

# **Chapter K**

# The Diagnosis Program GDTMON

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# K. The Diagnosis Program GDTMON

GDTMON (GDT monitor) is a helpful and flexible diagnosis tool for the monitoring, maintenance and tuning of mass storage subsystems which are based on one or more ICP Controllers. The key features of GDTMON:

- Diagnosis program with a graphical user interface. Clear performance representation with variable horizontal bars
- Available under MS-DOS, NetWare 3.x & 4.x, Windows 95, Windows NT, OS/2 and SCO UNIX
- Loadable locally (on the server) or remotely from an authorized workstation (NCPE and NETBIOS protocol support)
- Indicates the performance, expressed in [KB/sec] and [IO/sec], of:
   Host Drives (Disk, Chain, RAID 0, 1, 4, 5, 10)
   Logical Drives
  - Logical Drives - SCSI Drives
- Indicates the GDT cache utilization
  - Read-Hits
  - Write-Hits
  - Separate indication for data- and parity-cache (RAID 4/5)
- Allows online changing of the GDT cache parameters:
   Cache ON/OFF
   Delayed Write ON/OFF
  - Delayed Write ON/OFF
- Allows online changing of the SCSI devices' parameters:
  - SCSI protocol
  - Synchronous or Asynchronous data transfer
     Setting of the synchronous data transfer rate
  - Disconnect/Reconnect
  - Disk Cache ON/OFF
  - Tagged Queues ON/OFF
- Indicates the structure of Logical, Array and Host Drives
- Performs online parity checking of RAID 4 and RAID 5 Host Drives
- Allows the online RAID Level migration and capacity expansion of existing Array Drives
- Saves all relevant configuration data to floppy disk or hard disk
- · Sets up or removes RAID 1 Disk Arrays while maintaining full operational conditions
- Performs Hot Plugs on RAID 4 / RAID 5 disk arrays
- Allows to add or remove a dedicated or pool Hot Fix drive while maintaining full operational conditions

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# **K.1** Loading GDTMON

As mentioned before, the GDTMON program is available for various operating systems. It can be used either locally or remotely. This means that all ICP Controllers in a network can be monitored and serviced from one (or several) workstation(s). The communication between the ICP Controller(s) and the GDTMON program is based on the NETBIOS or NCPE protocols. Thus, for example, it is possible to monitor the ICP Controller in an OS/2 workstation or the ICP Controller in the Novell NetWare fileserver from a Windows 95 workstation.

In order to be able to access a certain computer system with its ICP Controller remotely on the network, a special communication module has to be loaded first, which routes the information through the network. For a Novell NetWare fileserver this is the CTRLSRV.NLM module (NCPE). For Windows NT (server and workstation), Windows 95 and OS/2 (server and workstation) this is the NBSERVx.EXE module (NETBIOS). While the module is loaded it searches for a CTRLSRV.CFG (Novell NetWare) or NBSERV.CFG (Windows NT, Windows 95 and OS/2) file, which includes the definition of the access rights of the different users and their passwords. The CFG file assigns every user to two different access levels. Access level 0 gives the user all functions to view and change the controller-, disk-drive and disk-array-settings. Access level 1 entitles the user only to view the various settings and performance data.

The Windows NT, Windows 95 and OS/2 driver diskettes include so-called DLLs for the supported protocols. Example: If the MON4NETB.DLL file is located in the same directory as GDTMON.EXE file for Windows NT, the NETBIOS protocol is automatically used for the GDTMON on this system. As soon as the NETBIOS support of this operating system is installed during the network configuration, the GDTMON on this system can communicate through this protocol with another system in the network which has a ICP Controller. The following drivers for the 'remote' GDTMONitor are currently available:

#### **OS/2**

GDTMON32.EXE MON2NETB.DLL MON2NCPE.DLL NBSRV2.EXE NBSRV.CFG NBCLEAN2.EXE GDTMONitor for OS/2 NETBIOS DLL for OS/2 NCPE DLL for OS/2 NETBIOS Server for OS/2 Configuration file for NetBios Server NETBIOS analysis program

#### Windows NT

GDTMON.EXE MON4NETB.DLL NBSRV4.EXE NBSRV.CFG NBCLEAN4.EXE GDTMONitor for Windows NT NETBIOS DLL for Windows NT NETBIOS Server for Windows NT Configuration file for NETBIOS Server NETBIOS analysis program

#### Windows 95

GDTMON.EXE MON5NETB.DLL NBSRV5.EXE NBSRV.CFG NBCLEAN5.EXE GDTMONitor for Windows 95 NETBIOS DLL for Windows 95 NETBIOS Server for Windows 95 Configuration file for NETBIOS Server NETBIOS analysis program

The MS-DOS GDTMON also allows remote access. The DLLs are integrated into the GDT-MON.EXE file, thus there is no NETBIOS server available for MS-DOS. Since there is no NETBIOS support within MS-DOS, it is necessary to load the NETBIOS program to access from a MS-DOS workstation through the network a ICP Controller in a Windows NT and

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OS/2 workstation or server, or a Windows 95 workstation. NETBIOS is part of the Novell NetWare operating system. For the remote access of a Novell NetWare fileserver the NETBIOS program is not needed.

#### K.1.1 Loading the GDTMON Program Under NetWare

The GDTMON program for NetWare is part of the GDT *Novell NetWare* disk. GDTMON can be used either under NetWare 3.1x or under NetWare 4.0x. There are two different methods of loading GDTMON:

- loading GDTMON on the fileserver
- loading GDTMON on an authorized workstation (remote)

**Loading GDTMON on the fileserver.** Beforehand, the GDT NetWare driver (GDTRP311.DSK for NetWare 3.11, GDTRP312.DSK for NetWare 3.12 and GDTRP400.DSK for NetWare 4.x) and the auto-loading module CTRLTRAN.DSK must have been loaded on the fileserver.

LOAD GDTMON <ENTER>

on the fileserver.

**Loading GDTMON on a workstation.** In this case, too, the GDT NetWare driver and the auto-loading module CTRLTRAN.DSK must have been previously loaded on the fileserver console. In addition, the module CTRLSRV.NLM has to be loaded. This module searches for a file named CTRLSRV.CFG. This file must be located in the same directory as CTRLSRV.NLM. The system administrator has to set up a user group named GDT\_OPERATOR. All users belonging to this group are given access (through GDTMON) to the ICP Controller(s) in this specific fileserver (Access level 0). Now, the GDTMON program can be loaded from one (or more) workstation(s):

GDTMON <ENTER>

By selecting the menu *Select Controller* of the GDTMON main menu, you can now choose either a fileserver (equipped with a ICP Controller), or a ICP Controller in your workstation.

#### K.1.2 Loading the GDTMON Program Under OS/2

The GDTMON program for OS/2 is part of the GDT OS/2 disk. To load the program under OS/2, enter:

GDTMON32 <ENTER>

#### K.1.3 Loading the GDTMON Program Under Windows NT

The GDTMON program for Windows NT is part of the *GDT Windows NT* disk. To load the program under Windows NT, enter:

GDTMON <ENTER>

#### K.1.4 Loading the GDTMON Program Under Windows 95

The GDTMON program for Windows 95 is part of the *GDT Windows 95* disk. To load the program under Windows 95, enter:

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GDTMON <ENTER>

#### K.1.5 Loading gdtmon under SCO UNIX

In order to be able to use the gdtmon program under SCO UNIX (2.x, 4.x and 5.x), it becomes necessary to substitute the standard terminal entry by a new one:

cd /usr/lib/terminfo <ENTER> tic gdt386.src <ENTER>

Before each loading of gdtmon, this terminal has to be activated by:

TERM = gdt386 <ENTER> export TERM <ENTER>

These two lines can also be inserted in the **.profile** file and will then be automatically processed during each login. The gdtmon program itself is copied during the SCO UNIX installation (chapter G of this User's Manual) into the */etc* directory. gdtmon is loaded by entering:

gdtmon <ENTER>

# K.2 The GDTMON Program

As mentioned before, the GDTMON program appears identical for all operating systems, so we can demonstrate the use and functioning of this program regardless of the operating system used. In previous chapters we have already described the hierarchical structure of the GDT firmware. We have defined 4 different levels of hierarchy: Level 1 where the physical SCSI drives named **Physical Drives** are found, level 2 containing the **Logical Drives** (made up of one or several **Physical Drives**), level 3 where we have the **Array Drives**, and finally, level 4 where the **Host Drives** are. Only the latter ones are known to the operating system. The drive of a given level of hierarchy is always set up by using the drives of the next lower level as components. Accordingly, GDTMON has various menu options, each referring to one level of hierarchy

Host Drives	 Level 4
Logical Drives	 Level 2
Physical Drives	 Level 1

Each menu option displays the performance of the drives belonging to the corresponding level. (Note: The performance of Array Drives and Host Drives is identical). The performance is measured in KB/s (kilobyte per second, transfer rate) and IO/s (I/Os per second, number of simultaneously processed I/Os on the ICP Controller). The performance is displayed numerically as well as graphically in the form of variable horizontal bars, with separate indications for each drive and its write and read accesses.

#### K.2.1 Select Controller

This menu option yields a list of available ICP Controllers. By selecting a protocol, you have either access to the ICP Controller(s) in your local computer (e.g., MS-DOS, Windows NT, Windows 95 or OS/2 protocol), or to a ICP Controller in another computer (server or work-station) in the network (NetWare NCPE or IBM NETBIOS protocol). All diagnosis and maintenance functions of GDTMON refer to the ICP Controller you have selected here (and the SCSI devices connected with this controller).

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(MS-DOS) in the Select Protocol menu indicates that the GDTMON program was loaded on a MS-DOS computer. I.e.: If GDTMON had been loaded under Windows NT, we would see there (Windows NT).







#### K.2.2 Host Drives

This menu option leads to the list of available Host Drives (level 4). We would like to recall that the operating system (e.g., NetWare) only recognizes these Host Drives and not their possibly complex structures. This means that it is of no importance for the operating system if a Host Drive consists of one single SCSI drive (of the type *disk*), or of 5 SCSI drives configured to form a RAID 4 Array Drive. Apart from the performance, the name, type, state and capacity (1024KB = 1MB) of a Host Drive is displayed. The figures shown at *Total* represent the overall performance of the Host Drives as a whole. With the  $\leftarrow$  and  $\rightarrow$  keys you may change the scale of the graphical KB/s indication. With the  $\uparrow$  and  $\downarrow$  keys you can scroll the screen to see further Host Drives (if available).

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GDT6537RP in Local\_Sys Ticks= 24 Samples: 2 Rat (Note: All Host Drives on the screen shown above are idle.)

#### K.2.3 Logical Drives

This menu option yields a list of available Logical Drives (level 2). Logical Drives are the components for Array Drives and Host Drives. In its most simple form, a Host Drive consists of one Logical Drive which is made up of a single SCSI drive (type *disk*). In case of RAID Host

2 Rate: 1.0s Scale:+ →

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Drives, the performance of the Logical Drives forming a RAID Host Drive are shown in the menu *Logical Drives*. The performance data displayed here gives immediate information on the quality of a given Host Drive. When judging the indicated performance of Logical Drives belonging to a RAID Host Drive, the following considerations should be taken into account:

(a) **RAID 0, RAID 1, RAID 10 and RAID 5 Host Drives** If a certain Logical Drive shows poor performance for a longer period (when compared to the other Logical Drives), this Logical Drive impairs the overall performance, making it the *bottle neck* of the entire RAID Host Drive.

#### (b) RAID 4 Host Drives

In principle, the same as in (a) applies to RAID 4 Host Drives, with the exception made for the parity Logical Drive. The poor performance can have various reasons: the SCSI drive forming the Logical Drive

- is too slow (different from the other SCSI drives with regard to type or manufacturer) has wrong parameters (SCSI II, disk cache, tagged queues etc.) has too many defects, causing the read/write actuator to have to move to *alternate tracks* very often

When setting up RAID 4/5 Host Drives, please observe the notes on RAID 4/5 Host Drives exposed in the chapter GDTSETUP in Detail.



