ImageCopy

User Manual

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Welcome

Congratulations on your purchase of this software, the ImageCopy Corporate Edition. You have selected a program which will help you save a lot of time when installing operating systems.

- ImageCopy duplicates complete hard disks bit by bit
- ImageCopy makes it possible to install operating systems in a very short time
- ImageCopy enlarges or reduces FAT-partitions during the copying
- ImageCopy adjusts all structures to fit the geometry of the new hard disk
- ImageCopy creates and reads compressed disk-image files
- ImageCopy facilitates the rescue of "dying" hard disks
- ImageCopy provides an optional "Fast-Copy mode" for FAT-partitions
- ImageCopy saves your engineer’s valuable productive time
- ImageCopy is flexible and extremely fast
- ImageCopy is comfortable and easy to operate
- ImageCopy is suitable for all PC-operating systems
- ImageCopy can be started directly from cd rom
- ImageCopy supports FireWire- und USB-Disks and is so very suitable for example to save the data of your laptop to an external drive

We wish you a lot of success with your copy of ImageCopy.

What can ImageCopy do?

ImageCopy is a software which duplicates entire hard-disks, and thus transfers any operating system or software that is installed to an unformatted, unpartitioned hard disk. It does not matter even if the two disks have different disk geometries (i.e. different number of sectors per track and different number of heads) - the software takes measures to overcome that. To do so, ImageCopy moves or changes the partitions when copying in such a way that they start again at a full cylinder number and end at the end of a cylinder. All the structures such as partition tables and boot blocks are adjusted accordingly, so that the target disk is fully operational even if it has a different geometry from the source disk. During the copying process, FAT partitions can also be enlarged or reduced (independently of cluster size).

Hard disks can be stored as compressed image files and these image files can also be copied back to ”virgin" hard disks. Here, too, the disk parameters can be different from those of the original disk.

The pre-requisites for successful copying are as follows:

- Both the source disk as well as the target disk must be completely addressable by BIOS, i.e. DOS must be installable on both the disks with the selected settings, and DOS must be able to address the entire disk. However, this is the case with most operating systems.
- The source disk, and hence the target disk, must be written to with a sector size of 512 bytes per sector. This is almost always the case.
- The target disk must be large enough to fit all data being copied from the source disk, i. e. it must provide at least as much space as is occupied by the FAT partitions. All other partitions (e. g. NTFS partitions) will be copied 1 : 1, i. e. the entire partition space must

be available for these partitions. The target disk may have defective blocks which will be taken into account with FAT partitions and registered as ”Bad Block" if "Verify" is enabled. With non-FAT partitions, a bad sector on the target disk may cause the copy process to be aborted depending on setup.

- The computer must have a cdrom drive from which the software can be started.

How to install ImageCopy

Use of the CD-Image-File (imagecopy_en.iso)

1) Burn the CD-Image with your burning software (e.g. Nero) on CD but import the image into the project instead of burning as data track. E.g. for Nero Express: <What would you like to burn? | Disk Image or saved Project>

2) Configure the boot order in the that you can boot from CD.

3) Boot your PC, ImageCopy will start automatically.

Using ImageCopy

What you must remember and follow

The following instructions are mainly intended for direct copying from hard disk to hard disk (this is the fastest way), they are, to some extent, also relevant for copying from and to image files.

Writing to the hard disk with ImageCopy should always be done in *that* PC in which the target disk is to remain after the copying. Do not attempt to *boot* from the source disk inserted for the copy in the "stranger" computer, as this could sometimes result in the data on this hard disk being destroyed.

Since almost all hard disks today are larger than 504 MB, the more modern BIOS versions carry out a so-called "mapping", i.e. they ”allot” a suitably increased number of heads to all programs, in order to keep the number of cylinders smaller than 1024 (with the same size of the hard disk).

Example: The BIOS *Setup* detects a hard disk with 1760 cylinders, 16 heads and 63 sectors (1680*16*63*512 bytes = 867041280 bytes = 846.7 MB). Since the maximum number of cylinders which can be used in the partition tables is 1024, BIOS maps, to all programs (naturally, FDISK as well) say, 880 cylinders, 32 heads, and 63 sectors; this results in the same size of the hard disk. Another BIOS might, for example, divide the number of physically present cylinders by 4 instead of by 2, the disk would then have 440 cylinders, 64 heads and 63 sectors.

The problem here is that a hard disk which has been partitioned in a computer with the first BIOS, will not be usable in the other computer! If an attempt is made to boot from that disk, in the worst case, data could even be lost (although this is usually not the case).

The problem of different mapping naturally applies to both the source disk as well as the target disk. However, since the target-disk is to remain in the computer where it is being copied, this point can be considered to have been already taken care of. The source disk is, however, basically read in a "stranger" computer by ImageCopy. ImageCopy detects, from the partition tables, with what geometry the hard disk was operated earlier, and if required, carries out a "remapping" according to this original disk geometry. In such a case, you will see the following message (example):

Warning: Source disk heads/sectors were mapped differently in PC where disk was originally partitioned!

Parameters reported by BIOS:	440 cyl, 64 heads, 63 secs
Parameters due to partition tables:	880 cyl, 32 heads, 63 secs

Should the source drive parameters be remapped corresponding to the values found in the partition table?

Hint: This is recommended only if you are not copying in raw mode.

The copying in this case follows the same sequence as before for the user, but ImageCopy suitably converts all cylinder, head and sector values internally, if the above was answered with "Yes".

If you copy hard disks which are smaller than 504 MB in capacity, (both the source disk as well as the target disk) or the computer in which the target disk is to remain has the same motherboard with the same BIOS as the original computer, the copying process does not have to be carried out in the target computer. However, please consider this to be only a special case and not a normal case!

Using Image Files

ImageCopy Corporate Edition provides the facility to save entire hard disks in one or more files as well, and to write back to a hard disk from this/these file(s). This extremely practical facility will put you in a position to store complete hard disks, on, say, a rewriteable CD-ROM, and then write directly to the disk, which has thus far been empty, from the CD-ROM, in the target computer in a very short time with the help of ImageCopy.

ImageCopy writes all the necessary information of the original disk to this compressed file, so that when you are generating a new hard disk, you can follow exactly the same procedure as you would for copying directly from disk to disk. The compression process takes place during the writing, and is very fast, so that the copying process to a file is only just a little slower than the direct disk-to-disk copying. A typical compression factor is 50 to 60% (i.e. the file has a size of 50 to 40% of the original disk), when all the data in the original disk is secured, as is done, for example, in the case of NTFS partitions. In such a case, the compression factor is correspondingly higher if the original disk has thus far undergone only a little writing and deletion, because when files are deleted, the data remains in the sectors and only the directory entry is deleted. Sectors which have not yet been written to have a constant value, so that in the compression process, these sectors can be compressed to about. 2% of the original size. Hence, we recommend that partitions which do not have a FAT file-system on them should be saved as soon as possible after commissioning the original disk, since in that case, the resulting file becomes correspondingly smaller.

