

Instruction Manual



Technician Procedures

IGS-5034-00

Fibre Channel Transceiver Test System

070-9968-00

Warning

The servicing instructions are for use by qualified personnel only. To avoid personal injury, do not perform any servicing unless you are qualified to do so. Refer to all safety summaries prior to performing service.

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General Safety Summary

Review the following safety precautions to avoid injury and prevent damage to this product or any products connected to it. To avoid potential hazards, use this product only as specified.

Only qualified personnel should perform service procedures.

While using this product, you may need to access other parts of the system. Read the *General Safety Summary* in other system manuals for warnings and cautions related to operating the system.

To Avoid Fire or Personal Injury

Use Proper Power Cord. Use only the power cord specified for this product and certified for the country of use.

Use Proper Voltage Setting. Before applying power, ensure that the line selector is in the proper position for the power source being used.

Connect and Disconnect Properly. Do not connect or disconnect probes or test leads while they are connected to a voltage source.

Ground the Product. This product is grounded through the grounding conductor of the power cord. To avoid electric shock, the grounding conductor must be connected to earth ground. Before making connections to the input or output terminals of the product, ensure that the product is properly grounded.

Observe All Terminal Ratings. To avoid fire or shock hazard, observe all ratings and marking on the product. Consult the product manual for further ratings information before making connections to the product.

Do not apply a potential to any terminal, including the common terminal, that exceeds the maximum rating of that terminal.

Do Not Operate Without Covers. Do not operate this product with covers or panels removed.

Use Proper Fuse. Use only the fuse type and rating specified for this product.

Avoid Exposed Circuitry. Do not touch exposed connections and components when power is present.

Wear Eye Protection. Wear eye protection if exposure to high-intensity rays or laser radiation exists.

Do Not Operate With Suspected Failures. If you suspect there is damage to this product, have it inspected by qualified service personnel.

Do Not Operate in Wet/Damp Conditions.

Do Not Operate in an Explosive Atmosphere.

Keep Product Surfaces Clean and Dry.

Provide Proper Ventilation. Refer to the manual's installation instructions for details on installing the product so it has proper ventilation.

Symbols and Terms

Terms in this Manual. These terms may appear in this manual:



WARNING. *Warning statements identify conditions or practices that could result in injury or loss of life.*



CAUTION. *Caution statements identify conditions or practices that could result in damage to this product or other property.*

Terms on the Product. These terms may appear on the product:

DANGER indicates an injury hazard immediately accessible as you read the marking.

WARNING indicates an injury hazard not immediately accessible as you read the marking.

CAUTION indicates a hazard to property including the product.

Symbols on the Product. The following symbols may appear on the product:



WARNING
High Voltage



Protective Ground
(Earth) Terminal



CAUTION
Refer to Manual



Double
Insulated

Service Safety Summary

Only qualified personnel should perform service procedures. Read this *Service Safety Summary* and the *General Safety Summary* before performing any service procedures.

Do Not Service Alone. Do not perform internal service or adjustments of this product unless another person capable of rendering first aid and resuscitation is present.

Disconnect Power. To avoid electric shock, disconnect the mains power by means of the power cord or, if provided, the power switch.

Use Caution When Servicing the CRT. To avoid electric shock or injury, use extreme caution when handling the CRT. Only qualified personnel familiar with CRT servicing procedures and precautions should remove or install the CRT.

CRTs retain hazardous voltages for long periods of time after power is turned off. Before attempting any servicing, discharge the CRT by shorting the anode to chassis ground. When discharging the CRT, connect the discharge path to ground and then the anode. Rough handling may cause the CRT to implode. Do not nick or scratch the glass or subject it to undue pressure when removing or installing it. When handling the CRT, wear safety goggles and heavy gloves for protection.

Use Care When Servicing With Power On. Dangerous voltages or currents may exist in this product. Disconnect power, remove battery (if applicable), and disconnect test leads before removing protective panels, soldering, or replacing components.

To avoid electric shock, do not touch exposed connections.

X-Radiation. To avoid x-radiation exposure, do not modify or otherwise alter the high-voltage circuitry or the CRT enclosure. X-ray emissions generated within this product have been sufficiently shielded.

Preface

This document contains maintenance and repair information for the IGS-5034-00 Fibre Channel Transceiver Test System. Information about operation and modification of the test system is located in two other manuals as follows:

- *IGS-5034-00 Fibre Channel Transceiver Test System User Manual*
- *System Administrator Procedures: IGS-5034-00 Fibre Channel Transceiver Test System Instruction Manual*

Product manuals for individual system components are also provided.

Terms Used in This Manual

This manual uses the following terms:

- “Test system,” “system,” or “tester” refers to the IGS-5034-00 Fibre Channel Transceiver Test System
- “Device under test,” “DUT,” or device refers to the fiber channel transceiver
- “uucp” refers to UNIX-to-UNIX-copy and is an automated method of transferring files and mail between two UNIX systems via modem
- “cu” refers to Call-UNIX and is a manual method of logging into one UNIX system from another UNIX system via modem
- “/etc/rc.local” refers to an ASCII file containing standard UNIX commands that are executed near the completion of power-up of the system
- “cron” or “crontab” refers to the standard UNIX job scheduler and the ASCII schedule file that it uses
- “lpr” refers to the standard UNIX printer routines

Contacting Tektronix

Service Support Contact your local Tektronix distributor or sales office. Or, visit our web site for a listing of worldwide service locations.

<http://www.tek.com>

For other information In North America:
1-800-TEK-WIDE (1-800-835-9433)
An operator will direct your call.

To write us Tektronix, Inc.
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Getting Started

Getting Started

This chapter introduces the test system and gives an overview of the responsibilities of the operator, technician, and system administrator.

Product Description

The test system performs manufacturing product verification testing upon a fibre channel transceiver, also called the device under test (DUT).

Using the test system, the operator can quickly verify whether the DUT is good or bad. The test system checks specific parameters of the DUT in areas such as bit-error-rate, optical levels, and pulse parameters. After testing the DUT, the system displays a message telling the operator if the DUT passed or failed. System software also documents test results for each DUT tested; this test data is accessible by the system administrator and the technician.

Figure 1–1 shows the test system as it looks during normal operation.

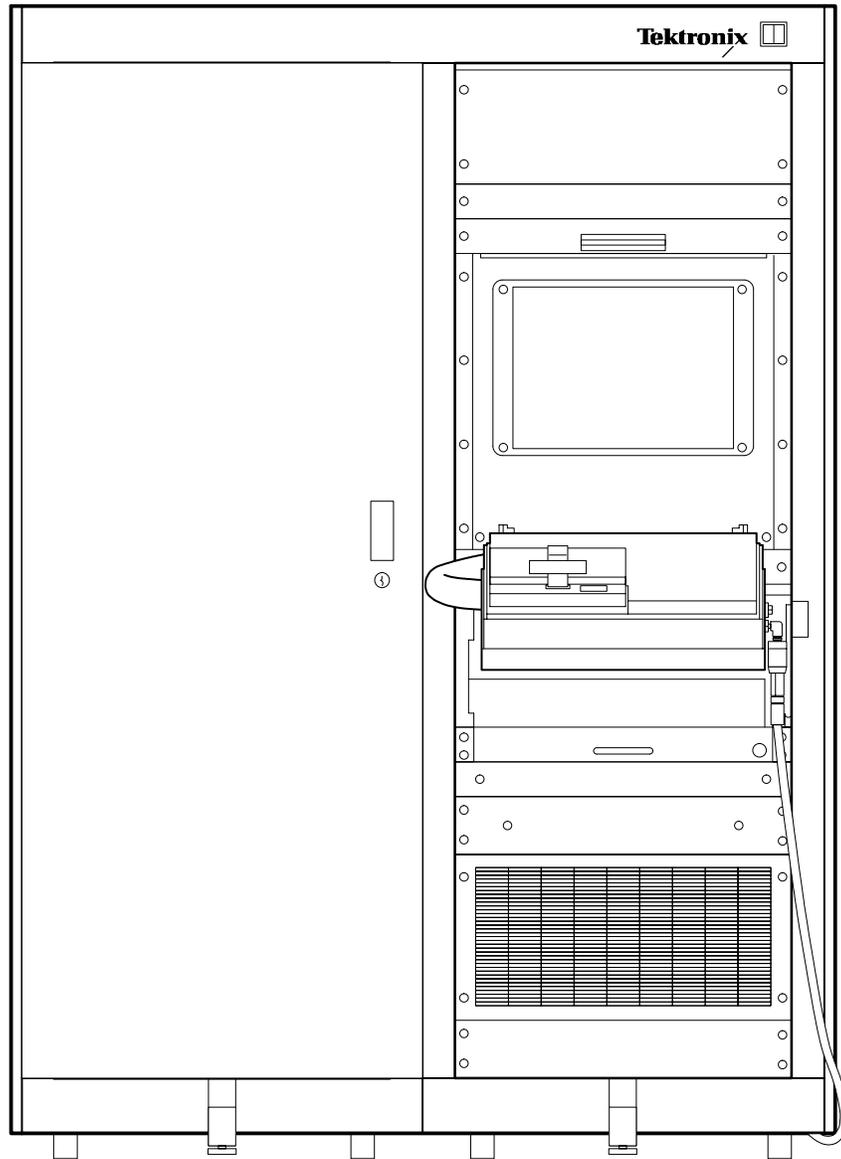


Figure 1-1: IGS-5034-00 Fibre Channel Transceiver Test System

Figure 1–2 shows the test system with the cabinet door open in preparation for maintenance or service.

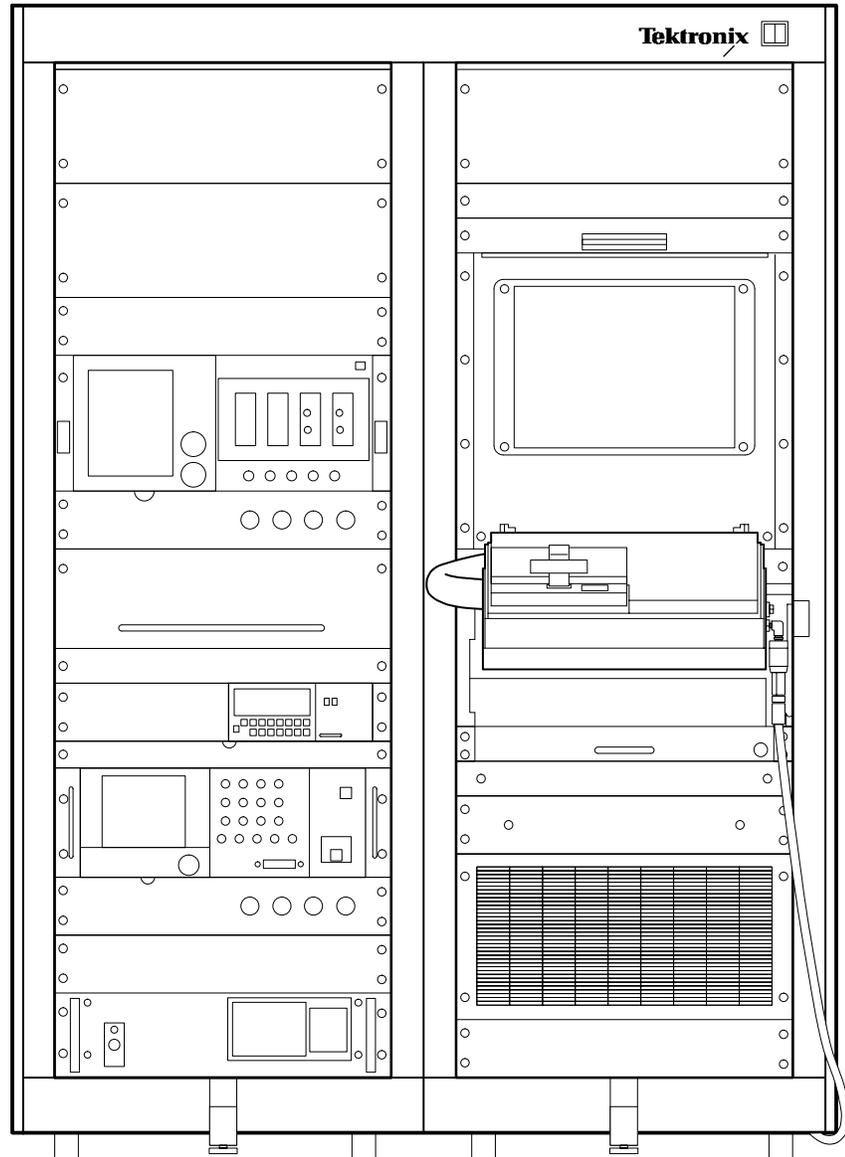


Figure 1–2: Test system shown with the front doors open

Figure 1-3 shows the test system from the rear with the doors open.