GDT6537RP in Local Sys Sampling Rate= 1.0 sec

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GDT	Controller Monit (C) Copyrig	tor v1.2 yht 1994	5 ICP - -1997 ICP	Intellio vortex (	rent Compute Computersyst	r Peripherals (TM eme GmbH	1)
	L	ogical D	nive Stat	istics	6 2	8 9 1 0 MB/	/=
	<u>_KB/s_I0/s_</u>						2
Read: Write:	00 00 LogDrive_1	Name :	DISK_A6	Disk:	ok	Size[MB]: 20	<b>3</b> 0
Read: Write:	00 00 Log. Drive 2	Name :	DISK_B3	Disk:	ok	Size[MB]: 200	<b>2</b> 8
Read: Write:	00 00 Log. Drive 3	Name :	DISK_C2	Disk:	ok	Size[MB]: 20	<b>7</b> 0
Read: Write: ▼	00 00 Log. Drive 4	Name :	DISK C4	Disk:	ok	Size[MB]: 20	<b>7</b> 0
Total Read: Write:	KB∕s I0∕s ⊢ 0 0 0 0	.1	.2 .3	.4 .5	.6 .7	.8 .9 1.0 MB/	s

The figures under *Total* represent the total performance of all Logical Drives. With the  $\leftarrow$  and  $\rightarrow$  keys you may change the scale of the graphical KB/s indication. With the  $\uparrow$  and  $\downarrow$  keys you can scroll the screen to see more Logical Drives (if available).

# **K.2.4 Physical Drives**



In addition to the performance report on the SCSI drives, you are given additional information on each device:

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- the GDT SCSI channel the SCSI drive is connected to
- which SCSI-ID the drive has the name of the SCSI drive
- the gross capacity (1MB = 1024KB)



The Retries/Reassigns counters have a particular meaning:

(1) The Retries counter is incremented by one unit whenever the ICP Controller retries to access a SCSI device. If this counter continues to increase (possibly on other SCSI drives, too) it is very likely that the SCSI cable is not *good* enough for the selected data transfer rate (cable too long, poor quality of cable and connectors), or that the SCSI bus is not properly terminated (too many terminators on the cable, or missing terminator). In very few cases is the SCSI drive concerned defective. The retry counter also increases when the SCSI parameters of a SCSI drive are changed (see further ahead). Obviously, retries due to this do not imply bad SCSI cabling.

(2) The reassign counter reflects the number of media defects which occur on the SCSI drive. Defective blocks of the SCSI device are assigned substitute blocks (spare blocks) which are either on the same track, or on alternate ones if all spare blocks (spare blocks) are already in use. The administration of the reassignments is carried out by the SCSI drive through according reassignment tables. Note: If a SCSI drive works with alternate tracks, it is generally no longer suitable for applications with high performance expectations. Whenever a defective block is being accessed, the read/write actuator has to move to an alternate position and this requires extra time. If you observe that the number of reassigns is constantly increasing, you may suspect that

something is wrong with this drive. With the  $\leftarrow$  and  $\rightarrow$  keys, you can change the scale of the graphical KB/s indication. With the  $\uparrow$  and  $\downarrow$  keys, you can scroll the screen to see more SCSI drives (if available).

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# **K.2.5 Cache Statistics**

This menu option gives information on the utilization of the GDT cache. For RAID 4/5 Host Drives, the data cache and parity cache are displayed separately. Note: The GDT firmware only allocates cache RAM to the GDT parity cache if RAID4/5 Host Drives have been extended. Drives have been set up.

GDT Controller Monitor v1.25 ICP - Intelligent Computer Peripherals (C) Copyright 1994-1997 ICP vortex Computersysteme GmbH	(TM)
Main Menu Select Controller Host Drives Logical Drives Physical Drives Cache Statistics Sampling Rate View/Change Settings F10: Toggle Colors F10: Toggle Colors	
GDT Controller Monitor v1.25 ICP - Intelligent Computer Peripherals (C) Copyright 1994-1997 ICP vortex Computersysteme GmbH	(TM)
Cache Statistics Cache : Delawel United on Cache Sizer (2004 MD	
cache: on Delayed Write: on Cache Size: 15384 KB Dirty Buffers:	0%
Read Hits: 0 Read Hits: (average)	0% 0%

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0 Flush Writes:

Write Hits: 0 Write Hits: (average)

GDT6537RP in Local\_Sys Ticks= 14 Samples:

Replacements:

0% 0%

Ø

0 Cache Writes:

2 Rate: 1.0s F10: Reset



# K.2.6 Sampling Rate

By setting the sampling rate, you can choose the interval at which the ICP Controller delivers new measurements. According to the operating system used, the sampling rate can be set to a maximum of 60 seconds. The default setting is 1 second.



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# K.3 The Menu: View/Change Settings

This menu includes a set of very powerful options and functions for the online maintenance and diagnosis of RAID 1/4/5/10 Host Drives.

GDT Control	ler Monitor v1.25 ICP - Intelligent Computer Peripherals (TM) D Copyright 1994-1997 ICP vortex Computersysteme GmbH
GDT6537RP in I	Main Menu Select Controller Host Drives Dysical Drives Cache Statistics Sampling Rate Uiew/Change Settings 10: Toggle Colors
From this menu you	can select further submenus:
Controller	<ul> <li>View the ICP Controller configuration</li> <li>View Last Events</li> <li>View/Change the Intelligent Fault Bus settings</li> </ul>
<b>Cache Settings</b>	- View/Change the GDT cache parameters
<b>Physical Drives</b>	- View/Change the SCSI parameters
Logical Drives	<ul> <li>Display the structure of Logical Drives</li> <li>Add/Remove Mirror Drives to/from Host Drives</li> <li>Perform a Hot Plug on a RAID 1 Host Drive</li> <li>Add/Remove Private Hot Fix and Pool Hot Fix drives to/from a RAID 1 Host Drive</li> </ul>
Array Drives	<ul> <li>Display the structure of RAID 4/5/10 Host Drives</li> <li>Perform a Parity Verify on RAID 4/5 Host Drives</li> <li>Perform a Parity Recalculation on RAID 4/5 Host Drives</li> <li>Perfrom online capacity expansion and/or RAID level migration</li> <li>Perform a Hot Plug on RAID 4/5/10 Host Drives</li> <li>Add/Remove Private Hot Fix and Pool Hot Fix drives to/from RAID 4/5/10 Host Drives</li> </ul>
Save Information	- Save all relevant configuration data to disk

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Before going into detail, some information on the so-called Hot Plug of fault tolerant disk arrays (RAID 1/4/5/10) is given below.

#### K.3.1 Notes and Information on the Hot Plug function of GDTMON

Fault tolerant means that a hard disk which is part of a RAID 1/4/5/10 Array Drive can fail without causing data loss on the Array Drive. At the same time, the Array Drive remains fully accessible. Obviously, the Array Drive then lacks the redundant data, therefore the defective disk should be replaced by an intact one as soon as possible. In chapters C (*RAIDYNE Quick-Setup*) and L (*GDTSETUP in Detail*), we have shown with various examples how to exchange a defective drive with GDTSETUP. Moreover, we described the functioning of the so-called Hot Fix drive. This "constantly available spare part when needed" automatically integrates itself into the Array Drive and is therefore the quickest means of regaining a redundant Array Drive.

The Hot Plug function enables the replacement of a drive of an Array Drive (either in the *ready* or *fail* state) while the system continues to run, that is, without having to shut down the NetWare fileserver for instance. A drive replacement may not only become necessary when the drive has already failed, but also when there are signs that a failure could occur soon (strong whistling of the hard disk, or constant retries of the read/write head). Only those users with thorough knowledge of RAID and the ICP Controller should use the Hot Plug function. Improper use can lead to data loss. (Naturally, we have integrated all kinds of security provisions into the ICP Controller and GDTMON. But how can we prevent a user from plugging out the wrong drive?). We recommend that you document each Array Drive immediately after its configuration with GDTSETUP. This record should at least comprise the following information:

- To which ICP Controller has the Array Drive been connected ?
- Which SCSI devices (hard disks) are part of the Array Drive ?
- To which SCSI ID have they been set?
- Which SCSI devices terminate a SCSI channel?

In addition, the SCSI devices themselves should be labeled with the above information. The following is an example of such a label.



**C**: controller number **y**: SCSI-ID

**f**: + = terminated, - = not terminated

Example:



controller number 1, SCSI channel B, SCSI-ID 6, Logical Drive number 3, terminated. The menu option *Save Information* of GDTSETUP, GDTMON program can be of help when setting up the documentation.

#### How does the Hot Plug mechanism work?

During the Hot Plug, the SCSI channel of the ICP Controller to which the drive to be exchanged is connected, is temporarily "halted" (for the time needed for the exchange), so that the drive can be disconnected from the SCSI bus and replaced without any risk. After the replacement, the SCSI channel halt is lifted and the firmware automatically begins to

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rebuild the new drive. The halting and the halt-lifting of the GDT SCSI channel is controlled by the Hot Plug function. The above mentioned halting of the SCSI channel avoids that interferences caused by plugging off the drive impair the functioning of other drives still active on this SCSI channel. Moreover it prevents the possible destruction of the SCSI processors of the ICP Controller or the SCSI protocol ICs of the SCSI drives. However, this implies that none of the SCSI devices of the halted SCSI channel can be accessed during the time the defective drive is being exchanged. This may affect, for example, other drives of this Array Drive, other Array Drives, simple Host Drives (of the type disk etc.), and *Not Direct Access Devices* (CD-ROMs, DAT streamers, MOs, etc.). If the ICP Controller has only one SCSI channel, or if all SCSI devices are connected to one single SCSI channel, then no SCSI device can be accessed during the time of replacement. Therefore, it is evident that it is best if the ICP Controller had as many SCSI channels as possible and that all SCSI devices were distributed equally to the available channels in order to avoid that the Array Drive or other SCSI devices cannot be accessed during the Hot Plug drive replacement. This nonaccessibility of the Array Drive during the replacement is communicated to the operating system by the GDT driver program that integrated the ICP Controller into the operating system. If the period of non-accessibility becomes too long a system error may occur. The Hot Plug should be carried out as quick as possible.

Various manufacturers offer so-called *Disk Shuttle* (sometimes also called *Disk Shelf*) subsystems. There are two categories of these subsystems: Non-Intelligent and Intelligent. Both generally consist of the shuttle itself, a shock safe metal or plastic enclosure containing the hard disk, a frame which is mounted in the computer case or in an external subsystem, and a sufficient cooling system.

Especially the last component is very important. If the hard disks run too hot, it is very likely that they will fail. In addition, their lifetime is reduced dramatically. The mounting frame has appropriate slide rails and locks that fit with the shuttle. The shuttle can be slid into or out of the mounting. When using any of these systems you have to make sure that the SCSI termination (regardless of whether the drive has been terminated or not) is made in the mounting frame. In addition, always use high quality connectors for the SCSI buses and the power supply. It is very important that during the plug out, the SCSI bus is disconnected first, and then the power supply. When plugging in again, the order is vice versa. The Non-Intelligent subsystems have no communication with the ICP Controller and no intelligent backplane (i.e., with sensors).

If it is intended to avoid this halting and halt-lifting of the GDT SCSI channel, an Intelligent subsystem is needed. The ICP Controllers support two different types of such subsystems: SAF-TE and DEC<sup>TM</sup> fault bus compliant subsystems. SAF-TE stands for <u>SCSI Accessed Fault-</u>Tolerant Enclosure and is soon becoming part of the SCSI specification. The DEC<sup>TM</sup> fault bus is a special technology from Digital Equipment (TM).

With these subsystems, the ICP Controller enables the performance of the so-called *Auto Hot Plug*, which reduces the whole Hot Plug procedure to the simple replacement of the disk shuttle which contains the desired hard disk. Furthermore, these subsystems have typically several LEDs to indicate for example the disk shuttle which contains the defective hard disk.

#### K.3.2 Controller

This option displays details on the ICP Controller. For example, how much Cache RAM the ICP Controller has and what the current termination setting of the various SCSI channels is.

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GDT Controller Monitor v1 (C) Copyright 19	.25 ICP - Intelligent Computer Peripherals (ТМ) 94-1997 ICP vortex Computersysteme GmbH
Controller Type: Processor: Cache RAM Size: Cache RAM Size: Channel Count: Ca Serial Number: Ph Firmware Version: Hardware Level: Ar Sa Channel SCSI-ID A 7 B 7 C 7	Controller Information GDT6537RP 1960RP-33-3.3, 33MHz (28820013/18861013) ED0, 60 ns 16384 KB, 1 bank(s) 3 08C0127F 02.19.00-R009 0 SCSI Termination 0n 0n 0n
L F2:Last Events F3	3:Fault Bus

GDT6537RP in Local\_Sys Sampling Rate= 1.0 sec

Press <F3> to get detailed information on the configuration of the Intelligent Fault Bus (IFB). Changing and enabling these features requires the existence of an IFB-compatible subsystem.



