

GHOST Manual

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Introduction

GHOST is designed to minimize the installation times for operating systems such as Win95, WinNT and OS/2. This is particularly useful to organizations which have a large number of similarly configured workstations to install. For example, GHOST reduces the time to install a typical 300 megabyte Win95 system from an hour with substantial operator input to about 5 minutes with no operator input required. With multi access packages, multiple workstations may be installed at the same time which further improves efficiency.

When cloning complete hard drives, procedures such as FDISK and FORMAT are a thing of the past - GHOST dynamically partitions and formats the target disk "on the fly" allowing FAT16, FAT32 and NTFS partitions to be expanded or contracted to fit the target.

GHOST is designed to be run under DOS and can be run from a DOS boot diskette. Although DOS-based, it can handle Win95/WinNT long file names, NTFS partitions, OS/2 extended attributes and even OS/2 boot manager partitions.

GHOST has two modes of operation - a simple, robust, menu driven user interface, and, to further aid automating the installation process, a batch mode.

Prior to Win95 there was little need for a utility like GHOST, as systems could be installed by simply using the DOS XCOPY command. Win95 introduced long file names, XCOPY could no longer do the job - hence the need for a utility like GHOST.

Not only is GHOST the fastest way to install Win95, WinNT and OS/2, it has another handy use - it can make complete backups of disks, even copying "in-use" system files which are missed by other backup utilities. Making GHOST a perfect choice for disaster recovery operations.

Overview

GHOST is essentially a disk and/or partition copying program. The entire contents of a disk may be copied from one disk to another, or they may be copied to a disk image file, and that image file can then be used as a template to create copies of the original disk. GHOST also allows these operations to be performed on the partitions of the disk i.e. the contents of a partition can be copied to another partition, or selected partitions can be copied to an image file and that image file can be used as a template to create copies of the original partitions.

Each disk is made up of a Master Boot Record and from 1 to 4 primary partitions. Primary partitions are *physical separate areas* of the disk, and are usually defined by the FDISK utility. Extended partitions may be further subdivided into logical drives, once again using the FDISK utility. However, it is not important to understand the exact details of how a disk is subdivided when using GHOST.

Disk Copying

GHOST copies *every* partition, regardless of type, from the source (disk or disk - image file) to the destination. If the source and destination disks were identical in size and structure then all that would be needed is a sector by sector copy; but in practice this is seldom the case. GHOST positions each partition or logical drive on the target disk using the same rules as FDISK. In addition, if the partition is a FAT16, FAT32 or NTFS type (which most PC disks are), GHOST allows the target partition to be expanded or contracted.

Partition Copying

GHOST can be used to make a copy of a single partition or to make an image file containing a copy of one or more disk partitions. Once an image file has been created, the contents for the selected partition can be loaded onto a target partition. The target partition must be large enough to accommodate the selected partition from the image file. It is important to note that the target partition must already be defined when using partition options. Partitions are usually defined by FDISK, but can be already defined on new disks.

Installation

GHOST requires no special installation procedures. It is supplied in a self-extracting file if downloaded from the GHOST web site <http://www.ghost.com>, or in unzipped form if supplied on diskette. Because GHOST is designed to be run on any PC (in accordance with the GHOST licensing rules) it does not need to be installed, but can be run from a DOS boot diskette. Of course the GHOST files can be copied onto a hard drive or network drive for improved performance.

From <http://www.ghost.com>

GHOST started life as a product that could be downloaded from the Internet with a free 30 day evaluation. It still can - just visit our web site at www.ghost.com and download the FREE full featured trial.

The files contained are:

File	Description
bugform.txt	Form for submitting bug reports
ghost.exe	This is it, the one that does all the work
ghost.doc	The GHOST manual in Word for Windows format
ghost.pdf	The GHOST manual in Adobe Acrobat format
ghostfaq.txt	Frequently Asked Questions
license.txt	Pricing and licensing information
switches.txt	A listing of command line switches
error.txt	A list of GHOST error codes
upgrade.txt	Instructions for upgrading your registered version of GHOST
whatsnew.gho	Contains list of latest modifications and bug fixes

The evaluation copy is a fully functional single user version, but it will time-out at the specified date.

Do not try and change the system date to fool GHOST - it independently checks the system date and will not complete the clone/dump/load operation if the system date has been set back.

From diskette with/without the manual

GHOST is supplied in a packaged form, either with or without the manual. The

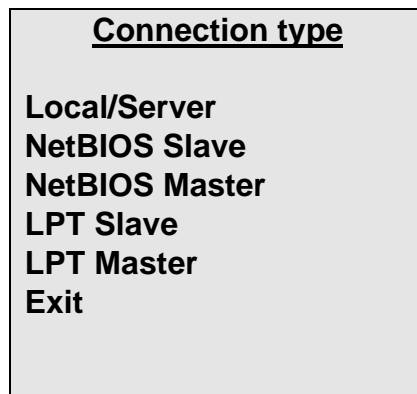
contents of the disk are the same as in the downloadable version - except, of course **ghost.exe** has no time-out.

Using GHOST

GHOST should be used in interactive mode initially. Once the interactive procedure has been finalized, the process can be automated by using batch mode.

To start GHOST in interactive mode, type GHOST at the DOS prompt. A startup banner will be displayed, then the initial menu.

Selecting connection type



In the vast majority of cases the default option of **Local/Server** is the best choice. This allows copying of disks and partitions on a local PC as well as copying and loading disk and partition contents to and from GHOST image files on either the network server or the local PC. Selecting it takes you to the **Transfer Option** menu. See next page for Transfer Options.

The next options (NetBIOS Slave/Master and LPT Slave/Master) are used only for peer to peer connections. If you have a client/server setup you are unlikely to need the peer-to-peer options. NetBIOS is only used when you connect a PC to another PC via a "converted" or "pinned-out" Ethernet cable or a mini-Hub in "workgroup" mode with only the two nodes connected. The NetBIOS interface/protocol is NOT needed to save an image file onto a server. The only components needed to save an image file of a hard drive are the GHOST program along with a boot disk with the network client components.

Peer to Peer Connections

Peer to peer connections are typically used when there is no network - just two computers which you wish to connect.

GHOST gives you the choice of connecting via NetBIOS or via the LPT (printer) port. In both cases one computer becomes the master, the other the slave. To connect via the printer port you need a LapLink or FastLynx type cable plugged into the printer port of both computers. To connect via NetBIOS you need a network card in each computer, a converted Ethernet cable, and the appropriate networking software. In general, connecting via the Network gives two to five times the performance of an LPT connection. A typical LPT connection speed is 5 Megs/minute, a typical NetBIOS connection speed is 20 Megs/minute.

Selecting which PC will be Master.

For **NetBIOS** and **LPT** connections, one machine must act as the **Master** and the other the **Slave**. *All operator input will be on the Master computer.*

Use the following table to choose which will be Master and which will be Slave.

Action	Master	Slave
Disk to disk copy	PC containing source disk	PC containing destination disk
Disk to file copy	PC containing source disk	PC receiving destination image file
File to disk copy	PC containing destination disk	PC containing source image file
Partition to partition copy	PC containing source partition	PC containing destination partition
Partition to file copy	PC containing source partition	PC receiving destination image file
File to partition copy	PC containing destination partition	PC containing source image file

Connecting via LPT

*Make sure both computers are connected via the printer port with a LapLink/FastLynx type parallel cable. GHOST must be running under DOS on both computers. Select Master and Slave computers based on table above. The parallel port **MUST** be set to Bi-Directional or EPP or ECP. You must experiment with the mode for best performance, Unidirectional will*

not work.

Start the Slave first - it will not time-out while waiting for a signal from the Master. The Master will time-out after 30 seconds if a connection has not been made.

Once a connection has been made, the data transfer speed will be displayed and the Transfer Option menu will be displayed. See ***Selecting Transfer Option.***

Connecting via NetBIOS(Peer to Peer)

Make sure both computers are connected via a converted Ethernet network cable. Both computers must be running the minimum network software for a NetBIOS connection. See below for details. Select Master and Slave computers as per the decision table on previous page. GHOST will automatically connect the two computers generally in about 30 seconds.

It may be useful to have a special boot diskette which loads just the network software needed by GHOST for the NetBIOS connect.

E.g. for an NE2000 network card the following files would be required. Your drivers and protocols might vary, this is only an example....

***LSL.COM
NE2000.INS
NE2000.COM
IPXODI.COM
NET.CFG
NETBIOS.EXE***

A batch file such as the following NETLOAD.BAT could be called from the AUTOEXEC.BAT file (i.e. CALL NETLOAD.BAT). NETLOAD.BAT could contain the following files

***LH LSL
LH NE2000
LH IPXODI
LH NETBIOS***

This will load the network drivers needed for the GHOST NetBIOS calls. Again, both machines will need a Network card, along with an Ethernet cable and the necessary network drivers. NetBIOS is available from www.novell.com or local BBS. If you are on a Netware network, most likely you will have the NetBIOS interface on the server (NETBIOS.com or NETBIOS.exe).

