

Subchapter 4.11—Cables

Requirements

SCSI Cabling Guidelines

- Ensure that the total cable length (including external and internal cables) does not exceed 6 meters for single-ended SCSI and 25 meters for Fast/Wide/Differential SCSI. When the different components are to be racked, consider the relative location of each of the devices relative to the SPU. Refer to the racking discussion, earlier in this Chapter, to see how the factory will determine the location of each of the components.
- The length of the SCSI bus cable should be kept as short as possible. However, do not use cables shorter than 0.5 meters.
- Make sure that all cables are attached to a device at both ends, except for the host adapter of course.
- SCSI cable impedance and construction can have significant effect on signal quality. For this reason, we recommend that only HP cables be used.
- Be sure to include the internal SCSI cable lengths of storage systems in your overall cable length calculations.

***Note:** The information in this section is intended to include both HP 3000 and HP 9000 information. Therefore, inclusion of a Storage Device in a table does not imply it is supported on the HP 3000. See the peripheral support matrix in **Appendix A** for a list of supported devices on the HP 3000.*

SCSI Cable and Terminator Connections

This discussion describes the requirements for connecting SCSI peripherals either to a host or each other, and also the terminator required for a chain of connected SCSI peripherals.

Here are the guidelines for choosing connections:

1. Determine the product numbers of the two devices to be connected.
2. Determine the SCSI bus type of the peripherals to be connected: single-ended or fast/wide.
3. Determine what connector is used on the peripherals. SCSI connector types are:
 - LDBL50 = 50-pin low-density bail lock connector
 - HDTS50 = 50-pin high-density thumb screw connector
 - HDTS68 = 68-pin high-density thumb screw connector
4. Use **Table 4.11.1** to determine the required cable group. Choose the cable with the desired length.
5. Use the following table to choose a terminator.

Connector	Product #	HP Part #
HDTS50	C2904A	A1658-62016
LDBL50	K2291	1252-3920
HDTS68 (SE)	A3328A	5063-5324
HDTS68 (FWD)	C2905A	A1658-62024

6. Use **Table 4.11.2** to determine if a cable and/or terminator is included with the peripheral or needs to be ordered.

A general rule of thumb is that cables must be ordered with the peripheral and terminators are usually supplied with the SCSI card. There are contradictions to this rule of course. **Table 4.11.3** attempts to identify when cables and terminators are included and are not included with peripherals

Special Cases

- The single-ended terminator for the HP High Availability Storage System is a 68-pin connector. This is currently the only product where this connector is used for single-ended devices. As such, this terminator is included, when certain single-ended cables are ordered.
- The High Availability Disk Arrays come with their own terminators.

Table 4.11.1 Cables Required for Connecting SCSI Peripherals

From I/O card/peripheral-to-peripheral (from connector type to connector type)	Cables Required			Cable Length (Meters)
	Product Number	HP Part Number	High Availability Storage System Opt. Number	
From HDTS50 to LDBL50 (SE)	K2296 K2297	5062-3384		0.5
		5062-3383		1.0
		5062-3388		1.5
		5062-3386		2.0
		5063-1218		2.5
From HDTS50 to HDTS50 (SE)	C2955A C2908A C2956A C2957A C2958A	8120-5547		0.5
		8120-5548		1.0
		8120-5549		1.5
		8120-5550		2.0
		8120-5551		5.0
From LDBL50 to LDBL50 (SE)	92222A 92222B 92222C C2927A C2928A	8120-5158		0.5
		8120-4998		1.0
		8120-5159		2.0
		5063-1212		3.0
		5063-1213		5.0
Extender Cables (Male/Female)	92222D C2900A C2901A	8120-5160		1.0
		8120-5519		3.0
		8120-5520		5.0
From HDTS68 to HDTS68 (FWD or SE)	A3401A #005 C2911C	8120-6147		0.5
		A1658-62018	#801	0.9
	C2924C A3401A #001 C7522A C7532A	A1658-62019		1.5
		A1658-62020	#802	2.5
		A1658-62021	#803	5.0
		A1658-62022	#804	10.0
		A1658-62023		20.0
From LDBL50 to HDTS68 (SE)	C2915A A3401A #002 A3401A #003 ¹	5063-1214	#821	1.0
		5063-1269	#822	2.0
		5063-5323 ¹	#823 ¹	1.0 ¹
From HDTS50 to HSTS68 (SE)	C2959A C2961A C2962A C2906A	5181-7704		0.5
		5181-7705	#825	1.0
		5181-7706	#826	1.5
		5181-7707	#827	2.0
HDTS68 V Cable (HA – FWD)	A3401A #004	5181-8686	#840	2

¹ This cable is the only one list which is a female to male, all others are male to male.

