User's Manual



R-Studio



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I Introduction to R-Studio

R-Studio is a family of powerful and cost-effective undelete and data recovery software. Empowered by new unique data recovery technologies, it is the most comprehensive data recovery solution for recovering files from <u>FAT/exFAT</u>, NTFS, NTFS5, ReFS/ReFS2+ (Windows), HFS/HFS+ and APFS (Macintosh), Little and Big Endian variants of <u>UFS1/UFS2</u> (FreeBSD/ØpenBSD/NetBSD/Solaris), <u>Ext2/3/4FS</u> and <u>XFS</u> (Linux) <u>partitions</u>. It functions on local and network disks, even if such partitions are <u>formatted</u>, damaged or deleted. Flexible parameter settings give you absolute control over the data recovery.

R-Studio Features System Requirements Contact Information and Technical Support R-Studio Registration and Activation Data Recovery Using R-Studio Basic File Recovery Advanced Data Recovery Mass File Recovery Volume Sets and RAIDs Data Recovery over Network R-Studio Technician/T80+ Technical Information and Troubleshooting R-Studio Emergency R-Studio Agent Emergency

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1.1 R-Studio Features

R-Studio is a family of file restoring utilities. It recovers files both on local drives and on drives on remote computers over network, even if their <u>partition</u> structures are damaged. A unique *IntelligentScan* technology and flexible parameter settings give you real control over the fastest data recovery ever seen.

R-Studio features:

- Standard "Windows Explorer" style interface.
- Host OS: An Intel-compatible platform running Windows 11 /10 /8.1/8 /7 /Vista /XP /2000 Windows Server 2019 /2016 /2012 /2008 /2003.
- Automatic check for updates.
- Remotely recovers data over network. Data can be recovered on network computers running Windows, MacOS X, Linux, and some other UNIX OS.
- Supported <u>file systems</u>: Windows: FAT12/16/32, <u>exFAT</u>, NTFS, NTFS5, ReFS/ReFS2+ file (Resilient File System); ReFS for Windows Server 2019 (including deduplication).
 macOS: HFS, HFS+, HFSX, APFS, FAT/exFAT;

Linux and UNIX: <u>Ext</u>2/3/4FS and <u>XFS</u> (created by Linux or other OS), and <u>UFS1, UFS2, UFS</u> <u>BigEndian</u> (used by the FreeBSD, OpenBSD, and NetBSD operating systems);

CD/DVD/Images: ISO9660;

Magnetic tape devices: UStar/Tar/CPIO/Pax (R-Studio Technician/T80+).

Please note, that when a file is being deleted on the HFS, HFS+, HFSX file systems, the computer completely removes all system information on it, and there is no way to recover the deleted file except by using the **Extra Search for Known File Types** option. Nevertheless, **R-Studio** is able to read existing files from HFS, HFS+, and HFSX disks.

- Support for <u>known file types</u>. **R-Studio** searches for files with known typical features of their structures allowing the user to search for files on devices with unknown files systems, including an HD, CD, DVD, floppy disk, Compact Flash Card, USB drive, ZIP drive, Memory Sticks, and other removable media.
- <u>Scan process</u> visualization. While scanning an object, **R-Studio** graphically shows items that have been found, including files of known types, FAT and NTFS MFT records, boot records, etc.
- Mass file recovery support.
- Support for estimation of chances for successful recovery.
- Support for file recovery lists lists of files that can be exported from **R-Studio**, manually edited, and then loaded back. Files from such lists will be automatically marked for recovery.
- APM, Basic and GPT support. **R-Studio** supports all three partition schemes used to define the low-level organization of data on drives <u>formatted</u> for use with Macintosh computers.
- Dynamic disk support.
- Support for <u>BitLocker Drive Encryption</u> encryption, both for the ToGo and System Drive Encryption methods.
- Software RAID, volume set, and stripe set support. Support for RAID 6, RAID 5, and RAID 4 layouts. Support for custom RAID layouts. Parameters like block size and order, offsets, and even the number of stripe blocks can be explicitly specified. Custom RAID configurations can be saved.
- Support for <u>Windows Storage Spaces</u>, created by Windows 8/8.1 and Windows 10/Threshold 2/? Anniversary/Fall Creators updates.
- Support for Apple software RAIDs
- Support for <u>Apple CoreStorage/FileVault/Fusion Drive Volumes</u>
- Support for <u>Linux mdadm Volumes</u>
- Support for Linux LVM/LVM2
- Support for Intel Software RAID.
- Hardware RAID, volume set, and stripe set support.
- RAID consistency check (check for valid data parity values).
- Automatic RAID parameter recognition.
- Creates image files for an entire drive, logical disk, or its part. Such image files can be processed like regular drives. In addition to simple exact object copies (Plain images) and <u>R-Drive Image</u> compatible images, it can create other disk image and virtual disk formats, together with opening several file formats "read-only". You may read more about those formats and their properties on the <u>Supported Virtual Disk and Disk Image</u> <u>Formats</u> page. Images may be saved either on the local or remote computer. Image creation can be stopped and then resumed. R-Studio can scan objects while creating their images. R-Studio Technician/T80+ supports <u>multi-pass</u> and <u>runtime</u> imaging. Images can be mounted in the operating system as devices which makes their content accessible to any program including any other data recovery software.
- Recovers files on damaged or deleted partitions.

- Recovers compressed files (NTFS, NTFS5).
- Recovers encrypted files (NTFS5).
- Recovers <u>alternative data streams</u> (NTFS, NTFS5).
- Support for NTFS deduplication, including Windows Server 2022.
- Support for file system journal on the HFS+ and Ext3/4fs file systems.
- Support for soft updates journal on the UFS file system.
- Support for extended attributes on the HFS+, Ext3/4fs, XFS, and UFS file systems.
- Support for compressed files on the HFS+ file system.
- Recognizes localized names.
- Recovered files can be saved on any (including network) drives visible to the host operating system.
- A hexadecimal disk and file viewer/editor supporting NTFS file non-resident attribute editing. Data alteration is available on the **Technician/T80+** and **Corporate** versions only.
- Patterns (or templates) in the hexadecimal editor allowing for parsing the data according to specific data structure. Such patterns may be custom-created.
- File preview. Most of the file types can be previewed to estimate recovery chances.
- Enhanced remote host scanning procedure. In the **R-Studio** network versions, data is analyzed on the remote host rather than on the home host, thereby the speed of recovery procedure greatly increases. The scan information may be saved either on the local or remote computer.
- Recovered files may be saved on a drive on a connected remote computer rather than be transferred over network to the local one. Saving recovered files on a remote computer may be useful when the remote computer has a healthy drive because you do not have to transfer files over network. It may be an external USB drive, for example.
- Support for S.M.A.R.T. (Self-Monitoring, Analysis and Reporting Technology) attribute monitoring.
- **R-Studio Emergency***. The **R-Studio Emergency** version starts from a floppy or compact disc when it is necessary to recover data on a computer, on which Windows cannot start up because its system files are corrupted or deleted.

*The **R-Studio Emergency** is a part of the **R-Studio** software package. When you buy an **R-Studio** single license you may run the **R-Studio Emergency** or/and install the **R-Studio** Windows version on one PC only and you may not transfer the licensed software to another PC.

R-Studio features available only in the Technician/T80+ versions:

- Magnetic tape devices file system: UStar/Tar/CPIO/Pax.
- **<u>USB Activation</u>** (Technician only)
- Portable version
- Show Files (Advanced) to process problematic hard drives with minimum disk access.
- Multitasking. Several data recovery tasks can be run simultaneously.
- Additional Recovery Options
- Hidden Devices. Some unnecessary devices can be hidden in the Main panel.
- Extended file information
- <u>Symbolic link recovery options</u>
- <u>Drive Copy Wizard</u> to copy any object in the Drives panel to any other object. In addition to byte to byte copy of any object visible in the Drives panel, smart copy of partitions and drives is available.
- <u>Mounting Virtual Objects to the System as Virtual Drives</u>
- <u>I/O Monitor and Sector Map files</u>.

- <u>Multi-pass</u> and <u>Runtime</u> imaging
- <u>Reverse RAIDs</u>: A technique that decomposes real drive objects into virtual RAIDs. Then those components of reverse RAID scan be processed like real objects. They can be viewed, edited, imaged, copied to physical devices.
- Support for third-party hardware.
- Forensic mode.
- File recovery over Internet.

R-Studio recovers files:

- That have been removed without the Recycle Bin, or when the Recycle Bin has been emptied;
- Removed by virus attack or power failure;
- After the partition with the files was reformatted, even for a different file system;
- When the partition structure on a drive was changed or damaged. In this case, **R-Studio** can scan the drive trying to find previously existed partitions and recover files from found partitions.
- After unsuccessful Windows update.
- From drives with <u>bad sectors</u>. In this case, **R-Studio** can first copy the entire drives or its part into an image file and then process such image file.

R-Studio can create image files for an entire drive, logical disk, or its part. Such image files can be processed like regular drives. Images are very useful if there is a risk of total data loss due to hardware malfunction. If bad blocks are constantly appearing on a drive, the only way to save the data is to immediately create an image of that drive. All data search, scan and recovery can be done from this image.

To learn more about the IntelligentScan technology, go to the IntelligentScan topic .

1.2 System Requirements

- An Intel-compatible platform running Windows 11, 10 /8.1/8 /7 /Vista /XP /2000 Windows Server 2022, 2019 /2016 /2012 /2008 /2003
- At least 256 MB of RAM, a mouse, and enough disk space for recovered files, image files, etc.
- The administrative privileges are required to install and run R-Studio utilities.
- A network connection for data recovering over network.

1.3 Contact Information and Technical Support

To obtain the latest version of **R-Studio**, go to:

Product Site: <u>http://www.r-tt.com</u> Sales Department: <u>sales@r-tt.com</u>

R-Studio Technical Support Team is available 24 hours a day, seven days a week, and has an average response time less than 4 hours.

Tech. Support: <u>support@r-tt.com</u> Send your support request to: <u>http://www.r-tt.com/SupportRequest.shtml</u>

File Recovery FAQ: <u>http://www.r-tt.com/File_Recovery_FAQ.shtml</u> R-TT Forum: <u>http://forum.r-tt.com</u>

1.4 R-Studio Registration and Activation

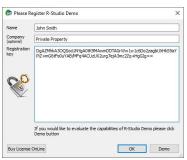
All **R-Studio** licenses require online activation via the Internet for the registration procedure after installation/reinstallation. **R-Studio Standalone** and **Corporation** can then be used offline, no reactivation is required, except for **R-Studio Emergency** registration or the periodic license verification that runs in the background. **R-Studio T80+** requires activation every time a new data recovery secession starts. If you don't have an Internet connection on the computer where **R-Studio** to be installed and activated, you'll need to complete activation manually using QR-code.

R-Studio software never transmits your data to R-TT, except for the information specified in our Sales Policy.

The **R-Studio Technician** license provides the ability to create <u>an activation USB stick</u>, which allows the license to activate/verify the license in a completely offline mode using a supported USB stick selected by the licensee.

- 1 Upon receiving the email with the Registration key, open the attachment, then select and copy the key.
- 2 Start R-Studio. The Please Register R-Studio Demo dialog box will appear.
- 3 Enter your registration information and then paste the Registration key. Do not try to type it manually.

Please Register **dialog box**



3 Click the OK button and wait for the Registration successful message.

If you don't have an Internet connection.

You need to manually obtain an activation code to complete the registration.

The Online Activation dialog window will appear next time you'll start **R-Studio**.

R-Studio Online Activation dialog box

	Your product key requires online activation.
	An error occurred during online activation: Host not found Check Internet connection and retry.
Manual activation code en	https://secure.r-tt.com/cgi-bin/UserConsole? mks=04d38kc20a0c5083311fa2b3590d4b3447461cct http://wsi
Manual activation code en	https://secure.r-tt.com/cgi-bin/UserConsole? mks=04d38kc20a0c5083311fa2b3590d4b3447461cct http://wsi

You may copy the url with the activation information and go to it on another computer connected to the Internet, obtain the activation code, and enter it into the respective field on the dialog box.

You may also use your smartphone to activate **R-Studio**. Scan the QR-code and go to the specified URL, obtain the activation code, and finish program activation.

1.5 R-Studio Main Panel

When **R-Studio** starts, its main panel appears on the Windows desktop.

				R-	Studio	Main panel	
😂 R-STUDIO - D	evice view						– 🗆 X
<u>Drive</u> <u>Create</u>	<u>T</u> ools <u>V</u> iew <u>H</u> el	p					
C Refresh Show Fi	iles Scan Partition	Search Create I) Image C	pen Image	Create Reg	ion RAIDs Connect To Remote	Remove
Device view							
Devic	e/Disk	Label	/Interfa	Start	Size	Name	Value
🗸 💻 Local Com	nputer				1	Drive Type	Physical Drive, Disk
> SSO KINGS	TON SA400S37120	50026B77843A	#0 SATA	2, SSD	111.79 GB	Name	Hitachi HTS545016B9SA00 PBBOC64G
> 🗵 TOSHI	BA DT01ACA100	44H5ATLKS	#1 SATA	2, HDD	931.51 GB	OS Object	\\.\PhysicalDrive2
🗸 💹 Hitach	ii HTS545016B9SA	100713PBPB08	#2 SATA	2, HDD	149.05 GB	R-Studio Driver	WinNT\Handle\Physical
🥪 l:		NTFS-Test	NTFS	512 KB	28.69 GB	Size	149.05 GB (312581808 Sectors)
🥯 F:	Ψ.	FAT32-TEST	FAT32	28.69 GB	26.27 GB	Logical Sector Size	512 Bytes
🥯 <mark>G</mark> :		FAT-TEST	FAT16	54.96 GB	2.01 GB	Physical Sector Size	512 Bytes
🧼 E:	Ψ	EXFAT	FAT32	56.97 GB	11.72 GB	Partition Size	149.05 GB (312581808 Sectors)
🥪 Pa	rtition5 🔹 🔻	HFS	HFSX	68.69 GB	21.48 GB	I/O Retries	Default 🔹
🥪 Pa	rtition6 🔹 🔻	EXTFS	Ext4	90.17 GB	25.02 GB	✓ Drive Control	
🗸 🥪 Pa	rtition7 🔹	XFS	XFS	115.19 GB	33.86 GB	Maximum Transfer	128 KB 👻
*	Reformatted1		NTFS	0 Bytes	33.86 GB	I/O Block Size	512 Bytes 👻
✓	0LM024 HN-M101	S314J90DA25783	#3 USB,	HDD	931.51 GB	Buffer Alignment 4	4 Bytes 👻
🧼 H:		VirtMach	exFAT	17 KB	931.51 GB	Y Physical Drive Geometry	
🗸 🏷 SanDis	sk Ultra Fit 1.00	4C5300011103	#4 USB		114.56 GB	Cylinders	19457
🥪 J:	•	exFAT-media	exFAT	16 KB	114.56 GB	Tracks Per Cylinder	255
						Properties S.M.A.R.T.	
.og							:
Туре	Date	Time				Text	
i) System	2/21/2024	9:23:35 AM	Success	fully loaded	user's file ty	pes definitions from "C:\Program F	Files (x86)\R-Studio Technician\Presets\UserKnownFile
1) System	2/21/2024	9:23:35 AM	Success	fully loaded	user's RAID	layouts from "C:/Program Files (x8	6)/R-Studio Technician/Presets/RAID6RS.xml"
Ready							

Drives panel: You can select an object by clicking it.

Device/Disk		Label	FS/Interface	Start	Size
🖳 Local Computer					
 KINGSTON SA400S37120G 03090005 		50026B77843A5618	#0 SATA2, S	SD	111.79 GB
EFI system partition	•		FAT32	1 MB	100 MB
Microsoft reserved partition	•			101 MB	16 MB
🥯 C:	•	System	NTFS	117 MB	111.18 GB
See Windows Recovery Partition	•		NTFS	111.29 GB	508 MB
TOSHIBA DT01ACA100 MS2OA750		44H5ATLKS	#1 SATA2, H	DD	931.51 GB
🥯 D:	•	Data	NTFS	1 MB	931.51 GB
 Hitachi HTS545016B9SA00 PBBOC64G 		100713PBPB08ECE4XS0F	#2 SATA2, H	DD	149.05 GB
🥯 E	•	NTFS-Test	NTFS	512 KB	28.69 GB
See E	•	FAT32-TEST	FAT32	28.69 GB	26.27 GB
🧼 G:	•	FAT-TEST	FAT16	54.96 GB	2.01 GB
⇔ E	•	EXFAT	FAT32	56.97 GB	11.72 GB
Service Partition 5	•	HFS	HFSX	68.69 GB	21.48 GB
Se Partition6	•	EXTES	Ext4	90.17 GB	25.02 GB
Y 🖙 Partition7	•	XFS	XFS	115.19 GB	33.86 GB
🔆 Reformatted1			NTFS	0 Bytes	33.86 GB
ST1000LM024 HN-M101MBB 2BA30001		S314J90DA25783	#3 USB, HDD)	931.51 GB
🥯 H:	•	VirtMach	exFAT	17 KB	931.51 GB
✓ SanDisk Ultra Fit 1.00		4C530001110316108204	#4 USB		114.56 GB
⇔ J:	-	exFAT-media	exFAT	16 KB	114.56 GB

A logical disk may be represented by its name or its partition.



Properties tab:

This tab shows the properties of an object selected in the Drives panel.

Na	ime	Value
	Drive Type	Physical Drive, Disk
	Name	Hitachi HTS545016B9SA00 PBBOC64G
	OS Object	\\.\PhysicalDrive0
	R-Studio Driver	WinNT\Handle\Physical
	Size	149.05 GB (312581808 Sectors)
	Logical Sector Size	512 Bytes
	Physical Sector Size	512 Bytes
	Partition Size	149.05 GB (312581808 Sectors)
	I/O Retries	Default
~	Drive Control	
	Maximum Transfer	128 KB
	I/O Block Size	512 Bytes
	Buffer Alignment	4 Bytes
~	Physical Drive Geometry	
	Cylinders	19457
	Tracks Per Cylinder	255
	Sectors Per Track	63
	Sector Size	512 Bytes
	Partition Layout Sector Siz	e 512 Bytes
Y	Device Identification	
	Vendor	Hitachi
	Product	HTS545016B9SA00
	Firmware	PBBOC64G
	Serial Number	100713PBPB08ECE4XS0F
~	IDE Properties	
	Size	149GB (312581808 LBA)
	Sector Size	512
	Device Type	HDD 2.5" 5400 RPM
	Interface	SATA 2.6, 1.5 Gb/s
	Standard	ATA8-ACS
	Features	S.M.A.R.T., APM, AAM, LBA48, NCQ
¥	SCSI Address	
	Port Number	2
	Path Id	1
	Target Id	0
	Lun	0
	Bus Type	SerialATA-II

Depending on the selected object, information on this Properties tab may vary.

The Properties tab names and values are described in detail on the Properties tab topic.

Log panel

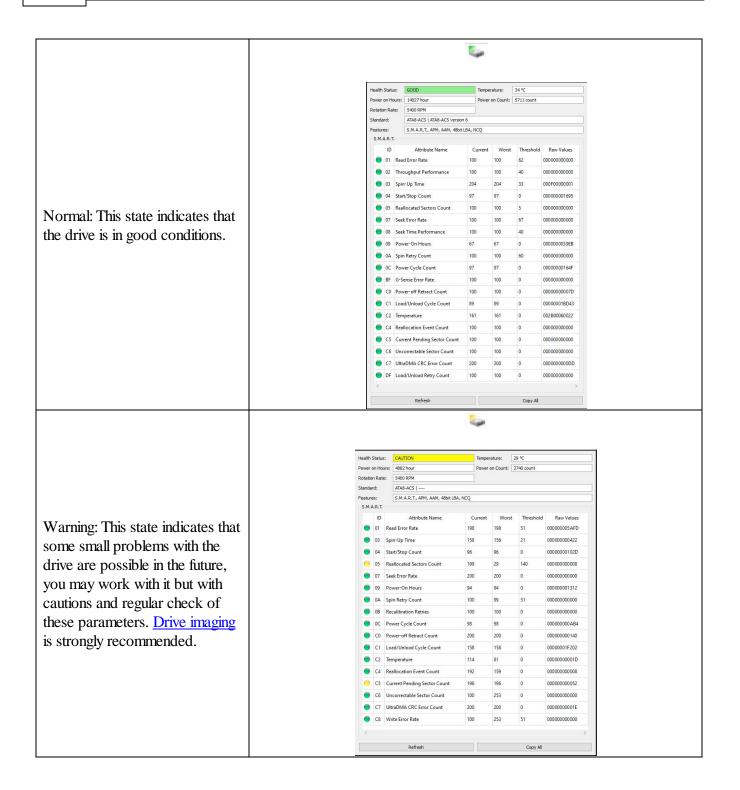
>
esets\UserKnownFile
AID6RS.xml"

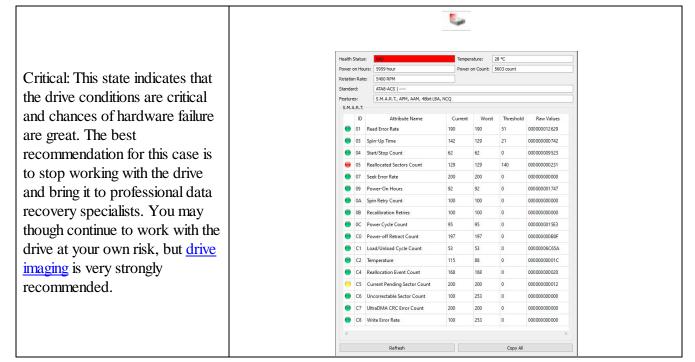
S.M.A.R.T. Info for a Drive

R-Studio shows drive <u>S.M.A.R.T.</u> states using their icons. You may copy all S.M.A.R.T. attributes and paste them into a text editor.

■ Drive S.M.A.R.T. states and icons

8





When a drive is selected in the **R-Studio** main panel, an additional S.M.A.R.T. tab will appear. You may view the detailed **S.M.A.R.T.** data of the drive.

S.M.A.R.T. (Self-Monitoring, Analysis and Reporting Technology) is a technology widely-used in drives and solid-state devices that monitors their reliability conditions to predict possible hardware failures.

Changing the program language

You may select the language of **R-Studio** main panel and its help. To do so, select an available language on **Change Language** on the **Help** menu.

Panel view options

You may set which panels and bars to enable/disable.

■ To enable/disable:						
Toolbar	Select/clear Toolbar on the View menu					
Status bar	Select/clear Status bar on the View menu					
Drive pane	Select/clear Device View on the View menu					
Properties pane	Select/clear Properties View on the View menu					
Log panel	og panel Select/clear Event Log on the View menu					
If you have several tab	in the right pane, you may easily switch to any of the tab by selecting on the View					
menu						
Properties Tab	to view the Properties tab					
Scan Information	to view the Scan Information Tab tab					
Tab						
Parents Tab	to view the Parents tab					
Properties	Select data types in which the data will be represented					



10

Connect

Click this button to connect to a remote computer on a network.



Refresh

Click this button to refresh the panels.



Scan

Click this button to start scanning a selected object.



Partition Search

Click this button to start fast searching for lost and deleted partitons.



Show Files

Click this button to start enumerating files on a selected object.



Open Image

Click this button to open a previously created image.



Create Image

Click this button to create an image of a selected area.



Create Region

Click this button to create a region on a selected disk.



RAIDs

Click this button to create a virtual volume set or RAID.

Select an appropriate type from the menu.



Remove

Click this button to remove a selected object in the main panel.

The button may change its appearance and title depending on the context.

Sometimes, there may be a lot of similar objects in the Drives panel. Those may be components of a RAID, for example. You may turn numerical indexes for such objects to distinguish them better. Those indexes will appear before the object names in the Drives panel.

To turn the numerical indexes on/off, go to the **Device** item on the **View** menu, and select/clear:

Show Physical Drives Indexes Show All Objects Indexes

to display the indexes only for drives to display the indexes for all objects in the Drives panel

		Device/Disk		Label	FS/Interface	Start	Size
	[0] L	ocal Computer					
~	<u>in</u> [-	4] KINGSTON SA400537120G 03090005		50026B77843A5618	#0 SATA2, St	SD	111.79 GB
	4	[23] EFI system partition	•		FAT32	1 MB	100 MB
	4	[24] Microsoft reserved partition	•			101 MB	16 MB
	4	[25] C:	•	System	NTES	117 MB	111.18 GB
	4	[26] Windows Recovery Partition	•		NTES	111.29 GB	508 MB
~	21	5] TOSHIBA DT01ACA100 MS2OA750		44H5ATLKS	#1 SATA2, H	DD	931.51 GB
	4	[27] D:	•	Data	NTFS	1 MB	931.51 GB
~	2	6] Hitachi HTS545016B9SA00 PBBOC64G		100713PBPB08ECE4XS0F	#2 SATA2, H	DD	149.05 GB
	4	[28] I:	•	NTFS-Test	NTFS	512 KB	28.69 GB
	4	≥ [29] F:	•	FAT32-TEST	FAT32	28.69 GB	26.27 GB
	4	≥ [30] G:	•	FAT-TEST	FAT16	54.96 GB	2.01 GB
	4	≥ [31] E:	•	EXFAT	FAT32	56.97 GB	11.72 GB
	4	[32] Partition5	•	HFS	HFSX	68.69 GB	21.48 GB
	4	[33] Partition6	•	EXTES	Ext4	90.17 GB	25.02 GB
	v 4	[34] Partition7	•	XFS	XFS	115.19 GB	33.86 GB
		🔆 [37] Reformatted1			NTFS	0 Bytes	33.86 GB
~	1	7] ST1000LM024 HN-M101MBB 2BA30001		S314J90DA25783	#3 USB, HDD)	931.51 GB
	4	[35] H:	•	VirtMach	exFAT	17 KB	931.51 GB
~	0	8] SanDisk Ultra Fit 1.00		4C530001110316108204	#4 USB		114.56 GB
	4	▶ [36] J:	•	exFAT-media	exFAT	16 KB	114.56 GB

You may select the units in which object's start and size are displayed

To select the units

- 1 Select Devices on the View menu
- 2 Select the units in which you want to see object sizes.

You may select Show as Bytes Show as Sectors Show as Bytes and Sectors

Depending on the task **R-Studio** performs, its panel may vary. Those panels are described in appropriate topics. The Properties tab names and values are described in detail on the **Properties tab** topic.

The general settings can be set on the <u>Settings</u> dialog box.

You may also copy the object's information displayed in the Drives panel. Right-click the object on the necessary column and select **Copy Device/disk**, **Copy Label**, and so on.

R-Studio has two operation modes:

File search on a partition (including recently found during drive scan).

In this mode, **R-Studio** analyzes MFTs on NTFS partitions, FATs on <u>FAT</u> partitions, and SuperBlocks on Ext2/3/4FS partitions. Then it displays all files which records have been found in the analyzed tables. Then recently deleted files, which records still remain, can be recovered. If files have not been found, that means that their records have been deleted. In this case, the drive must be scanned.

File search supports <u>file masks</u> and <u>regular expressions</u>. Multiple files in different folders can be found and recovered in one recover session.

R-Studio supports <u>mass file recovery</u>. There is no limit in the number of files that may be recovered during one session.

File content may be <u>previewed</u> before recovery.

File or drive binary data can be viewed and edited in the <u>Text/Bexadecimal editor</u>. Also can be viewed and changed all attributes for NTFS files.

Drive scan, searching for partitions.

In this mode, **R-Studio** scans the entire drive or its part. Using a number of statistic and deterministic criteria known as *IntelligentScan* technology, it determines existing or existed partitions on the drive, and their <u>file</u> <u>systems</u>. It is also possible to add new partitions, by setting manually all required parameters.

A drive can be scanned through several successive scans, each with its own parameters. **R-Studio** accumulates the information from successive scans and keeps track of changes in the information obtained from

different scans. The information obtained from the disc scan can be stored in a file. It may be loaded and processed later at any convenient time.

1.6 R-Studio Settings

You may specify some global setting for R-Studio on the Settings dialog box. You may reach it by selecting Settings on the Tools menu.

Main

Main dialog box

Main	System options		
File Systems		Debug mode Use dark theme	Enable forensic mode (de
Symbolic Links	Edit options		
Log	Enable write		
Known File Types	User paths		
Bad Sectors	File types	i)\R-Studio Technician\Prese	ts\UserKnownFileType1.xml
	RAID layout presets	n Files (x86) \R-Studio Techn	iidian\Presets\RAID6RS.xml
Memory Usage	Text/hexadecimal editor templates	C:\Program Files (x86)\R-St	tudio Technician\Templates\
	Mask presets	iles (x86)\R-Studio Technicia	n\Presets\maskpresets.xml
			nan distances
			Reset all hidden notific

■ Main settings

System Options	
Auto-refresh Drive Tree	If this box is selected, R-Studio automatically refreshes the list of connected drives. You may disable it if R-Studio experiences problems with connected devices.
Debug Mode	If this check box is selected, R-Studio displays an additional command Create FS Snapshot on the shortcut menu for an object with a <u>file system</u> . An FS Snapshot contains system data for the file system only (file descriptions without file contents). If a problem appears, this snapshot can be sent to R-Studio technical support to identify the problem. This option greatly slows R-Studio .
Enable forensic mode (demo)	If this check box is selected, R-Studio turns on the <u>Forensic mode</u> in demo mode.
Check for update	If this box is selected, R-Studio will automatically check for updates.
Use dark mode	If this box is selected, R-Studio will change to its dark mode.
Edit options	
Enable Write	If this check box is selected, R-Studio Technician/T80 + enables you to write any changes made in the <u>Text/Bexadecimal editor</u> . It enables <u>wiping objects</u> in R-Studio and R-Studio Corporate .
Max changes buffer size	Maximum amount of data stored for the Undo command in the <u>Text/</u> ? <u>hexadecimal editor</u> . R-Studio Technician (/ T80 +)
User paths	

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File types	Specifies a file name and path to the file where the descriptions of user's known file types are stored. You need to re-start R-Studio or click the Reload User's File Types button on the Known File Types tab for the new file to take effect.
RAID layout presets	Specifies a file name and path to the file where the descriptions of user's <u>RAID layouts</u> are stored
Text/nexadecimal editor templates	Specifies the path for <u>pattern description files</u> for <u>Text/Bexadecimal</u> <u>editor</u> .
Mask presets	Specifies a file name and path to the file with file mask presets.
Reset all hidden notifications	This button enables all previously disabled notification and warning messages.

File Systems

File Systems **dialog box**

Settings				>
Main	Default en	coding for HFS volumes		
File Systems	Encoding:	MacRoman		•
Symbolic Links		coding for Ext2/Ext3/Ext4/UFS volumes		
OG Log	Encoding:	Utf8		•
Known File Types	File system	i sorting a any sorting (Use on huge file systems)		
Bad Sectors				
Memory Usage				
		Qk	Gancel A	

□ File Systems

Default encoding for HFS volumes	
Encoding	Select the national encoding for the HFS partitions.
Default encoding for <u>Ext</u> 2/Ext3/? Ext4/ <u>DFS</u> volumes	
Encoding	Select the national encoding for the Ext2, Ext3, Ext4, and UFS partitions.
File system sorting	
Disable any sorting	Select this option if the number of files on the drive is so large that R-Studio sorts files in selected folders for too long time.

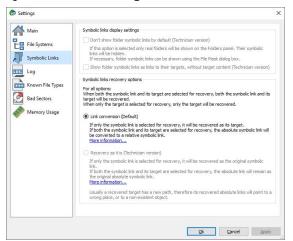
Symbolic Links

All settings are available in the Technician/T80+ version only!

Symbolic links (of symlinks for short) are object that contains references to other files or folders directory in the form of absolute or relative paths and that affect pathname resolution. For example, if a symlink c:

\ProgramData\Documents points to D:\Recovered Files\Root\Users\Public\Documents, entering it will result in entering D:\Recovered Files\Root\Users\Public\Documents.

Symbolic Links **dialog box**



Symbolic Links

Link conversion (Default)	
Both an object and its symbolic link are selected for recovery:	If both an object and its symbolic link are selected for recovery, both the object and its symbolic link will be recovered. The file path in that symbolic link will be converted from absolute to relative. Example: If the object C:\ProgramData\Documents is a symbolic link to C:\Users\Public\Documents, it will be converted to a symbolic link to\Users\Public\Documents. Therefore, the symbolic link will point to its object regardless of the place to which the object has been recovered.
Only an object is selected for recovery:	Only the selected object will be recovered.
Only a symbolic link is selected for recovery:	The selected symbolic link will be recovered as a real object.

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Log

Log dialog box

Main	Logging		
File Systems	Maximum messages in the Event Log:	1000	-
Symbolic Links	File name: C:\TMP\Log.log		
Log	Туре	Severity	
Known File Types	File Recover	and the second s	Information
Bad Sectors	File System Disk	Warning Warning	Success
Memory Usage	Partition Vetwork		

Log options

Logging	
Maximum messages in the Event Log	Specifies the maximum number of messages R-Studio will keep in the event log
Save log to file	If this check box is selected, R-Studio writes its log into a log file specified in the File name field.
File name	Specifies the file name in which the log will be saved.
Туре	
File	If this check box is selected, R-Studio logs all events with recovered files.
File System	If this check box is selected, R-Studio logs all events with the file system.
Partition	If this check box selected, R-Studio logs all events with partitions.
Recover	If this check box is selected, R-Studio logs all events with the recovering processes.
Drive	If this check box is selected, R-Studio logs all events with drives.
Network	If this check box is selected, R-Studio logs all events with network operation.
Severity	
Error	If this check box is selected, R-Studio adds error messages into its log.
Warning	If this check box is selected, R-Studio adds warning messages into its log.
Information	If this check box is selected, R-Studio adds information messages into its log.
Success	If this check box is selected, R-Studio adds success messages into its log.
	VRITE A LOG FILE ON THE DISK FROM WHICH YOU RECOVER DATA!!! Or you may obtain unpredictable results and lose all your data.
	Recover dialog box the Condense successful restoration events check box is selected, the only Error, Warning, and Information event messages.

Known File Types

Known File Types **dialog box**

Main	Program wi	additionally search for	the following lost files while s	ranning	
In Main	-		the following lost files while s	Larining	1.00
File Systems		ch keyword			×
	>	Archive			
Symbolic Links	>	Development files			
	> 🗹	Disk images			
Log	>	Document			
N	>	Document Databas			
Known File Types	2	Document Spread			
Bad Sectors	> 🗹	Executable, Library	DLL		
	> 🛛	Font			
Memory Usage	2	Graphics, Picture			
,,, .	Internet related files Multimedia				
		Multimedia Multimedia Audio			
		Multimedia Video			
		Multimédias			
		Other files			
		o cher mes			
		Reset	Select All	Edit User's File	Types
	Reset 1	to Recommended	Clear All	Reload User's F	ie Types

You may specify which <u>Known File Types</u> will be enabled/disabled by default. You may also specify know file types to search for during a specific <u>scan session</u> on the <u>Scan</u> dialog box.

■ Known File Types

Reset	Click this button to reset the settings to the previous state. Active until the Apply button is clicked.			
Select All	Click this button to select all file types in the list.			
Clear All	Click this button to clear all file types in the list except some predefined ones.			
Reload User's File Types	Click this button to apply new file types after the user's file types file has been changes from the Main tab.			
Edit User's File Types	Click this button to add a new customer's Known File Type, or to edit already existing ones. See the <u>Customizing File Types</u> help page for more details.			
Reset to Recommended	Click this button to reset the settings to the default (Recommended) file set.			

Source of the search for required file types if necessary

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Search for the doc pattern

	Program will additionally search for t	he following lost files while so	anning
File Systems Symbolic Links	Document Document Document Databas Microsoft Access 200 OpenOffice Base Do	7 XML Document (.accdt)	
Bad Sectors Memory Usage	Openovine Spread Apple Work Number Microsoft Exel 2007 Microsoft Exel 2007 Microsoft Exel 2002 Micros	heet s Document (.numbers) (ML Document (.xlsx) ment (.xls) es tmt) nU	
	Reset	Select All	Edit User's File Types

Bad Sectors

Bad Sectors dialog box

ettings		
Main	Default read retries count: 0 文 🗆 Set default read retries count for all	drives
File Systems Symbolic Links	ANSI: 8	
Symbolic Links	HEX: e5	
Log		
Known File Types		
Bad Sectors		
Memory Usage		
	Ok Ca	ncel Apply

■ Bad Sectors settings

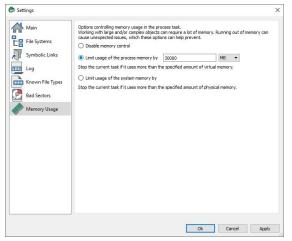
 Default read retries count Default read retries count If Default read attempts is set to 0, the entire part with bad sectors will be filled with the specified pattern. If Default read attempts is set to a non-zero value, R-Studio reads again that part sector by sector, repeating the attempts the specified number of times. If R-Studio still cannot read a bad sectors will be filled with the specified pattern. In this case only the bad sectors will be filled with the pattern, but that extremely slows the drive read process.

	For example, if you set Default read retries count to 1, a bad sector will be read 2 times.
Set default read retries count for all drives	Click this button to reset Default read retries count for all drives to the default value.
Pattern to fill bad blocks	Specifies a default pattern R-Studio will use to fill bad sectors in files to recover, in <u>images</u> , or when showing data in the <u>Text/Rexadecimal</u> <u>viewer/editor</u> . You may specify the pattern either in the ANSI or Hex data format. Note: R-Studio will never ever try to write anything on the drive from which data is to recover or an image is to create.

Memory Usage

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Memory Usage dialog box



These settings control how much memory **R-Studio** uses for its work. They help preventing **R-Studio** from locking when trying to perform very memory-consuming tasks like scanning large drives or processing file systems with a lot of files.

Memory Usage settings

Disable memory control	If this option is selected, the memory control is disabled.
Limit usage of the process memory by	If this option is selected, R-Studio will automatically stop performing the task when the amount of used virtual memory reaches the specified value.
Limit usage of the process memory by	If this option is selected, R-Studio will automatically stop performing the task when the amount of used physical memory reaches the specified value.

You may see how much memory **R-Studio** actually uses on the <u>Memory Usage</u> dialog box.

II Data Recovery Using R-Studio

Many specific data recovery cases are discussed in the R-TT's Data Recovery Guide.

Depending on the situation, data recovery may vary:

1. Recovery of deleted files that have resided on an existing logical disk

This can be done using **Basic File Recovery**.

2. Recovery of files that have resided on a data disk with a damaged file system, or on a previously deleted or re-formatted partition

If the file system on such <u>logical disk</u> is damaged, the operating system sees that logical disk as a <u>partition</u> without a valid <u>file system</u>. Such partition should be previously <u>scanned</u>. Also, it should be scanned if you want to recover data on a previously deleted or <u>reformatted</u> partition.

You may use <u>Fast Search for Lost</u> partitions if you want only to find partitions previously existed on the drive. It's much faster.

When the partition is scanned, a number of recognized partitions will appear. **R-Studio** shows them in different colors depending on which elements of the partition have been found.

- 🥪 F:	An existing logical disk or partition			
F: (Recognized12)	An existing logical disk or partition after drive scan			
Recognized18	A recognized partition. Both boot records and file entries are found for this partition			
Rec. Recognized22	A recognized partition. Only file entries are found for this partition			
Recognized16	A recognized partition. Only boot records are found for this partition			
Rec Recognized8	A fast found partition			
🖳 🧼 Empty Space21	Empty space on the object			
W DeletedPart1	A deleted partition			
Seaw Files	Files that have been found using scan for known file types (raw file search).			

Although such recognized partitions are virtual objects, files can be searched for and recovered from recognized partitions as from real logical disks using <u>Basic File Recovery</u>.

To successfully recover files from a recognized partition, it is necessary to find a right one which corresponds to the real logical disk on which the files resided. No strict rules can be applied to that, but the following considerations should be taken into account:

- If you are going to recover files from a **drive with a damaged file system**, most likely the right recognized partition will be a green one.
- If you are going to recover files from a **previously deleted** or **re-formatted partition**, most likely the right recognized partition will be a yellow one.

Also always check the recognized partition's file system, start point, and size. They should be the same for the recognized partition and real logical disk/partition. When in doubt, try to <u>preview</u> a couple of files from the recognized partition. If the files are seen correctly, this is the right partition.

- 3. Data recovery from a damaged system disk. The computer does not start up.
 - If this computer is on a network, create an **<u>R-Studio Agent Emergency</u>** startup disk for the computer, install **R-Studio** on another computer on the network, and recover data <u>over network</u>.
 - If this computer is stand-alone, create an **<u>R-Studio Emergency</u>** startup disk and use it to start up the computer and recover data. You may use external USB drives to store recovered files.

<u>R-Studio Features</u> <u>Contact Information and Technical Support</u> <u>Basic File Recovery</u> <u>Advanced Data Recovery</u> Mass File Recovery Volume Sets and RAIDs Data Recovery over Network Text/Bexadecimal editor Technical Information and Troubleshooting R-Studio Emergency R-Studio Agent Emergency

2.1 Basic File Recovery

NEVER TRY TO SAVE RECOVERED FILES/FOLDERS TO THE SAME LOGICAL DISK WHERE THEY RESIDE!!!

Or you may obtain unpredictable results and lose all of your data.

See the **Data Recovery Issues** topic for details.

Basic file recovery can be made for deleted files that has resided on an existing <u>logical disk</u> visible to the operating system. In all other cases, <u>Advanced Data Recovery</u> is required.

To recover deleted files from a logical disk (recognized partition),

1 Double-click a logical disk in the R-Studio's Drives panel to enumerate files on the disk

Other ways to enumerate files

• Select the disk and click the Open Drive Files button,

or

• Right-click the selected disk and select Open Drive Files on the shortcut menu,

or

• Select the disk and press the **F5** key.

or

• Select Open Drive Files on the Drive menu

If you try to enumerate files on a drive or another object without a valid file system on it, a Double-click a logical disk... message will appear. Select a logical disk on the object or <u>scan</u> the object.

> R-Studio will change its panel showing the disk's folders/files structure

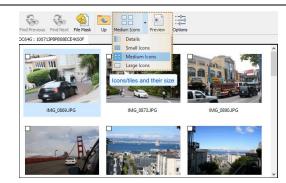
R-Studio analyzes data on the object and displays all files for which records have been found in the analyzed tables. If files have not been found, that means that their records have been deleted. To find such files, Advanced Data Recovery is required.

Please note that **R-Studio** shows only those files/folders that match a specified file mask.

🖃 R-Studio Main panel

Drive Eile Jools Yiew Help Composition Composition <thcomp< th=""><th>•</th><th></th></thcomp<>	•					
Report Aller Recover Revour	R-STUDIO - File view	– 🗆 X				
Response if lies Recover is account Marked Find Market Find Market Due Decks Preview Options Image: New York Find - Market HISSS50008850A00 PREDOCK Image: New York Recovery chances Image: New York New	Drive File Tools View Help					
Image: Second						
Name Recovery chances d sect: Size, Bytes Created Name Recovery chances d sect: Size, Bytes Created Name Recovery chances No 102,766,449 221/202. Recovery chances No 102,766,449 221/202. Nove Average Gragmented No 102,766,449 221/202. No No No No 102,766,449 221/202. Nove Average Gragmented No 102,766,449 221/202. No No No No 102,766,449 221/202. Nove Average Gragmented No 102,766,449 221/202. No No No No 002,766,449 221/202. Nove Average Gragmented No 102,766,449 221/202. No No No 004,002,01/66 Good Elisting file) No 102,766,449 221/202. No No 002,766,449 Cold Elisting file) No 102,766,442 221/202. No No 02,750,442 Cold Elisting file) No 22,523 221/202. No No 02,753 Cold Elis						
Image: Section of the seccore sectis the section of the section of the section o						
Strevelsion						
Image: Sector Processing Control Sector (Contents View Contents View Contents View Contents View Contents Contents Contents Contents Contents View Contents View Contents Contents View Contents Contents View Contents Conte						
Production Image: Product Produc						
System Volume Information System Volume Information Server Volume Information Signal Science Server Volume Informatio		☑ X ?est6.arc [F:\Root\SRECYCLE.BIN\?RICZIZ8.ar ● Above Average (Fragmented) No 102,760,448 2/21/202				
> Image South Status Sout						
Image: Second						
Image: Second						
In textual: In textual: Intervent Intervent </td <td></td> <td></td>						
Sorted by: Real Find All "File Stansions: doc", "Files to Recover" Good (Existing file) No 22,528 2/21/202 Wipe Test 3.doc Good (Existing file) No 22,528 2/21/202 Find All "File Stansions: doc", "Files to Recover" Good (Existing file) No 22,528 2/21/202 Find All "File Stansions: doc", "Files to Recover" Good (Existing file) No 22,528 2/21/202 Find All "File Stansions: doc", "Files to Recover" Good (Existing file) No 22,528 2/21/202 Modify Files to Recover(Wipe Test 3.doc Files to Recover(Wipe Test 3.doc No 22,528 2/21/202 No 22,538 2/21/202 Set 2/21/202 Set 2/21/202 Set 2/21/202 Modify Files to Recover(Wipe Test 3.doc Files to Recover(Wipe Test 3.doc Set 2/21/202 Read/Tiles to Recover(Wipe Test 3.doc Files to Recover(Wipe Test 3.doc Set 2/21/202 You may set which panels and bars to enable/disable. To enable/disable Total 13.19 GB n 399 files n 56 folders You may set which panels and bars to enable/disable Select/dlear Status bar on the View menu The Folders panel Select/dlear Event Log on the View menu The Files panel Select/dlear Find Results on the View	🗋 🦲 Metafiles					
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21

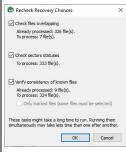


Recovery chances

R-Studio shows its estimates of chances for successful file recovery in the Rec column.

Recovery chances				
0	Undefined			
•	Good			
	Above average			
•	Average			
٠	Below average			
•	Bad			
TT 71				

When **R-Studio** has enumerated files, those estimates may not be accurate and aren't available for most files. You may improved them by right-clicking the root folder on the left pane, selecting **Recheck Recovery Chances** on the shortcut menu, and specifying required parameters.



The best estimations are though after scanning the disk/partition.

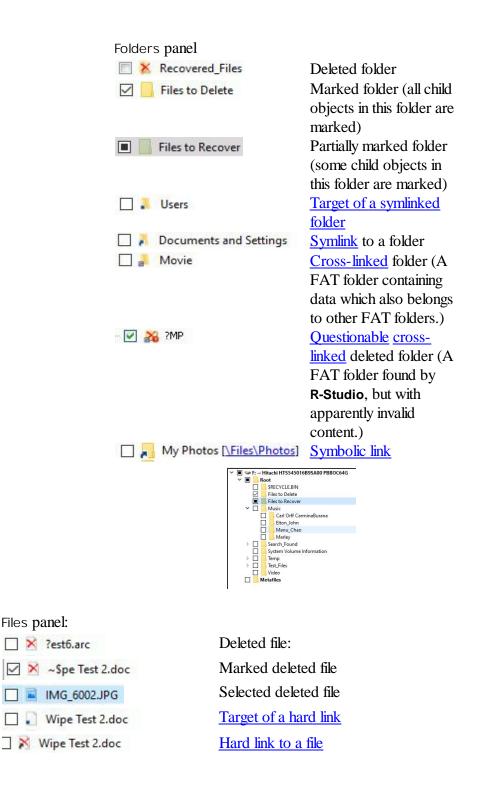
File Information

You may view some information about a file. Right-click the file and select Get Info on the context menu.

File Information

Location	G:/Files to Recover	
	[173]	
Parent Id:	and the second s	
	915.11 KB (937,070 Bytes)	
Flags:	valid first data offset	
Created:	12/4/2012 6:57:49 PM	
Modified:	5/17/2010 4:18:14 PM	
Accessed:	1/17/2019 12:00:00 AM	
1	File type: JPEG Digital Camera	
Recovery	chances: Good (Existing file)	

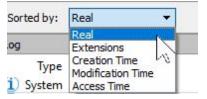
R-Studio Technician/T80+ shows much more information about a file. See the <u>Information about a File</u> topic for more details.



23

24

Name	Recovery chances	Bad sectors	Size, Bytes	Created	Modified	Accessed	FileId	Parentid
Rest2.arc [F:\Root\SRECYCLE.BIN\?IPP5DVN]	Undetermined (Unfragmented)	No	102,760,448	2/21/202	3/21/2005 10:22:26 PM	2/21/2024 12:00:00 AM	6400000000001a	644000000
?est4.arc [F:\Root\SRECYCLE.BIN\?R1PXCP2.arc]	Above Average (Fragmented)	No	102,760,448	2/21/202	3/21/2005 10:22:26 PM	2/21/2024 12:00:00 AM	6400000000001b	644000000
Rest5.arc [F:\Root\SRECYCLE.BIN\?R1MLPSB.arc]	Above Average (Fragmented)	No	102,760,448	2/21/202	3/21/2005 10:22:26 PM	2/21/2024 12:00:00 AM	6400000000001c	644000000
Rest6.arc [F:\Root\SRECYCLE.BIN\?RICZIZ8.arc]	Above Average (Fragmented)	No	102,760,448	2/21/202	3/21/2005 10:22:26 PM	2/21/2024 12:00:00 AM	6400000000001d	644000000
Rest7.arc [F:\Root\SRECYCLE.BIN\?RBFQSLS.arc]	Above Average (Fragmented)	No	102,760,448	2/21/202	3/21/2005 10:22:26 PM	2/21/2024 12:00:00 AM	6400000000001e	644000000
# IMG_6001.JPG	 Good (Existing file) 	No	656,192	2/21/202	5/17/2010 05:17:56 PM	2/21/2024 12:00:00 AM	64000000000012	644000000
IMG_6002.JPG	 Good (Existing file) 	No	937,070	2/21/202	5/17/2010 05:18:14 PM	2/21/2024 12:00:00 AM	64000000000013	644000000
☐ ₩ IMG_6003.JPG	Good (Existing file)	No	1,180,895	2/21/202	5/17/2010 05:18:36 PM	2/21/2024 12:00:00 AM	64000000000014	644000000
Outlook_recovered_by_R_Mail.pst	 Good (Existing file) 	No	163,840	2/21/202	5/14/2006 04:25:50 PM	2/21/2024 12:00:00 AM	64000000000022	644000000
test1.arc	 Good (Existing file) 	No	102,760,448	2/21/202	3/21/2005 10:22:26 PM	2/21/2024 12:00:00 AM	64000000000015	644000000
test3.arc	 Good (Existing file) 	No	102,760,448	2/21/202	3/21/2005 10:23:42 PM	2/21/2024 12:00:00 AM	64000000000016	644000000
Wipe Test 1.doc	 Good (Existing file) 	No	22,528	2/21/202	11/16/2003 11:13:20 PM	2/21/2024 12:00:00 AM	6400000000001f	644000000
Wipe Test 2.doc	 Good (Existing file) 	No	22,528	2/21/202	11/16/2003 11:13:20 PM	2/21/2024 12:00:00 AM	64000000000017	644000000
Wipe Test 3.doc	 Good (Existing file) 	No	22,528	2/21/202	11/16/2003 11:13:26 PM	2/21/2024 12:00:00 AM	64000000000018	644000000
Wipe Test 4.doc [F:\Root\SRECYCLE.BIN\?RA7ICE0.doc]	Above Average (Fragmented)	No	22,528	2/21/202	11/16/2003 11:13:20 PM	2/21/2024 12:00:00 AM	640000000000020	644000000
Wipe Test 5.doc [F:\Root\SRECYCLE.BIN\?RBOQ14E.doc]	Above Average (Fragmented)	No	22,528	2/21/202	11/16/2003 11:13:20 PM	2/21/2024 12:00:00 AM	64000000000021	644000000
Wipe Test 6.doc [F:\Root\SRECYCLE.BIN\?R7M5B4D.doc]	Above Average (Fragmented)	No	23,040	2/21/202	11/16/2003 11:14:08 PM	2/21/2024 12:00:00 AM	640000000000019	644000000



Sorted by:

You may also arrange the data as required: by their extensions, creation/modification time, or as a real file structure See Find and Mark Multiple Files for more details

Find Results panel



Select Drive

Click this button to return to the R-Studio main panel to select another drive.



Reopen Drive Files

Click this button to list files again.



ιÊ.

Recover

Click this button to recover selected folders/ files.



Recover Marked

Click this button to recover marked folders/ files.



Find

Click this button to find or/and mark a particular file/folder.



Find Next

Click this button to find the next object specified in the Find/Mark dialog box



Find Previous

Click this button to find the previous object specified in the Find/Mark dialog box.



File Mask

Click this button to specify a file mask.



Up

up.

Details

Small Icons

Hedium Icons

The **Unmask** button appears when a mask is applied. Click this button to remove the applied mask.



Details

8===

Vreview Option

Details

Click this button to move highlighting one folder

A button selecting how the files will be shown: Details, Small, Medium, Large Icons



Preview

Click this button to preview the selected

Options

Click this button to change Recovery

Options Options.

file.

The Log panel will show how many files and folders are on the object, and their size. You may specify which events will be shown in the log pane by setting a log filter.

Note: Metafiles are the file system's internal files invisible to any user, or file system data, which **R-Studio** represents as files. These files do not contain user data directly. Unless you want to scrutinize a disk file system, do not restore them.

If the Too many files... message appears, you may temporally stop file listing and browse through found files. Then you can resume file listing. You also may skip this file topic and continue. **R-Studio** will keep information about the entire file structure.

You may also copy the information about folders and files.

■ For the folder (the Folders pane):

Click Copy Folder:	To copy the folder's name
Click Copy Path:	To copy the path to the folder

■ For the file (the Contents pane):

Click Copy (Column	To copy the file's Name, Size, Created, etc., depending on which column is
Name):	selected
Click Copy Path:	To copy the file path.
Click Copy Selected	To copy all the columns of the selected file.
Text:	

Symbolic Link processing

R-Studio recognizes <u>symlinks</u> and processes them as specified in the <u>R-Studio Settings</u> panel. Go to the <u>Data Recovery Issues</u> topic for details.

You may open several disks/<u>partitions</u> in one tab. Read the <u>Opening several disks/partitions in one tab</u> help page for more details.

2 Select a file/folder to recover

You may select several files/folders in the same parent folder by pressing the **Shift** button and clicking the objects simultaneously.

■ Marking multiple files/folders from different parent folders manually:

Mark a file/folder to recover by clicking the box left to the object, or select **Mark** on the shortcut menu. You may mark several files/folders in different parent folders. You may mark all objects in the folder by selecting **Mark All** on the **Tools** or shortcut menu. To unmark an object, click the box left to the object once more or select **Unmark** on the shortcut menu. You may unmark all objects in the folder by selecting **Unmark All** on the **Tools** or shortcut menu.

The Log panel will show how many files and folders you have marked, and their total size.

R-Studio can search for a particular file. Go to the <u>Searching for a File</u> topic for details. If you need to find and mark many files, go to the <u>Find and Mark Multiple Files</u> topic for details.

File content may be previewed before recovery. Go to the Previewing Files topic for details.

If you do not find files that you want to recover:

Sometimes **R-Studio** can find the files but not the entire file paths to them. It puts such files into the **Extra Found Files** folder. Try to search for the files there. If that does not help, try to find them by using file search globally on the entire drive. Go to the <u>Searching for a File</u> topic for details

If you still cannot find files that you want to recover but are sure they have existed on the logical disk, you need to use <u>Advanced Data Recovery</u> to find them.

3 Click the Recover or Recover Marked button

Other ways to recover selected files

• Right-click the selected file/folder and select Recover or Recover Marked on the shortcut menu,

or

• Select Recover or Recover Marked on the File menu

or

• Press the **F2** button.

4 Specify recover options and output folder on the Recover dialog box and click the OK button

Recover dialog box

C Recover	×
Output folder: D:\Recovered_Files\	
Recover all marked files Recover only masked marked files	Marked for recovery: 111 files and 41 folders. Total size: 270.33 MB. Hidden from recovery by the applied mask: 257 files. Total size 16.91 GB.
Main Advanced Additional C	Dutput Folders Post Actions
Condense successful restoration	events Recover glternative data streams
Restore folder structure	Recover gecurity
Restore real folder structure	Recover extended attributes
Restore from root	Skip files with bad sectors
Recover metafiles	Do not recover duplicate files from Extra Found Files
Open local folder (folders) when	done
Reset To Defaults	Ok Cancel

Recover (Advanced) dialog box

tput folder: D	Recovered_Files		
Recover all ma Recover only	arked files masked marked files	MB.	les and 41 folders. Total size: 270.33 e applied mask: 257 files. Total size
Main Advar	nced Additional	Output Folders Post Action	5
File Already E First comp Compare If Existing: Equal time: Older: Newer:	are time Time Then:	O Fist compare size ☐ Compare Size If Existing: Then: Equal size: Remane ▼ Smaller: Overwrite ▼ Bigger: Skp ▼	Broken File Name Prompt Rename Prompt Rename Prompt Sap Hidden Attribute Prompt Renove
Extended	By default:	Rename 💌	

If you have another computer connected to **R-Studio** over network, the Recover dialog box will be slightly different. See **Data recovery over network** for details.

Recover options	
Recover all marked files	All files, regardless of the applied mask, will be recovered.
Recovered only masked marked files	Only files matching the applied mask will be recovered.
Condense successful restoration events	If this check box is selected, R-Studio will display only error and warning messages in its Log
Restore folder structure	If this check box is selected, R-Studio recovers the entire path to the selected object.
Restore from root	If this check box is selected, R-Studio recovers the entire path to the selected object starting from the root folder of the disk.
Recover metafiles	If this check box is selected, R-Studio recovers disk metafiles. Metafiles are the file system's internal files invisible to any user, or file system data, which R-Studio represents as files. These files do not contain user data directly. Unless you want to scrutinize a disk file system, do not restore them.
Recover alternative data streams	If this check box is selected, R-Studio recovers <u>alternative data</u> <u>streams</u> for file systems that support them. Has no effect on <u>FAT</u> files. See <u>Extended Information Recovery</u> for the NTFS file system, and <u>Data Recovery on HFS/FIFS+ File System</u> for the Mac computers.
Recover security	If this check box is selected, R-Studio recovers security attributes for NTFS files. Has no effect on FAT files. See <u>Extended</u> <u>Information Recovery</u> for details.
Recover extended attributes	If this check box is selected, R-Studio recovers extended file attributes in the file system.
Recover real folders structure	Enabled when the files are sorted by their extensions or date. See Find and Mark Multiple Files for details. If this check box is selected, R-Studio recovers the real folders/files structure on the disk rather than that of sorted files.

Skip files with <u>bad sectors</u>	If this check box is selected, R-Studio skips files with bad sectors and displays their list on the Files with bad sectors dialog box when the recovery has been completed. You may separately decide later what to do with those files. See <u>Bad sectors</u> for details.
	If this check box is cleared, R-Studio tries to read those sectors several times (specified on the <u>Settings/Bad Sectors</u> dialog box), and, if fails, fills bad sectors in the recovered file with the pattern specified on the same box. Information about such files will appear in the <u>Log</u> .
Do not recover duplicate files from Extra Found Files	If this check box is selected, R-Studio does not recover files from Extra Found Files (raw files) that are duplicates of the files found in file system (Root).
Ignore file mask	If this check box is selected, R-Studio recovers all content of a selected folder, ignoring a specified <u>File Mask</u> .
Open local folder (folders) when done	If this check box is selected, the folder with recovered files will be opened upon recovery completion.
Advanced	Specifies options for mass file recovery

If you want to recover multiple files at once, go to the <u>Recover Multiple Files</u> for more information.

R-Studio Technician/T80+

It has additional Recovery options.

If a file to be recovered appears to have an invalid name, a Broken File Name dialog box will appear. You may correct the name and resume file recovery.

Broken File Name dialog box

File Name:	?est5.arc			
New Name:	\$est5.arc			
	Edit broken symbols	only 🗹 Change all inv	alid symbols to: \$	
	Rename	Rename All	Skip	Skip All

Broken File Name properties

File name	Shows the current incorrect file name.
New name	Field for a new file name.
Edit broken symbols only	If this check box is selected, only invalid symbols may be corrected
Change all invalid symbols to	If this check box is selected, all invalid symbols will be changed to the specified symbol
Buttons	
Rename	Click to resume file recovery
Rename All	Click to resume file recovery. All other files will be renamed according to the specified rule.
Skip	Click to skip this file
Skip All	Click to skip all files and stop file recovery

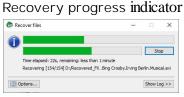
If there is no space available for the recovered files, the There is not enough space on the disk dialog box will appear. You may either select other place to store the files, skip that particular file or abort the recovery process.

There is not enough space on the disk dialog box

There is not enough space of the space of	in the disk	×
Current file information		
File Name: I:\\$est2.arc		
File Size: 98 MB		
Output folder: I:\		
	Skip File	Continue Recovery

> R-Studio will recover the selected/@narked files/folders to the specified folder and show the results in the Log pane

The Recovery progress indicator will show the log and progress of recovery process.



You may change some options during the process of file recovery.

You may change some options during the process of file recovery

Options (Rec	over files)			×
Drive Options	Post Actions			
	BEVT-22ZCT0 11.01A11 (Pa ount: Default (0) 💌	irtition 1)		
			OK	Cancel

Only in the Technician version

rive Option	ns Po	st Actions						
Shutdo	wn the o	omputer on a	I tasks	completion				
Email n	otification	ns						
Server:	tester 1	@example.co	m	Port:	25	\$ SSL	Auto	-
Sender en	nail:	tester 1@ex	ample.	com				
Recipient	s) email:	tester2@ex	ample.	com				
Custom su	bject:	Recovery R	esults					
Send en	al if	Au	thorizat	tion				
Erro	r occurre	d Login:	[tester 1				
Suo	ess	Passw	ord:	•••••				
						Tes	t email aci	count

Note: R-Studio recovers files from Ext2/3/4FS partitions, but writes it to FAT or NTFS local disks. Or you may write such files to network drives. **R-Studio** successfully recovers files from Ext2/3/4FS partitions except its security attributes. **R-Studio** recovers <u>symlinks</u> as files containing the path to files which symlinks point to.

See **Data Recovery on HFS/PIFS+ file system** for details on recovering data from disks with the HFS/HFS+ file system

Opening several disk/partitions in one tabSearching for a FileFinding Previous File VersionsPreviewing FilesFile MasksRegular ExpressionsEvent Log2.1.1Opening several disks/partitions in one tab

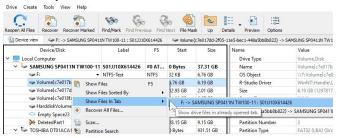
You may open several <u>disks/partitions</u> in one tab. Then you may search for files and recover them from several disks/partitions at once. This is especially useful if files are to be recovered from several recognized partitions found on one real disk/partition or a drive.

To open several disks/partitions in one tab,

- 1 Open one partition in a usual way (double-click a logical disk, for example).
- 2 Right-click the next partition, select Show Files In Tab, and select the tab you want the partition appear in, or

drag the disk/partition from the Device view to the required tab.

Several partitions in one tab



> R-Studio will show files from several partitions in one tab

Several partitions in one tab

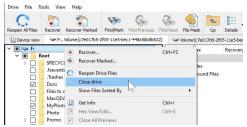
R-Studio - F Drive File 1		elp							
Reopen All Files	5	ver Marked Find/M	ark Find Previous Fi	Mext File Mask Up	Details Preview	Options			
Device view	See F:, Volume	{c7e017b5-2f05-11e	5-bec1-448a5bb8b822}	Solume{c7e017dd-2f	05-11e5-bec1-448a5bb8b8	822} -> SAMSU	NG SP0411N TW 100-11 :	S013310X614426	
🗸 🔳 🧼 F:	2		^	Name	Recovery chances	Size, Bytes	Created	Modified	Д
	Root			Rest2.arc	Undetermined	102,760,448	6/30/2005 11:51:40 PM	3/21/2005 11:23:04 PM	6/30/200
	SRECYCLE.BIN			Rest4.arc	Undetermined	102 760 448	6/30/2005 11:54:04 PM	3/21/2005 11:24:20 PM	6/30/200
	.fseventsd			Rest5.arc	Undetermined			3/21/2005 11:24:58 PM	6/30/200
	.Trashes			rest6.arc	Undetermined		6/30/2005 11:56:32 PM	3/21/2005 11:25:36 PM	6/30/200
	Docs			Rest7.arc	Undetermined		6/30/2005 11:57:45 PM	3/21/2005 11:25:46 PM	6/30/200
	Files to wipe MaxQDA			☐ ₩ IMG_6001.JPG	Good (Existing file)			5/17/2010 05:17:56 PM	8/22/202
	MyPhoto			☐ ₩ IMG_6002.JPG	Good (Existing file)		8/22/2021 04:21:28 PM		8/22/202
	Photo			☐ ₩ IMG_6003.JPG	Good (Existing file)		8/22/2021 04:21:28 PM	5/17/2010 05:18:36 PM	8/22/202
> []	Promo			Outlook.pst					
5 1	Recovered_File	5			Good (Existing file)		5/14/2006 05:17:09 PM		5/14/200
	System Volum			C test1.arc	 Good (Existing file) 		8/22/2021 04:21:27 PM	3/21/2005 10:22:26 PM	8/22/202
	Video			🗹 🔆 Test2.arc	Undetermined		6/30/2005 11:51:40 PM	3/21/2005 11:23:04 PM	6/30/200
	Metafiles			C test3.arc	 Good (Existing file) 		8/22/2021 04:21:27 PM	3/21/2005 10:23:42 PM	8/22/202
× 🗆 🛛 🛛	xtra Found Files			🗹 🛞 Test4.arc	Undetermined		6/30/2005 11:54:04 PM	3/21/2005 11:24:20 PM	6/30/200
	SSSFolder1316	61831		🗹 छ Test5.arc	Undetermined	102,760,448	6/30/2005 11:55:18 PM	3/21/2005 11:24:58 PM	6/30/200
🗸 🔳 🥪 Volu	me{c7e017b5-2	f05-11e5-bec1-44	8a5bb8b822}	🗌 🔆 Test6.arc	Undetermined	102,760,448	6/30/2005 11:56:32 PM	3/21/2005 11:25:36 PM	6/30/200
~ 🔳 📙 I	Root			🗌 🔆 Test7.arc	Undetermined	28,309,504	6/30/2005 11:57:45 PM	3/21/2005 11:25:46 PM	6/30/200
	SRECYCLE.BIN			Wipe Test 1.doc	 Good (Existing file) 	23,552	6/30/2005 11:58:04 PM	11/17/2003 12:13:14 AM	6/30/200
	Files to Delete			Wipe Test 2.doc	 Good (Existing file) 	22,528	8/22/2021 04:21:28 PM	11/16/2003 11:13:20 PM	8/22/202
	Files to Recove	er		Wipe Test 3.doc	 Good (Existing file) 	22,528	8/22/2021 04:21:28 PM	11/16/2003 11:13:26 PM	8/22/202
× 🗆	Music	_		Wipe Test 4.doc	Undetermined	22,528	6/30/2005 11:58:04 PM	11/17/2003 12:13:34 AM	6/30/200
		arminaBurana		Wipe Test 5.doc	Undetermined	23.040	6/30/2005 11:58:04 PM	11/17/2003 12:14:04 AM	6/30/200
	Elton_John			Wipe Test 6.doc	Undetermined	23 040	8/22/2021 04:21:28 PM	11/16/2003 11:14:08 PM	8/22/202
	Manu_Cha	10		Spe Test 2.doc	Good (Existing file)		7/6/2005 09:24:17 PM	7/6/2005 09:24:18 PM	7/6/2005
L	System Volum	alaformation							., .,
	-	e momation	~	<					
Sorted by: Re	al 🔻								
og									
Туре	Date	Time		was completed in o sec		Text			
System	8/25/2021	3:51:37 PM		ed mask preset file C:\Users	Tester 1\Documents\R-	TT\R-Studio\r	maskpresets.xml		
System	8/25/2021	3:52:28 PM		ed mask preset file C:\Users					
System	8/25/2021	3:57:32 PM		was completed in 0 sec					

Now files may be searched for, marked for recovery, and recovered.

To remove a disk/partition from the tab,

1 Right-click the required disk/partition in the tab and select Close drive in the shortcut menu.

Several partitions in one tab



> R-Studio will remove the selected disk/partition from the tab

2.1.2 Searching for a File

R-Studio can find a particular file, if it is difficult to find it manually in the Folders or Files panel. You can also automatically mark/unmark all found files.

To search for a file,

- 1 Click the Find button
 - Other ways to search for the file
 - Right-click a folder and select Find on the shortcut menu,

or

• Select a folder and select **Find** on the **Tools** menu

2 Specify a file to be found and its options on the Find dialog box, and click the OK button Note that a File Mask may be applied.

Find/Mark (Main) dialog box

Find/Mark - Vol	ume4					
Files and Folders:	• readn	ne.txt;My_Le	tter_??.dox;*.jpg			
Match case	Examp	le:r*me.t?t;	ginger.*;			
Eles		ders	🗹 Deleted		🗹 Existin	9
Look in						
O Entire partition	(Volume4)					
Folder	olume4\Root				-	S
🗹 Loc	ok in subfolde	irs				
Advanced option	ns					
Size From: 0		Вуt	es 🝸 🗌 Up To:	10		MB 🛩
Bad sectors:	Ves Yes		No No		Not know	n yet
	Good		Average			Bad
Recovery chances (for files only):	Undeter	mined	Warning	: This info	rmation may be	e incomplete.
Creation date	Custom	▼ 🗹 from	2021-01-27 ~	to 🗹	2022-12-27	-
Modification date	Custom	• 🗹 from	2022-01-22 ~	🗹 to	2023-02-22	- 🖾
Last access date	Custom	✓ from	2022-03-22 ~	⊠ to	2024-02-22	-
K Find first	0 <	Find previou	is 🖲 Fin	d next	> 0	Find last
🔵 🗐 Find all			⊖ Ma	rk al	0	Unmark all
					Ok	Cancel

□ Find/Mark options

• • •	how to treat specified strings. Please note that R-Studio stores previously entered search
strings. All Files and Folders	If this option is selected, R-Studio applies Advanced Options to all files.
File Extensions	If this option is selected, R-Studio treats specified strings as file extensions
Files and Folders	If this option is selected, R-Studio treats specified strings as file names. Use ? for one unspecified character and * for an unlimited number of them to specify file masks.
Regular Expressions	If this option is selected, R-Studio treats specified strings as regular expressions
File Id	Specifies File Id that R-Studio assigns to a file.
Match case	If this check box is selected, R-Studio makes a case-sensitive search
Look at	
Files	If this check box is selected, R-Studio includes files into a search.
Folders	If this check box is selected, R-Studio includes folders into a search. Disables when the Mark/Unmark All option is selected.
Deleted files	If this check box is selected, R-Studio makes a search among deleted files/folders.
Existing files	If this check box is selected, R-Studio makes a search among existing files/folders.
Look in	Specifies where R-Studio searches for, and marks, files. It can look for them on the Entire partition, or in/from a certain folder. If several <u>partitions</u> are opened in one tab, the places will be: All opened partitions, Selected partition, or in/from a certain folder. You may specify the starting folder for the search.

	Q:\Root\Documents
	Q:
	Q: \Root Q: \Root\Documents
	Q: \Root\Documents\important
	Judentifies current opened folder.
	identifies current starting folder for the search.
	sets starting folder to the current opened folder.
	Sets back current starting folder.
Advanced options	If this check box is selected, R-Studio will use the advanced options.
Size from/up to	Specifies file size limits. See the Data Formats and Multipliers topic for more details
	on data formats.
Bad sectors	Specifies whether there are bad sectors in the files. Not known: it's unclear if there are
	bad sectors in the files.
Runtime image	Specifies whether the files have already been included into the runtime image.
Recovery	Specifies files with certain recovery chances.
Chances	
Date	Specifies file date boundaries. Dates for Modified, Created, and Last Accessed
	timestamps may be set separately.
	The Set for all button sets the specified data for all fields.
Find/Mark options	Specify what R-Studio does with the found files.
	The Find first/previous/next/last options. R-Studio stops at the first/previous/next/last file
	that matches the specified search criteria.
	Find all files. R-Studio searches for all files that matches the specified search criteria
	The search results appear in the Find Results panel.
	Mark/Unmark All. R-Studio marks/unmarks all files that match the search criteria. When
	these options are selected, R-Studio marks/unmarks files only, not folders, regardless
	of what Look at: Folders specifies.
	Please note, that when performing a new find and mark/@nmark task, R-Studio does
	not takes into consideration the previous marked/@nmarked state of files. For example,
	if you first mark all doc files, and then all txt files, all doc files remain marked, too. To
	unmark them, you should specify doc once again and select Unmark files.
Find/mark	If this check box is selected, links to folders will be treated as real folders: they will
objects only in	appear among search results or marked objects.
real paths, ignore links to folders	

> R-Studio will show/mark the found file(s)

If you need to find and mark many files, go to the Find and Mark Multiple Files topic for details.

To repeat the search,

- * Click the Find Next or Find Previous buttons
 - Other ways to repeat the search

• Right-click a folder and select **Find Next** or **Find Previous** on the shortcut menu or

• Select a folder and select Find Next or Find Previous on the Tools menu

To find all files and show them in the Find Results panel,

* Select Find all on the on the Find dialog box,

or

select Find all on the Tools menu

> **R-Studio will show the found files in the** Find Results **panel**

You may do the following actions on the found files:

Recover, Mark, Preview

by right-clicking the found file and selecting the appropriate item in the shortcut menu.

2.1.3 Finding Previous File Versions

R-Studio can find previous versions of files. It searches for them in the file's current folder and in **Extra Found** Files.

File versions are searched for using file size. If the size of a files is within 10% of the original filesize, the following conditions are checked:

Conditions	Legend
File name	Ν
File extension	Е
Recognized file type	Т

To search for previous file versions,

- 1 Right-click the file and select Find Previous Versions of the File on the shortcut menu
- * **R-Studio** will show the files in the list:

File versions

Find Results	s	
NET	Name	
	Find All "All Files:", "G: -> SAMSUNG SP0411N TW100-11 : S01JJ20XC75851\"	
-E-	Root/Files to Recover/?est4.arc	
-E-	Root/Files to Recover/?est5.arc	
-E-	Root/Files to Recover/?est6.arc	
	=== Matching files: 3 Total files searched: 22 ===	

This technique can be used to find deleted original files after attacks of file encrypting viruses.

2.1.4 **Previewing Files**

R-Studio has a built-in file previewer that allows you to preview both existing and deleted files. You may use this feature to estimate chances for successful file recovery or to find a file to recover.

While previewing a file in the external viewer, you may recover it or mark the file for recovery using Previewer buttons.

Previewer buttons



Locate file, Mark for recovery, Previous file, Next file, Recover, Zoom In. Zoom Out, Actual Size, Rotate Counterclockwise, Rotate Clockwise, Fit in Window, Full Screen

To preview a file

- 1 Right-click a file to preview in the Files panel and select Preview on the shortcut menu
 - Other ways to preview the file
 - Select the file in the Files panel and click the Preview button,

or

- Select the file in the Files panel and select Preview on the File menu
- > R-Studio will show the content of the file

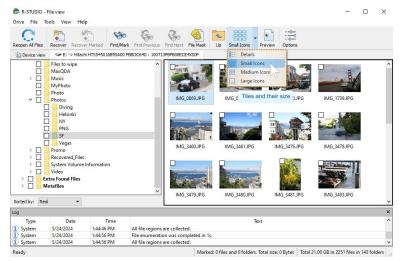
If you have several files open in the previewer, you may instantly close all of them by selecting **Close All Previews** on the **File** menu.

File Previewer for Pictures:

Pictures can be previewed either as tiles within the main window of **R-Studio** or in an external previewer.

Within the main window as tiles: Tile size can be changed..

Pictures as tiles



In the external viewer:

Picture files can be zoomed in/out and rotated.

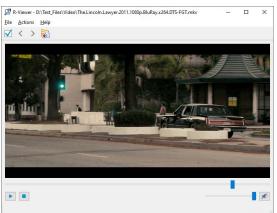
Picture file previewer



File Previewer for Video and Audio files:

Video and audio files can be played even without their respective application installed.

Video file previewer



File Previewer for Microsoft/Open/Pibre Office Documents:

Documents can be shown (including embedded pictures) even without their respective applications installed. They can be zoomed in/out for better viewing.

Microsoft/Open/Libre Office document previewer

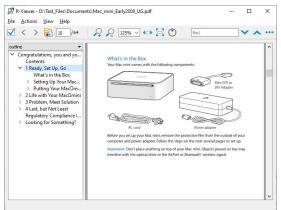


File Previewer for Adobe Acrobat PDF Files:

Files can be shown even without Adobe Acrobat installed.

The previewer allows the users to jump to a required page, zoom the document, and search for a required text.

Adobe Acrobat pdf document previewer



Supported File Types:

Documents:

MS Office and Open/Libre Office files, even without the programs installed:

- Word/Writer documents: docx;
- Excel/Calc spreadsheets: xlsx;
- PowerPoint presentation: pptx.

Office 97-2003, without the program installed:

- Word documents: doc;
- Excel spreadsheets xls;
- PowerPoint presentation ppt.

Adobe Acrobat document: pdf.

Multimedia Files

Video formats:

AIFF, ASF, AVI, BFI, CAF, FLV, GIF, GXF, HLS, QuickTime, 3GP, MP4, Matroska, Maxis XA, MPEG-DASH, MPEG program stream, MPEG transport stream (including AVCHD), MXF, Material eXchange Format, SMPTE, MSN Webcam stream, NUT, Ogg, OMA, RL2, TXD, WTV.

Audio formats:

8SVX, AAC, AAC+, AC-3, ADPCM, AMR-NB, AMR-WB, Amazing Studio PAF Audio, Apple lossless audio, QuickTime, ATRAC, CELT, DCA (DTS Coherent Acoustics), DPCM, DSD (Direct Stream Digitial), DSP Group TrueSpeech, DST (Direct Stream Transfer), DV audio, FLAC (Free Lossless Audio Codec), G.723.1, G.729, GSM, IAC (Indeo Audio Coder), iLBC (Internet Low Bitrate Codec), IMC (Intel Music Coder), Interplay ACM, MACE (Macintosh Audio Compression/Expansion), MACE (Macintosh Audio Compression/Expansion), MLP (Meridian Lossless Packing), Monkey's Audio, MP1

(MPEG audio layer 1), MP2 (MPEG audio layer 2), MP3 (MPEG audio layer 3), MPEG-4 Audio Lossless Coding (ALS), Musepack SV7/SV8, Nellymoser Asao, AVC (Audio for Video Codec), PCM A-law/fhu-law, QCELP/PureVoice, QDesign Music Codec, RealAudio, Vorbis, Voxware MetaSound, WavPack, Westwood Audio, Windows Media Audio, Xbox Media Audio

Graphic files (with file extensions)

3DS Max thumbnail (max), AAA logo (bpr), ACE texture (ace), ADEX (img, rle), AIM Grey Scale (ima, im), AIPD image (aipd), ARF (arf), AT&T Group 4 (att), AT&T multigen (icn), AVHRR Image (sst), AVT RAW (raw), AWD (awd), Ability Photopaint Image (apx), Access (g4, acc), Aces200 (ace), Acorn Sprite (acorn), AdTech perfectfax (adt), Adobe Illustrator (ai), Adobe PhotoParade(images) (php), Adobe Photoshop (psd), Advanced Art Studio (ocp, art, pic), AirNav (anv), Album bébé (frm), Alias Image File (pix, als, alias), Alpha Microsystems BMP (bmp), Amapi (2d), Amica Paint (ami, [b]), Amiga IFF (iff, blk), Amiga icon (info), Amstrad Cpc Screen (cpc), Analyze (avw), Analyze-7 (img), Andrew Toolkit raster object (atk), Apollo HDRU (hdru, hdr, gn), ArcInfo Binary (hdr), Art Director (art), Artisan (art), Artist 64 (a64), Artrage (ptg), Artweaver Document (awd), Astronomical Research Network (arn), Atari grafik (pcp), Aurora (sim), Auto F/X (afx), AutoCAD DWG (dwg, dwt), AutoCAD DXF (dxf), Autocad CAD-Camera (img), Autodesk Animator (fli, flc), Autodesk QuickCAD thumbnail (cad), Autodesk SKETCH thumbnail (skf), Autodesk SketchUp component (skp, skb), Autologic (gm, gm2, gm4), Award Bios Logo (epa), Axialis Screensaver(images) (ssp), B3D(images) (b3d), BFLI (bfl, bfli, fli, flp, afl), BIAS FringeProcessor (msk, img, raw, flt), BLP textures (blp), BMF (bmf), BSB/KAP (kap), BYU SIR (sir), Bert's Coloring (bmg, ibg), Bfx Bitware (bfx), Bio-Rad confocal (pic), Blazing Paddles (pi), Bob Raytracer (bob), Brender (pix), Brooktrout 301 (brk, 301, brt), Brother Fax (uni), Buttonz & Tilez texture (til), CALS Raster (cal, cals, gp4, mil), CDU Paint (cdu), CGM (cgm), CImage (dsi), CMU Window Manager (cmu), CP8 256 Gray Scale (cp8), CSV (csv), Calamus (cpi, crg), Camera RAW (raw), Canon EOS-1D Mark II RAW (cr2), Canon Navigator Fax (can), Canon PowerShot (crw), Cartes Michelin (big), Casio QV-10/100 Camera (cam), Casio RAW (bay, raw), Chinon ES-1000 digital camera (cmt), Cisco IP Phone (cip), Cloe Ray-Tracer (clo, cloe), ColoRIX (rix, sci, scx, sc?), CompW (wlm), CompuServe GIF (gif, giff), Computer Eyes, Digital Vision (ce), Computer Eyes Raw (ce1, ce2), Contax RAW (bay, raw), Core IDC (idc), Corel Draw Bitmap(preview) (cdr), Corel Draw Pattern(preview) (pat), Corel Flow(preview) (bmf), Corel Metafile Exchange(preview) (cmx), Corel PhotoPaint 6.0 (cpt), CoverDesigner(images) (ncd), CoverDesigner Template(images) (nct), Crayola (art), Creative PC-CAM RAW (bay, raw), DBW Render (), DIV Game Studio Map (map), DIV Game Studio Multi Map (fpg), DKB Ray-Tracer (dis), DNG (dng), DPX (dpx), Dali Raw (sd0, sd1, sd2), Datacopy (img), Degas & Degas Elite (pi1, pc1, pi2, pc2, pi3, pc3, pi4, pi5, pi6), Deluxe Paint, Electronic Arts (lbm, ilbm), Dicom (dcm, acr, dic, dicom, dc3), Digital F/X (tdim), Digital Research(GEM Paint) (img, gem), Direct Draw Surface (dds), Discorp CMP Image (cmp), DjVu (djvu, djv, iw4), DolphinEd (dol), Doodle Atari (doo), Doodle C64 (dd), Doodle C64(Compressed) (jj), Dr Halo (cut), Draz Paint (drz), EA Sports FSH (fsh), EPS Interchange Format (epi, ept), ERI-chan(Entis Rasterized Image) (eri), ESM Software Pix (pix), Ecchi (ecc), Eclipse (tile), Edmics (c4), Egg Paint (trp), Electric Image (ei, eidi), Embroidery (bmc), Encapsulated Postscript (ps, eps), Encapsulated Postscript (Preview) (eps), Enhance Simplex (esm), Enhanced Compressed Wavelet (ecw), Epson RAW (erf), Eroiica (eif), Everex Everfax (efx, ef3), Explore(TDI) & Maya (iff, tdi), FIF(Iterated System) (fif), FIT (fit), Face Painter (fpt), Fast Piecewise-constant (pwc), Fax Group 3 (g3, fax), Fax man (fmf), Faxable PCX (fcx), Faxable TIFF (ftf), Fenix Map (map), Fenix Multi Map (fpg), FileMagic (mag), Flash Image (fi), FlashCam Frame (ncy), FlashPix Format (fpx), Flexible

Image Transport System (fts, fits, fit), Foculus RAW (bay, raw), Fontasy Grafik (bsg), Fremont Fax96 (f96), Fugawi Map (fx3), Fuji S2 RAW (raf), Fun Painter II (fp2, fun), Fun Photor (fpr), Fuzzy bitmap (fbm, cbm), GRS16 (g16), Gamma Fax (gmf), GeoPaint (geo), Gfa Raytrace (sul), GigaPaint Hi-res (gih), GigaPaint Multi (gig), Gimp Bitmap (xcf), Gimp Brush (gbr), Gimp Icon (ico), Gimp Pattern (pat), GoDot (4bt, 4bit, clp), GunPaint (gun, ifl), HD Photo (wdp, hdp), HDRI (hdr, hdri), HF (hf), HP-48/49 GROB (gro, grb), HP-49 OpenFire (gro2, gro4), HPGL-2 (hp, hpg, hgl, plt, hpgl, hpgl2, gl2, prn, prt, spl), HRU (hru), HSI Raw (raw), Half-Life Model (mdl), Hasselblad RAW (3fr), Hayes JTFax (jtf), Hemera Photo Image (hpi), Hemera Thumbs (hta), Heretic II MipMap (m8), Hi-Eddi (hed), Hires C64 (hir, hbm), Homeworld Texture (lif), IBM Kips (kps), IBM Printer Page Segment (pse), IM5(Visilog) (im5), IMNET Image (imt), IOCA (ica, ioca, mod), IPLab (ipl), IPod thumb (ithmb), ISS (iss), IcoFX (ifx), Icon Library (icl), Imacon/Hasselblad RAW (fff), Image Capture Board (icb), Image Magick file (mif, miff), Image Speeder (ish), Image System(Hires) (ish), Image System(Multicolor) (ism), Image Systems RLC2 Graphic (rlc), ImageLab (b&w, b w), ImagePro Sequence (seq), Imaging Fax (g3n), Imaging Technology (img), Img Software Set (img), Inshape (iim), InterPaint(Hires) (iph), InterPaint(Multicolor) (ipt), Intergraph Format (itg, cit, rle), Interleaf (iimg), Iris CT (ct), Iris Graphics (iris), J Wavelet Image Codec (wic), JBIG (jbg, bie, jbig), JBIG-2 (jb2), JFIF based file (jb2), JPEG/JFIF (jpg, jpeg, jif, jfif, J, jpe), JPEG 8BIM header(Mac) (jpg, jpeg, jif, jfif, J, jpe), JPEG XR (jxr), JPEG-2000 Code Stream (jpc), JPEG-2000 JP2 File Format (jp2, j2k, jpx, jpf), JPEG-LS (jls), Jeff's Image Format (jif), Jigsaw (jig), Jovian VI (vi), Jpeg Network Graphics (jng), JustButtons animated bitmap (btn), KONTRON (img), Khoros Visualization Image file (vif, viff, xv), KinuPix Skin (thb), Kiss Cel (cel), Koala Paint (koa, kla), Koala Paint(Compressed) (gg), Kodak Cineon (cin), Kodak DC120 Digital Camera (kdc), Kodak DC25 Camera (k25), Kodak Photo CD (pcd), Kodak Pro Digital RAW (dcr), Kofax Group 4 (kfx), Kolor Raw Format (kro), Konica Camera File (kgp), LSS16 (lss, 16), LView Pro (lvp), LaserData (lda), Leaf RAW (mos), Leica RAW (bay, raw), Light Work Image (lwi), LucasFilm Format (lff), Lumena CEL (cel), LuraDocument Format (ldf), LuraDocument.jpm Format (jpm), LuraWave Format (lwf), LuraWave JPEG-2000 Code Stream (jpc), LuraWave JPEG-2000 Format (jp2, j2k, jpx, jpf), MAKIchan Graphics (mag), MGI Photosuite Project(images) (pzp), MGR bitmap (mgr), MRC(Medical Research Council) (mrc), MTV Ray-Tracer (mtv), Mac Paint (mac, mpnt, macp, pntg, pnt, paint), Mac icon (icns), Macintosh Quickdraw/Pict (pic, pict, pict2, pct), Mac OSX Resource (rsc, rsrc), Maggi Hairstyles & Cosmetics (fff), Male MRI (pd, t1, t2), Male Normal CT (fre), Mamiya RAW (mef), Marks Russel File (mrf), Mavica (411), Maw-Ware Textures (mtx), Mayura Draw (pdx), MegaPaint (bld), Megalux Frame (frm), Micro Dynamics MARS (pbt), Micro Illustrator Uncompressed (mil), Micrografx Picture Publisher 4.0 (pp4), Micrografx Picture Publisher 5.0 (pp5), Micron RAW (bay, raw), Microsoft Image Composer (mic), Microsoft Paint (msp), Microtek Eyestar (img), Mindjongg Format (ipg), Minolta DiMAGE RAW (mrw), Mobile FAX (rfa), MonkeyCard (pdb), MonkeyLogo (pdb), MonkeyPhoto (mph), MrSid (sid), Msx 2 Screen (sc2), Multiple Network Graphics (mng), NCR Image (ncr), NIST ihdr (pct), National Imagery Transmission F. (ntf, nitf), NeoBook Cartoon (car), Neochrome(ST & TT) (neo), Neopaint Mask (npm), Neopaint Stamp (stw), NewsRoom (nsr, ph, bn), Nifti (img), Nikon RAW (nef), Nokia Group Graphics (ngg), Nokia Logo File (nlm), Nokia OTA bitmap (otb), Nokia Operator Logo (nol), OAZ Fax (oaz, xfx), OS/2 Bitmap (bmp, bga), Olicom Fax (ofx), Olympus RAW (orf), Open Image Library Format (oil), OpenEXR (exr), Optigraphics (ctf), Optigraphics Tiled (ttf), Optocat (abs), Oric Hires (hir), Oric TAP (tap), OS/2 Warp (bga), PABX background (pix), PAX (pax), PC Paint/Pictor Page (pic, clp), PCO (b16), PM (pm), Page Control Language (pcl), Paint Magic (pmg), PaintShopPro Browser Cache File (jbf), PaintShopPro Brush (pspbrush), PaintShopPro Brush (jbr), PaintShopPro Frame (pfr, pspframe), PaintShopPro Image (psp, pspimage), PaintShopPro Mask (pspmask), PaintShopPro Mask (msk),

PaintShopPro Pattern (pat), PaintShopPro Picture Tube (tub, psptube), PaintShopPro Texture (tex), Palm Pilot (pdb), Panasonic DMC-LC1 RAW (srf), Panasonic LX3 RAW (rw2), Panasonic RAW (bay, raw), Pegs (pxs, pxa), Pentax *ist D (pef), Pfs Art Publisher (art), Photo Deluxe (pdd, pdb), Photo Filtre Studio (pfi), PhotoFantasy Image (fsy), PhotoFrame (frm), PhotoStudio File (psf), PhotoStudio Stamp (stm), Photomatrix (cat), Pic2 (p2), Picasso 64 (p64), Picture Gear Pocket (prc), Picture It! (mix), Pixar picture file (pic, pxr, picio, pixar), Pixel Power Collage (ib7, i17, i18, if9), Pixia (pxa), Pixibox (pxb), Planetary Data System (pds, img), Playback Bitmap Sequence (bms), Pocket PC Bitmap (2bp), Pocket PC Themes(images) (tsk), Polychrome Recursive Format (prf), Portable Bitmap (pbm, rpbm, ppma), Portable Document Format (pdf), Portable Greyscale (pgm, rpgm), Portable Image (pnm, rpnm, pbm, rpbm, pgm, rpgm, ppm, rppm), Portable Network Graphics (png, apng), Portable Pixmap (ppm, rppm), Portfolio Graphics (pgf), Portfolio Graphics Compressed (pgc), Portrait (cvp), Poser Bump (bum), Postscript (ps, ps1, ps2, ps3, eps, prn), PowerCard maker (crd), PowerPoint(images) (pps), PowerPoint Presentation(images) (ppt), Print Master (pm), Print Shop (psa, psb), Printfox/Pagefox (bs, pg, gb), Prism (cpa), Prisms (pri), Psion Series 3 Bitmap (pic), Psion Series 5 Bitmap (mbm), Punk Productions Picture (ppp), Puzzle (pzl), Q0 (q0, rgb), Qdv(Random Dot Software) (qdv), Qrt Ray-Tracer (qrt), Quake Texture (wal), Quantel VPB (vpb), QuickTime Image Format (qtif, qti), RAW DVR (raw), RIPTerm Image (icn), Radiance (rad, img, pic), Rainbow Painter (rp), Raw (raw, gry, grey), Rawzor (rwz), Rayshade (pic), Red Storm File Format (rsb), Ricoh Digital Camera (j6i), Ricoh Fax (001, ric), Ricoh IS30 (pig), Rm2K XYZ (xyz), Rollei RAW (rdc, ia), RoverShot RAW (bay, raw), RunPaint(Multicolor) (rpm), Saracen Paint (sar), SBIG CCD camera ST-4 (st4), SBIG CCD camera ST-X (stx, st4, st5, st6, st7, st8), SciFax (sci), SciTex Continuous Tone (sct, ct, ch), Seattle Film Works (sfw), Seattle Film Works multiimage (pwp, sfw), SecretPhotos puzzle (xp0), Sega SJ-1 DIGIO (sj1), Sharp GPB (img), Siemens Mobile (bmx), SIF MICHEL-Soft (sif), Sigma RAW (x3f), Silicon Graphics RGB (rgb, rgba, bw, iris, sgi, int, inta), Sinar RAW (cs1, sti), Skantek (skn), Slow Scan Television (hrz), SmartDraw 6 template (sdt), SmartFax (1), SmoothMove Pan Viewer (pan), Softimage (pic, si), Solitaire Image Recorder (sir), Sony DSC-F1 Cyber-shot (pmp), Sony DSC-F828 RAW (srf), Sony PS2 TIM (tm2), Sony Playstation TIM (tim), Sony RAW (sr2, arw), Spectrum 512 (spu), Spectrum 512(Compressed) (spc), Spectrum 512(Smooshed) (sps), SPOT (dat), SriSun (ssi), Stad (pic, pac, seq), Star Office Gallery (sdg), Starbase (img), Stardent AVS X (x, avs, mbfs, mbfavs), Starlight Xpress SX (RAW), Stereo Image (jps), ST Micro RAW (bay, raw), Structured Fax Format (sff), Sun Icon/Cursor (icon, cursor, ico, pr), Sun Rasterfile (ras, rast, sun, sr, scr, rs), Sun TAAC file (iff, vff, suniff, taac), Syberia texture (syj), Synthetic Universe (syn, synu), SVG (svg), TG4 (tg4), TI Bitmap (92i, 73i, 82i, 83i, 85i, 86i, 89i), TIFF Revision 6 (tif, tim, tiff), TMSat image (imi), TRS 80 (hr), TealPaint (pdb), Teli Fax (mh), Thumbnail (tnl), TilePic (tjp), Tiny (tny, tn1, tn2, tn3), TopDesign Thumbnail (b3d, b2d), Total Annihilation (gaf), Truevision Targa (tga, targa, pix, bpx, ivb), Ulead Pattern (pst), Ulead PhotoImpact (upi), Ulead Texture(images) (pe4), Usenix FaceServer (fac, face), Utah raster image (rle, urt), VIPS Image (v), VITec (vit), VRML2 (wrl), Venta Fax (vfx), Verity (vif), Vicar (vic, vicar, img), Vidcom 64 (vid), Video Display Adapter (vda), Vista (vst), Vivid Ray-Tracer (img), Vort (pix), Vue d'esprit (vob), WAD(Half life) (wad), WSQ (wsq), WaveL (iwc), Wavefront Raster file (rla, rlb, rpf), WebShots(images) (wb1, wbc, wbp, wbz), Weekly Puzzle (jig), WebP (webp, wep), Whypic (ypc), WinFAX (fxs, fxo, wfx, fxr, fxd, fxm), WinMIPS (pic), Windows & Aldus Metafile (wmf), Windows Animated Cursor (ani), Windows Bitmap (bmp, rle, vga, rl4, rl8, sys), Windows Clipboard (clp), Windows Comp. Enhanced Metafile (emz), Windows Compressed Metafile (wmz), Windows Cursor (cur), Windows DIB (dib), Windows Enhanced Metafile (emf), Windows Icon (ico), Winzle Puzzle (wzl), Wireless Bitmap(level 0) (wbmp, wbm, wap), Word Perfect Graphics(images) (wpg), Worldport Fax (wfx), X Windows System dump (xwd, x11), X11 Bitmap (xbm, bm), X11 Pixmap (xpm, pm), XV Visual

Schnauzer (p7), Xara(images) (xar), Xerox DIFF (xif), Ximage (xim), Xionics SMP (smp), YUV 16Bits (yuv, qtl, uyvy), YUV 16Bits Interleaved (yuv, qtl, uyvy), YUV 4:1:1 (yuv, qtl), YUV 4:2:2 (yuv, qtl), YUV 4:4:4 (yuv, qtl), ZX Spectrum Hobetta (\$s, \$c, !s), ZX Spectrum Snapshot(sna), ZX Spectrum standard (screen scr), ZZ Rough (rgh), Zeiss BIVAS (dta), Zeiss LSM (lsm), Zoner Callisto Metafile(zmf), Zoner Zebra Metafile (zbr), Zsoft Multi-page Paintbrush (dcx), Zsoft Publisher's Paintbrush (pcx, pcc, dcx), byLight (bif)

2.1.5 File Masks

R-Studio shows only those files/folders that match the specified file mask. File mask affects files/folders that are processed by the **Recover** and **Find** commands.

To specify a file mask,

- 1 Click the File Mask button
 - Other ways to specify the file mask
 - Right-click a folder and select File Mask on the shortcut menu

or

• Select the folder and select File Mask on the Tools menu

2 Specify the file mask on the File mask dialog box and click the OK button

Mask dialog box

FILES: MyDoc_???.docx;MyDocX.doc;	File Extensions: docx				
deleted/existing/empty folders/links Period: YTD	Match case Example: txt; c	doc; xls;			
EXT: jpg;png;gif	Show empty folders	Deleted files			
deleted/existing/empty folders/links Period: YTD	Don't show folder symbolic links	Existing files			
	Advanced options				
	Size From: 0	Bytes 🔻 🗌 Up To: 0	Bytes		
	Bad sectors: 🗹 Yes	⊠ No ☑	Not known yet		
	Runtime image: 🗹 No	Partially imaged	Fully imaged		
	Creation date Custom 👻 🗹	from 2021-01-27 V to 20	022-01-27 🗸		
	Modification date Custom 🔻 🖂 f	from 2021-01-27 🗸 🗹 to 20	022-01-27 🗸		
	Last access date Custom 👻 🗹 f	from 2021-01-27 V v to 20	022-01-27 ~		

File mask options

You may specify opt	You may specify options for All Files, File Extensions, Files, and Regular Expressions			
Match case	If this check box is selected, R-Studio makes a case-sensitive search.			
Show empty folders	If this check box is selected, R-Studio will show folders with no files in them.			
Deleted files	If this check box is selected, R-Studio makes a search among deleted files/folders.			
Existing files	If this check box is selected, R-Studio makes a search among existing files/folders.			
Hide symbolic links	If this check box is selected, R-Studio hides all <u>symbolic links</u> . It may be selected by default if the Don't show symbolic links by default option is selected on the <u>Settings</u> dialog box.			
Use advanced options	If this check box is selected, R-Studio will use the advanced options, even when they are hidden.			
Advanced Options				
Size from/up to	Specifies file size limits. See the Data Formats and Multipliers topic for more details on data formats.			

Bad sectors	Specifies whether there are bad sectors in the files. Not known: it's unclear if there are bad sectors in the files.
Runtime image	Specifies whether the files have already been included into the runtime image.
Date	Specifies file date boundaries. Dates for Modified, Created, and Last Accessed timestamps may be set separately.
	The Set for all button sets the specified data for all fields.

> R-Studio will show only those files that match the specified file masks

Click the **Unmask** button to remove the applied mask.

Mask presets

You may set various presets with different file masks. Just click on the Plus button to add the data from the dialog box to the presets. You may also give presets names, delete them, and store them permanently.

2.1.6 Regular Expressions

Regular expression is a notation for patterns of text, as opposed to exact strings of characters. The notation uses literal characters and metacharacters. Every character which does not have special meaning in the regular-expression syntax is a literal character and matches an occurrence of that character. For example, letters and numbers are literal characters. A metacharacter is a symbol with special meaning (an operator or delimiter) in the regular-expression syntax.

	Wildcard: any character
*	Repeat: zero or more occurrences of previous character or class
^	Line position: beginning of line
\$	Line position: end of line
[class]	Character class: any character in the set
[^class]	Inverse class: any character not in the set
[x-y]	Range: any characters within the specified range
\x	Escape: literal use of metacharacter x
\ <xyz< td=""><td>Word position: beginning of the word</td></xyz<>	Word position: beginning of the word
xyz\>	Word position: end of the word

For example, the following regular expression \cdot^* matches any string of characters, a matches any string beginning with character a.

2.1.7 Event Log

R-Studio logs and displays events in the Log panel. You may set a **Log filter** to display only needed information and to write it to a log file. You may specify the log settings on the <u>Settings</u> dialog box.

You may clear or save the log

To clear the log,

* Right-click the Log panel and select Clear Log on the shortcut menu.

To save the log to a file,

* Right-click the Log panel and select Save Log to File on the shortcut menu.

You may copy data from separate messages:

Click Copy (Column Name): To copy the record's Type, Date, Time, Text, depending on which column is selected

Click **Copy Selected Text**: To copy all the columns of the selected record.

2.2 Advanced Data Recovery

This chapter explains how to perform advanced data recovery operations.

- Drive Scan
- Fast-Search-for-Lost-Partition
- Customizing File Types
- Customizing File Types-I
- Customizing File Types-II
- **Regions**
- Exclusive Regions
- Images
- Wiping Objects

2.2.1 Drive Scan

In order to completely analyze data structure on an object, it must be scanned. Any object in the Drives panel can be <u>scanned</u>. In addition, you may create a *region* to scan only a part of an object. The <u>Regions</u> topic explains how to create and work with *regions*. Scan is also greatly improves estimations for chances of successful file recovery.

You may select scan area and some other scan parameters. Scan information may be saved to a file and later this file may be opened.

You may save scan information on the remote computer if necessary.

Note: You may use <u>Fast Search for Lost partitions</u> if you want only to find partitions previously existed on the drive. It's much faster.

Attention: Scanning large areas may be a very lengthy process! NEVER TRY TO SAVE SCAN INFORMATION TO THE OBJECT BEING SCANNED!!! Or you may obtain unpredictable results and lose all of your data.

To scan an object

- 1 Select an object in the R-Studio's Drives panel
- 2 Click the Scan button
 - Other ways to start scan
 - Right-click the selected drive and select Scan on the shortcut menu,

or

• Select Scan on the Drive menu

3 Specify the required parameters on the Scan dialog box and click the Scan button

Scan dialog box

	the er	e size: 37.31 GB) itire drive			The selected drive has not or its scan information has You may either <u>scan the er</u> Advanced mode to specify	not been loaded. tire drive or use	
Size: 37.3			Bytes	¥	parameters.		
			GB	*			
Ele System: NTFS;		NTFS; ReFS; FAT	/exFAT; Ext	2/Ext	3/Ext4; UFS; XFS; HFS; APFS	Change •	
		🗹 Extra Search	for Known P	ile Ty	Des	Known File Types	
Save t	o File:						
					le drives. This option saves si re. Actual data is not saved!)		

Scan options

Scan options	
Drive Size:	Shows the size of the object to be scanned
Start:	Sets the start point of the area to be scanned.
Size:	Sets the size of the area to be scanned.
Numbers in these	fields can be in bytes or sectors. See the Data Formats and Multipliers topic for
more details on da	ata formats.
File Systems:	Specifies the file systems which objects are to be searched for.
	Current version supports: <u>FAT</u> , NTFS, <u>exFAT</u> , ReFS, <u>Ext</u> 2/3/4FS, <u>XFS</u> , HFS,
	APFS, and <u>UFS</u> file systems. The Technician version supports also the ISO9660 file
	system.
	Please note that if you need to scan an HFS, HFS+, or HFSX disk, always enable the
	Extra search for <u>Known File Types</u> option. This is very important because when files are
	being deleted on the HFS, HFS+, HFSX file systems, the computer completely
	removes all system information on them, and there is no way to recover the deleted files
	except by using the Extra Search for Known File Types option. See Data Recovery
	on HFS/PIFS+ file system for details.
Extra search for Known File Types	Enables search for Known File Types.
Save scan Info to	If this checkbox is selected, R-Studio will save scan information to a specified file.
File:	Later this file may be opened. Please note, that this option does not save actual drive
	data, only information on drive data structure gathered during drive scan.
	If
Buttons	Т
Scan	Starts scanning
Advanced	Activates advanced scan options
Known File	Selects file types that R-Studio will recognize during the drive scan.
Types	
Cancel	Closes the dialog box
	Y TO SAVE SCAN INFORMATION TO THE OBJECT BEING SCANNED!!! you may obtain unpredictable results and lose all of your data.

If a remote computer is connected for **Data Recovery over Network**, the Scan dialog box will have a different look

Main	Post Ac	tions					
Scan an	ea (Driv	e size: 1.02 TB)					
0	n the er n area	itire drive		The selected drive has not yet or its scan information has not You may either scan the entire Advanced mode to specify cus	been loaded. drive or use		
Starts	0		Bytes 👻	parameters.			
Size: 1.02			TB 👻	3 ~			
Eile Syste	m:	NTFS; ReFS; FAT	/exFAT; Ext2/Ex	t3/Ext4; UFS; XFS; HFS; APFS	Change		
		Extra Search	for Known File T	/pes Kn	own Fijle Types.		
Save :	to File:	192.168.1.16	 /Users/emi 	lyanderson/Documents/scan.scn			
				ble drives. This option saves scan ure. Actual data is not saved!)	metadata,		

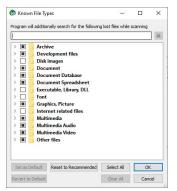
and the Save Scan Information File dialog box will appear when you select a place to store scan info. You may save it to the local or remote computer.

192.168.1.158	-	C:\Users\Public\disk_scan.scn		
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Known File Types (raw file search): While scanning, **R-Studio** can recognize the data's particular file type. Using such information, **R-Studio** can obtain more information about data/file structure on the object being scanned. By default, **R-Studio** tries to recognize the default list of supported file types specified on the Known File Types tab of the <u>Settings</u> panel, greatly increasing time required for the scan. You may reduce it by selecting only those file types that you need. Click the **Known File Types...** button and select the required file types on the File Types dialog box. These selections will be applied to that scan session only.

R-Studio places such found files in the Raw Files section in the the Drives panel.

File Types dialog box



Known File Types

Set as Default	Click this button to set the current list of selected file types as default values.
Revert to Default	Click this button to revert the default settings specified on the Known File Types tab of the <u>Settings</u> panel.
Reset to	Click this button to revert to factory-preset default settings.
Recommended	
Select All	Click this button to select all file types in the list.
Clear All	Click this button to clear all file types in the list except some predefined ones.

List of known file types

Document

AbiWord	Adobe InDesign	Adobe PDF	Apple iWork Keynote
Document: . abw	File: . indd	document: .pdf	document: .key
Apple iWork Pages	Apple iWork document	Capella document: . cap	Final Draft
document: .pages		1 1	Document: .fdr
FrameMaker	GNU Info	Garmin MapSource	Lotus AMI Pro
Document: .fm	Document: .info	data: .mps	Document: .sam
Lotus Organizer: . or 5	Lotus Word Pro	Microsoft Office Open	Microsoft OneNote
0	Document: .lwp	XML Document	section file: . one
Microsoft Pocket Streets	Microsoft PowerPoint	Microsoft PowerPoint	Microsoft Visio
Map File: .mps	2007 XML	Document: .ppt	document: .vsd
	Document: .pptx		
Microsoft Word 2007	Microsoft Word	Word for Macintosh	Microsoft Word2
XML Document: .docx	Document: .doc	Document: .mcw	Document: .doc
Microsoft Works	OLE Storage	OpenOffice Writer	OpenOffice
document: .wps		document: .odt	document: .ods
PageMaker	PostScript	QuarkXPress file: . qxd	QuarkXpress
Document: .p65	document:.ps		project: .qxp
Rich Text	TEX document: .tex	Text document: .txt	Unicode
Document: .rtf			document: .txt
WordPerfect			
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Document: E-book			
Chaoxing SSReader	EPUB eBook: .epub	FB2 eBook: .fb2	MOBIeBook:.mobi
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			Document: .xlsx
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Image: .img		Image: .gif	image: .img
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Advanced Streaming Format file: .asf	Audacity audio: .au	AudioCD file: .cda	Battery 3 sample: .nov
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Digital Speech File: .dss	Digital voice file: .dvf	EA ASF/MUS audio file: .asf	Extended M3U playlist: .m3u
FLAC audio file:.fla, .flac	KaraBox sound: .mkf	La Lossless audio file: .la	Liquid Audio File: .la1
MIDI Instrument definition: .idf	MIDI music: .mid	MIDI stream: .mds	MPEG Layer I audio file: .mpg
MPEG Layer II audio file: .mp2	MPEG Layer III audio file: .mp3	MUS music: .mus	Monkeys audio file: .ape
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file: .ogg	file:.ofr	Format: .psf	music:.rmi
RK Audio sound: .rka	Sierra AUD sound: . aud	Sony OpenMG audio file: . oma	Super NES audio file: .spc
TTA audio file: .tta	VQF sound: .vqf	WavPack audio file: .wv	Westwood AUD sound: .aud
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video: . 3gp	audio/video: . 3g2		Animation: .fsf
AMV Video: . amv	ARMovie video: .rpl	Adobe Filmstrip	Autodesk

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Director video: .dcr	DriveCam video: .dce	Eyemail video: .eye	Flash Video: .flv
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LZA Animation: .1za	Lotus ScreenCam video:.scm	MPEG Transport Stream video: .mts	MPEG video: .mpg
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Nancy Codec video: .noa	Nullsoft Video: .nsv	QV-10 video:.cam	QuickTime video: .mov
SGI movie format: . mv	SMJPEG Video: .mjpg	Sega FILM/CPK video:.cpk	Shockwave video:.swf
Smacker video: . smk	Sony Movie Player video: .mqv	VOB video files: .vob	VP6 encoded Video: .vp6
VideoCD video: .vcd	Vivo streaming video:.viv	Windows AVI Video:.avi	Windows Media Video: .wmv
Multimedia Files	•		
MP4 file: .mp4	Material Exchange File: .mxf	RIFF Multimedia File	Real Networks audio/? video:.rm
Archive Files			
7-Zip archive: .7z	ACE archive: .ace	AIN archive: .ain	ARJ archive: .arj
ARX archive: .arx	Android Package: .apk	BAG archive: .bag	BIX archive: .bix
BOA archive:.b58, .boa	BZip2 archive: .bz2	BlackHole archive: . bh	Blink archive: .bli
CPIO archive: .cpio	ChArc archive: .chz	Compress archive: . z	Crush archive: .cru
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UFA archive: .ufa	UHArc archive: .uha	UltraCompressor 2	WRAptor
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Creation File: .pcp	Validation		
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xz archive: .xz			
Executable/Library/DL	L		
DOS Style	ELF Executable (UNIX)	ELF Library (UNIX)	ELF Module (UNIX)
Executable: .exe			
Java Bytecode: .class	KolibriOS Executable	NetWare Loadable	Shell Script
		Module: .nlm	
UEFI Executable	Windows DLL: .dll	Windows	Windows 9x Device
.efi		Executable: .exe	Driver: .vxd
Windows Device	Windows OCX		
Driver: .sys	File: .ocx		
Development files			
ACUCOBOL object	Borland Delphi	Borland Turbo Pascal	C/C++ Source
ACOCODOL Object	Compiled Unit: .dcu	compiled Unit: . tpu	Code: . c
СОМ Туре	GUI Design Studio	LUA Script: . lua	Library: .lib
Library: .tlb	project: .gui	LUA Script Lua	Library 11D
Microsoft .NET XML	Microsoft ClassWizard	Microsoft Linker	Miana aft Dua a annilad
Resource	file: .clw	database .ilk	Microsoft Precompiled header: .pch
template: .resx	INCCIW	ualabase .IIK	neaderpen
	Microsoft Visual C++	Microsoft Visual Studio	Microsoft Visual Studio
Microsoft Program database: .pdb		Solution: .sln	
	project: .mdp		project: .dsp
Microsoft Visual Studio	OMF Object	PolySpace results: . chk	RDOFF Object
workspace: .dsw	library: .lib		File: .rdf
Resource Compiler	Visual Studio Solution	Visual Studio Widget	Visual Studio
Script File: .rc	User Options: . suo	File:.wid	Workspace Options
<i>V'</i> ID '			file:.opt
VisualBasic	WinDev Window: .wdw	Windows Compiled	XPCOM Type
Project: .vbp		resource (32bit):.res	Library: .xpt
Xcode			
Project: .pbxproj			
Disk images		Γ	-
Hyper-V virtual	JAM compressed	Norton Ghost disk	QEMU virtual
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image: .ghs

disk:.vhdx

disk:.jam

disk: .qcow2

R-Drive Image disk	VMware virtual	Virtual PC virtual	VirtualBox virtual
image: .rdr	disk:.vmdk	disk: .vhd	disk:.vdi
Other file types		1	
ABBYY Lingvo	AIX Backup File: .bff	ArtMoney Table	CrystalMaker Data
dictionary: .1sd		file: .amt	File:.cmdf, .cmmf
Dwarf Fortress save	EasyCrypto	Fallout 3 save	Java Applet cache
data:.dat	file:.encrypted	game:.fos	index:.idx
Kaspersky Anti-Virus	Kaspersky Anti-Virus	Kaspersky Anti-Virus	Magic 3D Easy View
data base: .avc	report: .rpt	signature bas: .kdc	object: .x
Microsoft Security	NHTSA UDS-1992	NOD32 Antivirus	ORTIMZeit
Catalog:.cat	crash test result: .uds	Update file: .nup	project: .ozv
OziExplorer Map	PRO100 project: .sto	PlayStation 3	RegEdit file: .reg
data: .map		Theme: .p3t	
RegEdit file	Source Game Engine	Unreal Package	Valve Texture
(UNICODE):.reg	Compiled AI		File: .vtf
	Nodegraph: .ain		
WinHelp:.hlp	WinHelp	WinXP Prefetch file: .pf	Windows Backup
	Contents: .cnt		File:.bkf
Windows Clipboard	Windows Color	Windows	Windows National
file:.clp	Profile: .icm	Minidump:.dmp, .mdm	locale: .nls
		p	
Windows Password	Windows Registry	Windows Thumbnail	Windows User
file:.pwl	hive:.dat, .hiv	cache: .db	Interface Module: .wim
Windows shortcut: .lnk	X-Plane Scenery: .dsf	XNA Game Data: .xnb	

Note: Using scan for Known File Types, **R-Studio** can successfully recover only un-fragmented files. You may also specify your own file types for scanning. See <u>Customizing File Types</u> for details. Userdefined file types precede over built-in ones, if their definitions overlap. You may set the defaults for known file types on the <u>R-Studio Settings</u>.

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R-Studio Technician/T80+

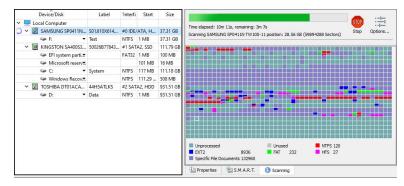
Scan (Post Actions) dialog box

Shutdov	vn the cor	nputer on all task	s completion						
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-		inple.com		T GI L	25	<u>.</u>	001	Hato	
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Recipient(s)) email:	tester2@exampl	e.com						
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Error	occurred	Login:	tester 1						
Succe	SS	Password:							

Post Actions Options

Shutdown the computer on task completion	If this check box is selected, R-Studio will shut down your computer when scan has been completed. You should select the Save to file checkbox and specify a place to save scan info to activate this option.
E-Mail notifications	If this check box is selected, R-Studio will inform you about the outcome of the operation via email.

> R-Studio starts scanning the object, and its panel will show information about new found objects:



🖃 R-Studio Main panel

	Files Scan Parti	tion Search Cr	eate Ima	ige Open	D Image C	reate Region	RAIDs	Connect To Remo	te Remove				
Device view	0												
Devi	ce/Disk	Label	'Interfa	Start	Size	^	Scanning						
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BEC.	Recognized2	NTFS-Test	NTFS	32 KB	6.76 GB								4
	F: (Recognized3)	Test	NTFS	1 MB	37.31 GE								4
	Recognized5	Ext4FS-Test	Ext4	21.63	6.52 GB								
	Recognized6	Ext4FS-Test	Ext4	21.63	37.27 GE								
	Recognized4	Double	NTFS	28.15	9.15 GB								
	Raw Files												
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	Recognized 199		HFS+	17.30	30.55 MI								
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	Recognized378		HFS+	17.34	47.32 MI								
	Recognized387		HFS+	17.34	30.55 MI								
	Recognized388		HFS+	17.34	30.55 M	= U	nprocessed	270	EXT2	d 8938			
	Recognized234		HFS+	17.36	30.55 M			154	HFS	39			
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Rec Recognized313 HFS+ 17.36 GB 30.55 M	
Recognized274 HFS+ 17.37 GB 30.55 M	
Recognized351 HFS+ 17.37 GB 30.55 M	
Recognized326 HFS+ 17.37 GB 61.09 M	
Recognized397 HFS+ 17.37 GB 94.63 M	
Recognized92 HFS+ 17.38 GB 122.19 1	
Recognized335 HFS+ 17.40 GB 61.09 M	
Recognized47 HFS+ 17.41 GB 61.09 M	
Recognized 169 HFS+ 17.42 GB 47.32 M	
Recognized202 HFS+ 17.43 GB 61.09 M	
Rec. Recognized342 HFS+ 17.43 GB 61.09 M	
Recognized346 HFS+ 17.43 GB 61.09 M	
Recognized403 HFS+ 17.44 GB 23.66 M	
Recognized440 HFS+ 17.44 GB 30.55 M	
Recognized444 HFS+ 17.44 GB 30.55 M	
Recognized80 HFS+ 17.45 GB 30.55 M	
Recognized84 HFS+ 17.45 GB 47.32 M	
Recognized122 HFS+ 17.45 GB 30.55 M	
Recognized123 HFS+ 17.45 GB 30.55 M	
Recognized125 HFS+ 17.45 GB 30.55 M	
Recognized130 HFS+ 17.45 GB 30.55 M	
Recognized175 HFS+ 17.46 GB 15.27 M	3
Commo Drive scan completed accessfully.	
FAT 2/0 E/12 8938 HTS 154 FFS 39 Specific Tire Documents 139155	
Time Text 8:21:51 AM Successfully loaded user's file types definitions from "CnProgram Files (x80)/R-St	

Drives panel after scanning: You can select an object by clicking it

The Log pane will show scan progress. Scan may be stopped by clicking the **Stop** button on the tab. Later the scan process may be resumed with different scan parameters. Some scan parameters may also be changed during the scan process. Click the Options button and change them on the Scanning dialog box. You may change some options during the scan process

Log Type 1 System 1 System 1 System

Options (Scar	nning)	
Drive Options	Post Actions	
SAMSUNG SPO	0411N TW 100-11 : S0 13330X9 12831	
Read retries o	count: Default (0) 🔻	

Only in the Technician version

Drive Options Por	st Actions							
Shutdown the co	omputer on all task	s completion						
Email notification Server: mail.ex	ample.com	Port: 25 🗘 SSL Auto 🗸						
Sender email:	tester 1@example	e.com						
Recipient(s) email:	tester2@example.com							
Custom subject:	Image Creation F	Image Creation Results						
Send email if	Authoriz	ation						
Error occurren	d Login:	tester 1						
Success	Password:							
		Test email account						

You may see which file object(s) is/are on a particular drive part. Click the corresponding rectangle in the Scan Information pane and view the information on the Scan Information dialog box.

Scan Information **dialog box**

Name	Offset (in sectors)	Size (in sectors)
FAT Table Entries	1941621	1
AT Table Entries	1941744	1
AT Table Entries	1941873	1
AT Table Entries	1941917	1
Sony cam video, XDC	1870088	64180
Text Document	1913786	1
Windows Executable	1934268	5293
Windows Bitmap Image	1939564	2055
Microsoft Visio Docu	1941620	337

Double-click an object to view/êdit the file object in the Text/Bexadecimal editor.

When an object is scanned, a number of Recognized partitions will appear. **R-Studio** shows them in different colors depending on which elements of the partition have been found.

- 🥪 F:	An existing logical disk or partition
F: (Recognized12)	An existing logical disk or partition after drive scan
Recognized18	A recognized partition. Both boot records and file entries are found for this partition
Recognized22	A recognized partition. Only file entries are found for this partition
Recognized16	A recognized partition. Only boot records are found for this partition
Rec Recognized8	A fast found partition

🖳 🧼 Empty Space21	Empty space on the object
meletedPart1	A deleted partition
Seaw Files	Files that have been found using <u>scan for known file types</u> (raw file search).

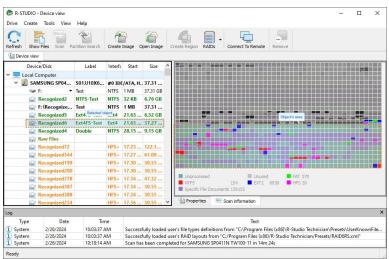
Although such recognized partitions are virtual objects, files can be searched for and recovered from recognized partitions as from real logical disks using Basic File Recovery.

To see the information about a newly found object, simply click it in the Drives panel. Click this link to see the information about the object Recognized13 on the logical disk H:



When an object in a scanned drive is selected, R-Studio shows the scanned area of the object.

Object's scanned area



All scanned information may be deleted on the shortcut menu for a scanned object.

Scan information may be saved in a file. Previously saved scan information may be loaded. This can be done on the **Drive** or shortcut menu for a selected object.

Resuming incomplete scans or scanning the object with different parameters

You may resume the scan of an incompletely scanned object or rescan the already scanned object with different parameters. The Scan dialog will be a little bit different in this case.

Scan dialog box for incomplete scans

() Reso	an the unpro	e size: 37.31 GB) entire drive :essed areas			The selected drive has been and has one unprocessed at the unprocessed area to co rescan the entire drive from use <u>Advanced mode</u> to spe parameters.	rea. You may <u>scan</u> mplete the scan, in the beginning, or
Start:	tart: 13.66		GB	•	parametera	
Size:	23.64	E.	GB	•		
Ele System: NTFS; ReFS; FAT/		(exFAT; E)	kt2/Ext	3/Ext4; UFS; XFS; HFS; APFS	Change •	
		Extra Search f	or Known	File Typ	bes	Known File Types
Save t	File:					
					e drives. This option saves so re. Actual data is not saved!)	an metadata,

You may rescan the entire drive, scan unscanned areas, or scan an explicitly specified area.

Scan of multiple areas

You may simultaneously scan several successive or overlapping areas. Click the **Advanced** button, specify an offset and size for a new area to scan on the Advanced Scan dialog box and click the **Add** button. You may specify and add several scan areas. You may select which areas should be scanned. Selected scan areas can be merged. Right-click a necessary area and select either **Merge Down**, **Merge Down All**, and **Merge Selected**. You may also select/unselect unscanned areas.

Advanced Scan dialog box

-		Offset, byte(sectors)	Size, byte(sectors)	the second second	Туре
	0 Bytes	(131072 Sectors)	64 MB (131072 Sectors) 960 MB (1966080 Sectors)	To scan Unscan	
H		(1310/2 Sectors)	640 MB (1310720 Sectors)	To scan	
		8 (3407872 Sectors)	35.68 GB (74835104 Sectors)	Unscan	
Offset	t: 1	GB 🔻	Size: 640 MB	•	Add
			Size: 640 MB Ext2/Ext3/Ext4; UFS; XFS; HFS; APF		Add Change •
Offset			Ext2/Ext3/Ext4; UFS; XFS; HFS; APF		

R-Studio accumulates the information from successive scans and keeps track of changes in this information obtained from different scans.

You may manage the areas

Managing scan information

Scan information may be saved to a file. Previously saved scan information may be loaded.

To save scan information

- 1 Select an object in the R-Studio Drives panel
- 2 Select Save Scan Information on the Drive or shortcut menu and save the scan information in a file The default file extension is *.scn.

If a remote computer is connected for **<u>Data Recovery over Network</u>**, the Save Scan Information File dialog box will appear when you select a place to store scan info. You may save it to the local or remote computer.

To load scan information

- 1 Select an object in the R-Studio Drives panel
- 2 Select Open Scan Information on the Drive or shortcut menu and select the required file with the scan information
 - The default file extension is *.scn.

If a remote computer is connected for **Data Recovery over Network**, the Open Scan Information File dialog box will appear when you select a place to load scan info from. You may load it from the local or remote computer.

192.168.1.158		C:\Users\Public\disk_scan.scn		
---------------	--	-------------------------------	--	--

> The scan information will appear in the Drives panel

To remove scan information

- 1 Select an object in the R-Studio Drives panel
- 2 Select Remove Scan Information on the Drive or shortcut menu
- > The scan information will disappear from the Drives panel

NEVER TRY TO SAVE SCAN INFORMATION ON THE OBJECT BEING SCANNED!!! Or you may obtain unpredictable results and lose all your data.

2.2.2 Fast Search for Lost Partitions

<u>Drive scan</u> gives very detailed and accurate results but takes long time. If you want to find only <u>partitions</u> previously existed on the drive you may use fast search for lost partitions which is much faster.

To perform fast search for lost partitions,

1 Select an object in the **R-Studio's** Drives panel

Fast search for lost partitions

R-STUDIO - Drive Create							- 🗆 X
C Befresh Show	Files Scan Partition Se	arch Create Imag	e Open Ir	nage Crea	(and 1)	AIDs Connect To Remot	te Remove
Device view							
D	evice/Disk	Label	i/Interfa	Start	Size	Name	Value
Local Co	mputer					Drive Type	Physical Drive, Disk
Y 📓 KING	STON SA400537120G 0	50026B77843A5	#0 SATA	2, SSD	111.79 GB	Name	WDC WD3200BEVT-08A23T1 02.01A02
	FI system partition		FAT32	1 MB	100 MB	OS Object	\\.\PhysicalDrive2
See 1	Microsoft reserved parti.	:		101 MB	16 MB	R-Studio Driver	WinNT\Handle\Physical
÷ (G 🔹	System	NTFS	117 MB	111.18 GB	Size	298.09 GB (625142448 Sectors)
Se 1	Nindows Recovery Partiz	:	NTFS	111.29 GB	508 MB	Logical Sector Size	512 Bytes
V 🛛 TOSHIBA DT01ACA100 MS2		44H5ATLKS	#1 SATA2, HDD		931.51 GB	Physical Sector Size	512 Bytes
🥪 D: 👻		Data	NTFS	1 MB 931.51 GB		Partition Size	298.09 GB (625142448 Sectors)
🗸 💹 WDO	WD3200BEVT-08A23T	WD-WXC1A801	#2 SATA	2 SATA2, HDD 298.		I/O Retries	Default 👻
S 1	/olume1	ext4fs	Ext4	992.50 KB	37.25 GB	✓ Drive Control	
S 1	/olume2	xfs	XFS	37.25 GB	37.25 GB	Maximum Trans	sfer 128 KB 🔻
Se 1	/olume3	exFAT	exFAT	74.51 GB	37.25 GB	I/O Block Size	512 Bytes 💌
	/olume4	NTES	NTFS	111.76 GB	44.70 GB	Buffer Alignmer	nt 4 Bytes 💌
	/olume5	FAT32	FAT32	156.46 GB	11.72 GB	Y Physical Drive Geo	ometry
	/olume6		NTES	168.18 GB	129.91 GB	Cylinders	38913
						Tracks Per Cylin	der 255
						Properties	S.M.A.R.T.
oq							
Type	Date	Time				Text	
) System			cessfully	naded user's	file types def		Files (x86)\R-Studio Technician\Presets\UserKnownFile.
System							(86)/R-Studio Technician/Presets/RAID6RS.xml"
Contraction of the second s	- Andread and a standa			terra producer de	river in the second		
eady							

2 Click the Partition Search button

R-Studio will start searching for lost partitions showing its progress.

