J4225A/26A/27A
DWDM Receiver Modules

User's Manual (Part No. J4225-90002)

Where to Find it - Online and Printed Information:

System installation (hardware/software)	VXIbus Configuration Guide* SpectralBER Installation & System Reference Manual
Module configuration	This Manual
Module control	This Manual
SCPI information	SpectralBER Remote Control Manual
VXI programming	SpectralBER Online Help
VXI example programs	SpectralBER Online Help SpectralBER Installation & System Reference Manual SpectralBER Remote Control Manual
VXI function reference	SpectralBER Online Help
Soft Front Panel information	SpectralBER Installation & System Reference Manual This manual and J4230A/31A/32A/33A/34A/35A DWDM Transmitter Modules User's Manuals SpectralBER Online Help
VISA language information	VISA User's Guide

**Supplied with Command Modules , Embedded Controllers, and VXLink.*

Legal and Safety Information

Agilent Technologies Warranty Statement

Agilent Product: J4225A/26A/27A **Duration Of Warranty:** 1 year

1. Agilent warrants Agilent hardware, accessories and supplies against defects in materials and workmanship for the period specified above. If Agilent receives notice of such defects during the warranty period, Agilent will, at its option, either repair or replace products which prove to be defective. Replacement products may be either new or like-new.

2. Agilent warrants that Agilent software will not fail to execute its programming instructions, for the period specified above, due to defects in material and workmanship when properly installed and used. If Agilent receives notice of such defects during the warranty period, Agilent will replace software media which does not execute its programming instructions due to such defects.

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4. Agilent products may contain remanufactured parts equivalent to new in performance or may have been subject to incidental use.

5. The warranty period begins on the date of delivery or on the date of installation if installed by Agilent. If customer schedules or delays Agilent installation more than 30 days after delivery, warranty begins on the 31st day from delivery.

6. Warranty does not apply to defects resulting from (a) improper or inadequate maintenance or calibration, (b) software, interfacing, parts or supplies not supplied by Agilent, (c) unauthorized modification or misuse, (d) operation outside of the published environmental specifications for the product, or (e) improper site preparation or maintenance.

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The customer shall provide:
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2. Adequate working space around the products for servicing by Agilent Technologies personnel.
3. Access to and use of all information and facilities determined necessary by Agilent Technologies to service and/or maintain the products. (Insofar as these items may contain proprietary or classified information, the customer shall assume full responsibility for safeguarding and protection from wrongful use.)
4. Routine operator maintenance and cleaning as specified in the Agilent Technologies Operating and Service Manuals.
5. Consumables such as paper, disks, magnetic tapes, ribbons, inks, pens, gases, solvents, columns, syringes, lamps, septa, needles, filters, frits, fuses, seals, detector flow cell windows, etc.

Certification

Agilent Technologies certifies that this product met its published specifications at the time of shipment from the factory. Agilent Technologies further certifies that its calibration measurements are traceable to the United States National Bureau of Standards, to the extent allowed by the Bureau's calibration facility and to the calibration facilities of other International Standards Organization members.

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Product maintenance agreements and other customer assistance agreements are available for Agilent Technologies products.

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Laser Safety Warning

To prevent personal injury, ensure the following information is reviewed before operating transmitter modules.

The Agilent J1422A, J4230A, J4231A and J4232A are classified as Class I (non-hazardous) laser products, which in the USA complies with the United States Food and Drug Administration (FDA) Standard 21 CFR Ch.1 1040.10, and Class 1 Europe complies with EN 60825-1 (1994).

For your protection, review all laser information given in this manual and in the Agilent J430A/31A/32A Transmit Modules User's Manual before installing or using these modules.

To avoid hazardous exposure to laser radiation, it is recommended that you do the following:

ALWAYS DEACTIVATE THE LASER BEFORE CONNECTING OR DISCONNECTING OPTICAL CABLES.

When connecting or disconnecting cables between the module(s) and the device-under-test, observe the connection sequence given below:

Connecting: Connect the optical cable to the device-under-test **before** connecting to the module's optical output connector.

Disconnecting: Disconnect the optical cable from the module's optical output connector **before** disconnecting from the device-under-test. Always ensure the screw cap is fitted properly on to the laser aperture.

