

CONFIGURATION OF COPPER BOX PERIPHERALS

HOT SWAPPING STRUCTURE ON NETSTRADA 3000

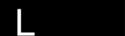
This structure is integrated in the Standard or Rack version Copper box and, together with the GO2173 RAID DPT SCSI controller, allows HDU hot swapping. Hot swapping is the feature by which a faulty HDU can be replaced without interrupting system activities and the automatic reconstruction of the data on the new hard disk. This structure consists of:

- IF2060 SCSI backplane
- Swap Board IF2061
- Jumper Board IF2054 or Terminator Board IF2053
- Mechanical structure
- HDU support frame.

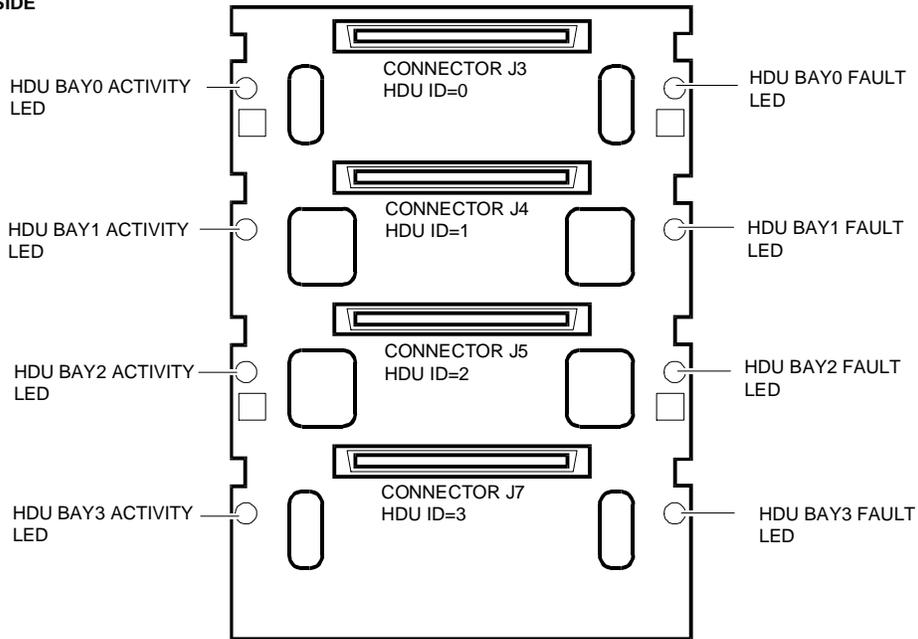
IF2060 SCSI BACKPLANE

The following components are located on the backplane:

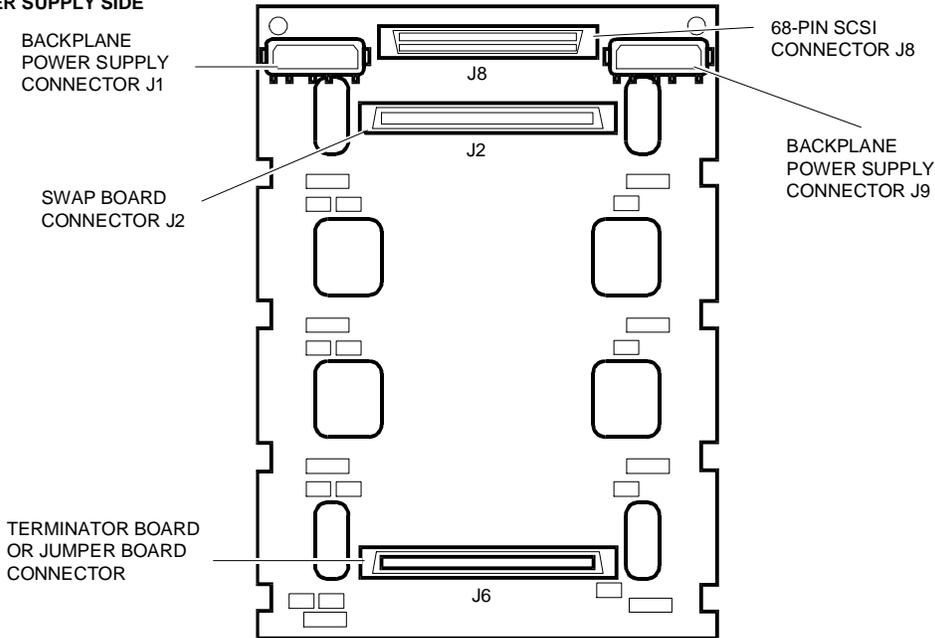
- Female 68-pin SCSI Wide connector (J8) for connection to the onboard SCSI controller (by means of board IF2063).
- Female 80-pin card-edge connector J2 for the connection of Swap Board IF2061.
- Female, 80-pin, SCA2, SCA-compatible connectors J3, J4, J5 and J7 for direct connection between the HDU and the backplane. These 80-pin connectors provide the standard SCSI signals, the power supply to the HDUs, the SCSI ID and certain control signals. A SCSI ID is set for each HDU on the backplane in increasing order from top to bottom (J3=ID0, J4=ID1, J5=ID2, J7=ID3) and which cannot be changed. On the backplane there are two SCSI channels that are separated in Duplexing configurations and connected one after the other in non-duplexing configurations. The first SCSI channel begins with connector J8, connects J3 ID=0 and J5 ID=2 and goes to J6 reserved for the swap board or jumper board. The second SCSI channel begins on the swap board and, by means of J6, connects J4 ID=1 and J7 ID=3 and is terminated on the swap board.
- Male, 4-pin connectors J1 and J9 for power supply to the backplane.
- Male, 80-pin connector J6 to which the jumper board or terminator board is attached. The two SCSI channels on the backplane can be joined by means of the jumper board or terminated by means of the terminator board. The jumper board is present in all systems, while it can be optionally replaced by the terminator board on systems in a duplexing configuration.
- There are two LEDs in each disk area on the backplane; a green LED indicating HDU activity and a yellow LED indicating HDU failure. The Faulty HDU LEDs in non-resilience configurations, in other words with a SCSI controller different than the DPT, are not operational and are therefore always off.
- In each disk area there are two springs that guarantee connection to reference ground and allow the generation of the swap signal when an HDU is either inserted or removed. The disks that are not connected to the SCSI backplane must be completely removed from the system since, even though being disconnected from the bus, they are still connected to ground as long as they remain inserted in the rack.



