User's Manual

R-Linux

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Introduction to R-Linux

R-Linux is a file recover utility for the Ext2/3/4FS file system used in the Linux OS and several Unixes. R-Linux uses unique IntelligentScan technology and flexible parameter settings to give you real control over the fastest data recovery ever seen. It recovers files from existing partitions even when file records are lost.

R-Linux is a lite version of more powerful file recover utility R-Studio. R-Studio utilizes the IntelligentScan technology to its full extent, and therefore can recover data from partitions with broken file systems. Also, R-Studio recovers data over network. To learn more about R-Studio, go to the R-Studio Features help page. To learn more about the IntelligentScan technology, go to the IntelligentScan help page.

R-Linux features:

- Standard "Windows Explorer" - style interface.
- Host OS: Linux, kernel 2.6 and above
- Supported file systems: Ext2/3/4FS (created by Linux or other OS).
- Support for known file types. R-Linux searches for files with known typical features of their structures allowing the user to search for files on devices with unknown file systems, including an HD, CD, DVD, floppy disk, Compact Flash Card, USB drive, ZIP drive, Memory Sticks, and other removable media.
- Scan process visualization. While scanning an object, R-Linux graphically shows items that have been found.
- Creates image files for an entire hard drive, partition, or its part. Such image files can be processed like regular disks. Images can be either simple exact object copies (Plain images) compatible with the previous versions of R-Linux, or compressed images that can be compressed, split into several parts, and password-protected. Such images are fully compatible with the images created by R-Drive Image, but incompatible with the previous versions of R-Linux. R-Linux can scan objects while creating their images.
- Recovers files on damaged or deleted partitions.
- Support for estimation of chances for successful recovery.
- Recovered files can be saved on any (including network) disks visible by the host operating system.
- Support for Linux mdadm Volumes
- Support for Linux LVM/LVM2
- A hexadecimal disk and file editor.
- Patterns (or templates) in the hexadecimal editor allowing for parsing the data according to specific data structure. Such patterns may be custom-created.

R-Linux recovers files:

- 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 hard drive was changed or damaged. In this case, R-Linux can scan the drive trying to find previously existed partitions and recover files from found partitions.
- From disks with bad sectors. In this case, R-Linux can first copy the entire disk or its part into an image file and then process such image file.

R-Linux can create image files for an entire hard drive, partition, or its part. Such image files can be processed like regular disks. 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 hard 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.

**R-Studio Features**

**System Requirements**

**Contact Information and Technical Support**

**Data Recovery Using R-Linux**

**Basic File Recovery**

**Advanced Data Recovery**

**Mass File Recovery**

**Text/Hexadecimal Editor**

**Technical Information and Troubleshooting**

### 1.1 R-Studio Features

**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 from Ext2/3/4FS (Linux), FAT12/16/32, exFAT, NTFS, NTFS5 (created or updated by Windows 2000/XP/2003/Vista/2008/7/8/8.1/10), HFS/HFS+ and APFS (Macintosh), Little and Big Endian variants of UFS1/UFS2 (FreeBSD/OpenBSD/NetBSD/Solaris) partitions. It functions on local and network disks, even if such partitions are formatted, damaged or deleted. Flexible parameter settings give you absolute control over the data recovery.

**R-Studio features:**

- Host OS: Linux, kernel 2.6 and above.
- Automatic check for updates.
- Remotely recovers data over network. Data can be recovered on network computers running Windows, Mac, and Linux and some other UNIX OS.
- Supported file systems: Ext2/3/4FS (created by Linux or other OS), FAT12, FAT16, FAT32, NTFS, NTFS5 (created and updated by Windows 2000/XP/2003/Vista/7/8/8.1/10), exFAT, ReFS/ReFS2+ file system (Resilient File System, Windows 2012/2016 Server) HFS, HFS+, HFSX, APFS, and UFS1, UFS2, UFS BigEndian (used by the FreeBSD, OpenBSD, and NetBSD operating systems).
  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 known file types. **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.
- Scan process 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 disks formatted for use with Macintosh computers.
• Dynamic disk support.
• 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 Windows Storage Spaces, created by Windows 8/8.1 and Windows 10/Threshold 2/Anniversary/Fall Creators updates.
• Support for software Apple software RAIDs
• Support for Apple CoreStorage/File Vault/Fusion Drive Volumes
• Support for Linux mdadm Volumes
• Support for Linux LVM/LVM2
• RAID consistency check (check for valid data parity values).
• Hardware RAID, volume set, and stripe set support.
• Automatic RAID parameter recognition.
• Reverse RAIDs: A technique that decomposes real disk 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 drives, etc. This technique also can re-construct data on the real parents of a virtual RAID. For example, it becomes possible to re-construct data on a missing disk.
• Creates image files for an entire hard drive, logical disk, or its part. Such image files can be processed like regular disks. Images can be either simple exact object copies (Plain images) compatible with the previous versions of R-Studio, or compressed images that can be compressed, split into several parts, and password-protected. Such images are fully compatible with the images created by R-Drive Image, but incompatible with the previous versions of R-Studio. Images may be saved either on the local or remote computer. R-Studio can scan objects while creating their images.
• Advanced object copy. In addition to byte to byte copy of any object visible in the Drives panel, smart copy of partitions and hard drives is available.
• Recovers files on damaged or deleted partitions.
• Recovers compressed files (NTFS, NTFS5).
• Recovers encrypted files (NTFS5).
• Recovers alternative data streams (NTFS, NTFS5).
• Support for NTFS deduplication.
• Support for Symbolic links. Symbolic link recovery options in the Technician version.
• 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, 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) disks visible to the host operating system.
• A hexadecimal disk and file editor supporting NTFS file non-resident attribute editing.
• 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 new R-Studio network versions, data are analyzed on the remote host rather than on the home host, thereby the speed of recovery procedure greatly increases.
• Recovered files may be saved on a disk 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 disk because you do not have to transfer files over network. It may be an external USB hard drive, for example.
• Forensic mode. (For the Technician version only).
• Support for third-party hardware. (For the Technician version only).
• R-Studio Emergency*. The R-Studio Emergency version starts from a floppy or compact disk when it is necessary to recover data on a computer, on which OS 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 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 hard 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.
• From disks with bad sectors. In this case, R-Studio can first copy the entire disk or its part into an image file and then process such image file.

R-Studio can create image files for an entire hard drive, logical disk, or its part. Such image files can be processed like regular disks. 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 hard 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 R-Linux System Requirements
• An Intel-compatible x86 or 64-bit platform with 32 MB RAM, a mouse, and enough disk space for recovered files, image files, etc.
• Linux: Fedora 12+, Ubuntu/Kubuntu 10.4+, Debian 4.0+ or any kernel 2.6+ Linux distribution capable of installing .rpm or .deb packages.
• Any Window manager.
• X.Org X server 1.7.6+ installed.
• Root privileges to install and run the program.

1.3 Contact Information and Technical Support
To obtain the latest version of R-Linux, go to:
Product Site: http://www.r-tt.com
Sales Department: sales@r-tt.com
R-Linux 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/SupportRequest.shtml

R-tt Forum: http://forum.r-tt.com

1.4 R-Linux Main Panel
When R-Linux starts, its main panel appears on the desktop.

**Drives** panel:
can select an object by clicking on it.
**Properties** tab:

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

![Properties tab](image)

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** window:

![Log window](image)

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

**R-Linux** shows hard drive **S.M.A.R.T.** states using their icons.

- **Hard drive S.M.A.R.T. states and icons**
Normal: This state indicates that the hard drive is in good conditions.

Warning: This state indicates that some small problems with the disk are possible in the future, you may work with it but with cautions and regular check of these parameters. Disk imaging is strongly recommended.
Critical: This state indicates that the hard drive conditions are critical and chances of hardware failure are great. The best recommendation for this case is to stop working with the disk and bring it to professional data recovery specialists. You may though continue to work with the disk at your own risk, but disk imaging is very strongly recommended.

When a hard drive is selected on the R-Linux 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 hard 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-Linux main panel. 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 Select/clear Event Log on the View menu

If you have several tabs 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 Tab** to view the Scan Information Tab tab
- **Parents Tab** to view the Parents tab
- **Properties** Select data types in which the data will be represented
Sometimes, there may be a lot of similar objects on 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 on 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** to display the indexes only for hard drives
- **Show All Objects Indexes** to display the indexes for all objects on the Drives panel

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-Linux 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.
Stop
Click this button to stop the current operation.

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

**R-Linux has two operation modes:**

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

In this mode, R-Linux analyzes data on the 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 disk must be scanned.

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

R-Linux supports mass file recovery. There is no limit in the number of files that may be recovered during one session.

File content may be previewed before recovery.

File or disk binary data can be viewed and edited in the text/hexadecimal editor. Also can be viewed and changed all attributes for NTFS files.

**Disk scan**, searching for partitions.

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

A disk can be scanned through several successive scans, each with its own parameters. R-Linux 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.

### 1.5 R-Linux Settings

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

**Main dialog box**

![Main dialog box](image)

### Main settings

<table>
<thead>
<tr>
<th>System Options</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Auto-refresh Drive Tree</strong></td>
<td>If this box is selected, <strong>R-Linux</strong> automatically refreshes the list of connected disks. You may disable it if <strong>R-Linux</strong> experiences problems with connected devices.</td>
</tr>
<tr>
<td><strong>Debug Mode</strong></td>
<td>If this check box is selected, <strong>R-Linux</strong> displays an additional command <strong>Create FS Snapshot</strong> on the shortcut menu 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 <strong>R-Linux</strong> technical support to identify the problem. This option greatly slows <strong>R-Linux</strong>.</td>
</tr>
<tr>
<td><strong>Check for update</strong></td>
<td>If this box is selected, <strong>R-Studio</strong> will automatically check for updates.</td>
</tr>
<tr>
<td><strong>Edit Options</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Enable Write</strong></td>
<td>If this check box is selected, <strong>R-Linux</strong> enables you to write any changes made in the <strong>Text/hexadecimal editor</strong>.</td>
</tr>
<tr>
<td><strong>Max changes buffer size</strong></td>
<td>Maximum amount of data stored for the <strong>Undo</strong> command in the <strong>Text/hexadecimal editor</strong>.</td>
</tr>
<tr>
<td><strong>Notifications</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Reset all hidden notifications.</strong></td>
<td>Click this button to enable all previously disabled notification messages.</td>
</tr>
<tr>
<td><strong>User's file mask presets</strong></td>
<td>Specifies a file name and path to the file with <strong>file mask</strong> presets.</td>
</tr>
</tbody>
</table>

### File Systems

- **File name:** Specifies a file name and path to the file with file mask presets.
File Systems dialog box