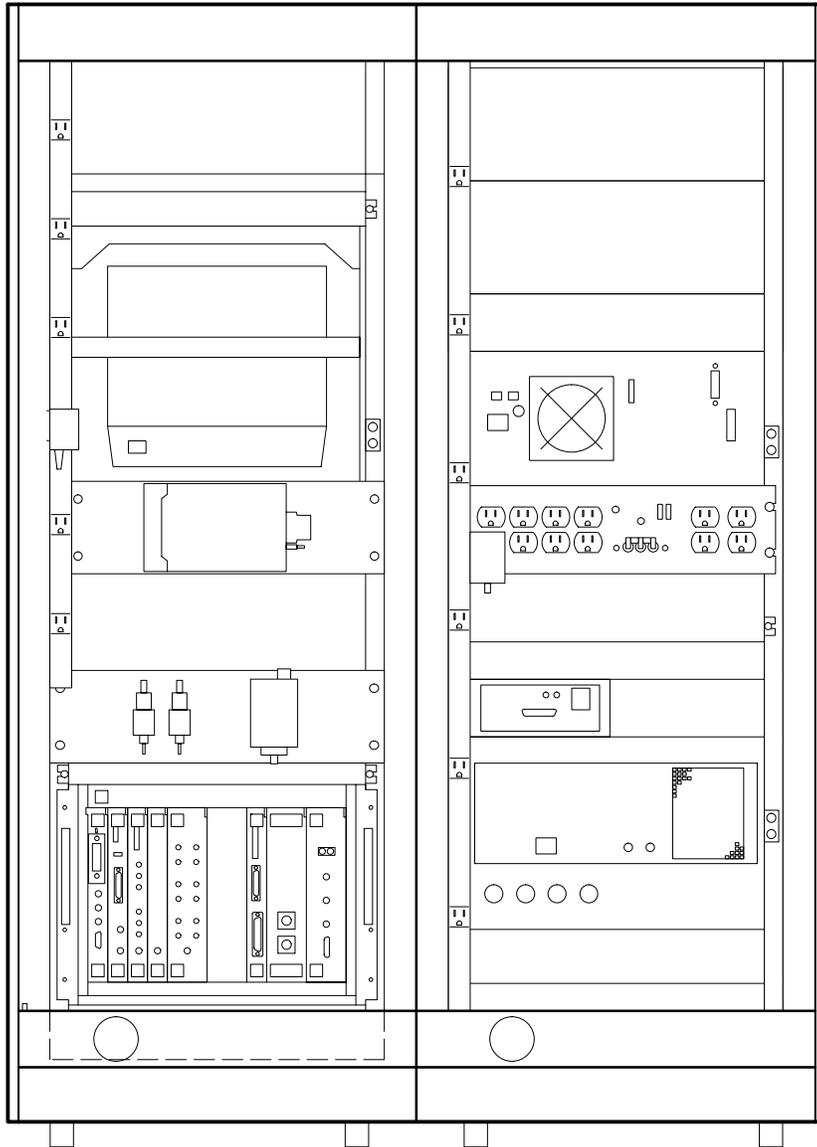


Figure 1-3: Test system shown with the rear doors open

Accessories

The test system includes several accessories as follows:

- SFTP_DUT, 2 (system self test procedures)
- Technician_DUT
- Golden_DUT (2)
- Shutdown_DUT (2)

Responsibilities

There are three different users that interface with the system: the operator, the technician, and the system administrator. The following descriptions give a brief overview of the responsibilities of each.

Operator Responsibilities

The responsibilities of the operator are as follows:

- Executing system verification tests (SFTP_DUT and Golden_DUT tests)
- Testing production DUTs
- Interpreting system prompts
- Calling the technician to handle system errors
- Following procedures for cleanliness and static control

Technician Responsibilities

The responsibilities of the technician are as follows:

- Starting up the test system
- Shutting down the test system
- Reconfiguring the system for the appropriate DUT adapter and test set
- Maintaining the cleanliness of the test fixture, DUT, and static control equipment
 - Maintaining lint free gloves, sticky mats, covers, and so on
 - Maintaining ground straps, shoe straps, jackets, and so on
- Changing the fiber optic cables
- Changing the air filters
- Removing instruments from the rack to send for calibration

- Reinstalling instruments and reconnecting cables on return from calibration
- Responding to system problems reported by the operator
 - Interpreting error messages
 - Detecting failures like fans, blowers, monitor, and so on
 - Localizing problems
- Deciding when a problem requires outside assistance
 - Knowing when to call for help
 - Knowing what not to try to do

System Administrator Responsibilities

The responsibilities of the system administrator are as follows:

- Responding to email notices of errors that have occurred in the test system
- Data analysis support: selecting, obtaining
- Installing and supporting data analysis software
- Assisting users in interpreting the data (technician support)
- Diagnosing what is causing the problem in the test system
- Providing interpretation of error messages for the technician
- Maintaining uucp
 - Monitoring uucp log files to confirm error-free transfers
 - Modifying uucp configuration files for frequency and time of calls
- Backups
 - Performing system backups to preserve test results
 - Maintaining free file space
 - Deleting old test results from system
- Maintaining cron
- Printer tasks
 - Enabling and disabling print queues
 - Monitoring print queue for proper operation
 - Modifying printer configuration files for new printers

- Software Modifications
 - Understanding the architecture and implementation of the test software
 - Making enhancements to the test system software

Functional Check

To verify correct test system operation, you should perform the functional check procedure, as described in the *Operating Basics* chapter of the *IGS-5034-00 Fibre Channel Transceiver Test System User Manual*. For more information about these tests, refer to the *Performance Verification* chapter of this manual.



Reference



Reference

This chapter provides some general reference information about the test system. Included is a brief description of the system from a technical viewpoint, procedures for starting up and shutting down the system, and some information about error messages.

System Description

Figures 2–1 and 2–2 show the test system instrument locations. Tables 2–1 and 2–2 list the test system instrument descriptions.

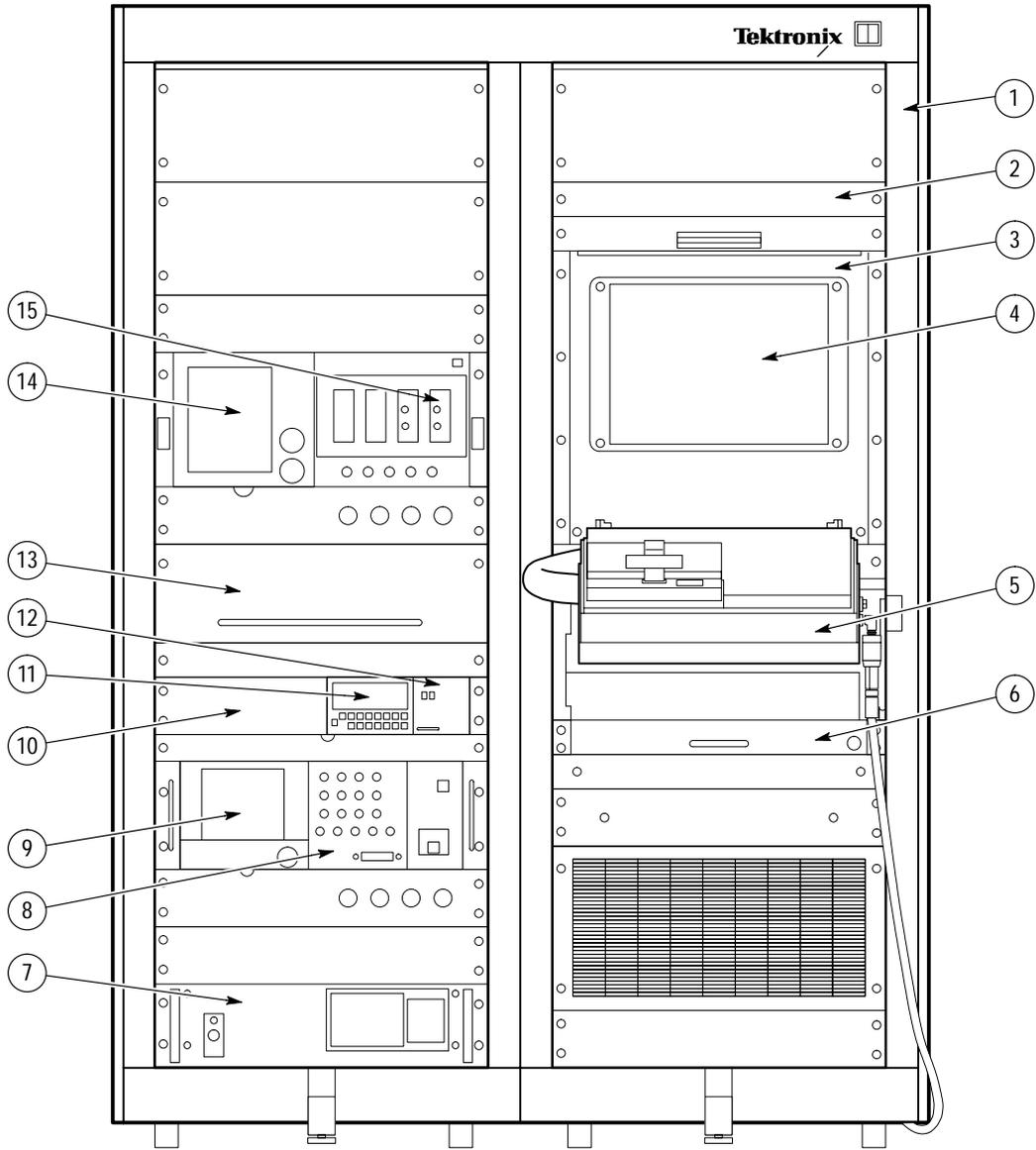


Figure 2-1: Test system equipment locations, front view

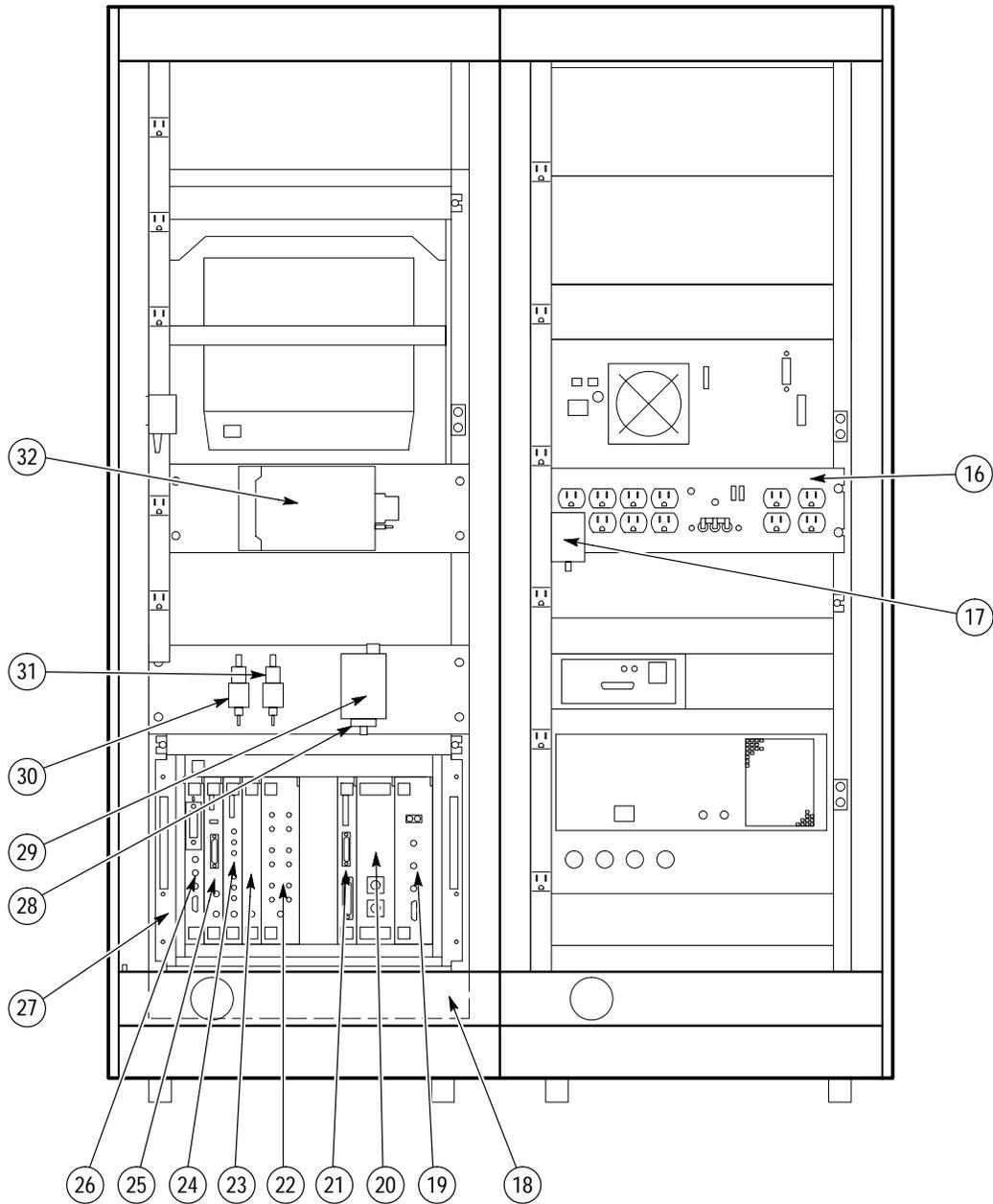


Figure 2-2: Test system equipment locations, rear view

Table 2-1: Test system instruments

Nomenclature	Description	Index no.
S5FX1-85-32-P44 Option X560A	SPARCstation 5 system 85 MHz microSPARC CPU 32 MBytes RAM 535 MByte internal hard disc drive TurboGX graphics card 17 in color monitor 3.5 in internal floppy disc drive (Option X560A) Sun OS 4.1.4 Operating System on Optical-CD Port expansion SBus card - 4 Serial and 1 Parallel Compact Keyboard for Voyager and SPARC	4 13
Test Fixture	Detachable Test Fixture for DUT	5
AT8A-03-04-01-02-4198	ELGAR GPIB programmable power supply configuration AT8A-03-04-01-02-4198 2 each 7V01 (0 V to 7 V power module, 0 to 15 A) 1 each 20V01 (0 V to 20 V power module, 0 to 10 A)	7
HFS9DG2	Data Generator Cards for HFS9003 (3 each)	8
HFS9003 Option 1R	Data Pattern Generator with rack mount option	9
A02463	Rack mount kit for a single Q8221	10
Q8221	Optical Power Meter	11
Q82202	Plug-in Unit Interface (1 each required for sensor)	12
CSA803A Option 1R, 10	Communication Signal Analyzer Oscilloscope rack mount option and prescaler delete option	14
SD22	12.5 GHz Sampling Head for CSA803A	15
MPD-861C	Marway MPD 861C power controller 1PH 24A	16
50-14000-008	Power supply for bar code scanner, 8 Vdc	17
400-53R-131	Broadband Communications Products, Inc. custom laser source instrument with rack mount. Special Modification to Model 400 laser: Wavelength = 780 nm Bandwidth > 750 MHz Average optical power = +5 dBm Extinct Ratio > 8:1 Delete Digital Input	18
Optical Switch	Custom Tektronix, Inc. Optical Switch and housing for P6701A	19
P6701A Option 1	Optical/Electrical converter, 450 to 1000 nm, DC to 850 MHz, with FC connector option	inside Optical module (19)

Table 2-1: Test system instruments (cont.)