In the case of FAT-partitions ImageCopy is able, if desired, to copy only the sectors which have actually been used, and to replace the sectors which are not used with a suitable space (standard setting). Naturally, this increases the compression factor a great deal, but on the

resulting target disk, it is not possible to carry out any Undelete of files which existed on the original disk and had been deleted.

Disk images can be distributed across up to 99 files; when restoring such a volume-set, ImageCopy knows where the files are located and automatically opens the required file. The distribution across several files is necessary, firstly, if the files are to be burnt on a CD-R (since only about 650 MB of space is available on them) or secondly, if the target drive is running out of space. By doing so, in case of a shortage of space on a network drive, it becomes possible to switch to another and continue there, and secondly, exchangeable media such as Zip- or Jaz-drives can also be used. ImageCopy detects the presence of exchangeable media and if a disk gets full, prompts the user to insert the next volume.

ImageCopy allows the simultaneous reading of a network file by several users, since the files are correspondingly opened in "Shared" mode. When writing to a file, ImageCopy insists on exclusive access, since conflicts may occur otherwise.

Possible key combinations in ImageCopy

In all input screens, in addition to the key combinations described in the respective chapters, it is also possible to use key combinations from other programs that you may be used to as follows:

Mouse-click on	A screen can be terminated by clicking on the symbol at the upper left of the border.
Alt-F4	Closes the current screen.
Esc	Closes the current screen (sometimes with a confirmatory query).
Cursor Up/Down	Moves the cursor to the next / previous input field or button, provided these keys do not already have a separate functionality within that field.
Tab/Shift Tab	Moves the cursor to the next / previous input field or button
Mouse-click on field	Places the cursor on the corresponding input field, or presses the button
Space bar on button	Activates the current button
Alt-?	The letters displayed in another on-screen color (symbolized here by "?") represent the relevant "hotkeys", i.e. if Alt-X is pressed, for example, the Exit button in the screen "Setup source and target drive" is activated.

Possible options of ImageCopy

After starting the program, you can set a number of program options by pressing on the "Options ..." button. The program then displays the screen as below, and you can make the settings according to your requirements. Pressing the "Default"-button at any time restores the standard default values. Pressing the restore-button sets the values present in the IMAGECPY.OPT file, and setting the OK-button confirms the choice of the options for the current copy (even if the values have not been saved with "Save"). When you save the current values with "Save", they are automatically loaded every time the program is started.

Each tab in the Options screen can be selected using the mouse or the corresponding hot key (e. g. Alt-M for the "Copy Mode" tab).

All the options can also be set in the command line; the more detailed description of the individual options further below also refers to the relevant switches in the chapter "Possible command line options".

"Sector I/O" Tab

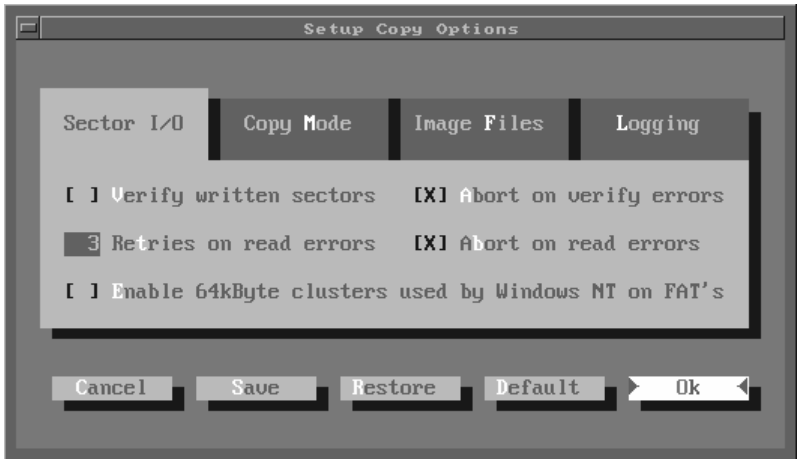

Fig. 4

Verify written sectors

Hotkey: Alt-V, relevant command line parameter: /v
Default: Off

When switched on, all the sectors which have been written to are also checked with Verify. This results in a correspondingly slower copy, but bad sectors are detected and output in the message window during the copying. Is Verify enabled, any bad clusters on the target disk detected during copying in File Mode will be entered in the FAT and all data will be written to a save area.

Abort on Verify errors

Hotkey: Alt-A, relevant command line parameter: /aw
Default: on

If an error is detected during Verify and this option has not been activated, the error is only output in the message window (or in the log file) and the copying process is continued. If the option is activated, copying will be aborted in case of verify error, unless the error can be fixed. If Verify has not been activated, this option is irrelevant.

Retries on read errors

Hotkey: Alt-T, corresponding command line parameter: /rX
default: 3

Number of repetitions in case of read errors. If you want to copy a ”dying” hard disk, it is a good idea to set this parameter to a suitably high value (maximum 99). Please note that with continuing read errors, the process of copying can become very slow, since firstly, after every read error, the hard disk controller has to be reset, and secondly, in case of errors, the reading takes place in "Single-sector mode".

Abort on read errors

Hotkey: Alt-B, relevant command line parameter: /ar
Default: On

If you should want to continue the copying despite the read errors, you must switch off this option. It must be switched off when you are salvaging a "dying" disk.

Enable 64 kByte clusters used by Windows NT on FAT's

Hotkey: Alt-E, corresponding command line parameter: /n

Default: Off

With this option enabled, ImageCopy can increase FAT16 partitions up to 4 Gbyte. To facilitate this, the cluster size must be set to 64 kByte. Note that 16 Bit FAT partitions of more than 2 GByte size can be used by Windows NT only.

"Copy Mode" Tab

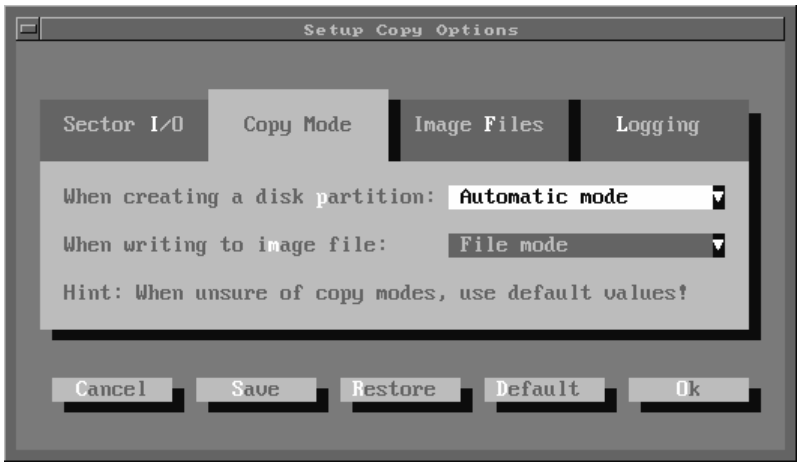

Fig. 5

When creating a disk partition:

Hotkey: Alt-P, corresponding command line parameter: /c

Default: Automatic

When writing data to a hard disk (either from an image file or from another hard disk) different copy modes can be pre-selected. See "ImageCopy Copy Modes" on page 38.