Selecting Transfer Option

<u>Transfer Option</u>	
Clone disk to disk...	
Dump disk image to file...	
Load disk from image file...	
<hr/>	
Check disk integrity...	
Check image file integrity...	
<hr/>	
Clone partition to partition...	
Dump partition(s) to image file...	
Load partition from image file...	
<hr/>	
Back to previous menu	

The Transfer Option menu presents eight choices which cover disk copying, integrity checking and partition copying. They are:

Clone disk to disk... Select this option if you wish to copy all disk contents including all partitions from one disk to another.

Dump disk image to file... Select this option if you wish to save an exact image copy of a disk in a file. The file can be on a local disk, a server drive, or on the drive of a PC connected via NetBIOS or the LPT port.

Load disk from image file... This is the reverse of the previous option. Select this if you wish to load the contents of a disk image file onto the disk of the local PC. The image file must have been previously created by GHOST.

Check disk integrity... Select this option if you wish to check the integrity of a disk.

Check image file integrity... Select this option if you wish to check the integrity of an image file.

Clone partition to partition... Select this option if you wish to copy a disk partition to another partition. The destination partition can be on a local disk or on the disk of a PC connected via NetBIOS or the LPT port.

Dump partition(s) to image file.... Select this option if you wish to save an exact image copy of one or more disk partitions in a file. The file can be on a local disk, a server drive, or on the drive of a PC connected via NetBIOS or the LPT port.

Load partition from image file...This is the reverse of the previous option. Select this if you wish to load the contents of a partition image file onto a partition of the local PC. Note that although the file can contain an image of more than one partition, only one partition can be selected for loading from the file. The file can be on a local disk, a server drive, or on the drive of a PC connected via NetBIOS or the LPT port. The image file must have been previously created by GHOST.

Clone disk to disk...

This consists of four steps as follows:

1. Select source drive.
2. Select destination drive.
3. Confirm destination drive details.
4. Proceed with disk clone.

Step One - Select source drive

Drive	Size in Megabytes	<u>Select local source drive</u>			Sectors per Track
		Primary Partitions	Cylinders	Heads	
1	2055	2	522	128	63
2	3063	2	778	128	63

GHOST will display the details of every disk it can find on the local PC and allow you to select the disk you wish to copy from.

Use the up and down arrows to move the highlight bar. Press **Enter** to select.

Step Two - Select destination drive

Drive	Size in Megabytes	<u>Select local destination drive</u>			Sectors per Track
		Primary Partitions	Cylinders	Heads	
1	2055	2	522	128	63
2	3063	2	778	128	63

GHOST will display the details of every disk it can find on the local/remote PC and allow you to select the disk you wish to copy to. If this is a local disk to disk copy, then the source disk will be unavailable for selection.

Use the up and down arrows to move the highlight bar. Press **Enter** to select.

Important: This is the disk that is going to get overwritten. Choose CAREFULLY.

Step Three - Destination drive details

If loading from a disk image file, or doing a disk to disk copy, GHOST will display a suggested partition layout for the target disk.

By default, GHOST will allocate any extra space that the new disk has to the first FAT or NTFS partition that it discovers.

Important: You can change the size of any target FAT or NTFS partition at this stage, simply by entering the new size (in megabytes).

Use up and down arrow to move between fields. GHOST will not allow you to enter a value which exceeds the available space, or which is not large enough to contain the data held in the source partition.

When you are satisfied with the allocation of space between partitions, press ***Enter*** to continue.

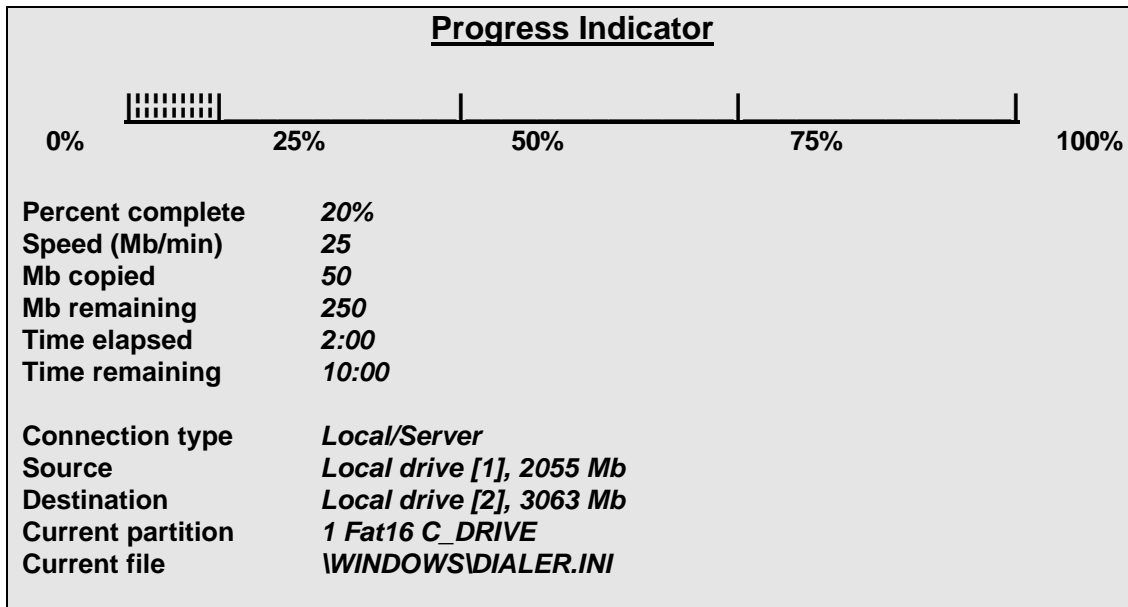
<u>Destination drive details</u>						
Part	Type	Description	Volume Label	New size in Mb	Old size in Mb	Change in Mb
1	06	Fat16	C_DRIVE	1800	800	1000
2	04	Fat16 extended	MY_DATA	200	200	0
3	07	NTFS extended	NT_DRIVE	650	650	0
4	07	HPFS extended	OS2DRIVE	400	400	0
		Free		0	0	0
				3063	2055	1000

Step Four - Proceed with disk clone

Before starting to overwrite the destination disk, GHOST displays the source and destination details and gives you a chance to back out. The default is to back out.

Only select Yes if you are really sure - the target drive will be completely overwritten, with NO chance of recovering any data.

Once the copy has started, GHOST keeps updating the Progress Indicator with information as shown.



When the disk copy is complete, the target PC will need to be rebooted (as after a change made by FDISK). By default GHOST prompts with:

Press Ctrl-Alt-Del to reboot.

Dump disk to image file...

This consists of three steps as follows:

1. Select source drive.
2. Enter file name to dump disk image to.
3. Proceed with disk copy.

Step 1 - Select source drive

Drive	Size in Megabytes	<u>Select local source drive</u>			
		Primary Partitions	Cylinders	Heads	Sectors per Track
1	2055	2	522	128	63
2	3063	2	778	128	63

GHOST will display the details of every disk it can find on the local PC and allow you to select the disk you wish to copy **from**.

Use the up and down arrows to move the highlight bar. Press **Enter** to select.

Step 2 - Enter file name to dump disk image to

<u>Enter file name to dump disk image to</u> <u>G:\VMAGES\WIN95.IMG</u>
--

Enter the full path name of the disk image file. E.g. if you are dumping (copying) the entire contents of a workstation disk to a server drive, you must enter the server's drive letter, any subdirectory names and of course the image file name.

If you selected the **Connection type->Local/Server** then the destination disk image file must reside on either a server drive (the most common option) or a local drive (but not the one that is being copied from).

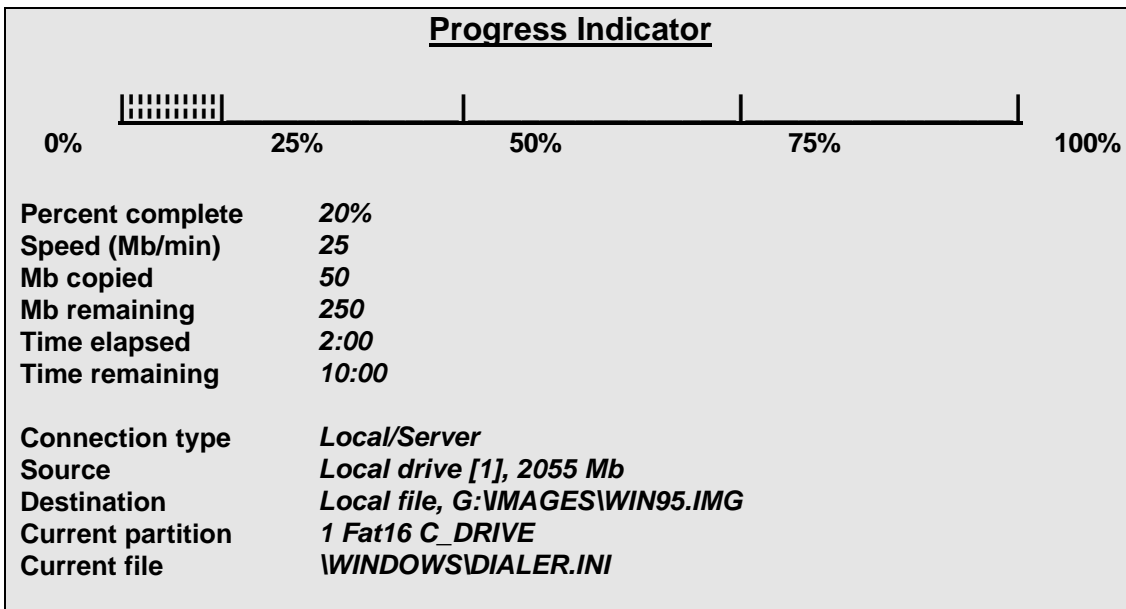
For any other **Connection type** (peer to peer via NetBIOS or LPT port) then the destination disk image file must reside on one of the remote drives.