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# K.3.3 Cache Settings

This submenu displays the current GDT cache settings which can be changed here. The various settings are:

Cache ON	the GDT cache is enabled, that is, all accesses to the Host Drives pass through the GDT cache
Cache OFF	the GDT cache is disabled
Delayed Write ON	Write accesses are delayed, i.e., the write-back cache algorithm is active
Delayed Write OFF	All write accesses are directly transmitted to the Host Drives. If delayed-write is off and the Cache is ON, the GDT cache works exclusively as a read cache.

Note: Best performance is achieved with Cache ON and Delayed Write ON.



GDT6537RP in Local\_Sys Sampling Rate= 1.0 sec

#### **K.3.4 Physical Drives**

This option gives a list of all direct access SCSI devices connected to the ICP Controller. Besides information on the GDT SCSI channel, the SCSI-ID, the name/vendor and the gross capacity (1MB = 1024KB), it also shows which SCSI device(s) belong to a given Logical Drive.

When you select a SCSI device in this list and then press <ENTER>, GDTMON gives you further information on the *Drive Settings* of this SCSI device. These settings may be changed.

The Last Status information should always be 0x00000000. After a device failure or other significant events, a different value may be displayed here. Chapter L.7.4 of this manual

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gives an excerpt of the SCSI specification with all relevant device Last Status information. This information may be of assistance in further analysis of the problem.

The Grown Defects counter shows the number of media defects which have occurred since the first time the device was operated with a ICP Controller. A specific SCSI hard disk is in a good condition when it has 0 grown defects. When this counter increases, there is definitely something wrong with the device.



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If you select the SEP of a SAF-TE subsystem, GDTMON displays a list of the installed and configured slots in the subsystem  $% \left( {{\rm SEP}} \right) = {\rm SEP} \left( {{\rm SEP}} \right) = {\rm$ 

GDT Controlle: (C)	r Monitor v1.25 ICP Copyright 1994-1997 I	- Intelli CP vortex	gent Compu Computersys	ter Peri steme G	ipherals (T mbH	M)
r View/Chg.	Ch: B ID: 0 CONNER Ch: B ID: 1 CONNER Ch: B ID: 2 CONNER Ch: B ID: 3 nStor	CFP2105E CFP2105E CFP2105E CFP2105E CR8 SA	Size[MB]: Size[MB]: Size[MB]:	2047 2047 2047	Log. Drive Log. Drive Log. Drive	555
Con Cac Slot	SAF-TE Con Installed Disk	figuration				
Log Ø Arr 1 Sav 2 3	Ch: B ID: B CONNER Ch: B ID: 1 CONNER No hard disk instal No hard disk instal Slot not present	CFP2105E CFP2105E led in this led in this	Size[MB]: Size[MB]: s slot s slot	2047 2047		
5 67	Slot not present Slot not present Slot not present					
F2:	<pre></pre>	< C.	ancel >			

GDT6127RP in Local\_Sys Sampling Rate= 1.0 sec

Press <F2> to get the status of the SAF-TE enclosure.



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# K.3.5 Logical Drives

This command yields a list of the existing Logical Drives. In addition to the Logical Drive numbers, information on the drives' type, state, net capacity and belonging to a given Array Drive / Host Drive is displayed. Press <F2> to obtain further information on a selected Logical Drive.

(C) Copyright 1994-1997 ICP vortex Computersysteme GmbH	
Log. Drive 1: Disk: ok Size[MB]: 200 Array Drive 5 Log. Drive 2: Disk: ok Size[MB]: 2008 Array Drive 5 Log. Drive 3: Disk: ok Size[MB]: 200 Array Drive 5 Log. Drive 4: Disk: ok Size[MB]: 200 Array Drive 5 Log. Drive 5: Disk: ok Size[MB]: 200 Array Drive 5 Cont Cach Phys	
ogil F2: Drive Information Array Save Information View/Change Settings	
DT6537RP in Local_Sys Sampling Rate= 1.0 sec	
GDT Controller Monitor v1.25 ICP - Intelligent Computer Peripherals (TM) (C) Copyright 1994-1997 ICP vortex Computersysteme GmbH Logical Drives Log. Drive 1: Disk: ok Size(MB1: 2008 Array Drive 5 Log. Drive 2: Disk: ok Size(MB1: 2008 Array Drive -	
GDT Controller Monitor v1.25 ICP - Intelligent Computer Peripherals (TM) (C) Copyright 1994-1997 ICP vortex Computersysteme GmbH Logical Drives Log. Drive 1: Disk: ok Size(MB1: 2008 Array Drive 5 Log. Drive 2: Disk: ok Size(MB1: 2008 Array Drive 5 Log. Drive 3: Disk: ok Size(MB1: 2008 Array Drive 5 Log. Drive 4: Disk: ok Size(MB1: 2008 Array Drive 5 Vie Con Cas Con Con Con Con Con Con Con Con	
GDT Controller Monitor v1.25 ICP - Intelligent Computer Peripherals (TM) (C) Copyright 1994-1997 ICP vortex Computersysteme GmbH Logical Drives Log. Drive 1: Disk: ok Size(MB1: 2008 Array Drive Log. Drive 2: Disk: ok Size(MB1: 2008 Array Drive Log. Drive 3: Disk: ok Size(MB1: 2008 Array Drive 5 Uie Con Ch: A ID: 6 SEAGATE ST52160N Size(MB1: 2008 Ch: A ID: 6 SEAGATE ST52160N Size(MB1: 2008 Array Drive 5 View/Change Settings	

Press <ENTER> to select a Logical Drive. The following options become available:

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# K.3.5.1 Set Logical Drive Name

Change the name of the Logical Drive. This name was defined within GDTSETUP, either automatically, or manually.

# K.3.5.2 Hot Plug: Replace Mirror Drive

If a RAID 1 or RAID 10 Host Drive has already been set up, a defective drive can be replaced (Hot Plug) while the system continues to be fully operational.

GDT Controller Monitor v1.25 ICP - (C) Copyright 1994-1997 ICP	Intelligent Computer Peripherals (TM) vortex Computersysteme GmbH prical Daiwes
Log. Drive 1: Disk: o Log. Drive 2: Disk: o Log. Drive 3: Disk: o Log. Drive 4: Disk: o Uiew Log. Drive 4: Disk: o Cont Cach Phys	SizelMBJ: 200 Array Drive 5 K SizelMBJ: 2008 Array Drive - 5 K SizelMBJ: 200 Array Drive 5
Array Save Information Sampling View/Chan	Logical Drive Settings Set Log. Drive Name Hot Plug: Replace Mirror Drive Hot Plug: Add Mirror Drive Hot Plug: Add Pool Hot Fix Drive Hot Plug: Remove Mirror Drive Hot Plug: Remove Pool Hot Fix Drive Hot Plug: Remove Pool Hot Fix Drive Pool Hot Fix Access

There are typically two different applications, where a Hot Plug becomes necessary.

**Application 1.** The RAID 1/10 Array Drive is in the fault tolerant (both drives are valid: *vv*). It is likely that a drive will fail soon (for example when there is a loud operating noise). As a preventative measure, this drive ought to be exchanged now, that is, in a moment when the Array Drive is still in a ready state and still has redundancy.

**Application 2.** The Array Drive is no longer fault tolerant, because a drive of the Array Drive has actually failed. The Array Drive is still fully operational, but it does not have redundancy any more. If another drive should fail, too, the Array Drive's functionality is impaired.

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#### **Example Session for Application 1**

We assume that there is a RAID 1 Array Drive which is fault tolerant. Its state is *w*, both Logical Drives are valid. After selecting the Array Drive, we choose the Replace Mirror Drive option.

GDT Controller Monitor v1.25 ICP - I (C) Copyright 1994-1997 ICP v	ntelligent Computer Peripherals (TM) ortex Computersysteme GmbH
Uiew Cont Cach Phys Logil F2: Drive Information —	ical Drives vv SizelMBJ: 200 Array Drive
GDT6537RP in Local_Sys Sampling Rate= 1.	te Settings Ø sec
GDT Controller Monitor v1.25 ICP - I (C) Copyright 1994-1997 ICP v Log Log. Drive 0: Mirror: ok	ntelligent Computer Peripherals (TM) ortex Computersysteme GmbH ical Drives vv SizeLMBI: 200 Array Drive
Logi Array Save Information Sampling View/Chan	Logical Drive Settings Set Log. Drive Name Hot Plug: Replace Mirror Drive Hot Plug: Add Mirror Drive Hot Plug: Remove Mirror Drive Hot Plug: Add Pool Hot Fix Drive Hot Plug: Remove Pool Hot Fix Drive Pool Hot Fix Access

A list is displayed which shows the members of the RAID 1 Array Drive.

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GDT Controller Monitor v1.25 ICP - Disk	Intelligent Drives ——	Computer	Periphera	als (TM)
No. Position Chn. ID Status Vendor T	уре	Attr.	Size[MB]	Drive
Ø PCI Ø/9 A Ø i SEAGATE S	T52160N	RW	2068	valid
I PCI 0/9 H 6 I SERGHTE S	122100N	RW	4068	Valla
L Select one of the disk drives for Hot	t Plug ——			
View/Chan	Hot Plug: J	Replace Mi	irror Driv	ve
	Hot Plug: A Hot Plug: J	ldd Mi Remove Mi	irror Driv irror Driv	ve Ve
	Hot Plug: A	dd Poo	ol Hot Fix	x Drive
	Pool Hot Fi	v Assacc	/1 1100 1 1/	
ONT/FORM is less 1 out of the Determined	rooi not ri	IX HUCESS		
GD16537KP in Local_Sys Sampling Rate= 1				
GDT Controller Monitor v1.25 ICP -	Intelligent	Computer	Periphera	als (TM)
GDT Controller Monitor v1.25 ICP - Disk	Intelligent Drives	Computer Attr.	Periphera Size[MB]	als (TM) Drive
GDT Controller Monitor v1.25 ICP - Disk No. Position Chn. ID Status Vendor T	Intelligent Drives Type	Computer Attr.	Periphera Size[MB]	als (TM) Drive
GDT Controller Monitor v1.25 ICP - Disk No. Position Chn. ID Status Vendor T 0 PCI 0/9 A 6 i SEAGATE S 1 PCI 0/9 C 2 i SEAGATE S	Intelligent Drives Type T52160N	Computer Attr. RW RM	Periphera Size[MB] 2068 2068	als (TM) Drive valid valid
GDT Controller Monitor v1.25 ICP - Disk No. Position Chn. ID Status Vendor T 0 PCI 0/9 A 6 i SEAGATE S 1 PCI 0/9 C 2 i SEAGATE S	Intelligent Drives Type T52160N T52160N	Computer Attr. RW RW	Periphera Size[MB] 2068 2068	als (TM) Drive valid valid
GDT Controller Monitor v1.25 ICP - Disk No. Position Chn. ID Status Vendor T 0 PCI 0/9 A 6 i SEACATE S 1 PCI 0/9 C 2 i SEACATE S	Intelligent Drives Type T52160N	Computer Attr. RW RH	Periphera Size[MB] 2068 2068	als (TM) Drive valid valid
GDT Controller Monitor v1.25 ICP - Disk No. Position Chn. ID Status Vendor T 0 PCI 0/9 A 6 i SEAGATE S 1 PCI 0/9 C 2 i SEAGATE S Scanning SCSI channe	Intelligent Drives Type T52160N T52160N	Computer Attr. RW RN	Periphera Size[MB] 2068 2068	als (TM) Drive valid valid
GDT Controller Monitor v1.25 ICP - Disk No. Position Chn. ID Status Vendor T 0 PCI 0/9 A 6 i SEACATE S 1 PCI 0/9 C 2 i SEACATE S Scanning SCSI channe Please	Intelligent Drives (ype 3752160N 3752160N 3752160N 3752160N 3752160N 3752160N 3752160N	Computer Attr. RW RW	Periphera Size[MB] 2068 2068	als (TM) Drive valid valid
GDT Controller Monitor v1.25 ICP - Disk No. Position Chn. ID Status Vendor T 0 PCI 0/9 A 6 i SEAGATE S 1 PCI 0/9 C 2 i SEAGATE S Scanning SCSI channe Please	Intelligent Drives Type T52160N T52160N T52160N	Computer Attr. RH RH	Periphera Size[MB] 2068 2068	als (TM) Drive valid valid
GDT Controller Monitor v1.25 ICP - Disk No. Position Chn. ID Status Vendor T 0 PCI 0/9 A 6 i SEAGATE S 1 PCI 0/9 C 2 i SEAGATE S Scanning SCSI channe Please	Intelligent Drives	Computer Attr. RW RN ID's !	Periphera Size[MB] 2068 2068 or Driv prop Driv	als (TM) Drive valid valid
GDT Controller Monitor v1.25 ICP - Disk No. Position Chn. ID Status Vendor T 0 PCI 0/9 A 6 i SEACATE S 1 PCI 0/9 C 2 i SEACATE S Scanning SCSI channe Please	Intelligent Drives ST52160N ST52100N ST52100N ST52100N ST52100N ST52100N ST	Computer Attr. RW RH ID's !	Periphera Size[MB] 2068 2068 2068 Discrete Prop Driv Signal Content Prop Driv Signal Content Prop Driv Signal Content Signal C	als (TM) Drive valid valid valid Ve ve ve ve ve
GDT Controller Monitor v1.25 ICP - Disk No. Position Chn. ID Status Vendor T 0 PCI 0/9 A 6 i SEAGATE S 1 PCI 0/9 C 2 i SEAGATE S Scanning SCSI channe Please	Intelligent Drives ype ST52160N ST52160N ST52160N ST52160N ST52160N St5210N St5210N St5210N St5210N St5210N St5210N St5210N St5210N St5210N St5210N St5210N St5210N St5210N St5210N St5210N St5210N St5210N St5210	Computer Attr. RW RH ID's ! ID's !	Periphera Size[MB] 2068 2068 	Als (TM) Drive valid valid valid Ve ve ve ve ve ve ve ve ve ve ve ve ve ve
GDT Controller Monitor v1.25 ICP - Disk No. Position Chn. ID Status Vendor T 0 PCI 0/9 A 6 i SEAGATE S 1 PCI 0/9 C 2 i SEAGATE S Canning SCSI channe Please	Intelligent Drives (ype) T52160N T5216	Computer Attr. RW RN ID's ! ID's !	Periphera Size[MB] 2068 2068 0 r Driv Prop Driv Driv Prop Driv Driv Driv Driv Driv Driv Driv Driv	als (TM) Drive valid valid valid