Nomenclature	Description	Index no.
VXOA41 Option 01	VXI Optical Attenuator with FC input connector option	20
VX4801	VXI Digital I/O	21
Clock Generator	Custom Tektronix, Inc. Fibre Channel Clock Generator	22
VX4320 Option 01	VXI RF Scanner 8 X 4:1 with slave interface	23
VX4234	VXI 4.5 Digital DMM	24
VX4240	VXI Transient Digitizer	25
VXIGPIB	GPIB-VXI/C Slot 0 Controller	26
VX1410 Option 1R	VXI Mainframe, 13 Slot with rackmount option	27
A08012	FC Connector mounted on Q82214	28
Q82214	Short Wavelength Sensor (calibrated @ 780 nm)	29
FC266	SpecialTektronix, Inc. Filter with P6701A produces Fibre Channel 266 Mb/s transfer function (4th-Order Bessel Thompson)	30
FS622	Tektronix, Inc. Filter with P6701A produces Fibre Channel 531 Mb/s transfer function (4th-Order Bessel Thompson)	31
Hayes 5300AM	Hayes Accura 144 and Fax 144 modem with 14.4 k Baud capable, RS-232 serial interface	32

Table 2-2: Rack cabinet and test fixture hardware

Nomenclature	Description	Location (Figure 2-1)
437-0209-01	2 bay equipment rack (36RU) includes: fan assemblies, power strips, copper grounding bus, main power remote switch, side panels, rear doors with locking assembly, vertical stabilizer kit, top and bottom bezels, adjustable instrument mounting bars, 4 in. swivel casters (4 per bay)	1
VD4080-99-1124	General Devices writing shelf and drawer	2
119-5079-00	Display Monitor rack mounting kit	3
6531-KB3M	Industrial Computer rack mounted keyboard drawer	6

Software Organizational Flow

Figure 2-3 shows the organization of the various software functional blocks.

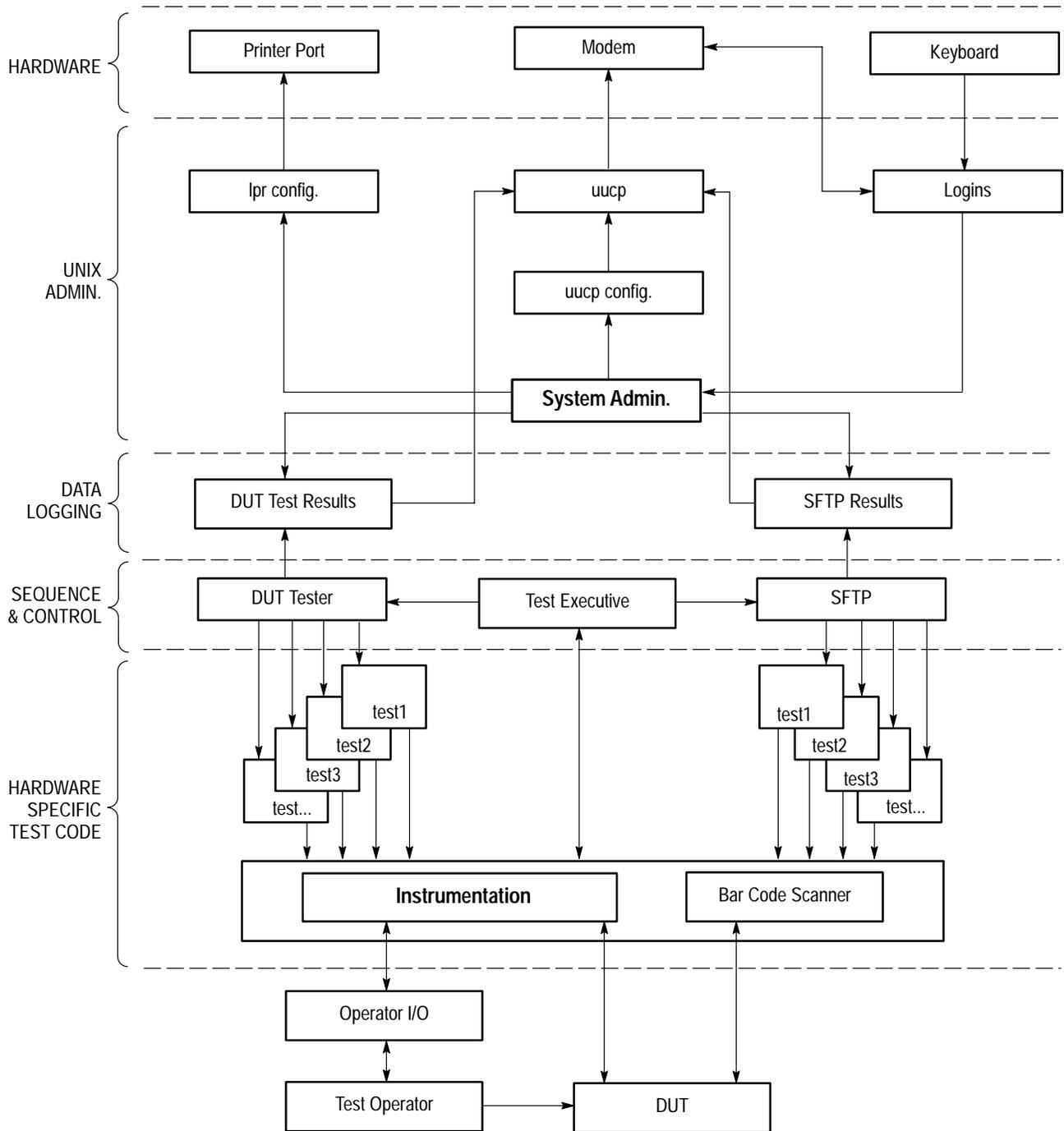


Figure 2-3: Software organizational flow chart

System Privileges

The technician has access to all standard UNIX utilities, has read-only access to diagnostic and test result files, and is able to restart the test system application software. The technician accesses the login prompt by inserting the Technician DUT in place of the test DUT to exit the test system software. When the prompt appears the technician can unlock the drawer holding the keyboard and access the UNIX system.

The system administrator has root privileges: read and write access to all files on the system. The system administrator is responsible for file system maintenance and deletion of old test result files to maintain free space in the file system.

Test Files

A separate file is created each time a part is inserted into the test fixture to be tested. The name of that file is the same as the bar code identity of the part. If a part is tested a second time, and the previous test result file is still on the system, a numeric suffix is appended to the file name to distinguish the file.

An index file is created each day that the test system is in operation. All parts tested during that day have an entry appended to that index file. The name of the index file contains the time and date of creation. Creating a new index file each day limits the size of the index file and makes it feasible to send the file from the test system to the system administrator workstation via uucp.

Each time the System Functional Test Procedure is executed, the results of the test are written to a file. The name of the file contains the time and date the procedure was executed.

Test File Format

Test files follow a defined format and contain additional information, which includes the result, the limits of the test, and the Pass/Fail information.

Test Record File Format. The test record file contains information as follows:

- Module bar code identifier
- Module test start date and time
- Keyword <additional information>
- Keyword <additional information>
- ...
- Module test end date and time

A “Keyword” is one of the test result variables, such as *Optical_Power* or *Extinction_Ratio*.

Test Record Index File Format. The test record index file contains information as follows:

- Index creation date and time
- Module 1 bar code identifier
- Module 1 test start date and time
- Module 1 test end date and time
- Module 1 pass/fail
- Module 2 bar code identifier
- ...

Sending Test Files

Test files are sent automatically by uucp. If you suspect a problem with test file transmission, contact the system administrator.

System Startup Procedure

To start up the test system, follow these steps:

1. Check that the test fixture is empty; if not, remove any DUT present.
2. Access the Sun workstation keyboard; it is located in a locked drawer beneath the test fixture.
3. Power on the test system using the power switch located in the upper right corner of the equipment rack. If power does not appear, examine the Marway Power Controller (right rear). The main breaker should be in the ON position. The Standby switch should be in the Remote position for front panel operation or in the Local position to bypass the front panel. As it starts up, the workstation monitor displays status information and other messages.

NOTE. Occasionally, the test system may report error conditions during the power-up sequence. This is usually due to some anomaly that occurred during shutdown (for example, if the system went down due to a power outage rather than an orderly shutdown). The system is often able to recover from these error conditions on its own. If the system responds with the login prompt with no further intervention on your part, you should assume that the system recovered correctly from the reported errors.

If, however, the system reports errors and asks for input (for example, regarding disposition of files), the system has entered an unknown condition. Do not attempt to interact further with the system. Call the system administrator for assistance and report the condition of the system, along with any error messages displayed.

4. At the login prompt, enter “test” as shown:

```
test ↵
```

After a few moments, the system returns a [test] prompt.

5. Wait one minute.
6. Type “wd” as shown:

```
[test] wd ↵
```

7. When the system displays “READY FOR DUT” it is ready for production testing.
8. Wait 20 minutes for the test system hardware to warm up.

This completes the power-up procedure.

Changing the DUT Type

To change the type of DUT being tested, follow these steps:

1. Open the test fixture lid.
2. To remove the DUT adapter currently in the test fixture (if any) loosen the four screws on the DUT adapter, and carefully lift the adapter out of the test fixture. Use the two “jack” levers to disengage the adapter.
3. Place the new adapter in the test fixture, carefully align the pairs of interface connectors underneath the adapter, and gently press the adapter into place.
4. Tighten the four screws on the DUT adapter finger-tight.

System Shutdown Procedure

To shut down the system, follow these steps:

1. Access the Sun workstation keyboard. (It is located in a locked drawer.)
2. Insert the Shutdown DUT in the test fixture. The system responds with a number of error messages (this is normal—you don't need to respond) and a series of shutdown messages.
3. At the # prompt, enter “/etc/halt” as shown:

```
# /etc/halt ↵
```

4. Wait about 20 seconds for several messages and finally the # prompt to reappear.
5. When the # prompt reappears, power off the system by pressing the power switch in the upper right corner of the test system.

Do not attempt to login to the computer until the system is powered back on.

Power Failure

If the test system has gone down due to a power failure, you will have to restart the system. Follow the *System Startup Procedure* on page 2–8.

If power was removed from the system without first performing the shutdown procedure, the next power-up of the system will take longer than normal. In this situation the standard UNIX power-up will perform a check of the file system to determine that there has been no damage done to the file system. If no problems are found operation will continue as usual after this point. However, it is possible that the data files that were open at the time of the power failure may not be present on the system or that they may be truncated. If damage has been done to the file system then standard UNIX system administration may be needed to recover from the problems.

GPIB Addresses

Each instrument on the GPIB bus has a unique address. All instruments connected to the GPIB bus must have different addresses, and the addresses must match what the test system software expects to see.

Table 2–3 shows the GPIB addresses expected by the system software for the individual instruments. The address assigned to each instrument is not the factory default address. Whenever an instrument is reinstalled (for example, after calibration or repair) the instrument GPIB address must be set or confirmed before starting production tests.

Table 2–3: Instrument GPIB addresses

Instrument	National Instrument device number	Primary GPIB address	Secondary GPIB address
VXIC National Instrument Slot 0 Controller	1	1	0
VX4240 Transient Digitizer	2	1	1
VX4234 DMM	3	1	2
VX4320 RF Scanner	4	1	3
VX4801 Digital I/O	6	1	4
VXOA41 Optical Attenuator	7	1	5
CSA803A Oscilloscope	8	2	na
HFS9003 Data Generator	9	3	na
AT8000 Programmable Power Supply	10	4	na
Q8221 Optical Power Meter	11	5	na

Error Messages

There are two main categories of error messages: ERROR messages and FAIL messages.

ERROR Messages

These messages often indicate a system problem, such as a bad cable. If the system reports an error to a specific instrument, you should check the communication path for that instrument, including GPIB and cable connections.

If you suspect a specific instrument is causing problems, you should run the functional check using the SFTP_DUT. If the DUT passes the functional check part of the test, then run the Golden_DUT portion of the test. If the Golden_DUT passes the test, you should assume that the production DUT caused the error message. If the Golden_DUT portion of the test fails, the path loss values may be out of bounds. Check the optical connections.

FAIL Messages FAIL messages are usually due to a bad DUT. If you suspect a system error, perform the functional check using the SFTP_DUT and the Golden_DUT. If the system passes the functional check, you should assume that the production DUT caused the error message.

Special Error Messages The operator may refer to the technician when they see the following messages:

“Bad Scan” Message. The test fixture is unable to read the bar code on the DUT. The operator should already have checked that the bar code is correctly placed and undamaged. If the bar code labels are OK, the bar code scanner may be out of alignment.

“No Lock” Message. Something is wrong with the solenoid lock assembly in the test fixture. The following conditions are the most likely to cause this message:

- Power to the solenoid is disrupted
- Mechanical components of the solenoid lock assembly are damaged or misaligned (see the exploded view diagram of the test fixture in the *Diagrams* chapter of this manual)
- The solenoid itself is damaged

When the “No Lock” message occurs, you should call the system administrator.