NEVER examine or stare into the open end of a broken, severed, or disconnected optical cable when it is connected to the module's optical output connector.

Arrange for service-trained personnel, who are aware of the hazards involved, to repair optical cables.

Use of controls or adjustments or performance procedures other than those specified herein may result in hazardous radiation exposure.

The following labels appears on the front panel of the module and indicate that a laser is fitted and that the radiation is non-hazardous.

CLASS 1 LASER PRODUCT translates as follows:

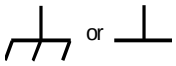
Finnish - LUOKAN 1 LASERLAITE

Finnish/Swedish - KLASS 1 LASER APPARAT

Restricted Rights Legend

The Instruction Documentation Symbol. The product is marked with this symbol when it is necessary for the user to refer to the instructions in the supplied documentation.

Indicates the field wiring terminal that must be connected to earth ground before operating the equipment - protects against electrical shock in case of fault.



Frame or chassis ground terminal—typically connects to the equipment's metal frame.

Alternating current (AC)

Direct current (DC).

Indicates hazardous voltages.

WARNING

Warning denotes a hazard. It calls attention to a procedure, which if not correctly performed or adhered to could result in injury or loss of life. Do not proceed beyond a warning note until the indicated conditions are fully understood and met.

CAUTION

Caution denotes a hazard. It calls attention to a procedure, which if not correctly performed or adhered to could result in damage to or destruction of the instrument. Do not proceed beyond a caution note until the indicated conditions are fully understood and met.

Indicates that a laser is fitted. The user must refer to the manual for specific Warning or Caution information to avoid personal injury or damage to the product.

General Safety Information

The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. Agilent Technologies assumes no liability for the customer’s failure to comply with these requirements.

DO NOT operate the product in an explosive atmosphere or in the presence of flammable gasses or fumes.

DO NOT use repaired fuses or short-circuited fuseholders: For continued protection against fire, replace the line fuse(s) only with fuse(s) of the same voltage and current rating and type.

DO NOT perform procedures involving cover or shield removal unless you are qualified to do so: Operating personnel must not remove equipment covers or shields. Procedures involving the removal of covers and shields are for use by service-trained personnel only.

DO NOT service or adjust alone: Under certain conditions, dangerous voltages may exist even with the equipment switched off. To avoid dangerous electrical shock, service personnel must not attempt internal service or adjustment unless another person, capable of rendering first aid and resuscitation, is present.

DO NOT operate damaged equipment: Whenever it is possible that the safety protection features built into this product have been impaired, either through physical damage, excessive moisture, or any other reason, REMOVE POWER and do not use the product until safe operation can be verified by service-trained personnel. If necessary, return the product to an Agilent Technologies Sales and Service Office for service and repair to ensure the safety features are maintained.

DO NOT substitute parts or modify equipment: Because of the danger of introducing additional hazards, do not install substitute parts or perform any unauthorized modification to the product. Return the product to an Agilent Technologies Sales and Service Office for service and repair to ensure the safety features are maintained.

Statement of Compliance

Safety Information

These modules have been designed and tested in accordance with publication EN61010-1(1993) / IEC 61010-1(1990) +A1(1992) +A2(1995) / CSA C22.2 No. 1010.1(1993) Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use, and have been supplied in a safe condition. The instruction documentation contains information and warnings which must be followed by the user to ensure safe operation and to maintain the modules in a safe condition.

CE

The CE mark shows that the product complies with all relevant European legal Directives.

ISM 1-A

This is a symbol of an Industrial Scientific and Medical Group 1 Class A product.

The CSA mark is a registered trademark of the Canadian Standards Association, and indicates compliance to the standards layed out by them.

The C-Tick mark is a registered trademark of the Australian Communications Authority. This signifies compliance with the Australian EMC Framework Regulations under the terms of the Radiocommunications Act of 1992.

Noise Declaration (German)

LpA<70dB

am Arbeitsplatz (operator position)
normaler Betrieb (normal position)
nach DIN 45635 pt.19 (per ISO 7779)

Electromagnetic Compatibility (EMC) Information

This product conforms with the protection requirements of European Council Directive 89/336/EEC for Electromagnetic Compatibility (EMC).