Features

Table 4.11.2 SCSI Peripheral Cable and Terminator Connections

Product Number	Description	Bus Type	Connector	Cable Included	Terminator Included
Disk Arrays					
A3539A	Model 10 High Availability Disk Array – Deskside	FWD	HDTS68	option	yes
A3540A	Model 10 High Availability Disk Array – Field Rack	FWD	HDTS68	option	yes
A3540AZ	Model 10 High Availability Disk Array – Factory Racked	FWD	HDTS68	option	yes
A3515A	Model 12 HP Deskside Disk Array with AutoRAID Technology	FWD	HDTS68	option	no
A3516A	Model 12 HP Rackmount Disk Array with AutoRAID Technology	FWD	HDTS68	option	no
A3516AZ	Model 12 HP Factory-Racked Disk Array with AutoRAID Technology	FWD	HDTS68	option	no
A3700A	Model 12H HP Rackmount Disk Array with AutoRAID Technology	FWD	HDTS68	option	no
A3700AD	Model 12H HP Deskside Disk Array with AutoRAID Technology	FWD	HDTS68	option	no
A3700AZ	Model 12H HP Factory-Racked Disk Array with AutoRAID Technology	FWD	HDTS68	option	no
A3549A	Model 20 High Availability Disk Array – Deskside	FWD	HDTS68	option	yes
A3550A	Model 20 High Availability Disk Array – Field Rack	FWD	HDTS68	option	yes
A3550AZ	Model 20 High Availability Disk Array – Factory Racked	FWD	HDTS68	option	yes
Storage Enclosure					
C3020T	SCSI system, 1-GB disk and 2-GB DDS tape	SE	LDBL50	no	no
C3021T	SCSI system, 2-GB disk and 2-GB DDS tape	SE	LDBL50	no	no
C3022R/T	SCSI system, 1-GB disk	SE	LDBL50	no	no
C3023R/T	SCSI system, 2-GB disk	SE	LDBL50	no	no
C3024R/T	SCSI system, two 2-GB disks	SE	LDBL50	no	no
C3040R/T	2.0-GB disk	SE	LDBL50	no	no
C3041R/T	Two 2.0-GB disks	SE	LDBL50	no	no
C3550R/T	2.0-GB disk	FWD	HDTS68	no	no
C3351R/T	Two 2.0-GB disks	FWD	HDTS68	no	no
C3660T/R	1.0-GB SCSI system disk	SE	LDBL50	no	no
C3662T/R	1.0-GB SCSI system disk	FWD	HDTS68	no	no
C5254RZ/R/T	One 2GB Disk S/E	SE	LDBL50	no	no
C5255RZ/R/T	Two 2GB Disk S/E	SE	LDBL50	no	no
C5256RZ	Three 2GB Disk S/E	SE	LDBL50	no	no
C5258R/T	One 2-GB Disk FWD	FWD	HDTS68	no	no
C5259RZ/R/T	Two 2-GB Disk FWD	FWD	HDTS68	no	no
C5260RZ	Five 2-GB Disk FWD	FWD	HDTS68	no	no
C5262RZ/R/T	One 4-GB Disk S/E	SE	LDBL50	no	no
C5264RZ/R/T	One 4-GB Disk FWD	FWD	HDTS68	no	no
C5265RZ	Five 4-GB Disk FWD	SE	LDBL50	no	no
A3311A	Deskside Enclosure	SE or FWD	HDTS68	Optional	FWD - No; SE - Yes
A3312A	Field Rack Enclosure	SE or FWD	HDTS68	Optional	FWD - No; SE - Yes
A3312AZ	Factory Rack Enclosure	SE or FWD	HDTS68	Optional	FWD - No; SE - Yes

¹ Single Ended Terminator included with cable options #821, #822, #823, #824, #825, #826, #827

