SCSI Differential Adapter User's Manual

adaptec

SDS-311F
SCSI Differential Adapter
Installation Manual

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Rev: B

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Changes

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Technical Assistance

Technical assistance for this product is available by calling our Development Systems Operation (DSO) hot line (Monday through Friday between 8:30 A.M. and 5:30 P.M. Pacific Coast Time):

DSO Hot Line: (408) 945-2527

Equipment Returns

All equipment returns must be accompanied by a Return Material Authorization (RMA) number. To determine if a return is necessary and to obtain an RMA number, call the DSO hot line. Proper handling of returned equipment can only be guaranteed with an RMA number. Return all equipment in either its original factory packaging material or containers that provide equivalent protection. Mark the outside of all containers "FRAGILE INSTRUMENT ENCLOSED."

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Preface

This manual is an installation guide for adding the SDS-311F SCSI Differential Adapter to an Adaptec SDS Development System or SCSI Bus Analyzer. This manual contains three chapters, organized as follows:

Chapter 1, Installation, is a tutorial chapter that details proper installation of the SDS-311F SCSI Differential Adapter hardware into your existing system. Please follow the documented procedures to ensure correct and safe operation of all the Adaptec hardware.

Chapter 2, Troubleshooting, provides a guide to correcting common problems with the SDS-311F SCSI Differential Adapter.

Chapter 3, Specifications, contains the detailed electrical, timing, environmental, and physical specifications of the SDS-311F Differential Adapter.

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Chapter 1

Installation

In addition to this manual, the SDS-311F SCSI Differential Adapter comes standard with the following components:

1. **Differential Adapter printed circuit board (PCB)** - This is a PC/XT 8-bit form-factor PCB that provides the differential interface for emulation or analysis on a differential SCSI bus. If you purchased your differential adapter in a turnkey system, this PCB will be shipped to you already installed in a computer. If you purchased your differential adapter as an integration kit, you must install this PCB into your own computer.

2. **SCSI 'P' connector translator** - This translator is used to connect an 8-bit, 50-pin differential SCSI 'A'-type bus to the differential adapter PCB's standard 68-pin SCSI 'P' connector.

3. **Internal connection cable** - A 50-pin flat ribbon cable is used to connect the differential adapter to a test adapter or bus analyzer PCB inside the computer.

These components connected to a SDS-310F bus analyzer allow you to perform 8- or 16-bit differential SCSI bus analysis. You can perform differential 8-bit SCSI bus emulations with the above components connected to a SDS SCSI test adapter.

NOTE

For more information on Adaptec's SDS-310F Bus Analyzer and SDS SCSI Test Adapter product offerings, contact your local Adaptec sales representative.

Installing the Hardware

The SDS-311F SCSI Differential Adapter is shipped in one of two basic setups: as part of a turnkey development system or individually as an integration kit. In the turnkey system, all PCBs have been shipped to you already installed in the Adaptec-supplied computer. If you purchased a turnkey system, you should familiarize yourself with the following installation procedure for background knowledge on how your system and SCSI bus have been set up.

If you purchased an integration kit, you must install the differential adapter PCB in your computer and connect it to the additional Adaptec PCB(s) you are using. The differential adapter hardware is configured depending upon if you are performing SCSI bus emulations, passively analyzing a SCSI bus, or performing a combination of both.

The installation of each configuration consists of two steps:

1. Installing the appropriate PCB components inside the computer.
2. Connecting the SCSI bus to the computer.

Configuring the Differential Adapter PCB

1. If you are installing the differential adapter at the physical end of the SCSI bus cable, install the five 16-pin dual in-line package (DIP) terminating resistors into sockets RN2, RN4, RN6, RN8, and RN10. The differential adapter PCB is shipped with these resistors already installed. Switches 1, 2, 3, and 4 at location S2 on the PCB should be turned ON to ground the RESERVED lines on the SCSI cable.
2. If you are installing the differential adapter in the middle of the SCSI bus cable, remove the five 16-pin terminating resistor DIPs from sockets RN2, RN4, RN6, RN8, and RN10. Switches 1, 2, 3, and 4 at location S2 on the PCB should be turned OFF to leave the RESERVED lines open.