When writing to image file:

Hotkey: Alt-M, corresponding command line parameter: /i

Default: Automatic

When writing data to an image file (either from an image file or from another hard disk) different copy modes can be pre-selected. See "ImageCopy Copy Modes" on page 38.

"Image Files" Tab

Fig. 6

Keep image file sizes less than XXX.X MB

Hotkey: Alt-K or Alt-B, relevant command line parameter: /f
Default: Not activated, or Size = 0

This option can be selected to restrict the size of image files. To do so, activate (display [X]) the corresponding field and enter the desired maximum size of the image files (e.g. 600). If, when generating an

image file, ImageCopy finds that it is becoming larger than, say, 600 MB, a new file (multiple volume) is created. The filename extension is then assigned accordingly, e.g. "I02" for Volume number 2. At the time of restoring, only the first file (e.g. TEST.IMC) need be selected; ImageCopy then continues at the end of the first file with the next file, e.g. TEST.I02.

If you are running out of available space on the target disk, ImageCopy displays a corresponding window, and facilitates continuation of the copy, e.g. on another network drive. This process is independent of the above limitations of file size.

Force requesting new path for every image volume

Hotkey: Alt-F, relevant command line parameter: /q
Default: on

This option, in conjunction with the above option to "Keep image file sizes less than XXX.X Mbyte" facilitates the selection of a new path name when generating a new file, based on the maximum permitted size. Normally, ImageCopy continues with a new file name without any reaction when the maximum size is reached; however, if "Force requesting new path for every image volume" has been activated, the user can continue with the next file in another directory, (as an example, if he so wishes).

Protect image files with password

Hotkey: Alt-P, relevant command line parameter: /w

Default: disabled

With this option enabled, image files will be protected by a password. Just before the actual copying starts, a dialog box displays where you can enter the desired password twice (the second time for

verification). Files that are protected this way can only be restored upon entering the correct password.

"Logging" Tab

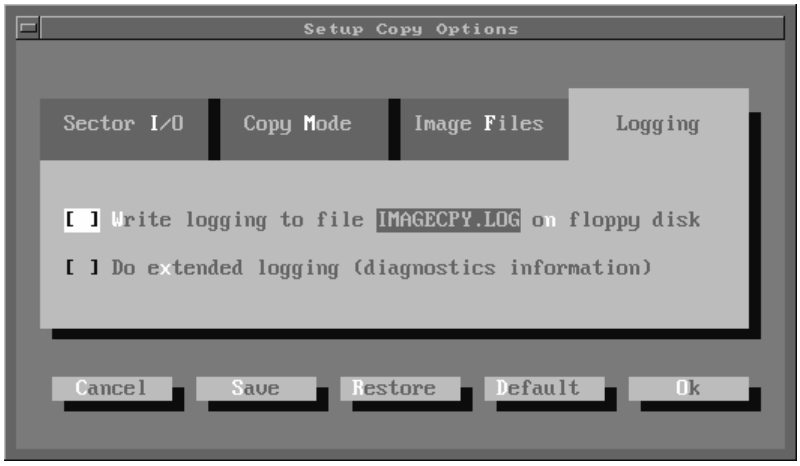

Fig. 7

Write logging to file IMAGECPY.LOG on floppy disk

Hotkey: Alt-L or Alt-N, relevant command line parameter: /l
Default: Not activated

To be able to document the successful execution of the copying process, a log file can be created, in which , for example, any read errors or verify errors can be entered. Basically, all information which is displayed in the message window during the copying process is written to this file when logging has been activated. When the logging is activated or the file name changed, the corresponding file is automatically created on the diskette.

Do extended logging (diagnostics information)

Hotkey: Alt-X, relevant command line parameter: /x
Default: Not activated

This option activates a "Diagnostics mode", i.e. comprehensive additional information is written to the log file to get information

about the copying run in case of a problem. In such a case, you can send us the contents of the log file and we can use the details in it to diagnose the problem and help you to solve it.

ImageCopy Copy Modes

ImageCopy has different copy modes to handle a variety of tasks while copying hard disks. It is advisable to use the default modes unless a special task requires one of the other modes. The following copy modes are available:

Automatic Mode

This mode (default mode for copying onto disk) automatically selects the fastest way to copy. Depending on the selected partition sizes, the program toggles between "File Mode" and "All Sectors Mode". The mode being used for copying a partition is displayed in the message window at the start of the copy process.

File Mode

This is the most flexibel way to copy as it allows to enlarge or reduce the partition sizes at lib. Compared to Sector Optimized Mode, speed in File Mode is reduced by ca. 25% if a physical disk is selected as the source. When copying from an image file that was created in File Mode onto disk, speed is about the same as if you copy back a file created in Optimized Sector Mode. With Verify enabled, any bad clusters on the target disk will be entered into the FAT (as done by FORMAT) and the files will be written to a save location. Note that in File Mode the files are written to a location other than the one they were in on the original disk, i. e. you may not be able to run any software copy-protected software. Other programs and operating systems do not have a problem with this. If an error is encountered in the file system, the program automatically switches into All Sectors

Mode. This mode is especially useful if Verify is enabled and no copy-protected software is installed on your system.

Sector Optimized Mode

Although this mode is the fastest mode, it has limited options for resizing partitions. It does not allow reducing FAT partitions, and FAT16 partitions can only be enlarged if the cluster size remains the same (e. g. enlarging a 850 MByte partition to up to 1 GByte, as this requires a different cluster size). The program generates a list of the sectors used and copies only those sectors onto the target disk. In this copy mode, all files will be located in the same positions (relative to the start of the data area) after the copy process (i. e. in the same cluster), which may be useful for the copying of disks that contain copy-protected software. If an error is encountered in the file system, the program automatically switches into All Sectors Mode. If an error is encountered during Verify, it cannot be corrected even in the case of FAT partitions, i. e. the file in question will only be partly readable.

All Sectors Mode

This mode copies the entire partition bit by bit (no matter whether or not a sector is occupied) onto the target disk. It is selected automatically if an error is found in the file system or if a non-FAT partition is being copied (such as NTFS). Although this mode copies without regard to the partition contents, the position of the partition within the disk as well as the boot sector will be adjusted to the new disk geometry. This copy mode is especially useful if you want to copy a defective disk. On FAT partitions that are copied using this mode, you can do an unerase of files after copying—just as you can on the original disk.

Raw Copy Mode

This mode copies the entire disk bit by bit without making any changes to it. It is recommended for exotic operating systems only or

for situations where the partition table of the source disk is destroyed. The target disk will in most cases be functional only if it has the same disk geometry (i. e. the same number of sectors and heads) as the source disk. If the program discovers an error in the partition tables, it automatically switches into this mode.