Step 3 - Proceed with disk dump

Confirm whether compression is to be used (the default is No Compression). When compression is used, copying operations are much slower. For this reason, it is recommended that compression be used only when there is very limited space on the target device.

Before starting to dump the disk contents to the image file, GHOST displays the source and destination details and gives you a chance to back out. The default is to back out.

Once the copy has started, GHOST keeps updating the Progress Indicator with information as shown.



When the disk copy is complete, the user is returned to the DOS prompt.

Load disk from image file...

This consists of four steps as follows:

1. Enter file name to load disk image from.
2. Select destination drive.
3. Confirm destination drive details.
4. Proceed with disk load.

Step 1 - Enter file name to load disk image from

<u>Enter file name to load disk image from</u>
<u>G:\VMAGES\WIN95.IMG</u>

Enter the full path name of the disk image file. E.g., if the disk image file resides on a server drive, you must enter the server's drive letter, any subdirectory names and of course the image file name.

If you selected the **Connection type->Local/Server**, then the disk image file must reside on either a server drive (the most common option) or a local drive (but not the one that is being copied to).

For any other **Connection type** (peer to peer via NetBIOS or LPT port) then the disk image file must reside on one of the remote drives.

Step 2 - Select destination drive

<u>Select local destination drive</u>					
Drive	Size in Megabytes	Primary Partitions	Cylinders	Heads	Sectors per Track
1	2055	2	522	128	63
2	3063	2	778	128	63

GHOST will display the details of every disk it can find on the local/remote PC and allow you to select the disk you wish to copy **to**. If this is a local disk to disk copy then the source disk will be unavailable for selection.

Important: This is the disk that is going to get overwritten. Choose CAREFULLY.

Step 3 – Confirm Destination drive details

If loading from a disk image file, or doing a disk to disk copy, GHOST will display a suggested partition layout for the target disk.

By default, GHOST will allocate any extra space that the new disk has to the first FAT or NTFS partition that it discovers.

Important: You can change the size of any target FAT or NTFS partition at this stage, simply by entering the new size (in megabytes).

Use up and down arrow to move between fields. GHOST will not allow you to enter a value which exceeds the available space, or which is not large enough to contain the data held in the source partition.

When you are satisfied with the allocation of space between partitions, press ***Enter***

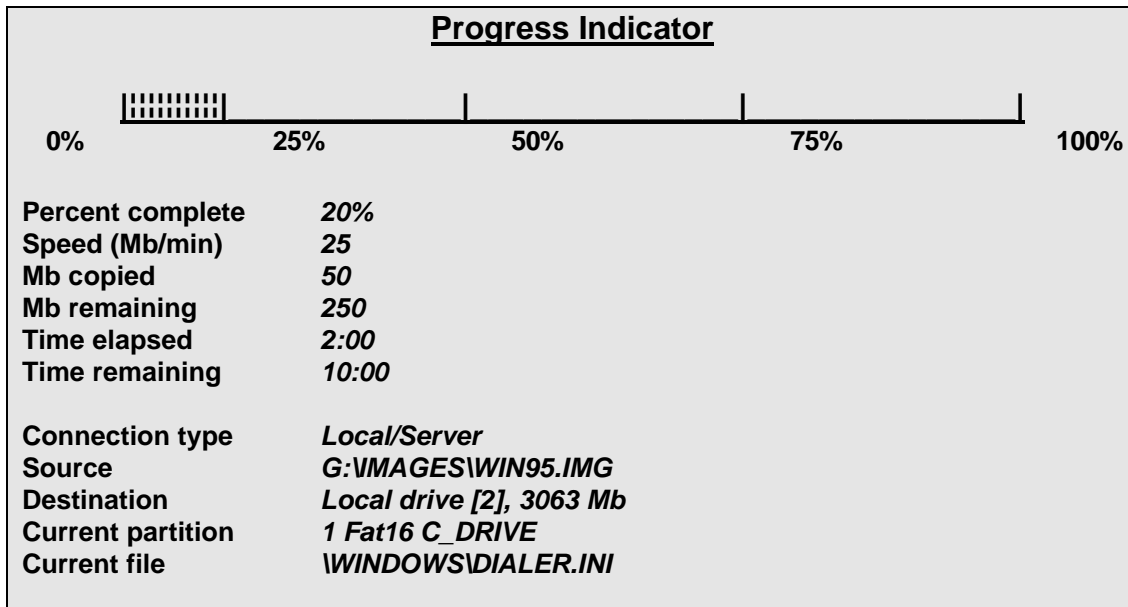
<u>Destination drive details</u>						
Part	Type	Description	Volume Label	New size in Mb	Old size in Mb	Change in Mb
1	06	Fat16	C_DRIVE	1800	800	1000
2	04	Fat16 extended	MY_DATA	200	200	0
3	07	NTFS extended	NT_DRIVE	650	650	0
4	07	HPFS extended	OS2DRIVE	400	400	0
		Free		0	0	0
				3063	2055	1000

Step 4 - Proceed with disk load

Before starting to overwrite the destination disk, GHOST displays the source and destination details and gives you a chance to back out. The default is to back out.

Only select Yes if you are really sure - the target drive will be completely overwritten, with NO chance of recovering any data.

Once the copy has started, GHOST keeps updating the Progress with information as shown.



When the disk image load is complete, the target PC will need to be rebooted (as after a change made by FDISK). By default GHOST prompts with:

Press Ctrl-Alt-Del to reboot.

Spanning an Image across multiple volumes

Overview

GHOST allows a disk or partition image to be split across multiple volumes. This is necessary where the image file would be too large to fit into a single destination file. The image is composed of two or more files (called “spans”), which are copied onto separate volumes. The only constraint on the selection of the destination volume is that it must not be part of the source selection e.g. it can not be on a source disk or partition if that disk or partition is being included in the image.

This is particularly useful for dumping disks or partitions with large amounts of data onto removable media such as JAZ or ZIP drives.

Operation

When performing a disk to image file dump or a partition to image file dump, If the destination drive does not have sufficient free space to accommodate the image, the user is first informed that there is not enough space on the destination volume and is asked whether the image file is to be compressed.

Not enough space – compress image file	
<hr/>	
Yes	No

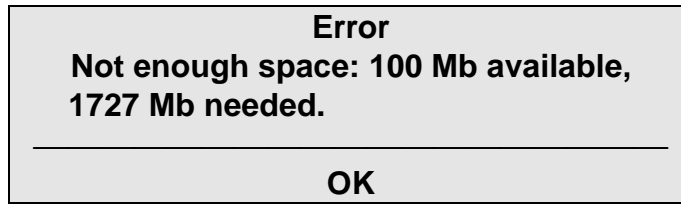
If the user selects compression and there is still not sufficient space , the following message is displayed :

There may not be enough space – Enable Spanning?	
<hr/>	
Yes	No

If the user chose not to use compression, the following message is displayed:

Do you wish to enable Spanning?	
<hr/>	
Yes	No

If Spanning is not enabled, an error message is displayed:



Before starting to dump the disk contents to the image file, GHOST displays the source and destination details and gives you a chance to back out. The default is to back out.

Once started, the dump continues until the destination volume is filled up. The user is then prompted to either select ENTER to continue, or specify where the next "span" of the image file is to be located.

Press Enter or select Filename



Either select OK to continue on the same form of Media. Example, if you started spanning onto a JAZ Drive and wish to span a 3.0 Gigabyte drive onto just JAZ disks, just hit enter to continue in JAZ disks.

If you wish to span across different forms of media, selecting "**Filename?**" Gives you the option to span onto a different location.

Caution, record where you save your segments of the "span". Also record what file name each "span" segment is. GHOST will not record where and what file name you have selected.

If you have a single partition on a drive or if you are "Imaging" a single partition, GHOST will end on the last spanned volume with not user intervention.

However, if you are "imaging" a hard drive with multiple partitions, GHOST needs to record boundary information onto the first span of the image file. This boundary information is recorded to track location of partition amongst the spanned set. The user is prompted to confirm that the first span is ready to be updated.

An example of how GHOST will prompt you for span set disk one.