See Figure 1-1, then continue installation with the appropriate section: **Installing with a Test Adapter PCB, Installing with an Analyzer PCB,** or **Installing with both Test Adapter and Analyzer PCBs.**

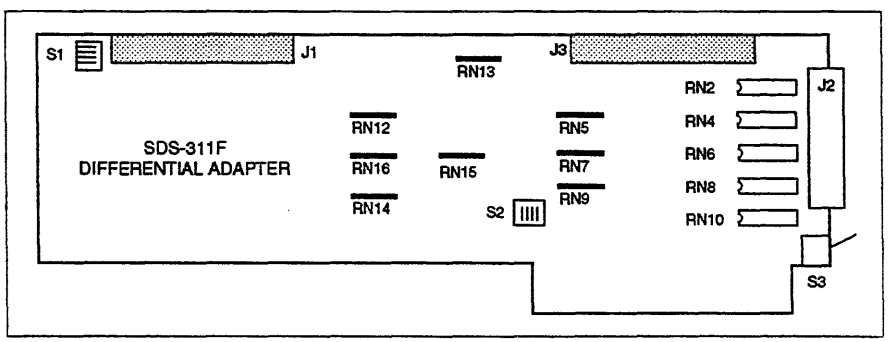

Figure 1-1.
SDS-311F Differential Adapter PCB

NOTE

Try to be consistent with your termination requirements. Each time you change termination requirements (by moving the differential adapter to or from the physical end of the SCSI cable) you will need to reopen your computer to install or remove these resistors and change switch S2.

Installing with a Test Adapter PCB

To perform differential SCSI bus emulation, a SDS Test Adapter must be installed in your system. Refer to the **Test Adapter User's Manual** for details on its installation. The differential adapter installation procedure is the same whether you are using a SDS-3 or SDS-3F Development System. You need to allocate an 8- or 16-bit backplane slot adjacent to your test adapter for your differential adapter PCB.

1. At location S1 on the differential adapter PCB, set switches 1, 2, 3, and 4 to OFF.

2. Switch S3 on the right edge of the differential adapter (under the 68-pin J2 connector) is not used in this configuration. Therefore, it should be toggled away from the J2 connector.

3. On your test adapter PCB, remove the terminating resistors next to the J4 SCSI connector . On a **SDS-3**, these are at locations RN1, RN2, and RN3. On a **SDS-3F**, these are at locations RN3, RN4, and RN5.

4. Connect the short 50-pin cable between connector J1 on the differential adapter and connector J1 on the test adapter. Make sure Pin 1 is located correctly on both ends of this cable.

5. Carefully install the differential adapter PCB into your computer next to the test adapter PCB. Secure the PCB connector bracket to the computer to minimize the chance of malfunction or damage.

See Figure 1-2.

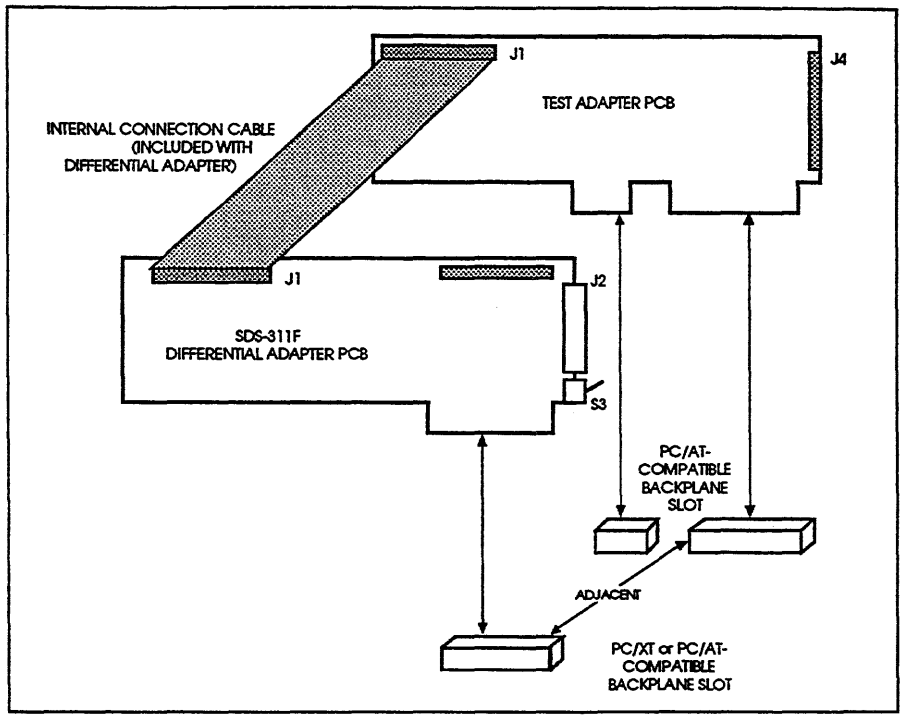

Figure 1-2.
Installing with a Test Adapter PCB

6. If you are testing on a 68-pin differential SCSI bus, plug the differential SCSI cable directly into the 68-pin J2 connector on the differential adapter PCB.