HDU SIDE



POWER SUPPLY SIDE



BOARD IF2060 (P.c.b. code 654531 V) EVOLUTION

DATE	LEV.	VIMO CODE	REASON FOR CHANGE	APPLIC.
10/96	Nasc	212771 A	New board.	Factory

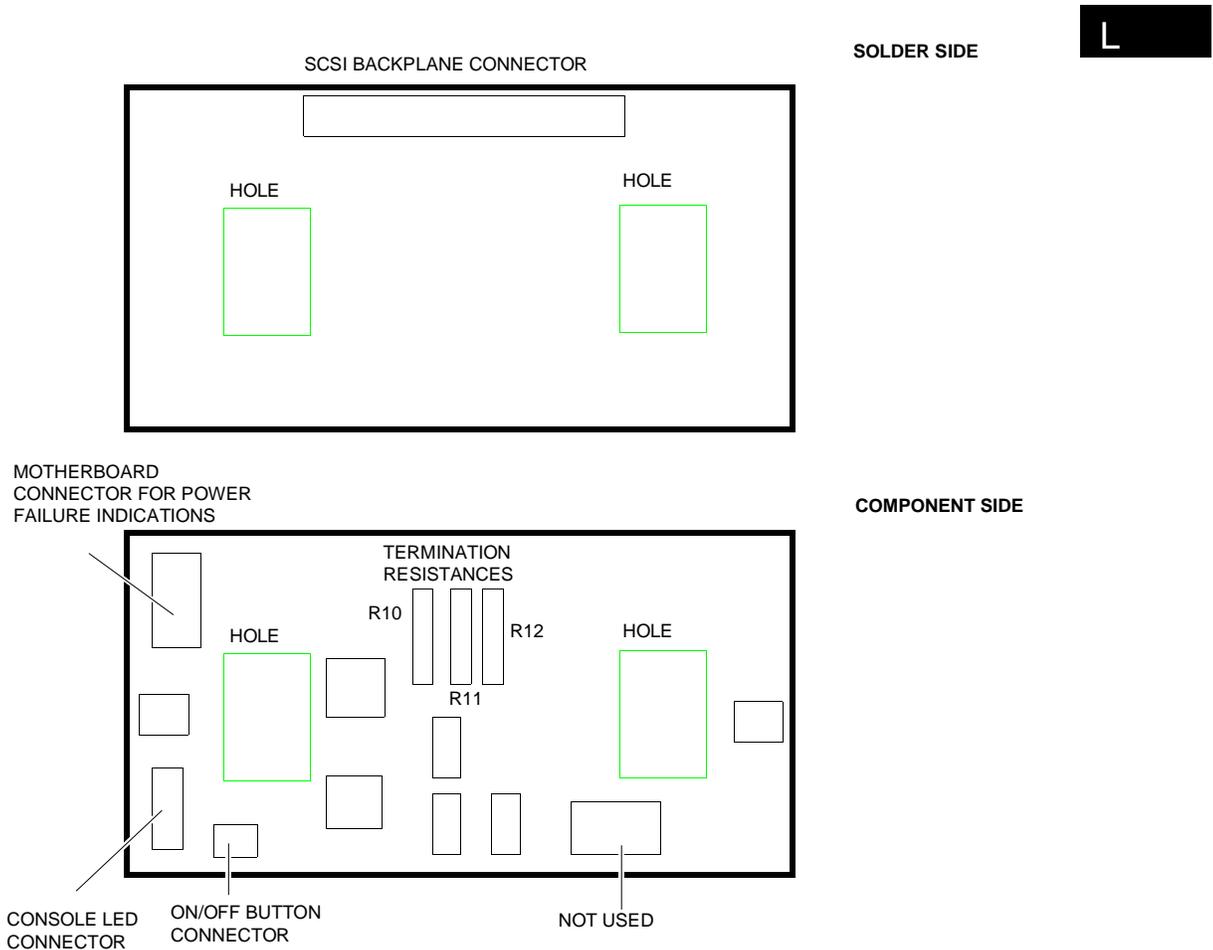
SWAP BOARD IF2061

This board has the following functions:

- **Bus Fault signal management** - Used for controlling the hot swapping between the SCSI controller and the swap board. The four signals are: MSWAP (pin 20); MSHOK (pin 22); MFCLK (pin 30); MFDAT (pin 34).
- **Console LED drive** - There are four LEDs on the front of the box:
 - SYS ON: green LED indicating when the system is powered on.
 - SCSI BUSY: green LED indicating when the SCSI channel is active.
 - HDU FAULT: yellow LED indicating a faulty hard disk. The faulty disk is identified by the corresponding yellow LED on the backplane.

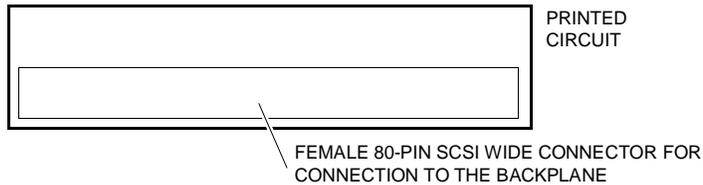
Note: *In non-resilience configurations, without the RAID DPT SCSI controller, the HDU Fault LED is not operational and is therefore always off.*

- SYS FAULT: yellow LED indicating a high temperature in the system box.
- **SCSI bus termination** - The SCSI channel termination is made on the swap board, is active and consists of three socket-installed terminators R10, R11 and R12. These terminators are always present, and in non-duplexing configurations they terminate the channel that begins with backplane connector J8 while in duplexing configurations they terminate the second SCSI channel that begins on the terminator board.
- **ON/OFF switch.**



BOARD IF2061 (P.c.b. code 654532 W) EVOLUTION

DATE	LEV.	VIMO CODE	REASON FOR CHANGE	APPLIC.
10/96	Nasc	212781 V	New board.	Factory
1/97	01		Even though grounded by the Adaptec AHA-2940UW controller, the MFCLK and MFDAT signals receive noise which in some cases cause the transmission on the SCSI channel of an incorrect disk error indication thus causing the Fault LED on the console and on the disk to come on. This problem is only visual and is corrected by means of a 470 pf capacitor fitted in position C11, currently free.	Factory