<table>
<thead>
<tr>
<th>File Systems</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Default encoding for Ext2/Ext3/Ext4 volumes</td>
<td>Select the national encoding for the Ext2, Ext3, and Ext4 partitions.</td>
</tr>
<tr>
<td>Disable any sorting</td>
<td>Select this option if the number of files on the disk is so large that R-Linux sorts files in selected folders for too long time.</td>
</tr>
<tr>
<td>Minimize disk access</td>
<td>Select this option if a lot of bad sectors are on the hard drive. R-Linux will reduce access to internal files in the file system to speed up the interpretation of file system data.</td>
</tr>
<tr>
<td>Show deleted empty folders</td>
<td>Select this option if you want to view empty deleted folders.</td>
</tr>
</tbody>
</table>

Log dialog box

Log options

<table>
<thead>
<tr>
<th>Logging</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum messages in the Event Log</td>
<td>Specifies the maximum number of messages R-Linux will keep in the event log</td>
</tr>
<tr>
<td>Save log to file</td>
<td>If this check box is selected, R-Linux writes its log into a log file specified in the File name field.</td>
</tr>
<tr>
<td>File name</td>
<td>Specifies the file name in which the log will be saved.</td>
</tr>
<tr>
<td>Type</td>
<td></td>
</tr>
<tr>
<td>File</td>
<td>If this check box is selected, R-Linux logs all events with recovered files.</td>
</tr>
<tr>
<td>File System</td>
<td>If this check box is selected, R-Linux logs all events with the file system.</td>
</tr>
<tr>
<td>Option</td>
<td>Description</td>
</tr>
<tr>
<td>----------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Partition</td>
<td>If this check box selected, <strong>R-Linux</strong> logs all events with partitions.</td>
</tr>
<tr>
<td>Recover</td>
<td>If this check box is selected, <strong>R-Linux</strong> logs all events with the recovering processes.</td>
</tr>
<tr>
<td>Disk</td>
<td>If this check box is selected, <strong>R-Linux</strong> logs all events with disks.</td>
</tr>
<tr>
<td>Network</td>
<td>If this check box is selected, <strong>R-Linux</strong> logs all events with network operation.</td>
</tr>
<tr>
<td>Severity</td>
<td>If this check box is selected, <strong>R-Linux</strong> logs all events with network operation.</td>
</tr>
</tbody>
</table>

**Severity**

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Error</td>
<td>If this check box is selected, <strong>R-Linux</strong> adds error messages into its log.</td>
</tr>
<tr>
<td>Warning</td>
<td>If this check box is selected, <strong>R-Linux</strong> adds warning messages into its log.</td>
</tr>
<tr>
<td>Information</td>
<td>If this check box is selected, <strong>R-Linux</strong> adds information messages into its log.</td>
</tr>
<tr>
<td>Success</td>
<td>If this check box is selected, <strong>R-Linux</strong> adds success messages into its log.</td>
</tr>
</tbody>
</table>

NEVER WRITE A LOG FILE ON THE DISK FROM WHICH YOU RECOVER DATA!!!
Or you may obtain unpredictable results and lose all your data.

**Note:** If in the **Recover** dialog box the Condense successful restoration events check box is selected, the **Log** will display only Error, Warning, and Information event messages.

**Known File Types**

**Known File Types dialog box**

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

<table>
<thead>
<tr>
<th>Button</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reset</td>
<td>Click this button to reset the settings to the previous state. Active until the <strong>Apply</strong> button is clicked.</td>
</tr>
<tr>
<td>Select All</td>
<td>Click this button to select all file types in the list.</td>
</tr>
<tr>
<td>Clear All</td>
<td>Click this button to clear all file types in the list except some predefined ones.</td>
</tr>
<tr>
<td>Reload User's File Types</td>
<td>Click this button to apply new file types after the user's file types file has been changes from the <strong>Main</strong> tab.</td>
</tr>
</tbody>
</table>

**Bad Sectors**

**Bad Sectors dialog box**

![Bad Sectors settings](image)

**Bad Sectors settings**

<table>
<thead>
<tr>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Default read attempts</td>
<td>Specifies a default value for I/O Tries, or how many times <strong>R-Linux</strong> will try to read a bad sector. You may specify this parameter for each drive separately on the <strong>Properties</strong> tab. <strong>R-Linux</strong> treats bad sectors in the following way: It reads a certain part of disk (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, <strong>R-Linux</strong> reads again that part sector by sector, repeating the attempts the specified number of times. If <strong>R-Linux</strong> 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 disk read process. For example, if you set Default read attempts to 1, a bad sector will be read 2 times.</td>
</tr>
<tr>
<td>Set for all drives</td>
<td>Click this button to reset I/O Tries for all drives to the default value.</td>
</tr>
<tr>
<td>Pattern to fill bad blocks</td>
<td>Specifies a default pattern <strong>R-Linux</strong> will use to fill bad sectors in files to recover, in images, or when showing data in the <strong>Text/hexadecimal editor</strong>. You may specify the pattern either in the <strong>ANSI</strong> or <strong>Hex</strong> data format. <strong>Note:</strong> <strong>R-Linux</strong> will never ever try to write anything on the disk from which data is to recover or an image is to create.</td>
</tr>
</tbody>
</table>

**Memory Usage**

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

### Memory Usage settings

<table>
<thead>
<tr>
<th>Disable memory control</th>
<th>If this option is selected, the memory control is disabled.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automatic</td>
<td>If this option is selected, R-Linux will automatically stop performing the task when the amount of used memory reaches the specified value. You may specify the limit for either the virtual or physical memory.</td>
</tr>
</tbody>
</table>

You may see how much memory R-Linux actually uses on the [Memory Usage] dialog box.
II Data Recovery Using R-Linux

Depending on the situation, data recovery may vary:

1. **Recovery of deleted files that have resided on an existing partition**
   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 partition is damaged, the operating system sees that partition as a partition without a valid file system. Such partition should be previously scanned. Also, it should be scanned if you want to recover data on a previously deleted or re-formatted partition.

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

<table>
<thead>
<tr>
<th>Partition 2</th>
<th>Recognized6</th>
<th>Recognized19</th>
<th>Recognized29</th>
<th>Raw Files</th>
</tr>
</thead>
<tbody>
<tr>
<td>An existing partition</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Both boot records and file entries are found for this partition</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Only file entries are found for this partition</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Only boot records are found for this partition</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Files that have been found using scan for known file types</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

   To successfully recover files from a recognized partition, it is necessary to find a right one which corresponds to the real partition 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 disk 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 partition. When in doubt, try to preview a couple of files from the recognized partition. If the files are seen correctly, this is the right partition.

R-Studio Features
Contact Information and Technical Support
Basic File Recovery
Advanced Data Recovery
Mass File Recovery
Various Disk and Volume Managers
Text/Hexadecimal Editor
Technical Information and Troubleshooting

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2.1 Basic File Recovery

NEVER TRY TO SAVE RECOVERED FILES/FOLDERS ON THE SAME PARTITION WHERE THEY RESIDE!!!

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

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

To recover deleted files from an existing or recognized partition,

1. Double-click a partition on the R-Linux’s Drives panel to enumerate files on the disk

   - Other ways to enumerate files
     1. Select the disk and click the Open Drive Files button,
     or
     2. Right-click the selected disk and select Open Drive Files on the context menu,
     or
     3. Select Open Drive Files on the Drive menu

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

   > R-Linux will change its panel showing the disk’s folders/files structure

   R-Linux 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-Linux shows only those files/folders that match a specified file mask.

   - R-Linux Main panel

   ![R-Linux Main panel](image)

   Panel view options
You may set which panels and bars to enable/disable. To enable/disable

| The Toolbar | Select/clear Toolbar on the View menu |
| The Status bar | Select/clear Status bar on the View menu |
| The Folders panel | Select/clear Folders View on the View menu |
| The Files panel | Select/clear Contents View on the View menu |
| The Log panel | Select/clear Event Log on the View menu |
| The Find Results panel | Select/clear Find Results on the View menu |

You may also arrange the data as required. On the View menu, select Arrange and then a required arrangement.

You may specify which columns will be visible on the Files panel. On the View menu, select Contents Columns, and select the columns you want to see.

Files can be shown as a list or as icons/tiles of different sizes.

Files shown as icons/tiles

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

Folders panel
- default
- Documents
- Music
- Extra Found Files
- $$$Folder184467440073709551259

Log panel

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The **Files** panel:

- **Deleted file:** MyPhoto1.jpg
- **Marked deleted file:** MyPhoto2.jpg
- **Selected deleted file:** MyPhoto3.jpg
- **Target of a hard link:** MyPhoto1.jpg
- **Hard link to a file:**

The **Find Results** panel:

- **Reopen Drive Files**
  - Click this button to list files again.

- **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 a particular file/folder.

- **Find Next**
  - Click this button to find the next object specified in the **Find** dialog window.

- **Find Previous**
  - Click this button to find the previous object specified in the **Find** dialog window.

- **File Mask**
  - Click this button to specify a file mask.

- **Stop**
  - Click this button to stop the current operation.

- **Up**
  - Click this button to move highlighting one folder up.

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-Linux 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 temporarily stop file listing and browse through found files. Then you can resume file listing. You also may skip this file topic and continue. R-Linux 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 Name):** To copy the file's Name, Size, Created, etc., depending on which column is selected
  - Click **Copy Path:** To copy the file path.
  - Click **Copy Selected Text:** To copy all the columns of the selected file.

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 context 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 context menu. To unmark an object, click the box left to the object once more or select **Unmark** on the context menu. You may unmark all objects in the folder by selecting **Unmark All** on the **Tools** or context menu.