7. If you are testing on a 50-pin differential SCSI bus, plug the 'P ' Connector Translator into the 68-pin J2 connector on the differential adapter PCB. Now plug your 50-pin differential SCSI cable into the 'P' Connector Translator. Refer to **Setting Up the SCSI 'P' Connector Translator** for switch settings on the translator.

CAUTION

DO NOT connect cables to both differential adapter J2 connector and test adapter J4 connector at the same time. Use one or the other, but not both!

Testing a Single-Ended SCSI Bus

With your differential adapter installed into your system at the end of the SCSI cable, you can still easily test a single-ended SCSI bus.

1. Unplug your differential SCSI cable from the differential adapter J2 connector.

2. Plug your single-ended SCSI cable into connector J4 on your test adapter PCB.

If you move your test adapter and differential adapter PCBs to the middle of the SCSI cable, your single-ended bus termination changes. Remove the terminating resistors at locations RN5, RN7, and RN9 from the differential adapter PCB. Follow the instructions for cable connection from **Testing a Single-Ended SCSI Bus** above.

When you move the PCBs back to the end of your cable, you must remember to reinstall the terminating resistors at locations RN5, RN7, and RN9 on the differential adapter PCB.

> *NOTE*
>
> *A test adapter running in the middle of a single-ended SCSI bus while attached to a SDS-311F creates a stub length of over 20 inches. Operating in this mode is NOT recommended.*

Installing with an Analyzer PCB

To perform differential SCSI bus analysis, a SDS-310F Bus Analyzer must be installed in your system. Refer to the **SDS-310F Bus Analyzer User's Manual** for details on its installation. You need to allocate an 8- or 16-bit backplane slot adjacent to your bus analyzer for your differential adapter PCB.

1. At location S1 on the differential adapter PCB, set switches 1, 2, 3, and 4 to ON.

2. Switch S3 on the right edge of the differential adapter (under the 68-pin J2 connector) should be toggled toward the J2 connector to perform differential analysis.

3. On the SDS-310F bus analyzer PCB, remove the terminating resistors at locations RP2, RP3, RP4, and RP5. These are next to the J1 SCSI connector.

4. Connect the short 50-pin cable between connector J3 on the differential adapter and connector J3 on the bus analyzer. Make sure Pin 1 is located correctly on both ends of this cable.

5. Carefully install the differential adapter PCB into your computer next to the bus analyzer PCB. Secure the PCB connector bracket to the computer to minimize the chance of malfunction or damage.

See Figure 1-3.