Re-insert 1ST portion of spanned image
G:\D1P1IMG.IMG

When the partition dump is complete, the user is returned to the DOS prompt.

Loading from a spanned image

When loading a disk or partition from an image file, the process is the same as loading from an un-spanned image file. The loading procedure is the reverse of the dumping procedure. The user is prompted to provide details of the each portion of the spanned image:



Either select OK to continue on the same form of Media. Example, if you originally spanning onto a JAZ Drive and wish to restore a 3.0 Gigabyte drive from just JAZ disks, just hit enter to continue in JAZ disks.

If you wish to restore from different forms of media, selecting “**Filename?**” Gives you the option to restore from a different location.

Caution, you need to know where you saved your segments of the “span”. Also you must know each file name each “span” segment is.

When the disk image load is complete, the target PC will need to be rebooted (as after a change made by FDISK). By default GHOST prompts with

Press Ctrl-Alt-Del to reboot.

Check disk integrity...

This consists of two steps as follows:

1. Select local source drive.
2. Proceed with integrity check.

Step 1 - Select local source drive

Drive	Size in Megabytes	<u>Select local source drive</u>			
		Primary Partitions	Cylinders	Heads	Sectors per Track
1	2055	2	522	128	63
2	3063	2	778	128	63

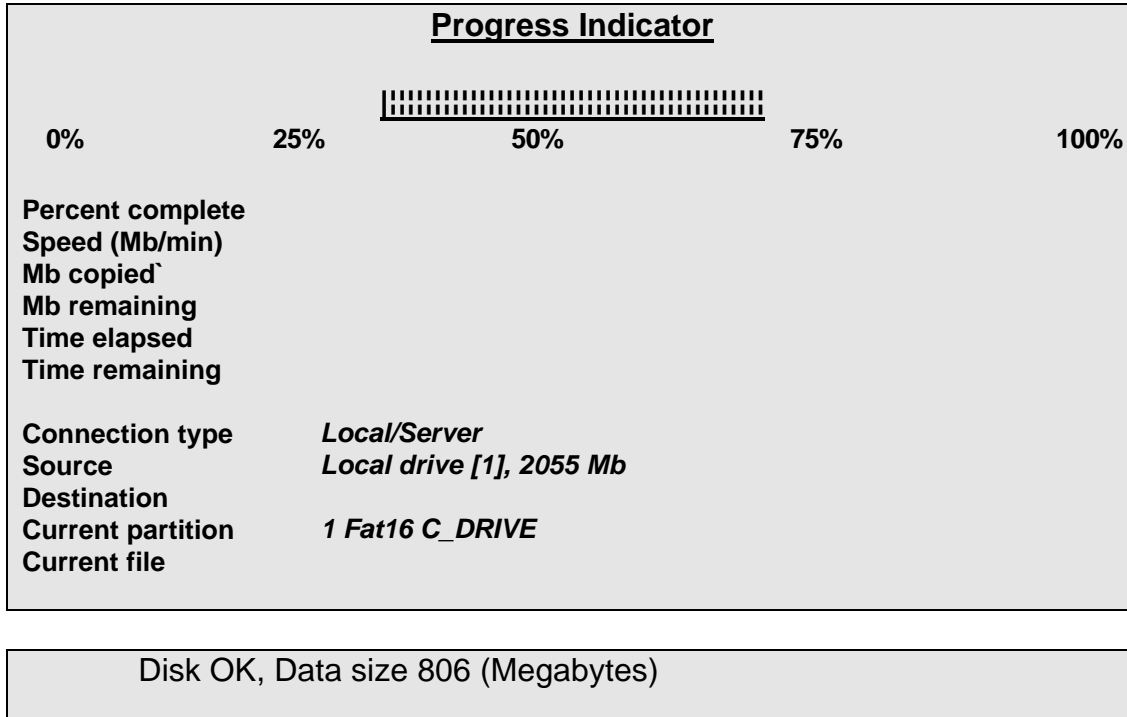
GHOST will display the details of every disk it can find on the local PC and allow you to select the disk you wish to check.

Use the up and down arrows to move the highlight bar. Press ***Enter*** to select.

Step 2 - Proceed with integrity check

Before starting to check the integrity of the selected drive, GHOST gives you a chance to back out. The default is to proceed.

The result of the integrity check is printed at the bottom of the screen and the user is returned to the DOS prompt.



Check image file integrity...

This consists of two steps as follows:

1. Enter image file name to check.
2. Proceed with integrity check.

Step 1 - Enter image file name to check

Enter image file name to check

G:\VMAGES\WIN95.IMG

Enter the full path name of the image file. E.g., if the image file resides on a server drive, you must enter the server's drive letter, any subdirectory names and of course the image file name.

If you selected the **Connection type->Local/Server**, then the image file must reside on either a server drive (the most common option) or a local drive.

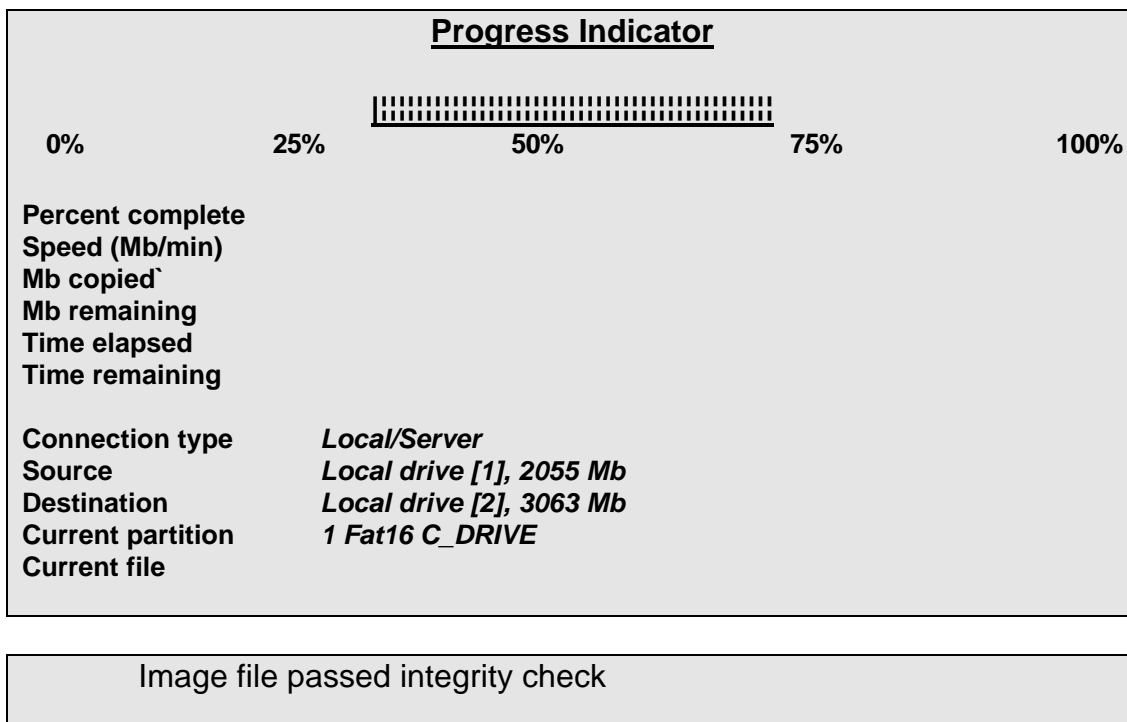
For any other **Connection type** (peer to peer via NetBIOS or LPT port) then the image file must reside on one of the remote drives.

Step 2 - Proceed with integrity check

Before starting to check the integrity of the image file, GHOST gives you a chance to back out. The default is to proceed.

Once the integrity check has started, GHOST keeps updating the Progress Indicator with information as shown.

The result of the integrity check is printed at the bottom of the screen and the user is returned to the DOS prompt.



Clone partition to partition...

This consists of five steps as follows:

1. Select source drive.
2. Select source partition.
3. Select destination drive.
4. Select destination partition.
5. Proceed with partition clone.

Note: Destination Partition MUST be pre-defined using FDISK!!

Step 1 - Select source drive

<u>Select local source drive</u>					
Drive	Size in Megabytes	Primary Partitions	Cylinders	Heads	Sectors per Track
1	2055	2	522	128	63
2	3063	2	778	128	63

GHOST will display the details of every disk it can find on the local PC and allow you to select the disk you wish to copy **from**.

Use the up and down arrows to move the highlight bar. Press **Enter** to select.

Step 2 - Select source partition

Select source partition from drive: 1					
Part	Type	Description	Volume Label	Size in Mb	Data in Mb
1	06	Fat16	C_DRIVE	800	356
2	06	Fat16 extended	MY_DATA	200	162
3	07	NTFS extended	NT_DRIVE	650	413
4	07	HPFS extended	OS2DRIVE	400	273
		Free		0	
Total				2055	1204

GHOST will display the details of all the partitions it can find on the selected source drive and allow you to select the partition you wish to copy **from**.

Use the up and down arrows to move the highlight bar. Press **Enter** to select.