JUMPER BOARD IF2054

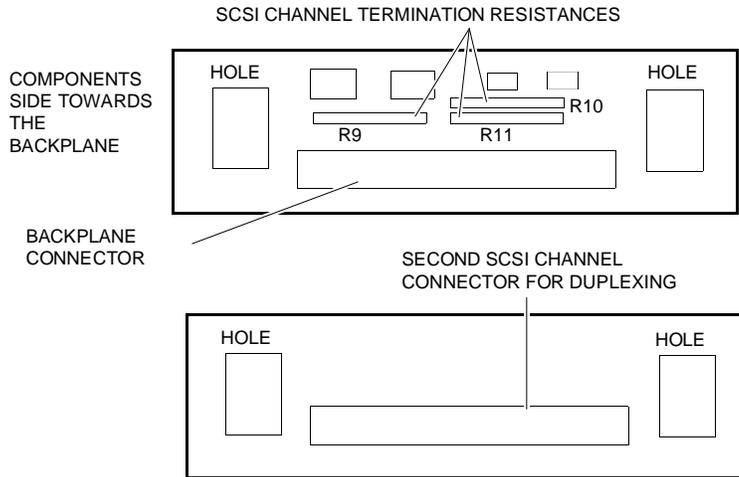
The jumper board is a jumper that joins the backplane's two SCSI buses and is inserted into the appropriate connector on the backplane. This board is present in all non-duplexing configurations.

BOARD IF2054 (P.c.b. code 654508 P) EVOLUTION

DATE	LEV.	VIMO CODE	REASON FOR CHANGE	APPLIC.
10/96	Nasc	212654 D	New board.	Factory

TERMINATOR BOARD IF2053

The terminator board is an active terminator for the SCSI bus and is used in duplexing configurations only. By means of R9, R10 and R11, it terminates the SCSI bus beginning with connector J8 on the SCSI backplane. This board has SCSI connector J2 which is the input of the second SCSI channel (duplexing channel). Connector J1 sees to the connection with the backplane in the place of the jumper board.



BOARD IF2053 (Cod. c.s. 654507 E) EVOLUTION



DATE	LEV.	VIMO CODE	REASON FOR CHANGE	APPLIC.
10/96	Nasc	212653 C	New board.	Factory
12/96	01		During disk activity in the Duplexing mode, a noise on the MFCLK signal causes an incorrect disk error indication to be transmitted through the SCSI channel (with the MFDATA signal) thus causing the related Fault LED on the console and on the disk to come on. This problem is visual only and is corrected by placing a 470 pF capacitor on the MFCLK signal. The problem described only occurs when MFCLK is not used and is grounded directly on the AHA2940UW controller.	Factory

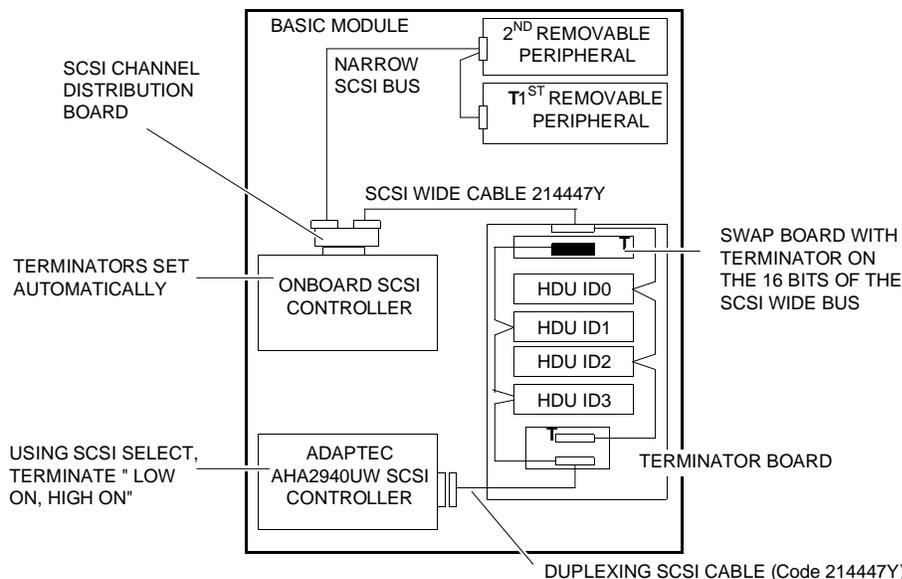
DUPLEXING CONFIGURATION

Disk duplexing is a particular mirroring configuration handled by the operating system. The hardware configuration consists of two separate SCSI channels that are to be connected to the same number of HDUs (one or two), and one SCSI controller per channel. The HDUs of each channel contain the same data and the controllers perform the same operations thus obtaining maximum redundancy. The necessary hardware consists of:

- Two SCSI controllers that must be terminated and have a SCSI ID=7. The channel on which the HDUs with ID=0 and ID=2 are connected is handled by the onboard SCSI controller while the other channel on which the HDUs with ID=1 and ID=3 are connected is handled by the Adaptec AHA 2940UW SCSI controller. The onboard controller also handles the internal removable SCSI peripherals. The terminators on the AHA 2940UW board are enabled by the SCSI Select Utility as "Low ON and High ON". The terminators on the onboard SCSI controller are set automatically.
- One Duplexing Kit, the same for Standard or Rack version systems, called DUP KIT3000UW and containing the terminator board and an internal SCSI Wide cable which connects the AHA 2940UW SCSI controller to the terminator board. The terminator board terminates the channel connected to the HDUs with ID=0 and ID=2; the terminator board has the channel input connector on which the HDUs with ID=1 and ID=3 are connected and which is terminated on the swap board.
- An equivalent number of HDUs (1 or 2) connected to the two channels. If there is only one HDU per channel, they must be installed in positions 0 and 1 (ID=0 and ID=1).

Note: The installation of the Duplexing Kit causes the system configuration to change and therefore the system needs to be reconfigured.

Note: Duplexing is only used with the operating systems that allow the software mirroring of the disks such as Windows NT 3.5 and NetWare 3.12 and 4.1.



Note: From March 1997, the duplexing SCSI cable code 21444 Y is replaced by cable code 214460 H so that the Duplexing Kit can be used for both the NetStrada 3000 and NetStrada 1000.

MECHANICAL STRUCTURE

The mechanical structure assembly consists of a rack capable of hosting up to four 3.5"x1" HDUs, the swap board and the console LED support. The backplane is secured at the rear of the rack while the door for accessing the disk area is at the front. Access to the disk area is protected by a key located on the door.