The Hot Plug function now displays a list of the positions available for the new drive. Each position is univocally determined by its coordinates (SCSI bus, SCSI ID).Obviously, the new drive can only be assigned to a position which is not occupied by another SCSI device yet, exception made for the position still occupied by the drive to be exchanged.

We choose entry number 1 and press <ENTER>.

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I C P	

Γ	GD1	r Cor	ntrol	ler M	onit	or v1.2	25 ICP	- Intelligent	: Computer	Periphera	als (TM)
L	No .	Posi	ition	Chn .	ID	Status	Vendor	Type	Attr.	Size[MB]	Drive
	0	PCI	0/9	A	6	i	SEAGATE	ST52160N	RW	2068	valid
	1	ru	077	C.	4		SCHGHIC	3132100N	ΛM	2000	varra
I	No.	Posi	ition	Chn.	ID	Status	Disk Dr Vendor	ive Positions	Attr.	Size[MB]	Drive
		DOT	0./0	-		:	OFACATE	eteot/on		20/0	
	ľ	PCI	0/9	B	ő	i	QUANTUM	P105S 910-10	)-94x RW	2068	Ø
	2	PCI	0/9	Ç	4	i	SEAGATE	ST5216ØN	RW	2068	
	34	PCI	0/9 0/9	Ĥ	12						
	5	<u>PČĪ</u>	Õ/Ś	Ä	3						
	5	PCI	0/9 0/9	A	45						
	ġ,	<b>PČ</b> Į	0/9	<b>B</b> .,	Ĭ	A (1					
ľ	Se.	ect	the	posit	10N	of the	new dis	k drive ——			
2T	114.4	100	in	000	Suc.	Camp	ng Pata	- 1			

For this example, we select the first position and receive the following message:

ſ	GD1	r Cor	n <b>trol</b> l	ler Mo	oni	tor v1.2	25 ICP	- Intellig	rent Com	oputer	Periphera	als (TM)
L	No .	Posi	ition	Chn.	ID	Status	Vendor	Type		Attr.	Size[MB]	Drive
l	0	PCI	0/9 0/9	A	6	i	SEAGATE	ST52160N		RW	2068	valid
		101	0, 7	v	-6		VENANTE	01021001		114	8000	V 11 4 11
l					_Г	Do u	u nealli	u want to r	anlace			
l	No .	Posi	ition	Chn .	I	this	drive in	the mirror	union	?	Size[MB]	Drive
l	0	PCI	0/9 0/9	CR		N	)		Yes		2068	0
l	Ż	PČI	0/9	ç	4						2068	
l	4	PCI	0/9	Å	2							
l	5	PCI	0/9	Ą	34							
l	8	PCI PCI	0/9 0/9	A B	5							
GJ	DT653	37RP	in Lo	ocal_S	Sys	Sampli	ing Rate:	= 1				

The Hot Plug function now informs us that all SCSI devices on the SCSI channel to which the drive to be exchanged is connected, have to be temporarily halted. In addition, it shows which Host Drives are affected by this brief halt. With regard to the new drive, we are given some important information: Required storage capacity, SCSI ID and SCSI bus termination. The <ENTER>-key may only be pressed when the new drive is ready at hand and after having checked its capacity, SCSI ID and SCSI termination (the latter two may have to be

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changed). In our example we presume that these preparations have been made, so we press  $<\!\!\text{ENTER}\!>$  in order to halt the SCSI channel.

GDT No.	Control Position PCI 0/9 PCI 0/9	ler Moni Chn. ID A 6 C 2	tor v1.25 Status V i S i S	ICP Dis endor EAGATE EAGATE	- Intelligen 5k Drives	t Computer Attr. RW RH	Periphera Size[MB] 2068 2068	ls (TM) Drive valid valid
No. 0 1 2	All SC have to This an Please Check The ne Press	SI devic be sto ffects H configu if SCSI disk d RETURN t	es connec pped temp ost Drive re the ne bus termi rive must o stop th	ted to orarily (s) Ø, w disk nators have a e SCSI	channel(s) C y until the H drive with S have to be a at least 200 channel for	ot Plug is CSI ID 4. dded or rei MB capacity unplugging,	completed woved.	
545678	PCI 0/9 PCI 0/9 PCI 0/9 PCI 0/9 PCI 0/9	A 3 A 4 A 5 B 1	CONTIEM	·				

Now we have entered the actual Hot Plug procedure. Disconnect the drive to be exchanged by plugging it off from the SCSI cable first, and then, from the power cable. We immediately connect the new drive to the plugs that are now free, first to the power supply and then to the SCSI bus cable. After having reconnected the new drive properly, press <ENTER>.

GE No. Ø	Positic Positic PCI 0/9 PCI 0/9	oller M on Chn. A C	lonito IDS 6 2	or v1.2 Status i i	5 ICP Dis Vendor SEAGATE SEAGATE	- Intelli sk Drives Type ST52160N ST52160N	gent Computer Attr. RW RN	Periphera Size[MB] 2068 2068	als (TM) Drive valid Valid
No 01	***     S       Plug i       YOU ML       All date       After       This       Press	CSI cF n the IST NOT DOING ta on confir ay cau	annel new d DO A SO M the n Ming, ise se	(s) C lisk dr NY UNF IIGHT ( new dis unplu erious	stopped ive at LUGGING AUSE SEI k drive lgging of hardware	*** CCSI chann OR PLUGGI RIOUS HARD will be d plugging damage.	el C, SCSI ID NG ON OTHER S WARE DAMAGE. estroyed. is not allow	4 CŠÍ CHANNE ed.	
45678	PCI 0/9 PCI 0/9 PCI 0/9 PCI 0/9	A A B	3451		•				

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GD	T Con	troll	er Mo	onit	or v1.2	25	ICP Dis	- Inte sk_Driv	elligent Ves —	Computer	Periphe	rals	(TM)
	Posi	tion	CNN .	10 :	status	ven	tor	Type		Attr.	SIZELMB	J Dri	ve
0	PCI	0/9	A	6	i	SEA	GATE	ST521	60N	RW	2068	val	id
	ru	079	C	4		5 EH	GHT E	3152.	.60N	KW	21068	Val	10
No.		e dis	k dr	ve	you hay	Je v	maar	d in l	nas alre	adu been	initiali	zed.	
	ļ	is di	sk di	rive	will	se u	sed	or the	Hot Pl	ug if you	confirm		
	- Pre	ss RE	a on TURN	to	s alsk confiri	api	Je w	п ре	destroy	ed !			
2	071	0.70	Å										
4	PČI	Ø/9	Ä	2									
5	PCI	0/9	Å	3									
1 ?	PČI	0/9	Ä	5									
8	PCI	0/9	B	1									

GDTMON recognizes that the new hard disk was already initialized before. Confirmation of this message destroys all data on the selected drive.

ſ	GD1	r Cor	ntrol	ler M	onit	or v1.2	25		- Intelli	gent Co	mpute	r	Periphera	als (TM)	)
L	No .	Posi	ition	Chn.	ID	Status	Ve	ndor	Type		Attr	١.	Size[MB]	Drive	_ 1
l	0	PCI	0/9 4/9	A	6	i	S E	AGATE	ST52160N		RW		2068	valid Valid	
		1.01	er r	v	4				0 001001				8000	V 81. 1 W	
l					_	Do yo	ոս	really	want to	add thi	5	-			
l	No .	Posi	ition	Chn.	ID	driv	ve.	to the	mirror u	nion ?	_		Size[MB]	Drive	_ •
	0	PCI	0/9 0/9	CB	2	1	ło			ies			2068	0	
	Ż	PČI	0/9	Ç	4								2068		
l	4	PCI	0/9	A	12										
	5	PCI	0/9 0/9	Å	3										
	Ž	PČI	0/9	Ä	5										
	8	PCI	0/9	B	1										
GJ	01653	87RP	in	ocal	Sus	Sampli	ng	Rate=	1						

After this confirmation, the Hot Plug is finished successfully. It takes approximately 10 minutes to re-synchronize the data with this sample configuration.

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#### **Example Session for Application 2**

We assume that there is a RAID 1 Array Drive which is no longer fault tolerant. Its state is -1/ $\nu$ , one drive has failed and is therefore no longer accessible on the SCSI bus. The ICP Controller started beeping. The audible alarm can be disabled within GDTMON by pressing <F2> as soon as the View/Change Settings menu is loaded:



After selecting the Array Drive, we choose the Replace Mirror Drive option.



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Before the new drive can be added, the missing drive has to be deleted in the RAID 1 configuration.



After confirming here with "Yes", you can follow the next paragraph "K.3.5.3 Hot Plug: Add Mirror Drive", to add a new mirror drive to the remaining drive out of the previously failed RAID 1 Array Drive.

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### K.3.5.3 Hot Plug: Add Mirror Drive

This option allows you to add another Logical Drive as a mirroring drive to another Logical Drive. The new hard disk (configured with a free SCSI-ID and a correct SCSI termination) can be plugged onto the SCSI cable while the system continues to be fully operational. If a spare and suitable hard disk is already connected and not yet assigned to a Logical Drive or Host Drive, it will be displayed in the list of Disk Drive Positions. There are two cases which make this function very interesting:

1. An existing hard disk should be given 100% redundancy, but there is no time to shut down the system and interrupt the normal operation

2. An existing hard disk has a high probability of failure, because it makes, for example, a strange noise or generates a lot of grown defects, but there is no time to shut down the system and interrupt the normal operation.

Once the new hard disk is added, the data synchronization (mirroring update) is automatically carried out in the background simultaneously with the normal operation.



In this example, there was already a spare hard disk available (on Channel B, SCSI ID 3). This drive must not be a Logical Drive. Otherwise it will not be available for this function.