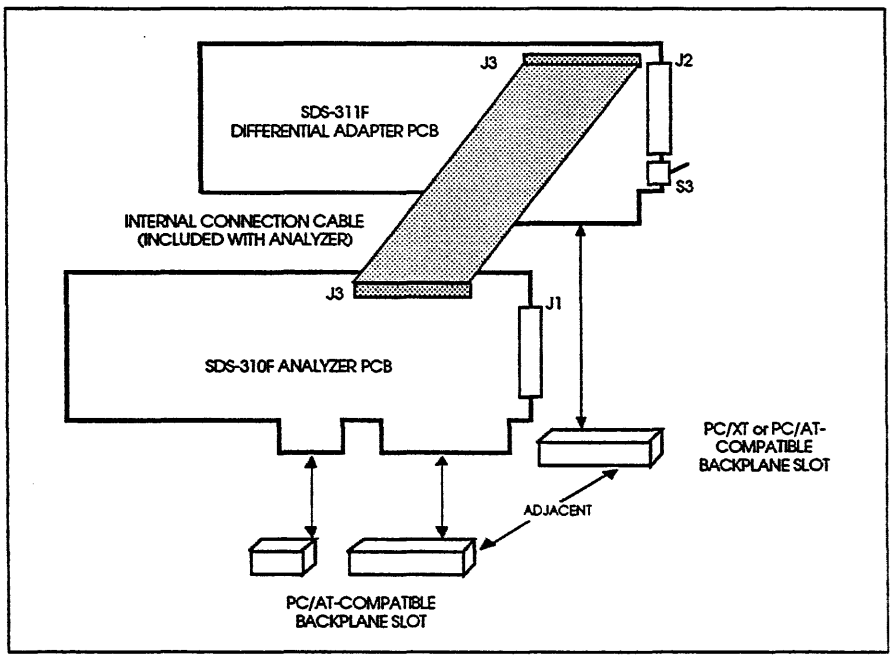

Figure 1-3.
Installing with a SDS-310F Bus Analyzer PCB

6. If you are analyzing a 68-pin differential SCSI bus, plug the differential SCSI cable directly into the 68-pin J2 connector on the differential adapter PCB.

7. If you are analyzing a 50-pin differential SCSI bus, plug the 'P' Connector Translator into the 68-pin J2 connector on the differential adapter PCB. Now plug your 50-pin differential SCSI cable into the 'P' Connector Translator. Refer to **Setting Up the SCSI 'P' Connector Translator** for switch settings on the translator.

CAUTION

DO NOT connect cables to both differential adapter J2 connector and bus analyzer J1 connector at the same time. Use one or the other, but not both!

Analyzing a Single-Ended SCSI Bus

With your differential adapter installed into your system at the end of the SCSI cable, you can still easily analyze a single-ended SCSI bus.

1. Differential adapter switch S3 should be toggled away from the J2 connector to perform single-ended analysis.
2. Unplug your differential SCSI cable from the differential adapter J2 connector.
3. If you are analyzing a 68-pin single-ended SCSI bus, plug your single-ended SCSI cable directly into the 68-pin J1 connector on your bus analyzer PCB.
4. If you are analyzing a 50-pin single-ended SCSI bus, plug the 'P' connector translator into the 68-pin J1 connector on the bus analyzer PCB. Now plug your 50-pin SCSI cable into the 'P' connector translator. Refer to the **SDS-310F Bus Analyzer User's Manual** for switch settings on the translator in this configuration.

If you move your bus analyzer and differential adapter PCBs to the middle of the SCSI cable, your single-ended bus termination changes. You have two choices:

1. Remove the terminating resistors at locations RN12, RN13, RN14, RN15, and RN16 from the differential adapter PCB. Follow the instructions for switch S3 and cable connection from **Analyzing a Single-Ended SCSI Bus** above.
2. Since you have already removed the SDS-310F termination earlier, disconnect the short 50-pin cable between the differential adapter and bus analyzer PCBs. Use the standalone bus analyzer with the single-ended SCSI cable plugged into either its 68-pin J1 connector or the 'P' connector translator.

When you move the PCBs back to the end of your cable, you must remember to reinstall the terminating resistors at locations RN12, RN13, RN14, RN15, and RN16 on the differential adapter PCB or to reconnect the short 50-pin cable between the two PCBs.

Installing with Both Test Adapter and Analyzer PCBs

To perform both differential SCSI bus emulation and analysis simultaneously, a SDS test adapter and a SDS bus analyzer must be installed in your system. See the **Test Adapter User's Manual** and **Bus Analyzer User's Manual** for details on their installation. You need to allocate an 8- or 16-bit backplane slot for the differential adapter between the test adapter and bus analyzer PCBs.

The differential adapter installation procedure is slightly different, depending upon if you have a SDS-3 or SDS-3F test adapter, and a SDS-310F or SDS-310A bus analyzer. Follow the basic installation instructions below, and note the exceptions for each configuration.

1. At location S1 on the differential adapter PCB, set switches 1, 2, 3, and 4 to OFF.

2. Switch S3 on the right edge of the differential adapter (under the 68-pin J2 connector) should be toggled toward the J2 connector to perform differential analysis.

3. Remove the terminating resistors next to the J4 SCSI connector on your test adapter PCB. On a **SDS-3**, these are at location RN1, RN2, and RN3. On a **SDS-3F**, these are at locations RN3, RN4, and RN5.

4. On a **SDS-310F**, remove the terminating resistors at locations RP2, RP3, RP4, and RP5. These are next to the J1 SCSI connector.

5. Connect the short 50-pin cable between connector J1 on the differential adapter and position J1 on the test adapter. Make sure Pin 1 is located correctly on both ends of this cable.