Step 3 - Select destination drive

Drive	Size in Megabytes	<u>Select local destination drive</u>			Sectors per Track
		Primary Partitions	Cylinders	Heads	
1	2055	2	522	128	63
2	3063	2	778	128	63

GHOST will display the details of every disk it can find on the local/remote PC and allow you to select the disk you wish to copy the partition to.

Use the up and down arrows to move the highlight bar. Press **Enter** to select.

Step 4 - Select destination partition

Select destination partition from drive: 2					
Part	Type	Description	Volume Label	Size in Mb	Data in Mb
1	06	Fat16	C_DRIVE	500	230
2	06	Fat16 extended	OLD_DATA	540	24
3	07	NTFS extended	NT_DRIVE	1024	415
		Free		994	
Total				3063	1208

GHOST will display the details of all the partitions it can find on the selected destination drive and allow you to select the partition you wish to copy to.

Use the up and down arrows to move the highlight bar. Press **Enter** to select.

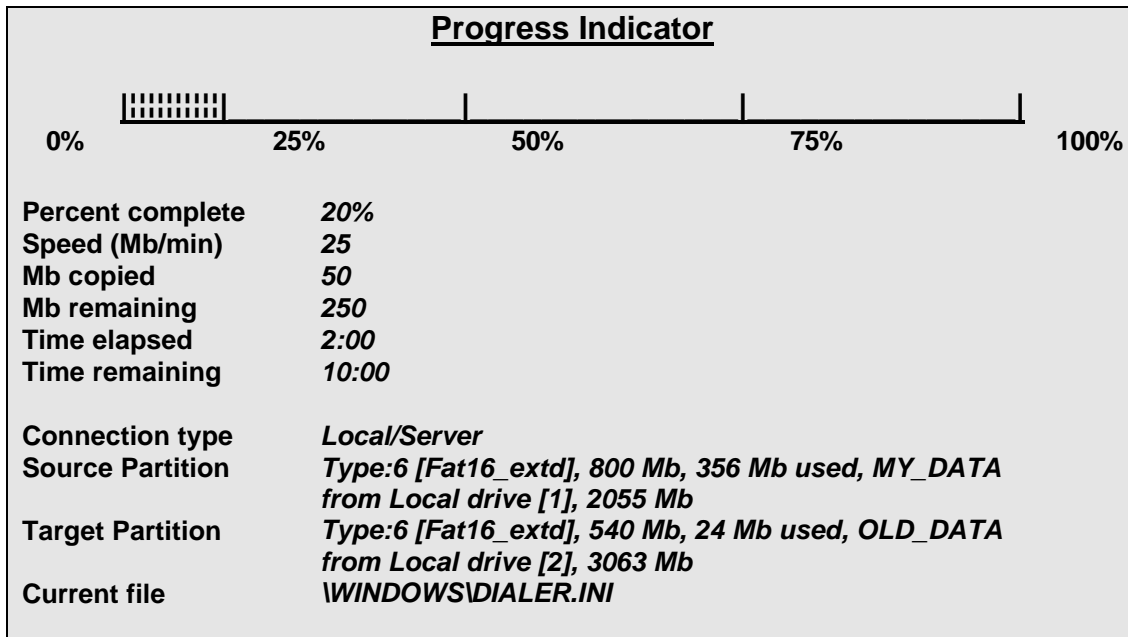
Important: This is the partition that is going to be overwritten. Choose CAREFULLY.

Step 5 - Proceed with partition copy

Before starting to overwrite the destination partition, GHOST displays the source and destination details and gives you a chance to back out. The default is to back out.

Only select Yes if you are really sure - the target partition will be completely overwritten, with NO chance of recovering any data.

Once the copy has started, GHOST keeps updating the Progress Indicator with information as shown.



When the partition copy is complete, the target PC will need to be rebooted (as after a change made by FDISK). By default GHOST prompts with

Press Ctrl-Alt-Del to reboot.

Dump partition(s) to image file...

This consists of four steps as follows:

1. Select source drive.
2. Select source partition(s).
3. Enter file name to dump disk image to.
4. Proceed with disk copy.

Step 1 - Select local source drive

<u>Select local source drive</u>					
Drive	Size in Megabytes	Primary Partitions	Cylinders	Heads	Sectors Per Track
1	2055	2	522	128	63
2	3063	2	778	128	63

GHOST will display the details of every disk it can find on the local PC and allow you to select the disk you wish to copy **from**.

Use the up and down arrows to move the highlight bar. Press ***Enter*** to select.

Step 2 - Select source partition(s)

Select source partition(s) from drive: 1						
Part	Type	Description	Volume Label	Size in Mb	Data in Mb	Select (Y/N)
1	06	Fat16	C_DRIVE	800	356	N
2	06	Fat16 extended	MY_DATA	200	162	N
3	07	NTFS extended	NT_DRIVE	650	413	Y
4	07	HPFS extended	OS2DRIVE	350	273	N
		Free		0		
Total				2055	1204	

GHOST will display the details of all the partitions it can find on the selected source drive and allow you to select the partitions you wish to include in the partition image file.

Use the up and down arrows to move the cursor. Press Y to select, N to deselect.

Step 3 - Enter file name to copy partition image to

Enter file name to copy partition image to

G:\IMAGES\WTPART.IMG

Enter the full path name of the image file. E.g. if you are dumping (copying) the partition contents to a server drive, you must enter the server's drive letter, any subdirectory names and of course the image file name.

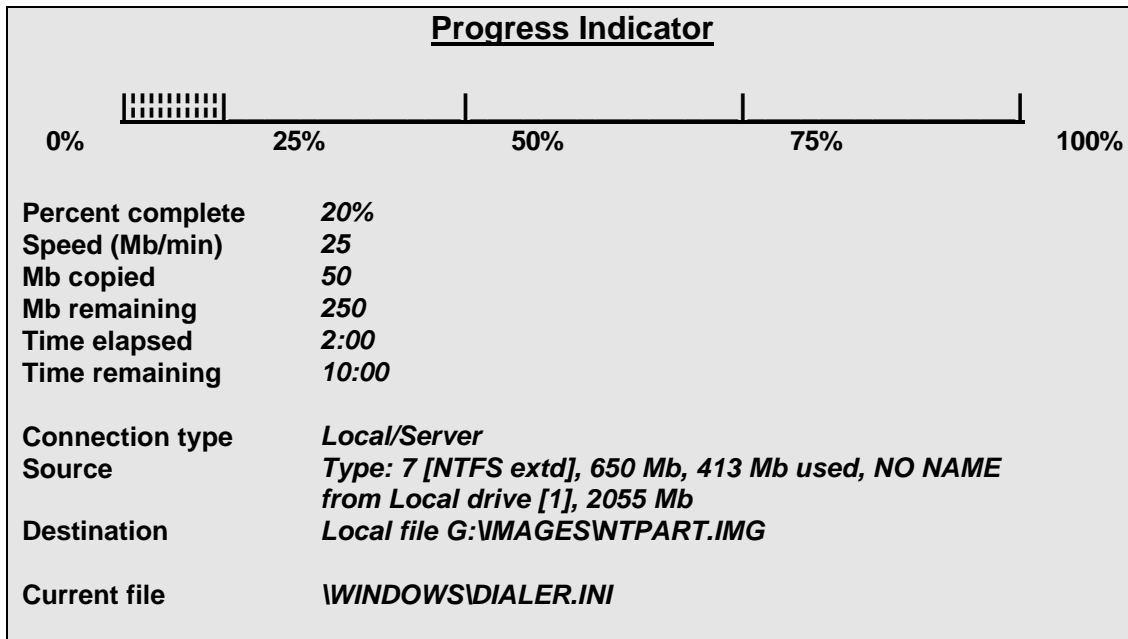
If you selected the **Connection type->Local/Server** then the destination image file must reside on either a server drive (the most common option) or a local drive (but not the one that is being copied from).

For any other **Connection type** (peer to peer via NetBIOS or LPT port) then the destination image file must reside on one of the remote drives.

Step 4 - Proceed with partition dump

Confirm whether compression is to be used (the default is No Compression). Before starting to dump the disk contents to the image file, GHOST displays the source and destination details and gives you a chance to back out. The default is to back out.

Once the dump has started GHOST keeps updating the Progress Indicator with information as shown.



When the partition dump is complete, the user is returned to the DOS prompt.

Load partition from image file...

This consists of five steps as follows:

1. Enter file name to load partition image from.
2. Select source partition from image file.
3. Select destination drive.
4. Select destination partition.
5. Proceed with partition load.

Step 1 - Enter file name to load disk image from

Enter file name to load image from

G:\IMAGES\WTPART.IMG

Enter the full path name of the partition image file. e.g., if the image file resides on a server drive, you must enter the server's drive letter, any subdirectory names and of course the image file name.

If you selected the **Connection type->Local/Server**, then the image file must reside on either a server drive (the most common option) or a local drive (but not the one that is being copied to).

For any other **Connection type** (peer to peer via NetBIOS or LPT port) then the image file must reside on one of the remote drives.