“Optics did not engage” Message. The test fixture was unable to connect the duplex SC optical cable to the DUT.

“Optics did not disengage” Message. The test fixture was unable to disconnect the duplex SC optical cable to the DUT.



Specifications

Specifications

Table 3–1 lists system-level characteristics.

Table 3–1: Test system characteristics

Characteristic	Description
System Warm-up Time	20 minutes
Ambient Temperature	20° C to 30° C
Weight	1000 lbs (approximate)
Power Consumption	< 24 A

For specifications pertaining to an individual instrument, refer to the manual(s) for that instrument.

WARNING

The following servicing instructions are for use only by qualified personnel. To avoid injury, do not perform any servicing other than that stated in the operating instructions unless you are qualified to do so. Refer to all Safety Summaries before performing any service.



System Overview

System Overview



WARNING. *Class IIIb laser product present in this system. Personnel servicing this equipment must be fully trained in laser safety procedures.*

For normal production testing, the operator inserts the DUT into the test fixture, captures the DUT, and closes the lid. The action of closing the lid initiates the software routines to perform the tests. (A lid switch communicates to the software, through digital I/O, that the test fixture is closed and ready.)

The electrical connections are made by way of pogo probes. When the test is complete, the software activates an electrical solenoid to release the lid and the display screen displays whether the DUT is good or bad. The lid is then opened to its full extent so that the DUT can then be quickly exchanged for the next DUT to be tested and the lid closed for the next test. An RS-232 interfaced bar code scanner is included in the test fixture. The test fixture prevents any hazardous laser beams from escaping the enclosure.

All test and measurement resources are standard catalog equipment which have passed the appropriate governing regulations.

An RS-232 modem interface is provided for remote monitoring. The modem is located inside the locked system cabinets. An appropriate phone connection should be made to the modem inside the cabinet.

Human Interface

Power is turned on by a switch located at the top right of the test system. This switch energizes a power controller which distributes power to the test system. Test system interaction with the operator has been discussed in the previous paragraphs. Technician (or system administrator) access to the test system can be made by way of the keyboard, which is normally locked in its drawer.

Laser Light Sources



WARNING. *Class IIIb laser product present. Do not disconnect optical fibers unless required to do so for servicing. Observe laser safety precautions for active laser components and attached optical fibers. Failure to observe these precautions can result in permanent eye damage.*

The test system has three sources of laser light:

- An active DUT inserted into the test fixture with power applied
- The Symbol Technologies, Inc. LS 1220 bar code scanner
- The Broadband Communications Products, Inc. laser source instrument

This section describes the conditions involving laser safety and the measures taken during system design and integration to minimize potential laser exposure to users.

External Exposure: Test Fixture Fibers

When the system doors are closed and locked the only optical path leading to external emission of laser light is the DUT Rcv fiber connector inside the test fixture.

Laser light from this port can be exposed only when there is no DUT in the test fixture. The origin of this laser light is the BCP laser source.

The following measures are implemented in the system to protect the operator from possible exposure to the BCP laser source at the exposed test fixture DUT Rcv fiber connector:

- Under normal operating conditions, the system software always configures the optical switches such that the BCP laser is not routed to the test fixture connectors when the lid is open.
- The test fixture lid is locked and unlocked under software control to prevent opening the lid during testing.
- The electrical hardware is prevented from completing the optical path to the class III laser while the lid is open.
- In the event of optical switch control power loss, the default relaxation position of the switches is to route the BCP laser signal away from the test fixture connectors.
- Under normal operating conditions, the system software always disables the optical attenuator output which blocks the output of the class III laser.
- The test fixture lid is captured in a trough so that when the lid is closed there are no possible line-of-sight exposures available to laser light.

Interior Exposure

For technicians with access to the interior of the system, there are optical ports which carry Class IIIb light levels and can pose laser exposure danger to the human eye if proper precautions are not taken.

Some of the capabilities of the system which allow interior access to the system without risk of exposure to the laser light are as follows:

- All laser light is carried through optical fibers, and cannot expose the human eye while these fibers and their connections are intact.
- The BCP laser source is equipped with a power key, which allows the key controller to lock the BCP laser source in the OFF position regardless of system power.

Test Fixture

The following text describes test fixture components.

Circuit Boards

The test fixture has two custom circuit boards integrated into the test fixture. These circuit boards are mounted on the inside of the test fixture.

One circuit board is attached to the main portion of the test fixture. The other is attached to the removable DUT Adapter.

Pogo probe receptacles are mounted directly through the back side of the DUT Adapter circuit board, and protrude into the test fixture. These pogo probes are visible when the lid of the test fixture is open and there is not a DUT inserted in the test fixture. (For information about the pogo probes, refer to *Replacing the Pogo Probes* on page 7–8.)

The various microswitches mounted in the test fixture also have their signals routed to the circuit board. The microswitches each have individual connectors.

Power

The AT8000 provides three independent power supplies: +5 V for the test fixture, +12 V for the solenoid, and +5 V for the DUT.

Optical Interconnections

Standard fiber optic cables and connectors are used throughout; these fiber optic components are 50 μm -multimode compatible.

Micro Switches

The test fixture is equipped with three microswitches to indicate certain states of mechanical action. The three states include lid closure, successful insertion of fiber optics into the DUT, and locked lid.

Solenoid Lock

The latching mechanism of the test fixture lid is equipped with a solenoid. The solenoid, when driven, pulls a locking pin into place so that the lid of the test fixture cannot be opened. When the solenoid is no longer driven, a spring returns the locking pin to its original position such that the lid is no longer locked and the operator may then open the lid.

Logic Table 4–1 describes the logic levels, the corresponding physical state of the microswitches and the solenoid.

Table 4–1: Logic levels vs. microswitch and solenoid physical states

Signal (1x2 header color; 1-red; 2-brown)	Physical state when digital I/O channel is high	Physical state when digital I/O channel is low
LID CLOSED	Lid of test fixture is open	Lid is closed
LOCKED	The locking pin is NOT in place	Locking pin is in place; lid is prevented from being opened
FIBRE Engaged	The fiber-to-DUT connection is OK	The fiber-to-DUT connection is faulty
LID SOLENOID	Current is allowed to flow through solenoid; solenoid tries to pull locking pin into LOCKED position	No current flow in solenoid; spring tries to force locking pin into UNlocked position
Optics valve	Current activates valve for piston	Air drives piston to release cable connection

Digital Control Signals The VX4801 is capable of configuring its channels for either logical input or output. The logic level of the instrument used is TTL, and the current drive capabilities of its signals are limited.

The Digital I/O instrument has two separate channels of 48 digital signals each. Each channel of 48 signals is divided into six 8-bit registers. The Digital I/O instrument can be configured for TTL input or output in 8-bit blocks only.

High Speed Inputs The inputs and the accompanying clock which drive the DUT are carried from the HFS9003 to the circuit board. On the circuit board these signals are terminated through 50 Ω to ground.

Outputs All of the TTL output signals received from the DUT (through the pogo probes) are buffered before being sent to the 50 Ω connectors on the circuit board.

The buffering includes line drivers, which drop the signal of the original TTL levels down to approximately 0.3 volt peak-peak.

Error Detector The BER test of the system relies entirely upon the word comparator located on the main circuit board.

System Workstation

The entire test system is controlled through a single computer. This computer (UNIX workstation) provides control over serial communication and GPIB communication.

The system contains the following items: SPARCstation 5 system, Sun OS 4.1.4 Operating System (SC-P), 85 MHz microSPARC CPU, 32 MBytes RAM, 535 MByte internal hard disk drive, TurboGX graphics card, 17 inch color monitor and 3.5 inch internal floppy disc drive (Option X560A).

Instrument name	SPARCstation 5 UNIX Workstation with Sun OS 4.1.4
Vendor	Sun Microsystems Incorporated
Ordering information	S5FX1-85-32-P44 , Option X560A Quantity: one (1)
Ordering information	SC-P Quantity: one (1)

Workstation Accessories

Additional hardware includes a SUN-X-SB-400P (Port expansion SBus card - 4 Serial and 1 Parallel), a Compact keyboard for Voyager and SPARC series systems (#320-1194) and a 6 foot keyboard Mini-DIN to mini-DIN cable (#530-1442).

Instrument name	SUN-X-SB-400P Port expansion SBus card 320-1194 Compact keyboard for Voyager and SPARC 530-1442. Mini-DIN to mini-DIN cable
Vendor	SunExpress (division of Sun Microsystems Inc.)
Ordering information	SUN-X-SB-400P Quantity: one (1)
Ordering information	320-1194 Quantity: one (1)
Ordering information	530-1442 Quantity: one (1)

GPIB Sun Interface

The Sun SPARC5 does not come equipped with an IEEE488 (GPIB) interface. GPIB is provided through the addition of a National Instruments GPIB-SPRC-B which interfaces to the Sun SBus and includes the needed software.

Instrument name	GPIB-SPRC-B
Vendor	National Instruments
Ordering information	776789-01 Quantity: one (1)

Modem

The modem is required for remote login to and from the site workstation and the System Administrator workstation. The modem should be capable of baud rates of 14,000 or higher, and be Hayes compatible in protocol.

Instrument name	Modem: 5300AM Accura 144 and Fax 144
Vendor	Hayes Microcomputer Products PO Box 105203 Atlanta, GA 30348
Ordering information	5300AM Quantity: one (1)

Bar Code Scanner

The Bar Code Scanner is used to read the DUT serial number located on each DUT in a bar code format. The scanner is mounted as an integral part to the test fixture. The optical scan beam is visible (standard 680nm type). This bar code scanner uses an RS-232 interface. It is designed to read type 39 bar codes.

Instrument name	LS 1220
Vendor	Symbol Technologies, Inc. 116 Wilbur Place, Bohemia, NY 11716 Tel: (516) 563-2400 or 1-800-SCAN-234 Fax: (516) 563-2831 Local Rep: Systems Technical Sales 6950 S.W. Hampton St., Suite 308, Tigard, OR 97223 Tel: (503) 624-2347 Fax: (503) 684-8470
Ordering information	LS 1220-I200A Quantity: one (1)

Bar Code Scanner Power Supply

The power supply for the scanner is a 110 Vac to 8 Vdc adapter.

Instrument name	50-14000-008
Vendor	Systems Technical Sales 6950 S.W. Hampton St., Suite 308, Tigard, OR 97223 Tel: (503) 624-2347 Fax: (503) 684-8470
Ordering information	50-14000-008 Quantity: one (1)

Pattern Generator Mainframe

The programmable pattern generator is comprised of a mainframe and data generator cards. The HFS9003 is a mainframe that accommodates three data generator cards.

The HFS9003 can support up to 12 channels of high speed stimulus. Although the MIM1063 requirement is for 20 channels, the test fixture demultiplexes the 10 data bits from the HFS to create the 20 bits needed for the MIM1063. The two remaining HFS channels are used for clocking the DUT and the test fixture.

Instrument name	HFS9003 Three-Slot Mainframe
Vendor	Tektronix, Inc.
Ordering information (Mainframe)	HFS9003 Option 1R Quantity: one (1)

Data Generator Cards

Each Data Generator card provides 4 output channels. A total of 12 output channels provide parallel 10-bit words, DUT clock, and the test fixture clock.

Instrument name	HFS9DG2
Vendor	Tektronix, Inc.
Ordering information (modular cards)	HFS9DG2 Quantity: three (3)

Optical to Electrical Converter

The Optical-to-Electrical Converter for this system is the Tektronix P6701A; this converter is housed with the Optical Switch Module.

Instrument name	P6701A Optical-to-Electrical Converter (FC input connector)
Vendor	Tektronix, Inc.
Ordering information	P6701A Option 01 Quantity: one (1)

Fiber Channel Filters

The system uses two filters: a Tektronix FS622 SONET filter and a custom-made filter.

The Fibre Channel FC-PH specifications (A.1.2.2) states that all measurements on the pulse parameters of the Fibre Channel Tx signal are to be made with an O/E Converter and Filter combination which have a specific combined frequency response. Such a combined frequency response is defined as a low pass fourth order Bessel-Thompson curve with the 3 dB point at 0.75 the data rate (such as 0.75×265.625 MHz).

In order to provide such a filter, Tektronix has provided the system with a custom built FFC266. The FFC266 uses a filter component from an outside vendor that is installed in a mechanical package identical to the Tektronix FS Sonet Filters (FS52, FS156, and FS622).

Instrument name	FFC266 filtering component (minus mechanical package)
Vendor	Integrated Microwave local Rep:Allis N.W. Tony DeVore 206-828-0444
Ordering information	part number 914325 (FFC266)

Instrument name	FS622 Filter
Vendor	Tektronix, Inc.
Ordering information	FS622 Filter Quantity: one (1)

Digital Oscilloscope

The CSA803A digital sampling oscilloscope is used to measure all time domain aspects of the DUT signals. It requires the presence of a sampling head such as the SD22. Equipped with the SD22, the CSA803A gives 12.5 GHz of bandwidth. This is used for Mask testing, Extinction Ratio measurements, and all high speed timing measurements (rise and fall times, RC0, RC1, and Byte Sync width).

Instrument name	CSA803A
Vendor	Tektronix, Inc.
Ordering information (Mainframe)	CSA803A Option 1R, 10 Quantity: one (1)

Sampling Head

The CSA803A digital sampling oscilloscope is used to measure all time domain aspects of the DUT signals. It requires a sampling head, such as the SD22.

Instrument name	SD22
Vendor	Tektronix, Inc.
Ordering information (Mainframe)	SD22 Quantity: one (1)

Digital Multimeter

The Digital Multimeter is a 4.5 digit DMM.

Instrument name	VX4234
Vendor	Tektronix, Inc.
Ordering information	VX4234 Quantity: one (1)

Optical Attenuator

An Optical attenuator in the system simulates fiber-loss errors (reduce DUT received power to test limits).