6. If you have a **SDS-310F**, connect the short 50-pin cable between connector J3 on the differential adapter and connector J1 on the bus analyzer. Make sure Pin 1 is located correctly on both ends of this cable. See Figure 1-4.

7. If you have a **SDS-310A**, connect the short 50-pin cable between connector J3 on the differential adapter and connector J1 on the bus analyzer. Make sure Pin 1 is located correctly on both ends of this cable. See Figure 1-5.

8. Carefully install the differential adapter PCB into your computer between the test adapter and bus analyzer PCBs. Secure the PCB connector bracket to the computer to minimize the chance of malfunction or damage.

9. If you are working on a 68-pin differential SCSI bus, plug the differential SCSI cable directly into the 68-pin J2 connector on the differential adapter PCB.

10. If you are working on a 50-pin differential SCSI bus, plug the 'P' Connector Translator into the 68-pin J2 connector on the differential adapter PCB. Now plug your 50-pin differential cable into the 'P' Connector Translator. Refer to **Setting Up the SCSI 'P' Connector Translator** for switch settings on the translator.

Using a Single-Ended SCSI Bus

With your differential adapter installed into your system at the end of the SCSI cable, you can still easily test a single-ended SCSI bus.

1. Differential adapter switch S3 should be toggled toward the J2 connector.

2. Unplug your differential SCSI cable from the differential adapter J2 connector.

3. Plug your single-ended SCSI cable into connector J4 on your test adapter PCB.

If you move your test adapter, bus analyzer, and differential adapter PCBs to the middle of the SCSI cable, your single-ended bus termination changes. Remove the terminating resistors at locations RN5, RN7, and RN9 from the differential adapter PCB. Follow the instructions for switch S3 and cable connection from **Using a Single-Ended SCSI Bus** above.

When you move the PCBs back to the end of your cable, you must remember to reinstall the terminating resistors at locations RN5, RN7, and RN9 on the differential adapter PCB.

CAUTION

DO NOT connect cables to the differential adapter J2 connector and the test adapter J4 connector or SDS-310F J1 connector at the same time.
Use only one SCSI bus connector at a time!