Step 2 - Select source partition from image file

Select source partition from image file					
Part	Type	Description	Volume Label	Size in Mb	Data In Mb
1	06	Fat16 extended	OLD_DATA	520	24
2	07	NTFS extended	NT_DRIVE	650	415
Total				1170	439

GHOST will display the details of the partitions it can find in the image file and allow you to select the partition you wish to copy **from**.

Use the up and down arrows to move the highlight bar. Press **Enter** to select.

Step 3 - Select destination drive

Select local destination drive					
Drive	Size in Megabytes	Primary Partitions	Cylinders	Heads	Sectors Per Track
1	2055	2	522	128	63
2	3063	2	778	128	63

GHOST will display the details of every disk it can find on the local PC and allow you to select the disk you wish to copy the partition to.

Use the up and down arrows to move the highlight bar. Press **Enter** to select.

Step 4 - Select destination partition

Select destination partition from drive: 2					
Part	Type	Description	Volume Label	Size in Mb	Data in Mb
1	06	Fat16	C_DRIVE	500	230
2	06	Fat16 extended	OLD_DATA	540	24
3	07	NTFS extended	NT_DRIVE	1024	415
		Free		994	
Total				3063	1208

GHOST will display the details of all the partitions it can find on the selected destination drive and allow you to select the partitions you wish to write the image file partition to.

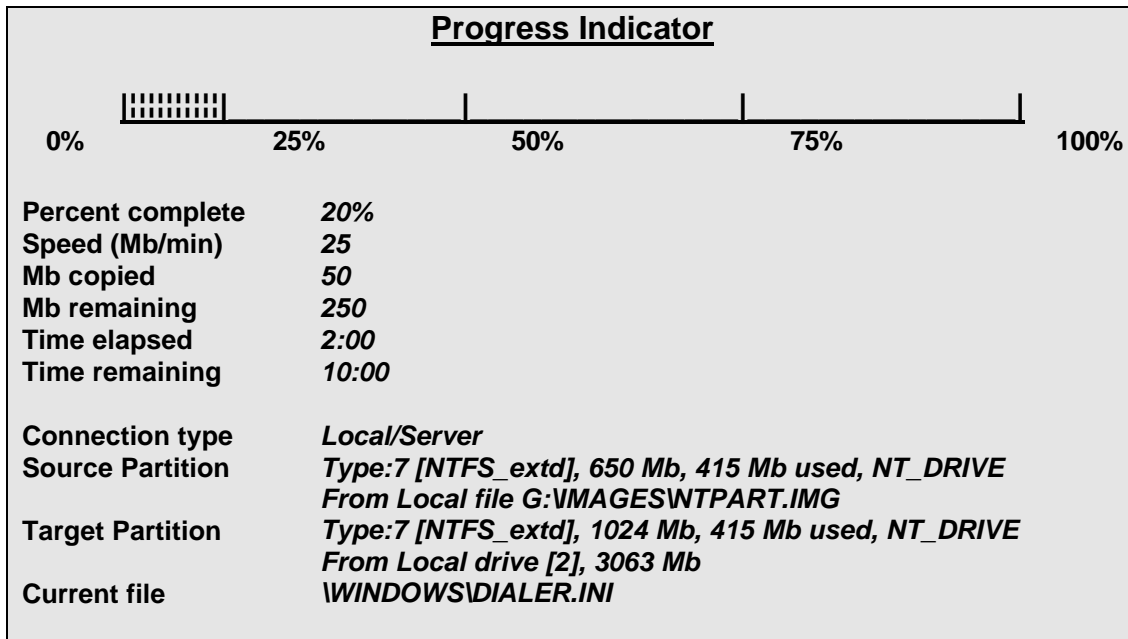
Important: This is the partition that is going to be overwritten. Choose CAREFULLY.

Step 5 - Proceed with partition load

Before starting to overwrite the destination partition, GHOST displays the source and destination details and gives you a chance to back out. The default is to back out.

Only select Yes if you are really sure - the target partition will be completely overwritten, with NO chance of recovering any data.

Once the load has started GHOST keeps updating the Progress Indicator with information as shown.



When the partition load is complete, the target PC will need to be rebooted (as after a change made by FDISK). By default GHOST prompts with:

Press Ctrl-Alt-Del to reboot.

Connecting a Workstation to a Server under DOS.

In order to facilitate dumping of images to a server and subsequent loading of images from a server, the server drive(s) must be visible to the GHOST application i.e. they must be visible to DOS.

The most convenient way to allow GHOST to copy images to the server and load images from the server is to create a network boot disk with the appropriate drivers and settings.

In general you need to understand the basics required to create a network accessible boot disk. Individual situations vary, therefore it is impossible to provide exacting procedures to assist you in creating and network client boot diskette.

Connecting to an NT Server

In the past, Microsoft provided a Workgroup Add-on for MS-DOS which could be used to create a network boot disk. Microsoft no longer supports this product.

Servers running NT 4.X can create a "Network Client" for MS-DOS installation disks which can be used to attach and "login" to a Windows NT network. To create a boot disk that is network attachable, search the help section on the NT 4.X server. NT 4.X server comes with a wizard to create DOS Network boot disks. The files on the client PC (autoexec.bat, config.sys and network drivers) can then be copied onto a boot floppy disk and used as a network boot disk.

Connecting to OS/2

Use IBM's DOS LAN Services product to generate and install the network drivers and configuration files needed.

If you have the OS/2 Warp Server CD then you can generate the diskettes needed from this. Once installed a boot diskette can be made with just the drivers and files needed.

NET Commands

Once the network drivers have been loaded, the following commands can be used to connect the DOS workstation to the server:

Command	Function
net start	<i>load network drivers</i>
net view	<i>Display list of machines</i>
net view	<i>Display list of shared resources belonging to machine.</i>
net use F:	<i>Connect F: to the shared path client on machine <u>rat</u></i>
net use /d F:	<i>To disconnect the shared drive F:</i>
net stop work	<i>Unload network drivers</i>
net stop	

Cloning Windows NT

GHOST supports NTFS and allows NTFS partitions to be expanded and contracted the same approach GHOST does with FAT partitions. NTFS image files are also supported, and no longer contain superfluous data.

Note: Unlike Win95 where GHOST can run in a DOS window on the source workstation, under WinNT the source PC must be booted under DOS.

Avoiding problems with the SID (Security Identifier)

Cloning WinNT is similar to cloning Window's 95 but there is a problem with the WinNT network Security Identifier or SID. Cloning a WinNT workstation disk can produce another workstation with a duplicate SID - something the NT Server will object to. Happily there is a way to get around this problem.

The solution relies on the way the WinNT workstation and the WinNT server assign the workstation a SID. It is not until the workstation **first connects** to the NT Server that the SID is assigned. Up to that point it is in a "waiting to be assigned" state. Therefore, the source NT workstation must be cloned (copied to a disk image file or to a destination disk) **before** the NT workstation makes its first official NT connection to the NT Server.

The sequence of actions is:

- Install the WinNT operating system from the NT installation CDROM.
- Before the NT workstation connects to the NT Server, boot it under DOS, and connect to the server (***See Connecting a workstation to a Server under DOS***).
- Make a disk image file of the source/template NT Workstation.
- Boot the target workstations under DOS, connect to the Server.
- Load the disk image file on to the target (see Cloning Multiple Workstations if you wish to do more than one at a time).
- When the disk load has finished, reboot the workstation under WinNT and when it first connects to the NT Server it's SID will be created.

Cloning Multiple Workstations

To clone multiple workstations at the same time, you must have a multi-user version of GHOST. The evaluation copy which is downloadable from <http://www.ghost.com> and the single user version will not allow cloning multiple workstations.

See **Ordering** if you need to upgrade to the multi-user version.

To clone multiple workstations at the same time:

- Make a disk image file of the system you wish to clone and save on a server drive.
- Boot the target workstations under DOS and connect to the server (**See *Connecting a workstation to a Server under DOS***).
- Use the **Local/Server->Load disk from image file...** option to load all target PC's from the same image file.
- To further automate the process, see the following section on ***Using GHOST in batch files***.

Note that, in practice, the number of workstations that can simultaneously download an image from a server depends on the speed of the Network and the speed of the Server. A medium speed network/server can generally handle five-ten concurrent GHOST loads, a high speed network/server can handle 10-20.

Using GHOST in Batch files

GHOST has two modes of operation: **Interactive** (the default) and **Batch**. Batch is useful in repetitive situations - especially when a large number of workstations need to be loaded. Most of the GHOST switches are to allow GHOST to run in batch mode. They specify such parameters as the source (disk, partition or image file), the target (disk, partition or image file), the type of connection (Local/Server, NetBIOS or LPT port) and whether to wait for user confirmation before starting.

See **Switches** for a detailed explanation of batch switches.

Some common examples of using GHOST in batch mode:

To load the disk image file SAVEDSK.IMG held on the server drive E: onto drive one of the local PC. Do not prompt if OK to proceed.

ghost -clone,mode=load,src=E:\SAVEDSK.IMG,dst=1 -sure

This example is typical of those that would be in a batch file to automate installation of workstations from a network server.