Optical Jukeboxes						
C1100B	Model 20XT Optical Jukebox	SE	LDBL50	no	yes	
C1704T	Model 120T Optical Jukebox	SE	LDBL50	no	yes	
Tape Libraries						
A3400A	48G DDS2 DAT Autochanger	SE	LDBL50	no	no	
A3544A	HP DLT Library 4/48	FWD	HDT568	option	no	
A3545A	HP DLT Library 2/48	FWD	HDT568	option	no	
A3546A	HP DLT Library 2/28	FWD	HDT568	option	no	
Racked Tape Solutions						
C2466R	2.0-GB DDS tape with data compression	SE	LDBL50	no	no	
A3330A	DDS-2 Rackmountable DAT Tape	SE	LDBL50	no	no	
Standalone Tape Drives						
7979S	1/2-inch tape drive	SE	LDBL50	K2296	K2291	
7980S	1/2-inch tape drive	SE	LDBL50	K2296	K2291	
7980SX	1/2-inch tape drive	SE	LDBL50	K2296	K2291	
C1520B	2.0-GB 4mm DDS tape standalone	SE	LDBL50	K2296	K2291	
C1521B	DDS-DC tape standalone	SE	LDBL50	K2296	K2291	
A3324A	DDS-2 DAT Tape Standalone	SE	LDBL50	K2296	K2291	
CD-ROM Standalone						
C2944A	Standalone external CD-ROM 4X Speed	SE	LDBL50	C2908A	Self terminated	

SCSI Cables for 28642A HP-PB SCSI Adapter

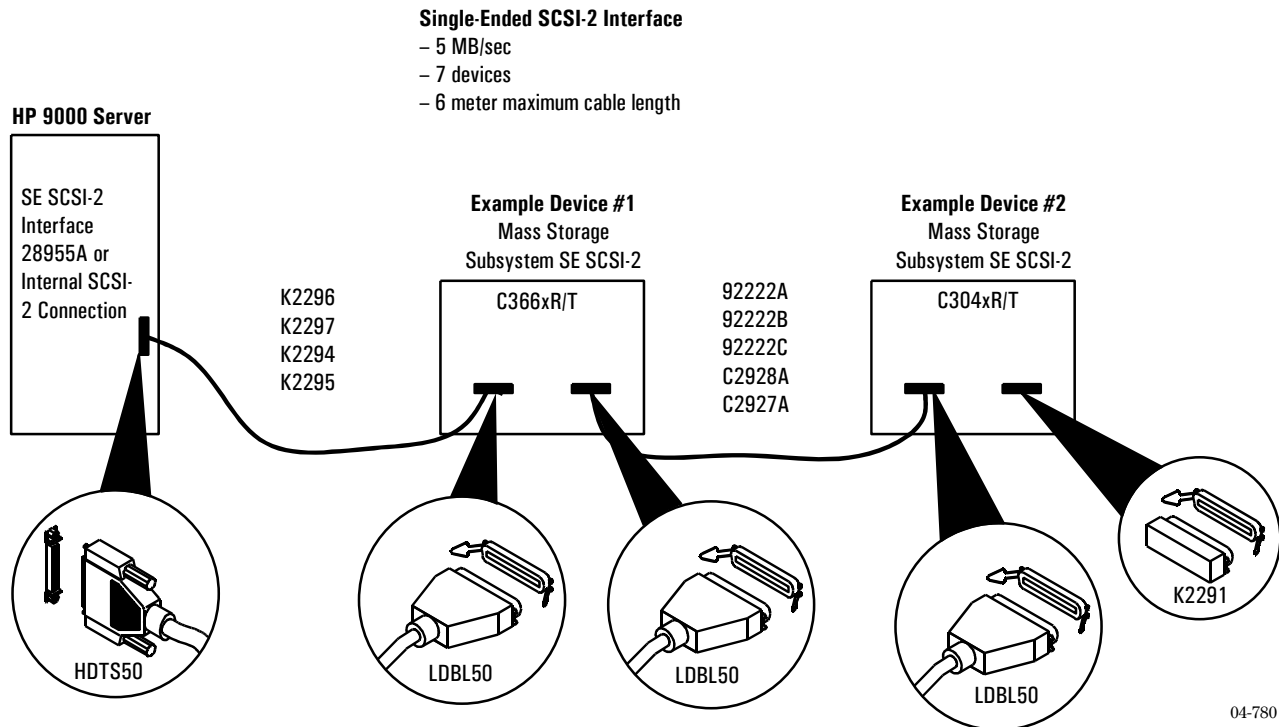
Adapter-to-Peripheral SCSI Cables:

For the 28642A HP-PB SCSI adapter; an adapter-to-peripheral, 1-meter shielded SCSI cable is included with the adapter. This cable has a 50-pin high-density thumbscrew connector for the adapter side and a 50-pin low-density bail-lock connector for the peripheral connect. (K2296 and K2297, listed in **Table 4.11.3**, are replacement cables for this adapter-to-peripheral cable. These and other cables listed in **Table 4.11.3** can be ordered from Complimentary Products Sunnyvale—CPS previously DMK).