Instrument name	VXOA41
Vendor	Tektronix, Inc.
Ordering information	VXOA41 Option 01 Quantity: one (1)

RF Scanner

A programmable scanner routes signals between various sources and acquisition instruments.

Instrument name	VX4320
Vendor	Tektronix, Inc.
Ordering information	VX4320 Option 01 Quantity: one (1)

Digital I/O Interface

The Digital I/O instrument sources and receives the low frequency input and output digital signals going to and coming from the test fixture.

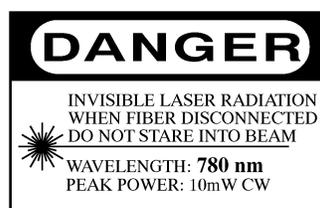
Instrument name	VX4801
Vendor	Tektronix, Inc.
Ordering information	VX4801 Quantity: one (1)

Laser Transmitter

The saturation BER test for the DUT requires an optical power of at least 0 dBm at the receiver of the DUT. To achieve this power, a laser transmitter with sufficient bandwidth and power is required. The power output of the laser transmitter must overcome the optical losses incurred as the laser signal is routed through the system, through the attenuator, and finally to the DUT receiver (a loss of approximately 4 dB).



WARNING. *The Model 400 Laser Transmitter is a Class IIIb laser product. The following label on the equipment indicates hazard:*



Observe laser safety precautions for active laser components and attached optical fibers. Failure to observe these precautions can result in permanent eye damage.

A laser transmitter is supplied by BCP for use in the system. This product is a modified model 400 BCP transmitter that produces approximately 5dBm of average power, greater than 750 MHz bandwidth, and only an analog input. The digital input is deleted.

Instrument name	400-53R-131
Vendor	BCP Inc. 305 East Drive, Suite A Melbourne, FL 32904 Tel: (407) 984-3671 Fax: (407) 728-0487 Contact: Whit Cotten, VP Marketing
Ordering information	400-53R-131 Quantity: one (1)

Power Supply

The ELGAR AT8000 power supply provides power to the DUT, the test fixture logic, and the test fixture solenoids. The supply configuration includes GPIB, front panel keyboard, two 7V01 (0 V to 7 V; 0 to 15 A) power modules, and one 20V01 (0 V to 20 V; 0 to 10 A) power module.

Instrument name	AT-8000 ELGAR GPIB programmable power supply
Vendor	Tektronix, Inc.
Ordering information	AT8A-03-04-01-02-4198 Quantity: one (1)

Optical Switches (1x2)

The various optical paths in the system are routed by 1x2 optical switches.
Detailed Description: 1 X 2 Bypass Multimode Optical Switch, 50/125/250 μm Fiber Type, 3 mm Heavy Duty Leads, 33 cm \pm 1 cm Lead Length, and FC/PC Connector (each end).

These switches are located within the Optical Switch module.

Instrument name	7-99421-1, 1x2 Bypass Switch
Vendor	AMP Global Passive Products Division 2525 E. Bayshore Rd. Palo Alto, CA 94303 Phone: (415) 812-8642
Ordering information	7-99421-1 Quantity: four (4)

Optical Splitter

The optical splitter routes the DUT transmit to the DUT receive, and, at the same time, views the DUT transmitter eye pattern with the oscilloscope.

Detailed Description: number of ports = 1 x 2, divide ratio= 50/50, fiber type = 50/125 μm -multiple mode, package = orange, 3 mm, heavy duty, lead length minimum = 35 \pm 2 cm, wavelength = 780 nm, connector = FC/PC (each end).

Instrument name	AC1100-TED596 50/50 Optical Coupler/Splitter
Vendor	JDS-Fitel, Inc. 570 West Hunt Club Road Nepean, Ontario, Canada, K2G 5W8 Phone: (613) 727-1303 Fax: (613) 727 8284
Ordering information	AC1100-TED596 Quantity: four (1)

Optical Jumper Cables

Three multiple mode fiber optic cables connect the optical modules. These are 50/125 μm Fiber Type, 3 mm Heavy Duty Leads, 40 cm long with FC/PC connectors (each end).

Part name	PC-2J-040CM, FC to FC fiber jumpers
Vendor	Seiko USA Torrence, CA Contact: Terese Padjen Phone: (310) 517-7786
Ordering information	PC-2J-040CM Quantity: three (3)

Duplex Optical Cable

The optical cable used to interface the DUT optics to the test system is a multiple mode duplex optical cable, 2m long, 50um fiber type with male SC connectors at each end. As this cable has a short insertion life, replacements should be kept in stock.

Part name	C038946, SC Duplex Cable Assembly
Vendor	Alcoa Fujikura Ltd. Tel: 1-800-395-4388 Rep: Debbie Christopher Tel: 1-800-395-4388
Ordering information	C038946 Quantity: one (1)

Pogo Pins for Test Fixture ECB

Several different styles (IDI Series 0 and 1) of spring contact “pogo” pins and receptacles are required to probe the DUT inside the test fixture as follows:

- MIM1063 uses: SX0A2.2G (80 each), SX0H2.2G (4 each), and RX0WW.016 (84 each)
- OESW uses: SX0U2.2G (4 each), RX0WW.016 (4 each), SX1A2G (20 each), and R1RP (20 each)
- MIM266 and MIM531 use: SX1A2G (53 each), and R1RP (53 each)

Part name	Series SL, Size 1
Vendor	Interconnect Devices Inc. address: 5101 Richland Ave.; Kansas City, KS 66106 Tel: 913-342-5544 Fax: 913-342-7043
Ordering information	Quantity: see above

Lock Solenoid

The test fixture has a solenoid which drives the locking pin of the latch. The solenoid is used to lock the lid to prevent the operator from inadvertently opening the test fixture during the middle of a test. This is a 12 VDC tubular solenoid with approx. 32 Ω impedance; 15 ounce pulling force at 12 VDC and rated for continuous use (such as when current is driving the solenoid as long as lid is locked).

Part name	Tubular Solenoid
Vendor	GUARDIAN Electric Manufacturing Co. address: Woodstock, Illinois 60098. Available from Newark.
Ordering information	T 6x12-CONT-12D Quantity: one (1)



Performance Verification

Performance Verification

This chapter describes how to check that the test system is performing correctly.

Equipment Required

To perform this procedure you need the following items:

- SFTP_DUT; a special DUT that has internal connections different than that of a standard DUT.
- Golden_DUT; a special DUT with “guaranteed good” performance specifications. There is a Golden_DUT for each type of fibre channel transceiver.

NOTE. *The SFTP_DUT and Golden_DUT have special bar codes. If these bar codes are damaged, misaligned, or incorrect, the test system cannot correctly recognize the DUTs.*

Performance Verification Procedure

There are two procedures you can follow to verify the performance of the system: the System Self Test procedure and the System Performance Verification procedure.

System Self Test

To run the System Self Test, install the SFTP_DUT in the test fixture, and then close the lid to start the test. When the System Self Test is initiated, the software queries every instrument on the GPIB bus. Once communications have been established, every instrument is asked for its ID which is compared to the expected value. All instruments with self-test capability are requested to initiate the self test and report the results to the system controller. The results of the self test, along with the time it was run, are stored in the system log file.

If any instrument does not respond, responds with the wrong ID, or fails its self test, this information is reported to the operator. The individual instrument which is reported as not operational should be evaluated using its own service manual.

After the GPIB communications phase of the SFTP test, the instrument verifies as many electrical connections as possible.

**System Performance
Verification**

Due to the mixed signal (optical and electrical) nature of this test system, it is impossible to completely self test the system. As a result, the performance of the optical portions of the test fixture are tested with a DUT which has been previously calibrated and is known to perform within certain bounds. The DUT used for this purpose is the Golden_DUT.

Once the Golden_DUT is installed in the test fixture and the lid is closed, the system performs the functional and performance tests on the Golden_DUT. Any results outside acceptable bounds are noted. This tests the functional aspects of the system.



Adjustment Procedures

Adjustment Procedures

This chapter describes the optical pathloss calibration and how to adjust the bar code scanner.

Optical Pathloss

The procedure used here requires checking the power at the system's optical switch input from the Attenuator (laser source) as a reference. Then the optical transmit path from the DUT to the power meter is checked by using a jumper to the laser source. After that, a jumper is placed to loop the DUT transmit to the DUT receive and the remaining losses found. This eliminates the need to handle the BCP output directly and thus reduce the possibility of exposure to the high power (Class III) source.

During this procedure, care is taken to minimize the risk of exposure to the Class III laser source. At each step of this procedure, the optical attenuator is used to block the light output of the laser source. The optical output of the attenuator is enabled only when the technician responds to the computer prompt which causes the measurements to begin. At the completion of the measurements for a given set of steps, the output of the laser is once again blocked by the attenuator. In addition, the attenuator controls the output power to less than 0 dBm.

To execute the pathloss calibration procedure, type the following while in the "test" directory:

```
<test directory prompt> pathloss
```

This begins the computer prompted procedure. This procedure compares the measured results against an expected range of values. If the actual measurement is out of range, the procedure is terminated and a suitable advisory message is displayed to aid in resolving the problem.

Step 1: Access the optical connections from the rear of the system rack and measure the optical power from the laser source as a reference.

The first step is to measure a reference power level against which all other path measurements are compared to compute the relative pathloss. The following messages appears at the beginning of the procedure.

DANGER: Accessible Class III laser in use!
Disable laser source before connecting and disconnecting optical cable to high power BCP laser. Do not look directly into laser light. Permanent eye damage may result.

Step:

1. Unlock the rear door (behind the computer display).
2. The Fixture must be installed with the lid closed for the entire procedure.
3. At the VX0A41 Attenuator, disconnect the optical cable attached to the connector labeled 'OPTICAL OUT.'
4. At the Optical Switch Module, disconnect the optical cable attached to the connector labeled 'OPTICAL OUTPUT To Power Meter.'
5. Attach the free end of the optical cable to the VX0A41 'OPTICAL OUT.' The Q82214 Sensor should now be attached to the VX0A41 Attenuator.

The first thing that the procedure checks is if the test fixture lid has been closed. If it has not, the procedure terminates and displays the following message:

```
**** Fixture Lid must be CLOSED!
```

If this occurs, you must restart the procedure as shown above, or testing continues. If the measured power is between +3 dBm and -3 dBm, the step has been successfully completed with the following message momentarily displayed (three seconds):

```
Ref Optical Power from laser source = <value> dBm
```

If the measured power is not between +3 dBm and -3 dBm, one of the following messages displays and the procedure terminates.

If the power is greater than +3 dBm:

```
*** ERROR Optical Power is too high  
    BCP laser may need recalibration
```

If the power is between -3 dBm and -10 dBm:

```
*** ERROR Optical Power is too low  
    Check optical cable connections  
    Optical cables may need cleaning  
    BCP laser and or VX0A41 may need recalibration
```

If the power is less than -10 dBm:

```
*** ERROR Optical Power is too low  
    Check optical cable connections  
    Verify that BCP key switch is in ON position
```

Optical cables may need cleaning
BCP laser and or VX0A41 may need recalibration

Step 2: Measure optical power at the DUT transmit through total path.

The next step is to measure the optical power from the output of the optical attenuator through the DUT transmit paths, to the oscilloscope and to the power meter. The following messages display:

DANGER: Accessible Class III laser in use! Disable laser source before connecting and disconnecting optical cable to high power BCP laser. Do not look directly into laser light. Permanent eye damage may result.

Step:

6. Reconnect the Q82214 Sensor to the Optical Switch connector labeled 'OPTICAL OUTPUT to Power Meter.'
7. Connect the VX0A41 Attenuator output to the PC-to-SC adapter and attach it to the Duplex-SC cable end at the DUT Transmit.

Press <cr> when ready. Type s<cr> to skip.

The first DUT transmission path measured starts at OS1 (optical switch number 1), through OS3, to OS2, to OS4 and then to the power meter. Hence the notation of "Optical Power OS1-3-2-4." If the measured power is between 0 dBm and -8 dBm, the step has been successfully completed with the following message momentarily displayed (three seconds):

```
Optical Power OS1-3-2-4 = <value> dBm
```

If the measured power is not between 0 dBm and -8 dBm, one of the following messages displays and the procedure terminates.

If the power is greater than 0 dBm:

```
*** ERROR Optical Power is too high  
BCP laser may need recalibration
```

If the power is between -8 dBm and -18 dBm:

```
*** ERROR Optical Power is too low  
Check optical cable connections  
Optical cables may need cleaning  
BCP laser and or VX0A41 may need recalibration
```

If the power is less than -18 dBm:

```
*** ERROR Optical Power is too low
    Check optical cable connections
    Verify that BCP key switch is in ON position
    Optical cables may need cleaning
    Optical Switch Module may have failed
    BCP laser and or VX0A41 may need recalibration
```

The next DUT transmission path measured starts at OS1 (optical switch number 1) through OS4 to the power meter. Hence the notation of “Optical Power OS1–4.” If the measured power is between $+3$ dBm and -3 dBm, the step has been successfully completed and the following message is displayed for about 3 seconds:

```
Optical Power OS1-4 = <value> dBm
```

If the measured power is not between $+3$ dBm and -3 dBm, one of the following messages displays and the procedure terminates.

If the power is greater than $+3$ dBm:

```
*** ERROR Optical Power is too high
    BCP laser may need recalibration
```

If the power is between -3 dBm and -10 dBm:

```
*** ERROR Optical Power is too low
    Check optical cable connections
    Optical cables may need cleaning
    BCP laser and or VX0A41 may need recalibration
```

If the power is less than -10 dBm:

```
*** ERROR Optical Power is too low
    Check optical cable connections
    Verify that BCP key switch is in ON position
    Optical cables may need cleaning
    Optical Switch Module may have failed
    BCP laser and or VX0A41 may need recalibration
```

The final DUT transmission path measured starts at OS1 (optical switch number 1), through the optical splitter to the P6701A OE (Optical to Electrical) converter. Hence the notation of “Optical Power at OE Converter.” If the measured power is between 0 dBm and -9 dBm, the step has been successfully completed with the following message is displayed for about 3 seconds:

```
Optical Power at OE Convertor = <value> dBm
```

If the measured power is not between 0 dBm and -9 dBm, one of the following messages displays and the procedure terminates.