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

  R-Linux can search for a particular file. Go to the **Searching for a File** topic for details. If you need to find and mark many files, go to the **Find and Mark Multiple Files** 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-Linux 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 disk. Go to the **Searching for a File** 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 **Advanced Data Recovery** 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 context menu, or
  - Select **Recover** or **Recover Marked** on the **File** menu
4 Specify recover options and output folder on the Recover dialog box and click the OK button

**Recover dialog box**

<table>
<thead>
<tr>
<th>Recover options</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Condense successful restoration events</td>
<td>If this check box is selected, R-Linux recovers the folder structure in which all files to recover reside starting from the common topmost folder.</td>
</tr>
<tr>
<td>Restore folder structure</td>
<td>If this check box is selected, R-Linux recovers the entire path to the selected object.</td>
</tr>
<tr>
<td>Restore from root</td>
<td>If this check box is selected, R-Linux recovers the entire path to the selected object starting from the root folder of the disk.</td>
</tr>
<tr>
<td>Recover metafiles</td>
<td>If this check box is selected, R-Linux recovers disk metafiles. Metafiles are the file system's internal files invisible to any user, or file system data, which R-Linux represents as files. These files do not contain user data directly. Unless you want to scrutinize a disk file system, do not restore them.</td>
</tr>
<tr>
<td>Recover alternative data streams</td>
<td>If this check box is selected, R-Linux recovers alternative data streams for NTFS files. Has no effect on FAT files.</td>
</tr>
<tr>
<td>Recover security</td>
<td>If this check box is selected, R-Linux recovers security attributes for NTFS files. Has no effect on FAT files.</td>
</tr>
<tr>
<td>Ignore file mask</td>
<td>If this check box is selected, R-Linux recovers all content of a selected folder, ignoring a specified File Mask.</td>
</tr>
</tbody>
</table>

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

**NEVER TRY TO SAVE RECOVERED FILES/FOLDERS ON THE SAME PARTITION WHERE THEY RESIDE!!!**

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

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

**Broken File Name properties**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>File name</td>
<td>Shows the current incorrect file name.</td>
</tr>
<tr>
<td>New name</td>
<td>Field for a new file name.</td>
</tr>
<tr>
<td>Edit broken symbols only</td>
<td>If this check box is selected, only invalid symbols may be corrected</td>
</tr>
<tr>
<td>Change all invalid symbols to</td>
<td>If this check box is selected, all invalid symbols will be changed to the specified symbol</td>
</tr>
</tbody>
</table>

**Buttons**

<table>
<thead>
<tr>
<th>Button</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rename</td>
<td>Click to resume file recovery</td>
</tr>
<tr>
<td>Rename All</td>
<td>Click to resume file recovery. All other files will be renamed according to the specified rule.</td>
</tr>
<tr>
<td>Skip</td>
<td>Click to skip this file</td>
</tr>
<tr>
<td>Skip All</td>
<td>Click to skip all files and stop file recovery</td>
</tr>
</tbody>
</table>

> **R-Linux** will recover the selected/marked files/folders to the specified folder and show the results in the Log pane.

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

Finding Previous File Versions  
Previewing Files  
File Masks  
Regular Expressions  
Event Log

### 2.1.1 Searching for a File

**R-Linux** can find a particular file, if it is difficult to find it manually on the Folders or Files panel. You can also automatically mark 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 context 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 options

You may specify how to treat specified strings. Please note that R-Linux stores previously entered search strings.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Files</td>
<td>If this option is selected, R-Linux treats specified strings as file names. Use ? for one unspecified character and * for an unlimited number of them to specify file masks.</td>
</tr>
<tr>
<td>File Extensions</td>
<td>If this option is selected, R-Linux treats specified strings as file extensions.</td>
</tr>
<tr>
<td>Regular Expressions</td>
<td>If this option is selected, R-Linux treats specified strings as regular expressions.</td>
</tr>
<tr>
<td>All Files</td>
<td>If this option is selected, R-Linux applies Advanced Options to all files.</td>
</tr>
<tr>
<td>Match case</td>
<td>If this check box is selected, R-Linux makes a case-sensitive search.</td>
</tr>
<tr>
<td>Look at</td>
<td>If this check box is selected, R-Linux includes files into a search.</td>
</tr>
<tr>
<td>Folders</td>
<td>If this check box is selected, R-Linux includes folders into a search. Disables when the Mark/Unmark All option is selected.</td>
</tr>
<tr>
<td>Deleted files</td>
<td>If this check box is selected, R-Linux makes a search among deleted files/folders.</td>
</tr>
<tr>
<td>Existing files</td>
<td>If this check box is selected, R-Linux makes a search among existing files/folders.</td>
</tr>
<tr>
<td>Look in</td>
<td>Specifies where R-Linux searches for, and marks, files. It can look for them on the Entire disk, or in/from a certain folder. You may specify the starting folder for the search.</td>
</tr>
</tbody>
</table>

- ! identifies 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-Linux 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.

File Id
Specifies File Id that R-Linux assigns to a file.

Recovery Chances
Specifies files with certain recovery 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-Linux does with the found files.
The Find first/previous/next/last options. R-Linux stops at the first/previous/next/last file that matches the specified search criteria.
Find all files. R-Linux searches for all files that matches the specified search criteria.
The search results appear on the Find Results panel.
Mark/Unmark All. R-Linux marks/unmarks all files that match the search criteria.
When these options are selected, R-Linux marks/unmarks files only, not folders, regardless of what Look at: Folders specifies.
Please note, that when performing a new find and mark/unmark task, R-Linux does not takes into consideration the previous marked/unmarked 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.

R-Linux 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 context menu
  or
- Select a folder and select Find Next or Find Previous on the Tools menu

To find all files and show them on the Find Results panel,
* Select Find all on the on the Find dialog box,
or
  select Find all on the Tools menu

R-Linux will show the found files on the Find Results panel
2.1.2 Finding Previous File Versions

**R-Linux** 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 file is within 10% of the original file size, the following conditions are checked:

<table>
<thead>
<tr>
<th>Conditions</th>
<th>Legend</th>
</tr>
</thead>
<tbody>
<tr>
<td>File name</td>
<td>N</td>
</tr>
<tr>
<td>File extension</td>
<td>E</td>
</tr>
<tr>
<td>Recognized file type</td>
<td>T</td>
</tr>
</tbody>
</table>

To search for previous file versions,

1. Right-click the file and select *Find Previous Versions of the File* on the context menu

   * **R-Linux** will show the files in the list:

   ![File versions](image.png)

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

2.1.3 Previewing Files

**R-Linux** has a built-in file previewer that allows you to preview both existing and deleted files. You may use this feature to estimate recovery or a file to be recovered.

To preview a file

1. Right-click a file to preview on the *Files* panel and select *Preview* on the context menu

   ![Other ways to preview the file](image.png)

   - Select the file on the *Files* panel and click the *Preview* button,
   - or
   - Select the file on the *Files* panel and select *Preview* on the *File* menu
R-Linux 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-Linux 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.

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/Libre 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.
The files can be shown in different layouts and rotated. Click the View menu and select the required options.

**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.

- **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 Digital), 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...
**Data Recovery Using R-Linux**

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/mu-law, QCELP / PureVoice, QDesign Music Codec, RealAudio, Vorbis, Voxware MetaSound, WavPack, Westwood Audio, Windows Media Audio, Xbox Media Audio