HDU SUPPORT FRAME

The HDU support frame is a metal container capable of hosting a 3.5" disk equipped with an 80-pin SCA (Single Connector Attachment) connector and designed for direct connection to the backplane. The support frame has two light conveyors that route the indications provided by the HDUs fitted on the backplane to the front of the box. This support has a handle to ease disk insertion and extraction.

REPLACING A FAULTY HDU

- The RAID DPT SCSI controller finds a faulty HDU, sends to the swap board the command to turn on the HDU Fault LED on the console.
- The operator accesses the disk area and removes the HDU whose corresponding yellow LED is on, without powering off the system and without interrupting the activities underway.
- The swap board generates the Swap signal and sends it to the SCSI controller.
- The operator inserts the new HDU, which must have the same physical characteristics as the one replaced, meaning it must be a 3.5" drive, 1" high, Wide or Ultra Wide and equipped with an 80-pin SCA interface connector.
- The swap board generates the Swap signal and sends it to the SCSI controller.
- If the faulty HDU was part of a fault tolerant array (RAID 1 or RAID 5), the SCSI controller begins the reconstruction of the data of the old hard disk onto to new one. The HDU Fault LED flashes during this phase.
- Once reconstruction is completed, the SCSI controller sends to the swap board the command that turns off the HDU Fault LED on the console.

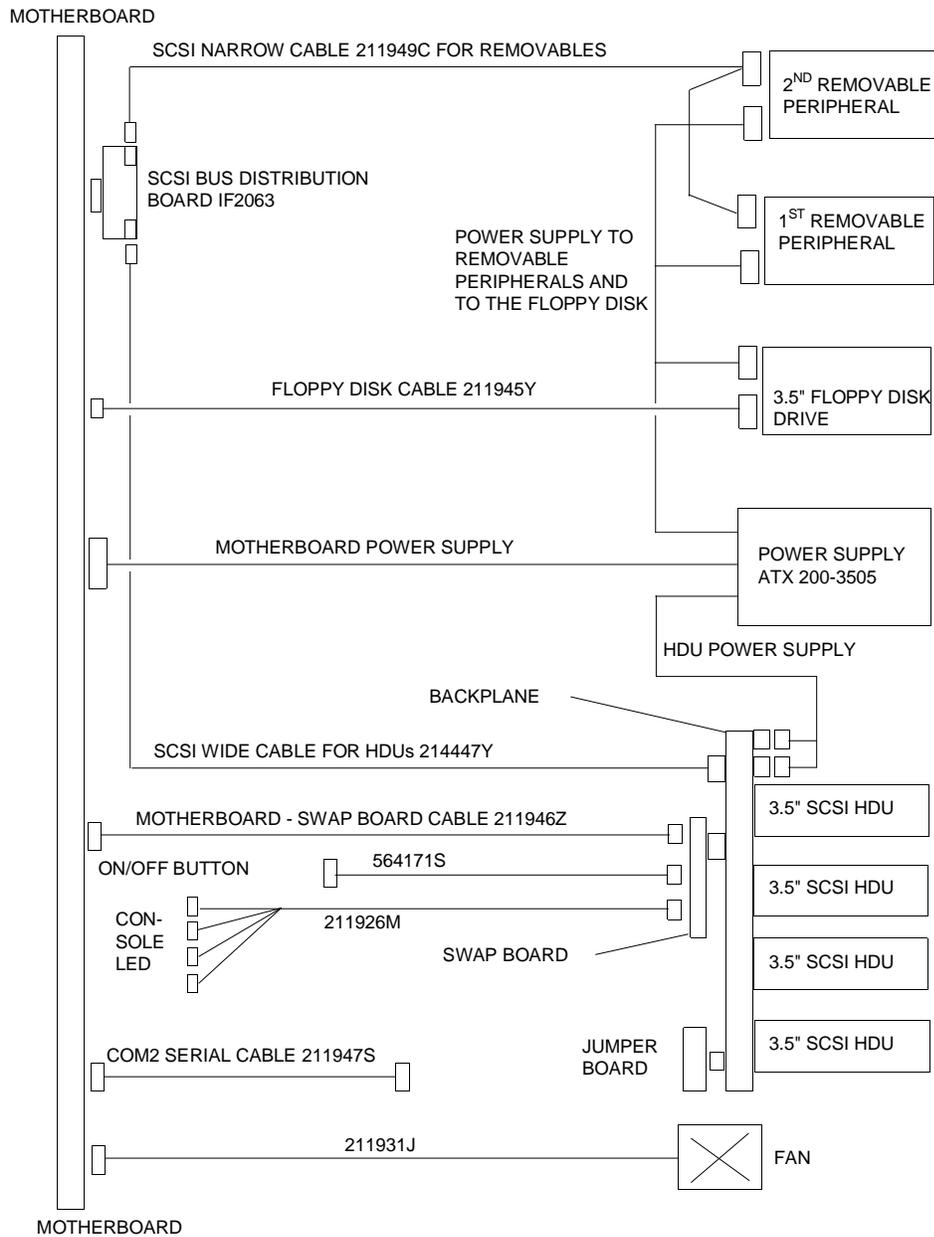
Note: *When an HDU is added or replaced, if the disk has already been used on another system equipped with a RAID controller make sure that this disk does not have any logical marker on it, in other words it must have been cleared ("ZAPPED").*