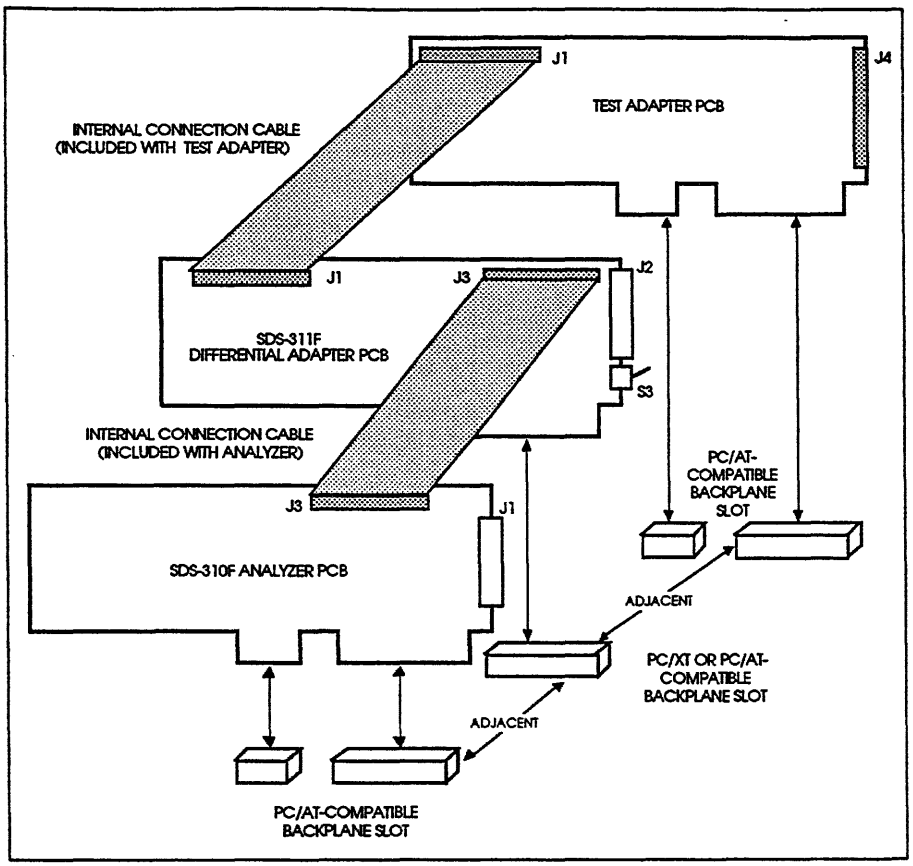

Figure 1-4.
Installing with Both Test Adapter and SDS-310F Bus Analyzer PCBs

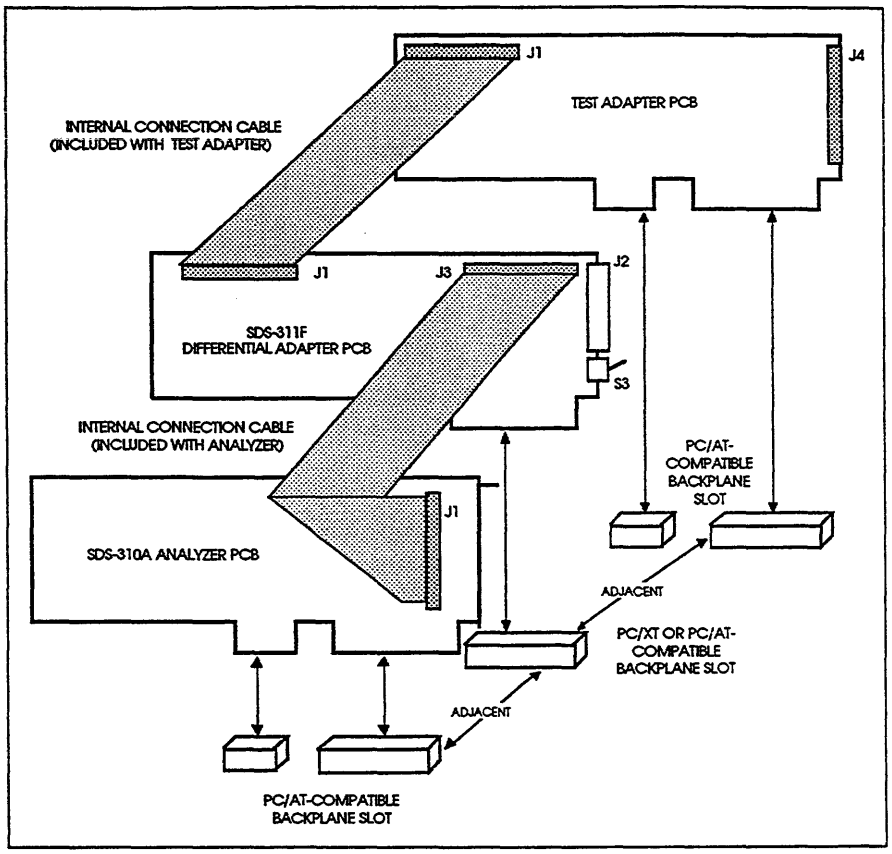

Figure 1-5.
Installing with Both Test Adapter and SDS-310A Bus Analyzer PCBs

Setting Up the SCSI 'P' Connector Translator

The SCSI 'P' connector translator is used to connect an 8-bit, 50-pin differential SCSI 'A'-type bus to the differential adapter PCB's standard 68-pin SCSI 'P' connector. It is also used to connect an 8-bit, 50-pin singled-ended SCSI 'A'-type bus to the SDS-310F bus analyzer's standard 68-pin SCSI 'P' connector. Refer to the **SDS-310F Bus Analyzer User's Manual** for more details on 50-pin singled-ended bus analysis.

The switch settings on the SCSI 'P' connector translator are important because they control the grounding of the RESERVED lines on the SCSI cable. The SCSI-2 specification Revision 10c is not specific about the RESERVED lines being open or grounded in SCSI devices not at the end of the SCSI cable.

The X3T9.2/90-048 Rev 5 proposal in the September 1990 SCSI mailing specifically addresses this issue. The RESERVED lines are to be connected to ground at terminator assemblies and at the ends of the SCSI cable, and remain open in the other SCSI devices.

The SDS-311F SCSI 'P' Connector Translator adheres to the above proposal if the switches are set as follows:

1. If the differential adapter is installed at the physical end of the SCSI differential cable, turn switches 1, 2, 3, and 4 ON to ground the RESERVED lines.