---

**Graphic files (with file extensions)**

<table>
<thead>
<tr>
<th>File Extension</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3DS Max thumbnail (max)</td>
<td>3DS Max thumbnail</td>
</tr>
<tr>
<td>AAA logo (bpr)</td>
<td>AAA logo</td>
</tr>
<tr>
<td>ACE texture (ace)</td>
<td>ACE texture</td>
</tr>
<tr>
<td>ADEX (img, rle)</td>
<td>ADEX</td>
</tr>
<tr>
<td>AIM Grey Scale (ima, im)</td>
<td>AIM Grey Scale</td>
</tr>
<tr>
<td>AIPD image (aipd)</td>
<td>AIPD image</td>
</tr>
<tr>
<td>ARF (arf)</td>
<td>ARF</td>
</tr>
<tr>
<td>AT&amp;T Group 4 (att)</td>
<td>AT&amp;T Group 4</td>
</tr>
<tr>
<td>AT&amp;T multigen (icn)</td>
<td>AT&amp;T multigen</td>
</tr>
<tr>
<td>AVHRR Image (sst)</td>
<td>AVHRR Image</td>
</tr>
<tr>
<td>AVT RAW (raw)</td>
<td>AVT RAW</td>
</tr>
<tr>
<td>AWD (awd)</td>
<td>AWD</td>
</tr>
<tr>
<td>Ability Photopaint Image (apx)</td>
<td>Ability Photopaint Image</td>
</tr>
<tr>
<td>Access (g4, acc)</td>
<td>Access</td>
</tr>
<tr>
<td>Aces200 (ace)</td>
<td>Aces200</td>
</tr>
<tr>
<td>Acorn Sprite (acorn)</td>
<td>Acorn Sprite</td>
</tr>
<tr>
<td>AdTech perfectfax (adt)</td>
<td>AdTech perfectfax</td>
</tr>
<tr>
<td>Adobe Illustrator (ai)</td>
<td>Adobe Illustrator</td>
</tr>
<tr>
<td>Adobe PhotoParade (images) (php)</td>
<td>Adobe PhotoParade</td>
</tr>
<tr>
<td>Adobe Photoshop (psd)</td>
<td>Adobe Photoshop</td>
</tr>
<tr>
<td>Advanced Art Studio (ocp, art, pic)</td>
<td>Advanced Art Studio</td>
</tr>
<tr>
<td>AirNav (avn)</td>
<td>AirNav</td>
</tr>
<tr>
<td>Album bébé (frm)</td>
<td>Album bébé</td>
</tr>
<tr>
<td>Alias Image File (pix, als, alias)</td>
<td>Alias Image File</td>
</tr>
<tr>
<td>Alpha Microsystems BMP (bmp)</td>
<td>Alpha Microsystems BMP</td>
</tr>
<tr>
<td>Amapi (2d)</td>
<td>Amapi</td>
</tr>
<tr>
<td>Amica Paint (ami, [b])</td>
<td>Amica Paint</td>
</tr>
<tr>
<td>Amiga IFF (iff, blk)</td>
<td>Amiga IFF</td>
</tr>
<tr>
<td>Amiga icon (info)</td>
<td>Amiga icon</td>
</tr>
<tr>
<td>Amstrad CPC Screen (cpc)</td>
<td>Amstrad CPC Screen</td>
</tr>
<tr>
<td>Analyze (avw)</td>
<td>Analyze</td>
</tr>
<tr>
<td>Analyze-7 (img)</td>
<td>Analyze-7</td>
</tr>
<tr>
<td>Andrew Toolkit raster object (atk)</td>
<td>Andrew Toolkit raster object</td>
</tr>
<tr>
<td>Apollo HDRU (hdr, hdu, gn)</td>
<td>Apollo HDRU</td>
</tr>
<tr>
<td>ArcInfo Binary (hdr)</td>
<td>ArcInfo Binary</td>
</tr>
<tr>
<td>Art Director (art)</td>
<td>Art Director</td>
</tr>
<tr>
<td>Artisan (art)</td>
<td>Artisan</td>
</tr>
<tr>
<td>Artist 64 (a64)</td>
<td>Artist 64</td>
</tr>
<tr>
<td>Artrage (ptg)</td>
<td>Artrage</td>
</tr>
<tr>
<td>Artweaver Document (awd)</td>
<td>Artweaver Document</td>
</tr>
<tr>
<td>Astronomical Research Network (arn)</td>
<td>Astronomical Research Network</td>
</tr>
<tr>
<td>Atari grafik (pcp)</td>
<td>Atari grafik</td>
</tr>
<tr>
<td>Aurora (sim)</td>
<td>Aurora</td>
</tr>
<tr>
<td>Auto F/X (afx)</td>
<td>Auto F/X</td>
</tr>
<tr>
<td>AutoCAD DWG (dwd, dwt)</td>
<td>AutoCAD DWG</td>
</tr>
<tr>
<td>AutoCAD DXF (dxf)</td>
<td>AutoCAD DXF</td>
</tr>
<tr>
<td>Autocad CAD-Camera (img)</td>
<td>Autocad CAD-Camera</td>
</tr>
<tr>
<td>Autodesk Animator (fli, flc)</td>
<td>Autodesk Animator</td>
</tr>
<tr>
<td>Autodesk QuickCAD thumbnail (cad)</td>
<td>Autodesk QuickCAD thumbnail</td>
</tr>
<tr>
<td>Autodesk SketchUp component (skp, skb)</td>
<td>Autodesk SketchUp component</td>
</tr>
<tr>
<td>Autologic (gm, gm2, gm4)</td>
<td>Autologic</td>
</tr>
<tr>
<td>Award Bios Logo (epa)</td>
<td>Award Bios Logo</td>
</tr>
<tr>
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<td>Everex Everfax</td>
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<td>Explore(TDI) &amp; Maya</td>
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Warp (bga), PABX background (pix), PC Paint / Pictor Page (pic, clp), PCO (b16), PM (pm), Page Control Language (pcl), Paint Magic (pmg), PaintShopPro Browser Cache File (jbf), PaintShopPro Brush (psbrush), PaintShopPro Brush (jbr), PaintShopPro Frame (pfr, psframe), PaintShopPro Image (psp, psimage), PaintShopPro Mask (pspmask), PaintShopPro Mask (msk), PaintShopPro Pattern (pat), PaintShopPro Picture Tube (tub, psptube), PaintShopPro Texture (txt), Palm Pilot (pdb), Panasonic DMC-LC1 RAW (srf), Panasonic LX3 RAW (rw2), Panasonic RAW (bay, raw), Pegs (pxs, pxa), Pentax *ist D (pef), PIF Art Publisher (art), Photo Deluxe (pdd, pdb), Photo Filitre Studio (pfi), PhotoFantasy Image (fsy), PhotoFrame (frm), PhotoStudio File (psf), PhotoStudio Stamp (stn), Photomatrix (cat), Pic2 (p2), Picasso 64 (p64), Picture Gear Pocket (pre), Picture It! (mix), Pixar picture file (pic, ppx, picio, pixar), Pixel Power Collage (ib7, ib17, ib18, 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, rbm, ppm), Portable Document Format (pdf), Portable Greyscale (pgm, rgb), Portable Image (pnm, rpn), Portable Network Graphics (png, apng), Portable Pixelmap (ppm, ppm), Portfolio Graphics (pgf), Portfolio Graphics Compressed (pge), Portrait (cwp), Poser Bump (bum), Postscript (ps, ps1, ps2, ps3, eps, pnm), PowerCard maker (crd), PowerPoint(images) (pps), PowerPoint Presentation(images) (ppt), Print Master (pm), Print Shop (psa, pnb), Printbox/Pagefox (bs, pg, gb), Prism (cpra), Prisms (pri), Psion Series 3 Bitmap (pic), Psion Series 5 Bitmap (mbm), Punk Productions Picture (ppp), Puzzle (pzi), Q0 (q0, rgb), Qdv(Random Dot Software) (qdv), Qt Ray-Tracer (qrt), Quake Texture (wal), Quantel VPB (vpb), QuickTime Image Format (qtif, qti), RAW DVR (raw), RIPTerm Image (icn), Radiance (rad, img, pix), Rainbow Painter (rp), Raw (raw, g, gr, gry, grey), Rawzor (rwz), Rayshade (pic), Red Storm File Format (rsf), Ricoh Digital Camera (j6i), Ricoh Fax (001, ric), Ricoh IS30 (pig), Rn2K 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 multi-image (pwp, stf), 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, rga, rbw, bwr, igi, 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) (sp), SPOT (dat), SriSun (ssi), Stad (pic, pac, seq), Star Office Gallery (sdg), Starbase (img), Stardent AVS X (x, avs, mfx, mfbas), Starlight Xpress SX (RAW), Stereo Image (ips), ST Micro RAW (bay, raw), Structured Fax Format (sff), Sun Icon/Cursor (icon, cursor, icf, pr), Sun RasterFile (ras, ras, sun, sr, scr, rs), Sun TAAC file (iff, vif, 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), TeaPaint (pdb), Telix File (mni), Thumbnails (tnl), TilePic (tpj), Tiny (tiny, tnl, tn2, tn3), TopDesign Thumbnail (b3d, b2d), Total Annihilation (gaf), Truevision Targa (tga, targa, pix, bpx, ibv), Ulead Pattern (psl), Ulead PhotoImpact (upi), Ulead Texture(images) (pe4), UsesX FaceServer (fac, face), Utah rastor image (rl, 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 (wvc), Wavefront Raster file (rl, rlb, rpf), WebShots(images) (wbl, wbc, wbp, wbx), Weekly Puzzle (jig), WebP (webp, wpe), Whypic (ypc), WinFAX (fix, fso, wfx, fxr, fxd, fxm), WinMIPS (pic),
2.1.4 File Masks

R-Linux 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 context 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

- File mask options

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Match case</td>
<td>If this check box is selected, <strong>R-Linux</strong> makes a case-sensitive search.</td>
</tr>
<tr>
<td>Show empty folders</td>
<td>If this check box is selected, <strong>R-Linux</strong> will show folders with no files matching the mask.</td>
</tr>
<tr>
<td>Deleted files</td>
<td>If this check box is selected, <strong>R-Linux</strong> makes a search among deleted files/folders.</td>
</tr>
<tr>
<td>Existing files</td>
<td>If this check box is selected, <strong>R-Linux</strong> makes a search among existing files/folders.</td>
</tr>
<tr>
<td>Use advanced options</td>
<td>If this check box is selected, <strong>R-Linux</strong> will use the advanced options, even when they are hidden.</td>
</tr>
</tbody>
</table>
R-Linux will show only those files that match the specified file masks

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.

2.1.5 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.

<table>
<thead>
<tr>
<th>Character</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>.</td>
<td>Wildcard: any character</td>
</tr>
<tr>
<td>*</td>
<td>Repeat: zero or more occurrences of previous character or class</td>
</tr>
<tr>
<td>^</td>
<td>Line position: beginning of line</td>
</tr>
<tr>
<td>$</td>
<td>Line position: end of line</td>
</tr>
<tr>
<td>[class]</td>
<td>Character class: any character in the set</td>
</tr>
<tr>
<td>[^class]</td>
<td>Inverse class: any character not in the set</td>
</tr>
<tr>
<td>[x-y]</td>
<td>Range: any characters within the specified range</td>
</tr>
<tr>
<td>\x</td>
<td>Escape: literal use of metacharacter x</td>
</tr>
<tr>
<td>&lt;xyz&gt;</td>
<td>Word position: beginning of the word</td>
</tr>
<tr>
<td>xyz&gt;</td>
<td>Word position: end of the word</td>
</tr>
</tbody>
</table>

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

2.1.6 Event Log
R-Linux 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 Settings dialog box.

You may clear or save the log

To clear the log,
* Right-click the Log panel and select Clear Log on the context menu.

To save the log to a file,
* Right-click the Log panel and select Save Log to File on the context menu.
2.2 Advanced Data Recovery

This chapter explains how to perform advanced data recovery operations.

- **Disk Scan**
- **Regions**
- **Exclusive Regions**
- **Images**

2.2.1 Disk Scan

In order to completely analyze data structure on an object, it must be scanned. Any object on the Drives panel can be scanned. In addition, you may create a region to scan only a part of an object. The **Regions** 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.

**Attention:** Scanning large areas may be a very lengthy process!

NEVER TRY TO SAVE SCAN INFORMATION ON THE OBJECT BEING SCANNED!!!

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

To scan an object

1. Select an object on the R-Linux’s Drives panel
2. Click the Scan button
   - Other ways to start scan
     - Right-click the selected disk and select **Scan** on the context menu, or
     - Select **Scan** on the Drive menu
3. Specify the required parameters on the Scan dialog box and click the Scan button

**Scan options**

- **Disk 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 data formats.

- **File Systems:** Specifies the file systems which objects are to be searched for.
Current version supports: Ext2/3/4FS.

Enables search for Known File Types.

If this checkbox is selected, **R-Linux** will save scan information to a specified file. Later this file may be opened. Please note, that this option does not save actual disk data, only information on disk data structure gathered during disk scan.

If this option is selected, **R-Linux** will show only scan progress.

If this option is selected, **R-Linux** will show graphic representation on objects found during scan.

**Buttons**

- **Scan**
  - Starts scanning
- **Advanced**
  - Activates advanced scan options
- **Known File Types...**
  - Selects file types that **R-Linux** will recognize during the disk scan.
- **Cancel**
  - Closes the dialog box

---

**Known File Types**: While scanning, **R-Linux** can recognize to which particular file type the data belong. Using such information, **R-Linux** can obtain more information about data/file structure on the object being scanned. By default, **R-Linux** tries to recognize all supported file types, 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.

**File Types dialog box**

- **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 **Settings** panel.
- **Reset to Recommended**
  - Click this button to revert to factory-preset default settings.
- **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**

* By default, files of this type are not selected. If necessary, select them manually

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<tr>
<th>Document</th>
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<tbody>
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<td>Adobe PDF document</td>
<td>Microsoft Word2 document</td>
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**Document: Spreadsheet**

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**Document: Database**

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<th>Internet shortcut</th>
<th>Outlook Express Messages</th>
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<td>XML document</td>
<td>XML document (Unicode)</td>
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<td>The Bat! Message Base</td>
<td>The Bat! Message Index</td>
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**Font**

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<th>BDF Unix font</th>
<th>BGI font</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPI DOS font</td>
<td>TrueType font</td>
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</table>