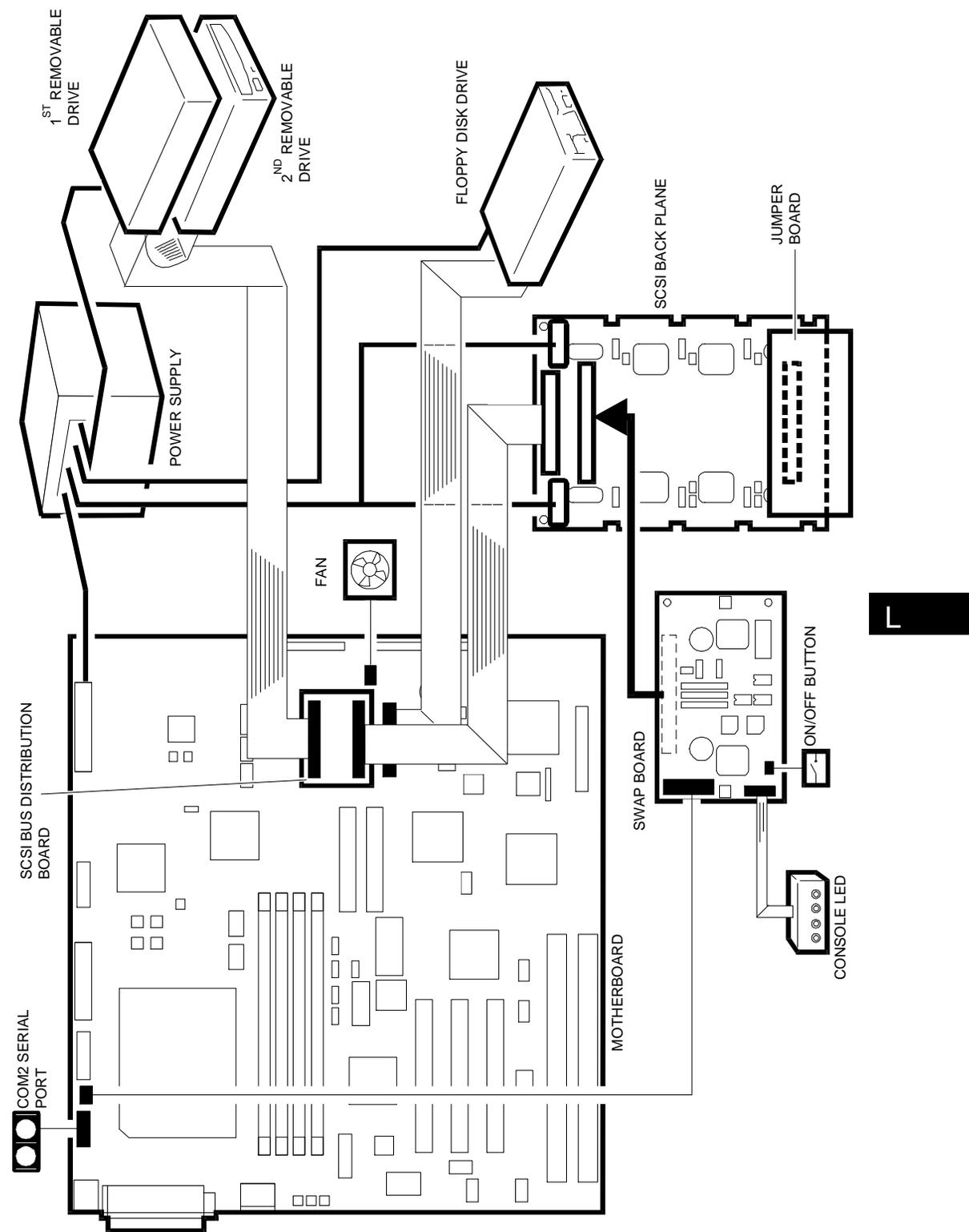
To clear a disk boot the system from the Storage Manager diskette and press CTRL-C during this boot sequence to prevent the utility from being automatically loaded, then activate the utility by typing "dptmgr /ZAP" at the DOS prompt. The utility will display the list of drives connected and will ask which drive has to be "ZAPPED".

Another method to clear one or more hard disks is the activation of the CLEANHDU Utility, available on diskette and which allows to recover the hard disks that are considered as being unrecoverable via software (see Appendix M).

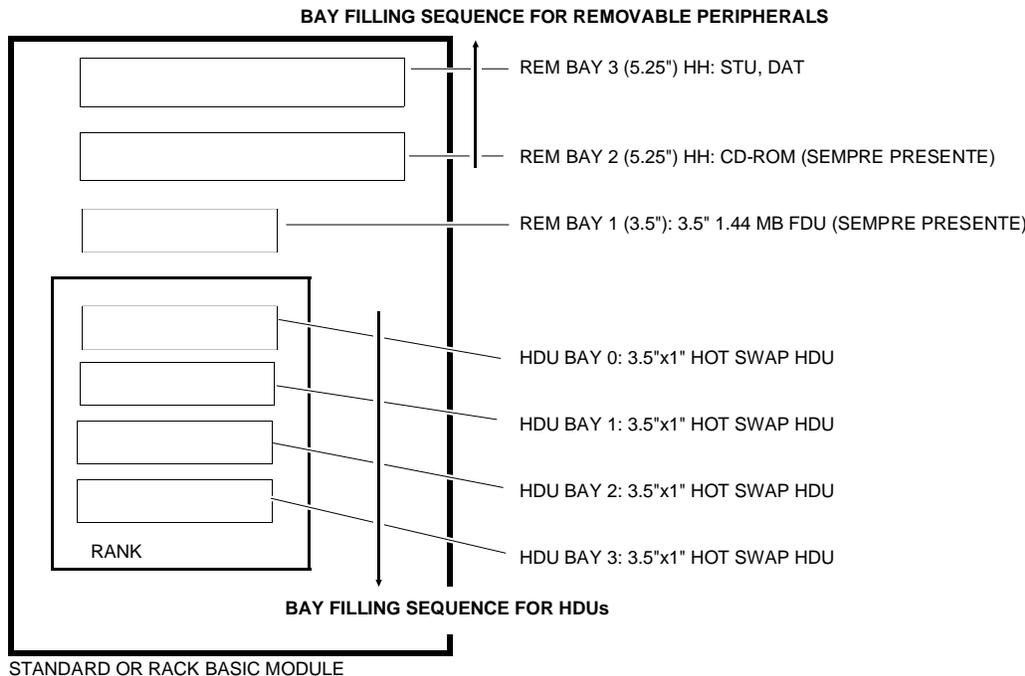
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HOT SWAPPING STRUCTURE CONNECTIONS





INSTALLABLE PERIPHERALS



BAY	INSTALLABLE PERIPHERALS	NOTES
BAY 1 (3.5")	1.44 MB (3.5") FDU	3.5" REM bay 1 is always accommodates a 3.5" 1.44 MB HDU
BAY 2 (5.25")	CD-ROM (5.25" HH)	5.25" HH REM bay 2 always accommodates a CD-ROM
BAY 3 (5.25")	STU (5.25" HH) or DAT (3.5")	5.25" HH REM bay 3 can only accommodate removable peripherals
BAY 0 (3.5"x1") BAY 1 (3.5"x1") BAY 2 (3.5"x1") BAY 3 (3.5"x1")	HDU (3.5"x1") Hot Swap	3.5"x1" bays 0, 1, 2 and 3 can only accommodate 3.5"x1" hotswappable SCSI HDUs. The HDUs can have different capacities with the exception in RAID arrays where paired HDUs must be identical. In the case of hot spares or replacement HDUs, HDUs with capacities greater than the ones replaced can be used.