Fast search for lost partitions

fresh Show Files Sc	an Partition S	Bearch Crea	te Image Open Image	Create Region RAIDs Connec	t To Remote Re	move		
Device view							_	
Device/Disl	🔁 🕞 Fast se	arch for lost p	artitions			- 🗆 🗙		
Local Computer								
V I KINGSTON SA	4 👘 🗖					Stop	A23T1 02.01A02	
See EFI system		e elapsed: 11s						
Se Microsoft	Sca			01A02 position: 168.65 GB (353683984 S			al	
Se C				ready see the partition you search for yo	ou may stop the se	arch. You may continue	Sectors)	
Se Windows	Found Part	later, if necessa	ry.					
	Found Part	tions:	Offset	Size	FS	Label		
- D:	type	1 MB (2048			10000	ext4fs	Sectors)	
~ 💹 WDC WD3200	Lost Lost		Sectors) 8127104 Sectors)	37.25 GB (78125056 Sectors) Ext4 37.25 GB (78125056 Sectors) XFS 37.25 GB (78125056 Sectors) exFAT		ext4fs xfs	pectors)	
Se Volume1	Lost		6252160 Sectors)		exEAT	xfs exFAT		
Se Volume2	Lost		234377216 Sectors)	44.70 GB (93745151 Sectors)	NTES	GUITU		÷
Se Volume3	Lost	156.46 GB (3	28122368 Sectors)	11.72 GB (24576000 Sectors)	FAT32	FAT32	-	
Se Volume4	11.00						-	
Wolume4	-						-	
Se Volume5							-	
volumeo								
	Option	ns				Show Log >>	-	_
	1						al	
	Date	Time			Text			
		2:11:59 PM	Successfully loade	d user's file types definitions from "C	:\Program Files ()	(86)\R-Studio Technicia	an\Presets\UserKnow	vnFil

> **R-Studio** will show fast-found partitions in blue.

Fast search for lost partitions

R-STUDIO - Drive Create	Device view Tools View Help											×
Refresh Show	Files Scan Complete s	can Create Image	Open Ima) age Create	Region RAI		To Rem	ote Remove				
	evice/Disk	Label	i/Interfa	Start	Size		10.00		0.0100.0000.0000			1111
Local C	omputer											
> 500 KIN	GSTON SA400537120G 0	. 50026B77843A5	#0 SATA	2. SSD	111.79 GB							
> 🗵 TOS	HIBA DT01ACA100 MS2.	. 44H5ATLKS	#1 SATA	2, HDD	931.51 GB							
~ 🗵 WD	C WD3200BEVT-08A2	. WD-WXC1A80	#2 SATA	2, HDD	298.09 GB							
\$	Volume1	ext4fs	Ext4	992.50 KB	37.25 GB							
\$	Volume2	xfs	XFS	37.25 GB	37.25 GB							
\$	Volume3	exFAT	exFAT	74.51 GB	37.25 GB							1013
\$	Volume4	NTFS	NTFS	111.76 GB	44.70 GB							
S	Volume5	FAT32	FAT32	156.46 GB	11.72 GB							
\$	Volume6		NTFS	168.18 GB	129.91 GB							
Rec	Recognized10	ext4fs	Ext4	1 MB	37.25 GB							
RED	Recognized11	xfs	XFS	37.25 GB	37.25 GB							
Red.	Recognized7	exFAT	exFAT	74.51 GB	37.25 GB							1999
RPD.	Recognized6		NTFS	111.76 GB	44.70 GB	Unprocess	ed		🔳 Unused			
Red.	Recognized8	FAT32	FAT32	156.46 GB	11.72 GB	NTFS	14		EXT2 2			
Ret.	Recognized9		Ext4	149.50 GB	148.55 GB	XFS	3		FAT 4	3		
						Properties		Scan information				
og											_	
Туре	Date	Time					Text					
System								am Files (x86)\R-Stuc				n⊦
System								s (x86)/R-Studio Tech			.xml"	
) System	2/20/2024 12	:18:29 PM Se	arch for los	t partitions o	n arive WDC V	1D 3200BEV 1-08	AZ311	02.01A02 has been co	mpleted in 3r	n 125		_

You may right-click the partition and select **Complete scan** to scan the entire drive.

2.2.3 Customizing File Types

You may create your own known file types and add their file signatures for scanning in Known File Types. They will appear in their respective folders on the File Types dialog box.

You can do that either by using the **R-Studio's** graphic interface or by direct editing the known file description file specified on the **R-Studio** Main settings dialog box.

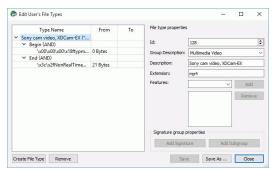
Creating a Known File Types using a Graphic User's Interface

The easiest way to add your own is to use the **R-Studio's** graphic interface.

To create a Known File Type,

- 1 On the <u>Known File Types</u> settings dialog box, click the Edit User's File Types... button
- > The Edit User's File Types dialog box will appear

Edit User's File Types ${\mbox{dialog box}}$



2 Click the Create File Types button and specify File type properties

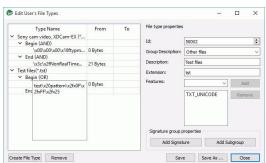
Edit User's File Types dialog box

Type Name Sony cam video, XDCam-EX (*	From	То	File type properties		
Begin (AND)			Id:	50002	2
\x00\x00\x00\x18ftypm	0 Bytes		Group Description:	Other files	
End (AND)					
\x3c\x2fNonRealTime	21 Bytes		Description:	Test files	
 Test files(*.tst) 			Extension:	tst	
Begin (OR)			Features:		
End (OR)			reatures:	``````````````````````````````````````	 Add
				TXT_UNICODE	Remove
			Signature group p	roperties	_
			Add Signat		Subgroup

File Types properties

id	digit	Required	Digital file type identifier. Should be unique for each custom file type.
group	string	Optional	Specifies a file type group in which found files will appear. You may specify either your own groups or select those predefined on the File Types dialog box.
descrip tion	string	Optional	Brief file description
feature s	NO_SCAN TXT_ANS I TXT_UNI CODE	Optional	Additional properties of the file type. If you want to specify several properties, they should be separated by a space. NO_SCAN: Not to be scanned for. If this flag is used, R-Studio will not search for such file type. Such files will be shown when sorting files by their extensions. TXT_ANSI: The file can be viewed as ANSI text. If this flag is specified, the file can be correctly represented as an ANSI text. When previewing, this file will be immediately sent to Text ? hexadecimal editor . TXT_UNICODE: The file can be viewed as UNICODE text. If this flag is specified, the file can be correctly represented as a UNICODE text. If this flag is specified, the file can be correctly represented as a UNICODE text. If this flag is specified, the file can be correctly represented as a UNICODE text. If this flag is specified, the file can be correctly represented as a UNICODE text. If this flag is specified, the file can be correctly represented as a UNICODE text. If this flag is specified, the file can be correctly represented as a UNICODE text. If this flag is specified, the file can be correctly represented as a UNICODE text. If this flag is specified, the file can be correctly represented as a UNICODE text. When previewing, this file will be immediately sent to Text/?
extensi on	<string ></string 	Optional	File extension.

3 Click the Add Signature button, specify the signature parameters, and click the Save button Edit User's File Types dialog box



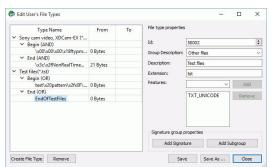
File signature properties

Begin	Specifies from where the signature begins.
End	If End, the offset is from the end of file to the first byte of the signature. That is, if the
	signature is two bytes long, the offset value should be 2.
AND	Shows the order of the logical operation (union or intersection)
OR	
From	A decimal number specifying the leftmost possible offset for the file signature.
То	A decimal number specifying the rightmost possible offset for the file signature.
10	A declinal number specifying the rightmost possible offset for the file signature.

You may specify as many signatures as you need. Moreover, you may specify subgroups within a signature using the Add Subgroup button. The structure of such possible subgroups is described on the <u>Customizing</u> File Types-II help page.

> The newly specified file type will appear on the Edit User's File Types dialog box and the <u>File Types</u> dialog box

Edit User's File Types dialog box



2.2.4 Customizing File Types-I

The syntax of signature description is similar to that of the XML language. They are stored in the file specified on the **R-Studio** Main settings dialog box.

More advanced features are described in Customizing File Types-II.

Signature file example

</FileType></FileTypeList>

File structure

File header

The file starts with a standard XML header <?xml version="1.0" encoding="utf-8"?>

Section FileTypeList
<FileTypeList>
It requires a closing element </FileTypeList>.

Section FileType

This is a description of each file signature.

Attributes:

id	<u32></u32>	Required	Digital file type identifier. Should be unique for each file type.	
group	<string></string>	Optional	Specifies a file type group in which found files will appear. You may specify either your own groups or those predefined on the <u>File Types</u> dialog box.	Default: unknown
description	<string></string>	Optional	Brief file description	Default: null (no description)
features	NO_SCAN TXT_ANSI TXT_UNICODE	Optional	Additional properties of the file type. If you want to specify several properties, they should be separated by a space.	Default: 0
extension	<string></string>	Optional	File extension.	Default: null (no extension)

File type properties flags

NO_SCAN	Not to be scanned for. If this flag is used, R-Studio will not search for such file type. Such
	files will be shown when sorting files by their extensions.
TXT_ANSI	The file can viewed as ANSI text. If this flag is specified, the file can be correctly
	represented as an ANSI text. When previewing, this file will be immediately sent to <u>Text/</u> ?
	<u>hexadecimal editor</u> .
TXT_UNICOD	File can viewed as UNICODE text. If this flag is specified, the file can be correctly
Е	represented as a UNICODE text. When previewing, this file will be immediately sent to
	Text/Bexadecimal editor.

This section can contain an unlimited number of the Signature elements. If there are several Signature elements, that means that all those signatures are simultaneously present in the file. Such signatures should have different offset attributes and they should not overlap.

The element contains a string value of the file signature consisting of ASCII characters and hex bytes in the $\ h$ format, where hh is a hexadecimal byte code. If there is not a hexadecimal number after $\ x$, $\ x$ are treated as a part of the string section of the signature

ibu	ites
	ibι

offset	<u16></u16>	Optional	Decimal offset for the signature	Default: 0
count	<ul6></ul6>	Optional	Decimal number specifying the number of signatures of the same length. Used when several signatures of the same length starting with the same offset can be present in a file. In this case they should be sequentially written in the element, and the size attribute specifies the length of signature. count*size should be equal to the number of bytes in the element. If only one signature can be on this offset, count should be equal "1", and size should be equal to the length (the number of bytes) of the signature.	Default: 1
size	<u16></u16>	Optional	Decimal number specifying the number of bytes in the signature.	Default: the number of bytes written in the element.
from	begin end	Optional	Specifies from where the offset is calculated. If end, the offset is from the end of file to the first byte of the signature. That is, if the signature is two bytes long, the offset value should be 2.	Default: begin

Comments

<!-- Comment string -->

An XML standard string for a comment.

2.2.5 Customizing File Types-II

Currently **R-Studio** supports two versions of file type descriptions. Version 2 extends legacy Version 1 by adding variable signature offsets and AND/OR combination of several signatures in one file type. The version of file type description is specified by the version attribute of the FileTypeList section. Version 1 is the default option.

File structure

Elements common to Versions 1 and 2 of file type description

File header

The file starts with a standard XML header <?xml version="1.0" encoding="utf-8"?>

Section FileTypeList

<FileTypeList>

Attributes:

version 1.0 2.0	Optional	Version of file type description	Default: 1.0
--------------------	----------	----------------------------------	--------------

It requires a closing element </FileTypeList>.

Comments

<!-- Comment string --> An XML-standard string for a comment.

Version 1 of file type description

Signature file example

```
<FileTypeList>
  <FileType id="2" group="archive" description="ARJ Archive" extension="arj">
        <Signature offset="3" count="1">Abc\x5c\x00\x04</Signature>
        <Signature offset="9" count="2">\x23\x01\xf4</Signature>
        </FileType>
<//FileTypeList>
```

Section FileType

This is a description of each file signature.

Attributes:

id	<u32></u32>	Required	Digital file type identifier. Should be unique for each file type.	
group	<string></string>	Optional	Specifies a file type group in which found files will appear. You may specify either your own groups or those predefined on the <u>File Types</u> dialog box. See the table below.	Default: unknown
description	<string></string>	Optional	Brief file description	Default: null (no description)
features	NO_SCAN TXT_ANSI TXT_UNICODE	Optional	Additional properties of the file type. If you want to specify several properties, they should be separated by a space.	Default: 0
extension	<string></string>	Optional	File extension.	Default: null (no extension)

	a des nags
NO_SCAN	Not to be scanned for. If this flag is used, R-Studio will not search for such file type.
	Such files will be shown when sorting files by their extensions.
TXT_ANSI	The file can be viewed as ANSI text. If this flag is specified, the file can be correctly represented as an ANSI text. When previewing, this file will be immediately sent to
	Text/Rexadecimal editor.
TXT_UNICODE	The file can be viewed as UNICODE text. If this flag is specified, the file can be correctly represented as a UNICODE text. When previewing, this file will be
	immediately sent to Text/Rexadecimal editor.

File type properties flags

List of predefined file type groups

Group	Name on the File Types dialog box.
archive	Archive Files
graphics	Graphics/Picture
internet	Internet-related files
multimedia	Multimedia Files
audio	Multimedia: Audio Files
video	Multimedia: Video Files
font	Font
document	Document
doc_database	Document: Database
doc_sheet	Document: Spreadsheet
exe	Executable/Library/DLL
unknown	Other file types

This section can contain an unlimited number of the Signature elements. If there are several Signature elements, that means that all those signatures are simultaneously present in the file. Such signatures should have different offset attributes and they should not overlap.

Element Signature

The element contains a string value of the file signature consisting of ASCII characters and hex bytes in the $\ h$ format, where hh is a hexadecimal byte code. If that is not a hexadecimal number after $\ x$, $\ x$ are treated as a part of the string section of the signature

Attributes:

offset	<u16></u16>	Optional	Decimal offset for the signature	Default: 0
count	<u16></u16>	Optional	Decimal number specifying the number of signatures of the same length. Used when several signatures of the same length starting with the same offset can be present in a file. In this case they should be sequentially written in the element, and the size attribute specifies the length of signature. count*size should be equal to the number of bytes in the element. If only one signature can be on this offset, count should be equal to "1", and size should	Default: 1

			be equal to the length (the number of bytes) of the signature.	
size	<u16></u16>	Optional	Decimal number specifying the number of bytes in the signature.	Default: the number of bytes written in the element.
from	begin end	Optional	Specifies from where the offset is calculated. If end, the offset is from the end of file to the first byte of the signature. That is, if the signature is two bytes long, the offset value should be 2.	Default: begin

Version 2 of file type description

Signature file example

```
<?xml version="1.0" encoding="utf-8"?>
<FileTypeList version="2.0">
  <FileType id="5626" group="_Test" description="Test file" extension="tst">
    <Begin combine="and">
      <Signature from="0" to="20">ABC</Signature>
      <Signature offset="1">CDEFG</Signature>
      <AND>
        <Signature offset="0">DE</Signature>
        <Signature offset="0">RTD</Signature>
       <OR>
          <Signature offset="12">CP</Signature>
          <Signature offset="16">RTD</Signature>
        </OR>
      </AND>
    </Begin>
    <End combine="or">
      <Signature from="3" to="20">ABC</Signature>
      <Signature offset="5">CDEFG</Signature>
      <AND>
        <Signature offset="2">DE</Signature>
       <Signature offset="3">RTD</Signature>
        <OR>
          <Signature offset="12">CP</Signature>
          <Signature offset="16">RTD</Signature>
        </OR>
      </AND>
    </End>
 </FileType>
</FileTypeList>
```

Section FileType

This is a description of each file signature.

Attributes:

Similar to those in Version 1.

The section can contain one element Begin and one End. It should contain at least one of them.

Example

Sections Begin and End

Specify the positions of file type signatures in the file.

Attributes

combine	and	Optional	Shows the order of the logical	Default: and
	or		operation (union or intersection)	

These sections can contain one of several elements Signature. And one or several elements OR or AND. If there are several elements inside the section they are combined according to the attribute combine.

Example:

```
<FileTypeList version="2.0">
  <FileType id="2" group="archive" description="ARJ Archive" extension="arj">
    <Begin combine="or">
      <Signature [attributes]> ... </Signature>
      . . .
      <Signature [attributes]> ... </Signature>
      <AND>
        . . .
      </AND>
      <OR>
        . . .
      </OR>
    </Begin>
    <End>
      <OR>
        . . .
      </OR>
      <Signature [attributes]> ... </Signature>
      . . .
      <Signature [attributes]> ... </Signature>
    </End>
  </FileType>
</FileTypeList>
```

Sections AND and OR

These sections can contain one of several elements Signature. And one or several elements OR OR AND. If there are several elements inside the section they are combined according to the section type (logical AND OR OR).

Example:

```
<FileTypeList version="2.0">
  <FileType id="2" group="archive" description="ARJ Archive" extension="arj">
   <Begin>
```

```
<Signature [attributes]> ... </Signature>
      . . .
      <Signature [attributes]> ... </Signature>
      <AND>
        <Signature [attributes]> ... </Signature>
        <OR>
          <Signature [attributes]> ... </Signature>
          <AND>
            <Signature [attributes]> ... </Signature>
            <Signature [attributes]> ... </Signature>
          </AND>
          <OR>
            <Signature [attributes]> ... </Signature>
            <Signature [attributes]> ... </Signature>
          </OR>
        </OR>
        <Signature [attributes]> ... </Signature>
      </AND>
    </Begin>
  </FileType>
</FileTypeList>
```

Element Signature

The element contains a string value of the file signature consisting of ASCII characters and hex bytes in the $\ h$ format, where hh is a hexadecimal byte code. If that is not a hexadecimal number after \x , \x are treated as a part of the string section of the signature

Attributes:

offset	<u16></u16>	Optional	Decimal offset for the signature	Default: 0
from	<u16></u16>	Optional	Decimal number specifying the	Default: undefined
			leftmost possible offset for the file	
			signature.	
			Ignored if the offset attribute is	
			specified.	
to	<u16></u16>	Optional	Decimal number specifying the	Default: undefined
			rightmost possible offset for the file	
			signature.	
			Ignored if the offset attribute is	
			specified.	
size	<u16></u16>	Optional	Decimal number specifying the	Default: the number
			number of bytes in the signature.	of bytes written in
				the element.

Example:

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</FileTypeList>

2.2.6 Regions

Scanning large objects may take a long time. Sometimes, only a smaller area of a drive needs to be scanned or searched for files. Such area is called a *region*. A <u>region</u> can be created on any object in the **R-Studio**'s Drives panel.

Created regions can be scanned, and files on them can be recovered in the same way as from drives or <u>logical</u> <u>disks</u>.

Created regions can be deleted or their size can be changed.

Note: **R-Studio** does not create anything real on the drive. Regions are virtual objects that do not affect actual data on the drive.

To create a region

1 Select an object in the R-Studio's Drives panel and click the Create Region button

Other ways to create the region

• Right-click the selected object and select Create Region on the shortcut menu

or

• Select the object and select Create Region on the Create menu

or

• Select the object and press the F4 key on the keyboard

		D	Device/Disk		Label	/Interfa	Start	Size
~	Lo	cal C	Computer					
>	SED	KIN	IGSTON SA400537120		50026B77843A	#0 SATA	2, SSD	111.79 GB
>	2	TO	SHIBA DT01ACA100 N	٨	44H5ATLKS	#1 SATA	2, HDD	931.51 GB
~	12	Hit	achi HTS545016B9SA0	J	100713PBPB08	#2 SATA	2, HDD	149.05 GB
		-	l:	•	NTFS-Test	NTFS	512 KB	28.69 GB
		9	F:	•	FAT32-TEST	FAT32	28.69 GB	26.27 GB
			G:	•	FAT-TEST	FAT16	54.96 GB	2.01 GB
		-	E:	٠	EXFAT	FAT32	56.97 GB	11.72 GB
		-	Partition5	•	HFS	HFSX	68.69 GB	21.48 GB
		-	Partition6	•	EXTES	Ext4	90.17 GB	25.02 GB
	~	-	Partition7	•	XFS	XFS	115.19 GB	33.86 GB
			₩ Reformatted1			NTFS	0 Bytes	33.86 GB

2 Specify required parameters on the Create region dialog box and click the Create button

Create region **dialog box**

Disk size:	149.05 GB (312581808 Sectors)		
Start:	0	Bytes	•
Size:	30	GB	-

Region options

Drive size:	Shows size of the object where the region is to be created. The region cannot be larger than this size.			
Start:	Start point of the region			
Size:	Size of the region. Cannot be larger than Drive size.			
	Numbers in these fields can be in bytes or sectors. See the Data Formats and Multipliers topic for more details on data formats.			

Device/Disk	Label	/Interfa	Start	Size
Y 💻 Local Computer				
> 100 KINGSTON SA400S37120	50026B77843A	#0 SATA	2, SSD	111.79 GB
> 🗵 TOSHIBA DT01ACA100 M	44H5ATLKS	#1 SATA	2, HDD	931.51 GB
V III Hitachi HTS545016B9S	100713PBPB	#2 SAT	A2, HDD	149.05 GB
✓ Segion 0 on Hitachi			0 Bytes	30 GB
🔀 DeletedPart1	NTFS-Test	NTFS	512 KB	28.69 GB
Service Partition1	NTFS-Test	NTFS	512 KB	28.69 GB
Service Partition2	FAT32-TEST	FAT32	28.69 GB	26.27 GB
🤏 E 🔹 🔻	NTFS-Test	NTFS	512 KB	28.69 GB
🥯 E 🛛 🔻	FAT32-TEST	FAT32	28.69 GB	26.27 GB
🥪 G: 🔻	FAT-TEST	FAT16	54.96 GB	2.01 GB
🥯 E 🛛 🔻	EXFAT	FAT32	56.97 GB	11.72 GB
See Partition5	HFS	HFSX	68.69 GB	21.48 GB
Partition6	EXTFS	Ext4	90.17 GB	25.02 GB
✓ Se Partition7	XFS	XFS	115.19 GB	33.86 GB
🔆 Reformatted1		NTFS	0 Bytes	33.86 GB

> A Region object will appear in the Drives panel.

To change the size of a region

* Right-click the Region in the R-Studio Drives panel, select Edit on the shortcut menu, and enter a new size on the Edit Region dialog box.

To convert a region into an exclusive one

* Right-click the Region in the R-Studio Drives panel and select Exclude area on the shortcut menu

To remove a region

* Select a Region in the R-Studio Drives panel and click the Remove button, or Right-click the selected region and select Remove Region on the shortcut menu.

2.2.7 Exclusive Regions

Exclusive regions are areas on any object visible in the **R-Studio**'s Drives panel that are excluded from drive operations. **R-Studio** never tries to read/Write data from/to such area. Exclusive regions are necessary when, for example, there are areas with <u>bad sectors</u> on a drive, and it is necessary to avoid any drive operations with such areas to not inflict further damage to such drive and to speed work with it.

Note: R-Studio does not create anything real on the drive. Exclusive regions are virtual objects that do not affect actual data on the drive.

To create an exclusive region

1 Right-click an object in the R-Studio's Drives panel and select Create Exclusive Region on the shortcut menu, or

Select the object and select Create Exclusive Region on the Create menu

2 Specify required parameters on the Create Exclusive Region dialog box and click the Add button

Create exclusive region dialog box

Create Exclusive Region		
Hitachi HTS54501689SA00 PB	BOC64G - 149.05 GB (160041885696 Bytes , 31258180	8 Sectors)
tart: 0		Bytes
ze: 149.05		GB
duded Areas:		
Offset	Size	
3 GB (48234496 Sectors)	12 GB (25165824 Sectors)	
00 GB (209715200 Sectors)	12 GB (25165824 Sectors)	
frat: 100 68	▼ Sina: 12 GB ▼	Add
ffset: 100 GB	▼ Size: 12 GB ▼	Add

Start:	Start point of the entire exclusive region			
Size:	e: Size of the entire exclusive region. Cannot be larger than Drive size.			
Offset:	Offset of the excluded area.			
Size:	Size of the excluded area.			
Numbers in	Numbers in these fields can be in bytes or sectors. See the Data Formats and Multipliers topic for			
more details	on data formats.			

Exclusive Region options

> An Exclusive Region object will appear in the Drives panel.

		-			
Device/Disk	Label	/Interfa	Start	Size	^
Microsoft reserved			101 MB	16 MB	
🥯 G 🔹 🔻	System	NTFS	117 MB	111.18 GB	
Secovery		NTFS	111.29 GB	508 MB	
Y 🗵 TOSHIBA DT01ACA100	44H5ATLKS	#1 SATA	2, HDD	931.51 GB	
🍛 D: 🔻	Data	NTFS	1 MB	931.51 GB	
✓ ☑ Hitachi HTS545016B9	100713PBPB	#2 SAT	A2, HDD	149.05	
✓ I Exclusive region 0 o		NTFS	0 Bytes	149.05 GB	
Se Partition1	NTFS-Test	NTFS	512 KB	28.69 GB	
Se Partition2			28.69 GB	26.27 GB	
Separtition3	FAT-TEST	FAT16	54.96 GB	2.01 GB	
Se Partition4	EXFAT	FAT32	56.97 GB	11.72 GB	
Service Partition5	HFS	HFSX	68.69 GB	21.48 GB	
Se Partition6	EXTES	Ext4	90.17 GB	25.02 GB	
Partition7	XFS	XFS	115.19 GB	33.86 GB	
🥯 i: 🔻	NTFS-Test	NTFS	512 KB	28.69 GB	
🥯 E 🛛 🔻	FAT32-TEST	FAT32	28.69 GB	26.27 GB	

Its properties can be seen on the Excluded Areas tab.

Start:	0			
Size:	160041885696			
Exclud	led Areas:			
	Offset		Size	
23 GE	8 (48234496 Sectors)	12 GB (25165824 Sectors)		
100 0	GB (209715200 Sectors)	12 GB (25165824 Sectors)		

To remove an exclusive region

* Select an Exclusive Region in the R-Studio Drives panel and click the Remove button, or Right-click the selected region and select Remove Region on the shortcut menu.

To change the size of an exclusive region

* Right-click an Exclusive Region in the R-Studio Drives panel, select Edit on the shortcut menu, and add/Remove excluded areas on the Edite Exclusive Region dialog box.

You may remove an excluded area by right-clicking it and selecting **Remove** on the shortcut menu.

2.2.8 Images

An *image* is an exact, byte by byte, copy of any object in the Drives panel. When created, images can be processed like their original objects.

Images are very useful if there is a risk of total data loss due to hardware malfunction. If bad blocks are constantly appearing on a drive, you must immediately create an image of this drive. All data search, scan and restoring can be done from this image.

While creating images, **R-Studio** can simultaneously perform drive scan and save scan information to lessen time necessary to process the drive.

The image can be saved on the remote computer if it is created <u>via network</u>. **R-Studio** can also load and process images created with the **DeepSpar Disk Imager**TM.

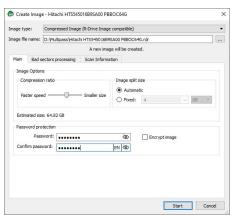
An imaging process can be stopped and then resumed later on.

R-Studio Corporate version and higher can create images directly on hard drives making in fact disk clones.

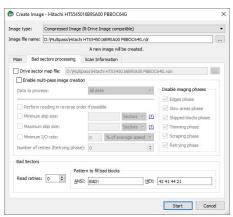
To create an image,

- 1 Select an object in the **R-Studio's** Drives panel and click the Create Image button
 - Other ways to create the image
 - Select the object and select Create Image on the Drive menu
 - or
 - Right-click the selected object and select Create Image File on the shortcut menu
- 2 Specify image options, a file name, and destination for the *image* on the Create Image dialog box Note: To store an image file, you need a <u>free space</u> equal to at least the object size.

Create Image (Main) dialog box



Create Image (Bad sector processing) dialog box



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Create Image (Scan Information) dialog box

mage type:	Compressed Imag	e (R-Drive Image compatible)		•		
nage file nar	ne: D:\Multipass\Hitac	achi HTS545016B9SA00 PBBOC64G.rdr				
		A new image will be created.				
Main B	ad sectors processing	Scan Information				
	scan information file					
		89SA00 PBBOC64G.scn				
Ele Syste	m: NTFS; ReFS; FAT/e	exFAT; Ext2/Ext3/Ext4; UFS; XFS; HFS; AP	FS	hange 🔻		
Extra	Search for Known File	Types	Known F	je Types		

■ Image Options

Image filename	Specifies the name and path for the image file
Image type:	Compressed image (R-Drive Image compatible): If this option is selected, R-Studio will create an image file which can be compressed, split into several parts, and password-protected. This image file is fully compatible with the images created by R-Drive Image , but incompatible with very old versions of R-Studio . Byte by byte image to a file: If this option is selected, R-Studio will create a simple exact copy of the object. Byte to byte image to a physical disk: R-Studio will create an exact copy of the disk on another hard drive. Data on the target drive will be overwritten. Available in the Corporate, Technician, and T80+ licenses. Some other image formats are also available in the Technician, and T80+ licenses. You may read more about these formats in the <u>Supported Virtual Disk</u> and <u>Disk Image Formats</u> page.
Image compression ratio	You may <u>compress</u> the data in the image to save space. Active only if the Compressed image (R-Drive Image compatible) is selected.
Estimated size	Shows the estimated size of the image file. An actual image size depends on how much empty space is on the selected <u>partition</u> and what file types are there. Active only if the Compressed image (R-Drive Image compatible) is selected.
Image split size	You may set this option to Automatic and let Windows decide how to split the image file. This mostly depends on the file system on the destination drive. You may also either explicitly specify the split size, or choose a preset for various devices with removable storage. Select Fixed size for that. Active only if the Compressed image (R-Drive Image compatible) is selected.
Password Encrypt image	You may protect your image file with a password. Note: If you leave the Encrypt image option clear this feature will provide a relatively moderate protection against conventional unauthorized access. If this option is selected, R-Studio will encrypt the image using the <u>AES-XTS</u> algorithm. Note: Only files in the RDR format can be password protected and encrypted.
Create scan information file	If this option is selected, R-Studio will perform drive scan simultaneously with image creation. See the Drive Scan help page to learn scan options.

Read retries	Specifies a value for I/O Tries, or how many times R-Studio will try to read a
	bad sector.
	R-Studio treats bad sectors in the following way:
	It reads a certain part of drive (predefined by Windows) and
	• If Default read attempts is set to 0, the entire part with bad sectors will be filled with the specified pattern.
	• If Default read attempts is set to a non-zero value, R-Studio reads again that
	part sector by sector, repeating the attempts the specified number of times. If
	R-Studio still cannot read a bad sector, it fills the sectors with the specified
	pattern. In this case only the bad sectors will be filled with the pattern, but that
	extremely slows the drive read process.
	For example, if you set Default read retries to 1, a bad sector will be read 2 times.
Pattern to fill bad blocks	Specifies a pattern R-Studio will use to fill bad sectors in this image. You may
	specify the pattern either in the ANSI or Hex data format.
	Note: R-Studio will never ever try to write anything on the drive from which
	data is to recover or an image is to create. This pattern fills bad sectors only in
	the image.
Drive sector map file	These options are available only in the Technician/T80+ versions. Read more
Enable multi-pass	about these options in the <u>I/O Monitor and Sector Map files</u> and <u>Multi-pass</u>
image creation	imaging help page.

If a remote computer is connected for **Data Recovery over Network**, the Create Image dialog box will have a different look. You may save the image to the local or remote computer.

	pe:	Compressed Imag	ge (R-Drive Image com	patible)		
Image file	ename:	192.168.1.36	 C:\Users\Tester1 	/Pocuments\Test.rdr		
			A new image	will be created.		
Main	Bad se	ctors processing	Scan Information	Additional Output Folders	Post Actions	
Imag	e Options					
Co	mpression	ratio		Image split size		
				Automatic		
Fat	ster speed		Smaller size	O Fixed: 4	✓ GB	*
Estin	ated size	: 4.35 GB				
Pass	word prot	ection				
	Passv	vord:		🕸 🗌 Encrypt imag	e	
Conf	irm passw	ord:	•	EN (2022)		

R-Studio Technician/T80+

These options are available only in the **Technician/T80+** versions.

Create Image (Additional output folders) **dialog box**

age type:	Compressed Imag	ge (R-Drive Image com	patble)		
age file name:	D: Multipass Hita	chi HTS54501689SA00	PBBOC64G.rdr		
		A new in	nage will be created.		
Main Bad s	ectors processing	Scan Information	Additional Output Folders	Post Actions	
1:\					 ×
I:\					 ×
					 ×
udditional outpu	ut folders will be cre	sated if they don't exis	t.		
.dditional outpr	ut folders will be cre	ated if they don't exis	t.		

Additional output folders

Additional output folders Additional output folders where image files will be stored when **R-Studio** runs out of space.

Create Image (Post Actions) dialog box

ge type:	Compre	ssed Image (R-I	Drive Image com	patible)			
ge file name:	D: Wuit	pass\Hitachi HT	S54501689SA00	PBBOC64G.rdr			
			A new in	nage will be created.			
lain Bad se	ectors pro	cessing Sca	an Information	Additional Output Folders	Post Actions		
Email notifi	cations	uter on all tasks	s completion		paint		
Server: m	ail.examp	e.com		Port:	25	SSL Auto	•
Sender email:	te	ster 1@example	.com				
Recipient(s) e	mail: te	ster 2@example	com				
Custom subje	ct: In	age Creation R	esults				
Send email it	f	Authoriz	ation				
Error oc	curred	Login:	tester 1				
Success		Password:					
						Test email acc	ount

Post Actions Options

Shutdown the computer on all tasks completion	If this check box is selected, R-Studio will shut down your computer when all task, including this image creation have been completed.
E-Mail notifications	If this check box is selected, R-Studio will inform you about the outcome of the operation via email.

> R-Studio will start creating the image, the Progress message showing the progress.

You may change some options during the imaging process. Click the $\ensuremath{\mathsf{Options}}$ button and change them as necessary/

You may stop the imaging process and then resume it later on. Click the **Stop** button and the Cancel drive operation dialog box will appear. Select **Stop** if yo want to keep the partially created image or **Discard** if you don't need this image file.

🗭 Options (Compressed drive image creation) X	Options (Compressed drive image creation) ×	
Options (Lompressed drive image creation) New Options Post Actions WOC WD12006EVT-222CT0 11.01A11 : WD-WXE808H13826 Read retries count: Default (0)	Bytons (Compressed mixe image creation) Drive Options Post Actions Shutdown the computer on all tasks completion Imail notifications Server: mail.example.com Port: 25 SS. Auto Sender enail: tester1@example.com Custom Realite Sendemail if Authorization Error occurred Quipri: tester1 Success Password: tester1	Cancel drive operation X Cancel drive operation X We you sure you want to stop image creation? Tou can save the incomplete image or discard already saved data. Stop Discard Cancel
	Test email account	
OK. Cancel	OK Cancel	

To resume the creation of the image for the same object, select the same file name for the image. You'll be able to create a new image file or continue to create the image for the object.

Resuming image creation

ige type	e:	Compressed Image	e (R-Drive Image	compatible)				
age file i	name:	D: Multipass Hitach	hi HTS545016B95	A00 PBBOC64	G.rdr			
Contin	ue incom	nplete image creatio	on	O Overw	rite existing imi	age		
Main	Bad se	ctors processing	Scan Informat	ion				
Image	Options							
Com	pression	ratio		Image split :	size			
				Automa	tic			
Fast	er speed		Smaller size	O Fixed:	4		GB	~
		: 64.82 GB						
Passw	ord prot							
	Passv			ŝ	Encrypt i	mage		
Confin	m passw	ord:		ŝ				

R-Studio will create a new file for every new start of imaging for the .rdi and .vmdk file types.

To process an already created *Image*, the image file should be opened.

To open an image

1 Click the Open Image button, or

Select Open Image File on the Drive menu

If a remote computer is connected for <u>Data Recovery over Network</u>, the Open Image File dialog box will appear when you select a place to load the image file from. You may load it from the local or remote computer.

192.168.1.158	3 -	C:\Users\IEUser\Documents\Test.rdr		
---------------	-----	------------------------------------	--	--

2 Select the required image file

If the image is a multi-volume one, and not all parts are at the same place, the dialog box will appear

Multi-volume image dialog box

R-STUDIO Network Technician		?	×
The archive F:/SAMSUNG SP0411N T	W100-11.rdr part #1 is not available.		
SAMSUNG SP0411N TW100-11.rdr:	G:\SAMSUNG SP0411N TW 100-11.rdr		
	СК	Skip	

Specify paths to other image parts and click the OK button.

> An Image object will appear in the Drives panel

Depending whether this is a byte-by-byte, compressed (**R-Drive Image** compatible), multi-volume, or VMDK image, its appearance in the Drives panels is different.

You may perform all data search, scan, and recovery from this image as it were a regular drive/disk object.

Device/Disk	Label	FS	Start	Size
🗸 💻 Local Computer				
> S TOSHIBA DT01ACA100 MS2OA750	44H5ATLKS	#0 SATA2	0 Bytes	931.51 GB
> S WDC WD10EACS-00ZJB0 01.01B01	WD-WCASJ0409502	#1 SATA2	0 Bytes	931.51 GB
🗸 📙 Image				
Y 🖙 QUANTUM FIREBALL CR8.4A A5U.1200	828907412585	#0 ATA (0 Bytes	7.87 GB
Separtition1	NTFS-Test	NTFS	32 KB	2.93 GB
Partition2	FAT32-TEST	FAT32	2.93 GB	2.94 GB
Separtition3	FAT-TEST	FAT16	5.87 GB	2.01 GB

A compressed (R-Drive	Image	compatible) image
-----------------------	-------	-------------------

Device/Disk	Label	FS	Start	Size
📃 Local Computer				
> S TOSHIBA DT01ACA100 MS2OA750	44H5ATLKS	#0 SATA2	0 Bytes	931.51 GE
> S WDC WD10EACS-00ZJB0 01.01B01	WD-WCASJ0409502	#1 SATA2	0 Bytes	931.51 GE
Y 📙 Image Files				
V St./Images/QUANTUM FIREBALL CR				7.87 GB
Partition1	NTFS-Test	NTFS	32 KB	2.93 GB
Partition2	FAT32-TEST	FAT32	2.93 GB	2.94 GB
Partition3	FAT-TEST	FAT16	5.87 GB	2.01 GB

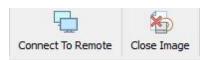
Device/Disk	Label	FS	Start	Size
Local Computer				
> See TOSHIBA DT01ACA100 MS2OA750	44H5ATLKS	#0 SATA2	0 Bytes	931.51 GB
> S WDC WD10EACS-00ZJB0 01.01B01	WD-WCASJ0409502	#1 SATA2	0 Bytes	931.51 GB
🗸 📕 Image				
12/12/2021 11:33:49 - Incomplete				
Y 🥪 QUANTUM FIREBALL CR8.4A A5U	828907412585	#0 ATA (0 Bytes	7.87 GB
Partition1	NTFS-Test	NTFS	32 KB	2.93 GB
Separtition2	FAT32-TEST	FAT32	2.93 GB	2.94 GB
Empty Space37			5.87 GB	2.01 GB
12/13/2021 13:28:58 - Incomplete				
Y 🥯 QUANTUM FIREBALL CR8.4A A5U	828907412585	#0 ATA (0 Bytes	7.87 GB
Service Partition1	NTFS-Test	NTFS	32 KB	2.93 GB
Separtition2	FAT32-TEST	FAT32	2.93 GB	2.94 GB
Empty Space40			5.87 GB	2.01 GB
12/13/2021 13:31:28				
V 🥪 QUANTUM FIREBALL CR8.4A A5U	828907412585	#0 ATA (0 Bytes	7.87 GB
Partition1	NTFS-Test	NTFS	32 KB	2.93 GB
Partition2	FAT32-TEST	FAT32	2.93 GB	2.94 GB
See Partition3	FAT-TEST	FAT16	5.87 GB	2.01 GB

		Device/Disk	Label	FS	Start	Size
× 💻	Lo	cal Computer				
>	> S TOSHIBA DT01ACA100 MS2OA750		44H5ATLKS	#0 SATA	0 Bytes	931.51 G
~	ST1000DM003-1CH162 CC44		S1DC12W0	#1 SATA	0 Bytes	931.51 G
		🤹 E 🗸 👻	Images	NTFS	1 MB	931.51 G
~		Image				
	~	QUANTUM FIREBALL CR8.4A A5U.1200	828907412585	Local	0 Bytes	7.87 GB
		Se Partition1	NTFS-Test	NTFS	32 KB	2.93 GB
	Partition2		FAT32-TEST	FAT32	2.93 GB	2.94 GB
	Partition3		FAT-TEST	FAT16	5.87 GB	2.01 GB

A VMDK image

To close an image

- * Select the image and click the Close Image button,
 - or right-click the image and select Close Image on the shortcut menu
 - or select the image and press the **F8** key.



To close all image

* Select Close All Images on the Tools menu

A <u>logical disk</u> (or disks) containing in an image can be mounted in the operating system as a device which makes its content accessible to any program including any other data recovery software.

To mount a logical disk in an image

1 Right-click the logical disk in the image in the Drives panel and select Mount on the shortcut menu

	Device/Disk	Label	FS	Start	Size
/ 💻 l	ocal Computer				
V I	TOSHIBA DT01ACA100	44H5ATLKS	#0 S	0 Bytes	931.51 GB
	Solume(3303cc57	Recovery	NTFS	1 MB	300 MB
	Se Volume(edb1043b x		FAT32	301 MB	100 MB
	Se Microsoft reserved . x			401 MB	128 MB
	🥯 C: 👻	System	NTFS	529 MB	291.57 GB
	🍩 Volume{44fd3858-3 x .		NTFS	292.09 GB	450 MB
	Solume(e0a573f2-1 		NTFS	292.53 GB	450 MB
	🍛 D: 👻	Data	NTFS	292.97 GB	638.54 GB
	Empty Space17			931.51 GB	1.69 MB
~	Image				
	🥯 G:	FAT32-TEST	FAT32	1.47 GB	1.07 GB

2 Select a disk letter to assign to the mounted logical disk and click OK

🕞 Drive image r	nount	X
Mount:	G:	
Select drive label:	Z:	-

> A Virtual disk object will appear in the Drives panel

Device/Disk	Label	FS	Start	Size
🗸 💻 Local Computer				
TOSHIBA DT01ACA100	44H5ATLKS	#0 S	0 Bytes	931.51 GB
Volume(3303cc57+	Recovery	NTFS	1 MB	300 MB
Se Volume(edb1043b x		FAT32	301 MB	100 MB
Microsoft reserved .*			401 MB	128 MB
😔 C: 👻	System	NTFS	529 MB	291.57 GB
Volume{44fd3858-3x.		NTFS	292.09 GB	450 MB
Volume{e0a573f2-1.		NTFS	292.53 GB	450 MB
🍩 D: 👻	Data	NTFS	292.97 GB	638.54 GB
Second Empty Space17			931.51 GB	1.69 MB
Y Image				
🥪 G:	FAT32-TEST	FAT32	1.47 GB	1.07 GB
Z: (virtual)			512 Bytes	1.07 GB

and this virtual disk will be available to system in the read-only mode

	s v	-		
$\leftrightarrow \rightarrow \checkmark \downarrow \blacksquare $	This PC → FAT32-TEST (Z:)	✓ Ö Search FAT	32-TEST (Z:))
3D Objects	^ Name	Date modified	Туре	Size
Desktop	Files to Delete	7/1/2005 1:06 AM	File folder	
Documents	Files to Recover	7/1/2005 12:50 AM	File folder	
Downloads	Temp	4/27/2007 10:56 AM	File folder	
b Music	TMP	7/1/2005 12:50 AM	File folder	

To unmount a virtual disk from the system

1 Right-click the virtual disk in the image in the Drives panel and select Unmount on the shortcut menu

2.2.9 Wiping Objects

Disk objects can be wiped in order to completely destroy its data.

Supported Wipe Algorithms

File wiping is necessary only for files stored on conventional hard drives. Files stored on new <u>SSD storage</u> <u>devices</u> cannot be effectively wiped out due to the principles of operation of these devices.

Currently **R-Studio** supports 6 wiping algorithms:

Zeroes	The disk object or file is filled with zeroes through 1 pass. The fastest but the least
	secure algorithm. Also it does not conceal the fact that the disk or file has been
	wiped.
Pseudo-random	The disk object or file is filled with pseudo-random numbers through 1 pass. A
numbers	slower but little bit more secure algorithm than the Zeroes algorithm and it also
	conceals to some degree the fact that the disk or file has been wiped.
DoD 5220.22-	The disk object or file is wiped using Department of Defense standard 5220.22-
M(3)	M(3). Provides high-grade data wiping filling the unused space or file with a special
	digital pattern through 3 passes This algorithm is very secure, but slow.
DoD 5200.28-	The disk object or file is wiped using Department of Defense standard 5200.28-
STD (7)	STD(7). Provides high-grade data wiping filling the unused space or file with a
	special digital pattern through 7 passes. This algorithm is very secure, but very
	slow.
Bruce Schneier(7)	The disk object or file is wiped using the Bruce Schneier(7) algorithm. The first
	pass overwrites the drive with the bit pattern "00", the second with "11", and the
	next five with a randomly generated bit pattern. This algorithm is very secure, but
	very slow.
Peter Gutmann	The disk object or file is wiped using the Peter Gutmann's algorithm. Provides high-
(35)	grade data wiping filling the unused space or file with a special digital pattern
	through 35 passes. This algorithm is military-level secure, but horribly slow.

What algorithm is to choose, depends on your specific needs. All of these wiping algorithms make recovery of wiped data with any software-based data recover utility impossible. So if you want to protect your information from a casual snooper, you may safely choose either the **Zeroes** or **Pseudo-random numbers** algorithm. The latter also conceals the fact that you wiped the data.

If you want more security, you need to know the following:

There are some techniques for recovery of wiped data. These techniques are based on the fact that magnetic medium on the hard drive's platters "store" some information about previously written data. Such information cannot be completely removed. Wiped data may be recovered even from mechanically damaged platters. So the only safe way to completely remove data from a hard drive is to mechanically grind the magnetic medium off the drive platters or dissolve them in special chemical solvents.

But in order to recover the wiped data using one of these techniques, a hard drive must be disassembled, its platters placed in a precise magnetic field measurement system, and the results of such measurement statistically processed. All that is very expensive and requires a very qualified and experienced personnel and a specially developed equipment. Only a very advanced organization such as a law enforcement or intelligence agency of a developed nation, or a special high-tech firm can afford this. Moreover, each successive wiping pass makes such

data recovery much and much harder. So, the **DoD 5220.22-M(3)** clearing and sanitizing standard overwriting the data with a special pattern through 3 passes is a rather reliable and safe choice for this case.

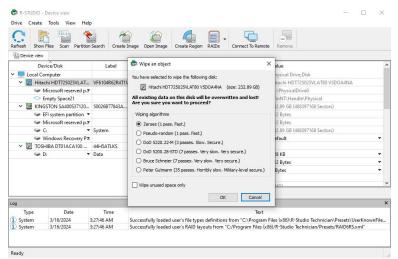
If you need the ultimate security, use the **DoD 5220.22-M(7)** clearing and sanitizing standard, the **Bruce Schneier(7)**, or even the **Peter Gutmann (35)** wiping algorithms. They render data almost unrecoverable, but they are extremely slow.

Wiping Disk Objects:

To wipe a disk object,

- 1 Right-click the disk object in the Device view pane and select Wipe...
- > The Wipe an object dialog box will appear.

Wiping Disk Objects



- 2 Select the desired wiping algorithms and click the OK button. You may wipe only unused space on the object.
- > R-Studio will start wiping the object.

2.3 Mass File Recovery

Recovery of multiple files

If you need to recover multiple files you may do it through the following steps:

- 1 Find and mark all the necessary files Go to the <u>Find and Mark Multiple Files</u> topic for more information
- 2 Recover all marked files in a single file recovery step Go to the <u>Recover Multiple Files</u> topic for more information
- 3 Create file recovery lists to manually edit the list of files to recovery (Technician/T80+ version) Go to the <u>File Recovery Lists</u> topic for more information

Memory considerations

R-Studio stores information about found files in computer memory. If there are too many files, **R-Studio** may run out of it. To avoid this, you have two options:

Recover all files

If you want to recover data from an entire file system object (a <u>logical disk</u>, <u>partition</u>, <u>partition image</u>, etc.), you may use the **Recover All Files** command from the **Drive** or shortcut menu. Right click the object in the Drives panel to access the shortcut menu. A <u>Recover</u> dialog box will appear. Select required restore settings, including file mask. This command restores unlimited number of files without memory restrictions.

View file information in steps

As soon as **R-Studio** nearly runs out of memory, a Too many files... message appears. You may temporally stop file listing and browse through found files. Then you can resume file listing. You also may skip this file section and continue file listing.

In all cases, **R-Studio** keeps information about the entire file structure.

- Find and Mark Multiple Files
- Recover Multiple Files

2.3.1 Find and Mark Multiple Files

If you need to find and mark many files at once, you may do that in the following ways:

By sorting them by their extensions or creation/anodification/accessed time

To sort files by their extensions or creation/modification/accessed time,

* In the Folders panel select the tab

Extensions to sort the files by their extensions

Creation to sort the files by their creation time

Modification to sort the files by their modification time

Time

Accessed to sort the files by their accessed time

Time

Given States of the second sta

• Select the disk in Drives panel, select **Open Drive Files Sorted By** on the **Drive** menu, and select the respective option,

or

• In the Drives panel, right-click the disk and select **Open Drive Files Sorted By** on the shortcut menu and select the respective option,

or

• In the Folders panel, right-click the disk letter and select **Show Files Sorted By** on the shortcut menu and select the respective option,

> **R-Studio** will show the sorted files in the Folders and Content panels, showing the path to each file:

Folders panel for files sorted by their extensions

Folders	×
v 🔳 🥪 I	G:
> 🗆	Archive
~ I	Document
[🔳 🔜 Microsoft Word Document (.doc)
> 🗆	Executable, Library, DLL
× 🔳	Graphics, Picture
[JPEG Image (.jpg)
~	Internet related files
[🔳 📙 Microsoft OutLook Personal Folder (
~ I	Multimedia Audio
[🔳 🔜 MPEG Layer III Audio (.mp3)
× 🔳	
[🔳 🔜 Windows AVI Video (.avi)
>	Other files
	W/O EXTENSION

Content panel with files/folders sorted by their extensions

Contents							
Name	Path	Size	Created	Modified	Accessed	FileId	Parent
AlbumArt_{00FEB343-A4EF-48C	Root/Music/Manu_Chao/	14542 Bytes	12/4/2012 6:55:38 PM	12/4/2012 6:55:40 PM	12/3/2012 11:00:00 PM	57 (53)	26 (31)
AlbumArt_{00FEB343-A4EF-48C	Root/Music/Elton_John/	14418 Bytes	12/4/2012 6:53:55 PM	4/27/2008 5:05:46 PM	12/3/2012 11:00:00 PM	38 (32)	26 (31)
AlbumArt_{00FEB343-A4EF-48C	Root/Music/Manu_Chao/	3340 Bytes	12/4/2012 6:55:38 PM	12/4/2012 6:55:38 PM	12/3/2012 11:00:00 PM	55 (51)	26 (31)
AlbumArt_{00FEB343-A4EF-48C	Root/Music/Elton_John/	3186 Bytes	12/4/2012 6:53:55 PM	4/27/2008 5:04:58 PM	12/3/2012 11:00:00 PM	39 (33)	26 (31)
AlbumArt_{6609CAD8-CCF6-4F	Root/Music/Elton_John/	7327 Bytes	12/4/2012 6:53:55 PM	4/27/2008 5:10:04 PM	12/3/2012 11:00:00 PM	40 (34)	26 (31)
AlbumArt_{6609CAD8-CCF6-4F		2245 Bytes	12/4/2012 6:53:55 PM	4/27/2008 5:08:22 PM	12/3/2012 11:00:00 PM	41 (35)	26 (31)
AlbumArt_(758956AA-1FD8-41D		7967 Bytes	12/4/2012 6:53:55 PM	4/27/2008 5:10:32 PM	12/3/2012 11:00:00 PM	42 (36)	26 (31)
🗌 🕷 AlbumArt_(758956AA-1FD8-41D	Root/Music/Elton_John/	2243 Bytes	12/4/2012 6:53:55 PM	4/27/2008 5:09:22 PM	12/3/2012 11:00:00 PM	43 (37)	26 (31)
AlbumArt_(A0F31A58-545E-402	Root/Music/Marley/	12034 Bytes	12/4/2012 6:53:59 PM	4/27/2008 6:03:20 PM	12/3/2012 11:00:00 PM	71 (64)	59 (31)
AlbumArt_(A0F31A58-545E-402	Root/Music/Marley/	2780 Bytes	12/4/2012 6:53:59 PM	4/27/2008 6:03:06 PM	12/3/2012 11:00:00 PM	72 (65)	59 (31)
AlbumArt_{AD88489E-F38C-494	Root/Music/Elton_John/	10136 Bytes	12/4/2012 6:53:55 PM	4/27/2008 5:08:08 PM	12/3/2012 11:00:00 PM	44 (38)	26 (31)
🗌 😹 AlbumArt_{AD88489E-F38C-494	Root/Music/Elton_John/	2577 Bytes	12/4/2012 6:53:55 PM	4/27/2008 5:07:06 PM	12/3/2012 11:00:00 PM	45 (39)	26 (31)
🛛 🔀 AlbumArtSmall.jpg	Root/Music/Elton_John/	2243 Bytes	12/4/2012 6:53:54 PM	4/27/2008 5:09:22 PM	12/3/2012 11:00:00 PM	37 (29)	26 (31)
🛛 🔀 AlbumArtSmall.jpg	Root/Music/Marley/	2780 Bytes	12/4/2012 6:53:59 PM	4/27/2008 6:03:06 PM	12/3/2012 11:00:00 PM	70 (63)	59 (31)
🛛 🔀 AlbumArtSmall.jpg	Root/Music/Elton_John/	3340 Bytes	12/4/2012 6:55:38 PM	12/4/2012 6:55:38 PM	12/3/2012 11:00:00 PM	54 (50)	26 (31)
🗹 🞽 Folder.jpg	Root/Music/Marley/	12034 Bytes	12/4/2012 6:53:59 PM	4/27/2008 6:03:20 PM	12/3/2012 11:00:00 PM	74 (67)	59 (31)
🛛 🞽 Folder.jpg	Root/Music/Manu_Chao/	14542 Bytes	12/4/2012 6:55:38 PM	12/4/2012 6:55:40 PM	12/3/2012 11:00:00 PM	56 (52)	26 (31)
🗌 🞽 Folder.jpg	Root/Music/Elton_John/	7967 Bytes	12/4/2012 6:53:57 PM	4/27/2008 5:10:32 PM	12/3/2012 11:00:00 PM	53 (49)	26 (31)
MG_6001.JPG	Root/SRECYCLE.BIN/	656192 Bytes	12/4/2012 6:57:49 PM	5/17/2010 4:17:56 PM	12/3/2012 11:00:00 PM	172 (116)	146 (31)
🗌 🛋 IMG_6002.JPG	Root/SRECYCLE.BIN/	937070 Bytes	12/4/2012 6:57:49 PM	5/17/2010 4:18:14 PM	12/3/2012 11:00:00 PM	173 (117)	146 (31)
🗌 📓 IMG_6003.JPG		1180895 Bytes	12/4/2012 6:57:49 PM	5/17/2010 4:18:36 PM	12/3/2012 11:00:00 PM	174 (118)	146 (31)
🗌 🙀 Picture 113.jpg	Root/	3048786 Bytes	2/24/2009 2:42:33 PM	4/23/2007 12:13:32 PM	12/3/2012 11:00:00 PM	167 (113)	146 (31)
Note: Picture 149.jpg		1678083 Bytes	2/24/2009 2:43:12 PM	4/23/2007 12:15:22 PM	12/3/2012 11:00:00 PM	168 (114)	146 (31)
Dicture 237 inc		2025/156 Ruter	2/24/2000 2-44-51 DM	A/22/2007 12-20-16 DM	12/2/2012 11-00-00 DM	160 (115)	146 (21)

To return to the conventional view,

* In the Drives panel, right-click the logical disk, select Open Drive Files Sorted By on the shortcut menu, and select Real File System Structure,

or

In the Folders panel, select Show Files Sorted By on the Drive menu and select Real File System Structure or

Select the Real tab

By finding and marking multiple files using the <u>Find/Mark</u> dialog box

You may find and mark all the files on the entire disk by using Mark matched files in the Find/Mark mode option. You may specify all the necessary search options and mark all the found files. Please note that each find and mark/unmark operation is independent from previous ones. That is, if a file matches the search criteria, it will be marked/unmarked regardless of its previous marked/unmarked state.

For example, if you first mark all doc files, and then all txt files, all doc files remain marked, too. If you then decide to unmark all files smaller than 2 kB, all doc and txt files will stay marked except those that less than 2 kB.

2.3.2 Recover Multiple Files

If **R-Studio** while recovering files encounters either an already existing file or file with a broken name, normally it will stop working and ask you what to do with the file. If you recover multiple files, that may require you answer a lot of the same questions. You may use Mass File Recovery Options on the <u>Recover</u> dialog box to instruct **R-Studio** what to do in those cases for all files.

Recover (Advanced) dialog box

tput folder:	D:\Recovered_Files	1	
Recover all r Recover only	narked files y masked marked file	MB.	1 files and 41 folders. Total size: 270.33 y the applied mask: 257 files. Total size
Main Adv	anced Additiona	Output Folders Post Act	tions
First cor Compa If Existing Equal time Older: Newer:	re Time	First compare size Compare Size Compare Size If Existing: Then: Equal size: Rename Smaller: Overwrite Bigger: Skip	
🗹 Extende	By default:	Rename 🔻	

■Advanced file recovery options

Auvanced me recovery of	
File Already Exists	These options instruct R-Studio what to do if there already exists a file with the
	same name.
Extended options	If this option is selected, <u>more advanced options</u> become accessible to process
	multiple duplicates of the file.
Prompt	If this option is selected, R-Studio asks the user what to do for each such file.
	It stops file recovery until it receives the answer.
Rename	If this option is selected, R-Studio adds a File ID to the file name. If a file
	already exists with the same name and that file ID, a number will be added to th
	file name and file ID.
Skip	If this option is selected, R-Studio skips all new files with the same name.
Overwrite	If this option is selected, R-Studio overwrites the existing file with the new one.
Overwrite Older	If this option is selected, R-Studio overwrites the existing file with the new one
	if the existing file is older than the new file. The time stamp used is Modified.
Overwrite Smaller	If this option is selected, R-Studio overwrites the existing file with the new one
	if the existing file is smaller than the new file. The time stamp used is Modified.
Overwrite Bigger	If this option is selected, R-Studio overwrites the existing file with the new one
	if the existing file is bigger than the new file. The time stamp used is Modified.
Broken File Name	These options instruct R-Studio what to do if a file to be recovered appears to
	have an invalid name.
Prompt	If this option is selected, R-Studio shows the standard <u>Broken File Name</u>
	dialog box for each file with a broken file name. It stops file recovery until it
	receives the answer.
Rename and change all	If this option is selected, R-Studio changes all invalid characters to the
invalid symbols to:	character specified.
Skip	If this option is selected, R-Studio skips all files with broken file names.
Hidden Attribute	These options instruct R-Studio what to do if a file to be recovered appears to
	have the Hidden attribute.
Prompt	If this option is selected, R-Studio asks the user what to do with the attribute.
	It stops file recovery until it receives the answer.

Remove	If this option is selected, R-Studio removes the Hidden attribute from all files.
Кеер	If this option is selected, R-Studio keeps the Hidden attribute for all files.

Extended options

These options give you more flexible ways to process multiple files with the same name. You may compare files by time (Modified) and size, and decide what **R-Studio** should do with those duplicates. If any of the files has an invalid time, the comparison by time is skipped. In this case, if comparison by size is not active, **R-Studio** goes to the default action.

First compare time First compare	These options instruct R-Studio which condition to use first, file time or size.
size Compare time Compare size	These options instruct R-Studio to enable comparison by time and size
Actions	These selectable actions instruct R-Studio what to do if the condition is met.
Empty field	If this option is selected, R-Studio skips the condition.
Prompt	If this option is selected, R-Studio asks the user what to do for each such file. It stops file recovery until it receives the answer.
Rename	If this option is selected, R-Studio adds a File ID to the file name. If a file already exists with the same name and that file ID, a number will be added to th file name and file ID.
Skip	If this option is selected, R-Studio skips all new files with the same name.
Overwrite	If this option is selected, R-Studio overwrites the existing file with the new one.
Time conditions	If the Modified time stamp is invalid, R-Studio will skip the comparison.
Equal time	Two time stamps are the same.
Older	The existing file is older than the new one.i
Newer	The existing file is newer than the new one.i
Size conditions	
Equal size	Two files have the same size.
Smaller	The existing file is smaller than the new one.i
Bigger	The existing file is bigger than the new one.i
By default	The action R-Studio takes when none of the comparison conditions have been met. That may happen when the comparison by size is not enabled.

Extended advanced file recovery options

2.3.3 Recovery Lists

You may create a file containing a list of files and folder found on a <u>disk/partition</u>. Then such file may be manually edited to specify files to recover, and then loaded back into **R-Studio**. **R-Studio** will automatically mark the files in this list for recovery. Such lists are very useful, for example, when it is necessary to have many files approved for recovery by someone else who is far away from the computer where **R-Studio** is running.

You may create recovery lists for the entire disk or for specific folders. Moreover, you may create a recovery list for all files within the disk/folder, or for marked files/folders only.

All versions of **R-Studio** can create recovery lists in the plain text format with basic functionality. **R-Studio Technician/T80+** can create <u>custom recovery lists</u> in other formats with more advanced options

Creating a simple recovery list

To create a recovery list

1 For an entire disk, select Export Recovery List on the File menu, or

Right-click the uppermost folder (higher than **Root**, usually the letter or the name of the disk) and select **Export Recovery List** on the shortcut menu.

For a specific folder, right-click the folder and select Export Recovery List on the shortcut menu.

2 Specify the place to save the recovery list and other necessary options on the Export Recovery List dialog box

Export Recovery List dialog box

Export the	entire folder/file tree	-
ile format:	Plain text	 Options
File name:	D:\Recovery_List\F_C-ONE 01GB i-Dis	k 2_00.txt
		OK Cancel

UTF-8 O UTF-16LE Write BOM

OK Cancel

Export Recovery List options

Export the entire folder/file tree Export marked file/folder names Export file/folder names	Specifies which file and folder names will be exported.
File format:	A file format for the recovery list. Only text format is available for the standalone and corporate versions. R-Studio Technician/T80+ can create <u>custom recovery lists</u> in other formats with more advanced options The following formats are available for R-Studio Technician/T80+ version: Plain Text HTML XML JSON CSV
File name:	Specifies a file name of the recovery list.

Editing the file recovery list

All files without any marks in the recovery list will be marked when the list is loaded into **R-Studio**. So, if you have some files in the recovery list that don't need to be recovered, just delete them from the list. In addition, you may use the following marks to specify some options

:+ Mark the file, or the folder, all its files, and subfolders within the folder.

- :* Mark the file, or the folder and its files, don't mark subfolders in the folder.
- :- Unmark the file, or the folder, its files, and subfolders in the folder.
- := Unmark the file or the folder and its files, dont unmark subfolders in the folder.
- : Provide the information on the file. (**R-Studio Technician/T80**+ only)

R-Studio processes records in the list consequently. That is, if there are the following lines in the file,

```
:+Files_to_Recover\
:-Files_to_Delete\File_2.jpg
the file File_2.jpg won't be marked for recovery, while for the lines
:-Files_to_Recover\File_2.jpg
:+Files_to_Recover\
file File_2.jpg will be.
```

Loading the edited recovery list

To load a recovery list into R-Studio,

- * Select Import Recovery List from the File menu and select the file, or Right-click the uppermost folder (higher than Root, usually the letter or the name of the disk) and select Import Recovery List on the shortcut menu.
- > **R-Studio** will load the file and mark the files accordingly.

An example of a simple recovery list

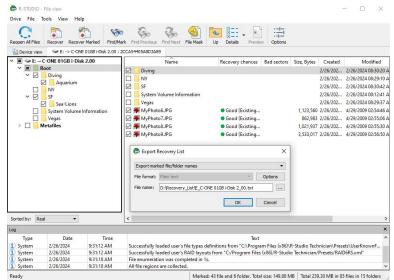
As an example, we'll create a simple recovery list, edit it to mark only those files that are to be recovered, and load it back to mark those files.

To create such recovery list

* Mark the necessary folders, right-click the Root folder, and select Export Recovery List on the shortcut menu.

Right-click the uppermost folder (higher than **Root**, usually the letter or the name of the disk) and select **Export Recovery List** on the shortcut menu.

Export Recovery List



Specify the necessary options and click the **OK** button.

Structure of a simple recovery list file created by R-Studio

```
:# Version = 1
:# Sort = by real
:# PathDelim = /
:# CaseSensitive
:# Drive = type:"Volume"; size:"1048576000"; mountpoint:"e:\"; label:"ntfs test";
fs:"NTFS";
:# Parent = type:"Drive"; size:"1048576000"; serial:"2cca54405a8d3a89";
firmware:"2.00"; product:"01gb i-disk"; vendor:"c-one";
Diving/
Diving/Aquarium/
Diving/Aquarium/20190822_100644.jpg
Diving/Aquarium/20190822_101620.jpg
Diving/Aquarium/20190822_102526.jpg
Diving/Aquarium/20190822_103830.jpg
Diving/Aquarium/20190822_104333.jpg
Diving/MyPhotol.jpg
Diving/MyPhoto2.jpg
Diving/MyPhoto3.jpg
Diving/MyPhoto4.JPG
Diving/MyPhoto5.jpg
SF/
SF/Sea-Lions/
SF/Sea-Lions/IMG_3493.JPG
SF/Sea-Lions/IMG_3535.JPG
SF/Sea-Lions/IMG_3542.JPG
SF/Sea-Lions/IMG_3579.JPG
SF/Sea-Lions/IMG_3580.JPG
SF/Sea-Lions/IMG_3581.JPG
SF/Sea-Lions/IMG_3589.JPG
SF/IMG_0869.JPG
SF/IMG 0873.JPG
SF/IMG 0890.JPG
SF/IMG_1739.JPG
SF/IMG_3460.JPG
SF/IMG_3461.JPG
SF/IMG_3476.JPG
SF/IMG_3478.JPG
SF/IMG_3479.JPG
SF/IMG_3480.JPG
SF/IMG_3481.JPG
SF/IMG_3493.JPG
SF/IMG_3535.JPG
SF/IMG_3542.JPG
SF/IMG_3579.JPG
SF/IMG_3580.JPG
SF/IMG_3581.JPG
SF/IMG_3589.JPG
SF/IMG_3590.JPG
SF/IMG_3591.JPG
SF/IMG_3592.JPG
```

SF/IMG_3593.JPG SF/IMG_3594.JPG SF/IMG_3595.JPG SF/IMG_3596.JPG SF/IMG_3608.JPG SF/IMG_3627.JPG MyPhoto6.JPG MyPhoto7.JPG MyPhoto8.JPG MyPhoto9.JPG

If such recovery list is created from an entire logical disk/partition, it will contain several virtual folders. For example, they'll have the following structure for an NTFS partition.

```
///m/$Extend/
///m/$Extend/$Deleted/
///m/$Extend/$RmMetadata/
///m/$Extend/$RmMetadata/$Txf/
///m/$Extend/$RmMetadata/$TxfLog/
///m/$Extend/$RmMetadata/$TxfLog/$Tops
///m/$Extend/$RmMetadata/$TxfLog/$TxfLog.blf
///m/$Extend/$RmMetadata/$Repair
///m/$Extend/$ObjId
///m/$Extend/$Quota
///m/$Extend/$Reparse
///m/$AttrDef
///m/$BadClus
///m/$Bitmap
///m/$Boot
///m/$LogFile
///m/$MFT
///m/$MFTMirr
///m/$Secure
///m/$UpCase
///m/$Volume
```

Now we need to edit this file to mark for recovery the following folders/files:

- 1. All files in the root folder;
- 2. Two files MyPhoto1. jpg and MyPhoto3. jpg in the Diving subfolder;
- 3. All files in the Diving/Aquarium/ folder;
- 4. All files in the SF/ folder except the SF/Sea-Lions/ subfolder.

The edited simple recovery list

The final simple recovery list will be the following:

```
:# Version = 1
:# Sort = by real
:# PathDelim = /
:# CaseSensitive
```

```
:# Drive = type:"Volume"; size:"1048576000"; mountpoint:"e:\"; label:"ntfs test";
fs:"NTFS";
:# Parent = type:"Drive"; size:"1048576000"; serial:"2cca54405a8d3a89";
firmware:"2.00"; product:"01gb i-disk"; vendor:"c-one";
:= Diving/
:+ Diving/Aquarium/
:+ Diving/MyPhoto1.jpg
:+ Diving/MyPhoto3.jpg
:+ SF/
:- SF/Sea-Lions/
MyPhoto6.JPG
MyPhoto7.JPG
MyPhoto8.JPG
MyPhoto9.JPG
```

Loading the edited recovery list

When we load this recovery list into **R-Studio**, will see the following results;

The root folder						
✓ ■ Set → C-ONE 01GB i-Disk 2.00	Name	Recovery chance	Bad sectors	Size, Bytes	Created	Mod
Y 🔳 📕 Root	Diving	,			11/22/2022 12:35:18 PM	11/22/2022
Diving	I NY				11/22/2022 12:35:20 PM	11/22/2022
Aquarium	SF SF				11/22/2022 12:35:27 PM	11/22/2022
	System Volume Information				11/22/2022 12:33:27 PM	11/22/2022
Y 🔳 SF	Vegas				11/22/2022 12:35:48 PM	11/22/2022
Sea-Lions	MyPhoto6.JPG	Good (Existin	OK	1 122 560	11/22/2022 12:35:56 PM	4/29/2009 0
System Volume Information	MyPhoto7JPG	Good (Existin			11/22/2022 12:35:56 PM	4/29/2009 0
Vegas		Good (Existin				4/29/2009 0
/ interaines	MyPhoto8JPG	Good (Existin			11/22/2022 12:35:56 PM 11/22/2022 12:35:57 PM	4/29/2009 0
The Diving folder		Cood (Ensur	U.L.	5,555,011		1/23/2003 0
	Name	Recovery chance	Bad sectors	Size, Bytes	Created	Moc
Y 🔳 📙 Root	Aquarium	neconcy chunce	Doo sectors	one, bytes	11/22/2022 01:09:07 PM	11/22/2022
Diving	W WyPhoto1.jpg	Good (Existin	OK	2 602 000	11/22/2022 12:35:18 PM	4/29/2009 0
Aquarium	MyPhoto2.jpg	Good (Existin			11/22/2022 12:35:19 PM	4/29/2009 0
NY NY	WyPhoto3.jpg	Good (Existin			11/22/2022 12:35:19 PM	4/29/2009 0
V SF						
Sea-Lions	MyPhoto4.JPG	 Good (Existin Good (Existin 			11/22/2022 12:35:19 PM 11/22/2022 12:35:20 PM	4/29/2009 (
> - Metafiles The SF folder						
✓ ■ — E: → C-ONE 01GB i-Disk 2.00	Name	Recovery chance	Bad sectors	Size, Bytes	Created	N ^
V 🔳 Root	Sea-Lions				11/22/2022 01:24:57 PM	11/22/20
V 🔳 Diving	🗹 🍀 IMG_0869.JPG	Good (Existin	OK	3,698,659	11/22/2022 12:35:27 PM	5/30/200
NY	🗹 🍀 IMG_0873.JPG	Good (Existin	OK	5,881,104	11/22/2022 12:35:28 PM	5/30/200
✓ ■ SF	🗹 🌞 IMG_0890.JPG	Good (Existin)	OK	5,663,358	11/22/2022 12:35:29 PM	5/30/200
Sea-Lions	MG 1739.JPG	Good (Existin	OK	4,266,181	11/22/2022 12:35:30 PM	6/3/2005
System Volume Information	MG 3460.JPG	Good (Existin	OK	4,593,453	11/22/2022 12:35:31 PM	6/5/2009
Vegas	MG 3461.JPG	Good (Existin			11/22/2022 12:35:31 PM	6/5/2009
> Metafiles	MG_3476JPG	Good (Existin	OK		11/22/2022 12:35:32 PM	6/5/2009
	MG_3478.JPG	Good (Existin			11/22/2022 12:35:33 PM	6/5/2005
	MG_3479.JPG	Good (Existin			11/22/2022 12:35:34 PM	6/5/2005
	MG 3480.JPG	Good (Existin			11/22/2022 12:35:34 PM	6/5/2005
	En line uno s toost o				11/22/2022 12:35:35 PM	6/20/200
	127 🛎 IMG 3481 IPG					
	MG_3481.JPG	 Good (Existin Releve Average 				
	🗹 💥 IMG_3493.JPG	Below Averag	ок	4,985,023	11/22/2022 12:35:36 PM	6/5/2009
	 ✓ ₩ IMG_3493.JPG ✓ ₩ IMG_3535.JPG 	 Below Averag Below Averag 	ок ок	4,985,023 3,718,479	11/22/2022 12:35:36 PM 11/22/2022 12:35:37 PM	6/5/2009 6/5/2009
	🗹 💥 IMG_3493.JPG	Below Averag	ок ок	4,985,023 3,718,479 4,110,749	11/22/2022 12:35:36 PM	6/5/2009

2.4 Volume Sets and RAIDs

R-Studio detects and processes valid hardware volume sets and RAIDs like regular drives/volumes.

R-Studio can analyze and recover data from software volume sets and RAIDs. If a software volume set or RAID is present in your system, **R-Studio** detects it, and a *Volume sets and RAIDs* object appears in the Drives panel. This object can be searched for files, scanned, and files found on it can be recovered the same way as from normal drives/volumes.

If, due to hardware failure, a hardware volume set or RAID cannot be accessed, or due to data loss your system does not recognize a software volume set or RAID, and you know what drives were in it, you may create a

Virtual volume set or *RAID* and process it like a real software volume set or RAID or hardware volume set or RAID.

You may find more information on RAID types in our article What is Hardware RAID.

You may turn <u>numerical indexes</u> for objects to distinguish them better while creating virtual RAIDs.

- Volume Sets, Stripe Sets, and Mirrors
- Basic RAID 4 and RAID 5 Operations
- Working with RAID 6 Presets
- Working with RAID6 (Double Xor)
- Working with RAIDs with Parity Delays
- Working with Advanced RAID Layouts
- <u>Nested and Non-Standard RAID Levels</u>
- Finding RAID Parameters
- <u>Checking RAID Consistency</u>
- Syntax of a Description File for RAID Configurations
- Description Files for RAID Configurations
- <u>Reverse RAIDs</u>
- Various Disk and Volume Managers

Managing your own RAID layouts

To save your own RAID layout in the presets

- 1 Click the More... button on Parents tab and select Save on the shortcut menu.
- 2 Specify the name for the configuration on the Preset name dialog box.

Preset name dialog box

New Block RA	ID Layout 🗙
reset name:	
TestRAID6	~
-	Cancel

> The new RAID configuration will be saved in the presets

The configurations are stored in the <u>user's RAID layout file</u>. The path and name for this file is specified on the <u>R-Studio Settings</u> dialog box. If no file is specified, **R-Studio** will ask you to enter the name.

Loading your RAID configuration

If there're objects in the Parents tab, the preset will be applied to them. If the Parents tab is empty, **R-Studio** will search the drives listed in the Drives tab for the parents in the <u>user's RAID layout file</u>. If the search fails, **R-Studio** will show the Reference Parents not found message.

To load your RAID configuration

- 1 Click the More... button on Parents tab and select the preset you want to load
- > The new RAID configuration will be loaded

To edit your own RAID configuration

1 Click the More... button on Parents tab and select Edit... on the shortcut menu

2 Select the required configuration on the Edit Block RAID Layout Presets dialog box.

Edit Block RAID Layout Presets dialog box

RAID5Layout	Remove
	Rename
	OK

- 3 Edit the parameters of the configuration and save it
- > The new configuration parameters will be saved.

Turning Drivess On-Line and Off-Line on-the-fly

You may turn the objects in the virtual RAID or volume set on-line and off-line by selecting/dearing the checkbox on the Parents tab. It may be useful, for example, if you need to see which drive is non-actual in a RAID 5.

Actually, when you turn an object off-line, **R-Studio** substitutes it with a *Missing Drive* or *Empty Space* object.

Missing Drives and Empty Space

If one <u>partition</u> from a hardware volume set or RAID or software volume set or RAID is absent, due to hardware failure, for example, you need to add a virtual missing drive or empty space in order to correctly reconstruct the hardware volume set or RAID or software volume set or RAID structure. The missing drive/êmpty space should be placed in the same place as the missing partition.

Note: R-Studio does not write anything real on the drive. Missing drives/empty space are virtual objects that do not affect actual data on the drive.

To add a Missing drive/Empty space object

- 1 Select a Volume sets and RAIDs object in the R-Studio's Drives panel
- 2 Right-click in the Parents tab in the right pane and select Add Missing Drive or Add Empty Space on the shortcut menu or select Add Missing Drive or Add Empty Space on the Create menu. Which object type is necessary, R-Studio decides automatically.

For the Empty space object, Specify its size on the Add Empty Space dialog box.

Add Empty Space dialog box

🗭 Empty space size	
Space size:	
120 GB	
OK	Cancel

> A Missing Drive or Empty Space object will appear in the Parents tab

2.4.1 Volume Sets, Stripe Sets, and Mirrors

To create a Volume set object

1 Click the Create Virtual RAID button and select Create Virtual Volume set or select the Create Virtual Volume set on the Create menu

> A Virtual Volume set object will appear in the Drives panel

			-	
Device/Disk	Label	FS	Start	Size
🗸 🛄 Local Computer				
 TOSHIBA DT01ACA100 MS2OA750 	44H5ATLKS	#1 SATA	0 Bytes	931.51 GB
Volume{3303cc57-3e4d-4507-872f-x.	Recovery	NTFS	1 MB	300 MB
🖙 EFI system partition 🔹		FAT32	301 MB	100 MB
Microsoft reserved partition			401 MB	128 MB
🗢 G 🗸 👻	System	NTFS	529 MB	292.01 GB
Volume{e0a573f2-14d5-4047-adfc-x.		NTFS	292.53 GB	450 MB
🥯 D: 👻	Data	NTFS	292.97 GB	638.54 GB
Empty Space21			931.51 GB	1.69 MB
Marvell 91xx Config 1.01				
 PIONEER DVD-RW DVR-219L 1.00 				
🍰 E:				
WDC WD10EACS-00ZJB0 01.01B01	WD-WCASJ0409502	#0 USB (0 Bytes	931.51 GB
🥪 Y: 👻	Backup II	NTFS	1 MB	931.51 GB
Y 🔜 Image Files				
Y:\VolumeSet\VolumeSetDisk1.bin		NTFS		897.75 MB
Y:\VolumeSet\VolumeSetDisk2.bin				897.75 MB
 Virtual Volume sets and RAIDs 				
Virtual volume set 1				

2 Drag the required partitions from the Drives panel to the Parents tab

Other ways to add objects

• Right-click the Parents tab and select the required partition from the shortcut menu, or

• Right-click the partition in the Drives panel, select Add to RAID on the shortcut menu, and select the RAID object you want to add the partition to.

Note: Objects should be placed in the same order as they were in the original volume set. If this order is incorrect, you must change it by dragging the parents to place them in the correct order.

Parents X					
Loc	ate Add Empty Space Remove Mov	e Up Move Down			
N	Device/Disk	Info/Bus	Start/Serial	Size	
A	Strate V:/VolumeSet/VolumeSetDisk1.bir	n NTFS		897.75 MB	
в	Y:/VolumeSet/VolumeSetDisk2.bir	n		897.75 MB	

> The Virtual volume set or RAIDs object can now be processed like regular drives/90lumes If R-Studio detects a valid file system on the newly created RAID object, a partition object will appear in the Drives panel.

Drives				
Device/Disk	Label	FS	Start	Size
V STOSHIBA DT01ACA100 MS2OA750	44H5ATLKS	#1 SATA2	0 Bytes	931.51 GB
Volume(3303cc57-3e4d-4507-872f-6ad.	Recovery	NTFS	1 MB	300 MB
Set EFI system partition		FAT32	301 MB	100 MB
Microsoft reserved partition			401 MB	128 MB
👄 C: 🗸 🗸	System	NTFS	529 MB	292.01 GB
Volume(e0a573f2-14d5-4047-adfc-387.x		NTFS	292.53 GB	450 MB
🥯 D: 👻	Data	NTFS	292.97 GB	638.54 GB
Empty Space21			931.51 GB	1.69 MB
Marvell 91xx Config 1.01				
 PIONEER DVD-RW DVR-219L 1.00 				
E				
WDC WD10EACS-00ZJB0 01.01B01	WD-WCASJ0409502	#0 USB (0	0 Bytes	931.51 GB
🥪 Y: 👻	Backup II	NTFS	1 MB	931.51 GB
✓ Image Files				
Y:\VolumeSet\VolumeSetDisk1.bin		NTFS		897.75 MB
Y:\VolumeSet\VolumeSetDisk2.bin				897.75 MB
 Virtual Volume sets and RAIDs 				
Virtual volume set 1		NTFS	0 Bytes	1.75 GB
Direct Volume		NTFS	0 Bytes	1.75 GB

To create a Stripe set object (RAID 0)

1 Click the Create Virtual RAID button and select Create Virtual Block RAID & Autodetect or select the Create Virtual Block RAID & Autodetect on the Create menu > A Virtual Block RAID object will appear in the Drives panel

Drives							×
		Device/Disk Volume{3303cc57-3e4d-4507-87 .,	Label Recovery	FS NTFS	Start 1 MB	Size 300 MB	'
		See EFI system partition		FAT32	301 MB	100 MB	۰.
		See Microsoft reserved partition			401 MB	128 MB	
		🗢 C: 🗸	System	NTFS	529 MB	292.01 GB	
		Solume{e0a573f2-14d5-4047-adf.★		NTFS	292.53 GB	450 MB	
		🥪 D: 👻	Data	NTFS	292.97 GB	638.54 GB	
		Empty Space21			931.51 GB	1.69 MB	
*		Image: Y:/RAID0/RAID0Disk2.dsk					
		Promise1+0 JBOD1.10			0 Bytes	37.31 GB	
~		Image: Y:/RAID0/RAID0Disk1.dsk					
	~	Promise1+0 JBOD1.10			0 Bytes	37.31 GB	
		Empty Space24			512 Bytes	37.31 GB	
	9	Marvell 91xx Config 1.01					
~	3	PIONEER DVD-RW DVR-219L 1.00					
		3 E					
¥	-	WDC WD10EACS-00ZJB0 01.01B01	WD-WCASJ0409502	#0 USB (0 Bytes	931.51 GB	
		🥯 Y: 👻	Backup II	NTFS	1 MB	931.51 GB	
✓ Vir	tual	Volume sets and RAIDs					
	E	Virtual Block RAID 1					

2 Select RAID 0 (Stripe set) on the RAID type

3 Drag the required partitions from the Drives panel to the Parents tab

Other ways to add objects

• Right-click the Parents tab and select the required partition from the shortcut menu,

or

• Right-click the partition in the Drives panel, select Add to RAID on the shortcut menu, and select the RAID object you want to add the partition to.

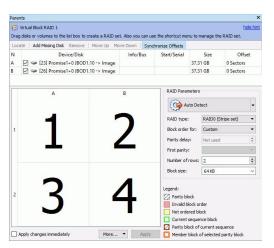
You may either make **R-Studio** to process your changes immediately or wait until you finish editing the RAID layout. Select or clear the Apply changes immediately checkbox on the Parents tab. Click the **Apply** button to apply the changes when are you through.

Note: Objects should be placed in the same order as they were in the original volume set. If this order is incorrect, you must change it by dragging the parents to place them in the correct order.

Locate	Click this button to locate the selected object in the Drives panel.
Add Empty Space/Add Missing Drive	Click this button to add an empty space or missing drive object to the RAID
Remove	Click this button to remove the selected object from the RAID
Move Up	Click this button to move up the selected object in the RAID
Move Down	Click this button to move down the selected object in the RAID
Synchronize Offsets	Click this button to make the offsets the same for all objects in the RAID
Reset changes	Click this button to return the configuration to the initial state (after clicking the Apply button or immediately after loading)

Object control buttons

The Block size and Offset (in sectors) parameters must be set the same as for the original volume set. You also need to specify Block order. You may select it on the Blocks order drop-down or shortcut menu. If the those parameters are not correct, data on the parents will not be damaged, but they cannot be recovered. 94



> The Virtual Block RAID object can now be processed like regular drives/?olumes If R-Studio detects a valid file system on the newly created RAID object, a partition object will appear in the Drives panel.

The **Description Files for RAID Configurations** topic shows the RAID description file for this RAID configuration.

Drives						
~	Lo	Device/Disk cal Computer	Label	FS	Start	Size
~	-	TOSHIBA DT01ACA100 MS2OA750	44H5ATLKS	#1 SATA	0 Bytes	931.51 GB
		Solume{3303cc57-3e4d-4507-872f.#	Recovery	NTFS	1 MB	300 MB
		🖙 EFI system partition 🔹		FAT32	301 MB	100 MB
		Served partition			401 MB	128 MB
		🤪 G 🗸 🗸	System	NTFS	529 MB	292.01 GB
		✓ Volume{e0a573f2-14d5-4047-adfc. x		NTFS	292.53 GB	450 MB
		🧼 D: 👻	Data	NTFS	292.97 GB	638.54 GB
		Empty Space21			931.51 GB	1.69 MB
~		Image: Y:/RAID0/RAID0Disk2.dsk				
		Promise1+0 JBOD1.10			0 Bytes	37.31 GB
~		Image: Y:/RAID0/RAID0Disk1.dsk				
	~	Promise1+0 JBOD1.10			0 Bytes	37.31 GB
		Empty Space24			512 Bytes	37.31 GB
	-	Marvell 91xx Config 1.01				
~	3	PIONEER DVD-RW DVR-219L 1.00				
		😃 E				
~	-	WDC WD10EACS-00ZJB0 01.01B01	WD-WCASJ0409502	#0 USB (0 Bytes	931.51 GB
		🥪 Y: 🔹	Backup II	NTFS	1 MB	931.51 GB
✓ Vir	tual	Volume sets and RAIDs				
~	6	Virtual Block RAID 1			0 Bytes	74.62 GB
		C Empty Space29			512 Bytes	7.84 MB
		Service Partition1	Stripe(0)	NTFS	7.88 MB	74.49 GB
		Empty Space30			74 50 GB	123 78 MB

You also may check the RAID consistency, if necessary. See the Checking RAID Consistency help page for details.

To create a Mirror set object (RAID 1)

- 1 Click the Create Virtual RAID button and select Create Virtual Mirror or select the Create Virtual Mirror on the Create menu
- > A Virtual Mirror object will appear in the Drives panel

Label ISATLKS covery tem	FS #1 SATA NTFS FAT32 NTFS NTFS NTFS	1 MB 301 MB 401 MB 529 MB 292.53 GB 292.97 GB	Size 931.51 GB 300 MB 100 MB 128 MB 292.01 GB 450 MB 638.54 GB
tem	NTFS FAT32 NTFS NTFS	1 MB 301 MB 401 MB 529 MB 292.53 GB 292.97 GB	300 MB 100 MB 128 MB 292.01 GB 450 MB
tem	FAT32 NTFS NTFS	301 MB 401 MB 529 MB 292.53 GB 292.97 GB	100 MB 128 MB 292.01 GB 450 MB
	NTFS NTFS	401 MB 529 MB 292.53 GB 292.97 GB	128 MB 292.01 GB 450 MB
	NTFS	529 MB 292.53 GB 292.97 GB	292.01 GB 450 MB
	NTFS	292.53 GB 292.97 GB	450 MB
a		292.97 GB	
a	NTFS		638.54 GB
		931.51 GB	1.69 MB
-WCASJ0409502	#0 USB (0 Bytes	931.51 GB
kup II	NTFS	1 MB	931.51 GB
	NTFS		897.75 MB
	NTFS		897.75 MB
	I-WCASJ0409502 ikup II	kup II NTFS NTFS	kup II NTFS 1 MB

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- 2 Drag the required partitions from the Drives panel to the Parents tab
 - Other ways to add objects
 - Right-click the Parents tab and select the required partition from the shortcut menu,
 - or
 - Right-click the partition in the Drives panel, select Add to RAID on the shortcut menu, and select the RAID object you want to add the partition to.

Par	ents						×
Lo	cate	Add Empty Space	Remove	Move Up	Move Down	Synchronize O	ffsets
Ν		Device/Disl		Info/Bu:	s Start/Seria	I Size	Offset
А		Y:/RAID1/RAID	1Disk1.bin	NTFS		897.75 MB	0 Sectors
в		Y:/RAID1/RAID	1Disk2.bin	NTES		897.75 MB	0 Sectors

> The Virtual Mirror object can now be processed like regular drives/9olumes If R-Studio detects a valid file system on the newly created RAID object, a partition object will appear in the Drives panel.

Drives				>
Device/Disk	Label	FS	Start	Size
V STOSHIBA DT01ACA100 MS20	44H5ATLKS	#1 SAT	0 Bytes	931.51 GB
Volume{3303cc57-3e4d-45.	Recovery	NTFS	1 MB	300 MB
🖙 EFI system partition 🔹		FAT32	301 MB	100 MB
Microsoft reserved partition			401 MB	128 MB
÷C: •	System	NTFS	529 MB	292.01 GB
Volume{e0a573f2-14d5-40.*		NTFS	292.53 GB	450 MB
🥯 D: 💌	Data	NTFS	292.97 GB	638.54 GB
Empty Space21			931.51 GB	1.69 MB
San Marvell 91xx Config 1.01				
✓ ➢ PIONEER DVD-RW DVR-219L 1				
🔔 E:				
 WDC WD10EACS-00ZJB0 01.01 	WD-WCASJ04095	#0 USB	0 Bytes	931.51 GB
🥪 Y: 👻	Backup II	NTFS	1 MB	931.51 GB
✓ Image Files				
Y:\RAID1\RAID1Disk1.bin		NTFS		897.75 MB
Y:\RAID1\RAID1Disk2.bin		NTFS		897.75 MB
 Virtual Volume sets and RAIDs 				
✓ is Virtual mirror 1		NTFS	0 Bytes	897.75 MB
Se Direct Volume		NTFS	0 Bytes	897.75 MB

2.4.2 Basic RAID 4 and RAID 5 Operations

RAID 4 and RAID 5 are much similar. You may create and edit a RAID 4 object the same way as a RAID 5 one.

To create a RAID 5 object

- 1 Click the Create Virtual RAID button and select Create Virtual Block RAID & Autodetect or select the Create Virtual Block RAID & Autodetect on the Create menu
- > A Virtual Block RAID object will appear in the Drives panel

Drives						×
	evice/Disk osoft reserved partition 👻	Label	FS	Start 401 MB	Size 128 MB	^
🥯 C:	-	System	NTFS	529 MB	292.01 GB	
Se Volu	me{e0a573f2-14d5-4047-a. x		NTFS	292.53 GB	450 MB	
🧼 D:	•	Data	NTFS	292.97 GB	638.54 GB	
Sec. Empl	ty Space21			931.51 GB	1.69 MB	
Y 📙 Image: Y	:/RAID5/RAID5Disk3.dsk					
🗸 🥪 Prom	nise1+0 JBOD1.10			0 Bytes	37.31 GB	
🥯 E	mpty Space30			512 Bytes	37.31 GB	
🝛 E	mpty Space29			31.50 KB	37.31 GB	
Y 📙 Image: Y	:/RAID5/RAID5Disk2.dsk					
See Prom	nise1+0 JBOD1.10			0 Bytes	37.31 GB	
🗸 📙 Image: Y	:/RAID5/RAID5Disk1.dsk					
🗸 🥯 Prom	nise1+0 JBOD1.10			0 Bytes	37.31 GB	
🥯 E	mpty Space24			512 Bytes	37.31 GB	
Se Marvell 9	1xx Config 1.01					
	DVD-RW DVR-219L 1.00					
3 E:						
Y 🗢 WDC WD	010EACS-00ZJB0 01.01B01	WD-WCASJ0409502	#0 USB	0 Bytes	931.51 GB	
🧼 Y:	-	Backup II	NTFS	1 MB	931.51 GB	
✓ Virtual Volume set	ets and RAIDs					
Virtual Bl	lock RAID 1					~

2 Select RAID 5 on the RAID type

3 Drag the required partitions from the Drives panel to the Parents tab

Other ways to add objects

• Right-click the Parents tab and select the required partition from the shortcut menu,

or

• Right-click the partition in the Drives panel, select Add to RAID on the shortcut menu, and select the RAID object you want to add the partition to.

You may either make **R-Studio** to process your changes immediately or wait until you finish editing the RAID layout. Select or clear the Apply changes immediately checkbox on the Parents tab. Click the **Apply** button to apply the changes when are you through.

Note: Objects should be placed in the same order as they were in the original RAID 5. If this order is incorrect, you must change it by dragging the parents to place them in the correct order.

Object control buttons

Locate	Click this button to locate the selected object in the Drives panel.
Add Empty Space/Add Missing Drive	Click this button to add an empty space or missing drive object to the RAID
Remove	Click this button to remove the selected object from the RAID
Move Up	Click this button to move up the selected object in the RAID
Move Down	Click this button to move down the selected object in the RAID
Synchronize Offsets	Click this button to make the offsets the same for all objects in the RAID
Reset changes	Click this button to return the configuration to the initial state (after clicking the Apply button or immediately after loading)

The RAID block size and Offset (in sectors) parameters must be set the same as for the original RAID 5.

You also need to specify Block order for virtual RAID 5. You may select it on the Block order drop-down or shortcut menu.

If the those parameters are not correct, data on the parents will not be damaged, but files from the RAID 5 cannot be recovered.

Note: You may check how correctly you have reconstructed the original RAID 5. Find a file and preview it. If the file appears correct, you have created a correct RAID 5 layout.

If your RAID 5 has an unusual configuration, you may create them manually. See <u>Working with Advanced</u> <u>RAID Layouts</u> for details.

Drives						
~ .	Lo	Device/Disk cal Computer	Label	FS	Start	Size
~	4	TOSHIBA DT01ACA100 MS2OA750	44H5ATLKS	#1 SATA2 (3	0 Bytes	931.51 GB
		Volume(3303cc57-3e4d-4507-872f-6ad5ef68209f)	Recovery	NTFS	1 MB	300 MB
		See EFI system partition		FAT32	301 MB	100 MB
		Microsoft reserved partition			401 MB	128 MB
		🗢 G 🔹 💌	System	NTFS	529 MB	292.01 GB
		Volume(e0a573f2-14d5-4047-adfc-387ed02237b9+		NTFS	292.53 GB	450 MB
		🧼 D: 👻	Data	NTFS	292.97 GB	638.54 GB
		Empty Space21			931.51 GB	1.69 MB
~		Image: Y:/RAID5/RAID5Disk3.dsk				
	~	Promise1+0 JBOD1.10			0 Bytes	37.31 GB
		Empty Space30			512 Bytes	37.31 GB
		Empty Space29			31.50 KB	37.31 GB
~		Image: Y:/RAID5/RAID5Disk2.dsk				
		Promise1+0 JBOD1.10			0 Bytes	37.31 GB
¥		Image: Y:/RAID5/RAID5Disk1.dsk				
	~	Promise1+0 JBOD1.10			0 Bytes	37.31 GB
		Empty Space24			512 Bytes	37.31 GB
	-	Marvell 91xx Config 1.01				
Y	3	PIONEER DVD-RW DVR-219L 1.00				
		la E				
~	-	WDC WD10EACS-00ZJB0 01.01B01	WD-WCASJ0409502	#0 USB (0:0)	0 Bytes	931.51 GB
			Backup II	NTFS	1 MB	931.51 GB
		Volume sets and RAIDs				
~	E	Virtual Block RAID 1			0 Bytes	74.62 GB
		Empty Space34			512 Bytes	7.84 MB
		Searchition1	RAID5	NTFS	7.88 MB	74.49 GB
		Empty Space35			74.50 GB	123.78 MB

	ate Add Missing Disk Remove Move	Up Move Down	Synchronize Offsets					
N	Device/Disk		Info/Bus	Start/Serial	Siz	e	Offse	t
A	🗹 🥯 Promise1+0 JBOD1.10 -> Ima	ige	#1 SCSI (3:0)		37.31 GB		0 Sectors	
в	🗹 🧼 Promise1+0 JBOD1.10 -> Ima	ige	#2 SCSI (3:1)		37.31 GB		0 Sectors	
С	Promise1+0 JBOD1.10 -> Ima	ige	#3 SCSI (3:2)		37.31 GB		0 Sectors	
	A	В	с	RAI	D Parameters			
	_	_		///// ·	hoose Variants	\$		
	- 1			RAI	ID type:	RAID5		•
1				Blo	k order for:	Left Asy	nchronous (Co	ni 🔻
				Par	ity delay:	Not use	d	
				Firs	t parity:			. 7
	·/////		1),	Nur	nber of rows:	3		
				Blo	tk size:	64 KB		
2	5 F		4					
			<i></i>					

Parents tab

> The RAID 5 object can now be processed like regular drives/volumes

If **R-Studio** detects a valid file system on the newly created RAID object, a <u>partition</u> object will appear in the Drives panel.

The **Description Files for RAID Configurations** topic shows the RAID description file for this RAID configuration.

You also may check the RAID consistency, if necessary. See the <u>Checking RAID Consistency</u> help page for details.

Creating and saving your own RAID 5 configuration

You may create and save your own RAID configurations for non-standard RAIDs. You may specify Offset, Block order/size and Row count. See Working with Advanced RAID 5 Layouts for details.

2.4.3 Working with RAID6 (Double Xor) Presets

R-Studio allows you to create and process RAID 6 Double Xor layouts with the following presets:EVENODDRAID DPX-Code(2)Adaptec 3805In addition you may create your own RAID 6 configurations.

Creating a RAID 6 (Double Xor) object from a preset:

We will use the EVENODD preset as an example.

To create a RAID 6 (Double Xor) object

- Click the Create Virtual RAID button and select Create Virtual Block RAID & Autodetect 1 or select the Create Virtual Block RAID & Autodetect on the Create menu
- A Virtual Block RAID object will appear in the Drives panel >

rives					
/ 🗖 Loca	Device/Disk	Label	FS	Start	Size
v @1	OSHIBA DT01ACA100 MS2OA750	44H5ATLKS	#1 SATA	0 Bytes	931.51 GB
4	Volume(3303cc57-3e4d-4507-87.*	Recovery	NTFS	1 MB	300 MB
4	EFI system partition		FAT32	301 MB	100 MB
4	Microsoft reserved partition 🔹			401 MB	128 MB
4	C: ▼	System	NTFS	529 MB	292.01 GB
5	Volume{e0a573f2-14d5-4047-ad.x		NTFS	292.53 GB	450 MB
4	🗃 D: 👻	Data	NTFS	292.97 GB	638.54 GB
5	Empty Space21			931.51 GB	1.69 MB
	Marvell 91xx Config 1.01				
🗸 🥝 F	NONEER DVD-RW DVR-219L 1.00				
1	3 E				
v @1	VDC WD10EACS-00ZJB0 01.01B01	WD-WCASJ0409502	#0 USB (0 Bytes	931.51 GB
6	₽ Y: ▼	Backup II	NTFS	1 MB	931.51 GB
Y 📙 I	mage Files				
<	Y:\RAID62X\RAID62X1.bin		NTFS		897.75 MB
9	Y:\RAID62X\RAID62X2.bin				897.75 MB
4	Y:\RAID62X\RAID62X3.bin				897.75 MB
4	Y:\RAID62X\RAID62X4.bin				897.75 MB
4	Y:\RAID62X\RAID62X5.bin				897.75 MB
4	Y:\RAID62X\RAID62X6.bin				897.75 MB
Virtual Vi	olume sets and RAIDs				
EN	/irtual Block RAID 1				

Select RAID 6/Double Xor on the RAID type 2

- Drag the required partitions from the Drives panel to the Parents tab 3
 - Other ways to add objects

• Right-click the Parents tab and select the required partition from the shortcut menu,

- or
- Right-click the partition in the Drives panel, select Add to RAID on the shortcut menu, and select the RAID object you want to add the partition to.

You may either make **R-Studio** to process your changes immediately or wait until you finish editing the RAID layout. Select or clear the Apply changes immediately checkbox on the Parents tab. Click the Apply button to apply the changes when are you through.

arer	its								
	virtual Block RAID								hide h
					the shortcut menu to n	hanage the RAID set			
Loca	te Add Missing	Disk Remove		own Synch	ronize Offsets				
		Device			Info/Bus	Start/Serial	Size	Offset	
		ID62X/RAID62X1.			NTFS		897.75 MB	0 Sectors	
		ID62X/RAID62X2.					897.75 MB	0 Sectors	
		ID62X/RAID62X3.					897.75 MB 897.75 MB	0 Sectors	
		ID62X/RAID62X4.					897.75 MB	0 Sectors	
		ID62X/RAID62X5.t					897.75 MB	0 Sectors	
	M 🗣 1:/KA	ID02X/KAID02X0.	an					1	
	A	в	С	D	E	F	RAID Parameters		
ſ	4		2	Λ		66	Auto Del	tect	-
1		2	3	4		190	RAID type:	RAID6 / Double Xor	÷
Ļ				-			Block order for:	EVENODD	•
	_	^		0			Parity delay:	Not used	¢
2	5	h		X		A ANN	First parity:		4
	J	U	/	U	- X//X+//		Number of rows:	4	0
	10000			-		77 <u>77777777</u> 777			
3	0	10	11				Block size:	64 KB	~
5	9	LU	11						
	_						Legend:		
	10				- /////////////////////////////////////		Parity block	dar	
4	1 2	14	15	16			Not ordered block of		
	TO	14	ТJ	T	JXX		Current sequer		
4					11111111		2 Parity block of	current sequence	
14	oply changes imm	ediately			More	 Apply 	Member block of the second	of selected parity block	

Note: Objects should be placed in the same order as they were in the original volume set. If this order is incorrect, you must change it by dragging the parents to place them in the correct order.

Object control buttons

Locate	Click this button to locate the selected object in the Drives panel.
Add Empty Space/Add Missing Drive	Click this button to add an empty space or missing drive object to the RAID
Remove	Click this button to remove the selected object from the RAID
Move Up	Click this button to move up the selected object in the RAID
Move Down	Click this button to move down the selected object in the RAID
Synchronize Offsets	Click this button to make the offsets the same for all objects in the RAID
Reset changes	Click this button to return the configuration to the initial state (after clicking the Apply button or immediately after loading)

The RAID block size and Offset (in sectors) parameters must be set the same as for the original volume set. You also need to specify Blocks order (EVENODD for our case) for virtual RAID 6 (Double Xor). You may select it on the Blocks order drop-down or shortcut menu.

If the those parameters are not correct, data on the parents will not be damaged, but they cannot be recovered.

Note: You may check how correctly you have reconstructed the original volume set or RAID. Find a file and preview it. If the file appears correct, you have created a correct RAID layout.

> The Virtual Block RAID object can now be processed like regular drives/volumes

If **R-Studio** detects a valid file system on the newly created RAID object, a <u>partition</u> object will appear in the Drives panel. The <u>Description Files for RAID Configurations</u> topic shows the RAID description file for this RAID configuration.

Drives						
v 🗖	Lo	Device/Disk cal Computer	Label	FS	Start	Size
~	-	TOSHIBA DT01ACA100 MS2OA750	44H5ATLKS	#1 SATA	0 Bytes	931.51 GB
		✓ Volume(3303cc57-3e4d-4507-87.	Recovery	NTFS	1 MB	300 MB
		See EFI system partition		FAT32	301 MB	100 MB
		Microsoft reserved partition			401 MB	128 MB
		🖙 C: 🔹	System	NTFS	529 MB	292.01 GB
		See Volume{e0a573f2-14d5-4047-adfx		NTFS	292.53 GB	450 MB
		🖙 D: 👻	Data	NTFS	292.97 GB	638.54 GB
		Empty Space21			931.51 GB	1.69 MB
	-	Marvell 91xx Config 1.01				
~	2	PIONEER DVD-RW DVR-219L 1.00				
		3 E:				
~	4	WDC WD10EACS-00ZJB0 01.01B01	WD-WCASJ0409502	#0 USB (0 Bytes	931.51 GB
		🥪 Y: 🗸 👻	Backup II	NTFS	1 MB	931.51 GB
~		Image Files				
		Y:\RAID62X\RAID62X1.bin		NTFS		897.75 MB
		Y:\RAID62X\RAID62X2.bin				897.75 MB
		Y:\RAID62X\RAID62X3.bin				897.75 MB
		Y:\RAID62X\RAID62X4.bin				897.75 MB
		Y:\RAID62X\RAID62X5.bin				897.75 MB
		Y:\RAID62X\RAID62X6.bin				897.75 MB
✓ Virt	tual	Volume sets and RAIDs				
~	0	Virtual Block RAID 1		NTFS	0 Bytes	3.51 GB
		Direct Volume		NTFS	0 Bytes	3.51 GB

You also may check the RAID consistency, if necessary. See the <u>Checking RAID Consistency</u> help page for details.

2.4.4 Working with RAID 6 Presets

R-Studio allows you to create and process RAID 6 layouts. You may use either presets for several RAID 6 layouts, or use your own custom ones.

R-Studio provides presets for the following RAID 6 layouts:

Reed-Solomon

Left Synchronous (standard),

Left Asynchronous (continuous),

Right Synchronous

Right Asynchronous

Creating a RAID 6 object from a preset:

We will use the Reed-Solomon (Left Synchronous (standard)) preset as an example.

To create a RAID 6 object

- 1 Click the Create Virtual RAID button and select Create Virtual Block RAID & Autodetect or select the Create Virtual Block RAID & Autodetect on the Create menu
- > A Virtual Block RAID object will appear in the Drives panel

Unives					~
~ 🗖 ı	Device/Disk .ocal Computer	Label	FS	Start	Size
Y 4	TOSHIBA DT01ACA100 MS2OA750	44H5ATLKS	#1 SAT	0 Bytes	931.51 GB
	See Volume{3303cc57-3e4d-4507*	Recovery	NTFS	1 MB	300 MB
	See EFI system partition		FAT32	301 MB	100 MB
	Served partition •			401 MB	128 MB
	🥯 G 🗸 🗸	System	NTFS	529 MB	292.01 GB
	Solume{e0a573f2-14d5-4047*		NTFS	292.53 GB	450 MB
	🥯 D: 👻	Data	NTFS	292.97 GB	638.54 GB
	Empty Space21			931.51 GB	1.69 MB
4	Marvell 91xx Config 1.01				
× (PIONEER DVD-RW DVR-219L 1.00				
	🎱 E:				
× 4	WDC WD10EACS-00ZJB0 01.01B01	WD-WCASJ0409502	#0 USB	0 Bytes	931.51 GB
	🥪 Y: 🗸	Backup II	NTFS	1 MB	931.51 GB
~	Image Files				
	Y:\RAID6RS\img1.bin				897.75 MB
	Simg2.bin		NTFS		897.75 MB
	Y:\RAID6RS\img3.bin				897.75 MB
	Y:\RAID6RS\img4.bin				897.75 MB
	Y:\RAID6RS\img5.bin				897.75 MB
✓ Virtu	al Volume sets and RAIDs				
1	Virtual Block RAID 1				

2 Select RAID 6/Reed-Solomon on the RAID type

3 Drag the required partitions from the Drives panel to the Parents tab

Other ways to add objects

• Right-click the Parents tab and select the required partition from the shortcut menu,

or

• Right-click the partition in the Drives panel, select Add to RAID on the shortcut menu, and select the RAID object you want to add the partition to.

You may either make **R-Studio** to process your changes immediately or wait until you finish editing the RAID layout. Select or clear the Apply changes immediately checkbox on the Parents tab. Click the **Apply** button to apply the changes when are you through.

Parents tab

	Add Missing	LASK RENIOVE MC	ive Up Move Down	Synchronize Of	fsets				
N	Device/Disk			Info/Bus	Start/Serial	Size	Offset		
4	Y:/RAID6RS/img1.bin					897.75 MB	0 Sectors		
В	Y:/RAID6RS/img2.bin			NTFS		897.75 MB	0 Sectors		
0	Y:/RAID6RS/img3.bin					897.75 MB	0 Sectors		
D	✓ S:/RAID6RS/img4.bin ✓ Y:/RAID6RS/img5.bin					897.75 MB	0 Sectors		
						897.75 MB	0 Sectors		
	A	В	с	D	E	RAID Parameters	l		
1	PC	1	2	3	DD	Auto Detect			
Ľ	XX9//		_	J	XX	RAID type:	RAID6 / Reed-Solomon		
	4	-	C			Block order for:	Left Synchronous (Stan		
2	4	5	6	PD	KS	Parity delay:	Not used		
			111111111		<i></i>	First parity:			
3	Q	0	DD	ØQ.	7	Number of rows:	5		
	0	3	<i>V.V</i>	///////////////////////////////////////		Block size:	64 KB		
4	12	PD	RS	10	11	Legend:			
11	///////////////////////////////////////					Invalid block order			

Note: Objects should be placed in the same order as they were in the original volume set. If this order is incorrect, you must change it by dragging the parents to place them in the correct order.

Locate	Click this button to locate the selected object in the Drives panel.
Add Empty Space/Add Missing Drive	Click this button to add an empty space or missing drive object to the RAID
Remove	Click this button to remove the selected object from the RAID
Move Up	Click this button to move up the selected object in the RAID
Move Down	Click this button to move down the selected object in the RAID
Synchronize Offsets	Click this button to make the offsets the same for all objects in the RAID
Reset changes	Click this button to return the configuration to the initial state (after clicking the Apply button or immediately after loading)

Object control buttons

The RAID block size and Offset (in sectors) parameters must be set the same as for the original volume set.

You also need to specify Blocks order (Left Synchronous (standard) for our case) for virtual RAID 6. You may select it on the Blocks order drop-down or shortcut menu.

If the those parameters are not correct, data on the parents will not be damaged, but they cannot be recovered.

Note: You may check how correctly you have reconstructed the original volume set or RAID. Find a file and preview it. If the file appears correct, you have created a correct RAID layout.

> The Virtual Block RAID object can now be processed like regular drives/volumes

If **R-Studio** detects a valid file system on the newly created RAID object, a <u>partition</u> object will appear in the Drives panel. The <u>Description Files for RAID Configurations</u> topic shows the RAID description file for this RAID configuration.

Device/Disk	Label	FS	Start	Size
V V TOSHIBA DT01ACA100 MS2OA750	44H5ATLKS	#1 SAT	0 Bytes	931.51 GB
💚 Volume(3303cc57-3e4d-4507- 	Recovery	NTFS	1 MB	300 MB
🖙 EFI system partition 👻		FAT32	301 MB	100 MB
Microsoft reserved partition •			401 MB	128 MB
🥯 C: 🚽	System	NTFS	529 MB	292.01 GB
Volume(e0a573f2-14d5-4047*		NTFS	292.53 GB	450 MB
🥯 D: 👻	Data	NTFS	292.97 GB	638.54 GB
Empty Space21			931.51 GB	1.69 MB
Marvell 91xx Config 1.01				
PIONEER DVD-RW DVR-219L 1.00				
i E:				
WDC WD10EACS-00ZJB0 01.01B01	WD-WCASJ0409502	#0 USB	0 Bytes	931.51 GB
🥗 Y: 👻	Backup II	NTFS	1 MB	931.51 GB
Y 📙 Image Files				
Y:\RAID6RS\img1.bin				897.75 ME
Y:\RAID6RS\img2.bin		NTFS		897.75 MB
Y:\RAID6RS\img3.bin				897.75 ME
Y:\RAID6RS\img4.bin				897.75 MB
Y:\RAID6RS\img5.bin				897.75 MB
 Virtual Volume sets and RAIDs 				
Virtual Block RAID 1		NTFS	0 Bytes	2.63 GB
Direct Volume		NTFS	0 Bytes	2.63 GB

You also may check the RAID consistency, if necessary. See the Checking RAID Consistency help page for details.

2.4.5 Working with RAIDs with Parity Delays

R-Studio allows you to create RAIDs with parity delays (any level that allows that). For example, let us create a RAID 5 the parity delays with the following layout:

- Three drives,
- Delay=16
- Block size: 16 KB
- Offset: 1088 sectors (544 KB)
- Block order: Left Asynchronous (Continuous)
- Block order table:

	А	В	С		
1	1	2	PD		
2	3	4	PD		
3	5	6	PD		
4	7	8	PD		
5	9	10	PD		
6	11	12	PD		
7	13	14	PD		
8	15	16	PD	Delay=16	
9	17	18	PD		
10	19	20	PD		
11	21	22	PD		
12	23	24	PD		
13	25	26	PD		
14	27	28	PD		
15	29	30	PD		
16	31	32	PD		
17	33	PD	34	Dalary 16	
18	35	PD	36	Delay=16	

19	37	PD	38	
20	39	PD	40	
21	41	PD	42	
22	43	PD	44	
23	45	PD	46	
24	47	PD	48	
25	49	PD	50	
26	51	PD	52	
27	53	PD	54	
28	55	PD	56	
29	57	PD	58	
30	59	PD	60	
31	61	PD	62	
32	63	PD	64	
33	PD	65	66	
34	PD	67	68	
35	PD	69	70	
36	PD	71	72	
37	PD	73	74	
38	PD	75	76	
39	PD	77	78	
40	PD	79	80	Dalar-16
41	PD	81	82	Delay=16
42	PD	83	84	
43	PD	85	86	
44	PD	87	88	
45	PD	89	90	
46	PD	91	92	
47	PD	93	94	
48	PD	95	96	

To create such RAID 5,

1 Click the Create virtual volume sets or RAIDs button and select Create Virtual Block RAID & Autodetect or select Create Virtual Block RAID & Autodetect on the Create menu

Check that the Apply changes immediately check box is clear on the Parents tab. This will prevent **R-Studio** from trying to start processing the RAID configuration until you specify it completely.

2 Drug the required objects from the Drives pane to the Parents tab and select RAID 5 on the RAID type

■ Other ways to add objects

• Right-click the Parents tab and select the required partition from the shortcut menu,

or

• Right-click the partition in the Drives panel, select Add to RAID on the shortcut menu, and select the RAID object you want to add the partition to.

These objects may be drives, logical drives, or images. Check that the objects are correctly placed. **Note:** Objects should be placed in the same order as they were in the original RAID 5. If this order is incorrect, you must change it by dragging the parents to place them in the correct order.

Object control buttons	
Locate	Click this button to locate the selected object in the Drives
	panel.
Add Empty Space/Add Missing Drive	Click this button to add an empty space or missing drive object
	to the RAID
Remove	Click this button to remove the selected object from the RAID
Move Up	Click this button to move up the selected object in the RAID
Move Down	Click this button to move down the selected object in the RAID
Synchronize Offsets	Click this button to make the offsets the same for all objects in
	the RAID
Reset changes	Click this button to return the configuration to the initial state
	(after clicking the Apply button or immediately after loading)

rives	~				
v 📃 La	Device/Disk ocal Computer	Label	FS	Start	Size
v 9	TOSHIBA DT01ACA100 MS2OA750	44H5ATLKS	#1 SAT	0 Bytes	931.51 GB
	Solume(3303cc57-3e4d-4507	Recovery	NTFS	1 MB	300 MB
	See EFI system partition		FAT32	301 MB	100 MB
	See Microsoft reserved partition			401 MB	128 MB
	🥯 C: 🔹	System	NTFS	529 MB	292.01 GB
	🧼 Volume{e0a573f2-14d5-4047-a.r.		NTFS	292.53 GB	450 MB
	🥯 D: 👻	Data	NTFS	292.97 GB	638.54 GB
	Empty Space21			931.51 GB	1.69 MB
-	Marvell 91xx Config 1.01				
× 3	PIONEER DVD-RW DVR-219L 1.00				
	🍰 E:				
× 9	WDC WD10EACS-00ZJB0 01.01B01	WD-WCASJ0409502	#0 USB	0 Bytes	931.51 GB
	🧇 Y: 👻	Backup II	NTFS	1 MB	931.51 GB
~	Image Files				
	Y:\RAID5HP\RAID5HPDisk1.bin				897.75 MB
	Y:\RAID5HP\RAID5HPDisk2.bin				897.75 MB
	Y:\RAID5HP\RAID5HPDisk3.bin				897.75 MB
 Virtua 	I Volume sets and RAIDs				
1	Virtual Block RAID 1				

3 Specify the Block size and Offset parameters on the Parents tab Disregard the Block order field.

4 Specify the parity delay number in the Parity delay control on the Parents tab.

The number of rows will change to 48.

■ If necessary, adjust the First parity parameter

By default, this parameter is set equal to Parity delay. By changing it, you may "shift" the block order table. For example, when the First parity parameter is set as 1 for the RAID 5 of 3 drives with Parity delay of 3., the block order table will be the following:**First parity parameter**

1	1	2	PD
2	3	PD	4
3	5	PD	6
4	7	PD	8
s////	PD	9	10
s'///	PD	11	12
	PD	13	14
в	15	16	PD
9	17	18	PD

5 Select Left Asynchronous (Continuous) on the Block Order Field and click the Apply button on the Parents tab

	/irtual Block RAID 1 disks or volumes to the list l	oox to create a RAID set. Also you	can use the shortcut m	ienu to r	nanage the RAID se	t.	hid	<u>e h</u>
Loca	te Add Missing Disk Re	move Move Up Move Down	Synchronize Offsets					
N A	De V:/RAID5HP/RA	vice/Disk ID5HPDisk1.bin	Info/Bus	Start/S	erial Si 897.75 M	ze B	Offset 1088 Sectors	
в	Y:/RAID5HP/RA	ID5HPDisk2.bin			897.75 M	в	1088 Sectors	
с	Y:/RAID5HP/RA	ID5HPDisk3.bin			897.75 M	в	1088 Sectors	
	A	В	С	^	RAID Parameters			
6	11	12 1/	///////////////////////////////////////	11,	@			
7	13	14	//////	11_	Auto Del	Auto Detect		•
8	15	16	/////ed////		RAID type:	type: RAID5		-
9	17	18	/////pp/////		Block order for:	Left Synchronous (Sta		
10	19	20	////æb////		Block order for:			
11	21	22 //	/////	1.	Parity delay:	16		\$
12	23	24	1////20		First parity:	16		•
13	25	26	/////		Number of rows:	rows: 48		¢
14	27	28	1////20					
15	29	30	/////	11.	Block size:	16 KB		~
16	31	32	/////20	11				
17	34	1//////////////////////////////////////	33					
18	36	///////////////////////////////////////	35					
19	38	///////////////////////////////////////	37					
20	40	///////////////////////////////////////	39		Legend:			
21	42	1//////	41		Parity block			
22	44	///////////////////////////////////////	43		Invalid block or			
23	46	1//////	45		Not ordered ble			
24	48	///////////////////////////////////////	47	~	Current sequer			

> The created Virtual Block RAID 1 object can now be processed like regular drives/Polumes If R-Studio detects a valid file system on this RAID object, a partition object will appear in the Drives panel.

Drives					
🗸 📃 Loi	Device/Disk cal Computer	Label	FS	Start	Size
v 🔪	TOSHIBA DT01ACA100 MS2OA750	44H5ATLKS	#1 SAT	0 Bytes	931.51 GB
	Solume{3303cc57-3e4d-4507.*	Recovery	NTFS	1 MB	300 MB
	🖙 EFI system partition 🛛 👻		FAT32	301 MB	100 MB
	Served partition 🝷			401 MB	128 MB
	🌳 C: 🗾 🔻	System	NTFS	529 MB	292.01 GB
	Se Volume{e0a573f2-14d5-4047-x.		NTFS	292.53 GB	450 MB
	🖙 D: 👻	Data	NTFS	292.97 GB	638.54 GB
	Empty Space21			931.51 GB	1.69 MB
-	Marvell 91xx Config 1.01				
× 🥝	PIONEER DVD-RW DVR-219L 1.00				
	3 E:				
✓ <i></i>	WDC WD10EACS-00ZJB0 01.01B01	WD-WCASJ0409502	#0 USB	0 Bytes	931.51 GB
	🥪 Y: 👻	Backup II	NTFS	1 MB	931.51 GB
× 📙	Image Files				
	Y:\RAID5HP\RAID5HPDisk1.bin				897.75 MB
	Y:\RAID5HP\RAID5HPDisk2.bin				897.75 MB
	Y:\RAID5HP\RAID5HPDisk3.bin				897.75 MB
✓ Virtual	Volume sets and RAIDs				
× (3	Virtual Block RAID 1		NTFS	0 Bytes	1.75 GB
	Direct Volume		NTFS	0 Bytes	1.75 GB

The **Description Files for RAID Configurations** topic shows the RAID description file for this RAID configuration.

You also may check the RAID consistency, if necessary. See the Checking RAID Consistency help page for details.

2.4.6 Working with Advanced RAID Layouts

R-Studio allows you to create and process very complex custom RAID layouts.

Advanced RAID 5

For example, let us create a RAID 5 with the following layout:

- Three drives,
- Block size: 4 KB
- Offset: 32768 sectors (64 KB)
- Block order:

	А	В	С
1	PD	1	2
2	PD	3	4

3	PD	5	6
4	7	PD	8
5	9	PD	10
6	11	PD	12
7	13	14	PD
8	15	16	PD
9	17	18	PD

To create such RAID 5,

1 Click the Create virtual volume sets or RAIDs button and select Create Virtual Block RAID & Autodetect or select Create Virtual Block RAID & Autodetect on the Create menu

Check that the Apply changes immediately check box is clear on the Parents tab. This will prevent **R-Studio** from trying to start processing the RAID configuration until you specify it completely.

2 Drug the required objects from the Drives pane to the Parents tab and select Custom on the RAID type

Other ways to add objects

• Right-click the Parents tab and select the required partition from the shortcut menu,

or

• Right-click the partition in the Drives panel, select Add to RAID on the shortcut menu, and select the RAID object you want to add the partition to.

These objects may be drives, logical disks, or images. Check that the objects are correctly placed.

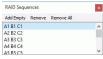
Locate	Click this button to locate the selected object in the Drives panel.
Add Empty Space/Add Missing Drive	Click this button to add an empty space or missing drive object to the RAID
Remove	Click this button to remove the selected object from the RAID
Move Up	Click this button to move up the selected object in the RAID
Move Down	Click this button to move down the selected object in the RAID
Synchronize Offsets	Click this button to make the offsets the same for all objects in the RAID
Reset changes	Click this button to return the configuration to the initial state (after clicking the Apply button or immediately after loading)

Object control buttons

Drives				×	
Device/Disk	Label	FS	Start	Size	
V STOSHIBA DT01ACA100 MS2OA750	44H5ATLKS	#1 SAT	0 Bytes	931.51 GB	
Volume{3303cc57-3e4d-4507-872f-6ax.	Recovery	NTFS	1 MB	300 MB	
🖙 EFI system partition 🔹		FAT32	301 MB	100 MB	
Microsoft reserved partition			401 MB	128 MB	
÷ C: •	System	NTFS	529 MB	292.01 GB	
Volume{e0a573f2-14d5-4047-adfc-38.*.		NTFS	292.53 GB	450 MB	
🛥 D: 👻	Data	NTFS	292.97 GB	638.54 GB	
Empty Space21			931.51 GB	1.69 MB	
Se Marvell 91xx Config 1.01					
PIONEER DVD-RW DVR-219L 1.00					
🥝 E:					
WDC WD10EACS-00ZJB0 01.01B01	WD-WCASJ04095	#0 USB (0 Bytes	931.51 GB	
🥪 γ: 🗸	Backup II	NTFS	1 MB	931.51 GB	
Y 🔄 Image Files					
Y:\RAID5Complex\RAID5CDisk1.bin				897.75 MB	
Y:\RAID5Complex\RAID5CDisk2.bin				897.75 MB	
Y:\RAID5Complex\RAID5CDisk3.bin				897.75 MB	
✓ Virtual Volume sets and RAIDs					
Virtual Block RAID 1					

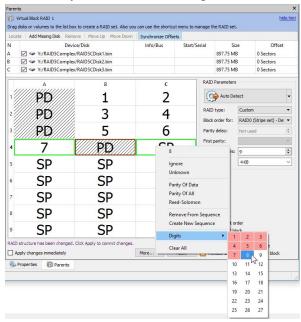
- **3** Specify the Block size and Offset parameters on the Parents tab Disregard the Block order for field.
- 4 Manually enter 9 to Number of rows on the Parents tab The Block order table will expand.
- 5 Enter the block order in the table on the Parents tab Use the RAID Sequence window to move from one row to another.

Sequences window



Using the keyboard: arrow keys to navigate, digit and p keys to enter the block order.

Using the mouse: right-click the cell and select the number or parity from the shortcut menu. If the block table is too large, you better use the keyboard to enter the digits.



Corrections: **R-Studio** will tell you if some digits are not correct. Navigate to the required cell and enter the correct value. Use the **Delete** key to clear a cell.

~~ ·	/irtual Block RAID 1 disks or volumes to the list box !	o create a RAID set. Also you	u can use the shortcut n	ienu to manage t	he RAID set.		<u></u>	de hir	
Loca	te Add Missing Disk Remov	e Move Up Move Down	Synchronize Offsets	1					
N A	Device/Disk Y:/RAID5Complex/RAID5CDisk1.bin		Info/Bus	Start/Serial	Siz 897.75 MB		Offset 32768 Sector		
3	Y:/RAID5Complex/F				897.75 ME		32768 Sector		
3	Y:/RAID5Complex/F	AID5CDisk3.bin			897.75 ME	3	32768 Sector	s	
1	A	В	С	RAID	Parameters				
1	////PD////	2	3	6	Auto Del	tect		•	
2	2	5	6	RAID	type:	Custom		•	
3	7	8	9		Block order for: RAID0 (St Parity delay: Not used First parity:		Stripe set) - De		
4	SP	SP	SP				d	\$	
5	SP	SP	SP	Number of rows		s: 9		\$	
6	SP	SP	SP	Block	Block size:			~	
7	SP	SP	SP						
8	SP	SP	SP						
9	SP	SP	SP	Legend					
time	block number should be used to s for RAIDs10/1E) s block numbering is not continue			Ds, 2	rity block valid block or it ordered bli				

Clear the table: Right-click the table and select Clear all on the shortcut menu.

6 When you finishes entering the information, click the Apply button on the Parents tab

	g disks or volumes to the list box t			nu to manage the	RAID set.			
Loci	ate Add Missing Disk Remov	e Move Up Move Down	Synchronize Offsets	Start/Serial	Siz	-	Offset	
A	Y:/RAID5Complex/F	and the second	1110/003	Start Schar	897.75 ME		32768 Sector	
В	Y:/RAID5Complex/F				897.75 MB		32768 Sector	
c	Y:/RAID5Complex/F	RAID5CDisk3.bin			897.75 MB		32768 Sector	rs
	A	В	С	RAI	D Parameters			
1	PD	1	2	3	Auto De	tect		•
2	PD	3	4	RAI	D type:	Custom		•
1		-		Bloc	Block order for:		Stripe set) - De	• •
31	////PD////	5	6	Pari	ty delay:	Not used		¢
4	7	PD	8		t parity: ber of rows:	0		*
5	9	PD	10		k size:	4 KB		~
6	11	PD	12					
7	13	14	PD		d:			
8	15	16	PD		arity block avalid block or			
9	17	18	PD		ot ordered bl urrent seque arity block of	nce block		

> The created Virtual Block RAID 1 object can now be processed like regular drives/?olumes If R-Studio detects a valid file system on this RAID object, a <u>partition</u> object will appear in the Drives panel. The <u>Description Files for RAID Configurations</u> topic shows the RAID description file for this RAID configuration.