2. If the differential adapter is installed in the middle of the SCSI differential cable, turn switches 1, 2, 3, and 4 OFF to leave the RESERVED lines open.

3. Switch 5 should always remain OFF when connected to a differential SCSI bus.

See Figure 1-6.

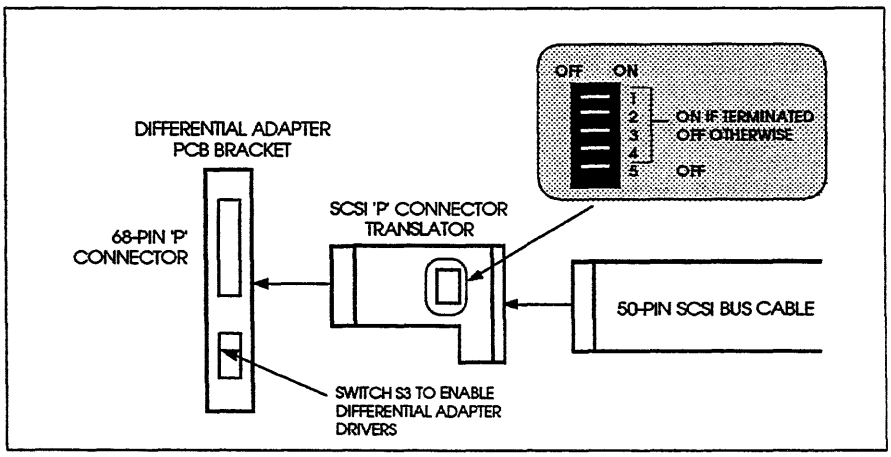

Figure 1-6. SCSI 'P' Connector Translator

Chapter 2

Troubleshooting

Common Problems

After installing the SDS-311F differential adapter into your system, something that worked previously may not work now. The chances are that a simple item was overlooked in the installation procedure.

The matrix in Figure 2-1 shows the SDS-311F differential adapter PCB switch settings in each of the hardware configurations. Figure 2-2 shows the termination differences between installing the SDS-311F at the physical end of the SCSI bus and installing it in the middle.

SDS-311F	Test Adapter		Bus Analyzer		Test Adapter & Bus Analyzer	
	Diff	SE*	Diff	SE	Diff	SE
Switch S1	OFF	OFF	ON	ON	OFF	OFF
Switch S3	NOT USED		UP	DOWN	UP	UP
	Remove TA termination		Remove BA termination		Remove TA & BA termination	

* Single-ended

Figure 2-1.
SDS-311F PCB Switch Settings

Configuration	SDS-311F	SCSI Bus End		SCSI Bus Middle	
		Diff	SE	Diff	SE
ALWAYS	Switch S2	ON	N/A	OFF	N/A
(311F & TA ONLY)	RN2, RN4, RN6, RN8, RN10	IN	IN	OUT	OUT
(311F & BA ONLY)	RN12, RN13, RN14, RN15, RN16	IN	IN	OUT	OUT
(311F, TA, & BA ONLY)	RN5, RN7, RN9, RN11	IN	IN	OUT	OUT

Figure 2-2.
SDS-311F PCB Termination

DSO Hotline

If your problem is not included in the following descriptions, or you need additional assistance, call our Development Systems Operation (DSO) hotline (Monday through Friday between 8:30 AM and 5:30 PM Pacific Coast Time) for assistance:

DSO Hotline: (408) 945-2527

Symptom:

The host computer will not boot.

Possible Cause:

The differential adapter is hooked up to a test adapter PCB, but the test adapter is not seated in the computer.

*Refer to the **Test Adapter User's Manual** for proper installation of the test adapter PCB.*

Symptom:

The following message is received:

"No Licensed Test Adapters Detected"

Possible Causes:

The test adapter was not re-installed or re-seated correctly after attaching the SDS-311F PCB.

*Refer to the **Test Adapter User's Manual** for proper installation of the test adapter PCB.*

Symptom:

The following message is received:

"No SCSI Synchronous Bus Analyzer Detected"

Possible Causes:

The bus analyzer was not re-installed or re-seated correctly after attaching the SDS-311F PCB.

*Refer to the **SDS-310F** or **SDS-310 Bus Analyzer User's Manual** for proper installation of the bus analyzer PCB.*

Symptom:

No devices are found on the bus.