Copying back image files onto disk

In general, the mode used to create the image files is automatically used to copy them back onto disk. The All Sectors Mode is an exception: if a file created in this mode contains a FAT partition, it is copied back in Sector Optimized Mode, unless the All Sectors Mode has explicitly been selected for the restore process or the source disk partition contained file errors. You can also use this mode to copy back image files created with older program versions.

How to set the source and target for copying

On starting the program, ImageCopy automatically tries to set the source disk as 1 and the target disk as 0, unless a different selection has been made in the command line. If disk 1 is not found, 0 is set as the source disk as well. If disk 0 is not found, the error message "Could not find drive 0" is displayed. In such a case, and also if the designation set for a disk is not recognized by ImageCopy, the display "Illegal Drive" appears in the field "Size (MB)"

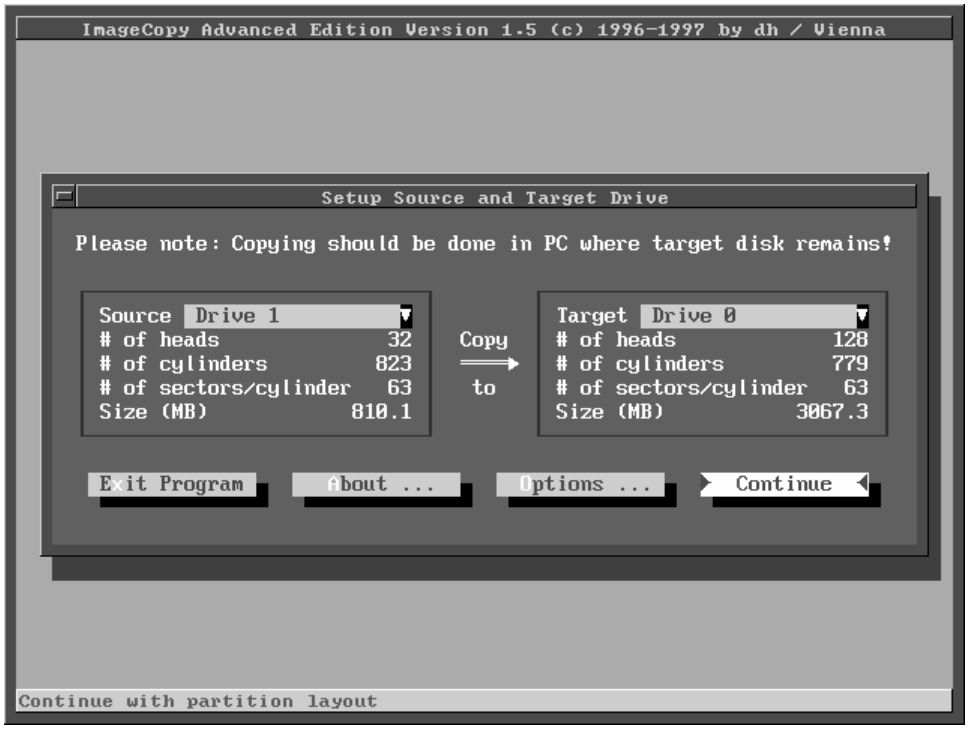

Fig. 8

In the input field "Source" and "Target", you can press the Enter-, space or cursor-down key to get a display of a selection window with the available drive designators and the display "Image File ...".

Select the desired drive and then press the Enter-key to confirm the selection. If you want to save an installed hard disk to a file (an image file), select the number of the disk as the source and a suitable image file as the target. If you wish to restore an image file to a hard disk, please select that image file as the source, and the drive number of the concerned hard disk as the target.

The corresponding files are selected in a separate window, which is similar to the window for file selection under Windows:

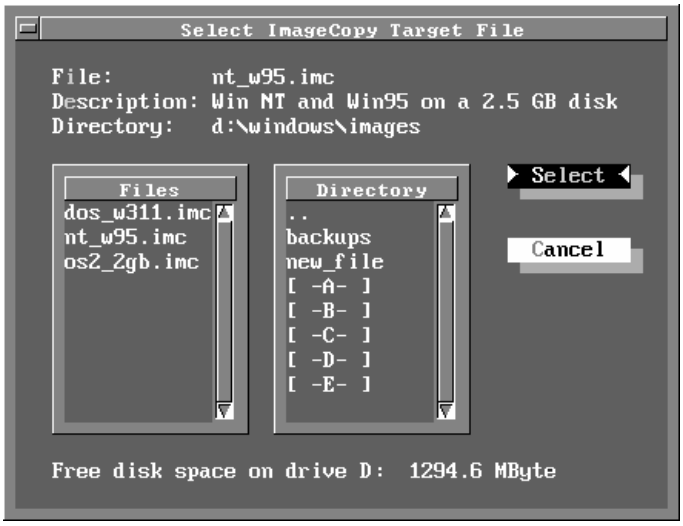

Fig. 9

When you specify a file name as the target file (as in the above diagram), you can also input a description of the file. This description is also stored, and displayed when the file is selected as the source file. The display of the available free space on the target disk (only if an image file has been selected as the target) will help you to select a drive on which there is sufficient space for the image file.

Please note that the selected target file should not exist on the source disk!

If, on continuing to the next screen (with the "Continue" button), ImageCopy finds that the target file is not located on a network drive, a corresponding warning message is output ("Be careful not to write the image file to the source disk (drive 0). This could result in invalid data in the image file. Continue with this file?") and the file name must be confirmed again.. This warning is not displayed when the program is run in batch mode. Even the confirmatory query whether an existing image file should be overwritten is suppressed in batch mode, so that copying can be carried out without supervision.

When you select the source and target field in the main window, an attempt is made to address the specified drive (if a file has not been selected) and the relevant parameters (no. of heads = # of heads, no. of

cylinders = # of cylinders and no. of sectors per cylinder = # of sectors / cylinder) are displayed. The calculated size of the hard disks (Size (MB)) is also displayed on the screen. If ImageCopy detects that the source disk has been partitioned with another disk geometry, a corresponding message is displayed (see the chapter "What you must remember and follow" on page 6). In this case, the parameters displayed are not the values reported by the BIOS, but those calculated from the partition table. If an image file has been selected as the source, the information pertaining to the disk from which the image file has been copied is displayed. Image files as the target are initially displayed with blank fields (or with 0), since the contents of the file have not yet been decided.

To place the cursor in the input fields, you can either use the mouse, or press the corresponding hotkeys (Alt-S or Alt-T). You can also move the cursor as usual with the Tabulator / Shift-Tabulator keys.

You can quit the program either with Alt-X, Alt-F4, with the mouse, or with Esc (after the confirmatory query).

If the same designators are entered for both the source and the target disk, then the corresponding error message is displayed at the start of the copying process ("Can't copy drive to itself!").