BAY FILLING SEQUENCE

In every basic module configuration there is a 1.44 MB FDU installed in 3.5" REM bay 1 and a CD-ROM installed in 5.25" HH REM bay 2.

The first 5.25" SCSI removable peripheral, besides the CD-ROM which is always present, is installed in REM bay 3. The bay filling sequence for removable peripherals goes from REM bay 1 to REM bay 3.

The bay filling sequence for the HDUs in the substructure has no specific rule even though usually HDU bay 0 is filled first to then proceed up to HDU bay 3. Some restrictions, however, do exist: for example in case the SCO operating system is installed from an STU in a channel on which HDUs and removable peripherals are shared, bay 2 (HDU ID=2) must remain free since this ID is assigned to the STU; there are no restrictions if the SCO operating system is installed from CD-ROM, which must have an ID=5.

SCSI CHANNEL CONFIGURATION

The system can use non-resilience and resilience configurations. The mechanical structure of the system is set for resilience configurations where the HDU, if connected to a RAID DPT SCSI controller, can be replaced without powering off the system and therefore interrupting the activities underway (hot swapping). The more common configurations are the following:

- **Non-resilience configuration:** the onboard SCSI controller manages the HDUs and basic module removable peripherals. It does not manage the PEM HDUs. Hot swapping is not possible in this configuration.
- **Basic module resilience configuration:** the onboard SCSI controller manages the removable peripherals in the basic module; the RAID DPT controller manages the HDUs in the basic module.
- **Resilience configuration in the PEM only:** the onboard SCSI controller manages the HDUs and removable peripherals in the basic module; the RAID DPT controller manages the HDUs in the PEM.
- **Resilience configuration in the basic module and in the PEM:** the onboard SCSI controller manages the removable peripherals in the basic module; the RAID DPT controller manages with one channel the HDUs in the basic module and the HDUs in the PEM with the other.
- **Duplexing configuration:** the onboard SCSI controller manages half of the HDUs and removable peripherals in the basic module; the Adaptec AHA2940UW SCSI controller manages the other half of the HDUs in the basic module.

The Ultra Wide PCI RAID DPT SCSI controller can manage from one to three SCSI channels and is only dedicated to the HDUs in the basic module and in the PEM; connection to external SCSI peripherals other than the PEM is not possible. The Adaptec AHA2940UW SCSI controller needs to be ordered for this type of connection.

Up to two DPT controllers can be installed in the system; the first, installed in PCI slot 2 of the motherboard, can manage the HDUs in the basic module and those in the PEM (with two separate channels) while the second DPT controller, installed in PCI slot 3, can only be connected to the HDUs of the PEM.

Note: *The onboard SCSI channel support SCSI Ultra Wide while the PEM SCSI channels work in the Fast Wide mode and not in the Ultra Wide mode.*

Note: *The PEM model that can be connected to this system is the PEM 241W/RS for the standard system or PEM 240W/RM for the Rack system. The PEM is described in Appendix J.*

Note: *The HDUs of a channel must all be Fast Wide or all Ultra Wide; Fast Wide and Ultra Wide HDUs are not to be used on the same channel even though technically possible.*

The rules for configuring the SCSI channel are that all the devices connected (max. 8, controller included) must have a different identifier (SCSI ID) and that the bus be terminated at its ends only (on the first and last device on the bus) while the terminator must be removed from all the peripherals in between.

In all the configurations where peripherals are connected to the SCSI bus, the maximum length of the SCSI channel is 6 meters.

RULES FOR ASSIGNING THE SCSI ID

Besides assigning a different address to the peripherals connected to the bus, the SCSI ID determines their priority. The ID is checked when, following simultaneous requests for SCSI bus accesses, the device with the highest priority is served first.

In a 16-bit SCSI Wide system (Fast or Ultra), the priority of the IDs follows this rule: 7, 6, 5, 4, 3, 2, 1, 0, 15, 14, 13, 12, 11, 10, 9, 8. Since IDs 8 to 15 always have a lower priority with respect to an 8-bit device, an 8-bit device that does not recognize IDs from 8 to 15 can coexist with a 16-bit device on the SCSI bus.

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If the SCSI Wide controller manages an 8-bit device, the controller cannot be configured with IDs from 8 to 15 since the device is unable to recognize the controller. IDs from 8 to 15 are, however, not used on these systems.

The particular structure of this system automatically assigns the SCSI ID to the HDUs according to the position they occupy in the rank. Usually the first HDU is located in bay 0 and therefore has a SCSI ID=0, the SCSI controller has a SCSI ID=7. If the removable SCSI peripherals are connected to the same channel as the HDUs, the CD-ROM will always have a SCSI ID=5 while the other peripheral, STU or DAT, will always have a SCSI ID=4. If the removable peripherals are connected to a separate SCSI channel, the SCSI ID of the peripherals can be set freely.

Note: *When the same kind of SCSI controllers are installed (onboard controller and AHA 2940UW), the prerequisites required for the installation of the SCO 3.2.4.2 and SCO Open Server 5.0x operating systems are that the removable peripheral used for installation (CD-ROM or STU) must be connected to the same channel as the boot HDU and that the STU be assigned an ID=2 and the CD-ROM an ID=5, with the consequent loss of HDU bay 2. Since the removables and the HDUs are connected to two different kinds of SCSI controllers (for example the removables to the onboard controller and the HDUs to the RAID DPT), the STU and CD-ROM must be assigned IDs of 2 and 5, respectively.*

The following table provides a typical example on how the SCSI IDs are set on non-resilient systems without PEM:

SCSI ID	0	1	2	3	4	5	6	7
Peripherals	1 st HDU	2 nd HDU	3 rd HDU	4 th HDU				RAID SCSI controller
					2 nd REM PER	CD-ROM		Onboard SCSI controller

This condition also applies to the optional controllers; for the RAID DPT controller in particular, this condition applies to all three channels.