The conformity assessment requirements have been met using the technical Construction file route to compliance, using EMC test specifications EN 55011:1991 (Group 1, Class A) and EN 50082-1:1992.

In order to preserve the EMC performance of the product, any cable which becomes worn or damaged must be replaced with the same type and specification.

See the “DECLARATIONs OF CONFORMITY” starting on page 6.

Electrostatic Discharge:
When any electrostatic air discharge is applied to the SpectralBER System according to IEC 61000-4-3:1995, degradation of performance may be observed in the form of occasional errors being counted.

Fuse Information

Fuses on the DWDM Receiver and Transmitter Modules are **not** user replaceable.

In both DWDM Receiver and Transmitter Modules the fuses are:

Agilent Ref.	Agilent Part No.	Amp	Volt	Type
F1, F2	2110-0945	3 A	125 V	M*
F3, F4, F500, F501	2110-0946	10 A	125 V	M*
F5	2110-1138	15 A	125 V	M*
F6	2110-0936	4 A	125 V	M*

* M = Medium Time Lag

DECLARATION OF CONFORMITY

According to ISO/IEC Guide 22 and CEN/CENELEC EN45014

Manufacturer's Name:	**Agilent Technologies UK Ltd.**
Manufacturer's Address:	Telecomms Networks Test Division South Queensferry West Lothian, EH30 9TG Scotland, United Kingdom

Declares that the product

Product Name:	SpectralBER DWDM Short Reach Receiver
Model Number:	J4225A
Product Options:	This declaration covers all options of the above product as detailed in TCF A-5951-9852-01.

EMC:

Conforms with the protection requirements of European Council Directive 89/336/EEC on the approximation of the laws of the member states relating to electromagnetic compatibility, against EMC test specifications EN 55011:1991 (Group 1, Class A) and EN 50082-1:1992.

As Detailed in:	Electromagnetic Compatibility (EMC) Technical Construction File (TCF) No. A-5951-9852-01
Assessed by:	DTI Appointed Competent Body EMC Test Centre, GEC-Marconi Avionics Ltd., Maxwell Building, Donibristle Industrial Park, Hillend, Dunfermline KY11 9LB Scotland, United Kingdom

Technical Report Number:6893/2200/CBR, dated 21 August 1997

Safety:

The product conforms to the following safety standards:

IEC 61010-1(1990) +A1(1992) +A2(1995) / EN 61010-1:1993
IEC 60825-1(1993) / EN 60825-1:1994

The product herewith complies with the requirements of the General Product Safety Directive 92/59/EEC.

South Queensferry, Scotland. ***01 May 2000*** W R Pearson

W.R. Pearson / Quality Manager

For further information, please contact your local Agilent Technologies sales office, agent, or distributor.

DECLARATION OF CONFORMITY

According to ISO/IEC Guide 22 and CEN/CENELEC EN45014

Manufacturer's Name:	**Agilent Technologies UK Ltd.**
Manufacturer's Address:	Telecomms Networks Test Division South Queensferry West Lothian, EH30 9TG Scotland, United Kingdom

Declares that the product

Product Name:	SpectralBER DWDM Long Reach Receiver
Model Number:	J4226A
Product Options:	This declaration covers all options of the above product as detailed in TCF A-5951-9852-01.

EMC:

Conforms with the protection requirements of European Council Directive 89/336/EEC on the approximation of the laws of the member states relating to electromagnetic compatibility, against EMC test specifications EN 55011:1991 (Group 1, Class A) and EN 50082-1:1992.

As Detailed in:	Electromagnetic Compatibility (EMC) Technical Construction File (TCF) No. A-5951-9852-01
Assessed by:	DTI Appointed Competent Body EMC Test Centre, GEC-Marconi Avionics Ltd., Maxwell Building, Donibristle Industrial Park, Hillend, Dunfermline KY11 9LB Scotland, United Kingdom

Technical Report Number:6893/2200/CBR, dated 21 August 1997

Safety:

The product conforms to the following safety standards:

IEC 61010-1(1990) +A1(1992) +A2(1995) / EN 61010-1:1993
IEC 60825-1(1993) / EN 60825-1:1994

The product herewith complies with the requirements of the General Product Safety Directive 92/59/EEC.