Basically, the target disk can also be smaller than the source disk, if the following conditions are met:

All non-FAT partitions must be accommodated in their full size on the target disk, and the *contents* of FAT partitions (DOS, Windows 3.x, Windows 95) must fit onto the remaining space on the target disk. If a 2 GB source disk contains a 1 GByte NTFS Partition and a 1 GByte FAT partition of which 300 MByte are used, the entire content of the disk can be copied onto a 1.5 GByte disk. ImageCopy will automatically reduce the FAT partition to 500 MByte. If you copy to a disk smaller than the source disk, ImageCopy automatically goes

into the "Ignoring Gaps" mode (see the next chapter). If the partitions existing on the source disk cannot be accommodated on the target disk, the following error message is displayed:

Too little space on target disk to copy
partitions of source disk (even when
ignoring unused gaps between partitions)

By pressing the "Continue" button (either with the mouse, the hotkey Alt-C or by hitting Enter), you get to the next screen (see the next chapter). ImageCopy then checks whether the target disk has a valid partition table. If that is the case, the user is informed accordingly, and the confirmatory query

Found valid partition information on target disk
(drive X). Disk was already in use and may contain data - are you really sure to overwrite this disk?

is displayed, with the corresponding disk designator being displayed in place of the "X". If this query is not confirmed, the program points out that as a precaution, the partition table should be deleted before copying and the computer should be re-started:

Some BIOSes map drives geometry depending on partition
information. To avoid invalid data structures after
copying, the current partition information should be
erased and the PC should be rebooted afterwards.

Would you like to erase the partition information on target disk (disk 0) and reboot the PC?

Caution: If you answer the above query with "Yes", the first sector of the target disk is overwritten with null-bytes and hence, the Master-Boot Record (including the partition table) of the target disk is irretrievably destroyed! Any data that may be present on the target disk would also be completely lost!

However, this query should be confirmed with "Yes", since otherwise, the target disk is sometimes reported with the wrong geometry by BIOS; but this is a very rare case.

On entering the next screen, ImageCopy checks the validity of the partition tables present on the source disk. If an error is found, then (depending on whether or not the source disk and the target disk have the same geometry) the following error message is displayed:

Errors or unknown partition structure detected:
I only can copy this disk with unmodified partition
tables. The target disk may or may not be functional
after copying.

Are you sure you want to copy this disk with
unmodified partition tables?

If the geometry is the same, the following text is displayed:

Errors or unknown partition structure detected:
Due to the equal drive geometry of source and target
disk there are no modifications in partition tables to
be done.

If the source disk is functional the target disk will
be functional too.

Are you sure you want to copy this disk?

If one of these two error messages is displayed, ImageCopy cannot take into account the structure of the data on the source disk and copies the source disk sector by sector to the target disk (raw copy mode). The target disk would then probably only work in the second case. If there are only standard operating systems on the starting (source) disk (i.e. DOS, Windows 3.x, Windows 95, Windows NT,

OS/2 or Netware), then the likelihood that the target disk will not work properly is high.

The settings of the partition size described in the next chapter for FAT partitions *cannot* be carried out in the Raw Copy mode, and this screen is then omitted.

Settings of the partition sizes

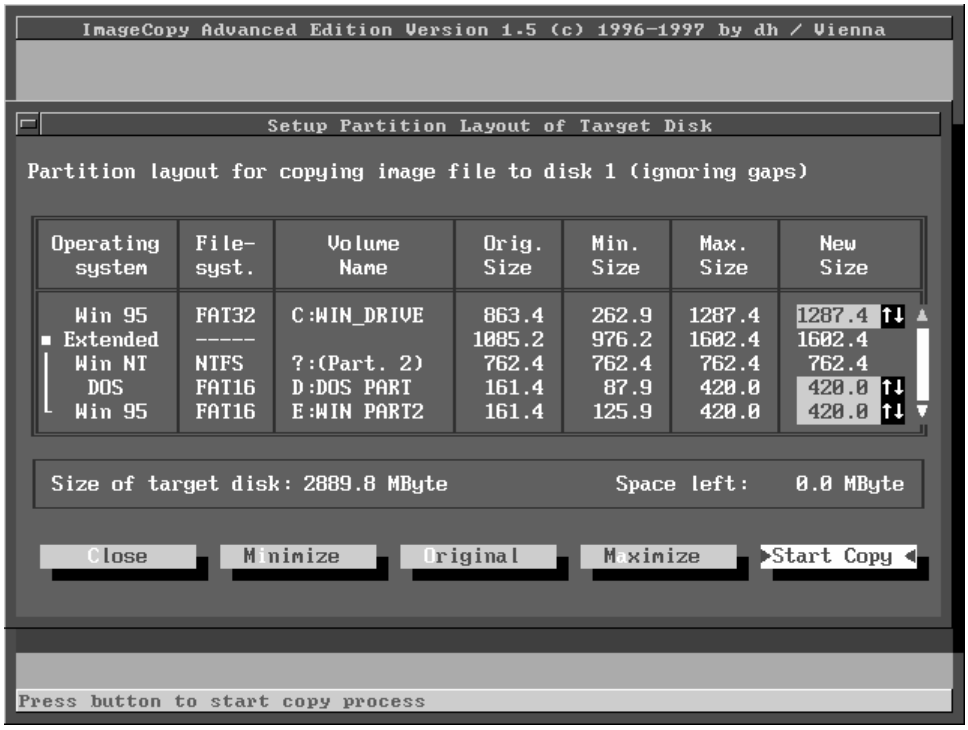

Fig. 10

The "future" layout of the target-disk is displayed in this screen. Here is some preliminary background information for better understanding:

Partitions are areas on the hard disk - normally set up by FDISK - which are essentially described by the starting cylinder, starting head and starting sector as well as the ending cylinder, head and sector. Any hard disk can have up to 4 primary or extended partitions of which one primary partition is normally designated as the starting partition. The so-called "extended partitions" contain logical "drives",

which can be considered to be subsets of the extended partitions. In an extended partition, there can theoretically be more than 20 logical drives. Every partition and every logical drive could contain a different operating system with a different file system.

So much for the theoretical background, which you do not *have* to understand to be able to make the necessary settings with ImageCopy.

ImageCopy displays the individual partitions and logical disk drives with their actual sizes, with the logical drives belonging to another partition ("Extended") being highlighted accordingly (see figure above). If a partition is extendable by ImageCopy, then an input field for the new size is displayed. In this field, you can input a new value (in MB) or by pressing the gray plus or minus keys, enter the maximum or minimum available new size. If the value that is input is too high or too low, ImageCopy corrects it automatically while leaving the field. In addition, the value can be increased or decreased with the cursor-up and down-keys, as also by using the "spin buttons" (symbols: upward arrow/downward arrow) with the mouse. If no changes can be made in the field because the relevant partition cannot be extended (e.g. in the case of NTFS), the input field is locked and displayed as normal text (without color attributes for input fields and without the spin buttons). The respective maximum and minimum sizes of FAT partitions are displayed depending on the current conditions. Basically, only partitions with FAT and FAT32 file systems (used by DOS, Windows 3.x, Windows 95) can be extended.