If the power is greater than 0 dBm:

*** ERROR Optical Power is too high
BCP laser may need recalibration

If the power is between -9 dBm and -15 dBm:

*** ERROR Optical Power is too low
Check optical cable connections
Optical cables may need cleaning
BCP laser and or VXOA41 may need recalibration

If the power is less than -15 dBm

*** ERROR Optical Power is too low
Check optical cable connections
Verify that BCP key switch is in ON position
Optical cables may need cleaning
Optical Switch Module may have failed
BCP laser and or VXOA41 may need recalibration\n");

Step 4: Measure loss from attenuator to DUT receive. This is used when setting the power levels for Receiver Sensitivity and Receiver Saturation.

This step measures the power loss from the optical attenuator through OS3, to OS2, through an optical jumper connecting the DUT transmit to the DUT receive, to OS1, to OS4 and to the power meter. This result is given the name "Optical Power OS3-2-1-4." This is followed by the final measurement of loss from the optical attenuator through OS3, to OS2, to OS4 and to the power meter. The result from this measurement is given the name "Optical Power OS3-2-4." The following message is displayed:

DANGER: Accessible Class III laser in use! Disable laser source before connecting and disconnecting optical cable to high power BCP laser. Do not look directly into laser light. Permanent eye damage may result.

Step:

8. Reconnect the VXOA41 Attenuator to the Optical Switch connector labeled 'OPTICAL INPUT from Attenuator and remove PC-to-SC adapter.'

9. Connect an SC-to-SC optical jumper cable at the DUT end.

Press <cr> when ready. Type s<cr> to skip.

If the measured power for OS3-2-1-4 is between +3 dBm and -5 dBm, the step has been successfully completed with the following message is displayed for about 3 seconds:

Optical Power OS3-2-1-4 = <value> dBm

If the measured power is not between +3 dBm and -5 dBm, one of the following messages displays and the procedure terminates.

If the power is greater than +3 dBm:

*** ERROR Optical Power is too high
BCP laser may need recalibration

If the power is between -5 dBm and -10 dBm:

*** ERROR Optical Power is too low
Check optical cable connections
Optical cables may need cleaning
BCP laser and or VX0A41 may need recalibration

If the power is less than -10 dBm:

*** ERROR Optical Power is too low
Check optical cable connections
Verify that BCP key switch is in ON position
Optical cables may need cleaning
Optical Switch Module may have failed
BCP laser and or VX0A41 may need recalibration

If the measured power for OS3-2-4 is between +3 dBm and -5 dBm, the step has been successfully completed with the following message is displayed for about 3 seconds:

Optical Power OS3-2-1-4 = <value> dBm

If the measured power is not between +3 dBm and -5 dBm, one of the following messages displays and the procedure terminates.

If the power is greater than +3 dBm:

*** ERROR Optical Power is too high
BCP laser may need recalibration

If the power is between -5 dBm and -10 dBm:

*** ERROR Optical Power is too low
Check optical cable connections
Optical cables may need cleaning
BCP laser and or VX0A41 may need recalibration

If the power is less than -10 dBm:

```
*** ERROR Optical Power is too low
    Check optical cable connections
    Verify that BCP key switch is in ON position
    Optical cables may need cleaning
    Optical Switch Module may have failed
    BCP laser and or VXOA41 may need recalibration
```

Step 5: Completion of the procedure and preparation to resume production testing.

This step marks the completion of the manual manipulation of cables. The following message is displayed:

```
DANGER: Accessible Class III laser in use! Disable laser source
         before connecting and disconnecting optical cable to
         high power BCP laser. Do not look directly into laser
         light. Permanent eye damage may result.
```

Step:

10. Disconnect the SC-to-SC optical jumper cable.

11. Replace protective covers on all adapters.

Press <cr> when completed.

When completed the results are summarized in the following displayed message:

```
Results:
  Ref_Power_BCP_Atten <value in dBm>
  Pathloss_Rx_To_Power_Meter <value in dB>
  Pathloss_Tx_To_Power_Meter <value in dB>
  Pathloss_Tx_To_OE <value in dB>
  Pathloss_OS1-3-2-4 <value in dB>
  Pathloss_OS3-2-4 <value in dB>
```

After the results are listed, the next step is decide whether or not to save the results for use by the tester. The following message displays:

```
Do you want to save these new values? (y=yes n=no)
```

If yes, type the letter y and return. The following message displays as an acknowledgement:

```
Values have been saved.
```

Otherwise the message is:

```
Values not saved.
```

Finally, close the rear system door and type the instruction below to enter the new results into the system environment. Without this step, the new results, although saved, are not used for the tests. This message prompts you to enter them into the environment.

Procedure Completed:
Close and lock the rear door.

Type the following to update the environment variables:
source path_vars

Bar Code Scanner Positioning

To position the bar code scanner, follow these steps:

1. Loosen (1/4 turn) the two adjustment screws shown in Figure 6-1.
2. Position the scanner by sliding the screw heads along the slots.
3. Gently tighten the screws when complete.

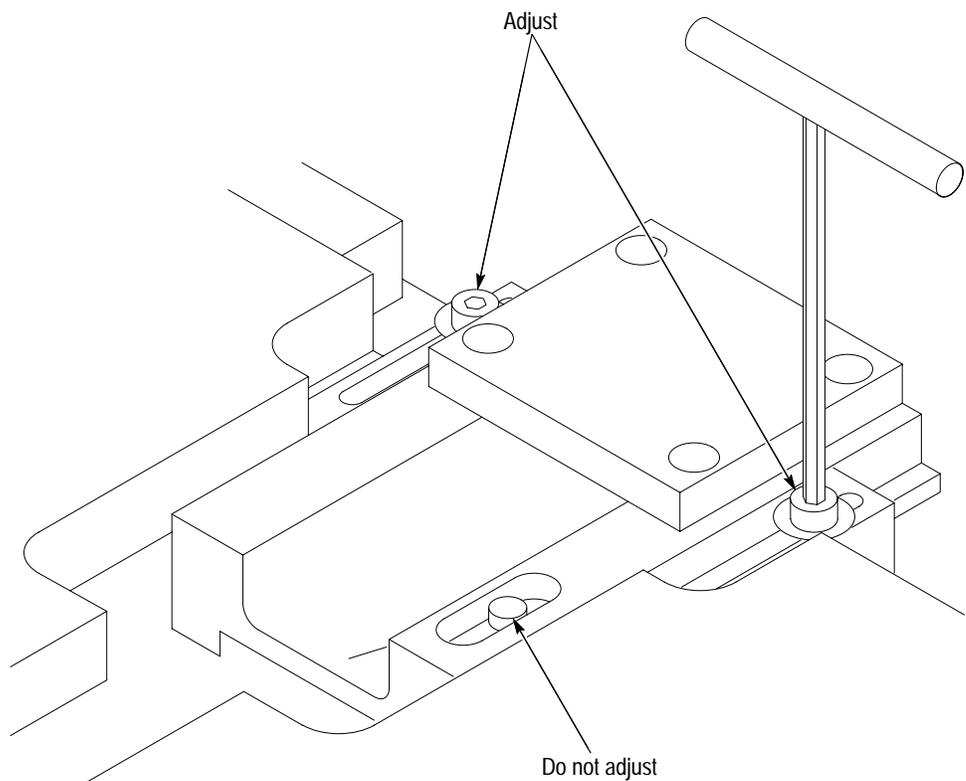


Figure 6-1: Bar code scanner adjustment screws



Maintenance

Maintenance

The system needs regular maintenance for best performance, which includes changing air filters in the VX1410 mainframe, cleaning or replacing the test fixture fiber optic cables, and replacing test fixture Pogo probes. This chapter includes information about removing and replacing test system modules, and some information about troubleshooting.

Special DUTs

The special DUTs (SFTP_DUT, Technician DUT, Golden_DUT, and System_Shutdown_DUT) should be kept in a static-safe enclosed case. This limits dust accumulation and protect the DUTs. Visual inspection upon every usage of these DUTs is recommended to ensure that they are not damaged.

The Golden DUT performance should be verified on a monthly basis. If it does not produce acceptable results, then the optical signal paths should be verified and the fiber optic cable should be cleaned.

To create a new Golden DUT, place a Golden bar code label on a DUT which is known to pass all tests. Be sure that the bar code label is for the correct type of DUT type (MIMG).

To create a new SFTP_DUT, you must build one using the schematic in the *Diagrams* section, and then place an SFTP bar code label on the DUT.

Static Precautions

The DUTs being tested are sensitive to static damage. When working with static-sensitive devices, you must observe standard anti-static precautions as follows:



CAUTION. Failure to observe these anti-static precautions can result in damage to the DUT. Damage to electrical components may not be immediately apparent. Always follow the precautionary measures when handling static-sensitive DUTs.

- Minimize handling of static-sensitive DUTs.
- Transport and store static-sensitive DUTs in their original containers or on conductive foam. Label any package that contains static-sensitive DUTs.

- Discharge static voltage from your body by wearing a wrist strap when handling these DUTs. Handling of these DUTs should be performed only at a static-free workstation by qualified personnel. (See Figure 7–1 for wrist strap connection location.)
- Do not put anything capable of generating or holding a static charge on the work surface.
- Avoid handling DUTs in areas that have a floor or work-surface covering capable of generating a static charge.
- Pick up DUTs by the body, never by the leads or pins.
- Do not slide DUTs over any surface.



CAUTION. *The body of the test fixture is capable of holding a static charge. An ionizer is provided to nullify any static buildup on the test fixture. Make sure that the ionizer is powered on and that the ionizer air flow toward the test fixture is not obstructed.*

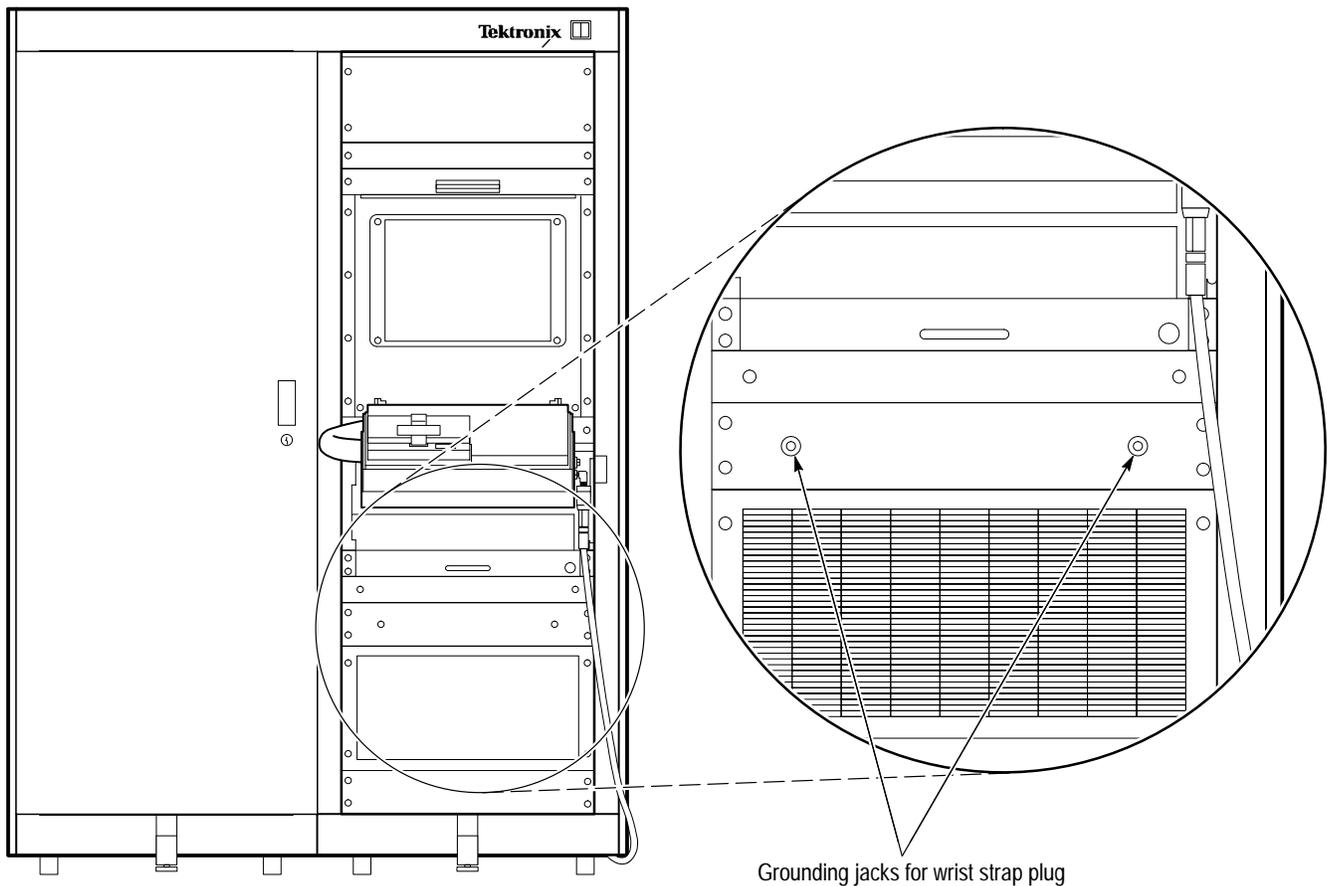


Figure 7-1: Wrist strap grounding connections

Inspection, Cleaning, and Routine Replacement Procedures

Regular inspection and cleaning of the system is required for proper operation.