Table 4.11.3

Product Number	Length	Description
Adapter-to-Peripheral SCSI Cables		
K2296	1 meter	High-density (HD) screw to low-density (LD) bail-lock male-male connector
K2297	1.5 meters	High-density (HD) screw to low-density (LD) bail-lock male-male connectors
Peripheral-to-Peripheral SCSI Cables		
92222A	0.5 meters	LD bail-lock male-male connectors
92222B	1 meter	LD bail-lock male-male connectors
92222C	2 meters	LD bail-lock male-male connectors
SCSI Extender Cables		
92222D	1 meter	LD bail-lock extension cable with 1 male and 1 female connector
C2900A	3 meters	LD bail-lock extension cable with 1 male and 1 female connector

Figure 4.11.1 Single-Ended Example



The cable included with the card is the K2296, which is the cable to connect HP 6000 SCSI Enclosure Family, but it is not the proper cable for connecting the HP High Availability Storage System Family. If both a HP 6000 SCSI Enclosure and a HP High Availability Storage System are to be connected to the 28655A, the most straight forward configuration is to have the HP 6000 SCSI Enclosure directly connected to the SPU and daisy-chain the HP High Availability Storage System. This is not mandatory however, just ensure the correct cables are ordered so the enclosures can be connected in the desired order.

Configuration

Single-Ended SCSI-2 Internal/External Cable Length Considerations

The Multi-Function I/O Cards (“Personality Cards”) used in the E-, G-, H- and I-class SPUs have both internal and external connections for hooking up Single-Ended SCSI-2 peripherals.

All peripherals that are installed inside the SPU cabinet (whether factory-integrated or field-installed) are cabled to an internal SCSI-2 bus.

The length of the internal cables must be considered as part of the maximum cable lengths connected to this Single-Ended SCSI-2 port.

Note: For K-Class servers, there are no internal, single-ended SCSI-2 cable length considerations, since the single-ended SCSI-2 connects only to the internal removable media devices (DDS and CD-ROM). External devices can be connected through the addition of a single-ended SCSI-2 HP-PB card.

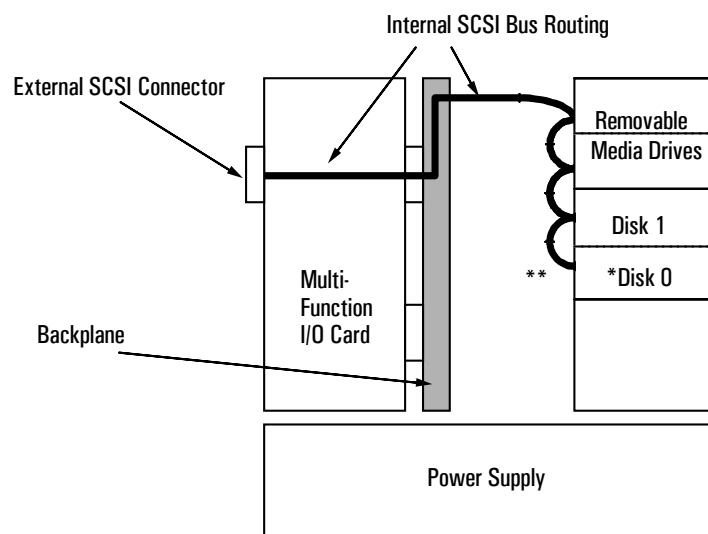
Table 4.11.4 shows the internal single-ended SCSI-2 cable lengths and the maximum external SCSI-2 cable length that can be connected.

Table 4.11.4 Single-Ended SCSI-2 Cable Lengths

System	Internal Single-Ended SCSI-2 Cable Length Equivalent Load	Maximum External Single-Ended SCSI-2 Cable Length
HP 3000 9x8 and 9x9	1.5 meters	4.5 meters
HP 3000 9x7	3.0 meters	3.0 meters

Figure 4.11.2 shows how the internal cabling is connected from the Multi-function I/O card to the internal peripherals in an E-Class SPU. In a G-, H-, I-Class SPU, additional cables add another 1.5 meters of internal cable length.