Drives				
Device/Disk V 💻 Local Computer	Label	FS	Start	Size
TOSHIBA DT01ACA100 MS2OA750	44H5ATLKS	#1 SATA	0 Bytes	931.51 GB
Volume(3303cc57-3e4d-4507-872f-x	Recovery	NTFS	1 MB	300 MB
See EFI system partition		FAT32	301 MB	100 MB
Section Microsoft reserved partition			401 MB	128 MB
Se C:	System	NTFS	529 MB	292.01 GB
Volume{e0a573f2-14d5-4047-adfc-		NTFS	292.53 GB	450 MB
🥯 D: 🗸	Data	NTFS	292.97 GB	638.54 GB
Empty Space21			931.51 GB	1.69 MB
Marvell 91xx Config 1.01				
 PIONEER DVD-RW DVR-219L 1.00 				
3 E				
 WDC WD10EACS-00ZJB0 01.01B01 	WD-WCASJ0409502	#0 USB (0 Bytes	931.51 GB
🥯 Y: 👻	Backup II	NTFS	1 MB	931.51 GB
🗸 📙 Image Files				
Y:\RAID5Complex\RAID5CDisk1.bin				897.75 MB
Y:\RAID5Complex\RAID5CDisk2.bin				897.75 MB
Y:\RAID5Complex\RAID5CDisk3.bin				897.75 MB
 Virtual Volume sets and RAIDs 				
 Virtual Block RAID 1 		NTFS	0 Bytes	1.72 GB
See Direct Volume		NTFS	0 Bytes	1.72 GB

You also may check the RAID consistency, if necessary. See the Checking RAID Consistency help page for details.

Advanced RAID 5

Another example is a RAID with the following layout, similar to that used in Mac Pro internal RAID cards with 4 drives.

- Four drives,
- Block size: 512 KB (1024 sectors)
- Offset: 32768 sectors (64 KB)
- Block order:

Sequence 1		S	Sequence 2			Sequence 3			Sequence 4		
Α	В	С	D	А	В	С	D	Α	В	С	D
PD	1	2	PD	3	4	PD	5	6	PD	7	8

As you see, this layout cannot be fit directly into a standard 2D block order table. Still, it's possible to create such RAID layout using the RAID Sequence window.

To create such RAID,

1 Click the Create virtual volume sets or RAIDs button and select Create Virtual Block RAID & Autodetect or select Create Virtual Block RAID & Autodetect on the Create menu

Check that the Apply changes immediately check box is clear on the Parents tab. This will prevent **R-Studio** from trying to start processing the RAID configuration until you specify it completely.

2 Drug the required objects from the Drives pane to the Parents tab and select Custom on the RAID type

Other ways to add objects

- Right-click the Parents tab and select the required partition from the shortcut menu,
- or
- Right-click the partition in the Drives panel, select Add to RAID on the shortcut menu, and select the RAID object you want to add the partition to.

These objects may be drives, logical disks, or images. Check that the objects are correctly placed.

Locate	Click this button to locate the selected object in the Drives panel.
Add Empty Space/Add Missing Drive	Click this button to add an empty space or missing drive object to the RAID
Remove	Click this button to remove the selected object from the RAID
Move Up	Click this button to move up the selected object in the RAID
Move Down	Click this button to move down the selected object in the RAID
Synchronize Offsets	Click this button to make the offsets the same for all objects in the RAID
Reset changes	Click this button to return the configuration to the initial state (after clicking the Apply button or immediately after loading)

■ Object control buttons

Device/Disk	Label	FS	Start	Size
Local Computer			June	
Y 🖙 TOSHIBA DT01ACA100 MS2OA750	44H5ATLKS	#1 SATA2	0 Bytes	931.51 GB
Volume{3303cc57-3e4d-4507-872f-6ad5ef	Recovery	NTFS	1 MB	300 MB
🖙 EFI system partition 👻		FAT32	301 MB	100 MB
Microsoft reserved partition			401 MB	128 MB
÷ C .	System	NTFS	529 MB	292.01 GB
Volume{e0a573f2-14d5-4047-adfc-387ed0.*		NTFS	292.53 GB	450 MB
🥯 D: 👻	Data	NTFS	292.97 GB	638.54 GB
Empty Space21			931.51 GB	1.69 MB
Sea Marvell 91xx Config 1.01				
PIONEER DVD-RW DVR-219L 1.00				
3 E:				
WDC WD10EACS-00ZJB0 01.01B01	WD-WCASJ0409502	#0 USB (0	0 Bytes	931.51 GB
🥪 Y: 🔻	Backup II	NTFS	1 MB	931.51 GB
Y Image Files				
Y:\RAID_MAC_Pro\RAID_MAC_ProDisk1.bin		NTFS		897.75 ME
Y:\RAID_MAC_Pro\RAID_MAC_ProDisk2.bin				897.75 ME
Y:\RAID_MAC_Pro\RAID_MAC_ProDisk3.bin				897.75 ME
Y:\RAID_MAC_Pro\RAID_MAC_ProDisk4.bin				897.75 MB
Virtual Volume sets and RAIDs				
Virtual Block RAID 1				

- **3** Specify the Block size and Offset parameters on the Parents tab Disregard the Block order field.
- 4 Manually enter 3 to Number of rows on the Parents tab and change Block order to Custom
- 5 Right-click the RAID Sequence window and select Remove All. Manually enter 3 to Number of rows on the Parents tab
- 6 Right-click Cell 1 in the block order table and select Create New Sequence.
- 7 Right-click Cell 2 in the block order table and select Add to Sequence, do that for Cell 3, too.
- 8 Right-click Cell 4 in the block order table and select Create New Sequence.
- 9 Right-click Cell 5 in the block order table and select Add to Sequence, do that for Cell 6, too. Continue those steps for the rest of the table until the RAID Sequence window will have 4 sequences of 3 drives:

Sequences window

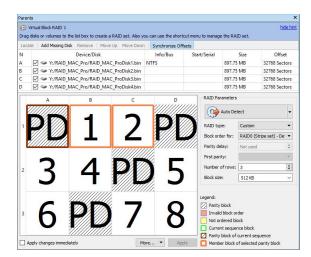
			_
Add Empty	Remove	Remove All	
A1 B1 C1			
D1 A2 B2			
C2 D2 A3			
B3 C3 D3			

10 Select the first line in the RAID Sequence window, right-click Cell 1 in the block order table, and select Parity of Data.

If any unnecessary sequences appear, right-click them in the RAID Sequence window, and select Remove.

- 11 Right-click Cell 2 in the block order table and select 1, do that for Cell 3 selecting 2. If any unnecessary sequences appear, right-click them in the RAID Sequence window, and select Remove.
- 12 Move to the next sequence in the RAID Sequence window and repeat the procedure for cells 4, 5, and 6.

Do that for the rest of the sequences until you fill all cells in the block order table in the Parents tab.



> The created Virtual Block RAID 1 object can now be processed like regular drives/?olumes If R-Studio detects a valid file system on this RAID object, a partition object will appear in the Drives panel. The <u>Description Files for RAID Configurations</u> topic shows the RAID description file for this RAID configuration.

Drive	25					
~	Lo	Device/Disk cal Computer	Label	FS	Start	Size
	v 🤪	TOSHIBA DT01ACA100 MS2OA750	44H5ATLKS	#1 SATA2	0 Bytes	931.51 GB
		Wolume(3303cc57-3e4d-4507-872f-6ad.r.	Recovery	NTFS	1 MB	300 MB
		See EFI system partition		FAT32	301 MB	100 MB
		Microsoft reserved partition			401 MB	128 MB
		÷ C: •	System	NTFS	529 MB	292.01 GB
		Solume{e0a573f2-14d5-4047-adfc-387.*		NTFS	292.53 GB	450 MB
		🖙 D: 💌	Data	NTFS	292.97 GB	638.54 GB
		Empty Space21			931.51 GB	1.69 MB
		Marvell 91xx Config 1.01				
	v 🥝	PIONEER DVD-RW DVR-219L 1.00				
		3 E:				
	v 🌳	WDC WD10EACS-00ZJB0 01.01B01	WD-WCASJ0409502	#0 USB (0	0 Bytes	931.51 GB
		🥪 Y: 👻	Backup II	NTFS	1 MB	931.51 GB
	× 📘	Image Files				
		Prolato_Prolato_Prolato_ProDisk		NTFS		897.75 MB
		Y:\RAID_MAC_Pro\RAID_MAC_ProDisk				897.75 MB
		> Y:\RAID_MAC_Pro\RAID_MAC_ProDisk				897.75 MB
		Service State And Antiperson And Antiperson				897.75 MB
~	Virtual	Volume sets and RAIDs				
	- 6	Virtual Block RAID 1			0 Bytes	2.29 GB
		See EFI System Partition		FAT32	20 KB	200 MB
		A HFS-Test	HFS-Test	HFS+	200.02 MB	6.67 GB

You also may check the RAID consistency, if necessary. See the Checking RAID Consistency help page for details.

Advanced RAID 6 Layout

For example, let us create a RAID 6 with the following layout:

- Five drives,
- Block size: 64 KB
- Offset: 0
- Block order:

	А	В	С	D	E
1	RS	1	2	3	PD
2	4	5	6	PD	RS
3	8	9	PD	RS	7
4	12	PD	RS	10	11
5	PD	RS	13	14	15

6	PA	PA	PA	PA	PA
---	----	----	----	----	----

where

PD is parity of data;

PA is parity of all;

RS is Reed-Solomon;

Rows from 1 to 5 use two types of error correction: parity of data (xor) and Reed-Solomon. That is, row 1 uses blocks A1 and E1, row 2 uses blocks D2 and E2, and so on.

Row 6 is used for error correction for columns. That is, column A uses block A6, column B uses B6, and so on. Parity of all is used for error correction.

1 Click the Create virtual volume sets or RAIDs button and select Create Virtual Block RAID & Autodetect or select Create Virtual Block RAID & Autodetect on the Create menu

Check that the Apply changes immediately check box is clear on the Parents tab. This will prevent **R-Studio** from trying to start processing the RAID configuration until you specify it completely.

2 Drug the required objects from the Drives pane to the Parents tab and select Custom on the RAID type

Other ways to add objects

• Right-click the Parents tab and select the required partition from the shortcut menu,

or

• Right-click the partition in the Drives panel, select Add to RAID on the shortcut menu, and select the RAID object you want to add the partition to.

These objects may be drives, logical disks, or images. Check that the objects are correctly placed.

Locate	Click this button to locate the selected object in the Drives panel.
Add Empty Space/Add Missing Drive	Click this button to add an empty space or missing drive object to the RAID
Remove	Click this button to remove the selected object from the RAID
Move Up	Click this button to move up the selected object in the RAID
Move Down	Click this button to move down the selected object in the RAID
Synchronize Offsets	Click this button to make the offsets the same for all objects in the RAID
Reset changes	Click this button to return the configuration to the initial state (after clicking the Apply button or immediately after loading)

Object control buttons

Device/Disk	Label	FS	Start	Size
V S TOSHIBA DT01ACA100 MS2OA750	44H5ATLKS	#1 SATA2	0 Bytes	931.51 GB
Volume(3303cc57-3e4d-4507-872f-6ad5e)	Recovery	NTFS	1 MB	300 MB
Section EFI system partition	-	FAT32	301 MB	100 MB
Microsoft reserved partition	•		401 MB	128 MB
👄 C:	- System	NTFS	529 MB	292.01 GB
Volume(e0a573f2-14d5-4047-adfc-387ed.	π.	NTFS	292.53 GB	450 MB
🧼 D:	- Data	NTFS	292.97 GB	638.54 GB
Empty Space21			931.51 GB	1.69 MB
Marvell 91xx Config 1.01				
 PIONEER DVD-RW DVR-219L 1.00 				
3 E				
WDC WD10EACS-00ZJB0 01.01B01	WD-WCASJ0409502	#0 USB (0:0)	0 Bytes	931.51 GB
🥯 Y:	Backup II	NTFS	1 MB	931.51 GB
Y 📙 Image Files				
Y:\RAID6Complex\img1.bin				897.75 MB
Y:\RAID6Complex\img2.bin		NTFS		897.75 MB
Y:\RAID6Complex\img3.bin				897.75 MB
Y:\RAID6Complex\img4.bin				897.75 MB
Y:\RAID6Complex\img5.bin				897.75 MB
 Virtual Volume sets and RAIDs 				
Virtual Block RAID 1				

3 Specify the Block size and Offset parameters on the Parents tab

Disregard the Block order parameter.

- 4 Manually enter 6 to Number of rows on the Parents tab
- 5 Enter the block order in the table on the Parents tab

You may enter either a block number, or an error correction block of the following types:

PD	Parity of data
PA	Parity of all
RS	Reed-Solomon
SP	Spare Part
Ι	Ignore

Note: You should specify an error correction block only when the correct sequence is selected on the RAID Sequences window.

Sequences window



Using the keyboard: arrow keys to navigate, digit, and rs, pd, pa, u, i keys to enter the block order.

Using the mouse: right-click the cell and select the number or parity from the shortcut menu. If the block table is too large, you better use the keyboard to enter the digits.

E	Virtual Block RAID	1								hi	de hir
			ite a RAID set.	Also you	can use the shortcut m	enu to manar	e the R/	AID set.		-	
Loca	te Add Missing	Disk Remove N	love Up Mov	e Down	Synchronize Offsets						
N	V:/RAI	Device/Dis D6Complex/img1.			Info/Bus	Start/Serial		si Size		Offset 0 Sectors	
3		D6Complex/img2.			NTFS			897.75	MB	0 Sectors	
5	🗹 🥯 Y:/RAI	D6Complex/img3.	bin					897.75	MB	0 Sectors	
)	V:/RAI	D6Complex/img4.	bin					897.75	MB	0 Sectors	
	🗹 🥯 Y:/RAI	D6Complex/img5.	bin					897.75	MB	0 Sectors	
_		В	c		D	E	RAI	D Param	eters		
1	//¢¢//	1	2		ָ א 🕅	5	1	Au	to Det	ect	+
1	/\X.\$	_	2		/		RAI	D type:		Custom	+
2	4	5	SP		CD	SP	Bloc	k order	for:	RAIDO (Stripe set) - De	• •
ŀ				6		-	Pari	ity delay		Not used	0
3	SP	SP	S	lgno Unkr		iP	Firs	t parity:			*
		~~	_	Unkr	lown		Nun	nber of r	ows:	6	•
4	SP	SP	S	1000	y Of Data y Of All	P	Bloc	size:		64 KB	~
5	SP	SP	S		-Solomon	P	Legen				
	υ.	01	-	Rem	ove From Sequence	-		arity blo			
6	SP	SP	S	Crea	te New Sequence	JΡ	the second se	nvalid bl lot order			
AID	structure has bee	n changed. Click Ap	niv to comm	Digit	s 🔸	1 2	3	4	5	e block	
	pply changes imm			Clear	All	6 7 11 12	8	9 14	10 15	rrent sequence selected parity block	
0.	Properties 6	Parents				16 17		14 19	15		_
						21 22		24	25		

For the rows:

Select the required row sequence on the RAID Sequences window, select the cell on the RAID table, and enter the required value. **R-Studio** automatically generates those sequences when you add RAID parents.

For the columns and arbitrary sequences:

You need to create those sequences and add the respective blocks to it manually.

To create a sequence: Click Add empty on the RAID Sequences window or select Create New Sequence on the shortcut menu on the Parents tab.

To add a block to a sequence: Right-click the respective cell and select Add To Sequence on the shortcut menu on the Parents tab.

To remove a block to a sequence: Right-click the respective cell and select Remove From Sequence on the shortcut menu on the Parents tab.

6 When you finishes entering the information, click the Apply button on the Parents tab

Pare	nts							×	
100	Virtual Block RAID 1 g disks or volumes to		ite a RAID set. Also y	ou can use the short	cut menu to manag	e the RAID set.		<u>hide hint</u>	
Loc	ate Add Missing I	Disk Remove M	love Up Move Down	Synchronize Off	sets				
N A	🗹 🥯 Y:/RAIE	Device/Disl D6Complex/img1.l		Info/Bus	Info/Bus Start/Seri		Off 0 Sectors	set	
в	V:/RAIL	D6Complex/img2.	bin	NTFS		897.75 MB	0 Sectors		
С	V:/RAI	D6Complex/img3.	bin			897.75 MB	0 Sectors		
D	V:/RAI	D6Complex/img4.	bin			897.75 MB	0 Sectors		
E	V:/RAI	D6Complex/img5.	bin			897.75 MB	0 Sectors		
1	Â RS 4 8	1 5 9	2 6 PD	3 PD RS	PD RS 7	RAID Parameters Auto Det RAID type: Block order for: Parity delay: First parity: Number of rows:	Custom RAID0 (Stripe set) - Not used	• • • De: • •	
4	12	PD	RS	10	11	Block size:	64 KB	~	
5	PD PA	RS PA	13 PA	14 PA	15 PA	Legend: Parity block: Invailal block order Not ordered block Current sequence block Parity block of current sequence			
	Apply changes imme	diately		More	 Apply 		of selected parity blo	sk.	

> The created Virtual Block RAID 1 object can now be processed like regular drives/?olumes If R-Studio detects a valid file system on this RAID object, a partition object will appear in the Drives panel.

The **Description Files for RAID Configurations** topic shows the RAID description file for this RAID configuration.

Driv	es						×
*		Loo	Device/Disk cal Computer	Label	FS	Start	Size
	~	-	TOSHIBA DT01ACA100 MS2OA750	44H5ATLKS	#1 SATA	0 Bytes	931.51 GB
			Wolume{3303cc57-3e4d-4507-872.*	Recovery	NTFS	1 MB	300 MB
			🖙 EFI system partition 🔹		FAT32	301 MB	100 MB
			See Microsoft reserved partition			401 MB	128 MB
			😔 G 🚽 🚽	System	NTFS	529 MB	292.01 GB
			Wolume(e0a573f2-14d5-4047-adfcx.		NTFS	292.53 GB	450 MB
			🧼 D: 👻	Data	NTFS	292.97 GB	638.54 GB
			Empty Space21			931.51 GB	1.69 MB
			Marvell 91xx Config 1.01				
	~	3	PIONEER DVD-RW DVR-219L 1.00				
			🥝 E:				
	~	-	WDC WD10EACS-00ZJB0 01.01B01	WD-WCASJ0409502	#0 USB (0 Bytes	931.51 GB
			🥪 Y: 👻	Backup II	NTFS	1 MB	931.51 GB
	~		Image Files				
			Y:\RAID6Complex\img1.bin				897.75 MB
			Y:\RAID6Complex\img2.bin		NTFS		897.75 MB
			Y:\RAID6Complex\img3.bin				897.75 MB
			Y:\RAID6Complex\img4.bin				897.75 MB
			Y:\RAID6Complex\img5.bin				897.75 MB
*	Virt	ual	Volume sets and RAIDs				
	~	6	Virtual Block RAID 1		NTFS	0 Bytes	2.19 GB
			See Direct Volume		NTFS	0 Bytes	2.19 GB

You also may check the RAID consistency, if necessary. See the <u>Checking RAID Consistency</u> help page for details.

2.4.7 Nested and Non-Standard RAID Levels

R-Studio can work with various <u>nested and non-standard RAID levels</u>. Currently, the following RAID levels are supported:

- <u>RAID10 (1+0)</u>
- <u>RAID1E</u>
- RAID5E
- RAID5EE
- RAID6E
- 2.4.7.1 RAID10 (1+0)

A RAID 10 (or 1+0) is a stripe of mirrors. Its block order can be represented as:

	А	В	С	D
1	1	1	2	2

To create a RAID 10 object

- 1 Click the Create Virtual RAID button and select Create Virtual Block RAID & Autodetect or select the Create Virtual Block RAID & Autodetect on the Create menu
- > A Virtual Block RAID object will appear in the Drives panel

Drives					
~ 🗖	Device/Disk Local Computer	Label	FS	Start	Size
~	TOSHIBA DT01ACA100 MS2OA750	44H5ATLKS	#1 SATA	0 Bytes	931.51 GB
	Volume(3303cc57-3e4d-4507-872.	Recovery	NTFS	1 MB	300 MB
	See EFI system partition		FAT32	301 MB	100 MB
	Microsoft reserved partition			401 MB	128 MB
	🖙 C: 👻	System	NTFS	529 MB	292.01 GB
	Volume(e0a573f2-14d5-4047-adf		NTFS	292.53 GB	450 MB
	🥯 D: 👻	Data	NTFS	292.97 GB	638.54 GB
	Empty Space21			931.51 GB	1.69 MB
	Marvell 91xx Config 1.01				
~	PIONEER DVD-RW DVR-219L 1.00				
	3 E				
~	WDC WD10EACS-00ZJB0 01.01B01	WD-WCASJ0409502	#0 USB (0 Bytes	931.51 GB
	🥪 Y: 👻	Backup II	NTFS	1 MB	931.51 GB
~	Image Files				
	Y:\RAID10\RAID10-1.bin				897.75 ME
	Partition23			512 Bytes	897.75 ME
	 Y:\RAID10\RAID10-2.bin 				897.75 ME
	Partition25			512 Bytes	897.75 ME
	Y:\RAID10\RAID10-3.bin				897.75 ME
	Y:\RAID10\RAID10-4.bin				897.75 MB
Y Virt	ual Volume sets and RAIDs				
	Virtual Block RAID 1				

2 Drag the required partitions from the Drives panel to the Parents tab

Other ways to add objects

• Right-click the Parents tab and select the required partition from the shortcut menu, or

• Right-click the partition in the Drives panel, select Add to RAID on the shortcut menu, and select the RAID object you want to add the partition to.

3 Select RAID 10 on the RAID type

You may either make **R-Studio** to process your changes immediately or wait until you finish editing the RAID layout. Select or clear the Apply changes immediately checkbox on the Parents tab. Click the **Apply** button to apply the changes when are you through.

Note: Objects should be placed in the same order as they were in the original RAID 10. If this order is incorrect, you must change it by dragging the parents to place them in the correct order.

Locate	Click this button to locate the selected object in the Drives panel.
Add Empty Space/Add Missing Drive	Click this button to add an empty space or missing drive object to the RAID
Remove	Click this button to remove the selected object from the RAID
Move Up	Click this button to move up the selected object in the RAID
Move Down	Click this button to move down the selected object in the RAID
Synchronize Offsets	Click this button to make the offsets the same for all objects in the RAID
Reset changes	Click this button to return the configuration to the initial state (after clicking the Apply button or immediately after loading)

Object control buttons

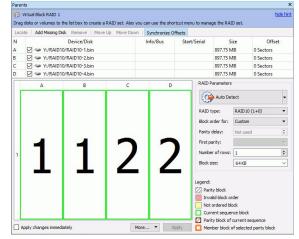
The RAID block size and Offset (in sectors) parameters must be set the same as for the original RAID 10. You also need to specify Block order for virtual RAID 10. You may select it on the Block order drop-down or shortcut menu.

If the those parameters are not correct, data on the parents will not be damaged, but files from the RAID 10 cannot be recovered.

Note: You may check how correctly you have reconstructed the original RAID 10. Find a file and preview it. If the file appears correct, you have created a correct RAID 10 layout.

Drives				
Device/Disk	Label	FS	Start	Size
V STOSHIBA DT01ACA100 MS2OA750	44H5ATLKS	#1 SAT	0 Bytes	931.51 GB
✓ Volume{3303cc57-3e4d-4507.x	Recovery	NTFS	1 MB	300 MB
👄 EFI system partition 🔹		FAT32	301 MB	100 MB
Microsoft reserved partition 👻			401 MB	128 MB
🛥 Ci 🗾 👻	System	NTFS	529 MB	292.01 GB
Solume(e0a573f2-14d5-4047		NTFS	292.53 GB	450 MB
🥯 D: 👻	Data	NTFS	292.97 GB	638.54 GB
Empty Space21			931.51 GB	1.69 MB
Marvell 91xx Config 1.01				
PIONEER DVD-RW DVR-219L 1.00				
3 E				
WDC WD10EACS-00ZJB0 01.01B01	WD-WCASJ0409502	#0 USB	0 Bytes	931.51 GB
🥯 Y: 👻	Backup II	NTFS	1 MB	931.51 GB
Y 📙 Image Files				
Y:\RAID10\RAID10-1.bin				897.75 MI
Partition23			512 Bytes	897.75 MB
Y:\RAID10\RAID10-2.bin				897.75 MB
Partition25			512 Bytes	897.75 ME
Y:\RAID10\RAID10-3.bin				897.75 MB
Y:\RAID10\RAID10-4.bin				897.75 MB
 Virtual Volume sets and RAIDs 				
 Virtual Block RAID 1 			0 Bytes	1.75 GB
Empty Space33			512 Bytes	7.84 MB
Separtition1		NTFS	7.88 MB	74.49 GB





> The RAID 10 object can now be processed like regular drives/volumes

If **R-Studio** detects a valid file system on the newly created RAID object, a <u>partition</u> object will appear in the Drives panel.

The **Description Files for RAID Configurations** topic shows the RAID description file for this RAID configuration.

You also may check the RAID consistency, if necessary. See the Checking RAID Consistency help page for details.

2.4.7.2 RAID1E

RAID 1E is utilizes both the mirroring and striping: data is striped across all drives, as in RAID 0. Additionally, a copy of each stripe is stored on a different drive, as in RAID 1. Its block order can be represented as:

	Α	В	С
1	1	1	2
2	2	3	3

To create a RAID 1E object

1 Click the Create Virtual RAID button and select Create Virtual Block RAID & Autodetect or select the Create Virtual Block RAID & Autodetect on the Create menu

rives				
Device/Disk	Label	FS	Start	Size
V STOSHIBA DT01ACA100 MS2OA	44H5ATLKS	#1 SAT	0 Bytes	931.51 GB
Volume{3303cc57-3e4d-450.x	Recovery	NTFS	1 MB	300 MB
🖙 EFI system partition 🔹		FAT32	301 MB	100 MB
Microsoft reserved partition •			401 MB	128 MB
🥯 C: 👻	System	NTFS	529 MB	292.01 GB
Solume{e0a573f2-14d5-404.		NTFS	292.53 GB	450 MB
🥯 D: 👻	Data	NTFS	292.97 GB	638.54 GB
Empty Space21			931.51 GB	1.69 MB
Marvell 91xx Config 1.01				
V 2 PIONEER DVD-RW DVR-219L 1.00				
🍰 E:				
 WDC WD10EACS-00ZJB0 01.018 	WD-WCASJ0409502	#0 USB	0 Bytes	931.51 GB
🥪 Y: 👻	Backup II	NTFS	1 MB	931.51 GB
Y 📙 Image Files				
Y:\RAID1E\RAID1EDisk1.bin		NTFS		897.75 ME
Y:\RAID1E\RAID1EDisk2.bin				897.75 ME
Y:\RAID1E\RAID1EDisk3.bin				897.75 ME
 Virtual Volume sets and RAIDs 				
Virtual Block RAID 1				

> A Virtual Block RAID object will appear in the Drives panel

2 Drag the required partitions from the Drives panel to the Parents tab

Other ways to add objects

• Right-click the Parents tab and select the required partition from the shortcut menu, or

• Right-click the partition in the Drives panel, select Add to RAID on the shortcut menu, and select the RAID object you want to add the partition to.

3 Select RAID 1E on the RAID type

You may either make **R-Studio** to process your changes immediately or wait until you finish editing the RAID layout. Select or clear the Apply changes immediately checkbox on the Parents tab. Click the **Apply** button to apply the changes when are you through.

Note: Objects should be placed in the same order as they were in the original RAID 1E. If this order is incorrect, you must change it by dragging the parents to place them in the correct order.

Locate	Click this button to locate the selected object in the Drives panel.
Add Empty Space/Add Missing Drive	Click this button to add an empty space or missing drive object to the RAID
Remove	Click this button to remove the selected object from the RAID
Move Up	Click this button to move up the selected object in the RAID
Move Down	Click this button to move down the selected object in the RAID
Synchronize Offsets	Click this button to make the offsets the same for all objects in the RAID
Reset changes	Click this button to return the configuration to the initial state (after clicking the Apply button or immediately after loading)

□ Object control buttons

The RAID block size and Offset (in sectors) parameters must be set the same as for the original RAID 1E.

You also need to specify Block order for virtual RAID 1E You may select it on the Block order drop-down or shortcut menu.

If the those parameters are not correct, data on the parents will not be damaged, but files from the RAID 1E cannot be recovered.

Note: You may check how correctly you have reconstructed the original RAID 1E. Find a file and preview it. If the file appears correct, you have created a correct RAID 1E layout.

Device/Disk	1000		e	
Device/Disk	Label	FS	Start	Size
Y 🔜 Local Computer				
Y 🖙 TOSHIBA DT01ACA100 MS2OA	44H5ATLKS	#1 SAT	0 Bytes	931.51 GB
Volume(3303cc57-3e4d-450x.	Recovery	NTFS	1 MB	300 MB
🖙 EFI system partition 🔹		FAT32	301 MB	100 MB
Microsoft reserved partition			401 MB	128 MB
🥯 C: 🔫	System	NTFS	529 MB	292.01 GB
Solume(e0a573f2-14d5-404.x)		NTFS	292.53 GB	450 MB
🥯 D: 👻	Data	NTFS	292.97 GB	638.54 GB
Empty Space21			931.51 GB	1.69 MB
Se Marvell 91xx Config 1.01				
✓ ➢ PIONEER DVD-RW DVR-219L 1.00				
3 E				
WDC WD10EACS-00ZJB0 01.01	WD-WCASJ0409502	#0 USB	0 Bytes	931.51 GB
🥪 Y: 👻	Backup II	NTFS	1 MB	931.51 GB
Y 📴 Image Files				
Y:\RAID1E\RAID1EDisk1.bin		NTFS		897.75 ME
Y:\RAID1E\RAID1EDisk2.bin				897.75 ME
Y:\RAID1E\RAID1EDisk3.bin				897.75 ME
 Virtual Volume sets and RAIDs 				
Virtual Block RAID 1		NTFS	0 Bytes	1.32 GB
Service Volume		NTES	0 Bytes	1.32 GB

Parents tab

Loca	te Add Missing Disk Remove	Move Up Move Down	Synchronize Offsets				
N A	Device		Info/Bus NTFS	Start/Serial	Size 897.75 MB	0 Sect	Offset
в	Y:/RAID1E/RAID1EDisk				897.75 MB	0 Sect	
c	Y:/RAID1E/RAID1EDisk	3.bin			897.75 MB	0 Sect	ors
	A	В		c i	RAID Parameters		
ſ					Auto Det	ect	
					RAID type:	RAID 1E	
					Block order for:	Sequential	
1					Parity delay:	Not used	E
				-	First parity:		9
					Number of rows:	2	
			-		Block size:	64 KB	
2	2	3	3		egend: Parity block Invalid block or Not ordered blo Current sequer Parity block of	nce block	

> The RAID 1E object can now be processed like regular drives/volumes

If **R-Studio** detects a valid file system on the newly created RAID object, a <u>partition</u> object will appear in the Drives panel.

The **Description Files for RAID Configurations** topic shows the RAID description file for this RAID configuration.

You also may check the RAID consistency, if necessary. See the Checking RAID Consistency help page for details.

2.4.7.3 RAID5E

RAID 5E (where E stands for Enhanced) is a RAID 5 layout with an integrated hot-spare drive, where the spare drive is an active part of the block rotation scheme. An example of such RAID layout is in the table below:

	А	В	С	D
1	1	2	3	PD
2	5	6	PD	4
3	9	PD	7	8
4	PD	10	11	12
5	SP	SP	SP	SP

where PD and SP stand for Parity of Data and Spare Part.

To create a RAID 5E object

- 1 Click the Create Virtual RAID button and select Create Virtual Block RAID & Autodetect or select the Create Virtual Block RAID & Autodetect on the Create menu
- > A Virtual Block RAID object will appear in the Drives panel

A	1.11.12			
Device/Disk V 💻 Local Computer	Label	FS	Start	Size
Y 🖙 TOSHIBA DT01ACA100 MS20	44H5ATLKS	#1 SAT	0 Bytes	931.51 GB
Volume(3303cc57-3e4d-4.x	Recovery	NTFS	1 MB	300 MB
🖙 EFI system partition 🔹		FAT32	301 MB	100 MB
 Microsoft reserved partition 			401 MB	128 MB
🥯 G 🔹 👻	System	NTFS	529 MB	292.01 GB
Volume(e0a573f2-14d5-4.*		NTFS	292.53 GB	450 MB
🥯 D: 👻	Data	NTFS	292.97 GB	638.54 GB
Empty Space21			931.51 GB	1.69 MB
Sea Marvell 91xx Config 1.01				
✓ ➢ PIONEER DVD-RW DVR-219L				
🎱 E				
WDC WD10EACS-00ZJB0 01.0	WD-WCASJ0409	#0 USB	0 Bytes	931.51 GB
🥪 Y: 🔹	Backup II	NTFS	1 MB	931.51 GB
Y 📙 Image Files				
Y:\RAID5E\RAID5EDisk1.bin		NTFS		897.75 ME
Y:\RAID5E\RAID5EDisk2.bin				897.75 ME
Y:\RAID5E\RAID5EDisk3.bin				897.75 MB
Y:\RAID5E\RAID5EDisk4.bin				897.75 ME
 Virtual Volume sets and RAIDs 				
Firtual Block RAID 1				

2 Drag the required partitions from the Drives panel to the Parents tab

Other ways to add objects

- Right-click the Parents tab and select the required partition from the shortcut menu, or
- Right-click the partition in the Drives panel, select Add to RAID on the shortcut menu, and select the RAID object you want to add the partition to.

3 Select RAID 5E on the RAID type

You may either make **R-Studio** to process your changes immediately or wait until you finish editing the RAID layout. Select or clear the Apply changes immediately checkbox on the Parents tab. Click the **Apply** button to apply the changes when are you through.

Note: Objects should be placed in the same order as they were in the original RAID 5E. If this order is incorrect, you must change it by dragging the parents to place them in the correct order.

Locate	Click this button to locate the selected object in the Drives panel.
Add Empty Space/Add Missing Drive	Click this button to add an empty space or missing drive object to the RAID
Remove	Click this button to remove the selected object from the RAID
Move Up	Click this button to move up the selected object in the RAID
Move Down	Click this button to move down the selected object in the RAID
Synchronize Offsets	Click this button to make the offsets the same for all objects in the RAID
Reset changes	Click this button to return the configuration to the initial state (after clicking the Apply button or immediately after loading)

Object control buttons

The RAID block size and Offset (in sectors) parameters must be set the same as for the original RAID 5E. You also need to specify Block order for virtual RAID 5E You may select it on the Block order drop-down or shortcut menu. If the those parameters are not correct, data on the parents will not be damaged, but files from the RAID 5E cannot be recovered.

Note: You may check how correctly you have reconstructed the original RAID 5E. Find a file and preview it. If the file appears correct, you have created a correct RAID 5E layout.

Drives				;
Device/Disk V 💻 Local Computer	Label	FS	Start	Size
Y 🖙 TOSHIBA DT01ACA100	44H5ATLKS	#1 SA	0 Bytes	931.51 GB
Volume{3303cc57-3e. *	Recovery	NTFS	1 MB	300 MB
🖙 EFI system partition 👻		FAT32	301 MB	100 MB
Microsoft reserved pax.			401 MB	128 MB
👄 C: 🗾 👻	System	NTFS	529 MB	292.01 GB
Volume{e0a573f2-14		NTFS	292.53 GB	450 MB
🥯 D: 👻	Data	NTFS	292.97 GB	638.54 GB
Empty Space21			931.51 GB	1.69 MB
Se Marvell 91xx Config 1.01				
✓ ➢ PIONEER DVD-RW DVR-2				
🥝 E:				
✓ See WDC WD10EACS-00ZJB0	WD-WCASJ040	#0 US	0 Bytes	931.51 GB
🥪 Y: 👻	Backup II	NTFS	1 MB	931.51 GB
🗸 📙 Image Files				
Y:\RAID5E\RAID5EDis		NTFS		897.75 MI
Y:\RAID5E\RAID5EDis				897.75 M
Y:\RAID5E\RAID5EDis				897.75 M
Y:\RAID5E\RAID5EDis				897.75 M
 Virtual Volume sets and RAIDs 				
Virtual Block RAID 1		NTFS	0 Bytes	2.10 GB
Section 2010 Prince 2010 Princ		NTFS	0 Bytes	2.10 GB

Parents tab

Virtual Block RAID 1 hide hin rag disks or volumes to the list box to cre the RAID s ocate Add Missing Disk Remove Move Up Synch Device/Disk Offset Info/Bus Y:/RAID5E/RAID5EDisk1.bir NTFS 897.75 MB 0 Sectors ✓ Y:/RAID5E/RAID5EDisk1.bin
 ✓ Y:/RAID5E/RAID5EDisk2.bin
 ✓ Y:/RAID5E/RAID5EDisk3.bin
 ✓ Y:/RAID5E/RAID5EDisk4.bin 0 Sectors 0 Sectors 897.75 MB 897.75 MB 897.75 MB 0 Sectors Auto Detec 2 3 1 PD RAID type: RAIDS ¥ Block order for: Left Sync n 🔻 5 6 PD 4 Parity delay: First parity: Number of rows: 5 • 9 PD 8 7 Block size: 64 KB 12 PD 10 11 Legend: Parity block Invalid block order Not ordered block Current sequence block Qurrent sequence block Parity block of current sequence Member block of selected parity block SP SP SP SP

> The RAID 5E object can now be processed like regular drives/Volumes

If **R-Studio** detects a valid file system on the newly created RAID object, a <u>partition</u> object will appear in the Drives panel.

The **Description Files for RAID Configurations** topic shows the RAID description file for this RAID configuration.

You also may check the RAID consistency, if necessary. See the Checking RAID Consistency help page for details.

2.4.7.4 RAID5EE

RAID 5EE (where E stands for Enhanced) is a RAID 5 layout with an integrated hot-spare drive, where the spare drive is an active part of the block rotation scheme. An example of such RAID layout is in the table below:

	А	В	С	D
1	1	2	SP	PD
2	4	SP	PD	3

3	SP	PD	5	6
4	PD	7	8	SP

where PD and SP stand for Parity of Data and Spare Part.

To create a RAID 5EE object

- 1 Click the Create Virtual RAID button and select Create Virtual Block RAID & Autodetect or select the Create Virtual Block RAID & Autodetect on the Create menu
- > A Virtual Block RAID object will appear in the Drives panel

Drives				>
Device/Disk V 💶 Local Computer	Label	FS	Start	Size
V STOSHIBA DT01ACA100 MS2	44H5ATLKS	#1 SAT	0 Bytes	931.51 GB
Volume{3303cc57-3e4d-4	Recovery	NTFS	1 MB	300 MB
🖙 EFI system partition 🔹		FAT32	301 MB	100 MB
Microsoft reserved partiti.			401 MB	128 MB
🥯 C: 👻	System	NTFS	529 MB	292.01 GB
Solume(e0a573f2-14d5-4.★		NTFS	292.53 GB	450 MB
🥯 D: 👻	Data	NTFS	292.97 GB	638.54 GB
Empty Space21			931.51 GB	1.69 MB
Se Marvell 91xx Config 1.01				
 PIONEER DVD-RW DVR-219L 				
3 E:				
WDC WD10EACS-00ZJB0 01.0	WD-WCASJ0409	#0 USB	0 Bytes	931.51 GB
🥯 Y: 👻	Backup II	NTFS	1 MB	931.51 GB
Y 📙 Image Files				
Y:\RAIDSEE\RAIDSEEDisk		NTFS		897.75 MB
Y:\RAIDSEE\RAIDSEEDisk				897.75 MB
Y:\RAID5EE\RAID5EEDisk				897.75 MB
Y:\RAID5EE\RAID5EEDisk		NTFS		897.75 MB
 Virtual Volume sets and RAIDs 				
Firtual Block RAID 1				

2 Drag the required partitions from the Drives panel to the Parents tab

Other ways to add objects

- Right-click the Parents tab and select the required partition from the shortcut menu, or
- Right-click the partition in the Drives panel, select Add to RAID on the shortcut menu, and select the RAID object you want to add the partition to.

3 Select RAID 5EE on the RAID type

You may either make **R-Studio** to process your changes immediately or wait until you finish editing the RAID layout. Select or clear the Apply changes immediately checkbox on the Parents tab. Click the **Apply** button to apply the changes when are you through.

Note: Objects should be placed in the same order as they were in the original RAID 5EE. If this order is incorrect, you must change it by dragging the parents to place them in the correct order.

Locate	Click this button to locate the selected object in the Drives panel.
Add Empty Space/Add Missing Drive	Click this button to add an empty space or missing drive object to the RAID
Remove	Click this button to remove the selected object from the RAID
Move Up	Click this button to move up the selected object in the RAID
Move Down	Click this button to move down the selected object in the RAID
Synchronize Offsets	Click this button to make the offsets the same for all objects in the RAID
Reset changes	Click this button to return the configuration to the initial state (after clicking the Apply button or immediately after loading)

Object control buttons

The RAID block size and Offset (in sectors) parameters must be set the same as for the original RAID 5EE.

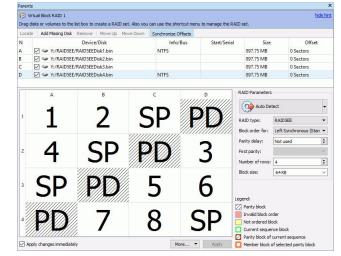
You also need to specify Block order for virtual RAID 5EE You may select it on the Block order drop-down or shortcut menu.

If the those parameters are not correct, data on the parents will not be damaged, but files from the RAID 5EE cannot be recovered.

Note: You may check how correctly you have reconstructed the original RAID 5EE. Find a file and preview it. If the file appears correct, you have created a correct RAID 5EE layout.

Device/Disk	Label	FS	Start	Size
V STOSHIBA DT01ACA100 MS2OA7	44H5ATLKS	#1 SAT	0 Bytes	931.51 GB
Solume(3303cc57-3e4d-450.*	Recovery	NTFS	1 MB	300 MB
🖙 EFI system partition 💌		FAT32	301 MB	100 MB
Microsoft reserved partition *			401 MB	128 MB
🥯 G 👻	System	NTFS	529 MB	292.01 GB
🖙 Volume(e0a573f2-14d5-4047 x .		NTFS	292.53 GB	450 MB
🥯 D: 👻	Data	NTFS	292.97 GB	638.54 GB
Empty Space21			931.51 GB	1.69 MB
Marvell 91xx Config 1.01				
 PIONEER DVD-RW DVR-219L 1.00 				
i				
WDC WD10EACS-00ZJB0 01.01B01	WD-WCASJ0409502	#0 USB	0 Bytes	931.51 GB
🥯 Y: 👻	Backup II	NTFS	1 MB	931.51 GB
🗸 📙 Image Files				
Y:\RAID5EE\RAID5EEDisk1.bin		NTFS		897.75 M
Y:\RAID5EE\RAID5EEDisk2.bin				897.75 M
Y:\RAID5EE\RAID5EEDisk3.bin				897.75 M
Y:\RAID5EE\RAID5EEDisk4.bin		NTFS		897.75 M
 Virtual Volume sets and RAIDs 				
Virtual Block RAID 1		NTFS	0 Bytes	3.51 GB
Direct Volume		NTFS	0 Bytes	3.51 GB

Parents tab



> The RAID 5EE object can now be processed like regular drives/volumes

If **R-Studio** detects a valid file system on the newly created RAID object, a <u>partition</u> object will appear in the Drives panel.

The **Description Files for RAID Configurations** topic shows the RAID description file for this RAID configuration.

You also may check the RAID consistency, if necessary. See the Checking RAID Consistency help page for details.

2.4.7.5 RAID6E

RAID 6E (where E stands for Enhanced) is a RAID 6 layout with an integrated hot-spare drive, where the spare drive is an active part of the block rotation scheme. An example of such RAID layout is in the table below:

	А	В	С	D	E	F
1	RS	1	2	3	4	PD
2	5	6	7	8	PD	RS
3	10	11	12	PD	RS	9
4	15	16	PD	RS	13	14
5	20	PD	RS	17	18	19
6	PD	RS	21	22	23	24
7	SP	SP	SP	SP	SP	SP

where RS, PD and SP stand for Reed-Solomon, Parity of Data, and Spare Part, respectively.

To create a RAID 6E object

- 1 Click the Create Virtual RAID button and select Create Virtual Block RAID & Autodetect or select the Create Virtual Block RAID & Autodetect on the Create menu
- > A Virtual Block RAID object will appear in the Drives panel

Drives				;
Device/Disk	Label	FS	Start	Size
Y STOSHIBA DT01ACA100 MS	44H5ATLKS	#1 SA	0 Bytes	931.51 GB
Volume{3303cc57-3e4dx.	Recovery	NTFS	1 MB	300 MB
See EFI system partition 💌		FAT32	301 MB	100 MB
Microsoft reserved part.			401 MB	128 MB
🥯 Ci 🗸 🗸	System	NTFS	529 MB	292.01 GB
Solume{e0a573f2-14d5.		NTFS	292.53 GB	450 MB
🧼 D: 👻	Data	NTFS	292.97 GB	638.54 GB
Empty Space21			931.51 GB	1.69 MB
Marvell 91xx Config 1.01				
✓ ➢ PIONEER DVD-RW DVR-21				
i E:				
✓ See WDC WD10EACS-00ZJB0 0	WD-WCASJ040	#0 US	0 Bytes	931.51 GB
🛥 Y: 👻	Backup II	NTFS	1 MB	931.51 GB
V Image Files				
Y:\RAID6E\RAID6E1.bin				897.75 ME
Y:\RAID6E\RAID6E2.bin		NTFS		897.75 MB
Y:\RAID6E\RAID6E3.bin				897.75 ME
Y:\RAID6E\RAID6E4.bin				897.75 MB
Y:\RAID6E\RAID6E5.bin				897.75 ME
Y:\RAID6E\RAID6E6.bin				897.75 MB
 Virtual Volume sets and RAIDs 				
Virtual Block RAID 1				

2 Drag the required partitions from the Drives panel to the Parents tab

Other ways to add objects

• Right-click the Parents tab and select the required partition from the shortcut menu,

or

• Right-click the partition in the Drives panel, select Add to RAID on the shortcut menu, and select the RAID object you want to add the partition to.

3 Select RAID 6E on the RAID type

You may either make **R-Studio** to process your changes immediately or wait until you finish editing the RAID layout. Select or clear the Apply changes immediately checkbox on the Parents tab. Click the **Apply** button to apply the changes when are you through.

Note: Objects should be placed in the same order as they were in the original RAID 6E. If this order is incorrect, you must change it by dragging the parents to place them in the correct order.

Locate	Click this button to locate the selected object in the Drives
	panel.
Add Empty Space/Add Missing Drive	Click this button to add an empty space or missing drive object to the RAID

Object control buttons

Remove	Click this button to remove the selected object from the RAID
Move Up	Click this button to move up the selected object in the RAID
Move Down	Click this button to move down the selected object in the RAID
Synchronize Offsets	Click this button to make the offsets the same for all objects in the RAID
Reset changes	Click this button to return the configuration to the initial state (after clicking the Apply button or immediately after loading)

The RAID block size and Offset (in sectors) parameters must be set the same as for the original RAID 6E.

You also need to specify Block order for virtual RAID 6E You may select it on the Block order drop-down or shortcut menu.

If the those parameters are not correct, data on the parents will not be damaged, but files from the RAID 6E cannot be recovered.

Note: You may check how correctly you have reconstructed the original RAID 6E. Find a file and preview it. If the file appears correct, you have created a correct RAID 6E layout.

Device/Disk	Label	FS	Start	Size
V 💻 Local Computer	LODE	15	Jun	JILE
Y 🐲 TOSHIBA DT01ACA100 MS2OA	44H5ATLKS	#1 SAT	0 Bytes	931.51 GB
Volume(3303cc57-3e4d-450.*	Recovery	NTFS	1 MB	300 MB
🖙 EFI system partition 🔹		FAT32	301 MB	100 MB
Microsoft reserved partition •			401 MB	128 MB
🥯 Ci 🗾 👻	System	NTFS	529 MB	292.01 GB
Solume(e0a573f2-14d5-404		NTFS	292.53 GB	450 MB
🥯 D: 👻	Data	NTFS	292.97 GB	638.54 GB
Empty Space21			931.51 GB	1.69 MB
Marvell 91xx Config 1.01				
 PIONEER DVD-RW DVR-219L 1.00 				
3 E:				
WDC WD10EACS-00ZJB0 01.01B	WD-WCASJ0409502	#0 USB	0 Bytes	931.51 GB
🥯 Y: 👻	Backup II	NTFS	1 MB	931.51 GB
🗸 📙 Image Files				
Y:\RAID6E\RAID6E1.bin				897.75 M
Y:\RAID6E\RAID6E2.bin		NTFS		897.75 M
Y:\RAID6E\RAID6E3.bin				897.75 M
Y:\RAID6E\RAID6E4.bin				897.75 M
See Y:\RAID6E\RAID6E5.bin				897.75 M
Y:\RAID6E\RAID6E6.bin				897.75 M
 Virtual Volume sets and RAIDs 				
 Virtual Block RAID 1 		NTFS	0 Bytes	3.01 GB
Sect Volume		NTFS	0 Bytes	3.01 GB

Parents tab

ocat		Disk Remove			se the shortcut menu t chronize Offsets	-	180.00		
ı		Device			Info/Bus	Start/Serial	Size	Offset	
	🗹 🥯 Y:/R/	AID6E/RAID6E1.bi	in				897.75 MB	0 Sectors	
	tund -	AID6E/RAID6E2.bi			NTFS		897.75 MB	0 Sectors	
		AID6E/RAID6E3.bi					897.75 MB	0 Sectors	
		AID6E/RAID6E4.bi					897.75 MB	0 Sectors	
	Y:/RAID6E/RAID6E5.bin						897.75 MB 897.75 MB	0 Sectors 0 Sectors	
2	5	6	7	8	PP	Þ¢	RAID type: Block order for:	RAID6E / Reed-Solom	
, P	DC	1	2	3	Λ	DE	Auto De	tect	
Ľ	(*//????///)					4444	RAID type:	RAID6E / Reed-Solom	10
2	5	6	7	8	PD	RS			
	10	4.4	10	1/14/14	11144	\sim	Parity delay:	Not used	
3	10	11	12	PL	V KS	9	First parity:		
			1111111	11111	,,,,,,,,, ,, ,,,,		Number of rows:	7	
4	15	16	PD	RS	13	14	Block size:	64 KB	-
5	20	DA	DC	17	18	19			
	20	(N/N#///	///////////////////////////////////////	Т/	10	T			
6/	DA	Ø¢	21	22	23	24	Legend:		
1	X/X 4 ///	///////////////////////////////////////	Z I	22	25	27	Invalid block of	rder	
	CD	CD	SP	SF	CD	CD	Not ordered bl	ock	

> The RAID 6E object can now be processed like regular drives/volumes

If **R-Studio** detects a valid file system on the newly created RAID object, a <u>partition</u> object will appear in the Drives panel.

The **Description Files for RAID Configurations** topic shows the RAID description file for this RAID configuration.

You also may check the RAID consistency, if necessary. See the Checking RAID Consistency help page for details.

2.4.8 Finding RAID Parameters

R-Studio can find parameters for RAID 5 and 6. RAID parameters can be found automatically or manually.

The number of drives in the RAID should be between 3 and 32. RAID parameters can be found only when all original drives (or their images) are present. Even one substitute object in a RAID (like a missing drive) makes finding RAID parameters impossible.

To find RAID parameters automatically,

- 1 Click the Auto Detect button on the Parents tab
- R-Studio will start searching for the RAID parameters and show the most probable one on the RAID Parameter Detection dialog box

RAID Parameter Detection dialog box

Of Of	Name ffset 0	Hits 48	A 2048 Sectors	2049.5	В	^	N	Device/Disk	Info/Rus	Start/Seria	Size	Offset
		48	2048 Sectors	2040 5					1110/005	rune sene		
2 Of				2040 3	ectors	2048 Se	A 🗹	Y:/RAID_Detection/			1.21 GB	2048 Se. 2048 Se.
	ITSET I	3	2050 Sectors	2051 S	ectors	2050 Se		Y:/RAID_Detection/			1.21 GB	2048 Se. 2048 Se.
B Of	ffset 2	3	2051 Sectors	2050 S	ectors	2051 Se						
Of	ffset 3	2	2028 Sectors	2030 S	ectors	2028 Se						
6 Of	ffset 4	2	2052 Sectors	2050 S	ectors	2052 St 🗸						
c						>						
und R.	LAID Layouts							A	В		(
	Probability	Drive	s Order	Block Size	Table	^	77	A	в		(-
7.6	6%	A,B,C		32768 Bytes	3x3	RAIE			1		-	
2 0.7	7%	A,B,C		32768 Bytes	3x3	RAIE	1				4	<u> </u>
8 0.2	2%	C,B,A		32768 Bytes	3x3	RAIE			//////	1111		
0.1	1%	Not detected		1048576 Byte	3x3	Inco 🜱	2	Л			-)
٢						>	2		1/1)

- 2 Click the Apply button and R-Studio will change the RAID layout to the selected one on the Parents tab.
- 3 Click the Apply button on the Parents tab
- > R-Studio will use the found parameters for the RAID.

If necessary, you may return to the RAID Parameter Detection dialog box by clicking the **Choose Variants** button, and select another RAID layout.

To find RAID parameters manually,

1 Click the drop-down Auto Detect list on the Parents tab and select Advanced Detection.

2 Specify the necessary detection parameters on the RAID Parameter Detection dialog box and click the Start detection button

Raid Parameters Detection dialog box

Raid Parameters Detec	tion								<u> </u>	
und offsets					Raid Layout					
Name Custom 0	Hits	A 0 Sectors	B 0 Sectors	0 Sector	N A 🗹 🥯	Device/Disk Y:/RAID_Detection	Info/Bus	tart/Seria	Size 1.21 GB	Offset 156 Sec
2 Custom 1		156 Sectors	0 Sectors	0 Sector		Y:/RAID_Detection Y:/RAID_Detection			1.21 GB 1.21 GB	0 Sectors 0 Sectors
<				>						
ound RAID Layouts										
Probability	Drives Or	der BIOC	k Size Table							
د 🛛				>						
dvanced Options										
lax Offset: 1.21				GB 🔻						
	e: (fast)		(reliable)						
Iffsets search performanc AID layouts search perfo)	-	(reliable)						

You may change the drive order, offset for drive(s), and enable/@isable drives.

Advanced Parameters

Max offset:	The area on the drive to find RAID parameters in.
Offset search performance RAID layouts search performance	Cumulative parameters that estimates the probability of certain found RAID parameters. Moving it to the right increases accuracy but slows the process. Moving it to the left reduces the accuracy but makes the process faster.

You may add your own RAID offsets. Right-click empty space in the **Found offsets** pane and select **Add Custom offset** on the shortcut menu and specify the offset individually for every drive.

3 Select an offset and click the Click here to find RAID Layouts button on the Raid Parameters Detection dialog box

RAID Parameters Detection dialog box

Ra	id Parameters Det	ection - Compl	eted									-)
our	id offsets							Raid	d Layout					
	Name	Hits	A		В		^	N	Device/Disk	Info/Bus	tart/Seria	Size	Offs	et
	Offset 0	48	2048 Sectors	2048 Se	ctors	20	4	A	Y:/RAID_Detection			1.21 GB	2048 S	
	Offset 1	3	2050 Sectors	2051 Se	ctors	20	5	B	V:/RAID_Detection			1.21 GB	2048 S	
	Offset 2	3	2051 Sectors	2050 Se	ctors	20	5	-				1121 00	2040 0	
	Offset 3	2	2028 Sectors	2030 Se	ctors	20	2							
	Offset 4	2	2052 Sectors	2050 Se	ctors	20	5,							
		-				>								
J	d RAID Layouts	1						Г	A	В			с	
	Probability		is Order	Block Size		able	^						_	-
	7.6%	A,B,C		32768 Bytes	3x3		F	1		- 1)	
	0.7%	A, B, C		32768 Bytes	3x3		F			_		4		
	0.2%	C,B,A		32768 Bytes	3x3		F		1//	///////	/////.			
	0.1%	Not detected		1048576 Rytes	3x3	>	1 ~	2	Δ	Ø	X//	1	2	
						-	_	÷	- T 🖉	V//V)	
	anced Options									///////		/////	/////	1
	Offset: 1.21			-		GB	•	3		6				1
fs	ets search performa	ance: (fast	.)			(reli	able)	3	.	O				1
1	layouts search per	rformance: (fast	.)			(reli	able)			_	//	[[]]]]	77///	1
	6	Detect again									4	pply	Cano	ol

- 4 Select a RAID variant in the Found RAID layouts pane and click the Apply button
- 5 Click the Apply button on the Parents tab

> R-Studio will use the found parameters for the RAID.

If necessary, you may return to the RAID Parameter Detection dialog box by clicking the **Choose Variants** button, and select another RAID layout.

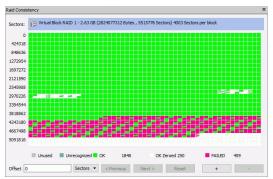
2.4.9 Checking RAID Consistency

You may check RAID consistency (whether the data parity values are valid) for RAID layouts with parity blocks.

To check RAID consistency,

- * Right-click the RAID and select Check RAID consistency... on the shortcut menu
- > The RAID consistency check window will appear showing the progress.

RAID consistency check window



When the check is finished, you may inspect the results.

Block	
color	
Green	Data parity values are valid.
Red	Data parity values are not valid.
White	0's

When a mouse pointer hovers over a block, a tooltip will show the sector range within the block and number of consistent and inconsistent sectors. Double-clicking the block moves it to the upper-leftmost corner and zooms in the data by 2.

RAID consistency check controls

Sectors	The number of the first sector in the row.
Offset	Offset in the data. Enter the address you want to jump to and press the Enter key.
Sectors/Bytes/KB	Specifies the dimension of the data in the Offset field.
Previous/Next	Moves to the previous/flext part of the data.
+/?	Zooms into/ðut of, the data.

2.4.10 Syntax of a Description File for RAID Configurations

You may create and store your own RAID configurations The syntax of those files is similar to that of the XML language. They are stored in an .xml file specified on the <u>**R-Studio Settings**</u>.

A number of file examples are shown on the **Description Files for RAID Configurations** topic.

There are two types of such description files: for RAID presets and custom-created RAID layouts.

RAID preset configuration file

Custom-created RAID configuration file example

```
<?xml version="1.0" encoding="UTF-8"?>
<RAIDList version="1">
    <RAID blockSize="65536" name="RAID6Complex" rows="6" type="256">
        <Parents>
            <Parent name="imq1.bin" size="941359104" order="1"/>
            <Parent name="imq2.bin" fs="NTFS" size="941359104" order="2"/>
            <Parent name="img3.bin" size="941359104" order="3"/>
            <Parent name="img4.bin" size="941359104" order="4"/>
            <Parent name="imq5.bin" size="941359104" order="5"/>
        </Parents>
        <Table>
            <Block id="A1">ReedSolomon</Block>
            <Block id="B1">1</Block>
            <Block id="C1">2</Block>
            <Block id="D1">3</Block>
            <Block id="E1">XorOfData</Block>
            <Block id="A2">4</Block>
            <Block id="B2">5</Block>
            <Block id="C2">6</Block>
            <Block id="D2">XorOfData</Block>
            <Block id="E2">ReedSolomon</Block>
            <Block id="A3">8</Block>
            <Block id="B3">9</Block>
            <Block id="C3">XorOfData</Block>
            <Block id="D3">ReedSolomon</Block>
            <Block id="E3">7</Block>
            <Block id="A4">12</Block>
            <Block id="B4">XorOfData</Block>
            <Block id="C4">ReedSolomon</Block>
            <Block id="D4">10</Block>
            <Block id="E4">11</Block>
            <Block id="A5">XorOfData</Block>
            <Block id="B5">ReedSolomon</Block>
            <Block id="C5">13</Block>
            <Block id="D5">14</Block>
```

```
<Block id="E5">15</Block>
            <Block id="A6" sequence="1">XorOfAll</Block>
            <Block id="B6" sequence="2">XorOfAll</Block>
            <Block id="C6" sequence="3">XorOfAll</Block>
            <Block id="D6" sequence="4">XorOfAll</Block>
            <Block id="E6" sequence="5">XorOfAll</Block>
        </Table>
        <Sequences>
            <Sequence id="1">A1 A2 A3 A4 A5 A6</Sequence>
            <Sequence id="2">B1 B2 B3 B4 B5 B6</Sequence>
            <Sequence id="3">C1 C2 C3 C4 C5 C6</Sequence>
            <Sequence id="4">D1 D2 D3 D4 D5 D6</Sequence>
            <Sequence id="5">E1 E2 E3 E4 E5 E6</Sequence>
        </Sequences>
    </RAID>
</RAIDList>
```

File structure

File header

The file starts with a standard XML header: <?xml version="1.0" encoding="utf-8"?>

Section RAIDList

<RAIDList>

It can contain any number of the <RAID> sections and requires a closing element </FileTypeList>.

Section structure example:

```
<RAIDList>
<RAID [attributes]>
...
</RAID>
...
<RAID [attributes]>
...
</RAID>
```

Section RAID

This section describes each RAID layout.

It must contain at least one <Table> and <Parents> sections and can contain one block <Sequences>...

```
<RAIDList version="1">

<RAID blockSize="65536" name="RAID5" rows="3" type="5" order="2"
parityDelay="1">

</Parents>
</Parents>
</Parents>
</Parents>
</Parents>
</Table>
</Table>
</Sequences>
</RAID>
</RAID>
</RAIDList>
```

blocksize	<u32></u32>	Required	The block size of the RAID in bytes
name	<string></string>	Optional	The name of the RAID layout
rows	<u16></u16>	Required	The number of rows in the RAID layout table.
type	<u16></u16>	Required	The type of the RAID preset. The following types are
			supported:
			1: RAID0 (Stripe set)
			2: RAID10
			3: RAID1E
			4: RAID4
			5: RAID5
			6: RAID5E
			7: RAID5EE
			8: RAID6 / Reed-Solomon Encoding
			9: RAID6E / Reed-Solomon Encoding
			10: RAID6 / Vertical Xor Encoding
			256: Custom Raid Table
			If the RAID type parameter contradicts to the RAID table,
			the RAID table always prevails.
order	<u16></u16>	Required/Optio	The RAID sub-type. For example, order="2" means Left
		nal	Asynchronous for RAID5 layouts. Any value for the custom
			RAID layouts will be ignored.
parityDela	<u16></u16>	Required	The Parity delay parameter.
У			

Attributes:

Section structure example:

Section Parents

This section describes the RAID parents. It contains the <Parent> elements of the RAID.

Section structure example:

Element Parent

The element specifies the parent of the RAID.

Attributes:

comp	<string></string>	Required/O	The file-container with the parent object.
		ptional	
name	<string></string>	Required	The object name of the RAID parent.
offset	<u16></u16>	Required is	The offset value in bytes
		not 0	
size=	<u16></u16>	Required	The object size in bytes
order	<u16></u16>	Required	The order of the RAID object

Section Table

Section structure example:

```
<RAIDList>
<RAID name="example" parents="2" rows="2" blocksize="16777216">
<Table>
<Block [attributes]> ... </Block>
<Block [attributes]> ... </Block>
<Block [attributes]> ... </Block>
<Block [attributes]> ... </Block>
</Table>
</RAID>
</RAID>
```

Element Block

The element specifies the block number in the RAID layout table (a positive integer number) or an error correction block of the following types:

- PD OT ParityOfData
- PA OT ParityOfAll
- RS OF ReedSolomon
- U Or Unknown
- I OT Ignore

Any other value is treated as Unknown.

Attributes:

id	<string></string>	Required	The alpha-numerical identifier of the block in the RAID layout
			table. The element in the 3-rd column of the 2-nd line is
			designated as C2. AA is used after letter z, and so on.
sequence	<string></string>	Optional	The numerical identifier for non-default sequences.

Section Sequences

This section describes the non-default data checksum sequences used to preserve data integrity. It is not necessary to explicitly list default sequences (the table rows). Sequences can contain any number of the <Sequence> elements.

Section structure example:

```
<RAIDList>
<RAID name="example" parents="4" rows="4" blocksize="16777216">
<Parents>
</Parents>
</Parents>
</Table>
...
</Table>
...
</Sequences>
</Sequences>
</Sequence [attributes]> ... </Sequence>
</Sequences>
</RAID>
</RAID>
</RAIDList>
```

Element Sequence

The element contains the list of the RAID blocks belonging to that sequence. The elements are separated by a space.

Attributes:

id <ul6> Required The sequence identifier.</ul6>	
--	--

Element example:

See the **<u>RAID configuration file example</u>**.

Comments

<!-- Comment string -->
An XML standard string for a comment.

2.4.11 Description Files for RAID Configurations

Below are description files for RAID examples described in the <u>Volume Sets and RAIDs</u> chapter. The syntax of them is described in the <u>Syntax of a Description File for RAID Configurations</u> topic.

StripeSet

The stripe set layout is described in the **Volume Sets**, **Stripe Sets**, **and Mirrors** topic.

```
</Parents>
</RAID>
</RAIDList>
```

Basic RAID 5

The RAID layout is described in the Working with Basic RAID 4 and RAID 5 Operations topic.

RAID 5 with parity delays

Advanced RAID 5

The RAID layout is described in the **Working with Advanced RAID Layouts** topic.

```
<?xml version="1.0" encoding="UTF-8"?>
<RAIDList version="1">
<RAID blockSize="4096" name="RAID5Complex" rows="9" type="256">
<Parents>
<Parent name="RAID5CDisk1.bin" offset="16777216" size="941359104"
order="1"/>
<Parent name="RAID5CDisk2.bin" offset="16777216" size="941359104"
order="2"/>
<Parent name="RAID5CDisk3.bin" offset="16777216" size="941359104"
order="3"/>
</Parents>
<Table>
<Block id="A1">XorOfData</Block>
<Block id="B1">1</Block>
```

```
<Block id="C1">2</Block>
            <Block id="A2">XorOfData</Block>
            <Block id="B2">3</Block>
            <Block id="C2">4</Block>
            <Block id="A3">XorOfData</Block>
            <Block id="B3">5</Block>
            <Block id="C3">6</Block>
            <Block id="A4">7</Block>
            <Block id="B4">XorOfData</Block>
            <Block id="C4">8</Block>
            <Block id="A5">9</Block>
            <Block id="B5">XorOfData</Block>
            <Block id="C5">10</Block>
            <Block id="A6">11</Block>
            <Block id="B6">XorOfData</Block>
            <Block id="C6">12</Block>
            <Block id="A7">13</Block>
            <Block id="B7">14</Block>
            <Block id="C7">XorOfData</Block>
            <Block id="A8">15</Block>
            <Block id="B8">16</Block>
            <Block id="C8">XorOfData</Block>
            <Block id="A9">17</Block>
            <Block id="B9">18</Block>
            <Block id="C9">XorOfData</Block>
        </Table>
    </RAID>
</RAIDList>
```

Advanced RAID 5

```
The RAID layout is described in the Working with Advanced RAID Layouts topic.
<?xml version="1.0" encoding="UTF-8"?>
<RAIDList version="1">
     <RAID blockSize="524288" name="RAID_MacPro" rows="3" type="256">
         <Parents>
             <Parent name="RAID_MAC_ProDisk1.bin" fs="NTFS" offset="16777216"</pre>
size="941359104" order="1"/>
             <Parent name="RAID_MAC_ProDisk2.bin" offset="16777216" size="941359104"</pre>
order="2"/>
             <Parent name="RAID_MAC_ProDisk3.bin" offset="16777216" size="941359104"
order="3"/>
             <Parent name="RAID_MAC_ProDisk4.bin" offset="16777216" size="941359104"
order="4"/>
         </Parents>
         <Table>
             <Block id="A1" sequence="1">XorOfData</Block>
             <Block id="B1">1</Block>
             <Block id="C1">2</Block>
             <Block id="D1" sequence="2">XorOfData</Block>
             <Block id="A2">3</Block>
             <Block id="B2">4</Block>
             <Block id="C2" sequence="3">XorOfData</Block>
             <Block id="D2">5</Block>
```

RAID 6 Reed-Solomon (Left Synchronous (Standard)) Preset

The RAID layout is described in the Working with RAID 6 Presets topic.

```
<?xml version="1.0" encoding="UTF-8"?>
<RAIDList version="1">
<RAID blockSize="65536" name="RAID6RS" rows="5" type="8" order="1"
parityDelay="1">
<Parents>
<Parent name="img1.bin" size="941359104" order="1"/>
<Parent name="img2.bin" fs="NTFS" size="941359104" order="2"/>
<Parent name="img3.bin" size="941359104" order="3"/>
<Parent name="img4.bin" size="941359104" order="4"/>
<Parent name="img5.bin" size="941359104" order="5"/>
</Parents>
</Parents>
</Parents>
```

RAID6 (Double Xor) Preset

Advanced RAID 6

The RAID layout is described in the Working with Advanced RAID Layouts topic.

```
<?xml version="1.0" encoding="UTF-8"?>
<RAIDList version="1">
<RAID blockSize="65536" name="RAID6Complex" rows="6" type="256">
<Parents>
<Parent name="img1.bin" size="941359104" order="1"/>
```

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```
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```

```
<Parent name="img2.bin" fs="NTFS" size="941359104" order="2"/>
            <Parent name="img3.bin" size="941359104" order="3"/>
            <Parent name="imq4.bin" size="941359104" order="4"/>
            <Parent name="img5.bin" size="941359104" order="5"/>
        </Parents>
        <Table>
            <Block id="A1">ReedSolomon</Block>
            <Block id="B1">1</Block>
            <Block id="C1">2</Block>
            <Block id="D1">3</Block>
            <Block id="E1">XorOfData</Block>
            <Block id="A2">4</Block>
            <Block id="B2">5</Block>
            <Block id="C2">6</Block>
            <Block id="D2">XorOfData</Block>
            <Block id="E2">ReedSolomon</Block>
            <Block id="A3">8</Block>
            <Block id="B3">9</Block>
            <Block id="C3">XorOfData</Block>
            <Block id="D3">ReedSolomon</Block>
            <Block id="E3">7</Block>
            <Block id="A4">12</Block>
            <Block id="B4">XorOfData</Block>
            <Block id="C4">ReedSolomon</Block>
            <Block id="D4">10</Block>
            <Block id="E4">11</Block>
            <Block id="A5">XorOfData</Block>
            <Block id="B5">ReedSolomon</Block>
            <Block id="C5">13</Block>
            <Block id="D5">14</Block>
            <Block id="E5">15</Block>
            <Block id="A6" sequence="1">XorOfAll</Block>
            <Block id="B6" sequence="2">XorOfAll</Block>
            <Block id="C6" sequence="3">XorOfAll</Block>
            <Block id="D6" sequence="4">XorOfAll</Block>
            <Block id="E6" sequence="5">XorOfAll</Block>
        </Table>
        <Sequences>
            <Sequence id="1">A1 A2 A3 A4 A5 A6</Sequence>
            <Sequence id="2">B1 B2 B3 B4 B5 B6</Sequence>
            <Sequence id="3">C1 C2 C3 C4 C5 C6</Sequence>
            <Sequence id="4">D1 D2 D3 D4 D5 D6</Sequence>
            <Sequence id="5">E1 E2 E3 E4 E5 E6</Sequence>
        </Sequences>
    </RAID>
</RAIDList>
RAID10 (1+0)
The RAID layout is described in the RAID10 (1+0) topic.
<?xml version="1.0" encoding="UTF-8"?>
<RAIDList version="1">
```

```
<RAID blockSize="65536" name="RAID10" rows="1" type="2" order="7"
parityDelay="1">
```

```
© 2025 R-Tools Technology Inc.
```

```
<Parents>
        <Parent name="RAID10-1.bin" size="941359104" order="1"/>
        <Parent name="RAID10-2.bin" size="941359104" order="2"/>
        <Parent name="RAID10-3.bin" size="941359104" order="3"/>
        <Parent name="RAID10-4.bin" size="941359104" order="4"/>
        </Parents>
        <//RAID>
</RAIDList>
```

RAID1E

```
The RAID layout is described in the RAID1E topic.
<?xml version="1.0" encoding="UTF-8"?>
<RAIDList version="1">
    <RAID blockSize="65536" name="RAID1E" rows="2" type="3" order="1"</pre>
parityDelay="1">
        <Parents>
             <Parent name="RAID1EDisk1.bin" fs="NTFS" size="941359104" order="1"/>
             <Parent name="RAID1EDisk2.bin" size="941359104" order="2"/>
             <Parent name="RAID1EDisk3.bin" size="941359104" order="3"/>
        </Parents>
    </RAID>
</RAIDList>
RAID5E
The RAID layout is described in the RAID5E topic.
<?xml version="1.0" encoding="UTF-8"?>
<RAIDList version="1">
    <RAID blockSize="65536" name="RAID5E" rows="5" type="6" order="1"</pre>
```

parityDelay="1">

</RAIDList>

RAID5EE

The RAID layout is described in the **RAID5EE** topic.

RAID6E

The RAID layout is described in the **RAID6E** topic.

</RAIDList>

2.4.12 Various Disk and Volume Managers

R-Studio can work with objects created by various disk and volume managers. Currently, the following managers are supported:

- <u>BitLocker Drive Encryption</u>
- <u>Windows Dynamic Disks</u>
- <u>Windows Storage Spaces</u>
- Apple RAIDs
- Apple CoreStorage/FileVault/Fusion Drive Volumes
- Linux mdadm RAIDs
- Linux Logical Volume Manager (LVM and LVM2)

R-Studio can automatically recognize and add their physical components, component images, or the user can manually add the components when their data is damaged so severely that **R-Studio** cannot recognize them.

In addition, R-Studio can work with various virtual disk and disk image formats.

2.4.12.1 BitLocker Drive Encryption

BitLocker Drive Encryption, or **BitLocker**, is a data protection feature introduced by Microsoft since Windows Vista. It implements some hard/software measures to encrypt either USB external flash drives or internal system SSD/HDD devices. You may read more about **BitLocker Drive Encryption** on the <u>Microsoft site</u> or <u>Wikipedia</u>.

There are following encryption methods (protectors in the Microsoft terms) that can be utilized in the **BitLocker** protection:

- A <u>TPM/TPM+PIN</u> chip
- A USB key (a flash drive containing a .bek file)
- A user's password (not to confuse with a user's logon password) / recovery key

These methods can be used either individually or as a combination thereof. If they are used as a combination, knowing the decryption information for only one method is enough to unlock the device.

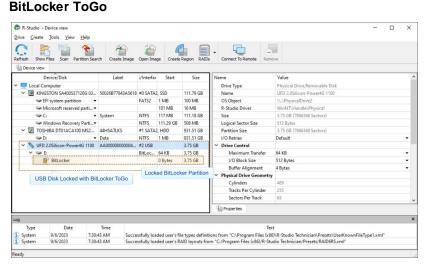
R-Studio can unlock devices encrypted with BitLocker provided that all the necessary information is known.

BitLocker ToGo

This is the method used to lock external removable devices. The password or a recovery key is necessary to know to unlock the device. A recovery key may be in the printed form or contained in a file. A name of such a file has the following pattern: BitLocker Recovery Key 600397A9-48AA-4DE4-B775-C71EB130EA1B.txt , where the last characters is the **BitLocker** volume identifier. That file contains the **BitLocker** volume identifier and a recovery key.

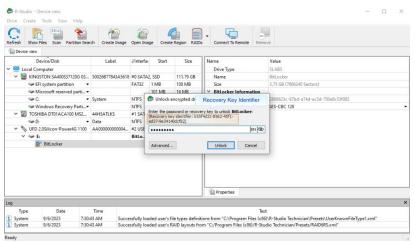
To unlock a BitLocker ToGo device,

1 Locate the device and double-click the BitLocker partition.



2 Enter the password or recovery key and click the Unlock button.

BitLocker ToGo



> R-Studio will unlock the volume

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BitLocker ToGo

🕞 R-Studio - De	evice view						- 0	×
Drive Create	Tools View Help							
Refresh Show F	les Scan Partition Search	Create Image Oper	a Image	Create Region	RAIDs Co	nnect To Remote Remove		
Device view	BitLocker							
	Device/Disk	Label	FS	Start	Size	Name	Value	
🖌 💷 Local Cor	nputer					Drive Type	SLABS	
Y 🐓 KINGS	STON SA400537120G 030900	50026B77843A5618	#0 SATA	2, SSD	111.79 GB	Name	BitLocker	
See EF	system partition 🔹		FAT32	1 MB	100 MB	Size	3.75 GB (7864320 Sectors)	
Se Mi	icrosoft reserved partition 👻			101 MB	16 MB	Y FAT Information		
See C:	•	System	NTFS	117 MB	111.18 GB	Cluster Size	32 KB (64 Sectors)	
Se Wi	indows Recovery Partition •		NTFS	111.29 GB	508 MB	First Cluster Offset	512 KB (1024 Sectors)	
🗢 Er	npty Space16			111.79 GB	1.44 MB	Root Directory Cluster	4	
🗸 🍉 TOSH	IBA DT01ACA100 MS2OA750	44H5ATLKS	#1 SATA	2, HDD	931.51 GB	First FAT Offset	64 KB (128 Sectors)	
🥯 D:		Data	NTFS 1 MB 931.51 GB		931.51 GB	Size of One FAT Table	512 KB (1024 Sectors)	
🗸 🥌 UFD 2	.0Silicon-Power4G 1100	AA0000000000485	#2 USB		3.75 GB	Sector Size	512 Bytes	
Pa	artition1			1 MB	3.75 GB	Major Version	1	
1	BitLocker		exFAT	0 Bytes	3.75 GB	Minor Version	0	
Se E			1.1	1 MR	3.75 GB	Volume Size	3.75 GB (7864320 Sectors)	
L	K	Ui	nlocked	BitLocker P	artition	V BitLocker Information		
USB	Disk Locked with BitLoo	cker ToGo				BitLocker Volume GUID	6876dd5d-e754-3043-ab4c-d2b16177e7be	
						Encryption Type	XTS-AES 128	
						Properties		
og						-		
Туре	Date Tir	me				Text		
File System	6/14/2023 12:32:38			e was shrunk				
File System	6/14/2023 12:32:38							
 System 	6/14/2023 12:32:38	PM All file regio	ons are co	lected.				

BitLocker System Drive Encryption

This is the method used to lock internal system drives.

Depending on what methods are used, the following information is necessary to know to unlock the drive.

- A recovery key in the printed form or in a file. A name of such a file has the following pattern: BitLocker Recovery Key FDA7B96C-635E-45AA-BE63-00C3DB3771EE.txt , where the last characters is the **BitLocker** volume identifier. That file contains the **BitLocker** volume identifier and a recovery key.
- A password used to start the preboot process. It shouldn't be confused with the password for the user's logon.
- An external USB flash drive containing its .bek file. Note that Windows sets System and Hidden attributes for such files and Windows doesn't show such files by default.

To unlock a system drive with a BitLocker partition,

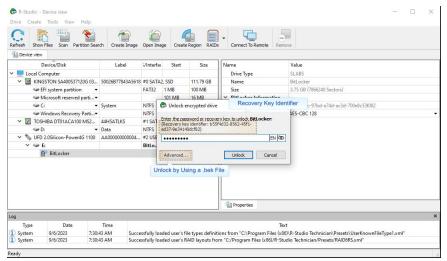
1 Locate the device and double-click the BitLocker partition.

BitLocker System Drive Encryption

Drive Create Jools View Help	th Create Image	Open Imag	ge Create	Region RAIDs	Connect To Remote Remo	ve .	
Device view					I		
Device/Disk	Label	i/Interfac	Start	Size	Name	Value	
V 💻 Local Computer					Drive Type	Physical Drive, Disk	
✓ I KINGSTON SA400537120G 03	50026B77843A5618			111.79 GB	Name	SAMSUNG MZNLF128HCHP-000L1 FXT21L4Q	
See EFI system partition		FAT32	1 MB	100 MB	OS Object	/dev/discs/disc0/disc	
Microsoft reserved parti •			101 MB	16 MB	R-Studio Driver	ahci	
	System		117 MB	111.18 GB	Size	119.24 GB (250069680 Sectors)	
Secovery Parti▼			111.29 GB	508 MB	Logical Sector Size	512 Bytes	
	44H5ATLKS	#1 SATA2	, HDD	931.51 GB	Physical Sector Size	4 KB	
	Data		1 MB	931.51 GB	GPT Disk GUID	12802b76-691e-4844-b2d3-db67e8b74f09	
 WDC WD20SPZX-08UA7 02.0 	WD-WXV2EC02V	#2 SATA2	, HDD	1.82 TB	I/O Retries	1	•
🥪 Y: 👻	Backup	exFAT	1 MB	1.82 TB	✓ Drive Control		
Y:/BitLocker/BitLockerFullSy	Image			1	Maximum Transfer	128 KB	•
✓ I SAMSUNG MZNLF128HC	S2G0NX0H523494	SATA2, SS	D	119.24 GB	I/O Block Size	4 KB	
Set EFI system partition		FAT32	1 MB	100 MB	Buffer Alignment	4 KB	•
Microsoft reserved p			101 MB	16 MB	✓ Physical Drive Geometry		
👻 🥯 Basic data partition		BitLoc	117 MB	118.61 GB	Cylinders	15566	
BitLocker			0 Bytes	118.61 GB	Tracks Per Cylinder	255	
Windows Recovery P			118.72 GB d BitLock	530 MB er Partition	Properties		
g System Disk Locked with I Type Date	BitLocker				Text		
1) System 9/6/2023 8:14:3	2 AM Succe	ssfully loan	ded user's fi	ile types definit	ions from "C:\Program Files (x86)	\R-Studio Technician\Presets\UserKnownFileType1.xml*	

2 Enter the password or recovery key and click the Unlock button.

BitLocker System Drive Encryption



If you have the .bec file, click the Unlock by key file button and load the file.

> **R-Studio** will unlock the volume

BitLocker System Drive Encryption

Drive Create Jools View Help		1	4					
Refresh Show Files Scan Partition Sea	ch Create Image	Open Ima	ge Create	Region RAIDs	Connect To Remote Remov	e		
Device/Disk	Label	i/Interfac	Start	Size	Name	Value		
Local Computer					Drive Type	SLABS		
 KINGSTON SA400537120G 03 	50026B77843A5618	#0 SATA	2, SSD	111.79 GB	Name	BitLocker		
Section FI System partition		FAT32	1 MB	100 MB	Size	118.61 GB (248740943 Sectors)		
Microsoft reserved parti •			101 MB	16 MB	✓ BitLocker Information			
⇔C:	System	NTFS	117 MB	111.18 GB	BitLocker Volume GUID	a6990d43-c3ea-7a46-b0de-337fc43cf89d		
See Windows Recovery Parti		NTFS	111.29 GB	508 MB	Encryption Type	XTS-AES 128		
✓ ☑ TOSHIBA DT01ACA100 MS2	44H5ATLKS	#1 SATA	, HDD	931.51 GB	✓ NTFS Information			
🖘 D: 👻	Data	NTFS	1 MB	931.51 GB	Cluster Size	4 KB (8 Sectors)		
WDC WD20SPZX-08UA7 02.0	WD-WXV2EC02V	#2 SATA	, HDD	1.82 TB	MFT Record Size	1 KB		
🥪 Y: 👻	Backup	exFAT	1 MB	1.82 TB	MFT Position	3 GB (6291456 Sectors)		
Y:/BitLocker/BitLockerFullSy	Image			-	MFT Mirror Position	8 KB (16 Sectors)		
✓ I SAMSUNG MZNLF128HC	S2G0NX0H523494	SATA2, S	SD	119.24 GB	Index Block Size	4 KB		
Set EFI system partition		FAT32	1 MB	100 MB	Sector Size	512 Bytes		
Microsoft reserved p			101 MB	16 MB	Volume Size	118.61 GB (248740942 Sectors)		
🗡 🧼 Basic data partition		BitLo	117 MB	118.61 GB				
P BitLocker		NTFS	0 Bytes	118.61 GB				
Windows Recovery P				S20 MAR	Properties			
Log System Disk Locked with	BitLocker	0.11001						1
					Text m °C:/Program Files (x86)/R-Stud	io lechnician/Presets/KAIDbRS.xml*		
			n was comp					
i) System 9/6/2023 9:14	57 AM All fil	e regions a	re collected					

TPM/TPM+PIN modes

Only in registered **R-Studio Technician/T80+** versions.

If only the TPM/TPM+PIN hardware was used to encrypt the partition, you must have either the FVEK (Full Volume Encryption Key) or VMK (Volume Master Key) data. Obtaining these keys is a very hard task, only quite advanced forensic professionals can do that using specialized hardware. Sometimes it may be possible to extract a FVEK from memory dumps and/or hibernation files, but this is still not a trivial process.

If you have FVEK or VMK data, click the **Advanced** button, select the key type of the data, enter the key or load a file with the key.

BitLocker TPM/TPM+PIN modes

Load and apply crypto	context Export crypto context
Gey	
Select a proper key typ BitLocker:	be and enter the key to unlock
Password	•
Input format: ANSI st	ring
Key ID: ba321d0d-b	ucb-41/1-9cc2-56/td3b8tbd0

R-Studio will unlock the volume.

You may also save and load encryption information from a BitLocker Encryption volume.

2.4.12.2 Windows Dynamic Disks

R-Studio supports <u>dynamic disks</u>, including <u>Windows software RAIDs</u>, mirrors, and spanned volumes. When **R-Studio** detects components from such dynamic disks, it assembles them accordingly.

Windows dynamic disks (RAID5)

🏲 🔿 🖄 🛅	Volume	Windows Software RAID5	Actions
þ 🛃 Event '	RAID5-LDM (E	Simple Basic NTFS Healthy (Boot, Page File, Crash Dump, Primary Pagebion) 148.71 GB 137.34 GB 22 % i) RAID-5 Dynamic NTFS Healthy 148.81 GB 148.81 GB	Disk Ma More
 b 🕺 Sharec b 🌺 Local U 	<	III III	
 N Perfori Device Storage Windo Disk N Services au 	Dynamic 74.41 GR	RAIDS-LDM (E) 7.4.40 GB NTFS Healthy	
	Disk 1 Basic 149.05 GB Online	System Reserved 350 MB NTFS Healthy (System, Active, Primary Partit Healthy (Boot, Page File, Cras, Dump, Primary Partition)	
	Disk 2 Dynamic 74.41 GB Online	RAIDS-IDM (E) 74.40 GB NTFS Healthy	
	Disk 3 Dynamic 74.41 GB Online	RAIDS-IDM (E) 72.40 GB NITS Healthy	

R-Studio detects components form dynamic disks and creates those dynamic disks automatically. At the same time, **R-Studio** gives access to the parents of the dynamic disks (drives and images).

Windows dynamic disks (RAID5) in R-Studio

Device/Disk	Label	FS	Start	Size
V STOSHIBA DT01ACA100 MS2OA750	44H5ATLKS	#0 SATA	0 Bytes	931.51 GB
Volume(3303cc57-3e4d-4507-872f	Recovery	NTFS	1 MB	300 MB
Volume(edb1043b-3073-4184-a4d5-x.		FAT32	301 MB	100 MB
Microsoft reserved partition			401 MB	128 MB
🗢 G 🗸 👻	System	NTFS	529 MB	291.57 GB
Volume{44fd3858-351c-43f0-8439-1.		NTFS	292.09 GB	450 MB
Volume{e0a573f2-14d5-4047-adfc-3		NITTE	202.52.00	150 MB
🥯 D:	Components of	f Windows sof	tware RAID	5 38.54 GB
🖙 Empty Space19			951. 1 GB	1.69 MB
✓ 📕 Image				
 ST380815AS 4.AAB 	5QZ5GPEJ	#3 SATA	0 Bytes	74.53 GB
See Disk2-01			992.50 KB	74.53 GB
🗸 🔜 Image				
🛩 🥪 ST380215A 3.AAD	9RX2E6NG	#0 ATA (0 Bytes	74.53 GB
Disk3-01			992.50 KB	74.53 GB
🗸 🔄 Image				
 ST380013AS 3.05 	3JV4MHM8	#2 SATA	0 Bytes	74.53 GB
Disk1-01			992.50 KB	74.53 GB
V SWDC WD10EACS-00ZJB0	20131218013D	#1 LICD /	0.0.444	021 51 GB
🥪 Y: 👻	Backup II	Window	vs software	RAID5 B
Virtual Volume sets and RAIDs				

If recognized parents of a dynamic disk, including drive images, are added to **R-Studio** later, it automatically adds them to their respective dynamic disk.

When an automatically created dynamic disk is selected, **R-Studio** highlights its components.

Also, **R-Studio** automatically detects inconsistent components of dynamic disks and marks them accordingly.

Windows dynamic disks (RAID5) with unsynced parent

	Device/Disk	Label	FS	Start	Size
	Local Computer				
~	TOSHIBA DT01ACA100 MS2OA750	44H5ATLKS	#0 SATA	0 Bytes	931.51 GB
	Volume{3303cc57-3e4d-4507-872f	Recovery	NTFS	1 MB	300 MB
	🖙 Volume{edb1043b-3073-4184-a4d5- x .		FAT32	301 MB	100 MB
	Microsoft reserved partition			401 MB	128 MB
	🗢 G 🗸 🗸	System	NTFS	529 MB	291.57 GB
	Volume{44fd3858-351c-43f0-8439-1.		NTFS	292.09 GB	450 MB
	Volume(e0a573f2-14d5-4047-adfc-3π.		NTFS	292.53 GB	450 MB
	🧼 D: 👻	Data	NTFS	292.97 GB	638.54 GB
	Empty Space19			931.51 GB	1.69 MB
~	lmage				
	✓ ST380815AS 4.AAB UI	nsynced compor	ent of Window	ws software	RAID5 3
	🧼 Disk2-01			992.50 B	74.53 GB
~	Image Image				
	Y ST380215A 3.AAD	9RX2E6NG	#0 ATA (0 Bytes	74.53 GB
	Disk3-01 - LDM UNSYNC			992.50 KB	74.53 GB
~	- Image				
	 ST380013AS 3.05 	3JV4MHM8	#2 SATA	0 Bytes	74.53 GB
	See Disk1-01			992.50 KB	74.53 GB
~	WDC WD10EACS-00ZJB0	20131218013D	#1 USB (0 Bytes	931.51 GB
	🥪 Y: 👻	Backup II	NTFS	1 MB	931.51 GB
 Virt 	ual Volume sets and RAIDs				
	Volume1	RAID5-LDM	NTFS		149.06 GB

R-Studio shows the components of the selected dynamic disk on its LDM Components tab.

LDM Components tab

Disk 0:	Disk1-01 (ST380013AS 3.05 - 3JV4MHM8) - 74.53 GB : Y:/RAID5-WinLDM/ST381 -	Disconnect
Size:	74.53 GB	
Drive Name:	Disk1-01	
Located On:	ST380013AS 3.05	
Image file name:	Y: /RAID5-WinLDM/ST380013AS-33V4MHM8.rdr	
Serial:	3JV4MHM8	
LDM Host Disk GUID:	8276047e-b42e-11e5-93f3-20cf30be3944	
Disk 1:	Disk2-01 (ST380815AS 4.AAB - 5QZ5GPEJ) - 74.53 GB : Y;/RAID5-WinLDM/ST3: 💌	Disconnect
Size:	74.53 GB	
Drive Name:	Disk2-01	
Located On:	ST380815AS 4.AAB	
Image file name:	Y:/RAID5-WinLDM/ST380815AS-5QZ5GPEJ.rdr	
	5QZ5GPEJ	
LDM Host Disk GUID:	82760481-b42e-11e5-93f3-20cf30be3944	
Disk 2:	Disk3-01 (ST380215A 3.AAD - 9RX2E6NG) - 74.53 GB : Y:/RAID5-WinLDM/ST38 💌	Disconnect
Size:	74.53 GB	
	Disk3-01	
	ST380215A 3.AAD	
	Y:/RAID5-WinLDM/ST380215A-9RX2E6NG.rdr	
	9RX2E6NG	
LDM Host Disk GUID:	82760484-b42e-11e5-93f3-20cf30be3944	
	Reassemble	

R-Studio shows broken dynamic disks in pink.

Broken dynamic disks in R-Studio

ves				
Device/Disk	Label	FS	Start	Size
V STOSHIBA DT01ACA100 MS2OA750	44H5ATLKS	#0 SATA	0 Bytes	931.51 GB
Solume{3303cc57-3e4d-4507-872f	Recovery	NTFS	1 MB	300 MB
🖙 Volume{edb1043b-3073-4184-a4d5- x .		FAT32	301 MB	100 MB
Microsoft reserved partition			401 MB	128 MB
🖙 C: 👻	System	NTFS	529 MB	291.57 GB
Solume(44fd3858-351c-43f0-8439-1.★		NTFS	292.09 GB	450 MB
Volume(e0a573f2-14d5-4047-adfc-3π.		NTFS	292.53 GB	450 MB
🍩 D: 👻	Data	NTFS	292.97 GB	638.54 GB
Empty Space19			931.51 GB	1.69 MB
🗸 📙 Image				
 ST380215A 3.AAD 	9RX2E6NG	#0 ATA (0 Bytes	74.53 GB
See Disk3-01			992.50 KB	74.53 GB
🗸 📙 Image				
 ST380013AS 3.05 	3JV4MHM8	#2 SATA	0 Bytes	74.53 GB
See Disk1-01			992.50 KB	74.53 GB
WDC WD10EACS-00ZJB0	201312180100	=1 LICD /		001 51 GB
🥯 Y: 👻	Backup II Brok	en Windows :	software RA	ID5 1 GB
Virtual Volume sets and RAIDs				
Volume1	RAID5-LDM	NTES		149.06 GB

The LDM Components tab also allows you to manually disconnect or connect the components, for example, if they are such damaged that **R-Studio** cannot recognize them as parts of a broken dynamic disk. Select the object from the drop-down box and click the **Connect** button. **R-Studio** displays the objects it recognizes as the components of the dynamic disk in blue.

Adding a component manually

4 Components		
Disk 0:	Disk1-01 : Y:/RAID5-WinLDM/ST380013AS-3JV4MHM8.rdr	Disconnect
Drive Name: Image file name:	Disk1-01: Y:/RAID5-WinLDM/ST380013A5-3JV4MHM8.rdr ST380013A5 3.05 (3JV4HIM8)DM/ST380013A5-3JV4HHM8-UN.rdr ST380013A5 3.05 (3JV4MHM8) - 74AID5-WinLDM/ST380013A5-3JV4MHM8.rdr TOSHEBA DT0JACA 100 MS20A750 (44H5ATLKS) - 931.51 GB	
LDM Host Disk GUID:	MIDC MID 10EA CC 0073P0 / 201212120120 \ 021 E1 CP	
Disk 1:	Disk2-01 (\$T380815AS 4.AA8 - 5QZ5GPEJ) - 74.53 GB : Y:/RAID5-WinLDM/ST3: 💌	Disconnect
Size:	74.53 GB	
Drive Name:	Disk2-01	
Located On:	ST380815AS 4.AAB	
Image file name:	Y:/RAID5-WinLDM/ST380815AS-5QZ5GPEJ.rdr	
Serial:	5QZ5GPEJ	
LDM Host Disk GUID:	82760481-b42e-11e5-93f3-20cf30be3944	
Disk 2:	Disk3-01 - LDM UNSYNC (\$T380215A 3.AAD - 9RX2E6NG) - 74.53 GB : Y:/RAID! 💌	Disconnect
Size:	74.53 GB	
Drive Name:	Disk3-01 - LDM UNSYNC	
Located On:	ST380215A 3.AAD	
Image file name:	Y:/RAID5-WinLDM/ST380215A-9RX2E6NG.rdr	
Serial:	9RX2E6NG	
LDM Host Disk GUID:	82760484-b42e-11e5-93f3-20cf30be3944	

You may immediately switch to the dynamic disk configuration that **R-Studio** believes most probable by clicking the **Reassemble** button.

R-Studio shows dynamic disks with manually added components in blue:

Dynamic disks with added components in R-Studio

rives							
		Device/Disk cal Computer		Label	FS	Start	Size
-	L	TOSHIBA DT01ACA100 MS2	0.0750	44H5ATLKS	#0 SATA	0 Bytes	931.51 GB
	-	Volume(3303cc57-3e4d-			NTES	1 MB	300 MB
		Volume(edb1043b-3073-			FAT32	301 MB	100 MB
		 Microsoft reserved partit 			PAISZ	401 MB	128 MB
		Se C:		System	NTES	529 MB	291.57 GB
		Volume{44fd3858-351c-4		.,	NTES	292.09 GB	450 MB
		Wolume{e0a573f2-14d5-4			NTES	292.53 GB	450 MB
		🥯 D:	-	Data	NTFS	292.97 GB	638.54 GB
		Sempty Space19				931.51 GB	1.69 MB
~		Image					
	~	ST380815AS 4.AAB		5QZ5GPEJ	#3 SATA	0 Bytes	74.53 GB
		Disk2-01				992.50 KB	74.53 GB
~		Image	0				1
	~	ST380215A 3.AAD	Manua	lly added compo	onent of Windo	ows softwar	e RAID5
		See Disk3-01				992.50.3	74.53 GB
~		Image					
	~	ST380013AS 3.05		3JV4MHM8	#2 SATA	0 Bytes	74.53 GB
		Partition1				31.50 KB	
×	5	WDC WD10EACS-00ZJB0		301313100130	#11100 /	0.0.4	031 51 CD
		↔ Y:	Window	s software RAID	5 with a manu	ally aded co	omponent
 Virt 	tual	Volume sets and RAIDs				1	
	E	Volume1					149.06 GB

2.4.12.3 Windows Storage Spaces

<u>Storage pools and spaces</u> is a new storage technology, first introduced in Windows 8 and Windows Server 2012, that allows the user to combine various (not always similar) drives into a kind of a RAID or compound

volume. First, the drives are combined into a storage pool, then several storage spaces with striping (similar to RAID0), mirroring (similar to RAID1), and parity (similar to RAID5) can be created in that storage pool. You may read more about storage pools and spaces in the Microsoft's <u>Storage Spaces: FAQ</u>.

R-Studio supports Windows Storage Spaces created by Windows 8/8.1 and Windows 10/Threshold 2/? Anniversary/Fall Creators updates.

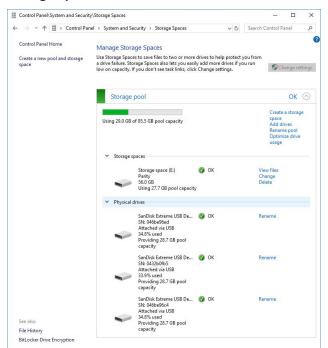
When drives from a storage pool are connected to a Windows computer, it automatically detects them and assembles storage spaces accordingly.

Storage spaces

Image: Image	W					_	□ × ^ (2)
Navigation Details pane	Medium icons	Small icons EE Details Content	÷ ↓ Sc by	ort (tai)		selected tems	
$\leftarrow \rightarrow \cdot \uparrow \blacksquare$ This	PC >				ڻ ~	Search This PC	م
 ➡ Pictures ✓ ^ ➡ Pictures ➡ Recovery_from_l ➡ R-TT ➡ Virtual 		Objects wnloads		Desktop		Documents Pictures	^
🗸 🛄 Desktop	Vic	leos					
> OneDrive > & Tester 1	Devices and dr	ives (3)			5	torage spaces	

Storage pools and spaces can be managed using the Storage Spaces item in the Control Panel.

Storage spaces



R-Studio detects drives (or their images) from storage pools and creates storage pools and spaces automatically. At the same time, **R-Studio** gives access to the parents of the storage spaces (drives and images).

Storage spaces in R-Studio

Drives						
Device/Disk		Label		S	Start	Size
TOSHIBA DT01ACA100 MS2OA750		44H5ATLKS	#0 S#	TA	0 Bytes	931.51 GB
Volume(3303cc57-3e4d-4507-872f-		Recovery	NTES		1 MB	300 MB
Volume(edb1043b-3073-4184-a4d5	.		FAT3	2	301 MB	100 MB
Microsoft reserved partition	•				401 MB	128 MB
🥯 C:	٠	System	NTES		529 MB	291.57 GB
Volume[44fd3858-351c-43f0-8439-	17.		NTFS		292.09 GB	450 MB
Volume{e0a573f2-14d5-4047-adfc-			NITTO		202.62.60	450 \$ 40
🥪 D:	•	Data St	orage	spa	ces created	by Windows
Empty Space26					931.51 GB	T.o. MB
✓ See Msft Storage Space 0.1		{f6b5bd51-e549-44	#4 Le	acal		56 GR
HarddiskVolume21	•			Sto	rade space	components
See E	*	Test_WSS	NTF		123 110	33.6 (08
V SanDisk Extreme 0001		0432b0fb5	#1 U	SB (0 Bytes	29.22 GB
Storage pool					129 MB	29.10 GB
Microsoft reserved partition	•				17 KB	128 MB
SanDisk Extreme 0001		046be96c4	#2 U	SB (0 Bytes	29.22 GB
Storage pool					129 MB	29.10 GB
Microsoft reserved partition	•				17 KB	128 MB
✓ SanDisk Extreme 0001		046be96ed	#3 U	SB (0 Bytes	29.22 GB
Storage pool					100 MD	20 10 CP
Microsoft reserved partition	•	S	torage	e spa	ces created	by R-Studio
 Virtual Volume sets and RAIDs 						
✓ I Storage space						56 GB
System Reserved Partition					1 MB	128 MB
GPTPart1		Test WSS	NTE		129 MB	55.87 GB

If recognized parents of a storage space, including drive images, are added to **R-Studio** later, it automatically adds them to their respective storage space.

When an automatically created storage space is selected, **R-Studio** highlights its components. It also highlights the storage space that Windows may itself create from the same components.

R-Studio shows the components of the selected storage space on its WSS Components tab.

WSS Components tab

Disk 0:	Storage pool (SanDisk Extreme 0001 - 046be96ed) - 29.10 GB	•	Disconnect
Size:	29.10 GB		
Drive Name:	Storage pool		
Located On:	SanDisk Extreme 0001		
WSS Object Name:	SanDisk Extreme USB Device		
Serial:	046be96ed		
WSS Host Disk GUID:	b1a113be-2821-aaac-b234-626b5636a13b		
Disk 1:	Storage pool (SanDisk Extreme 0001 - 0432b0fb5) - 29.10 GB	•	Disconnect
Size:	29.10 GB		
Drive Name:	Storage pool		
Located On:	SanDisk Extreme 0001		
WSS Object Name:	SanDisk Extreme USB Device		
Serial:	0432b0fb5		
WSS Host Disk GUID:	c7ae5cea-7bb8-9785-31bc-362c378cc015		
Disk 2:	Storage pool (SanDisk Extreme 0001 - 046be96c4) - 29.10 GB	•	Disconnect
Size:	29.10 GB		
Drive Name:	Storage pool		
Located On:	SanDisk Extreme 0001		
WSS Object Name:	SanDisk Extreme USB Device		
Serial:	046be96c4		
WSS Host Disk GUID:	85e4c51c-d462-db61-178b-fbc72f85c187		
	Reassemble		

R-Studio shows broken storage spaces in pink.

Broken storage spaces in R-Studio

Drives				
Device/Disk	Label	FS	Start	Size
Y 💻 Local Computer				
TOSHIBA DT01ACA100 MS2OA750	44H5ATLKS	#0 SATA	0 Bytes	931.51 GB
Volume{3303cc57-3e4d-4507-872f	Recovery	NTFS	1 MB	300 MB
Volume{edb1043b-3073-4184-a4d5.		FAT32	301 MB	100 MB
Microsoft reserved partition			401 MB	128 MB
🖙 C: 🗸 🗸	System	NTFS	529 MB	291.57 GB
Volume(44fd3858-351c-43f0-8439-1x.		NTFS	292.09 GB	450 MB
Volume(e0a573f2-14d5-4047-adfc		NTFS	292.53 GB	450 MB
🍛 D: 👻	Data	NTFS	292.97 GB	638.54 GB
Empty Space24			931.51 GB	1.69 MB
 Msft Storage Space 0.1 	{f6b5bd51-e549-4426	#4 Local		56 GB
HarddiskVolume21			1 MB	128 MB
🥯 E 🔹 👻	Test_WSS	NTFS	129 MB	55.87 GB
💙 🍉 SanDisk Extreme 0001	0432b0fb5	#1 USB (0 Bytes	29.22 GB
Storage pool			129 MB	29.10 GB
See Microsoft reserved partition			17 KB	128 MB
🛩 🦫 SanDisk Extreme 0001	046be96c4	#2 USB (0 Bytes	29.22 GB
Storage pool				
Microsoft reserved partition			Broken storage space	
 Virtual Volume sets and RAIDs 				N N
👻 🕼 Storage space				56 GB
System Reserved Partition			1 MB	128 MB
GPTPart1	Test WSS	NTES	129 MB	55.87 GB

The WSS Components tab also allows you to manually disconnect or connect the components, for example, if they are such damaged that **R-Studio** cannot recognize them as parts of a broken storage space. Select the object from the drop-down box and click the **Connect** button. **R-Studio** displays the objects it recognizes as the components of the storage space in blue.

Adding a component manually

Missing disk 0:	[Choose correspondent disk]	-	Disconnect
Size:	[Choose correspondent disk]		
Drive Name:	SanDisk Extreme 0001 (046be96ed) - 29.22 GB SanDisk Extreme 0001 (046be96ed) - 29.22 GB : D:/SanDisk Extreme 0001.rdr		
WSS Host Disk GUID:	TOSHTRA DT014CA100 ME2OA750 (44HEATLKS) 021 51 CR		
Disk 1:	Storage pool (SanDisk Extreme 0001 - 0432b0fb5) - 29.10 GB	•	Disconnect
Size:	29.10 GB		
Drive Name:	Storage pool		
Located On:	SanDisk Extreme 0001		
WSS Object Name:	SanDisk Extreme USB Device		
Serial:	0432b0fb5		
WSS Host Disk GUID:	c7ae5cea-7bb8-9785-31bc-362c378cc015		
waa nosc Disk GOLD:	c/acadea-/bad-9/03-310c-302c3/0cc013		

You may immediately switch to the storage space configuration that **R-Studio** believes most probable by clicking the **Reassemble** button.

R-Studio shows storage spaces with manually added components in blue:

Drives				;
Device/Disk V 💻 Local Computer	Label	FS	Start	Size
V SHIBA DT01ACA100 MS2OA750	44H5ATLKS	#0 SATA	0 Bytes	931.51 GB
Volume{3303cc57-3e4d-4507-872f	Recovery	NTFS	1 MB	300 MB
Volume{edb1043b-3073-4184-a4d5-x.		FAT32	301 MB	100 MB
Microsoft reserved partition			401 MB	128 MB
🍛 C: 👻	System	NTFS	529 MB	291.57 GB
Volume{44fd3858-351c-43f0-8439-1.		NTFS	292.09 GB	450 MB
Volume{e0a573f2-14d5-4047-adfc-3x.		NTFS	292.53 GB	450 MB
🍩 D: 👻	Data	NTFS	292.97 GB	638.54 GB
Empty Space17			931.51 GB	1.69 MB
Msft Storage Space 0.1	{f6b5bd51540-44	#4 Local		56 68
See HarddiskVolume11	Manually added stora		age space o	component
Volume{0b902862-d693-11e6-bf7e*	Test_WSS	NTFS	129 MB	5.87 GB
V Image				
Y 🥯 SanDisk Extreme 0001	046be96ed	#1 USB (0 Bytes	29.22 GB
Microsoft reserved partition			17 KB	128 MB
Storage pool			129 MB	29.10 GB
🗸 🦆 SanDisk Extreme 0001	046be96c4	#2 USB (0 Bytes	29.22 GB
Storage pool			129 MB	29.10 GB
Microsoft reserved partition			17 KB	128 MB
🛩 🦫 SanDisk Extreme 0001	0432b0fb5	#3 USB (29.22 GB
Storage pool			120 MR	20 10 GP
Microsoft reserved partition	Storage space	with a mai	nually adde	d component
 Virtual Volume sets and RAIDs 				
👻 🎁 Storage space				56 GB
System Reserved Partition			1 MB	128 MB
GPTPart1	Test_WSS	NTFS	129 MB	55.87 GB

Storage spaces with added parents in R-Studio

2.4.12.4 Apple RAIDs

OS X can create several software RAIDs from drives connected to a Mac computer: RAID1 (Mirror set), RAID0 (Stripe set), and Concatenated disk set.

149

Apple RAID0 example

640.14 GB Hitachi HTS54		First Aid RAID	
SuperDrive	RAID Set Name:	Test Mac RAID 0	
	Format:	Mac OS Extended (Journaled)	\$
ST380215 A Media.dmg	RAID Type:		٠
SoftRAID 4.5.2.dmg SoftRAID 4.5.2.dmg 4.03 GB UFD 2.0 Silicon RAID Slice for "Test Ma A.03 GB UFD 2.0 Silicon RAID Slice for "Test Ma RAID Slice for "Test Ma 7.37 GB Test Mac RAID 0			_
Test Mac RAID 0	3.68 GB - RAID S	-	
	+ - Options	Delete Updat	e

R-Studio detects components of Apple RAID sets and creates their virtual RAIDs automatically. At the same time, **R-Studio** gives access to the individual components of the Apple RAID sets (drives and images).

Apple RAIDs in R-Studio

Device/Disk		Label	FS		Start	Size
💻 Local Computer						
V STOSHIBA DT01ACA100 MS2OA750		44H5ATLKS	#0 SAT	A	0 Bytes	931.51 GB
Volume{3303cc57-3e4d-4507-872f	.7 1	Recovery	NTFS		1 MB	300 MB
Volume{edb1043b-3073-4184-a4d5-	π.		FAT32		301 MB	100 MB
Microsoft reserved partition	•				401 MB	128 MB
🥯 G:	- 5	System	NTFS		529 MB	291.57 GB
Volume(44fd3858-351c-43f0-8439-1			NTFS		292.09 GB	450 MB
Volume(e0a573f2-14d5-4047-adfc-3	37.				*** ** **	MB
🧼 D:	+ 1	Data	Apple RAID components 4 GB			
Empty Space25					931.51 GB	1.69 MB
V 🥪 UFD 2.0Silicon-Power4G 1100	1	AA0000000000485	#1 USB	(0 Bytes	3.75 GB
Volume{925190b2-d68b-11e6-bf7e-	×		FAT32		20 KB	200 MB
Said Partition 2	•				200.02 MB	3.43 GB
See E	+ 1	Boot OS X	HFS+		3.63 GB	128 MB
V Se UFD 2.0Silicon-Power4G 1100	1	AA0000000000485	#2 USB	(0 Bytes	3.75 GB
Volume{9251907a-d68b-11e6-bf7e-			FAT32		20 KB	200 MB
Search Raid Partition 1	+		HFS+		200.02 MB	3.43 GB
9 H:	+ 1	Boot OS X	HFS+	Ap	ple RAID	128 MB
Virtual Volume sets and RAIDs						
Test Mac RAID 0		Test Mac RAID 0	HFS+			6.86 GB

If recognized components of an Apple RAID, including drive images, are added to **R-Studio** later, it automatically adds them to their respective Apple RAID.

When an automatically created Apple RAID is selected, **R-Studio** highlights its components.

R-Studio shows the components of the Apple RAID on its MacOS Components tab.

MacOS Components tab

Disk 0:	Raid Partition 1 (UFD 2.0Silicon-Power4G 1100 - AA0000000000485) 🔻	Disconnect
Size:	3.43 GB	
Drive Name:	Raid Partition 1	
Located On:	UFD 2.0Silicon-Power4G 1100	
Serial:	AA0000000000485	
MacOS RAID Host Disk GUID:	26d41b64-5dd3-4ef2-9263-9c5c2aff1631	
Disk 1:	Raid Partition 2 (UFD 2.05/licon-Power4G 1100 - AA000000000485)	Disconnect
Size:	3.43 GB	
Drive Name:	Raid Partition 2	
.ocated On:	UFD 2.0Silicon-Power4G 1100	
Serial:	AA000000000485	
MacOS RAID Host Disk GUID:	017463f2-0b41-4ddd-909d-246f6fcc7b20	

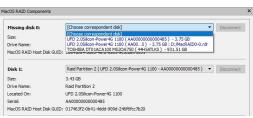
R-Studio shows broken Apple RAIDs in pink.

Broken Apple RAIDs in R-Studio

Drives				×
Device/Disk	Label	FS	Start	Size
V STOSHIBA DT01ACA100 MS2OA750	44H5ATLKS	#0 SATA	0 Bytes	931.51 GB
Volume(3303cc57-3e4d-4507-872f+	Recovery	NTFS	1 MB	300 MB
Volume(edb1043b-3073-4184-a4d5-x.		FAT32	301 MB	100 MB
See Microsoft reserved partition			401 MB	128 MB
🗢 C: 🔹	System	NTFS	529 MB	291.57 GB
Volume(44fd3858-351c-43f0-8439-1.		NTFS	292.09 GB	450 MB
Volume(e0a573f2-14d5-4047-adfc-3x.		NTFS	292.53 GB	450 MB
👄 D: 👻	Data	NTFS	292.97 GB	638.54 GB
Empty Space25			931.51 GB	1.69 MB
 UFD 2.0Silicon-Power4G 1100 	AA0000000000485	#1 USB (0 Bytes	3.75 GB
Volume(925190b2-d68b-11e6-bf7e		FAT32	20 KB	200 MB
Said Partition 2			200.02 MD	3 43 CB
👄 E 🗸 👻	Boot OS X	HFS+	Broken Apple	RAID
 Virtual Volume sets and RAIDs 				N
🕼 Test Mac RAID 0		HFS+		6.86 GB

The MacOS Components tab also allows you to manually disconnect or connect the components, for example, if they are such damaged that **R-Studio** cannot recognize them as parts of a broken Apple RAID. Select the object from the drop-down box and click the **Connect** button. **R-Studio** displays the objects it recognizes as the components of the Apple RAID in blue.

Adding a com	ponent	manually
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You may immediately switch to the Apple RAID configuration that **R-Studio** believes most probable by clicking the **Reassemble** button.

R-Studio shows Apple RAIDs with manually added components in blue:

Drives					
Device/Disk	Label	FS	Start	Size	
TOSHIBA DT01ACA100 MS2OA750	44H5ATLKS	#0 SATA	0 Bytes	931.51 GB	
Volume{3303cc57-3e4d-4507-872f	Recovery	NTFS	1 MB	300 MB	
Volume{edb1043b-3073-4184-a4d5-x.		FAT32	301 MB	100 MB	
Microsoft reserved partition			401 MB	128 MB	
🥯 G 🗸 🗸	System	NTFS	529 MB	291.57 GB	
Volume{44fd3858-351c-43f0-8439-1.		NTFS	292.09 GB	450 MB	
Volume{e0a573f2-14d5-4047-adfc-3x.		NTES	292.53 GR	450 MR	
🧼 D: 👻	Dat Manually added Apple RAID0 component				
Second Se			931.31 Gb	1.03 MR	
Y Image		_			
✓ See UFD 2.0Silicon-Power4G 1100	AA0000000000485	#2 USB (0 Bytes	3.75 GB	
Se EFI System Partition		FAT32	20 KB	200 MB	
See Raid Partition 2			200.02 MB	3.43 GB	
Sooter Sooter	Boot OS X	HFS+	3.63 GB	128 MB	
 WFD 2.0Silicon-Power4G 1100 	AA0000000000485	#1 USB (0 Bytes	3.75 GB	
Volume(9251907a-d68b-11e6-bf7e*		FAT32	20 KR	200 MR	
Search Raid Partition 1	Apple RAID0	with a manu	ally added o	omponent	
	Boot US X	HFS+	3.03 GB	128 MB	
 Virtual Volume sets and RAIDs 					

2.4.12.5 Apple CoreStorage/FileVault/Fusion Drive Volumes

The macOS operating system has the following disk management systems: **FileVault**, is a disk encrypted utility;

Fusion Drive is an Apple's hybrid drive technology;

<u>CoreStorage</u> is a logical volume management system.

R-Studio supports all these technologies and can unlock their encrypted volumes (drives and images) using either their passwords or recovery keys.

CoreStorage/FileVault

Locked CoreStorage Volume in R-Studio

ives						×
Device/Disk	Label	FS	St	art	Size	^
Y STOSHIBA DT01ACA100 MS2OA750	44H5ATLKS	#0 SAT	0 Byte	s	931.51 GB	
Volume(3303cc57-3e4d-4507-872f-6ad5ex	Recovery	NTFS	1 MB		300 MB	
👄 EFI system partition 👻		FAT32	301 M	в	100 MB	
See Microsoft reserved partition			401 M	в	128 MB	
👄 C: 🗸 🗸	System	NTFS	529 M	в	291.57 GB	
Volume(44fd3858-351c-43f0-8439-1a637.		NTFS	292.09	GB	450 MB	
Volume(e0a573f2-14d5-4047-adfc-387ed.		NTFS	292.53	GB	450 MB	
🥯 D: 🔄	Data	NTFS	292.97	GB	638.54 GB	
Concentration Empty Space17	Locked Core	Storage Vo	olume	SB	1.69 MB	
Image: C:/Containers/Apple_Core_Storage						
Data 🚰					5.90 GB	
👻 🍩 SanDisk Extreme 0001	04f18af5a	#3 USB	0 Byte	s	59.63 GB	
See EFI System Partition		FAT32	20 KB		200 MB	
Sectore CoreStorage Protective Partition			200.02	MB	59.31 GB	
Se Booter	Boot OS X	HFS+	59.50	GB	128 MB	
						×

To unlock the volume

- 1. Right-click the encrypted volume and select Unlock encrypted drive on the shortcut menu.
- 2. Enter the password/recovery key on the Unlock encrypted drive dialog box

Unlock encrypted	
inter the password or n	ecovery key to unlock Data
•••••	E
Advanced	Unlock Can

> R-Studio will unlock the volume

Unlocked CoreStorage Volume in R-Studio

	Device/Disk	Label	FS	Start	Size	^
v 🖏	TOSHIBA DT01ACA100 MS2OA750	44H5ATLKS	#0 SAT	0 Bytes	931.51	
	Volume(3303cc57-3e4d-4507-872f-6ad5ex.	Recovery	NTFS	1 MB	300 MB	
	👄 EFI system partition 👻		FAT32	301 MB	100 MB	
	See Microsoft reserved partition			401 MB	128 MB	
	🗢 C: 👻	System	NTFS	529 MB	291.57	
	🖙 Volume{44fd3858-351c-43f0-8439-1a637.#		NTFS	292.09 GB	450 MB	
Volume{e0a573f2-14d5-4047-adfc-3			NTFS	292.53 GB	450 MB	
	🥯 D: 🚬	Data	NTFS	292.97 GB	638.54	
	Sempty Space17	Unlocked Cor	e Storage	Volume B	1.69 MB	
~	Image: C:/Containers/Apple_Core_Storage.ru					
	🕼 Data	Data	HFS+		5.90 GB	
~	🖙 SanDisk Extreme 0001	04f18af5a	#3 USB	0 Bytes	59.63 GB	
	Set EFI System Partition		FAT32	20 KB	200 MB	
	CoreStorage Protective Partition			200.02 MB	59.31 GB	
	Booter	Boot OS X	HFS+	59,50 GB	128 MB	

If the volume is partially encrypted, **R-Studio** can recognize which part is encrypted and which isn't. It will provide a correct access to the unencrypted and encrypted parts of the volume, provided that the correct password is entered.

Partially encrypted volume



R-Studio Technician/T80+

In addition to the password, it's possible to enter other decryption data. Click the **Advanced**... button and enter available data.

Unlock encrypted drive: Advanced

oad and apply crypto context	Export crypto context
ey	
	nter the key to unlock
NPFS-2:	nter the key to unlock
APFS-2: Password Password	nter the key to unlock
NPF5-2: Password Password Recovery key Pure volume key (direct AES-XX)	• KX key for container)
ielect a proper key type and er APF5-2: Password Password Recovery key Pure volume key (drect AES-XO Pure encryption key to decrypt	• KX key for container)

This data is usually very hard to obtain and only very advanced institutions can recover it from actual hardware.

Data recovery from deleted or damaged APFS volumes

Note: this method doesn't always yields positive results.

When macos deletes an APFS volumes, it also wipes out all decryption information from its APFS container. In this case even knowing the password won't help. Still, there's a trick that may help to open a deleted or damaged encrypted volume.

Let's us have a hard drive with an APFS container with 3 APFS volumes:

APFS container and its volumes

Driv		8 🕤	telp	rch Create Image	Open Im) (e Region Star	t Runtime Image RA		nnect To Remote Remove
(in	Device view									
	(Device/Disk	-	Label	i/Interfa	Start	Size	Name		Value
~ 1	Local C	mputer						Drive Type		Physical Drive.Disk
			DG 0	50026B77843A56	#0 SATA	SSD	111.79 GB	Name		m.2 Smartbuy S11-2280T 256GB SBFM00.6
		FI system partition	-		FAT32	1 MB	100 MB	OS Object		\\.\PhysicalDrive2
		Aicrosoft reserved p	art •			101 MB	16 MB	R-Studio Drive	r	WinNT\Handle\Physical
				System	NTFS	117 MB	111.18 GB	Size		238.47 GB (500118192 Sectors)
	50	Vindows Recovery	art		NTFS	111.29 GB	508 MB	Logical Sector	Size	512 Bytes
	🗸 🕅 TOS	HIBA DT01ACA100	MS2	44H5ATLKS	#1 SATA	2, HDD	931.51 GB	Physical Secto	r Size	4 KB
);	•	Data	NTFS	1 MB	931.51 GB	Partition Size		238.47 GB (500118192 Sectors)
	∽ 💹 m.2	Smartbuy S11-2280	T 25	7D4B07690EDF0	#2 SATA	2, SSD	238.47 GB	GPT Disk GUID		975b2fc1-b26e-4513-8bc5-54e0d283c332
		FI System Partition	-		FAT32	20 KB	200 MB	I/O Retries		Default
	Y OF	PFS Container	+		APFS	200.02 MB	238.28 GB	V Drive Control		
	1	APFS-1		APFS-1	APFS	0 Bytes	238.28 GB	Maximum	Transfer	128 KB
		APFS-2		APFS-2	APFS	0 Bytes	238.28 GB	I/O Block	lize	4 KB
	1	APFS-3		APFS-3	APFS	0 Bytes	238.28 GB	Buffer Alig	nment	4 Bytes
								Y Physical Drive	Geometry	1
			APFS	container and	volumes			Cylinders		31130
								Tracks Per	Cylinder	255
								Properties	S.M.A.F	R.T.
.og										
	Туре	Date		Time					Text	
i)	System	11/16/2023	9:25	21 AM Succ	essfully lo	aded user's f	file types defin	itions from "C:\Prog	ram Files (x	86)\R-Studio Technician\Presets\UserKnownFileTy
	System	11/16/2023	9:25							tudio Technician/Presets/RAID6RS.xml*
	Partition	11/16/2023		00 AM The						Broken_APFS\APFS-1.ccxt.

One of them has been deleted and **R-Studio** cannot unlock (decrypt) it:

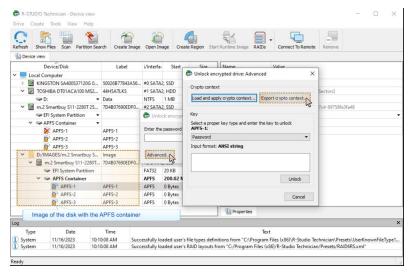
APFS container with a deleted APFS volume

Drive C	reate Tools View H	elp tion Sea	rch Create Image	Open In	nage Creat	e Region Star	rt Runtime Image	RAIDs -	Connect To Remote Remove
Devio			77 . 72 . 71	1000	1.02	1 632	1		1.001
_	Device/Disk		Label	i/Interfa	Start	Size	Name		Value
	cal Computer						Drive Type		APFS Volume
~ 550	KINGSTON SA400S37120	IG 0	50026B77843A56			111.79 GB	Name		APFS-1
	Section EFI system partition	•		FAT32	1 MB	100 MB	Size		238.28 GB (499708512 Sectors)
	Microsoft reserved p				101 MB	16 MB	Logical Vol		e Deleted
	⇔C:		System		Unlock en	crypted drive	×	nation	
	Secovery P			NTFS				GUID	7b066bf2-3f35-4a08-a7c4-89758fe3fa48
V 💹 TOSHIBA DT01ACA100 MS			44H5ATLKS	#1 SA	APFS volume's keybag				4 KB (8 Sectors)
	See D:		Data	NTFS d				cks	4469156
~ IS9	m.2 Smartbuy S11-2280	T 25	7D4B07690EDF0	#2 SA				te Time	
	Section 2017 System Partition	•		FAT3	Advanced		Cancel		
~	APFS Container	•		APFS					
	APFS-1		APFS-1	APFS	0 Bytes	238.28 GB			
	APFS-2		APFS-2	APFS	0 Bytes	238.28 GB			
	APFS-3		APFS-3	APFS	0 Bytes	238.28 GB			
							Properties		
.og									
Тур			Time					Text	
i) System	n 11/16/2023	9:41:	48 AM Succ	essfully le					iles (x86)\R-Studio Technician\Presets\UserKnownFileTyp 5)/R-Studio Technician/Presets/RAID6RS.xml''

But if we have an image of the disk's previous state, we can extract the necessary encryption information from that image.

Load the image and double-click the existing volume. Click the Advanced... button instead of entering its password.

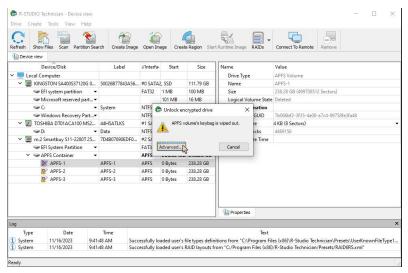
Export of encryption information



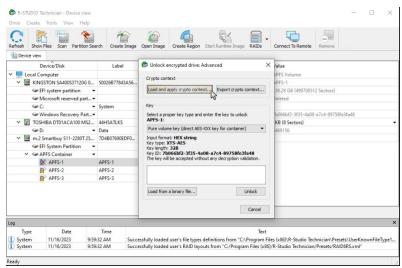
Click the **Export crypto context...** button and save a file with this information. Then click the **Close Image** button to unload the image.

Then double-click the APFS-1 volume and click the Advanced button.

APFS container with a deleted APFS volume



Click the Load and apply crypto context... button



Loading the encryption information

and load the file generated from the image.

Select the required information type (a password for our case), enter the data, and click the Unlock button.

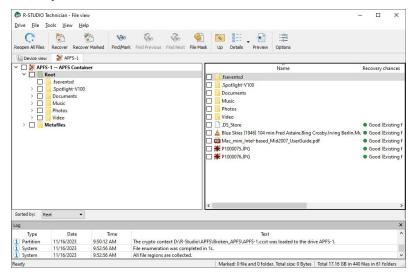
Unlocking the APFS volume

R-STUDIO Technician - Device vie	W		- 🗆 X
Drive Create Tools View Hel	p		
Refresh Show Files Scan Partition	Search Create Ima	sge Open Image Create Region Start Runtime Image RAIDs	Connect To Remote Remove
Device view			
Device/Disk	Label	🕞 Unlock encrypted drive: Advanced 🛛 🗧 🗧	< /alue
Y Local Computer			PFS Volume
V III KINGSTON SA400537120G	0 50026B77843A5	6 Crypto context	PES-1
Section Section	+	Load and apply crypto context Export crypto context	38.28 GB (499708512 Sectors)
Microsoft reserved part		Loaded: D:\R-Studio\APFS\Broken_APFS\APFS-1.ccxt	Deleted
Se C:	- System		
Windows Recovery Par		Kev	× bf2-3f35-4a08-a7c4-89758fe3fa48
VINDOWS RECOVERY PAR		Select a proper key type and enter the key to unlock	Sectors)
D:	Data	APFS-1:	(Sectors)
		Password	20
 m.2 Smartbuy S11-2280T 2 		Input format: ANSI string	82
System Partition	•	alpuc formac: Ansi scring	
 APFS Container 	•	0000000	
APFS-1	APFS-1		
APFS-2	APFS-2		
APFS-3	APFS-3		
		Unlock	
Log		Cancel]
Type Date	Time	Text	-
		uccessfully loaded user's file types definitions from "C:\Program Fi	iles (x86)\R-Studio Technician\Presets\UserKnownFileTv
		uccessfully loaded user's RAID layouts from "C:/Program Files (x86	
		he crypto context D:\R-Studio\APFS\Broken_APFS\APFS-1.ccxt wa	
Ready			

Note that the password will be explicitly shown.