After selecting the new hard disk, the following message appears:

GDT Cont	oller Monitor v1.25 ICP - Intelligent Computer Peripherals ( (C) Copyright 1994-1997 ICP vortex Computersysteme GmbH Logical Drives Log. Drive 0: Disk: ok Size[MB]: 200 Array Drive	(M)
No. No. 0 1 2 3 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	SCSI devices connected to channel(s) B to be stopped temporarily until the Hot Plug is completed. affects Host Drive(s) se configure the new disk drive with SCSI ID 3. k if SCSI bus terminators have to be added or removed. new disk drive must have at least 200 MB capacity. s RETURN to stop the SCSI channel for unplugging/plugging. RETURN to confirm 4	
4 5 PCI Ø 6 PCI Ø 7 PCI Ø 8 PCI Ø	9 A 1 9 A 2 9 A 3 9 A 4	

The following message indicates that channel  ${\bf B}$  was stopped for the time of the actual Hot Plug

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GDT Conti	oller Monitor (C) Copyright Log. Drive Ø	v1,25 ICP - 1994-1997 ICI Disk:	· Intelligent · vortex Comp .ogical Drive .k Size	Computer Pe utersysteme 5 [NB]: 200	ripherals GmbH Array Driv	(TM) /e
No 9 411 c 2 3 Press	SCSI channel( in the new di MUST NOT DO AN DOING SO MI lata on the ne confirming, May cause ser Nay cause ser	5) B stopped sk drive at S( Y UNPLUGGING ( GHT CAUSE SERI w disk drive w unplugging or ious hardware	*** SI channel B R PLUGGING O OUS HARDWARE VIII be destr plugging is damage.	, SCSI ID 3. N OTHER SCSI DAMAGE. oyed. not allowed.	CHANNELS	
4 5 PCI 0/ 6 PCI 0/ 7 PCI 0/ 8 PCI 0/	79 A 1 79 A 2 79 A 3 79 A 4					

Now, the new hard disk is added as a mirror to the selected Logical Drive. The updated list of available Logical Drives shows the change. The Logical Drive changed its type to *Mirror* and the data on the new hard disk are currently synchronized, indicated through the "\*" behind the "v".

GDT Controller Monitor v1.25 ICP - Intelligent Computer Peripherals (TM) (C) Copyright 1994-1997 ICP vortex Computersysteme GmbH
Logical Drives Log. Drive 0: Mirror: ok v* SizelMBJ: 200 Array Drive Cont Cach Phys Logil F2: Drive Information Array Save Information Sampling Rate Uiew/Change Settings
GDT6537RP in Local_Sys Sampling Rate= 1.0 sec

After pressing <F2>, the new structure is displayed.









GDT6537RP in Local\_Sys Sampling Rate= 1.0 sec

The entry "invalid" for the second drive means that the data have not yet been (completely) copied from the first drive. After the completion of the synchronization process, this entry changes into "valid".

### K.3.5.4 Hot Plug: Remove Mirror Drive

This option allows the removal of a Mirror Drive from a RAID 1 or RAID 10 Array Drive. Once the drive has been removed, the data on the other drive are no longer redundant.



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# K.3.5.5 Hot Plug: Add Pool Hot Fix Drive

A Pool Hot Fix Drive is a spare drive within the so-called Hot Fix Pool. A drive in a Hot Fix Pool is available for several RAID 1 and RAID 10 Array Drives as a Hot Fix drive. Thus, several Array Drives can share one Hot Fix drive. Of course, once this drive has been used by one of the Array Drives, it is no longer available for the others.

GDT Controller Monitor v1.25 ICP - (C) Copyright 1994-1997 ICP	Intelligent Computer Peripherals (TM) vortex Computersysteme GmbH
Log. Drive 0: Mirror: of Cont Cach Phys	k vv – Size[MB]: 200 Array Drive
Array Save Information Sampling View/Chan	Logical Drive Settings Set Log. Drive Name Hot Plug: Replace Mirror Drive Hot Plug: Add Mirror Drive Hot Plug: Remove Mirror Drive Hot Plug: Remove Mirror Drive Hot Plug: Remove Pool Hot Fix Drive Hot Plug: Remove Pool Hot Fix Drive Pool Hot Fix Access

After selecting this option, GDTMON scans the ICP Controller for drives which are suitable









for becoming a Pool Hot Fix drive (i.e. they belong to no Logical Drive), and for free coordinates (SCSI Channel / SCSI ID). We choose Channel C and SCSI ID 4 for the new Hot Fix Drive.

GDT Controller Monitor v1.25 ICP - Intelligent Computer Peripherals (TM) (C) Copyright 1994-1997 ICP vortex Computersysteme GmbH Logical Drives Log. Drive 0: Mirror: ok vv SizelMBJ: 200 Array Drive
All SCSI devices connected to channel(s) C have to be stopped temporarily until the Hot Plug is completed. This affects Host Drive(s) Please configure the new disk drive with SCSI ID 4. Check if SCSI bus terminators have to be added or removed. The new disk drive must have at least 200 MB capacity. Press RETURN to stop the SCSI channel for unplugging/plugging. Press RETURN to confirm !
5 PCI 0/9 A 2 6 PCI 0/9 A 3 7 PCI 0/9 A 4 8 PCI 0/9 A 5 GDT6537RP in Local_Sys Sampling Rate= 1
GDT Controller Monitor v1.25 ICP - Intelligent Computer Peripherals (TM) (C) Copyright 1994-1997 ICP vortex_Computersysteme GmbH
Log. Drive 0: Mirror: ok vv Size[MB]: 200 Array Drive
****       SCSI channel(s) C stopped ***         Plug in the new disk drive at SCSI channel C, SCSI ID 4.         YOU MUST NOT DO ANY UNPLUCGING OR PLUCGING ON OTHER SCSI CHANNELS         DOING SO MIGHT CAUSE SERIOUS HARDHARE DAMAGE.         All data on the new disk drive will be destroyed.         After confirming, unplugging or plugging is not allowed.         This may cause serious hardware damage.         Press RETURN to confirm !
4 5 PCI 0/9 A 2 6 PCI 0/9 A 3 7 PCI 0/9 A 4 8 PCI 0/9 A 5

After the completion of this function, the Pool of Hot Fix drives contains a new drive (in our example here, it is the only drive. To allow a RAID 1 or RAID 10 Array Drive access to the Hot Fix Pool, use the Pool Hot Fix Access menu (K.3.5.7).

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# K.3.5.6 Hot Plug: Remove Pool Hot Fix Drive

It may become necessary to remove a certain drive from the Hot Fix Pool.

	Control Position	ler Mo Chn.	nitor ID Sta	v1.25 atus Ve	ICP Dis Indor	- Intelligent k Drives —— Type	Computer Attr.	Periphera Size[MB]	als (TM) Drive
0	PCI 0/9	C	4	i SI	AGATE	ST52160N	RW	2068	1
L Sel	ect one	of the	disk	drives	5 for H	ot Plug ——			
L Sel	ect one	of the	disk	drives Vi	s for H iew/Cha	ot Plug n  Hot Plug: 1 	Replace Mi Add Mi	irror Driv	/e
L Sel	ect one	of the	disk	drives Vi	s for H iew/Cha	ot Plug n  Hot Plug: 1 - Hot Plug: 1 Hot Plug: 1 Hot Plug: 1	Replace Mi Add Mi Remove Mi Add Poo	irror Driv irror Driv irror Driv ol Hot Fix	ie ie ie c Drive
L Self	ect one	of the	disk	drives Vi	5 for H iew/Cha	ot Plug – Hot Plug: – Hot Plug: Hot Plug: Hot Plug: Hot Plug:	Replace Mi Add Mi Remove Mi Add Poo Remove Poo	irror Driv irror Driv irror Driv ol Hot Fix ol Hot Fix	/e /e ∢ Drive ≮ Drive

# K.3.5.7 Pool Hot Fix Access

This function enables or disables the access of a certain RAID 1 or RAID 10 Array Drive to the Hot Fix Pool.







If the access had been enabled before, you could disable it now.

# K.3.6 Array Drives

This command yields a list of the existing RAID 4 and RAID 5 Array Drives. In addition to the Array Drive number, information on the RAID level of the Array Drive: 4 or 5), the state (error, idle, build, ready, fail, expand, rebuild) and the net capacity are displayed. Press <F2> to obtain further information on a selected Array Drive.

GDT Controller Monitor v1.25 ICP - Int (C) Copyright 1994-1997 ICP vor	elligent Computer Peripherals (TM) tex Computersysteme GmbH man Dailes
Array Drive 0: RAID-5:	ready Size[MB]: 400
Controller	
Physical D Logical Dn F2: Drive Information -	
Array Drive Array Drive Co	mponents
Log. Drive 0: Disk: ok Sizel	MB]: 200 Master HB]: 200
Loğ. Drive 2: Disk: ok Sizel	MB]: 200
FOL Dating Tabana dias	
CDT CDT	

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If you press once more <F2>, you get detailed information on the physical hard disk.



#### K.3.6.1 Parity Verify

This option verifies online the parity information of the selected RAID 4 or RAID 5 Array Drive. Pressing <ESC> terminates this process. If this option is selected for several Array Drives, the processes are put into a queue and performed one after the other.





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# K.3.6.2 Parity Recalculate

If the parity verify option reports a parity problem, it is advisable to recalculate the parity of the selected Array Drive anew.



The state of the Array Drive changes into "build/patch", and the build process is started immediately. The word "patch" indicates that the parity of this Array Drive was calculated anew. After this procedure the Array Drive assumes the *ready/patch* sate.



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# K.3.6.3 Expand Array Drive

There are two fundamental functions which are available within this option:

- Migrate the RAID level of the selected RAID Array Drive (RAID 0-> RAID 4 and vice versa, RAID 0 -> RAID 5 and vice versa)
- Expand the capacity of the selected Array Drive by adding one or several new hard disks

Both functions can be selected at the same time. E.g., migrate from RAID 0 to RAID 5 and add a new drive.

To initiate a migration or expansion with a RAID 4/5 Array Drive, the state must be *ready*. The data on the Array Drive remain intact and are not affected by the expansion. The additional capacity is introduced as new Host Drive.

If a Logical Drive fails during the expansion, the expansion process continues until the expansion is finished. The Array Drive changes into the *fail* state.

The new capacity is available as a new Host Drive. Windows NT (Tool: Disk Administrator) and Novell NetWare (*Scan for new Devices* and then Tool: Install) allow the online integration of new disk capacity.

Depending on the RAID level the current Array Drive has, selecting a different one here, will cause the Migration of the RAID level of the Array Drive. If you select the same RAID level, the following procedure will expand the capacity of the Array Drive, only.









After confirming this request, the SCSI channels are scanned for free positions and already existing available (i.e., not yet assigned to a Logical Drive) hard disks.



For this demo, we select the hard disk on channel A and ID  $\ensuremath{\mathsf{0}}$  .

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GDT Controller Monit (C) Copyrid	or v1.25 ICP - Intelligent ht 1994-1997 ICP vortex Compu	Computer Peripherals (TM) tersysteme GmbH
Aronau	Array Driv Drive 0: RAID-5: ready	es
View/Chg. Controller	Disk Drive Positions -	
No. Position Chn. ID	Status Vendor Type	Attr. Size[MB] Drive
8         PCI         0/9         A         0           1         PCI         0/9         B         0           2         PCI         0/9         B         0           3         PCI         0/9         A         1           4         PCI         0/9         A         2           5         PCI         0/9         A         3           6         PCI         0/9         A         5           7         PCI         0/9         A         5	I SEAGATE ST52160N I QUANTUM P105S 910-10- I SEAGATE ST52160N	RH 2068 94x RH 99 RH 2068 Fragment
8 PCI 0/9 B 1 Select the position	of the new disk drive	8 
GDIGJOTAF IN LUCAL_SYS	Sampling Rate- 1.0 Sec	
GDT Controller Monit (C) Copyrig	or v1.25 ICP - Intelligent ht 1994-1997 ICP vortex Compu	Computer Peripherals (TM) tersysteme GmbH
View/Chg.	Drive 0: RAID-5: ready	SizeLMBJ: 400
No Position Chn ID	Do you really want to add t	his Size[MR] Drive
	No No	2040
1 PCI 0/9 B 0	100 <u>1155</u>	
3 PCI 0/9 A 1 4 PCI 0/9 A 2 5 PCI 0/9 A 3		2000 Fragment
6 PCI 0/9 A 4 7 PCI 0/9 A 5 8 PCI 0/9 B 1		

The new drive is built into the Array Drive. According to the Expansion Progress Information this takes approximately 18 minutes. During the expansion the Array Drive's state is *ready/expand*.