Figure 4.11.2 E-Class Internal SCSI Cabling

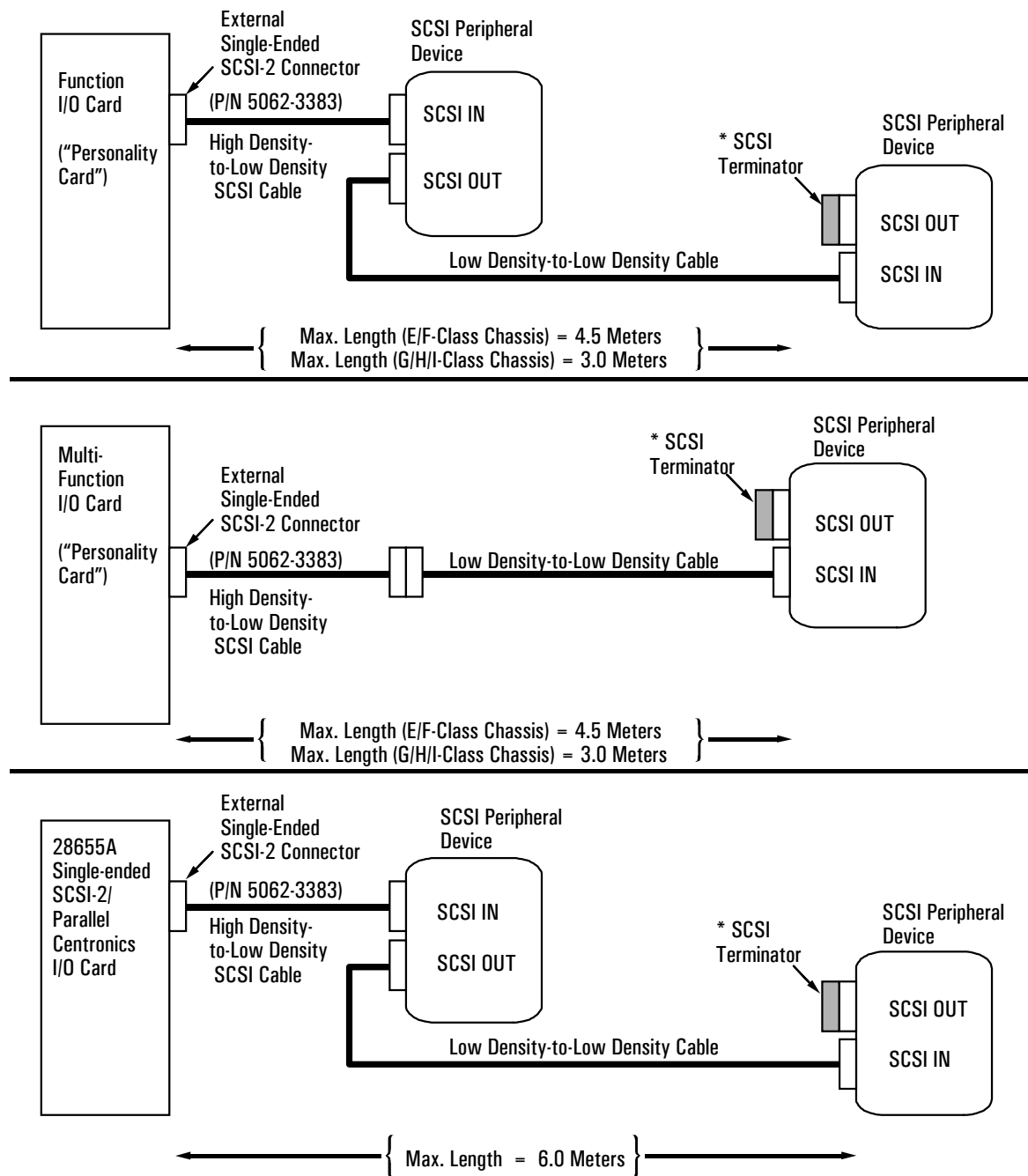


Internal SCSI Bus Layout
(E-Class Chassis Only)

- * In a diskless system, the terminator is installed on the cable
- ** Maximum number of internal drives:
 - E-Class: 4
 - G-, H-, I-Class: 6
(3 on left side, 3 on right side)

Figure 4.11.3 shows examples of external single-ended SCSI-2 cabling and configuration.