To copy drive one to drive two on a PC, without final prompt

ghost -clone,mode=copy,src=1,dst=2 -sure

To connect via NetBIOS to another PC running GHOST in slave mode, and dump a disk image of local drive two to the remote file C:\DRIVE2.IMG

ghost -nbm -clone,mode=dump,src=2,dst=C:\DRIVE2.IMG

Using GHOST inside of Windows95 from a DOS Window

GHOST can be run from a DOS window under Windows95. **Note, however, that it should not be used to load disk or partition images when run inside a Windows95 DOS window.** This is because Windows95 may write to the hard disk during the loading of the image, and corrupt the disk.

Using GHOST inside of Windows NT from a DOS Window

GHOST can not currently be run inside a DOS window under Windows NT. This is because NT traps the low level write operations that GHOST uses.

GHOST and CDROMs

GHOST can be used to install a complete Windows'95 system (or WinNT) from a single disk image file held on a CDROM. This technique is being exploited by several Universities who are issuing students with a CDROM containing a GHOST disk image file and GHOST. Students can re-load their Notebook computers from the CDROM at any stage, just by clicking on the GHOST icon. No further user-input is required.

“Burning” a GHOST disk image file onto a CDROM is a useful technique for any organization which distributes updates via CDROMS.

There is a special version of GHOST available, which will only read an image from a CDROM drive. Ask your GHOST reseller for more details.

Switches

GHOST may be run in interactive or batch mode. Batch mode is useful for automating installation or backup using GHOST. Most of the GHOST switches are used to assist with batch mode operation. To list switches from GHOST, type:

ghost -h

All switches must be preceded with a - (hyphen) or / (slash). Switches are case insensitive - they may be entered in upper, lower or mixed case. A detailed list of switches with explanations follows.

Switch	Explanation																
-AFILE	Overrides default abort log file with specified path.																
-CLONE	<p>,mode={COPY LOAD DUMP PCOPY PLOAD PDUMP},src={drive file},dst={drive file},szen={F V nnnnM nnP}</p> <p>CLONE using arguments. This is the most useful of the batch switches and has a series of arguments which define:</p> <p>(a) mode This defines the type of clone command :</p> <p>COPY – disk to disk copy LOAD – file to disk load DUMP – disk to file dump PCOPY – partition to partition copy PLOAD – file to partition load PDUMP – partition to file dump</p> <p>(b) src</p> <table> <tr> <th>Mode</th><th>Meaning</th></tr> <tr> <td>COPY/DUMP</td><td>Source drive (e.g. 1)</td></tr> <tr> <td>LOAD</td><td>Disk image filename (e.g. G:\IMAGES\SYSTEM2.IMG)</td></tr> <tr> <td>PCOPY/PDUMP</td><td>Source partition (e.g. 1:2) which indicates the second partition on drive 1.</td></tr> <tr> <td>PLOAD</td><td>Partition image filename and partition number (e.g. G:\IMAGES\DISK1.IMG:2) which indicates the second partition in the image file.</td></tr> </table> <p>(c) dst</p> <table> <tr> <th>Mode</th><th>Meaning</th></tr> <tr> <td>COPY/LOAD</td><td>Destination drive (e.g. 2)</td></tr> <tr> <td>DUMP</td><td>Disk image filename (e.g. G:\IMAGES\SYSTEM2.IMG)</td></tr> </table>	Mode	Meaning	COPY/DUMP	Source drive (e.g. 1)	LOAD	Disk image filename (e.g. G:\IMAGES\SYSTEM2.IMG)	PCOPY/PDUMP	Source partition (e.g. 1:2) which indicates the second partition on drive 1.	PLOAD	Partition image filename and partition number (e.g. G:\IMAGES\DISK1.IMG:2) which indicates the second partition in the image file.	Mode	Meaning	COPY/LOAD	Destination drive (e.g. 2)	DUMP	Disk image filename (e.g. G:\IMAGES\SYSTEM2.IMG)
Mode	Meaning																
COPY/DUMP	Source drive (e.g. 1)																
LOAD	Disk image filename (e.g. G:\IMAGES\SYSTEM2.IMG)																
PCOPY/PDUMP	Source partition (e.g. 1:2) which indicates the second partition on drive 1.																
PLOAD	Partition image filename and partition number (e.g. G:\IMAGES\DISK1.IMG:2) which indicates the second partition in the image file.																
Mode	Meaning																
COPY/LOAD	Destination drive (e.g. 2)																
DUMP	Disk image filename (e.g. G:\IMAGES\SYSTEM2.IMG)																

	PCOPY/PLOAD	Destination partition (e.g. 2:2) which indicates the second partition on drive 2.
	PDUMP	Partition image filename (e.g. G:\IMAGES\DISK1.IMG).
(d) <u>szen</u>	The <u>szen</u> argument is used to set the size of the destination partitions for either a disk load or disk copy operation.	
	F (Fixed)	This indicates that partition are to have the same size as the original source partition.
	nnnnM	This indicates that the partition is to have a size of nnnn Mb
	mmP	This indicates that the partition is to have a size of mm per cent of the target disk.
	F	Resizes the <u>first</u> partition to maximum size allowed based on file type.
	L	Resizes the <u>last</u> partition to maximum size allowed based on file type.
	V (Variable)	Indicates that the partition will be resized according to the following rules : Rule 1: If the destination disk is larger than the original source disk, then the partition(s) will be expanded to have the maximum amount of space subject to the free space available and the partition type (eg FAT16 partitions will have a maximum size of 2048 Mb). Rule 2: If the destination disk is smaller than the original source disk, (but still large enough to accommodate the data from the source disk), the free space left over after the data space has been satisfied will be distributed between the destination partitions in proportion to the data usage in the source partitions.

A few examples will help illustrate:

To copy drive one to drive two on a PC, without final prompt

Ghost -clone,mode=copy,src=1,dst=2 -sure

To connect via NetBIOS to another PC running GHOST in slave mode, and dump a disk image of local drive two to the remote file C:\DRIVE2.IMG

Ghost -nbm -clone,mode=dump,src=2,dst=C:\DRIVE2.IMG

To copy drive one, second partition on a PC to drive two, first partition on the same PC, without final prompt

ghost -clone,mode=pcopy,src=1:2,dst=2:1 -sure

To load the disk image file SAVEDSK.IMG held on the server drive E: onto drive one of the local PC. Do not prompt if OK to proceed.

ghost -clone,mode=load,src=E:\SAVEDSK.IMG,dst=1 -sure

This example is typical of those that would be in a batch file to automate installation of workstations from a network server.

To load partition 2 from an image file onto the second partition of the local disk

Ghost -clone,mode=pload,src=g:\imgs\part2.img:2,dst=1:2

To load a disk from an image file and resize the destination partitions into a 60:40 allocation

Ghost -clone,mode=load,src=g:\imgs\2prtdisk.img,dst=2, size1=60P,size2=40P

To clone a three partition disk and keep the first partition on the destination drive the same size as on the source disk, but divide up the remaining space between the other partitions leaving no unallocated space

Ghost -clone,mode=copy,src=1,dst=2,size1=F,size2=V,size3=V

-DD	This option dumps disk metrics to the dump log file.
-DFILE	Overrides default dump log file with specified path.
-DI	<u>D</u> iagnostics. This is useful for debugging purposes. For each disk present on the PC, the physical attributes such as Drive, Cylinders, Heads, Sectors per track and Total sectors are displayed. For each partition present on each disk , the Number, Type, Physical/Logical flag, Starting sector and number of sectors are displayed. The diagnostics may be redirected to a file and emailed or faxed to Binary Research to

	assist with problem solving. E.g. ghost -di >diag.ls will output disk diagnostics to the file <i>diag.ls</i>
-F64	Allows 64K clustersize when loading from old image files.
-FNX	Disables Extended INT13 Support.
-FX	Flag Exit. Normally when GHOST has finished copying a new system to a disk it prompts the user to reboot with a Press Ctrl-Alt-Del to Reboot window. However if GHOST is being run as part of a batch file it is sometimes useful to have it just exit back to the DOS prompt after completion so that further batch commands may be processed. -FX enables this. See -RB for another option on completing a clone.
-IA	Image All. When copying a partition from a disk to an image file or another disk, GHOST examines the source partition and decides whether to copy just the files and directory structure, or to do an image (sector by sector) copy. If it understands the internal format of the partition it defaults to copying the files and directory structure. Generally this is the best option, but occasionally if a disk has been set up with special hidden security files which are in specific positions on the partition, the only way to reproduce them accurately on the target partition is via an image or sector by sector copy. The Image All switch forces GHOST to do a sector by sector copy of all partitions.
-LPM	LPT Master mode. This switch causes GHOST to automatically go into LPT master mode, and is the equivalent of selecting the LPT Master option from the Connection type menu. See Peer to Peer Connections, Connecting via LPT for more information.
-LPS	LPT Slave mode. This switch causes GHOST to automatically go into LPT slave mode, and is the equivalent of selecting the LPT Slave option from the Connection type menu. See Peer to Peer Connections, Connecting via LPT for more information.
-NBM	NetBIOS Master mode. This switch causes GHOST to automatically go into NetBIOS master mode, and is the equivalent of selecting the NetBIOS Master option from the Connection type menu. See Peer to Peer Connections, Connecting via NetBIOS for more information.
-NBS	NetBIOS Slave mode. This switch causes GHOST to automatically go into NetBIOS slave mode, and is the equivalent of selecting the NetBIOS Slave option from the Connection type menu. See Peer to Peer Connections, Connecting via NetBIOS for more information.