Possible Causes:

1. The differential SCSI bus is not properly terminated.

   Make sure both ends of the SCSI bus are terminated, and ONLY the devices at the ends are terminated. Refer to the ***Installing the Differential Adapter PCB*** *section of this manual for details on SDS-311F PCB termination.*

2. The short 50-pin cable from the differential adapter is not connected to the test adapter.

   Make sure this cable is connected properly between J1 on the differential adapter and J1 on the test adapter. Refer to the ***Installing With a Test Adapter PCB*** *section of this manual for more details.*

Symptom:

One of the following messages is received:

"Timeout During Arbitration"
"Timeout During Selection"
"Reset Detected"

Possible Causes:

1. The drive to be accessed on the SCSI differential bus is not powered up.

   Make sure all devices on the bus have power before beginning your test.

2. The short 50-pin cable from the differential adapter is not connected to the test adapter.

   Make sure this cable is connected properly between J1 on the differential adapter and J1 on the test adapter. Refer to the ***Installing With a Test Adapter PCB*** *section of this manual for more details.*

Symptom:

Signal values are inverted in the SDS-310F bus analyzer timing display.

Possible Cause:

Incorrect bus analyzer configuration mode set.

Change to 'INDIRECT' mode. The SDS-310F analyzing a differential SCSI bus connected to the SDS-311F is indirectly hooked onto the SCSI bus. Refer to the **SDS-310F User's Manual** for details on **Config Mode.**

Chapter 3

Specifications

Electrical Specifications

Differential Adapter PCB:
Current: 2.4 amps maximum
Voltage: 5.0 VDC ± 0.25 VDC

Differential Signals:
27 SCSI signals (BSY, SEL, ATN, REQ, ACK, C/D, I/O, MSG, RST, DP0, DP1, D0-D15): As proposed in ANSI Document X3T9.2/90-048, Revision 5.
Voltage limitations: +12 volts to –7 volts
Differential bus driver: EIA specification RS-485

Environmental Specifications

Operating temperature: 0°C (32°F) to 55°C (131°F)
Non-operating temperature: –40°C (–40°F) to 75°C (167°F)
Humidity: 10% to 95%, noncondensing

Physical Specifications

Shipping weight: 1 pound
PCB: Standard full-size, single-width AT form factor (13.25" x 4.75").
SCSI 'P' connector translator dimensions: 3" x 1.5" x 0.7"

Minimum Computer Requirements

PC/AT-compatible computer
CGA video controller
i286 CPU
640 KBytes RAM
360 KByte 5 1/4", 1.2 MByte 5 1/4" or 1.44 MByte 3 1/2" floppy drive
2 or 3 free backplane slots, depending upon your configuration
DOS 3.0

Differential Adapter PCB 68-pin 'P' Connector (J2)

Connector type: Shielded, high-density, 68-conductor connector consisting of two rows of 34 female contacts with adjacent contacts 1.27 mm (0.05") apart.

Pin	Name	Pin	Name
1	+DB(12)	2	-DB(12)
3	+DB(13)	4	-DB(13)
5	+DB(14)	6	-DB(14)
7	+DB(15)	8	-DB(15)
9	+DB(P1)	10	-DB(P1)
11	GROUND	12	GROUND
13	+DB(0)	14	-DB(0)
15	+DB(1)	16	-DB(1)
17	+DB(2)	18	-DB(2)
19	+DB(3)	20	-DB(3)
21	+DB(4)	22	-DB(4)
23	+DB(5)	24	-DB(5)
25	+DB(6)	26	-DB(6)
27	+DB(7)	28	-DB(7)
29	+DB(P)	30	-DB(P)
31	DIFFSENS	32	GROUND
33	TERMPWR	34	TERMPWR
35	TERMPWR	36	TERMPWR
37	RESERVED	38	RESERVED
39	+ATN	40	-ATN
41	GROUND	42	GROUND
43	+BSY	44	-BSY
45	+ACK	46	-ACK
47	+RST	48	-RST
49	+MSG	50	-MSG
51	+SEL	52	-SEL
53	+C/D	54	-C/D
55	+REQ	56	-REQ
57	+I/O	58	-I/O
59	GROUND	60	GROUND
61	+DB(8)	62	-DB(8)
63	+DB(9)	64	-DB(9)
65	+DB(10)	66	-DB(10)
67	+DB(11)	68	-DB(11)