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W.R. Pearson / Quality Manager

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DECLARATION OF CONFORMITY

According to ISO/IEC Guide 22 and CEN/CENELEC EN45014

Manufacturer's Name:	**Agilent Technologies UK Ltd.**
Manufacturer's Address:	Telecomms Networks Test Division South Queensferry West Lothian, EH30 9TG Scotland, United Kingdom

Declares that the product

Product Name:	SpectralBER DWDM Short Reach Receiver
Model Number:	J4227A
Product Options:	This declaration covers all options of the above product as detailed in TCF A-5951-9852-01.

EMC:

Conforms with the protection requirements of European Council Directive 89/336/EEC on the approximation of the laws of the member states relating to electromagnetic compatibility, against EMC test specifications EN 55011:1991 (Group 1, Class A) and EN 50082-1:1992.

As Detailed in:	Electromagnetic Compatibility (EMC) Technical Construction File (TCF) No. A-5951-9852-01
Assessed by:	DTI Appointed Competent Body EMC Test Centre, GEC-Marconi Avionics Ltd., Maxwell Building, Donibristle Industrial Park, Hillend, Dunfermline KY11 9LB Scotland, United Kingdom

Technical Report Number:6893/2200/CBR, dated 21 August 1997

Safety:

The product conforms to the following safety standards:

IEC 61010-1(1990) +A1(1992) +A2(1995) / EN 61010-1:1993
IEC 60825-1(1993) / EN 60825-1:1994

The product herewith complies with the requirements of the General Product Safety Directive 92/59/EEC.

South Queensferry, Scotland. ***01 May 2000*** W R Pearson

W.R. Pearson / Quality Manager

For further information, please contact your local Agilent Technologies sales office, agent, or distributor.

Contents

Chapter 1
Module Overview

Introduction

This manual provides you with information about the following Dense Wave Division Multiplexing (DWDM) receiver modules:

- Agilent J4225A Short Reach Optical Receiver (operates with optical levels down to −19 dBm).
- Agilent J4226A Long Reach Optical Receiver (operates with optical levels down to −28 dBm).
- Agilent J4227A Short Reach Optical Receiver (operates with optical levels down to −19 dBm).

Description

The modules are register-based C-size double slot VXI modules. The modules have four optical **Input** ports, each port can receive optical signals with wavelengths between 1200 nm and 1600 nm.

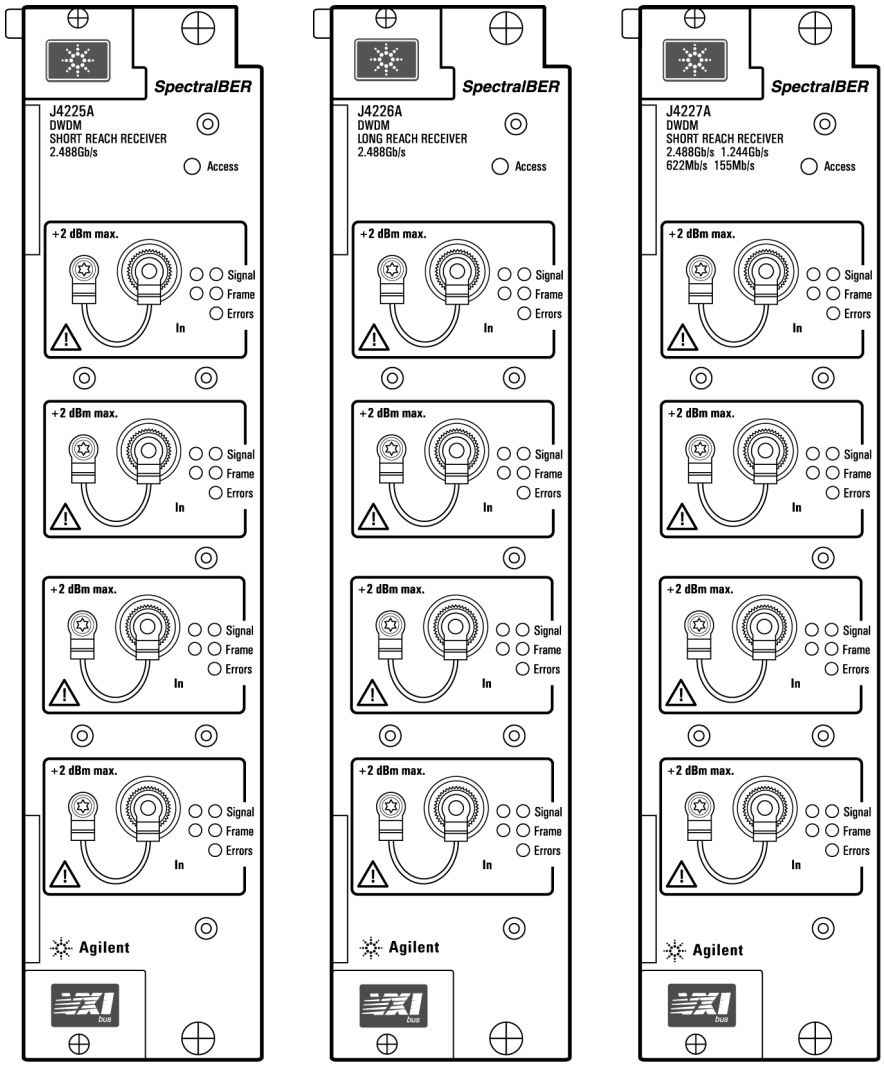
These modules can detect alarms (see list below), make BER measurements and capture the J0 trace message in a 2.5 Gb/s, 1.2 Gb/s (J4227A only), 622 Mb/s (J4227A only), or 155 Mb/s (J4227A only) concatenated signal carrying PRBS payloads.