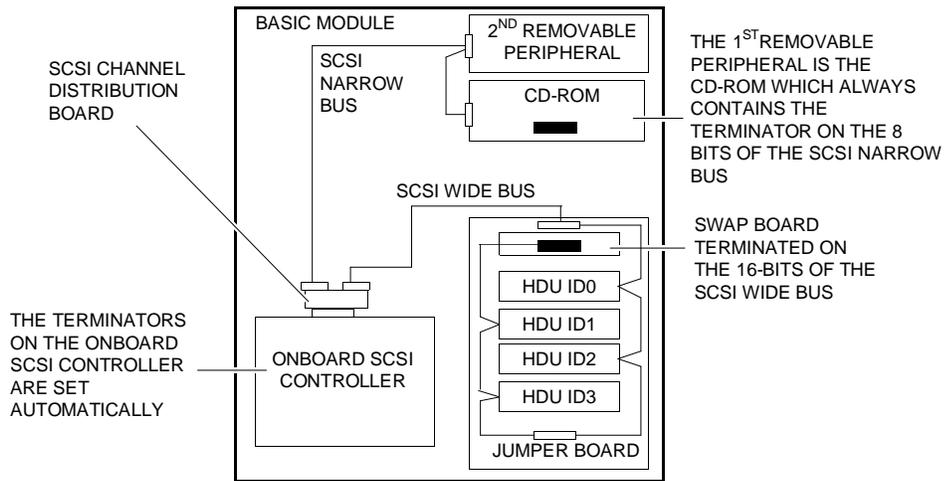
The SCSI ID is automatically assigned to the HDUs, while the SCSI ID is assigned to the removable peripherals by physically setting the jumpers or DIP-switches present on the drives. The SCSI firmware automatically recognizes the ID of the peripheral and therefore this value does not have to be set via software.

The SCSI controller ID is only set via software by means of the SCU for the onboard controller, or by means of the DPT Configuration Utility for the RAID controllers. The default value for all the controllers is ID=7; this value must not be changed if not for SIREN configurations which are only possible with the RAID DPT GO2173 SCSI controller.

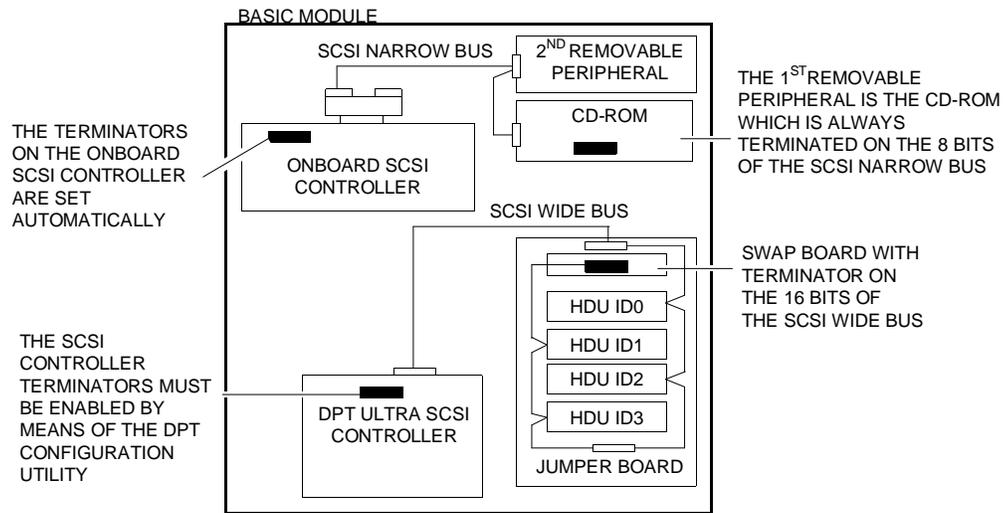
TERMINATION RULES

The SCSI channel must always be terminated at its ends (on the first and last device on the bus) and the terminator removed from all peripherals in between. On these systems, the SCSI terminator for the HDU assembly is always present on the swap board and cannot be removed.

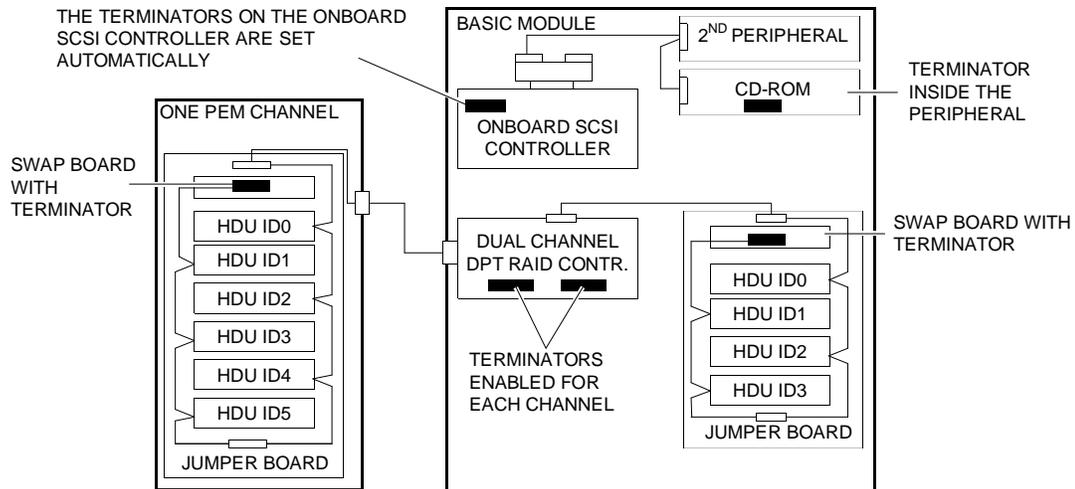
If only the onboard SCSI controller is installed in the system and is dedicated to the HDUs and to the internal removable peripherals, the terminators must be installed on the HDU assembly and on the last peripheral (CD-ROM); the terminators are set automatically on the motherboard SCSI controller.