**Graphics/Picture**

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<tr>
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<th>Adobe Photoshop image</th>
<th>Agfa/Matrix Scodl image</th>
<th>Alias Wavefront Raster image</th>
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</thead>
<tbody>
<tr>
<td>AutoCAD Binary image</td>
<td>AutoCAD image</td>
<td>Autodesk Animator Pro color map</td>
<td>Autodesk Animator Pro image</td>
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<tr>
<td>Autodesk Animator image</td>
<td>Autologic image</td>
<td>BMF image</td>
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<tr>
<td>CompuServe GIF image</td>
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<tr>
<td>CorelDraw CMX image</td>
<td>CorelDraw image</td>
<td>Cubicomp Picture Maker image</td>
<td>Dr. Halo palette</td>
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<tr>
<td>Enhanced MetaFile image</td>
<td>Epson Stylus image</td>
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<tr>
<td>GEM Raster image *</td>
<td>GEM VDI image</td>
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<tr>
<td>Multimedia: Audio Files</td>
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<tr>
<td>----------------------------------------</td>
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</tr>
<tr>
<td>AIFF sound</td>
<td>AVR sound</td>
<td>Advanced Streaming</td>
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<tr>
<td>CMF music</td>
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<td>MPEG Layer I audio file *</td>
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<td>Next/Sun sound</td>
<td>Ogg Vorbis audio file</td>
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<td>Sierra AUD sound</td>
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<td>Multimedia: Video Files</td>
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<tr>
<td>ANIM animation</td>
<td>Adobe Filmstrip</td>
<td>BINK video</td>
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</tr>
<tr>
<td>DeluxePaint animation</td>
<td>Director video</td>
<td>Intel DVI video</td>
<td>Interplay MVE video</td>
</tr>
<tr>
<td>LZA animation</td>
<td>MPEG video</td>
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</tr>
<tr>
<td>QV-10 video</td>
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</tr>
<tr>
<td>Smacker video</td>
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<td></td>
</tr>
<tr>
<td>Multimedia Files</td>
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</tr>
<tr>
<td>Archive Files</td>
<td></td>
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<tr>
<td>---------------------------------------------------</td>
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</tr>
<tr>
<td>RIFF Multimedia File</td>
<td>Real Networks audio/video</td>
<td></td>
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</tr>
<tr>
<td>7-Zip archive</td>
<td>ACE archive</td>
<td>AIN archive</td>
<td>ARJ archive</td>
</tr>
<tr>
<td>ARX archive</td>
<td>Aladdin Systems StuffIt archive</td>
<td>BAG archive</td>
<td>BIX archive</td>
</tr>
<tr>
<td>BOA archive</td>
<td>BZip2 archive</td>
<td>BlackHole archive</td>
<td>Blink archive</td>
</tr>
<tr>
<td>CPIO archive</td>
<td>CRUSH archive</td>
<td>ChArc archive</td>
<td>Compress archive</td>
</tr>
<tr>
<td>FOXSQZ archive</td>
<td>GZip archive</td>
<td>HA archive *</td>
<td>HAP archive</td>
</tr>
<tr>
<td>HPACK archive</td>
<td>Hyper archive</td>
<td>InstallShield Cabinet archive</td>
<td>InstallShield Data archive</td>
</tr>
<tr>
<td>InstallShield archive</td>
<td>JAM archive</td>
<td>JAR archive</td>
<td>JRC archive</td>
</tr>
<tr>
<td>LHA/LZARK archive</td>
<td>LIMIT archive</td>
<td>LZA archive</td>
<td>LZOParchive</td>
</tr>
<tr>
<td>LZSH archive</td>
<td>LZX archive</td>
<td>Microsoft Cabinet archive</td>
<td>Microsoft Compress 5 archive</td>
</tr>
<tr>
<td>Microsoft Compress 6 archive</td>
<td>PAKLEO archive</td>
<td>Pack archive *</td>
<td>QFC archive</td>
</tr>
<tr>
<td>Quantum archive *</td>
<td>Quark archive</td>
<td>RAR archive</td>
<td>RPM archive</td>
</tr>
<tr>
<td>ReSOF archive</td>
<td>SAR archive</td>
<td>SBC archive</td>
<td>SCO archive *</td>
</tr>
<tr>
<td>SQZ archive</td>
<td>SZip archive</td>
<td>StuffIt archive</td>
<td>TAR archive</td>
</tr>
<tr>
<td>UFA archive</td>
<td>UHArc archive</td>
<td>UltraCompressor 2 archive</td>
<td>UltraCrypt 2 archive</td>
</tr>
<tr>
<td>WIN-Freeze archive *</td>
<td>WRAptor archive</td>
<td>WinImp archive</td>
<td>YAC archive</td>
</tr>
<tr>
<td>YBS archive</td>
<td>ZIP archive</td>
<td>ZOO archive</td>
<td>ZZip archive</td>
</tr>
<tr>
<td>Executable/Library/DLL</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DOS Style Executable</td>
<td>ELF Executable</td>
<td>ELF Library (UNIX)</td>
<td>ELF Module (UNIX)</td>
</tr>
<tr>
<td>Java Bytecode</td>
<td>Novell NetWare</td>
<td>RDOFF executable</td>
<td></td>
</tr>
<tr>
<td>Development files</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COM Type library library</td>
<td>Microsoft ClassWizard file</td>
<td>Microsoft Linker database</td>
<td>Microsoft Precompiled header</td>
</tr>
<tr>
<td>Microsoft Program database</td>
<td>Microsoft Visual C++ project</td>
<td>Microsoft Visual Studio project</td>
<td>Microsoft Visual Studio workspace</td>
</tr>
<tr>
<td>OMF Object library</td>
<td>Windows Compiled resource (16bit) *</td>
<td>Windows Compiled resource (32bit)</td>
<td></td>
</tr>
<tr>
<td>Other file types</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
R-Linux starts scanning the object, and its panel will show information about new found objects:

Drives panel after scanning:
You can select an object by clicking on it
The Log pane will show scan progress. Scan may be stopped by clicking the Stop button on the toolbar. Later the scan process may be resumed with different scan parameters.

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

Scan Information dialog box

Select the file object and click Open in Hex Editor to view/edit the file object in the Text/Hexadecimal Editor.

To see the information about a newly found object, simply click it on the Drives panel. Click this link to see the information about the object Recognized0 on the partition.
When an object is scanned, a number of Recognized partitions will appear. R-Linux shows them in different colors depending on which elements of the partition have been found.

<table>
<thead>
<tr>
<th>Partition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Recognized</strong></td>
<td>Both boot records and file entries are found for this partition</td>
</tr>
<tr>
<td><strong>Recognized</strong></td>
<td>Only file entries are found for this partition</td>
</tr>
<tr>
<td><strong>Recognized</strong></td>
<td>Only boot records are found for this partition</td>
</tr>
<tr>
<td><strong>Raw Files</strong></td>
<td>Files that have been found using scan for known file types</td>
</tr>
</tbody>
</table>

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

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

**Multiple scans**

If the selected object has been completely scanned, you may rescan it either completely or with new scan parameters. If the selected object has been scanned partially, you may scan the rest of the object, ignore the existing scan information and scan the entire object, or specify scan parameters manually.

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

You may make several scans of 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.
Advanced Scan dialog box

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 on the R-Linux Drives panel
2. Select Save Scan Information on the Drive or context menu and save the scan information in a file
   The default file extension is *.dpl.

To load scan information
1. Select an object on the R-Linux Drives panel
2. Select Open Scan Information on the Drive or context menu and select the required file with the scan information
   The default file extension is *.scn.
   > The scan information will appear in the Drives panel

To delete scan information
1. Select an object on the R-Linux Drives panel
2. Select Delete Scan Information on the Drive or context 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 Regions
Scanning large objects may take a long time. Sometimes, only a smaller area of a disk needs to be scanned or searched for files. Such area is called a region. A region can be created on any object in the R-Linux’s Drives panel.

Created regions can be scanned, and files on them can be recovered in the same way as from hard drives or partitions.

Created regions can be deleted.

Note: R-Linux does not create anything real on the disk. Regions are virtual objects that do not affect actual data on the disk.
To create a region

1 Select an object on the R-Linux’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 context menu
     - Select the object and select Create Region on the Create menu

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

Create region dialog box

<table>
<thead>
<tr>
<th>Region options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disk size:</td>
</tr>
<tr>
<td>Start:</td>
</tr>
<tr>
<td>Size:</td>
</tr>
</tbody>
</table>

Numbers in these fields can be in bytes or sectors. See the Data Formats and Multipliers topic for more details on data formats.

> A Region object will appear on the Drives panel.

To change the size of a region

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

To delete a region

* Select a Region on the R-Linux Drives panel and click the Delete button, or
  Right-click the selected region and select Delete Region on the context menu.

2.2.3 Exclusive Regions

Exclusive regions are areas on any object visible on the the R-Linux’s Drives panel that are excluded from disk operations. R-Linux never tries to read/write data from/to such area. Exclusive regions are necessary when, for example, there are areas with bad sectors on a hard drive, and it is necessary to avoid any disk operations with such areas to not inflict further damage to such drive and to speed work with it.
Note: R-Linux does not create anything real on the disk. Exclusive regions are virtual objects that do not affect actual data on the disk.

To create an exclusive region

1. Right-click an object on the R-Linux'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

| Offset: | Start point of the exclusive region |
| Size:   | Size of the exclusive region. Cannot be larger than Disk size. |

Numbers in these fields can be in bytes or sectors. See Data Formats and Multipliers for more details.

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

Its properties can be seen on the Excluded Areas tab.

To delete an exclusive region

* Select an Exclusive Region on the R-Linux Drives panel and click the Delete button, or
  Right-click the selected region and select Remove Region on the context menu.

To change the size of an exclusive region

* Right-click an Exclusive Region on the R-Linux Drives panel, select Edit on the context menu, and
  add/delete excluded areas on the Edit Exclusive Region tab.
  You may delete an excluded area by right-clicking it and selecting Remove on the context menu.
2.2.4 Images

An image is an exact, byte by byte, copy of any object on 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 hard drive, you must immediately create an image of this drive.

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

All data search, scan and restoring can be done from this image.

To create an image,

1. Select an object on the R-Linux’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
     - Right-click the selected object and select Create Image File on the context 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 free space equal to at least the object size.

   Create Image dialog box

   ![Create Image dialog box](image1)

   Create Image (Scan Information) dialog box

   ![Create Image (Scan Information) dialog box](image2)
### Create Image dialog box

![Create Image dialog box](image)

#### Image Options

<table>
<thead>
<tr>
<th>Image name</th>
<th>Specifies the name and path for the image file</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plain image</td>
<td>If this option is selected, <strong>R-Linux</strong> will create a simple exact copy of the object. This image format is compatible with the previous versions of <strong>R-Linux</strong>.</td>
</tr>
<tr>
<td>Compressed image (R-Drive Image compatible)</td>
<td>If this option is selected, <strong>R-Linux</strong> 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 <strong>R-Drive Image</strong>, but incompatible with the previous versions of <strong>R-Linux</strong>.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Image compression ratio</th>
<th>You may compress the data in the image to save space. Active only if the Compressed image (R-Drive Image compatible) is selected.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated size</td>
<td>Shows the estimated size of the image file. An actual image size depends on how much empty space is on the selected partition and what file types are there. Active only if the Compressed image (R-Drive Image compatible) is selected.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Image split size</th>
<th>You may set this option to Automatic and let the system decide how to split the image file. This mostly depends on the file system on the destination disk. 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.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Password</td>
<td>You may protect your image file with a password. <strong>Note:</strong> This feature provides a relatively moderate protection against conventional unauthorized access. Active only if the Compressed image (R-Drive Image compatible) is selected.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Create scan information file</th>
<th>If this option is selected, <strong>R-Linux</strong> will perform disk scan simultaneously with image creation. See the <strong>Disk Scan</strong> help page to learn scan options</th>
</tr>
</thead>
</table>
| Read attempts | Specifies a value for I/O Tries, or how many times **R-Linux** will try to read a bad sector. **R-Linux** treats bad sectors in the following way: It reads a certain part of disk (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-Linux** reads again that part sector by sector, repeating the attempts the specified number of times. |

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If R-Linux 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 disk read process. For example, if you set Default read attempts to 1, a bad sector will be read 2 times.

| Pattern to fill bad blocks | Specifies a pattern R-Linux will use to fill bad sectors in this image. You may specify the pattern either in the ANSI or Hex data format. |

Note: R-Linux will never ever try to write anything on the disk from which data is to recover or an image is to create. This pattern fills bad sectors only in the image.