R-Studio will open files on the volume.

Files opened on the deleted APFS volume



Apple Fusion Drive

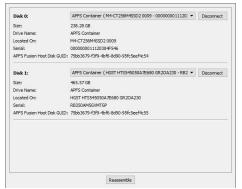
R-Studio detects components of Apple Fusion Drive and creates virtual Fusion Drives automatically. At the same time, **R-Studio** gives access to the individual components of the Fusion Drives (drives and images).

Fusion Drive in R-Studio

Device/Disk	Label	FS	Start	Size
🗸 💻 Local Computer				
V SHIBA DT01ACA100 MS2OA	44H5ATLKS	#0 SAT	0 Bytes	931.51 GB
Volume(3303cc57-3e4d-45.*	Recovery	NTFS	1 MB	300 MB
Volume(edb1043b-3073-41.r.		FAT32	301 MB	100 MB
Microsoft reserved partition			401 MB	128 MB
🥯 G 👻 👻	System	NTFS	529 MB	291.57 GB
Volume(44fd3858-351c-43f x		NTFS	292.09 GB	450 MB
Volume(e0a573f2-14d5-40		NTFS	292.53 GB	450 MB
🥪 D: 👻	Data	NTES	292.97 GB	638.54 GB
Empty Space ²⁵			931.51 GB	1.69 MB
V Se HGST HTS545050 Fusion Drive	e components .	#1 SAT	0 Bytes	465.76 GB
Volume(6b12/42t-b50a-48		FAT32	20 KB	200 MB
👐 Basic data partition 👻			200.02 MB	465.57 GB
M4-CT256M4SSD2 0009	00000001112030	#2 SAT	0 Bytes	238.47 GB
Volume(523cd3cd-4364-4dπ		FAT32	20 KB	200 MB
🖙 HarddiskVolume11 👻			201 MB	238.28 GB
 Virtual Volume sets and RAIDs 				
✓ ● APFS Fusion Container				703.85 GB
APFS_Fusion_Test	APFS_Fusion_Test	APFS	0 Bytes	703.85 GB
		Fusior	Drive	

When an automatically created Fusion Drive is selected, **R-Studio** highlights its components. **R-Studio** shows the components of the Fusion Drive on its APFS Fusion Components tab.

Fusion Drive Components tab



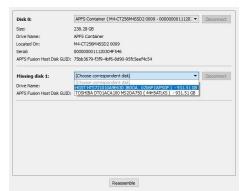
R-Studio shows broken Fusion Drive s in pink.

Device/Disk	Label	FS	Start	Size
Local Computer				
V STOSHIBA DT01ACA100 MS2OA	44H5ATLKS	#0 SAT	0 Bytes	931.51 GB
Volume{3303cc57-3e4d-45.x	Recovery	NTFS	1 MB	300 MB
🧼 Volume{edb1043b-3073-41🛪		FAT32	301 MB	100 MB
Microsoft reserved partition			401 MB	128 MB
🥯 G 🗸 👻	System	NTFS	529 MB	291.57 GB
Solume{44fd3858-351c-43f x		NTFS	292.09 GB	450 MB
Volume{e0a573f2-14d5-40		NTFS	292.53 GB	450 MB
🥯 D: 👻	Data	NTFS	292.97 GB	638.54 GB
Empty Space25			931.51 GB	1.69 MB
HGST HTS721010A9E630 JB00	JR10206P1WPS0F	#1 SAT	0 Bytes	931.51 GB
✓ Volume(7b838964-3992-4d.★		FAT32	20 KB	200 MB
🍩 Data 👻	Data	HFSX	200.02 MB	931.19 GB
Empty Space28			931.39 GB	128.00 MB
M4-CT256M4SSD2 0009	00000001112030	#2 SAT	0 Bytes	238.47 GB
Volume{523cd3cd-4364-4dx		FAT32	20 KB	200 MB
See HarddiskVolume11 🔹			201 MB	238.28 GB
Virtual Volume sets and RAIDs				
Y 🕞 APFS Fusion Container				238.28 GB
APFS_Fusion_Test	APFS_Fusion_Test	APFS	0 Bytes	703.85 GB

Broken Fusion Drive in R-Studio

The Fusion Drive Components tab also allows you to manually disconnect or connect the components, for example, if they are such damaged that **R-Studio** cannot recognize them as parts of a broken Fusion Drive. Select the object from the drop-down box and click the **Connect** button. **R-Studio** displays the objects it recognizes as the components of the Fusion Drive in blue.

Adding a component manually



You may immediately switch to the Fusion Drive configuration that **R-Studio** believes most probable by clicking the **Reassemble** button.

R-Studio shows Fusion Drive with manually added components in blue:

Fusion Drive with added members in R-Studio

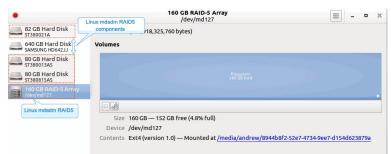
Device/Di	sk	Label	FS	St	art	Size
Local Computer			#0 SAT			931.51 GB
				0 Byte		
	03cc57-3e4d-45. x	Recovery	NTFS	1 MB		300 MB
	lb1043b-3073-41 		FAT32	301 M	-	100 MB
	reserved partition			401 M	-	128 MB
🥯 C:		System	NTFS	529 M	-	291.57 GB
Solume Volume 44	fd3858-351c-43f .r .		NTFS	292.09	GB	450 MB
Solume{e0	a573f2-14d5-40 7		NTFS	292.53	GB	450 MB
🧼 D:	Manually ad	ded Fusion Driv	e compo	nent	GB	638.54 GB
Empty Spa				201.0	GB	1.69 MB
Y SHGST HTS7210	10A9E630 JB0O	JR10206P1WPS0F	#1 SAT	0 Byte	5	931.51 GB
Se Volume(7b	838964-3992-4d. x		FAT32	20 KB		200 MB
🥯 Data	-	Data	HFSX	200.02	MB	931.19 GB
APFS Fusio	n-VirtualPv-75b			201 M	B	931.32 GB
Sempty Spa	ce28			931.39	GB	128.00 ME
✓ ✓ M4-CT256M45	SD2 0009	000000001112030	#2 SAT	0 Byte	s	238.47 GB
Solume{52	3cd3cd-4364-4d.		FAT32	20 KB		200 MB
See HarddiskV	olume11 👻			201 M	в	238.28 GB
Virtual Volume sets an	d RAIDs					
Y 🕼 APFS Fusion C	ontainer					1.14 TB
APFS_Fusio	on Test	APFS_Fusion_Test	APFS	0 Byte	s	703.85 GB

2.4.12.6 Linux mdadm RAIDs

mdadm is a Linux utility used to manage and monitor software RAID devices.

R-Studio supports such devices and when drives from a mdadm RAID are connected to a Windows computer, it automatically detects them and assembles mdadm RAIDs accordingly.

Linux mdadm RAIDs



R-Studio detects components from mdadm RAIDs and creates those RAIDs automatically. At the same time, **R-Studio** gives access to the components of those RAIDs (drives and images).

mdadm RAIDs in R-Studio

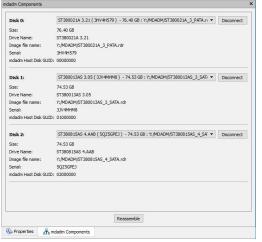
Device/Disk	Label	FS	Start	Size	
V TOSHIBA DT01ACA100 MS2OA750	44H5ATLKS	#0 SATA	0 Bytes	931.51 GB	
↔ Volume{3303cc57-3e4d-4507-872f .	Recovery	NTFS	1 MB	300 MB	
Volume(edb1043b-3073-4184-a4d5-x.		FAT32	301 MB	100 MB	
Microsoft reserved partition			401 MB	128 MB	
÷0.	System	NTFS	529 MB	291.57 GB	
Volume[44fd3858-351c-43f0-8439-1.		NTFS	292.09 GB	450 MB	
See Volume(e0a573f2-14d5-4047-adfc-3 x .		NTFS	292.53 GB	450 MB	
🥯 D: 👻	Data	NTFS	Linux mda		
Empty Space20					
WDC WD10EACS-00ZJB0 01.01B01	WD-WCASJ0409502	#1 SATA	compo	onents	
🤪 Y: 👻	Backup II	NTFS	1 MB	931.51 GB	
V Image					
🛩 🥪 ST380815AS 4.AAB	5QZ5GPEJ	#1 SATA	0 Bytes	74.53 GB	
See Partition1			512 Bytes	2.00 TB	
✓ Image					
ST380021A 3.21	3HV4H579	ATAPI	0 Bytes	76.40 GB	
V Image					
🛩 🥌 ST380013AS 3.05	3JV4MHM8	#1 SATA	0.0.4	74 63 68	
Se Partition1			Linux md	adm RAID	
Virtual Volume sets and RAIDs			the same of states		
virt-mdadm-andrew-System-Product		Ext4		223.40 GB	

If recognized components of a mdadm RAID, including drive images, are added to **R-Studio** later, it automatically adds them to their respective mdadm RAID.

When an automatically created mdadm RAID is selected, **R-Studio** highlights its components.

R-Studio shows the components of the mdadm RAIDs on its mdadm Components tab.

mdadm Components tab



R-Studio shows broken mdadm RAIDs in pink.

Broken mdamd RAIDs in R-Studio

Device/Disk		Label	FS	Start	Size
Local Computer					
V STOSHIBA DT01ACA100 MS2OA750		44H5ATLKS	#0 SATA	0 Bytes	931.51 GB
Volume{3303cc57-3e4d-4507-872f-	.7 1	Recovery	NTFS	1 MB	300 MB
Volume{edb1043b-3073-4184-a4d5	j- <u>x</u> .		FAT32	301 MB	100 MB
Microsoft reserved partition	•			401 MB	128 MB
🥯 C:	-	System	NTFS	529 MB	291.57 GB
Volume{44fd3858-351c-43f0-8439-	1		NTFS	292.09 GB	450 MB
Volume{e0a573f2-14d5-4047-adfc-	3π.		NTFS	292.53 GB	450 MB
🍩 D:	¥ 1	Data	NTFS	292.97 GB	638.54 GB
Empty Space20				931.51 GB	1.69 MB
WDC WD10EACS-00ZJB0 01.01B01	1	WD-WCASJ0409502	#1 SATA	0 Bytes	931.51 GB
🥪 Y:	-	Backup II	NTFS	1 MB	931.51 GB
Y 📙 Image					
ST380021A 3.21	-	3HV4H579	ATAPI	0 Bytes	76.40 GB
Y 📙 Image					
👻 🥪 ST380013AS 3.05	1	3JV4MHM8	#1 CATA	0.0.4	7452.00
Partition1			Broke	en Linux mo	dadm RAID
Virtual Volume sets and RAIDs					T

The mdadm Components tab also allows you to manually disconnect or connect the components, for example, if they are such damaged that **R-Studio** cannot recognize them as parts of a broken mdadm RAID. Select the object from the drop-down box and click the **Connect** button. **R-Studio** displays the objects it recognizes as the components of the mdadm RAID in blue.

Adding a component manually



You may immediately switch to the mdadm RAID configuration that **R-Studio** believes most probable by clicking the **Reassemble** button.

R-Studio shows mdadm RAIDs with manually added components in blue:

Drives						
v 🗖	Loi	Device/Disk cal Computer	Label	FS	Start	Size
~	5	TOSHIBA DT01ACA100 MS2OA750	44H5ATLKS	#0 SATA	0 Bytes	931.51 GB
		Solume{3303cc57-3e4d-4507-872f	Recovery	NTFS	1 MB	300 MB
		🖙 Volume{edb1043b-3073-4184-a4d5- x		FAT32	301 MB	100 MB
		Served partition			401 MB	128 MB
		🗢 C: 🗸 🗸	System	NTFS	529 MB	291.57 GB
		Wolume{44fd3858-351c-43f0-8439-1.		NTFS	292.09 GB	450 MB
		See Volume{e0a573f2-14d5-4047-adfc-3x		NTFS	292.53 GB	450 MB
		🥯 D: 👻	Data	NTFS	292.97 GB	638.54 GB
		Second Se			931.51 GB	1.69 MB
~		Image ST380815AS 4.AAB Partition1	5 Manually adde	ed mdadm	RAID comp	5-
~	-	Image		*****	512 Bytes	2.00 TB
		ST380021A 3.21	3HV4H579	ATAPI	0 Bytes	76.40 GB
~		Image				
	~	ST380013AS 3.05	3JV4MHM8	#1 SATA	0 Bytes	74.53 GB
		Partition1			512 Bytes	2.00 TB
¥	÷	WDC WD10EACS-00ZJB0	201312180130	#71ISR (O Ruter	031 51 GB
✓ Vir	ual	See Y: Volume sets and RAIDs	mdadm RAID with	a manually	added com	ponent 3
		virt-mdadm-andrew-System-Product	*******************	Ext4		148.94 GB

mdadm RAIDs with added components in R-Studio

2.4.12.7 Linux LVM/LVM2

Linux LVM is a logical volume manager for the Linux OS that manages drives and other data storage devices. Using it, It is possible to create single logical volumes on several physical drives, add and replace them in a running system, resize logical volumes, create various RAID configuration, and so on. You may read more about Linux LVM in our article: <u>What is Logical Volume Manager (LVM)</u>.

 File Tools View Help

 Volume Croups

 VLVM_Test

 /dev/sdd1

 /dev/sd1

 /dev/sd21

 /dev/sd21
 </

LVM volume example

R-Studio detects drives from LVMs and creates their virtual volumes automatically. At the same time, **R-Studio** gives access to the components of the virtual LVM volumes (drives and images).

Device/Disk	Label	FS	Start	Size
Y 💻 Local Computer				
TOSHIBA DT01ACA100 MS2OA750	44H5ATLKS	#0 SATA	0 Bytes	931.51 GB
Volume{3303cc57-3e4d-4507-872f	Recovery	NTFS	1 MB	300 MB
Volume{edb1043b-3073-4184-a4d5-x.		FAT32	301 MB	100 MB
See Microsoft reserved partition			401 MB	128 MB
👄 C: 👻	System	NTFS	529 MB	291.57 GB
Solume{44fd3858-351c-43f0-8439-1.		NTFS	292.09 GB	450 MB
Volume{e0a573f2-14d5-4047-adfc-3x.		NTFS	202 52 60	ALO A AR
🧼 D: 👻	Data	NTFS	LVM Components GE	
Empty Space21			931.51 GB	59 MB
V S UFD 2.0Silicon-Power4G 1100	AA0000000000485	#1 USB (0 Bytes	3.75 GB
Partition1			1 MB	3.75 GB
V S UFD 2.0Silicon-Power4G 1100	AA0000000000485	#2 USB (0 Bytes	3.75.00
Partition1			1 MB	LVM Volume

LVM Volumes in R-Studio

If recognized components of an LVM volume, including drive images, are added to **R-Studio** later, it automatically adds them to their respective LVM volume.

When an automatically created LVM volume is selected, **R-Studio** highlights its components.

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R-Studio shows the components of the LVM volume on its LVM Components tab.

LVM Components tab

Disk 0:	Partition1 (UFD 2.0Silicon-Power4G 1100 - AA0000000000485) - 3.75 GB	•	Disconnect
Size:	3.75 GB		
Drive Name:	Partition1		
Located On:	UFD 2.0Silicon-Power4G 1100		
LVM Object Name:	pv0		
Serial:	AA000000000485		
LVM Host Disk GUID:	zsiwUQ-j1US-TFev-6Uhd-4Fqb+HYXr-LbGgyi		
Disk 1:	Partition1 (UFD 2.0Silicon-Power4G 1100 - AA0000000000485) - 3.75 GB	•	Disconnect
Size:	3.75 GB		
Drive Name:	Partition 1		
Located On:	UFD 2.0Silicon-Power4G 1100		
LVM Object Name:	pv1		
Serial:	AA000000000485		
LVM Host Disk GUID:	HISI1D-pFA4-3bdW-6G0j-813I-9Pw5-mDFjKD		
	Reassemble		

R-Studio shows broken virtual LVM volumes in pink. **Broken LVM volumes in R-Studio**

Drives				>
Device/Disk	Label	FS	Start	Size
Y 💻 Local Computer				
TOSHIBA DT01ACA100 MS2OA750	44H5ATLKS	#0 SATA	0 Bytes	931.51 GB
Volume(3303cc57-3e4d-4507-872f*	Recovery	NTFS	1 MB	300 MB
Volume{edb1043b-3073-4184-a4d5-x.		FAT32	301 MB	100 MB
Served partition			401 MB	128 MB
😔 G 🗸 🗸	System	NTFS	529 MB	291.57 GB
Volume{44fd3858-351c-43f0-8439-1		NTFS	292.09 GB	450 MB
Volume(e0a573f2-14d5-4047-adfc-3π.		NTFS	292.53 GB	450 MB
🥯 D: 👻	Data	NTFS	292.97 GB	638.54 GB
Empty Space21			931.51 GB	1.69 MB
Y 🖙 UFD 2.0Silicon-Power4G 1100	AA0000000000485	#1 USB (0 ~ ~	
Service Partition1			1 Broken I	VM Volume
 Virtual Volume sets and RAIDs 				
EVM_Test-LVM_Test_Vol		Ext4		

The LVM Components tab also allows you to manually disconnect or connect the components, for example, if they are such damaged that **R-Studio** cannot recognize them as parts of a broken LVM volume. Select the object from the drop-down box and click the **Connect** button. **R-Studio** displays the objects it recognizes as the components of the LVM volume in blue.

Adding a component manually

1 Components				
Disk 0:	Partition1 (UFD 2.0Silicon-Power4G 1100 - AA0000000000485) - 3.75 GB 🔹	Disconnect		
Size:	3.75 GB			
Drive Name:	Partition 1			
ocated On:	UFD 2.0Silicon-Power4G 1100			
VM Object Name:	pv0			
erial:	AA000000000485			
VM Host Disk GUID:	zslwUQ-j1US-TFev-6Uhd-4Fqb-HYXr-LbGgyi			
Missing disk 1:	[Choose correspondent disk]	Disconnect		
ize:	[Choose correspondent disk] UED 2,05ilicon-Power4G 1100 (AA00000000000485) - 3,75 GB			
Drive Name: VM Host Disk GUID:	UFD 2.05/iicon-Power4G 1100 (AA000000B : C:/Containers/LVM2_Mirror_2_4G.rdr TOSHIBA DT01ACA300 MS20A750 (44H5ATLKS) - 931 51 GB			

You may immediately switch to the LVM volume configuration that **R-Studio** believes most probable by clicking the **Reassemble** button.

R-Studio shows virtual LVM volumes with manually added components in blue:

LVM volumes with added components in R-Studio

Drives					>
Device/Disk		Label	FS	Start	Size
V STOSHIBA DT01ACA100 MS2OA750	44H	5ATLKS	#0 SATA	0 Bytes	931.51 GB
Volume{3303cc57-3e4d-4507-872f	. Reci	overy	NTFS	1 MB	300 MB
Volume{edb1043b-3073-4184-a4d5-	π.		FAT32	301 MB	100 MB
Microsoft reserved partition	•			401 MB	128 MB
🥯 C:	▼ Syst	em	NTFS	529 MB	291.57 GB
Volume{44fd3858-351c-43f0-8439-1	π.		NTFS	292.09 GB	450 MB
Volume(e0a573f2-14d5-4047-adfc-3π.			NITEC	202 52 60	450 MB
🍩 D:	- Data	Manu	ally added I	LVM compo	nent + GB
Empty Space21				931.51 Gb	1.69 MB
V Image					
V 🖙 UFD 2.0Silicon-Power4G 1100	AA0	000000000485	#1 USB (0 Bytes	3.75 GB
See Partition1				1 MB	3.75 GB
Y 🕪 UFD 2.0Silicon-Power4G 1100	۵۵۵	000000000485	#1 LISR (A Ruter	3 75 GB
🍩 F:	LVM	volume with a	manually a	dded comp	onent 5B
 Virtual Volume sets and RAIDs 					
LVM_Test-LVM_Test_Vol			Ext4		7.49 GB

2.5 Data Recovery over Network

Available in the **Corporate and Technician/Y80+** versions. The **Standalone** version works with networks only in the Demo mode.

This chapter explains how to perform data recovery operations over network.

R-Studio has network capabilities that allow the system administrator, using its computer, to recover files on any computers accessible over network.

R-Studio supports the TCP/IP protocol and any protocol supported in Microsoft Network.

R-Studio Agent must be installed on computers where files are to be recovered. This program gives **R-Studio** access to local drives on remote computers over network.

If, due to file system crash, the network computer where you are going to recover your data cannot start, you may use **<u>R-Studio Agent Emergency</u>** to start the computer.

Files can be recovered without *R-Studio Agent* if the computer where the files are to be recovered runs Windows is accessible from a computer also running Windows. In this case, the administrator must have administrator privileges on the remote computer.

You should always disable a firewall and/or antivirus software on the both computers. As an alternative, advanced users may tune them to allow **R-Studio** and *R-Studio* Agent to communicate via network.

All data transmitted over network are encrypted with a strong algorithm for data security. Restoring data over network is very much the same as that on a local computer.

In addition, **R-Studio** can load/save any files like <u>drive images</u>, <u>scan info</u> files, <u>RAID configuration</u> files, from/to the computers to which it has access using *R-Studio Agent*.

- <u>R-Studio Agent</u>
- Data Recovery over Network
- Connecting over the Internet
- 2.5.1 R-Studio Agent

R-Studio Agent is a program that provides **R-Studio** with an access to the drives of a network computer. It should be installed and properly registered on the computer which drives are to be accessed. *R-Studio Agent* has versions for the following PC operating systems:

- <u>Windows</u>
- Mac OS
- Linux

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and there is <u>**R-Studio Agent Emergency</u>** that can be used to start a computer from which you are going to recover data that cannot start other way due to a file system crash, for example. Please, note that you need to use <u>**R-Studio Emergency**</u> as an emergency agent if you want to start an Intel-based Mac computer.</u>

Note: You cannot use this program to start Mac computers based on Apple Silicon.

R-Studio can work equally with all versions of *R-Studio Agent* and access computers run under Windows, Mac OS, and Linux.

You must have enough rights on the remote computer to install and run *R-Studio Agent*.

2.5.1.1 R-Studio Agent for Windows

R-Studio Agent should be installed under an administrator account.

When installed, *R-Studio Agent* starts automatically and runs as a service. To configure it, *R-Studio Agent* should be started again manually.

-	The	following	switches are available:
	1110	iono ming	Switchies are available.

-?	evokes a help screen;
-install	installs <i>R-Studio Agent</i> as a service
-remove	removes <i>R-Studio Agent</i> services
-console	starts <i>R-Studio Agent</i> as a console application

Started without a switch, *R-Studio Agent* runs as a GUI application and its icon appears on the taskbar tray. In this mode, it can be configured and its log may be viewed.

Simply connect to the remote computer providing a desired password for *R-Studio Agent* in the Connect to Remote Computer dialog box. **R-Studio** checks if there is *R-Studio Agent* running on this computer. If not, a Can't connect... message will appear.

Click the Yes button, and R-Studio will remotely install *R-Studio Agent*.

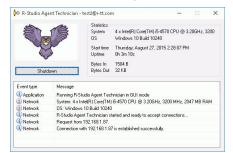
Attention Windows users: R-Studio Agent may be remotely installed over a network from a computer running Windows to another computer running Windows. To do so, you must have administrator accounts on both computers.

0

To access the R-Studio Agent main panel,

- 1 Click its tray icon
- > The main panel will appear. You may view its log

R-Studio Agent main panel



To configure *R*-Studio Agent,

1 Right-click its tray icon and select Configure

2 Specify required parameters on the Please configure R-Studio Agent dialog box and click the OK button

Please configure R-Studio Agent dialog box

assword	•••••		
e-Enter	•••••		
Accepted I	Protocols	Accepted IP Ac	Idresses
Pipes		IP Address	192 . 168 . 1 . 0
TCP/I	P	Subnet Mask	255 . 255 . 255 . 🚺
Port 31			

R-Studio Agent Options

Password:	Enter a password to obtain access to this computer from a network.	
Re-Enter:	Re-enter the password.	
Accepted Protocols		
Pipes	supported by Windows. To improve security, this option should be disabled.	
TCP/IP	supported by any network OS.	
Port	port for incoming connections	
Accepted IP Addresse	es	
IP Address	specifies addresses from which this computer can be accessed.	
Subnet Mask	specifies a subnet mask of the network from which this computer can be accessed.	

> *R-Studio Agent* will now run with the specified parameters

2.5.1.2 R-Studio Agent for Mac

You need to have an administrative account on the Mac computer to start R-Studio Agent for Mac.

To start the R-Studio Agent for Mac and access its main panel,

- 1 Go to the Application folder, double-click R-Studio Agent for Mac, and enter the account password
- > The main panel will appear. You may view its log

R-Studio Agent for Mac main panel



To configure *R*-Studio Agent for Mac,

1 Go to the R-Studio Agent for Mac menu and select Preferences

2 Specify required parameters on the Please configure R-Studio Agent dialog box and click the OK button

Please configure R-Studio Agent Mac dialog box

Password	•••••	•••	
Re-Enter	•••••		
coming cor	nectio	n preferences	
🗹 En	able in	coming connections	
TCP/	IP Port	3174	
ccepted IP /	ddres	s	
IP Ad	dress	192.168.001.001	
Subn	et Mask	255.255.255.000	

R-Studio Agent for Mac Options

Password:	Enter a password to obtain access to this computer from a network.		
Re-Enter:	Re-enter the password.		
Incoming connection preferences			
Enable incoming connections	Select this checkbox if you want to allow incoming connections.		
TCP/IP Port	A TCP/IP port for incoming connections		
Accepted IP Addresse	es		
IP Address	specifies addresses from which this computer can be accessed.		
Subnet Mask	specifies a subnet mask of the network from which this computer can be accessed.		

> *R-Studio Agent for Mac* will now run with the specified parameters

Connecting from R-Studio Agent for Mac to R-Studio.

To establish a connection from R-Studio Agent for Mac to R-Studio,

- 1 Run the **R-Studio** Agent for Mac and select Connect from the Tools menu
- 2 Enter the necessary information on the Connect to R-Studio dialog box and click the Connect button.

Connect to R-Studio dialog box



□ Connect to R-Studio settings

Server	Specify the DNS name or IP address of the host where R-Studio is running.
Port	Specify the port set on the R-Studio Connect to Remote Computer dialog box.
Password	Specify the password set on the R-Studio Connect to Remote Computer dialog box.

> R-Studio Agent for Mac will connect to the computer where R-Studio is running and it will show the drive and logical disk structure of the remote computer.

rives						×
	Device/Disk	Label	FS NTES	Start 1 MB	Size 300 MB	'
	Volume[3303cc57-3e4.x	Recovery				
	🖙 EFI system partition 🔻		FAT32	301 MB	100 MB	-1
	Microsoft reserved par x .			401 MB	128 MB	
	🖙 C: 👻	System	NTFS	529 MB	292.01 GB	
	Volume(e0a573f2-14d. x		NTFS	292.53 GB	450 MB	
	🧼 D: 👻	Data	NTFS	292.97 GB	638.54 GB	
	Empty Space18			931.51 GB	1.69 MB	
	Marvell 91xx Config 1.01					
~	PIONEER DVD-RW DVR-21					
	🥝 E:					
× 😪	Remote Computer	192.168.1.60				
*	🖙 NVidia Hitachi HTS547564	J2180053CAX6XC	SATA2	0 Bytes	596.17 GB	
	🍩 Mac OS 👻	HD	HFS+	0 Bytes	595.37 GB	
	Series EFI System Partition		FAT32	20 KB	200 MB	
	Recovery HD	Recovery HD	HFS+	595.57 GB	619.89 MB	
~	Se WDC WD75 DA-00AWA1	7D577A141262	USB	0 Bytes	6.99 GB	
	Service EFI System Partition		FAT32	20 KB	200 MB	
	Sec. Empty Space29			6.87 GB	128.00 MB	
	See HES-Test	HFS-Test	HFS+	0 Bytes	6.67 GB	

It can be processed the same way as that on a local computer. 2.5.1.3 R-Studio Agent for Linux

You need to have the root privileges to run R-Studio Agent for Linux.

Unlike <u>R-Studio Agent for Windows</u> and <u>R-Studio Agent for Mac</u>, R-Studio Agent for Linux is a console application and should be run in the Terminal. You also need to mark it as an executable before start.

When it is started for the first time, R-Studio Agent for Linux asks for its configuration.

R-Studio Agent for Linux Configuration dialog box



Specify password for incoming connection	Enter a password to obtain access to this computer from a network.
Confirm password for incoming connection	Re-enter the password for confirmation.
Specify IP address	Specifies addresses and a subnet mask from which this computer can be accessed. Enter 0 to allow connections from any address.
Specify TCP/IP Port for listening	A TCP/IP port for incoming connections. Press Enter for the default one [3174].

R-Studio Agent for Linux Options

Don't pay much attention to the warning about "unregistered demo version". If necessary, you'll be able to register R-Studio Agent for Linux through R-Studio.

You may see the current configuration by starting **R-Studio Agent for Linux** with the command rsagent -- show_config.

R-Studio Agent for Linux Configuration dialog box



You may change the current configuration by starting **R-Studio Agent for Linux** with the command rsagent -- configure.

Connecting from R-Studio Agent for Linux to R-Studio.

To establish a connection from R-Studio Agent for Linux to R-Studio,

- 1 Run the R-Studio Agent for Linux and press Enter
- 2 Enter the necessary information

Connect to R-Studio dialog box



> R-Studio Agent for Linux will connect to the computer where R-Studio is running and it will show the drive and logical disk structure of the remote computer.

Drives				
Device/Disk V 💻 Local Computer	Label	FS	Start	Size
Y 🖙 TOSHIBA DT01ACA100 MS	44H5ATLKS	#1 SA	0 Bytes	931.51 GB
Volume[3303cc57-3e4d.x	Recovery	NTFS	1 MB	300 MB
🖙 EFI system partition 🛛 🔻		FAT32	301 MB	100 MB
Microsoft reserved partix.			401 MB	128 MB
🥯 C: 👻	System	NTFS	529 MB	292.01 GB
Volume(e0a573f2-14d5. x		NTFS	292.53 GB	450 MB
🍛 D: 👻	Data	NTFS	292.97 GB	638.54 GB
Empty Space18			931.51 GB	1.69 MB
San Marvell 91xx Config 1.01				
✓ ➢ PIONEER DVD-RW DVR-219				
😃 E				
Y 🧝 Remote Computer	192.168.1.245			
VBOX HARDDISK 1.0	VBdfb5f256-7ee	SATA2	0 Bytes	10.09 GB
🍩 /media/tester/Storage 👻	Storage	Ext4	0 Bytes	10.09 GB
VBOX HARDDISK 1.0	VB55c0fbc5-f8e	SATA2	0 Bytes	103.38 GB
Partition1		Ext4	1 MB	99.38 GB
Partition2			99.39 GB	4.00 GB
		Ext4	1 MB	99.38 GB

It can be processed the same way as that on a local computer.

2.5.2 Data Recovery over Network

Generally, data restoring over network is very much the same as that on a local computer.

*R***-Studio Agent** should be running on the network computer where data are to be recovered.

Read the <u>Connecting over the Internet</u> topic to learn how to establish connection between **R-Studio** and **R-Studio** Agent over the Internet.

To connect to a remote computer

1 Click the Connect to Remote button or select Connect To Remote on the Drive menu and select Connect to the remote computer

A list of nearby computers will appear in the Computer List on the Connect to Remote Computer dialog box.

Connect to Remote Computer dialog box

		ote Computer		1
		note computer om remote compute		
) marcan		on renote compute	~	
Computer:	192.	168.1.63		✓ Port: 3174
assword:	••••	••••		EN
Computers lis Host Na		IP Address	Host OS	Comments
		Connect	Cancel	

2 Select a computer from the list on the Connect to Remote Computer dialog box and enter the password

Otherwise, you need to specify in the Computer: field the name or IP address of the remote computer where data are to be recovered. The Port should coincide with the port specified for the <u>**R-Studio Agent**</u>. The Password: field is for the password of *R-Studio Agent* running on the remote computer. If you want to see the entered password, right-click the field and select **Show password** on the shortcut menu.

Note: If the remote computer is started with **<u>R-Studio Agent Emergency</u>**, leave this field blank.

R-Studio will connect to the remote computer and show its drive and logical disk structure of the remote computer below the device/@lisk structure of your local computer

Drives				
Device/Disk	Label	FS	Start	Size
✓ SAMSUNG SP0411N TW100	S01JJ20XC75851	#0 AT	0 Bytes	37.31 GB
🥯 E 🔹 👻	NTFS-Test	NTFS	32 KB	6.76 GB
🥯 G: 👻	FAT32-TEST	FAT32	6.76 GB	6.19 GB
	FAT-TEST	FAT16	12.95 GB	2.01 GB
Volume[c7e018fa-2f05-	HFS-Test	HFS+	14.96 GB	6.67 GB
🍩 HarddiskVolume5 🛛 🕶	Ext4FS-Test	Ext4	21.63 GB	6.52 GB
🥯 U: 👻	Double	NTFS	28.15 GB	9.15 GB
> 🧼 TOSHIBA DT01ACA100 MS	44H5ATLKS	#1 SA	0 Bytes	931.51 GB
Marvell 91xx Config 1.01				
✓ ➢ PIONEER DVD-RW DVR-219				
3 E				
Y 🏽 Remote Computer	192.168.1.63			
 WBOX HARDDISK 1.0 	VB737fc0ed-546	#0 AT	0 Bytes	40 GB
🥯 C: 👻	Windows 10	NTFS	1 MB	40.00 GB
 WBOX HARDDISK 1.0 	VB2fe89676-23e	#1 AT	0 Bytes	1 GB
🥯 E: 🗸	TestVHD	NTFS	64 KB	1021 MB
VBOX CD-ROM 1.0				
🥝 D:				

It can be processed the same way as that on a local computer.

Recover dialog box

Main Advanced	▼ D:\	L
Main Advanced		
Condense successful rest	oration events	Recover alternative data streams
Restore folder structure		Recover security
Restore real folder stri	ucture	Recover extended attributes
Restore from root		Skip files with bad sectors
Recover metafiles		
Ignore file mask	Reset To Default	s Ok Cancel

When the Recover dialog box appears, you may select whether you want to save recovered files on the local or remote computer. Saving recovered files on a remote computer may be useful when the remote computer has a healthy drive because you do not have to transfer files over network. It may be an external USB drive, for example.

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When **R-Studio** connects to the remote computer, it check if *R-Studio Agent* is present and its password. If there is no *R-Studio Agent* installed, **R-Studio** may try to remotely install it. See the <u>R-Studio Agent</u> topic for details.

2.5.3 Connecting over the Internet

Available in the Technician/T80+ only.

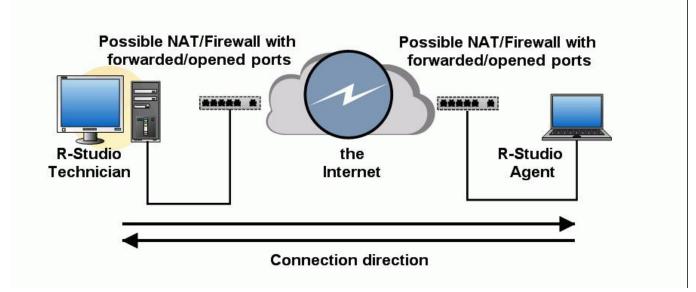
R-Studio and **R-Studio** Agent can be connected over the Internet. The connection can be made either using IP addresses or DNS names.

If hosts where **R-Studio** and **R-Studio** Agent are running have public IP addresses the connection can be made the same way as for the local network, except that the IP address or DNS name should be explicitly specified in the Computer filed the Connect to Remote Computer dialog box

If either (or both) of the hosts are on private networks behind NATs and firewalls and do not have public IP addresses, the corresponding ports should be opened or forwarded. In addition, connection should be made either only from **R-Studio** or from **R-Studio** Agent.

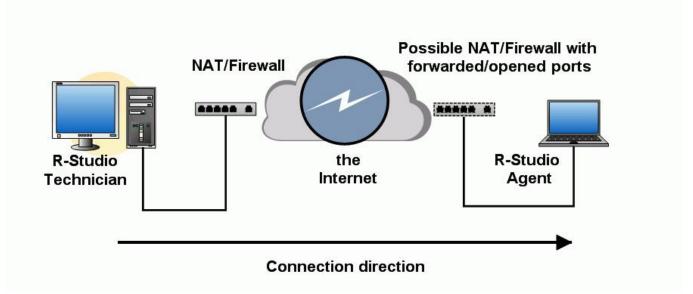
Connection directions

* Both R-Studio and R-Studio Agent have public IP addresses (no <u>NAT</u>/Brewall) or the ports on the NAT/? firewall are forwarded/opened.



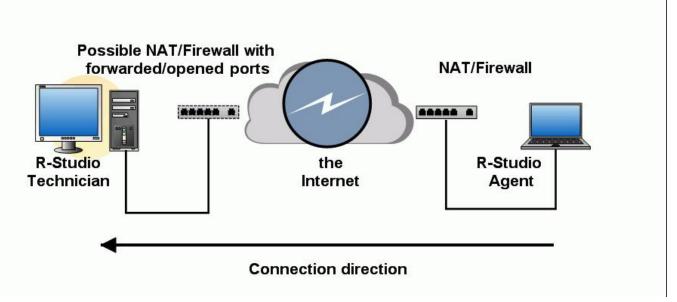
A connection can be made either from **R-Studio** or from **R-Studio** Agent.

* R-Studio is behind a NAT and R-Studio Agent has a public IP address or the ports on its NAT/Brewall are forwarded/opened.

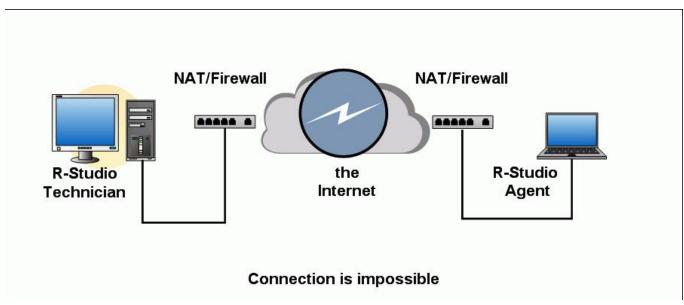


A connection should be made from **R-Studio**.

* **R-Studio** has a public IP address or the ports on its NAT/@rewall are forwarded/@pened and R-Studio Agent is behind a NAT.



A connection should be made from **R-Studio Agent**.



* Both R-Studio and R-Studio Agent are behind NATs/farewalls.

No connections are possible.

Connection from R-Studio Agent to R-Studio

R-Studio settings

If a connection is to be made from **R-Studio Agent** to **R-Studio**, **R-Studio** should be set to accept connection on the Connect to Remote Computer dialog box.

Connect to Remote Computer dialog box

Walt connection	from remote compute	r)	
Allow connection	from any address		
Allow connection	from the host:		
IP Address:			Port: 8080
Subnet Mask:			
sword:			
nouters list:			
nputers list: Host Name	IP Address	Host OS	Comments
	IP Address	Host OS	Comments
nputers list: Host Name	IP Address	Host OS	Comments
	IP Address	Host OS	Comments
	IP Address	Host OS	Comments

Select Wait connection from remote computer, and specify options for incoming connections.

R-Studio Incoming Connection Options

Password:	Enter a password to obtain access to this computer from a network.
Allow connection from any address	Select this option if you want to allow connections to R-Studio from any IP address
Allow connection from the host	Select this option if you want to allow connections to R-Studio from a specific IP address or a network
IP Address	specifies addresses from which this computer can be accessed.
Subnet Mask	specifies subnet mask of the network from which this computer can be accessed.

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Port pc

port for incoming connections.

R-Studio will wait for an incoming connection.

Waiting for remote connection dialog box

	Stop	>
Waiting for remote connection		

Connecting from R-Studio Agent to R-Studio.

To establish a connection from R-Studio Agent to R-Studio,

(See the <u>**R-Studio Agent for Mac</u> or <u>R-Studio Agent for Linux**</u> help page to learn how to establish connections from those **R-Studio Agent** versions).</u>

- 1 Right-click the R-Studio Agent tray icon and select Connect
- 2 Enter the necessary information on the Connect to R-Studio dialog box and click the Connect button.

Connect to R-Studio dialog box

rver:	rstudio.example.com	Port:	8080	
sword:	•••••			

■ Connect to R-Studio settings

Server	Specify the DNS name or IP address of the host where R-Studio is running.
Port	Specify the port set on the R-Studio Connect to Remote Computer dialog box.
Password	Specify the password set on the R-Studio Connect to Remote Computer dialog box.

> R-Studio Agent will connect to the computer where R-Studio is running and it will show the drive and logical disk structure of the remote computer.

Drives					
Device		Label	FS	Start	Size
Y 🧼 SAMSUN	G SP0411N TW100	S01JJ20XC75851	#0 AT	0 Bytes	37.31 GB
🥯 F:		NTFS-Test	NTFS	32 KB	6.76 GB
🥯 G:	•	FAT32-TEST	FAT32	6.76 GB	6.19 GB
🥯 H:	Ŧ	FAT-TEST	FAT16	12.95 GB	2.01 GB
🥯 Volur	ne{c7e018fa-2f05	HFS-Test	HFS+	14.96 GB	6.67 GB
🍛 Hardi	diskVolume5 🔹	Ext4FS-Test	Ext4	21.63 GB	6.52 GB
🧼 U:		Double	NTFS	28.15 GB	9.15 GB
> 🥯 TOSHIBA	DT01ACA100 MS	44H5ATLKS	#1 SA	0 Bytes	931.51 GB
Se Marvell 9	1xx Config 1.01				
Y 😃 PIONEER	DVD-RW DVR-219				
3 E:					
🗸 😹 Remote Com	puter	192.168.1.63			
Y 🥪 VBOX HA	RDDISK 1.0	VB737fc0ed-546	#0 AT	0 Bytes	40 GB
🥯 G	Ŧ	Windows 10	NTFS	1 MB	40.00 GB
Y SOX HA	RDDISK 1.0	VB2fe89676-23e	#1 AT	0 Bytes	1 GB
🧼 E:		TestVHD	NTFS	64 KB	1021 MB
VBOX CD	-ROM 1.0				
2 D:					

It can be processed the same way as that on a local computer.

III R-Studio Technician/T80+

R-Studio Technician/T80+ Demo can perform all data recovery actions except saving recovered files greater than 1MB and multi-pass imaging.

The **R-Studio T80**+ version requires an active internet connection to run and register. You may read more about **R-Studio T80**+ in our article <u>R-Studio T80+ - A Professional Data Recovery and Forensic Solution for Small</u> <u>Business and Individuals Just for US\$1/day.</u>

			R-Stı	idio Ma	ain Tech	nician/T80+ pane	I
😂 R-STUDIO	Technician - Device view					-	– – ×
<u>Drive</u> reate	<u>T</u> ools <u>V</u> iew <u>H</u> elp						
Refresh Show	W Files Show Files (Advanced	d) Scan Partition	Search	Create Image	Open Image	Create Region Start Runtime In	mage RAIDs Connect To Remote Remove I/O Monitor
Device view	N						
	Device/Disk	Label	j/Interfac	Start	Size	Name	Value
🖳 Local C	omputer (2 hidden devices)					Drive Type	Physical Drive, Disk
👻 😰 Hita	achi HTS545016B9SA00 P	100713PBPB08E	#2 SATA	2, HDD	149.05 GB	Name	Hitachi HTS545016B9SA00 PBBOC64G
		NTFS-Test	NTFS	512 KB	28.69 GB	OS Object	\\.\PhysicalDrive2
	F: 👻	FAT32-TEST	FAT32	28.69 GB	26.27 GB	R-Studio Driver	WinNT\Handle\Physical
🥯 G: 🔻		FAT-TEST	FAT16	54.96 GB	2.01 GB	Size	149.05 GB (312581808 Sectors)
🥯 E: 🗸 🔻		ExFAT	exFAT	56.97 GB	11.72 GB	Logical Sector Size	512 Bytes
See Partition5		HFS	HFSX	68.69 GB	21.48 GB	Physical Sector Size	512 Bytes
9	Partition6 -	EXTES	Ext4	90.17 GB	25.02 GB	Partition Size	149.05 GB (312581808 Sectors)
v 🍛	Partition7 -	XFS	XFS	115.19 GB	33.86 GB	I/O Retries	Default 🔹
	💥 Reformatted1		NTFS	0 Bytes	33.86 GB	✓ Drive Control	
						Maximum Transfer	128 KB 🔹
						I/O Block Size	512 Bytes 🔹
						Buffer Alignment	4 Bytes 🔹
						✓ Physical Drive Geometry	
						Cylinders	19457
						Tracks Per Cylinder	255
						Properties S.M.A.R.	л.
og							
Type Date Time					Text		
i) System	12/4/2024 12:03	3:22 PM Suce	Successfully loaded user's file types definitions from "C:\Program Files (x86)\R-Studio Technician\Presets\UserKnownFileType1.xml"				
			Successfully loaded user's RAID layouts from "C:/Program Files (x86)/R-Studio Technician/Presets/RAID6RS.xml"				

R-Studio Technician has additional controls on its main panel.



Start runtime image

Click this button to start <u>runtime imaging</u> of the selected object.

(Technician/T80+ versions only)



I/O Monitor Click this button to open <u>I/O Monitor</u>.



Show Files (Advanced)

Click this button to start <u>enumerating files with minimum disk</u> <u>access</u>.

This chapter covers features that available only in the **R-Studio Technician/T80+** versions have additional features that are not available in other versions:

• **<u>USB Activation</u>** (Technician only)

- Portable version
- <u>Multitasking</u>
- **Show Files (Advanced)**
- Additional Recovery Options
- Mounting Virtual Objects to the System as Virtual Drives
- Hidden Devices
- File Information
- <u>Symbolic Link Processing</u>
- <u>Custom Recovery Lists</u>
- Drive Copy Wizard
- File Maps
- <u>I/O Monitor and Sector Map files</u>
- <u>Runtime Imaging</u>
- Multi-pass Imaging
- <u>Reverse RAIDs</u>
- Working with the Third-Party Hardware
- Forensic Mode

Some other information about **R-Studio Technician/T80+** is shown on the following pages:

- <u>R-Studio Settings</u>
- Drive Scan
- Images
- <u>BitLocker Drive Encryption</u>
- <u>Apple CoreStorage/FileVault/Fusion Drive Volumes</u>
- Connecting over the Internet
- Supported Virtual Disk and Disk Image Formats

3.1 USB Activation

The **R-Studio Technician** license provides the ability to create an activation USB, which allows the licensee to activate/verify the license in a completely offline mode using a supported USB stick selected by the licensee. The article <u>R-Studio Technician: activation using a USB stick</u> explains this process in more detail.

The activation USB can be used not only to verify the license, but also to add **R-Studio Technician Portable** and one of the versions (based on WinPE or Linux) of the bootable **R-Studio Technician Emergency** (Startup version). It means that a technician version licensee can create a universal USB stick and use it to run **R-Studio Technician** on any computer online or offline, running OS or with a damaged OS, at a facility with or without Internet access.

Creating an Activation Stick

To create an activation USB stick you need a working Internet connection.

1. Run **R-Studio**, go to the Help, and select Create Activation USB.

2. Select one of the supported USB sticks and click the OK button. USB devices that are not supported for creating an activation stick will not be displayed in the list.

R-Studio will display a message about the completion of the operation, and from this moment on, this **R-Studio Technician** license will be automatically activated when you start the software with the USB stick connected to the serviced computer. Internet connection and online activation will no longer be required

Erased, Damaged or Lost Activation Stick

The same activation stick with corrupted data but with working hardware

Quick format doesn't erase the activation information, even if the USB stick been formatted to another file system.

If the data on the activation stick has been completely erased, you can recreate the activation data on the same stick. There are no limitations for the activation stick recreation ON THE SAME USB DEVICE.

The activation stick is lost or damaged.

You can temporally activate the installed **R-Studio Technician** over the Internet and contact $\underline{\text{R-TT}}$, Inc <u>customer support</u> for assistance.

3.2 **Portable version**

R-Studio Technician may be installed on and run from, a removable device like a USB memory stick. This portable version has all functionality of an installable version and can be used on any Windows computer. It can be installed on the USB Activation Stick in necessary. The article <u>R-Studio Technician: activation using a USB stick</u> explains how.

R-Studio Technician Portable creation

A device for the portable version should have approximately 500 MB of free space.

Select Creation a portable version... on the Installation mode panel during installation.

Installation mode

R-Studio Tech	nician 9.3 Setup				-		×
	What	do you wan	t to do?				
-200	Selec	t installation m	ode				
) Install Softv	are						
	Install R-Studio Tec	thnician 9.3 on	this comput	er.			
0							
~ I	table version on a		errored .				
	Select this option if of your customers 1				9.3 on t	the compu	iters
	. ,						
R-Tools Technolog							
R-Tools Technolog	inc		< Back	Next	_	Can	

and continue installation process.

R-Studio Technician Portable start.

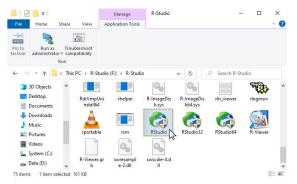
Insert the removable device with R-Studio Technician Portable

R-Studio Technician starts automatically if AutoRun and AutoPlay services are enabled. If they are disabled, go to the device and start the program manually.

R-Studio Technician Portable start

File Hom	R-Studio (I	View	Manage Drive Tools					×
Navigation Panes	Extra lar	0.00	Small icons Details	4 4 4	Current view •	Show/	Options	
 Docum Downlo Music Pictures Videos System 	ads ; (C:)	R-Studio	autor	n				
🐅 Data (D: 🛖 VirtMac 🕞 R-Studi								

R-Studio Technician Portable start



R-Studio Technician Portable activation

Sometimes R-Studio Technician Portable may need activation. You may do it the following way:

* If there's a working internet connection for the computer: enter the registration code for **R-Studio Technician Portable**.

R-Studio Technician Portable start

Contract Contract	Tester 1
Company optional)	R-TT Testing Team
Registration (ey	DgkEtlwAeXRB4SrpOp+gQWSAOEsAAsecHgr7MDT3GqdVp0UDh Is IP2xl3 mk958Hz9Yjftgertewrte4eCS2XH24ryyASLHT6GuPQSHIAvcc6HybHoGCA ==
Co	
	The software registration key found on your computer is not valid for the version you are starting.

If there's no internet connections: You need to manually obtain an activation code to complete the registration. The Online Activation dialog window will appear.

R-Studio Technician Portable Online Activation dialog box



You may copy the url with the activation information and go to it on another computer connected to the Internet, obtain the activation code, and enter it into the respective field on the dialog box.

You may also use your smartphone to activate **R-Studio**. Scan the QR-code and go to the specified URL, obtain the activation code, and finish program activation.

R-Studio Technician Portable operation

You may work with the same way as with an installed **R-Studio Technician**, including its work with data recovery hardware.

R-Studio Technician Portable with data recovery hardware

Drive Create	5	•		1			4	5	-	D	
Refresh Show	Files Show Files (Advanced)	Scan Partition Searc	h Creat	e Image Ope	en Image Cre	ate Region Start Ru	ntime Image	RAIDs Cor	nnect To Remote Remove I/O Monitor	
	Device/Disk		Label	S/Interfac	Start	Size	1				_
🗸 🛄 Local Co			Luber	Sy meen of	June	Size	Deer	oSpar U	SB Stabiliz	er Pro: DSU20499 🔯 🛛 🚺	
			S2G0NX0H523494	#0 SATA2	CCD	119.24 GB					-
			5200INX0F1323494				Bad sectors proce	essing:	Mode: HDD 🔻	Speed optimization	
	Fl system partitio			FAT32	1 MB	100 MB	Repower duration	n:	2000msec 💲	Aggressive speed optimization	
	Aicrosoft reserved	partition •			101 MB	16 MB	USB speed:		Auto 👻	Turn off drive if inactive	
C: Bitocker C: [Volume] Windows Recovery Partition Windows Windows Recovery Partition Windows Windows WDEVF				BitLocker		118.12 GB	USB speed:				
				118.12 GB	GB Response to write attempts: Ignore 🔻 🗌 Report drive as read-only						
				NTFS	117 MB	118.12 GB	Read timeout		2000msec 🗘	Disable ATA-over-USB	
		Partition		NTFS	118.24 GB	1.01 GB			2000mace		
		200BEVT	WD-WXE808HN38	DeepSpar	HDD	111.79 GB	Reset Pas	sword Unloc	k Edit algorith	m Apply	
🥪 P	artition1		NTFS-Good	NTES	1 MB	39.09 GB	harmonia in				-
se P	artition2		NTES-Bad	NTES	39.09 GB	72.70 GB	Name		Value		
Y NIED	2.0Silicon-Power	G 1100	AA0000000000485	#1 USB		3.75 GB	Drive Type		Physical Driv	re .	
Ge E			RSPORTABLE	FAT32	1 MB	3.75 GB	Name		DEEPSPAR: V	VDC WD1200BEV T-22ZCT0	
	ric Externa 0056		2222222222222222222222		THE	232,89 GB	USB Stabilize	r Pro	DSU20499, C	onnected	
- 🗞 Gene		-	RWC-Data	NTES	1 MB	232.89 GB		(2)			
91			KWC*Data	NIFS	I IVID	232.00 GB	Properties	S.M.A	.R.T.		
og											-
Type	Date	Ti	me					Text			1
DeepSpar	10/25/2024	6:34:53	M SCSI Seria	Number:	4DF53101022	20'					
DeepSpar	10/25/2024	6:34:53	AM Capacity:	111.8 GB (2	34441648 LB	As)					
DeepSpar	10/25/2024	6:34:53	M Source: U	SB3.0 devid	e						
DeepSpar	10/25/2024	6:34:53									
DeepSpar	10/25/2024	6:34:53			4DF53101022						
DeepSpar	10/25/2024	6:34:53 /			D1200BEVT-						
DeepSpar	10/25/2024	6:34:53			WD-WXE808						
DeepSpar	10/25/2024	6:34:53 /	AM Capacity:	111.8 GB (2	34441648 LB	As)					

3.3 Show Files (Advanced)

File enumeration may take a very long time if a hard drive has some hardware issues or its file system is severely damaged. Moreover, each access to a problematic drive inflicts additional damage. **R-Studio Technician/T80+** has a special action to avoid this: **Show Files (Advanced)** that minimizes both parsing the file system and disk access.

There are two types of this action: the first one when the entire file system is processed with some exclusions (default), and the second one when only some individual folders are processed.

Enumerate files for the entire FS

These options depend on the file system type being processed. You should know what your are doing when selecting/clearing them. If you don't know which option to select/clear, select **Do not process deleted files**.

NTFS		FAT/exFAT
Show Files (Advanced)	×	Show Files (Advanced) ×
tou can minimze drive access by configuring the File crumeration mode: ● Enumerate files for the entre PS Enumerate files in individual folders starting f File crumeration options: D on not process deleted files Siop parsing of NTPS sub- Siop parsing of NTPS sub- Siop parsing of NTPS sub- Siop parsing of NTPS sub- NTPS sub- CK	on the root	You can minimize drive access by configuring the following options. Files enumeration mode: Image: Strumerate Res in Individual folders starting from the root Files enumeration options: Image: Do not process deleted files Image: OK Cancel
	Show Files (Advanced)	×
	You can minimize drive access by configuring the Files enumeration mode:	

FAT32 Broken Hi Cluster

Windows erases file's hi clusters when deletes files on FAT32 file systems. That makes recovery of such files very difficult. **R-Studio** may collect more information about such files to increase their chances for their successful recovery. Such collection will require additional information which in its turn require additional disk reads. You can control to what extent **R-Studio Technician/T80**+ will reduce disk reads.

No additional disk reads (fastest but less files to find)	R-Studio Technician/T80+ will try to recover broken hi clusters without additional disk reads and therefore additional information. Fast but not many files will be successfully recovered.
Smart disk reads (default, most files to find)	Some additional disk reads will be performed to gather more information, and R-Studio Technician/T80+ will use some heuristic methods to recover broken hi clusters. Slower but more files will be successfully recovered.
Exhaustive disk reads (very slow but recovers the largest number of files)	A lot of additional disk reads will be performed to gain most possible information to recover the maximum possible number of files will be successfully recovered.

APFS/HFS	EXT	XFS
Show Files (Advanced)	Show Files (Advanced)	Show Files (Advanced)
You can minimize drive access by configuring the following options.	You can minimize drive access by configuring the following options.	You can minimize drive access by configuring the following options.
Files enumeration mode:	Files enumeration mode:	Files enumeration mode:
Enumerate files for the entire FS	 Enumerate files for the entire FS 	Enumerate files for the entire FS
Enumerate files in individual folders starting from the root	 Enumerate files in individual folders starting from the root 	 Enumerate files in individual folders starting from the root
Files enumeration options:	Files enumeration options:	Files enumeration options:
Do not process deleted files	Do not process deleted files	Do not process deleted files
Skip parsing of orphan inodes	Skip parsing of Ext4 journal	Skip parsing of XFS journal
OK Cancel	Skip parsing of orphan inodes	Skip parsing of orphan inodes

Enumerate files in individual folders starting from the root

R-Studio Technician/T80+ can enumerate files and subfolders in individual folders rather than in the entire file system. This is especially important when the hard drive has severe hardware damage or file system corruption. This can be done by selecting **Enumerate files in individual folders starting from the root** on the Show Files (Advanced) dialog box.

Files in individual folders

Show Files (Advanced)	×
You can minimize drive access by configuring the following	options.
Files enumeration mode:	
O Enumerate files for the entire FS	
Enumerate files in individual folders starting from the n	oot
Files enumeration options:	
Do not process deleted files	
Quickly return only the minimum set of file information	file name, flags)
	ine name, nago,

Click the folder where you want to enumerate files. Files and subfolders in individual folders

R-STUDIO	Technician - File vi	ew		-	×
Drive File	<u>Tools</u> <u>V</u> iew <u>H</u> e	lp			
teopen Al Files	Recover Recov	ver Marked Find/Ma	k Find Previous Find Next File Mask Up Details Preview Options		
Device view	v Partition2	-> TOSHIBA MK20350	SS DK022A : 4DF531010220		
Already	processed folde	s (Eartitic Unproc empson) stores a tion Data tion Data	Luprocessed folders Unprocessed folders Unprocessed folders Unprocessed folders Unprocessed folder Unprocessed folder U		
Sorted by: Re	al		<		
og T	Date	Time	Text		
Type U System	11/18/2024	10:00:03 AM	File enumeration for "Downloads" was completed in 1s.		
	11/18/2024	10:00:28 AM	File enumeration for "Music" was completed in 1s.		
) System					

3.4 Multitasking

R-Studio Technician can perform several tasks simultaneously. For example, you can simultaneously recover files from one disk, create an image of another disk using <u>USB Stabilizer</u>, and scan a loaded image. The number of simultaneously running tasks depends on the system performance: CPU power, RAM size, free space on the disks, data transfer speed, and so on.

When, for example, 3 tasks are simultaneously running, **R-Studio Technician** will mark them with a special rotating sign in its Device view pane. In this example, these 3 tasks are file recovery from a logical disk (partition), hard drive image creation, and scanning of an image of a hard drive.

Three tasks running

Drive Create Tools View Help							
efresh Show Files Show Files (Advanced)	Scan Partition Se	arch Cre	ate Image	Open Image	Create Region Start Runtime Im	nage RAIDs Connect To Remote Remove I/O Monitor	
Device view CE: -> SSD HCS 1A25E :				Size	Name	Value	
	Label	5/Interfac	Start	Size			
Local Computer SSD HCS1A25E					Drive Type	Partition	
	YS2020100140	#2 SATA		59.63 GB 200 MB	Name Mount Points	Basic data partition	
- crroysterrr undon	Source	FAT32 NTFS	20 KB 201 MB	200 MB 59.43 GB	Mount Points Size	E:\ 59.43 GB (124633088 Sectors)	
C DEEPSPAR: WDC WD1200BEV	4DF531010220	DeepSpar		111.79 GB	Partition Offset	201 MB (411648 Sectors)	
Partition1	ADF351010220	NTES	1 MB	39.09 GB	Partition Size	59.43 GB (124633088 Sectors)	
Partition2	NTES-Bad	NTES	39.09 GB	72.70 GB	Partition Number	2	
D:/IMAGES/M2.rdr	Image	in s	55.05 00	12110 00	GPT Partition GUID	- b5197a72-bd77-428b-984e-dda9e1998aa7	
		#2 USB. S	SD	238.47 GB	GPT Type GUID	Data Partition. ebd0a0a2-b9e5-4433-87c0-68b6b72699c7	
SPECIFIC State of the state of	1012105011050250	FAT32	1 MB	100 MB	GPT Partition Attributes		
Running tasks osoft reserved par			101 MB	16 MB	GPT Partition Name	Basic data partition	
Service data partition	Images	NTES	117 MB	238.36 GB	✓ NTFS Information		
					Cluster Size	4 KB (8 Sectors)	-
					MFT Record Size	1 KB	-
List of runnin	g tasks					Stop all tasks	_
			N				
reating image file of DEEPSPAR: WDC WD1200	BEVT-22ZCTO						_
				_			
anning SPCC M.2 PCIe SSD VC2S0390 position	1: 30.06 GB (6303387	2 Sectors)					
covering [329/644] D:/Recovered Files/Root	/Test-Files/Video/MPE	S/Mpeg Vid	eo.mpeq				

It also shows a list of running tasks. You may switch to the required task by clicking it. The progress bar at the bottom show the overall progress of all tasks.

Each task runs independently in its own tab, has its own <u>I/O Monitor</u>, and can be independently controlled:

File recovery

R-STUDIO Tec	hnician - File vie	2W			-		>
rive <u>F</u> ile <u>To</u>	ols <u>V</u> iew <u>H</u> e	lp					
copen Al Files	Recover Recov	er Marked Find/M	ark Find Previous Find Next File Mask Up Details Preview Options				
Device view	() E: -> SSD	HCS1A25E : YS20201	0014056AA				
						1	
				STOP		~	
				Stop (Options	I/O Monite	ж
	7s, remaining: 1n						
ecovering [327)	644] D:/Recovere	d_Files/Root/Test-Fi	es/Video/MP4/VID_20150918_220020.mp4				
	D: Recovered F	ies)					
ecovered files							
Root/Test-Files	Alideo /hAN/						^
		a soul is southed fall."	2008 promo (hg) m4v.m4v				
		neral_nospital_tall_	2005_promo_(rid)_m4v.m4v				
Root/Test-Files							
	/Video/Mov/FIL						
Root/Test-Files	/Video/Mov/FIL	E0032.MOV					
Root/Test-Files	/Video/MP4						
Root/Test-Files	/Video/MP4/mt	4 Haiti can succe	ed, but_not_without_your_help_(Former_US_president_Bill_Clinton).mp4				1
		20150918_215223					~
noop lest the	o traco, tra o tra						
Туре	Date	Time	Text				
System	10/24/2024	1:53:34 PM	All file regions are collected.				
Recover	10/24/2024	1:53:45 PM	Using file exist rules: By default:Rename;				
Recover	10/24/2024	1:53:45 PM	Recover destination: D:\Recovered Files\				
	10/24/2024	1:54:19 PM	Sectors 3145728-3145983 failed to read from after 1 attempt. The drive responded with an error				
	10/24/2024	1:54:39 PM	Sectors 3184896-3185151 failed to read from after 1 attempt. The drive responded with an error				
OS I/O error							

Image creation

R-STUDIO To Drive Create	echnician - Device vie ToolsYiew										-		×
efresh Show	Files Show Files (Adv	anced) Scan Pa	Tition Sea	rch Crea	te Image Ope	n Imag	create Re	gion Start Runt	ime Image RAIDs	Connect To Remot	e Remove	I/O Mor	nitor
Dev	vice/Disk	Label	/Interfa	Start	Size	· •						-	_
Local Co	mputer									STOP		~	V
V SSD	HCS1A25E	YS2020100140	#2 SATA	SSD	59.63 GB			m 54s, remaining		Stop	Options	I/O Moni	itor
- E	FI System Partition -		FAT32	20 KB	200 MB	-	reating image fi	INE OT DEEPSPAR:	WDC WD1200BEVT-22ZC	0			
🥯 F		Source	NTES	201 MB	59.43 GB				WDC WD1200BEVT-22ZC	the second s			
V S DEEF	SPAR: WDC WD120	4DF531010220	DeepSp	ar	111.79 GB	D	rive sector map	file: D:\IMAGES	DEEPSPAR WDC WD1200	BEVT-22ZCT0.rsm			
🥯 F	artition1	NTFS-Good	NTFS	1 MB	39.09 GB		Multi-pass phas	se:	Main phase				
9 F	artition2	NTFS-Bad	NTFS	39.09 GB	72.70 GB		Rescued:		44.09 GB				
✓ D:/IN	AGES/SPCC M.rdr	Image					Unprocessed le	ft on device:	67.67 GB				
× 50 9	PCC M.2 PCIe SSD	AA240301N30	#4 USB,	SSD	238.47 GB		Unprocessed for	or the operation:	67.67 GB				
4	EFI system partiti		FAT32	1 MB	100 MB		Skipped slow a		13.50 MB in 54 blocks (bl				
4	Microsoft reserv			101 MB	16 MB		Skipped bad ar		19.38 MB in 80 blocks (bl	ock size: 256 KB)			
6	Basic data partiti	Images	NTFS	117 MB	238.36 GB		Not yet trimme		1.75 MB in 14 blocks				
R	Recognized0		FAT32	1 MB	100 MB		Not yet scrapp	ed:	N/A				
R	Recognized0	Images	NTFS	117 MB	238.36 GB		Bad sectors:	and the second se	N/A				
RI	Recognized0	ANACONDA	FAT12	8.48 GB	7.50 MB	11.2	Actual read spi		65.10 MB/sec (average in	56.37 MB/sec)			
BI	Recognized0	SOURCE	FAT32	18.42 GB	10.00 GB		Data processin	g speea:	41.99 MB/sec				
R	Recognized0	SOURCE	FAT32	28.42 GB	10.00 GB	- 3	Properties	S.M.A.R.T	: 🏠 Create Image				
9													
Type US I/O error	Date 2/1//2025	Time 2:50:41 PM							1200BEV 1-22ZC 10 after				
OS I/O error		2:50:45 PM							1200BEV T-22ZCT0 after				
OS I/O error	2/17/2025	2:50:48 PM	Sectors	985504-798	35535 [4K] faile	d to re	ad from DEEP	SPAR: WDC WD	1200BEVT-22ZCT0 after	1 attempt. The o	peration time	ed out	

Image scan

R-STUDIO Tec Drive Create	hnician - Device view]ools ⊻iew <u>H</u> elp								- 0	×
efresh Show F	les Show Files (Advance	ed) Scan Partition Se	arch Cre	ate Image	Open Image	Create Region Star	t Runtime Image	RAIDs Connect To Remote	Remove I/O Monitor	
Device view		5E : YS202010014056AA								
D	evice/Disk	Label	3/Interfac	Start	Size					
Local Com	nputer					Time elapsed: 7n	12.	STO		2
Y 📓 SSD H	CS1A25E	YS202010014056AA	#2 SATA,	SSD	59.63 GB			62 GB (273921552 Sectors) Stop	Options I/O Monit	tor
🥪 EFI	System Partition	-	FAT32	20 KB	200 MB			02.00 (270322022 000010)		
See E		 Source 	NTFS	201 MB	59.43 GB					
✓ ☆ DEEPS	PAR: WDC WD1200BEV.	4DF531010220	DeepSpa	, HDD	111.79 GB					
🥪 Pa	rtition1	NTFS-Good	NTFS	1 MB	39.09 GB					
🥪 Pa	rtition2	NTFS-Bad	NTFS	39.09 GB	72.70 GB					
Y D:/IM/	AGES/M2.rdr	Image								
🗸 🖼 SP	CC M.2 PCle SSD VC2S0	AA240301N30256	#2 USB, 5	SD	238.47 GB					
S	EFI system partition		FAT32	1 MB	100 MB					
	Microsoft reserved par			101 MB	16 MB					
	Basic data partition	Images	NTFS	117 MB	238.36 GB					
						Unprocessed	34	Unused Specific File Documents 460	FAT 101	
						Properties	Scanning			
9										
Туре	Date	Time					Text			
OS I/O error	10/24/2024 2:14	45 PM Sectors	63491584-	63491839 fa	iled to read from	n after 1 attempt. 1	The operation ti	med out		
OS I/O error	10/24/2024 2:14					m after 1 attempt. 1				
						n after 1 attempt. 1				
						m after 1 attempt. 1				
OS I/O error	10/24/2024 2:14	:55 PM Sectors	63514880-	63515135 fa	iled to read from	m after 1 attempt. 1	The operation tip	med out		

When all tasks have been completed, **R-Studio Technician** will show their results with special marks.

All task completed

<u>D</u> rive <u>C</u> reat	e J	ools <u>V</u> iew <u>H</u> elp							
	W File	s Show Files (Adva	nced) Scan Par	tition Searc	h Create	Image Oper		ge Create Region	start Runtime Image RAIDs Connect To Remote Remove I/O Monitor
× Device vie	w	✓ F: -> SSD HCS 1	A25E : YS20201001	056AA (N	TFS)				
[Devi	Success	Label	/Interfa	Start	Size	^	Name	Value
🗸 💻 Local (Com							Drive Type	Computer, Local Computer
✓ 150 SS	DHC	S1A25E	YS20201001405	#2 SATA	SSD	59.63 GB		Name	Local Computer
Failure	EFI	System Partition 🔻		FAT32	20 KB	200 MB		OS	Windows 10 Build 19045
			Source	NTES	201 MB	59.43 GB		System	4 x Intel(R) Core(TM) i5-4570 CPU @ 3.20GHz, 3200 MHz, 16262 MB RAM
	EPSP	AR: WDC WD1200	4DF531010220	DeepSpa	ar	111.79 GB			
	Part	ition1	NTFS-Good	NTES	1 MB	39.09 GB			
9	Part	ition2	NTFS-Bad	NTFS	39.09 GB	72.70 GB			
Y, D:/	IMA	GES/SPCC M.rdr	Image						
< · · · ·	SPC	C M.2 PCle SSD V	AA240301N302	#4 USB,	SSD	238.47 GB			
		EFI system partition		FAT32	1 MB	100 MB			
Success	Ş۵.	Microsoft reserve			101 MB	16 MB			
	ŵ	Basic data partition	Images	NTFS	117 MB	238.36 GB			
	REC.	Recognized0		FAT32	1 MB	100 MB			
	REC.	Recognized0	Images	NTFS	117 MB	238.36 GB			
	REC.	Recognized0	ANACONDA	FAT12	8.48 GB	7.50 MB			
	Sar	Recognized0	SOURCE	FAT32	18.42 GB	10.00 GB	v	Properties	
Log									
Туре		Date	Time						Text
1) Recover					evict rules: F	By default:Re	name	2	
i) Recover						D:\Recovered			
1) Recover					lly recovere				
1) Recover		2/17/2025 3	:41:56 PM	Elapsed: 2	200				

These marks will disappear when the corresponding tabs are opened.

3.5 Additional Recovery Options

R-Studio Technician has additional **Recovery** options.

Recover (Additional Output Folders) dialog box

tput folder	D:\Reco	vered_Files\					
Recover Recover Recover		l files ied marked files	Marked for 20.99 GB.	recovery: 2249 fil	e and 143 folde	r. Total size:	
Main A	dvanced	Additional Out	put Folders	Post Actions			
Y:\							×
I:\							×
Z:\File	s\						×
							×

Additional Output Folders

Additional Output Folders	Additional output folders where recovered files will be stored when R-Studio
	runs out of space.

NEVER TRY TO SAVE RECOVERED FILES/FOLDERS TO THE SAME LOGICAL DISK WHERE THEY RESIDE!!!

Or you may obtain unpredictable results and lose all of your data.

Recover (Post Actions) dialog box

tput folder: D:\Reco	vered_hies\							
Recover all marked Recover only mask		Marked for 20.99 GB.	recovery:	2249 fi	le and 1	43 folde	r. Total siz	te:
Main Advanced	Additional Out	put Folders	Post A	ctions				
Server: mail.exe Sender email: Recipient(s) email:	tester 1@examp		Port:	25	•	SSL	Auto	•
Custom subject:	Recovery Resul							_
Send email if	Author							
Error occurred	Login:	tester 1						
Success	Password:	•••••	•					
						Test	t email acc	count

Post Actions Options

Shutdown the computer on task completion	If this check box is selected, R-Studio will shut down your computer when file recovery has been completed. The program will warn you if any option on the Advanced tab is set to Prompt.
E-Mail notifications	If this check box is selected, R-Studio will inform you about the outcome of the operation via email.

3.6 Mounting Virtual Objects in the System as Virtual Drives

Virtual objects created in the Device view pane of **R-Studio** can be mounted in the system as read-only virtual drives. Such virtual drives become accessible to the system and to other programs. Moreover, such virtual drives remain mounted after **R-Studio** has been closed.

To mount a virtual object as a read-only virtual drive in the system

1 Right-click the virtual object and select Mount on the shortcut menu

Device/Disk	Label	FS	Start	Size
Local Computer				
V 🐓 TOSHIBA DT01ACA100 MS2OA750	44H5ATLKS	#0 SATA2	0 Bytes	931.51 GB
Volume(3303cc57-3e4d-4507-872f-6ad5.	Recovery	NTFS	1 MB	300 MB
Volume(edb1043b-3073-4184-a4d5-d22		FAT32	301 MB	100 MB
Microsoft reserved partition			401 MB	128 MB
🛥 C: 👻	System	NTFS	529 MB	291.06 GB
Volume(2f380b2f-7551-482b-b096-2089		NTFS	291.58 GB	524 MB
Empty Space22			292.09 GB	1 MB
🖙 Volume(44fd3858-351c-43f0-8439-1a637 		NTFS	292.09 GB	450 MB
Volume(e0a573f2-14d5-4047-adfc-387e		NTFS	292.53 GB	450 MB
🥯 D: 👻	Data	NTFS	292.97 GB	638.54 GB
Empty Space23			931.51 GB	1.69 MB
WDC WD10EADS-00L5B1 01.01A01	WD-WCAU4D920178	#1 SATA2	0 Bytes	931.51 GB
🥯 E 🗸 👻	Backup II	NTFS	1 MB	931.51 GB
Y 📙 Image Files				
 E:/RAID5/RAID5-byte/Disk1.dsk 				37.31 GB
Empty Space27			512 Bytes	37.31 GB
🔆 DeletedPart1		NTFS	31.50 KB	9.77 GB
Sector E:/RAID5/RAID5-byte/Disk2.dsk				37.31 GB
 E:/RAID5/RAID5-byte/Disk3.dsk 				37.31 GB
Empty Space32			512 Bytes	37.31 GB
🔆 DeletedPart1		NITEC	21,50 KB	9.77 GB
Empty Space31	Virtual ob	ect in R-Studio	50 KB	37.31 GB
Virtual Volume sets and RAIDs				
 Virtual Block RAID 1 			0 Bytes	74.62 GB
Empty Space40			512 Bytes	7.84 MB
🔆 DeletedPart1		NTFS	31.50 KB	9.77 GB
Partition1	RAID5	NTFS	7.88 MB	74.49 GB
Empty Space41			74.50 GB	123.78 MB

2 Select the mount type on the Mount as a virtual drive dialog box and click the OK button.



■*Mount* options

Mount as:	 Physical drive: The virtual drive will be mounted as a read-only virtual physical drive. Windows will search for partitions on it, and if it finds any with supported file systems, it will assign disk letters to them. Recommended if the drive should be accessible to the host Windows and other programs in the system. If the data on the drive is severely damaged, it may slow down, lock, or even crash the host Windows. Partition: The virtual drive will be mounted as a read-only partition with a virtual partition table created by R-Studio. Recommended if the drive should be accessible only to another data recovery program.
Drive letter	Select the disk letter for the virtual drive if the virtual drive is mounted as a partition. The letter may be assigned automatically by the system, specified manually, or the virtual drive may have no letter at all. The latter is recommended if you don't want Windows to analyze the data on the drive.

> A read-only virtual drive will appear in the Drives panel

Device/Disk	Label	FS	Start	Size
V 💻 Local Computer				
V SHIBA DT01ACA100 MS2OA750	44H5ATLKS	#0 SATA2		931.51 GB
Volume{3303cc57-3e4d-4507-872f-6ad5.*	Recovery	NTFS	1 MB	300 MB
Volume{edb1043b-3073-4184-a4d5-d22*		FAT32	301 MB	100 MB
Microsoft reserved partition			401 MB	128 MB
🥯 C: 🔹 🔻	System	NTFS	529 MB	291.06 GB
Volume{2f380b2f-7551-482b-b096-2089		NTFS	291.58 GB	524 MB
Empty Space22			292.09 GB	1 MB
Volume{44fd3858-351c-43f0-8439-1a637.		NTFS	292.09 GB	450 MB
Volume{e0a573f2-14d5-4047-adfc-387e		NTFS	292.53 GB	450 MB
🥯 D: 👻	Data	NTFS	292.97 GB	638.54 GB
Empty Space23			931.51 GB	1.69 MB
WDC WD10EADS-00L5B1 01.01A01	Connected virtual	drive rA2	0 Bytes	931.51 GB
🥯 E 🔹 🔻	Backup II	NTES	1 MB	931.51 GB
👻 🥯 R-TT Disk Image V1.0 (virtual)	0000RTTZ	#2 Local (0 Bytes	74.62 GB
Empty Space45			512 Bytes	7.84 MB
🔆 DeletedPart1		NTFS	31.50 KB	9.77 GB
🥯 E 👻	RAID5	NTES	7.88 MB	74.49 GB
Empty Space46			74.50 GB	123.78 MB
V Image Files				
Y SE:/RAID5/RAID5-byte/Disk1.dsk				37.31 GB
Sec. Empty Space27			512 Bytes	37.31 GB
₩ DeletedPart1		NTFS	31.50 KB	9.77 GB
E:/RAID5/RAID5-byte/Disk2.dsk				37.31 GB
E:/RAID5/RAID5-byte/Disk3.dsk				37.31 GB
Empty Space32			512 Bytes	37.31 GB
>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>		NTFS	31.50 KB	9.77 GB
Empty Space31			31.50 KB	37.31 GB
 Virtual Volume sets and RAIDs 				
Virtual Block RAID 1			0 Bytes	74.62 GB
Empty Space40			512 Bytes	7.84 MB
>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>		NTES	31.50 KB	9.77 GB
Partition1	RAID5	NTES	7.88 MB	74,49 GB
Empty Space41			74,50 GB	123.78 MB

And in the system (Windows Disk Management) as a physical drive

Basic 931.39 GB Online	39 GB 300 MI 100 M 291.06 GB NTFS			524 MB Healthy	450 MB Healthy	450 MB Healthy	Data (D:) 638.54 GB NTFS Healthy (Basic Data	
Disk 1 Basic 931.51 GB Online	Backup 931.51 G Healthy	B NTFS	Partition)	onnected	l virtual	drive		
Disk 2 Basic 74.62 GB Read Only		B NTFS	al Drive)		123 I Unal	VIB located		

or

as a partition (Windows Disk Management) as a physical drive

Basic 931.39 GB Online	9 GB 300 MI 100 M 291.06 GB N		System (C:) 291.06 GB NTFS Healthy (Boot, Pag	524 MB Healthy	450 MB Healthy	450 MB Health	Data (D:) 638.54 GB NTFS Healthy (Basic Data
Disk 1 Basic 931.51 GB Online	Backup 931.51 G Healthy	B NTFS	v Partition)	onnected	partitior		1
Disk 2 Basic 74.62 GB Read Only	74.62 GE		v Partition)				

And this virtual disk becomes accessible to the system and other programs.

To unmount a virtual drive

1 Right-click the virtual drive in the Drives panel and select Unmount on the shortcut menu

3.7 Hidden Devices

R-Studio Technician/T80+ can hide unnecessary devices on the Device View pane. Most likely, they may be system drives and drives connected to save recovered data. Hiding those devices doesn't prevent **R-Studio Technician/T80**+ from saving recovered and service files on them.

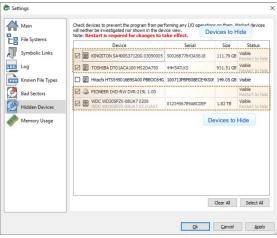
No hidden devices

Device/Disk			Label	FS/Interface	Start	Size
Local Computer						
 KINGSTON SA400537120G 03090005 		50026B778	43A5618	#0 SATA2, S	5D	111.79 GB
See EFI system partition	-			FAT32	1 MB	100 MB
Microsoft reserved partition	-		System D	ieke	101 MB	16 MB
🥯 C:	•	System	System L	ISKS	117 MB	111.18 GB
Secovery Partition	-			NTFS	111.29 GB	508 MB
V 🗵 TOSHIBA DT01ACA100 MS2OA750		44H5ATLK	S	#1 SATA2, H	DD	931.51 GB
🍛 D:	-	Data		NTFS	1 MB	931.51 GB
V 🕎 Hitachi HTS54501689SA00 PBBOC64G		100713PB	BOBECE4XSOF	#2 SATA2, H	DD	149.05 GB
🥪 E	-	NTFS-Test		NTFS	512 KB	28.69 GB
🥯 E	•	FAT32-TES	T	FAT32	28.69 GB	26.27 GB
🥪 G:	-	FAT-TEST		FAT16	54.96 GB	2.01 GB
See E:	•	EXFAT	Disks with	Lost Data	6.97 GB	11.72 GB
Partition5	-	HFS		HFSX	68.69 GB	21.48 GB
Partition6	•	EXTFS		Ext4	90.17 GB	25.02 GB
✓ Searce Y Searce	*	XFS		XFS	115.19 GB	33.86 GB
🔀 Reformatted1				NTFS	0 Bytes	33.86 GB
V 3 PIONEER DVD-RW DVR-219L 1.00			00.001			
3 H:			CD/DVI	Drive		
WDC WD205PZX-08UA7 02.01A02		012345678	IGARCDEF	#3 USB, HDD		1.82 TB
🥪 Y:	-	í Exter	nal USB Dis	k to Save R	ecovered [Data TB

To hide unnecessary devices,

1 Go to Settings and then to the Hidden Devices tab, mark all devices you want to hide,

Hidden Devices tab



and restart R-Studio Technician/T80+.

> Only necessary devices will be visible

Necessary devices

			Device/Disk		Label	3/Interfac	Start	Size
,	📃 Lo	cal	Computer (3 hidder	devices)				
	× 12	Hit	achi HTS545016B99	A00 PB	100713PBPB08EC	#2 SATA2	, HDD	149.05 GB
		-	l:	-	NTFS-Test	NTFS	512 KB	28.69 GB
		9	F:	-	FAT32-TEST	FAT32	28.69 GB	26.27 GB
		-	G:	•	FAT-TEST	FAT16	54.96 GB	2.01 GB
		-	E:	*	EXFAT	FAT32	56.97 GB	11.72 GB
		-	Partition5	•	HFS	HFSX	68.69 GB	21.48 GB
		-	Partition6		EXTFS	Ext4	90.17 GB	25.02 GB
	~	-	Partition7	-	XFS	XFS	115.19 GB	33.86 GB
			Keformatted1			NTFS	0 Bytes	33.86 GB

You may make hidden devices visible once again on the Hidden Devices tab.

Settings				
Main Fle Systems	Check devices to prevent the program from per wil neither be investigated nor shown in the de Note: Restart is required for changes to	vice view.	n them. Marked o	devices
Symbolic Links	Device	Serial 100713PBPB08ECE4XS0F	Size 149.05 GB	Status Visible
Log	🗹 🥼 KINGSTON SA400S37120G 03090005	50026B77843A5618	111.79 GB	Hidden
Known File Types	🗹 🥼 TOSHIBA DTO 1ACA 100 MS2OA 750	44H5ATLKS	931.51 GB	Hidden
Bad Sectors	PIONEER DVD-RW DVR-219L 1.00			Hidden
Hidden Devices	🗹 🥼 WDC WD20SPZX-08UA7 0209	0123456789ABCDEF	1.82 TB	Hidden
Memory Usage	Hidden Devices			

3.8 File Information

R-Studio Technician/T80+ shows much more information about files than R-Studio does.

Info about a	file	with	good	chances	
for recovery					



Info for a file with below average recovery chances

Cirque.Du.Soleil.Kooza.2008.avi	8,
- D	
Cirque.Du.Soleil.Kooza.2008.avi	
Location: G: (Recognized0)/\$RECYCLE.BIN/?R/	0197JX/Movies
Id: [440]	
Parent Id: [437]	
Size: 1.36 GB (1,462,525,952 Bytes)	
Flags: deleted, link target, valid first data o	ffset
Created: 6/2/2012 10:06:31 PM	
Modified: 1/22/2011 1:19:16 PM	
Accessed: 6/1/2012 11:00:00 PM	
File type: Windows AVI Video	
Recovery chances: Below Average (Wrong Sig overwritten by existing file	
Overlapping files	
[180] Cirque.Du.Soleil.Kooza.2008.avi	
[1175] Cirque.Du.Soleil.Kooza.2008.avi	
[1174] ?RZGJPJL.avi	
Regions	
✓ sector 1129248 size: 6.27 MB (6,569,984 B)	tes) / first data
[1175] Cirque.Du.Soleil.Kooza.2008.avi	
[1174] ?RZGJPJL.avi	
[180] Cirque.Du.Soleil.Kooza.2008.avi	
> sector 1142080 size: 1.36 GB (1.455,955,96	8 Bytec) / data

■More information

X	Click this button to pin the file information. This panel will show the information
	about the "pinned" file regardless of the current selected file.

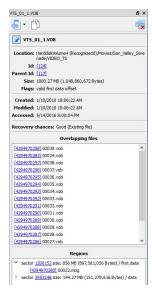
Ď	Click this button to copy all this information
 [131530753] test4.arc [131596289] test5.arc [131727361] test7.arc [4784139] MyDoc3.odt [6252874458] MyDoc3.odt [6252872881] MyDoc1.odt [6252874458] MyDoc3.odt 	Click this button to select the file you want to go to.
×	Click this button to close all the information.
Overlapping files	Shows the list or files that may occupy the same drive sectors. You may click the file id to see information about this file.
Regions	Shows the list of sectors occupied by the file and corresponding overlapping files. You may click a sector number open the sector in the built-in Hexadecimal editor.

Examples of file information on other file systems

File info on an ext4fs file system



Info for a file on an HFS+ file system



File info on an APFS file system

hnny_Cash-I_Got_Stripes.mp3	8×
- Johnny_Cash-I_Got_Stripes.mp3	
Location: Root\.Trashes\502\Johnny_Cash-I_Got_Stripes.	.mp3
Id: [580000000001f2]	
Parent Id: [5840000000033e]	
Size: 2.87 MB (3,008,512 Bytes)	
Created: 3/3/2022 11:07:38 AM	
Modified: 4/28/2016 02:38:28 PM	
Accessed: 6/20/2022 02:08:25 PM	
Owner: 99	
Group: 99	
Permission: rwxrwxrwx (100777)	
CNID: 242	
File type: MPEG Layer III Audio	
Recovery chances: Good (Existing file)	
Region status: [OK]	
Overlapping files	
[Sa000000000717] Johnny_Cash-I_Got_Stripes.mp3	
[Sa00000000014b] Johnny_Cash-I_Got_Stripes.mp3	
Regions	
sector <u>2379920</u> size: 2.87 MB (3,008,512 Bytes) / first of	data
[5a000000000717] Johnny_Cash-I_Got_Stripes.m	p3
[Sa00000000014b] Johnny_Cash-I_Got_Stripes.m	p3

Info for a file on an XFS file system

ohnny-cash-san-quentin.mp3	ē ×
a • b	
- johnny-cash-san-quentin.mp3	
Location: Root/Music/johnny-cash-san-quentin	n.mp3
Id: [4:000000000000000012]	
Parent Id: [4c400000000001]	
Size: 3.61 MB (3,787,963 Bytes)	
Flags: cross ink	
Created: 6/17/2022 12:53:24 PM	
Modified: 4/28/2016 02:32:14 PM	
Accessed: 6/17/2022 12:53:24 PM	
Owner: 1000	
Group: 1000	
Permission: rwxrwxrwx (100777)	
File type: MPEG Layer III Audio	
Recovery chances: Good (Existing file)	
Region status: [OK]	
Overlapping files	
[4e000000000015] \$InodeIndx0000009e	
Regions	
	-> / 6 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -
> sector <u>96584</u> size: 3.61 MB (3,787,963 Byte	s) / first data

3.9 Symbolic Link Processing

R-Studio Technician/T80+ give its users more control over symbolic links processing.

<u>Symbolic links</u> (of symlinks for short) are object that contains references to other files or folders directory in the form of absolute or relative paths and that affect pathname resolution. For example, if a symlink c: \ProgramData\Documents points to D:\Recovered Files\Root\Users\Public\Documents, entering it will result in entering D:\Recovered Files\Root\Users\Public\Documents.

Symbolic Links dialog box

Main	Symbolic links display settings
File Systems	Don't show folder symbolic links by default (Technician version)
File Systems	If this option is selected only real folders will be shown on the Folders panel. Their symbolic inks will be hidden.
Symbolic Links	If necessary, folder symbolic links can be shown using the File Mask dialog box.
Log	Show folder symbolic links as links to their targets, without target content (Technician version)
	Symbolic links recovery options
Known File Types	For all options:
Bad Sectors	When both the symbolic link and its target are selected for recovery, both the symbolic link and its target will be recovered.
Hidden Devices	When only the target is selected for recovery, only the target will be recovered.
Hidden Devices	Link conversion (Default)
Memory Usage	If only the symbolic link is selected for recovery, it will be recovered as its target. If both the symbolic link and its target are selected for recovery, the absolute symbolic link will be converted to a relative symbolic link. <u>More information</u>
	O Recovery as it is (Technician version)
	If only the symbolic link is selected for recovery, it will be recovered as the original symbolic link.
	ink. If both the symbolic link and its target are selected for recovery, the absolute link will remain a the original absolute symbolic link. <u>More information</u>
	Usually a recovered target has a new path, therefore its recovered absolute links will point to wrong place, or to a non-existent object.

Symbolic Links

Symbolic links display settings	
Don't show symbolic links by default (Technician version)	If this option is selected, R-Studio hides all symbolic links by default. Only real objects will be visible. You may make them visible by clearing the Hide symbolic links option on the <u>Mask</u> dialog box.
Show folder symbolic links as links to their targets, without target content (Technician version)	Only links to their target will be shown in the right pane (Contents). They target content can be reached by clicking those links.

Symbolic links recovery options	
For all options:	When both the symbolic link and its target are selected for recovery, both the symbolic link and its target will be recoveredl. When only the target is selected fore recovery, only the target will be recovered.
Link conversion (Default)	
Only a symbolic link is selected for recovery:	The selected symbolic link will be recovered as its target.
If both a symbolic link and its target are selected for recovery:	If both a symbolic link and its target are selected for recovery, both the target and its symbolic link will be recovered. The file path in that symbolic link will be converted from absolute to relative. Example: If the object C:\ProgramData\Documents is a symbolic link to C:\Users\Public\Documents, it will be converted to a symbolic link to\Users\Public\Documents. Therefore, the symbolic link will point to its object regardless of the place to which the object has been recovered.
Recovery as it is (Technician version)	
Only a symbolic link is selected for recovery:	The symbolic link will be recovered as a symbolic link which may contain a path to a nonexistent object.
If both the symbolic link and its target are selected for recovery, the absolute link will remain as the original absolute symbolic link.	If both the symbolic link and its target are selected for recovery, the file path in that symbolic link will remain unchanged. Example: The place to store recovered data: D:\Recovered Files. The object to recover: C:\Users\Public\Documents The symbolic link: C:\ProgramData\Documents After recovery: The recovered object: D:\Recovered Files\Root\Users\Public\Documents The recovered symbolic link: D:\Recovered Files\Root\ProgramData\Documents pointing to C: \Users\Public\Documents. Therefore, if someone tries to enter to the symbolic link, the system will open the object C:\Users\Public\Documents, rather than recovered D:\Recovered Files\Root\Users\Public\Documents. Usually a recovered target has a new path, therefore its recovered absolute links will point to a wrong place, or to a non-existent object.

The Data Recovery Topics topic explains processing of symbolic links recovery in more detail.

3.10 Custom Recovery Lists

The **R-Studio Technician/T80+** versions can create more advanced <u>recovery lists</u>.

Export Recovery List options

specifies which the and tolder names will be exported.	Export the entire folder/file tree	Specifies which file and folder names will be exported.
--	------------------------------------	---

Export marked file/folder names Export file/folder names	
File format:	A file format for the recovery list. Only text format is available for the standalone and corporate versions. R-Studio Technician/T80+ can create <u>custom recovery lists</u> in other formats with more advanced options The following formats are available for R-Studio Technician/T80+ version: Plain Text HTML XML JSON CSV
File name:	Specifies a file name of the recovery list.

Editing the file recovery list

All files without any marks in the recovery list will be marked when the list is loaded into **R-Studio**. So, if you have some files in the recovery list that don't need to be recovered, just delete them from the list. In addition, you may use the following marks to specify some options

- :+ Mark the file, or the folder, all its files, and subfolders within the folder.
- :* Mark the file, or the folder and its files, don't mark subfolders in the folder.
- :- Unmark the file, or the folder, its files, and subfolders in the folder.
- := Unmark the file or the folder and its files, dont unmark subfolders in the folder.
- Provide the information on the file. (**R-Studio Technician/T80**+ only)

R-Studio processes records in the list consequently. That is, if there are the following lines in the file,

```
:+Files_to_Recover\
:-Files_to_Delete\File_2.jpg
the file File_2.jpg won't be marked for recovery, while for the lines
:-Files_to_Recover\File_2.jpg
:+Files_to_Recover\
file File_2.jpg will be.
```

A simple recovery list for reference

Structure of a simple recovery list file created by R-Studio

```
:# Version = 1
:# Sort = by real
:# PathDelim = /
:# CaseSensitive
:# Drive = type:"Volume"; size:"1048576000"; mountpoint:"e:\"; label:"ntfs test";
fs:"NTFS";
:# Parent = type:"Drive"; size:"1048576000"; serial:"2cca54405a8d3a89";
firmware:"2.00"; product:"01gb i-disk"; vendor:"c-one";
Diving/
Diving/Aquarium/
Diving/Aquarium/20190822_100644.jpg
Diving/Aquarium/20190822_101620.jpg
Diving/Aquarium/20190822_102526.jpg
Diving/Aquarium/20190822_103830.jpg
```

```
Diving/Aquarium/20190822_104333.jpg
Diving/MyPhoto1.jpg
Diving/MyPhoto2.jpg
Diving/MyPhoto3.jpg
Diving/MyPhoto4.JPG
Diving/MyPhoto5.jpg
SF/
SF/Sea-Lions/
SF/Sea-Lions/IMG_3493.JPG
SF/Sea-Lions/IMG_3535.JPG
SF/Sea-Lions/IMG 3542.JPG
SF/Sea-Lions/IMG_3579.JPG
SF/Sea-Lions/IMG_3580.JPG
SF/Sea-Lions/IMG_3581.JPG
SF/Sea-Lions/IMG 3589.JPG
SF/IMG_0869.JPG
SF/IMG 0873.JPG
SF/IMG_0890.JPG
SF/IMG_1739.JPG
SF/IMG_3460.JPG
SF/IMG_3461.JPG
SF/IMG_3476.JPG
SF/IMG_3478.JPG
SF/IMG_3479.JPG
SF/IMG_3480.JPG
SF/IMG_3481.JPG
SF/IMG_3493.JPG
SF/IMG_3535.JPG
SF/IMG_3542.JPG
SF/IMG_3579.JPG
SF/IMG_3580.JPG
SF/IMG_3581.JPG
SF/IMG_3589.JPG
SF/IMG_3590.JPG
SF/IMG 3591.JPG
SF/IMG_3592.JPG
SF/IMG_3593.JPG
SF/IMG_3594.JPG
SF/IMG_3595.JPG
SF/IMG_3596.JPG
SF/IMG_3608.JPG
SF/IMG_3627.JPG
MyPhoto6.JPG
MyPhoto7.JPG
MyPhoto8.JPG
MyPhoto9.JPG
```

If such recovery list is created from an entire logical disk/partition, it will contain several virtual folders. For example, they'll have the following structure for an NTFS partition.

///m/\$Extend/

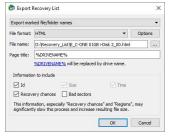
///m/\$Extend/\$Deleted/

```
///m/$Extend/$RmMetadata/
///m/$Extend/$RmMetadata/$Txf/
///m/$Extend/$RmMetadata/$TxfLog/
///m/$Extend/$RmMetadata/$TxfLog/$Tops
///m/$Extend/$RmMetadata/$TxfLog/$TxfLog.blf
///m/$Extend/$RmMetadata/$Repair
///m/$Extend/$ObjId
///m/$Extend/$Quota
///m/$Extend/$Reparse
///m/$AttrDef
///m/$BadClus
///m/$Bitmap
///m/$Boot
///m/$LogFile
///m/$MFT
///m/$MFTMirr
///m/$Secure
///m/$UpCase
///m/$Volume
```

HTML format

This is a default format of recovery lists for the **R-Studio Technician/T80**+ version. It allows its users to supply their customers with the recovery lists with the easiest way to edit.

Export Recovery List dialog box for the HTML format



HTML Options dialog box



You may export the default HTML template and edit it to adapt it for your own purposes.

When the customer loads an HTML recovery list in their browser, they can mark files they want to recover, and export their names into the final recovery list in the plain text format.

HTML Recovery list in a browser

	0:/Recovery_List/E_C-ONE%200	D1GB%20	i-Disk%202 A 습	s) © 3 ☆	œ	8	
C-ONE 01GB i-E 48 files in 5 folders (177.87 MB)	Disk 2.00 / E:			Export Marke	d Files to I	Recovery	y List
Root	Name	Size	Recovery chances	Created	٩	Aodified	
V Diving	Diving			11/22/2022, 12:35:18 PM	11/22/20	022, 1:09	9:07 P
Aquarium	SF			11/22/2022, 12:35:27 PM	11/22/20	022, 1:24	4:57 P
Sea-Lions	MyPhoto6.JPG	1.1 MB	Good (Existing file)	11/22/2022, 12:35:56 PM	4/29/20	09, 2:54:	46 AN
	MyPhoto7.JPG	843 KB	Good (Existing file)	11/22/2022, 12:35:56 PM	4/29/20	09, 2:55:	06 AN
	MyPhoto8JPG	998 KB	Good (Existing file)	11/22/2022, 12:35:56 PM	4/29/20	09, 2:55:	30 AI
	MyPhoto9JPG	3.4 MB	Good (Existing file)	11/22/2022, 12:35:57 PM	4/29/20	09, 2:56:	50 AN

You may compare this list with the edited simple recovery list.

■ An exported recovery list

```
:# Version = 1
:# Sort = by real
:# PathDelim = /
:# CaseSensitive
:# Drive = type:"Volume"; size:"1048576000"; mountpoint:"e:\"; label:"ntfs test";
fs:"NTFS";
:# Parent = type:"Drive"; size:"1048576000"; serial:"2cca54405a8d3a89";
firmware:"2.00"; product:"01gb i-disk"; vendor:"c-one";
Diving/Aquarium/20190822_100644.jpg
:! Id=630001
Diving/Aquarium/20190822_101620.jpg
:! Id=640001
Diving/Aquarium/20190822_102526.jpg
:! Id=650001
Diving/Aquarium/20190822_103830.jpg
:! Id=660001
Diving/Aquarium/20190822_104333.jpg
:! Id=670001
Diving/MyPhoto1.jpg
:! Id=270001
Diving/MyPhoto2.jpg
:! Id=280001
Diving/MyPhoto3.jpg
:! Id=290001
Diving/MyPhoto4.JPG
:! Id=2a0001
Diving/MyPhoto5.jpg
:! Id=2b0001
SF/IMG 0869.JPG
:! Id=370001
SF/IMG 0873.JPG
:! Id=380001
SF/IMG 0890.JPG
:! Id=390001
SF/IMG_1739.JPG
:! Id=3a0001
SF/IMG_3460.JPG
```

:! Id=3b0001 SF/IMG_3461.JPG :! Id=3c0001 SF/IMG_3476.JPG :! Id=3d0001 SF/IMG 3478.JPG :! Id=3e0001 SF/IMG_3479.JPG :! Id=3f0001 SF/IMG_3480.JPG :! Id=400001 SF/IMG_3481.JPG :! Id=410001 SF/IMG_3493.JPG :! Id=1000000 SF/IMG_3535.JPG :! Id=1000001 SF/IMG_3542.JPG :! Id=1000002 SF/IMG_3579.JPG :! Id=1000003 SF/IMG_3580.JPG :! Id=1000004 SF/IMG_3581.JPG :! Id=1000005 SF/IMG_3589.JPG :! Id=1000006 SF/IMG 3590.JPG :! Id=1000007 SF/IMG_3591.JPG :! Id=4a0001 SF/IMG_3592.JPG :! Id=4b0001 SF/IMG_3593.JPG :! Id=4c0001 SF/IMG_3594.JPG :! Id=4d0001 SF/IMG_3595.JPG :! Id=4e0001 SF/IMG_3596.JPG :! Id=4f0001 SF/IMG_3608.JPG :! Id=500001 SF/IMG_3627.JPG :! Id=510001 MyPhoto6.JPG :! Id=5e0001 MyPhoto7.JPG :! Id=5f0001 MyPhoto8.JPG :! Id=600001 MyPhoto9.JPG :! Id=610001

A manually edited plain text recovery list

The edited simple recovery list

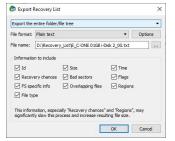
The final simple recovery list will be the following:

```
:# Version = 1
:# Sort = by real
:# PathDelim = /
:# CaseSensitive
:# Drive = type:"Volume"; size:"1048576000"; mountpoint:"e:\"; label:"ntfs test";
fs:"NTFS";
:# Parent = type:"Drive"; size:"1048576000"; serial:"2cca54405a8d3a89";
firmware:"2.00"; product:"01gb i-disk"; vendor:"c-one";
:= Diving/
:+ Diving/Aquarium/
:+ Diving/MyPhotol.jpg
:+ Diving/MyPhoto3.jpg
:+ SF/
:- SF/Sea-Lions/
MyPhoto6.JPG
MyPhoto7.JPG
MyPhoto8.JPG
MyPhoto9.JPG
```

Plain text format

Custom recovery lists in the text format contains more information about files than simple recovery lists.

Export Recovery List dialog box for the plain text format



You may compare two versions of the same plain text recovery list:

An advanced text recovery list

This is an advanced version of the recovery list described on the <u>Recovery List</u> page.

```
:# Version = 1
:# Sort = by real
:# PathDelim = /
:# CaseSensitive
:# Drive = type:"Volume"; size:"1048576000"; mountpoint:"e:\"; label:"ntfs
test"; fs:"NTFS";
:# Parent = type:"Drive"; size:"1048576000"; serial:"2cca54405a8d3a89";
firmware:"2.00"; product:"01gb i-disk"; vendor:"c-one";
Diving/
:! Id=4000000260001
:! Flags=directory
:! Created=11/22/2022 12:35:18 PM
:! Modified=11/22/2022 01:09:07 PM
```

```
:! MFT number=38
:! Parent MFT number=5
Diving/Aquarium/
:! Id=400000620001
:! Flags=directory
:! Created=11/22/2022 01:09:07 PM
:! Modified=11/22/2022 01:09:58 PM
:! Accessed=11/22/2022 01:22:17 PM
:! MFT number=98
:! Parent MFT number=38
Diving/Aquarium/20190822_100644.jpg
:! Id=630001
:! Size=3.63 MB (3,808,537 Bytes)
:! Created=11/22/2022 01:09:56 PM
:! Modified=8/21/2019 11:06:44 PM
:! Accessed=11/22/2022 01:09:56 PM
:! File type=JPEG Digital Camera
:! Recovery chances=Good (Existing file)
:! Regions (sector size=512B):
:! sector 449232 size: 3.63 MB (3,808,537 Bytes) / first data
   :! other files: [48000000530001] IMG 0510.JPG
:! sector 682862 (offset: 80 ) size: 72 Bytes / resident
    :! other files: [48000000540001] IMG_0516.JPG
:! sector 682862 (offset: 176 ) size: 104 Bytes / resident
   :! other files: [48000000540001] IMG 0516.JPG
:! MFT number=99
:! Parent MFT number=98
Diving/Aquarium/20190822_101620.jpg
:! Id=640001
:! Size=3.23 MB (3,389,662 Bytes)
:! Created=11/22/2022 01:09:56 PM
:! Modified=8/21/2019 11:16:20 PM
:! Accessed=11/22/2022 01:09:57 PM
:! File type=JPEG Digital Camera
:! Recovery chances=Good (Existing file)
:! Regions (sector size=512B):
:! sector 456672 size: 3.23 MB (3,389,662 Bytes) / first data
    :! other files: [48000000550001] IMG_0525.JPG
:! sector 682864 (offset: 80 ) size: 72 Bytes / resident
    :! other files: [48000000550001] IMG_0525.JPG
:! sector 682864 (offset: 176 ) size: 104 Bytes / resident
    :! other files: [48000000560001] IMG_0539.JPG
:! MFT number=100
:! Parent MFT number=98
Diving/Aquarium/20190822_102526.jpg
:! Id=650001
:! Size=3.06 MB (3,208,377 Bytes)
:! Created=11/22/2022 01:09:57 PM
```

:! Accessed=11/22/2022 01:22:18 PM

```
:! Modified=8/21/2019 11:25:26 PM
:! Accessed=11/22/2022 01:09:57 PM
:! File type=JPEG Digital Camera
:! Recovery chances=Good (Existing file)
:! Regions (sector size=512B):
:! sector 463296 size: 3.06 MB (3,208,377 Bytes) / first data
    :! other files: [48000000560001] IMG 0539.JPG
:! sector 682866 (offset: 80 ) size: 72 Bytes / resident
    :! other files: [48000000570001] IMG_0541.JPG
:! sector 682866 (offset: 176 ) size: 104 Bytes / resident
    :! other files: [48000000570001] IMG 0541.JPG
:! MFT number=101
:! Parent MFT number=98
Diving/Aquarium/20190822_103830.jpg
:! Id=660001
:! Size=3.22 MB (3,381,308 Bytes)
:! Created=11/22/2022 01:09:57 PM
:! Modified=8/21/2019 11:38:30 PM
:! Accessed=11/22/2022 01:09:58 PM
:! File type=JPEG Digital Camera
:! Recovery chances=Good (Existing file)
:! Regions (sector size=512B):
:! sector 469568 size: 3.22 MB (3,381,308 Bytes) / first data
    :! other files: [48000000580001] IMG_0542.JPG
:! sector 682868 (offset: 80 ) size: 72 Bytes / resident
    :! other files: [48000000580001] IMG_0542.JPG
:! sector 682868 (offset: 176 ) size: 104 Bytes / resident
    :! other files: [48000000590001] IMG_0543.JPG
:! MFT number=102
:! Parent MFT number=98
Diving/Aguarium/20190822 104333.jpg
:! Id=670001
:! Size=3.19 MB (3,344,532 Bytes)
:! Created=11/22/2022 01:09:58 PM
:! Modified=8/21/2019 11:43:33 PM
:! Accessed=11/22/2022 01:09:58 PM
:! Recovery chances=Good (Existing file)
:! Regions (sector size=512B):
:! sector 476176 size: 3.19 MB (3,344,532 Bytes) / first data
    :! other files: [48000000590001] IMG_0543.JPG
:! sector 682870 (offset: 80 ) size: 72 Bytes / resident
    :! other files: [480000005a0001] IMG 0545.JPG
:! sector 682870 (offset: 176 ) size: 104 Bytes / resident
    :! other files: [480000005a0001] IMG 0545.JPG
:! MFT number=103
:! Parent MFT number=98
Diving/MyPhoto1.jpg
:! Id=270001
:! Size=2.56 MB (2,682,000 Bytes)
:! Created=11/22/2022 12:35:18 PM
```

```
:! Modified=4/29/2009 02:52:42 AM
:! Accessed=11/22/2022 12:35:19 PM
:! File type=JPEG Digital Camera
:! Recovery chances=Good (Existing file)
:! Regions (sector size=512B):
:! sector 11336 size: 2.56 MB (2,682,000 Bytes) / first data
    :! other files: [48000000460002] IMG_3579.JPG, [480000001000003]
IMG_3579.JPG
:! sector 682742 (offset: 80 ) size: 72 Bytes / resident
    :! other files: [48000000470002] IMG_3580.JPG, [480000001000004]
IMG 3580.JPG
:! sector 682742 (offset: 176 ) size: 90 Bytes / resident
    :! other files: [48000000470002] IMG 3580.JPG, [480000001000004]
IMG_3580.JPG
:! MFT number=39
:! Parent MFT number=38
Diving/MyPhoto2.jpg
:! Id=280001
:! Size=1.75 MB (1,830,252 Bytes)
:! Created=11/22/2022 12:35:19 PM
:! Modified=4/29/2009 02:53:22 AM
:! Accessed=11/22/2022 12:35:19 PM
:! File type=JPEG Digital Camera
:! Recovery chances=Good (Existing file)
:! Regions (sector size=512B):
:! sector 16576 size: 1.75 MB (1,830,252 Bytes) / first data
    :! other files: [48000000480002] IMG_3581.JPG, [480000001000005]
IMG 3581.JPG
:! sector 682744 (offset: 80 ) size: 72 Bytes / resident
    :! other files: [48000000480002] IMG_3581.JPG, [480000001000005]
IMG_3581.JPG
:! sector 682744 (offset: 176 ) size: 90 Bytes / resident
    :! other files: [48000000490002] IMG 3589.JPG, [480000001000006]
IMG 3589.JPG
:! MFT number=40
:! Parent MFT number=38
Diving/MyPhoto3.jpg
:! Id=290001
:! Size=1.73 MB (1,816,964 Bytes)
:! Created=11/22/2022 12:35:19 PM
:! Modified=4/29/2009 02:53:58 AM
:! Accessed=11/22/2022 12:35:19 PM
:! File type=JPEG Digital Camera
:! Recovery chances=Good (Existing file)
:! Regions (sector size=512B):
:! sector 20152 size: 1.73 MB (1,816,964 Bytes) / first data
    :! other files: [48000000490002] IMG_3589.JPG, [480000001000006]
IMG 3589.JPG
:! sector 682746 (offset: 80 ) size: 72 Bytes / resident
    :! other files: [480000001000007] IMG_3590.JPG
:! sector 682746 (offset: 176 ) size: 90 Bytes / resident
```

```
:! other files: [480000004a0001] IMG 3591.JPG
:! MFT number=41
:! Parent MFT number=38
Diving/MyPhoto4.JPG
:! Id=2a0001
:! Size=880.15 KB (901,269 Bytes)
:! Created=11/22/2022 12:35:19 PM
:! Modified=4/29/2009 02:54:20 AM
:! Accessed=11/22/2022 12:35:20 PM
:! File type=JPEG Digital Camera
:! Recovery chances=Good (Existing file)
:! Regions (sector size=512B):
:! sector 23704 size: 880.15 KB (901,269 Bytes) / first data
    :! other files: [480000004b0001] IMG_3592.JPG
:! sector 682748 (offset: 80 ) size: 72 Bytes / resident
    :! other files: [480000004c0001] IMG 3593.JPG
:! sector 682748 (offset: 176 ) size: 90 Bytes / resident
    :! other files: [480000004d0001] IMG_3594.JPG
:! MFT number=42
:! Parent MFT number=38
Diving/MyPhoto5.jpg
:! Id=2b0001
:! Size=3.13 MB (3,286,883 Bytes)
:! Created=11/22/2022 12:35:20 PM
:! Modified=4/29/2009 03:13:38 AM
:! Accessed=11/22/2022 12:35:20 PM
:! File type=JPEG Digital Camera
:! Recovery chances=Good (Existing file)
:! Regions (sector size=512B):
:! sector 25472 size: 3.13 MB (3,286,883 Bytes) / first data
    :! other files: [480000004e0001] IMG 3595.JPG
:! sector 682750 (offset: 80 ) size: 72 Bytes / resident
   :! other files: [480000004f0001] IMG 3596.JPG
:! sector 682750 (offset: 176 ) size: 90 Bytes / resident
    :! other files: [48000000500001] IMG_3608.JPG
:! MFT number=43
:! Parent MFT number=38
SF/
:! Id=400000360001
:! Flags=directory
:! Created=11/22/2022 12:35:27 PM
:! Modified=11/22/2022 01:24:57 PM
:! Accessed=11/22/2022 01:25:09 PM
:! MFT number=54
:! Parent MFT number=5
SF/Sea-Lions/
:! Id=4000000420002
:! Flags=directory
:! Created=11/22/2022 01:24:57 PM
```

```
:! Modified=11/22/2022 01:25:09 PM
:! Accessed=11/22/2022 01:27:46 PM
:! MFT number=66
:! Parent MFT number=54
SF/Sea-Lions/IMG_3493.JPG
:! Id=430002
:! Size=4.75 MB (4,985,023 Bytes)
:! Created=11/22/2022 01:25:05 PM
:! Modified=6/5/2009 06:50:22 PM
:! Accessed=11/22/2022 01:25:05 PM
:! File type=JPEG Digital Camera
:! Recovery chances=Good (Existing file)
:! Regions (sector size=512B):
:! sector 208544 size: 4.75 MB (4,985,023 Bytes) / first data
    :! other files: [480000002a0001] MyPhoto4.JPG
:! sector 682798 (offset: 80 ) size: 72 Bytes / resident
    :! other files: [480000002b0001] MyPhoto5.jpg
:! sector 682798 (offset: 176 ) size: 90 Bytes / resident
    :! other files: [480000002b0001] MyPhoto5.jpg
:! Overlapping files=[480000001000000] IMG_3493.JPG
:! MFT number=67
:! Parent MFT number=66
SF/Sea-Lions/IMG_3535.JPG
:! Id=440002
:! Size=3.55 MB (3,718,479 Bytes)
:! Created=11/22/2022 01:25:06 PM
:! Modified=6/5/2009 06:55:56 PM
:! Accessed=11/22/2022 01:25:06 PM
:! File type=JPEG Digital Camera
:! Recovery chances=Good (Existing file)
:! Regions (sector size=512B):
:! sector 218288 size: 3.55 MB (3,718,479 Bytes) / first data
   :! other files: [480000002d0001] IMG_0201.JPG
:! sector 682800 (offset: 80 ) size: 72 Bytes / resident
    :! other files: [480000002d0001] IMG_0201.JPG
:! sector 682800 (offset: 176 ) size: 90 Bytes / resident
    :! other files: [480000002e0001] IMG 0211.JPG
:! Overlapping files=[480000001000001] IMG_3535.JPG
:! MFT number=68
:! Parent MFT number=66
SF/Sea-Lions/IMG_3542.JPG
:! Id=450002
:! Size=3.92 MB (4,110,749 Bytes)
:! Created=11/22/2022 01:25:06 PM
:! Modified=6/5/2009 06:57:38 PM
:! Accessed=11/22/2022 01:25:07 PM
:! File type=JPEG Digital Camera
:! Recovery chances=Good (Existing file)
:! Regions (sector size=512B):
:! sector 225552 size: 3.92 MB (4,110,749 Bytes) / first data
```

```
:! other files: [480000002e0001] IMG 0211.JPG
:! sector 682802 (offset: 80 ) size: 72 Bytes / resident
    :! other files: [480000002f0001] IMG_0250.JPG
:! sector 682802 (offset: 176 ) size: 90 Bytes / resident
    :! other files: [480000002f0001] IMG_0250.JPG
:! Overlapping files=[480000001000002] IMG 3542.JPG
:! MFT number=69
:! Parent MFT number=66
SF/Sea-Lions/IMG_3579.JPG
:! Id=460002
:! Size=3.92 MB (4,109,345 Bytes)
:! Created=11/22/2022 01:25:07 PM
:! Modified=6/5/2009 06:59:32 PM
:! Accessed=11/22/2022 01:25:07 PM
:! File type=JPEG Digital Camera
:! Recovery chances=Good (Existing file)
:! Regions (sector size=512B):
:! sector 233584 size: 3.92 MB (4,109,345 Bytes) / first data
    :! other files: [48000000300001] IMG_0283.JPG
:! sector 682804 (offset: 80 ) size: 72 Bytes / resident
    :! other files: [48000000300001] IMG 0283.JPG
:! sector 682804 (offset: 176 ) size: 90 Bytes / resident
    :! other files: [48000000310001] IMG 0389.JPG
:! Overlapping files=[480000001000003] IMG_3579.JPG
:! MFT number=70
:! Parent MFT number=66
SF/Sea-Lions/IMG_3580.JPG
:! Id=470002
:! Size=3.35 MB (3,510,477 Bytes)
:! Created=11/22/2022 01:25:08 PM
:! Modified=6/5/2009 06:59:40 PM
:! Accessed=11/22/2022 01:25:08 PM
:! File type=JPEG Digital Camera
:! Recovery chances=Good (Existing file)
:! Regions (sector size=512B):
:! sector 241616 size: 3.35 MB (3,510,477 Bytes) / first data
   :! other files: [48000000310001] IMG 0389.JPG
:! sector 682806 (offset: 80 ) size: 72 Bytes / resident
    :! other files: [48000000320001] IMG_0390.JPG
:! sector 682806 (offset: 176 ) size: 90 Bytes / resident
    :! other files: [48000000320001] IMG_0390.JPG
:! Overlapping files=[480000001000004] IMG 3580.JPG
:! MFT number=71
:! Parent MFT number=66
SF/Sea-Lions/IMG_3581.JPG
:! Id=480002
:! Size=4.09 MB (4,285,353 Bytes)
:! Created=11/22/2022 01:25:08 PM
:! Modified=6/5/2009 06:59:48 PM
:! Accessed=11/22/2022 01:25:09 PM
```

```
:! File type=JPEG Digital Camera
:! Recovery chances=Good (Existing file)
:! Regions (sector size=512B):
:! sector 248480 size: 4.09 MB (4,285,353 Bytes) / first data
    :! other files: [48000000330001] IMG_0391.JPG
:! sector 682808 (offset: 80 ) size: 72 Bytes / resident
   :! other files: [48000000330001] IMG_0391.JPG
:! sector 682808 (offset: 176 ) size: 90 Bytes / resident
    :! other files: [48000000340001] IMG_3694.JPG
:! Overlapping files=[480000001000005] IMG_3581.JPG
:! MFT number=72
:! Parent MFT number=66
SF/Sea-Lions/IMG_3589.JPG
:! Id=490002
:! Size=4.44 MB (4,651,043 Bytes)
:! Created=11/22/2022 01:25:09 PM
:! Modified=6/5/2009 07:00:18 PM
:! Accessed=11/22/2022 01:25:10 PM
:! File type=JPEG Digital Camera
:! Recovery chances=Good (Existing file)
:! Regions (sector size=512B):
:! sector 256856 size: 4.44 MB (4,651,043 Bytes) / first data
   :! other files: [48000000340001] IMG_3694.JPG
:! sector 682810 (offset: 80 ) size: 72 Bytes / resident
    :! other files: [48000000350001] IMG_3699.JPG
:! sector 682810 (offset: 176 ) size: 90 Bytes / resident
   :! other files: [48000000350001] IMG_3699.JPG
:! Overlapping files=[480000001000006] IMG_3589.JPG
:! MFT number=73
:! Parent MFT number=66
SF/IMG 0869.JPG
:! Id=370001
:! Size=3.53 MB (3,698,659 Bytes)
:! Created=11/22/2022 12:35:27 PM
:! Modified=5/30/2009 10:13:46 AM
:! Accessed=11/22/2022 01:22:26 PM
:! File type=JPEG Digital Camera
:! Recovery chances=Good (Existing file)
:! Regions (sector size=512B):
:! sector 111224 size: 3.53 MB (3,698,659 Bytes) / first data
   :! other files: [4800000000000] $MFTMirr
:! sector 682774 (offset: 80 ) size: 72 Bytes / resident
    :! other files: [48000000010000] $MFTMirr
:! sector 682774 (offset: 176 ) size: 90 Bytes / resident
   :! other files: [48000000020000] $LogFile
:! MFT number=55
:! Parent MFT number=54
SF/IMG 0873.JPG
:! Id=380001
:! Size=5.61 MB (5,881,104 Bytes)
```

```
:! Created=11/22/2022 12:35:28 PM
:! Modified=5/30/2009 10:15:56 AM
:! Accessed=11/22/2022 01:22:28 PM
:! File type=JPEG Digital Camera
:! Recovery chances=Good (Existing file)
:! Regions (sector size=512B):
:! sector 118448 size: 5.61 MB (5,881,104 Bytes) / first data
    :! other files: [48000000020000] $LogFile
:! sector 682776 (offset: 80 ) size: 72 Bytes / resident
    :! other files: [48000000040000] $AttrDef
:! sector 682776 (offset: 176 ) size: 90 Bytes / resident
    :! other files: [48000000040000] $AttrDef
:! MFT number=56
:! Parent MFT number=54
SF/IMG_0890.JPG
:! Id=390001
:! Size=5.40 MB (5,663,358 Bytes)
:! Created=11/22/2022 12:35:29 PM
:! Modified=5/30/2009 10:47:26 AM
:! Accessed=11/22/2022 01:22:29 PM
:! File type=JPEG Digital Camera
:! Recovery chances=Good (Existing file)
:! Regions (sector size=512B):
:! sector 129936 size: 5.40 MB (5,663,358 Bytes) / first data
    :! other files: [48000000060000] $Bitmap
:! sector 682778 (offset: 80 ) size: 72 Bytes / resident
   :! other files: [48000000060000] $Bitmap
:! sector 682778 (offset: 176 ) size: 90 Bytes / resident
    :! other files: [48000000070000] $Boot
:! MFT number=57
:! Parent MFT number=54
SF/IMG_1739.JPG
:! Id=3a0001
:! Size=4.07 MB (4,266,181 Bytes)
:! Created=11/22/2022 12:35:30 PM
:! Modified=6/3/2009 09:59:04 AM
:! Accessed=11/22/2022 01:22:30 PM
:! File type=JPEG Digital Camera
:! Recovery chances=Good (Existing file)
:! Regions (sector size=512B):
:! sector 141000 size: 4.07 MB (4,266,181 Bytes) / first data
    :! other files: [48000000070000] $Boot
:! sector 682780 (offset: 80 ) size: 72 Bytes / resident
    :! other files: [48000000070000] $Boot
:! sector 682780 (offset: 176 ) size: 90 Bytes / resident
    :! other files: [48000000000000] $UpCase
:! MFT number=58
:! Parent MFT number=54
SF/IMG_3460.JPG
:! Id=3b0001
```

```
:! Size=4.38 MB (4,593,453 Bytes)
:! Created=11/22/2022 12:35:31 PM
:! Modified=6/5/2009 04:58:08 PM
:! Accessed=11/22/2022 01:22:30 PM
:! File type=JPEG Digital Camera
:! Recovery chances=Good (Existing file)
:! Regions (sector size=512B):
:! sector 149336 size: 4.38 MB (4,593,453 Bytes) / first data
   :! other files: [48000000000000] $UpCase
:! sector 682782 (offset: 80 ) size: 72 Bytes / resident
   :! other files: [48000000000000] $UpCase
:! sector 682782 (offset: 176 ) size: 90 Bytes / resident
   :! other files: [48000000200001] $Tops
:! MFT number=59
:! Parent MFT number=54
SF/IMG 3461.JPG
:! Id=3c0001
:! Size=3.91 MB (4,102,032 Bytes)
:! Created=11/22/2022 12:35:31 PM
:! Modified=6/5/2009 04:58:26 PM
:! Accessed=11/22/2022 01:22:31 PM
:! File type=JPEG Digital Camera
:! Recovery chances=Good (Existing file)
:! Regions (sector size=512B):
:! sector 158312 size: 3.91 MB (4,102,032 Bytes) / first data
   :! other files: [48000000200001] $Tops
:! sector 682784 (offset: 80 ) size: 72 Bytes / resident
   :! other files: [48000000200001] $Tops
:! sector 682784 (offset: 176 ) size: 90 Bytes / resident
   :! other files: [48000000210001] $TxfLog.blf
:! MFT number=60
:! Parent MFT number=54
SF/IMG_3476.JPG
:! Id=3d0001
:! Size=3.92 MB (4,114,595 Bytes)
:! Created=11/22/2022 12:35:32 PM
:! Modified=6/5/2009 05:02:50 PM
:! Accessed=11/22/2022 01:22:32 PM
:! File type=JPEG Digital Camera
:! Recovery chances=Good (Existing file)
:! Regions (sector size=512B):
:! sector 166328 size: 3.92 MB (4,114,595 Bytes) / first data
   :! other files: [48000000210001] $TxfLog.blf
:! sector 682786 (offset: 80 ) size: 72 Bytes / resident
   :! sector 682786 (offset: 176 ) size: 90 Bytes / resident
   :! MFT number=61
:! Parent MFT number=54
SF/IMG_3478.JPG
```

```
:! Id=3e0001
:! Size=4.74 MB (4,968,784 Bytes)
:! Created=11/22/2022 12:35:33 PM
:! Modified=6/5/2009 05:03:22 PM
:! Accessed=11/22/2022 01:22:33 PM
:! File type=JPEG Digital Camera
:! Recovery chances=Good (Existing file)
:! Regions (sector size=512B):
:! sector 174376 size: 4.74 MB (4,968,784 Bytes) / first data
    :! other files: [48000000230001] $TxfLogContainer00000000000000000000
:! sector 682788 (offset: 80 ) size: 72 Bytes / resident
    :! other files: [48000000230001] $TxfLogContainer00000000000000000000
:! sector 682788 (offset: 176 ) size: 90 Bytes / resident
   :! other files: [48000000250001] WPSettings.dat
:! MFT number=62
:! Parent MFT number=54
SF/IMG_3479.JPG
:! Id=3f0001
:! Size=4.28 MB (4,484,110 Bytes)
:! Created=11/22/2022 12:35:34 PM
:! Modified=6/5/2009 05:03:42 PM
:! Accessed=11/22/2022 01:22:34 PM
:! File type=JPEG Digital Camera
:! Recovery chances=Good (Existing file)
:! Regions (sector size=512B):
:! sector 184088 size: 4.28 MB (4,484,110 Bytes) / first data
   :! other files: [48000000250001] WPSettings.dat
:! sector 682790 (offset: 80 ) size: 72 Bytes / resident
    :! other files: [48000000250001] WPSettings.dat
:! sector 682790 (offset: 176 ) size: 90 Bytes / resident
    :! other files: [48000000270001] MyPhoto1.jpg
:! MFT number=63
:! Parent MFT number=54
SF/IMG_3480.JPG
:! Id=400001
:! Size=4.28 MB (4,491,209 Bytes)
:! Created=11/22/2022 12:35:34 PM
:! Modified=6/5/2009 05:03:48 PM
:! Accessed=11/22/2022 01:24:01 PM
:! File type=JPEG Digital Camera
:! Recovery chances=Good (Existing file)
:! Regions (sector size=512B):
:! sector 192848 size: 4.28 MB (4,491,209 Bytes) / first data
    :! other files: [48000000270001] MyPhoto1.jpg
:! sector 682792 (offset: 80 ) size: 72 Bytes / resident
    :! other files: [48000000280001] MyPhoto2.jpg
:! sector 682792 (offset: 176 ) size: 90 Bytes / resident
   :! other files: [48000000280001] MyPhoto2.jpg
:! MFT number=64
:! Parent MFT number=54
```

```
SF/IMG_3481.JPG
:! Id=410001
:! Size=3.38 MB (3,541,845 Bytes)
:! Created=11/22/2022 12:35:35 PM
:! Modified=6/20/2009 11:00:56 AM
:! Accessed=11/22/2022 01:23:57 PM
:! File type=JPEG Digital Camera
:! Recovery chances=Good (Existing file)
:! Regions (sector size=512B):
:! sector 201624 size: 3.38 MB (3,541,845 Bytes) / first data
    :! other files: [48000000290001] MyPhoto3.jpg
:! sector 682794 (offset: 80 ) size: 72 Bytes / resident
   :! other files: [48000000290001] MyPhoto3.jpg
:! sector 682794 (offset: 176 ) size: 90 Bytes / resident
    :! other files: [480000002a0001] MyPhoto4.JPG
:! MFT number=65
:! Parent MFT number=54
SF/IMG_3493.JPG
:! Id=1000000
:! Size=4.75 MB (4,985,023 Bytes)
:! Flags=deleted
:! Created=11/22/2022 12:35:36 PM
:! Modified=6/5/2009 06:50:22 PM
:! Accessed=11/22/2022 12:35:37 PM
:! File type=JPEG Digital Camera
:! Recovery chances=Below Average (Integrity OK, Beginning overwritten by
existing file [48000000430002])
:! Regions (sector size=512B):
:! sector 208544 size: 4.75 MB (4,985,023 Bytes) / first data
    :! other files: [480000005b0001] IMG_0547.JPG
:! sector 682796 (offset: 80 ) size: 72 Bytes / resident
    :! other files: [480000005b0001] IMG 0547.JPG
:! sector 682796 (offset: 176 ) size: 90 Bytes / resident
   :! other files: [480000005c0001] IMG_0550.JPG
:! Overlapping files=[48000000430002] IMG_3493.JPG
:! MFT number=66
:! Parent MFT number=54
SF/IMG_3535.JPG
:! Id=1000001
:! Size=3.55 MB (3,718,479 Bytes)
:! Flags=deleted
:! Created=11/22/2022 12:35:37 PM
:! Modified=6/5/2009 06:55:56 PM
:! Accessed=11/22/2022 12:35:37 PM
:! File type=JPEG Digital Camera
:! Recovery chances=Below Average (Integrity OK, Beginning overwritten by
existing file [48000000440002])
:! Regions (sector size=512B):
:! sector 218288 size: 3.55 MB (3,718,479 Bytes) / first data
    :! other files: [480000005c0001] IMG_0550.JPG
:! sector 682798 (offset: 80 ) size: 72 Bytes / resident
```