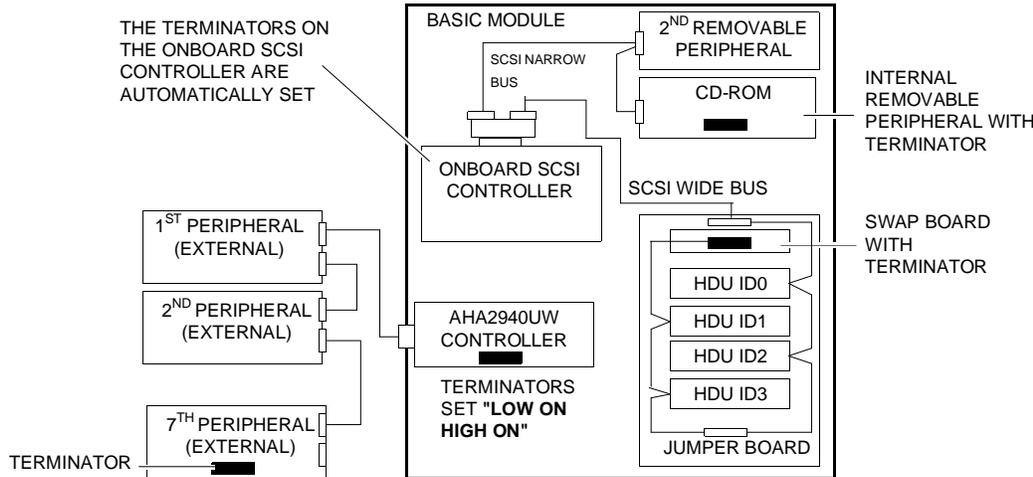
If there are two SCSI controllers installed in the system, one for the HDUs and one for the internal removables, the HDU channel is terminated on the swap board and on the SCSI controller while the channel for removables is terminated on the SCSI controller and on the last peripheral (CD-ROM).



In case of connection to the PEM, at least one channel of the RAID DPT controller is needed. The terminator must be present on the controller and swap board of the PEM. The RAID DPT controller is always located at the ends of the channel.



In case of connection to external SCSI peripherals, excluding the PEM, a dedicated AHA 2940UW controller needs to be ordered since the onboard controller does not have the external SCSI Narrow connector. In this case the terminator must be present on the controller and on the last external peripheral connected to the system.



The termination of the onboard SCSI controller is made on the board and consists of active terminators that are automatically set without operator intervention.

The termination on the AHA 2440UW SCSI controller is made on the board and consists of active terminators that are enabled or disabled by means of the SCSI Select Utility; termination can be made on the SCSI Narrow bus, on the most significant 8 bits of the SCSI Wide bus, or within the SCSI Wide bus (16 bits).

The termination on the RAID DPT SCSI controller is made on the board and consists of active terminators that are enabled or disabled by means of the DPT Configuration Utility for each of the channels on the controller. The default value is "Termination Bus ON" for all channels.

The SCSI termination is always made on the swap board for the HDU assembly of both the system and PEM. The SCSI termination for the internal removable peripherals is always made on the last peripheral of the bus (CD-ROM) in all configurations, therefore for the added removable SCSI peripheral make sure, during installation, that the terminators inside the drive are removed.

Terminators are not installed on the SCA SCSI HDUs while in the case of any external SCSI peripheral connected to the system, termination is made directly on the peripheral (for the location of this terminator see the documentation provided with the peripheral).

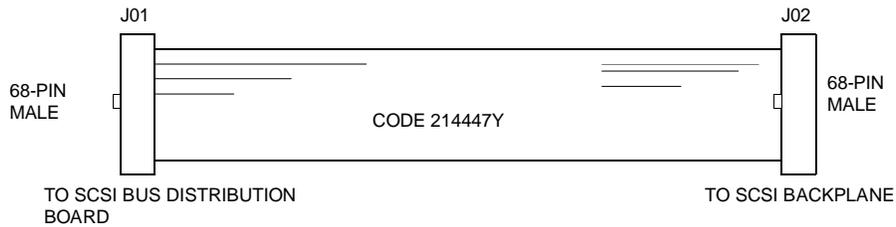
CABLING OF PERIPHERALS

The onboard floppy controller allows the management of up to two peripherals with floppy disk interface. Only the 3.5" 1.44 MB FDU can be connected to these systems and is always present. The interface cable consists of a dual connector flat cable, one end of which connected to the motherboard floppy connector and the other to the FDU.

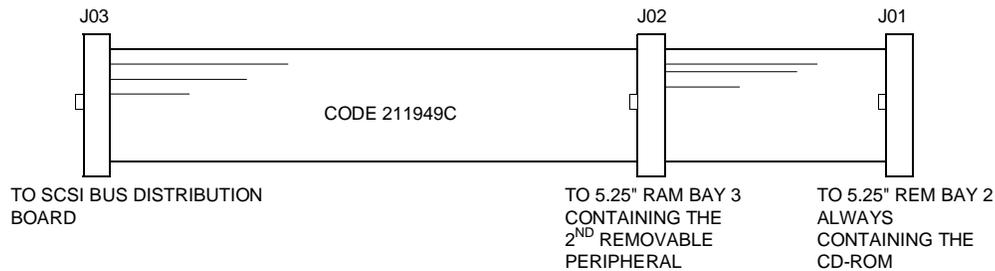


As far as the connection of SCSI peripherals is concerned, there are two internal cables present in every configuration:

- A dual-connector SCSI Wide cable used for connecting the SCSI bus distribution board to the SCSI backplane. Only the HDU assembly can be connected to this cable.



- A SCSI Narrow cable with three connectors used for the connection of internal removable SCSI peripherals only (first and second).



Any external peripheral, PEM excluded, connects to the high density SCSI Wide connector of the optional AHA 2940UW controller on the rear of the system by means of SCSI cable CBL 3000EXT. Additional peripherals are daisy-chained using cable CBL 5365; the maximum length allowed for the SCSI channel is 6 meters. The PEM is connected to the external high density SCSI Wide connector of the Ultra Wide RAID DPT controller on the rear of the system by means of SCSI Wide cable CBL 5350W.



SCSI CABLES

PDG	VAR.	DESCRIPTION	LENGTH (m)
CBL 3000EXT		External SCSI cable for adapting 68-pin high density SCSI connectors to 50-pin low density SCSI Narrow connectors	1.5
CBL 5365		External SCSI Narrow cable for adapting 50-pin high density SCSI connectors to 50-pin low density SCSI connectors	1.5
CBL 5350W	CAV 232	External SCSI Wide cable for connecting the system basic module to the first or second PEM Wide, code 564180 Y. This cable has two 68-pin high density SCSI connectors	1.1
	CAV 265	External SCSI Wide cable connecting the system basic module to the remaining PEM Wide, code 564172 T. This cable has two 68-pin high density connectors	1.5

Note: The internal SCSI Wide cable for the additional channels of the GO2098/2173 controller has code 564173 V and is contained in the expansion kit of the second SCSI channel EXP 2NDSCSIW, EXP 2NDSCSIUW and in the expansion kit of the second and third SCSI channel EXP 2&3SCSIW, EXP 2&3SCSIUW.