GDT Controller Monitor v1.25 ICP - (C) Copyright 1994-1997 ICP	Intelligent Computer Peripherals (TM) vortex Computersysteme GmbH
Uiew/Chg. Controller Cache Sett Durisel D	-5: ready Size[MB]: 400
Logical Dr Appray Drive Save Information View/Chan	Parity Verify Parity Recalculate Expand Array Drive Pool Hot Fix Access Hot Plug: Replace Drive Hot Plug: Replace Drive
Progress In Elapsed Time: <u>90:00</u> GDT6537RP in Local Sys Sampling Rate= :	S4 Estimated Time: 00:17:05

As expected the Array Drive's capacity is now 600MB.

GDT Controller (C) Co	Monitor v1.25 pyright 1994-1	ICP - 997 ICP	Intelligent vortex Comp	Computer utersystem	Peripherals e GmbH	5 (TM)
	Array Drive Ø	: RAID	-5: ready	ves	ize[MB]:	600
View/Chg. Controller Cache Sett Physical D Logical Dr	F2: Drive Inf	ormation	1			
Save Inform	ation Sa	mpling l ew/Chang	late ve Settings			
		e w onan				
GDT6537RP in Local	Sys Sampling	Rate= 1	.0 sec			

# K.3.6.4 Pool Hot Fix Access

This function enables or disables the access of a certain RAID 4 or RAID 5 Array Drive to the Hot Fix Pool.

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GDT Controller (C) Co	Monitor v1.25 ICP opyright 1994-1997 IC	- Intelligent Com P vortex Compute:	mputer Peripheral rsysteme GmbH	s (TM)
r View∕Chg.	Array Drive 0: RAI	D-5: ready	Size[MB]:	400
Controll Cache Se Physical Logical Array Dr Save Inf	The access to the Ho Do you want No	t Fix Pool is en to disable it ? I	abled ! Kes	
	Uiew/Cha	N Hot Plug: Rep Hot Plug: Add Hot Plug: Add Hot Plug: Rem Hot Plug: Rem	lace Drive priv. Hot Fiy Pool Hot Fiy ove priv. Hot Fiy ove Pool Hot Fiy	( Drive ( Drive ( Drive ( Drive ( Drive
GDT6537RP in Local	l_Sys Sampling Rate=	1.0 sec		

If the access had been enabled before, you would be able to disable it now.

#### K.3.6.5 Hot Plug: Replace Drive

In a similar way as was described a few pages before with the RAID 1 Array Drives, this function is designed to replace a defective drive of a RAID 4 or RAID 5 Array Drive, while the system continues to be fully operational.



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There are typically two different applications where a Hot Plug is necessary.

**Application 1.** The RAID 4/5 Array Drive is in the *ready* state. It is likely that a drive will soon fail (for example when there is a loud operating noise). As a preventative measure, this drive ought to be exchanged now, that is, in a moment when the Array Drive is still in a ready state and still has redundancy.

**Application 2.** The RAID 4/5 Array Drive is no longer fault tolerant (*fail* state), because a drive of the Array Drive has actually failed. The Array Drive is still fully operational, but it does not have redundancy any more. If another drive should also fail, the Array Drive's functional to a strain drive should also fail. tionality is impaired.

#### **Example Session for Application 1**

We assume that there is a RAID 5 Array Drive which is fault tolerant. Its state is ready, all drives are valid. After selecting the Array Drive, we choose the Replace Drive option.

ſ	GD1	í Coi	ntrol	ler Mo	onito	r v1.2	25 ICI	) - Intelligent	Computer	Peripher	als (TM)
L	No .	Pos	ition	Chn.	ID St	tatus	Vendor	Type	Attr.	Size[MB]	Drive
	0	PCI	0/9 479	A	6	i	SEAGATI	ST52160N	RW	2068	0
	2	PCI	0/9	Č	2	i	SEAGATI	ST52160N	ŔŴ	2068	2
	- Sel	lect	one	of the	e disl	k driv	ves for	Hot Plug ——			
						Ļ	VIEW/C	an Hot Plug:	Replace D	rive	
								Hot Plug: Hot Plug:	Add priv. Add Pool	Hot F Hot F	ix Drive ix Drive
								Hot Plug: Hot Plug:	Remove pr Remove Po	iv. Hot F pl Hot F	ix Drive ix Drive
GJ	DT653	37RP	in L	ocal (	Sus (	Sampli	ing Rate	= 1.0 sec			

A list of the Array Drive's components is displayed. For our example we choose No.1 for the Hot Plug. GDTMON scans the ICP Controller's SCSI Channels for drives which are still free (not yet assigned to Logical Drives) and free (i.e., not occupied) SCSI Channels and SCSI IDs.

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GDT Controller Monitor v1.25 ICP - Intelligent	Computer I	Periphera	uls (TM)
No. Position Chn. ID Status Vendor Type	Attr. S	Size[MB]	Drive
0 PCI 0/9 A 6 i SEAGATE ST52160N	RW	2068	0
2 PCI 0/9 C 2 i SEAGATE ST52160N	RŴ	2068	2
Scanning SCSI channels / target Please wait !	ID's !		
Hot Plug: Hot Plug: Hot Plug: Hot Plug: Hot Plug: Hot Plug:	Replace Dri Add priv. Add Pool Remove priv Remove Pool	Hot Fi Hot Fi Hot Fi V. Hot Fi Hot Fi	x Drive x Drive x Drive x Drive x Drive
GDIBJ37KF IN LOCAL_SYS SAMPIING RATE= 1.0 SEC			
GDT Controller Monitor v1.25 ICP - Intelligent	Computer I	Periphera	ls (TM)
GDT Controller Monitor v1.25 ICP - Intelligent Disk Drives No. Position Chn. ID Status Vendor Type	Computer I Attr. S	Periphera Size[MB]	ls (TM) Drive
GDT Controller Monitor v1.25 ICP - Intelligent Disk Drives No. Position Chn. ID Status Vendor Type 0 PCI 0/9 A 6 i SEAGATE ST52160N	: Computer I Attr. S RW	Periphera Size[MB] 2068	ls (TM) Drive Ø
GDT Controller Monitor v1.25 ICP - Intelligent Disk Drives No. Position Chn. ID Status Vendor Type 0 PCI 0/9 A 6 i SEAGATE ST52160N 1 PCI 0/9 B 3 i SEAGATE ST52160N 2 PCI 0/9 C 2 i SEAGATE ST52160N	Computer I Attr. S RW RW RW	Periphera Size[MB] 2068 2068 2068	Als (TM) Drive 0 1 2
GDT Controller Monitor v1.25 ICP - Intelligent Disk Drives No. Position Chn. ID Status Vendor Type 0 PCI 0/9 A 6 i SEAGATE ST52160N 1 PCI 0/9 B 3 i SEAGATE ST52160N 2 PCI 0/9 C 2 i SEAGATE ST52160N Disk Drive Driving	Computer 1 Attr. 5 RW RW RW	Periphera Size[MB] 2068 2068 2068	uls (TM) Drive 0 1 2
GDT Controller Monitor v1.25 ICP - Intelligent Disk Drives No. Position Chn. ID Status Vendor Type Ø PCI Ø/9 A 6 i SEAGATE ST52160N I PCI Ø/9 B 3 i SEAGATE ST52160N 2 PCI Ø/9 C 2 i SEAGATE ST52160N No. Position Chn. ID Status Vendor Type	Computer 1 Attr. 5 RW RH RH Attr. 5	Periphera Size[MB] 2068 2068 2068 Size[MB]	ls (TM) Drive 0 1 2 Drive
GDT Controller Monitor v1.25 ICP - Intelligent Disk Drives No. Position Chn. ID Status Vendor Type 0 PCI 0/9 A 6 i SEAGATE ST52160N 1 PCI 0/9 B 3 i SEAGATE ST52160N 2 PCI 0/9 C 2 i SEAGATE ST52160N No. Position Chn. ID Status Vendor Type 0 PCI 0/9 B 3 i SEAGATE ST52160N	Computer 1 Attr. 5 RW RW RW Attr. 5	Periphera Size[MB] 2068 2068 2068 Size[MB] 2068	ls (TM) Drive 0 1 2 Drive 1
GDT Controller Monitor v1.25       ICP - Intelligent Disk Drives         No. Position Chn. ID Status Vendor Type         Ø PCI Ø/9 A 6       i SEAGATE ST52160N         I PCI Ø/9 B 3       i SEAGATE ST52160N         2 PCI Ø/9 C 2       i SEAGATE ST52160N         Disk Drive Positions       Disk Drive Positions         No. Position Chn. ID Status Vendor Type       Ø         Ø PCI Ø/9 B 3       i SEAGATE ST52160N         I PCI Ø/9 B 4       i SEAGATE ST52160N         I PCI Ø/9 B 5       i SEAGATE ST52160N	Computer 1 Attr. 5 RH RH Attr. 5 Attr. 5 RH -94x RH	Periphera Size[MB] 2068 2068 2068 Size[MB] 2068 2068 2068	Is (TM)
GDT Controller Monitor v1.25       ICP - Intelligent         No. Position Chn. ID Status Vendor Type         Ø PCI Ø/9 A 6       i SEAGATE ST52160N         1 PCI Ø/9 B 3       i SEAGATE ST52160N         2 PCI Ø/9 C 2       i SEAGATE ST52160N         Disk Drive Positions       Disk Drive Positions         No. Position Chn. ID Status Vendor Type         Ø PCI Ø/9 B 3       i SEAGATE ST52160N         I PCI Ø/9 A 6       i SEAGATE ST52160N         I PCI Ø/9 B 3       i SEAGATE ST52160N         I PCI Ø/9 B 3       i SEAGATE ST52160N         2 PCI Ø/9 B 3       i SEAGATE ST52160N         3 PCI Ø/9 C 4       i SEAGATE ST52160N         4 PCI Ø/9 A 1       i SEAGATE ST52160N	Computer 1 Attr. 5 RW RW Attr. 5 Attr. 5 RW -94x RW RW	Periphera Size[MB] 2068 2068 2068 2068 Size[MB] 2068 2068 99 2068	ls (TM) Drive 0 2 Drive 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
GDT Controller Monitor v1.25       ICP - Intelligent Disk Drives         No. Position Chn. ID Status Vendor Type         0 PCI 0/9 A 6       i SEAGATE ST52160N         1 PCI 0/9 B 3       i SEAGATE ST52160N         2 PCI 0/9 C 2       i SEAGATE ST52160N         Disk Drive Positions       Disk Drive Positions         No. Position Chn. ID Status Vendor Type       0         0 PCI 0/9 B 3       i SEAGATE ST52160N         1 PCI 0/9 B 3       i SEAGATE ST52160N         2 PCI 0/9 B 3       i SEAGATE ST52160N         3 PCI 0/9 B 3       i SEAGATE ST52160N         3 PCI 0/9 C 4       i SEAGATE ST52160N         4 PCI 0/9 A 4       i SEAGATE ST52160N         5 PCI 0/9 A 3       1	Computer 1 Attr. 5 RH RH Attr. 5 Attr. 5 RH D-94x RH RH	Periphera Size[MB] 2068 2068 2068 2068 3ize[MB] 2068 99 2068	Is (TM) Drive
GDT Controller Monitor v1.25         ICP - Intelligent Disk Drives           No. Position Chn. ID Status Vendor Type         0           0         PCI 0/9 A         6         i         SEAGATE ST52160N           1         PCI 0/9 B         3         i         SEAGATE ST52160N           2         PCI 0/9 C         2         i         SEAGATE ST52160N           2         PCI 0/9 B         3         i         SEAGATE ST52160N           1         PCI 0/9 B         3         i         SEAGATE ST52160N           2         PCI 0/9 B         0         i         SEAGATE ST52160N           3         PCI 0/9 B         0         i         QUANTUM P1055 910-10           3         PCI 0/9 C         4         i         SEAGATE ST52160N           4         PCI 0/9 A         1         SEAGATE ST52160N         i           3         PCI 0/9 A         2         i         SEAGATE ST52160N           4         PCI 0/9 A <td>Computer 1 Attr. 5 RH RH Attr. 5 Attr. 5 RH H-94x RH RH</td> <td>Periphera Size[MB] 2068 2068 2068 Size[MB] 2068 99 2068</td> <td>Als (TM) Drive 0 1 2 Drive</td>	Computer 1 Attr. 5 RH RH Attr. 5 Attr. 5 RH H-94x RH RH	Periphera Size[MB] 2068 2068 2068 Size[MB] 2068 99 2068	Als (TM) Drive 0 1 2 Drive
GDT Controller Monitor v1.25 ICP - Intelligent Disk Drives No. Position Chn. ID Status Vendor Type 0 PCI 0/9 A 6 i SEAGATE ST52160N 1 PCI 0/9 B 3 i SEAGATE ST52160N 2 PCI 0/9 C 2 i SEAGATE ST52160N Disk Drive Positions No. Position Chn. ID Status Vendor Type 0 PCI 0/9 B 3 i SEAGATE ST52160N 1 PCI 0/9 A 0 i SEAGATE ST52160N 1 PCI 0/9 A 1 SEAGATE ST52160N 4 PCI 0/9 A 1 5 PCI 0/9 A 2 6 PCI 0/9 A 2 6 PCI 0/9 A 3 7 PCI 0/9 A 4 8 PCI 0/9 A 5 Select the position of the new disk drive —	Computer 1 Attr. S RH RH Attr. S Attr. S H H H H H H H H H	Periphera Size[MB] 2068 2068 2068 Size[MB] 2068 2068 99 2068	Als (TM) Drive 2 Drive i

The list of Disk Drive Positions shows us the following:

- No.0 This is the position of the drive which should be replaced. Since it is still there, the hard disk's state, vendor, type, attributes, size and Logical Drive number are displayed.
  No.1, 2, 3 Free available (i.e., not yet assigned to a Logical Drive) drives. 1 and 3 could also be used for the replacement.
  No.4 to No.17 These are free (i.e., not occupied) plugging positions for the new hard disk (On the above screen you can't see positions No.9 to No.17, but you can scroll the list with the Page-Down/Up keys).