General Cleanliness

It is important that the test system and its surrounding area be kept clean and dust-free. Doing so reduces maintenance costs, down time, and ultimately increases the accuracy and reliability of the test results.

It is also important that the DUT is handled properly, so that it does not add any further dust or dirt to the test fixture. Keep the optical connectors on the DUT covered at all times except when testing.

Cleaning and Replacing the Fiber Optic Cables

Under normal operation the only fiber optic cables which are exposed to the environment are the cables which connect to the DUTs. These cables are Duplex SC cable type and the exposed ends are enclosed in the test fixture. This reduces the exposure to dust and particulate contamination. However, these connectors are inserted into many DUT couplings repeatedly during a day. This may result in degradation of the fiber terminations.

Having clean fiber optic cables is critical to the performance of this system.



CAUTION. *It is important that the fiber optic cables are kept clean at all times. Dirty cables can result in loss of optical power, variable optical connections, or damage to the DUT.*

Cleaning the Fiber Optic Cables. If the test fixture fiber optic cable is suspected of particulate contamination (for example if the power output of the DUT is not reproducible) then it should be cleaned. To clean the fiber cable open the test fixture. The fiber connector ends are accessible at this time. To clean the fibers follow the directions on the fiber optic cleaning kit. If power readings still fluctuate it is advisable to change the fiber optic cable.

Replacing the Fiber Optic Cables. The frequency of replacement for the cable depends on the cleanliness and physical tolerances of the DUTs inserted into the test fixture.



WARNING. *Class IIIb laser product accessible during this procedure. The following label on the equipment indicates hazard:*



Invisible laser radiation is present when the fiber is disconnected from the bulkhead. Wear laser safety goggles. Always avoid direct exposure to the beam. Failure to do so can result in permanent eye damage.

To replace the fiber optic cable, follow these steps:

1. Insert the Technician_DUT into the test fixture and close the lid. This exits the automatic test program.
2. When the system returns a prompt, open the test fixture and remove the Technician DUT.

3. Remove the old duplex fiber from the test fixture by removing the four screws that retain the cable. Figure 7-2 shows the location of the screws.

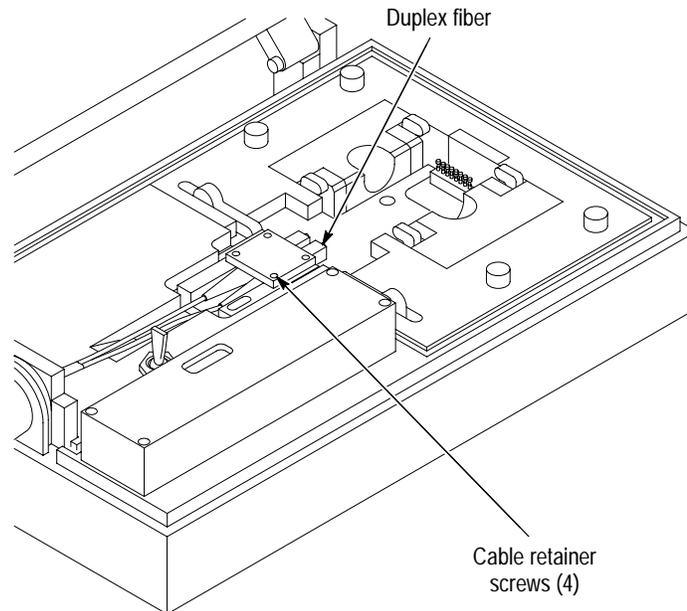


Figure 7-2: Position of duplex optic fiber in test fixture and screw locations

4. Feed the duplex end (with housing) of the new fiber through the conduit of the test fixture located to the left of the lid. Figure 7-3 shows a duplex fiber.

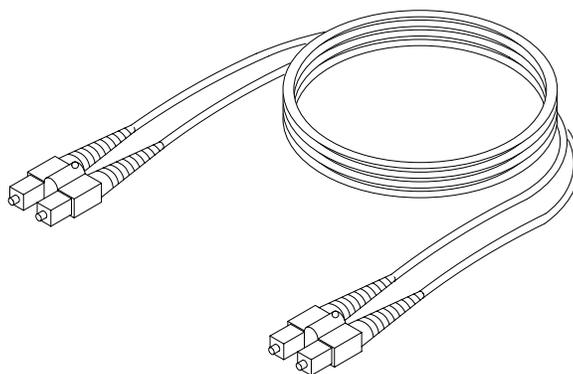


Figure 7-3: Duplex fiber optic cables

5. From the rear of the system (door opened), carefully pull the cable through so that you can later insert the cable ends into the SC connections on the optical switched module.

6. Insert the SC cable into the optical module located on the right side of the VX1410 mainframe.
7. From the front of the system, attach the optical cable to the sliding actuator (reverse of step 4).
8. Reinvoke the auto test program by entering “wd” at the UNIX prompt.

Inspecting the Test Fixture

The test fixture has precise mechanical assemblies. It should be inspected every day for signs of obvious wear, such as bent pins. Care should be taken to ensure that excess dust does not accumulate inside the test fixture. The bar code scanner portion of the test fixture should be visually inspected for items that could block its scanning range.

Replacing a DUT Adapter. To replace the DUT adapter, follow these steps:

1. Open the test fixture lid.
2. To remove a DUT adapter currently in the test fixture (if any), loosen the four screws on the DUT adapter, carefully lift it out of the test fixture, and use the two “jack” levers to disengage the adapter.
3. To install a DUT adapter, carefully align the pairs of interface connectors underneath the adapter and gently press the adapter into place.
4. For the OESW DUT adapter, disconnect the four coaxial cables.
5. Place the correct DUT adapter into the test fixture and tighten the four screws on the DUT adapter finger-tight.

Replacing the Base Unit. The base unit is the part that connects to the lever and assembly. To replace the base unit, follow these steps:

1. Remove two 7/64 screws and remove the hose.
2. Remove the conduit.
3. Pull down the release lever and lift the base unit up and out from the system.
4. To install a base unit, place the supports in the cradle and align the unit. The cradle captures the base unit so it cannot fall to the ground.
5. Reinstall the hose from the front of the system.

Figure 7–4 shows how to remove the test fixture.

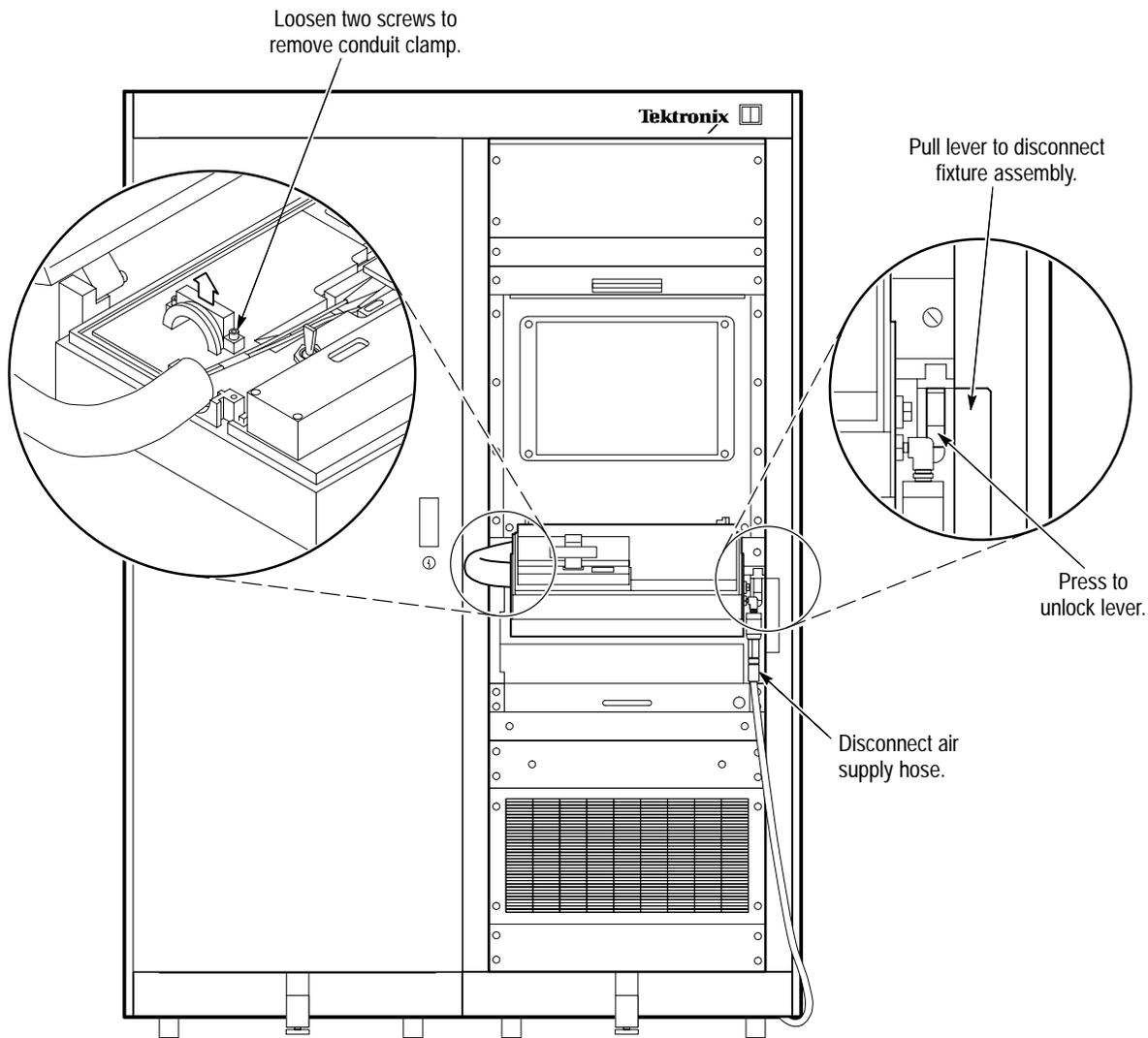


Figure 7-4: Test fixture removal

Replacing the Air Filters

The test system, in general, uses unfiltered air flow except for the VX1410 mainframe. The frequency of replacement for its filter depends on the cleanliness of the ambient environment. At a minimum, the filter should be checked at least every three months.

The filter is accessed from the front of the system. Figure 7-5 shows the location of the filter.

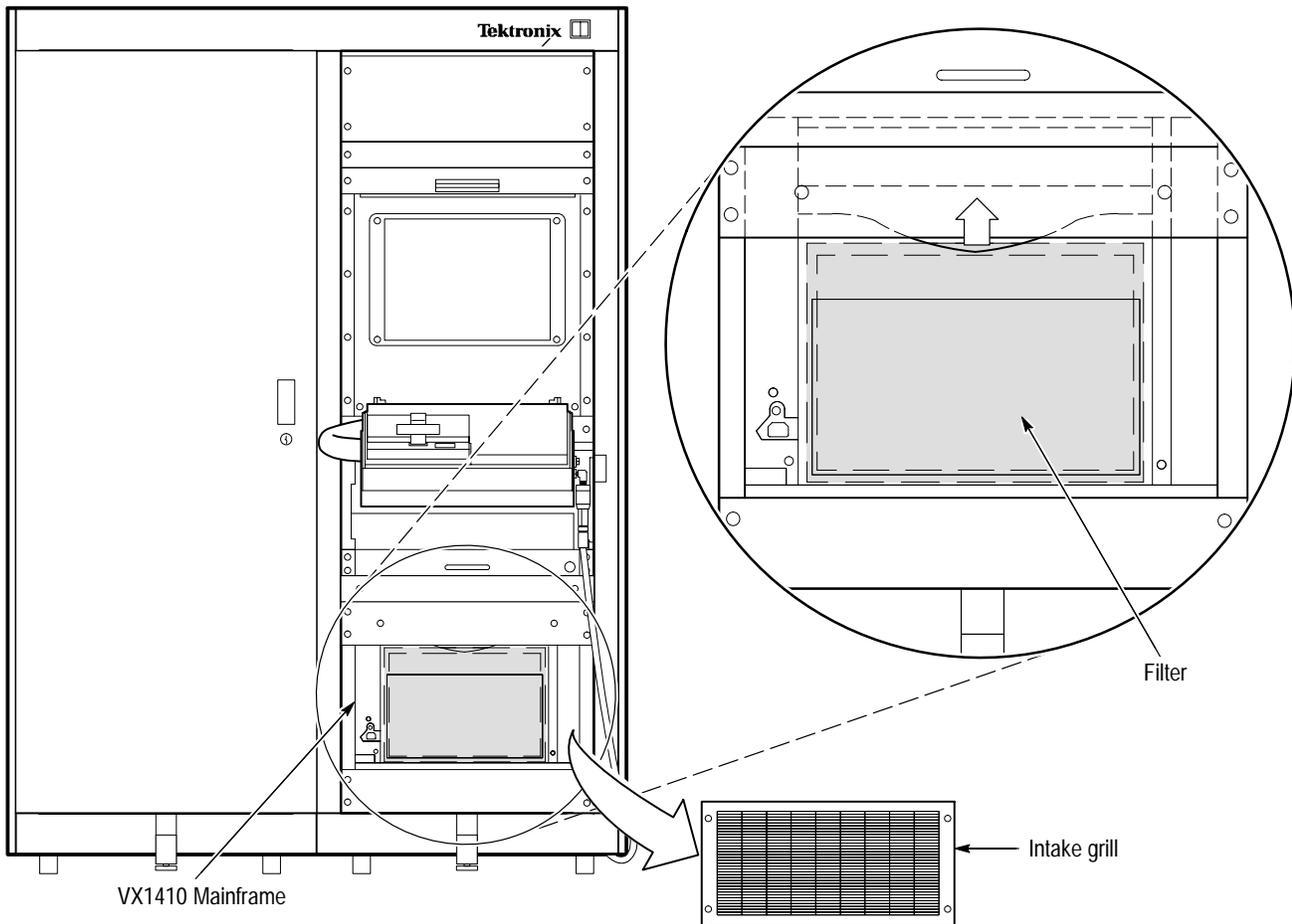


Figure 7-5: Accessing fan filter

Fan Filter Replacement. To replace the fan filter, follow these steps:

1. Remove the four screws holding the intake grill below the test fixture and remove the grill.
2. Replace the filter and reinstall the grill.