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```
:! other files: [480000005d0001] IMG 0551.JPG
:! sector 682798 (offset: 176 ) size: 90 Bytes / resident
    :! other files: [480000005d0001] IMG_0551.JPG
:! Overlapping files=[480000000440002] IMG 3535.JPG
:! MFT number=67
:! Parent MFT number=54
SF/IMG_3542.JPG
:! Id=100002
:! Size=3.92 MB (4,110,749 Bytes)
:! Flags=deleted
:! Created=11/22/2022 12:35:37 PM
:! Modified=6/5/2009 06:57:38 PM
:! Accessed=11/22/2022 12:35:38 PM
:! File type=JPEG Digital Camera
:! Recovery chances=Below Average (Integrity OK, Beginning overwritten by
existing file [48000000450002])
:! Regions (sector size=512B):
:! sector 225552 size: 3.92 MB (4,110,749 Bytes) / first data
    :! other files: [480000005e0001] MyPhoto6.JPG
:! sector 682800 (offset: 80 ) size: 72 Bytes / resident
    :! other files: [480000005e0001] MyPhoto6.JPG
:! sector 682800 (offset: 176 ) size: 90 Bytes / resident
    :! other files: [480000005f0001] MyPhoto7.JPG
:! Overlapping files=[48000000450002] IMG_3542.JPG
:! MFT number=68
:! Parent MFT number=54
SF/IMG_3579.JPG
:! Id=1000003
:! Size=3.92 MB (4,109,345 Bytes)
:! Flags=deleted
:! Created=11/22/2022 12:35:38 PM
:! Modified=6/5/2009 06:59:32 PM
:! Accessed=11/22/2022 12:35:39 PM
:! File type=JPEG Digital Camera
:! Recovery chances=Below Average (Integrity OK, Beginning overwritten by
existing file [48000000460002])
:! Regions (sector size=512B):
:! sector 233584 size: 3.92 MB (4,109,345 Bytes) / first data
    :! other files: [480000005f0001] MyPhoto7.JPG
:! sector 682802 (offset: 80 ) size: 72 Bytes / resident
   :! other files: [48000000600001] MyPhoto8.JPG
:! sector 682802 (offset: 176 ) size: 90 Bytes / resident
    :! other files: [48000000600001] MyPhoto8.JPG
:! Overlapping files=[480000000460002] IMG 3579.JPG
:! MFT number=69
:! Parent MFT number=54
SF/IMG 3580.JPG
:! Id=1000004
:! Size=3.35 MB (3,510,477 Bytes)
:! Flags=deleted
```

```
:! Created=11/22/2022 12:35:39 PM
:! Modified=6/5/2009 06:59:40 PM
:! Accessed=11/22/2022 12:35:39 PM
:! File type=JPEG Digital Camera
:! Recovery chances=Below Average (Integrity OK, Beginning overwritten by
existing file [48000000470002])
:! Regions (sector size=512B):
:! sector 241616 size: 3.35 MB (3,510,477 Bytes) / first data
    :! other files: [48000000610001] MyPhoto9.JPG
:! sector 682804 (offset: 80 ) size: 72 Bytes / resident
    :! other files: [48000000610001] MyPhoto9.JPG
:! sector 682804 (offset: 176 ) size: 90 Bytes / resident
    :! other files: [48000000630001] 20190822 100644.jpg
:! Overlapping files=[480000000470002] IMG_3580.JPG
:! MFT number=70
:! Parent MFT number=54
SF/IMG_3581.JPG
:! Id=1000005
:! Size=4.09 MB (4,285,353 Bytes)
:! Flags=deleted
:! Created=11/22/2022 12:35:39 PM
:! Modified=6/5/2009 06:59:48 PM
:! Accessed=11/22/2022 12:35:40 PM
:! File type=JPEG Digital Camera
:! Recovery chances=Below Average (Integrity OK, Beginning overwritten by
existing file [48000000480002])
:! Regions (sector size=512B):
:! sector 248480 size: 4.09 MB (4,285,353 Bytes) / first data
    :! other files: [48000000630001] 20190822_100644.jpg
:! sector 682806 (offset: 80 ) size: 72 Bytes / resident
   :! other files: [48000000640001] 20190822_101620.jpg
:! sector 682806 (offset: 176 ) size: 90 Bytes / resident
    :! other files: [48000000640001] 20190822_101620.jpg
:! Overlapping files=[480000000480002] IMG 3581.JPG
:! MFT number=71
:! Parent MFT number=54
SF/IMG 3589.JPG
:! Id=1000006
:! Size=4.44 MB (4,651,043 Bytes)
:! Flags=deleted
:! Created=11/22/2022 12:35:40 PM
:! Modified=6/5/2009 07:00:18 PM
:! Accessed=11/22/2022 12:35:41 PM
:! File type=JPEG Digital Camera
:! Recovery chances=Below Average (Integrity OK, Beginning overwritten by
existing file [48000000490002])
:! Regions (sector size=512B):
:! sector 256856 size: 4.44 MB (4,651,043 Bytes) / first data
   :! other files: [48000000650001] 20190822_102526.jpg
:! sector 682808 (offset: 80 ) size: 72 Bytes / resident
    :! other files: [48000000650001] 20190822_102526.jpg
```

```
:! sector 682808 (offset: 176 ) size: 90 Bytes / resident
    :! other files: [48000000660001] 20190822 103830.jpg
:! Overlapping files=[480000000490002] IMG_3589.JPG
:! MFT number=72
:! Parent MFT number=54
SF/IMG_3590.JPG
:! Id=1000007
:! Size=4.67 MB (4,899,941 Bytes)
:! Flags=deleted
:! Created=11/22/2022 12:35:41 PM
:! Modified=6/5/2009 07:00:22 PM
:! Accessed=11/22/2022 12:35:42 PM
:! File type=NTFS Directory Entries
:! Recovery chances=Average (Signature, Unfragmented)
:! Regions (sector size=512B):
:! sector 265944 size: 4.67 MB (4,899,941 Bytes) / first data
    :! other files: [48000000660001] 20190822_103830.jpg
:! sector 682810 (offset: 80 ) size: 72 Bytes / resident
    :! other files: [48000000670001] 20190822_104333.jpg
:! sector 682810 (offset: 176 ) size: 90 Bytes / resident
    :! other files: [48000000670001] 20190822 104333.jpg
:! MFT number=73
:! Parent MFT number=54
SF/IMG_3591.JPG
:! Id=4a0001
:! Size=4.08 MB (4,280,042 Bytes)
:! Flags=deleted
:! Created=11/22/2022 12:35:42 PM
:! Modified=6/5/2009 07:00:22 PM
:! Accessed=11/22/2022 12:35:42 PM
:! File type=JPEG Digital Camera
:! Recovery chances=Good (Integrity OK, Unfragmented)
:! Regions (sector size=512B):
:! sector 275520 size: 4.08 MB (4,280,042 Bytes) / first data
    :! other files: [48000000370001] IMG_0869.JPG
:! sector 682812 (offset: 80 ) size: 72 Bytes / resident
   :! other files: [48000000370001] IMG 0869.JPG
:! sector 682812 (offset: 176 ) size: 90 Bytes / resident
    :! other files: [48000000380001] IMG 0873.JPG
:! MFT number=74
:! Parent MFT number=54
SF/IMG_3592.JPG
:! Id=4b0001
:! Size=5.04 MB (5,285,211 Bytes)
:! Flags=deleted
:! Created=11/22/2022 12:35:42 PM
:! Modified=6/5/2009 07:00:22 PM
:! Accessed=11/22/2022 12:35:43 PM
:! File type=JPEG Digital Camera
:! Recovery chances=Good (Integrity OK, Unfragmented)
```

```
:! Regions (sector size=512B):
:! sector 283880 size: 5.04 MB (5,285,211 Bytes) / first data
   :! other files: [48000000380001] IMG_0873.JPG
:! sector 682814 (offset: 80 ) size: 72 Bytes / resident
   :! other files: [48000000390001] IMG_0890.JPG
:! sector 682814 (offset: 176 ) size: 90 Bytes / resident
   :! other files: [48000000390001] IMG_0890.JPG
:! MFT number=75
:! Parent MFT number=54
SF/IMG_3593.JPG
:! Id=4c0001
:! Size=4.74 MB (4,969,442 Bytes)
:! Flags=deleted
:! Created=11/22/2022 12:35:43 PM
:! Modified=6/5/2009 07:00:26 PM
:! Accessed=11/22/2022 12:35:44 PM
:! File type=JPEG Digital Camera
:! Recovery chances=Average (Signature, Unfragmented)
:! Regions (sector size=512B):
:! sector 294208 size: 4.74 MB (4,969,442 Bytes) / first data
    :! other files: [480000003a0001] IMG_1739.JPG
:! sector 682816 (offset: 80 ) size: 72 Bytes / resident
   :! other files: [480000003a0001] IMG_1739.JPG
:! sector 682816 (offset: 176 ) size: 90 Bytes / resident
    :! other files: [480000003b0001] IMG_3460.JPG
:! MFT number=76
:! Parent MFT number=54
SF/IMG_3594.JPG
:! Id=4d0001
:! Size=4.69 MB (4,917,237 Bytes)
:! Flags=deleted
:! Created=11/22/2022 12:35:44 PM
:! Modified=6/5/2009 07:00:30 PM
:! Accessed=11/22/2022 12:35:45 PM
:! File type=JPEG Digital Camera
:! Recovery chances=Average (Signature, Unfragmented)
:! Regions (sector size=512B):
:! sector 303920 size: 4.69 MB (4,917,237 Bytes) / first data
    :! other files: [480000003b0001] IMG 3460.JPG
:! sector 682818 (offset: 80 ) size: 72 Bytes / resident
   :! other files: [480000003c0001] IMG_3461.JPG
:! sector 682818 (offset: 176 ) size: 90 Bytes / resident
    :! other files: [480000003c0001] IMG 3461.JPG
:! MFT number=77
:! Parent MFT number=54
SF/IMG_3595.JPG
:! Id=4e0001
:! Size=5.09 MB (5,338,697 Bytes)
:! Flags=deleted
:! Created=11/22/2022 12:35:45 PM
```

```
:! Modified=6/5/2009 07:00:32 PM
:! Accessed=11/22/2022 12:35:46 PM
:! Recovery chances=Average (Unrecognized, Unfragmented)
:! Regions (sector size=512B):
:! sector 313528 size: 5.09 MB (5,338,697 Bytes) / first data
   :! other files: [480000003d0001] IMG 3476.JPG
:! sector 682820 (offset: 80 ) size: 72 Bytes / resident
    :! other files: [480000003d0001] IMG_3476.JPG
:! sector 682820 (offset: 176 ) size: 90 Bytes / resident
   :! other files: [480000003e0001] IMG_3478.JPG
:! MFT number=78
:! Parent MFT number=54
SF/IMG_3596.JPG
:! Id=4f0001
:! Size=4.93 MB (5,174,072 Bytes)
:! Flags=deleted
:! Created=11/22/2022 12:35:46 PM
:! Modified=6/5/2009 07:00:34 PM
:! Accessed=11/22/2022 12:35:47 PM
:! File type=JPEG Digital Camera
:! Recovery chances=Average (Signature, Unfragmented)
:! Regions (sector size=512B):
:! sector 323960 size: 4.93 MB (5,174,072 Bytes) / first data
    :! other files: [480000003e0001] IMG_3478.JPG
:! sector 682822 (offset: 80 ) size: 72 Bytes / resident
   :! other files: [480000003f0001] IMG_3479.JPG
:! sector 682822 (offset: 176 ) size: 90 Bytes / resident
   :! other files: [480000003f0001] IMG 3479.JPG
:! MFT number=79
:! Parent MFT number=54
SF/IMG_3608.JPG
:! Id=500001
:! Size=5.01 MB (5,257,021 Bytes)
:! Flags=deleted
:! Created=11/22/2022 12:35:47 PM
:! Modified=6/5/2009 07:01:28 PM
:! Accessed=11/22/2022 12:35:48 PM
:! File type=JPEG Digital Camera
:! Recovery chances=Average (Signature, Unfragmented)
:! Regions (sector size=512B):
:! sector 334072 size: 5.01 MB (5,257,021 Bytes) / first data
    :! other files: [48000000400001] IMG_3480.JPG
:! sector 682824 (offset: 80 ) size: 72 Bytes / resident
   :! other files: [48000000400001] IMG 3480.JPG
:! sector 682824 (offset: 176 ) size: 90 Bytes / resident
    :! other files: [48000000410001] IMG 3481.JPG
:! MFT number=80
:! Parent MFT number=54
SF/IMG_3627.JPG
:! Id=510001
```

```
:! Size=3.48 MB (3,651,691 Bytes)
:! Flags=deleted
:! Created=11/22/2022 12:35:48 PM
:! Modified=6/5/2009 07:02:36 PM
:! Accessed=11/22/2022 12:35:48 PM
:! Recovery chances=Average (Unrecognized, Unfragmented)
:! Regions (sector size=512B):
:! sector 344344 size: 3.48 MB (3,651,691 Bytes) / first data
    :! other files: [48000000410001] IMG_3481.JPG
:! sector 682826 (offset: 80 ) size: 72 Bytes / resident
    :! other files: [48000001000000] IMG_3493.JPG
:! sector 682826 (offset: 176 ) size: 90 Bytes / resident
    :! other files: [48000001000000] IMG_3493.JPG
:! MFT number=81
:! Parent MFT number=54
MyPhoto6.JPG
:! Id=5e0001
:! Size=1.07 MB (1,123,560 Bytes)
:! Created=11/22/2022 12:35:56 PM
:! Modified=4/29/2009 02:54:46 AM
:! Accessed=11/22/2022 12:35:56 PM
:! File type=JPEG Digital Camera
:! Recovery chances=Good (Existing file)
:! Regions (sector size=512B):
:! sector 436440 size: 1.07 MB (1,123,560 Bytes) / first data
    :! other files: [480000004c0001] IMG_3593.JPG
:! sector 682852 (offset: 80 ) size: 72 Bytes / resident
    :! other files: [480000004d0001] IMG_3594.JPG
:! sector 682852 (offset: 176 ) size: 90 Bytes / resident
    :! other files: [480000004d0001] IMG_3594.JPG
:! MFT number=94
:! Parent MFT number=5
MyPhoto7.JPG
:! Id=5f0001
:! Size=842.76 KB (862,983 Bytes)
:! Created=11/22/2022 12:35:56 PM
:! Modified=4/29/2009 02:55:06 AM
:! Accessed=11/22/2022 12:35:56 PM
:! File type=JPEG Digital Camera
:! Recovery chances=Good (Existing file)
:! Regions (sector size=512B):
:! sector 438640 size: 842.76 KB (862,983 Bytes) / first data
    :! other files: [480000004e0001] IMG 3595.JPG
:! sector 682854 (offset: 80 ) size: 72 Bytes / resident
    :! other files: [480000004e0001] IMG_3595.JPG
:! sector 682854 (offset: 176 ) size: 90 Bytes / resident
    :! other files: [480000004f0001] IMG_3596.JPG
:! MFT number=95
:! Parent MFT number=5
MyPhoto8.JPG
```

```
:! Id=600001
:! Size=997.99 KB (1,021,937 Bytes)
:! Created=11/22/2022 12:35:56 PM
:! Modified=4/29/2009 02:55:30 AM
:! Accessed=11/22/2022 12:35:57 PM
:! File type=JPEG Digital Camera
:! Recovery chances=Good (Existing file)
:! Regions (sector size=512B):
:! sector 440328 size: 997.99 KB (1,021,937 Bytes) / first data
    :! other files: [480000004f0001] IMG_3596.JPG
:! sector 682856 (offset: 80 ) size: 72 Bytes / resident
    :! other files: [48000000500001] IMG_3608.JPG
:! sector 682856 (offset: 176 ) size: 90 Bytes / resident
   :! other files: [48000000500001] IMG_3608.JPG
:! MFT number=96
:! Parent MFT number=5
MyPhoto9.JPG
:! Id=610001
:! Size=3.37 MB (3,533,017 Bytes)
:! Created=11/22/2022 12:35:57 PM
:! Modified=4/29/2009 02:56:50 AM
:! Accessed=11/22/2022 12:35:57 PM
:! File type=JPEG Digital Camera
:! Recovery chances=Good (Existing file)
:! Regions (sector size=512B):
:! sector 442328 size: 3.37 MB (3,533,017 Bytes) / first data
   :! other files: [48000000510001] IMG 3627.JPG
:! sector 682858 (offset: 80 ) size: 72 Bytes / resident
   :! other files: [48000000510001] IMG_3627.JPG
:! sector 682858 (offset: 176 ) size: 90 Bytes / resident
   :! other files: [48000000530001] IMG_0510.JPG
:! MFT number=97
:! Parent MFT number=5
```

Other recovery list formats

You may export recovery lists in the following formats:

XML format

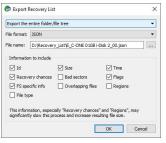
Export Recovery List dialog box for the XML format

```
    Export Recovery List
    X
Export the entire folde/file tree
    File format:
    M&
    M
    M
    M
    M
    Size
    The name:
    Dr:Recovery_ListE_COVE 01G8 i-0isk 2_00.xml
    m
    Thormation to include
    Id
    M
    Size
    The
    Recovery chances
    Bad sectors
    Filess
    Fis specific info
    Overlapping files
    Regions
    File type
    This information, expecially Recovery chances
    OK
    Cancel
```

JSON format

Custom recovery lists in the text format contains more information about files than simple recovery lists.

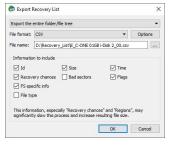
Export Recovery List dialog box for the JSON format



CSV format

Custom recovery lists in the text format contains more information about files than simple recovery lists.

Export Recovery List dialog box for the CSV format



CSV Options dialog box

Delimeter	Dot	•
String separator	•	-
Encoding		
	TF-16LE 🗌 Wri	

3.11 Drive Copy Wizard

You may copy any object in the Drives panel to any other object, if there is enough space on the target one. Before **Copy object to...** becomes enabled on the **Create** menu, you need to enable writing.

To enable writing,

- 1 In the **R-Studio** main panel, select the Tools menu, then Settings, and select Enable Write on the <u>Settings</u> dialog box.
- > The Copy object to... will be enabled on the Create menu. Now objects can be copied.

While the objects are being copied, you may change some parameters and view the <u>I/O monitor</u> on the Object Copy Progress dialog box.

R-Studio Technician	>
	Stop
Time elapsed: 9m 35s, remaining: 20m	14s
Copy disk	

You may change some options during the copy process

Drive Options	Post	Actions						
ST380817AS 3.4	42 : 4	MR29A6X						
Read retries cou	unt:	Default (0) 🔻	•					
					OF		Cance	
					0		Cano	2
ptions (Copy di	isk)							
		tions						
ve Options P	ost Ac							
ve Options P	ost Ac		s completion					
ve Options P	ost Ac compu	iter on all task	-					
ve Options P	ost Ac compu	iter on all task	s completion	25	\$	SSL /	Auto	•
ve Options P	ost Ac compu ons xampl	iter on all task	Port:	25	÷	SSL /	Auto	•
ve Options P Shutdown the Email notification ierver: mail.e	ost Ac compu ons xampl tes	iter on all task e.com iter 1@example	Port: e.com	25	÷	SSL /	Auto	•
ve Options P Shutdown the Email notification ierver: mail.e	ost Ac compu ons tes tes	iter on all task e.com iter 1@example	Port: e.com e.com	25	•	SSL /	Auto	•
ve Options P Shutdown the Email notification ierver: mail.e iender email: tedpient(s) email:	ost Ac compu ons tes tes	iter on all task e.com iter1@exampl iter2@exampl	Port: e.com Results	25	\$	SSL /	Auto	•
ve Options P Shutdown the Email notification ierver: mail.e iender email: teopient(s) email: Sustom subject:	ost Ac compu ons tes tes Ima	iter on all task e.com iter 1@exampl iter 2@exampl age Creation F	Port: e.com Results	25	•	SSL /	Auto	•
ve Options P Shutdown the Email notification ierver: mail.e ierder email: tecipient(s) email: Custom subject: Send email if	ost Ac compu ons tes tes Ima	e.com eter 1@exampl ter 2@exampl age Creation F	Port: e.com e.com Results ration	25	•	SSL /	Auto	•

Depending on the objects to copy and your tasks, you may do:

Binary (byte to byte copy)

An exact copy of the source object (or a part thereof) to the destination device (from its beginning or a specified offset). Any object may be copied to any object this way.

To perform a binary copy of an object,

- 1 Select Copy object to... on the Create menu
- 2 Select a source and destination objects in the Drives Copy Wizard panel and click the Next button Drives Copy Wizard

ives	Source						Destination			
Device/Disk	Label	FS	Start	Size	^	Device/Disk	Label NTFS-Test	FS NTFS	Start 32 KB	Size 6.76 GB
Y 🗹 🥯 SAMSUNG SP0411N .	. S01JJ20XC75851	#0 A	0 Bytes	37.31 GB		🗌 🥪 G: 🗸 🗸	FAT32-TEST	FAT32	6.76 GB	6.19 GB
	NTFS-Test	NTFS	32 KB	6.76 GB			FAT-TEST	FAT16	12.95 GB	2.01 GB
🗌 🥪 G:	FAT32-TEST	FAT32	6.76 GB	6.19 GB		Volume(c7e018f. x	HFS-Test	HFS+	14.96 GB	6.67 GB
🗌 🥪 H: 🔹	FAT-TEST	FAT16	12.95 GB	2.01 GB		🗌 🥯 HarddiskVolume s	Ext4FS-Test	Ext4	21.63 GB	6.52 GB
Volume(c7e018f. ,	HFS-Test	HFS+	14.96 GB	6.67 GB		🗌 🥪 U: 🗸	Double	NTFS	28.15 GB	9.15 GB
🗌 🥯 HarddiskVolume	Ext4FS-Test	Ext4	21.63 GB	6.52 GB		Y 🗌 🥪 TOSHIBA DT01ACA	44H5ATLKS	#1 SA	0 Bytes	931.51 GB
🗌 🥪 U:	Double	NTFS	28.15 GB	9.15 GB		🗌 🥯 Volume(3303cc5 x	Recovery	NTFS	1 MB	300 MB
Y 🗌 🥪 TOSHIBA DT01ACA	44H5ATLKS	#1 SA	0 Bytes	931.51 GB		🗌 🥯 EFI system partit. .		FAT32	301 MB	100 MB
🗌 🥯 Volume{3303cc5.	Recovery	NTFS	1 MB	300 MB		🗌 🥯 Microsoft reserv. x			401 MB	128 MB
🗌 🥯 EFI system partit.	•	FAT32	301 MB	100 MB		_ @ G	System	NTFS	529 MB	292.01 GB
Microsoft reserv.	•		401 MB	128 MB		🗌 🥯 Volume[e0a573f. x		NTFS	292.53 GB	450 MB
🗌 🥪 C: 🔹	System	NTFS	529 MB	292.01 GB		🗌 🥪 D: 🗸	Data	NTFS	292.97 GB	638.54 GB
Volume{e0a573f.	•	NTFS	292.53 GB	450 MB		🗌 🖘 Empty Space33			931.51 GB	1.69 MB
🗌 🥪 D:	 Data 	NTFS	292.97 GB	638.54 GB		Marvell 91xx Config 1.01				
Empty Space33			931.51 GB	1.69 MB		✓ ➢ PIONEER DVD-RW DVR				
San Marvell 91xx Config 1.01						3 E:				
 PIONEER DVD-RW DVR 						Y 🖂 🖙 MAXTOR 6L040J2 A	562207818367	#2 US	0 Bytes	37.28 GB
A E					~	Empty Space34			512 Bytes	37.28 GB

3 Select Binary (byte to byte) copy on the Copy Options dialog box, specify copy options, and click the Next button

Copy options **dialog box**

ource: S		W100-11 (S01JJ20X)		21 00 (7024	2025 (
1		3.0500 (5622078183			Contraction in the second s
<u>B</u> inary (byt	e to byte) copy py any object to an				
Source			Destinat	ion	
Copy w	hole object				
Copy []	inge				
Offset	0	Sectors 👻	Offset:	0	Sectors
	[0 Sectors 78	242975 Sectors]		[0 Sectors .	78177791 Sectors]
Size	78177792	Sectors 💌			
	[0 Sectors 78	177792 Sectors]			

Copy options

Source	
Copy whole object	Select this option if you want to copy the entire source object to the destination one
Copy range	Select this option if you want to copy a part of the source object
Offset	Specify the offset from which the source object data will be copied to the destination object
Size	Specify the size of the source object data which will be copied to the destination object
Destination	
Offset	Specify the offset on the destination object to which the source object data will be copied

3 View the copy task settings on the Drives Copy Wizard and click the Finish button

Drives Copy Wizard

	ору
	JNG SP0411N TW100-11
Serial:	
	ATA (0)
	e: 512 Bytes
	37.31 GB (78242976 Sectors)
	AXTOR 6L04032 A93.0500
	562207818367
	USB (2)
	512 Bytes
Size:	37.28 GB (78177792 Sectors)
Operation 1 of	1
Operation	
Model:	
	37.31 GB (78242976 Sectors)
	i: IDE/ATA@PriMst
	D: MAXTOR 6L04032 A93.0500 (37.28 GB (78177792 Sectors))
Target Off	
Duration:	458 seconds

or click the <- Drive Copy Wizard button to edit the copy parameters

> R-Studio will start copying data from the source object to the destination one.

Smart partition copy

Only <u>partitions</u> can be copied with this option to other partitions or empty spaces. You may change some parameters of the the copied partition(s) on the destination drive.

To perform a smart partition copy of a partition,

- 1 Select Copy object to... on the Create menu
- 2 Select source and destination partitions in the Drives Copy Wizard panel and click the Next button

Drives Copy Wizard

rives											
	Source						Destination				
Device/Disk	Label	FS	Start	Size	^	Device/Disk	Label	FS	Start	Size	
Y 💻 Local Computer						🗌 🥪 E: 🛛 🔻	NTFS-Test	NTFS	32 KB	6.76 GB	
Y SAMSUNG SP0411N	S01JJ20XC75851	#0 A	0 Bytes	37.31 GB		🗌 🥯 G: 😽	FAT32-TEST	FAT32	6.76 GB	6.19 GB	
🗌 🥪 F: 🔹	NTFS-Test	NTFS	32 KB	6.76 GB		□ - +:	FAT-TEST	FAT16	12.95 GB	2.01 GB	
🗹 🥯 G: 👻	FAT32-TEST	FAT32	6.76 GB	6.19 GB		🗌 🥯 Volume{c7e018f. x	HFS-Test	HFS+	14.96 GB	6.67 GB	
🗌 🥪 H: 🛛 🗸	FAT-TEST	FAT16	12.95 GB	2.01 GB		🗌 🥯 HarddiskVolume	Ext4FS-Test	Ext4	21.63 GB	6.52 GB	
Volume{c7e018f. x	HFS-Test	HFS+	14.96 GB	6.67 GB		🗌 🥪 U: 🛛 🗸	Double	NTFS	28.15 GB	9.15 GB	
🗌 🥯 HarddiskVolume s	Ext4FS-Test	Ext4	21.63 GB	6.52 GB		Y 🗌 🥯 TOSHIBA DT01ACA	44H5ATLKS	#1 SA	0 Bytes	931.51 GB	
🗌 🥪 U: 🗸	Double	NTFS	28.15 GB	9.15 GB		Volume(3303cc5 x	Recovery	NTFS	1 MB	300 MB	
Y 🗌 🥯 TOSHIBA DT01ACA	44H5ATLKS	#1 SA	0 Bytes	931.51 GB		🔲 🥯 EFI system partit 		FAT32	301 MB	100 MB	
Volume[3303cc5.	Recovery	NTFS	1 MB	300 MB		🔲 🥯 Microsoft reserv. z			401 MB	128 MB	
🔲 🥯 EFI system partit. x		FAT32	301 MB	100 MB		🗌 🥯 G 🗸 🗸	System	NTFS	529 MB	292.01 GB	
☐ See Microsoft reserv.			401 MB	128 MB		Volume{e0a573f. z		NTFS	292.53 GB	450 MB	
🗌 🥯 C: 👻	System	NTFS	529 MB	292.01 GB		🗌 🧼 D: 🗸	Data	NTFS	292.97 GB	638.54 GB	
Volume{e0a573f. x		NTFS	292.53 GB	450 MB		🗌 🥯 Empty Space33			931.51 GB	1.69 MB	
🗌 🥪 D: 👻	Data	NTFS	292.97 GB	638.54 GB		Marvell 91xx Config 1.01					
Empty Space33			931.51 GB	1.69 MB		PIONEER DVD-RW DVR					
Se Marvell 91xx Config 1.01						3 E:					
✓ ➢ PIONEER DVD-RW DVR						Y 🗌 🥯 MAXTOR 6L040J2 A	562207818367	#2 US	0 Bytes	37.28 GB	
2 E:						M Space34			512 Bytes	37.28 GB	

3 Select Smart partition copy in the Copy Options panel, specify copy options, and click the Next button Copy options dialog box

Constant				
Copy opt	tions			
Source:	G: 6.19 GB (1	2978176 Sectors)		
Destination:	Empty Space3	34 37.28 GB (78177791 Sectors)		
O Binary (b	yte to byte) co	py .		
You may	copy any object	ct to any object.		
Smart pa	rtition copy			
	on drive.	change some parameters of the copied partition	n(s) on the	
Minimum	partition size:	2.04 GB (4280222 Sectors)		
	partition size:			
Maximum		37.28 GB (78177728 Sectors)		
Maximum	n partition size: v <u>w</u> ithout stretc	37.28 GB (78177728 Sectors)		
Maximum Copy © Copy	n partition size: v <u>w</u> ithout stretc	37.28 GB (78177728 Sectors)	Bytes	•
Maximum Copy © Copy	n partition size: v without stretc v to:	37.28 GB (78177728 Sectors)	Bytes	•
Maximum Copy © Copy <u>Eree</u>	n partition size: v without stretc v to:	37.28 GB (78177728 Sectors) hing	Bytes Sectors	
Maximum Copy © Copy <u>Eree</u>	n partition size: v without stretc v to: space before:	37.28 GB (78177728 Sectors) hing 0 [0 Bytes 37835555328 Bytes]		
Maximum Copy © Copy Eree Eree	n partition size: v without stretc v to: space before:	37.28 GB (78177728 Sectors) hing 0 [0 brites 37835555328 Brites] 4280222		

Copy options

Destination	
Copy without stretching	Select this option if you want to copy the partition exactly to the destination place

Copy to:	Select this option if you want to change some parameters of the copied partition on the destination place
Free space before	Specify how much space will be left empty before the start of the copied partition
Partition size	Select this option and specify the new size of the copied partition
Partition type Primary (Active)/? Primary/2ogical	Specify the type of the partition to be copied. Do not change this setting unless you have serious reasons to do so.

3 View the copy task settings on the Drives Copy Wizard and click the Finish button

Drives Copy Wizard

Source: G:	
Size:	6.19 GB (12978176 Sectors)
3120.	0.19 GD (129/01/0 Sectors)
Operation 1 of	
	Copy/Restore partition
	34 seconds
Duration:	34 seconds

or click the Drive Copy Wizard button to edit the copy parameters

> R-Studio will start copying data from the source partition to the destination place.

Smart drive copy

Only whole drives can be copied with this option to other drives. You may change some parameters of the copied drives.

To perform a smart drive copy of a drive,

- 1 Select Copy object to... on the Create menu
- 2 Select a source and destination drives in the Drives Copy Wizard panel and click the Next button

Drives Copy Wizard

	Source					Destination			
Device/Disk	Label	FS	Start	Size	Device/Disk	Label	FS	Start	Size
✓ ✓ ✓ WDC WD75AA-00BA	WD-WMA2L28	#0 AT	0 Bytes	7.02 GB	✓ □	WD-WMA2L28	#0 AT	0 Bytes	7.02 GB
🗌 🥪 F: 🗸 👻	NTFS-Test	NTFS	32 KB	2.93 GB	🗌 🤪 F: 🗸 🔻	NTFS-Test	NTFS	32 KB	2.93 GB
🗌 🥪 G: 🗸 🗸	FAT32-TEST	FAT32	2.93 GB	2.03 GB	🗌 🥪 G: 🗸 🗸	FAT32-TEST	FAT32	2.93 GB	2.03 GB
🗌 🥪 H: 🗸 🗸	FAT-TEST	FAT16	4.96 GB	2.01 GB	_ 🤪 H: 🗸	FAT-TEST	FAT16	4.96 GB	2.01 GB
🔲 🥯 Empty Space21			6.96 GB	60.45 MB	🗌 🥯 Empty Space21			6.96 GB	60.45 ME
Y 🔲 🥪 TOSHIBA DT01ACA10	44H5ATLKS	#1 SA	0 Bytes	931.51 GB	Y 🗌 🥯 TOSHIBA DT01ACA10	44H5ATLKS	#1 SA	0 Bytes	931.51 G
🗌 🥯 Volume(3303cc57. x	Recovery	NTFS	1 MB	300 MB	□ 🥯 Volume(3303cc57. x	Recovery	NTFS	1 MB	300 MB
🔲 🥯 EFI system partition		FAT32	301 MB	100 MB	🗌 🥯 EFI system partitio n		FAT32	301 MB	100 MB
🔲 🥯 Microsoft reserve. 			401 MB	128 MB	🗌 🥯 Microsoft reserve. 			401 MB	128 MB
🗌 🥪 C: 🗸 🗸	System	NTFS	529 MB	292.01 GB	_ @ C: •	System	NTFS	529 MB	292.01 G
🗌 🥪 Volume{e0a573f2. 		NTFS	292.53 GB	450 MB	Volume(e0a573f2 .		NTFS	292.53 GB	450 MB
🗌 🥪 D: 🗸 🗸	Data	NTFS	292.97 GB	638.54 GB	🗌 🥪 D: 🗸 🗸	Data	NTFS	292.97 GB	638.54 G
🗌 🥯 Empty Space28			931.51 GB	1.69 MB	🗌 🝚 Empty Space28			931.51 GB	1.69 MB
Marvell 91xx Config 1.01					Marvell 91xx Config 1.01				
✓ ➢ PIONEER DVD-RW DVR-2					✓ → PIONEER DVD-RW DVR-2				
3 E					3 E:				
✓ ☐	562207818367	#2 US	0 Bytes	37.28 GB	✓ ☑ S MAXTOR 6L040J2 A9	562207818367	#2 US	0 Bytes	37.28 GB
Empty Space29			512 Bytes	37.28 GB	🗌 🕯 Empty Space29			512 Bytes	37.28 GB

3 Select Smart drive copy in the Copy Options panel, specify copy options, and click the Next button Copy options dialog box

Copy op	tions
Source:	WDC WD75AA-00BAA0 10.09K11 (WD-WMA2L2883101) 7.02 GB (14726880 Sectors)
Destination:	MAXTOR 6L04032 A93.0500 (562207818367) 37.28 GB (78177792 Sectors)
O Binary (t	yte to byte) copy
You may	copy any object to any object.
🖲 Smart dr	ive copy
Only wh copied d	ole drives can be copied with this option to other drives. You may change some parameters of the rives.
Copying	mode
O Cop	all partitions onto original places
O One	partition after another
	Fixed active partition
Expa	nd/Shrink partition to whole disk
	ixed active partition
-	n
Descripti	are empty (not-used) places between the partitions or they occupy less or morespace than the

Copy options

Copying mode	
Copy all partitions onto original places	Select this option if you want to copy all partitions to their original places.
One partition after another	Select this option if you want to copy the partitions one after another preserving their space. If there is empty space between the partitions, it will be omitted. Otherwise it is similar to Copy all partitions onto original places. If Fixed active partition is selected, the original offset/Size of the active partition will be preserved (in case the loader has links to it).
Expand/Shrink partition to whole drive	Specify this option if you want to proportionally expand/\$hrink the selected partitions to occupy the entire target drive. If Fixed active partition is selected, the original offset/\$ize of the active partition will be preserved (in case the loader has links to it).

3 View the copy task settings on the Drives Copy Wizard and click the Finish button

Drives Copy Wizard

Drives Copy Wizar	d	
mart drive co	ру	
Source: WDC WD2	5AA-00BAA0 10.09K11	-
Serial:	WD-WMA2L2883101	
BUS:	ATA (0)	
Sector size:		
Size:	7.02 GB (14726880 Sectors)	
	FOR 6L04032 A93.0500	
Serial:	562207818367	
	USB (2)	
Sector size:		
Size:	37.28 GB (78177792 Sectors)	
Operation 1 of 5		
Operation:		
Model:	MAXTOR 6L04032 A93.0500	
Size:	37.28 GB (78177792 Sectors)	
Connected:		
Duration:	1 seconds	
Operation 2 of 5		
	Copy/Restore partition	
	WDC WD75AA-00BAA0 10.09K11 (7.02 GB (14726880 Sectors))	
	MAXTOR 6L04032 A93.0500 (37.28 GB (78177792 Sectors))	
	: 32 KB (64 Sectors)	
Duration:	25 seconds	
Operation 3 of 5		
	Copy/Restore partition	
	WDC WD75AA-00BAA0 10.09K11 (7.02 GB (14726880 Sectors))	
	MAXTOR 6L040J2 A93.0500 (37.28 GB (78177792 Sectors))	
	: 20.80 GB (43615232 Sectors)	
Duration:	34 seconds	
Operation 4 of 5	Com Parters and Part	
	Copy/Restore partition WDC WD75AA-00BAA0 10.09K11 (7.02 GB (14726880 Sectors))	
	MAXTOR 6L040J2 A93.0500 (37.28 GB (78177792 Sectors))	
	MAXTOR 6L040J2 A93.0500 (37.28 GB (76177792 Sectors)) : 35.23 GB (73873408 Sectors)	
Duration:	25 seconds	
Operation 5 of 5	25 seconds	
	Copy boot loader	
	WDC WD75AA-00BAA0 10.09K11 (7.02 GB (14726880 Sectors))	
	MAXTOR 6L040J2 A93.0500 (37.28 GB (78177792 Sectors))	
Target Offset		

or click the **Cancel** button to cancel this process.

> R-Studio will start copying data from the source drive to the destination one.

3.12 File Maps

R-Studio can show file maps. Right-click the file and select **File map** in their shortcut menu.

File Map

Drive File To	chnician - File view ols <u>V</u> iew <u>H</u> elp							-	- 0	×
C teopen All Files	Recover Recover Market	d Find/Mark Fi	Manual Previous Find Next	File Mask Up	Details Preview) : w Options				
Device view	D: -> TOSHIBA DTO	1ACA 100 MS2OA75	0 : 44H5ATLKS							
>	rwc	^	Name	F	Recovery chances	Bad sectors	Size, Bytes	Created	Mo	dified
	Scan_Info		Documents					2/6/2022	2/6/2022 1	0:49:31
	ScanZ		Music					2/6/2022	2/6/2022 1	0:49:39
, -	Scripts		Photos					2/6/2022	9/15/2023	12:30:1
	Seagate Signature		Video					2/6/2022	11/21/2022	2 12:08:
	Soft		🛾 📥 Blue Skies (1946)	104 min.Fred Ast	Good (Existing		1,415,178,	2/6/2022	11/3/2012	10:10:0
> 🗆	SR] 🧰 Mac_mini_Intel-I	ased_Mid2007_U	Good (Existing	No	893,646	2/6/2022	6/26/2013	07:58:0
	ssd		🛛 🍀 P1000075.JPG		Good (Existing	No	2,145,007	2/6/2022	8/6/2005 0	6:04:54
> 🗆 🗌	svk	~ [🛛 🍀 P1000076.JPG		Good (Existing	No	2,027,541	2/6/2022	8/6/2005 0	6:06:04
Sorted by: Real	•	<								
lua Skier (1945) 1	04 min.Fred Astaire.Bing Cr	oshy Indea Berlin M	tusical avi							
0	ی و و و بر بر و و و و و									
204800 409600 614400 819200 1024000 1228800										
204800 409600 614400 819200 1024000 1228800 1433600										
204800 409600 614400 819200 1024000 1228800 1433600 1638400										
204800 409600 614400 819200 1228800 1433600 1638400 1843200										
204800 409600 614400 819200 1024000 1228800 1433600 1638400 1843200 2048000										
204800 409600 614400 819200 1024000 11228800 1433600 1638400 1843200 2048000										
204800 409600 614400 819200 1024000 11228800 1433600 1638400 1843200 2048000 2252800										
204800 409600 614400 1024000 1228800 1433600 1638400 1845200							10670			
204800 409600 614400 819200 122800 122800 1433600 1638400 1443200 2252800 2252800 2457600			Kayizel	ok			10670			
204800 409600 614400 819200 1024000 1024000 1133500 1433500 1433500 2048000 2252800 2252800 2457600			cognized		< Previous	Next >				
204800 61480 61480 819200 1228800 1228800 143360 143360 143360 2048000 2255800 2245760 0 0 ffret [0				ok	< Previous	Next >	10670			

3.13 I/O Monitor and Sector Map Files

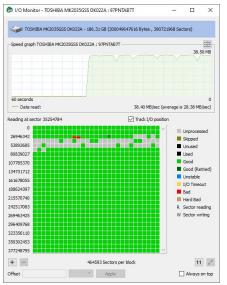
These features greatly improves working with failing drives for **R-Studio**.

VO Monitor

I/O Monitor allows you to inspect the process of drive input/output operations in real time. When **R-Studio** performs a disk operation the **I/O Monitor button** becomes active.

Click this button, and the I/O Monitor will appear.

I/O Monitor



You may also start **I/O Monitor** from the shortcut menu and progress dialog boxes during various drive operations.

Sector Map Files

<u>Sector map files</u> are files that contain information about conditions of drive sectors, which may be good, bad, slow, and unstable. **R-Studio** estimates chances for successful file recovery basing on these files and avoiding unnecessary attempts to read <u>bad sectors</u>. Sector map files are crucial for <u>multi-pass imaging</u>.

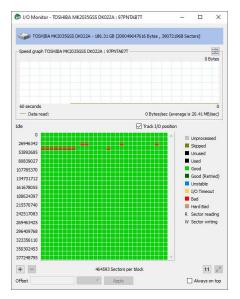
R-Studio creates its own sector map files or can import such files created from other disk imaging programs. Currently **R-Studio** supports sector map files from <u>HDDSuperClone</u> and <u>DDRescue</u>.

To open, save or clean a sector map file for an object,

* Right-click the object and select Open Sector Map, Save Sector Map, or Clean Sector Map, respectively, on the shortcut menu.

You may look at the graphical representation of the loaded sector map by starting I/O Monitor.

Sector Map



3.14 Runtime Imaging

Runtime imaging is <u>image</u> creation for a drive object performed simultaneously with other data read operations from this drive. When **R-Studio** reads data from a certain area of the source (a drive, <u>partition</u>, or region), it writes the data to the target which can be either a dedicated drive or an image file. When the data from this area is needed again, **R-Studio** reads it from the target rather than the source thus reducing access to the source. This is very important for faulty or unstable drives which health may be constantly deteriorating during data recovery operations.



R-Studio also creates a sector map file during runtime imaging.

To start runtime imaging of an object,

using a plain image file

1 Select a drive object in the R-Studio's Drives panel and click the Start Runtime Image button, or right-click the object and select Set Runtime Image on the shortcut menu.

Runtime imaging

efresh Show Files Show Files (Advance	ed) Scan Partitio	n Search Create Image Op	en Image Create Region	Start Runtime Image RAIDs Con	nect To Remote Remove I/O M	Ionitor
Device view		1886 221 249 1 2		4		
Device/Disk	Label	i/Interfai Start	Size Name	Value		
Local Computer		😂 Start/resume runtime i	mage		×	
✓ W KINGSTON SKC600256G S45	50026B7785A98					
EFI system partition				ead from the selected drive in any mode first step when working with degraded		
Microsoft reserved partit.		recovery process sa	er by ensuring that the same s	ectors never have to be read twice and		
	System		the source drive fails during the			
Windows Recovery Parti.				done. An image file can be stored in an can be stored on a separate physical dri		
Empty Space18		larger than the source drive	. All existing data on this clone	drive will be overwritten. In both cases		
 ST2000VX017-3CV102 CV10 D: 	WWD0FX5M		tatus of every sector			
V TOSHIBA MK2529GSG PS112E	Data	Project and sector map file:				
EFI System Partition	298KW051W		A new imag	e will be created.		
	Images	Destination type:	VMDK image file	•		
	images	Image file:	le: D: \RunTime \TOSHIBA MK2529GSG PS112E.vmdk			
Drive for runtin imaging	ne				OK Cancel	
			Properties	S.M.A.R.T.		
Ng .						
Type Date	Time			Text		
System 10/18/2024 12:1	8:57 PM Suc	ccessfully loaded user's file typ	oes definitions from "C:\Prog	gram Files (x86)\R-Studio Technician	\Presets\UserKnownFileType1.xml	
System 10/18/2024 12:1	8:57 PM Sue	ccessfully loaded user's RAID I	ayouts from "C:/Program Fil	les (x86)/R-Studio Technician/Presets	s/RAID6RS.xml"	

Select **Plain** or <u>another image type</u> in the **Image type** field, specify the file name and path for the image and sector map files, and click the **OK** button. Don't select the **VMDK image file** unless you can disable writing to the drive later. Cloning to a physical drive is not recommended because Windows can write some data to the drive corrupting the imaged data when the image has been completed and runtime imaging is over.

Plain image file requires immediate allocation of disk space equal to the object size, whereas VMDK image file is growing gradually upon imaging progress.

> R-Studio will turn on runtime imaging.

R-STUDIO 1	echnician - Device	view						- 🗆	×
Drive Create	Tools View	Help							
Refresh Show	Files Show Files (7 -	Can Partition Sea	ch Complete	Runtime Imag	Open Image	Create Region Stop Runt	me Imaging RAIDs Connect To Remote Remove	
Device view								Stop Runtime Imaging	
21.12	Device/Disk		Label	S/Interfac	Start	Size	Name	Value	
🗸 🛄 Local Ci	omputer						Drive Type	Physical Drive, Disk	
~ 50 KIN	STON SKC600256	G \$4500105	50026B7785A98B	43 #0 SATA2	SSD	238.47 GB	Name	TOSHIBA MK2529GSG PS112E	
	EFI system partitio			FAT32	1 MB	100 MB	OS Object	\\.\PhysicalDrive2	
	Microsoft reserved	partition •			101 MB	16 MB	R-Studio Driver	WinNT\Handle\Physical	
	Ci .		System	NTFS	117 MB	237.37 GB	Size	232.89 GB (488397168 Sectors)	
\$	Windows Recovery	Partition •		NTFS	237.48 GB	1008 MB	Logical Sector Size	512 Bytes	
0	Empty Space18				238.47 GB	8.32 MB	Physical Sector Size	512 Bytes	
✓ ☑ ST20	00VX017-3CV102	CV10	WWD0FX5M	#1 SATA2	HDD	1.82 TB	Partition Size	232.89 GB (488397168 Sectors)	
6	D:	•	Data	NTFS	1 MB	1.82 TB	GPT Disk GUID	41c86d81-ac17-4f28-ae77-2a7acb25477f	
🗸 💹 TOS	HIBA MK2529GSG	PS112E	Z98RW65TW	#2 SATA2,	HDD	232.89 GB	I/O Retries	Default	•
	D:\RunTime\T PS	112E.vmdk					Y Drive Control		
	EFI System Pa	untime ima	ingo filo	FAT32	20 KB	200 MB	Maximum Transf	er 128 KB	
4	E:	unume ima	ige nie	exFAT	201 MB	232.69 GB	I/O Block Size	512 Bytes	
							Buffer Alignment	4 Bytes	•
							Physical Drive Geom	netry	
							Properties 🔛 S.I	M.A.R.T. 🕂 Runtime Image	
oq									
Type	Date	Tin					Text		-
) System	10/18/2024	12:18:57 F		Illy loaded us	r's file turner a	ofinitions from		tudio Technician\Presets\UserKnownFileType1.xml"	
i) System	10/18/2024	12:18:57 F						echnician/Presets/RAID6RS.xml"	
1) Imaging	10/18/2024	12:25:26 F		image data ca					

Select the object and click the **Stop Runtime Imaging** button or this item in the shortcut o menu turn runtime imaging off.

using a physical drive

1 Select a drive object in the R-Studio's Drives panel and click the Start Runtime Image button, or right-click the object and select Set Runtime Image on the shortcut menu.1

Runtime imaging

efresh Show	V Files Show Files (Adva	inced) Scan	Partit	ion Search Create Image	Open Image	Create Region		AIDs Connect To Remote F	emo	ve I/O Monitor	
Device viev	· .										
	Device/Disk			Label S/Interface	Start	Size	Name	Value			1
r 💻 Local C				C Start/resume runtime	image				×		
✓ III KINGSTON SKC600256G S4500105 50026										5 03090005	
	EFI system partition	•		This process maintai	ns a real-time c	opy of all data read	from the selected drive i	n any mode of operation. It is h degraded drives! It makes the			
	Microsoft reserved part			recovery process sa	fer by ensuring	that the same sec	tors never have to be rea	d twice and also reduces the			
9			System	degree of data loss in case						tors)	
	Windows Recovery Part	tition •		This copy can be either an free space than the capaci	image file or a s	ector-by-sector do	one. An image file can be stored on a separate	stored in any location with more physical drive of the same size or			
	Empty Space21		_	larger than the source driv	e. All existing da	ata on this clone dr		both cases a sector map file will			
Y Drive	e to save runtime in	nage (Targ								ttors)	
vata				Project and sector map file: D:\RunTime\KINGSTON SA400S37120G 03090005.rsm						-448a5bb8b822	
ARRANTER ARRA	SSD 120GB P0921A		FC201	A new image will be created.					···.,		-
teres	GSTON \$A400537120G	03090005	500265	Destination type:	Sector by sect	tor done			•		-
	EFI system partition Microsoft reserved part			Destination drive: III CSL SSD 12068 P0921A : FC2017091037273 - [111.79 GB]							-
	DeletedPart1	ition •	-	Destination drive: [1] CSL SSD 120G8 PU921A : FC2017/9103/273 - [111./9 GB]							÷
	Empty Space26			Don't select this option because operating syst	unless you can em can write so	disable writing to the drive to the drive data to the drive data to the drive dri drive drive drive drive drive dr	re drive. Cloning to a phys /e corrupting the imaged of // the imaged of the imaged	ical drive is not recommended data when the image has been			÷.
	Windows Recovery Part	tition v		completed and runtime ima						-	
	windows Recovery Pan	uuon •						OK Cancel			
og Driv	ve for runtime imag	ing (Sourc	e) 📕						.d		×
Туре	Uate	lime					Text				
System		2:48:49 PM						io Technician\Presets\UserKnow	mFile	aType1.xml"	
) System	10/18/2024 2	2:48:49 PM	Si	accessfully loaded user's RA	ID layouts from	n "C:/Program Fi	les (x86)/R-Studio Techi	nician/Presets/RAID6RS.xml"			

Select **Physical drive** in the **Image type** field, specify the name and path for the sector map file, and click the **OK** button.

Note: all data on the drive will be destroyed.

> R-Studio will turn on runtime imaging.

Runtime imaging

<u>C</u>	Jools View !	•	Partition Search	omplete Runtir	ne Image Opi	en Image Crea	te Region Stop Runtime Imaging	RAIDs Connect To Remote Remove	
E Device view	Device/Disk		Label	S/Interfac	Start	Size	Name	Value	-
local C	omputer						Drive Type	Physical Drive Disk	
	GSTON SKC6002560	5 S4500105	50026B7785A98B43	#0 SATA S	5D	238.47 GB	Name	KINGSTON SA400537120G 03090005	
	EFI system partition			FAT32	1 MB	100 MB	OS Object	\\.\PhysicalDrive3	
	Microsoft reserved				101 MB	16 MB	R-Studio Driver	WinNT\Handle\Physical	
		-	System	NTES	117 MB	237.37 GB	Size	111.79 GB (234441648 Sectors)	
See Windows Recovery Partition			-,	NTES	237.48 GB	1008 MB	Logical Sector Size	512 Bytes	
Empty Space21					238.47 GB	8.32 MB	Physical Sector Size	4 KB	
ST2000VX017-3CV102 CV10			w Drive for runtin	ne imaging	(Source)	1.82 TB	Partition Size	111.79 GB (234441648 Sectors)	
	D:		Data	NTES	1.MB	1.82 TB	GPT Disk GUID	c6fdf401-8d92-11ef-8881-448a5bb8b822	
	GSTON SA400S3712		50026B77843A5618	#3.SATA, 55		1111.79 GB	I/O Retries	Default	-
4 🕅	CSL SSD 120GB P09	21A	FC2017091037273	#2 SATA		111.79 GB	✓ Drive Control		
	EFI system partition	1	Drive for runtin	ne imanina	(tennet)	100 MB	Maximum Transfer	128 KB	-
9	Microsoft reserved	partition	Drive for furthing	ne maging	(iniger)	16 MB	I/O Block Size	4 KB	-
×	DeletedPart1			NTES	117 MB	111.18 GB	Buffer Alignment	4 Bytes	-
0	Empty Space26				117 MB	111.18 GB	Y Physical Drive Geometr		
9	Windows Recovery	Partition		NTES	111.29 GB	508 MB	Properties S.M.A.		-
og									
Type	Date	Time					Text		_
1) System	10/18/2024	2:48:49 PM	Successfully loa	ded user's file	types definiti	ons from "C:\Pre	ogram Files (x86)\R-Studio Techn	ician\Presets\UserKnownFileType1.xml"	
) System	10/18/2024	2:48:49 PM	Successfully loa	ded user's RA	D layouts from	m "C:/Program F	iles (x86)/R-Studio Technician/P	esets/RAID6RS.xml"	
Imaging	10/18/2024	2:53:03 PM	Runtime image	data cache wi	itten: 428 KB				

Select the object and click the **Stop Runtime Imaging** button or select this item in the shortcut menu to turn runtime imaging off.

R-Studio stores the information about runtime configurations and asks the users whether they want to keep runtime imaging or discard it during its startup.

Runtime imaging

Re	esume runtime image							
i			closed. Resuming is strongly recommended to avoid rereading any to not want to resume a runtime image, please remove the checkmark					
	u do not want to resume the ru the object.	intime image operation for any of th	e storage devices listed below, you can simply remove the checkmark					
\square	Source drive:	Ge WDC WD1200BEVT-22ZCT0 11.01A11 : WD-WXE808HN3826 - [111.79 GB]						
	Destination:	VMDK image file	tipass\WDC WD1200BEVT-22ZCT0 11.01A11.vmdk					
		D: Wultipass\WDC WD1200BEVT-22ZCT0 11.01A11.rsm						

This configuration will appear in **R-Studio**.

Runtime imaging

Device/Disk		Label	FS	Start	Size
Local Computer					
KINGSTON SA400S37120G 03090005		50026B77843A5618	#0 SATA2, S	SD	111.79 GB
Set EFI system partition			FAT32	1 MB	100 MB
Microsoft reserved partition	•			101 MB	16 MB
👄 C:		System	NTFS	117 MB	111.18 GB
Se Windows Recovery Partition			NTFS	111.29 GB	508 MB
Empty Space19				111.79 GB	1.44 MB
TOSHIBA DT01ACA100 MS2OA750		44H5ATLKS	#1 SATA2, H	DD	931.51 GB
🥯 D:	-	Data	NTFS	1 MB	931.51 GB
 WDC WD1200BEVT-22ZCT0 11.01A11 L: Multipass: WDC WD1200BEVT-22ZCT0 11.01A1 	1.vmdk	WD-WXE808HN3826	#2 SATA2, HE	D	111.79 GB
⇔E	-	NTFS-Good	NTFS	1 MB	39.09 GB
See Fi	÷	NTFS-Bad	NTFS	39.09 GB	72.70 GB

Completing Runtime Image

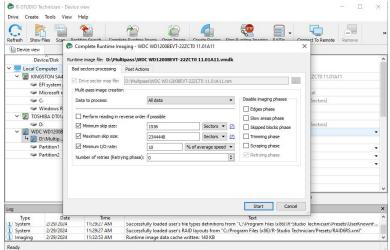
- You may complete the runtime image without browsing through the entire file system on the disk.
- 1 Select the object being imaged and click the Complete Runtime Image button,
 - or right-click the object and select Complete Runtime Image on the shortcut menu.

Runtime imaging

🕐 R-Studio Technician - Device view Drive <u>C</u> reate Tools View <u>H</u> elp						- 0	I X
Refresh Show Files Scan Partition Searc	Complete Runtime	e Image	Open Image	Create Region	Stop Runtime Imaging RAIDs	Connect To Remote Remove Stop	
Device/Disk	Label	FS	Start	Size	Name	Value	
Local Computer					Drive Type	Physical Drive Disk	
KINGSTON SA400537120G 030	50026B77843A5618	#0 SATA	2. SSD	111.79 GB	Name	WDC WD1200BEVT-22ZCT0 11.01A11	
Section FI system partition		FAT32	1 MB	100 MB	OS Object	\\.\PhysicalDrive2	
See Microsoft reserved partiti •			101 MB	16 MB	R-Studio Driver	WinNT\Handle\Physical	
÷	System	NTFS	117 MB	111.18 GB	Size	111.79 GB (234441648 Sectors)	
Secovery Partiti	-	NTFS	111.29 GB	508 MB	Logical Sector Size	512 Bytes	
Empty Space18			111.79 GB	1.44 MB	Physical Sector Size	512 Bytes	
V Se TOSHIBA DT01ACA100 MS20	44H5ATLKS	#1 SATA	2, HDD	931.51 GB	Partition Size	111.79 GB (234441648 Sectors)	
🖙 D: 👻	Data	NTFS	1 MB	931.51 GB	I/O Retries	Default	
WDC WD1200BEVT-22ZCT0 11		#2 SATA2	, HDD	111.79 GB	✓ Drive Control		
General Gener					Maximum Transfer	128 KB	
	NTFS-Good	NTFS	1 MB	39.09 GB	I/O Block Size	512 Bytes	-
🥯 F: 👻	NTFS-Bad	NTFS	39.09 GB	72.70 GB	Buffer Alignment	4 Bytes	•
					Y Physical Drive Geometry		
					Cylinders	14593	
					Tracks Per Cylinder	255	
					Properties S.M.A.R.	T.	
og							
	Time				Text		
1) System 1/25/2023 12:45:						-Studio Technician\Presets\UserKnownFileType1.xml*	
1) System 1/25/2023 12:45:	58 PM Success	fully load	ed user's RAII	D layouts from	"C:/Program Files (x86)/R-Studio	Technician/Presets/RAID6RS.xml"	
eady							

> The Complete Runtime Imaging dialog box will appear.

Runtime imaging

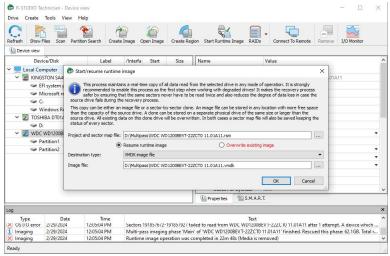


Select the necessary parameters of multi-pass imaging and select the OK button.

> **R-Studio** will complete the creation of the runtime image.

If the runtime image has not been completed, you may resume it next time you start R-Studio.

Runtime imaging



Creating runtime image for individual files

You may create a runtime image containing only individual files rather than all data on the disk.

1 Establish a runtime imaging for the disk with the files, open the disk, mark the files, and click the Save marked to runtime image button.

or right-click on the right pane, and select Save Marked to Runtime Image on the shortcut menu.

Runtime imaging

	echnician - File viev ools View Help				5 2			-	□ ×
	i 🚺 🧯		9 5	00	60 60	1	• 8:::	•	
Reopen All Files	Recover Recove	r Marked Save to	Runtime Image Save Marked to Runtime Image	Find/Mark Find	Previous Find Next	File Mask	Up Details	Preview	Options
Device view	Partition 1 ->	WDC WD12008EVT	F-22ZCT0 11.01A11 : WD-WXE808HN3826						
	tion1 → WDC WD1	200BEVT-22ZCT	0 11.0 Name	time image s	Recovery chances	Bad sectors	Size, Bytes	Created	Mo
	oot		SRECYCLE.BIN					11/15/20	4/14/2022
> 🗆	SRECYCLE.BIN Documents		Documents					11/15/20	11/15/2021
× 🔳 🗼		Filer	🔲 🦲 Music					11/15/20	11/15/2021
R R		liles	Photos					11/15/20	11/15/2021
	Music		System Volume Information					11/15/20	11/16/2021
> 🗆	Photos		🔳 🦲 Video					11/15/20	11/15/2021
	System Volume I	nformation	🔲 📥 Blue Skies (1946) 104 min.Fred	Ast Partially	Good (Existing		1,415,178,	11/15/20	11/3/2012 1
× 🔳	Video		🔲 🧰 Mac_mini_Intel-based_Mid200	7_U Partially	Good (Existing		893,646	11/15/20	6/26/2013 0
> [🔲 🎇 P1000075.JPG	Partially	Good (Existing		2,145,007	11/15/20	8/6/2005 06
5	Flv M4V		🔲 🎇 P1000076.JPG	Partially	Good (Existing		2,027,541	11/15/20	8/6/2005 06
> <mark>.</mark>	Mov MP4 MPEG MTS Intafiles		FestVHDGPT.vhd	Partially	Good (Existing		1,073,742,	11/15/20	12/12/2013
Sorted by: Rea	al 👻		د						:
Log									>
Type I Imaging	Date 3/1/2024 3/1/2024	Time 8:33:31 AM 8:33:39 AM	Kuntime image data cache written: 140 KB		Text				
1 System 1 System	3/1/2024	8:33:39 AM 8:33:39 AM	File enumeration was completed in 1s. File overlap check is completed in 0 sec						
Ready	57 17 2024	0.00.00 /0.01		Marked: 56 file a	The second s	VICTOR IN	otal 18.13 GB i		

> The Complete Runtime Imaging dialog box will appear.

Runtime imaging

Reopen All Files	Recover Recover	Complete Runtime	maging - WD	C WD1200BEVT	-22ZCT0 11.0	1 1A11	50	· 3		× Details	• Preview	 Options
0.0	ition1 - WDC WD1		ultipass\WD	C WD1200BEVT	-222CT0 11	.01A11.vn	ndk			ize, Bytes	Created	Mod
~ 🔳 📕 F	Root	Bad sectors processing	Post Action	ns						ic, bytes		4/14/2022 1
>	SRECYCLE.BIN	and a second sec							-			11/15/2021
× 🔳	Documents	Drive sector map file		ss\WDC WD1200	BEVT-22ZCT0	11.01A11.	rsm					11/15/2021
	OpenOffice-fi pdf	Multi-pass image crea	ion								11/15/20	11/15/2021
> D	Music	Perform reading in	reverse order	if possible				Disable imagin	ng phases		11/15/20	11/16/2021
	Photos	Minimum skip size:		1536		Sectors -	(2)	Edges pha	ase		11/15/20	11/15/2021
	System Volume In	Maximum skip size		2344448		Sectors 💌	(?)	Slow area	is phase	415, 178,	11/15/20	11/3/2012 1
× 🔳	Video	Minimum I/O rate:						Skipped bl	locks phase	893,646	11/15/20	6/26/2013 0
	Avi Avi			10	% of ave	rage speed		Trimming p		2,145,007	11/15/20	8/6/2005 06
	Flv	Number of retries (Re	trying phase):	0			٢	Scraping p		2,027,541	11/15/20	8/6/2005 06
E	M4V Mov MP4 MPEG	Skip files with bad	sectors					Retrying p		073,7 <mark>42,</mark>	11/15/20	12/12/2013
> 🗆 📙 🖡	MTS Metafiles											
Sorted by: Re	al 🔫	1						-	-)
.og								Start	Cancel			×
Type	Date	Time						Text				^
Imaging	3/1/2024			ta cache writter								
1) System 1) System	3/1/2024 3/1/2024			vas completed i is completed in								

Select the necessary <u>parameters of multi-pass</u> imaging and select the **OK** button. You may Skip files with <u>bad</u> <u>sectors</u> if necessary.

> **R-Studio** will complete the creation of the runtime image.

You may open such images as regular ones.

Runtime imaging

🗭 R-STUDIO Technician - Device vie	N					- 🗆 ×
Drive Create Tools View Help	0					
Refresh Show Files Scan Partition	Search Create Im	age Open	Image C	reate Region	Start Runtime Image RAIDs	Connect To Remote Remove I/O Monitor
Device view						
Device/Disk	Label	√Interfa	Start	Size	Name	Value
Local Computer					Drive Type	Partition, Primary
V III KINGSTON SA400537120G	50026B77843A5	. #0 SATA	2, SSD	111.79 GB	Name	Partition1
EFI system partition	•	FAT32	1 MB	100 MB	Size	39.09 GB (81972923 Sectors)
Microsoft reserved par			101 MB	16 MB	Partition Offset	1 MB (2048 Sectors)
🥯 G	- System	NTFS	117 MB	111.18 GB	Partition Size	39.09 GB (81972923 Sectors)
Windows Recovery Pa.	T	NTFS	111.29 GB	508 MB	Partition Type	NTFS/HPFS/exFAT (0x7)
V 💹 TOSHIBA DT01ACA100 MS	44H5ATLKS	#1 SATA	2, HDD	931.51 GB	✓ NTFS Information	
🥪 D:	- Data	NTFS	1 MB	931.51 GB	Cluster Size	4 KB (8 Sectors)
Y 📙 D:/Multipass/WDC WD120	Image				MFT Record Size	1 KB
WDC WD1200BEVT	WD-WXE808			111.79 GB	MFT Position	3 GB (6291456 Sectors)
Separtition1	NTFS-Good	NTFS	1 MB	39.09 GB	MFT Mirror Position	8 KB (16 Sectors)
Separtition2	NTFS-Bad	NTFS	39.09 GB	72.70 GB	Index Block Size	4 KB
					Sector Size	512 Bytes
					Volume Size	39.09 GB (81972920 Sectors)
					Properties	
og						
Type Date	Time				Te	ext
	10:19:54 AM	uccessfully	loaded us	er's file types d	efinitions from "C:\Program	Files (x86)\R-Studio Technician\Presets\UserKnownFileType1.xml
						6)/R-Studio Technician/Presets/RAID6RS.xml"
eady						

Such image contains information about the entire file system, but when a non-imaged file is opened, it'll contain only zeros.

3.15 Multi-pass Imaging

Multi-pass imaging is a process of <u>image</u> creation through several passes (phases). Each phase reads data from different areas of a hard drive, starting from areas with good sectors then going to slow sector areas and finishes with <u>bad sector</u> areas. This approach maximizes the amount of data that can be recovered from a failing drive and reduces it chances to fail during this process.

Phase 1. Copying most good data from the drive

In this phase, **R-Studio** reads data from drive by sector blocks, or groups of consecutive drive sectors read in one go. The phase is performed in several steps.

Step 1. R-Studio reads data from the drive until it runs into a block with bad or slow sector(s). Then it drops that block and jumps to another area until it finds a block with no bad or slow sectors. Then it continues reading data until it runs into another bad or slow block, and the process repeats. When this step is finished, most good data from the hard drive has been read, and **R-Studio** has detected the front blocks (edges) of bad and slow sector areas.

Step 2. R-Studio finds the rear edges of bad sector areas. It reads the skipped area from its rear end backwards until it runs into a block with a bad sector. Then **R-Studio** jumps to another bad sector area and the process is going on until all bad sector areas have been processed. When this step is finished, some good data from the hard drive has been read, and **R-Studio** has detected the rear edges of bad sector areas.

Step 3. R-Studio reads data from slow sector areas. It does that much the same way as for bad sector areas. When this step is finished, good data from slow sectors on the hard drive has been read, and **R-Studio** has detected the rear edges of slow sector areas.

Step 4. **R-Studio** finds the rear edges of bad sector areas in slow sector areas. When this step is finished, some new good data from slow sectors on the hard drive has been read, and **R-Studio** has detected the rear edges of all bad sectors within slow sector areas.

Step 5. R-Studio tries to read all skipped sector blocks. This is done without skipping bad sector blocks and checking read speed against minimum I/O rate.

When *Phase 1* is completed, **R-Studio** has read most of readable data and detected front and rear edges of all bad sector areas.

R-Studio tries to read the rest of data in the next phases, and does that sector by sector (rather than blocks).

Phase 2. Trimming

R-Studio detects the front and rear sectors of bad sector areas. When this step is finished, some new good data from bad sector areas has been read, and **R-Studio** has detected the front and rear sectors of all bad sector areas.

Phase 3. Scraping

R-Studio tries to read data from bad sector areas sector by sector.

Phase 4. Retrying (mostly optional)

R-Studio tries to read data from bad sectors through several attempts.

You may read more about this process in our article Multi-pass imaging in R-Studio

To create an image through multi-pass imaging,

1 Select an object in the R-Studio's Drives panel and click the Create Image button

Device/Disk		Label	FS/Interface	Start	Size
🖳 Local Computer					
 KINGSTON SKC600256G \$4500105 		50026B7785A98B43	#0 SATA2, 9	SD	238.47 GB
EFI system partition	•		FAT32	1 MB	100 MB
Microsoft reserved partition	-			101 MB	16 MB
🥯 C:	•	System	NTFS	117 MB	237.37 GB
Secovery Partition	-		NTFS	237.48 GB	1008 MB
Empty Space20				238.47 GB	8.32 MB
Image: Strandov X017-3CV102 CV10		WWD0FX5M	#1 SATA2, H	HDD	1.82 TB
🥯 D:	•	Data	NTFS	1 MB	1.82 TB
WDC WD1200BEVT-22ZCT0 11.01A11		WD-WXE808HN3826	#2 SATA2, H	HDD	111.79 GB
See E	•	NTFS-Good	NTFS	1 MB	39.09 GB
🥯 G:	•	NTFS-Bad	NTFS	39.09 GB	72.70 GB
UFD 2.0Silicon-Power4G 1100		AA0000000000485	#3 USB		3.75 GB
🥯 F:	-	RSACTIVATIO	FAT32	64 KB	3.75 GB

■ Other ways to create the image

• Select the object and select Create Image on the Drive menu

or

• Right-click the selected object and select Create Image File on the shortcut menu

2 Specify image options, a file name, and destination for the *image* on the Create Image dialog box and click the OK button

Create Image (Bad sector processing) dialog box

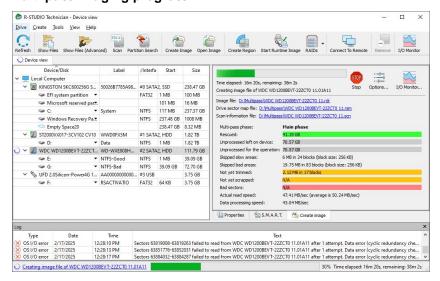
e type:		Compre	essed Ima	ge (R-C	Drive Image com	oatible)									
ge file nar	me:	D: Muit	ipass \WD	C WD1	200BEVT-22ZCT	0 11.rdr									
					A new in	nage will be cre	ated.								
ain B	ad se	ctors pro	cessing	Sca	in Information	Additional O	utput Folder	s Po	ist Actions						
Drive s	ector	map file:	D: MIL	ltipass	WDC WD12008EVT-222CT0 11.rsm										
Enable	e mult	i-pass im	age crea	tion					l hour						
									Disable imaging phases						
Data to	o proc	ess:			All data			•	Edges phase						
				197.3	if possible			0							
_									Slow areas phase						
Use less strict options for FS me			1536		Sectors .	(2)	Skipped blocks phase								
		n skip siz			2344448		Sectors •		Trimming phase						
Slo					2344448	% of a	-								
1000		etries (R	ateria a	hanalı		76 01 d	F	Scraping phase							
		ethes (R	etrying p	nasē):	0			hand	Retrying phase						
Block s	ize:				Auto-detect			•							
Hul	ti-pas	s advant	ed						Reset to default						
Bad Secti	ors														
			P	attern t	o fill bad blocks										
Read ret	ries:	0	¢	NSI:	1		HEX:	e5							

Bad sectors processing options

Some options can be changed	even during the process of image creation.
Image filename	Specifies the name and path for the image file
Image type:	Compressed image (R-Drive Image compatible): If this option is selected, R-Studio will create an image file which can be compressed, split into several parts, and password-protected. This image file is fully compatible with the images created by R-Drive Image , but incompatible with very old versions of R-Studio . Byte by byte image to a file: If this option is selected, R-Studio will create a simple exact copy of the object. Byte to byte image to a physical disk: R-Studio will create an exact copy of the disk on another hard drive. Data on the target drive will be overwritten. Available in the Corporate, Technician, and T80+ licenses. Some other image formats are also available in the Technician, and T80+ licenses. You may read more about these formats in the <u>Supported Virtual</u> <u>Disk and Disk Image Formats</u> page.
Drive sector map file	A file with the sector map of the object to image. Optional for the RDI image type, mandatory for the other image types.
Enable multi-pass image creation	Turns multi-pass imaging on and off.
Data to process	All data: All data on the disk will be imaged. Existing files only (FS bitmap): Only the disk area occupied by the existing files of the file system will be imaged. If there are more than one partition exist on a hard drive, existing files will be imaged from all partitions.

	Unused clusters only: Only the unused clusters of the file system will be imaged. If there are more than one partition exist on a hard drive, unused clusters will be imaged from all partitions. Existing files + Unused clusters: First the existing files then the unused clusters will be imaged. 2 image files will be created. Unused clusters + Existing files: First the unused clusters then the existing files will be imaged. 2 image files will be created.
Perform reading in reverse order if possible	Switches the direction of all phases/steps to reverse.
Use less strict options for FS metadata	When this option is selected, the area where FS metadata resides will be treated differently: Block size will be smaller, no skipped blocks, I/O timeout will be increased for devices with support of such features.
Minimum skip size	Minimum size of drive area to skip when a bad sector is encountered.
Maximum skip size	Maximum size of drive area to skip when a bad sector is encountered.
Slow I/O rate	Data read rate from which the block being read will be trated as a slow one. Can be either as % of average speed or in Mb/sec. It can also be turned off.
Number of retries (Retrying phase)	The number of read attempts in the Retrying phase.
Block size	The block size to process as a single unit.
Disable imaging phases	Multi-imaging phases that can be skipped. They can be skipped or added even during image creation
Start runtime imaging	Click this button to switch to <u>runtime imaging</u> .

R-Studio will start creating the image, the Progress showing the progress.
 Multi-pass imaging progress



You may change some operation parameters during image creation. Click the **Options** button and change them accordingly.

Drive Options tab

Options (Cor	mpressed drive image creatio	n)	
Drive Options	Multi-pass imaging options	Post Actions	
WDC WD1200	DBEVT-22ZCT0 11.01A11: WD-V	WXE808HN3826	
Read retries of	count: Default (0) 🔻		

Multi-pass imaging options tab

rive Options	Multi-pass imaging o	puons	Post Actions		
Multi-pass imag	ge creation				
Data to proces	is:	All data	E)		Disable imaging phases
The second second second	ading in reverse order rict options for FS met		le		Edges phase Slow areas phase
Skip size:		1536		Sectors 👻 (?)	Skipped blocks phase
Maximum s	kip size:	234444	18	Sectors 👻 (?)	Trimming phase
Slow I/O ra	ate:	10	% of	average speed 💌	Scraping phase
Number of retr	ies (Retrying phase):	0		Retrying phase	
Block size:		Auto-d	etect	•	
lulti-pass adva	nced				

Post Actions tab

Orive Options	Multi-p	bass imaging op	tions	Post Actions						
Shutdown	the comp	uter on all task	s comple	etion						
Email notifi	cations									
Server: m	ail.examp	de.com			Port:	25	-	SSL	Auto	•
Sender email:	te	ster 1@example	e.com							
Recipient(s) e	mail: te	ster 2@example	e.com							
Custom subje	t: In	age Creation P	esults							
Send email it	f	Authoriz	ation							
Error oc	curred	Login:	tester	1						
Success		Password:								
								Teres	t email acco	
								lesi	cemail acco	unt

When the imaging is over, **R-Studio** will show its results.

Multi-pass imaging results

Drive Create	5 📂	nced) Scan Part	ition Search	Create I	mage Open	Image Create Region Start Runt	ime Image RADs Connect To Remote Remove I/O Mon	
Device view	iles Show Files (Adva	iceu) scail Pail	Juon Search	Create 1	inage open	inage create keylon Start Kun	ane maye Katos Connect to Kenote Kenote 1/0 Mon	00
Der	rice/Disk	Label	/Interfa	Start	Size	Create image		
🗸 🛄 Local Cor	nputer					Compressed drive image of	reation and cranning	
V SS KING	TON SKC600256G S	50026B7785A98.	. #0 SATA	2, SSD	238.47 GB	Image of "WDC WD1200B	EVT-222CT0 11.01A11" was successfully created in 57m 46s.	
🥪 El	system partition		FAT32	1 MB	100 MB			
🥯 N	icrosoft reserved para	1		101 MB	16 MB	Image file: D: Wultipass WDC WD		
🥪 C		System	NTFS	117 MB	237.37 GB		sWDC WD1200BEVT-22ZCT0 11.rsm	
🥪 W	indows Recovery Pa.		NTES	237.48 GB	1008 MB	Scan information file: D: Multipas	s\WDC WD1200BEVT-22ZCT0 11.scn	
🗢 Er	mpty Space20			238.47 GB	8.32 MB	Multi-pass phase:	Trimming phase	
✓ ☑ ST200	0VX017-3CV102 CV10	WWD0FX5M	#1 SATA	2, HDD	1.82 TB	Rescued:	111.79 GB	
🥪 D		Data	NTES	1 MB	1.82 TB	Unprocessed left on device:	N/A	
Y 💹 WDC	WD1200BEVT-22ZCT.	WD-WXE808H	#2 SATA	2, HDD	111.79 GB	Unprocessed for the operation:	N/A	
Se E	-	NTFS-Good	NTFS	1 MB	39.09 GB	Skipped slow areas:	N/A	
🥪 G		NTFS-Bad	NTES	39.09 GB	72.70 GB	Skipped bad areas:	N/A	
🗸 🏷 UFD 2	.0Silicon-Power4G 1	AA00000000000.	. #3 USB		3.75 GB	Not yet trimmed:	N/A	
Se F:		RSACTIVATIO	FAT32	64 KB	3.75 GB	Not yet scrapped:	N/A	_
						Bad sectors:	40.50 KB in 81 sectors (sector size: 512 Bytes)	-
						Actual read speed: Data processing speed:	86.08 KB/sec (average is 86.08 KB/sec) 2.87 KB/sec	
						Properties S.M.A.R.1	5. 🏠 Create Image	
.og								8
Туре	Date	Time				Text	til s	
S OS I/O error	2/17/2025 1	:13:37 PM	Sector 1336	36880 failed	to read from	wDC WD1200BEVT-22ZCT0 11.01	A11 after 1 attempt. Data error (cyclic redundancy check) (23)	
1) Imaging							11.01A11' finished. Rescued this phase: 9.71MB. Total rescued: 11	
1 Imaging	2/17/2025 1	:13:38 PM	mage of "\	NDC WD120	OBEVT-22ZC	T0 11.01A11" was successfully crea	ted in 57m 46s.	

Advanced multi-pass imaging settings window

Note: You should completely understand what you are going to do, or you may severe deteriorate **R-Studio** performance or even damage the hard drive being imaged. When in doubt, confine yourself to parameters on the Multi-pass imaging options tab.

The Bad sector processing dialog box spe cifies options for all stages of multi-pass imaging. You can perform more versatile control of these options on the Advanced multi-pass imaging settings window. You may add or delete individual phases and steps, change their order, and fine-tune each phase and step separately.

			1 Move up	Move dow										
Base settings	Possible areas	_	Options	Block size			Slow I/O rate	Block skip rules		Skip after N failed blocks		Skip size	Max :	skip size
Run 1 times		a - 10						Slow	•	2 ~	1536	Sectors 🔻	2344448	Sectors
All data 👻	Not processed	•	Options:	Auto-dete	ct 🔻	10	% of average speed 🔻	Timeout	-	1	1526	Sectore ¥	2244449	Sectors
Reverse								Drive ready	[102]	<u> </u>	1000		2311110	Sectors
Run 1 times		_						Slow	•	2 ~	1536	Sectors •	2344448	Sectors
Al data 👻	ALL SKIPPED BLOCKS	•	Options:	Auto-dete	ct 🔻	10	% of average speed 🔻	Timeout Bad	•	1	1536	Sectors •	2344448	Sectors
Reverse								Drive ready						
Block mode 👻	Class diseased blacks		Onlines.			Diesk		Timeout			4535	Castera -	224442	Sectors
All data Reverse Switch direction	Slow skipped blocks		optons.	Autorece		USU		Drive ready			1330	Jectora	2311110	Sectors
Run 1 times								1						
Block mode	ALL SKIPPED BLOCKS	•	Options:	Auto-dete	ct 🔻	Disab	oled 🔹		•	Disabled ~	0	Sectors *	0	Sectors
Reverse														
Run 1 times Trimming mode All data Reverse	ALL SKIPPED BLOCKS ALL BAD BLOCKS	•	Options:											
Run 1 times Sector by sector All data	ALL SKIPPED BLOCKS ALL BAD BLOCKS	•	Options:											
Run 0 times	ALL BAD SECTORS	•	Options:											
	Run 1 times Image: Sector by sector Reverse Run 1 times Block mode Image: Sector by sector Run 2 times Image: Sector by sector	Run 1 times S Block mode Al data Reverse Block mode Al data Start times S Block mode Al data Preverse Block mode Al data Run 2 times S Block mode Al data Sector by sector Run 1 times S Timming mode Al data Reverse Run 1 times S Timming mode Al data Reverse Run 1 times S Sector by sector Al data Reverse Run 1 times S Sector by sector Al data Run 1	Run 1 times C Biock mode • Al data • Reverse • Biock mode • Al data • Biock mode • Al data • Parente • Biock mode • Al data • Parente • Biock mode • Al data • © Switch direction • Run 1 times C Biock mode • Al data • Q subt direction • Run 1 times C Timming mode • Al data • Run 1 times C Sector by sector • Al data • Run 1 times C Sector by sector • Al data • Al data • Run 1 times C Sector by sector • Al data • Al data • Run 1 times C Sector by sector • All balo BLOCOS • Sector by sector • Aut BAD SECTORS <td>Run 1 times Controls Biock mode V Al data V Reverse AL SIGPPED BLOOKS Options: Biock mode V Al data V Al data V Al data V Reverse Run 1 times Biock mode V Al data V Store ree Sow skipped blocks V Run 2 times Controns: V Store ree Sow skipped blocks V Run 1 times Controns: V Al data V AL SIGPPED BLOOKS V Run 1 times Controns: V Run 1 times Controns: V Run 1 times Controns: V Al data V AL SIGPPED BLOOKS V Run 1 times Controns: V Al data V AL SIGPPED BLOOKS V Al data V AL SIGPPED BLOOKS V Run 1 times Controns: V Al data AL BAD BLOOKS V Al data AL BAD BLOOKS V Run 1 times Controns: V Run 1 times Controk V</td> <td>Run 1 times C Biock mode V Al data V Reverse All SGPED BLOOKS V Biock mode V Ald data V Ald data V Ald data V Biock mode V Ald data V Run 2 times C Biock mode V Ald data V Skow skepped blocks V Options: V Ald data V Skow skepped blocks V Options: V Ald data V Ald bab (BLOCK) V Run 1 times C Run 1 times C Run 1 times C Run 1 times</td> <td>Run 1 times C Biock mode V Al data V Reverse Ruito-detect Biock mode V Al data V Serverse Ruito-detect Biock mode V Al data V Ruito-detect V Biock mode V Al data V Run 2 times Ruito-detect Biock mode V Al data V Solv dispeed bloods V Options: V Auto-detect V Run 2 times Ruito-detect Run 1 times C Run 1 times C</td> <td>Run 1 times C Biock mode • Al data • Reverse Ruito detect Biock mode • Al data • Biock mode • Al data • Start Start • Biock mode • Al data • Start Start • Biock mode • Al data • Start Start • Biock mode • Al data • Start Start • Biock mode • Al data • Start Start • Biock mode • All Start • Start Start • Run 1 times C Run 1 times</td> <td>Run 1 times C Biock mode • Al data • Biock mode • Run 1 times • Biock mode • Run 1 times • Biock mode • Al data • Soverster • Biock mode • Al data •<</td> <td>Run 1 times C Auto-detect D % of average speed Sow Ald sda Auto-detect D % of average speed Sow Reverse Biok mode Auto-detect D % of average speed Sow Biok mode Auto-detect D % of average speed Sow Ald sda Auto-detect D % of average speed Sow Ald sda Auto-detect D % of average speed Sow Reverse Auto-detect D % of average speed Sow Reverse Auto-detect Deabled Monecut Sow skoped blocks Options: Auto-detect Deabled Monecut Sow skoped blocks Options: Auto-detect Deabled Monecut Sow skoped blocks Options: Auto-detect Deabled Monecut Run 1 times C Auto-detect Deabled Wonecut Run 1 times C Options: Run 1 times C Run 1 times C</td> <td>Run 1 times C Auto-detect Do 16 of average speed Sow Reverse Bock mode Auto-detect Do 16 of average speed Sow Immoutor Bad Reverse Bock mode Auto-detect Do 16 of average speed Sow Immoutor Bad Bock mode Auto-detect Do 16 of average speed Sow Immoutor Bad I</td> <td>Run 1 times C Autor detect D Not processed Coptoms: National detect D Solv 2 Image: Coptom Solution of the coptom Sol</td> <td>Ren times Som Image: sector in the sec</td> <td>Run Tumes E Participation Paritipation Participation Pa</td> <td>Rain times P Processed P</td>	Run 1 times Controls Biock mode V Al data V Reverse AL SIGPPED BLOOKS Options: Biock mode V Al data V Al data V Al data V Reverse Run 1 times Biock mode V Al data V Store ree Sow skipped blocks V Run 2 times Controns: V Store ree Sow skipped blocks V Run 1 times Controns: V Al data V AL SIGPPED BLOOKS V Run 1 times Controns: V Run 1 times Controns: V Run 1 times Controns: V Al data V AL SIGPPED BLOOKS V Run 1 times Controns: V Al data V AL SIGPPED BLOOKS V Al data V AL SIGPPED BLOOKS V Run 1 times Controns: V Al data AL BAD BLOOKS V Al data AL BAD BLOOKS V Run 1 times Controns: V Run 1 times Controk V	Run 1 times C Biock mode V Al data V Reverse All SGPED BLOOKS V Biock mode V Ald data V Ald data V Ald data V Biock mode V Ald data V Run 2 times C Biock mode V Ald data V Skow skepped blocks V Options: V Ald data V Skow skepped blocks V Options: V Ald data V Ald bab (BLOCK) V Run 1 times C Run 1 times C Run 1 times C Run 1 times	Run 1 times C Biock mode V Al data V Reverse Ruito-detect Biock mode V Al data V Serverse Ruito-detect Biock mode V Al data V Ruito-detect V Biock mode V Al data V Run 2 times Ruito-detect Biock mode V Al data V Solv dispeed bloods V Options: V Auto-detect V Run 2 times Ruito-detect Run 1 times C Run 1 times C	Run 1 times C Biock mode • Al data • Reverse Ruito detect Biock mode • Al data • Biock mode • Al data • Start Start • Biock mode • Al data • Start Start • Biock mode • Al data • Start Start • Biock mode • Al data • Start Start • Biock mode • Al data • Start Start • Biock mode • All Start • Start Start • Run 1 times C Run 1 times	Run 1 times C Biock mode • Al data • Biock mode • Run 1 times • Biock mode • Run 1 times • Biock mode • Al data • Soverster • Biock mode • Al data •<	Run 1 times C Auto-detect D % of average speed Sow Ald sda Auto-detect D % of average speed Sow Reverse Biok mode Auto-detect D % of average speed Sow Biok mode Auto-detect D % of average speed Sow Ald sda Auto-detect D % of average speed Sow Ald sda Auto-detect D % of average speed Sow Reverse Auto-detect D % of 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Advanced multi-pass imaging settings

Depending on the phase/step, these options are different. Some of them are described in the <u>Bad sectors</u> processing options tab, some are self-evident, and some are described in the table below.

Advanced bad sectors p	processing options
Possible areas	Specifies the areas to which this phase will be applied. Selecting an area in ALL
	CAPITALS selects all their subareas.
Options	You may specify separate options for sectors where FS metadata resides.
Block skip rules	Specifies how many times various failed blocks will be encountered to skip them.
Skip after N failed blocks	

Close k areas to process	Close All selected subareas	
Drive ready sectors	Drive ready sectors	
Bad sectors	Bad sectors	
ALL BAD SECTORS Timeout sectors	Timeout sectors	Failed bloc
ALL BAD SECTORS	ALL BAD SECTORS	
Drive ready blocks	Drive ready blocks	Close
Bad blocks	Bad blocks	Drive ready
Timeout blocks	Timeout blocks	Bad
ALL BAD BLOCKS	ALL BAD BLOCKS	Timeout
Drive ready skipped blocks	Drive ready skipped blocks	Slow
Bad skipped blocks	Bad skipped blocks	
Timeout skipped blocks	 Timeout skipped blocks 	
ALL SKIPPED BLOCKS Slow skipped blocks	ALL SKIPPED BLOCKS Slow skipped blocks	
Not processed	Not processed	

Options		Block size	Slow I/O rate	Block skip r	ules	Skip after N failed bloc	ks –	Skip size	Max	skip size
				Slow	•	2	~ 1536	Sectors 💌	2344448	Sectors 🔻
Options:	•	Auto-detect 👻	10 % of average speed 💌	Timeout Bad Drive ready	•	1	× 1536	Sectors 👻	2344448	Sectors 💌
Meta options:	•	Auto-detect 🔻	Disabled 👻	Timeout Bad Drive ready	•	Disabled	~ 0	Sectors 👻	0	Sectors +

FS metadata options

Some <u>additional options</u> may appear when third-part hardware is used.

A particular set of these options can be saved as a preset and loaded back when necessary.

The Bad sector processing tabs will look different when the advanced multi-pass imaging settings have been altered.

Multi-pass imaging options tab

Image type:	Compressed	Image (R	Drive Image comp	atible)		
mage file name	D: Multipass	WDC WD	1200BEVT-22ZCT0	11.rdr		
			A new in	nage will be created.		
Main Bad	sectors process	ang S	can Information	Additional Output Folders	Post Actions	
Drive sect	or map file:	: Multipa:	ss WDC WD 12008	EVT-22ZCT0 11.rsm		
Enable m	ulti-pass image					
			Advanced m	ulti-pass options are set.		
Multi-p	ass advanced					Reset to default
Bad Sectors						
		Patterr	to fill bad blocks			
Read retries	0 0	ANSI:	8	HEX: e5		
		MADE.	a	UDA. [63	R	

Multi-pass imaging options tab

Orive Options	Multi-pass imaging opti	ions Post Actions	
Multi-pass ima		ulti-pass options are set.	
Multi-pas	ss advanced		Reset to default

3.16 Reverse RAIDs

Reverse RAIDs is a technique that is reverse to creating virtual RAIDs. When creating a reverse RAID, the data from a real object is decomposed into virtual parents. Then data on those virtual parents can be processed like on real objects. They can be viewed, edited, imaged, copied to physical drives, etc.

<u>Reverse RAID of an Object</u>

This technique can be used to decompose data on a single volume into virtual parents. Then such virtual parents can be processed like on real objects. They can be viewed, edited, imaged, copied to physical drives, etc.

• **Reverse RAID of a RAID**

This technique can be used to re-construct data on individual RAID drives when data on physical drives is corrupted, but can be recovered using RAID redundancy. A missing drive is an example of this case. Or if there are <u>bad sectors</u> scattered over the physical drives but the overall RAID integrity remains. Then the data can be copied to physical drives to create a healthy RAID.

Note: Many controllers write their own metadata to drives to recognize that the drives belong to certains RAIDs. Without that metadata they won't see those RAIDs. You have to write that metadata manually.

3.16.1 Reverse RAID of an Object

This technique can be used to decompose data on a single object into virtual parents. Then such virtual parents can be processed like on real objects. They can be viewed, edited, imaged, copied to physical drives, etc.

Suppose you have an image of a former RAID 6 (Reed-Solomon) and you wand to re-create data on individual drives from that RAID 6. You can do that by creating a reverse RAID of an <u>image</u>.

Note: Many controllers write their own metadata to drives to recognize that the drives belong to certains RAIDs. Without that metadata they won't see those RAIDs. You have to write that metadata manually.

To create a reverse RAID of a drive image (or other drive object),

1 Right-click the drive object in the Drives panel and select Create Reverse RAID on the shortcut menu.

Drives				×
Device/Disk	Label	FS	Start	Size
Y 💻 Local Computer				
Y 🖙 TOSHIBA DT01ACA100 MS2OA750	44H5ATLKS	#1 SATA	0 Bytes	931.51 GB
Volume(3303cc57-3e4d-4507-87.,	Recovery	NTFS	1 MB	300 MB
🖙 EFI system partition 👻		FAT32	301 MB	100 MB
Microsoft reserved partition			401 MB	128 MB
🗢 C: 👻	System	NTFS	529 MB	292.01 GB
Volume(e0a573f2-14d5-4047-adf.r.		NTFS	292.53 GB	450 MB
🤪 D: 🗸 🗸	Data	NTFS	292.97 GB	638.54 GB
Empty Space25			931.51 GB	1.69 MB
Y SAMSUNG SP0411N TW100-11	S01JJ20XC75851	#2 ATA	0 Bytes	37.31 GB
🥯 E 🗸 👻	NTFS-Test	NTFS	32 KB	6.76 GB
🥯 G: 👻	FAT32-TEST	FAT32	6.76 GB	6.19 GB
🥶 H: 🗸	FAT-TEST	FAT16	12.95 GB	2.01 GB
Volume(c7e018fa-2f05-11e5-bec.	HFS-Test	HFS+	14.96 GB	6.67 GB
See HarddiskVolume25	Ext4FS-Test	Ext4	21.63 GB	6.52 GB
Empty Space31			28.15 GB	9.16 GB
Se Marvell 91xx Config 1.01				
 PIONEER DVD-RW DVR-219L 1.00 				
3 E:				

> The Reverse parents will appear in the Drives panel

Drives				
Device/Disk	Label	FS	Start	Size
V V TOSHIBA DT01ACA100 MS2OA750	44H5ATLKS	#1 SAT	0 Bytes	931.51 GB
Volume{3303cc57-3e4d-4507-8.	Recovery	NTFS	1 MB	300 MB
🖙 EFI system partition 🔹		FAT32	301 MB	100 MB
Microsoft reserved partition •			401 MB	128 MB
🥯 G 👻	System	NTFS	529 MB	292.01 GB
Solume(e0a573f2-14d5-4047-a. 		NTFS	292.53 GB	450 MB
🧼 D: 👻	Data	NTFS	292.97 GB	638.54 GB
Empty Space25			931.51 GB	1.69 MB
SAMSUNG SP0411N TW100-11	S01JJ20XC75851	#2 ATA	0 Bytes	37.31 GB
✓				
Reverse parent #A				18.65 GB
Severse parent #B				18.65 GB
Reverse parent #C				18.65 GB
🥯 F: 👻	NTFS-Test	NTFS	32 KB	6.76 GB
🥯 G: 👻	FAT32-TEST	FAT32	6.76 GB	6.19 GB
🥶 H: 🗸	FAT-TEST	FAT16	12.95 GB	2.01 GB
Volume{c7e018fa-2f05-11e5-bex.	HFS-Test	HFS+	14.96 GB	6.67 GB
See HarddiskVolume25	Ext4FS-Test	Ext4	21.63 GB	6.52 GB
Empty Space31			28.15 GB	9.16 GB
Marvell 91xx Config 1.01				
 PIONEER DVD-RW DVR-219L 1.00 				
🎱 E:				

Initially, the reverse RAID is set to its default values as RAID 5 on the Parents tab.

ocate	Add reverse parent	Remove Mov	e Up Move Down	Synchronize Offsets		
	Devic Device pa	:e/Disk rent	0 Sectors		ffset	
	🛩 [34] Reverse pa		0 Sectors			
	[33] Reverse pa	rent	0 Sectors			
	A	В	с	RAID Parameters		
				RAID type:	RAID5	•
	-	7	100 100	Block order for:	Left Synchronous (Standard)	•
				Parity delay:	Not used	¢
	-	2		First parity:		
· · · · ·	1//	///////////////////////////////////////		Number of rows:	3	٥
2	Λ		2	Block size:	64 KB	~
		5	56	Legend:		

2 Adjust RAID parameters on the Parents tab, as necessary. You need to add one reverse parent, change RAID type, and adjust RAID offset.

Pare	ints						×
	Reverse RAID a disks or volume	es to the list box to	create a RAID s	iet. Also vou car	use the shortcut menu	to manage the RAID set.	ride hint
					Synchronize Offsets		
N A	🗹 🥯 [39] F	Device/Disk Reverse parent	Move	Up 512 Sector	c	lffset	
в		Reverse parent		512 Sectors	5		
C		Reverse parent		512 Sectors			
D	🗹 🥯 (33) F	Reverse parent		512 Sectors	5		
	A	В	С	D	RAID Parameters		
			-		RAID type:	RAID6 / Reed-Solomon	-
1	D Q	1	7	D	Block order for:	Left Synchronous (Standard)	-
	RQ		Z	TL	Parity delay:	Not used	•
	-	_			First parity:	75 15	
2	2	Δ			Number of rows:	4	\$
	J	T	$\nabla \mathcal{U}$	IX Q	Block size:	64 KB	~
3	6 PD	PD RS	RS 7	5 8		odk nce block current sequence	
	Apply changes in	nmediately	More	Apply	Member block of the second	of selected parity block	

Process the appeared reverse parents in the Drives panel as real objects.
 These parents can be imaged, viewed/@dited, etc.

Drives				,
Device/Disk	Label	FS	Start	Size
V STOSHIBA DT01ACA100 MS2OA	44H5ATLKS	#1 SAT	0 Bytes	931.51 GB
Volume{3303cc57-3e4d-450x.	Recovery	NTFS	1 MB	300 MB
🖙 EFI system partition 🔹		FAT32	301 MB	100 MB
Microsoft reserved partition•			401 MB	128 MB
🤪 C: 🗸 🗸	System	NTFS	529 MB	292.01 GB
Volume{e0a573f2-14d5-404.*		NTFS	292.53 GB	450 MB
🧼 D: 👻	Data	NTFS	292.97 GB	638.54 GB
Empty Space25			931.51 GB	1.69 MB
✓ SAMSUNG SP0411N TW100	S01JJ20XC75851	#2 AT	0 Bytes	37.31 GB
✓ (Reverse RAID				
Reverse parent #A				18.65 GB
Reverse parent #B				18.65 GB
Reverse parent #C				18.65 GB
Reverse parent #D				18.65 GB
🗢 E 👻 👻	NTFS-Test	NTFS	32 KB	6.76 GB
🥯 G: 👻	FAT32-TEST	FAT32	6.76 GB	6.19 GB
⇒ H: ▼	FAT-TEST	FAT16	12.95 GB	2.01 GB
Solume{c7e018fa-2f05-11e	HFS-Test	HFS+	14.96 GB	6.67 GB
HarddiskVolume25	Ext4FS-Test	Ext4	21.63 GB	6.52 GB
Empty Space31			28.15 GB	9.16 GB
Se Marvell 91xx Config 1.01				
V 3 PIONEER DVD-RW DVR-219L 1.00				
3 E:				

3.16.2 Reverse RAID of a RAID

This technique can be used to re-construct data on individual RAID drives when data on physical drives is corrupted, but can be recovered using RAID redundancy.

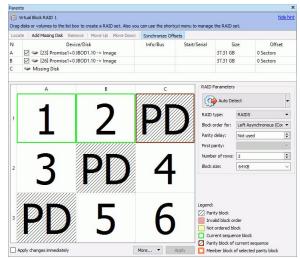
Suppose you have a RAID 5 with one missing drive and you need to reconstruct data on that drive. You can do that by creating a reverse RAID for it and then copy data from that missing drive to a real one, or to an <u>image</u>.

Note: Many controllers write their own metadata to drives to recognize that the drives belong to certains RAIDs. Without that metadata they won't see those RAIDs. You have to write that metadata manually.

To create a reverse RAID of a RAID with a missing drive,

1 Create a virtual RAID 5 of the existing drives or their images

Add a missing drive to the Parents tab.



If necessary, read the <u>Basic RAID 4 and RAID 5 Operations</u> and <u>Volumes Sets and RAIDs</u> help pages for details.

2 Right-click the Virtual Block Raid in the Drives panel and select Create Reverse RAID on the shortcut menu.

> The Reverse parents will appear in the Drives panel

Device/Disk	Label	FS	Start	Size
🛚 🜉 Local Computer				
SAMSUNG HD642JJ1AA01110	S1AFJ1MQ400283	#0 SATA	0 Bytes	596.17 GB
ST3500320ASSD15	9QM59J7M	#2 SATA	0 Bytes	465.76 GB
4 闄 Image: Y:/RAID5/RAID5Disk2.dsk				
Promise1+0 JBOD1.10		#2 SCSI	0 Bytes	37.31 GB
4 🍺 Image: Y:/RAID5/RAID5Disk1.dsk				
4 🍩 Promise1+0 JBOD1.10		#1 SCSI	0 Bytes	37.31 GB
Second Se			512 Bytes	37.31 GB
PIONEERDVD-RW DVR-219L1.00			0 Bytes	
🍰 E:			0 Bytes	
Virtual Volume sets and RAIDs				
4 🥼 Virtual Block RAID 1			0 Bytes	74.62 GB
Empty Space28			512 Bytes	7.84 MB
Se Partition1	RAID5	NTFS	7.88 MB	74.49 GB
Empty Space29			74.50 GB	123.78 MB
Severse parent #A			0 Bytes	37.31 GB
Severse parent #B			0 Bytes	37.31 GB
Reverse parent #C			0 Bytes	37.31 GB

These parents may be processed as real objects, they can be imaged, viewed/êdited. For your case the missing drive can be copied to a drive in the Drive Copy Wizard.

rives												
inves.		Source							Destination			
	Device/Disk	Label	FS	Start	Size	^		Device/Disk	Label	FS	Start	Size
	Empty Space24	cuber		17 KB	37.31 GB			ocal Computer	cober	1.5	Store	JALC
~				17 ND	57.51 06			Car Computer	MUSATIKS	#150	0 Bytes	931.51 GB
	Promise1+0 JBO			0 Bytes	37.31 GB			Volume(3303cc5			1 MB	300 MB
~				o oytes	51151 00			EFI system partita		FAT32		100 MB
	✓ □			0 Bytes	37.31 GB			Microsoft reserv.			401 MB	128 MB
	Empty Space			512 Bytes	37.31 GB			П	System	NTFS	529 MB	292.01 GB
	Marvell 91xx Config 1.01							Volume(e0a573f.		NTFS	292.53 GB	450 MB
~	PIONEER DVD-RW DVR							🗌 🧼 D: 🔹	Data	NTFS	292.97 GB	638.54 GB
	E:							Empty Space23			931.51 GB	1.69 MB
~	□ 🧇 WDC WD10EACS-00	WD-WCASJ04	#0 US	0 Bytes	931.51 GB		× 🗹	🕬 SAMSUNG SP0411N	S01JJ40WC94266	#2 A	0 Bytes	37.31 GB
	🗌 🥪 Y: 🛛 👻	Backup II	NTFS	1 MB	931.51 GB			🗌 🕯 Empty Space24			17 KB	37.31 GB
✓ Virt	tual Volume sets and RAIDs						~	Image: Y:/RAID5/RAID5				
~	🔲 🧊 Virtual Block RAID 1			0 Bytes	74.62 GB			🔲 🥯 Promise1+0 JBO			0 Bytes	37.31 GB
	Empty Space37			512 Bytes	7.84 MB		~	Image: Y:/RAID5/RAID5				
	Partition1	RAID5	NTFS	7.88 MB	74.49 GB		~	🗌 🍩 Promise1+0 JBO			0 Bytes	37.31 GB
	🗌 🕯 Empty Space38			74.50 GB	123.78 MB			🗌 🍛 Empty Spac			512 Bytes	37.31 GB
	🗌 🥯 Reverse parent #A				37.31 GB			Marvell 91xx Config 1.01				
	🗌 🥯 Reverse parent #B				37.31 GB		× 4	PIONEER DVD-RW DVR				
	🗹 🥯 Reverse parent #C				37.31 GB	~		🥝 E:				

Note: The reverse parents contain the data that should be on the RAID parents, according to its layout, while RAID parents contain actual data, that may be corrupted.

3.17 Working with Third-Party Hardware

The Technician/T80+ version of **R-Studio** can work together with <u>third-party hardware</u> developed for in-depth data recovery. Currently, the following devices are supported:

- DeepSpar Disk Imager
- DeepSpar USB Stabilizer
- DeepSpar USB Stabilizer 10GB
- DeepSpar RapidSpar
- <u>PC-3000 UDMA hardware</u>

3.17.1 DeepSpar Disk Imager™

DeepSpar Disk ImagerTM (**DDI**) is an HDD imaging device specifically built for data recovery from drives with hardware issues. It greatly increases imaging speed, accuracy, and integrity of data retrieved from such drives.

The main features that **DDI** provides when working with drives are the following:

- Direct low-level access to a drive bypassing the computers BIOS.
- Disabling specific drive read/write heads.
- Disable SMART subsystem, Bad Sector Reallocation, and Read Look-Ahead
- Read sector timeout controlled by Software/Plardware/PHY drive reset commands
- Bit level analysis of corrupted data to filter out the read-write channel noise
- Fully customizable multi-pass imaging

And many more others an advanced drive imager must have. You may learn more about **DDI** on its vendor site: **DeepSpar Disk Imager**TM.

DeepSpar Disk Imager[™] basics

The main idea of data recovery with **DDI** is to clone data from the source drive with a certain level of hardware malfunction to a clone drive and perform data recovery operations either from the clone drive or while data is being cloned. Such approach greatly reduces tear and wear of the source drive and reduces further deterioration of its state.

There are two modes in which **DDI** processes drives:

- **DDI** clones the entire source drive to the source one consequently, sector by sector. Any further data recovery will be made from the clone HDD.
- **DDI** clones those sectors of the source HDD which have been read during data recovery. Such readings are optimized to minimize the movement of the drive's head unit. All following reads from those sectors will be done from the clone drive. For example, if files are to be recovered from a <u>partition</u> on the drive, **DDI** will clone the boot record of the drive, the file table of the partition, and the sectors of the files. If the partition is scanned, the scanned sectors will be cloned, too. All consecutive operations, such as file preview, and so on, will be done from the clone drive. This greatly reduces the time necessary to perform the recovery operations and furthermore drive wear.

DeepSpar Disk ImagerTM board



Read the DDI documentation on how to install DDI connect the drives to DDI and start working with it.

The **DDI** board should be installed into a separate network computer (the **DDI computer**), and the source and clone drives should be connected to it. The DDI computer should be started using the boot USB stick supplied with the board. **R-Studio** running on another computer (the **R-Studio computer**) accesses the drive via the network. All data recovery operations will be done through this setup:



There may be several **DDI computers** on the network, **R-Studio** will connect to all of them. Such configuration may be useful for RAID recovery when several drives on the RAID have hardware problems.

Working with DDI

To start working with DDI, its computer should be connected to R-Studio.

To connect R-Studio to the DDI computer,

- * Select Connect to DDI on the Drive menu
- > The drives connected to DDI will appear in the Drive pane.

		Device/Disk	Labe	I nterface	/F Start	Size
~		Local Computer				
	>	SA400537120G 03	090005 50026B77843	A5618 #0 SATA	2, SSD	111.79 GB
	>	Se TOSHIBA DT01ACA100 MS2C	A750 44H5ATLKS	#1 SATA	2, HDD	931.51 GB
	>	ST380817AS 3.42	4MR29A6X	#2 SATA	HDD	74.53 GB
~ 1	2	DDI Devices				
		DDI-DS400521 - VProject#1	50026B77843	A5618 DDI		111.79 GB
		See DDI-DS400522 - VProject#2	44H5ATLKS	DDI		931.51 GB
	*	DDI-DS400523 - VProject#3	4MR29A6X	DDI		74.53 GB
		Partition1	NTFS-Test	NTFS	512 KB	6.94 GB
		Partition2	FAT32-TEST	FAT32	6.94 GB	36.23 GB
		Partition3	FAT-TEST	FAT16	43.17 GB	2.01 GB
		Empty Space32			45.18 GB	29.35 GB

Now it is possible to work with drives connected to **DDI** like all other drive objects in the **Drive** panel. For example, such drives may be included into <u>virtual RAIDs</u> and other compound objects.

Viewing the drive map

A drive map shows the conditions for individual drive sectors. You may see which sectors are OK, bad, or unstable.

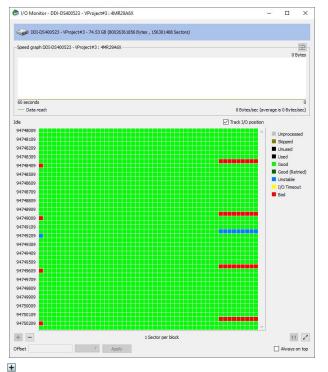
To view the drive map,

 Right-click the required drive/partition and select I/O Monitor on the shortcut menu, or

select the object and select I/O Monitor on the Drive menu

> The drive map will appear in the I/O Monitor window.

DDI I/O Monitor **window**

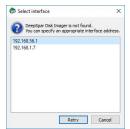


You may also image individual files and view file maps.

R-Studio can also load and process <u>images</u> created with the **DeepSpar Disk Imager**TM.

Connecting to DeepSpar Disk Imager™ manually

If **R-Studio** cannot find **DeepSpar Disk Imager**TM, the Select Interface dialog box will appear. Try to find the DDI interface manually.



3.17.2 DeepSpar USB Stabilizer™

This hardware works under Windows 10/11-64 bits

The **USB Stabilizer** is a device that allows any Windows software to reliably work with unstable/degraded USB storage devices providing a connection between the computer and source device. The storage devices can be hard drives, <u>SSD devices</u>, USB memory sticks, memory cards connected through a special adapter, etc. Windows shows such device as if it was connected directly to the system providing access to it for **R-Studio**.



If any drive issue occurs, **USB Stabilizer** handles this issue preventing the system from freezes, crashes, or disconnecting the drive. Such handling may include various drive resets or even drive repower without system loosing the device.

You may learn more about USB Stabilizer on its vendor's USB Stabilizer or our sites.

Installing USB Stabilizer:

USB Stabilizer Tech/Pro

1 Connect the USB Stabilizer to your computer and power it on

There should be no device connected.

The USB STABILIZER object should appear in the Safely Remove Hardware menu when USB Stabilizer is connected.

2 Run R-Studio, locate the DEEPSPAR NO DEVICE object in the Device/Disk panel, and click the Install driver button on the Properties tab.

You may install the drivers either online or offline.

The DEEPSPAR NO DEVICE object should appear in the Safely Remove Hardware menu

DeepSpar USB Stabilizer

tefresh Show	Files Show Files (Advance	d) Scan Partito	n Search	Create Imag	e Open Imag	e Create Region Start Run	time Image RAIDs Connect To Remote Remove I/O Monitor
Device view	12						
E	Device/Disk	Label	i/Interfa	Start	Size	>>> Deen Car	r USB Stabilizer
Local C	omputer					♥ Deepspa	II USB Stabilizer
V 📓 KIN	GSTON SKC600256G S45	50026B7785A98	#0 SATA	2, SSD	238.47 GB	DeepSpar USB Driver is	not installed Install driver online Install driver offine
	EFI system partition 🔹		FAT32	1 MB	100 MB		
i	Microsoft reserved partit x .			101 MB	16 MB	Name	Value
4	G 🔹	System	NTFS	117 MB	237.37 GB	Drive Type	Physical Drive
500	Windows Recovery Parti.		NTFS	237.48 GB	1008 MB	Name	DEEPSPAR: NO DEVICE
0	Empty Space16			238.47 GB	8.32 MB	USB Stabilizer	DeepSpar USB Driver is not installed
ST2000VX017-3CV102 CV10		WWD0FX5M	#1 SATA		1.82 TB	Physical Sector Size	4 KB
S	D: 👻	Data	NTFS	1 MB	1.82 TB	I/O Retries	Default
C DEE	PSPAR: NO DEVICE		DeepSpa	er		Y Drive Control	
Se E		DEEPSPARUSB	FAT12	3 KB	4 MB	Maximum Transfer	128 KB -
						I/O Block Size	4 KB 🗸
						Buffer Alignment	2 Bytes
						Bus Type	DeepSpar 🔻
						Properties	
og							
Type	Date	Time					Text
					file types defi	initions from "C:\Program File	es (x86)\R-Studio Technician\Presets\UserKnownFileType1.xml"
							R-Studio Technician/Presets/RAID6RS.xml"

R-Studio will start installing the drivers. You need to restart your system to complete installation.

> The DEEPSPAR: POWER OFF object will appear in the the Device/Disk panel.

DeepSpar USB Stabilizer

Lefresh Show Files Show Files (Advance	ped) Scan Partitio	n Search	Create Imag	e Open Imag	e Create Region Start Ru	untime Image RAIDs Connect To Remote Remove I/O Monit	or
Device view						Option	s
Device/Disk	Label	i/Interfa	Start	Size	DeenSpa	ar USB Stabilizer Pro: DSU20499 🥘 🤇) off
 Local Computer 					A peeboba		-
✓ W KINGSTON SKC600256G S45	. 50026B7785A98				Bad sectors processing:	Mode: SSD 🔻 🗹 Speed optimization	10
EFI system partition	-	FAT32	1 MB	100 MB	Repower duration:	2000msec Aggressive speed optimization	
Microsoft reserved partit:			101 MB	16 MB	1.1		
🥪 C:	System	NTFS	117 MB	237.37 GB	USB speed:	Auto Turn off drive if inactive	
Windows Recovery Parti:		NTFS	237.48 GB	1008 MB	Response to write attemp	pts: Ignore 🔻 🗌 Report drive as read-only	
Empty Space15			238.47 GB	8.32 MB	Read timeout	2000msec Disable ATA-over-USB	
✓ I ST2000VX017-3CV102 CV10	WWD0FX5M			1.82 TB 1.82 TB			
🥯 D:	• Data	NTFS 1 MB			Reset Password Ur	Jnlock Edit algorithm	pply
CEEPSPAR: POWER OFF		DeepSpa	r				
					Name	Value	
					Drive Type	Physical Drive	
					Name	DEEPSPAR: POWER OFF	
					USB Stabilizer Pro	DSU20499, Power off	
					Properties		
ig							
Type Date	Time					Text	
System 10/17/2024 12	10:31 PM Su	ccessfully lo	aded user's	file types defi	nitions from "C:\Program Fi	Files (x86)\R-Studio Technician\Presets\UserKnownFileType1.xml"	
	10:31 PM Su	ccessfully lo	aded user's	RAID layouts	from "C:/Program Files (x86	6)/R-Studio Technician/Presets/RAID6RS.xml"	
DeepSpar 10/17/2024 12	:10:32 PM Fo	und DeepSp	ar USB 'DSU	20499' (versio	n 4.01a/4.01a/401).		

R-Studio is now ready for work with **USB Stabilizer**.

USB Stabilizer Pro

1 Connect the USB Stabilizer to your computer and power it on

There should be no device connected.

The USB STABILIZER object should appear in the Safely Remove Hardware menu when USB Stabilizer is connected..

2 Run USB Stabilizer Control Panel that comes with USB Stabilizer Pro and click the Install button.

There should be no device connected.

DeepSpar USB Stabilizer Pro

	1			 () 	
ettings	Log	Sector Map	Algorithms	00	
atus: N	I/A				
			er is not installed!		~
ew Dec	epSpar L stall' to	JSB driver (relea	9' (version 4.00a/4. ase '4.00a') is avail nstall the latest rele	ble!	

Control Panel will start installing the drivers. You need to restart your system to complete installation.

> The DEEPSPAR: POWER OFF object will appear in the the Device/Disk panel.

DeepSpar USB Tech Stabilizer

Refre	esh Show	Files Show Files (Advance	ed) Scan Partitio	an Search	Create Imag	e Open Image	Create Region Start Run	time Image RAIDs	Connect To Remote Remove I/O M	Monitor
1	Device view									
	D	evice/Disk	Label	i/Interfa	Start	Size	Deen Enge	UCP Stabili	zer Pro: DSU20499 🚳	Off
~	Local Co	mputer					v Deepspar	USD SLADIII.	2er Pro: D3020499	
~	KINC	STON SKC600256G S45	50026B7785A98	#0 SATA2	, SSD	238.47 GB	Bad sectors processing:	Mode: HDD 🔻	Speed optimization	
	9 E	FI system partition		FAT32	1 MB	100 MB	Repower duration:	2000msec 🗘	Aggressive speed optimization	
		Microsoft reserved partit x .			101 MB	16 MB				
	90	a -	System	NTFS	117 MB	237.37 GB	USB speed:	Auto 👻	Turn off drive if inactive	
	S# 1	Vindows Recovery Parti.		NTFS	237.48 GB	1008 MB	Response to write attempts	: Ignore 🔻	Report drive as read-only	
	0	Empty Space15			238.47 GB	8.32 MB	Read timeout	2000msec 🗘	Disable ATA-over-USB	
~	 Image: ST20 	00VX017-3CV102 CV10	WWD0FX5M	#1 SATA2	, HDD	1.82 TB				
	S [): 🕶	Data	NTFS	1 MB	1.82 TB	Reset Password Unio	ock Edit algorithm		Apply
	DEER	SPAR: POWER OFF		DeepSpa	r		Name	Value		
										-
							Drive Type	Physical Drive		
								DEEPSPAR: POWER C		
							USB Stabilizer Pro	DSU20499, Power off		
							Properties			
Log										
	Туре	Date	Time					Text		
1) s	ystem	10/17/2024 12:1	0:31 PM Sue	ccessfully lo	aded user's	file types defini	itions from "C:\Program File	s (x86)\R-Studio Techr	nician\Presets\UserKnownFileType1.xm	sl'''
i) s	ystem	10/17/2024 12:1	10:31 PM Suc	ccessfully lo	aded user's	RAID layouts fr	om "C:/Program Files (x86)/	R-Studio Technician/P	resets/RAID6RS.xml"	
1 C	DeepSpar	10/17/2024 12:1	10:32 PM For	und DeepSp	ar USB 'DSU	20499' (version	4.01a/4.01a/401).			

R-Studio is now ready for work with **USB Stabilizer**.

Working with USB Stabilizer:

1 Connect the device for recovery to USB Stabilizer and click the Power button

DeepSpar USB Stabilizer

efresh Show F	les Show Files (Advance					1				
Device view	ties show mes (advance	d) Scan Partitio	n Search	Create Imag	e Open Imag	e Create Region Start Ru	ntime Image RAIDs	Connect To Remote Remove	I/O Monitor	
									Options	
De	vice/Disk	Label	i/Interfa	Start	Size	>>> Deen Cue	UCD Chala	ilizer Pro: DSU20499	10	T'n
Local Cor	nputer					🖉 DeepSpa	r USB Stab	liizer Pro: DS020499	1981	m J
V M KING	TON SKC600256G \$45	50026B7785A98	#0 SATA	2, SSD	238.47 GB	Bad sectors processing:	Mode: SSD 🔻	Speed optimization		12
Se EF	system partition 🔹		FAT32	1 MB	100 MB					
🥪 M	icrosoft reserved partita.			101 MB	16 MB	Repower duration:	2000msec 🗘	Aggressive speed optimization		
@ C		System	NTFS	117 MB	237.37 GB	USB speed:	Auto 👻	Turn off drive if inactive		
Se W	indows Recovery Parti.	-	NTFS	237.48 GB	1008 MB	Response to write attempt	s: Ianore 🔻	Report drive as read-only		
🗢 Er	npty Space15			238.47 GB	8.32 MB					
	0VX017-3CV102 CV10	WWD0FX5M	#1 SATA	2. HDD	1.82 TB 1.82 TB	Read timeout	2000msec 🗘	Disable ATA-over-USB		
🥪 D:		Data	NTES	1 MB		Reset Password Un	n	Apply		
TEEP!	PAR: POWER OFF		DeepSpa	r			11.2			-
						Name	Value			'
						Drive Type	Physical Drive			
						Name	DEEPSPAR: POWE	R OFF		
						USB Stabilizer Pro	DSU20499, Power	off		
						Properties				
9										>
Туре	Date	Time					Text			
System	10/17/2024 12:1	0:31 PM Suc	cessfully lo	aded user's	file types defi	nitions from "C:\Program Fil	es (x86)\R-Studio Te	chnician\Presets\UserKnownFileType	1.xml"	
System	10/17/2024 12:1	0:31 PM Suc	cessfully lo	aded user's	RAID layouts	from "C:/Program Files (x86)	/R-Studio Technicia	n/Presets/RAID6RS.xml"		
DeepSpar	10/17/2024 12:1	0:32 PM Fou	and DeepSp	ar USB 'DSU	20499' (versio	n 4.01a/4.01a/401).				
										_

> R-Studio will show the USB Stabilizer's drive.

DeepSpar USB Stabilizer

	chnician - Device Tools View H	view Help							-		>
efresh Show	Files Show Files (A	Advanced)	Partition Se	earch	Create Imag	e Open Imag	e Create Region Start Runti	me Image RAIDs	Connect To Remote Remove	I/O Monitor	
	evice/Disk	Lai	oel i/	/Interfa	Start	Size	DeepSpar	USB Stab	ilizer Pro: DSU20499	On On	
Local Co							×				-
	STON SKC6002560	50026B77	85A98 #	‡0 SATA,	SSD	238.47 GB	Bad sectors processing:	Mode: SSD 🔻	Speed optimization		
 EFI system partition EFI system partition 			F	AT32		100 MB 16 MB	Repower duration:	2000msec 📫	Aggressive speed optimization		
		partit z .						lised.			
se (6	 System 	N	VTFS	117 MB	237.37 GB	USB speed:	Auto 👻	Turn off drive if inactive		
 Windows Recovery Partix Empty Space15 ST2000VX017-3CV102 CV10 		Partix	N	NTES	237.48 GB	1008 MB	Response to write attempts:	ts: Ignore Report drive as read-only			
					238.47 GB	8 8.32 MB					
		V10 WW				1.82 TB	Read timeout	2000msec 🗘	Disable ATA-over-USB		
Se 1		▼ Data	BB Stabili	zer's d	rive	1.82 TB	Reset Password Unloc	k Edit algorith	-	Appl	he
Y TOP DEED	SPAR: SAMSUNG	SSD 8 4DE53101	0220	DeepSpa	C SSD	931.51 GB	Incodentia, Passing childe	Loit agona		. app	-
	JEFI System Partitio			AT32	1 MB	47 MB	Name	Value			
1	PTPart1	211		xt4	48 MB	232.83 GB	Drive Type	Physical Driv	VE.		
	PTPart2		6	X14	232.88 GB	14.90 GB	Name		SAMSUNG SSD 870 EVO 1TB		
				xt4	247.78 GB	683.73 GB	USB Stabilizer Pro	DSU20499. C	oppected		
	SPTPart3		5	Xt4	247.78 08	063.73 GB	The arties				-
					USB S	tabilizer's o	drive info				
Туре	Date	Time						Text			
System	10/17/2024	12:10:31 PM	Succes	sfully lo	aded user's	file types defi	nitions from "C:\Program Files	(x86)\R-Studio T	Technician\Presets\UserKnownFileType	1.xml"	
System	10/17/2024	12:10:31 PM					from "C:/Program Files (x86)/R	-Studio Technici	an/Presets/RAID6RS.xml"		
DeepSpar	10/17/2024	12:10:32 PM					n 4.01a/4.01a/401).				
DeepSpar	10/17/2024	12:20:29 PM			cess (Chann						
DeepSpar	10/17/2024	12:20:33 PM 12:20:33 PM				ling to execut	e some optional ATA-over-US	6 commands! Co	insider disabling them.'		
DeepSpar DeepSpar	10/17/2024	12:20:33 PM 12:20:33 PM		USB2.0	SSD 870 EVC	1170					
DeepSpar	10/17/2024	12:20:33 PM			ober: '4DF5						
DeepSpar	10/17/2024	12:20:33 PM				870 EVO 1TB'					
DeepSpar	10/17/2024	12:20:33 PM				FOR134948B					
DeepSpar	10/17/2024	12:20:33 PM			GB (195352						

It may take quite a long time to turn the drive on depending on the drive conditions. **R-Studio** will show the **DEEPSPAR: DEVICE IS BUSY** line if there's not enough power for the hard drive to work. That may happen when computer's USB port cannot deliver enough power and the external power supply is disconnected.

R-Studio can now process the **USB Stabilizer drive** as it's a common drive connected to a USB port.

You may read about USB Stabilizer parameters in its manual.

You may change other parameters for USB Stabilizer Pro through its Control Panel.

Note: When the Control Panel and R-Studio are running simultaneously, the Control Panel intercepts all controls of USB Stabilizer except the power button.

USB Stabilizer Control Panel

iettings	Log	Sector Map	Algorithms		0
	Interfac Iways or	п Тор	Hide in Sys	tem Tray	
	utostari	with Windows			
F	vents ailed Re /rite Att		Successful		
Data	Recover	y Settings		5	
R	eport Di	m Mounting rive as Read-Onl SI Pass-Through	□ Turn Off D y ☑ Report Ba		-
Stora	age Dev	ice Type:	SSD / Flash D	Nevice	~
Read	Timeou	it Reset:	Repower		~
Bad	Block Re	ad Retries:	Allow		~
Resp	ionse to	Write Attempts:	Ignore		~
Spee	d Optim	ization:	Off		~
Read	d Timeou	ıt (ms):	1000		

Read the USB Stabilizer Pro documentation for more details.

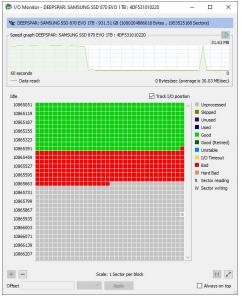
You may change these parameter during drive operations with USB Stabilizer.

DeepSpar USB Stabilizer

Drive Create	Tools View H	нр										
tefresh Show F	les Show Files (Ac		can Partition	Search	Create Imag	je Open Image	Create Region	Start Runtime Image	RAIDs +	Connect To Remo	ote Remove I	I/O Monitor
Device view												
De	vice/Disk		Label	i/Interfa	Start	Size						
🖌 💻 Local Con	nputer						Time elements th	25m, remaining: 8h 3	1		STOP	~
V 💹 KINGS	TON SKC600256G	45 50026	5B7785A98	#0 SATA,	SSD	238.47 GB		PAR: SAMSUNG S33.		248 Contore)	Stop Options	I/O Monitor.
🥪 EF	system partition	-				100.10	Scarning OLLP'S	- MR. 3MM30143 333	33 00 (20003)			
🥯 M	icrosoft reserved p	artita. 🔛	Options (Sca	nning)						×		
🥯 C		•	orive Options	Post Ac	Kons							
🥯 W	indows Recovery P	arti.T										
🗢 En	npty Space15	1	DEEPSPAR: S	AMSUNG SS	D 870 EVO :	ITB: 40F531010	220					
✓ ☑ ST2000	0VX017-3CV102 CV	10	Read retries	count:	Default (0) -						
🥯 D:		-	-									
) 🗸 🐮 DEEPS	PAR: SAMSUNG S	D 8	DeepSpar US	R Stabilizer	Bad sector	s processing:	Mode: SSD 🔻	Speed optimiza	tion			
Se UE	FI System Partition		occpopul ou	o o coonteer			_					
🥪 GF	TPart1				Repower d	uration:	2000msec 🗘	Aggressive spe	ed optimization		FAT SI	
🥪 GF	TPart2				USB speed	:	Auto 👻	Turn off drive it	inactive		EXT2 9	2282
🥪 GF	TPart3				Response	to write attempts	Ignore 👻	Report drive as	read-only			
					Read ti		2000msec \$	Disable ATA-ov				
og					[♥] Read u	meour	2000msec 💌		3-050			
Туре	Date				Reset	Password Unio	ck Edit algorit	nm				
OS I/O error	10/17/2024	2:05:0										
	10/17/2024	2:05:0										
	10/17/2024	2:05:										
	10/17/2024	2:05:										
OS I/O error		2:05:							-			
	10/17/2024	2:05:							OK	Cancel		
OS I/O error		2:05:2						uttempti me operati				
	10/17/2024	2:05:23 PM						attempt. The operati				
	10/17/2024	2:05:26 PN						attempt. The operati				
	10/17/2024	2:05:28 PM						attempt. The operati				
OS I/O error		2:05:31 PM					ead from after 1	attempt. The operati	on timed out			

You may also watch drive read operations in real time at the I/O monitor.

.DeepSpar USB Stabilizer



You may specify the algorithm to process faulty drives. Click the **Edit algorithm** button and specify algorithm's parameters.

.DeepSpar USB Stabilizer

	thnician - Device vi Tools View He									- 0
Refresh Show F	les Show Files (Ad	vanced) Scan	Partition Sea	arch Create Image	Open Image	Create Region	Start Runtime In	nage RAIDs	Connect To Remote	Remove I/O Monitor
	vice/Disk	Lab	al ://	nterfa Start	Size					
Local Cor		Lab		incertar State	Jize				191	D 🗄 📉
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	I system partition	1							yrs) 50	
	icrosoft reserved pa	Drive Option	ns Post	Actions						
Se C:			R: SAMSUNG	SSD 870 EVO 1TB : 4	DF531010220					
Se W	indows Recovery P	ar Read retr	ies count:	Default (0) 🔻						
	npty Space15									
✓ ☑ ST200	0VX017-3CV102 CV	10 DeepSpar	LISE Stabil	🕞 Edit algorithm			×			
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V X DEEPS	PAR: SAMSUNG SS	D		If 🔻 2	reads aft	er repower are no	t successful	optimization		
🥯 UI	FI System Partition			Then 👻 do a	a reset.			active		
🥪 GI	PTPart1			If 👻 no data is re	trieved for 4	• co	nsecutive reads	ad-only		FAT 5854
🥯 GI	PTPart2			Then 🔻 do a				USB		EXT2 90671
🥯 GI	PTPart3			If -	a repower.			030		
		_								
og				Then 👻						
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OSI/O error	10/17/2024	1						Cal	nut i	
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OS I/O error	10/17/2024	2:05:19 PM		30321954-30321985						
	10/17/2024	2:05:21 PM		30322050-30322081						
	10/17/2024	2:05:23 PM		30322082-30322113						
	10/17/2024	2:05:26 PM		30322434-30322465						
OSI/O error										
	10/17/2024	2:05:28 PM	Sectors	30322722-30322753	[4K] failed to r	ead from after 1	attempt. The op	eration timed out	F	

Some additional options will appear on the Advanced multi-pass imaging settings window when creating a multi-pass image.

Options	Block size	I/O timeouts	Slow I/O rate
Options: 💌	Auto-detect 💌	Default 🗸	10 % of average speed 🔻

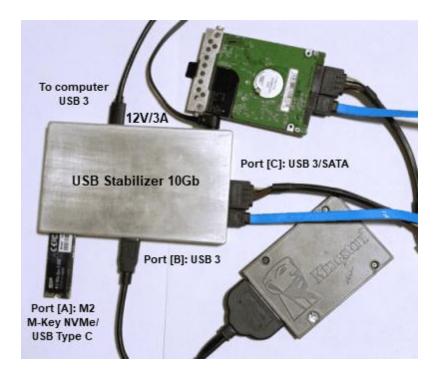
3.17.3 DeepSpar USB Stabilizer 10GB™

This hardware works under Windows 10/11-64 bits

The **USB Stabilizer 10Gb** is a further development of the **USB Stabilizer**. In addition to all standard features of the **USB Stabilizer** this device has more advanced feature:

- Simultaneous work with 3 independent devices.
- A maximum speed of more than 800 MBps data transfer.
- Device current graphs in real time on their I/O monitor.
- Customizable algorithms for unattended operations.
- Additional hardware handling commands.

These 3 input ports are: Port [A]: M2 M-Key NVMe/USB Type C Port [B]: USB 3 Port [C]: USB 3/SATA



You may learn more about USB Stabilizer 10Gb on its vendor's USB Stabilizer 10Gb site.

Installing USB Stabilizer 10Gb:

The USB Stabilizer 10Gb should be connected to a USB 3 port only!. Connecting to USB 2/1 ports may result in malfunctioning of the device: some ports may not work correctly.

1 Connect the USB Stabilizer 10Gb to your computer and power it on There should be no device connected.

Locate 3 DEEPSPAR NO DEVICE objects in the Device/Disk panel, and click the Install driver button on 2 the Properties tab.

You may install the drivers either online or offline.

DeepSpar USB Stabilizer 10Gb

C	Jools View He		artition Search	Create Image	Open Image	Create Region Start F	kuntine Image RAIDs Connect To Remote ID No	vitor
Device view		rencedy been r		create image	open indge	ereate region and cr	anning indge forder context to remote itempte i joind	
D	evice/Disk	Label	/Interfa	Start	Size	Deen Cue	ICP Ctabilizer	
🖌 🛄 Local C	omputer (3 hidden de	evi				v DeepSpa	r USB Stabilizer	
TOEE DEE	PSPAR [A]: NO DEVIC	E	DeepSpar			eenSpar USB Driver is	not installed Install driver online Install driver offline	
TOE DEE	PSPAR [B]: NO DEVIC	E	DeepSpar					
TOEE DEE	PSPAR [C]: NO DEVIC	E	DeepSpar		Na	ime	Value	
						Drive Type	Physical Drive	
						Name	DEEPSPAR [A]: NO DEVICE	
						USB Stabilizer	DeepSpar USB Driver is not installed	
						Physical Sector Size	4 KB	
						I/O Retries	Default	1
					~	Drive Control		
						Maximum Transfer	128 KB	1
						I/O Block Size	4 KB	
						Buffer Alignment	2 Bytes	
						Bus Type	DeepSpar	0
					q	Properties		
og								×
Type	Date	Time					Text	
i) System	2/19/2025	3:35:30 PM	Successfully I	oaded user's file	types definit	ons from "C:\Program I	Files (x86)\R-Studio Technician\Presets\UserKnownFileType1.xml"	
U System	2/19/2025	3:35:31 PM					6)/R-Studio Technician/Presets/RAID6RS.xml"	

R-Studio will start installing the drivers. You need to restart your system to complete installation.

3 DEEPSPAR: POWER OFF objects will appear in the the Device/Disk panel. >

R-STUDIO Te	chnician - Device vi	ew				
ive <u>C</u> reate	Tools View He	lp				
fresh Show	Files Show Files (Ad	vanced) Scan F	artition Search	Create Image	e Open In	arage Create Region Start Runtime Image RAIDs Connect To Remote Remove IJO Monitor
Device view						
De	vice/Disk	Label	√Interfa	Start	Size	DeepSpar USB Stabilizer 10Gb: DSU50197 🔯 Port: [A] USB-C 🔻 🔘 Off
💻 Local Co	mputer (3 hidden de	evi				V Deepspar usb scabilizer tudu. Dsusutav 💓 Port. (A) usb.c. • 0 on
DEEP	SPAR [A]: POWER O	FF	DeepSpar			Bad sectors processing: Mode: HDD Speed optimization
DEEP	SPAR [B]: POWER O	FF	DeepSpar			
DEEP	SPAR [C]: POWER O	FF	DeepSpar			Repower duration: 2000msec 🔹 🗌 Aggressive speed optimization
						USB speed: Auto 👻 🗌 Turn off drive if inactive
						Response to write attempts: Ignore Report drive as read-only
						Disable ATA-over-USB
						Read timeout 2000msec 🗘 Reset level: Light reset 🕶
						Drive ready settings
						Drive ready timeout: after reset 15sec 🗘 , after repower 45sec 🗘
						Power off and stop after 5 consecutive drive ready timeout blocks.
						Edit algorithm Apply
						Name Value
						Drive Type Physical Drive
						C Properties
						E rope des
1						
Туре	Date	Time				Text
System	2/19/2025	3:42:30 PM				definitions from "C:\Program Files (x86)\R-Studio Technician\Presets\UserKnownFileType1.xml"
System	2/19/2025	3:42:30 PM				uts from "C:/Program Files (x86)/R-Studio Technician/Presets/RAID6RS.xml"
DeepSpar	2/19/2025	3:42:32 PM	Found DeepSp	ar USB 10Gb	'DSU5019	7' (version 4.05a/2.05a/2019).

R-Studio is now ready for work with USB Stabilizer 10Gb. You may read about USB Stabilizer 10Gb parameters in its manual.

Working with USB Stabilizer 10Gb:

Below is an example of a simultaneous work with 3 independent devices:

- 1. An M.2 NVMe Realteck SSD device, 256GB.
- 2. A USB-connected device (a SATA Kingston 120GB SSD device connected to a USB<->SATA adaptor).
- 3. A SATA HDD (Western Digital WD1200BEVT HDD 120GB Capacity).

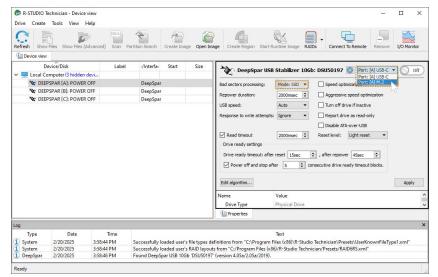
DeepSpar USB Stabilizer 10Gb

Working with M2 M-Key NVMe devices.

Such device should be inserted into the [A] M2 M-Key NVMe slot. Be careful with such devices as they may be very prone to static electricity. Consult its respective manual when necessary.

1 Select the DEEPSPAR [A] object and Port [A] M.2 in the drop-down box.

DeepSpar USB Stabilizer 10G



2 Click the Power On slider.

DeepSpar USB Stabilizer 10G

Type Date Time Scill selimit rutilities Text 1 0 peepspan 2/20/2025 4411/11 PM NVMe Model: SPCC M2 PCIe SD; VID/br/0EC 1 <th>CR-STUDIO T</th> <th>echnician - Device vie</th> <th>w</th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th><u> 19 - 19</u></th> <th></th> <th>×</th>	CR-STUDIO T	echnician - Device vie	w							<u> 19 - 19</u>		×	
Refer Sour Fies Show Fies Show Fies Show Fies Connect To Renote Remove UD Monitor Device Units Label Interfs Sata Sa	Drive Create	Tools View Hel	p										
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Local Computer (3 hidden devi 'No DEEPSPAR (A) POWER OFF DeepSpar 'No DEEPSPAR (B) POWER OFF DeepSpar 'No DEEPSPAR (B) POWER OFF DeepSpar 'No DEEPSPAR (C) POWER OFF DeepSpar 'No DEEPSPAR 'No DEEPSPAR (C) POWER OFF DeepSpar 'No DEEPSPAR 'No DEEPSPAR 'No DEEPSPAR 'No DEEPSPAR 'No No N	-					10							
Verail Computer (3 Middle dow.) Unew processing: Note DEEPSPAR (AP OWER OFF DeepSpar Note DEEPSPAR (AP OWER OFF DeepSpar Bad acctors processing: Mode: SSD () Speed optimization Note DEEPSPAR (C): POWER OFF DeepSpar Bad acctors processing: Mode: SSD () Speed optimization Note DEEPSPAR (C): POWER OFF DeepSpar Bad acctors processing: Mode: SSD () Speed optimization Note DEEPSPAR (C): POWER OFF DeepSpar Bad acctors processing: Mode: SSD () Deale Africance () Note DEEPSPAR (C): POWER OFF DeepSpar Bad acctors processing: Mode: SSD () Deale Africance () We DEEPSPAR (C): POWER OFF DeepSpar BeepSpar Deale Africance () Bad acctors processing: Bad acctors processing: Mode: SSD () Deale Africance () Bad acctors processing: Bad acctors procesing: Bad acctors processing: <td></td> <td></td> <td></td> <td>i/Interfa</td> <td>Start</td> <td>Size</td> <td>DeepSpar USB</td> <td>Stabilizer 10Gl</td> <td>: DSU50197 🚳 Port: [</td> <td>A] M.2</td> <td>• On</td> <td>63</td>				i/Interfa	Start	Size	DeepSpar USB	Stabilizer 10Gl	: DSU50197 🚳 Port: [A] M.2	• On	63	
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*** DEEPSPARICE POWER OFF DeepSpar USB speed: Auto Tum off drive if nactive Response to write attempts: Ignore Resport drive as read-only Dasable ATA over-USB Dasable ATA over-USB Drive ready stimps: Downer-USB Drive ready timeout: after reset 1 Spece 1: , after repower 4 Spece 2: , after reset 1 Spece 2: , after repower 4 Spece 2: , after reset 1 Spece 2: , after reset 2: , after reset 1 Spece 2: , after reset 1 Spece 2: , after reset 2: , after reset 1 Spece 2:	The DEE	PSPAR [B]: POWER OF	F	DeepSpar									
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Image: State Sta							USB speed:	Auto 👻	Turn off drive if inactive				
Image: State Sta							Pernonce to write attempte:	Ionore 💌	Report drive as read-on	du			
Image: Section of the section of th							and a second	1.0.0	_	.,			
Drive ready settings Drive ready settings Drive ready timeout: after reset: 15sec: 5; , after reporter 45sec: 9; Drive ready timeout: after reset: 15sec: 5; consecutive drive ready timeout blocks. Edit algorithm Name Value Drive Type Physical Drive Upper bype Physical Drive Value Drive Type Drepspare 220/0205 41111 PM NVMe Model: SPCC M2.2Pcic SSD; VIDAk IOC: DeepSpare 220/0205 1D DeepSpare 220/0205 21111 PM Capacity; 2285 568 (500118192; LBAs)									Disable ATA-over-USB				
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Image: Constraint of the series of							Drive Type	Physical Drive					
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DeepSpar 2/20/2025 4:11:11 PM NVMe Serial Number: 'AA240301N30256600131' DeepSpar 2/20/2025 4:11:11 PM Capacity: 238.5 GB (500118192 LBAs) •							1050						
1 DeepSpar 2/20/2025 4:11:11 PM Capacity: 238.5 GB (500118192 LBAs)												- 1	
							00131						
		2/20/2023	*********	Capacity: 250.	00 (000110	52 LOAS)				_			

DeepSpar USB Stabilizer 10G will initialize the device and show its content.
 DeepSpar USB Stabilizer 10G

Refer Sow File: Sow File: Som Perithon Search Create Rangio Create Rangio Start Runtime Image RAID: Correct To Remote Nonconcentration Image: Device View Image: Create Rangio Start Runtime Image RAID: Correct To Remote Nonconcentration Nonconcentration </th <th></th> <th>echnician - Device view Tools View Help</th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th>3<u>-</u>31</th> <th></th> <th>×</th>		echnician - Device view Tools View Help								3 <u>-</u> 31		×
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V ■ Local Computer (3 hidden dexi V The DEEPSPAR (IA) POESSD Composed on the set of the set o	Device view											
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Name Value Drive Type DeepSper			mages			230.30 00						
							Response to write attempts:	ignore •	-	Ŷ		
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	U DeepSpar	2/20/2025 4:		wer on: su	iccess (Cha	nnei v).						

The device is initialized and ready for work.

Working with USB-connected devices

Such devices can be USB sticks, external USB drives, or any other devices connected to their respective USB adapters. For our case, it's an SSD device connected to the port [B] USB-A through an SSD<->USB 3 adapter.

1 Select the DEEPSPAR [B] object, select Mode: SSD in the Bad sector processing drop-down box, and click the Power slider

						14 M Mm 204
🗇 R-S	TUDIO Technician - Device	view				- 🗆 X
Drive	<u>Create</u> Tools <u>View</u> <u>H</u>	lelp				
Refresh	Show Files Show Files (A	dvanced) Scan Partit	on Search	Create Ir	nage Open In	age Create Region Start Runtime Image RAIDs - Connect To Remote Remove IJO Monitor
🔛 De	vice view					
	Device/Disk	Label	√Interfa	Start	Size	
× 🔲	Local Computer (3 hidden o	levi				🛛 🔌 DeepSpar USB Stabilizer 10Gb: DSU50197 👰 🦲 😳
~	CEEPSPAR [A]: PCIE SSC	000000000000000000000000000000000000000	DeepSpa	ar	238.47 GB	Bad sectors processing: Mode: SSD Speed optimization
	Series EFI system partition		FAT32	1 MB	100 MB	
	Microsoft reserved a			101 MB	16 MB	Repower duration: 2000msec 🗧 🗌 Aggressive speed optimization
	Sasic data partition	Images	NTES	117 MB	238.36 GB	USB speed: Auto 👻 🗌 Turn off drive if inactive
1	CEEPSPAR [B]: KINGSTO		DeepSpa	ar		Response to write attempts: Ignore Report drive as read-only
	DEEPSPAR [C]: POWER		DeepSp			Disable ATA-over-USB
						Drive ready settings Drive ready timeout: after reset 15sec C Power off and stop after S Consecutive drive ready timeout blocks.
						Name Value *
						Drive Type Physical Drive
						Properties
Log						,
T	ype Date	Time			1 33 10 10620	Text
	pSpar 2/20/2025				A SA400S37120	G'
1 Dee	pSpar 2/20/2025	4:23:57 PM A	TA Serial N	lumber: '50	026B77843A56	18'
1 Dee	pSpar 2/20/2025	4:23:57 PM C	apacity: 11	1.8 GB (234	441648 LBAs)	
Ready						

DeepSpar USB Stabilizer 10G

DeepSpar USB Stabilizer 10G will initialize the device and show its content.
 DeepSpar USB Stabilizer 10G

R-STUDIO Technician - Device view Drive Create Tools View Help Refresh Show Files Show Files (Advan	ced) Scan Partit	on Search	Create Im	age Open Im	age Create Region Start Ru	ntime Image RAI		×
Device view Device/Disk Local Computer (3 hidden devi.		√Interfa	Start	Size				*
Very DEEPSPAR (Li): PCIE SD EFI system partition Microsoft reserved part. Basic data partition DEPSPAR [Bis MikiSTon) EFI system partition Microsoft reserved part. DEPSPAR [Bis MikiSTon] Windows Recovery Part. Not DEEPSPAR [C]: POWER OFF	Images 4DF531010220	FAT32 NTFS DeepSpa	1 MB 101 MB 117 MB 1 MB 101 MB 117 MB 111.29 GB	238.47 GB 100 MB 16 MB 238.36 GB 111.79 GB 100 MB 16 MB 111.18 GB 508 MB	Bad sectors processing: Reporter duration: USB speed: Response to write attempts: Response to write attempts: Response to write attempts: Response to write attempts: Prive ready stempt: Power off and stop after Edit algorithm	-	A get optimization A get optimization Turn off drive if nactive Report drive as read-only Deable ATA-over-USS Reset level: Light reset	alv
					Name	Value Physical Drive		
.og								
			KINGSTON	SA400S37120		ext		
	23:57 PM A	A Serial N		26B77843A56	18'			

The device is initialized and ready for work.

Working with SATA devices.

The SATA device is connected to the [C] SATA 3 port using a SATA 3-compatible data and power cables.

1 Select the DEEPSPAR [C] object, Port: [C] SATA in the drop-down box, and click the Power slider.

DeepSpar USB Stabilizer 10G

	R-STUDIO Technician - Device view Irive Create Tools View Help								- 0	×
Device/Disk Label /Interfs Start Size ■ Cocid Computer (B hiden devic. 00000000000 DeepSpar 28.47 GB Bad sectors processing: Speed optimate/El Start Prot: (C USPA / Prot: (C USPA	efresh Show Files Show Files (Advance		ion Search	Create Im	age Open Im	age Create Region Start R			nove I/OM	Nonitor
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Y Y DEEPSPAR [A]: PCIE S00 000000000000000000000000000000000000	💻 Local Computer (3 hidden devi					C Deepspar usb	Stabilizer 100L	Dorts [C] LI	P.A) 01
	DEEPSPAR [A]: PCIE SSD	00000000000000	. DeepSpa	r	238.47 GB	Bad sectors processing:	Mode: HDD V	Speed optimizat	ATA	
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Vec DEES/SAR (B): KNNOSTON AD7331010220 Program Vec DEES/SAR (B): KNNOSTON AD7331010220 Firsystem partition Firsystem Firsystem partition Firsystem Firsys	Microsoft reserved part			101 MB	16 MB		Land			
	Se Basic data partition	Images	NTFS	117 MB	238.36 GB	USB speed:	Auto 👻	Turn off drive if inactive		
See Microsoft reserved part. 101 M8 16 M8 Impty Space21 117 M8 111.18 G8 Microsoft reserved part. Name 200meec © Power off and stop after reset [ssec ©], after resource with remout blocks. Edit algorithm Read menut Value Drive Type Physical Drive We Properties We Properties	✓ ℃ DEEPSPAR [B]: KINGSTON	4DF531010220	DeepSpa	r	111.79 GB	Response to write attempts:	Ignore 👻	Report drive as read-only		
^{March} Microsoft reserved part	See EFI system partition		FAT32	1 MB	100 MB			Disable ATA-over-LISB		
	Microsoft reserved part			101 MB	16 MB				10000	
The DEEPSPAR [C]: POWER OFF DeepSpar Drive ready timeout: after reset [Isset 4] Drive Type Physical Drive Drive ready timeout: after reset [Isset 4] Drive Type Physical Drive	Empty Space21			117 MB	111.18 GB		2000msec 🔤	Reset level: Light reset	•	
Image: Second	Windows Recovery Par		NTFS	111.29 GB	508 MB	Drive ready settings				
Edit algorithm Activ Edit algorithm Edit algorithm Name Value Drive Type Physical Drive Image: Properties Image: Properties DeepSpar 2/20/2025 422557 PM DiseSpar 2/20/2025 422557 PM DiseSpar 2/20/2025 422557 PM	TEEPSPAR [C]: POWER OFF		DeepSpa	r		Drive ready timeout: after	reset 15sec	🗘 , after repower 45sec 🔹		
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DeepSpar 2/20/2025 4:23:57 PM ATA Serial Number: '50026877843A5618'						C'				

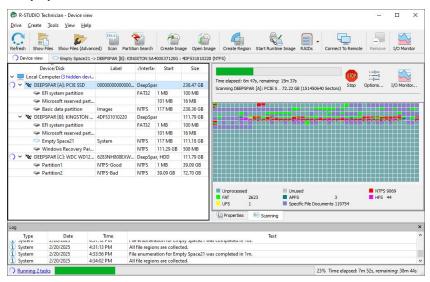
DeepSpar USB Stabilizer 10G will initialize the device and show its content.
 DeepSpar USB Stabilizer 10G

Create	Tools View Hel		ition Search	Create Im	age Open Im	age Create Region Start Ru	untime Image RAII		I/O Monitor
Device view									
D	evice/Disk	Label	/Interfa	Start	Size	DeepSpar USB	Stabilizer 10Ch	: DSU50197 🔯 Port: [C] SATA 🔻	On
Local Co	omputer (3 hidden de	i				C Deepspar USB	Stabilizer 1060	Port: [C] SAIA	on
~ ** DEE	PSPAR [A]: PCIE SSD	000000000000000000000000000000000000000	DeepSpa	r	238.47 GB	Bad sectors processing:	Mode: HDD 🔻	Speed optimization	
a	EFI system partition		FAT32	1 MB	100 MB				
G	Microsoft reserved pa	t		101 MB	16 MB	Repower duration:	2000msec 🔹	Aggressive speed optimization	
	Basic data partition	Images	NTES	117 MB	238,36 GB	USB speed:	Auto 👻	Turn off drive if inactive	
	PSPAR [B]: KINGSTON		DeepSpa		111.79 GB	Response to write attempts:	Ignore 👻	Report drive as read-only	
	EFI system partition	III IDI DO IO IOLLO	EAT32	1 MB	100 MB	Responde to mile attempts.	agritice .		
	Microsoft reserved pa	•		101 MB	16 MB			Disable ATA-over-USB	
	Empty Space21	and the second se		117 MB	111.18 GB	Read timeout	2000msec 🗘	Reset level: Light reset 👻	
	Windows Recovery Pa		NTES	111.29 GB	508 MB	Drive ready settings			
	PSPAR [C]: WDC WD1				111.79 GB	Drive ready timeout: after	renet IEcos	, after repower 45sec	
	Partition1	NTFS-Good	NTFS	1 MB	39.09 GB				
	Partition2	NTFS-Bad	NTES	39.09 GB	72.70 GB	Power off and stop after	er 5 🗘 cor	nsecutive drive ready timeout blocks.	
	antition2	IN IF 5* Dad	NIFS	59.09 GB	12.10 06				
						Edit algorithm			Apply
						Name	Value		
						Drive Type	Physical Drive		
						Properties			
g									
Туре	Date	Time			TALSON		ext		
DeepSpar					41648 LBAs)	020			
DeepSpar			Power off: si						
DeepSpar			ower on: si						

Now all three devices are initialized and ready to work with.

Scanning the M.2 SSD device [A]:

DeepSpar USB Stabilizer 10G



Recovering data from the SSD device [B]:

DeepSpar USB Stabilizer 10G

R-STUDIO	fechnician - File vie Tools <u>V</u> iew He			-	
copen All Files	Recover Recov	5 V	k Find Previous Find Next File Mark Up Details Preview Options		
Device view	Empty Spa	ce21 -> DEEPSPAR []: KINGSTON SA400S37120G : 4DF531010220 (NTFS)		
	USB_Stabil		Name Recovery chances	i sect	Size, Bytes
× 🔳	Users		Application Data		
>		mpty Space21\Root	Pro Cookies		
>	Default	r [Empty Space21\F	Local Settings		
2	Public	r (Empty Space21)	My Documents		
Ý			NetHood		
	VirtualE	lox	V PrintHood		
	3D Obje		Recent		
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	Contact		Templates		
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	> 🗹 🔤 Desktop		Vindetermined (Unfragmented)		331,77
	V 🔽 🌄 Documi	ents 4YOU	NTUSER.DAT(53b39e88-18c4-11ea- O Undetermined (Unfragmented)		65,53
		Music [Empty Space	2111 X NTUSER.DAT(53b39e88-18c4-11ea- Below Average (Beginning overwritten by existing file)		524,28
		Pictures [Empty Sp.			524,28
		Videos [Empty Spa		No	2
	> 🗹 🛛 R-T				
orted by: Re					
	a •				
g			-		
Type	Date	Time	Text The enumeration for comply spaces i was completed in tos.		
System	2/20/2025	4:31:13 PM	All file regions are collected.		
System	2/20/2025	4:33:56 PM	File enumeration for Empty Space21 was completed in 1m.		
System	2/20/2025	4:34:02 PM	All file regions are collected.		

Imaging the HDD device [C]:

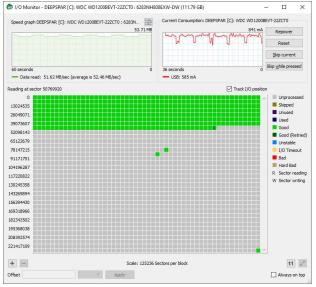
DeepSpar USB Stabilizer 10G

R-STUDIO Technician - Device vie prive <u>Create</u> Tools <u>View</u> Hel									×
efresh Show Files Show Files (Adv	anced) Scan Partit		Create In		-	ime Image RAIDs Connect To Remote	Remove	I/O Monit	itor
Device/Disk	Label	/Interfa		Size				_	_
Local Computer (3 hidden de	i					STOP		~	1
V TE DEEPSPAR [A]: PCIE SSD	000000000000000	. DeepSpa	ar.	238.47 GB	Time elapsed: 8m 34s, remainin		Options	I/O Monito	Dr.
Set EFI system partition			1 MB	100 MB	Creating image file of DEEPSPA	R [C]: WDC WD12008EVT-22ZCT0			
Microsoft reserved pa	t		101 MB	16 MB	Image file: D:\IMAGES\DEEPSP	AR [C] WDC WD12008EVT-22ZCT0.rdr			
Sasic data partition	Images	NTES	117 MB	238.36 GB		ES/DEEPSPAR [C] WDC WD 1200BEVT-22ZCT0).rsm		
✓ ★ DEEPSPAR [B]: KINGSTON		DeepSpa	ar	111.79 GB			2112011		
See EFI system partition		EAT32	1 MB	100 MB	Multi-pass phase:	Main phase			
Microsoft reserved pa	t		101 MB	16 MB	Rescued:	21.06 GB			
Empty Space21	System	NTES	117 MB	111.18 GB	Unprocessed left on device:	90.73 GB			
Windows Recovery Pa		NTES	111.29 GB	508 MB	Unprocessed for the operation:				
✓ ★ DEEPSPAR [C]: WDC WD1		. DeepSpa	ar, HDD	111.79 GB	Skipped slow areas: Skipped bad areas:	N/A N/A			
Se Partition1	NTFS-Good	NTES	1 MB	39.09 GB	Not vet trimmed:	N/A			
Partition2	NTES-Bad	NTES	39.09 GB	72.70 GB	Not yet trimmed: Not vet scrapped:	N/A N/A			
					Bad sectors:	N/A			
					Actual read speed:	52.88 MB/sec (average is 52.43 MB/sec)			
					Data processing speed:	41.89 MB/sec			
					Properties 👘 Create	image			-
g									Ì
Type Date	Time				Text	6			
System 2/20/2025			ns are colleg		as completed in ros.				
System 2/20/2025					vas completed in 1m.				
System 2/20/2025			ns are colleg						

I/O Monitor for USB Stabilizer

In addition to standard data, it also shows a drive current graph

DeepSpar USB Stabilizer 10G



You may skip a certain sector when necessary. Click the **Skip current** button to do so. The **Skip while pressed** button makes **R-Studio** skip sectors while this button is pressed.

Adiitonal options on the Advanced multi-pass imaging settings

Some additional options will appear on the Advanced multi-pass imaging settings window when creating a multi-pass image.



3.17.4 DeepSpar RapidSpar™

RapidSpar is a specialized data recovery device from <u>DeepSpar</u> intended to extract data from problematic drives. Failing (source) and target drives are connected to the device, and it autonomously copies data from the source to the target in a way that maximizes the amount of successfully extracted data and minimizes possible damage to the source drive. The copy parameters can be quickly changed during this process directly on the device. Then the recovery software can read data from the target drive.

When connected to a PC, the specialized software (including **R-Studio**) can read (and clone) only those drive areas that contain the necessary files and folders to decrease time required for data recovery.

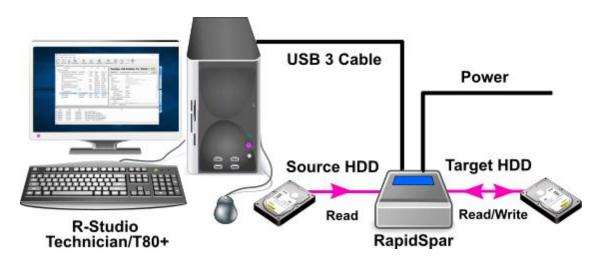
In addition, it's possible to perform some repair works with hard drives.

You may read more about RapidSpar on its web site.

- 🗆 ×

Ontion

O off



RapidSpar doesn't require any installed drivers.

Working with RapidSpar:

Type

1 Connect the source and target hard drives to RapidSpar and start the device. Refer to the **RapidSpar** manual for detailed instructions.

DeepSpar RapidSpar 🕞 R-Studio Technician - Device view Drive Create Tools View Help Refresh Show Files Scan Part RATES - Connect Remove Stop P. 4 8 1 6 ~ Device view Device/Disk Label FS Start Size DeepSpar RapidSpar Pro: DSR11 Local Computer ✓ WDC WDS500G280A-005M50 40... 200619800287 ✓ Windows Recovery Partition ▼ Recovery Clean device sector map Imaging strategy: Balanced • #0 SAT... 0 Bytes NTFS 1 MB 465.76 GB 499 MB 100 MB 500 MB 600 MB 616 MB Section EFI system partition . FAT32 Vame Value Microsoft reserved partition 👻 16 MB 465.16 GB Drive Type NTFS

Apply Physical Drive DEEPSPAR: TOSHIBA MK8054GSYF DSR11755, Power off C. V CEEPSPAR: TOSHIBA MK8054GS... 49EFT1LYT D: Name RapidSpar Pro Local Drive Control Maximum Transfer 8 MB I/O Block Size 4 KB Buffer Alignment 2 Bytes RapidSpar exFAT 64 KB 238.43 GB Device Identification Vendor Product TOSHIBA MK8054GSYF Serial Number 49EFT1LYT USBStabilizer Bus Type Droperties Date Time Text

> R-Studio will show the RapidSpar drive.

DeepSpar RapidSpar

and the second second second second	nician - Device view								>
rive <u>C</u> reate]	ools ⊻iew <u>H</u> elp								
efresh Show File	es Scan Partition Search	Create Image	Complete Runt) ime Image - C	Spen Image Cr	eate Region Sta	art runtime imag	ge RAIDs Connect Remove Stop	
Device view									
De	vice/Disk	Label	FS	Start	Size			Deside Despid	
📃 Local Com	outer						Deeps	par RapidSpar Pro: DSR11	😂 (On 🕥
	DS500G2B0A-00SM50 40	200619800287	#0 SAT	0 Bytes	465.76 GB		Clean device	sector map Imaging strategy: Balanced -	Apply
🥪 Win	dows Recovery Partition +	Recovery	NTFS	1 MB	499 MB	11	Clean device	sector map thaging strategy	Abbo
👄 EFI s	ystem partition 👻		FAT32	500 MB	100 MB	Name		Value	
	osoft USB Stabilizer's	drive		600 MB	16 MB	Drive Typ	e	Physical Drive	
🥪 C:	USB Stabilizers	anve	NTFS	616 MB	465.16 GB	Name		DEEPSPAR: TOSHIBA MK8054GSYF	
V DEEPSP	AR: TOSHIBA MK8054GS	49EFT1LYT	Local	0 Bytes	74.53 GB	RapidSpa	r Pro	DSR11755, Connected	
Se Part	ition1	System Reserved	NTES	1 MB	350 MB	Size		74.53 GB (156301488 Sectors)	,
Se Part	ition2		NTES	351 MB	73.75 GB	✓ Drive Co	ntrol		
Se Part	ition3		NTES	74.09 GB	450 MB	Maxir	mum Transfer	8 MB	-
🥪 D:		RapidSpar	exFAT	64 KB	238.43 GB	1/O B	lock Size	4 KB	-
						Buffe	r Alignment	2 Bytes	+
								Size 512 Bytes	-
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						Vend	or	TOSHIBA	
						Prode	uct	MK8054GSYF	
						Serial	Number	49EFT1LYT	
						. T		UCDCA-LUC	
	USB Stabilizer	in info				Propertie	es -		
9	03B Stabilizer	5 1110							
Туре	Date T	ime					Te	avt	
	2022-04-18 4:06:31		05270582 dwld	tx=12 Name:	=C: Parents=2,	Equals=12.5			
	2022-04-18 4:06:31				=Partition1 Pare				
System	2022-04-18 4:06:31				Partition2 Pare				
	2022-04-18 4:06:31				=Partition3 Pare				
Debug Mode	2022-04-18 4:06:31	PM CDevic	TreeAutoRet	resher::checl	RebuildTree():	frive tree should	be rebuilt.		

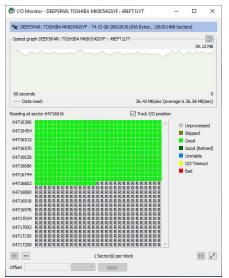
Read the **RapidSpar** documentation for the information about its parameters.

R-Studio can now process the **RapidSpar drive** as it's a common drive connected to a USB port. You may change these parameter during drive operations with **RapidSpar**.

DeepSpar RapidSpar

Drive Create Tools View Help											
Refresh Show Files Scan Partition Search	Create Im	age Con	nplete Runti) meImage (Open Image Cr	eate Region Start r	untime image RAIDs	- Connect	Remove I/O Monitor Opti		
Device view											
Device/Disk	Lab	el	FS	Start	Size	DEEPSPAR: 1	OSHIBA MK8054GSYF -	74.53 GB (800	026361856 Bytes , 156301488 Se	ctors) 333978 9	Sectors per
Local Computer						Solock					
WDC WDS500G2B0A-00SM50 40.	. 2006198002	87	#0 SAT	0 Bytes	465.76 GB						
Secovery Partition •	Recovery		NTFS	1 MB	499 MB						
Section •		A 1/0	Ontions (S	canning driv	DEEDSDAR- TO	SHIBA MK8054GSY	E)	×			
Microsoft reserved partition		00	options (a	coming and	VEDELE SPARE TO	51 IIDA WIX0034031	0	^			
۵C: •											
DEEPSPAR: TOSHIBA MK8054GS.	49EFT1LYT	DEE	PSPAR: TO:	SHIBA MK805	HAGSYF: 49EFT 1LY	T					
See Partition1	System Res			-					NTFS Directory Entries	11429	
Se Partition2		Dee	pSpar USB	Stabilizer: C	lean device sector	map Imaging str	ategy: Balanced 🔻		NTFS Restore Points	1	
Partition3								1	ReES BootRecord	0	
Se D:	RanidSpar								FAT Table Entries	3092	
	RapidSpar								FAT Table Entries FAT Boot Sectors	3092 5	
	RapidSpar						ОК	Cancel	FAT Table Entries FAT Boot Sectors Ext2/Ext3/Ext4 Directory Ent UFS/FFS CylinderGroup	3092 5	
	RapidSpar							Cancel	FAT Table Entries FAT Boot Sectors Ext2/Ext3/Ext4 Directory Ent UFS/FFS CylinderGroup HFS/HFS+ VolumeHeader	3092 5 ries 0	
	RapidSpar						ree+Extents 39	Cancel	FAT Table Entries FAT Boot Sectors Ext2[Ext3]Ext4 Directory Ent UFS/FFS CylinderGroup HFS/HFS+ VolumeHeader APFS SuperBlock	3092 5 ries 0 0 0 0	
	RapidSpar					APFS Volume	ree + Extents 39 Rock 0	Cancel	FAT Table Entries FAT Boot Sectors Ext2/Ext3/Ext4 Directory Ent UFS/FFS CylinderGroup HFS/HFS + VolumeHeader APFS SupeBlock APFS Node	3092 5 ries 0 0 0 0 0	
	RapidSpar					APFS Volume	ree+Extents 39 Rock 0 Loot 3	Cancel	FAT Table Entries FAT Boot Sectors Ext2,Ext3/Ext4 Directory Ent UFS/FFS CylinderGroup HFS/HFS + VolumeHeader APFS SuperBlock APFS Node ISO9660 VolumeDescriptor	3092 5 ries 0 0 0 0 0 0 0	
	RapidSpar					APFS Volume	ree+Extents 39 Rock 0 Loot 3	Cancel	FAT Table Entries FAT Boot Sectors Ext2/Ext3/Ext4 Directory Ent UFS/FFS CylinderGroup HFS/HFS + VolumeHeader APFS SupeBlock APFS Node	3092 5 ries 0 0 0 0 0	
	RapidSpar					APFS Volume	ree+Extents 39 Rock 0 Loot 3		FAT Table Entries FAT Boot Sectors Ext2,Ext3/Ext4 Directory Ent UFS/FFS CylinderGroup HFS/HFS + VolumeHeader APFS SuperBlock APFS Node ISO9660 VolumeDescriptor	3092 5 ries 0 0 0 0 0 0 0	
 D: 	RapidSpar					APFS Volume APFS Bitmapf ISO9660 Dire	ree + Extents 39 Block 0 Loot 3 ctory Entries 0		FAT Table Entries FAT Boot Sectors Ext2,Ext3/Ext4 Directory Ent UFS/FFS CylinderGroup HFS/HFS + VolumeHeader APFS SuperBlock APFS Node ISO9660 VolumeDescriptor	3092 5 ries 0 0 0 0 0 0 0	
© D: Type Date	lime					APFS Volume APFS Bitmapf ISO9660 Dire	ree + Extents 39 Block 0 Loot 3 ctory Entries 0		FAT Table Entries FAT Boot Sectors Ext2,Ext3/Ext4 Directory Ent UFS/FFS CylinderGroup HFS/HFS + VolumeHeader APFS SuperBlock APFS Node ISO9660 VolumeDescriptor	3092 5 ries 0 0 0 0 0 0 0	
** D: Type Date 4175- Debug Mode 2022-04-18 4175-	fime PM S			1880, 838860		APFS Volume APFS Bitmapf ISO9660 Dire	ree + Extents 39 Nock 0 Loot 3 ctory Entries 0		FAT Table Entries FAT Boot Sectors Ext2,Ext3/Ext4 Directory Ent UFS/FFS CylinderGroup HFS/HFS + VolumeHeader APFS SuperBlock APFS Node ISO9660 VolumeDescriptor	3092 5 ries 0 0 0 0 0 0 0	
Type Date Topbug Mode 2022-04-18 4175-5 Debug Mode 2022-04-18 4175-5	fime PM S PM S	tep 22, 10	(2215432	920, 838860	18), state:1	APFS Volume APFS Bitmapf ISO9660 Dire	ree + Extents 39 Nock 0 Loot 3 ctory Entries 0		FAT Table Entries FAT Boot Sectors Ext2,Ext3/Ext4 Directory Ent UFS/FFS CylinderGroup HFS/HFS + VolumeHeader APFS SuperBlock APFS Node ISO9660 VolumeDescriptor	3092 5 ries 0 0 0 0 0 0 0	
Type Date Type Date Debug Mode 2022-04-18 Debug Mode 2022-04-18 Debug Mode 2022-04-18 H175-5 Debug Mode	fime PM S PM S PM S	tep 22, IC tep 23, IC	(2215432 (22187876	1920, 838860 5352, 838860	18), state:1 18), state:1	APFS Volume APFS Bitmapf ISO9660 Dire	ree + Extents 39 Nock 0 Loot 3 ctory Entries 0		FAT Table Entries FAT Boot Sectors Ext2,Ext3/Ext4 Directory Ent UFS/FFS CylinderGroup HFS/HFS + VolumeHeader APFS SuperBlock APFS Node ISO9660 VolumeDescriptor	3092 5 ries 0 0 0 0 0 0 0	
Type Date Debug Mode 2022-04-18 4175-5 Debug Mode 2022-04-18 4175-5	fime PM S PM S PM S	tep 22, IC tep 23, IC	(2215432 (22187876	920, 838860	18), state:1 18), state:1	APFS Volume APFS Bitmapf ISO9660 Dire	ree + Extents 39 Nock 0 Loot 3 ctory Entries 0		FAT Table Entries FAT Boot Sectors Ext2,Ext3/Ext4 Directory Ent UFS/FFS CylinderGroup HFS/HFS + VolumeHeader APFS SuperBlock APFS Node ISO9660 VolumeDescriptor	3092 5 ries 0 0 0 0 0 0 0	

You may also watch drive read operations in real time at the I/O monitor. .DeepSpar RapidSpar



3.17.5 PC-3000 UDMA hardware

PC-3000 UDMA form <u>ACELab®</u> is a hardware-software solution for hard drive repair and data recovery. Its hardware part is a PCI-Express card that can work with both IDE and SATA hard drives providing access to hard drives with severe physical failures. Its software part is **Data Extractor UDMA** that performs actual data recovery. The **PC-3000 UDMA** card can be used alone for raw data extraction and drive repair.

R-Studio can work directly with the **PC-3000 UDMA** card as an alternative to data recovery software. Our article **Joint work of R-Studio and PC-3000 UDMA hardware** explains this in more detail.

3.18 Forensic Mode

Note: This feature is available for R-Studio Technician/T80+ only!

When this mode is enabled, **R-Studio** will generate a <u>forensic</u> data collection audit log that can be presented at court hearings. This log includes information about a hardware configuration on which the forensic data collection takes place and MD5 for recovered files.

Note: A new log will be generated each time the hardware configuration is changed (a drive is connected/? disconnected, an external USB device is connected/@isconnected, etc)

To enable this feature,

* Select Enable Forensic Mode on the Main tab of the <u>Settings</u> dialog box.

Main	System options			
File Systems	Auto-refresh drive tree	Debug mode Zenable forensic	mode	
Symbolic Links	Edit options			
Log	Enable write			
Known File Types	Max changes buffer size: 64		MB	•
Bad Sectors Hidden Devices Memory Usage	User paths File types RAID layout presets Text/hexadecimal editor templates Mask presets	i)(R-Studio Technican/Presetts/LiserKnownFileType n Files (dx8))R-Studio Technican/Presetts/RAIDRR. C: (Program Files (x86))R-Studio Technican/Presetts (x86)R-Studio Technican/Presetts/madipreset	S.xml ates\	···· ····
		Reset all hidde	n notifi	cation

The Forensic Log tab will appear on the Recover dialog box.

Forensic Log tab

upur 10	der: D:\Reco	vered_	Files \			
4ain	Advanced	Addit	ional Output Folders	Forensic Log Settings	Post Actions	
lase na	me:		Stiven v. Christofer			
ase nu	mber:		28-S-0205-CR-85763	L		_
Operato	r/Investigator	name:	J.F. Lewson			
ile nam	e:		C:\Users\Tester 1\Do	ocuments\R-TT\R-Studio\Fo	rensic_Log.log	

Enter the required information on this tab and then go to the other tabs of the <u>Recovery</u> dialog box.

While file recovery, **R-Studio** will create forensic data collection audit log in the specified folder. Below is an example of such log.

R-Studio Technician

- Drive Number 4 ------* Drive Type [256 bytes]: Physical Drive,Disk