If there are extendable partitions, then "Minimize", "Maximize" and ”Original” buttons are also displayed, with the help of which the minimum, maximum or original sizes can be simultaneously set *for all* partitions. If you press the "Original" button although the original size cannot be set (in cases where the target disk is smaller than the source disk), the applicable maximum size will be entered instead ("Original

partition size(s) failed due to lack of disk space on target - Setting maximum partition size(s) instead!").

The program sets the maximum size (default setting upon entering this screen) in the following way: If the target disk is bigger than the source disk, the surplus space will be allocated proportionately to all extendable partitions. If the target disk is smaller than the source disk, the minimum size of each partition will first be internally selected (equals the space occupied) and then the remaining space on the target disk will be allocated to each partition.

Note that normal FAT file systems (excluding FAT32) for DOS, Windows 3.x and Windows 95 cannot be larger than ca. 2 Gbyte. This is not a restriction posed by Image-Copy, but rather a characteristic of the FAT file system. The special FAT16 version with 64 kByte clusters that is used by Windows NT is an exception as it can be up to 4 GByte in size. FAT32 partitions do not have these limitations and can be enlarged by ImageCopy to up to 8 GByte.

The table below also indicates the file system and the operating system that that partition uses by preference.

The possible displays in the column Operating System are as follows:

Operating system	Explanation
Extended	This is not an operating system but a "container" for logical drives; lines below it with a highlighted color attribute are present in the respective Extended Partition
DOS	DOS operating system. Is also used by Windows 95.
DOS hidden	DOS partition hidden by OS/2 Bootmanager
OS/2 hidden	OS/2 partition hidden by the OS/2 Bootmanager
Boot managr	OS/2 Bootmanager
Win NT	Windows NT with NTFS file system
OS/2 or NT	Windows NT or OS/2 with HPFS file system
OS/2 (?)	Probably OS/2, with unknown file system
Unix (?)	Probably Unix
Win 95	Windows 95 with VFAT.
Win95 Ext	Like Extended (see above), but set up by Windows 95 FDISK
Win95 hidden	Windows 95 with FAT32, hidden by OS/ Bootmanager.
NT Str/Vs	Windows NT with NTFS Stripe Set or Volume Set
Linux	Linux operating system
ServPart	Service Partition of Compaq
Netware	Novell Netware 3.x or 4.x
Type XX	Unknown operating system with Type XX (in hex)

The possible displays in the column File System are as follows:

File system	Explanation
-------	No file system (e.g. in case of Extended Partition and Bootmanager).
FAT12	FAT File system with 12-bit FAT. Used by DOS, Windows 3.x and Windows 95.
FAT16	FAT File system with 16-bit FAT. Used by DOS, Windows 3.x and Windows 95.
FAT32	FAT File system with 32-bit FAT. Optionally used by Windows 95 OEM Version from SRV2 onwards.
HPFS	OS/2 High Performance File System
NTFS	NT New Technology File System (Windows NT)
Netware	File system used by Netware 3.x, Netware 4.x

If the list of partitions has more than 5 entries, then the Page-Up or Page-Down keys can be used to scroll the display. This can also be done by clicking on the arrows that appear (on the right-hand side of the list) with the mouse.

If you wish to restore the starting conditions of the partition layout because you want the discard the changes you have made, press the "Original" key.

The text displayed on the uppermost line of the screen, i.e. "Partition layout for copying disk X to disk Y" (where the corresponding disk designators are put in place of X and Y) can, depending on the existing conditions, have the following appendage: "(ignoring gaps)". The technical background of this message is as follows: ImageCopy tries to map the layout of the source disk as accurately as possible on the target disk. This also includes faithfully reproducing even unused intermediate spaces between the existing partitions on the target disk. However, if one of the existing FAT partitions has to be resized (i.e. New Size not equal to Size (MB)), ImageCopy ignores these unused intermediate spaces when copying, in order to make space for any

further extensions. An Extended Partition which originally had unused space is displayed with its new size in the field Size (MB) even on switching to the "Ignoring gaps" mode.

Despite the displacement of the partitions in the "Ignoring gaps" mode, after copying, your target disk works just as well as the source disk, since ImageCopy automatically tailors all the required structures when copying.

Hints for copying the various operating systems

Basically, all operating systems which adhere to the structures of FDISK can be copied. If the partition table of ImageCopy is detected to be defective, the copying can still be done in "Raw Mode"; however, this can only succeed with identical disk geometries.

If an operating system also stores data which is dependent on the disk geometry *within* the partition (except in the boot-block, which is also suitably changed by ImageCopy), such data cannot be changed by ImageCopy, since its structure is not known. In such a case, the target disk may contain data which is then recognized by the operating system as defective, and the operating system may, for example, not be started. Such behavior can only occur when the disk geometries are different or in case of extensions of partitions.

ImageCopy has been thoroughly tested with the most popular operating systems, for which the correct functioning is ensured even when the geometries of the source and target disks are different. Below, you will find separate notes and hints for the configurations tested with ImageCopy:

DOS and Windows 3.x

A FAT (FAT12 or FAT16) file system is used exclusively in this constellation. These partitions can be extended up to 2 GB or reduced

down to their minimum size (determined by the size of the space occupied). Sometimes, a permanent swap-file of Windows 3.x which may be present cannot be used, in which case Windows displays the corresponding error message at startup, and it is then possible to delete the file.

DOS and Windows 3.x with Disk Manager

If your source disk was configured using a disk manager (program for hard disks larger than 504 MByte on old motherboards) such as Ontrak, you should proceed as follows: install the source and target disks in a computer with LBA mode, set up the source disk as disk 0 (not in LBA mode) and the target disk as disk 1 (using LBA mode) on its own connection cabel (i. e. not as slave to the source disk) and boot from the source disk. Then start ImageCopy from diskette and copy from disk 0 to disk 1. This results in a correctly copied hard disk with the disk manager being out of commission on the target disk. This has been tested with Ontrak but should hold for other disk managers too.

Windows 95

In recent times, Windows 95 sits on top of DOS 7, which in turn uses a so-called VFAT (FAT12 or FAT16 with an extension for long file names). What holds good for partitions under DOS and Windows 3.x holds good for these partitions as well. All the data (including the swap file, the Registry and long file names) will continue to be available unchanged even with extended partitions. The FAT32 being used in the newer OEM versions of Windows 95 is also completely supported, so that while copying, you can increase these partitions from the minimum of 500 MB (specification of Windows 95) to a maximum of 8 GB.

Please note that particularly when you are using Windows 95, and if there is a lot of difference in the hardware configuration of the original and target PC (e.g. different processor), the target system sometimes cannot run at all. This is *not* a failure of ImageCopy, but is due to the Plug & Play technology of Windows 95.

Windows NT with NTFS

Windows NT is copied unchanged, the partitions and the boot block are matched to the geometry of the target disk if necessary. Extension of the partition is not possible, but Windows NT can ”append” the unused space on the target disk to an existing partition with the help of a "Volume-Set", so that more space is available to the user on the existing disk (without a new disk designation being assigned). If the NT Bootmanager is to be installed, please note the next point.