-NTD	Enable NTFS Internal diagnostic checking.
-NTC	Enable NTFS contiguous cluster run allocation.
-NTN	Inhibit CHKDSK on NTFS Volume boot.
-NTIC	Ignore the NTFS volume CHKDSK bit.
-NTIL	Ignore non-empty NTFS Log File Check (Inconsistent volume).
-OR	<u>OVER</u>VERRIDE , allows the user to override GHOST internal space and integrity checks.
-QUIET	Disables status updates and user intervention.
-RB	<u>Re</u>Boot after finishing a load or copy . After completing a load or copy operation, the target PC must be rebooted so that the operating system can load the new disk / partition information. Normally GHOST prompts the user to Press Ctrl-Alt-Del to reboot , in a similar way to FDISK. -RB tells GHOST to automatically reboot after completing the clone, and is useful when automating GHOST in a batch command file. See the -FX switch for another option on completion of a clone.
-SPAN	Enables Spanning across volumes.
-SPLIT=x	Use this to create a “forced” size volume set. For example, if you would like to force smaller image files from a 1024 Megabyte drive, you could specify 200 megabyte segments. For example, GHOST -SPLIT=200 will divide the image into 200 Megabyte segments.
-SURE	Use the -<u>SURE</u> switch in conjunction with -CLONE to avoid being prompted with the final Proceed with disk clone - destination drive will be overwritten? Question. This command is useful in batch mode.
-XINT13ON	This forces the use of BIOS Extended Int13 system calls if present.
-Z	Forces compression to be used when dumping a disk or partition to an image file. Note that using this option will cause the operation to be much slower and is only recommended if there is insufficient space on the destination device to store the image without compression.

Glossary of Terms

Term	Meaning
Cylinders	A parameter which along with heads and sectors/track defines the size of a disk.
Disk	A hardware device to store data, typically made up of a Master Boot Record and a number of partitions.
Drive	Another name for a partition. Each drive is accessed by a drive letter. E.g. C:
FAT	File allocation table. Used by DOS, Win95 and sometimes OS/2 to allocate space to files and directories.
Head	Each disk has a fixed number of heads. A head will read from a single platter of a disk.
HPFS	High Performance File System - an alternative to a FAT file system which is used by OS/2
NetBIOS	A high level Network programming interface which is supported by lower level Network protocols such as IPX/SPX and TCP/IP.
NTFS	New Technology File System. An alternative to FAT and HPFS file systems used by WinNT
Partition	A contiguous area on a disk, defined in the Master Boot Record and which has a specific file system such as FAT, HPFS or NTFS
Sector	A 512 byte area on a disk. The smallest addressable unit.
Track	A group of sectors which make up one ring on a disk platter.

FAQ

Can GHOST for DOS handle long file names for Windows'95, Window's NT and OS/2?

Yes.

Will it work with mixed SCSI and IDE drives?

This depends on the operating system. It will do the copy successfully, but if you try and reboot then the correct disk drivers may not be present, Win95 tends to be more forgiving than OS/2 and WinNT.

Can the disk image be compressed?

The disk images for FAT (Win 3.x), VFAT (Win95) and NTFS(WinNT) only include the data for directories and files. For other partition types the partition is treated like a "black box" and all sectors are copied.

Will it work on systems with multiple Operating Systems loaded.

Yes - subject to any limitations on the operating systems. E.g. for Linux and SCO UNIX the target disk must be identical to the source disk.

Does GHOST support the beta Win9x with its FAT32 tables?

Yes.

Does it work over TCP/IP? What network protocols do work?

For general usage, all that is required by GHOST in Local/Server mode is that the server drive(s) are visible. E.g. if the server drive was **G:** then the workstation would need to connect to the server with the appropriate network software so that the workstation could access the **G:** drive. In this way, GHOST is independent of the underlying network protocol. In the less common peer-to-peer connection situation via NetBIOS, then NetBIOS must be supported by the network protocol. Most protocols do support NetBIOS e.g. TCP/IP, IPX/SPX.

Does GHOST work with NTFS? How about HPFS?

As of revision 3.0 GHOST works fully with NTFS, i.e. partitions are copied on a data basis and can be resized in the same way as FAT partitions.

GHOST will currently work with HPFS but it is clumsy. GHOST currently does not understand the internal format of HPFS, so it resorts to a sector by sector copy. This is slower than just copying the data and does not allow expanding or contracting the partitions.

Can GHOST work with WinNT? What about SIDS (Security Identifiers)?

Yes, GHOST will work with WinNT. Care must be taken when cloning WinNT workstations to avoid SID problems. See **Cloning WinNT** for more information.

Does GHOST work with Netware (by Novell) servers?

GHOST can dump and restore workstation disk images to and from a Netware server, however it has not been tested duplicating a Netware server. It is unlikely to work.

Can GHOST Clone Novell Netware volumes?

GHOST can clone Netware partitions. However, no re-sizing is available, and the configuration must be the same or Netware might have difficulties binding to dissimilar hardware configurations.

Can GHOST do a push install to a client running just TCP/IP?

No.

Why is it the only backup that doesn't clobber long file names in Win95?

Because GHOST gets underneath the usual file system interface and deals directly with the low level file structure.

Can a WinNT system be replicated to a different size disk?

Yes.

When I do a dir /a /s on the original hard drive from the root I get 4,295 files, but on the target drive I get 4,294 files. Why?

Some temporary files are not included when copying a FAT partition. These are: SWAPPER.DAT, WIN386.SWP, SPART.PAR, PAGEFILE.SYS and 386SPART.PAR

Excluding these files speeds the copy and reduces the size of the disk image files.

Does GHOST transfer data from one computer to another like Laplink or Fastlynx?

Yes, GHOST is capable of data transfer via the printer ports. Typical data transfer speed is 5-6 megabytes/minute.

How does GHOST load an image back to the hard drive without first formatting the hard drive?

To save time, GHOST formats "on the fly".

When I copy an image from a 200 Megabyte hard drive to a 1 gigabyte hard drive what about the rest of the 800 megabyte free space?

It gets formatted and is made part of the partition. The free space is available for use immediately.

How fast does GHOST work?

This depends on what GHOST is doing and the speed of the system. For a disk-to-disk copy speeds range from 20 megs/minute to 100 megs/minute. For a Network copy speeds range from 10 megs/minute to 70 megs/min.

Ordering

U.S.A	TIMPANI 9230 Deering Avenue Chatsworth, CA 91311 Phone (Toll free) 1 (888) 99-GHOST (U.S.A) Fax: 818-885-6769 Email: sales@ghost.com WWW: http://www.ghost.com
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***Other International Distributors are available.
Please visit our web site at <http://www.ghost.com>
for our current list.***

Applying the key to GHOST

If the name of your GHOST environment file is (for Example) **bm512.env**, customize using the following command line:

```
ghost -#e=bm512.env
```

GHOST must be at least revision **1.4.5** for this to work. If your version is earlier then download the latest version from **<http://www.ghost.com>**

It may pay to make a backup of your GHOST environment file in case it is accidentally deleted.

GHOST Technical Support

If you experience a problem with GHOST, the first step is to load the latest version from <http://www.ghost.com> to see if the problem persists. If it does then please fill out the following sheet and fax to **+1 (414) 964 2201** or email the details to support@ghost.com

You may contact our technical support at the following:

USA – telephone 414-961-70774-4099 fax 414-964-2201 support@ghost.com

GHOST Problem Report Sheet

Bug Number		Date	
GHOST Version			
Author			
Company			
Contact Name			
Phone number			
Internet address			
State, Country			
Abort Number			
Abort Message			
Reproducible (Y/N)		Urgency (1-5)	
Parallel, Serial, NetBIOS or Local			
Brief Description of problem			
Hardware Make and Model			
Notes			

Licensing of GHOST

GHOST is licensed and sold on a “per-seat” basis. For every workstation and or Hard Drive that you create using GHOST requires a unique license. For example if you wish to use GHOST to prepare and rollout 400 workstations to Windows 95, you need to purchase a 400 machine license pack. Or, in another example, if you use GHOST to take a single Hard Drive and clone it to other Hard Drives, each Hard Drive requires a license.

A 25 workstation license grant entitles you to use GHOST on total of 25 Unique Workstations, and no more. A 200 machine license grant, entitles you to use GHOST on total of 200 Unique Workstations, and no more.

Once a workstation is legally licensed, you may use GHOST on that workstation repetitively, as often as you wish.

Contact **TIMPANI** for complete licensing and terms:
1-888-99-GHOST

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