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GD1	「 Contr	oller	4onitor	v1.25	ICP	- Intellig	gent Computer	Periphera	als (TM)
L No.	Positi	on Chn	. ID Sta	atus Ven	dor	Type	Attr.	Size[MB]	Drive
0	PCI Ø/	′9 A	6	i SEA	GATE	ST52160N	RW	2068	0
2	PCI 0/	9 C	2	i SEA	GATE	ST52160N	RW	2068	2
No. 12345678	All have This Plea Cheo The Press PCI 0/ PCI 0/ PCI 0/ PCI 0/	SCSI de to be affect se conf k if SC new dis s RETUR S RETUR 9 A 9 A 9 A 9 A	evices of stopped ts Host ligure CSI bus sk drive RN to si N to cor 2 3 4 5	connecte l tempor Drive(s the new termina Must H top the Ifirm	d to parily disk tors ave a SCSI	channel(s , until th drive wit have to b t least 2 channel fo	) B Hot Plug is h SCSI ID 3. added or re 00 MB capacit or unplugging	completed moved. y plugging.	

GDT6537RP in Local\_Sys Sampling Rate= 1.0 sec

For our example we now take the new hard disk (which must have a capacity equal or larger than 200MB) set it to SCSI ID 3 and observe the SCSI termination.



GDT6537RP in Local\_Sys Sampling Rate= 1.0 sec

After this message we can unplug the old drive and plug in the new one again and confirm this procedure.

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Γ	GD1	í Cor	ntrol	ler M	lonit	tor v1.	25 I	CP -	Intelli	gent	Computer	Periphe	rals (TM)
ןו	No .	Posi	ition	Chn .	ID	Status	Vendo	p	Туре		Attr.	Size[MB	] Drive
	0	PCI	0/9	A	6	i	SEAGA	TE	ST52160N		RW	2068	0
	2	PCI	0/9	Ċ	2	i	SEAGA	TE	ST52160N		ŔŴ	2068	2
l													
	No .	Posi	iti	Tho	DOW	diek d	niua i	e ku	ilt into	tha	dick ann:		Drive
	Ø	PCI	0/ 8/	1 IIE		UISK U	Pl	ease	wait !	0116	WINK WING	9:	1
	23	PČI	0/ 0/9										
	<b>4</b>	PČÎ	0/9 0/9	Ĥ	12								-
	ě	PČÎ	0/9 0/9	Ä	34								
l	8	PČÎ	<b>0</b> ⁄9	Ä	5								



If everything was OK, GDTMON displays the following message:

ſ	GD	r Coi	ntrol	ler M	onit	or v1.2	25 ICP	- Intellige	nt Computer	Peripher	als (TM)	)
L	No .	Pos	ition	Chn.	ID	Status	Vendor	Type	Attr.	Size[MB]	Drive	_ 1
	0	PCI	0/9 0/9	Ą	6	i	SEAGATE	ST52160N	RM	2068	0	
	2	PCI	0/9	C	2	i	SEAGATE	ST52160N	RW	2068	2	
		he Ho he di he ti ontro	ot Plu isk an ime ti oller amuna	ug wa rray' he di 's ut N to	s fi s st sk a iliz conf	nished atus ha rray ne ation a irm ! -	successf as change eds to a and the a	fully ! ed to REBUIL assume the R lisk array's	D. EADY status capacity.	depends	on the	
	345678	PCI PCI PCI PCI PCI PCI	0/9 0/9 0/9 0/9 0/9 0/9	CAAAAA	412345	i	SEAGATE	ST5216ØN	RW	2068		
~	17456	141010	in la		Suc.	County	ng Patos	1 0 500				

If the new drive, which we have plugged in just before, had contained data from a previous operation with a ICP Controller, GDTMON would have reported this.





GDT Controller Monitor v1.25 ICP - Intelligent Computer Peripherals (TM) (C) Copyright 1994-1997 ICP vortex Computersysteme GmbH
Array Drive 0: RAID-5: rebuild Size[MB]: 400
- Iliow/Chr.
Controller
Physical D
Logical Dr Array Drive
Save Information Sampling Rate
View/Change Settings
Description of the second s
Progress Information: Hrray Kebuild
Elapsed Time: 00100106 Estimated Time: 00103109

GDT6537RP in Local\_Sys Sampling Rate= 1.0 sec

#### **Example Session for Application 2**

We assume that there is a RAID 5 Array Drive where one drive has failed. Its state is *fail*. After selecting the Array Drive, we choose the Replace Drive option.

GDT Controller Monitor v1.25 ICP - (C) Copyright 1994-1997 ICP	Intelligent Computer Peripherals (TM) vortex Computersysteme GmbH
View/Chg. Controller Cache Sett Physical D Logical Dr Array Drive Save Information View/Chan	Array Drives Size(MB): 400 Array Settings Parity Verify Parity Recalculate Expand Array Drive Pool Hot Fix Access Hot Plug: Add Prol Hot Plug: Add Prol Hot Flug: Add Prol Hot Flug: Remove Prol Hot Flug: Remove Prol Hot Flug: Remove Prol Hot Fix Drive Hot Plug: Remove Pool Hot Fix Drive
GDT6537RP in Local_Sys Sampling Rate= 1	.0 sec

GDTMON shows the failed drive (No.1),

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Γ	GDI	í Cor	ntrol	ler Mo	onit	or v1.2	25 ICP	- Intelligent	Computer	Periphera	als (TM)
L	No .	Posi	ition	Chn .	ID	Status	Vendor	Type	Attr.	Size[MB]	Drive
	0 1 2	PCI PCI PCI	0/9 0/9 0/9	A BC	632	1.1.1	SEAGATE SEAGATE SEAGATE	ST52160N ST52160N ST52160N ST52160N	RW fail RW	2068 2068 2068	Ø 32
	The	e fai	iled/1	Aissir	ng d	rive(s)	) will be	used for Hot	Plug —		
						L	View/Cha	n Hot Plug: Hot Plug: Hot Plug: Hot Plug:	Replace D Add priv. Add Pool Remove pr Remove Poo	oive Hot F Hot F iv. Hot F bl Hot F	ix Drive ix Drive ix Drive ix Drive ix Drive
<b>.</b>	TZES	מחדי	in 1.	1 6	·	C	D.4	1 8			

After pressing the <ENTER>-key, GDTMON scans the ICP Controller for free plugging positions:





Intelligent Computer Peripheral	s®
I C P	

Γ	GD1	r Coi	ntrol	ler M	onit	tor v1.2	25 ICP	- Intelligent	Computer	Periphera	als (TM)
L	No .	Pos	ition	Chn.	ID	Status	Vendor	Type	Attr.	Size[MB]	Drive
	0	PCI	0/9	A	6	i	SEAGATE	ST52160N	RW	2068	0
	2	PCI	0/9	Ċ	2	i	SEAGATE	ST52160N	RW	2068	2
l								<b>.</b>			
	No .	Pos	ition	Chn.	ID	Status	Disk Driv Vendor	ve Positions – Type	Attr.	Size[MB]	Drive
	Ø	FCI	0/9	Ŗ	3	į	SEAGATE	ST52160N	fail	2068	3
	2	PCI	0/9	B	Ő	i	QUANTUM	P105S 910-10-	-94x RW	2068	
	3	PCI	0/9 0/9	Ċ	4	i	SEAGATE	ST5216ØN	RW	2068	
	5	PČÎ	õ⁄ģ	Ä	Ż						
	?	PCI	0/9	Ä	4						
	- Sel	PCI lect	0/9 the	A posit:	ion	of the	new disk	drive ——			
ст	14-6		in	000		Caust	ng Pato-	1 0 000			

The list of Disk Drive Positions shows us the following:

- No.0 This is the position of the drive which should be replaced. Since it is still there, but defective, the hard disk's state, vendor, type, attributes, size and Logical Drive number are displayed.
  No.1, 2, Free available (i.e., not yet assigned to a Logical Drive) drives. 1 and 3 could also be used for the replacement.
  No.4 to These are free (i.e., not occupied) plugging positions for the new hard disk (On No.17 the above screen you can't see positions No.9 to No.17, but you can scroll the list with the Page-Down/Up keys).

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ſ	GDT No ,	Cor Posi	ntrol ition	ler M Chn.	onito ID S	r v1.: tatus	25 I( I Vendor	CP – Int Disk Dri P Type	telligen ives —	t Computer Attr.	Periphera Size[MB]	als Dri	(TM) ve
	0 1 2	PCI PCI PCI	0/9 0/9 0/9	A B C	6 3 2	i i i	SEAGA1 Seaga1 Seaga1	TE ST52 IE ST52 TE ST52	2160N 2160N 2160N	RW Fail RW	2068 2068 2068	0 3 2	
	No. 123	A) ha F) C) C) C) T) P) P) P)	ll SC ave ti nis a: lease neck ne ne ress ress ress	SI de o be ffect: conf if SC w dis RETUR	vices stopp s Hos igure SI bu k dri N to to c	conne ed ter t Dri the i s ter ve mu stop onfilm	ected ( mporari ve(s) - new dis minator st have the SCS	to chann ly unti sk drive s have at lea l chann	nel(s) B il the H e with S to be a to be a st 200 h nel for u	ot Plug is CSI ID 3. dded or re MB capacit unplugging,	completed moved. y. Yplugging	d.	
	45678	PCI PCI PCI PCI PCI	0/9 0/9 0/9 0/9	A A A	2345								

GDT6537RP in Local\_Sys Sampling Rate= 1.0 sec

For our example we now take the new hard disk (which must have a capacity equal to or larger than 200MB) set it to SCSI ID 3 and observe the SCSI termination.



After this message we can unplug the old drive and plug the new one in again and confirm this procedure.

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Intelligent Computer Pertpherals *	
ΙСΡ	

GD1 No.	[ Control] Position	ler Moni <sup>.</sup> Chn. ID	tor v1.2 Status	5 ICP - Disk Vendor	· Intelligent (Drives —— Type	Computer Attr.	Periphera Size[MB]	als (TM) Drive
0 1 2	PCI 0/9 PCI 0/9 PCI 0/9	A 6 B 3 C 2	i i i	SEAGATE Seagate Seagate	ST52160N ST52160N ST52160N	RW Fail RW	2068 2068 2068	0 3 2
No.	This di This di This di This di This di All da' Press R PCI 0/9 PCI 0/9 PCI 0/9 PCI 0/9 PCI 0/9	isk drive sk drive sk drive sk drive sk drive a on th turn to A 1 A 2 A 3 A 4 A 5	e belong belong you hav will b is disk confirm	ed to the ed to the e used fo drive wil	logical dri disk array in has alre or the Hot Plu l be destroy	ve with numb with numb ady been i ug if you ed ?	umber 3. rr 0. confirm.	ed.

GDT6537RP in Local\_Sys Sampling Rate= 1.0 sec

GDTMON has detected data on the new drive (i.e., it was already used as a Logical Drive with a ICP Controller).