```
* Name [62 bytes]: KINGSTON SA400S37120G 03090005
* OS Object [38 bytes]: \\.\PhysicalDrive0
* R-Studio Driver [44 bytes]: WinNT\Handle\Physical
* Size [8 bytes]: 111.7GB (234441648 sec)
* Sector Size [4 bytes]: 512B
* Partition Size [8 bytes]: 111.7GB (234441648 sec)
* GPT Disk GUID [74 bytes]: 69e6114c-6751-5e84-ed6d-8ece5d5616b4
# I/O Retries [4 bytes]: Default
+ Drive Control [8 bytes]:
 # Maximum Transfer [4 bytes]: 131072
  # I/O Block Size [4 bytes]: 4096
  # Buffer Alignment [4 bytes]: 4
+ Physical Drive Geometry [8 bytes]:
  * Cylinders [8 bytes]: 14593
  * Tracks Per Cylinder [4 bytes]: 255
  * Sectors Per Track [4 bytes]: 63
  * Sector Size [4 bytes]: 512B
# Partition Layout Sector Size [4 bytes]: 512B
+ Device Identification [8 bytes]:
  * Vendor [32 bytes]: KINGSTON
  * Product [64 bytes]: SA400S37120G
  * Firmware [16 bytes]: 03090005
  * Serial Number [32 bytes]: 50026B77843A5618
+ IDE Properties [8 bytes]:
 * Size [48 bytes]: 111.7GB (234441648 LBA)
  * Sector Size [8 bytes]: 512
  * Device Type [8 bytes]: SSD
  * Interface [38 bytes]: SATA 3.2, 6.0 Gb/s
  * Interface Speed [18 bytes]: 6.0 Gb/s
  * Standard [12 bytes]: ACS-3
  * Features [70 bytes]: S.M.A.R.T., APM-, LBA48, NCQ, TRIM
+ SCSI Address [8 bytes]:
  * Port Number [1 bytes]: 2
  * Path Id [1 bytes]: 0
  * Target Id [1 bytes]: 0
  * Lun [1 bytes]: 0
* Bus Type [4 bytes]: SerialATA-II
- Drive Number 5 -----
* Drive Type [256 bytes]: Physical Drive, Disk
* Name [56 bytes]: TOSHIBA DT01ACA100 MS20A750
* OS Object [38 bytes]: \\.\PhysicalDrive1
* R-Studio Driver [44 bytes]: WinNT\Handle\Physical
* Size [8 bytes]: 931.5GB (1953525168 sec)
* Sector Size [4 bytes]: 512B
* Partition Size [8 bytes]: 931.5GB (1953525168 sec)
# I/O Retries [4 bytes]: Default
+ Drive Control [8 bytes]:
  # Maximum Transfer [4 bytes]: 131072
  # I/O Block Size [4 bytes]: 4096
 # Buffer Alignment [4 bytes]: 4
+ Physical Drive Geometry [8 bytes]:
```

^{*} Cylinders [8 bytes]: 121601

```
* Tracks Per Cylinder [4 bytes]: 255
  * Sectors Per Track [4 bytes]: 63
  * Sector Size [4 bytes]: 512B
# Partition Layout Sector Size [4 bytes]: 512B
+ Device Identification [8 bytes]:
  * Vendor [32 bytes]: TOSHIBA
  * Product [64 bytes]: DT01ACA100
  * Firmware [16 bytes]: MS2OA750
  * Serial Number [32 bytes]: 44H5ATLKS
+ IDE Properties [8 bytes]:
  * Size [50 bytes]: 931.5GB (1953525168 LBA)
  * Logical Sector Size [8 bytes]: 512
  * Physical Sector Size [10 bytes]: 4096
  * Device Type [36 bytes]: HDD 3.5" 7200 RPM
  * Interface [38 bytes]: SATA 3.0, 6.0 Gb/s
  * Interface Speed [18 bytes]: 6.0 Gb/s
  * Standard [18 bytes]: ATA8-ACS
  * Features [58 bytes]: S.M.A.R.T., APM-, LBA48, NCQ
+ SCSI Address [8 bytes]:
  * Port Number [1 bytes]: 2
  * Path Id [1 bytes]: 1
  * Target Id [1 bytes]: 0
  * Lun [1 bytes]: 0
* Bus Type [4 bytes]: SerialATA-II
- Drive Number 6 -----
* Drive Type [256 bytes]: Physical Drive, Disk
* Name [62 bytes]: WDC WD1200BEVT-22ZCT0 11.01A11
* OS Object [38 bytes]: \\.\PhysicalDrive2
* R-Studio Driver [44 bytes]: WinNT\Handle\Physical
* Size [8 bytes]: 111.7GB (234441648 sec)
* Sector Size [4 bytes]: 512B
* Partition Size [8 bytes]: 111.7GB (234441648 sec)
# I/O Retries [4 bytes]: Default
+ Drive Control [8 bytes]:
 # Maximum Transfer [4 bytes]: 131072
 # I/O Block Size [4 bytes]: 512
 # Buffer Alignment [4 bytes]: 4
+ Physical Drive Geometry [8 bytes]:
 * Cylinders [8 bytes]: 14593
  * Tracks Per Cylinder [4 bytes]: 255
  * Sectors Per Track [4 bytes]: 63
  * Sector Size [4 bytes]: 512B
# Partition Layout Sector Size [4 bytes]: 512B
+ Device Identification [8 bytes]:
 * Vendor [32 bytes]: WDC
  * Product [64 bytes]: WD1200BEVT-22ZCT0
  * Firmware [16 bytes]: 11.01A11
  * Serial Number [32 bytes]: WD-WXE808HN3826
+ IDE Properties [8 bytes]:
  * Size [48 bytes]: 111.7GB (234441648 LBA)
  * Sector Size [8 bytes]: 512
  * Interface [38 bytes]: SATA 2.5, 3.0 Gb/s
```

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_____263
```

```
* Standard [18 bytes]: ATA8-ACS
 * Features [66 bytes]: S.M.A.R.T., APM, AAM, LBA48, NCQ
+ SCSI Address [8 bytes]:
 * Port Number [1 bytes]: 2
  * Path Id [1 bytes]: 4
 * Target Id [1 bytes]: 0
 * Lun [1 bytes]: 0
* Bus Type [4 bytes]: SerialATA-II
- Drive Number 7 -----
* Drive Type [256 bytes]: Volume, Disk
* Name [6 bytes]: C:
* Mount Points [8 bytes]: C:\
* OS Object [98 bytes]: \\?\Volume{daf04b8f-aece-4176-9e12-25271c9682d5}
* R-Studio Driver [42 bytes]: WinNT\Handle\Logical
* Size [8 bytes]: 111.1GB (233156718 sec)
* Sector Size [4 bytes]: 512B
* Partition Offset [8 bytes]: 117MB (239616 sec)
* Partition Size [8 bytes]: 111.1GB (233156718 sec)
* Partition Number [4 bytes]: 3
* GPT Partition GUID [74 bytes]: daf04b8f-aece-4176-9e12-25271c9682d5
* GPT Type GUID [256 bytes]: Data Partition, ebd0a0a2-b9e5-4433-87c0-68b6b72699c7
+ NTFS Information [8 bytes]:
 * Cluster Size [4 bytes]: 4KB (8 sec)
 * MFT Record Size [4 bytes]: 1KB
 * MFT Position [8 bytes]: 3GB (6291456 sec)
 * MFT Mirror Position [8 bytes]: 8KB (16 sec)
 * Index Block Size [4 bytes]: 4KB
 * Sector Size [4 bytes]: 512B
 * Volume Size [8 bytes]: 111.1GB (233156717 sec)
# I/O Retries [4 bytes]: Default
+ Drive Control [8 bytes]:
 # Maximum Transfer [4 bytes]: 131072
 # I/O Block Size [4 bytes]: 512
 # Buffer Alignment [4 bytes]: 4
+ Physical Drive Geometry [8 bytes]:
 * Cylinders [8 bytes]: 14593
 * Tracks Per Cylinder [4 bytes]: 255
 * Sectors Per Track [4 bytes]: 63
 * Sector Size [4 bytes]: 512B
+ SCSI Address [8 bytes]:
  * Port Number [1 bytes]: 2
  * Path Id [1 bytes]: 0
 * Target Id [1 bytes]: 0
 * Lun [1 bytes]: 0
* Bus Type [4 bytes]: SerialATA
- Drive Number 8 -----
* Drive Type [256 bytes]: Volume, Disk
* Name [90 bytes]: Volume{06a81b86-6c2b-4a3c-9170-fff1161fb034}
* OS Object [98 bytes]: \/?\Volume{06a81b86-6c2b-4a3c-9170-fff1161fb034}
* R-Studio Driver [42 bytes]: WinNT\Handle\Logical
* Size [8 bytes]: 508MB (1040384 sec)
```

```
* Sector Size [4 bytes]: 512B
* Partition Offset [8 bytes]: 111.2GB (233398272 sec)
* Partition Size [8 bytes]: 508MB (1040384 sec)
* Partition Number [4 bytes]: 4
* GPT Partition GUID [74 bytes]: 06a81b86-6c2b-4a3c-9170-fff1161fb034
* GPT Type GUID [256 bytes]: Windows Recovery Partition, de94bba4-06d1-4d40-a16a-
bfd50179d6ac
* GPT Partition Attributes [256 bytes]: System, No automount (0x80000000000000)
+ NTFS Information [8 bytes]:
  * Cluster Size [4 bytes]: 4KB (8 sec)
  * MFT Record Size [4 bytes]: 1KB
  * MFT Position [8 bytes]: 169.3MB (346792 sec)
  * MFT Mirror Position [8 bytes]: 8KB (16 sec)
  * Index Block Size [4 bytes]: 4KB
  * Sector Size [4 bytes]: 512B
  * Volume Size [8 bytes]: 507.9MB (1040383 sec)
# I/O Retries [4 bytes]: Default
+ Drive Control [8 bytes]:
  # Maximum Transfer [4 bytes]: 131072
  # I/O Block Size [4 bytes]: 512
  # Buffer Alignment [4 bytes]: 4
+ Physical Drive Geometry [8 bytes]:
  * Cylinders [8 bytes]: 14593
  * Tracks Per Cylinder [4 bytes]: 255
  * Sectors Per Track [4 bytes]: 63
  * Sector Size [4 bytes]: 512B
+ SCSI Address [8 bytes]:
  * Port Number [1 bytes]: 2
  * Path Id [1 bytes]: 0
  * Target Id [1 bytes]: 0
  * Lun [1 bytes]: 0
* Bus Type [4 bytes]: SerialATA
- Drive Number 9 -----
* Drive Type [256 bytes]: Volume, Disk
* Name [6 bytes]: D:
* Mount Points [8 bytes]: D:\
* OS Object [98 bytes]: \\?\Volume{78addf5b-0000-0000-10000000000}}
* R-Studio Driver [42 bytes]: WinNT\Handle\Logical
* Size [8 bytes]: 931.5GB (1953519616 sec)
* Sector Size [4 bytes]: 512B
* Partition Offset [8 bytes]: 1MB (2048 sec)
* Partition Size [8 bytes]: 931.5GB (1953519616 sec)
* Partition Number [4 bytes]: 1
* Partition Type [256 bytes]: NTFS/HPFS/exFAT (0x7)
+ NTFS Information [8 bytes]:
  * Cluster Size [4 bytes]: 4KB (8 sec)
  * MFT Record Size [4 bytes]: 1KB
  * MFT Position [8 bytes]: 3GB (6291456 sec)
  * MFT Mirror Position [8 bytes]: 8KB (16 sec)
  * Index Block Size [4 bytes]: 4KB
  * Sector Size [4 bytes]: 512B
```

```
# I/O Retries [4 bytes]: Default
+ Drive Control [8 bytes]:
  # Maximum Transfer [4 bytes]: 131072
  # I/O Block Size [4 bytes]: 512
  # Buffer Alignment [4 bytes]: 4
+ Physical Drive Geometry [8 bytes]:
  * Cylinders [8 bytes]: 121601
  * Tracks Per Cylinder [4 bytes]: 255
  * Sectors Per Track [4 bytes]: 63
  * Sector Size [4 bytes]: 512B
+ SCSI Address [8 bytes]:
  * Port Number [1 bytes]: 2
  * Path Id [1 bytes]: 1
  * Target Id [1 bytes]: 0
  * Lun [1 bytes]: 0
* Bus Type [4 bytes]: SerialATA
- Drive Number 10 -----
* Drive Type [256 bytes]: Volume, Disk
* Name [90 bytes]: Volume{f6b7cc94-0000-0000-0000-10000000000}
* OS Object [98 bytes]: \/?\Volume{f6b7cc94-0000-0000-0000-10000000000}}
* R-Studio Driver [42 bytes]: WinNT\Handle\Logical
* Size [8 bytes]: 39GB (81972923 sec)
* Sector Size [4 bytes]: 512B
* Partition Offset [8 bytes]: 1MB (2048 sec)
* Partition Size [8 bytes]: 39GB (81972923 sec)
* Partition Number [4 bytes]: 1
* Partition Type [256 bytes]: NTFS/HPFS/exFAT (0x7)
+ NTFS Information [8 bytes]:
  * Cluster Size [4 bytes]: 4KB (8 sec)
  * MFT Record Size [4 bytes]: 1KB
 * MFT Position [8 bytes]: 3GB (6291456 sec)
  * MFT Mirror Position [8 bytes]: 8KB (16 sec)
  * Index Block Size [4 bytes]: 4KB
  * Sector Size [4 bytes]: 512B
  * Volume Size [8 bytes]: 39GB (81972920 sec)
# I/O Retries [4 bytes]: Default
+ Drive Control [8 bytes]:
  # Maximum Transfer [4 bytes]: 131072
 # I/O Block Size [4 bytes]: 512
  # Buffer Alignment [4 bytes]: 4
+ Physical Drive Geometry [8 bytes]:
  * Cylinders [8 bytes]: 14593
  * Tracks Per Cylinder [4 bytes]: 255
  * Sectors Per Track [4 bytes]: 63
  * Sector Size [4 bytes]: 512B
+ SCSI Address [8 bytes]:
  * Port Number [1 bytes]: 2
  * Path Id [1 bytes]: 4
  * Target Id [1 bytes]: 0
  * Lun [1 bytes]: 0
* Bus Type [4 bytes]: SerialATA
```

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```
- Drive Number 11 -----
* Drive Type [256 bytes]: Volume, Disk
* Name [90 bytes]: Volume{f6b7cc94-0000-0000-0000-b0c509000000}
* OS Object [98 bytes]: \/?\Volume{f6b7cc94-0000-0000-0000-b0c509000000}
* R-Studio Driver [42 bytes]: WinNT\Handle\Logical
* Size [8 bytes]: 72.6GB (152461312 sec)
* Sector Size [4 bytes]: 512B
* Partition Offset [8 bytes]: 39GB (81975296 sec)
* Partition Size [8 bytes]: 72.6GB (152461312 sec)
* Partition Number [4 bytes]: 2
* Partition Type [256 bytes]: NTFS/HPFS/exFAT (0x7)
+ NTFS Information [8 bytes]:
  * Cluster Size [4 bytes]: 4KB (8 sec)
  * MFT Record Size [4 bytes]: 1KB
  * MFT Position [8 bytes]: 3GB (6291456 sec)
  * MFT Mirror Position [8 bytes]: 8KB (16 sec)
 * Index Block Size [4 bytes]: 4KB
  * Sector Size [4 bytes]: 512B
  * Volume Size [8 bytes]: 72.6GB (152461311 sec)
# I/O Retries [4 bytes]: Default
+ Drive Control [8 bytes]:
 # Maximum Transfer [4 bytes]: 131072
 # I/O Block Size [4 bytes]: 512
 # Buffer Alignment [4 bytes]: 4
+ Physical Drive Geometry [8 bytes]:
  * Cylinders [8 bytes]: 14593
  * Tracks Per Cylinder [4 bytes]: 255
  * Sectors Per Track [4 bytes]: 63
 * Sector Size [4 bytes]: 512B
+ SCSI Address [8 bytes]:
 * Port Number [1 bytes]: 2
 * Path Id [1 bytes]: 4
  * Target Id [1 bytes]: 0
  * Lun [1 bytes]: 0
* Bus Type [4 bytes]: SerialATA
- Drive Number 12 -----
* Drive Type [256 bytes]: Volume, Disk
* Name [90 bytes]: Volume{e7571fdc-fbbd-42cf-86fe-03807522d76d}
* OS Object [98 bytes]: \\?\Volume{e7571fdc-fbbd-42cf-86fe-03807522d76d}
* R-Studio Driver [42 bytes]: WinNT\Handle\Logical
* Size [8 bytes]: 100MB (204800 sec)
* Sector Size [4 bytes]: 512B
* Partition Offset [8 bytes]: 1MB (2048 sec)
* Partition Size [8 bytes]: 100MB (204800 sec)
* Partition Number [4 bytes]: 1
* GPT Partition GUID [74 bytes]: e7571fdc-fbbd-42cf-86fe-03807522d76d
* GPT Type GUID [256 bytes]: UEFI System Partition, c12a7328-f81f-11d2-ba4b-
00a0c93ec93b
* GPT Partition Attributes [256 bytes]: No automount (0x800000000000000)
+ FAT Information [8 bytes]:
  * FAT Bits (12,16,32) [4 bytes]: 32
  * Cluster Size [4 bytes]: 1KB (2 sec)
```

```
* First Cluster Offset [8 bytes]: 3.99MB (8188 sec)
  * Root Directory Cluster [4 bytes]: 2
  * First FAT Offset [8 bytes]: 3.24MB (6654 sec)
  * Size of One FAT Table [8 bytes]: 384.5KB (769 sec)
  * Number of FAT Copies [4 bytes]: 2
  # Active FAT copy [4 bytes]: Auto
  * Sector Size [4 bytes]: 512B
  * Major Version [1 bytes]: 0
  * Minor Version [1 bytes]: 0
  * Volume Size [8 bytes]: 100MB (204800 sec)
# I/O Retries [4 bytes]: Default
+ Drive Control [8 bytes]:
  # Maximum Transfer [4 bytes]: 131072
  # I/O Block Size [4 bytes]: 512
  # Buffer Alignment [4 bytes]: 4
+ Physical Drive Geometry [8 bytes]:
  * Cylinders [8 bytes]: 14593
  * Tracks Per Cylinder [4 bytes]: 255
  * Sectors Per Track [4 bytes]: 63
  * Sector Size [4 bytes]: 512B
+ SCSI Address [8 bytes]:
  * Port Number [1 bytes]: 2
  * Path Id [1 bytes]: 0
  * Target Id [1 bytes]: 0
  * Lun [1 bytes]: 0
* Bus Type [4 bytes]: SerialATA
- Drive Number 13 -----
* Drive Type [256 bytes]: Volume
* Name [58 bytes]: Microsoft reserved partition
* OS Object [48 bytes]: \Device\HarddiskVolume2
* R-Studio Driver [42 bytes]: WinNT\Native\Logical
* Size [8 bytes]: 16MB (32768 sec)
* Sector Size [4 bytes]: 512B
* Partition Offset [8 bytes]: 101MB (206848 sec)
* Partition Size [8 bytes]: 16MB (32768 sec)
* Partition Number [4 bytes]: 2
* GPT Partition GUID [74 bytes]: ad153538-3269-4fe5-a229-0aa8afc25a2d
* GPT Type GUID [256 bytes]: System Reserved Partition, e3c9e316-0b5c-4db8-817d-
f92df00215ae
* GPT Partition Attributes [256 bytes]: No automount (0x800000000000000)
# I/O Retries [4 bytes]: Default
+ Drive Control [8 bytes]:
  # Maximum Transfer [4 bytes]: 131072
  # I/O Block Size [4 bytes]: 512
  # Buffer Alignment [4 bytes]: 4
+ Physical Drive Geometry [8 bytes]:
  * Cylinders [8 bytes]: 14593
  * Tracks Per Cylinder [4 bytes]: 255
  * Sectors Per Track [4 bytes]: 63
  * Sector Size [4 bytes]: 512B
+ SCSI Address [8 bytes]:
  * Port Number [1 bytes]: 2
```

```
* Path Id [1 bytes]: 0
  * Target Id [1 bytes]: 0
  * Lun [1 bytes]: 0
* Bus Type [4 bytes]: SerialATA
- Drive Number 14 -----
* Drive Type [256 bytes]: Partition
* Name [42 bytes]: EFI system partition
* Size [8 bytes]: 100MB (204800 sec)
* Partition Offset [8 bytes]: 1MB (2048 sec)
* Partition Size [8 bytes]: 100MB (204800 sec)
* Partition Number [4 bytes]: 1
* GPT Partition GUID [74 bytes]: e7571fdc-fbbd-42cf-86fe-03807522d76d
* GPT Type GUID [256 bytes]: UEFI System Partition, c12a7328-f81f-11d2-ba4b-
00a0c93ec93b
* GPT Partition Attributes [256 bytes]: No automount (0x800000000000000)
* GPT Partition Name [42 bytes]: EFI system partition
+ FAT Information [8 bytes]:
  * FAT Bits (12,16,32) [4 bytes]: 32
  * Cluster Size [4 bytes]: 1KB (2 sec)
  * First Cluster Offset [8 bytes]: 3.99MB (8188 sec)
  * Root Directory Cluster [4 bytes]: 2
  * First FAT Offset [8 bytes]: 3.24MB (6654 sec)
  * Size of One FAT Table [8 bytes]: 384.5KB (769 sec)
  * Number of FAT Copies [4 bytes]: 2
 # Active FAT copy [4 bytes]: Auto
 * Sector Size [4 bytes]: 512B
 * Major Version [1 bytes]: 0
  * Minor Version [1 bytes]: 0
  * Volume Size [8 bytes]: 100MB (204800 sec)
- Drive Number 15 -----
* Drive Type [256 bytes]: Partition
* Name [58 bytes]: Microsoft reserved partition
* Size [8 bytes]: 16MB (32768 sec)
* Partition Offset [8 bytes]: 101MB (206848 sec)
* Partition Size [8 bytes]: 16MB (32768 sec)
* Partition Number [4 bytes]: 2
* GPT Partition GUID [74 bytes]: ad153538-3269-4fe5-a229-0aa8afc25a2d
* GPT Type GUID [256 bytes]: System Reserved Partition, e3c9e316-0b5c-4db8-817d-
f92df00215ae
* GPT Partition Attributes [256 bytes]: No automount (0x800000000000000)
* GPT Partition Name [58 bytes]: Microsoft reserved partition
- Drive Number 16 -----
* Drive Type [256 bytes]: Partition
* Name [42 bytes]: Basic data partition
* Mount Points [8 bytes]: C:\
* Size [8 bytes]: 111.1GB (233156718 sec)
* Partition Offset [8 bytes]: 117MB (239616 sec)
* Partition Size [8 bytes]: 111.1GB (233156718 sec)
* Partition Number [4 bytes]: 3
* GPT Partition GUID [74 bytes]: daf04b8f-aece-4176-9e12-25271c9682d5
```

```
* GPT Type GUID [256 bytes]: Data Partition, ebd0a0a2-b9e5-4433-87c0-68b6b72699c7
* GPT Partition Name [42 bytes]: Basic data partition
+ NTFS Information [8 bytes]:
  * Cluster Size [4 bytes]: 4KB (8 sec)
  * MFT Record Size [4 bytes]: 1KB
  * MFT Position [8 bytes]: 3GB (6291456 sec)
  * MFT Mirror Position [8 bytes]: 8KB (16 sec)
  * Index Block Size [4 bytes]: 4KB
  * Sector Size [4 bytes]: 512B
  * Volume Size [8 bytes]: 111.1GB (233156717 sec)
- Drive Number 17 -----
* Drive Type [256 bytes]: Partition
* Name [54 bytes]: Windows Recovery Partition
* Size [8 bytes]: 508MB (1040384 sec)
* Partition Offset [8 bytes]: 111.2GB (233398272 sec)
* Partition Size [8 bytes]: 508MB (1040384 sec)
* Partition Number [4 bytes]: 4
* GPT Partition GUID [74 bytes]: 06a81b86-6c2b-4a3c-9170-fff1161fb034
* GPT Type GUID [256 bytes]: Windows Recovery Partition, de94bba4-06d1-4d40-a16a-
bfd50179d6ac
* GPT Partition Attributes [256 bytes]: System, No automount (0x80000000000000)
+ NTFS Information [8 bytes]:
  * Cluster Size [4 bytes]: 4KB (8 sec)
  * MFT Record Size [4 bytes]: 1KB
  * MFT Position [8 bytes]: 169.3MB (346792 sec)
  * MFT Mirror Position [8 bytes]: 8KB (16 sec)
  * Index Block Size [4 bytes]: 4KB
  * Sector Size [4 bytes]: 512B
  * Volume Size [8 bytes]: 507.9MB (1040383 sec)
- Drive Number 18 -----
* Drive Type [256 bytes]: Empty Space
* Name [28 bytes]: Empty Space18
* Size [8 bytes]: 1.44MB (2959 sec)
* Partition Offset [8 bytes]: 111.7GB (234438656 sec)
* Partition Size [8 bytes]: 1.44MB (2959 sec)
- Drive Number 19 -----
* Drive Type [256 bytes]: Partition, Primary
* Name [22 bytes]: Partition1
* Mount Points [8 bytes]: D:\
* Size [8 bytes]: 931.5GB (1953519616 sec)
* Partition Offset [8 bytes]: 1MB (2048 sec)
* Partition Size [8 bytes]: 931.5GB (1953519616 sec)
* Partition Number [4 bytes]: 1
* Partition Type [256 bytes]: NTFS/HPFS/exFAT (0x7)
+ NTFS Information [8 bytes]:
  * Cluster Size [4 bytes]: 4KB (8 sec)
  * MFT Record Size [4 bytes]: 1KB
  * MFT Position [8 bytes]: 3GB (6291456 sec)
  * MFT Mirror Position [8 bytes]: 8KB (16 sec)
```

```
* Index Block Size [4 bytes]: 4KB
```

```
* Sector Size [4 bytes]: 512B
 * Volume Size [8 bytes]: 931.5GB (1953519615 sec)
- Drive Number 20 -----
* Drive Type [256 bytes]: Partition, Primary
* Name [22 bytes]: Partition1
* Size [8 bytes]: 39GB (81972923 sec)
* Partition Offset [8 bytes]: 1MB (2048 sec)
* Partition Size [8 bytes]: 39GB (81972923 sec)
* Partition Number [4 bytes]: 1
* Partition Type [256 bytes]: NTFS/HPFS/exFAT (0x7)
+ NTFS Information [8 bytes]:
 * Cluster Size [4 bytes]: 4KB (8 sec)
 * MFT Record Size [4 bytes]: 1KB
 * MFT Position [8 bytes]: 3GB (6291456 sec)
 * MFT Mirror Position [8 bytes]: 8KB (16 sec)
 * Index Block Size [4 bytes]: 4KB
 * Sector Size [4 bytes]: 512B
 * Volume Size [8 bytes]: 39GB (81972920 sec)
- Drive Number 21 -----
* Drive Type [256 bytes]: Partition, Primary
* Name [22 bytes]: Partition2
* Size [8 bytes]: 72.6GB (152461312 sec)
* Partition Offset [8 bytes]: 39GB (81975296 sec)
* Partition Size [8 bytes]: 72.6GB (152461312 sec)
* Partition Number [4 bytes]: 2
* Partition Type [256 bytes]: NTFS/HPFS/exFAT (0x7)
+ NTFS Information [8 bytes]:
 * Cluster Size [4 bytes]: 4KB (8 sec)
 * MFT Record Size [4 bytes]: 1KB
 * MFT Position [8 bytes]: 3GB (6291456 sec)
 * MFT Mirror Position [8 bytes]: 8KB (16 sec)
 * Index Block Size [4 bytes]: 4KB
 * Sector Size [4 bytes]: 512B
 * Volume Size [8 bytes]: 72.6GB (152461311 sec)
* * * * * * * * * * * * * * * *
----- Session 1
_____
START Date / Time of Collection: 2022-07-05 03:56:48
Case Name: Stiven v. Christofer
Case Number: 28-S-0205-CR85763
Operator / Investigator Name: J.F. Lewson
Source drive:Sector Modification Date
                                           MD5
     SHA-1
                                           SHA-256
                           File Name
20
                     2021-11-15 11:18:41
                                          Partition1/Root
   $I30: INDEX_ALLOC (Non-Resident)
```

288-295 20 2022-04-14 10:07:42 Partition1/Root/SRECYCLE.BIN 20 2022-04-14 10:07:42 Partition1/Root/\$RECYCLE.BIN/S-1-5-21-1491398347-2858144638-2526585153-1002 2022-04-14 10:07:42 a526b9e7c716b3489d8cc062fbce4005 20 2df502a944ff721241be20a9e449d2acd07e0312 e1b9ce9b57957b1a0607a72a057d6b7a9b34ea60f3f8aa8f38a3af979bd23066 Partition1/Root/\$RECYCLE.BIN/S-1-5-21-1491398347-2858144638-2526585153-1002/desktop.ini 20 2021-11-15 11:18:41 Partition1/Root/\$RECYCLE.BIN/S-1-5-21-3229151806-1869599629-3662833694-1001 2021-11-15 11:18:41 20 a526b9e7c716b3489d8cc062fbce4005 2df502a944ff721241be20a9e449d2acd07e0312 e1b9ce9b57957b1a0607a72a057d6b7a9b34ea60f3f8aa8f38a3af979bd23066 Partition1/Root/\$RECYCLE.BIN/S-1-5-21-3229151806-1869599629-3662833694-1001/desktop.ini 2021-11-15 10:47:20 20 Partition1/Root/Documents \$I30: INDEX_ALLOC (Non-Resident) 99920-99927 20 2021-11-15 10:47:19 Partition1/Root/Documents/OpenOffice-files 2021-11-15 10:47:18 20 Partition1/Root/Documents/OpenOffice-files/Calc-files 20 2021-11-15 10:47:18 Partition1/Root/Documents/OpenOffice-files/Calc-files/ods-files 2020-04-06 16:21:52 bleb4cc9101bcb86c0042231f898f0ae 20 8e5da7978ebe26604b5f556ec2d20a4ce1176ff1 4d226d7f3c0e1c874f0aaf772f9a5cf9bed2c7d982906a4a0314c206cbc4bb35 Partition1/Root/Documents/OpenOffice-files/Calc-files/ods-files/.DS Store DATA: DATA (Non-Resident) 99960-99975 20 2020-04-06 16:18:30 eab006354c7cf4e1fd3772afd0643672 bfc7b3368a46a640c3145646b0dfad10bb89f096 4709af13b6dbaf11feab0750bc2a3734eab9a94e184bd7f736805adcb02ac368 Partition1/Root/Documents/OpenOffice-files/Calc-files/odsfiles/file example ods 10.ods DATA: DATA (Non-Resident) 99976-100007 20 2020-04-06 16:20:50 94790aeb545e806ea9cf161f6ae2697f 152a13f940c2dfa4530b1b022897cb3dbd0cb45b edb79e7965f6b61722f1c6427200e4ba44692e573b2f2f8cd210f356aed7f3c9 Partition1/Root/Documents/OpenOffice-files/Calc-files/odsfiles/file_example_ods_1000.ods DATA: DATA (Non-Resident) 100008-100111 20 2020-04-06 16:19:47 000389561d71032e79411613d73f01f5 3e9fdd1b26eed17f40e98a0f8d13af11decdf951 b668e04c130d51d023531482c8067b5232284decdf54760c6ae431e3718388c3 Partition1/Root/Documents/OpenOffice-files/Calc-files/odsfiles/file_example_ods_50.ods DATA: DATA (Non-Resident)

```
100112-100143
```

```
2020-04-06 16:21:44
 20
                                                28aa35b07f4a28f4f001e28f277dd1be
      f9dfcafc3e9b6c1c15a949ab9150b8e7d599f1d6
069ad480df6dba6de101188dc126f688127206932d98f02149eb390b6e8f2928
Partition1/Root/Documents/OpenOffice-files/Calc-files/ods-
files/file_example_ods_5000.ods
   DATA: DATA (Non-Resident)
         100144-100519
20
                        2021-11-15 10:47:19
Partition1/Root/Documents/OpenOffice-files/Calc-files/oxlsx-files
 20
                        2020-04-06 16:31:06
                                                c763a032a1999d42934abebc25fc6a83
      07c1d02aa03ae7768dfb88445bff68e9c32c2264
208fef9240237b668cbb927255a8f204e6ab808a68701ffe72bf3ca85e4d13e1
Partition1/Root/Documents/OpenOffice-files/Calc-files/oxlsx-files/.DS_Store
   DATA: DATA (Non-Resident)
         100520-100535
 20
                        2020-04-06 16:25:50
                                                f893b7290b96905f0776e0e1cb4b91c4
      d80a4175a6a2767b61fe8e2b33774bd211b6a934
ab82e943104f1edfa17b58595b4221c02ddf93aa4056fa630473de192f85d1fe
Partition1/Root/Documents/OpenOffice-files/Calc-files/oxlsx-
files/file_example_OXLSX_10.xlsx
   DATA: DATA (Non-Resident)
         100536-100551
                        2020-04-06 16:30:27
 20
                                                be99eeaa2e2aa77ecb4d7b9eeff44cb4
      laad45945f99a02383e168e339a20d38999491b6
cd6583c0aa16dde7342c4dc5483987edf173d7378ce946ded7383bbf4b5990ba
Partition1/Root/Documents/OpenOffice-files/Calc-files/oxlsx-
files/file_example_OXLSX_100.xlsx
   DATA: DATA (Non-Resident)
         100552-100575
                                                2280cba8bea0ded6bf9c428939f9cb32
                        2020-04-06 16:30:10
2.0
      4aee4fe0add47392f508fef28af3f5c02a9eb4a2
59da4d0e97a54c462fcf34268b14a4214ef324da368712a0a32678c976e89484
Partition1/Root/Documents/OpenOffice-files/Calc-files/oxlsx-
files/file_example_OXLSX_50.xlsx
   DATA: DATA (Non-Resident)
        100576-100591
20
                        2020-04-06 16:30:42
                                                980e7a175ea67333379753a788d331e5
      c90c1841006b8da26e69636596c7a8e5fcc26ec6
0d66f10f1b76f620d69e4054eeab6669f2e64b0b2fa5e3365101027aa5b657e7
Partition1/Root/Documents/OpenOffice-files/Calc-files/oxlsx-
files/file_example_OXLSX_5000.xlsx
   DATA: DATA (Non-Resident)
        54912-55287
20
                        2020-04-06 16:23:13
                                                db42bc048678d194bda93124fcc1e359
      9f7137c6703b51cd78a797b56b5f2a2e7c8b83ea
433476459c23ba979ab467ce4c310e29a40e3b9a8d68dd63467b503ddc4cdf23
Partition1/Root/Documents/OpenOffice-files/Calc-files/.DS Store
   DATA: DATA (Non-Resident)
         99944-99959
                        2021-11-15 10:47:19
 20
Partition1/Root/Documents/OpenOffice-files/Microsoft-files
                        2021-11-15 10:47:19
 2.0
Partition1/Root/Documents/OpenOffice-files/Microsoft-files/Excel-files
```

```
2021-11-15 10:47:19
 20
Partition1/Root/Documents/OpenOffice-files/Microsoft-files/Excel-files/xls-files
   $130: INDEX ALLOC (Non-Resident)
         101296-101303
 20
                        2020-04-06 16:13:48
                                                7901a6038143aa293bff65c1dcc564a9
      13c30d142999708f8b0f3b71bce35c1c91304032
ad75eff3191cbb4e3215b25ce1733f062f474ff6aa242db82de391eada0f114e
Partition1/Root/Documents/OpenOffice-files/Microsoft-files/Excel-files/xls-files/
.DS Store
   DATA: DATA (Non-Resident)
         101008-101023
 20
                        2018-10-19 11:12:18
                                                01a42d82b4e2e143876cc0afea4883ed
      3cc9264c3a5569c08abfb9ee343dba1bf96f1b3d
be198ae04df0476e6a8153e4b396da05c9badef729f87f1abbb626f8bfae8491
Partition1/Root/Documents/OpenOffice-files/Microsoft-files/Excel-files/xls-
files/file_example_XLS_10.xls
   DATA: DATA (Non-Resident)
         100928-100967
 20
                        2018-10-19 11:14:00
                                                efcb6e746de385a6ba15f9e697503f4c
      96451e09d24aacaab7c00292316020ecd8090dbf
8562df19f14cb945b769a0812fb1afd5acd9e349f0cdd71150282202d71319ee
Partition1/Root/Documents/OpenOffice-files/Microsoft-files/Excel-files/xls-
files/file_example_XLS_100.xls
   DATA: DATA (Non-Resident)
         6944-7015
 20
                        2018-10-19 11:14:56
                                                f9773bf0bd611c8a9107140956b3881f
      7a538e2ca18bb7cb0c2fb0130767012f7acd9019
d3107cae4af0231540887be840135ec03763d83926c2900fb76aead0226787ca
Partition1/Root/Documents/OpenOffice-files/Microsoft-files/Excel-files/xls-
files/file_example_XLS_1000.xls
   DATA: DATA (Non-Resident)
         4992-5295
 20
                        2018-10-19 11:13:23
                                                b3df6dd6764416491f51415c4ccf1aaf
      eealbebb11f6beab8f38bc2b1705dbf598bcbfa6
a7beba6217ffa60c9e79f0310d024a74cbaf363d7b884d214178e413e758b68e
Partition1/Root/Documents/OpenOffice-files/Microsoft-files/Excel-files/xls-
files/file_example_XLS_50.xls
   DATA: DATA (Non-Resident)
         100872-100927
 20
                        2018-10-19 11:15:24
                                                ecb548b885ec5cf6f6e38ece80fa5f2e
      5ddffe520563c9b9c26a7c297c99b2e896e891d0
bc8d33d7033eb858dd63ae4882d4381fb9fe85c0740fd41efb9a309fca9e366f
Partition1/Root/Documents/OpenOffice-files/Microsoft-files/Excel-files/xls-
files/file_example_XLS_5000.xls
   DATA: DATA (Non-Resident)
         101496-102863
 20
                        2021-11-15 10:47:19
Partition1/Root/Documents/OpenOffice-files/Microsoft-files/Excel-files/xlsx-files
    $I30: INDEX_ALLOC (Non-Resident)
         55288-55295
```

```
2020-04-06 16:16:33
20
                                                8f9765363a3610383bbafb7ed7e8928c
      075e8f3a721f3d733c20e897c3e9db0c907322b7
9320252c62acfa865ebd315c1597d767f9ebc16ea410bff7e3d2e479bdcde088
Partition1/Root/Documents/OpenOffice-files/Microsoft-files/Excel-files/xlsx-files/
.DS Store
   DATA: DATA (Non-Resident)
         101280-101295
20
                        2018-10-19 11:16:15
                                                bd5ec17de931c601b3231fdb4eac6db6
      2a647da6430913fa47cfd7874721f0832bb91f52
584bd2879378c518796f4422f8ed41c971798e76c5ee58c307fc3d40adb03eaa
Partition1/Root/Documents/OpenOffice-files/Microsoft-files/Excel-files/xlsx-
files/file_example_XLSX_10.xlsx
   DATA: DATA (Non-Resident)
        101112-101135
20
                        2018-10-19 11:17:58
                                                43cb8b1c3ede97eaeb779d0bc7d03710
      41360a2a5d2f8a2aaacd2ae503ea754fc33d93f4
97e004974d26f04bf7bf960d5b4e33f2f59a81d79e95526804f5b570f819eacb
Partition1/Root/Documents/OpenOffice-files/Microsoft-files/Excel-files/xlsx-
files/file example XLSX 100.xlsx
   DATA: DATA (Non-Resident)
         100840-100871
20
                        2018-10-19 11:18:45
                                                513e4fac7ff88720001864d1a350ed1c
      87e9c39ea24c1949cca6f68ff42cdb8208c32a13
14fed5fcf63206d7f5bd275058b7d79184ce187b062fcdab5d9ff77b4ea19502
Partition1/Root/Documents/OpenOffice-files/Microsoft-files/Excel-files/xlsx-
files/file_example_XLSX_1000.xlsx
   DATA: DATA (Non-Resident)
         9720-9831
20
                        2018-10-19 11:16:44
                                                775654d96ef34c95ce1a60e9606977e9
     1954ba25e67edc407955203d21aeb8c3a99d272f
e40aeadfebe57e3be87ac46260ad09ec1c4c030b95eef2af767382d0fe79198a
Partition1/Root/Documents/OpenOffice-files/Microsoft-files/Excel-files/xlsx-
files/file_example_XLSX_50.xlsx
    DATA: DATA (Non-Resident)
        101088-101111
20
                        2018-10-19 11:19:09
                                                ea38c0c454aa508b5909161bd8260918
     e566e8c34a723ad44431cc3f0fdbf3bce18410e5
acbd5c728f2738a70f59c245c961eb8122d59aa07b7debdc7d348efe472b650b
Partition1/Root/Documents/OpenOffice-files/Microsoft-files/Excel-files/xlsx-
files/file example XLSX 5000.xlsx
   DATA: DATA (Non-Resident)
        103080-103551
20
                        2020-04-06 16:31:14
                                                52d71be9d0971685678823c546b72eff
     1930f5ed939a35965802a508afb3865810e7e0af
8ffc5293b616b558264fdb2277fb6a8d032ebecaf6b678b491ddcfdef1a3f9f2
Partition1/Root/Documents/OpenOffice-files/Microsoft-files/Excel-files/.DS_Store
   DATA: DATA (Non-Resident)
         100984-101007
 20
                        2021-11-15 10:47:19
Partition1/Root/Documents/OpenOffice-files/Microsoft-files/Word-files
                        2021-11-15 10:47:19
 2.0
Partition1/Root/Documents/OpenOffice-files/Microsoft-files/Word-files/Doc-files
```

```
275
```

```
2020-04-06 16:12:41
 20
                                                34b20ad44b5d33cc3401b0ca1c9c55ad
      236a6271d535ea5149eca9fe73e939900968c019
9cc166b17367418d3af128bd74ae79c7b0a20c0a1fd19c4d458c1834897905db
Partition1/Root/Documents/OpenOffice-files/Microsoft-files/Word-files/Doc-files/
.DS Store
   DATA: DATA (Non-Resident)
         101056-101071
 20
                        2018-10-19 11:10:23
                                                759cbcd3d7c574ec4de97222bc407665
      1308c158c06c9050ffa3f0f5898a5ccf4a94c8c7
3fbfda0b36c4edc4b4d48ec5c0425ced04ed15c6e3891495201a7289533a2ce2
Partition1/Root/Documents/OpenOffice-files/Microsoft-files/Word-files/Doc-
files/DOCFile_500kb.doc
   DATA: DATA (Non-Resident)
         103592-104599
 20
                        2018-10-19 11:20:26
                                                35176f9b7f521954445100e5df74dee9
      5aee31c3f490b421e75548ea713a6755818980db
f907aadb6b9b38c8e19eaf44aa11796051eeac35d0d2115246449da98f1137f7
Partition1/Root/Documents/OpenOffice-files/Microsoft-files/Word-files/Doc-
files/file-sample-doc 100kB.doc
   DATA: DATA (Non-Resident)
         102864-103071
 20
                        2018-10-19 11:19:59
                                                bb8c0ad499fc64837a45154a27e07734
      1e09acf84e23e9eddb152f812354785e2f7cd159
2bcd9c011678a8aa7045a6485bef7872c4295fbb6c2467cc29135ffcc769457b
Partition1/Root/Documents/OpenOffice-files/Microsoft-files/Word-files/Doc-
files/file-sample-doc_1MB.doc
   DATA: DATA (Non-Resident)
         104808-106823
 20
                        2018-10-19 11:21:18
                                                e16fb51cef336edf2c19d065ef49a662
      15bfff84aea3602cd0ec81bd7ac9789a969c3528
41f65cf10d9b0b42d12307a46b66ae632e6d883e067db5959969822780823d7a
Partition1/Root/Documents/OpenOffice-files/Microsoft-files/Word-files/Doc-
files/file-sample-doc_500kB.doc
   DATA: DATA (Non-Resident)
         106824-107807
 20
                        2021-11-15 10:47:19
Partition1/Root/Documents/OpenOffice-files/Microsoft-files/Word-files/Docx-files
                        2020-04-06 16:12:41
                                                0717f9af8c983c9af7d5fb9d311ab163
      0ce1f83b661658d58caee54b75ede278a30e0927
359246310af6c9ff8c7192b637ae949a8c388f1c9b684d46c1ea013d4fcafffb
Partition1/Root/Documents/OpenOffice-files/Microsoft-files/Word-files/Docx-files/
.DS Store
   DATA: DATA (Non-Resident)
         101040-101055
 20
                        2018-10-19 11:11:20
                                                96d043aabc6bdad1046db4c47aa7a3a8
      7705c94a188ecebd1be2f68f70687b1ef7360d21
9383ce8098236174683cefab77cbddfe8cc17d8656b4e87281e783ce55b76d52
Partition1/Root/Documents/OpenOffice-files/Microsoft-files/Word-files/Docx-
files/DOCXFile_500kb.docx
   DATA: DATA (Non-Resident)
         107824-108511
```

```
20
                        2018-10-19 11:22:33
                                                0815c2eb26ab3ad59fab1ccba9d18fd0
      20898f28011ae05f5062e09690b292ed13fbbf20
acd7fe4a7ee20c77b48489be5b9dbad8a850a2b29af721c912f6993e238b5471
Partition1/Root/Documents/OpenOffice-files/Microsoft-files/Word-files/Docx-
files/file-sample-docx 100kB.docx
   DATA: DATA (Non-Resident)
         108512-108759
20
                        2018-10-19 11:21:55
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Partition1/Root/Documents/OpenOffice-files/Microsoft-files/Word-files/Docx-
files/file-sample-docx_1MB.docx
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        108760-110847
20
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Partition1/Root/Documents/OpenOffice-files/Microsoft-files/Word-files/Docx-
files/file-sample-docx 500kB.docx
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20
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Partition1/Root/Documents/OpenOffice-files/Microsoft-files/Word-files/.DS Store
   DATA: DATA (Non-Resident)
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20
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Partition1/Root/Documents/OpenOffice-files/Microsoft-files/.DS Store
   DATA: DATA (Non-Resident)
         100968-100983
 20
                        2021-11-15 10:47:19
Partition1/Root/Documents/OpenOffice-files/Writer-files
                        2021-11-15 10:47:19
2.0
Partition1/Root/Documents/OpenOffice-files/Writer-files/odocx-files
                        2020-04-06 16:33:22
 20
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      79bfe4ccde5838e150a0f236b9c7478104b9cd09
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Partition1/Root/Documents/OpenOffice-files/Writer-files/odocx-files/file-sample-
odocx 100kB.docx
   DATA: DATA (Non-Resident)
         101136-101279
                        2020-04-06 16:36:02
20
                                                e579cd58b1ac23749e4251835bc0f610
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1c0f9edf45a390e0d279a1d10da038e374b515cef3e5c077c8bae99e3dd4a5cc
Partition1/Root/Documents/OpenOffice-files/Writer-files/odocx-files/file-sample-
odocx 1MB.docx
   DATA: DATA (Non-Resident)
        112144-114047
```

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277
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2020-04-06 16:36:58
 20
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05100d4633bff3a8809b8b075ecbb7e9dd22f94148307faabad972ee8c8307d7
Partition1/Root/Documents/OpenOffice-files/Writer-files/odocx-files/file-sample-
odocx_500kB.docx
   DATA: DATA (Non-Resident)
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                        2020-04-06 16:34:45
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fb723512f7f3f166cb0013f3160d98b648719f08bc6dcde7db5043277cb1ca85
Partition1/Root/Documents/OpenOffice-files/Writer-files/odocx-
files/ODOCXFile_500kb.docx
   DATA: DATA (Non-Resident)
         114952-115823
 20
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Partition1/Root/Documents/OpenOffice-files/Writer-files/odt-files
                        2020-04-06 16:43:34
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8fcb878c093e2f4652b632bb347b3f69db28ece431801b9651b3809b47ff16e4
Partition1/Root/Documents/OpenOffice-files/Writer-files/odt-files/.DS_Store
   DATA: DATA (Non-Resident)
         9832-9847
                        2020-04-06 16:40:21
 20
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Partition1/Root/Documents/OpenOffice-files/Writer-files/odt-files/file-sample-
odt_100kB.odt
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 20
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Partition1/Root/Documents/OpenOffice-files/Writer-files/odt-files/file-sample-
odt_1MB.odt
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         116088-118183
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de09f89e254cc5ecc388ba278cf2f224067e9fbc9c64ae3009adf565fcc798c6
Partition1/Root/Documents/OpenOffice-files/Writer-files/odt-files/file-sample-
odt_500kB.odt
   DATA: DATA (Non-Resident)
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 20
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ed39112cdf37ddc805e39b9edb033fd97dcce179831c1392a2a59e46f85a0796
Partition1/Root/Documents/OpenOffice-files/Writer-files/odt-files/ODTFile 500kb.odt
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 20
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Partition1/Root/Documents/OpenOffice-files/Writer-files/.DS_Store
```

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DATA: DATA (Non-Resident)
         101024-101039
 20
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Partition1/Root/Documents/OpenOffice-files/.DS_Store
   DATA: DATA (Non-Resident)
        99928-99943
 20
                        2021-11-15 10:47:20
                                                Partition1/Root/Documents/pdf
 20
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      7ed087345df3071191fbb455470a4ae8e4b423e7
2a42cd96488ebc2e8fd807008726dee7ab1709c007fa9abe8affbc5843591bb0
Partition1/Root/Documents/pdf/file-sample-pdf_100kB.pdf
   DATA: DATA (Non-Resident)
         6424-6943
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                        2018-10-19 11:28:32
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Partition1/Root/Documents/pdf/file-sample-pdf_1MB.pdf
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         120360-122727
20
                        2018-10-19 11:30:08
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      34d580da967fbc3ba1bc54e59da11b7183afffb6
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Partition1/Root/Documents/pdf/file-sample-pdf_500kB.pdf
   DATA: DATA (Non-Resident)
         122728-124143
                        2018-10-19 12:05:41
20
                                                2cea8c95dc5f5db6065f704068292867
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Partition1/Root/Documents/pdf/large_pdf.pdf
   DATA: DATA (Non-Resident)
         124144-154039
20
                        2018-10-19 11:49:27
                                                4bfa34445fe5e92cee0d4be1c4b6afbd
      4c166dd5ad455053664bb095fbed5238f5a17a68
1284a8bd83fa65802aa0ee0d7ca77a008c6db18cbd288f1b1f1319aae703fa4a
Partition1/Root/Documents/pdf/PDFFile_500kb.pdf
   DATA: DATA (Non-Resident)
         154040-156631
20
                        2018-06-22 11:08:57
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      31249aec7b1e9dd55828b296f3626c5654071860
b0e8e10fc34b366dfa1709719cd737745581fb277a82509a60518cb5e6c8ddfc
Partition1/Root/Documents/easychair.docx
   DATA: DATA (Non-Resident)
        55296-59767
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      f09aedad237560fe3fc2d255d39520923cab91f2
6387b9576f369e587e7c810df976b29ededf8c4f7e3f1d6662b7ccd78dc4a521
Partition1/Root/Documents/Mac_mini_Early2009_UG.pdf
   DATA: DATA (Non-Resident)
         59768-66015
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20
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Partition1/Root/Documents/Mac_mini_Intel-based_Mid2007_UserGuide.pdf
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                        2013-06-26 07:56:33
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Partition1/Root/Documents/Mac_mini_Intel_User_Guide.pdf
   DATA: DATA (Non-Resident)
         67768-72199
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Partition1/Root/Documents/MyDoc1.docx
   DATA: DATA (Non-Resident)
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Partition1/Root/Documents/Test_Arch.zip
   DATA: DATA (Non-Resident)
        156632-163591
 20
                        2021-11-15 10:47:28
                                               Partition1/Root/Music
    $I30: INDEX_ALLOC (Non-Resident)
         296-303
                        2021-11-15 10:47:25
 20
                                                Partition1/Root/Music/Andre_Rieu
    $130: INDEX ALLOC (Non-Resident)
         4968-4991
 20
                        2016-06-05 06:40:09
                                                a44be999d6682d18644da916cc3a5569
      545dca6e41229c13c8ea51930b809c1155ba1ae8
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Partition1/Root/Music/Andre Rieu/Andr Rieu-
Air_On_A_G_String_Johann_Sebastian_Bach_(mp3.cc).mp3
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         508840-521647
 20
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      19c0fc620469b9f709a9e5f41358cc9f77935133
9a61b7a900bce729eab4c964ebfdac730e656e0b4206741d09f8b1ea9ce0d34a
Partition1/Root/Music/Andre_Rieu/Andr_Rieu-Ballade_Pour_Elise_(mp3.cc).mp3
   DATA: DATA (Non-Resident)
         521648-529695
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                        2016-06-05 06:39:10
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Partition1/Root/Music/Andre Rieu/Andr Rieu-Barbero de Sevilla F garo -
_Largo_Al_Fact_tum_(mp3.cc).mp3
    DATA: DATA (Non-Resident)
         529696-544487
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```
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88ff016fb6208004ad2b77d58c0b58ca54fcaa1d76a0c58c9030bc554977496a
Partition1/Root/Music/Andre_Rieu/Andr_Rieu-Clavelitos_(mp3.cc).mp3
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         544488-551535
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Partition1/Root/Music/Andre_Rieu/Andr_Rieu-
Funiculi_Funicula_isp._Mario_Lanza_(mp3.cc).mp3
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         551536-558855
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Partition1/Root/Music/Andre_Rieu/Andr_Rieu-Greensleeves_(mp3.cc).mp3
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Partition1/Root/Music/Andre_Rieu/Andr_Rieu-
Romantic_Paradise_Live_in_Italy_(mp3.cc).mp3
   DATA: DATA (Non-Resident)
         573032-574559
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d7d259fb9aea96c6016bd0a2cce50a63a84344d5ca87ea98df496b4d697fbc60
Partition1/Root/Music/Andre Rieu/Andr Rieu-
Suite_for_Jazz_Orchestra_No._2_Vals_No._2_Dmitry_Shostakovich_(mp3.cc).mp3
   DATA: DATA (Non-Resident)
         574560-583311
 20
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6d0a3e7cef78acd51b5fd4402aa8d2f9e691e1666e154a58fda31050874f9a38
Partition1/Root/Music/Andre_Rieu/Andre_Rieu-
All_Men_Shall_Be_Brothers_From_Beethoven_s_9th_Symphony_Live_In_Dublin_(mp3.cc).mp3
   DATA: DATA (Non-Resident)
         167896-177111
                        2016-06-05 06:40:08
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Partition1/Root/Music/Andre_Rieu/Andre_Rieu-Andante_-_Piano_Concerto_No._21_-
_Elvira_Madigan_Mozart_(mp3.cc).mp3
   DATA: DATA (Non-Resident)
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e8ec4dac74ef09da945f22715ad4de103374e725961d0ad36f4f5db42d6f6444
Partition1/Root/Music/Andre Rieu/Andre Rieu-
Bella_Tarantella_Love_inVenice_2014_(mp3.cc).mp3
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204840-217055
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Partition1/Root/Music/Andre Rieu/Andre Rieu-
C.Orff._Fortuna_imperatrix_mundi_(mp3.cc).mp3
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         217064-227039
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e631522504fa6d6f73809bfbe7a6218a55b7ccec7bb17676785a1b8d17b09583
Partition1/Root/Music/Andre_Rieu/Andre_Rieu-Carnival_of_Venice_(mp3.cc).mp3
   DATA: DATA (Non-Resident)
         227040-248655
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Partition1/Root/Music/Andre Rieu/Andre Rieu-
Cielito_Lindo_Meksikanskaya_narodnaya_pesnya_(mp3.cc).mp3
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 20
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Partition1/Root/Music/Andre_Rieu/Andre_Rieu-Concierto_De_Aranjuez_(mp3.cc).mp3
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                        2016-06-05 06:39:10
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abebd5f9a4c397e6ea404e8b2a2bb002a6f89b45403e6af7d456d275b1c59f28
Partition1/Root/Music/Andre Rieu/Andre Rieu-
Einzug_der_Gladiatoren_nemeckij_marsh_(mp3.cc).mp3
   DATA: DATA (Non-Resident)
         275504-285607
 20
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Partition1/Root/Music/Andre_Rieu/Andre_Rieu-Einzugsmarsch_(mp3.cc).mp3
   DATA: DATA (Non-Resident)
         264288-275503
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Partition1/Root/Music/Andre_Rieu/Andre_Rieu-Francuzskij_kankan_(mp3.cc).mp3
   DATA: DATA (Non-Resident)
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Partition1/Root/Music/Andre_Rieu/Andre_Rieu-Heigh-Ho_(mp3.cc).mp3
    DATA: DATA (Non-Resident)
         291712-294151
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Partition1/Root/Music/Andre_Rieu/Andre_Rieu-I_Hear_The_Sound_Of_Cymbals_(mp3.cc).mp3
    DATA: DATA (Non-Resident)
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                        2016-06-05 06:40:19
 20
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Partition1/Root/Music/Andre_Rieu/Andre_Rieu-
Jackety_Sax_Benny_Hill_Theme_(mp3.cc).mp3
    DATA: DATA (Non-Resident)
         306984-313959
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                        2016-06-05 06:40:19
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7eae251302dfbec1381e645c1feb6fb81a3bfb40dd378c835fd7082be83b227e
Partition1/Root/Music/Andre_Rieu/Andre_Rieu-Kalinka_(mp3.cc).mp3
   DATA: DATA (Non-Resident)
         313960-325439
 20
                        2016-06-05 06:40:05
                                                ed26972ec518840247f114119e032cb9
      954750d662eec3f4f7469c7dc86dfb6caac47852
43ce97c1e7f4358484b18cbfcf5046e4a9fff92378f63603a4d4d1251a3c8c25
Partition1/Root/Music/Andre Rieu/Andre Rieu-Main Title The Godfather (mp3.cc).mp3
   DATA: DATA (Non-Resident)
         325440-334727
 20
                        2016-06-05 06:39:44
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9fe1e61c05e2c3815df1a7b4f2933b8fd3d8fac85f21cee97bb890259c2268cb
Partition1/Root/Music/Andre Rieu/Andre Rieu-Marche De Radetzky (mp3.cc).mp3
    DATA: DATA (Non-Resident)
         334728-343527
                        2016-06-05 06:40:22
 20
                                                16c30e0592019ff78261b8ace757d93c
      26c8510995f161358ca9a623cc6830ec0f3bb7f0
0926727b89c24ec0837ec080a9fcd6dca7977568a0c4cdae2f0bdfdde21588ce
Partition1/Root/Music/Andre_Rieu/Andre_Rieu-
Moonriver_from_Breakfast_At_Tiffany_s_Henry_Mancini_violin_cover_(mp3.cc).mp3
    DATA: DATA (Non-Resident)
         352904-362279
 20
                        2016-06-05 06:40:21
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0926727b89c24ec0837ec080a9fcd6dca7977568a0c4cdae2f0bdfdde21588ce
Partition1/Root/Music/Andre_Rieu/Andre_Rieu-
Moonriver_from_Breakfast_At_Tiffany_s_Henry_Mancini_violin_cover_(mp3.cc) (1).mp3
   DATA: DATA (Non-Resident)
         343528-352903
 20
                        2016-06-05 06:39:22
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3adba60be7fc3f52ff992361feb663af28ab74f5ff475616368b6d69ba4605b4
Partition1/Root/Music/Andre Rieu/Andre Rieu-O Sole Mio (mp3.cc).mp3
   DATA: DATA (Non-Resident)
         362280-377447
```

20 2016-06-05 06:39:08 7a4d0e64b2e59713d8372bc8c33a413f 6eb557504149913d0642d0a355fb57c2a168af78 650857fb1cbacbe2984478823d857c4c49055302e375039a389112f314ce28bf Partition1/Root/Music/Andre_Rieu/Andre_Rieu-Sabre_Dance_(mp3.cc).mp3 DATA: DATA (Non-Resident) 377448-384543 2016-06-05 06:40:26 20 85af6129badd4d015270a811c686b5ed fa8560286a78c9fb2476223d241dabfc080ac585 72454419c59109188499bf8f20f94988ab0f6feec1ef0b083cf0b3d481919e0f Partition1/Root/Music/Andre_Rieu/Andre_Rieu-Second_Waltz_Shostakovich_(mp3.cc).mp3 DATA: DATA (Non-Resident) 384544-394927 20 2016-06-05 06:39:37 d8f4430b58e89bfbca7e04d9c8c1ae85 ed606770fb935d2c7da8cec4634ae25cf6251bc0 258c0d8334a22f8cfe48cfa4f407faa4911a86e6dc0159eed3943989efc5aeb2 Partition1/Root/Music/Andre Rieu/Andre Rieu-The Blue Danube (mp3.cc).mp3 DATA: DATA (Non-Resident) 394936-417087 20 2016-06-05 06:39:33 526ac06ad6e99e345c605e8ee5308765 a26404f1a20c22fb35c1f2e1a789689e16503f05 3f19694235113ab6393a3e3b9e7a7c0bff2c34de5f5a23b1946f19dbc44b2522 Partition1/Root/Music/Andre_Rieu/Andre_Rieu-The_Gypsy_Baron_(mp3.cc).mp3 DATA: DATA (Non-Resident) 417088-437583 20 2016-06-05 06:39:41 5e069942912410b0a2b9a07393c5bca8 1d9a975521d5841a4096be46b52cea589a3b996a d3ed442842ec32249c32fd65368878a1d3ffb0b6796c5a7fe23ba072c9b13792 Partition1/Root/Music/Andre_Rieu/Andre_Rieu-The_Stars_And_Stripes_Forever_(mp3.cc).mp3 DATA: DATA (Non-Resident) 437584-448295 2016-06-05 06:39:30 20 620bf7a865780b1d6f5357af14d91ad5 7634bcf96204d17693e4616ae29abad6499624b6 6a06815b8af9bfb97b6f6363c4f818439b69b22dd25dfd77fee199125fe00c79 Partition1/Root/Music/Andre_Rieu/Andre_Rieu-Thunder_And_Lightning_Polka_(mp3.cc).mp3 DATA: DATA (Non-Resident) 448296-460503 20 2016-06-05 06:39:16 c9cf9053c04806485687e3cc0c26fef2 56258d0bc0e87ebea17ec4f918166e2387711f1e 350efbb5f6dd944682942dd6e88bfbd4cf1c60104bcd95a172067ac32e9538c6 Partition1/Root/Music/Andre_Rieu/Andre_Rieu-Tiritomba_Love_inVenice_2014_(mp3.cc).mp3 DATA: DATA (Non-Resident) 460504-470655 20 2016-06-05 06:39:18 e9f2e7b7ec1b375bf8409bbb63c0c1d3 516710c7d6977e5654ba350b12e3619d2272ad3b 61b1e1ed2daec5f1244624145ccd81aba6efa16a5f38bcf150ddba1c78deff21 Partition1/Root/Music/Andre_Rieu/Andre_Rieu-Valse_Neige_(mp3.cc).mp3 DATA: DATA (Non-Resident)

```
470656-481119
```

```
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Partition1/Root/Music/Andre_Rieu/Andre_Rieu-Viennese_Waltz_(mp3.cc).mp3
    DATA: DATA (Non-Resident)
         481120-508839
 20
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                                                Partition1/Root/Music/Barry_Sisters
    $130: INDEX ALLOC (Non-Resident)
         7016-7023
 20
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0ff94b864e65320d8059654c503843df15f2edc91768e6d5821c557c845215e5
Partition1/Root/Music/Barry_Sisters/Barry_Sisters-Ketsele_Baroyges.mp3
   DATA: DATA (Non-Resident)
         583312-588871
 20
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      48db9c5251b72973949dcf6cc0696bb3e42bc916
b1518592e55d37fd09cb91b3d1a9e66b49dc0b72cc673f189b5ad18ee75f664a
Partition1/Root/Music/Barry_Sisters/Barry_Sisters-L'Chaim.mp3
    DATA: DATA (Non-Resident)
         588872-595495
 20
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b81c2fbc0e859c621194bcf7a25cffb4726452e5d0c8ca864e03f00188e71c96
Partition1/Root/Music/Barry Sisters/Barry Sisters-Tum Balalaika.mp3
   DATA: DATA (Non-Resident)
         595496-602071
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 20
                        2013-10-18 14:14:54
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Partition1/Root/Music/Barry_Sisters/Barry_Sisters-Vaybele_a_Tsnie.mp3
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         602072-608455
 20
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Partition1/Root/Music/Barry_Sisters/Barry_Sisters-Yidl_Mitn_Fidl.mp3
   DATA: DATA (Non-Resident)
         608456-625383
 20
                        2013-10-18 13:06:18
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920841b083ac3a3783c057428cf447576d9b2eda5bf0a20efee56e70c30d2e4f
Partition1/Root/Music/Barry_Sisters/Barry_Sisters_Chiribim_Chiribom.mp3
   DATA: DATA (Non-Resident)
         625392-631599
 20
                        2013-10-18 14:20:22
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      011f89ba643ce150000bf5db3d5f1d25d93f0293
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Partition1/Root/Music/Barry_Sisters/Bublitshki_Barry_Sisters.mp3
   DATA: DATA (Non-Resident)
         631600-641023
```

```
20
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bc0052be54f9175bb0e590aac8ecf1dcf4ba7587c263cf9fca6bc8ccc0feb3dc
Partition1/Root/Music/Barry_Sisters/Hava_Nagila-Barry_Sisters.mp3
   DATA: DATA (Non-Resident)
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                        2013-10-18 13:41:54
 20
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f16175bc9c26f9fe3fc8d8b8a497eef3d29f6642372a9472cf33e805cf4c8882
Partition1/Root/Music/Barry_Sisters/Hevenu_Shalom_Aleihem-Barry_Sisters.mp3
   DATA: DATA (Non-Resident)
         648904-656031
 20
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Partition1/Root/Music/Barry Sisters/Papirosn Barry Sisters.mp3
   DATA: DATA (Non-Resident)
         656032-665879
 20
                        2013-10-18 13:37:44
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Partition1/Root/Music/Barry_Sisters/Vi_iz_dus_geseleh-Barry_Sisters.mp3
   DATA: DATA (Non-Resident)
         665880-682359
 20
                        2021-11-15 10:47:26
Partition1/Root/Music/Electric_Lgcht_Orchestra
 20
                        2021-11-15 10:47:27
Partition1/Root/Music/Electric_Lgcht_Orchestra/Time_1981
    $130: INDEX ALLOC (Non-Resident)
         54296-54303
 20
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348646f1fa7fd3f99d595b68a33c90f2ec43d0a439d1bbb2768c06f47ffae21a
Partition1/Root/Music/Electric_Lgcht_Orchestra/Time_1981/01. PROLOGUE .mp3
   DATA: DATA (Non-Resident)
         50824-54295
 20
                        2005-04-07 03:11:40
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      8bb96b64b57214247bc90c129cf363ac14f29a3b
f7d0d08f9116c4279f07c753763b89aa4415afd102b3235ab4e8f3caaadc55e7
Partition1/Root/Music/Electric Lqcht Orchestra/Time 1981/02. TWILIGHT .mp3
    DATA: DATA (Non-Resident)
         700776-708375
 20
                        2005-04-07 03:11:40
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      ea5a27d3abbe6dad451b8d5fcab8e2ed20916918
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Partition1/Root/Music/Electric_Lgcht_Orchestra/Time_1981/03. YOURS TRULY, 2095.mp3
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 20
                        2005-04-07 03:11:40
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Partition1/Root/Music/Electric_Lgcht_Orchestra/Time_1981/04. TICKET TO THE MOON .mp3
   DATA: DATA (Non-Resident)
```

```
720200-731799
 20
                        2005-04-07 03:11:40
                                                f9d68c6e0468aed135415687d65e41a6
     bd2292b32c41c9d04b8c64e80162c37a14377986
32f769043c203cd172d4595c79e043e650b48b218e0c7187c7c53576272d98e9
Partition1/Root/Music/Electric Lqcht Orchestra/Time 1981/05. THE WAY LIFE'S MEANT TO
BE .mp3
   DATA: DATA (Non-Resident)
         731800-744895
 20
                        2005-04-07 03:11:40
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Partition1/Root/Music/Electric_Lgcht_Orchestra/Time_1981/06. ANOTHER HEART BREAKS
.mp3
   DATA: DATA (Non-Resident)
         744896-755583
                        2005-04-07 03:11:40
 20
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644040723a1cd11e09a7bf8e4d8cd88cd30716b9679ae9884af9583dd6744e44
Partition1/Root/Music/Electric_Lgcht_Orchestra/Time_1981/07. RAIN IS FALLING.mp3
    DATA: DATA (Non-Resident)
         755584-766583
 20
                        2005-04-07 03:11:40
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2ce95099a194b20d8e64d8ed79ab4e61ecbc784b6695e3af431a7e9dcd92bad7
Partition1/Root/Music/Electric Lqcht Orchestra/Time 1981/08. FROM THE END OF THE
WORLD .mp3
    DATA: DATA (Non-Resident)
         766584-775807
 20
                        2005-04-07 03:11:40
                                                13521f054f7d59ba7cab3df7da45257e
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0a943aaa8f0318db5db96170499523f8890de0a788885943adba75efd7db8af6
Partition1/Root/Music/Electric_Lgcht_Orchestra/Time_1981/09. THE LIGHTS GO DOWN .mp3
   DATA: DATA (Non-Resident)
         775808-785815
                        2005-04-07 03:11:40
 20
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1790a250729eb139b25d588de3f53834b8f2f7cd2928125784b0df8aeb3a892b
Partition1/Root/Music/Electric Lqcht Orchestra/Time 1981/10. HERE IS THE NEWS .mp3
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         785816-796343
                        2005-04-07 03:11:40
 2.0
                                                4a6ac89638420964737bcd597e12f667
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4a47e924470a26a57ebb89b947cfdc9eb96477838050fea459aaa01544a8aa8d
Partition1/Root/Music/Electric_Lgcht_Orchestra/Time_1981/11. 21ST CENTURY MAN .mp3
   DATA: DATA (Non-Resident)
         796344-808063
 20
                        2005-04-07 03:11:40
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      e985fc4780e2f3ce001ba44e6cadaff8df4b4bab
0089088cb3062cbfa50f8d414ecb68c5c94f9d9aec77966fae55a154553f7f5c
Partition1/Root/Music/Electric_Lgcht_Orchestra/Time_1981/12. HOLD ON TIGHT.mp3
   DATA: DATA (Non-Resident)
         808064-816815
```

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5b78807b8012ed28af78845c00244a3ae6575e8afaf280d0c3184de600d55541
Partition1/Root/Music/Electric_Lgcht_Orchestra/Time_1981/13. EPILOGUE.mp3
    DATA: DATA (Non-Resident)
         816816-821127
 20
                        2021-11-15 10:47:28
                                               Partition1/Root/Music/Ennio
Morricone
    $I30: INDEX_ALLOC (Non-Resident)
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 20
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554c109bf97dcfca8d5bbc27d255dc2e963ca7430056105fc3538529ccdaed38
Partition1/Root/Music/Ennio Morricone/Ennio Morricone-A Gun for Ringo.mp3
   DATA: DATA (Non-Resident)
         821128-825511
 20
                        2001-08-16 14:00:00
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f54573a8c38b12641a9a9db40ba85ddfa0ec67103e3967d5f45e7f97fe9971f7
Partition1/Root/Music/Ennio Morricone/Ennio Morricone-C'Era Una Volta Il Trenino.mp3
   DATA: DATA (Non-Resident)
         825512-832503
                        2001-08-16 14:00:00
 20
                                                cc03b5901e0950ed7f6fce239c53f387
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d77bd85c9a96cc1ba4a3f091499a725910552ad4a2b7df1ee78412d09f5d0934
Partition1/Root/Music/Ennio Morricone/Ennio Morricone-Chi Mai.mp3
   DATA: DATA (Non-Resident)
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 20
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Partition1/Root/Music/Ennio Morricone/Ennio Morricone-Cockey'S Song.mp3
   DATA: DATA (Non-Resident)
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 20
                        2001-08-16 14:00:00
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7cc3f790f6f420158a51bfc20c7b23e468259b9b09d664f6effa116b242112ca
Partition1/Root/Music/Ennio Morricone/Ennio Morricone-Farewell to Cheyenne.mp3
   DATA: DATA (Non-Resident)
         848992-853927
                        2001-08-16 14:00:00
 20
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Partition1/Root/Music/Ennio Morricone/Ennio Morricone-For A Few Dollar.mp3
   DATA: DATA (Non-Resident)
         853928-858559
 20
                        2001-08-16 14:00:00
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Partition1/Root/Music/Ennio Morricone/Ennio Morricone-Goodbye Colone.mp3
   DATA: DATA (Non-Resident)
         858560-861895
```

```
2001-08-16 14:00:00
 20
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Partition1/Root/Music/Ennio Morricone/Ennio Morricone-Le Vent, Le Cri.mp3
   DATA: DATA (Non-Resident)
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54bde5e91c19478763fd4a20947a573ffda7a217832e596849967eeb7bfddeb8
Partition1/Root/Music/Ennio Morricone/Ennio Morricone-March of the macgregors.mp3
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         876824-881551
20
                        2001-08-16 14:00:00
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Partition1/Root/Music/Ennio Morricone/Ennio Morricone-Once Upon A Time In
America.mp3
   DATA: DATA (Non-Resident)
         881552-888727
20
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Partition1/Root/Music/Ennio Morricone/Ennio Morricone-Once Upon A Time In The
West.mp3
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 20
      50a4f21dc3daa70a9d5474bca6cbd1b2fcc5069e
cd81f63dba683d5a7be2a10a67a5c953a67ceb62f4f5c60972103fae64924410
Partition1/Root/Music/Ennio Morricone/Ennio Morricone-Overture a fistful of
dollars.mp3
   DATA: DATA (Non-Resident)
         895632-901135
20
                        2016-04-28 14:51:04
                                                678be5fa10fd689690b47a63b8091549
      8a196fde7b67298c6f65f44b17a74a318218c748
c0fba9eb8cd60edf592efde7a94c273083a20f55fa5e7349781bbae8605025d3
Partition1/Root/Music/ CONFEDERATE_SONG_TO_ARMS_IN_DIXIE.mp3
   DATA: DATA (Non-Resident)
         163592-167895
20
                        2016-04-28 15:12:33
                                                cb2a01e7a4de030627a8bd11330853a4
     55d40b7ca48373cc59e03b2614a0005731d5de62
605c872d2891b98875f39782521e108538dc511464535a89a76b786b48348c81
Partition1/Root/Music/derek-warfield-the-southern-wagon.mp3
   DATA: DATA (Non-Resident)
         682360-690663
                                                d09612ad1b02eb2f89ce0f7cb54687b0
20
                        2016-04-28 15:14:01
     72d986512c390254a289a02ea36c1a6b10ff7cd8
9c783ba314837f59174f2a3713327f92fdc0cb4de41643bd23ab8717a3887989
Partition1/Root/Music/derek-warfield-the-wearing-of-the-grey.mp3
   DATA: DATA (Non-Resident)
         690664-700767
```

```
20
                        2016-04-28 14:46:58
                                                31cce7cada7d6e1250024562038f851f
      d7bbd1e78ad71bb930cc00b809ea08ae7d3f8c06
48ef762818c7e36088ed5ca27c8d0f725ee0ea16860cae92cc810b5161495de0
Partition1/Root/Music/Im_a_good_old_rebel.mp3
   DATA: DATA (Non-Resident)
         901136-915415
 20
                        2016-04-28 14:36:43
                                                698ab247141b7ee08376ca4bdc107614
      324362db1940e541cb85932aabba5335b6d39051
2c23952b20f4187c39d0fd1a78ff32d49c6d217d49eb3f60d45d2643a24121a7
Partition1/Root/Music/johnny-cash-cry-cry.mp3
   DATA: DATA (Non-Resident)
         915416-922327
 20
                        2016-04-28 14:32:14
                                                24d2f32b70c8720297b4683e45526d53
      e0dd254f7b546f3e11ce1e9a09f58570c361dd19
7adc7fe757bc7cdef0fe354b0bb8d78a22c192f8c4a52c177d9a025297e213a5
Partition1/Root/Music/johnny-cash-san-quentin.mp3
   DATA: DATA (Non-Resident)
         922328-929727
 20
                        2016-04-28 14:38:27
                                                ea34e906ad80d8c007b228d64f43325d
      61c9e3055c945058176152d9e3173f90a9f4c37b
fd4d14e4c536ced737fddd3c9503c4d6fe2fa2b15a797bffce2a822b6edbdb01
Partition1/Root/Music/Johnny_Cash-I_Got_Stripes.mp3
   DATA: DATA (Non-Resident)
         929728-935607
 20
                        2016-04-28 14:29:20
                                                012ff60673c13ee257122f7c89ccc8a1
      3bc32eb8195628611ebb11ecfe891b5ec974d3e5
63c6eb80644401b50f6056ccfa6bba2b28acd50354de27ab94ec7b2bb3838a35
Partition1/Root/Music/Johnny_Cash-Man_in_Black.mp3
   DATA: DATA (Non-Resident)
         935608-949151
 20
                        2016-04-28 14:22:18
                                                59d71c51254e6a34ec2b56bd24215f0e
      ae45fd4e2ae3f49d99703e42ab4098eb971d2454
1c48623249bf89e918b06169d6e6ff08f5d9902ec744762dd99d040f690348c1
Partition1/Root/Music/Johnny_Cash-THE_GENERAL_LEE.mp3
   DATA: DATA (Non-Resident)
         949152-956031
 20
                        2016-04-28 14:35:10
                                                59f3006e9f2f718ab75f7373e92bbd12
     bffb06aa970738517061f1358e318e5cc78273c6
5f7d1a6b32d4f316ac05b41e91b6a2752a860338cb7c09850c5d92a3ce897472
Partition1/Root/Music/johnny_cash_ghost_riders_in_the_sky.mp3
    DATA: DATA (Non-Resident)
         956032-963071
 20
                        2016-04-28 14:44:03
                                                5286083472934c6997889b1384dd750a
      f3eb5f4e78bfca1a1e4718c83a1e3b7a8efa946f
e02aa2f29274a73d1d4580cb00f5bc6f4166ca87427e0d8a4558ffea3e7fc1bf
Partition1/Root/Music/Stonewall_Jacksons_Way.mp3
   DATA: DATA (Non-Resident)
         963072-967495
 20
                        2016-04-28 14:58:37
                                                aec6b3e9c714bdb1472d21aad613006a
      e0c8ab1280482e428a65286e156a3287274fdb3e
d3b8e261c2afb6b0989e6a2d83205ea06603345ad3b336447d68ace48e697af7
Partition1/Root/Music/The_Bonnie_Blue_Flag.mp3
   DATA: DATA (Non-Resident)
```

```
978264-988463
20
                        2016-04-28 14:16:20
                                                85c29de2ac785e0f2453e0b86334ef54
      d5b2bc5822e324b4e943e076e6075aab8314cb56
a9070f9bc811a4174461542046a71870a99a84c5d05dee4452bcb1ce24f72a91
Partition1/Root/Music/THE BONNIE BLUE FLAG-1861.mp3
   DATA: DATA (Non-Resident)
         967496-978263
20
                        2016-04-28 14:17:10
                                                6cb3521e4ab602c95a09a61348545cfe
      3bdeb449dc5dbf5508e097b41a91d85c8a02df3f
c56dbe344b96a59932a0049378a6c591d19d189948ea0fd1e3b33dfd2ff6e7d4
Partition1/Root/Music/Yankee_Doodle.mp3
    DATA: DATA (Non-Resident)
         988464-993359
20
                        2021-11-15 10:47:35
                                                Partition1/Root/Photos
    $I30: INDEX_ALLOC (Non-Resident)
         54320-54327
                        2021-11-15 10:47:29
 20
                                                Partition1/Root/Photos/Diving
                                                1be9257a5f5816119a1ee7932f277709
 20
                        2009-04-29 02:52:42
     b164610273e1684806c4cfdfb087dd6bb9c45ae4
de7eee26d1a8ef8b8f7098ca323d635bc2f2e2ec3260a8e7cdb9afee41d679aa
Partition1/Root/Photos/Diving/MyPhoto1.jpg
   DATA: DATA (Non-Resident)
         993360-998599
20
                        2009-04-29 02:53:22
                                                96d4bd523d897cb9b71d81b9703e7361
      d4688bb699075afc0892b2a044eb42367c934c3e
7c0cb8fc34246a7711cf0e0ea56589fafdc204a911d20fe60ec23f516ca6a859
Partition1/Root/Photos/Diving/MyPhoto2.jpg
   DATA: DATA (Non-Resident)
         998600-1002175
20
                        2009-04-29 02:53:58
                                                bb6bbeaad2b8ef9c9abe4648de3a5999
      cdfcfb3779a3a208af1f7643914dce53632588c4
6030e056aa02221686bf6e6a32cfa7abff8a1401c28b43d57eab23a2aa1fc5f2
Partition1/Root/Photos/Diving/MyPhoto3.jpg
    DATA: DATA (Non-Resident)
         1002176-1005727
20
                        2009-04-29 02:54:20
                                                beb944c66d0c83a708fe1c69011a5d42
      4a9ebcece6a0c3a780f6e9852e065f2ce7d625a0
2b6598767763c096a1ec8161fd98ad00c878a514e91224e74598774e1285d00e
Partition1/Root/Photos/Diving/MyPhoto4.JPG
   DATA: DATA (Non-Resident)
         1005728-1007495
20
                        2009-04-29 03:13:38
                                                55bef019410f8bcd10731a46fa250909
      35fa0050b34ec540b6f9facd24d01d31094f8bc4
c343fee6083774eeabe36c0e4496de4af942ec99ac3f454c675cef28cf6f9552
Partition1/Root/Photos/Diving/MyPhoto5.jpg
   DATA: DATA (Non-Resident)
        1007496-1013919
20
                        2021-11-15 10:47:30
                                                Partition1/Root/Photos/Helsinki
    $130: INDEX_ALLOC (Non-Resident)
         54312-54319
```