Figure 4.11.3 Single-Ended SCSI-2 Cable Length Limits



* The last device on the SCSI cable must have an external SCSI terminator.

** If no devices are attached to the external SCSI connector, the 50-pin high-density terminator is required.

Miscellaneous

Fast/Wide/Differential SCSI Interface Connections and HP-HSC Fast/Wide/Differential SCSI-2 Interface Connections

- Total cable length is maximum of 25 meters per interface card
- Include all applicable cable lengths in this maximum
 - Interface cable (0.9-meter, 2.5-meter, 5-meter, 10-meter)
 - Extender cables (2-meter, 5-meter, 10-meter)
 - “Daisy-chain” cables (0.9-meter)
 - SwitchOver “V-cables” (2-meter)
 - Cable-length equivalents internal to fast/wide disks and arrays
 - Fast/Wide SCSI array (0.7-meter)
 - Fast/Wide SCSI disk drive
 - R-suffix “rackmount” products (1.75-meter)

Single-Ended SCSI Interface Connections

- Total length of cabling is 6 meters per interface card
Single-ended SCSI disk as system disk
- Must be housed in 1.6-meter expansion cabinet immediately adjacent to SPU
- Must be connected to SCSI interface card in card cage within SPU due to “autoconfig” considerations
- Interconnection cable must be 2.0 or 2.5 meters (both included with SPU card)

Connecting a Mass Storage Subsystem

- Maximum of one mass storage subsystem connected to SCSI interface via 2.5-meter cable
- Maximum of two mass storage subsystems connected to SCSI interface via 2.0-meter cable
- Internal cable equivalent of a mass storage subsystem is 1.75 meters
- Six meter maximum total cable length applies to internal and external cable

Procedure and Requirements

The following list shows what is *required* for connecting SCSI peripherals to a host or to each other and what terminator is required for the daisy-chain.

1. Determine the product numbers of the two devices to be connected and the SCSI bus type (e.g., Single-Ended or Fast/Wide/Differential) of the peripheral(s). NOTE: connections can *not* be made between different SCSI bus types.
2. Determine what connector is used on the peripheral(s). SCSI connector types are:
 - LDBL50 = 50-pin Low-Density Bail Lock Connector
 - HDTS50 = 50-pin High-Density Thumb Screw Connector
 - HDTS68 = 68-pin High-Density Thumb Screw Connector
3. Use the **Table 4.11.5** or **4.11.6** (Single-Ended or Fast/Wide/Differential) to determine what cable group and terminator is *required*. Choose the cable for the desired length. The listing includes product number, HP part number, and cable length in meters.
4. Determine from the SCSI Peripheral Cable and Terminator Connections **Table 4.11.7** if a cable and/or terminator is included with the peripheral or needs to be ordered.

NOTES:

All cables are male/male (m/m) except the extender cables which are m/f.
Extender cables are used to extend the length of a standard cable by connecting between a standard cable and a peripheral.

Figure 4.11.4 Single-Ended Example

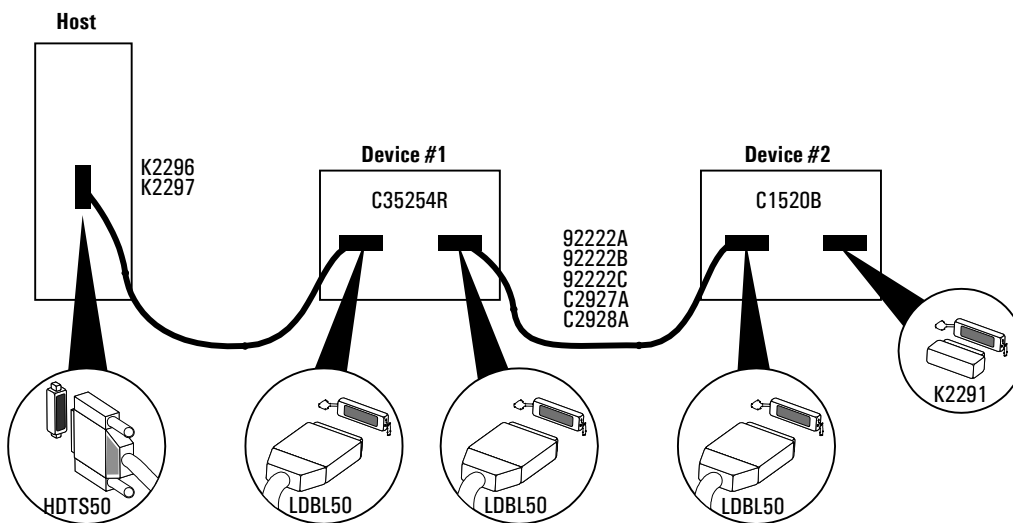


Table 4.11.5 Single-Ended (SE) Interface (5 MB/sec, 7 devices, 6-meter maximum daisy-chain cable length)