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

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
2. Select the required image file

> An Image object will appear on the Drives panel

You may perform all data search, scan, and recovery from this image as it were a regular drive/disk 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 Find and Mark Multiple Files topic for more information
2. Recover all marked files in a single file recovery step
   Go to the Recover Multiple Files for more information

Memory considerations

R-Linux stores information about found files in computer memory. If there are too many files, R-Linux 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 partition, partition image, etc.), you may use the Recover All Files command from the Drive or context menu. Right click the object in the Drives panel to
access the context menu. A **Recover** 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-Linux** 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-Linux** 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/modification/accessed time**

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

- **On the Folders/Files panel** select the tab
  - **Extensions** to sort the files by their extensions
  - **Creation Time** to sort the files by their creation time
  - **Modification Time** to sort the files by their modification time
  - **Accessed Time** to sort the files by their accessed time

**Other ways to sort files by their extensions or creation/modification/accessed time**

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

  or

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

  or

- On the **Folders** panel, select **Show Files Sorted By** on the **Drive** menu and select respective option.

> **R-Linux** 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

- **Content** panel with files/folders sorted by their extensions
To return to the conventional view,

* **On the Drives panel**, right-click the partition, select Open Drive Files Sorted By on the context menu, and select Real File System Structure,

or

* **On the Folders panel**, select Show Files Sorted By on the Drive menu and select Real File System Structure.

**By finding and marking multiple files using the Find/Mark 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-Linux** 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 Recover dialog box to instruct **R-Linux** what to do in those cases for all files.

**Mass File Recovery Options**

| File Already Exists | These options instruct **R-Linux** what to do if there already exists a file with the same name. |
Prompt
If this option is selected, R-Linux asks the user what to do for each such file. It stops file recovery until it receives the answer.

Add a File ID to filename
If this option is selected, R-Linux 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 the file name and file ID.

Overwrite
If this option is selected, R-Linux overwrites the old file with the new one.

Skip
If this option is selected, R-Linux skips all new files with the same name.

Broken File Name
These options instruct R-Linux what to do if a file to be recovered appears to have an invalid name.

Prompt
If this option is selected, R-Linux shows the standard Broken File Name dialog box for each file with a broken file name. It stops file recovery until it receives the answer.

Rename and change all invalid symbols to:
If this option is selected, R-Linux changes all invalid characters to the character specified.

Skip
If this option is selected, R-Linux skips all files with broken file names.

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-Linux 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-Linux goes to the default action.

Recover (Advanced - Extended options) dialog box

Extended advanced file recovery options

<table>
<thead>
<tr>
<th>First compare time</th>
<th>These options instruct R-Linux which condition to use first, file time or size.</th>
</tr>
</thead>
<tbody>
<tr>
<td>First compare size</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Compare time</th>
<th>These options instruct R-Linux to enable comparison by time and size.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compare size</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Actions</th>
<th>These selectable actions instruct R-Linux what to do if the condition is met.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Empty field | If this option is selected, **R-Linux** skips the condition.
--- | ---
Prompt | If this option is selected, **R-Linux** 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-Linux** 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 the file name and file ID.
Skip | If this option is selected, **R-Linux** skips all new files with the same name.
Overwrite | If this option is selected, **R-Linux** overwrites the existing file with the new one.

**Time conditions**

| | If the Modified time stamp is invalid, **R-Linux** will skip the comparison.
--- | ---
Equal time | Two time stamps are the same.
Older | The existing file is older than the new one.
Newer | The existing file is newer than the new one.

**Size conditions**

| | Two files have the same size.
--- | ---
Equal size | Two files have the same size.
Smaller | The existing file is smaller than the new one.
Bigger | The existing file is bigger than the new one.

**By default**
The action **R-Linux** takes when none of the comparison conditions have been met. That may happen when the comparison by size is not enabled.

### 2.4 Various Disk and Volume Managers

**R-Linux** can work with objects created by various Linux disk and volume managers. Currently, the following managers are supported:

- **Linux mdadm RAIDs**
- **Logical Volume Manager (LVM and LVM2)**

**R-Linux** 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-Linux** cannot recognize them.

#### 2.4.1 Linux mdadm RAIDs

**mdadm** is a Linux utility used to manage and monitor software RAID devices.

**R-Linux** supports such devices and when drives from a mdadm RAID are connected to a Linux computer, it automatically detects them and assembles mdadm RAIDs accordingly.
Linux mdadm RAIDs

R-Linux detects components from mdadm RAIDs and creates those RAIDs automatically. At the same time, R-Linux gives access to the components of those RAIDs (hard drives and images).

mdadm RAIDs in R-Linux

When an automatically created mdadm RAID is selected, R-Linux highlights its components. It also highlights the mdadm RAID that Linux may itself create from the same components.

R-Linux shows broken mdadm RAIDs in pink.

Broken mdadm RAIDs in R-Linux

2.4.2 Linux LVM/LVM2

Linux LVM is a logical volume manager for the Linux OS that manages disk drives and other data storage devices. Using it, it is possible to create single logical volumes on several physical disks, 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 on this Wikipedia article: Logical Volume Manager (Linux).
LVM volume example

R-Linux automatically detects disks from LVMs and creates their virtual volumes automatically. At the same time, R-Linux gives access to the components of the virtual LVM volumes (hard drives and images).

LVM Volumes in R-Linux

When an automatically created LVM volume is selected, R-Linux highlights its components. It also highlights the LVM volume that Linux may itself create from the same components.

R-Linux shows broken virtual LVM volumes in pink. Broken LVM volumes in R-Linux
III  Text/Hexadecimal Editor

Any object visible by R-Linux can be viewed and edited in the Text/Hexadecimal 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.

- Viewing and Editing Objects
- Navigating through an Object
- Data Copy
- Files and Sectors

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3.1  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 disk, you need to enable writing.

To enable writing,

* On the R-Linux main panel, select Enable Write on the Tools menu

> The Editable: status will change to Yes from Read Only.
Now the object can be edited.

To view/edit an object,

1 Right-click the object and select View/Edit on the context 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 Viewer/Editor panel will appear

**R-Linux Text/Hexadecimal editor**

![Image of R-Linux Text/Hexadecimal editor interface]

**Data Parsed According to the Selected Pattern**

<table>
<thead>
<tr>
<th>Name</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Master booting loader rank</td>
<td>0</td>
</tr>
<tr>
<td>Master bootstrap loader</td>
<td>0x83 0x20 0x10 0x1A 0x00 0x80 0x55 0x3C</td>
</tr>
<tr>
<td>Windows disk signature</td>
<td>0x9C 0x26 0x3c</td>
</tr>
<tr>
<td>Partition 0</td>
<td></td>
</tr>
<tr>
<td>_slave active partition</td>
<td>0x80</td>
</tr>
<tr>
<td>Start head</td>
<td>32</td>
</tr>
<tr>
<td>End head</td>
<td></td>
</tr>
<tr>
<td>Sectors preceding</td>
<td>254</td>
</tr>
<tr>
<td>Sectors in partition</td>
<td>712716590</td>
</tr>
</tbody>
</table>

**Object Properties**

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>SAMSUNG SP0411N T0100-07 : SD1J40WC94Z666 (as superuser)</td>
</tr>
<tr>
<td>Sim</td>
<td>0</td>
</tr>
<tr>
<td>Offset</td>
<td>0x0000000000000000</td>
</tr>
<tr>
<td>Sector</td>
<td>0</td>
</tr>
<tr>
<td>Partition is sector 0</td>
<td></td>
</tr>
<tr>
<td>Size</td>
<td>512</td>
</tr>
<tr>
<td>Offset</td>
<td></td>
</tr>
</tbody>
</table>
Object Sector Mapping

Data Shown as Various Digits

Binary view

Text view
Find Results

List of Bookmarks

Text/hexadecimal Editor status

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.

To enable/disable:

<table>
<thead>
<tr>
<th>Panel Type</th>
<th>Command in View Menu</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANSI data</td>
<td>Select/clear ANSI</td>
</tr>
<tr>
<td>OEM data</td>
<td>Select/clear OEM</td>
</tr>
<tr>
<td>UNICODE data</td>
<td>Select/clear UNICODE</td>
</tr>
<tr>
<td>UNICODE+ data</td>
<td>Select/clear UNICODE+</td>
</tr>
<tr>
<td>Toolbar</td>
<td>Select/clear Toolbar</td>
</tr>
<tr>
<td>Properties View</td>
<td>Select/clear Properties View</td>
</tr>
<tr>
<td>Sectors View</td>
<td>Select/clear Sectors View</td>
</tr>
<tr>
<td>Data Interpreter View</td>
<td>Select/clear Data Interpreter View</td>
</tr>
<tr>
<td>Template View</td>
<td>Select/clear Template View</td>
</tr>
<tr>
<td>Bookmarks View</td>
<td>Select/clear Bookmarks View</td>
</tr>
<tr>
<td>Find Results View</td>
<td>Select/clear Find Results View</td>
</tr>
</tbody>
</table>
2 View the information and make necessary changes
Select Enable Write on the Tools menu if you want to save changes.

Viewing
You may view data in 4 various code pages: ANSI/OEM/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.

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 on the Template pane in various representations.
You may find the next or previous data that matches the pattern signature on the disk. Right-click the right pane of the editor and select either Find Template Signature Next or Find Template Signature Previous on the context menu. You may also select these items on the Edit menu.

Navigating.
Text/hexadecimal Editor gives you various ways to navigate into an object. See the Navigating through an Object for more details.