[	GD <sup>*</sup> No.	T Cor Pos:	ntrol ition	ler M Chn.	onit ID	or v1.2 Status	25 ICP Dis Vendor	- Intellig k Drives - Type	gent Comput Att	ter Peripher tr. Size[MB]	als (TM) Drive
	0	PCI PCI	0/9 0/9	AB	6	i	SEAGATE SEAGATE	ST52160N ST52160N	RW £ a	2068 11 2068	0
	۵ No.	Pos	ition	Chn.	ID	Do yo dri	ou really ive to th	want to a e array ur	add this nion ?	. Size[MB]	Drive
	0	PCI PCI PCI	0/9 0/9 0/9	B A B	3		No		Yes	1 2068 2068 99	3
	34567-8	PCI PCI PCI PCI PCI PCI	0/9 0/9 0/9 0/9 0/9 0/9	CAAAAA	412345	1	SERGATE	2122100M	KM	4 2068	
GI	01755	87 RP	in l	ncal	Suc	Sampli	ing Rate:	1.0 sec			

This confirmation deletes all data on the new drive and prepares it for the Array Drive.

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Intelligent (	Computer P	ertpherals ®
	C	P

[	GD1	í Co	ntrol	ler M	lon i t	or v1	25	ICP - Dis	- Intell sk Drives	igent	Computer	Periphe	rals (TM)
L	No.	Pos	ition	Chn.	ID	Status	; Ven	dor	Туре		Attr.	Size[MB	] Drive
	0	PCI	0/9	A	6	i	SEA	GATE	ST52160	N	RW	2068	0
	2	PCI	0/9	Ċ	2	i	SEA	GATE.	ST52160	Ň	RW	2068	2
	No . 9 12345678	Pos PCI PCI PCI PCI PCI PCI PCI PCI	iti 0/ 0/9 0/9 0/9 0/9 0/9 0/9 0/9	The A A A A	new 12345	disk (	lrive	is ) Pleas	built int se wait !	o the	disk arr	аў į	Drive 3

GD16537RP in Local\_Sys Sampling Rate= 1.0 sec

Γ	GD	T Co	ntrol	ler I	Monito	r v1.	25 I CI	P - Inte	lligent	Computer	Peripher	als (TM)	
L	No .	Pos	ition	h Chn	. ID S	tatus	Vendor	Туре		Attr.	Size[MB]	Drive	
	0	PCI	0/9	Ą	6	i	SEAGAT	E <u>ST521</u>	50N	RW	2068	0	
	2	PCI	0/9	Ċ	2	i	SEAGAT	E \$T521	SØN	RW	2068	2	
		he H he d he t ontr	ot Pl isk a ime t oller Rallb	ug wa array the di the di s u N to	as fin 's sta isk ar tiliza confi	ished tus h ray n tion rm !	success as chang eeds to and the	sfully ! ged to R assume disk ar:	EBUILD. the REA ray's ca	DY status apacity.	depends	on the	
	345678	PCI PCI PCI PCI PCI PCI	0/9 0/9 0/9 0/9 0/9 0/9	CAAAAA	412345	i	SEAGAT	E ST5210	50N	RW	2068		
21	1735		in	002	Sue	[mac2	ing Rafe	a- 1 A c	20				

The Array Drive changes its state to *rebuild*. This means that the ICP Controller rebuilds the original data on the new drive.

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# K.3.6.6 Hot Plug: Add private Hot Fix Drive

This function allows you to add a Hot Fix Drive to an existing RAID 4 / RAID 5 Array Drive. "Private" means that this Hot Fix Drive is only available for the selected Array Drive and cannot be accessed from other Array Drives.



After selecting this option GDTMON scans the ICP Controller for free positions where the new Hot Fix Drive can be plugged in.

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GDT Controller Monitor ( (C) Copyright 1	v1.25 ICP - Intelligent 1994-1997 ICP vortex Compu Annau Driv	Computer Peripherals (TM) tersysteme GmbH
<u>Array Dri</u>	ive 0: RAID-5: ready	SizeLMB]: 400
View/Chg. [ Controller]	Disk Dnive Positions -	
No. Position Chn. ID Stat	tus Vendor Type	Attr. Size[MB] Drive
0 PCI 0/9 A 0 i 1 PCI 0/9 B 0	I SEAGATE ST52160N Dijantijm p1058 910-10-	RW 2068 94x RW 99
2 PCI 0/9 C 4 i	SEAGATE ST52160N	RW 2068
4 PCI 0/9 A 2		
6 PCI 0/9 A 4		
8 PCI 0/9 B 1		
• Select the position of 1	the new disk drive ———	
DI6537RP in Local Sys Sav	Apling Rate= 1.0 sec	

For our example, we choose the drive on Channel C and SCSI ID 4. (If we would plug in now a new drive we would have to set the SCSI ID to 4 and make sure that the SCSI termination is set properly).

GDT Controller (C) Co	Monitor v1.25 ICP - Intelligent Comput pyright 1994-1997 ICP vortex Computersys Array Drives Array Drive 0: RAID-5: ready	er Peripherals (TM) teme GmbH Size[MB]: 400
No. No. 0 1 1 2 1 3 1 1 2 2 2 2 2 2 2 2 2 2 2 2 2	evices connected to channel(s) C stopped temporarily until the Hot Plug ts Host Drive(s) Ø, figure the new disk drive with SCSI ID 4 CSI bus terminators have to be added or sk drive must have at least 200 MB capac RN to stop the SCSI channel for unpluggi N to confirm !	is completed. removed. ity. ng/plugging.
6 PCI 0/9 A 7 PCI 0/9 A 8 PCI 0/9 B	4 5 1 Sus Samling Pater 1 & see	

GDTMON adds the new drive to the selected Array Drive.

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GDT Controller Monitor v1.25 ICP - Intelligent Computer Peripherals (TM) (C) Copyright 1994-1997 ICP vortex Computersysteme GmbH	
Array Drive 0: RAID-5: ready Size[MB]: 400	
<ul> <li>**** SCSI channel(s) C stopped ***         Plug in the new disk drive at SCSI channel C, SCSI ID 4.         Plug in the new disk drive at SCSI channel C, SCSI ID 4.         You MUST NOT DO ANY UNPLUGCING OR PLUGGING ON OTHER SCSI CHANNELS         DOING SO MIGHT CAUSE SENIOUS HARDWARE DAMAGE.         All data on the new disk drive will be destroyed.         After confirming, unplugging or plugging is not allowed.         This may cause serious hardware damage.         Press REIURN to confirm 1     </li> </ul>	
4 5 PCI 0/9 A 3 6 PCI 0/9 A 4 7 PCI 0/9 A 5 8 PCI 0/9 B 1	
DT6537RP in Local_Sys Sampling Rate= 1.0 sec	

If we now look at the Array Drive's structure (press <F2>), we can see the new drive added as a Hot Fix Drive to the Array Drive.

GDT Controller Monitor v1 (C) Copyright 19	.25 ICP - 94-1997 ICP	Intelligent Co vortex Compute	mputer Peripherals rsysteme GmbH	(TM)
Array Driv	e Ø: RAID-	5: ready	Size[MB]:	400
[ View/Chg. Controller				
Cache Sett Physical D				
Logical Dr F2: Drive	Information	·		
	Array Drive	Components-		
Log. Drive V: Disk:	OK SI	ZelMBJ: 200	Master	
Log. Drive 2: Disk:	ok Ši	ze[MB]: 200		
Log. Drive 1: Disk:	ok Si	ze[MB]: 2068	Hot Fix (priv.)	
- F2: Drive Information -				

# K.3.6.7 Hot Plug: Add Pool Hot Fix Drive

A Pool Hot Fix Drive is a spare drive within the so-called Hot Fix Pool. A drive in a Hot Fix Pool is available for several RAID 4/5 Array Drives as a Hot Fix drive. Thus, several Array

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Drives can share one Hot Fix drive. Of course, once this drive has been used by one of the Array Drives, it is no longer available for the others.

GDT Controller Monitor v1.25 ICP - Intelligent Computer Peripherals (TM) (C) Copyright 1994-1997 ICP vortex Computersysteme GmbH								
	Array	Drive	0: RAII	)-5: ready		Size[MB]:	400	
[ View∕Ch [ Control	g. Ier		Dick Duis	a Positions				
No. Position	Chn. ID	Status	Vendor	Type	Attr.	Size[MB]	Drive	
0 PCI 0/9	A Ø	i	S EAGATE Oliantiim	ST52160N P1055 910-10-	RW -94× RW	2068		
2 PCI 0/9 3 PCI 0/9 4 PCI 0/9 5 PCI 0/9 6 PCI 0/9 7 PCI 0/9 8 PCI 0/9 8 PCI 0/9 5 Select the	C 4 A 1 A 2 A 3 A 4 A 5 B 1 Position	i of the	SEAGATE new disk	ST52160N	RW	2068	Fragment	
- Select the		e une	new alsk	arive				

We select SCSI Channel C and ID4 for the new Pool Hot Fix Drive.

GDT Controll (C)	er Monitor Copyright	v1.25 I 1994-1997	CP - Intelligent ICP vortex Comp	Computer Peripherals (TM) utersysteme GmbH	)
	Array Di	rive Ø:	RAID-5: ready	Size[MB]: 400	
[ View/Chg	en l				
Cache Se Physical	tt				
Logical Appau Dr	Dr̃L F2: Dri	ive Inform	ation ———		
		A			
Log. Drive	Ø' Nisk'	Array ok	Drive Components	00 Masten	
Log. Drive	0: Disk: 4: Disk: 2: Disk	ok ok	SizeLMBJ: 2 SizeLMBJ: 2 SizeLMBJ: 2 SizeLMBJ: 2	00 Master 00	
Log. Drive Log. Drive Log. Drive Log. Drive	0: Disk: 4: Disk: 2: Disk: 1: Disk:	ok ok ok ok ok	Drive Components Size[MB]: 2 Size[MB]: 2 Size[MB]: 2 Size[MB]: 20	00 Master 00 68 Hot Fix (Pool)	
Log. Drive Log. Drive Log. Drive Log. Drive	0: Disk: 4: Disk: 2: Disk: 1: Disk:	ok ok ok ok ok	Drive Components Size[WB]: 2 Size[WB]: 2 Size[MB]: 2 Size[MB]: 20	00 Master 00 08 68 Hot Fix (Pool)	
Log. Drive Log. Drive Log. Drive Log. Drive	0: Disk: 4: Disk: 2: Disk: 1: Disk:	ok ok ok ok ok	Drive Components Size[MB]: 2 Size[MB]: 2 Size[MB]: 2 Size[MB]: 20	00 Master 00 68 Hot Fix (Pool)	

You may disable or enable the access of a certain RAID 4/5 Array Drive to the pool of Hot Fix Drives with the option "Pool Hot Fix Access" (see K.3.6.4).

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# K.3.6.8 Hot Plug: Remove Private Hot Fix Drive

This function is used, if you want to remove a private Hot Fix Drive from an Array Drive.

#### K.3.6.9 Hot Plug: Remove Pool Hot Fix Drive

In a similar way as with the "Remove private Hot Fix Drive" function, here you can remove a Hot Fix Drive from the Hot Fix Pool. A possible reason for this could be that you want to add it as a private Hot Fix Drive to an Array Drive.

	GD	T Co	ntrol	ler M	lonit	tor v1.	25 I	CP -	Intelligen	t Computer	Peripher	als (TM)
	No .	Pos	ition	Chn.	ID	Status	Vendo	)r	fype	Attr.	Size[MB]	Drive
	0	PCI	0/9	C	4	i	SEAGA	ATE E	ST52160N	RW	2068	1
	L Se	lect	one	of tł	ne di	isk dri	ves fo	or Ho	t Plug ——			
							View/	/Chan				
l						L			Hot Plug: Hot Plug:	Add priv.	Hot F	ix Drive
l									Hot Plug: Hot Plug:	Add Pool Remove pr	Hot F iv. Hot F	ix Drive ix Drive
									Hot Plug:	Remove Po	ol Hot F	ix Drive
ļ	'NT 2 5'	ססרכ	in I		Suc	Count	ing D.	to-	A 500			

### K.3.7 Save Information

The *Save Information* option gives you the possibility to save the configuration information regarding the selected ICP Controller and its SCSI devices in an ASCII-file. This may help if you require support and is also good for your system documentation.

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