Replacing the Pogo Probes

Spring loaded Pogo probes are used to interface electrically to the DUT. Each of these Pogo probes consists of two pieces: a probe tip with integrated spring and a receptacle for the probe tip. (See Figure 7-6.)

The receptacles for each probe are soldered into the circuit board mounted on the underside of the test fixture. Corresponding to each receptacle location is a hole in the delrin (machined, hard, black plastic) block of the test fixture; this provides protection for the Pogo probes against possible damage.

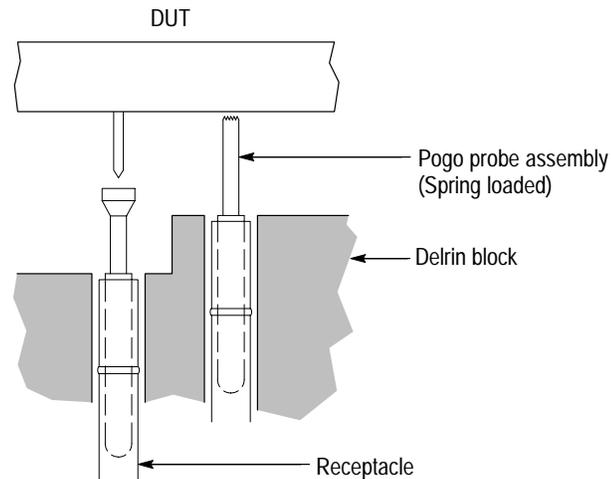


Figure 7-6: The Pogo probes

Damaged Pogo probes in the test fixture must be replaced. Damage to Pogo probes is not limited to bent probes. During normal use, the probe can become damaged internally, causing it to be permanently depressed below the level of the others. Although it may be effective on a short-term basis to simply lift up the probe to the level of the others, it is better to replace the probe with a new one.

To replace the Pogo probes, follow these steps:

1. Remove the damaged Pogo probe by lifting it straight up and out of its receptacle. See Figure 7-7.



CAUTION. When pushing a Pogo probe down into its position, very little force is required to seat the probe into its position. Excessive downward force seats the Pogo probe at too low a height and possibly damages its receptacle.

2. Place a new Pogo probe into the Pogo receptacle. Using a narrow tool such as a small hex (allen) wrench or center punch, gently depress the probe until it is seated. When it is fully seated, the probe should sit at the same height as the others.

This completes the Pogo probe replacement procedure.

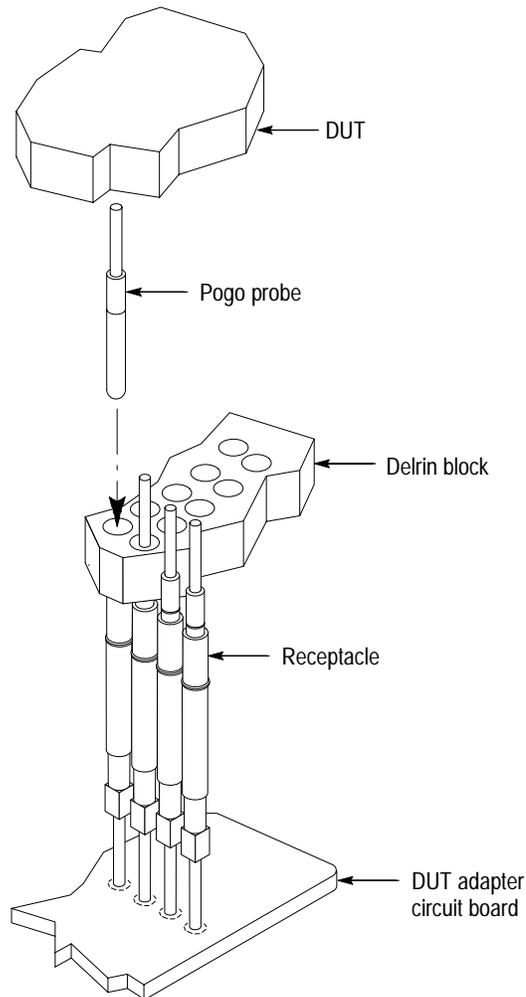


Figure 7-7: Through-hole Pogo probe replacement

To replace the receptacle, follow these steps:

1. Use the Delrin block as a spacer to set the Pogo probes to the correct height.
2. Solder the receptacle into place.

This completes the receptacle replacement procedure.

Calibration

Individual instruments should be maintained and calibrated at regular intervals of one year.

Troubleshooting Procedures

The test system can provide rudimentary functional and operational troubleshooting of the system itself in case there is a failure. This section describes how the system should be diagnosed for any problems.

If there appears to be a problem with the system, follow these steps:

1. Observe all instruments and ensure that the power indication light is on. Turn on any instruments that appear to be off. If the instrument cannot be turned on then refer to the individual instrument service manual for recommended service procedures.
2. Verify all GPIB addresses.
3. After all instruments are on, place the SFTP DUT in the test fixture and close the lid. This causes the system software to verify that all programmable instruments are on the communications bus. The SFTP also causes all instruments to undergo any internal self test routines that they have.

NOTE. *If there is a GPIB communication error it is always a good idea to open the back of the system rack and ensure that all GPIB cables are properly mounted. The system cannot differentiate between a bad GPIB connection and an instrument that does not respond.*

4. If the instrument identification phase of the SFTP passes then the continuity test is performed. This tests as many electrical signal paths as possible.

NOTE. *If power to the test fixture is interrupted, the test system hangs. The system cannot monitor test fixture power.*

5. If the continuity test passes then place the Golden DUT in the test fixture and close the lid. The performance of the Golden DUT has been verified to meet all of the fibre channel specifications. The system runs all functional and performance tests on the Golden DUT. Any significant variations are noted.

If the system passes these tests then there is probably a problem with the DUT(s) in question. If the problem persists please call your Tektronix service representative.

NOTE. *The modem communication path is not tested by the system. This is the responsibility of the system administrator.*

Other Test Procedures

Some aspects of the system cannot be tested with the self test procedure. Following is a list of the items whose performance must be independently verified.

- | | |
|-------------------------|---|
| Computer | The computer is not tested via the SFTP routine. If no messages appear on the screen then there is most likely a problem with the computer or the computer system. Refer to the computer system manual to ensure that the computer is working properly. |
| Bar Code Scanner | <p>If a valid DUT is placed in the test fixture, and no message appears or the message says “BAD SCAN” then one of the following problems is probably occurring:</p> <ul style="list-style-type: none">■ The DUT is misaligned. Check that the DUT is properly aligned. If the DUT is properly aligned then check to make sure that the bar code is readable.■ The bar code scanner operation can be checked by closing the test fixture with no DUT. There is a bar code in the top of the test fixture which the bar code scanner reads when the lid is closed. If the scanner reads this bar code correctly, the system should display “READY FOR DUT.” If the bar code scanner cannot read the bar code, the system displays a “BAD SCAN” message. |

Module Removal and Replacement

Occasionally, instruments must be removed from the test system for calibration or repair. The following text describes some rules to observe when removing or replacing test system instruments.

NOTE. Do not remove or replace the Marway Power Controller from the test system. Contact your Tektronix representative for servicing information.

- | | |
|-----------------------------|--|
| Removing Instruments | When removing a plug-in module from an instrument or an instrument from the rack, you need to follow some rules. |
|-----------------------------|--|

Removing Plug-In Modules. When removing a plug-in module from an instrument, you must first turn off power to the instrument before removing the plug-in module.

Removing Instruments. To remove an instrument from the rack, follow these steps:

1. Turn off power to the instrument
2. Unplug the instrument power cord.
3. Remove the instrument GPIB cable, grounding cable, and other connections, if any.
4. Remove the instrument.

Replacing Instruments

When replacing a plug-in module in an instrument or an instrument in the rack, you need to follow some rules.

Replacing Plug-In Modules. When replacing a plug-in module in an instrument, follow these steps:

1. Turn off power to the instrument before replacing the plug-in module.
2. Make sure that the replacement module is exactly the same type of module and that it is replaced in exactly the same slot.
3. Turn on power to the instrument.
4. Verify that the module GPIB address is set correctly. (Refer to *GPIB Addresses* on page 2–10.) Check with the system administrator to make sure that the listed GPIB addresses are current.
5. Execute the *Performance Verification* procedure (page 5–1) using the SFTP DUT and the Golden DUT.

Installing Instruments. When replacing an instrument in the rack, follow these steps:

1. Make sure that the replacement instrument is exactly the same type of instrument and that it is replaced in exactly the same slot.
2. Replace the instrument grounding cable.
3. Replace the instrument GPIB cable and other connections, if any.
4. Plug in the instrument power cord.
5. Turn on power to the instrument.
6. Verify that the instrument GPIB address is set correctly. (Refer to *GPIB Addresses* on page 2–10.) Check with the system administrator to make sure that the listed GPIB addresses are current.

7. Execute the *Performance Verification* procedure (page 5–1) using the SFTP DUT and the Golden DUT.

Servicing the Test Fixture

If the test fixture needs to be serviced, it can be removed as shown in Figure 7–8.

NOTE. The test fixture has the formal part description of IGS-1578-35. Use this part number when contacting Tektronix concerning the test fixture.

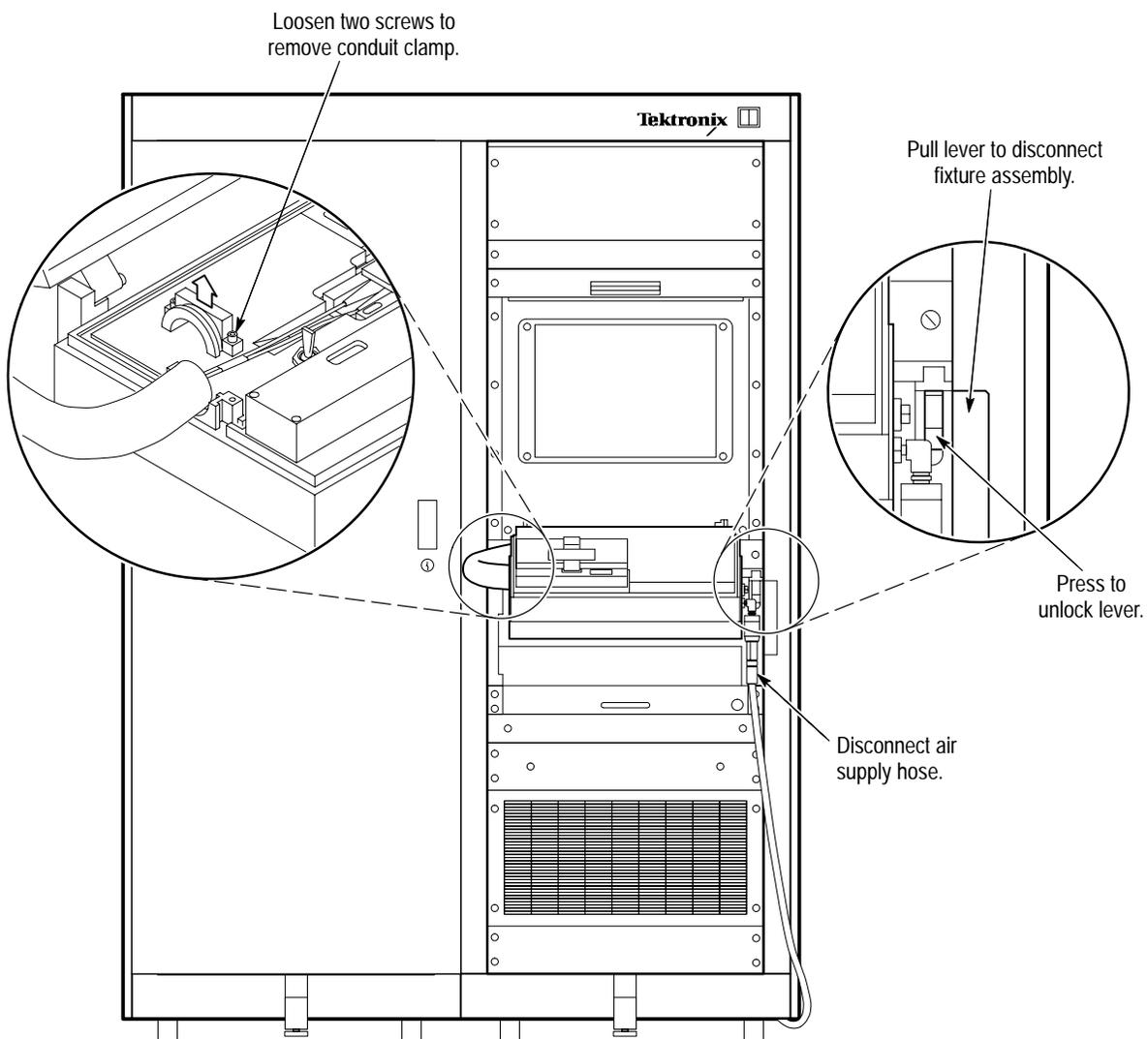


Figure 7–8: Test fixture removal



Diagrams



Diagrams

This section contains wiring diagrams for the test system, and schematic diagrams for the test fixture. For instrument-level diagrams, refer to the individual instrument manuals.