From:	To:	Peripherals—LDBL50			Peripherals—HDT50		
HDT50	< ---Connector--- >	Product Number	HP Part Number	Cable Length	Product Number	HP Part Number	Cable Length
SCSI I/O Cards	Terminator Cables	K2291	1252-3920		C2904A	A1658-62016	
		K2296	5062-3384	0.5 m	C2955A	8120-5547	0.5 m
		K2297	5062-3383	1.0 m	C2908A	8120-5548	1.0 m
			5062-3388	1.5 m	C2956A	8120-5549	1.5 m
			5062-3386	2.0 m	C2957A	8120-5550	2.0 m
			5062-1218	2.5 m	C2958A	8120-5551	5.0 m

From:	To:	Peripherals—LDBL50			Peripherals—HDT50		
LDBL50	< ---Connector--- >	Product Number	HP Part Number	Cable Length	Product Number	HP Part Number	Cable Length
Peripherals e.g.: C1520B C170xT C302xT	Cables	92222A	8120-5158	0.5 m			
		92222B	8120-4998	1.0 m	K2296	5062-3383	1.0 m
		92222C	8120-5159	2.0 m	K2297	5062-3388	1.5 m
		C2927A	5063-1212	3.0 m		5062-3386	2.0 m
		C2928A	5063-1213	5.0 m		5062-1218	2.5 m
		92222D	8120-5160	1.0 m			
	Extender cables (m/f)	C2900A	8120-5519	3.0 m			
		C2901A	8120-5520	5.0 m			

Figure 4.11.5 Fast/Wide/Differential Example

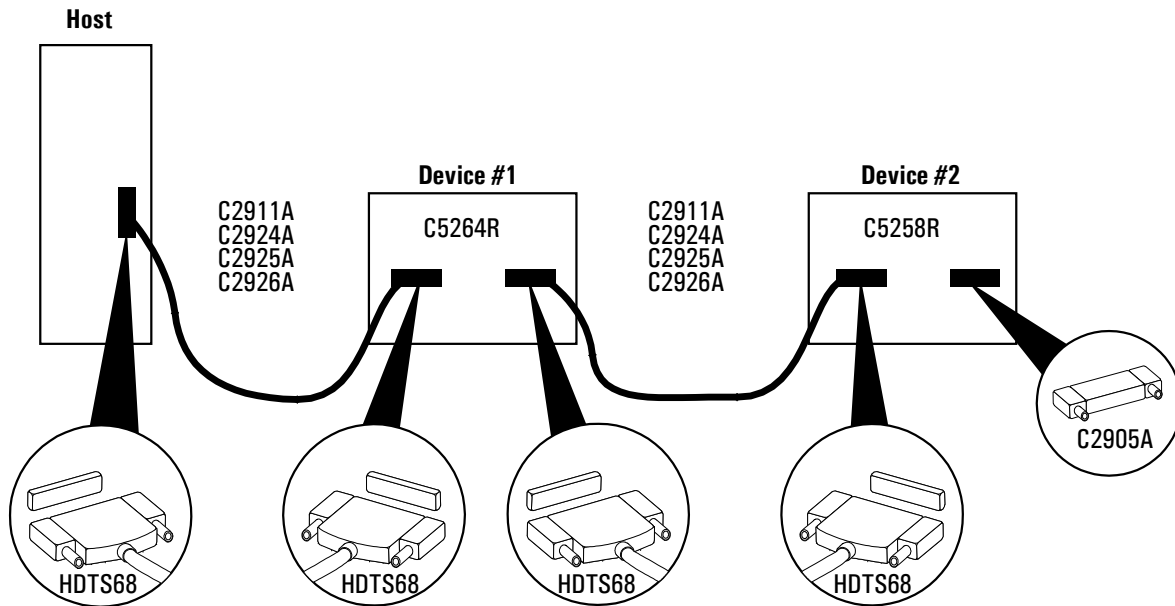


Table 4.11.6 Fast/Wide/Differential (FWD) Interface (20 MB/sec, 15 devices, 25-meter maximum daisy-chain cable length) (also known as Fast/Wide Differential Interface)