Data Copy
Text/hexadecimal 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

<table>
<thead>
<tr>
<th>Fill options</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fill pattern</td>
<td></td>
</tr>
<tr>
<td>HEX</td>
<td>Field for the pattern to fill the area in the hexadecimal representation</td>
</tr>
<tr>
<td>ANSI</td>
<td>Field for the pattern to fill the area in the ANSI encoding</td>
</tr>
<tr>
<td>OEM</td>
<td>Field for the pattern to fill the area in the OEM encoding</td>
</tr>
<tr>
<td>UNICODE</td>
<td>Field for the pattern to fill the area in the UNICODE encoding</td>
</tr>
<tr>
<td>Fill range</td>
<td></td>
</tr>
<tr>
<td>From (hex)</td>
<td>Field for the start position of the area to fill with the pattern</td>
</tr>
<tr>
<td>To (hex)</td>
<td>Field for the end position of the area to fill with the pattern</td>
</tr>
</tbody>
</table>
3 Click the Save Changes button to save the changes

- Other ways to save the changes made
  - Select Save Changes on the Edit menu

> 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/Editor 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 context menu
2 Right-click the end of the selection and select Select To on the context 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

<table>
<thead>
<tr>
<th>Select dialog box</th>
</tr>
</thead>
<tbody>
<tr>
<td>From (hex)</td>
</tr>
<tr>
<td>To (hex)</td>
</tr>
</tbody>
</table>

3 Select an appropriate item in the Tools menu to save the data in a required format and specify its file name

Select:

<table>
<thead>
<tr>
<th>Save to Binary File...</th>
<th>to save the data in the binary format (default extension is .bin)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Save to Hexadecimal File</td>
<td>to save the data in the binary format (default extension is .hex)</td>
</tr>
</tbody>
</table>

on the Tools menu.

If you select an existing file, R-Linux will ask you if you want to append or overwrite the file.

> 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
2 Select the necessary file and load the data.

> The area in the Viewer/Editor will be overwritten with the new data.
3.2 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/edited, 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.

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

Go To Offset options

<table>
<thead>
<tr>
<th>From:</th>
<th>Jump / offset direction. For example, if you need to find the offset from the object end for a selected byte, switch to the End (backward) option.</th>
</tr>
</thead>
<tbody>
<tr>
<td>HEX / DEC</td>
<td>Switch between the hexadecimal and decimal data representation.</td>
</tr>
<tr>
<td>Range</td>
<td>Range of values that can be entered.</td>
</tr>
<tr>
<td>dec / hex:</td>
<td>Alternative data representation.</td>
</tr>
<tr>
<td>Offset:</td>
<td>Flat data offset (without separation between the sector and offset in the sector).</td>
</tr>
<tr>
<td>Sector / offset</td>
<td>Data offset represented as a sector and offset in the sector.</td>
</tr>
<tr>
<td>Go! /OK buttons</td>
<td>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.</td>
</tr>
</tbody>
</table>

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 options

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not Equal</td>
<td>Search for the place which content is not equal to the string. For example, the first byte not equal to 00 or FF.</td>
</tr>
<tr>
<td>Search for</td>
<td>Field for the string to search for in the hexadecimal representation</td>
</tr>
<tr>
<td>HEX</td>
<td>Field for the string to search for in the ANSI encoding</td>
</tr>
<tr>
<td>ANSI</td>
<td>Field for the string to search for in the OEM encoding</td>
</tr>
<tr>
<td>OEM</td>
<td>Field for the string to search for in the UNICODE encoding</td>
</tr>
<tr>
<td>Match case</td>
<td>Select this check box to make the search case-sensitive</td>
</tr>
<tr>
<td>Search area</td>
<td>Select this check box to start search from the current position</td>
</tr>
<tr>
<td>From current position</td>
<td></td>
</tr>
<tr>
<td>From start position</td>
<td>Select this check box to start search from the beginning of the object</td>
</tr>
<tr>
<td>From Address</td>
<td>Select this check box and specify the range in which the search is to be carried out</td>
</tr>
<tr>
<td>Search position</td>
<td>Select this check box to search the entire object</td>
</tr>
<tr>
<td>Exhaustive search</td>
<td></td>
</tr>
<tr>
<td>Search at offset</td>
<td>Select this check box and specify the sector offset from which the search will start</td>
</tr>
<tr>
<td>Reverse</td>
<td>Select this check box to start the search in the reverse direction</td>
</tr>
<tr>
<td>Find all</td>
<td>Select this check box to search for all instances of the string to search. Search results will be shown in the Find Results pane.</td>
</tr>
</tbody>
</table>

Text/hexadecimal Editor will show the search progress. Search results are shown on 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:

Sector1 | FILEAAAAA..............................................
Sector2   FILEBBBB..............................................
Sector3   NOTAFILE...............................................

And the search string is Not Equal FILE.
If the Exhaustive search option is selected, the Text/hexadecimal Editor will stop at the first A character in Sector1.
If the Search at offset=0 option is selected, the Text/hexadecimal 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.

### 3.3 Data Copy

Text/hexadecimal Editor gives you various ways to copy selected data navigate in an object.

**Data selected in Text/hexadecimal editor**

Depending on what column you have control-clicked, the following commands are available in the context menu:

<table>
<thead>
<tr>
<th>Action</th>
<th>Context Menu Command</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copy Editor Display</td>
<td>When right-clicking any column</td>
</tr>
<tr>
<td>Copy as File Signature</td>
<td>When right-clicking any column</td>
</tr>
</tbody>
</table>
When right-clicking the Binary data column
Copy as "Binary data"

When right-clicking the ANSI column
Copy as "ANSI"

When right-clicking the UNICODE column
Copy as "UNICODE"

3.4 Files and Sectors
You may see which file is written on a particular sector. To do so:

1. Enumerate files on a logical disk on 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

Sector 507706 (Parent) (Micron USB to JTAG/AVR Adapter Record 507840)
IV Technical Information and Troubleshooting

This chapter covers various technical issues and troubleshooting.

- IntelligentScan technology
- Data Recovery Issues
- Data Formats and Multipliers
- Memory Usage
- R-Linux Switches
- Properties Tab

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4.1 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 disk, analyzes them, and tries to determine a record to which the data belong. The following record types are possible:

1. MBR record
2. NTFS Boot Sector record
3. FAT Boot Sector record
4. MFT record
5. NTFS Folder record
6. FAT record
7. FAT Folder record
8. Ext2/3/4FS SuperBlocks record

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 partitions 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 disk 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 reformatted. 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 disk, one having the FAT file system, the other the NTFS. Then, found files 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.

### 4.2 Data Recovery Issues

**Files:**

**Hard links**

Hard links 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: □ ![MyPhoto1.jpg](image)

The target file: □ ![MyPhoto1.jpg](image)

You may find a target or hard link for a file. Right-click the file and select **Links** on the context menu.

### 4.3 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-Linux** 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:

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>b</td>
<td>1 byte</td>
<td>2^0</td>
</tr>
<tr>
<td>kb</td>
<td>1 kb = 2^10=1024 bytes</td>
<td>2^10</td>
</tr>
<tr>
<td>mb</td>
<td>1 mb = 2^20=104857 bytes</td>
<td>2^20</td>
</tr>
<tr>
<td>gb</td>
<td>1 gb = 2^30=1073741824 bytes</td>
<td>2^30</td>
</tr>
<tr>
<td>tb</td>
<td>1 tb = 2^40=1099511627776 bytes</td>
<td>2^40</td>
</tr>
<tr>
<td>eb</td>
<td>1 eb = 2^50=1125899906842624 bytes</td>
<td>2^50</td>
</tr>
<tr>
<td>hex</td>
<td>A hexadecimal number</td>
<td></td>
</tr>
<tr>
<td>sec (sector)</td>
<td>A number is in sectors</td>
<td></td>
</tr>
</tbody>
</table>

You may also select the multipliers in the drop-down boxes.

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.
When the multiplier has been changed, the data value will be changed according to the specific context 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

### 4.4 Memory Usage

You may see how much memory **R-Linux** uses while performing a data recovery task. This is especially useful when scanning large disks on a computer with limited resources.

**To view memory usage,**

1. Select Memory usage on the Tools menu

**R-Linux** will show the total memory in your computer and how much memory it uses

<table>
<thead>
<tr>
<th>Memory usage dialog box</th>
</tr>
</thead>
</table>

- **Process Memory**
  - Shows how much memory **R-Linux** uses. Limit shows how much memory your system can virtually allocate to **R-Linux**. 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

### 4.5 R-Linux Switches

If there are problems in starting **R-Linux** and while working with it, you may use switches to avoid them.

The following switches are available:

<table>
<thead>
<tr>
<th>Switch</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-all_drives</td>
<td>Forces <strong>R-Linux</strong> to show all partitions in the system. Normally <strong>R-Linux</strong> shows only local disks in the system. Some storage devices may pretend that they are not local disks.</td>
</tr>
<tr>
<td>Switch</td>
<td>Description</td>
</tr>
<tr>
<td>---------</td>
<td>-------------</td>
</tr>
<tr>
<td><code>-debug</code></td>
<td>Includes additional debug information. When this switch is used, an additional command <strong>Create FS Snapshot</strong> on the context 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 <strong>R-Linux</strong> technical support to identify the problem. This switch greatly slows <strong>R-Linux</strong>. You may also turn this mode on by selecting <strong>Debug Mode</strong> on the <strong>Tools</strong> menu.</td>
</tr>
<tr>
<td><code>-flush</code></td>
<td>Flushes the log file after each write to log operations. This switch is helpful when <strong>R-Linux</strong> locks and its log file remains in memory cache unwritten to a disk. This switch greatly slows <strong>R-Linux</strong>.</td>
</tr>
<tr>
<td><code>-log &lt;filename&gt;</code></td>
<td>Started with this switch, <strong>R-Linux</strong> writes its log into the specified file. If <strong>R-Linux</strong> locks and its log file remains in memory cache unwritten to a disk, use the <code>-flush</code> switch.</td>
</tr>
<tr>
<td><code>-mem &lt;size in MB&gt;</code></td>
<td>Sets memory usage limit in MB for <strong>R-Linux</strong> to reconstruct the file tree. When it exceeds the limit, a <strong>Too many files...</strong> 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: <code>-mem 400</code> - sets the limit to 400 MB.</td>
</tr>
<tr>
<td><code>-no_ide_ext</code></td>
<td>Turns off the inquiry about extended information on HDDs in Wind9x/ME. This switch may be helpful if <strong>R-Linux</strong> returns information about HDDs incorrectly (detects HDD geometry incorrectly).</td>
</tr>
<tr>
<td><code>-no_int13</code></td>
<td>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).</td>
</tr>
<tr>
<td><code>-no_ios</code></td>
<td>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).</td>
</tr>
<tr>
<td><code>-reset</code></td>
<td><strong>R-Linux</strong> resets an HDD controller each time it reads a bad sector. This switch may be helpful if the controller locks after it attempts to read a bad sector, or returns incorrect data.</td>
</tr>
<tr>
<td><code>-safe</code></td>
<td>Disables automatic partition search on a hard drive, file system recognition on partitions, and other potentially problematic operations. In this mode, it is necessary to use <strong>Find partition</strong> command from the hard drive context menu to manually find a partition.</td>
</tr>
</tbody>
</table>

If an unrecognized problem appears, start **R-Linux** with the `-debug` and `-log <filename>` switches, and send the log and screenshot of the **R-Linux** main panel to the **R-Linux** technical support:

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

### 4.6 Properties Tab

**Object size units**

You may select the units in which the information on object sizes will be displayed.
To select the units

1. Select Properties 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

1. Basic information

   This section shows basic information for a disk object.