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291
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20 2007-07-25 00:14:30 28b5e80d00c5c1e44547e944319f2fc4 6cffe5d309990d77989a119859d4f353f0e0169a 2622f7b32f509b200ac78787efd194133f8d36000fc739d22f0dad47a606e7b4 Partition1/Root/Photos/Helsinki/Helsinki 005.jpg DATA: DATA (Non-Resident) 1013920-1016151 20 2007-07-25 00:14:35 0985e9acf3eed9f6efdc54f6444a890c 8409c041c31a8eb3023994ed1b8f49781abf32cd 477aa2e3af10f4bc3715b20d37e89e52692450827b65563ff2223cc54d763287 Partition1/Root/Photos/Helsinki/Helsinki 007.jpg DATA: DATA (Non-Resident) 1016152-1018815 20 2007-07-25 00:14:37 6c0f93298d0e48ba408f661bfc2236e6 6fa4cc63ea595337398e2edb7f070860cd510b03 8cfc04cb423aa7bfdaac2580107e4dc2a5d05544848ea3de7c8c2fd22519390f Partition1/Root/Photos/Helsinki/Helsinki 008.jpg DATA: DATA (Non-Resident) 1018816-1021879 20 2007-07-25 00:14:39 eb17a6b5efad44800ce7d7d83c69eff6 ea0ca44a349338d6c4776c6a96fb7829316d9041 b83b385bf8de8d8457ffa0b8ae5e6adb625fc9153ffab29bae8afda438cb516c Partition1/Root/Photos/Helsinki/Helsinki 009.jpg DATA: DATA (Non-Resident) 1021880-1024591 20 2007-07-25 00:14:54 52a5aadcbfcaf383d1a0297bac0fb533 7faad9d693e98fad561813e6d4257fc34ef214fb 77cfcae9196c54e0a33116bfc6659e33835bae5ade4aa19a71f3a64fdd943b04 Partition1/Root/Photos/Helsinki/Helsinki 014.jpg DATA: DATA (Non-Resident) 1024592-1027959 20 2007-07-25 00:14:56 ff01a8fcc0828e06a441d6da9d971b25 ae1fd253e25c59f3825809fc18055c7a84dde7ff 78dd23b664150bbfcedb1a8146c8b6db6e00b6839ba9f3e7b5c064d61740fe77 Partition1/Root/Photos/Helsinki/Helsinki 015.jpg DATA: DATA (Non-Resident) 1027960-1031215 20 2007-07-25 00:14:59 b7fd46830da4a1c74c0dca5be70fcdfd b550ecd95a731e7fe45cf52b43676883409773c9 08447b4529b38472248673ee2ebb2e9f24958cbd662bf53680fe5bb43f647846 Partition1/Root/Photos/Helsinki/Helsinki 016.jpg DATA: DATA (Non-Resident) 1031216-1034159 20 2007-07-25 00:15:14 42cd2c12e0f30c16eaa5e32791ea2865 e6d0da7d265e116f8a7988070b2a8296798f2d91 df4725a0326e39af256d3a49cc83e4d4d435f121ac79a1a26eb1177060031040 Partition1/Root/Photos/Helsinki/Helsinki 020.jpg DATA: DATA (Non-Resident) 1034160-1039799 20 2007-07-25 00:15:55 8364499c7c8615c153efece95eb08384 2465309940f8a58182b4ed088bef7665d6b35159 84c973bf92e484c4f56575d929df42fb4ffffa275d9d1558a57d5618eec4a3be Partition1/Root/Photos/Helsinki/Helsinki 036.jpg DATA: DATA (Non-Resident)

```
1039800-1042735
20
                        2007-07-25 00:15:57
                                                21f868c3943b06282bb955cd9acf182b
     7957e9ea9347cb656f160cb053034817a52d803a
5716a3e5ee831b4df017e0eccd9df6a4b082c330d23ed134ca8859cbff65e00c
Partition1/Root/Photos/Helsinki/Helsinki 037.jpg
   DATA: DATA (Non-Resident)
         1042736-1045207
20
                        2007-07-25 00:16:04
                                                5e0825fd4b9ea941bc183b07ee53b30b
     10f84ba2a8812560d8b9f840046c1228cc47482a
34c4ad4320904766be78eb8a5c6041ad0dd63a8c6796730ac99f6e6d7ff375c1
Partition1/Root/Photos/Helsinki/Helsinki 039.jpg
    DATA: DATA (Non-Resident)
         1045208-1048895
20
                        2007-07-25 00:16:26
                                                f60112a20189a34ded555d744fc995cd
      2031d955a59fb5bbeaac6c5d02f34e55134791be
9fde08acebe4cb7e8dc5708a7d088791a25530418c9a35c9117da43c03a3013e
Partition1/Root/Photos/Helsinki/Helsinki 046.jpg
   DATA: DATA (Non-Resident)
        1048896-1052791
20
                        2007-07-25 00:16:53
                                                6bdc1d3560757979d5a8c74499703fca
     d3734dd78b1dc1d7aa80e7a37c052a64e90b7161
86abc31897dd528e0d2bfbe7adbe0cf13c750f0a335cff560bd9809ee30200ec
Partition1/Root/Photos/Helsinki/Helsinki 055.jpg
   DATA: DATA (Non-Resident)
         1052792-1056847
20
                        2007-07-25 00:16:57
                                                eab027d27180b03de7e2545824918f50
      a7840875a34c7b006c79a13f2cf4c97a8db83f84
587323db9e818f483b1f6dff3720e3c94db08a508d93473ac6c82f43dd2448d9
Partition1/Root/Photos/Helsinki/Helsinki 056.jpg
   DATA: DATA (Non-Resident)
        1056848-1062087
                        2007-07-25 00:17:39
20
                                                fe959fdcae31e90b0fdb0a3982e59b79
     74a2b387cd3326b645d66c1219ab2104d4f10d25
7d23a5b29e990e1f4310f53f432e73dd89001a511fa0a8672214e7ab2ab86bb8
Partition1/Root/Photos/Helsinki/Helsinki 068.jpg
   DATA: DATA (Non-Resident)
        1062088-1066479
 20
                        2007-07-25 00:17:51
                                                048ac817b294fcbd35226d924dd6403e
     136b336c3532deca6c127d208732db730c3632d4
7b835006d4c1d9f5785f1a784cb86d2be8f47cef5e697df057dd918070c417db
Partition1/Root/Photos/Helsinki/Helsinki 072.jpg
   DATA: DATA (Non-Resident)
         1066480-1069903
20
                        2007-07-25 00:17:53
                                                2b62227eb196f862d1cf457a5ddac5cc
      347e84f14e2e129a591d2d522e81297d4d4c7522
779fc6198aab07b47c7164961b9fe7fd337e52d4ef113689abaa1f31c264a1bb
Partition1/Root/Photos/Helsinki/Helsinki 073.jpg
   DATA: DATA (Non-Resident)
         1069904-1072775
20
                        2007-07-25 00:17:56
                                                890e90a5a7abb2d1a27392229808b4c2
      5acbac453876602bcb7faaba6914248a0d872608
36274f507db46efa766e15f0a461fe5a28ed10826a281b4b96e9df0711564baf
Partition1/Root/Photos/Helsinki/Helsinki 074.jpg
```

```
DATA: DATA (Non-Resident)
         1072776-1075887
 20
                        2007-07-25 00:18:01
                                                d39d9a42c01b2108540103ce2f788520
      21dfc2b20479ee49c336da51cf587e72012b5bcf
495dd2dc8a6d2604529975e79572ae86d42014b3e05ce342606fcfb234afa2f6
Partition1/Root/Photos/Helsinki/Helsinki 076.jpg
   DATA: DATA (Non-Resident)
         1075888-1079175
 20
                        2007-07-25 00:18:04
                                                8e8492d1199d9009f051056b7e87f6d0
      7a03c9c26fac9c90861e698647b473f0a2a1b0dc
68029f074e36d150bec089850c56c82d5e372763c6cebedf3f471d637a92aa68
Partition1/Root/Photos/Helsinki/Helsinki 077.jpg
   DATA: DATA (Non-Resident)
         1079176-1082087
 20
                        2007-07-25 00:18:06
                                                883494b431679f7f9d39ea7d1ceb157c
      50bc8c009c7c51b4616d27a1617facb6fe328fd1
5928276ed054d2e97359345c2ba204ce53fe1cae4357100ef71dfe1aa3a023ca
Partition1/Root/Photos/Helsinki/Helsinki 078.jpg
   DATA: DATA (Non-Resident)
         1082088-1084655
 20
                        2007-07-25 00:18:08
                                                f47cd4b931c58d5c6afd085467ceed91
     b08393e2e176e342a02d3faa0ddd920cad62c021
d4169e76e48b21e828783e426a4fe722ee4be7070ee164802fe941b43819e2bf
Partition1/Root/Photos/Helsinki/Helsinki 079.jpg
   DATA: DATA (Non-Resident)
         1084656-1087415
 20
                        2007-07-25 00:18:11
                                                6d75cc9c722568437c5e8794412248b6
      13fa2483785d35170cc086691f4394650f91a418
ca5a0e3e2d3e675605bf3eaf97c2bfaa7aa543f26b21f168275aa41eb6411580
Partition1/Root/Photos/Helsinki/Helsinki 080.jpg
   DATA: DATA (Non-Resident)
         1087416-1090207
 20
                        2007-07-25 00:18:13
                                                9796e28ed4fa1a498fb0d4a88d54271a
      597df2450fcb9a316a6ff38d73019d7d3a61fefc
e368ca4f127fadca31ca967bbc4e0c053b545155864d65fdb12172ccdbc041d1
Partition1/Root/Photos/Helsinki/Helsinki 081.jpg
   DATA: DATA (Non-Resident)
         1090208-1092983
 20
                        2007-07-25 00:18:31
                                                4c313faa0ef5e45095fbbfb9df12ba3b
      701e94358467ab51eeb285128eab7b14c5a991e4
a113063e2a5139328035dfb08a1e90e1e28a547ce3d4596e1d1d2ade4a8018a3
Partition1/Root/Photos/Helsinki/Helsinki 087.jpg
   DATA: DATA (Non-Resident)
         1092984-1095375
 20
                        2007-07-25 00:18:33
                                                2b19644cde41ead9a90607ddefbd9baf
      bdd733f02ffa868959fd0211032d6743924ca0a0
f2e739d955a2257d9b5cee24b3748e28ab6303ae314c5ebd5007426f3cdef87f
Partition1/Root/Photos/Helsinki/Helsinki 088.jpg
    DATA: DATA (Non-Resident)
         1095376-1097783
```

```
2007-07-25 00:18:35
                                                726690c9daec4197326eefa1c43aeea9
20
     029b8a8f3e152b12ad93fc24d007dbd0c4e4795b
9ba48d14266e1e0b3e0ef70e5784a948729ead0873ea22487a97a4d4107c24df
Partition1/Root/Photos/Helsinki/Helsinki 089.jpg
   DATA: DATA (Non-Resident)
         1097784-1100831
                        2007-07-25 00:18:37
20
                                                0c72be139e24115e6c158746f68cc331
     10b55785fbb2dd271d493be3602a5f5547b252f4
a4e27da775a445947ae3609332aa8685a67de31c62d8057cc9499e26bd70d1d2
Partition1/Root/Photos/Helsinki/Helsinki 090.jpg
   DATA: DATA (Non-Resident)
         1100832-1103079
20
                        2007-07-25 00:18:39
                                                f85c8796fa3172ddb8bdaa6cccb10a53
     1567805661f1d053fa4d53957d6d9893e1efd7ab
246697b1731a42e45c1526217fd9aac2ba85cc0d29970c6179e94a87f7ed03ae
Partition1/Root/Photos/Helsinki/Helsinki 091.jpg
   DATA: DATA (Non-Resident)
        1103080-1105343
20
                        2021-11-15 10:47:30
                                              Partition1/Root/Photos/NY
    $I30: INDEX_ALLOC (Non-Resident)
         54328-54335
20
                        2009-05-24 07:43:16
                                                77b5b122cd1b05c2af50cd0836f9b985
      31a3271a5d1b054dc69992580d32f26a8adb9383
47fa5a2e0ef322ddc7018a13324c80ea39dfda762d844de8de680b358b088044
Partition1/Root/Photos/NY/IMG 0201.JPG
   DATA: DATA (Non-Resident)
         1118136-1124855
20
                        2009-05-24 08:25:48
                                                a09054f3aceefb09a45ca4478b43640e
      05311785bee82da2d04a7b83d8fa4108d48a7f84
401d1499cd59ec7ffc8e215baeaffea2c1d752a60df93783a6c328dc3373b1a4
Partition1/Root/Photos/NY/IMG 0211.JPG
   DATA: DATA (Non-Resident)
         1124856-1133791
20
                        2009-05-24 09:58:56
                                                a343458fad6b045f9d77c6fb646f71ce
     dd2bbbb4381c49130a9ad450252f0b8c849cfaa2
860249189d3d69279458b6b3f41b2839fde01df255c81ceaf3c2ce13a4104a2c
Partition1/Root/Photos/NY/IMG_0250.JPG
   DATA: DATA (Non-Resident)
        1133792-1142863
20
                        2009-05-24 14:21:14
                                                c29ac1f58994cb46c53a56f46fdde5b5
     a8f5e6e7eafc146e3e868eaadf38cc9f0c28ebfe
d97b2373efdab0df6877c8637749310b0c11310081e1830eac7e630232a21b8c
Partition1/Root/Photos/NY/IMG 0283.JPG
   DATA: DATA (Non-Resident)
        1142864-1151551
20
                        2009-05-25 11:07:46
                                                f8d65215fe542da63bdee82868e0fe9a
     f9eabae61c6d18c1ad3c5dc2d45b1a0a01e6d09a
fc31eadca0b68f19c6ba0be9c8ec51ec87e2fb0e718dc2ace60e257883a6162b
Partition1/Root/Photos/NY/IMG 0389.JPG
   DATA: DATA (Non-Resident)
        1151552-1159343
```

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295
```

20 2009-05-25 11:15:24 f145c400d3ed9e69557851c522320a56 3f56ea39f77f1fd9b18dc2041f51baa61504103f 7b4c77c6dad37857ec7fd82e960db64e4c842d05cfc72115b7d439942f8d051f Partition1/Root/Photos/NY/IMG_0390.JPG DATA: DATA (Non-Resident) 1159344-1167087 20 2009-05-25 11:15:32 b603d9b3aff85c5f62a9e8091f2dc916 b496ea7f8aa7ed6e5b4c893225ae3912fc8a0970 1028b54e45ac0d610863a8e8a3448c7a428518e96b517ba9170aa5eea7cfd0eb Partition1/Root/Photos/NY/IMG 0391.JPG DATA: DATA (Non-Resident) 1167088-1175415 20 2009-06-06 12:01:08 94ca44fd6bcad151e18159393fc0e71c 0b9a0d4d357d9236ac8dbc2d09b3e4792c934a14 c8a4056f1e11d6d4041bf97db5cb37c102f9117e36009a723881f809cb84c881 Partition1/Root/Photos/NY/IMG_3694.JPG DATA: DATA (Non-Resident) 1175416-1187271 20 2009-06-06 12:11:32 35df6163f8b1154b535bb185aced2d56 01f1be100762c5d175ec75eb8333079551f29c00 fc71d8ebcc188ba26d3e07a28da5ddf89078606d20d84f4922412ef8a5aac283 Partition1/Root/Photos/NY/IMG_3699.JPG DATA: DATA (Non-Resident) 1187272-1197455 20 2021-11-15 10:47:34 Partition1/Root/Photos/PNG \$I30: INDEX_ALLOC (Non-Resident) 54336-54351 20 2016-08-09 06:29:55 0e20c4014a80419756af6b3618d894d4 dfeb1486ddb64d89b56426847dc945d40a7413fe 7392ae31589eeb672798620f5fa6f5776a67c7aa7494c455e509df324e915a09 Partition1/Root/Photos/PNG/DSC00398.png DATA: DATA (Non-Resident) 1197456-1204095 20 2016-08-09 06:29:55 50a39ae6bdde09570419e04899e861ca 7d9a673c484ae32fa631bc03bdf3f3c5c670524f 957f4fa27af2dbbc6b4d5156a8151a6222093e8dad15a7c53559c118fe8443ef Partition1/Root/Photos/PNG/DSC00400.png DATA: DATA (Non-Resident) 1204096-1208903 20 2016-08-09 06:29:56 07a975f0d121d5710e9e0678c9f08a5d d15beaa4483bda7879642f452a76a5f9d0e5a2ec aabc57174e53dd3af315c336720dfef22fdaee6ece52bfc59a8e36ed09cd31a6 Partition1/Root/Photos/PNG/DSC00401.png DATA: DATA (Non-Resident) 1208904-1214455 20 2016-08-09 06:29:56 1cfea16f1e3b86b9d85ec43a1c146405 c78d1c40f4579c7c8a98d9cd6629083a48c42a03 51415fb98f758a51ec6fd914cf6b57b9d34fd3564f61b05a57df7376f038b536 Partition1/Root/Photos/PNG/DSC00402.png DATA: DATA (Non-Resident) 1214456-1219775

```
20
                        2016-08-09 06:29:57
                                                f39301a4119a7e8b83f8bb9573675cb7
     1bd0dc7373246658aa02cd49846f51b9cb4baa85
f5cc938586b14de903d81f20d3948c41ceb47ccbb4bc8062899f750371d5ff85
Partition1/Root/Photos/PNG/DSC00403.png
   DATA: DATA (Non-Resident)
         1219776-1230831
                        2016-08-09 06:29:57
20
                                                2b6dd7410024c29335480e4b01ecf6bf
      8b76cfdfc2c4bc8ccfef9bfa859e0a7d798bdc25
elef35ccca901231062b8d831a77e703819a931a5e63e0c23761754798e3e44b
Partition1/Root/Photos/PNG/DSC00409.png
   DATA: DATA (Non-Resident)
         1230832-1236839
20
                        2016-08-09 06:29:57
                                                831472853caf70e4279eb9b10fb95502
     946d4e88d33b732e7ebf9e4a76ba8eac5d5efbab
3f124d3163afa23b01b70667de6c4eb8ae56763bca0def60a74f24f7c9eb434c
Partition1/Root/Photos/PNG/DSC00410.png
   DATA: DATA (Non-Resident)
        1236840-1243119
20
                        2016-08-09 06:29:58
                                                554ec19309cce9e77234673957d843a6
      4487afbe76ff4de2a255a2cf1b3c428c46ac0fe1
1ada79bc031064a27353aea69860a3edd9bcfc6eadbcc9af2c115cad419cc275
Partition1/Root/Photos/PNG/DSC00411.png
   DATA: DATA (Non-Resident)
        1243120-1249863
20
                        2016-08-09 06:29:58
                                                bbbfa1afbe6caf6d20727636eca423c6
     11b5983ecb84b0fd177be00e6319d2598d0e577e
9374fb21b2c7126dfc5f7101471baffff849998d9eb42796a280c448ba95ba68
Partition1/Root/Photos/PNG/DSC00412.png
   DATA: DATA (Non-Resident)
         1249864-1256839
 20
                        2016-08-09 06:29:58
                                                d6596d9f439081baed836fa0c8a28a8e
     15c0b00e68f538c8d5ef69b2bc27e9362a8dd439
4cdcf050e903d1daa38d87b04855c7419e44409165d2ea41381c7cb122d3b257
Partition1/Root/Photos/PNG/DSC00413.png
   DATA: DATA (Non-Resident)
         1256840-1264383
20
                        2016-08-09 06:29:59
                                                3980b368079e048f6f8eed6d218f1456
      97d2ce7c74dfd4a07f6b162b69b822945e50413d
073a2f3e47a5092e8877a46b441a3f95eaa73d1e7558c746ca833b87dadc1013
Partition1/Root/Photos/PNG/DSCN0108.png
   DATA: DATA (Non-Resident)
        1264384-1278247
20
                        2016-08-09 06:29:59
                                                3af85c982fdaee46f578fcec569f037e
     36a556ffd3c56988dcec87a15b61c0a916132be3
c412553bcb7e21e6cf15e377873ee80738a6b6f9990b4e84fd7fa9b1db44a95f
Partition1/Root/Photos/PNG/DSCN0109.png
   DATA: DATA (Non-Resident)
         1278248-1288871
20
                        2016-08-09 06:30:00
                                                clac17a6c98f27fbeac401359f14b515
     e6b6186c29e38ea7dbda9ba4b8c242732d4b2241
3bb72a8e56f4f4f36760fd9256a366690650f54f8202d789bde31af8535fad46
Partition1/Root/Photos/PNG/DSCN0113.png
   DATA: DATA (Non-Resident)
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1288872-1299927
 20
                        2016-08-09 06:30:01
                                                03d72084aa58d9ce060595bcfe0257a7
      973a861c8388d4caac711f847005e944edb50d13
b2ce7f5ec69b5418bc723a160f4cc8780a9d3184efb2d3de220d0cb848cb6c33
Partition1/Root/Photos/PNG/DSCN0116.png
   DATA: DATA (Non-Resident)
         1299928-1311911
 20
                        2016-08-09 06:30:01
                                                a066c510d6c6ae3227d4f675abe5b0f1
     b2ae56bbcbd1962ba46802878e67b96dcf384673
1344199eda7438278493240159d4547186da9e9f485480bf7b435f4184a12835
Partition1/Root/Photos/PNG/DSCN0117.png
   DATA: DATA (Non-Resident)
         1311912-1323551
 20
                        2016-08-09 06:30:02
                                                d5dfe820657d381ad10740edc4536a67
      6b7e5f77db5bbacb5a5516ab6bbe20e19b928d48
3bd8b74067d514bd306318489cbbfd056aaa25a7cdf19e888198e35e56259e37
Partition1/Root/Photos/PNG/DSCN0121.png
   DATA: DATA (Non-Resident)
         1323552-1343399
 20
                        2016-08-09 06:30:02
                                                9a667f59d860a11fb4a0bda9f6fdf0d6
      9a6cc2c151aae01c03fe955fa44b5e1e482d5ce7
7759c44a7b384eb1c5bd0e351bfd91a7a839f1ac4bfa7ab813ae5c48514a2bc3
Partition1/Root/Photos/PNG/DSCN0124.png
   DATA: DATA (Non-Resident)
         1343400-1347279
 20
                        2016-08-09 06:30:03
                                                2c08bc733d7461eeac2b1a9af2b9f360
      dc4fe2772c7392aa184a9f83fd9a34114024f5ef
af0c4ab532fca75fa8f84b80a0d7fd6b3d9593f531ea989ba84b8b7f94d6a3b7
Partition1/Root/Photos/PNG/DSCN0125.png
   DATA: DATA (Non-Resident)
         1347280-1357855
                        2016-08-09 06:30:03
 20
                                                0a5e03889a84d667baabdd3094e61025
      ec6077f5b83a2f683c82a7279511a6478fe98f91
f85747e4ca8289fd1ef0c96fddd7aaddf70b3733c2a91054f762968ce8ee6942
Partition1/Root/Photos/PNG/DSCN0129.png
   DATA: DATA (Non-Resident)
         1357856-1367767
 20
                        2016-08-09 06:30:04
                                                5ee9282489f0903303703bb5d77d439a
      d5da1618ec1281d2e48e8f74fdce2e1eab40576e
b5be34d6680d6ea87ae54801dbb57cb720b2bd872dcfc527a8550c895c03727b
Partition1/Root/Photos/PNG/DSCN0131.png
   DATA: DATA (Non-Resident)
         1367768-1379495
 20
                        2016-08-09 06:30:05
                                                9e953995ca786148098b427656a60e35
      090f7c89de46092ea19b3b0a0f8b93300bbf0dc6
46d66ae03cdb2566c5893391e2c8cdd3f8402914bdd635cc9def0d46c7bfb23d
Partition1/Root/Photos/PNG/DSCN0132.png
   DATA: DATA (Non-Resident)
         1379496-1384247
 20
                        2016-08-09 06:30:05
                                                cfe7fe275b90861aa58433e1aaada445
      84afbdceb6f06bc5fd4ef5ae58a7417357d2b5fb
5edfd80300f07e45c8484d52c005afe83c00b56df1e56f3387ae2047120c4729
Partition1/Root/Photos/PNG/DSCN0133.png
```

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DATA: DATA (Non-Resident)
         1384248-1402263
 20
                        2016-08-09 06:30:06
                                                ca234fe6fa2fc56916c1450e9fcc891a
      f62c36132b14d9afa36d1a2927cb4c5f2bba9705
7462ead43cbfbee4df6e1673ccc2d08800641de9b32f905f0f85dd7196a916f6
Partition1/Root/Photos/PNG/DSCN0135.png
   DATA: DATA (Non-Resident)
         1402264-1413071
 20
                        2016-08-09 06:30:06
                                                2c386dda664658d66050e7cfd9d869fd
      7ca02cbaab88968b2b30e34b2d1e81cd9fe0b8a4
d219ab0e123d60887b31202dae8c68045518346d90511b86d3c908c763b58b2a
Partition1/Root/Photos/PNG/DSCN0136.png
   DATA: DATA (Non-Resident)
         1413072-1425783
20
                        2016-08-09 06:30:07
                                                b2b1be511998f2e630475d164efa0c3d
      1482b7550f5f958eb62e5c3a77a13b594d33695f
7d580fccd6dfb31cca059dfd4032ec4793de0acba9c3ba89ac63fc3724f5b4fc
Partition1/Root/Photos/PNG/DSCN0138.png
   DATA: DATA (Non-Resident)
         1425784-1432047
20
                        2016-08-09 06:30:09
                                                28c3d52822bcd0eb7123a20f9d0f71a0
      0add9ad208f1878ee29f26f74746591c81377934
ae8696cbc2e7427fa257d6760471a8aa8255f6c17e5ade05c8c83874e8c765da
Partition1/Root/Photos/PNG/IMG 0301.png
   DATA: DATA (Non-Resident)
         1432048-1460183
                        2016-08-09 06:30:10
                                                f5e5a8ad113cf60301cc3038738018df
 20
      db903a727602dca3f285d4c837bb7b04591dd260
229324830ef256de4a568105244876dc6cb38c7fcbc883b23d1ceb599c10d529
Partition1/Root/Photos/PNG/P1000075.png
   DATA: DATA (Non-Resident)
         1460184-1482863
20
                        2016-08-09 06:30:11
                                                dbc0c95df4c2b4a16fd5d653a03e3a03
      3fde4c2902804033cfc33f70292b5e840b649917
f257c37d5437b8f38c33d97f2df239fb07990af33080676d5721a798c3fcd268
Partition1/Root/Photos/PNG/P1000076.png
   DATA: DATA (Non-Resident)
         1482864-1500847
20
                        2016-08-09 06:30:12
                                                a3df8bed38651d33eac4b21dd6a001e5
      20c969a51774ada67c4488028b73fe5db1883ef7
9475b205dded40cc9b42d5c9a5ac75021fba4c068f4e1aa5f984e4b42930a1b5
Partition1/Root/Photos/PNG/P1000077.png
   DATA: DATA (Non-Resident)
        1500848-1522703
20
                        2016-08-09 06:30:13
                                                7262d86f98a816ac5aa19d5000fdaa38
      ca5a2244d3bdea722af50db79459d4f56ac29aea
19265744bc50cc6ebdb7dd30c358d350d589827ce088da6b12a73d7bcc6b8415
Partition1/Root/Photos/PNG/P1000078.png
   DATA: DATA (Non-Resident)
        1522704-1544367
```

80+ 299

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20
                        2016-08-09 06:30:14
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      a3d919d08dfae21239593898960b415f4fcad938
c8fa689c01b91841af197ff442ba4aefb5673021bdcc4e9cfd9e40504ac381df
Partition1/Root/Photos/PNG/P1000079.png
   DATA: DATA (Non-Resident)
         1544368-1566127
 20
                        2016-08-09 06:30:15
                                                b3943271dec5e1d6f8f98ce41195a573
      9fa3da99f4a4ca7c1370f8c91d4789e3d6de658d
60bacec13cd11f0b094df945f9024bff7b916d8491cb3219085c7d1e22322bfc
Partition1/Root/Photos/PNG/P1000080.png
   DATA: DATA (Non-Resident)
         1566128-1587527
 20
                        2016-08-09 06:30:16
                                                399f7ca061e54f792c0842ddb75abe08
      f70bd20e4ae6d08da136889d32d066f6fdf17089
fe0f4d8b2cb268cd92235375fcb5df2445c27498c663ee64f3e84a5d97931246
Partition1/Root/Photos/PNG/P1000081.png
   DATA: DATA (Non-Resident)
         1587528-1609207
 20
                        2016-08-09 06:30:17
                                                badbc4166c959a41bc77820f2c1aa5ac
      24d11bd0f46e9598a4a5a09e7c2c250f4c0190f1
fb9a16f920b54863194096ebdc384445f0fb82d3cdbf1224607fa46b6f72a6f2
Partition1/Root/Photos/PNG/P1010289.png
   DATA: DATA (Non-Resident)
         1609208-1631775
 20
                        2016-08-09 06:30:18
                                                3699a09b4d90e3e0466d2e025ac71f38
     db77c0005f5554eeb928a28e642c20b1c1c19459
424a8ae233c30ce4931ef37b5d76c6c335261af36b76af9bcb2e82e2e67a4c7a
Partition1/Root/Photos/PNG/P1010292.png
   DATA: DATA (Non-Resident)
         1631776-1645127
 20
                        2016-08-09 06:30:19
                                                9c8dfa6629ca4056b66ba70df36b6155
      3014b48f9d129411703968c62347a6741bde31da
397078f5d412f0dadf993efbbc6fc986e107bbef03a8e88a59f26d62ee629833
Partition1/Root/Photos/PNG/P1010296.png
   DATA: DATA (Non-Resident)
         1645128-1663407
 20
                        2016-08-09 06:30:20
                                                449a39e60fb73cd06792eb33702e3fd2
      7aa3459012435f09a2abfe5d2aaee35beea20e8b
70c8b6f17dfe2770bd089fc1c837863743d638b991eaf382713adb536cd14338
Partition1/Root/Photos/PNG/P1010299.png
   DATA: DATA (Non-Resident)
         1663408-1680375
 20
                        2016-08-09 06:30:21
                                                ee784f441db80e795a4f50a5ed06bc31
      f544a576568271f1a70995fe83bdc6926351b954
9d17e3ea583d57ca7d2b2abaa7b0f676a098d0e2e8508085eee3dd0df639f32e
Partition1/Root/Photos/PNG/P1010302.png
   DATA: DATA (Non-Resident)
         1680376-1692727
 20
                        2016-08-09 06:30:22
                                                9b2ee5928e602ec7610cad42538a2ea7
      c8a6797e0898840a416b40a71facdc991badd151
b3520b16941b9a6a82db76978bad29faed5bd1af715f9f8d0a9511e830e51c39
Partition1/Root/Photos/PNG/P1010304.png
   DATA: DATA (Non-Resident)
```

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1692728-1704823
20
                        2016-08-09 06:30:23
                                                1bfbd10558bb2dd12cadfd3032b78572
     fec0d4502b9ff0d5b892e00edb5f8a7a391f79f2
af314883ec48e419f8dfdf653c212be1dd9664af4f1fce7dd6bd56becf925b1e
Partition1/Root/Photos/PNG/P1010316.png
   DATA: DATA (Non-Resident)
        1704824-1726783
20
                        2021-11-15 10:47:35
                                                Partition1/Root/Photos/SF
    $I30: INDEX_ALLOC (Non-Resident)
        54352-54359
20
                        2009-05-30 10:13:46
                                                be7dba7a3fff3748f1f438b728b279a4
      3cc2043ed0f732f71cf92f505fafb9e8282925e2
9249d50a8d9054d2bc182f1504f085621c8db30e7fd3081b5dfd83f5d9890c3a
Partition1/Root/Photos/SF/IMG 0869.JPG
   DATA: DATA (Non-Resident)
         1726784-1734007
20
                        2009-05-30 10:15:56
                                                999611c3e27def28c94708e9b6203db8
     34b2fda8e0db1bdee804c403574e0e067e07cb13
71f3335d6e50b888d6f80b57c2408921466623ef90d1a6f33b6c5e8a775573d1
Partition1/Root/Photos/SF/IMG 0873.JPG
   DATA: DATA (Non-Resident)
         1734008-1745495
 20
                        2009-05-30 10:47:26
                                                ca72b6c55f22a45908b24cbd8bf29a56
      4a6f4ab37a9caa41ba1b8f5b97d81b4c157d9d20
84b973d5bafd5fa96a9c62130536c457d0f67e77db155e41f819a83d13867d52
Partition1/Root/Photos/SF/IMG_0890.JPG
   DATA: DATA (Non-Resident)
        1745496-1756559
20
                        2009-06-03 09:59:04
                                                bfa7e431bf44e036bd8c6f77179e7543
     c501d565c9570983c7be391ad6c4175c23d8e077
e77e31291d871816c80055edee4ad8c650617c58f4dcd55b9492b8e5a07742ca
Partition1/Root/Photos/SF/IMG 1739.JPG
   DATA: DATA (Non-Resident)
         1756560-1764895
20
                        2009-06-05 16:58:08
                                                1854c9f44cc66810600f955e7e57bdb1
      4f878ac70788a0b2942afe7449bb2b13adac23f5
e4503c9868e27b7a333e69624fe3b7d62e2ca932e1990fd96d0fc22102111c4d
Partition1/Root/Photos/SF/IMG 3460.JPG
   DATA: DATA (Non-Resident)
         1764896-1773871
                        2009-06-05 16:58:26
2.0
                                                6f2ac54948b5b30ce16e477c66e111ce
      6fc0971621d0185a8364b15518eceb79d39b4d9e
acafd581b254a3c004a962a13f4cf37197819770b7b8b45d12315d7f74f8f243
Partition1/Root/Photos/SF/IMG_3461.JPG
   DATA: DATA (Non-Resident)
        1773872-1781887
20
                        2009-06-05 17:02:50
                                                2a052e493fbcd7cdd55a850a611cc445
      442be0bacc541cfd913bfd9322b6fd453359f39d
da4c8a85efc46392dba681825a0a4eecd9a6a3d1d0f33b233638d89ea5ff981a
Partition1/Root/Photos/SF/IMG_3476.JPG
   DATA: DATA (Non-Resident)
        1781888-1789927
```

2009-06-05 17:03:22 20 44652638deef4f478e07706566550c61 b4393152bedf73c7c5df083b42ff7843d4602f67 b5e555ca283d8ed1b765f12312f87c3c311ef157dd8bfbbe6f1392dabbb770f1 Partition1/Root/Photos/SF/IMG_3478.JPG DATA: DATA (Non-Resident) 1789928-1799639 2009-06-05 17:03:42 20 3872c8067f88768007a636d612c3650e d32f3acf3b3deeb86916106fa7d9c4537979d9eb e9af47c22716e1d660cf85cb51b096a331f74f6f630fda53e941e3fb61000e96 Partition1/Root/Photos/SF/IMG 3479.JPG DATA: DATA (Non-Resident) 1799640-1808399 20 2009-06-05 17:03:48 035c6628e8d5bbed6287bb85cf6022b2 aa888343c7b2cc0b633cec47a12ac1b984f7ea99 17475eae12901a87325a745dd90adae4565f5de89f122c72a6bb64bf6de96304 Partition1/Root/Photos/SF/IMG 3480.JPG DATA: DATA (Non-Resident) 1808400-1817175 20 2009-06-20 11:00:56 e41f63dcb998da55a02dd60fa505bcdc a0abbb34ddd702d6497978d1f48c92aff7f7cf31 02f936f3ba9a24f0fce9c3fa840780d36bf7eb6b01671312c085aa4c54b43ddb Partition1/Root/Photos/SF/IMG_3481.JPG DATA: DATA (Non-Resident) 1817176-1824095 20 2009-06-05 18:50:22 22e77e0803b18803256074b4c252bd88 6f562ec7317481dff469c03a3e6390f9c370f00d 036c2c5dd5e4b22b3894b3a45dd6bec0da5ca5330b3d0031c40a4e32af2634de Partition1/Root/Photos/SF/IMG_3493.JPG DATA: DATA (Non-Resident) 1824096-1833839 20 2009-06-05 18:55:56 1300d583c82fe612dd57d3ad910a9486 0e57692faeabc7845441bd30ac282f2cb83f29f1 6f6f10a14c50635a84a63fefcc97845831f0dbd5f78d54e6b16589462f825926 Partition1/Root/Photos/SF/IMG 3535.JPG DATA: DATA (Non-Resident) 1833840-1841103 20 2009-06-05 18:57:38 8b1353ff9495552a19b0bfeec5394247 1f4fe5885358892353a875c06b616c9cfe14d81b 69b90255a3a0f893a3e7565c69f0cec869ed2bce143fda09e4c1ffc99a6c00f6 Partition1/Root/Photos/SF/IMG 3542.JPG DATA: DATA (Non-Resident) 1841104-1849135 20 2009-06-05 18:59:32 cefa4e580592809baf1c00cefacd93f0 7c871f52b0f04cd6ceb2e6bce43164157eef6234 965587104c3492b03b42fca3c7f84ddadcf789462f1b0d46bb972b3d6466bba0 Partition1/Root/Photos/SF/IMG 3579.JPG DATA: DATA (Non-Resident) 1849136-1857167 20 2009-06-05 18:59:40 9143872d4928619a667153c4ed3a303c 11cdcf422af6bfda3857dfa92b38eb9095c9d242 4e8e53a15940b4c9aa50be4bb088aabfe42734e5b31259f750d0fa1db4f0b1e7 Partition1/Root/Photos/SF/IMG 3580.JPG DATA: DATA (Non-Resident)

```
1857168-1864031
 20
                        2009-06-05 18:59:48
                                                a545a740177ead5214943f35115e2d84
      1897045c018a11183ab3acf9e4ba123e666508f1
6fed1d2964c18f82e7d5ea8f5d3077c09a56d8536359cdd81147299abce60b47
Partition1/Root/Photos/SF/IMG 3581.JPG
   DATA: DATA (Non-Resident)
         1864032-1872407
 20
                        2009-06-05 19:00:18
                                                74896797a5afc74f9d257c087a2d7637
      407583fd0347dfa12f33662d334d230facd3b02d
4a825f744198f83421b6a61bb96e5bce642f3256bfc16178e674e3ddb5a42eed
Partition1/Root/Photos/SF/IMG_3589.JPG
    DATA: DATA (Non-Resident)
         1872408-1881495
 20
                        2009-06-05 19:00:22
                                                191bf4eac6e4bec6779e857609448a0c
      1f9531e936ae6efdf1328c4b55e22640860e2f98
e872c99ba38c4110b6175cd3cf1e5e7fd7efbb7ce3062d96ab6c5eaa140323ab
Partition1/Root/Photos/SF/IMG_3590.JPG
   DATA: DATA (Non-Resident)
         1881496-1891071
 20
                        2009-06-05 19:00:22
                                                d8b25a6d107fa25e67c01fd1691a840a
      ea92863dc37bf6d1c9d2c8f29f16424c4f768bf6
18a4871a2a3fbadb0d29653d8588b4fb32e41b9a3c6637279279384675f12dd7
Partition1/Root/Photos/SF/IMG 3591.JPG
   DATA: DATA (Non-Resident)
         1891072-1899431
 20
                        2009-06-05 19:00:22
                                                be2a41a0f6c956b0a9105cbc81366a86
      6f62e8ea9a06e82a63f796eb532be7ecdeebfd49
b68f3bad91756a3e13652c6195c2884b7867f2a13cab485ce2cb779ac36f7754
Partition1/Root/Photos/SF/IMG 3592.JPG
   DATA: DATA (Non-Resident)
         1899432-1909759
 20
                        2009-06-05 19:00:26
                                                482bfbc2665903526f3bb328d70bcc68
      61deca50b2413161e868a249afd24fa696f4cb33
fafd55132f1cc69b75470ea0c745d694240e7184b46af5c4896a0bd741f28c60
Partition1/Root/Photos/SF/IMG 3593.JPG
   DATA: DATA (Non-Resident)
         1909760-1919471
                        2009-06-05 19:00:30
 20
                                                157a7a625ea640ff216ef35c01b20740
      69d556d9d0b24e42803719f268abacb8a9b13312
428284f5eb2a1955514beaff192dc352276b4ff2630f8c45418a361be6194c9d
Partition1/Root/Photos/SF/IMG 3594.JPG
   DATA: DATA (Non-Resident)
         1919472-1929079
 20
                        2009-06-05 19:00:32
                                                b36d08d7fddeae5a02bf023c82f6ce6a
      9e42ca16ed3796bf4e5999a2984a0b02b16e0c11
3f26880ee0c4a655f47b60537967f1c4343884a8641c21ccb6f217a51298b4e9
Partition1/Root/Photos/SF/IMG_3595.JPG
    DATA: DATA (Non-Resident)
         1929080-1939511
 20
                        2009-06-05 19:00:34
                                                298393890a37472a688a82e7bbc13ec7
      03c15b242f3f0b7c82bae05898db3ad4bcd912cb
84a890dd1d913c5daccd41689890c1156ab5d45f36e34563f0c018bd145579b1
Partition1/Root/Photos/SF/IMG 3596.JPG
```

```
DATA: DATA (Non-Resident)
         1939512-1949623
 20
                        2009-06-05 19:01:28
                                                af118fa168b1e768805bab011ed79ec3
      9b25a5144660578d6cc32f6ea8c363460cf3f683
f0f404ce95f1b8b1e78a1d396f3bcaebb675663ea1f1456de1fd929580a5f4a1
Partition1/Root/Photos/SF/IMG_3608.JPG
   DATA: DATA (Non-Resident)
         1949624-1959895
 20
                        2009-06-05 19:02:36
                                                84013837a9cd3be6cd35dd5afb77099b
      946ed167cd548dcf48f35ee0990010941789cece
dd15a8d44aae3e54207f8cb5f0f4f214f0676b882f596d41009a03f2f6a72546
Partition1/Root/Photos/SF/IMG_3627.JPG
   DATA: DATA (Non-Resident)
         1959896-1967031
 20
                        2021-11-15 10:47:36
                                                Partition1/Root/Photos/Vegas
    $I30: INDEX_ALLOC (Non-Resident)
         54360-54367
 20
                        2009-05-27 20:46:20
                                                0f5cb6b4dc609659f4ce7e5a1c4c01aa
      fca842cc27792be149e0186d246d9d9c40c28ecf
5b38b41aaa5e3ecf533862027673b0d4179cbcc3fdfd44e99aa2d701b4025a6e
Partition1/Root/Photos/Vegas/IMG 0510.JPG
   DATA: DATA (Non-Resident)
         1967032-1975471
 20
                        2009-06-20 02:42:41
                                                c5497d040ee9ca74aacb1a627584620b
      5b0a9e275afe04aee280915acb838038dbc72eab
1cfb5f3818b7930f31a8e63762a5652badd4a1e58977f5954e2bac8507d1d71b
Partition1/Root/Photos/Vegas/IMG_0516.JPG
   DATA: DATA (Non-Resident)
         1975472-1983991
                        2009-05-27 20:55:54
 20
                                                be3c022f27e9b50f54fde9ed2926716d
      e9b1ad5e0e40903ed58448dbf90701db4ff4f4bc
0ee032b760e54100eb1fc9db986ef972a23094fb7b94edd1907f94d52a0ca3b5
Partition1/Root/Photos/Vegas/IMG_0525.JPG
    DATA: DATA (Non-Resident)
         1983992-1991639
 20
                        2009-05-27 20:59:50
                                                0d30cbcb374dc62be046953738a90523
     df8f55969022328fb652f8141b41321bf855deb3
c57233f22715b0a50cbd90e2b48acda7aaab245a8c31bc9a45aaff16373d9675
Partition1/Root/Photos/Vegas/IMG_0539.JPG
   DATA: DATA (Non-Resident)
         1991640-2000143
 20
                        2009-05-27 21:00:44
                                                277f3865011837bc68612c72eb9a2691
     b6e63a75c77639cdade2a42ca29d8eebb1e5023f
613c9c7ee324ae96857260ba9e56a1d3145de5ab368331035854a555c7cefa5e
Partition1/Root/Photos/Vegas/IMG_0541.JPG
   DATA: DATA (Non-Resident)
         2000144-2007823
 20
                        2009-05-27 21:04:54
                                                77acf0f1d75d65cbb59329f3253e4030
      6a4fd9123679ffcfdf3e0aa00a8ab81946bcba8f
6fa349225b5fd265133ff2bd8b5d780154bfe47bd1ee00c754181fe10dbd90fa
Partition1/Root/Photos/Vegas/IMG 0542.JPG
   DATA: DATA (Non-Resident)
         2007824-2015527
```

```
2009-05-27 21:05:02
 20
                                                960983bce3dfa5e34935b215f0e018ce
      31a3b17c2f0b01d6924ca2c0bb82c25f1aa76de3
b52a36769aa422b741ef739e8f8bc5fe7b820e31bbc0954f5a07f028c4c8973b
Partition1/Root/Photos/Vegas/IMG_0543.JPG
    DATA: DATA (Non-Resident)
         2015528-2022495
                        2009-06-20 02:42:23
 20
                                                06ce765c697ea92ab4782b4696174512
      f3dcfcfc2e2ddd9a76ac0d172c1ee07c62beec8a
b2b195f7a62c89e5b1f9b45c3016a5e53b90b3cb8e4d6ad517d1c05b5750d0fe
Partition1/Root/Photos/Vegas/IMG 0545.JPG
   DATA: DATA (Non-Resident)
         2022496-2030367
 20
                        2009-06-20 02:42:17
                                                b2f292f1694c9d12f2b100abec8e252d
      039efc71f61ac6816f7d53f0cecabf6a64b8122d
c10eecef25e4a6d7650e4c239df01192e5c700b24b8bf275768bb8de3d881cae
Partition1/Root/Photos/Vegas/IMG 0547.JPG
   DATA: DATA (Non-Resident)
         2030368-2036887
 20
                        2009-05-27 21:09:00
                                                f7960866200a1f52ee74a46ebcd9761e
      f09b4b253fdaa5bdcf8b425111492d1ece716488
3184ac48cc4db4822d2df1ef5539e413473705fa478aa1d467eb0fcd21ee182c
Partition1/Root/Photos/Vegas/IMG_0550.JPG
    DATA: DATA (Non-Resident)
         2036888-2044927
 20
                        2009-05-27 21:09:10
                                                4ac853b049966e9cee7e7cdf9894eb9c
      30e71ec78c93e590083c26222afecfcb377766d6
5043a207a823a52d556a2532bd92e3c104941793efb1e7cbc417baa2451b72ab
Partition1/Root/Photos/Vegas/IMG_0551.JPG
   DATA: DATA (Non-Resident)
         2044928-2051983
 20
                        2009-04-29 02:54:46
                                                3feacbf5dd9afc05143f12a55f0536f0
      acf18fc7824c46e2107113e28438a1a7f3d5364c
501d7f5876228466260bcf200bed3e71fbf362f9f7f5601cf45ff8b7e3dd792e
Partition1/Root/Photos/MyPhoto6.JPG
   DATA: DATA (Non-Resident)
         1105344-1107543
 20
                        2009-04-29 02:55:06
                                                22bf64446fcd3a630ab17bf839de6e7d
      6e023a946c407fb59b2b96216f46b6d0e7f4081d
d317be69a99418cd6c1aa628837db02537b04cd2c0549099e2f5edc7f4361c40
Partition1/Root/Photos/MyPhoto7.JPG
    DATA: DATA (Non-Resident)
         1107544-1109231
 20
                        2009-04-29 02:55:30
                                                cb4bed7e6405a90b65cd80ccbec04928
      6581e5cc10659704ea5d98b81a7a326ab9640a26
94f3d3b0877947b05a4e4a6be15f9caa590ff9a9dbc3984b65bf5ea9760758d8
Partition1/Root/Photos/MyPhoto8.JPG
   DATA: DATA (Non-Resident)
         1109232-1111231
 20
                        2009-04-29 02:56:50
                                                2abc60a295d7e3eaa91cb7ad92efc788
      52de9551e8710d6978e525194b8e9cd3a44ea992
20141717c1bfbf42901603843fdd360a56ed64af6865fdc61197ec48fc89807b
Partition1/Root/Photos/MyPhoto9.JPG
   DATA: DATA (Non-Resident)
```

```
1111232-1118135
 20
                        2021-11-16 09:38:58
                                                Partition1/Root/System Volume
Information
 20
                        2021-11-16 09:38:58
                                                9a9e2941af363372e78db223793602c9
      172678454aa1776e9a7e71ecacb3b5a57f388c75
2ac9b80907e81185d3479e340ed6123a4063cf0fd1305cd6b66227cf30a74647
Partition1/Root/System Volume Information/IndexerVolumeGuid
                        2021-11-16 09:39:01
 20
                                                1e7a6c21c279de2ce269b029a0e2c472
      c5d14bce2dc6fd037e4ecf41a0b8ff864c0d1baf
ad4f52a33fa3d312a93a946a3c8dd4bc5826046f2e570f1c93b3c97246c6e5ec
Partition1/Root/System Volume Information/tracking.log
   DATA: DATA (Non-Resident)
         4912-4951
 20
                        2021-11-15 10:46:45
                                                69921f526526f76d9f2ecce1e61a4408
      72f60bff40c69e35d3c3ce6e00d72a2b132c28b0
5a88103911c673be8f0b86345b0c0c7a275b6312a7b666f75de78409b3cb2f48
Partition1/Root/System Volume Information/WPSettings.dat
                        2021-11-15 10:50:33
 20
                                              Partition1/Root/Video
    $I30: INDEX ALLOC (Non-Resident)
         54384-54391
                        2021-11-15 10:47:43
 20
                                              Partition1/Root/Video/Avi
    $I30: INDEX_ALLOC (Non-Resident)
         54368-54375
 20
                        2021-11-15 10:48:51
Partition1/Root/Video/Avi/Cops Season 24 HDTV
    $I30: INDEX_ALLOC (Non-Resident)
         54376-54383
 20
                        2016-06-05 22:18:26
                                                7f0357f25d88e1369c8dc1acd0aed663
      317dd884a8bc77e96e7fd1656e4aed35d077b0da
a48313a5f5756abd792ba5fa1da6e92f9caf0a7511435e2f5dcfce5250bea41a
Partition1/Root/Video/Avi/Cops_Season_24_HDTV/Cops.S24E01.HDTV.XviD.avi
   DATA: DATA (Non-Resident)
         3870016-4228031
 20
                        2016-06-05 22:19:24
                                                8dd47bbfb3420f7ff4b0b101e8cad36b
      1fd74b806f952314abfecea3fbd56b0560ebb315
72a952dc62b83d078327a25c5e0d81e6027e684238c7b1bcf02c1c29e8f097ef
Partition1/Root/Video/Avi/Cops_Season_24_HDTV/Cops.S24E02.HDTV.XviD.avi
   DATA: DATA (Non-Resident)
         4228032-4585423
                        2016-06-05 22:19:41
 20
                                                e389377f24ca35cc802aa90d821a246d
      3f4c33408ad18287d5f1dca0b474c208748c7002
8622c265f0c0533bd756b0b45fdbf661c23370c093c8a708b14a503238a2ad9f
Partition1/Root/Video/Avi/Cops_Season_24_HDTV/Cops.S24E03.HDTV.XviD.avi
   DATA: DATA (Non-Resident)
         4585424-4943447
                                                5e828eea4a7d198d5d029eb6a5fd8a97
 20
                        2016-06-05 22:12:38
      5f696a6568215a658415bbf736098166253c7bd2
ce10df567443f9c8211655bf9c62071d636dd5106f334efbbf22d57b62e0a256
Partition1/Root/Video/Avi/Cops_Season_24_HDTV/Cops.S24E04.HDTV.XviD.avi
   DATA: DATA (Non-Resident)
         4943448-5301583
```

```
2016-06-05 22:17:43
 20
                                                409e0f6332db4c12da861cd3cab5ae14
     6d21926f26bd26e3730274b37ad69731219c29f5
e8b357b3f488e04276a2f1dfd9147e8f1b73e4a5a4ad7854abebb1e6a83fc379
Partition1/Root/Video/Avi/Cops_Season_24_HDTV/Cops.S24E05.HDTV.XviD.avi
   DATA: DATA (Non-Resident)
         5301584-5659415
20
                        2016-06-05 22:18:57
                                                b55ee3db70b62f883db5573a5746e4d1
      08c309ee65b69c1a937f447b9b45e95055ad422e
e39d39283cd4fbee2a5e4e59dba6751c4b2be36eedfaf0ad4d2b3e904867dd9d
Partition1/Root/Video/Avi/Cops_Season_24_HDTV/Cops.S24E06.HDTV.XviD.avi
   DATA: DATA (Non-Resident)
         5659416-6017039
20
                        2016-06-05 22:17:05
                                                1febb45222f9f114e88c533c36f8f29b
     b1656a3eb4766af43e31b46defb3827be551bfde
42513d7f9738dd06077f8e2636cdb6852aa852bc67316cbbc45b6bec5cff69c9
Partition1/Root/Video/Avi/Cops Season 24 HDTV/Cops.S24E07.HDTV.XviD.avi
   DATA: DATA (Non-Resident)
         6701312-7058527
20
                        2016-06-05 22:16:17
                                                0ecf424d46e619cd1d09bce2dae5b570
     a15b481e4083022254c0ff9aa85f369782a7c87b
7240d9aed4d0129139f9d817bd1beb140f2c46b226e77570f083387e54a04ebd
Partition1/Root/Video/Avi/Cops_Season_24_HDTV/Cops.S24E08.HDTV.XviD.avi
   DATA: DATA (Non-Resident)
         7058528-7416287
20
                        2016-06-05 22:17:14
                                                88b3f03a9e20f9b2310dde6cd0296fca
     b839c39d53c22c5e8a46cda745f0c90ac86ac38d
2b61dad5b94d79f8b0e202db5dc30f5a581f1093b588a16354701419aaeb6ebb
Partition1/Root/Video/Avi/Cops_Season_24_HDTV/Cops.S24E09.HDTV.XviD.avi
   DATA: DATA (Non-Resident)
         7416288-7774255
20
                        2016-06-05 22:19:17
                                                de1cf8808dff26c1b4398220a8913dd1
     139ad01952126d3294c49e4f2258168462f4b61d
3a70dfd2993d0ae572855aa7a20847d58a0e8823fba77e0e136a9a2a92b0bb6e
Partition1/Root/Video/Avi/Cops_Season_24_HDTV/Cops.S24E10.HDTV.XviD.avi
   DATA: DATA (Non-Resident)
        7774256-8132167
20
                        2016-06-05 22:16:49
                                                216bdd9f74a00a7a9b4383e2e655ef58
      47bdb9493dc69f0aff6c38536f3100cca3c6c3f3
ed4d42a3c4162a16da28f21d85a2dfb53b0f07fe005b9012e573717fef70af59
Partition1/Root/Video/Avi/Cops Season 24 HDTV/Cops.S24E11.HDTV.XviD.avi
   DATA: DATA (Non-Resident)
         8132168-8489975
20
                        2016-06-05 22:17:34
                                                51bf22c8ed46f23cd1efde24952d305e
     a090ee7373d093cf91ee3afa42decbbdf5f43d6a
72d917ebda33cc238fa1bcada877f7949ff460105e7467d2c314a63fd1224740
Partition1/Root/Video/Avi/Cops_Season_24_HDTV/Cops.S24E12.HDTV.XviD.avi
   DATA: DATA (Non-Resident)
         8489976-8847887
 20
                        2016-06-05 22:19:31
                                                ac81e8b5472ca54054c8e57b6e69b1b0
     bdb5963313cf1cdcbd9d7ae2e66daf8b669000d6
eae261da6d61b544dc42c8843ab4752496fb4869fcbff869baa9f62ea47b9ee7
Partition1/Root/Video/Avi/Cops_Season_24_HDTV/Cops.S24E13.HDTV.XviD.avi
   DATA: DATA (Non-Resident)
```

8847888-9206559 20 2016-06-05 22:16:28 8d99cfc73a09a48825a276375bfad763 735aa03db094173277fb702ef0c7d96bdc8e11c2 052e121628b631a3154d04a2b30774340fdaf0e4593b9b751187f867b2c433e3 Partition1/Root/Video/Avi/Cops_Season_24_HDTV/Cops.S24E14.HDTV.XviD.avi DATA: DATA (Non-Resident) 9206560-9565823 20 2016-06-05 22:18:51 6c498108cd539cb1b05c813b8e91893d 843e634c0def9751870c8bbe5087be478211d62b 42d916b97a81a2147ef5e03a9e07dab0e6db4d6b148693492644f539ebbf1cdc Partition1/Root/Video/Avi/Cops_Season_24_HDTV/Cops.S24E15.HDTV.XviD.avi DATA: DATA (Non-Resident) 9565824-9923519 20 2016-06-05 22:18:10 0e418b50264b2bb748f031e1250de762 b6a7edd6909b1ff6e5d6e85b6cd3734a8ddff4ef 9286b40a34a4fae19a24117c179cca4f4493f54341dc66fa2255e49eb209c1ab Partition1/Root/Video/Avi/Cops_Season_24_HDTV/Cops.S24E16.HDTV.XviD.avi DATA: DATA (Non-Resident) 9923520-10281511 20 2016-06-05 22:19:07 65fe333f28d8c5f27d21a2445d95fa91 f6ed23e660b1f8559e5f7151ee16cd583e3fc353 344d36ce2ecefe1d3676197f247dca485e37be2282a469aa2fb2a219907d737e Partition1/Root/Video/Avi/Cops_Season_24_HDTV/Cops.S24E17.HDTV.XviD.avi DATA: DATA (Non-Resident) 10281512-10639959 20 2016-06-05 22:18:17 514b0659f98a3c45202f1cc8a125fe61 1ba85643445ac825a4d4a5281020d6f82b5bc69a b99c92603b97699ed7aa10a4e7f21fbd92a4cd8688a4083e33e8a4c54049aaba Partition1/Root/Video/Avi/Cops.S24E18.HDTV.XviD.avi DATA: DATA (Non-Resident) 2051984-2410095 20 2016-06-05 22:18:12 0e6f2a5dea0e8a1e4dd33ad2c99395cb 9a0b653b3820ba4dd0d78ae94d0da524ff62567a 133cccd202e162aa8f52cbf289351dcb3414d78cfb82945ae49233b4d245d907 Partition1/Root/Video/Avi/Cops.S24E19.HDTV.XviD.avi DATA: DATA (Non-Resident) 2410096-2765911 20 2016-06-05 22:18:38 f3704970997f2eb8af3fb9dd2691f7d0 580ca470463e58d4b29eba6471081910b7b4ebfc 3544a68251c3b273675eae72431be23a3971057c6c18292bf69f71cd5b42590f Partition1/Root/Video/Avi/Cops.S24E20.HDTV.XviD.avi DATA: DATA (Non-Resident) 2765912-3124295 20 2016-06-05 22:18:47 ba81e0c6597f2e3898535fb78ffa0ccb 7f537260ad18099950dcc69964de66ceb45fe176 3797d035d4b503fa1c8b05153790ed1371394b7d549589219955d75c77abedbd Partition1/Root/Video/Avi/Cops.S24E21.HDTV.XviD.avi DATA: DATA (Non-Resident) 3124296-3481199 20 2016-06-05 22:19:37 f61d04146b1f1e8404b1a16e9adfab5e 306ebaddaa2d57688f4e5888cf5363da207e3f28

```
ad0d94c09fb496f2f2177c0d6de71ac3d8f2188c1631676ed713acd251b3f406
```

```
Partition1/Root/Video/Avi/Cops.S24E22.HDTV.x264.mp4
```

```
DATA: DATA (Non-Resident)
         3481200-3870015
 20
                        2021-11-15 10:48:56
                                                Partition1/Root/Video/Flv
 20
                        2010-01-05 14:11:42
                                                d2ef7350396693de9389e8b39774b4d7
      31920aa00dc386e8d2e1889f80c7b170560d349c
38a0753248b06cfca4ceeb4bc67198214216bdd2313e0d8cc3ee641471054766
Partition1/Root/Video/Flv/Better than me flv.flv
   DATA: DATA (Non-Resident)
         6017040-6033135
 20
                        2021-11-15 10:48:56
                                                 Partition1/Root/Video/M4V
 20
                        2012-08-22 07:36:44
                                                 968139c8f965b32be629b5eddac23382
      3d4ab462a46e985f61e55d3d293598ae658179e9
d84d38f3792764ab30e3d735da22c5977920c92a0339d46055d5710b40e008bc
Partition1/Root/Video/M4V/general hospital fall 2008 promo (hg) m4v.m4v
   DATA: DATA (Non-Resident)
         6033136-6035127
                        2021-11-15 10:49:34
 20
                                                 Partition1/Root/Video/Mov
 20
                        2015-10-11 07:33:14
                                                 53bd8bd63f73df2e647b20ac336b5184
      3847624df92163b5857177e06fccfc01f09655c6
4b5af7cae10bd584f7ffcfd7c6a690a8df6f12bf4a5d54e83fdcec6d44d6ae8d
Partition1/Root/Video/Mov/FILE0031.MOV
   DATA: DATA (Non-Resident)
         10639960-13303647
 20
                        2015-10-11 07:48:14
                                                 4d0737f26d565e7ade41c1eeff0e7cae
      9a11b89381fc546c638eb8cbdfb1a1f4b892348e
0afc907c0ae3aa8f6ee9a35ec2f863650872a30f9dcc3cb72391f856b7124370
Partition1/Root/Video/Mov/FILE0032.MOV
   DATA: DATA (Non-Resident)
        13303648-15967559
 20
                        2021-11-15 10:50:25
                                                 Partition1/Root/Video/MP4
 20
                        2010-11-30 10:58:19
                                                 3e3661d0dc6f16a5d416791614623e9e
      3d41e5063b1c5b1a4f659c669a2016873578c3c2
553fcee0ff4df6eefc45024c334ff2ddda887031c2d2ce75d64f8a0cc28365f1
Partition1/Root/Video/MP4/mp4
Haiti_can_succeed,_but_not_without_your_help_(Former_US_president_Bill_Clinton).mp4
   DATA: DATA (Non-Resident)
         15967560-16143863
 20
                        2015-09-18 17:52:23
                                                 f9d18db99b4d4f3d5d8f7ecda07a283a
      3f30923a876e075e0c5735d095fafc71798a5a8f
d055ab546e6c24517aeaadc8217b3a56443baf902230c7a41235f6402770e4c0
Partition1/Root/Video/MP4/VID 20150918 215223.mp4
    DATA: DATA (Non-Resident)
         16143864-16348887
 20
                        2015-09-18 18:00:20
                                                b970ad6b6fc339a639a747d43279fc24
      226dd51746a2765ebfeb7e58a61d5f43ee8cfcf3
0e2d63dc86db96e93cb84e61724699bce08aa1f68ca17216e98355800ead5038
Partition1/Root/Video/MP4/VID 20150918 220020.mp4
    DATA: DATA (Non-Resident)
         16348888-16685327
 20
                        2015-09-20 08:31:20
                                                 050863ea63873886856c1850f89b2872
      15e1a4f4ed00ae657cc4892959e2d161d011b84f
64e86ce37f11c639c102721be53d58f6f42302056fc183a701c7cbd6696a0f38
Partition1/Root/Video/MP4/VID_20150920_123120.mp4
```

```
DATA: DATA (Non-Resident)
         16685328-16938367
 20
                        2021-11-15 10:50:29
                                                Partition1/Root/Video/MPEG
 20
                        2016-08-06 11:50:22
                                                8661e7edc04aa49accced6da2520decc
      0b7c023cd7f19445e78f11a5d3d4c2058196e307
63a8045b7ee6345adec7079e0e18fe89656e0cb188eb34712614e9b539f89740
Partition1/Root/Video/MPEG/Mpeg_Video.mpeg
   DATA: DATA (Non-Resident)
         6035128-6119063
 20
                        2021-11-15 10:50:33
                                                Partition1/Root/Video/MTS
 20
                        2015-08-05 03:44:42
                                                28264a21f4babe4c26fd9422ecce8066
      ddd8c7b7717e0c0374d50af851a499b9ec11e428
fdaf9826c0bb27005d60b611857f6ac4d81191cfcdd63519343f7d4192208491
Partition1/Root/Video/MTS/00026.MTS
   DATA: DATA (Non-Resident)
         16938368-17128831
 20
                        2013-03-20 07:16:48
                                                c8813d64f8e33e4e41c773d188ce6f62
      cd6dae3c9a31db7f02d18bfa8fa493d85b64e64b
1cfbb5d3d93c7725f06a388d93490e112427c640db705dfe90036c98c6db4820
Partition1/Root/Video/MTS/00140.MTS
   DATA: DATA (Non-Resident)
         6119064-6132695
 20
                        2013-03-20 07:16:20
                                                40566a6585ba0440175eed119a32a32a
      95776ef4d52ea51062c472ce744de1ef075bdf2f
34cf55b950cbce275ddc1ecad2e9fc0821e4b664d23eeb3270059b3e6e8d0c4e
Partition1/Root/Video/MTS/00168.MTS
   DATA: DATA (Non-Resident)
         6132696-6148823
 20
                        2013-03-20 07:15:22
                                                90b17b9d8b04d14b2a72aa1a7ea2c6c8
      19ddc6147e3f8d9c628c83cf33525cc859423c00
fbf55ea6c3b86c666c79caaf5c1386eebede4f02b8b70c7c91610effaf874ddc
Partition1/Root/Video/MTS/00346.MTS
   DATA: DATA (Non-Resident)
         17128832-17145343
 20
                        2016-06-05 09:36:07
                                                d6b0ce497e569371b94e19fea48355cd
      37fbacb48c80859f47024f2382d9880be633477b
b08522bb8e9d63c86c290a8c7032f3097fc78db704ea1d54eaaa75934c29de46
Partition1/Root/Video/The.Lincoln.Lawyer.2011.1080p.BluRay.x264.DTS-FGT.mkv
   DATA: DATA (Non-Resident)
         17145344-33576271
 20
                        2012-11-03 10:10:07
                                                9565cf6684e2858bda872890a32cc671
      da8c56c8b989ed9c2b42057ac657257520cfe661
beedd667813a9279426cfa769cb39f53156080fe78e73803dcb3206978985b04
Partition1/Root/Blue Skies (1946) 104 min.Fred Astaire.Bing Crosby.Irving
Berlin.Musical.avi
   DATA: DATA (Non-Resident)
         33576272-36340295
 20
                        2013-06-26 07:58:08
                                                12ab314eb73a4a938bed3d6550da0ff2
      22b0141246f4f5c7cf20171645c0f8de596cb35a
eada5fecc16cb98c28c54b080319ff79eb20b62a313ed4b6ba5c254a4a3ede7e
Partition1/Root/Mac mini Intel-based Mid2007 UserGuide.pdf
   DATA: DATA (Non-Resident)
         6148824-6150575
```

```
2005-08-06 06:04:54
20
                                            59262f761288b9fd5f1306a80aa25ddb
     95f732edc568a3563de4f2fa4410b4b488a9778e
d1205b011a0139b8a9c8fcc15ca227a72c7ef575828ff99d747021ebbab04fca
Partition1/Root/P1000075.JPG
   DATA: DATA (Non-Resident)
        36340296-36344487
                      2005-08-06 06:06:04
                                            33e7439162b60fc39c701fe1d40cdde7
20
     fef0d28922959512f5766b22867100583a83ea27
7645c7b66336c420372c6f4e4b8f3c1d9cf14cff36d6599b54587b8f8a8827e8
Partition1/Root/P1000076.JPG
   DATA: DATA (Non-Resident)
        36344488-36348455
20
                      2013-12-12 08:31:39
                                            bf2a0fb0328c20ab65a1d9485d9748c4
     e3c3e84fc05f16d09edce676ff52a24812f15a1f
1fb743fa827fe7569bb93232555389aa596398997b7e4946fba2f9141f78b26c
Partition1/Root/TestVHDGPT.vhd
   DATA: DATA (Non-Resident)
        36348456-38445615
END Date / Time of Collection: 2022-07-05 04:02:59
_____
                                                      _____
```

IV Text/hexadecimal Editor

Any object visible to **R-Studio** can be viewed and edited in the **Text/Bexadecimal editor**. It is also able to parse the data and represent data according to various data patterns. You may also create your own patterns to parse data.

Note: Data alteration is available on the Technician/T80+ and Corporate versions only.

You may turn <u>numerical indexes</u> for objects to distinguish them better.

- Viewing and Editing Objects
- Navigating through an Object
- Data Copy
- Files and Sectors
- <u>Creating Custom Patterns</u>
- Pattern Example I
- Pattern Example II

<u>R-Studio Features</u> <u>Contact Information and Technical Support</u> <u>Data Recovery Using R-Studio</u> <u>Basic File Recovery</u> <u>Advanced Data Recovery</u> <u>Mass File Recovery</u> <u>Volume Sets and RAIDs</u> Data Recovery over Network Technical Information and Troubleshooting R-Studio Emergency R-Studio Agent Emergency

4.1 Viewing and Editing Objects

YOU MUST BE ABSOLUTELY SURE OF WHAT AND WHERE YOU ARE WRITING! Or you may completely lose all your data.

Before you can physically write anything on a drive, you need to enable writing.

To enable writing,

- 1 In the **R-Studio** main panel, select the Tools menu, then Settings, and select Enable Write on the <u>Settings</u> dialog box.
- > The Editable: status will change to Yes from Read Only. Now the object can be edited.

Locking and unlocking objects

It is possible to manually lock an object being edited in Text/Bexadecimal Editor.

When an object is locked, **Text/Bexadecimal Editor** has an exclusive access to it, and no other programs or Windows can make any changes on it. **Text/Bexadecimal Editor** itself always locks the object itself before writing anything on the drive and then unlocks it. But sometimes locking/Anlocking may take quite a lot of time, up to several seconds. That is why sometimes it is a good practice to lock an object while editing it in **Text/?** hexadecimal Editor. This can be done by selecting Lock on the Tools menu.

When considering locking an object in Text/Bexadecimal Editor, keep in mind the following:

- Starting from Windows 7, it is impossible to change data if it resides on a <u>logical disk</u> without locking the drive. If the data is on a place outside of any logical disk (on an unmounted <u>partition</u> or empty space), such lock is not necessary. Windows Vista, XP, or below do not have such restrictions.
- The Lock command tries to lock all logical disks on which the object being edited is placed. For a drive, those are all its logical disks, for a file that is a logical disk where it resides. And if a RAID is created from logical disks and a file is opened on that RAID, **Text/Bexadecimal Editor** blocks all logical disks on which the file resides.

Moreover:

- If a logical disk is opened in **Text/Rexadecimal Editor**, the **Lock** command locks the drive if there is no files opened by some other programs.
- If a drive is opened in **Text/Bexadecimal Editor**, the **Lock** command locks the drive if all its logical disks can be locked. That may cause problems is one of the logical disks is a system one.

To view/@dit an object,

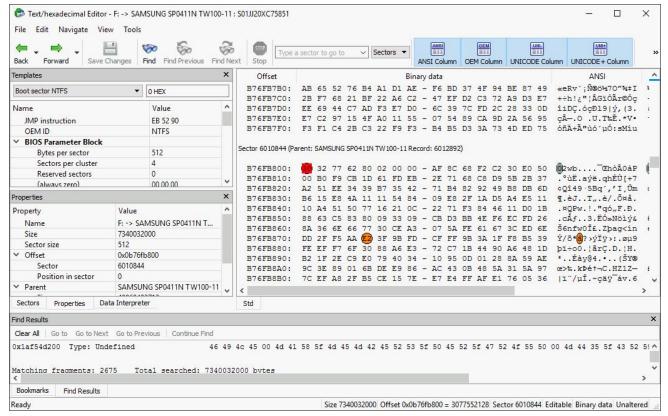
- 1 Right-click the object and select View/Edit on the shortcut menu
 - Other ways to view/edit the object
 - Select the object and select View/Edit on the File menu

or

• Select the object and press the Ctrl+E keys

> A Text/Bexadecimal Editor panel will appear

■ *R*-Studio Text/*R*exadecimal editor



Data Parsed According to the Selected Pattern Object Properties

Templates							
Boot sector NTFS 🔹	0 HEX						
Name	Value						
JMP instruction	EB 52 90						
OEM ID	NTFS						
✓ BIOS Parameter Block							
Bytes per sector	512						
Sectors per cluster	4						
Reserved sectors	0						
(always zero)	00 00 00						
(unused)	00 00						
Media descriptor	F8						
(unused)	00 00						
Sectors per track	63						
Number of Heads	255						
Hidden sectors	2048						
(unused)	00 00 00 00						
(always 80 00 80 00)	80 00 80 00						
Total sectors	14335996						
Logical Cluster Number for the fil	6						
Logical Cluster Number for the fil	151						
Clusters Per File Record Segment	246						
Clusters Per Index Block	2						
Volume serial number (hex, revers	0x5cece47d						
Volume serial number (hex)	7D E4 EC 5C						
64-bit serial number (hex)	7D E4 EC 5C 30 ED 5						
Checksum	0						
Bootstrap Code	FA 33 C0 8E D0 BC 0						
Signature (55 AA)	55 AA						

Properties								
Property	Value							
Name	F: -> SAMSUNG SP0411N TW100-11: S01JJ20XC75851							
Size	7340032000							
Sector size	512							
✓ Offset	0x0b76fb948							
Sector	6010844							
Position in sector	328							
✓ Parent	SAMSUNG SP0411N TW100-11							
Size	40060403712							
✓ Offset	0x0b77fb948							
Sector	6012892							

Object Sector Mapping

Sectors		^
Sector	Parent Sector	^
6010842	6012890	
6010843	6012891	- 10
6010844	6012892	
6010845	6012893	
6010846	6012894	
6010847	6012895	Y

Data Shown as Various Digits

-	a Interpreter		>
Na	me	Value	1
	8 bit binary	00110000	
	ANSI character	0	
	OEM character	0	
×	Little Endian		
	UTF8 character	0	
	UTF16 character	(B)	
	8 bit hexadecimal number	0x30	
	8 bit octal number	060	
	8 bit unsigned decimal n	48	
	8 bit signed decimal nu	48	
	16 bit hexadecimal num	0x3230	
	16 bit octal number	031060	
	16 bit unsigned decimal	12848	
	16 bit signed decimal nu	12848	
	32 bit hexadecimal num	0x62773230	
	32 bit octal number	014235631060	
	32 bit unsigned decimal	1651978800	
	32 bit signed decimal nu	1651978800	
	64 bit hexadecimal num	0x28062773230	
	64 bit octal number	050014235631060	
	64 bit unsigned decimal	2750431048240	
	64 bit signed decimal nu	2750431048240	
	Windows time	1601-01-04 04:2	
	DOS time	2029-03-23 06:1	
	Unix time	2022-05-08 03:0	
~	Big Endian		
	UTF8 character	0	
	UTF16 character	\$	
	8 bit hexadecimal number	0x30	
	8 bit octal number	060	
	8 bit unsigned decimal n	48	
	8 bit signed decimal nu	48	
	16 bit hexadecimal num	0x3032	
	16 bit octal number	030062	
	16 bit unsigned decimal	12338	
	16 bit signed decimal nu	12338	
	32 bit bexadecimal num	0x30327762	
	32 bit octal number	06014473542	
	32 bit unsigned decimal	808613730	
	32 bit signed decimal nu	808613730	
	64 bit hexadecimal num	0x30327762800	
	64 bit octal number	0300623566120	
	64 bit unsigned decimal	3472969527594	
	64 bit signed decimal		
	un oit signed decimal nu	3412303321394	
	Windows time	12606-05-28 15:	

Binary view

Offset								Bina	iry	data							
Sector 6010844 (Pa	arent:	SAM	SUNG	SP0	411N	TW1	00-1	1 Red	oro	: 60 :	12893	2)					
B76FB800:	30	32	77	62	80	02	00	00	_	AF	80	68	F2	C2	30	EO	50
B76FB810:	00	BO	F9	CB	1D	61	FD	EB	-	2E	71	68	CB	D9	5B	2B	31
B76FB820:	A2	51	EE	34	39	B7	35	42	-	71	B 4	82	92	49	B 8	DB	61
B76FB830:	B6	15	E8	4A	11	11	54	84	-	09	E8	2F	1A	D5	A4	E5	11
B76FB840:	10	A4	51	50	77	16	21	oc	-	22	71	F3	84	46	11	DO	13
B76FB850:	88	63	C5	83	80	09	33	09	-	CB	D3	BB	4E	F6	EC	FD	21
B76FB860:	8A	36	6E	66	77	30	CE	A3	-	07	5A	FE	61	67	30	ED	61
B76FB870:	DD	2F	F5	AA	£2)	3F	9B	FD	-	CF	FF	9B	3A	1F	F8	B 5	3
B76FB880:	FE	EF	F7	6F	30	88	A6	E3	-	72	C7	1B	44	90	A6	48	11
B76FB890:	B2	1F	2E	C9	EO	79	40	34	-	10	95	OD	01	28	8A	59	A
B76FB8A0:	90	3E	89	01	6B	DE	E9	86	-	AC	43	OB	48	5A	31	5A	9'
B76FB8B0:	7C	EF	A8	2F	B5	CE	15	7E	-	E7	E4	FF	AF	E1	76	05	3
B76FB8C0:	1F	3E	92	47	2B	OB	81	8B	-	FF	FB	94	00	CD	80	02	8
B76FB8D0:	26	40	C9	E9	32	50	58	44	-	D9	BD	3D	28	4B	OA	50	7
B76FB8E0:	31	87	A5	09	01	6C	8F	66	-	74	F4	A1	21	07	02	76	4
B76FB8F0:	D1	86	DD	24	EA	74	94	45	-	CA	5A	ED	57	8B	D6	C8	2
B76FB900:	34	DC	FF	A4	06	24	82	46	-	43	E5	D9	74	11	14	03	8
B76FB910:	49	98	68	10	44	53	5A	C2	-	48	7D	01	42	D7	BD	D5	9
B76FB920:	B1	B 3	F5	C9	EB	4B	18	AF	-	56	AE	20	75	6A	A5	07	2
B76FB930:	6B	A9	40	EF	07	73	5D	C1	-	B3	97	2F	FD	64	3A	6C	5
B76FB940:	A2	09	93	4A	43	6F	02	10	-	143	86	DA	C7	F4	E7	77	A
B76FB950:	56	D2	89	EA	1E	C9	28	A6	-	E4	FF	AO	05	Cl	EE	82	9
B76FB960:	9E	3E	3C	C5	A7	OB	00	C4	-	E4	23	06	44	81	90	B3	0
B76FB970:	3C	38	DO	AO	94	56	83	92	-	90	15	B2	28	90	93	65	A
B76FB980:	83	35	15	95	9F	4F	98	59	-	7C	B1	E8	80	3A	8D	8F	4
B76FB990:	D4	9F	82	AD	18	AO	2A	39	-	76	A4	A2	D3	15	71	69	3
B76FB9A0:	AF	60	A9	87	B9	AF	5D	CC	-	CB	B 5	70	2A	D7	C9	24	6
B76FB9B0:	AO	B 8	3D	D2	D2	1B	8F	8B	-	D8	64	F5	81	63	76	2B	81
B76FB9C0:	A5	82	69	93	87	32	44	78	-	CO	F5	6F	2D	81	CO	OF	A
B76FB9D0:	32	71	34	29	A2	8C	E9	80	-	72	1E	EB	F3	4B	3D	FC	B
B76FB9E0:	E9	76	92	B 8	B 5	3B	76	D4	-	D3	DE	AB	18	82	04	DO	70
B76FB9F0:	8B	5C	A2	80	1E	89	90	91	-	29	FO	4F	B6	11	27	10	41

Text view

ANSI	OEM	UNICODE UNICODE+
2wb TEhòÂ0àP	2wbC»ih0αP	008.0.00 00.308.P
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Find Results

																						**														-
x18df81800	Type:	Undefined	46	49	4c	45	20	69	73	20	2d	2c	20	72	65	61	64	0a	73	74	61	6e	64	61	72	64	20	69	6e	70	75	74	2e	0a	00	01
x18dfe2800	Type:	Undefined	46	49	4c	45	20	2e	2e	2e	0a	20	20	20	20	70	74	61	72	20	2d	78	20	5b	2d	76	5d	20	5b	2d	7a	5d	20	5b	2d	6
x18ef05000	Type:	Undefined	46	49	4c	45	32	0a	20	20	46	49	4c	45	31	20	2d	61	74	20	46	49	4c	45	32	20	20	20	46	49	4c	45	31	20	69	7:
x18ef05400	Type:	Undefined	46	49	4c	45	20	65	78	69	73	74	73	20	61	6e	64	20	65	78	65	63	75	74	65	20	28	6f	72	20	73	65	61	72	63	6
x18f02d600	Type:	Undefined	46	49	4c	45	4e	41	4d	45	55	4e	41	56	41	49	4c	41	42	4c	45	00	57	45	52	52	51	4e	45	52	52	51	52	50	4c	4:
x19ab98c00	Type:	Undefined	46	49	4c	45	3a	20	28	0a	20	20	20	20	20	20	20	20	70	6b	2e	45	72	72	61	72	45	бe	75	6d	2e	50	41	43	4b	4:
x19c194c00	Type:	Undefined	46	49	4c	45	4e	41	20	69	6e	20	72	3a	0a	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	64	61	74	61	21
x1a035b800	Type:	Undefined	46	49	4c	45	20	73	65	6d	61	6e	74	69	63	73	3a	20	73	65	74	3a	70	61	67	65	63	61	63	68	65	20	75	6e	73	6!
x1a04bd800	Type:	Undefined	46	49	4c	45	29	0a	09	64	6f	5f	49	52	51	28	4c	4f	4£	4e	47	53	4f	4e	32	5f	50	45	52	46	43	4e	54	5f	49	5;
xlacca6400	Type:	Undefined	46	49	4c	45	3a	42	54	4e	5f	45	58	50	4c	4f	52	45	52	46	49	4c	45	5f	44	45	54	41	49	4c	53	56	49	45	57	01
x1aeddb000	Type:	Undefined	46	49	4c	45	00	6e	6f	2d	70	6c	75	67	69	6e	2d	66	6f	72	2d	66	69	6c	65	00	42	56	57	5f	45	52	52	4f	52	5:
x1af54d200	Type:	Undefined	46	49	4c	45	00	4d	41	58	5f	4d	45	4d	42	45	52	53	5f	50	45	52	5f	47	52	4f	55	50	00	4d	44	35	5f	43	52	5:

List of Bookmarks

Bookmarks				×
Bookmark	Location	Offset	Sector	
Bookmark 1	Std	0x0b76fb800	6010844	
Bookmark 2	Std	0x0b76fb874	6010844	
Bookmark 3	Std	0x0b76fb8e4	6010844	
Bookmark 4	Std	0x0b76fb948	6010844	

Text/Rexadecimal Editor status

Ready Size 7340032000 Offset 0x0b76fb948 = 3077552456 Sector 6010844 Editable Binary data Unaltered



1/0

Previous Pattern

Click this button to go to the previous pattern.

Next Pattern

Click this button to go to the next pattern.

Save Changes

Click this button to save changes.



Code pages Turns supported code pages on/off.

Autoflow

Click this button to turn autoflow on.

Panel view options

You may set which panels and bars to enable/disable.

<u> </u>	
ANSI data	Select/&lear ANSI on the View menu
OEM data	Select/&lear OEMr on the View menu
UNICODE data	Select/&lear UNICODE on the View menu
UNICODE+ data	Select/&lear UNICODE+ on the View menu
Toolbar	Select/&lear Toolbar on the View menu
Properties View	Select/&lear Properties View on the View menu
Sectors View	Select/&lear Sectors View on the View menu
Data Interpreter View	Select/elear Data Interpreter View on the View menu
Template View	Select/@lear Template View on the View menu
Bookmarks View	Select/&lear Bookmarks View on the View menu
Find Results View	Select/&lear Find Results View on the View menu

2 View the information and make necessary changes

Select Save Changes on the Tools menu if you want to save changes.

Other ways to save changes

• Select Save Changes on the File menu

or

• Press the Ctrl+S keys

Viewing

There are up to four tabs showing the data in different representations. Actual number of tabs depends on the object and property being viewed/edited.

Std	Exact attribute data. If the attribute is compressed, R-Studio decompresses it prior to
	showing.
Unlimited	Exact attribute data + $\frac{\text{free space}}{\text{free space}}$ of last cluster. If the attribute is compressed, R-Studio
	decompresses it prior to showing.
Direct	Actual data written on the drive. If the attribute is not compressed, it coincides with the Std
	representation.
Allocation	Resident part of the attribute.

You may view data in 4 various code pages: ANSI/ØEM/UNICODE/UNICODE+ by switching on/off the respective code pages in the **Code pages** buttons or select the appropriate code pages on the **View** menu. You may see which file is written on a particular sector. See **Files and Sectors** for details.

Patterns or Templates

You may select a pattern according to which the data will be parsed and shown in the parsed data pane. The Data Interpreter shows the data selected in the Template pane in various representations.

You may find the next or previous data that matches the pattern signature on the drive. Right-click the right pane of the editor and select either Find Template Signature Next or Find Template Signature Previous on the shortcut menu. You may also select these items on the Edit menu.

You may also create your own patterns to parse data from various objects.

Navigating

Text/Bexadecimal Editor gives you various ways to navigate into an object. See the **Navigating through** an **Object** for more details.

Data Copy

Text/Bexadecimal Editor gives you various ways to copy selected data navigate in an object. See the **Data Copy** for more details.

Filling an area with a pattern

To fill an area with a pattern, select **Fill** on the **Edit** menu, and specify the pattern and area on the Fill dialog box.

Fill dialog box

Fill		>
Fill pattern		
ANSI:	BAD!	
HEX:	42 41 44 21	
OEM:	BAD!	
UNICODE:	格口	
Fill range		
From (hex):	b76fb800	
To (hex)	b76fb91e	

Fill options

Fill pattern	
HEX	Field for the pattern to fill the area in the hexadecimal representation
ANSI	Field for the pattern to fill the area in the ANSI encoding
OEM	Field for the pattern to fill the area in the OEM encoding
UNICODE	Field for the pattern to fill the area in the UNICODE encoding
Fill range	
From (hex)	Field for the start position of the area to fill with the pattern
To (hex)	Field for the end position of the area to fill with the pattern

3 Click the Save Changes button to save the changes

Other ways to save the changes made

• Select Save Changes on the Edit menu

or

- Press the F2 key
- > Viewer/Editor will save the changes on the object

YOU MUST BE ABSOLUTELY SURE OF WHAT AND WHERE YOU ARE WRITING! Or you may completely lose all your data.

Selecting and saving an area in the Viewer/Editor

You may select an area in the Viewer/Pditor panel and save it as a file.

To select and save an area in the Viewer/Editor panel,

- 1 Right-click the beginning of the selection and select Select From on the shortcut menu
- 2 Right-click the end of the selection and select Select To on the shortcut menu
 - Other ways to select an area
 - Select Select... on the Tools menu and specify an area to select on the Select dialog box,

or

• Click the start point of the area and drag the mouse cursor to its end.

If you need to select an entire object, select Select All on the Tools menu or click the Ctrl+A key

Select dialog box

C Selection		×
From (hex):	0	
To (hex):	E8E0DB5FFF	
Reset	OK	Cancel

3 Select an appropriate item in the Tools menu to save the data in a required format and specify its file name

Select:

Save to Binary File	to save the data in the binary format (default extension is .bin)
Save to Hexadecimal File	to save the data in the binary format (default extension is hex)

on the **Tools** menu.

If you select an existing file, **R-Studio** will ask you if you want to append or overwrite the file.

	A	C:\Users\IEUser\Documents\data.bin already Do you want to Append or Overwrite it? Can		other file.
--	---	--	--	-------------

If a remote computer is connected for **Data Recovery over Network**, the Save as... dialog box will appear when you select a place to save the data. You may save it to the local or remote computer.

Save as Bina				
192.168.1.63	▼ C:\Use	ers\IEUser\Docun	nents\data.bin	
				 10

> Viewer/Editor will save the data in the file

Loading data from an external file

You may load a data from a file and overwrite an area of the object opened in the Viewer/Editor panel.

To load binary data from a file and overwrite an area of the object opened in the Viewer/Editor panel,

1 Select an area to overwrite and select Load from File... on the Tools menu

If a remote computer is connected for **Data Recovery over Network**, the Open as Binary File dialog box will appear when you select a place to open the data file from. You may open it from the local or remote computer.

192.168.1.63	-	C:\Users\IEUser\Documents\data.bin	
--------------	---	------------------------------------	--

- 2 Select the necessary file and load the data.
- > The area in the Viewer/Editor will be overwritten with the new data.

4.2 Navigating through an Object

Navigating

You may quickly move to a particular part of the object. To move to a particular part of the object being viewed/êdited, enter the required offset in the **Go to Offset** field between the buttons.

Type an offset to which you want to go. You may select between bytes and sectors. See the **Data Formats and Multipliers** topic for more details on data formats.

If a file is opened in Text/Bexadecimal Editor, you may select data representation for that file.

Type a sector to go to 🛛 🗸 Sectors 👻 DATA: DATA (NR) 🔹

You may also use the Go To Offset dialog box to go to a specified place in the object. Click the Offset field on the **Status** bar. You may also use this dialog box to copy the offset.

Go To Offset dialog box

From:	Begin		HEX	
	O Current position	0	DEC	
	O Current position (backward)			
	O End (backward)			
	Range: [0953c93fff]			
Offset:	b76fb800			\$
	dec: 3077552128			2.87 GB
	Range: [04a9e49f]		Range:	[01ff]
Sector:	5bb7dc 🗘	offset:	0	\$
	dec: 6010844		dec: 0	

□ Go To Offset options

From:	Jump/&ffset direction. For example, if you need to find the offset from the object end for a selected byte, switch to the End (backward) option.
HEX/DEC	Switch between the hexadecimal and decimal data representation.
Range	Range of values that can be entered.
dec/hex:	Alternative data representation.
Offset:	Flat data offset (without separation between the sector and offset in the sector).
Sector/@ffset	Data offset represented as a sector and offset in the sector.
Go!/OK buttons	The Go! button moves the cursor to the specified positions, but the Go To Offset dialog box remains open. The OK button closes the dialog box after moving the cursor.

Searching

To search for a particular string, click the Find, Find Next, or Find Previous buttons or the same items on the Edit menu, and specify the string on the Search dialog box.

Search dialog box

Search for	Not Equal		
ANSI:	FILE		
HEX:	46 49 4c 45		
QEM:	FILE		
UNICODE:	整雍		
	Match Case		
Search area	3		Search options
From c	urren <u>t</u> position		O Exhaustive search
	tart position		Search at offset (hex)
O From a	dress (hex):		1 HEX Y
0		HEX 🔻	1 HEX 7
<u>T</u> o add	ress (hex):		Reverse 8
0		HEX -	Find All

Not Equal	Search for the place which content is not equal to the string. For example, the first byte not equal to 00 or FF.					
Search for	· · · ·					
HEX	Field for the string to search for in the hexadecimal representation					
ANSI	Field for the string to search for in the ANSI encoding					
OEM	Field for the string to search for in the OEM encoding					
UNICODE	Field for the string to search for in the UNICODE encoding					
Match case	Select this check box to make the search case-sensitive					
Search area	· · · ·					
From current position	Select this check box to start search from the current position					
From start position	Select this check box to start search from the beginning of the object					
From Address	Select this check box and specify the range in which the search is to be carried out					
Search position						
Exhaustive search	Select this check box to search the entire object					
Search at offset	Select this check box and specify the sector offset from which the search will start					
Reverse	Select this check box to start the search in the reverse direction					
Find all	Select this check box to search for all instances of the string to search. Search results will be shown in the Find Results pane.					

Search options

Text/Bexadecimal Editor will show the search progress.

Search results are shown in the Find Results pane. You may easily move to the required found item by clicking the item.

■Features of the Not Equal option

Suppose we have an object which first 3 consecutive sectors start with:

Sectorl	FILEAAAAA
Sector2	FILEBBBBB
Sector3	NOTAFILE

And the search string is Not Equal FILE.

If the Exhaustive search option is selected, the **Text/Rexadecimal Editor** will stop at the first A character in Sector1.

If the Search at offset=0 option is selected, the **Text/Bexadecimal Editor** will stop at the N character in Sector3.

Bookmarking

You may create bookmarks to easily move to those places. Right-click the cursor on the place you want to bookmark and select **Toggle Bookmark** on the shortcut menu. The list of bookmarks appears in the Bookmark pane. You may easily move to the required bookmark by clicking it in the list.

You may control bookmarks on the Edit menu.

4.3 Data Copy

Text/Bexadecimal Editor gives you various ways to copy selected data navigate in an object.

Data selected in Text/Rexadecimal Editor

Find Next		Stop	0	ffset	to go	o to	~	Byte	s	•	DAT	A: DA	TA (I	NR)		•		Column	OEM Column	UNIC	CODE Column	UNICODE + Col	lumn Auto flor
Offset								Bina	iry i	data									ANSI		0	DEM	UNICODE
5160:	00	00	00	00	00	00	00	00	-	00	00	00	00	00	00	00	00						
5170:	00	00	00	00	00	00	00	00	-	22	14	00	00	00	00	00	00					. "	
5180:	05	00	53	00	75	00	6D	00	-	6D	00	61	00	72	00	79	00	S.	u.m.m.a.r	· y .	s.u.m	.m.a.r.y.	.Summary
5190:	49	00	6E	00	66	00	6F	00	-	72	00	6D	00	61	00	74	00	I.n.	f.o.r.m.a	.t.	I.n.f.o	.r.m.a.t.	Informat
51A0:	69	00	6F	00	6E	00	00	00	-	00	00	00	00	00	00	00	00	i.o.	n		i.o.n		ion
51B0:	00	00	00	00	00	00	00	00	-	00	00	00	00	00	00	00	00						
51C0:	28	00	02	01	02	00	00	00	-	04	00	00	00	FF	FF	FF	FF	(ÿ	ŸŸŸ	((Å
51D0:	00	00	00	00	00	00	00	00	-	00	00	00	00	00	00	00	00						
51E0:	00	00	00	00	00	00	00	00	-	00	00	00	00	00	00	00	00						
51F0:	00	00	00	00	16	00	00	00	-	00	10	00	00	00	00	00	00						· · · · m

Depending on what column you have control-clicked, the following commands are available in the shortcut menu:

When right-clicking any column Copy Editor Display	Data pasted into a text editor Untitled - Notepad Ele Edit Format View Help Sector 40 (Parent: E: Record: 2942184) S180: 05 00 53 00 75 00 60 00 - 60 00 61 00 72 00 79 00s.u.m.m.a.r.ys.u.m.m.a.r.ysummary v
When right-clicking any column Copy as File Signature	Data pasted into a text editor Untitled - Notepad X E 681 Format View Help \x85\x80\x75\x80\x75\x80\x6D\x80\x6D\x80\x6D\x80\x6D\x80\x79\x80
When right-clicking the Binary data column Copy as "Binary data"	Data pasted into a text editor
When right-clicking the ANSI column Copy as "ANSI"	Data pasted into a text editor
When rightl-clicking the UNICODE column Copy as "UNICODE"	Data pasted into a text editor

4.4 Files and Sectors

You may see which file is written on a particular sector. To do so:

- 1 Enumerate files on a logical disk in the Drives panel.
- 2 Go to the tab of that logical disk and select Show Files in HexEditor on the Files menu.
- 3 Return to the Drives panel and select View/Edit on the shortcut menu.
- > R-Studio will show a file that belongs to a particular section.

File in a sector

Offset								Bina	iry	data								
278113E0:	4E	1A	OF	9A	30	DB	BB	68	-	72	69	0B	8D	63	48	7C	35	N
278113F0:	76	A3	C1	EF	AF	D2	AD	38	-	D4	5A	32	59	90	EO	E6	53	VEÁI
Sector 1294474 (i	Paren	t: WE	DC W	D75A	A-(File	that	t bel	on	gs to	o this	s se	ctor					
ID: 131399681	Roo	t/File	s to v	wipe/	test2	.arc	×	-										
27811400:	CE	OF	AD	EE	22	B1	09	63	-	31	CF	AB	38	BO	60	F9	28	Îî
27811410:	DE	BD	BC	6F	6D	E6	A4	93	-	9D	8E	FO	DO	39	24	B4	6B	Disto
27811420:	13	9F	C3	06	4A	AC	85	F4	-	FD	73	FD	CD	05	2F	46	37	. YA.
27811430:	FC	8D	EC	B1	FC	0E	15	DF	-	F5	CD	92	31	FO	AB	45	A9	ü.l±
27811440:	9C	74	7A	48	DC	79	08	9B	-	68	OE	C1	03	9C	CA	91	34	oet zH
27811450:	01	OF	69	FO	3A	D1	72	9E	-	B7	D2	DA	97	66	8A	9E	73	18
27811460:	5E	FD	CF	4F	EA	14	63	6C	-	F2	2F	EF	67	AB	6E	36	16	^ýÏC
27811470:	B5	28	39	80	72	2B	FD	AS	-	25	32	07	12	27	1B	E7	71	μ(9.
27811480:	D7	4B	04	45	7C	6C	62	B8	-	BO	10	BO	38	C3	02	DC	EE	×K.E
27811490:	18	79	50	14	06	E7	CE	A2	-	B5	20	88	47	06	BB	88	70	.yP.
278114A0:	FE	BE	90	9D	74	44	F3	96	-	84	90	CC	AO	B7	86	AE	63	þ%
278114B0:	03	64	79	09	AA	42	A9	17	-	4B	59	22	1B	42	71	8F	8E	.dy.
278114C0:	CO	39	B8	38	D6	9E	9D	92	-	6D	BE	C6	74	FC	6C	BE	58	À9,8
278114D0:	98	58	C4	39	08	8C	8B	16	-	3E	9F	D8	E5	55	A1	CA	AF	.XAS
278114E0:	B3	48	82	72	71	08	A2	C2	-	57	FB	08	64	C6	88	56	FE	°H,r
278114F0;	36	0A	68	10	CE	B9	52	06	-	A9	65	99	7E	F3	20	DD	48	6.h.

4.5 Creating Custom Patterns

You may create your own patterns yourself.

An example of a commented pattern parsing an AVI file.

The syntax of pattern description is similar to that of the XML language. The folder where the files should be placed is specified on the Main tab of the <u>Settings</u> dialog box.

Pattern structure

Pattern header

Each pattern starts with a standard header

<?xml version="1.0" encoding="utf-8"?>

Section template

Each pattern starts with a section giving to the pattern a name that will be shown in the parsed data pane.

Attributes:

name Specifies the pattern name shown in the parsed data pane

Example:

Section signature

Attributes:

```
align <positive integer> Specifies if the data structure address is aligned (i.g., by a sector: 512)
```

This section contains elements field with hex-codes of the signature. The attribute offset specifies their offset from the start of the record. Field length is equal to the number of hex-codes.

Example:

```
<signature align="1">
    <field offset="0">46 49</field>
    <field offset="2">4c 45</field>
</signature>
```

Section section

Such sections contain all expressions and operations needed for the pattern to parse the data. A section name is shown in the parsed data pane. In fact, sections are virtual objects used to group logically connected fields. Sections can be nested.

The main section is not shown in the parsed data pane.

Section contain elements field which are actual data objects. field names are shown in the parsed data pane with their values.

Attributes:

Attributes:	
name	Specifies the pattern name shown in the parsed data pane
Example:	
<section nam<="" td=""><td>e="JUNK"></td></section>	e="JUNK">
<pre></pre>	
List of All Objec	ts in Patterns
Data types (in	
• integer	·
Sub-types:	
int8	
int16	
int32	
int64	
uint8	
uint16	
uint32	
uint64	
uintX	
Attributes:	
endian: (be le Optional. Default:system.
system)	
base: (de	optional operation and representation Demain deerman
hex oct	al)

	Optional. Speemes data representation. Default. decimar.						
hex octal)							
as-offset:	Optional. Specifies that this field is an offset and its value should be evaluated using						
<expression></expression>	the expression. A special variable this returns the value of this field.						
<pre>purpose: (offset rsector sector cluster rcluster)</pre>	Optional. Specifies the type of the as-offset expression result . If this attribute is present, the attribute is necessary if the offset value should differ from the value of this field (variable this). rsector and rcluster are offsets relative to the absolute position of the pattern beginning.						
assigned- template: <templatename></templatename>	Specifies the pattern name linked with this field. Ignored if the as-offset or purpose attributes are not specified.						
var: <name></name>	Optional. Specifies the name under which the value of this field can be accessed in expressions.						

• binary Attributes:

display-encoding:	Optional. Default: hex.
(hex binary)	
size: <bytes></bytes>	Mandatory.

• char

Attributes:

size: <bytes></bytes>	Mandatory.
codepage: (ansi	Optional. Specifies which codepage is used. Default: ansi.
oem utf8 utf16)	

• filetime

Shows time in the Win32 format (64 bits)

• unixtime

Shows time in the Unix format (seconds from 01/01/1970)

• filetime

Shows time in the DOS format (date: hiword, time: loword)

• bits

Attributes:

size: <bytes></bytes>	Mandatory.
pos: <comma separated list of</comma 	Mandatory. Specifies bit positions in a data block.
bit positions>	

Commands

• goto

Specifies a jump to a specified offset (either absolute or relative one)

Attributes:

address:	Specifies an absolute address to jump to.
<expression></expression>	
offset: <expression></expression>	Specifies a relative offset to jump by.

One and only one of the attributes should always be specified.

• if

Evaluates a condition specified in the test attribute and, if the condition is true, reads fields specified in this tag.

Attribute:

test: <expression> Sets</expression>	a condition to test against.
--------------------------------------	------------------------------

• repeat

Reads the fields specified in the tag until the exit condition is equal to 0 or specified times Attributes:

count: <expression></expression>	<expression> is evaluated one time upon entering the block. Internal</expression>
	elements are read the specified number of times.
test: <expression></expression>	<expression> is evaluated upon entering the block. Similar to the $C++$</expression>
	construction while() {}.
test: <expression></expression>	<expression> is evaluated upon exiting the block. Similar to the $C++$</expression>
	<pre>construction do {} while().</pre>

• setvar

Sets the value of an internal variable. As an example, this command is convenient to store the current offset. The value of the current offset is stored in a predefined variable offset.

Attributes:

var: <string></string>	Specifies the name of the variable.
expr: <expression></expression>	Specifies an expression which result will be assigned to the variable.

Expressions

Expressions in the patterns are arithmetic expressions which syntax is similar to that of the C language, including operation preceding.

The following operations are supported:

Predefined variables

• offset

An offset in bytes from the pattern beginning data is currently read at.

• start_position

An absolute position of the pattern beginning. offset + start_position = absolute offset.

• this

This variable exists only within the context of the ass-offset expression evaluation and is the current value of the data field for which that expression is specified

4.6 Pattern Example I

```
Below is an example of a commented pattern parsing an AVI file.
<?xml version="1.0" encoding="utf-8"?>
<!-- A pattern section. The pattern name is AVI File. -->
<template name="AVI File">
<!-- A template signature section. Alignment is 1. -->
<signature align="1">
<!-- A 4-byte signature at offset 0x00. -->
<field offset="0x00">52 49 46 46</field> <!-- ANSI: RIFF -->
<!-- A 4-byte signature at offset 0x08. -->
<field offset="0x08">41 56 49 20</field> <!-- ANSI: LIST -->
```

</signature>

<!-- A data section. Its name is AVI File. This is the main data section. It is not shown in the parsing tree as a section (its name is ignored). -->

<section name="AVI File">

<!-- The first 4 bytes are read and shown as an ANSI string. -->

<field type="char" size="4" name="Signature: RIFF" var="signature"/>

<!-- The current position is moved to the beginning of the file. -->

<goto offset="-4"/>

<!-- The first 4 bytes in the file are read and shown as an unsigned integer. The internal variable signature gets the value of the field. -->

```
<field type="uint32" base="hex" name="Signature RIFF as unsigned integer in hex
format" var="signature"/>
```

<!-- A test against the condition (signature == RIFF) -->

<if test="signature == 0x46464952"> <!-- ANSI: RIFF -->

<!-- The next 4 bytes are read and shown as an unsigned integer. The internal variable dataSize gets the value of the field. -->

<field type="uint32" name="Size of the data in file" var="dataSize"/>

<!-- A new internal variable endoffile is created and the expr field evaluates its value.-->

<setvar var="endOfFile" expr="offset + dataSize - 8"/>

<!-- The next 4 bytes is read and shown as an ANSI string. -->

<field type="char" size="4" name="File type"/>

```
<!-- A new section named DATA is created -->
```

<section name="DATA">

<!-- A new internal variable chunksOffset is created, the expr filed evaluating its value. This variable gets the absolute value of template offset. -->

<setvar var="chunksOffset" expr="start_position"/>

<!-- A loop is created. Its condition is set in the test field (while the endofFile variable is greater then the current position.) -->

```
<repeat test="endOfFile > offset">
```

<!-- 4 bytes are read and shown as an ANSI string. -->

<field type="char" size="4" name="Signature"/>

<!-- The current position is moved backwards by 4 bytes. -->

<goto offset="-4"/>

<!-- The same 4 bytes are read and shown as an unsigned integer. The internal variable signature gets this value. -->

<field type="uint32" name="Signature as unsigned integer"
var="signature"/>

```
<!-- A test against the condition (signature == LIST) -->
<if test="signature == 1414744396"> <!-- ANSI: LIST -->
  <!-- The section is shown. Its name is LIST -->
  <section name="LIST">
    <!-- The current position is moved backward by 4 bytes. -->
```

<goto offset="-4"/>

<!-- The 4 bytes are read and shown as an unsigned hexadecimal integer. This field has the attributes offset and assigned-template. If the user double-clicks this field, the AVI File LIST pattern will be invoked and the current pattern position will be moved to the address specified in as-offset.-->

```
<field type="uint32" base="hex" name="Signature LIST as unsigned</pre>
       in hex format"
                          as-offset="start_position +
                                                        offset -
                                                                     4" assigned-
integer
template="AVI File LIST"/>
```

<!-- The next 4 bytes are read and shown as an unsigned integer. The listSize variable gets its value. -->

<field type="uint32" name="Size of the data in the list"</pre> var="listSize"/> <!-- The 4 bytes are read and shown as an ANSI string. -->

<field type="char" size="4" name="List type"/>

<!-- The current position is moved backward by 4 bytes. -->

```
<goto offset="-4"/>
```

<!-- The same 4 bytes are shown as an unsigned hexadecimal integer. The listType variable</p> gets its value.-->

```
<field type="uint32" base="hex" name="List type as unsigned integer in</pre>
hex format" var="listType"/>
```

<!-- A test against condition (type == movi) --> <if test="listType == 0x69766f6d"> <!-- ANSI: movi --> <!-- The chunksOffset variable gets the value evaluated in the expr attribute. --> <setvar var="chunksOffset" expr="start_position + offset - 4"/> </if>

```
<!-- The current position is moved to the address evaluated in the address attribute. -->
    <goto address="offset + listSize - 4"/>
 </section>
</if>
```

```
<!-- A test against condition (signature == JUNK) -->
<if test="signature == 1263424842"> <!-- ANSI: JUNK -->
  <!-- The section is shown with the JUNK name. -->
   <section name="JUNK">
```

<!-- The next 4 bytes are read and shown as an unsigned integer. The internal variable junkSize gets its value. -->

```
<field type="uint32" name="Size of the data of the junk"</pre>
var="junkSize"/>
                <!-- The current position is moved by junkSize bytes forward. -->
                <goto offset="junkSize"/>
              </section>
            </if>
           <!-- A test against condition (signature == idx1) -->
           <if test="signature == 829973609"> <!-- ANSI: idx1 -->
             <!-- The section is shown with the idx1 name. -->
              <section name="idx1">
                    <!-- The next 4 bytes are read and shown as an unsigned integer. The internal variable</p>
idxSize gets its value. -->
                              <field type="uint32" name="Size of the data of the idx1"
var="idxSize"/>
                <!-- The section is shown with the First AVIINDEXENTRY name. -->
                <section name="First AVIINDEXENTRY">
                  <!-- The 4 bytes are read and shown as an ANSI string. -->
                  <field type="char" size="4" name="Chunck id"/>
                  <!-- The next 4 bytes are read and shown as an unsigned hexadecimal integer. -->
                  <field type="uint32" base="hex" name="Flags"/>
                   <!-- The next 4 bytes are read ans shown as an unsigned hexadecimal integer. The offset
attribute is evaluated for this field as a sum of the chunksoffset variable and valued of this field. -->
                                <field type="uint32" base="hex" name="Chunk offset" as-
offset="chunksOffset + this"/>
                  <!-- The next 4 bytes are read and shown as an unsigned integer. -->
                  <field type="uint32" name="Chunk size"/>
                </section>
                <!-- The current position is moved by idxSiz bytes forward. -->
                <goto offset="idxSize"/>
              </section>
           </if>
           <!-- A test against the condition. \& \& is a logical AND (\&\&) -->
                 <if test="signature != 1414744396 &amp;&amp; signature != 1263424842</pre>
&& signature != 829973609">
             <!-- An empty section is shown. Its name is Unknown signature found -->
              <section name="Unknown signature found">
              </section>
             <!-- The current position is moved to the address set in the endoffile variable. -->
              <goto address="endOfFile"/>
            </if>
```

```
</repeat>
</section>
</if>
</section>
</template>
```

4.7 Pattern Example II

```
<?xml version="1.0" encoding="utf-8"?>
<!-- A pattern section. The pattern name is AVI File LIST -->
<template name="AVI File LIST">
    <!-- A template signature section. Alignment is 1. -->
    <signature align="1">
        <!-- A 4-byte signature at offset 0x00. -->
        <field offset="0x00">4C 49 53 54</field> <!-- ANSI: LIST -->
        </signature>
```

<!-- A data section. Its name is AVI File LIST. This is the main data section. It is not shown in the parsing tree as a section (its name is ignored).-->

<section name="AVI File LIST">

<!-- The first 4 bytes are read and shown as an ANSI string. -->

<field type="char" size="4" name="Signature: LIST"/>

<!-- The current position is moved to the beginning of the file (4 bytes backward). -->

<goto offset="-4"/>

<!-- The first 4 bytes in the file are read and shown as an unsigned integer. The internal variable signature gets the value of the field. -->

<field type="uint32" name="Signature LIST as unsigned integer" var="signature"/>

<!-- A test against the condition (signature == LIST) -->

<if test="signature == 1414744396"> <!-- ANSI: LIST -->

<!-- The next 4 bytes are read and shown as an unsigned integer. The internal variable listSize gets its
value. -->

```
<field type="uint32" name="Size of the data in the list" var="listSize"/><setvar var="endOfList" expr="offset + listSize"/>
```

<field type="char" size="4" name="List type"/>

```
<goto offset="-4"/>
```

<field type="uint32" base="hex" name="List type as unsigned integer in hex
format" var="listType"/>

```
<!-- A test against condition (listType == movi) -->
```

<if test="listType == 0x69766f6d"> <!-- ANSI: movi-->

<!-- This chunk is not to be parsed. The current position is moved to the end of the chunk. -->

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```
<goto address="endOfList"/>
      </if>
      <setvar var="mediaType" expr="0"/>
      <repeat test="endOfList > offset - 8">
        <section name="CHUNK">
          <field type="char" size="4" name="Chunk ID"/>
          <goto offset="-4"/>
          <field type="uint32" name="Chunk ID as unsigned integer" var="chunkId"/>
          <if test="chunkId == 1414744396"> <!-- ANSI: LIST -->
            <goto offset="-4"/>
    <field type="uint32" base="hex" name="LIST chunk ID as unsigned integer in hex</pre>
format" as-offset="start_position + offset - 4" assigned-template="AVI File LIST"/>
          </if>
                       <field type="uint32" name="Size of the data in the chunk"
var="chunkSize"/>
          <setvar var="endOfChunk" expr="offset + chunkSize"/>
          <!-- Rounding the value of the variable endofchunk to a number divisible by 2. -->
          <if test="endOfChunk &amp; 1">
            <setvar var="endOfChunk" expr="endOfChunk &amp; 0xFFFFFFE"/>
            <setvar var="endOfChunk" expr="endOfChunk + 2"/>
          </if>
          <if test="chunkId == 1751742049"> <!-- ANSI: avih -->
            <field type="uint32" name="Number of microseconds between frames"/>
            <field type="uint32" name="Approximate maximum data rate of the file"/>
            <field type="uint32" name="Alignment for data, in bytes"/>
               <field type="uint32" name="Bitwise combination of zero or more of the
flags"/>
            <field type="uint32" name="Total number of frames of data in the file"/>
            <field type="uint32" name="Initial frame for interleaved files"/>
            <field type="uint32" name="Number of streams in the file"/>
            <field type="uint32" name="Suggested buffer size for reading the file"/>
            <field type="uint32" name="Width of the AVI file in pixels"/>
            <field type="uint32" name="Height of the AVI file in pixels"/>
            <field type="binary" size="16" name="Reserved"/>
          </if>
          <if test="chunkId == 1852994675"> <!-- ANSI: strn -->
```

```
<field type="char" size="chunkSize" name="Stream name"/>
          </if>
          <if test="chunkId == 1752331379"> <!-- ANSI: strh -->
            <field type="char" size="4" name="Type"/>
            <goto offset="-4"/>
               <field type="uint32" base="hex" name="Type as unsigned integer in hex</pre>
format" var="type"/>
            <setvar var="mediaType" expr="type"/>
            <field type="char" size="4" name="Handler (codec)"/>
            <field type="uint32" base="hex" name="Flags"/>
              <field type="uint32" name="Number of the first block of the stream that</pre>
is present in the file"/>
            <field type="uint32" name="Scale"/>
            <field type="uint32" name="Rate"/>
            <field type="uint32" name="Start time of stream"/>
               <field type="uint32" name="Size of stream in units as defined in Rate</pre>
and Scale"/>
              <field type="uint32" name="Size of buffer necessary to store blocks of</pre>
that stream"/>
            <field type="uint32" name="Quality"/>
               <field type="uint32" name="Sample size (number of bytes of one stream</pre>
atom)"/>
          </if>
          <if test="chunkId == 1718776947"> <!-- ANSI: strf-->
            <if test="mediaType == 0x73646976"> <!-- ANSI: vids -->
              <section name="BITMAPINFOHEADER">
                          <field type="uint32" name="Number of bytes required by the</pre>
structure"/>
                <field type="int32" name="Width of the bitmap, in pixels"/>
                <field type="int32" name="Height of the bitmap, in pixels"/>
                <field type="uint16" name="Number of planes for the target device"/>
                <field type="uint16" name="Number of bits-per-pixel"/>
                     <field type="uint32" name="Type of compression for a compressed</pre>
bottom-up bitmap"/>
                <field type="uint32" name="Size, in bytes, of the image"/>
                      <field type="int32" name="Horizontal resolution, in pixels-per-</pre>
meter, of the target device for the bitmap"/>
                  <field type="int32" name="Vertical resolution, in pixels-per-meter,</pre>
of the target device for the bitmap"/>
                     <field type="uint32" name="Number of color indexes in the color</pre>
table that are actually used by the bitmap"/>
```

```
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```

```
<field type="uint32" name="Number of color indexes that are required</pre>
for displaying the bitmap"/>
              </section>
            </if>
            <if test="mediaType == 0x73647561"> <!-- ANSI: auds -->
              <section name="WAVEFORMATEX">
                 <field type="uint16" name="Waveform-audio format type"/>
                  <field type="uint16" name="Number of channels in the waveform-audio</pre>
data"/>
                       <field type="uint32" name="Sample rate, in samples per second
(hertz)"/>
                   <field type="uint32" name="Required average data-transfer rate, in</pre>
bytes per second, for the format tag"/>
                <field type="uint16" name="Block alignment, in bytes"/>
                    <field type="uint16" name="Bits per sample for the Waveform-audio</pre>
format type"/>
                          <field type="uint16" name="Size, in bytes, of extra format</pre>
information appended to the end of the WAVEFORMATEX structure"/>
              </section>
            </if>
          </if>
          <goto address="endOfChunk"/>
        </section>
      </repeat>
    </if>
    <if test="signature != 1414744396">
      <section name="Invalid LIST signature found">
      </section>
    </if>
  </section>
</template>
```

V Technical Information and Troubleshooting

This chapter covers various technical issues and troubleshooting.

- IntelligentScan technology
- Data Recovery Issues
- Extended Information Recovery
- Data Formats and Multipliers
- Data Recovery on HFS/HFS+ file system
- Supported Virtual Disk and Disk Image Formats
- Bad Sectors
- Memory Usage
- <u>**R-Studio Switches**</u>
- Properties Tab

R-Studio Features Contact Information and Technical Support Data Recovery Using R-Studio Basic File Recovery Advanced Data Recovery Mass File Recovery Volume Sets and RAIDs Data Recovery over Network Text/Bexadecimal Editor R-Studio Emergency R-Studio Agent Emergency

5.1 IntelligentScan Technology

R-Studio uses a unique *IntelligentScan* technology when it tries to recover the data on the area being scanned.

While scanning the selected area, **R-Studio** reads data directly from the drive, analyzes them, and tries to determine a record to which the data belong. The following record types are possible:

- MBR/GPT records
- NTFS Boot Sector, Folder, and MFT records
- FAT/exFAT Boot Sector, folder, and file records
- ReFS Boot sector records and ReFS Meta blocks
- HFS/HFS+ Volume headers and BTree+ nodes
- APFS Super blocks, APFS Volume blocks, and APFS nodes
- Ext2/3/4FS SuperBlocks records
- <u>UFS</u>/FFS SuperBlock records
- Specific file signatures of Known File types for raw file carving

All these record types have different, but known, structure. Knowing valid values of record fields and relations between them for each record type, **R-Studio** determines a record type for the data. If such record type cannot be unambiguously determined, the data are assigned to the most probable record type. The same data can be assigned to several record types, with a certain probability for each assignment. A list of possible files is generated from these records.

R-Studio generates a record list for each record type. This list contains references to records assigned to a record type from the list with their assignment probability. The same data can be included into different record lists. Then **R-Studio** analyzes relations between elements in each list and between different lists, and generates a list of found <u>partitions</u> with their parameters, such as partition start point and probable size, file system type, cluster size, and existence probability.

Using the file list and partition list, **R-Studio** reconstructs file systems and files on the found partitions. One file can be attributed to several different partitions.

When the entire drive or its part has been scanned, **R-Studio** shows all found partitions. Then the parameters of the found partitions may be manually corrected, if additional information on them is available.

Using the *IntelligentScan* technology, **R-Studio** can recover files not only on new and existing partitions. It also can find and recover data on partitions that have been deleted or <u>reformatted</u>. If, for example, there was an NTFS partition, which later was reformatted as a FAT partition, **R-Studio** will show two partitions on the same place on the drive, one having the FAT file system, the other the NTFS. Then, files found on those partitions can be recovered.

The *IntelligentScan* technology makes **R-Studio** a very powerful data recovery tool, but it is not omnipotent. As it uses probabilistic approach to data reconstruction, it cannot guarantee 100% correct results. Moreover, even if **R-Studio** has reconstructed data structure correctly, it is impossible to guarantee that all found files will be completely and correctly recovered, as new data may be already written over the old files. See the <u>Data</u> <u>Recovery Issues</u> topic for details.

5.2 Data Recovery Issues

NEVER TRY TO SAVE RECOVERED FILES/FOLDERS TO THE SAME LOGICAL DISK WHERE THEY RESIDE!!!

Or you may obtain unpredictable results and lose all of your data.

R-Studio writes directly to a drive only when writing recovered data and from its hex editor, if writing is enabled. In all other actions, **R-Studio** only reads data and analyzes them, and never modifies data on the drives being analyzed.

Most operating systems use lazy-write. So, there is a time lag between file actions and actual changes on data on a drive. **R-Studio** analyzes data on drives only. That is why it does not always detect recent changes in data structure.

Most operating systems constantly write their service information on drives. Such writing is especially intensive during startup and shutdown procedures. When an operating system deletes a file/folder, it treats the space where it has resided as empty and may write something in this place. If this happened, the file/folder and its parameters may be detected correctly, but its data may be lost.

Folder names like **\$\$\$Folder58448** on NTFS <u>partitions</u> mean that the folder has not been found on the drive but some references to it have been. For example, folders My documents, Work, Photos have been found and all they have one parent folder, whose description has not actually been found on the drive, so its name is unknown and therefore represented as **\$\$\$Folder58448**. It may happen that the description of such folders was outside of the

scan area, so try to enlarge the region or scan the entire drive. If that does not help, most likely that the description of the folder has been overwritten.

Folder names like **\$ROOT58448** on <u>FAT</u> partitions mean that some folders have been found, but they cannot be included into the folder structure for this FAT partition. Sometimes, such folders may contain other folder structures.

If you recover a file, and it appears that the file contains wrong data, try to do the following:

• Scan:

the logical disk, if the file has been just deleted.

the drive, if the data structure is damaged more seriously.

• Search for the file to be restored on all found partitions and try to recover it from all found partitions. Check each recovered file to ensure that it contains correct data. As soon as you found the partition from which the file is recovered correctly, use this partitions to recover all other deleted files.

If there are several deleted files to be restored, you should use a file larger than 2KB to select the required partition.

FAT file system:

Cross-Linked Folders

Often **R-Studio** finds several FAT folder records that contain the same data. Such folders are called *cross-linked*. **R-Studio** marks such folders with an arrow mark: $\Box = Movie$

R-Studio attributes the content of cross-linked folders to one folder called a *target folder*. When recovering, **R-Studio** places the content to the target folder.

To view the list of cross-linked folders,

- 1 Right-click a cross-linked folder and select Cross Linked Folders on the shortcut menu
- > A list of cross-linked folders will appear

You may go to any folder in this list by clicking it.

To find a target folder,

* Right-click a cross-linked folder and select Go Target on the shortcut menu, or Select the cross-linked folder and select Goto Target on the File menu If Go Target is gray, this folder is already the target folder.

To set the target folder manually,

 Right-click a cross-linked folder and select Set As Default Target on the shortcut menu, or Select the cross-linked folder and select Set As Default Target on the File menu.
 If Set As Default Target is grow this folder is already the target folder.

If Set As Default Target is gray, this folder is already the target folder.

Questionable Folders

Sometimes, **R-Studio** may find FAT records, which look like folders, but their content is invalid. For example, file names have invalid characters, date, time, and size, or other file attributes may look strange. Please note that **R-Studio** correctly recognizes localized names. **R-Studio** treats such records as folders, but does not analyze their content and structure. You can manually scan such folders, but results may be unpredictable. Usually, such scan reveals garbage.

R-Studio marks such folders with a question mark. W 🏭 👬

To re-scan an object,

* Right-click a questionable folder in the R-Studio's Folders panel and select Rescan on the shortcut menu, or

Select the questionable folder and select Rescan on the File menu.

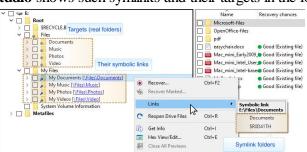
ReFS, NTFS, APFS, HFS, XFS, and ext fs file systems:

Symbolic links (symlinks)

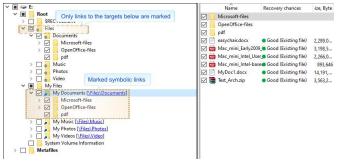
<u>Symbolic links</u> (of symlinks for short) are object that contains references to other files or folders directory in the form of absolute or relative paths and that affect pathname resolution. For example, if a symlink C: \ProgramData\Documents points to D:\Recovered Files\Root\Users\Public\Documents, entering it will result in entering D:\Recovered Files\Root\Users\Public\Documents.

They are present in almost all modern file systems. NTFS, HFS+, APFS, and EXT FS are probably the most popular examples.

R-Studio shows such symlinks and their targets in the following way:



Symlinks can be marked for recovery



Only symlinks on the picture above are marked for recovery. They will be recovered as real files and folders.

× ■ 🖙 E	Name	Recovery chances	ize, Byte
V Root	Microsoft-files		
▼ Root > 0 SECYCLERIN Y a Files Y y OpenOffice-files y w y w y OpenOffice-files y w	Name	 Good (Existing file) Good (Existing file) Good (Existing file) 	ize, Byte 2,289,0 3,198,5 2,266,0 893,646 14,191, 3,563,2

Only targets (real folders) on the picture above are marked for recovery. They will be recovered as real files and folders.

🖩 🥪 E	Name Recovery chan	ces ize, Byte
	Microsoft-files	
Both the targets (real folders) and their links are marked Decoursers Decourser		ng file) 2,289,0 ng file) 3,198,5 ng file) 2,266,0 ng file) 893,646 ng file) 14,191,

Both targets (real folders) and symlinks on the picture above are marked for recovery. They will be recovered as real files and folders and symlinks.

The <u>R-Studio Settings</u> topic gives more details about symlink recovery.

Files:

Hard links

<u>Hard links</u> are file system entries that give file names to files. This term is usually used when files may have several names. **R-Studio** shows hard links using the following icons:

A hard link: 🗌 🎽 Wipe Test 2.doc

The target file: 🗌 🎧 Wipe Test 2.doc

You may find a target or hard link for a file. Right-click the file and select Links on the shortcut menu.

5.3 Extended Information Recovery

R-Studio supports recovery of compressed files, <u>alternative data streams</u>, encrypted files, file security and extended file attributes. If the **R-Studio** host OS and the file system of the disk you are going to save file to support any particular extended information, it will be saved with the file, too. Otherwise, the extended information will be saved as separate files with the same name as the restored file and extension showing the type of the extended information. Below is a quick reference for the host OS and file system of the target drive.

Extended Information	Required host OS	Required target disk FS
Encrypted files	Windows 2000/XP/2003/Vista/?	NTFS
	2008/7/8/8.1/10	
Alternative data streams	Windows NT/2000/XP/2003/?	NTFS
	Vista/2008/7/8/8.1/P0	
File security	Windows NT/2000/XP/2003/?	NTFS
	Vista/2008/7/8/8.1/P0	
Extended file attributes	Windows NT/2000/XP/2003/?	NTFS or FAT/exFAT
	Vista/2008/7/8/8.1/P0	

5.4 Data Formats and Multipliers

You may enter data in all numerical fields either in sectors or in bytes. If there is no letters are after the number, **R-Studio** assumes the numbers are in bytes.

Decimal numbers are entered as they are: 2372354

Hexadecimal numbers are entered as 0x23Fa67 or 23Fa67 hex.