From:	<Connector.... >	To:	Peripherals—HDTS68		
HDTS68 I/O Card 28696A		Terminator	C2905A	A1658-62024	
		Cables		8120-6147	0.5 m
			C2911C	A1658-62018	0.9 m
				A1658-62019	1.5 m
			C2924C	A1658-62020	2.5 m
				A1658-62021	5.0 m
			C7522A	A1658-62022	10 m
		C7532A	A1658-62023	20 m	

Table 4.11.7 SCSI Peripheral Cable and Terminator Connections

Product Number	Description	Bus Type	Connector	Cable Included	Terminator Included
7979S	1/2-inch tape drive	Single-Ended	LDBL50	K2296	K2291
7980S	1/2-inch tape drive	Single-Ended	LDBL50	K2296	K2291
7980SX	1/2-inch tape drive	Single-Ended	LDBL50	K2296	K2291
A1999A	600 MB CD-ROM drive standalone	Single-Ended	HDTS50	C2908A	Self-terminated
A2655A	600 MB CD-ROM drive	Single-Ended	HDTS50	C2908A	Self-terminated
A2656A	2.0-GB DDS tape drive	Single-Ended	HDTS50	C2908A	Self-terminated
A2657A	1.0-GB disk drive	Single-Ended	HDTS50	C2908A	Self-terminated
C1520B	2.0-GB 4mm DDS tape standalone	Single-Ended	LDBL50	K2296	K2291
C1521B	DDS-DC tape standalone	Single-Ended	LDBL50	K2296	K2291
C1700T	Model 40T Optical Jukebox	Single-Ended	LDBL50	No	No
C1705T	Model 200T Optical Jukebox	Single-Ended	LDBL50	No	No
C1100B	Model 20XT Optical Jukebox	Single-Ended	LDBL50	No	No
C2466R	2.0-GB DDS tape with data compression	Single-Ended	LDBL50	No	No
C3020T	SCSI system, 1-GB disk and 2-GB DDS tape	Single-Ended	LDBL50	No	No
C3021T	SCSI system, 2-GB disk and 2-GB DDS tape	Single-Ended	LDBL50	No	No
C3022R/T	SCSI system, 1-GB disk	Single-Ended	LDBL50	No	No
C3023R/T	SCSI system, 2-GB disk	Single-Ended	LDBL50	No	No
C3024R/T	SCSI system, two 2-GB disks	Single-Ended	LDBL50	No	No
C3040R/T	2.0-GB disk	Single-Ended	LDBL50	No	No
C3041R/T	Two 2.0-GB disks	Single-Ended	LDBL50	No	No
C3550R/T	2.0-GB disk	Fast/Wide/Differential	HDTS68	No	No
C3551R/T	Two 2.0-GB disks	Fast/Wide/Differential	HDTS68	No	No
C5254R/T	One 2-GB disk drive	Single-Ended	LDBL50	No	No
C5254RZ	One 2-GB disk drive	Single-Ended	LDBL50	Yes	Yes
C5255R/T	Two 2-GB disk drives	Single-Ended	LDBL50	No	No
C5255RZ	Two 2-GB disk drives	Single-Ended	LDBL50	Yes	Yes
C5256RZ	Three 2-GB disk drives	Single-Ended	LDBL50	Yes	Yes
C5258R/T	One 2-GB disk drive	Fast/Wide/Differential	HDTS68	No	No
C5259R/T	Two 2-GB disk drives	Fast/Wide/Differential	HDTS68	No	No
C5259RZ	Two 2-GB disk drives	Fast/Wide/Differential	HDTS68	Yes	Yes
C5260RZ	Five 2-GB disk drives	Fast/Wide/Differential	HDTS68	Yes	Yes
C5262R/T	One 4-GB disk drive	Single-Ended	LDBL50	No	No
C5262RZ	One 4-GB disk drive	Single-Ended	LDBL50	Yes	Yes
C5264R/T	One 4-GB disk drive	Fast/Wide/Differential	HDTS68	No	No
C5264RZ	One 4-GB disk drive	Fast/Wide/Differential	HDTS68	Yes	Yes
C5265RZ	Five 4-GB disk drives	Fast/Wide/Differential	HDTS68	Yes	Yes