   □ More information...

   | Drive Type | Device/disk type and subtype. Current R-**Linux** 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, RAID5 |
   | Name       | Device/disk name |
   | Size       | Device/disk size |
   | Bus Type   | Device/disk bus type. Can be: IDE/ATA, IDE/ATAPI, SCSI, Floppy, USB, 1394, SSA, FibreChannel, RAID, SMART, A BIOS |

2. Information on hard drives and logical disks

   This section shows available information on hard drives and logical disks. These properties depend on the drive/disk type and appear only when applicable. Under Windows NT/2000/XP/2003, 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...

<p>| OS object   | Appears for image files under Windows 9x/ME and NT/2000/XP/2003, for drives/disks under Windows NT/2000/XP/2003 only. An object name used by OS to access the device/disk. |
| 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 hard drive. For a logical disk it shows the physical geometry for a hard 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 |</p>
<table>
<thead>
<tr>
<th>Vendor</th>
<th>Product</th>
<th>Firmware</th>
<th>Bus</th>
<th><strong>SCSI Address</strong></th>
<th>This section shows SCSI information for the drive/disk</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Port Number</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Path ID</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Target ID</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Lun</td>
<td></td>
</tr>
</tbody>
</table>

**Windows 9x/ME adds the following properties:**

| **Int13 Drive Number** | 128 for the first hard drive accessible through Int13, 129 for the second one, etc. 0...128 for drives and other devices accessible through a Windows 9x/ME protected mode driver, if their Int13 device option is disabled. **R-Linux** 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 hard 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 hard drives and logical disks

This section shows properties that control access (read and write) to hard drives and logical disks. They are set to their optimal values and should be altered only if access problems appear.

- **More information...**

<table>
<thead>
<tr>
<th><strong>Drive Control</strong></th>
<th>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.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Maximum transfer</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>I/O Unit</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Buffer Alignment</strong></td>
<td>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.</td>
</tr>
</tbody>
</table>

These three properties are set by OS drivers. If the drivers set incorrect values, problems may appear during data transfer operations. 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 bad sectors 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 hard drive, the hard drive-controller pair may refuse to perform any successive read/write operations with the entire hard drive when it fails to read/write such sectors. In this case, set this parameter to zero. **R-Linux** treats bad sectors in the following way: |

---

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It reads a certain part of disk (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-Linux reads again that part sector by sector, repeating the attempts the specified number of times. If R-Linux 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 disk read process.

For example, if you set Default read attempts to 1, a bad sector will be read 2 times.

4. Partition properties

A partition is a continuous area on a hard drive, characterized by its offset and size. There are partitions on basic disks, dynamic disks, and recognized volumes and partitions. R-Linux treats regions like partitions.

More information...

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Partition Offset</td>
<td>Initial offset for the partition.</td>
</tr>
<tr>
<td>Partition Size</td>
<td>Size of the partition.</td>
</tr>
<tr>
<td>Partition Type</td>
<td>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-Linux will process this partition correctly, as it does not use this property.</td>
</tr>
<tr>
<td>Partition number</td>
<td>Appears under WinNT/2000/XP/2003 only. Shows the number of the partition on the physical drive.</td>
</tr>
</tbody>
</table>

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 disk 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), RAIDx5 (RAIDs Level 5), both physical and created by the user (Virtual Volume Sets, Virtual Stripe Sets, Virtual Mirrors, Virtual RAID5).

More information...

Main properties of compound volumes are parents (disk 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 hard drive as a LDM database rather than partition tables. Under Windows 2000/XP/2003, LDM disks are also called Dynamic Disks.

More information...

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offset of Logical Disk</td>
<td>Initial offset of a logical disk on a hard drive. For disks, initially formatted by LDM, this value is often 31.5KB, for converted disks, it may be larger.</td>
</tr>
<tr>
<td>Supposed Parents Count</td>
<td>Supposed number of parent partitions for compound LDM volumes. If the LDM database is not damaged, the value of this property must be equal to the number of</td>
</tr>
<tr>
<td><strong>LDM Host GUID</strong></td>
<td>Global Unique Identifier of a computer system where this LDM disk group has been created.</td>
</tr>
<tr>
<td><strong>LDM DiskGroup GUID</strong></td>
<td>Global Unique Identifier of the LDM disk group.</td>
</tr>
<tr>
<td><strong>LDM Disk GUID</strong></td>
<td>Global Unique Identifier of the hard drive.</td>
</tr>
<tr>
<td><strong>LDM Volume GUID</strong></td>
<td>Global Unique Identifier of the volume.</td>
</tr>
<tr>
<td><strong>LDM Disk ID</strong></td>
<td>Local hard drive Identifier, unique within this LDM disk group.</td>
</tr>
<tr>
<td><strong>LDM Partition ID</strong></td>
<td>Local partition Identifier, unique within this LDM disk group.</td>
</tr>
<tr>
<td><strong>LDM Component ID</strong></td>
<td>Local component Identifier, unique within this LDM disk group.</td>
</tr>
<tr>
<td><strong>LDM Volume ID</strong></td>
<td>Local volume Identifier, unique within this LDM disk group.</td>
</tr>
<tr>
<td><strong>LDM Disk AltName</strong></td>
<td>Additional Alternative Name given by LDM to the hard drive.</td>
</tr>
<tr>
<td><strong>LDM Disk DriveHint</strong></td>
<td>Last name of the volume, under which it has been mounted in the system. May be either a letter (C:, D:, etc.), or a mount point under Windows 2000/XP/2003.</td>
</tr>
</tbody>
</table>

### 7. File System Volume properties

A **File System (FS) volume** is a disk object where a certain, supported by **R-Linux**, file system is present. There are two FS volume types: FS volume on a regular disk 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.

| **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-Linux** 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-Linux** 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-Linux** operation. |

#### 7.2. FAT Volume properties

These properties are present for all FAT volumes and represent their main properties. For **recognized volumes**, these values can be altered.
### More information...

<table>
<thead>
<tr>
<th>FAT Information</th>
<th>Regular volumes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recognized FAT</td>
<td>Recognized volumes</td>
</tr>
<tr>
<td>FAT Bits (12,16,32)</td>
<td>FAT type. 12 for the FAT12, 16 for the FAT16, 32 for the FAT32.</td>
</tr>
<tr>
<td>Cluster Size</td>
<td>Cluster size for the FAT volume.</td>
</tr>
<tr>
<td>First Cluster Offset</td>
<td>Offset of the first cluster from the start of the FAT volume.</td>
</tr>
<tr>
<td>Boot Directory Cluster</td>
<td><em>(For FAT32 only.)</em> Cluster number where the root directory starts on the FAT volume where the logical disk resides.</td>
</tr>
<tr>
<td>Root Directory Offset</td>
<td><em>(For FAT12 and 16 only.)</em> Root directory offset from the start of the FAT volume.</td>
</tr>
<tr>
<td>Root Directory Length</td>
<td><em>(For FAT12 and 16 only.)</em> Root directory length for the FAT volume.</td>
</tr>
<tr>
<td>First FAT Offset</td>
<td>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.</td>
</tr>
<tr>
<td>Size of One FAT Table</td>
<td>Size of one FAT table on the volume.</td>
</tr>
<tr>
<td>Sector Size</td>
<td>Sector size of the hard drive. This property is read from the boot sector of the FAT volume and does not affect <strong>R-Linux</strong> operation.</td>
</tr>
<tr>
<td>Number of FAT Copies</td>
<td>Number of FAT copies on the FAT volume.</td>
</tr>
<tr>
<td>Active FAT copy</td>
<td>Active FAT table number for the FAT volume. Can be set to Disabled, Auto, 1, or 2. If it is Disabled, <strong>R-Linux</strong> 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, <strong>R-Linux</strong> uses the first or second FAT table copy, respectively. If it is Auto, <strong>R-Linux</strong> 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.</td>
</tr>
<tr>
<td>Major version</td>
<td>FAT version.</td>
</tr>
<tr>
<td>Minor version</td>
<td>FAT minor version.</td>
</tr>
<tr>
<td>Volume size</td>
<td>Size of the volume.</td>
</tr>
</tbody>
</table>

### 7.3. Ext2/3/4FS Volume properties

These properties are present for all Ext2/3/4FS volumes and represent their main properties. For **recognized volumes**, these values can be altered.

<table>
<thead>
<tr>
<th>Ext2/3/4FS Information</th>
<th>Regular volumes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recognized Ext2/3/4FS</td>
<td>Recognized volumes</td>
</tr>
<tr>
<td>Property</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Block Size</td>
<td>Block size of Ext2/3/4FS file system. A block in the Ext2/3/4FS file system is similar to a cluster in the FAT file system.</td>
</tr>
<tr>
<td>First SuperBlock Offset</td>
<td>Offset of the first SuperBlock from the start of the Ext2/3/4FS volume.</td>
</tr>
<tr>
<td>Blocks Per Volume</td>
<td>Number of blocks in the Ext2/3/4FS volume.</td>
</tr>
<tr>
<td>INodes Per Volume</td>
<td>Number of inodes on the Ext2/3/4FS volume. An inode is a record describing file's size, attributes, position on an Ext2/3/4FS 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.</td>
</tr>
<tr>
<td>Creator OS</td>
<td>The OS that created this Ext2/3/4FS volume. May be Linux, Hurd, Masix, FreeBSD, Lites.</td>
</tr>
<tr>
<td>Minor version</td>
<td>Ext2/3/4FS minor version. Usually 0.</td>
</tr>
<tr>
<td>Last Mount Time</td>
<td>Last mount time for this Ext2/3/4FS volume.</td>
</tr>
<tr>
<td>Last Write Time</td>
<td>Last write time for this Ext2/3/4FS volume.</td>
</tr>
<tr>
<td>Last Check Time</td>
<td>Last check time for this Ext2/3/4FS volume.</td>
</tr>
<tr>
<td>Volume size</td>
<td>Size of the volume.</td>
</tr>
</tbody>
</table>

### 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.

More information...

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parsed File Entries</td>
<td>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.</td>
</tr>
<tr>
<td>Parsed Boot Records</td>
<td>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.</td>
</tr>
<tr>
<td>Estimated Size</td>
<td>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.</td>
</tr>
</tbody>
</table>
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