The following case-insensitive notation is possible:

b	1 byte
kb	$1 \text{ kb} = 2^{10}=1024 \text{ bytes}$
mb	$1 \text{ mb} = 2^{20} = 104857 \text{ bytes}$
dp	$1 \text{ gb} = 2^{30} = 1073741824 \text{ bytes}$
tb	$1 \text{ tb} = 2^{40} = 1099511627776 \text{ bytes}$
eb	$1 \text{ eb} = 2^{50} = 1125899906842624 \text{ bytes}$
hex	A hexadecimal number
sec	A number is in sectors
(sector)	

You may also select the multipliers in the drop-down boxes.

Determined to a construct of the set of the

If a file is opened in Text/Bexadecimal Editor, you may select data representation for that file.

Type a sector to go to v Sectors v DATA: DATA (NR) v

When the multiplier has been changed, the data value will be changed according to the specific shortcut commands for that field:

Suppose, the initial value is 1 GB, and the sector size of the object is 512 byte. The results will be the following:

Command: No recalculate

Change from GB to MB: 1 Change from GB to Sectors: 1

Command: Always recalculate

Change from GB to MB: 1024 Change from GB to Sectors: 2097152

Command: Units type recalculate

Change from GB to MB: 1 Change from GB to Sectors: 2097152

5.5 Data Recovery on HFS/HFS+ File System

When deleting a file, Mac OS X deletes system BTree+ records describing the file. Therefore, it is hard to recover such file directly. Those records may remain in:

- 1. The swap file (if the deleted file has been deleted recently).
- 2. In the journal (if the HFS+ journaling is on, and the deleted file has been CREATED recently)

Actually, if a file has been deleted, chances that the records would be found are small. To greatly increase the chances to recover deleted files successfully, you may actively use scanning with enabled <u>Known Files Types</u>.

Note: All above is correct for intentionally deleted files. In case of a corrupted file system, HFS/HFS+ can be recovered quite successfully.

When recovering files with HFS+-specific attributes (resource fork, finder info, etc.), **R-Studio** saves it in the so-called <u>AppleDouble</u> format. When they are copied to an HFS+ disk under Mac OS X, those attributes will be automatically restored.

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5.6 Supported Virtual Disk and Disk Image Formats

Along with file formats used for purely disk backup and <u>imaging</u> purposes, there are file formats for virtual disks. Virtual disks are software components that emulates data storage devices in virtual machines. A the same time, virtual disks can be used for disk backup and imaging, too. That is why it's expedient for disk backup and imaging software to support various file formats for virtual disks. This is especially important for system interoperability, when it's necessary to use disk backup/image files on other machines where the disk backup and imaging software isn't installed.

Currently **R-Studio** supports the following virtual disk and disk image formats:

RDR: A proprietary disk image format developed by **R-Tools Technology, Inc (R-TT)**. It is the main format in **R-Drive Image, R-Studio, R-Linux**, and **R-Undelete**. RDR files are interchangeable, that is, any **R-TT** program may load and process, within its capabilities, any rdr file created in another **R-TT** program.

The following image formats can be created only in the **R-Studio Corporate** and **Technician/T80**+ versions:

VHD/VHDX: A virtual disk file format built into Windows. It's a native virtual hard drive for Hyper-V, the Windows virtual machine. You may read more about these file formats in Wikipedia: <u>VHD (file format)</u>. **R**-**Studio** creates a special file with some metadata for the VHD file format, its extension is vhr. The VHDX file format contains this metadata within its main file.

VMDK: A virtual disk file format for the most virtual machines like VMware Workstation, VirtualBox, Parallels Desktop for Mac, etc. You may read more about these file format in our Glossary: <u>What is a VMDK Virtual Disk</u>.

VDI: A virtual disk file format for the VirtualBox virtual machine. **R-Studio** creates a special file with some metadata for the VDI file format, its extension is vdr. You may read more about these file format in Wikipedia: <u>VDI</u>.

R-Studio Standalone can load these image formats.

Features	RDR	VHD/VHDX	VMDK	VDI
Several objects in one file	Yes	No	No	No
Compression	Yes	No	Yes	No
Encryption	Yes	No	No	No
Image Split	Yes	No	Yes	No
Native mounting on Windows	No	Yes	No	No
Mounting on Windows using R-Studio	Yes	Yes	Yes	Yes

The main features of these file formats are presented in the table below:

Additional file formats that can be opened "read-only"

Extensions Description	Licenses
------------------------	----------

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dmg	Apple Disk Image	All
e01/ewf	Expert Witness File Format	Technician/T80+
aff	Advanced Forensic Format	Technician/T80+

5.7 Bad Sectors

Quite often, drives from which the data are to be recovered have <u>bad sectors</u>, or those sectors that are very hard, even impossible, to read, mostly due to hardware problems. **R-Studio** tries to read such sectors several times. The number of tries is specified either on the <u>Settings/Bad Sectors</u> dialog box, or on the <u>Properties</u> tab, the Drive Control section, for each drive separately.

When **R-Studio** encounters such bad sectors while performing various tasks and they appear unreadable, it treats them as follows:

Object images:

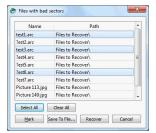
R-Studio fills the space in the <u>image</u> file where the bad sectors should be with the pattern specified in the Pattern to fill bad blocks field on the <u>Settings/Bad Sectors</u> dialog box. Please note that **R-Studio** writes the pattern on the image, not on the source drive.

Files

If Skip files with bad sectors on the <u>Recovery</u> dialog box is cleared, **R-Studio** fills bad sectors in the recovered file with the pattern specified on the the <u>Settings/Bad Sectors</u> dialog box. Information about such files will appear in the <u>Log</u>.

If Skip files with bad sectors on the <u>Recovery</u> dialog box is selected, **R-Studio** skips files with bad sectors and displays their list on the Files with bad sectors dialog box when the recovery has been completed. You may select files to immediately recover them or to mark for later recovery. You may also save this list to a text file.

Files with bad sectors dialog box



■Files with bad sectors Buttons

Select All	Click this button to select all files in the list.
Clear All	Click this button to unselect all selected files.
Mark	Click this button to mark all selected files in the list.
Save to File	Click this button to save the list of files with bad sectors to a text file.
Recover	Click this button to immediately recover selected files. The bad sectors in the recovered files will be filled with the pattern specified in the Pattern to fill bad blocks field on the <u>Settings/Bad Sectors</u> dialog box.

Objects edited in the Text/Rexadecimal Editor/Viewer

Bad sectors in the objects viewed/êdited in the <u>Text/Bexadecimal Editor</u> are shown as filled with the pattern specified in the Pattern to fill bad blocks field on the <u>Settings/Bad Sectors</u> dialog box.

5.8 Memory Usage

You may see how much memory **R-Studio** uses while performing a data recovery task. This is especially useful when scanning large drives on a computer with limited resources. You may specify memory control options on the Memory usage tab in the **R-Studio** <u>Settings</u>.

To view memory usage,

- 1 Select Memory usage on the Tools menu
- > R-Studio will show the total memory in your computer and how much memory it uses

Memory usage dialog box

rocess	Memory	System Me	emory Physical	System M	lemory Swap
Used:	264.20 MB	Used:	1.49 GB	Used:	1.49 GB
Free:	128.00 TB	Free:	14.39 GB	Free:	17.26 GB
Limit:	34.64 GB	Limit:	15.88 GB	Limit:	18.76 GB

Memory usage

Process Memory	Shows how much memory R-Studio uses. Limit shows how much memory your system can virtually allocate to R-Studio . Actual memory allocation depends also on the RAM and swap file sizes.
System Memory Physical	Shows how much RAM is in your system
System Memory Swap	Shows how much virtual memory is in your system

5.9 R-Studio Switches

If there are problems in starting **R-Studio** and while working with it, you may use switches to avoid them. The following switches are available:

-all_drives	Forces R-Studio to show all <u>logical disks</u> in the system. Normally R-Studio shows
	only local drives in the system. Some storage devices may pretend that they are not
	local drives.
-debug	Includes additional debug information. When this switch is used, an additional
	command Create FS Snapshot on the shortcut menu appears for an object with a file
	system. An FS Snapshot contains system data for the file system only (file
	descriptions without file contents). If a problem appears, this snapshot can be sent to
	R-Studio technical support to identify the problem. This switch greatly slows
	R-Studio. You may also turn this mode on by selecting Debug Mode on the Settings
	dialog box.
-flush	Flushes the log file after each write to log operations. This switch is helpful when
	R-Studio locks and its log file remains in memory cache unwritten to a drive. This
	switch greatly slows R-Studio .
-log <filename></filename>	Started with this switch, R-Studio writes its log into the specified file. If R-Studio
	locks and its log file remains in memory cache unwritten to a drive, use the -flush
	switch.
-mem <size in="" mb=""></size>	Sets memory usage limit in MB for R-Studio to reconstruct the file tree. When it
	exceeds the limit, a Too many files message appears. You may temporally stop file

	listing and browse through found files. Then you can resume file listing. You also may skip this file section and continue file listing. Example: -mem 400 - sets the limit to 400 MB.
-no_ide_ext	Turns off the inquiry about extended information on HDDs in Wind9x/ME. This switch may be helpful if R-Studio returns information about HDDs incorrectly (detects HDD geometry incorrectly).
-no_int13	Turns off the disc access through Int13 in Wind9x/ME. This switch may be helpful if the system operates incorrectly (detects HDD geometry incorrectly or lock the system).
-no_ios	Turns off the Wind9x/ME protected-mode I/O system. This switch may be helpful if this system operates incorrectly (detects HDD geometry incorrectly or lock the system).
-reset	R-Studio resets an HDD controller each time it reads a <u>bad sector</u> . This switch may be helpful if the controller locks after it attempts to read a bad sector, or returns incorrect data.
-safe	Disables automatic <u>partition</u> search on a drive, file system recognition on partitions, and other potentially problematic operations. In this mode, it is necessary to use Find partition command from the drive shortcut menu to manually find a partition.

If an unrecognized problem appears, start **R-Studio** with the -debug and -log < filename > switches, and send the log and screenshot of the **R-Studio** main panel to the **R-Studio** technical support:

<u>R-Studio Technical Support Team</u> is available 24 hours a day, seven days a week, and has an average response time less than 4 hours.

5.10 Properties Tab

Object size units

You may select the units in which the information on object sizes will be displayed. Some parameters can be edited when the Debug mode is turned on on the Main dialog box of the **R-Studio** settings.

To select the units

- 1 Select Properties on the View menu
- 2 Select the units in which you want to see object sizes.

You n	nay select
Show	as Bytes
Show	as Sectors
Show	as Bytes and Sectors

1.Basic information

This section shows basic information for a drive object.

More information...

Drive Type	Device/drive type and subtype. Current R-Studio version supports the following
	types: Disk, WORM, CDROM, Optical, Changer, Floppy, RAM Disk, LDM Partition, LDM Component, LDM Volume and subtypes:

	Device, OS File, Physical Drive, Mount Point, Partition, Volume Set, Mirror, Stripe Set, RAID 4, RAID 5, RAID 6
Name	Device/drive name
Size	Device/drive size
Bus Type	Device/drive bus type. Can be: IDE/ATA, IDE/ATAPI, SCSI, Floppy, USB, 1394, SSA, FibreChannel, RAID, SMART, ABIOS

2.Information on drives and logical disks

This section shows available information on drives and <u>logical disks</u>. These properties depend on the drive/disk type and appear only when applicable. Under Windows, an IDE drive/disk may be represented as a SCSI device, that is why the SCSI Address section appears under these OSes for those drives/disks.

■ More information...

More Information			
OS object	Appears for <u>image</u> files under Windows for drives/disks. An object name used by OS		
	to access the Device/drive.		
R-Studio driver	Driver names (both internal and OS) used to access this drive/disk.		
Sector Size	Drive/disk sector size		
Physical Drive Geometry	This section shows physical geometry for a drive. For a logical disk it shows the physical geometry for a drive where the logical disk resides		
Cylinders			
Tracks Per Cylinder			
Sectors Per Track			
Sector Size			
Device Identification	This section shows vendor information for the drive/disk		
Vendor			
Product			
Firmware			
Bus			
SCSI Address	This section shows SCSI information for the drive/disk		
Port Number			
Path ID			
Target ID			
Lun			
Windows 9x/ME a	Windows 9x/ME adds the following properties:		
Int13 Drive Number	128 for the first drive accessible through Int13, 129 for the second one, etc. 0128 for drives and other devices accessible through a Windows 9x/ME protected mode driver, if their Int13 device option is disabled. R-Studio can use Int13 disk access, and for some drive types, like SCSI devices, Int13 access is preferable. You may consider enabling the Int13 device option in the Windows Device Manager for such devices.		
Int13 Extension Version	Int13 Extension Version Support for drives. Extended Int13 support is necessary for large drives. If this property is zero, Extended Int13 is not supported, otherwise, it		

shows Extended Int13 standard version, the large, the better.

3. Properties controlling access to drives and logical disks

This section shows properties that control access (read and write) to drives and logical disks. They are set to their optimal values and should be altered only if access problems appear.

Drive Control	
Maximum transfer	Maximum data size that can be read or written during a single access to the drive. If there are problems with drive access, decrease the value of this property
I/O Unit	Data size read or written during a single access to the drive is a multiple value of this property. If there are problems with drive access, decrease the value of this property
Buffer Alignment	Drive data transfer buffer is positioned at an address multiple value of this property. If there are problems with drive access, increase the value of this property.
	es are set by OS drivers. If the drivers set incorrect values, problems may appear during ons. You can alter them until data transfer becomes stable.
I/O Tries	 Number of read/write tries during access to the drive. If there are <u>bad sectors</u> on the drive, increase the value of this property. This may help to successfully read those sectors. Sometimes, if the I/O Tries parameter is set too large and there are some unreadable sectors on the drive, the drive-controller pair may refuse to perform any successive read/write operations with the entire drive when it fails to read/write such sectors. In this case, set this parameter to zero. The default value is specified in the <u>Settings (Bad Sectors)</u> panel. R-Studio treats bad sectors in the following way: It reads a certain part of drive (predefined by Windows) and If Default read attempts is set to a non-zero value, R-Studio reads again that part sector by sector, repeating the attempts the specified number of times. If R-Studio still cannot read a bad sector, it fills the sectors with the specified pattern. In this case only the bad sectors will be filled with the pattern, but that extremely slows the drive read process.

4.Partition properties

■ More information...

A *partition* is a continuous area on a drive, characterized by its offset and size. There are partitions on basic disks, dynamic disks, and recognized volumes and partitions. **R-Studio** treats regions like partitions.

Partition Offset	Initial offset for the partition.
Partition Size	Size of the partition.
Partition Type	File system type for the partition. If the record in the drive partition table is incorrect, this property may differ from the actual file system type for this partition. Still, R-Studio will process this partition correctly, as it does not use this property.
Partition number	Appears under Windows NT/2000/XP/2003/Vista/2008/7/8/8.1/10 only. Shows the number of the partition on the physical drive.

■ More information...

For regions and recognized partitions, Partition Offset and Partition Type properties can be manually corrected.

5.Compound volume properties

A *compound volume* is a union of several partitions or other drive objects. Each union type has its own rules, unique for each compound volume type. Among compound volumes are: *Volume Sets* (RAIDs Level 0), *Mirrors* (RAIDs Level 1), *RAIDs4/5/6* (RAIDs Level 4/5/6), both physical and created by the user (*Virtual Volume Sets*, *Virtual Stripe Sets*, *Virtual Mirrors*, *Virtual RAID5*).

More information...

- Moro information

Main properties of compound volumes are *parents* (drive objects from which a compound volume is created) and their order. These properties may be viewed in the Parents tab. For user-created compound volumes these properties may be altered.

Raid Block Size Data block size for compound volumes of RAID (Level 0-5) types

6.LDM disks and volumes (Dynamic Disks)

LDM disks and volumes are volumes controlled by Logical Disk Manager (LDM). They are represented on a drive as a LDM database rather than partition tables. Under Windows 2000/XP/2003/Vista/2008/7/8/8.1/10, LDM disks are also called *Dynamic Disks*.

More information	
Offset of Logical Disk	Initial offset of a logical disk on a drive. For disks, initially formatted by LDM, this
	value is often 31.5KB , for converted disks, it may be larger.
Supposed Parents	Supposed number of parent partitions for compound LDM volumes. If the LDM
Count	database is not damaged, the value of this property must be equal to the number of
	parent objects in the Parents tab for the drive object.
LDM Host GUID	Global Unique Identifier of a computer system where this LDM disk group has been
	created.
LDM DiskGroup GUID	Global Unique Identifier of the LDM disk group.
LDM Disk GUID	Global Unique Identifier of the drive.
LDM Volume GUID	Global Unique Identifier of the volume.
LDM Disk ID	Local drive Identifier, unique within this LDM disk group.
LDM Partition ID	Local partition Identifier, unique within this LDM disk group.
LDM Component ID	Local component Identifier, unique within this LDM disk group.
LDM Volume ID	Local volume Identifier, unique within this LDM disk group.
LDM Disk AltName	Additional Alternative Name given by LDM to the drive.
LDM Disk DriveHint	Last name of the volume, under which is has been mounted in the system. May be
	either a letter (C:, D:, etc.), or a mount point under Windows 2000/XP/2003/Vista/?
	2008/7/8/8.1/10.

7.File System Volume properties

A *File System (FS) volume* is a disk object where a certain, supported by **R-Studio**, file system is present. There are two FS volume types: FS volume on a regular drive object and a recognized volume, found by a scan process. FS volume properties depend on volume's file system and type.

7.1.NTFS Volume properties

These properties are present for all NTFS volumes and represent their main properties. For *recognized volumes*, these values can be altered.

More information... NTFS Information Regular volumes **Recognized NTFS** Recognized volumes Cluster Size Cluster size for the NTFS volume. MFT record size Size of one MFT record describing one file on the NTFS volume. This is an important property of any NTFS volume. Its common value is 1KB. If this property has incorrect value, many files may be incorrectly recovered. Sector Size Sector size for the physical drive. This property is read from the boot sector of the NTFS volume and does not affect **R-Studio** operation. Index Block Size Index block size for the NTFS volume. This property determines binary trees used to store NTFS folder structure. It does not affect R-Studio operation. MFT position MFT offset from the start of the NTFS volume. MFT Mirror Position Second MFT copy offset from the start of the NTFS volume. Volume size Size of the NTFS volume. This property does not affect **R-Studio** operation.

7.2.FAT Volume properties

These properties are present for all <u>FAT</u> volumes and represent their main properties. For *recognized volumes*, these values can be altered.

■ More information...

FAT Information	Regular volumes
Recognized FAT	Recognized volumes
FAT Bits (12,16,32)	FAT type. 12 for the FAT12, 16 for the FAT16, 32 for the FAT32.
Cluster Size	Cluster size for the FAT volume.
First Cluster Offset	Offset of the first cluster from the start of the FAT volume.
Boot Directory Cluster	(<i>For FAT32 only.</i>) Cluster number where the root directory starts on the FAT volume where the logical disk resides.
Root Directory Offset	(For FAT12 and 16 only.) Root directory offset from the start of the FAT volume.
Root Directory Length	(For FAT12 and 16 only.) Root directory length for the FAT volume.
First FAT Offset	Offset for the first FAT table on the volume. Together with the Size of One Fat Table property, is a most important property for a FAT volume. If this property is incorrect, many files (especially fragmented ones) may be incorrectly recovered.
Size of One FAT Table	Size of one FAT table on the volume.
Sector Size	Sector size of the drive. This property is read from the boot sector of the FAT volume and does not affect R-Studio operation.
Number of FAT Copies	Number of FAT copies on the FAT volume.

Active FAT copy	Active FAT table number for the FAT volume. Can be set to Disabled, Auto, 1, or 2. If
	it is Disabled, R-Studio processes the volume as there is no FAT table present. This
	may be useful if the volume has been reformatted and thus a new FAT table is created
	and the old one is deleted. In this case, it is reasonable to recover files from the
	previous volume without processing the new and irrelevant FAT table. All files will be
	recovered as continuous byte chains beginning from their start cluster. Unfragmented
	files will be recovered successfully. If it is 1 or 2, R-Studio uses the first or second
	FAT table copy, respectively. If it is Auto, R-Studio uses both FAT table copies and
	decides, which FAT table copy should be used for a particular FAT table sector. This
	may be useful when both FAT tables are partially damaged.
Major version	FAT version.
Minor version	FAT minor version.
Volume size	Size of the volume.

7.3.Ext2/3/4FS Volume properties

These properties are present for all <u>Ext2/3/4FS</u> volumes and represent their main properties. For *recognized volumes*, these values can be altered.

■ More information...

Ext2FS Information	Regular volumes
Recognized Ext2/3/4FS	Recognized volumes
Block Size	Block size of Ext2FS file system. A block in the Ext2/3/4FS file system is similar to a cluster in the FAT file system.
First SuperBlock Offset	Offset of the first SuperBlock from the start of the Ext2/3/4FS volume.
Blocks Per Volume	Number of blocks in the Ext2/3/4FS volume.
INodes Per Volume	Number of inodes on the Ext2/3/4FS volume. An inode is a record describing file's size, attributes, position on an Ext2F/3/4S volume - all information about a file, except its name, which is stored separately. Therefore, the INodes Per Volume parameter is equal to the maximum number of files on an Ext2/3/4FS volume.
Creator OS	The OS that created this Ext2/3/4FS volume. May be Linux, Hurd, Masix, FreeBSD, Lites.
Major version	Ext2/3/4FS version. Usually 1.
Minor version	Ext2/3/4FS minor version. Usually 0.
Last Mount Time	Last mount time for this Ext2/3/4FS volume.
Last Write Time	Last write time for this Ext2/3/4FS volume.
Last Check Time	Last check time for this Ext2/3/4FS volume.
Volume size	Size of the volume.

7.4.Recognized Volume properties

These properties are present for all *recognized volumes*, regardless of their file system type. They estimate how reliable those volumes are recognized. This is useful for fast search for, and selection of, optimally recognized volume to recover.

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More information	
Parsed File Entries	Number of files proving that this recognized volume existed. May have any non- negative values. The main property characterizing the reliability of volume recognition. The larger it, the higher probability that this recognized volume has file system properties that have been correctly found.
Parsed Boot Records	Number of boot records proving that this recognized volume existed. May be 0 or 1. This is the second important property characterizing the reliability of volume recognition.
Estimated Size	Estimated size of the recognized FS partition/volume. This property shows the most probable size of the recognized FS partition/volume. Alternatively, Size and Partition Size are set to the highest possible values in order to recover the maximum number of files.

■ More information.

VI R-Studio Emergency

Note: You cannot use this program to work with Mac computers based on Apple Silicon.

R-Studio Emergency is a tool that allows you to startup a computer with a damaged startup disk and recover data stored on its hard drives. Then restored data can either be saved on its disk or transferred to a working computer via a network.

The R-Studio Emergency version is a part of the R-Studio software package.

You may run this R-Studio Emergency version on a computer for which you have bought an R-Studio license, and you may not transfer the licensed software to another computer.

<u>R-Studio Emergency</u> <u>Contact Information and Technical Support</u> <u>Installing R-Studio Emergency Startup Media Creator</u> <u>Creating Startup Disks</u>

 R-Studio Emergency Operation

 Starting a Computer with the R-Studio Emergency Startup Disks

 File Recovery

 Searching for a File

 Disk Scan

 Disk Images

Using R-Studio Emergency as Emergency Agent

<u>Technical Information</u> <u>Network Drives</u> <u>Properties and Text/Hexadecimal Viewer</u> <u>Log</u> <u>Devices to Store Recovered Files</u>

Hardware Compatibility List

6.1 Contact Informaiton and Technical Support

To obtain the latest version of R-Studio Emergency, go to:

Product Site: <u>http://www.r-tt.com</u> Sales Department: <u>sales@r-tt.com</u>

R-StudioTechnical Support Team is available 24 hours a day, seven days a week, and has an average response time less than 4 hours.

Tech. Support: support@r-tt.com

Send your support request to: http://www.r-tt.com/Support_request.html

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6.2 Creating Startup Disks

- Installing R-Studio Emergency Startup Media Creator
- Creating Startup Disks Using R-Studio Emergency Startup Media Creator
- <u>Creating Startup Disks for Mac and Linux Computers</u>

6.2.1 Installing R-Studio Emergency Startup Media Creator

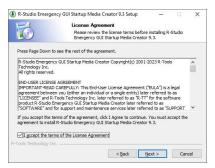
You must have administrative privileges to install R-Studio Emergency Startup Media Creator.

If you are not sure whether you have such privileges, you almost certainly do not have them. Contact your system administrator for assistance.

1 Run the setup wizard



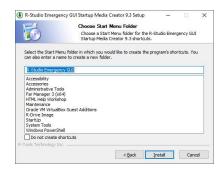
2 Read the License Agreement and accept its conditions.



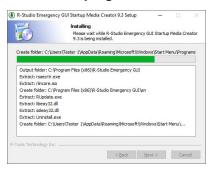
3 Select the installation location

	Choose the folder in wh Startup Media Creator 9 Emergency GUI Startup Media r, click Browse and select an	i.3. lia Creator 9.3 in	-	cy GUI
			the following	
		Julei loideli. Cild		
Destination Folder				
C:\Program Files (x	6) R-Studio Emergency GUI		Browse.	

4 Select the Start Menu Folder



5 Wait for the program to install



6 You may start creating R-Studio Emergency immediately upon install completion.



6.2.2 Creating Startup Disks Using R-Studio Emergency Startup Media Creator

You need to create either

- A startup FAT/FAT32 removable device recognized by your system as a bootable one. The total available size
 of the device should be more than 50 MB. You may use this device to start both UEFI computers (modern
 Windows/Mac/Linux systems) and old Windows/Mac/Linux machines.
 or
- A startup CD/DVD disc. You may create an ISO image, or write the disc directly from **R-Studio** Emergency Startup Media Creator, if there is a CD/DVD recorder in your system. You may use this disc to start both UEFI computers (modern Windows/Mac/Linux systems) and old Windows/Mac/Linux machines.
- An ISO image to start up a virtual machine, to create a USB device using other software, or to burn it to a CD/DVD disc using your favorite CD/DVD writing software.

You may create a Linux-based or WinPE based startup disk.

Note: R-Studio Emergency Startup Media Creator supports creating WindowsPE startup disks starting from Windows 8.1. It's possible to create such disk from **R-Studio** Emergency Startup Media Creator on earlier Windows versions if you yourself correctly install a workable copy of WindowsPE Assessment and Deployment

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Kit (Windows ADK). Microsoft recommends Windows ADK from Windows 10 version 2004 (20H1) for versions prior to Windows 10.

You may create the **R-Studio Emergency** on a <u>USB Activation Stick</u>.

1 Run R-Studio Emergency

Welcome dialog box



click the Next button to select the base for the startup disk.

A Linux-based disk

Check the Hardware Compatibility List.

If you have problems with starting you computer up from the **R-Studio** Emergency startup disks, select **Configure startup media troubleshooting options** on the Startup media type selection dialog box. Then the <u>Startup Media Troubleshooting Options</u> dialog box will appear. You may configure these options to eliminate those problems.

2 Select Linux based on the Startup OS selection and click the Next button.

Startup OS selection **dialog box**

Please select a	tion a startup OS type	C
Boot media type	Linux based	÷
Configure sta	rtup media troubleshooting options	

3 Select the device on which you want to create the startup disk.

Startup media type selection dialog box

8	ISO image	ISO image file for a startup CD/DVD/BD
5	CD/DVD-RW (E:\)	SONY DVD RW DRX-S70U 1.D4
P	Removable (F:)	Removable Disk

3 Enter your license key to register your copy of the R-Studio Emergency Startup Media Creator and click the Next button.

Registration **dialog box**

Please register l	R-Studio Emergency GUI Startup Media Creator	C
Name	Tester 1	
Company	R-TT Testing Team	
Registration key	Place for R-Studio license Key	
	If you just evaluate the capabilities of R-Studio data recovery software leave all the fields blank and click "Next" button	

3 Read and accept the License Agreement and click the Next button.

License Agreement dialog box



4 Specify the path and name for the ISO file or verify that you've select the correct USB device and click the Next button.

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Insert media dialog box

R-Studio Emergency GUI Startup Media Creator - R	Removable Disk	>
Insert media Ready to create R-Studio Emergency GUI startup me	adia	
		0
Please confirm that F:\is a correct USB disk to create the	e emergency startup disk.	

> R-Studio Emergency Startup Media Creator will start creating the startup USB disk showing the progress on the Creating startup media dialog box

Creating startup media **dialog box**

ig startup media			
ase wait while data is being o	pied onto the sta	artup media	
media creation progress:			
			31%
		Next >	Stop
		Next >	Stop

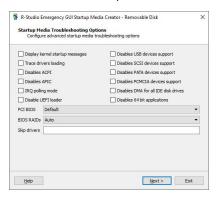
R-Studio Emergency Startup Media Creation is Finished message



Startup Media Troubleshooting Options

Those options will help you if you have problems with starting you computer up from the **R-Studio** startup disks. Please, contact the **R-Studio Technical Support Team** for more information.

R-Studio Startup Media Troubleshooting Options dialog box



A WindowsPE-based disk

2 Select Windows based on the Startup OS selection and click the Next button.

Startup OS selection **dialog box**

Reat mode tune	Windows based
	windows based .
Windows Assess Additional drivers	ment and Deployment Kit - Windows 10, version 10.1.19041.1
-	sr TRemove Remove all
Wireless LAN	85U Wireless LAN 802.11n USB 2.0 Network Adapter, Realtek RT.8188U 20211 USB 2.0 Network Adapter, Realtek RTL8191SU Wireless LAN 0 Network Adapter, Realtek RTL8191SU Wireless LAN 802.11 USB 2.0 N

If you select this option for the first time, you'll need to download and install some extra Windows components. Click the Download button and follow the on-screen instructions. When the process is finished, you'll be able to continue creating the startup disk. You don't have to perform these steps next times.

You may also add hardware drivers at this stage.

3 Select the device on which you want to create the startup disk.

Startup media type selection **dialog box**

SOR	ISO image	ISO image file for a startup CD/DVD/BD
Ó	CD/DVD-RW (E:\)	SONY DVD RW DRX-S70U 1.D4
ļ	Removable (F:)	Removable Disk

3 Enter your license key to register your copy of the R-Studio Emergency Startup Media Creator and click the Next button.

Registration **dialog box**

Please register	R-Studio Emergency GUI Startup Media Creator
Name	Tester 1
Company	R-TT Testing Team
Registration key	Place for R-Studio license Key
	If you just evaluate the capabilities of R-Studio data recovery software leave all the fields blank and click "Next" button

3 Read and accept the License Agreement and click the Next button.

License Agreement dialog box



4 Specify the path and name for the ISO file or verify that you've select the correct USB device and click the Next button.

Insert media dialog box

			-
Insert media Ready to create R-Stu	idio Emergency GUI start	up media	
			C C
lease confirm that F:\is a	correct USB disk to creat	e the emergency startup disk.	

> R-Studio Emergency Startup Media Creator will start creating the startup USB disk showing the progress on the Creating startup media dialog box

Creating startup media **dialog box**

R-Studio Emergency GUI Startup Media Creator - Removable Disk	×			
Creating startup media Please wait while data is being copied onto the startup media				
Startup media creation progress:				
	31%			

R-Studio Emergency Startup Media Creation is Finished message



6.2.3 Creating Startup Disks on Mac and Linux Computers

To start a Mac or a Linux computer, you may use the following devices:

1. A USB device created using the R-Studio Emergency Startup Media Creator for Windows. See the <u>Creating</u> <u>Startup Disks Using R-Studio Emergency Startup Media Creator</u> page for more details.

2. A USB device created using a Mac or Linux computer. To create such device, download the ZIP archive of R-Studio Emergency, unzip it, and write files to a FAT32-formatted USB device.

Please note that you cannot use this disk to start non-UEFI computers (old Macs, for example), nor can you just copy those files to a CD/DVD disc to create an R-Studio Emergency startup disc. If you need a CD/DVD disk, burn it using the ISO image.

3. A startup CD/DVD disc. Download the ISO image of that disk and burn it or use the R-Studio Emergency Startup Media Creator for Windows to burn it on a Windows computer.

6.3 R-Studio Emergency Operation

Starting a Computer with the R-Studio Emergency Startup Disks File Recovery Searching for a File Disk Scan Disk Images

Using R-Studio Emergency as Emergency Agent

Technical InformationProperties and Text/Hexadecimal ViewerNetwork DrivesLogDevices to Store Recovered Files

Hardware Compatibility List

<u>R-Studio Emergency</u> <u>Contact Information and Technical Support</u> <u>Installing R-Studio Emergency Startup Media Creator</u> <u>Creating Startup Disks</u>

6.3.1 Starting a Computer with the R-Studio Emergency Startup Disks

We recommended that you print out this help page and have the hardcopy on hand while you are performing this action.

If there is a non-IDE disk controller in your system, or you plan to use network disks or external hardware devices, first check the <u>Hardware Compatibility List</u>.

If you plan to use any external device, turn it on before starting the system.

If the motherboard in your computer supports the Serial ATA (SATA) devices, but IDE disks are also present, only the SATA devices should be set to the Enhanced Mode in BIOS.

To start the computer with the R-Studio Emergency startup CD/DVD disc or any removable device,

- 1 Make sure that the first startup device in the system BIOS is the CD/DVD drive or the removable device Disable "Secure boot" in the system BIOS if your computer is certified to run Windows 8. Refer to your system documentation for details.
- 2 Insert the R-Studio Emergency startup CD/DVD disc and start your computer

■If you have a Mac computer

To start a Mac computer with the **R-Studio Emergency** startup disk,

- 1. Insert a CD/DVD disc or connect a USB disk
- 2. Switch the Mac on.
- 3. While loading, press the Option key on the Mac keyboard (the Alt key if you use a non-Apple keyboard).

The Options key



4. Select the EFI boot disk and press Enter.

The R-Studio Emergency startup disk



R-Studio Emergency will start loading.

Then a startup screen will appear:



Select the **R-Studio Emergency** GUI (Graphic Mode) to run **R-Studio Emergency** in the graphic mode in which its user interface is similar to the Windows version. If **R-Studio Emergency** cannot run in this mode, restart the system in the Safe VGA mode (only VESA-compliant) which is compatible with most video cards and monitors. If it fails too, select the Text mode in which the **R-Studio Emergency** user interface is shown in the pseudo-graphic mode compatible with all video cards. The help describes this pseudo-graphic mode.

> R-Studio Emergency will start and its Device/Disk panel will appear

To start the computer with the R-Studio Emergency startup floppy disks,

1 Make sure that the first startup device in the system BIOS is A (Floppy)

Refer to your system documentation for details.

- 2 Insert the first startup floppy disk and start your computer
- > The following text will appear on the screen:

Loading Uncompressing ... OK, starting the kernel VFS: Insert the second boot disk and press ENTER

- 3 Insert the second disk and press ENTER.
- > R-Studio Emergency will start and its Device/Disk panel will appear

Secure boot:

It may be impossible to start a Windows 8 certified computer with the R-Studio Emergency startup disk without some additional actions. This happens because any computer should use a so-called "Secure boot" procedure to comply with Windows 8 hardware certification from Microsoft. In brief, this procedure prevents computer from booting into any operating system that isn't digitally signed with an appropriate digital signature. "Secure boot" is claimed to prevent unauthorized modification of the boot sector by bootkits, viruses, trojans, and other malicious software. To the date, only Windows 8, Windows Server 2012, and selected Linux distributions support this feature. As a side effect, it also prevents most LiveCDs, rescue disks (R-Studio and R-Drive Image included), and other OS from running.

Likely enough, the other requirement of Windows 8 hardware certification is to make it possible for the user to disable the Secure boot procedure. Those settings can be done through the system BIOS under the Boot options. Generally, it's enough to enable Legacy support in those options, but sometimes it may require additional actions. Please, refer to your system documentation to learn more about disabling/enabling Secure boot.

When Secure boot is disabled, it should be possible to start the computer with the R-Studio Emergency startup disk.

Please note that you should enable this feature back after using the startup disks because Windows 8 or Server 2012 may not start properly without the Secure boot feature enabled.

6.3.2 File Recovery

To recover files,

- 1 Select a partition on the Device/Disk panel on which the files to recover reside and press the Enter key
- > R-Studiowill change its panel showing the disk's folders/files structure
- 2 Select the file to recover on the Files View panel. Use the Tab key to switch between panes

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Files View panel

ew of Partition2 - R-St y Pictures	File Name	Size	Modifie
y Videos			up level
-TT -R-Studio	7_wallpaper.jpg desktop.ini		10.05.1
-RECOVERY	real_cf.png		23.10.1
nloads	rear_er.png	4100	23.10.1
orites			
ks			
al Settings			
ic			
Documents			
Hood 🛛			
ctures]			
ntHood			
ent 💡			
rrows to scroll)			

3 Press the F2 key and specify the output folder on the Recover dialog box

Recover **dialog box**

Drive			
F	iles View of	Partition2 - R-Studio Emergency Demo (Tab to switch pane -	
			ed
			1>_
	lolder	P4 60 5.	11
	0.		15
	C:	Disk1/Part02 NTFS 100GB 4 0.	11
	Z:	System Reser Disk1/Part01 NTFS 100MB	
	CDO	<dismounted> 9 192.168.1.20:Net Drive</dismounted>	
	NET_DRIVE_0	9 152.100.1.20.net_Drive	
			Ĥ
Lon			
* Re			, M
* 1		•	
* Re	OK	Unmount Map Network Drive Cancel	
? Re			
* O			, i
			7
F1 Hei	In F2 Recove	Pr F3 View F4 Select Drive F7 Promerties F10 Menu	

External USB drives with the NTFS file system: R-Studio Emergency can save recovered files on such disks if they are properly disconnected in a Windows system using the **Safely Remove Hardware** icon in the system tray or while shutting Windows down.

Searching for a File Mapping Network Drives Viewing object properties

6.3.3 Searching for a File

To search for a file,

- 1 Select Find on the Tools menu (or press the Alt+F key)
- 2 Specify a file name or mask

Find dialog box

	w of Partition2 - R-St			
	Pictures	File Name		ze Modified
	Videos			oto up level>
▼-R-		7_wallpaper.jpg		65K 10.05.11
	R-Studio	desktop.ini		04B 19.03.15
	R [[]	= Find	1	18B 23.10.11
-Down				
	r Afile mask			
-Link				
-Loca				
	c Look at			
	o [X] Deleted files			
-NetH		[X] Folders		
-IPic				
-Pr in		Car	cel	
Rece				
Log (Ctrl+Ar				
	of selected files to N			
	1 were successfully re			
	of selected files to N			
	file NET_DRIVE_0/real_		file exists	
* 0 files of	1 were successfully re	covered		
F1 Help F2 R	ecover F3 View F4 Se	lect Drive F7 Prop	erties F10	Menu
ook at	dialog box			
LUUN ai	uning UUA			

Deleted files: If it is selected, **R-Studio** makes a search among deleted files/folders.

Existing files:	If it is selected, R-Studio makes a search among existing files/folders.
Files:	If it is selected, R-Studio includes files into a search.
Folders:	If it is selected, R-Studio includes folders into a search.

To find the next file corresponding to the specified file mask,

* Press the Alt+N key

6.3.4 Disk Scan

To scan an object

- 1 Select an object on the Device/Disk panel and press the F6 key
- 2 Specify the required parameters on the Scan dialog box and press the Enter key

Scan dialog box

Wrive loois Help	
Drives View - R-Studio Emergency Demo	
Device/Disk FS Start Size Properties (Alt+Arrows to sc	roll)
►-VBOX HARDDISK 1 SATA2 100GBDrive Type Partitio	n, Primary 🔼
System Reserv NTFS 1024KB 100MB Name Partitio	n2
Partition [] (2	10542592 s
UBOX CD-RO	06848 sec)
Disk size: 1006B	10542592 s
HPF	S/exFAT (0
Start: 0	
B (8 sec)
Size: 10068	
	6291456 se
Save scan info to file during scan: Select	16 sec)
Do not save	
File Types Scan Cancel (2	10542591 s
Log (Ctrl+Ar	
* Recovering	
* 1 files of 1 were successfully recovered	
* Recovering of selected files to NET DRIVE 0/ started	
! Recovering file NET DRIVE 0/real cf.png failed. The file exists	
* 0 files of 1 were successfully recovered	
F1 Help F3 View F5 Open Files F6 Scan F10 Menu Alt-X Shutdown	

Scan dialog box

<u> </u>					
Start:	Sets the start point of the area to be scanned.				
Size:	Sets the size of the area to be scanned.				
Numbers in these	Numbers in these fields can be in bytes or sectors.				
If no letters are aft	If no letters are after the numbers, R-Studio assumes the numbers in bytes.				
The following case	e-ignoring notation is possible:				
b	Bytes				
kb	Kilobytes				
mb	Megabytes				
gb	Gigabytes				
tb	Terabytes				

> When an object is scanned, it may be searched for files, and found files may be recovered the same way as for a regular object

Scan results

Drive Tools Help			
Drives	View - R-Stud	io Emergency Demo -	
Device/Disk FS S	tart Size	Properties (Alt+Arr	ows to scroll)
►-UBOX HARDDISK 1 SATA2	100GB	Drive Type	Partition, Primary
Sustem Reserv NTFS 1	024KB 100MB	-Name	Partition2
▶-Partition2 NTFS	101MB 100GB	-Size	100GB (210542592 s
-Extra Found Files		-Partition Offset	101MB (206848 sec)
-Recognized@ NTFS	OB 100GB	-Partition Size	100GB (210542592 s
UBOX CD-ROM 1.0 ATAPI	82MB	-Partition Type	NTFS/HPFS/exFAT (0
		-NTFS Information	
		-Cluster Size	4.00KB (8 sec)
		-MFT Record Size	1.00KB
		MFT Position	3.00GB (6291456 se
		-MFT Mirror Posi	8.00KB (16 sec)
		-Index Block Siz	4.00KB
		-Sector Size	512B
		-Volume Size	100GB (210542591 s
-Log (Ctrl+Arrows to scroll	0		>
* Recovering of selected fi	les to NET DR	ITUE 0/ started	
* 1 files of 1 were success	fully recover	ed	
* Recovering of selected fi			
! Recovering file NET DRIVE			exists
* O files of 1 were success	fully recover	ed	
			 _
F1 Help F3 View F5 Open F	iles F6 Scan	F10 Menu Alt-X Si	hutdown

Found objects:

Extra Found Files	Entries of known file types have been found
Recognized1	Records and file entries are found for this partition
Recognized2	Only file entries are found for this partition
Recognized3	Only boot records are found for this partition

To save scan information

- 1 Select an object with scan information
- 2 Press the Alt+D key and select Save Scan Information on the Drive menu
- 3 Specify the output folder and file name on the Save Scan Information dialog box

Mapping Network Drives

To open scan information

- 1 Select an object to which scan information is to be opened
- 2 Press the Alt+D key and select Open Scan Information on the Drive menu
- 3 Specify the folder and file name with the scan information on the Open Scan Information dialog box

Mapping Network Drives

To delete scan information

- 1 Select an object to which scan information is to be deleted
- 2 Press the Alt+D key and select Delete Scan Information on the Drive menu

6.3.5 Disk Images

To create an image file

1 Select an object on the Device/Disk panel

2 Press the Alt+D key and select Create Plain Image File or Create Compressed Image File on the Drive menu

Create Image **dialog box**

O Save n NET_DRIVE 0 District of the second sec	rit						
Save in INST_DRIUE_0 Dist_Control					Demo ———		-
Save in NET_DRIUE_0 10	Dev	r=[]	🗕 Create Extended	l Image File –			
U	→ -U						
U	1.1	Save in NET_DRIU	E_0			1	Θ
U	4						0/0
.TemporaryItems (Folder) 04.08.12 72 72 Accr (Folder) 19.01.12 72 75 Assubatter (Folder) 19.01.12 72 Assubatter (Folder) 19.01.12 72 Backups (Folder) 12.08.11 72 Composition (Folder) 12.08.11 72 Pub-boiles (Folder) 12.08.11 72 Files (Folder) 23.04.15 75 Forum (Folder) 23.04.15 77 FTP (Folder) 20.04.15 70 ITTT2 (Folder) 20.04.12 70	Lu				<goto th="" up<=""><th></th><th></th></goto>		
Assistanter CF01der> 19.63.15 Backups CF01der> 27.65.12 D0-bovies CF01der> 27.65.12 D0-bovies CF01der> 28.04.15 Files CF01der> 23.04.15 FOrum CF01der> 28.04.15 FTT CF01der> 28.04.15 ITTT2 CF01der> 20.04.15		.TemporaruItems					2 5
Backups CF01der> Z7.03.14 C CF01der> Z7.03.14 DP-bovies CF01der> Z0.61.2 PUP-bovies CF01der> Z0.04.15 Files CF01der> Z0.04.15 FTP CF01der> Z0.04.15 ITCTF2 CF01der> 20.01.12		Acer			(Folder) 1	9.01.12	
C (Folder> 17.95.12 DM-Twoies (Folder> 26.06.13 Files (Folder> 23.04.15 Forum (Folder> 23.04.15 FTT (Folder> 28.04.15 FTT (Folder> 28.04.15 FTT (Folder> 28.04.12 (Folder> 20.04.12 (Folder> 20.04.		AsusRouter			(Folder) 1	9.03.15	
DD-Twoics CPolder> 62, 66, 13 Files CPolder> 23, 64, 15 Forum CPolder> 28, 04, 15 FTP CPolder> 26, 06, 15 ITCTE2 CPolder> 20, 01, 12		Backups			(Folder) 2	7.03.14	
Files CF04er> 23.04.15 Forum CF04er> 28.04.15 FTP CF04er> 26.04.13 ITGTF2 CF04er> 20.01.12		С			(Folder) 1	7.05.12	
Forum (Folder> 28.04.15 FTP (Folder> 16.05.13 HTCTP2 (Folder> 20.01.12		DVD-Movies			<folder> 6</folder>	2.08.13	
FTF (Folder) 16.65.13 HTCTP2 (Folder) 20.01.12 Log		Files			(Folder) 2	3.04.15	
hTCTP2 (Folder> 20.01.12		Forum			(Folder) 2	8.04.15	
Log		FTP			(Folder) 1	6.05.13	
		HTCTP2			(Folder) 2	0.01.12	
	Log					_	
		File mame:			Unmount 🔳	OK -	
	* 1						
Re Save as type: Specified (*.rdr) Map Network Drive Cancel	* Re	Save as upe: Sp	ecified (*.rdr)	Map Networl	k Drive 🗕	Cancel -	
Re	* Re * 1 * Re ! Re						
0	* 0						
	-						5
1 Help F3 View F5 Open Files F6 Scan F10 Menu Alt-X Shutdown	E1 He	elp F3 View F5 Oper	n Files F6 Scan	F10 Menu A	It-X Shutdo	wn	

Plain Image

- If this option is selected, **R-Studio** will create a simple exact copy of the object. This image format is compatible with the previous versions of **R-Studio**.
- Compressed Image If this option is selected, **R-Studio** will create an image file compatible with the images created by **R-Drive Image**, but incompatible with the previous versions of **R-Studio**.
- 3 Specify the output folder and file name on the Create Image File dialog box

Mapping Network Drives

To load an image file

- 1 Press the Alt+D key and select Open Image File on the Drive menu
- 2 Specify the folder and file name with the image on the Open Image File dialog box

Mapping Network Drives

6.4 Using R-Studio Emergency as an Emergency Agent

R-Studio Emergency Linux version can be used as an emergency agent for **R-Studio**. Moreover, if you have a Mac computer, this is the only way to start it with **R-Studio Agent Emergency**.

To start the computer with the R-Studio Emergency/Agent startup CD/DVD disc or any removable device ,

- 1 Make sure that the first startup device in the system BIOS is the CD/DVD drive or the removable device Disable "Secure boot" in the system BIOS if your computer is certified to run Windows 8. Refer to your system documentation for details.
- 2 Insert the R-Studio Emergency startup CD/DVD disc or the removable device and start your computer

■If you have a Mac computer

- To start a Mac computer with the **R-Studio Emergency** startup disk,
- 1. Insert a CD/DVD disc or connect a USB disk
- 2. Switch the Mac on.
- 3. While loading, press the **Option** key on the Mac keyboard (the **Alt** key if you use a non-Apple keyboard).

The Options key

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4. Select the EFI boot disk and press Enter.

The R-Studio Emergency startup disk



R-Studio Emergency will start loading.

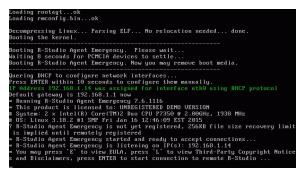
Then a startup screen will appear:

Startup Options



- 2 Select the R-Studio Agent Emergency to run R-Studio Emergency as an emergency agent.
- > R-Studio Agent Emergency will start and its prompt will appear

R-Studio Emergency as an Emergency Agent



If your network has a DHCP server

The computer running R-Studio Agent Emergency will be assigned an IP address automatically

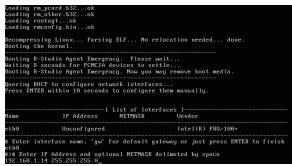
A prompt with a computer address will appear. You need to remember it to access the computer via network.

If your network does not have a DHCP server

You need to configure the interfaces and IP addresses manually.

- 1. Press Enter to start configuring the settings. A prompt to select an interface will appear. Enter the selected interface name and press **Enter**.
- 2. A prompt to enter its IP address and optional subnet mask will appear. Enter the IP address and optional subnet mask and press **Enter**.

Network Setting Configuration



3. A prompt to configure another interface, gateway, or to finish configuring the interfaces will appear. Enter gw, enter the IP address of the gateway, and press **Enter**.

Network Setting Configuration

192.168.1.	IP Address and optio 14 255.255.255.0		
	IP Address		es] Vendor
	192.168.1.14 Unconfigured		Intel(R) PRO/100+ Default gateway
w ># Enter 92.168.1.	default gateway IP A 1	ddress	ay or just press ENTER to finish
w ># Enter 92.168.1. >	default gateway IP A 1	ddress List of Interface	28] 28

4. Press **Enter** to finish configuring the interfaces, or enter the name of the next interface to configure.

> R-Studio Agent Emergency will show a prompt that is ready to accept connections

R-Studio Emergency as an Emergency Agent

gu 9# Enter default gateway IP Address 192.160.1.1 P>						
	IP Address					
	192.168.1.14 192.168.1.1	255.255.255.0				
* This pro # System: # OS: Linu ? R-Studio is implie * R-Studio * R-Studio * You may	ed until remotely reg Agent Emergency sta Agent Emergency is press `E` to view EU	ÚNREGISTERED DEU)2 Duo CPU P7350 Jan 16 12:46:09 J not yet register istered rted and ready tu listening on IP(3 LA, press `L` to	@ 2.00GHz, 1364 MHz 2ST 2015 ed, 256KB file size recov) accept connections	ht Notice		

Now the computer may be accessed by **R-Studio** via network.

Secure boot:

It may be impossible to start a Windows 8 certified computer with the R-Studio Emergency startup disk without some additional actions. This happens because any computer should use a so-called "Secure boot" procedure to comply with Windows 8 hardware certification from Microsoft. In brief, this procedure prevents computer from booting into any operating system that isn't digitally signed with an appropriate digital signature. "Secure boot" is claimed to prevent unauthorized modification of the boot sector by bootkits, viruses, trojans, and other malicious software. To the date, only Windows 8, Windows Server 2012, and selected Linux distributions support this feature. As a side effect, it also prevents most LiveCDs, rescue disks (R-Studio and R-Drive Image included), and other OS from running.

Likely enough, the other requirement of Windows 8 hardware certification is to make it possible for the user to disable the Secure boot procedure. Those settings can be done through the system BIOS under the Boot options. Generally, it's enough to enable Legacy support in those options, but sometimes it may require additional actions. Please, refer to your system documentation to learn more about disabling/enabling Secure boot.

When Secure boot is disabled, it should be possible to start the computer with the R-Studio Emergency startup disk.

Please note that you should enable this feature back after using the startup disks because Windows 8 or Server 2012 may not start properly without the Secure boot feature enabled.

To connect to R-Studio's computer,

1 Press the Enter key and enter the IP address of the computer where $R\-Studio$ is running as <code>IPaddress:port</code>.

The default port is 8080, and you don't have to specify it.

- 2 Enter the password if required, and press the Enter key.
- > When the connection is established successfully, R-Studio Agent Emergency will notify you about this.

R-Studio Emergency as an Emergency Agent

Waiting 8 seconds for PCMCIA devices to settle Booting R-Studio Agent Emergency. Now you may remove boot media.
Quering DHCP to configure network interfaces Press ENTER within 10 seconds to configure them manually. IP Address 192.160.1.14 was assigned for interface eth0 using DHCP protocol Default gateway is 192.168.1.1 now * Running R-Studio Agent Emergency 7.6.1116
 This product is licensed to: UMREGISTERED DEMO VERSION System: 2 x Intel(R) Core(TM)2 Duo CPU P7350 @ 2.006Hz, 1930 MHz 0S: Linux 3.18.2 #1 SMP Fri Jan 16 12:46:09 EST 2015 7 R-Studio Agent Emergency is not yet registered, 256KB file size recovery limit is implied until remotely registered
 R-Studio Agent Emergency started and ready to accept connections R-Studio Agent Emergency is listening on IP(s): 192.168.1.14 You may press 'E' to view EULA, press 'L' to view Third-Party Copyright Notice s and Disclaimers, press ENTER to start connection to remote R-Studio
Enter R-Studio IP address or just press ENTER to cancel>192.168.1.10:8080 # Enter password or just press ENTER to connect without one> Connection with 192.168.1.10:8080 is established successfully. * R-Studio Agent Emergency is listening on IP(s): 192.168.1.14 * You may press 'E' to view EULA, press 'L' to view Third-Party Copyright Notice s and Disclaimers, press ENTER to start connection to remote R-Studio

6.5 R-Studio Emergency Technical Information

Properties and Text/Hexadecimal Viewer Network Drives Log Devices to Store Recovered Files R-Studio Emergency

R-Studio Emergency

<u>Contact Information and Technical Support</u> <u>Installing R-Studio Emergency Startup Media Creator</u> <u>Creating Startup Disks</u>

R-Studio Emergency Operation

Starting a Computer with the R-Studio Emergency Startup Disks File Recovery Searching for a File Disk Scan Disk Images

Using R-Studio Emergency as Emergency Agent

Hardware Compatibility List

6.5.1 Properties and Text/Hexadecimal Viewer

To view object properties,

- 1 Select an object
- 2 Press the F7 key

To view an object

- 1 Select an object
- 2 Press the F3 key
- 3 Press the **F6** key to view and select file attributes Press the **Esc** key to close the viewer.

6.5.2 Network Drives

To map a network drive,

- 1 On a dialog box with Map Network Drive, press the Alt+M key
- > The Querying DHCP message will appear

If the network has a DHCP server, the computer will obtain an IP address automatically. A list of adapters and their IP addresses will appear on the Network Adapters dialog box.

If the network does not have a DHCP server, select a network adapter on the Network Adapters dialog box and press the **F4** key. Enter the IP address and network mask and press the **Enter** button.

Network Addresses dialog box

Files View of Partition2 - R-Studio Emergency Demo (Tab to switch pane 	
Network Adapters	
i i i i i i i i i i i i i i i i i i i	fied
	vel>^
Intel(R) PRO/100+ # 0 192.168.1.11 255.255.255.0	3.15
Default gateway 192.168.1.1	2.13
	3. <mark>15</mark>
[]— Please specify Addresses ———	3.15 2.13
Intel(R) PR0/100+ # 0	2 15
Inter(k) Ind/100+ # 0	2 15
	2.15
IP Address: 192.168.1.11	2 15
	2 13
Tet Mask: 255.255.255.0	2.15
	2.15
OK Cancel	2.15
Log	
* 1	
* Re	
t Re F4 Edit Address OK Cancel	
× 0	
I Ke	ated
F1 Help F2 Recover F3 View F4 Select Drive F7 Properties F10 Menu	

- 2 Select a configured network adapter and press the Enter key
- 3 Enter the required information on the Map Network Drive message message

Map Network dialog box



Server IP Address:	IP address of the computer where the network drive is to reside.
Server Share Name:	Name of the shared folder where the network drive is to reside.
Login:	Username of a user on the computer where the network drive is to reside.
Password:	User's password on the computer where the network drive is to reside.

For the network drive's path //SERVER/Net_Drive,

Server IP address: The IP address of the SERVER computer (192.168.1.20) Server share name: Net_Drive.

> The mounted network disk will appear

To disconnect a mounted network drive

- 1 Select a mounted network drive
- 2 Switch to the Disconnect button and press the Enter key

6.5.3 Log

To clear log information

* Select Clear Log on the Tools menu

To save log information to a file

* Select Save Log To File on the Tools menu

6.5.4 Devices to Store Recovered Files

R-Studio Emergency can write recovered files to the following devices:

- FAT devices such as USB sticks, memory cards, and other similar devices. Such devices are inexpensive and easily available, they can be fully accessed by all operating systems, but they have one important drawback: they cannot store files larger that 2GB. So, if you plan to recover large video files, this is not your option.
- exFAT devices such as large USB sticks and memory cards, external hard disks, and other similar devices. They are fully accessed by all operating systems. Unlike FAT devices, they don't have the 2GB file size limit.
- NTFS disks (primarily used in Windows computers).

Access without any third-party software:

Windows computers: full.

Mac computers: read.

Linux computers: full.

• HFS/HFS+ disks (used in Mac computers).

Access without any third-party software:

Windows computers: no.

Mac computers: full. Some access problems may appear for files written by **R-Studio Emergency**. Linux computers: full. Some access problems may appear for files written by **R-Studio Emergency**.

• Ext2/3/4 disks (used in Linux computers).

Access without any third-party software:

Windows computers: no.

- Mac computers: no
- Linux computers: full.

- XFS disks (used in Linux computers).
- Access without any third-party software:

Windows computers: no.

Mac computers: no

Linux computers: full.

• Network disks. Such disks may be on other network computers or NAS devices. See the <u>Network Drives</u> page for more details

■How to solve file access problems on Macs

Finder in the OSX system shows such inaccessible folders and files in the following way:



To get access to such data, do the following:

1. Under an administrator account, right-click the folder and select **Get Info** on the contextual menu. **Info of an inaccessible folder**



Click the **Lock** icon in the **Sharing & Permissions** section to unlock the folder properties. The system will ask you for the account password.

2. Click the **Privilege** column and select **Read & Write** on the contextual menu. **Setting the access rights for the folder**

	•
Charing & Dermissione	_
Read & Write	
Read only Write only (Drop Box)	Privilege
✓ No Access	C No Access

3. If this is a folder with other folders and files, click the **Properties** icon and select **Apply to enclosed** items.

Setting access rights for enclosed items in the folder

	and the second
Sharing & Permiss	sions:
You can read and w	
Name	Privilege
everyone	C Read & Write
-	Click the Lock icon to lock the
	folder's properties
	folder's properties

Then click the **Lock** icon to lock the properties back.

6.6 R-Studio Emergency Hardware Compatibility List

R-Studio Emergency supports the following hardware devices:

Data Storage Devices

Buta Otoruge Bernoco	Nethonking Derices
Serial ATA and Parallel ATA drivers	Ethernet (10 or 100Mbit)
ACPI firmware driver for PATA	3c501 `EtherLink`
AHCI SATA	3c503 `EtherLink II`
ALI PATA	3c505 `EtherLink Plus`
AMD/NVidia PATA	3c507 `EtherLink 16`
ARTOP 6210/6260 PATA	3c509/3c529 (MCA)/3c579 `EtherLink III`
ARTOP/Acard ATP867X PATA	3c515 ISA `Fast EtherLink`
ATI PATA	3c590/3c900 series (592/595/597)
CMD / Silicon Image 680 PATA	`Vortex/Boomerang`
CMD640 PCI PATA	3cr990 series `Typhoon`
CMD64x PATA	AMD 8111 (new PCI lance)
CS5510/5520 PATA	AMD LANCE and PCnet (AT1500 and NE2100)
CS5530 PATA	AMD PCnet32 PCI
CS5535 PATA	AT1700/1720

Networking Devices

CS5536 PATA Compag Triflex PATA Cypress CY82C693 PATA EFAR SLC90E66 Generic ATA HPT 343/363 PATA HPT 366/368 PATA HPT 370/370A/371/372/374/302 PATA HPT 372N/302N PATA IT8211/2 PATA **IT8213 PATA** Initio 162x SATA Intel ESB, ICH, PIIX3, PIIX4 PATA/SATA Intel PATA MPIIX Intel PATA old PIIX Intel SCH PATA JMicron PATA Legacy ISA PATA Marvell PATA support via legacy mode Marvell SATA NETCELL Revolution RAID NVIDIA SATA Nat Semi NS87410 PATA Nat Semi NS87415 PATA Ninia32/Delkin Cardbus ATA **OPTI FireStar PATA** OPTI621/6215 PATA Older Promise PATA controller PCMCIA PATA Pacific Digital ADMA Pacific Digital SATA QStor Platform AHCI SATA Promise PATA 2027x Promise SATA SX4 Promise SATA TX2/TX4 ODI VLB PATA RADISYS 82600 PATA RDC PATA SC1200 PATA SERVERWORKS OSB4/CSB5/CSB6/HT1000 PATA

Adaptec Starfire/DuraLAN Ansel Communications EISA 3200 Apricot Xen-II on board Ethernet Atheros L2 Fast Ethernet Broadcom 440x/47xx ethernet CS89x0 Cabletron E21xx DECchip Tulip (dc2114x) PCI Dave ethernet support (DNET) Davicom DM910x/DM980x Early DECchip Tulip (dc2104x) PCI EtherExpress 16 EtherExpressPro support/EtherExpress 10 (i82595) Generic DECchip & DIGITAL EtherWORKS PCI/EISA HP 10/100VG PCLAN (ISA, EISA, PCI) HP PCLAN (27245 and other 27xxx series) HP PCLAN+ (27247B and 27252A) ICL EtherTeam 16i/32 Intel(R) PRO/100+ LP486E on board Ethernet Myson MTD-8xx PCI Ethernet NE2000/NE1000 NI5010 NI5210 NI6510 National Semiconductor DP8381x series PCI Ethernet OpenCores 10/100 Mbps Ethernet MAC PCI NE2000 and clones support (see help) RDC R6040 Fast Ethernet Adapter RealTek RTL-8129/8130/8139 PCI Fast Ethernet Adapter RealTek RTL-8139 C+ PCI Fast Ethernet Adapter SEEQ8005 SMC 9194 SMC EtherPower II SMC Ultra SMSC LAN9420 PCI ethernet adapter SiS 900/7016 PCI Fast Ethernet Adapter Silan SC92031 PCI Fast Ethernet Adapter driver

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ServerWorks Frodo / Apple K2 SATA SiS 964/965/966/180 SATA SiS PATA Silicon Image 3124/3132 SATA Silicon Image SATA ULi Electronics SATA ULA PATA VIA PATA VIA SATA VITESSE VSC-7174 / INTEL 31244 SATA Winbond SL82C105 PATA Winbond W83759A VLB PATA

SCSI low-level drivers

3ware 5/6/7/8xxx ATA-RAID 3ware 97xx SAS/SATA-RAID **3ware 9xxx SATA-RAID** 7000FASST SCSI ACARD SCSI ARECA (ARC11xx/12xx/13xx/16xx)SATA/SAS RAID Host Adapter Adaptec AACRAID Adaptec AHA152X/2825 Adaptec AHA1542 Adaptec AIC79xx U320 Adaptec AIC7xxx Adaptec AIC7xxx Fast -> U160 Adaptec AIC94xx SAS/SATA Adaptec I2O RAID AdvanSys SCSI Always IN2000 SCSI BusLogic SCSI DMX3191D SCSI DTC3180/3280 SCSI EATA ISA/EISA/PCI (DPT and generic EATA/DMA-compliant boards) Emulex LightPulse Fibre Channel Support Future Domain 16xx SCSI/AHA-2920A Generic NCR5380/53c400 SCSI MMIO Generic NCR5380/53c400 SCSI PIO HP Smart Array SCSI driver HighPoint RocketRAID 3xxx/4xxx Controller

Sun Cassini Sun GEM Sun Happy Meal 10/100baseT Sundance Alta TI ThunderLAN ULi M526x controller VIA Rhine WD80*3 Winbond W89c840 Ethernet Zenith Z-Note nForce Ethernet

Ethernet (1000 Mbit)

Alteon AceNIC/3Com 3C985/NetGear GA620 Gigabit Atheros L1C Gigabit Ethernet Atheros L1E Gigabit Ethernet Atheros/Attansic L1 Gigabit Ethernet **Broadcom CNIC** Broadcom NetXtremeII Broadcom Tigon3 DL2000/TC902x-based Gigabit Ethernet IP1000 Gigabit Ethernet Intel(R) 82575/82576 PCI-Express Gigabit Ethernet Intel(R) 82576 Virtual Function Ethernet Intel(R) PRO/1000 Gigabit Ethernet Intel(R) PRO/1000 PCI-Express Gigabit Ethernet JMicron(R) PCI-Express Gigabit Ethernet National Semiconductor DP83820 New SysKonnect GigaEthernet Packet Engines Hamachi GNIC-II Packet Engines Yellowfin Gigabit-NIC QLogic QLA3XXX Network Driver Support Realtek 8169 gigabit ethernet SiS190/SiS191 gigabit ethernet SysKonnect Yukon2 VIA Velocity Ethernet (10000 Mbit)

Broadcom NetXtremeII 10Gb Chelsio 10Gb Ethernet Chelsio Communications T3 10Gb Ethernet

IBM Power Linux RAID adapter	Chelsio Communications T4 Ethernet
IBM ServeRAID	Cisco VIC Ethernet NIC Support
Initio 9100U(W)	Intel(R) 10GbE PCI Express adapters
Initio INI-A100U2W	Intel(R) PRO/10GbE
Intel/ICP (former GDT SCSI Disk Array) RAID	Mellanox Technologies 10Gbit Ethernet
Controller	Myricom Myri-10G Ethernet
LSI Logic Legacy MegaRAID Driver	NetXen Multi port (1/10) Gigabit Ethernet NIC
LSI Logic Management Module	Neterion X3100 Series 10GbE PCIe Server Adapter
LSI Logic MegaRAID Driver	QLOGIC QLCNIC 1/10Gb Converged Ethernet
LSI Logic MegaRAID SAS RAID Module	NIC Support
LSI MPT Fusion SAS 2.0 Device Driver	QLogic QLGE 10Gb Ethernet Driver Support
Marvell 88SE64XX/88SE94XX SAS/SATA	S2IO 10Gbe XFrame NIC
NCR53c406a SCSI	ServerEngines' 10Gbps NIC - BladeEngine
PAS16 SCSI	Solarflare Solarstorm SFC4000/SFC9000-family
PMC SIERRA Linux MaxRAID adapter	Sun Neptune 10Gbit Ethernet
PMC-Sierra SPC 8001 SAS/SATA Based Host	Tehuti Networks 10G Ethernet
Adapter driver	Token Ring driver support
Promise SuperTrak EX Series	3Com 3C359 Token Link Velocity XL adapter
QLogic ISP4XXX host adapter family	Generic TMS380 PCI
QLogic QLA2XXX Fibre Channel Support	Generic TMS380 Token Ring ISA/PCI adapter
Qlogic FAS SCSI	IBM Lanstreamer chipset PCI adapter
Qlogic QLA 1240/1x80/1x160 SCSI	IBM Olympic chipset PCI adapter
SYM53C8XX Version 2 SCSI	IBM Tropic chipset based adapter
Symbios 53c416 SCSI	Madge Smart 16/4 PCI Mk2
Tekram DC390(T) and Am53/79C974 SCSI	Proteon ISA
Tekram DC395(U/UW/F) and DC315(U) SCSI	SMC ISA/MCA adapter
Trantor T128/T128F/T228 SCSI	SysKonnect TR4/16 ISA
UltraStor 14F/34F	USB Network Adapters
UltraStor SCSI	ASIX AX88xxx Based USB 2.0 Ethernet Adapters
VMware PVSCSI driver	CDC EEM
Workbit NinjaSCSI-32Bi/UDE	CDC Ethernet support (smart devices such as cable
USB support	modems)
Cypress C67x00 HCD	Davicom DM9601 based USB 1.1 10/100 ethernet
Datafab Compact Flash Reader	devices
Freecom USB/ATAPI Bridge	GeneSys GL620USB-A based cables
ISD-200 USB/ATA Bridge	Host for RNDIS and ActiveSync devices
ISP 1760 HCD	MosChip MCS7830 based Ethernet adapters
ISP116X HCD	NetChip 1080 based cables (Laplink,)
ISP1362 HCD	Prolific PL-2301/2302 based cables
Lexar Jumpshot Compact Flash Reader	

OXU210HP HCD Olympus MAUSB-10/Fuji DPC-R1 R8A66597 HCD SL811HS HCD SanDisk SDDR-09 (and other SmartMedia, including DPCM) SanDisk SDDR-55 SmartMedia USB 2.0 USB Mass Storage USB Monitor USBAT/USBAT02-based storage xHCI HCD (USB 3.0)

Block devices

Compaq SMART2 Compaq Smart Array 5xxx Mylex DAC960/DAC1100 PCI RAID Controller Normal floppy disk Promise SATA SX8

IEEE 1394 (FireWire) support

Legacy alternative FireWire driver stack Storage devices (SBP-2 protocol)

PCMCIA network device support

3Com 3c574 PCMCIA 3Com 3c589 PCMCIA Asix AX88190 PCMCIA COM20020 ARCnet PCMCIA Fujitsu FMV-J18x PCMCIA NE2000 compatible PCMCIA New Media PCMCIA SMC 91Cxx PCMCIA Xircom 16-bit PCMCIA

Other devices

Microsoft Hyper-V Utilities driver Microsoft Hyper-V client drivers Microsoft Hyper-V virtual block driver Microsoft Hyper-V virtual network driver Microsoft Hyper-V virtual storage driver SMSC LAN95XX based USB 2.0 10/100 ethernet devices

Sharp Zaurus (stock ROMs) and compatible Simple USB Network Links (CDC Ethernet subset) USB CATC NetMate-based Ethernet device USB KLSI KL5USB101-based ethernet device USB Pegasus/Pegasus-II based ethernet device USB RTL8150 based ethernet device

VII R-Studio Agent Emergency

R-Studio Agent Emergency is a tool that allows you to start a network computer with a damaged startup disk and recover data stored on its hard drives. Then restored data can be transferred to a working computer via the network.

It works very simple: Just start the computer with the **R-Studio Agent Emergency** startup disk(s) and, if necessary, manually configure a network interface for **R-Studio Agent Emergency**. When started, the computer and its hard drives can be accessed by **R-Studio** installed on another computer on the network.

Note: You cannot use this program to start Mac computers based on Apple Silicon.

<u>Contact Information and Technical Support</u> <u>Installing R-Studio Agent Emergency Startup Media Creator</u> <u>Creating Startup Disks</u> <u>Starting a Computer with the R-Studio Agent Emergency Startup Disk</u>

Hardware Compatibility List Disk Controllers Network Cards

7.1 Contact Information and Technical Support

To obtain the latest version of R-Studio Agent Emergency, go to:

Product Site: <u>http://www.r-tt.com</u> Sales Department: <u>sales@r-tt.com</u>

R-Studio Technical Support Team is available 24 hours a day, seven days a week, and has an average response time less than 4 hours.

Tech. Support: support@r-tt.com

Send your support request to: http://www.r-tt.com/Support_request.html

7.2 Installing R-Studio Agent Emergency Startup Media Creator

You must have administrative privileges to install R-Studio Agent Emergency Startup Media Creator.

If you are not sure whether you have such privileges, you almost certainly do not have them. Contact your system administrator for assistance.

1. Run the setup file.

2. Follow the on-screen instructions.

You may create startup disks even before the installation ends.

7.3 Creating Startup Disks

You need to create either

• A startup CD/DVD disc. You may create an ISO image, or write the disc directly from **R-Studio** Emergency Startup Media Creator, if there is a CD/DVD recorder in your system.

or

• A startup FAT/FAT32 removable device recognized by your system as a bootable one. The total available size of the device should be more than 10 MB.

or

• 4 formatted floppy disks

Check the Hardware Compatibility List.

When R-Studio Agent Emergency Startup Media Creator starts, its Welcome dialog box appears:

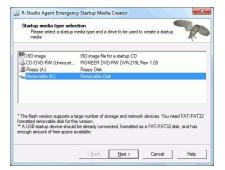
Welcome to R-Studio Agent Emergency Startup Media Creator dialog box

Welcome dialog box



click the Next button to see the list of all devices on which startup disks may be created.

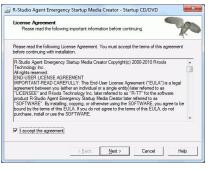
Startup media type selection dialog box



To create a startup CD/DVD disc directly on your CD/DVD writer (if present):

- 1 Run R-Studio Agent Emergency
- 2 Select the CD/DVD writer on the Startup media type selection dialog box and click the Next button
- 3 Read and accept the License Agreement and enter the R-Studio Agent registration key on the R-Studio Agent Emergency Activation dialog box and click the Next button Note: You should enter the registration key of R-Studio Agent, not R-Studio itself.

R-Studio Agent Emergency License Agreement dialog box



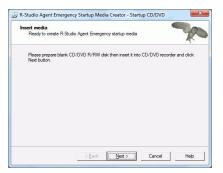
R-Studio Agent Emergency Activation dialog box

	4
Name	Tester 1
Company	R-TT Testing Team
Registration Number	gegsdigb aseyftqecawrwqecwer vtq345345135 b45n aadfff sad asfafdta nb5647353583avetv
If you just eva the fields blan	uate the capabilities of R-Studio data recovery software leave all and click "Next" button

if you do not enter the registration key, **R-Studio Agent** Emergency will work in the Demo mode. You may enter the key later when **R-Studio Agent** Emergency and **R-Studio** establish a connection

4 Insert a blank CD/DVD disk into the CD/DVD recorder and click the Next button

Insert media disc **dialog box**



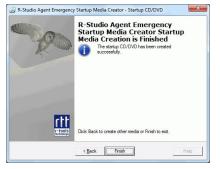
> R-Studio Agent Emergency Startup Media Creator will start creating the startup CD/DVD disc showing the progress on the Creating startup media dialog box

Creating startup media **dialog box**

Creating startup r		11 IV			All and a second	7
Please wait whil	e data is bein	g copied onto	the startup me	dia	R	-
Startup media cr	reation progres	58:				

When R-Studio Agent Emergency Startup Media Creator finishes creating the startup CD/DVD disc, the R-Studio Agent Emergency Startup Media Creation is Finished message will appear You may either exit R-Studio Emergency Startup Media Creator by clicking the Finish button or create another startup media by clicking the Back button.

R-Studio Agent Emergency Startup Media Creation is Finished message



To create an ISO image of a startup CD/DVD disc

- 1 Run R-Studio Agent Emergency
- 2 Select ISO Image for a startup CD/DVD on the R-Studio Agent Emergency Startup Media Creator dialog box and click the Next button
- 3 Read and accept the License Agreement and enter the R-Studio Agent registration key on the R-Studio Agent Emergency Activation dialog box and click the Next button Note: You should enter the registration key of R-Studio Agent, not R-Studio itself.

if you do not enter the registration key, **R-Studio Agent** Emergency will work in the Demo mode. You may enter the key later when **R-Studio Agent** Emergency and **R-Studio** establish a connection.

- 4 Select a place and file name for the ISO image of the startup CD/DVD and click the Save button
- > When R-Studio Bootable Startup Media Creator finishes writing the file with the ISO image, the R-Studio Agent Emergency Startup Media Creation is Finished message will appear

You may either exit **R-Studio Bootable Startup Media Creator** by clicking the **Finish** button or create another startup media by clicking the **Back** button.

R-Studio Agent Emergency Startup Media Creation is Finished dialog box



5 Create the startup CD/DVD using your favorite CD/DVD creation software

Load the created ISO image into the CD/DVD creation software. Consult documentation for the software for details.

To create a startup FAT/FAT32 removable device

- 1 Run R-Studio Agent Emergency
- 2 Select the removable device on the Startup media type selection dialog box and click the Next button
- 3 Read and accept the License Agreement and enter the registration key on the R-Studio Agent Emergency Activation dialog box and click the Next button
- 4 Check that the correct FAT/FAT32-formatted device is selected and click the Next button

Confirm device selection dialog box

Insert media Ready to create R-Studio Agent Emergency startup media							
Please confirm that	K:\is a correct U	6B disk to create t	he emergenc	y startup <mark>dis</mark> k.			

R-Studio Agent Emergency Startup Media Creator will start creating the startup USB disk showing the progress on the Creating startup media dialog box

When R-Studio Agent Emergency Startup Media Creator finishes creating the startup device, the R-Studio Agent Emergency Startup Media Creation is Finished message will appear

You may either exit **R-Studio Emergency Startup Media Creator** by clicking the **Finish** button or create another startup media by clicking the **Back** button.



R-Studio Agent Emergency Startup Media Creation is Finished dialog box

To create floppy disks:

You will need 4 formatted floppy disks.

- 1 Run **R-Studio** Agent Emergency
- 2 Select Floppy Disk for the startup floppy disk on the R-Studio Agent Emergency Startup Media Creator dialog box and click the Next button
- 3 Enter the registration information and number on the Registration dialog box and click the Next button If you leave all the field blank, **R-Studio Agent Emergency** will work with the **Demo-version limitations**
- 4 Insert the floppy disk and click the Next button on the Insert floppy dialog box

Insert floppy **dialog box**

Ready to create F	-Studio Agent I	Emergency st	artup media	,	2
Please prepare 4 f	omatted floppy	disk(s) then	insert the first o	ne into drive A:1	and click
Next button.					
WARNING! All ext	sting data on th	e floppy disk	s will be overw	ritten.	

> R-Studio Agent Emergency Startup Media Creator will start creating the startup floppy disk showing the progress on the Creating startup media dialog box

Creating startup media dialog box

Creating startup media Please wait while data is being copied onto the startup media					
Startup media crea	ation progress:				

5 Insert the second floppy disk and click the OK button when the Please insert formatted diskette #2 into drive A: message will appear



Do it with the next 2 floppy disks.

When R-Studio Startup Media Creator finishes creating the startup floppy disk, the R-Studio Agent Emergency Startup Media Creation is Finished message will appear. You may either exit R-Studio Startup Media Creator by clicking the Finish button or create another startup media by clicking the Back button.

R-Studio Agent Emergency Startup Media Creation is Finished dialog box



7.4 Starting a Computer with the R-Studio Agent Emergency Startup Disk

We recommended that you print out this help page and have the hardcopy on hand while you are performing this action.

Before you start the computer you should be aware that your network has a DHCP server or you know the computer's IP address and network mask.

If there is a non-IDE disk controller in your system, or you plan to use network disks or external hardware devices, first check the <u>Hardware Compatibility List</u>.

If you plan to use any external device, turn it on before starting the system.

If the motherboard in your computer supports the Serial ATA (SATA) devices, but IDE disks are also present, only the SATA devices should be set to the Enhanced Mode in BIOS.

To start the computer with the R-Studio Agent Emergency startup disks

1 Make sure that the first startup device in the system BIOS is the device from which you plan to start your computer (a CD/DVD drive or A (Floppy))

Disable "Secure boot" in the system BIOS if your computer is certified to run Windows 8. Refer to your system documentation for details. Refer to your system documentation for details.

- 2 Insert the R-Studio Agent Emergency startup CD/DVD disc, a removable device, or the first floppy disk and start your computer
- R-Studio Agent Emergency will start and its prompt will appear If you start your computer with floppy disks, you'll see prompts to insert a next floppy disk.

Booting R-Studio Emergency. Please wait...

If your network has a DHCP server

The computer running R-Studio Agent Emergency will be assigned an IP address automatically

A prompt with a computer address will appear. You need to remember it to access the computer via network.

If your network does not have a DHCP server

You need to configure the interfaces and IP addresses manually.

- 1. A prompt to select an interface will appear. Enter the selected interface name and press Enter.
- 2. A prompt to enter its IP address and optional subnet mask will appear. Enter the IP address and optional subnet mask and press **Enter**.

[List of							
Interfaces]							
Name	IP Address	NETMASK	Vendor				
	-						
re0	Unconfigured		RealTek				
8139C+							
	_						
<pre># Enter interface name, 'gw' for default gateway or just press</pre>							
ENTER to finish							
#>re0							
# Enter IP address and optional NETMASK delimited by space							
#>192.168.0.10 255.255.255.0							
#>192.108.0	.10 255.255.255.0						

3. A prompt to configure another interface, gateway, or to finish configuring the interfaces will appear. Enter gw, enter the IP address of the gateway, and press **Enter**.

-----[List of Interfaces]-----IP Address NETMASK Name Vendor Unconfigured RealTek re0 8139C+ # Enter interface name, 'gw' for default gateway or just press ENTER to finish #>re0 # Enter IP address and optional NETMASK delimited by space #>192.168.0.10 255.255.255.0 -----[List of Interfaces]------Name IP Address NETMASK Vendor ______ _____

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re0 192.168.0.10 255.255.255.0 RealTek 8139C+ qw Unconfigured Default gateway # Enter interface name, 'gw' for default gateway or just press ENTER to finish #>aw # Enter default gateway IP Address #>192.168.0.1 -----[List of Interfaces]-----IP Address Name NETMASK Vendor 192.168.0.10 255.255.255.0 re0 RealTek 8139C+ 192.168.0.1 Default aw gateway # Enter interface name, 'gw' for default gateway or just press ENTER to finish #>

4. Press Enter to finish configuring the interfaces, or enter the name of the next interface to configure.

> R-Studio Agent Emergency will show a prompt that is ready to accept connections

* R-Studio Agent started and ready to accept connections...* You may press ENTER to start to remote R-Studio...

Now the computer may be accessed by **R-Studio** via network.

Secure boot:

It may be impossible to start a Windows 8 certified computer with the R-Studio Agent Emergency startup disk without some additional actions. This happens because any computer should use a so-called "Secure boot" procedure to comply with Windows 8 hardware certification from Microsoft. In brief, this procedure prevents computer from booting into any operating system that isn't digitally signed with an appropriate digital signature. "Secure boot" is claimed to prevent unauthorized modification of the boot sector by bootkits, viruses, trojans, and other malicious software. To the date, only Windows 8, Windows Server 2012, and selected Linux distributions support this feature. As a side effect, it also prevents most LiveCDs, rescue disks (R-Studio and R-Drive Image included), and other OS from running.

Likely enough, the other requirement of Windows 8 hardware certification is to make it possible for the user to disable the Secure boot procedure. Those settings can be done through the system BIOS under the Boot options. Generally, it's enough to enable Legacy support in those options, but sometimes it may require additional actions. Please, refer to your system documentation to learn more about disabling/enabling Secure boot.

When Secure boot is disabled, it should be possible to start the computer with the R-Studio Agent Emergency startup disk.

Please note that you should enable this feature back after using the startup disks because Windows 8 or Server 2012 may not start properly without the Secure boot feature enabled.

Starting a Connection from R-Studio Agent Emergency

When you need to connect **R-Studio** and **R-Studio Agent Emergency** over the Internet, it may be necessary to start the connection from the computer where **R-Studio Agent Emergency** is running.

To connect to R-Studio's computer,

1 Press the Enter key and enter the IP address of the computer where R-Studio is running as IPaddress:port.

```
* R-Studio Agent started and ready to accept connections...
* You may press ENTER to start connection to remote R-Studio...
# Enter R-Studio IP address or just press ENTER to cancel>
192.168.0.25:80
```

The default port is 8080, and you don't have to specify it.

2 Enter the password if required, and press the Enter key.

```
* R-Studio Agent started and ready to accept connections...
* You may press ENTER to start connection to remote R-Studio...
# Enter R-Studio IP address or just press ENTER to cancel>
192.168.0.25:80
# Enter password or just press ENTER to connect without
one>PaSsWoRd1234
```

> When the connection is established successfully, R-Studio Agent Emergency will notify you about this.

```
* R-Studio Agent started and ready to accept connections...
* You may press ENTER to start connection to remote R-Studio...
# Enter R-Studio IP address or just press ENTER to cancel>
192.168.0.25:80
# Enter password or just press ENTER to connect without
one>PaSsWoRd1234
Connection with 192.168.0.25:80 is established successfully.
```

7.5 R-Studio Agent Emergency Hardware Compatibility List

Disk Controllers Network Cards

<u>R-Studio Agent Emergency</u> <u>Contact Information and Technical Support</u> <u>Installing R-Studio Agent Emergency Startup Media Creator</u> <u>Creating Startup Disks</u> Starting a Computer with the R-Studio Agent Emergency Startup Disk

7.5.1 Disk Controllers

R-Studio Agent Emergency is based on the **FreeBSD 5.3** kernel and supports devices from the list published at <u>http://www.freebsd.org/releases/5.3R/hardware-i386.html</u>.

*: Supported in the floppy version

Disk controllers

IDE/ATA controllers (ata driver) *

The adapters supported by the <u>aic</u> driver include:

Adaptec AHA-1505 (ISA) Adaptec AHA-1510A, AHA-1510B (ISA) Adaptec AHA-1520A, AHA-1520B (ISA) Adaptec AHA-1522A, AHA-1522B (ISA) Adaptec AHA-1535 (ISA) Creative Labs SoundBlaster SCSI host adapter (ISA) Adaptec AHA-1460, AHA-1460B, AHA-1460C, AHA-1460D (PC Card) Adaptec AHA-1030B, AHA-1030P (PC98) NEC PC-9801-100 (PC98)

The aha driver supports the following SCSI host adapters:

Adaptec AHA-154xB Adaptec AHA-154xC Adaptec AHA-154xCF Adaptec AHA-154xCP Adaptec AHA-1640 Adaptec AHA-174x in 154x emulation mode DTC 3290 SCSI controller in 1542 emulation mode Tekram SCSI controllers in 154x emulation mode

The ahb driver supports the following SCSI host adapters:

Adaptec AHA-1740 Adaptec AHA-1742 Adaptec AHA-1740A Adaptec AHA-1742A

The ahc driver supports the following SCSI host adapter chips and SCSI controller cards:

Adaptec AIC7770 host adapter chip Adaptec AIC7850 host adapter chip Adaptec AIC7860 host adapter chip Adaptec AIC7870 host adapter chip Adaptec AIC7880 host adapter chip Adaptec AIC7890 host adapter chip Adaptec AIC7891 host adapter chip Adaptec AIC7892 host adapter chip Adaptec AIC7895 host adapter chip Adaptec AIC7896 host adapter chip Adaptec AIC7897 host adapter chip Adaptec AIC7899 host adapter chip Adaptec 274X(W) Adaptec 274X(T) Adaptec 284X Adaptec 2910

Adaptec 2915 Adaptec 2920 Adaptec 2930C Adaptec 2930U2 Adaptec 2940 Adaptec 2940J Adaptec 2940N Adaptec 2940U Adaptec 2940AU Adaptec 2940UW Adaptec 2940UW Dual Adaptec 2940UW Pro Adaptec 2940U2W Adaptec 2940U2B Adaptec 2950U2W Adaptec 2950U2B Adaptec 19160B Adaptec 29160B Adaptec 29160N Adaptec 3940 Adaptec 3940U Adaptec 3940AU Adaptec 3940UW Adaptec 3940AUW Adaptec 3940U2W Adaptec 3950U2 Adaptec 3960 Adaptec 39160 Adaptec 3985 Adaptec 4944UW NEC PC-9821Xt13 (PC-98) NEC RvII26 (PC-98) NEC PC-9821X-B02L/B09 (PC-98) NEC SV-98/2-B03 (PC-98) Many motherboards with on-board SCSI support The ahd driver supports the following: Adaptec AIC7901 host adapter chip Adaptec AIC7901A host adapter chip Adaptec AIC7902 host adapter chip Adaptec 29320 host adapter Adaptec 39320 host adapter Many motherboards with on-board SCSI support Controllers supported by the aac driver include: Adaptec AAC-364 Adaptec SCSI RAID 2120S

Adaptec SCSI RAID 2130S Adaptec SCSI RAID 2200S Adaptec SCSI RAID 2410SA Adaptec SCSI RAID 2810SA Adaptec SCSI RAID 5400S Dell CERC SATA RAID 2 Dell PERC 2/Si Dell PERC 2/QC Dell PERC 3/Si Dell PERC 3/Di Dell PERC 320/DC HP NetRAID 4M The adv driver supports the following SCSI controllers: AdvanSys ABP510/5150 AdvanSys ABP5140 AdvanSys ABP5142 AdvanSys ABP902/3902 AdvanSys ABP3905 AdvanSys ABP915 AdvanSys ABP920 AdvanSys ABP3922 AdvanSys ABP3925 AdvanSys ABP930, ABP930U, ABP930UA AdvanSys ABP960, ABP960U AdvanSys ABP542 AdvanSys ABP742 AdvanSys ABP842 AdvanSys ABP940 AdvanSys ABP940UA/3940UA AdvanSys ABP940U AdvanSys ABP3960UA AdvanSys ABP970, ABP970U AdvanSys ABP752 AdvanSys ABP852 AdvanSys ABP950 AdvanSys ABP980, ABP980U AdvanSys ABP980UA/3980UA MELCO IFC-USP (PC-98) RATOC REX-PCI30 (PC-98) @Nifty FNECHARD IFC-USUP-TX (PC-98) The adw driver supports SCSI controllers including: AdvanSys ABP940UW/ABP3940UW

AdvanSys ABP950UW AdvanSys ABP970UW AdvanSys ABP970UW

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AdvanSys ABP3950U2W

BusLogic BT-445C

The **bt** driver supports the following BusLogic MultiMaster ``W", ``C", ``S", and ``A" series and compatible SCSI host adapters:

BusLogic BT-445S BusLogic BT-540CF BusLogic BT-542B BusLogic BT-542B BusLogic BT-542D BusLogic BT-545C BusLogic BT-545S BusLogic/BusTek BT-640 BusLogic BT-742A BusLogic BT-742A BusLogic BT-747C BusLogic BT-747D **BusLogic BT-747S** BusLogic BT-757C BusLogic BT-757CD BusLogic BT-757D BusLogic BT-757S **BusLogic BT-946C** BusLogic BT-948 BusLogic BT-956C BusLogic BT-956CD **BusLogic BT-958** BusLogic BT-958D Storage Dimensions SDC3211B / SDC3211F AMI FastDisk Host Adapters that are true BusLogic MultiMaster clones are also supported by the bt driver. The dpt driver provides support for the following RAID adapters: **DPT Smart Cache Plus** Smart Cache II (PM2?2?, PM2022 [EISA], PM2024/PM2124 [PCI]) (Gen2) Smart RAID II (PM3?2?, PM3021, PM3222) Smart Cache III (PM2?3?) Smart RAID III (PM3?3?, PM3332 [EISA], PM3334UW [PCI]) (Gen3) Smart Cache IV (PM2?4?, PM2042 [EISA], PM2044/PM2144 [PCI]) (Gen4) Smart RAID IV The adapters currently supported by the asr driver include the following: Adaptec Zero-Channel SCSI RAID 2000S, 2005S, 2010S, 2015S Adaptec SCSI RAID 2100S, 2110S Adaptec ATA-100 RAID 2400A Adaptec SCSI RAID 3200S, 3210S Adaptec SCSI RAID 3400S, 3410S Adaptec SmartRAID PM1554 Adaptec SmartRAID PM1564

Adaptec SmartRAID PM2554 Adaptec SmartRAID PM2564 Adaptec SmartRAID PM2664 Adaptec SmartRAID PM2754 Adaptec SmartRAID PM2865 Adaptec SmartRAID PM3754 Adaptec SmartRAID PM3755U2B / SmartRAID V Millennium Adaptec SmartRAID PM3757 DEC KZPCC-AC (LVD 1-ch, 4MB or 16MB cache), DEC KZPCC-CE (LVD 3-ch, 64MB cache), DEC KZPCC-XC (LVD 1-ch, 16MB cache), DEC KZPCC-XE (LVD 3-ch, 64MB cache) -- rebadged SmartRAID V Millennium The amr driver supports the following: AMI MegaRAID 320-1 AMI MegaRAID 320-2 AMI MegaRAID 320-4X AMI MegaRAID Series 418 AMI MegaRAID Enterprise 1200 (Series 428) AMI MegaRAID Enterprise 1300 (Series 434) AMI MegaRAID Enterprise 1400 (Series 438) AMI MegaRAID Enterprise 1500 (Series 467) AMI MegaRAID Enterprise 1600 (Series 471) AMI MegaRAID Elite 1500 (Series 467) AMI MegaRAID Elite 1600 (Series 493) AMI MegaRAID Elite 1650 (Series 4xx) AMI MegaRAID Express 100 (Series 466WS) AMI MegaRAID Express 200 (Series 466) AMI MegaRAID Express 300 (Series 490) AMI MegaRAID Express 500 (Series 475) **Dell PERC** Dell PERC 2/SC Dell PERC 2/DC Dell PERC 3/DCL Dell PERC 3/QC Dell PERC 4/Di HP NetRAID-1/Si HP NetRAID-3/Si (D4943A) HP Embedded NetRAID **Note:** Booting from these controllers is supported. EISA adapters are not supported. Controllers supported by the mlx driver include: Mylex DAC960P Mylex DAC960PD / DEC KZPSC (Fast Wide) Mylex DAC960PDU Mylex DAC960PL Mylex DAC960PJ

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Mylex DAC960PG

Mylex DAC960PU / DEC PZPAC (Ultra Wide)

Mylex AcceleRAID 150 (DAC960PRL)

Mylex AcceleRAID 250 (DAC960PTL1)

Mylex eXtremeRAID 1100 (DAC1164P)

RAIDarray 230 controllers, aka the Ultra-SCSI DEC KZPAC-AA (1-ch, 4MB cache), KZPAC-CA (3-ch, 4MB), KZPAC-CB (3-ch, 8MB cache)

All major firmware revisions (2.x, 3.x, 4.x and 5.x) are supported, however it is always advisable to upgrade to the most recent firmware available for the controller. Compatible Mylex controllers not listed should work, but have not been verified.

Note: Booting from these controllers is supported. EISA adapters are not supported.

Controllers supported by the mly driver include:

Mylex AcceleRAID 160 Mylex AcceleRAID 170 Mylex AcceleRAID 352 Mylex eXtremeRAID 2000 Mylex eXtremeRAID 3000 Compatible Mylex controllers not listed should work, but have not been verified.

The twe driver supports the following ATA RAID controllers:

AMCC's 3ware 5000 series AMCC's 3ware 6000 series AMCC's 3ware 7000-2 AMCC's 3ware 7006-2 AMCC's 3ware 7500-4LP AMCC's 3ware 7500-8 AMCC's 3ware 7500-12 AMCC's 3ware 7506-4LP AMCC's 3ware 7506-8 AMCC's 3ware 7506-12 AMCC's 3ware 8006-2LP AMCC's 3ware 8500-4LP AMCC's 3ware 8500-8 AMCC's 3ware 8500-12 AMCC's 3ware 8506-4LP AMCC's 3ware 8506-8 AMCC's 3ware 8506-8MI AMCC's 3ware 8506-12 AMCC's 3ware 8506-12MI

The twa driver supports the following PATA/SATA RAID controllers:

AMCC's 3ware 9500S-4LP AMCC's 3ware 9500S-8 AMCC's 3ware 9500S-8MI AMCC's 3ware 9500S-12 AMCC's 3ware 9500S-12MI

The ncr driver provides support for the following NCR/Symbios SCSI controller chips:

53C810 53C810A 53C815 53C820 53C825A 53C860 53C875 53C875J 53C885 53C895 53C895A 53C896

53C1510D

The following add-on boards are known to be supported:

I-O DATA SC-98/PCI (PC-98) I-O DATA SC-PCI (PC-98)

The sym driver provides support for the following Symbios/LSI Logic PCI SCSI controllers:

53C810 53C810A 53C815 53C825 53C825A 53C860 53C875 53C876 53C895 53C895A 53C896 53C897 53C1000 53C1000R 53C1010-33 53C1010-66 53C1510D

The SCSI controllers supported by sym can be either embedded on a motherboard, or on one of the following add-on boards:

ASUS SC-200, SC-896 Data Technology DTC3130 (all variants) DawiControl DC2976UW Diamond FirePort (all) I-O DATA SC-UPCI (PC-98) Logitec LHA-521UA (PC-98) NCR cards (all)

Symbios cards (all) Tekram DC390W, 390U, 390F, 390U2B, 390U2W, 390U3D, and 390U3W Tyan S1365 The following devices are currently supported by the ncv driver: I-O DATA PCSC-DV KME KXLC002 (TAXAN ICD-400PN, etc.), KXLC004, and UJDCD450 Macnica Miracle SCSI-II mPS110 Media Intelligent MSC-110, MSC-200 NEC PC-9801N-J03R New Media Corporation BASICS SCSI **Qlogic Fast SCSI** RATOC REX-9530, REX-5572 (SCSI only) Controllers supported by the stg driver include: Adaptec 2920/A Future Domain SCSI2GO Future Domain TMC-18XX/3260 IBM SCSI PCMCIA Card ICM PSC-2401 SCSI MELCO IFC-SC RATOC REX-5536, REX-5536AM, REX-5536M, REX-9836A Note that the Adaptec 2920C is supported by the **ahc** driver. Cards supported by the isp driver include: **ISP1000** PTI SBS440 **ISP1020 ISP1040** PTI SBS450 Ologic 1240 Qlogic 1020 Qlogic 1040 Qlogic 1080 Qlogic 1280 **Qlogic** 12160 Qlogic 2100 Qlogic 2102 Qlogic 2200 Qlogic 2202 Ologic 2204 Qlogic 2300 Qlogic 2312 PTI SBS470 Antares P-0033 Controllers supported by the amd driver include: MELCO IFC-DP (PC-98)

Tekram DC390 Tekram DC390T Controllers supported by the nsp driver include: Alpha-Data AD-PCS201 I-O DATA CBSC16 Adaptec AIC-7110 Parallel to SCSI interfaces (vpo driver) The following controllers are supported by the ida driver: Compaq SMART Array 221 Compaq Integrated SMART Array Controller Compag SMART Array 4200 Compag SMART Array 4250ES Compaq SMART 3200 Controller Compaq SMART 3100ES Controller Compaq SMART-2/DH Controller Compaq SMART-2/SL Controller Compaq SMART-2/P Controller Compaq SMART-2/E Controller Compag SMART Controller Controllers supported by the ciss driver include: Compaq Smart Array 5300 Compaq Smart Array 532 Compaq Smart Array 5i HP Smart Array 5312 HP Smart Array 6i HP Smart Array 641 HP Smart Array 642 HP Smart Array 6400 HP Smart Array 6400 EM HP Smart Array 6422 HP Smart Array V100 HP Modular Smart Array 20 (MSA20) HP Modular Smart Array 500 (MSA500) Controllers supported by the iir driver include: Intel RAID Controller SRCMR Intel Server RAID Controller U3-1 (SRCU31a) Intel Server RAID Controller U3-1L (SRCU31La) Intel Server RAID Controller U3-2 (SRCU32) All past and future releases of Intel and ICP RAID Controllers. Intel RAID Controller SRCU21 (discontinued) Intel RAID Controller SRCU31 (older revision, not compatible) Intel RAID Controller SRCU31L (older revision, not compatible) The SRCU31 and SRCU31L can be updated via a firmware update available from Intel. Promise SuperTrak ATA RAID controllers (pst driver)

The hptmv driver supports the HighPoint RocketRAID 182x SATA controllers.

Controllers supported by the ips driver include:

IBM ServeRAID 3H ServeRAID 4L/4M/4H ServeRAID Series 5 ServeRAID 6i/6M

The following controllers are supported by the mpt driver:

LSI Logic 53c1030 (Dual Ultra320 SCSI)

LSI Logic FC909 (1Gb/s Fibre Channel)

LSI Logic FC909A (Dual 1Gb/s Fibre Channel)

LSI Logic FC919 (2Gb/s Fibre Channel)

LSI Logic FC929 (Dual 2Gb/s Fibre Channel)

The SCSI controller chips supprted by the mpt driver can be found onboard on many systems including:

Dell PowerEdge 1750

IBM eServer xSeries 335

SCSI controllers supported by the trm driver include:

Tekram DC-315 PCI Ultra SCSI adapter without BIOS and internal SCSI connector

Tekram DC-315U PCI Ultra SCSI adapter without BIOS

Tekram DC-395F PCI Ultra-Wide SCSI adapter with flash BIOS and 68-pin external SCSI connector

Tekram DC-395U PCI Ultra SCSI adapter with flash BIOS

Tekram DC-395UW PCI Ultra-Wide SCSI adapter with flash BIOS

Tekram DC-395U2W PCI Ultra2-Wide SCSI adapter with flash BIOS

For the Tekram DC-310/U and DC-390F/U/UW/U2B/U2W/U3W PCI SCSI host adapters, use the sym driver.

The wds driver supports the WD7000 SCSI controller.

7.5.2 Network Cards

R-Studio Agent Emergency is based on the **FreeBSD 5.3** kernel and supports devices from the list published at <u>http://www.freebsd.org/releases/5.3R/hardware-i386.html</u>.

*: Supported in the floppy version

Ethernet NICs

Adapters supported by the sf driver include:

ANA-62011 64-bit single port 10/100baseTX adapter

ANA-62022 64-bit dual port 10/100baseTX adapter

ANA-62044 64-bit quad port 10/100baseTX adapter

ANA-69011 32-bit single port 10/100baseTX adapter

ANA-62020 64-bit single port 100baseFX adapter

The ti driver supports Gigabit Ethernet adapters based on the Alteon Tigon I and II chips. The ti driver has been tested with the following adapters:

3Com 3c985-SX Gigabit Ethernet adapter (Tigon 1)

3Com 3c985B-SX Gigabit Ethernet adapter (Tigon 2)

Alteon AceNIC V Gigabit Ethernet adapter (1000baseSX)

Alteon AceNIC V Gigabit Ethernet adapter (1000baseT)

Digital EtherWORKS 1000SX PCI Gigabit adapter

Netgear GA620 Gigabit Ethernet adapter (1000baseSX) Netgear GA620T Gigabit Ethernet adapter (1000baseT) The following adapters should also be supported but have not yet been tested: Asante GigaNIX1000T Gigabit Ethernet adapter Asante PCI 1000BASE-SX Gigabit Ethernet adapter Farallon PN9000SX Gigabit Ethernet adapter NEC Gigabit Ethernet Silicon Graphics PCI Gigabit Ethernet adapter The pcn driver supports adapters and embedded controllers based on the AMD PCnet/FAST, PCnet/FAST+, PCnet/FAST III, PCnet/PRO and PCnet/Home Fast Ethernet chips: AMD Am53C974/Am79C970/Am79C974 PCnet-PCI * AMD Am79C970A PCnet-PCI II * AMD Am79C971 PCnet-FAST * AMD Am79C972 PCnet-FAST+ * AMD Am79C973/Am79C975 PCnet-FAST III * AMD Am79C976 PCnet-PRO * AMD PCnet/Home HomePNA Allied-Telesis LA-PCI Contec C-NET(98)S (PC-98) NEC SV-98/2-B05, B06 The Inc driver supports the following adapters: Novell NE2100 * Novell NE32-VL * Isolan AT 4141-0 (16 bit) Isolan BICC Isolink 4110 (8 bit) **Diamond HomeFree Digital DEPCA** Hewlett Packard Vectra 486/66XM Hewlett Packard Vectra XU Also supported are adapters working with the pcn driver. The lnc driver runs these in compatibility mode, thus the **pcn** driver should be preferred. SMC 83c17x (EPIC)-based Ethernet NICs (tx driver) The ed driver supports the following Ethernet NICs: 3Com 3c503 Etherlink II **AR-P500** Ethernet Accton EN1644 (old model), EN1646 (old model), EN2203 (old model) (110pin) (flags 0xd00000) Accton EN2212/EN2216/UE2216 Allied Telesis CentreCOM LA100-PCM V2 Allied Telesis LA-98 (flags 0x000000) (PC-98) Allied Telesis SIC-98, SIC-98NOTE (110pin), SIU-98 (flags 0x600000) (PC-98) Allied Telesis SIU-98-D (flags 0x610000) (PC-98) AmbiCom 10BaseT card Bay Networks NETGEAR FA410TXC Fast Ethernet

CNet BC40 adapter Compex Net-A adapter Contec C-NET(98), RT-1007(98), C-NET(9N) (110pin) (flags 0xa00000) (PC-98) Contec C-NET(98)E-A, C-NET(98)L-A, C-NET(98)P (flags 0x300000) (PC-98) Corega Ether98-T (flags 0x000000) (PC-98) Corega Ether PCC-T/EtherII PCC-T/FEther PCC-TXF/PCC-TXD CyQ've ELA-010 **DEC EtherWorks DE305** Danpex EN-6200P2 D-Link DE-298, DE-298P (flags 0x500000) (PC-98) D-Link DE-650/660 D-Link IC-CARD/IC-CARD+ Ethernet ELECOM LD-98P (flags 0x500000) (PC-98) ELECOM LD-BDN, LD-NW801G (flags 0x200000) (PC-98) ELECOM Laneed LD-CDL/TX, LD-CDF, LD-CDS, LD-10/100CD, LD-CDWA (DP83902A) HP PC Lan+ 27247B and 27252A IBM Creditcard Ethernet I/II ICM AD-ET2-T, DT-ET-25, DT-ET-T5, IF-2766ET, IF-2771ET, NB-ET-T (110pin) (flags 0x500000) (PC-98) I-O DATA LA/T-98, LA/T-98SB, LA2/T-98, ET/T-98 (flags 0x900000) (PC-98) I-O DATA ET2/T-PCI I-O DATA PCLATE Kansai KLA-98C/T (flags 0x900000) (PC-98) Kingston KNE-PC2, KNE-PCM/x Ethernet Linksys EC2T/PCMPC100/PCM100, PCMLM56 Linksys EtherFast 10/100 PC Card, Combo PCMCIA Ethernet Card (PCMPC100 V2) Logitec LAN-98T (flags 0xb00000) (PC-98) MACNICA Ethernet ME1 for JEIDA MACNICA ME98 (flags 0x900000) (PC-98) MACNICA NE2098 (flags 0x400000) (PC-98) MELCO EGY-98 (flags 0x300000) (PC-98) MELCO LGH-98, LGY-98, LGY-98-N (110pin), IND-SP, IND-SS (flags 0x400000) (PC-98) MELCO LGY-PCI-TR MELCO LPC-T/LPC2-T/LPC2-CLT/LPC2-TX/LPC3-TX/LPC3-CLX NDC Ethernet Instant-Link NEC PC-9801-77, PC-9801-78 (flags 0x910000) (PC-98) NEC PC-9801-107, PC-9801-108 (flags 0x800000) (PC-98) National Semiconductor InfoMover NE4100 NetGear FA-410TX NetVin 5000 Network Everywhere Ethernet 10BaseT PC Card Networld 98X3 (flags 0xd00000) (PC-98) Networld EC-98X, EP-98X (flags 0xd10000) (PC-98) Novell NE1000/NE2000/NE2100 PLANEX ENW-8300-T

PLANEX EN-2298-C (flags 0x200000) (PC-98) PLANEX EN-2298P-T, EN-2298-T (flags 0x500000) (PC-98) PLANEX FNW-3600-T RealTek 8029 SMC Elite 16 WD8013 SMC Elite Ultra SMC EtherEZ98 (flags 0x000000) (PC-98) WD8003E/WD8003EBT/WD8003S/WD8003SBT/WD8003W/WD8013EBT/WD8013W SMC and clones Socket LP-E Surecom EtherPerfect EP-427 Surecom NE-34 TDK LAK-CD031, Grey Cell GCS2000 Ethernet Card Telecom Device SuperSocket RE450T **VIA VT86C926** Winbond W89C940 C-Bus, ISA, PCI and PC Card devices are supported. Adapters supported by the rl driver include: Accton ``Cheetah" EN1207D (MPX 5030/5038; RealTek 8139 clone) Allied Telesyn AT2550 Allied Telesyn AT2500TX Belkin F5D5000 BUFFALO(Melco INC.) LPC-CB-CLX(CardBus) Compag HNE-300 CompUSA no-name 10/100 PCI Ethernet NIC Corega FEther CB-TXD Corega FEtherII CB-TXD D-Link DFE-530TX+ D-Link DFE-538TX (same as 530+?) D-Link DFE-690TXD Edimax EP-4103DL CardBus Encore ENL832-TX 10/100 M PCI Farallon NetLINE 10/100 PCI Genius GF100TXR, GigaFast Ethernet EE100-AXP KTX-9130TX 10/100 Fast Ethernet LevelOne FPC-0106TX Longshine LCS-8038TX-R NDC Communications NE100TX-E Netronix Inc. EA-1210 NetEther 10/100 Nortel Networks 10/100BaseTX OvisLink LEF-8129TX **OvisLink LEF-8139TX** Peppercon AG ROL-F Planex FNW-3800-TX

SMC EZ Card 10/100 PCI 1211-TX SOHO(PRAGMATIC) UE-1211C

The wb driver supports Winbond W89C840F based Fast Ethernet adapters and embedded controllers including:

Trendware TE100-PCIE *

The vr driver supports VIA Technologies Rhine I, Rhine II, and Rhine III based Fast Ethernet adapters including:

D-Link DFE530-TX Hawking Technologies PN102TX AOpen/Acer ALN-320

The sis driver supports Silicon Integrated Systems SiS 900 * and SiS 7016 * based Fast Ethernet adapters and embedded controllers, as well as Fast Ethernet adapters based on the National Semiconductor DP83815 (MacPhyter) chip. Supported adapters include:

@ Nifty FNECHARD IFC USUP-TX
MELCO LGY-PCI-TXC
Netgear FA311-TX (DP83815)
Netgear FA312-TX (DP83815)
SiS 630, 635, and 735 motherboard chipsets

The nge driver supports National Semiconductor DP83820 * and DP83821 based Gigabit Ethernet adapters including:

SMC EZ Card 1000 (SMC9462TX) D-Link DGE-500T Asante FriendlyNet GigaNIX 1000TA and 1000TPC Addtron AEG320T LinkSys EG1032 (32-bit PCI) and EG1064 (64-bit PCI) Surecom Technology EP-320G-TX Netgear GA622T Netgear GA621 Ark PC SOHO-GA2500T (32-bit PCI) and SOHO-GA2000T (64-bit PCI) Trendware TEG-PCITX (32-bit PCI) and TEG-PCITX2 (64-bit PCI)

The ste driver supports Sundance Technologies ST201 based Fast Ethernet adapters and embedded controllers including:

D-Link DFE-530TXS D-Link DFE-550TX

Adapters supported by the sk driver include:

3COM 3C940 single port, 1000baseT adapter Belkin F5D5005 single port, 1000baseT adapter Linksys EG1032 single port, 1000baseT adapter SK-9521 SK-NET GE-T single port, 1000baseT adapter SK-9821 SK-NET GE-T dual port, 1000baseT adapter * SK-9822 SK-NET GE-T dual port, 1000baseT adapter * SK-9841 SK-NET GE-LX single port, single mode fiber adapter * SK-9842 SK-NET GE-LX dual port, single mode fiber adapter * SK-9843 SK-NET GE-SX single port, multimode fiber adapter * SK-9844 SK-NET GE-SX dual port, multimode fiber adapter * SMC 9452TX single port, 1000baseT adapter

The tl driver supports Texas Instruments ThunderLAN based Ethernet and Fast Ethernet adapters including a large number of Compaq PCI Ethernet adapters. Also supported are:

Olicom OC-2135/2138 10/100 TX UTP adapter

Olicom OC-2325/OC-2326 10/100 TX UTP adapter

Racore 8148 10baseT/100baseTX/100baseFX adapter

Racore 8165 10/100baseTX adapter

The tl driver also supports the built-in Ethernet adapters of various Compaq Prosignia servers and Compaq Deskpro desktop machines including:

Compaq Netelligent 10

Compaq Netelligent 10 T PCI UTP/Coax

Compaq Netelligent 10/100

Compaq Netelligent 10/100 Dual-Port

Compaq Netelligent 10/100 Proliant

Compaq Netelligent 10/100 TX Embedded UTP

Compaq Netelligent 10/100 TX UTP

Compaq NetFlex 3P

Compaq NetFlex 3P Integrated

Compaq NetFlex 3P w/BNC

The dc driver provides support for the following chipsets: *

DEC/Intel 21143 ADMtek AL981 Comet, AN985 Centaur, ADM9511 Centaur II and ADM9513 Centaur II ASIX Electronics AX88140A and AX88141 Conexant LANfinity RS7112 (miniPCI) Davicom DM9009, DM9100, DM9102 and DM9102A Lite-On 82c168 and 82c169 PNIC Lite-On/Macronix 82c115 PNIC II Macronix 98713, 98713A, 98715, 98715A, 98715AEC-C, 98725, 98727 and 98732 Xircom X3201 (cardbus only)

The following NICs are known to work with the dc driver at this time:

3Com Office Connect 10/100B (ADMtek AN985 Centaur-P)
Abocom FE2500
Accton EN1217 (98715A)
Accton EN2242 MiniPCI
Adico AE310TX (98715A)
Alfa Inc GFC2204 (ASIX AX88140A)
Built in 10Mbps only Ethernet on Compaq Presario 7900 series desktops (21143, non-MII)
Built in DE500-BA on DEC Alpha workstations (21143, non-MII)
Built in Sun DMFE 10/100 Mbps Ethernet on Sun Netra X1 and Sun Fire V100 (DM9102A, MII)
Built in Ethernet on LinkSys EtherFast 10/100 Instant GigaDrive (DM9102, MII)
CNet Pro110B (ASIX AX88140A)
CNet Pro120A (98715A or 98713A) and CNet Pro120B (98715)
Compex RL100-TX (98713 or 98713A)
D-Link DFE-570TX (21143, MII, quad port)
Digital DE500-BA 10/100 (21143, non-MII)

ELECOM Laneed LD-CBL/TXA (ADMtek AN985) Hawking CB102 CardBus IBM EtherJet Cardbus Adapter Intel PRO/100 Mobile Cardbus (versions that use the X3201 chipset) Jaton XpressNet (Davicom DM9102) Kingston KNE100TX (21143, MII) Kingston KNE110TX (PNIC 82c169) LinkSys LNE100TX (PNIC 82c168, 82c169) LinkSys LNE100TX v2.0 (PNIC II 82c115) LinkSys LNE100TX v4.0/4.1 (ADMtek AN985 Centaur-P) Matrox FastNIC 10/100 (PNIC 82c168, 82c169) Melco LGY-PCI-TXL Microsoft MN-120 10/100 CardBus (ADMTek Centaur-C) Microsoft MN-130 10/100 PCI (ADMTek Centaur-P) NDC SOHOware SFA110A (98713A) NDC SOHOware SFA110A Rev B4 (98715AEC-C) NetGear FA310-TX Rev. D1, D2 or D3 (PNIC 82c169) Netgear FA511 PlaneX FNW-3602-T (ADMtek AN985) SMC EZ Card 10/100 1233A-TX (ADMtek AN985) SVEC PN102-TX (98713) Xircom Cardbus Realport Xircom Cardbus Ethernet 10/100 Xircom Cardbus Ethernet II 10/100 Adapters supported by the aue driver include: Abocom UFE1000, DSB650TX NA Accton USB320-EC, SpeedStream ADMtek AN986, AN8511 Billionton USB100, USB100LP, USB100EL, USBE100 Corega Ether FEther USB-T, FEther USB-TX, FEther USB-TXS D-Link DSB-650, DSB-650TX, DSB-650TX-PNA Elecom LD-USBL/TX Elsa Microlink USB2Ethernet HP hn210e I-O Data USB ETTX Kingston KNU101TX LinkSys USB10T adapters that contain the AN986 Pegasus chipset, USB10TA, USB10TX, USB100TX, USB100H1 MELCO LUA-TX, LUA2-TX Planex UE-200TX Sandberg USB to Network Link (model number 133-06) Siemens Speedstream SmartBridges smartNIC SMC 2202USB SOHOware NUB100

The cue driver supports CATC USB-EL1210A based USB Ethernet adapters including:

Belkin F5U011/F5U111 CATC Netmate CATC Netmate II SmartBridges SmartLink

The kue driver supports Kawasaki LSI KL5KLUSB101B based USB Ethernet adapters including:

3Com 3c19250 3Com 3c460 HomeConnect Ethernet USB Adapter ADS Technologies USB-10BT AOX USB101 ATen UC10T Abocom URE 450 Corega USB-T D-Link DSB-650C Entrega NET-USB-E45, NET-HUB-3U1E I/O Data USB ETT Kawasaki DU-H3E LinkSys USB10T Netgear EA101 Peracom USB Ethernet Adapter SMC 2102USB, 2104USB

The <u>axe</u> driver supports ASIX Electronics AX88172 based USB Ethernet adapters including:

Buffalo (Melco Inc.) LUA-U2-KTX D-Link DUBE100 LinkSys USB200M Netgear FA120 System TALKS Inc. SGC-X2UL

The rue driver supports RealTek RTL8150 based USB Ethernet adapters including:

Buffalo (Melco Inc.) LUA-KTX Green House GH-USB100B LinkSys USB100M Billionton 10/100 FastEthernet USBKR2

The <u>udav</u> driver supports the following adapters:

Corega FEther USB-TXC

Adapters supported by the <u>de</u> driver include:

Adaptec ANA-6944/TX Cogent EM100FX and EM440TX Corega FastEther PCI-TX D-Link DFE-500TX DEC DE435, DE425, DEC DE450, and DEC DE500 ELECOM LD-PCI2T, LD-PCITS I-O DATA LA2/T-PCI SMC Etherpower 8432, 9332 and 9334 ZNYX ZX3xx

Controllers and cards supported by the fe driver include:

Allied Telesis RE1000, RE1000Plus, ME1500 (110-pin) CONTEC C-NET(98)P2, C-NET (9N)E (110-pin), C-NET(9N)C (ExtCard) CONTEC C-NET(PC)C PCMCIA Ethernet Eiger Labs EPX-10BT Fujitsu FMV-J182, FMV-J182A Fujitsu MB86960A, MB86965A Fujitsu MB86960A, MB86965A Fujitsu MBH10303, MBH10302 Ethernet PCMCIA Fujitsu Towa LA501 Ethernet HITACHI HT-4840-11 NextCom J Link NC5310 RATOC REX-5588, REX-9822, REX-4886, and REX-R280 RATOC REX-5588, REX-9822, REX-4886, and REX-R280 RATOC REX-9800/9881/9882/9883 TDK LAC-98012, LAC-98013, LAC-98025, LAC-9N011 (110-pin) TDK LAK-CD021, LAK-CD021A, LAK-CD021BX Ungermann-Bass Access/PC N98C+(PC85152, PC85142), Access/NOTE N98(PC86132) (110-pin)

Adapters supported by the fxp driver include:

Intel EtherExpress PRO/10 Intel InBusiness 10/100 Intel PRO/100B / EtherExpressPRO/100 B PCI Adapter * Intel PRO/100+ Management Adapter Intel PRO/100 VE Desktop Adapter Intel PRO/100 M Desktop Adapter Intel PRO/100 S Desktop, Server and Dual-Port Server Adapters Contec C-NET(PI)-100TX (PC-98) NEC PC-9821Ra20, Rv20, Xv13, Xv20 internal 100Base-TX (PC-98) NEC PC-9821X-B06 (PC-98) Many on-board network interfaces on Intel motherboards

The ex driver supports the following Ethernet adapters:

Intel EtherExpress Pro/10 Intel EtherExpress Pro/10+ The Olicom OC2220

The <u>ie</u> driver provides supports the following 8 and 16bit ISA Ethernet cards that are based on the Intel i82586 chip:

3COM 3C507 AT&T EN100 AT&T Starlan 10 AT&T Starlan Fiber Intel EtherExpress 16 RACAL Interlan NI5210

The <u>ep</u> driver supports Ethernet adapters based on the 3Com 3C5x9 Etherlink III Parallel Tasking chipset, including:

3Com 3C1 CF 3Com 3C509-TP, 3C509-BNC, 3C509-Combo, 3C509-TPO, 3C509-TPC ISA 3Com 3C509B-TP, 3C509B-BNC, 3C509B-Combo, 3C509B-TPO, 3C509B-TPC ISA 3Com 3C529, 3C529-TP MCA 3Com 3C562/3C563 PCMCIA 3Com 3C569B-J-TPO, 3C569B-J-COMBO CBUS 3Com 3C574-TX, 3CCFE574BT, 3CXFE574BT, 3C3FE574BT PCMCIA 3Com 3C579-TP, 3C579-BNC EISA 3Com 3C589, 3C589B, 3C589C, 3C589D, 3CXE589DT PCMCIA 3Com 3CCFEM556B, 3CCFEM556BI PCMCIA 3Com 3CXE589EC, 3CCE589EC, 3CXE589ET, 3CCE589ET PCMCIA 3Com Megahertz 3CCEM556, 3CXEM556, 3CCEM556B, 3CXEM556B PCMCIA 3Com OfficeConnect 3CXSH572BT, 3CCSH572BT PCMCIA Farallon EtherMac PCMCIA

The el driver supports the 3Com 3c501 8bit ISA Ethernet card.

The <u>xl</u> driver supports the following hardware:

3Com 3c900-TPO * 3Com 3c900-COMBO * 3Com 3c905-TX * 3Com 3c905-T4 * 3Com 3c900B-TPO * 3Com 3c900B-TPC * 3Com 3c900B-FL * 3Com 3c900B-COMBO * 3Com 3c905B-T4 * 3Com 3c905B-TX * 3Com 3c905B-FX * 3Com 3c905B-COMBO * 3Com 3c905C-TX * 3Com 3c980, 3c980B, and 3c980C server adapters 3Com 3cSOHO100-TX OfficeConnect adapters 3Com 3c450 HomeConnect adapters 3Com 3c555, 3c556 and 3c556B mini-PCI adapters 3Com 3C3SH573BT, 3C575TX, 3CCFE575BT, 3CXFE575BT, 3CCFE575CT, 3CXFE575CT, 3CCFEM656, 3CCFEM656B, and 3CCFEM656C, 3CXFEM656, 3CXFEM656B, and 3CXFEM656C CardBus adapters 3Com 3c905-TX, 3c905B-TX 3c905C-TX, and 3c920B-EMB embedded adapters Both the 3C656 family of CardBus cards and the 3C556 family of MiniPCI cards have a built-in proprietary modem. Neither the xl driver nor any other driver supports this modem. The \underline{vx} driver supports the following cards: 3Com 3c590 EtherLink III PCI *

3Com 3c592 EtherLink III EISA

3Com 3c595 Fast EtherLink III PCI in 10 Mbps mode *

3Com 3c597 Fast EtherLink III EISA in 10 Mbps mode

Crystal Semiconductor CS89x0-based NICs (cs driver)

The \underline{sn} driver supports SMC9xxx based ISA and PCMCIA cards including:

3Com Megahertz X-Jack Ethernet PC-Card CC-10BT

The <u>xe</u> driver supports the following cards:

Xircom CreditCard Ethernet (PS-CE2-10) Xircom CreditCard Ethernet + Modem 28 (PS-CEM-28) Xircom CreditCard Ethernet + Modem 33 (CEM33) Xircom CreditCard 10/100 (CE3, CE3B) Xircom CreditCard Ethernet 10/100 + Modem 56 (CEM56) Xircom RealPort Ethernet 10 (RE10) Xircom RealPort Ethernet 10/100 (RE100) Xircom RealPort Ethernet 10/100 + Modem 56 (REM56, REM56G) Accton Fast EtherCard-16 (EN2226) Compaq Netelligent 10/100 PC Card (CPQ-10/100) Intel EtherExpress Pro/100 PC Card Mobile Adapter 16 (Pro/100 M16A) Other similar devices using the same hardware may also be supported.

Adapters supported by the lge driver include:

SMC TigerCard 1000 (SMC9462SX) * D-Link DGE-500SX *

The txp driver supports the following cards:

3Com 3CR990-TX-95 * 3Com 3CR990-TX-97 * 3Com 3cR990B-TXM * 3Com 3CR990SVR95 * 3Com 3CR990SVR97 * 3Com 3cR990B-SRV *

The <u>bge</u> driver provides support for various NICs based on the Broadcom BCM570x family of Gigabit Ethernet controller chips, including the following:

3Com 3c996-T (10/100/1000baseTX) * Dell PowerEdge 1750 integrated BCM5704C NIC (10/100/1000baseTX) * Dell PowerEdge 2550 integrated BCM5700 NIC (10/100/1000baseTX) * Dell PowerEdge 2650 integrated BCM5703 NIC (10/100/1000baseTX) * IBM x235 server integrated BCM5703x NIC (10/100/1000baseTX) * HP ProLiant NC7760 embedded Gigabit NIC (10/100/1000baseTX) * HP ProLiant NC7770 PCI-X Gigabit NIC (10/100/1000baseTX) * HP ProLiant NC7781 embedded PCI-X Gigabit NIC (10/100/1000baseTX) * Netgear GA302T (10/100/1000baseTX) * SysKonnect SK-9D21 (10/100/1000baseTX) *

The <u>em</u> driver supports Gigabit Ethernet adapters based on the Intel 82540, 82541PI, 82542, 82543, 82544, 82546, 82546EB and 82547 controller chips:

Intel PRO/1000 CT Network Connection (82547)

Intel PRO/1000 F Server Adapter (82543)

Intel PRO/1000 Gigabit Server Adapter (82542)*

Intel PRO/1000 GT Desktop Adapter (82541PI)

Intel PRO/1000 MF Dual Port Server Adapter (82546)

Intel PRO/1000 MF Server Adapter (82545)

Intel PRO/1000 MF Server Adapter (LX) (82545)

Intel PRO/1000 MT Desktop Adapter (82540)

Intel PRO/1000 MT Desktop Adapter (82541)

Intel PRO/1000 MT Dual Port Server Adapter (82546)

Intel PRO/1000 MT Quad Port Server Adapter (82546EB)

Intel PRO/1000 MT Server Adapter (82545)

Intel PRO/1000 T Desktop Adapter (82544)

Intel PRO/1000 T Server Adapter (82543)

Intel PRO/1000 XF Server Adapter (82544)

Intel PRO/1000 XT Server Adapter (82544)

The gx driver supports Gigabit Ethernet adapters based on the Intel 82542 and 82543 controller chips:

Intel PRO/1000 Gigabit Server Adapter (82542)

Intel PRO/1000 F Server Adapter (82543)

Intel PRO/1000 T Server Adapter (82543)

The <u>hme</u> driver supports the on-board Ethernet interfaces of many Sun UltraSPARC workstation and server models. Cards supported by the <u>hme</u> driver include:

Sun PCI SunSwift Adapter Sun SBus SunSwift Adapter ``(hme'' and ``SUNW,hme'') Sun PCI Sun100BaseT Adapter 2.0 Sun SBus Sun100BaseT 2.0 Sun PCI Quad FastEthernet Controller Sun SBus Quad FastEthernet Controller

The my driver provides support for various NICs based on the Myson chipset. Supported models include:

Myson MTD800 PCI Fast Ethernet chip Myson MTD803 PCI Fast Ethernet chip Myson MTD89X PCI Gigabit Ethernet chip

Broadcom BCM4401 based Fast Ethernet adapters (bfe driver) *

The <u>re</u> driver supports RealTek RTL8139C+, RTL8169, RTL8169S and RTL8110S based Fast Ethernet and Gigabit Ethernet adapters including:

Alloy Computer Products EtherGOLD 1439E 10/100 (8139C+) * Compaq Evo N1015v Integrated Ethernet (8139C+) * Corega CG-LAPCIGT Gigabit Ethernet (8169S) * Gigabyte 7N400 Pro2 Integrated Gigabit Ethernet (8110S) * PLANEX COMMUNICATIONS Inc. GN-1200TC (8169S) * Xterasys XN-152 10/100/1000 NIC (8169) *

The ixgb driver supports the following cards:

Intel PRO/10GbE LR Server Adapter *

Intel PRO/10GbE SR Server Adapter *

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