Windows NT writes so-called Security Identifiers (SID) to the hard disk, and these are also copied. If you are using several identical hard disks at different workstations in the same Windows NT network, the same SID can result in problems as regards the network rights.

To modify this security information, there is an especially designed program which is available from the Internet free of charge ("Freeware") but cannot be included in our ImageCopy distribution. You can download this NTSID program from http://www.sysinternals.com/newsid.htm.

Windows NT with Windows NT Bootmanager

ImageCopy has a separate program section which, after copying the disk, checks whether data for an NT Bootmanager was found. If that is the case, all the relevant files are suitably adjusted after copying and the message "Windows NT boot manager files successfully patched!" is displayed. The patching of the Bootmanager takes place automatically and no intervention from the user is required. The target disk will have

the same boot-menu as the source disk after the patching and all the previously bootable operating systems can be started as before. This also holds when a partition referenced by the Bootmanager has been extended by ImageCopy.

OS/2 with HPFS

OS/2 with HPFS can also be copied to a different disk without any problems. If OS/2 is used with a FAT file system (this is a rather rare case), the partition can be extended as before.

OS/2 Bootmanager

The OS/2 Bootmanager "resides" in a separate partition and in that partition, also stores data about the disk geometry or data about the operating systems to be started. Since the location and the structure of this data would have been made available by IBM only on payment of a correspondingly high amount, and because this procedure is not completely comprehensible, we have dispensed with having the program carry out the modification of the OS/2 Bootmanager. If an attempt is made to copy a disk with OS/2 Bootmanager with the source and target disks of different disk geometries, or in "Ignoring gaps" mode, the following message is displayed on pressing the Start Copy button:

Warning: Found OS/2 boot manager! Due to the different layout of source and target disk the boot manager should be removed BEFORE copying and a OS/2 or DOS partition should be made startable to allow reinstalling the boot manager after copying. If this is not done, the target disk will not be bootable!

Do you want to continue anyway?

The Bootmanager should be removed before copying (with OS/2’s FDISK), and the OS/2 partition should be set to "Startable". After the

copying process is over, you can boot from OS/2, the Bootmanager can be installed again with FDISK and the partitions to be booted can be assigned again.

If the copying is done to a disk with the same geometry without the "Ignoring gaps" mode, the above procedure need not be carried out. The corresponding warning is not displayed then either.

Novell Netware 3.x and 4.x

Netware addresses the Netware partitions entirely with its own drivers, so that sometimes, after copying to another disk, another driver has to be used. E.g. during a test, an IDE disk smaller than 504 MB was copied to an 850 EIDE disk. Then, the IDE driver had to be replaced by the ISADISK driver, in order to be able to address the 850 MB EIDE disk under Novell. After this change-over (which can be made quite simply from DOS) the target disk was fully operational again.

Basically, when using Adaptec controllers and SCSI disks greater than 1 GB, it must be remembered that under Novell Netware, these controllers are normally *not* operated in the so-called Extended Translation Mode and hence, BIOS only reports a disk of 1 GB and the rest of the disk cannot then be addressed. Unfortunately, in such a case, ImageCopy cannot create completely functional and operational disks.

Novell supports the creation of several partitions on the disk and the "concatenation" of these partitions to a logical drive (Novell calls this "Spanning" - but the feature is not available in the Small Office version), i.e. the user again sees just one drive designator, so that even when copying to a larger disk, the additional space that is available on it can be utilized comfortably.

Starting the copy

After setting the required layout of the target disk, you can start the actual copying process. However, should you have to quit the screen with the layout of the target disk, please press the Close button.

Pressing the "Start Copy" button initiates verification of the copying process. However, a confirmatory query is displayed beforehand.

Caution: On starting the copy, on confirming the warning that is displayed: "Copying disk X to disk Y will destroy all data on target disk Y - Are you really sure you want to continue this procedure?", the data on the target disk is irretrievably destroyed!

If an error is found in the file system, a relevant message is displayed. If the file system of the source disk is repaired using SCANDISK before copying, the disk can be copied in the normal way. Alternatively, you can switch to the proposed All Sectors Mode, however, the errors in the file system will also be present on the target disk.

Before the actual copying process, ImageCopy checks whether the first sector, the last sector, and one in the middle can be copied, i.e. these selected sectors are written to the target disk, read again, and compared with the original. If this process cannot be completely carried out successfully, the copy process is canceled.

During the copy process, *no* check is made whether the data on the target disk tallies with that on the source disk (this is also the standard procedure in the case of a normal "Copy" command under DOS, since the hard disks usually work without any problems), if the Verify option has been switched off.

If you chose to enlarge a FAT partition, you may at this point get the following message (example):

Data on drive C:(MY_WIN95) does not fit in the partition due to modified cluster size. Partition size must be enlarged to min. 1209.2 MByte or shrunk to 1024 MByte.

Now setting partition size to 1024 MByte.

The background to this message is the following: As the FAT file system groups data in so-called clusters (e. g. of 16 Kbyte size, so that a file just one byte in size will occupy all of 16 KByte) that are chosen in accordance with partition size, the space can become too small if you enlarge a partition that already contains many small files. If, for example, the partition size is smaller than 1 GByte, then 1000 very small files will take up 16 MByte. If, however, the partition size is set to greater than 1 GByte, those files will occupy 32 MByte. ImageCopy recognizes this problem and, depending on space available, suggests either the maximum size in conjunction with the smaller cluster size or the minimum size in conjunction with the larger partition size. After displaying this error message, the program returns to the previous screen with the modified partition size to allow the user to adjust the size once more. When copying continues, the file system won't be verified again as this was done previously.

Messages displayed during the copy

During the actual copy process, a number of values are displayed on the screen for keeping track of the current status at any time. Apart from the current status information such as the head or track being currently copied, you will also find statistical information. This includes, firstly, the average transfer rate ("Average MB/min") and secondly the estimated total time ("Estimated time"), or the time that has already elapsed ("Elapsed time") and the time still remaining ("++ Remaining"). As regards the transfer rate, it must be remembered that it is not the data transfer rate of a hard disk, but the overall data throughput that is displayed (i.e. reading from the source disk plus writing to the target disk plus Verify). Typically, with modern hard

disks, a throughput of about 150 to 300 MByte (the latter value almost exclusively for SCSI disks) per minute is reached, so that a fully occupied 1GB EIDE disk is copied within minutes. Other parameters displayed are shown in the following diagram.

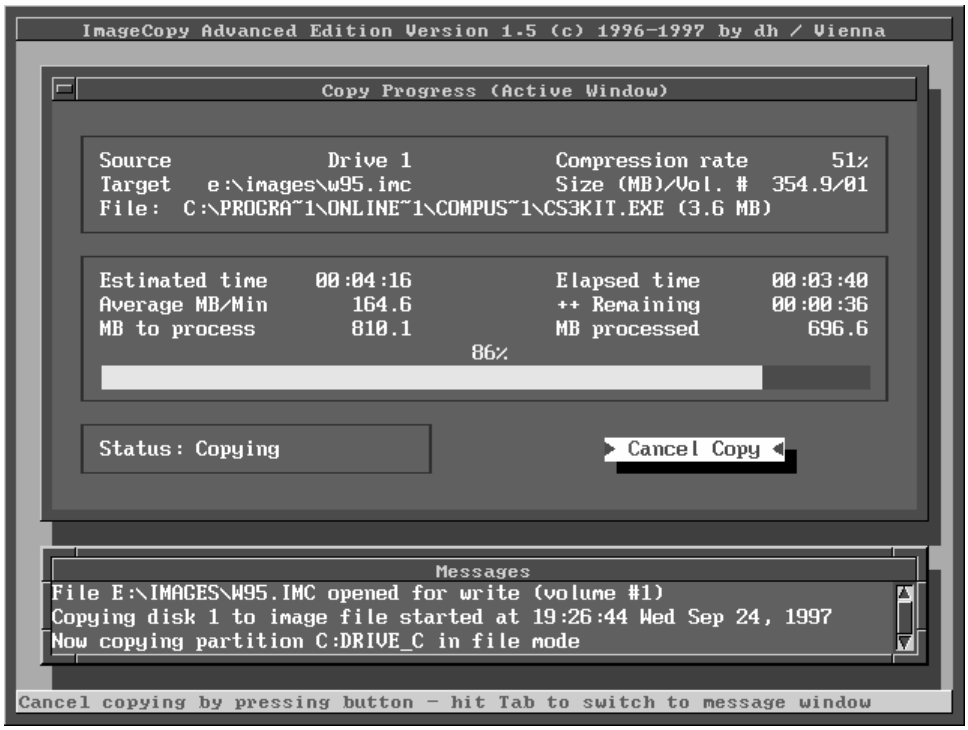

Fig. 11

The current status of the copying run is displayed in the field "Status". Most of the time, you will see the display "Copying" or "Verifying" in this field.

During the copy, any error messages (read or verify errors) are displayed in the lower window (the message window). If the program is not set to abort when these errors are encountered, the copying continues normally. While the copying is going on, you can also switch between the two windows by pressing the Tab key; this has no effect on the copying process.

If you wish to look at messages which have already appeared in the message window, you can scroll to the desired position using the

Cursor up/down or Page up/down keys. If the cursor is on the last line of the messages (can be done with Control-Page down), messages which follow push the previous ones upwards. However, if you are on a line other than the last line, messages which follow are appended at the end of the window, without changing the current position, so that you can continue to examine the current line. No lines are lost in this case either. Skipping to the end of the messages (with Control-Page down) re-activates the scroll mode.

You can use the mouse to change the size and position of this message window, as is normally done under Windows, so that you can set whatever view of the message texts you want.

Aborting the copy process

You can cancel the copy process at any time either by hitting the Enter key or by pressing the "Cancel Copy" buttons with the mouse. If you answer the subsequent question, "Are you sure to abort disk copying?" with "Yes", the copy that is going on is aborted.

However, if you reply with "No", the copy process is continued normally.

A copy run that is aborted with "Cancel Copy" results in an incompletely copied hard disk. Such disks should not be used since the behavior of the system or the copied programs could be unpredictable.

Procedure to be carried out after the copy

After the copying is complete (on-screen message "Disk copying successfully finished!") the source disk can be put away after switching off the computer, and the computer rebooted. After copying, ImageCopy displays the message:

Do you want to exit ImageCopy now?

If you answer this question with "Yes", the log file is closed, the program is terminated and the DOS-prompt ("A:>") is displayed.

If ImageCopy detects a startable partition on the target disk and if drive 0 has been selected as the target disk, the corresponding message

Please exit program, switch off your PC and
remove ImageCopy floppy disk and source disk.
Now your PC is ready to boot from the target
disk after disabling the source disk in the
BIOS setup.

is displayed. Please note that you must always terminate the program before switching off the computer, since otherwise, the log file cannot be closed.

Please do not forget to deactivate the source disk again after the copying process in the BIOS setup of the computers.

It is now possible to start from the copied hard disk.

If you have copied from an image file to disk 0 and a startable partition is found, the following is displayed instead of the above text

Your PC is ready to boot from the target drive.
Please remove ImageCopy floppy disk and press
the reboot button to boot from target drive now.

You can then press the Reboot button to once again start from the hard disk (do not forget to remove the floppy disk).

Changing information on the target disk after copying

In general, a successfully copied target disk can be used straight after copying. However in some cases, relevant changes will have to be

made before using the disk. For example after duplicating NT workstations for use on the same network, where you should change information such as the computer name and the SID (see chapter "Windows NT with NTFS" on page 54).

Alternatively you can use the PostInstall tool for Windows 95 that comes with ImageCopy to change the user name, company name and serial number of the CD-ROM that were selected during installation of the source disk after copying is completed. Simply run POSTINST.EXE in Windows 95 (no installation is necessary for this program) and enter the correct values.

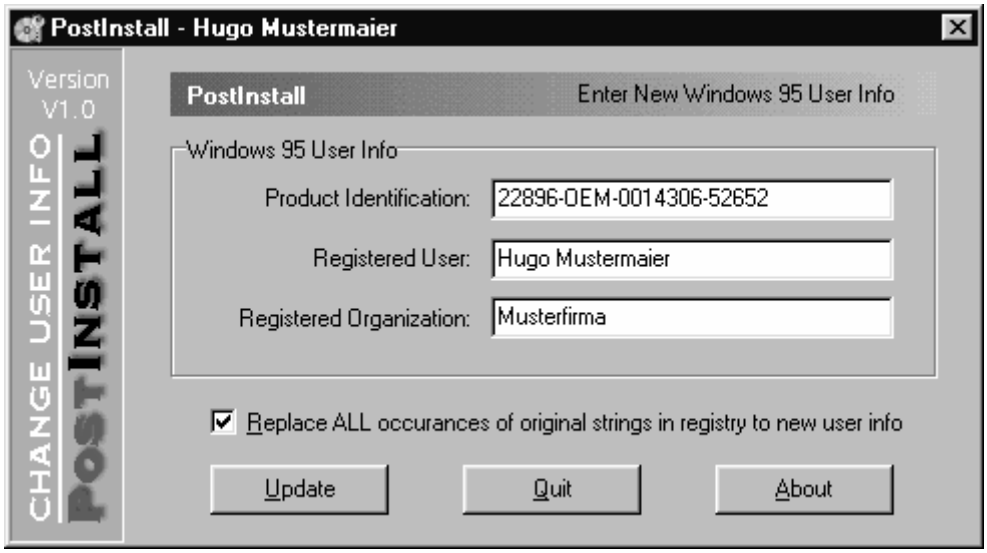

Fig. 12

If you enable "Replace ALL occurances of original strings in registry to new user info", the entire registry will be searched for the old values, and the values will be replaced with the new ones. In this case you should make a backup of the registry before modifying it (or keep the source disk) as some programs may have a problem with this.