- Loss of Signal (LOS)
- Out of Frame (OOF)
- Loss of Frame (LOF)
- Pattern Sync Loss (PSL)
- Alarm Indication Signal - Line (AIS-L)/Multiplex Section - Alarm Indication Signal (MS-AIS)

The modules can detect B1, B2 and Bit errors. These errors can then be presented to you as an error count or as an error ratio. Error counting is inhibited when alarm conditions occur. For example, B1 and B2 error counting is inhibited during a LOS or LOF condition, and Bit Error counting is inhibited during a LOS, LOF or Pattern Sync Loss condition.

Note Alarms are latched during the gating period. The status of these alarms can be read via SCPI or from the soft panel.

Front Panel Features



J4225A **J4226A** **J4227A**

Ports

The modules have four optical **Input** ports. Each port can receive optical signals with wavelengths between 1200 nm and 1600 nm and a maximum input power of +2 dBm without damage.

Caution **Damage can be caused if the optical input power is greater than +2 dBm.**

LEDs

Access This LED is ON when the module is being accessed.

Signal The red LED is ON for a LOS condition, the green LED is ON when the signal is good.

Frame The red LED is ON for a LOF or OOF condition, the green LED is ON when framing is good.

Errors This red LED is ON when errors are detected.

Module Identification

An identification label is attached to the module clamshell enclosure. The serial number on the label has a two letter reference denoting country of origin (GB = Great Britain) and an eight digit serial number. The serial number is unique to each module and should be quoted in all correspondence with Agilent Technologies.

Safety Precautions for the Operator

The following general safety precautions must be observed during all phases of operation, service, and repair of this module. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the module. Agilent Technologies assumes no liability for the customer's failure to comply with these requirements.

In particular, the operator should note the following safety information:

- "Laser Safety Warning" on page 4
- "Safety Symbols" on page 4
- "ESD Precautions" on page 16
- "Operators Maintenance" on page 16

DO NOT operate damaged equipment: Whenever it is possible that the safety protection features built into this product have been impaired, either through physical damage, excessive moisture, or any other reason, REMOVE POWER and do not use the product until safe operation can be verified by service-trained personnel. If necessary, return the product to a Agilent Technologies Sales and Service Office for service and repair to ensure the safety features are maintained.

Additional Safety Precautions for Service Engineers

DO NOT substitute parts or modify equipment: Because of the danger of introducing additional hazards, do not install substitute parts or perform any unauthorized modifications to the module. Return the module to a Agilent Technologies Sales and Service Office for service and repair to ensure the safety features are maintained.

DO NOT service or adjust alone: Under certain conditions, dangerous voltages may exist even with the equipment switched off. To avoid dangerous electrical shock, service trained personnel must not attempt internal service or adjustment unless another person, capable of rendering first aid and resuscitation, is present.

ESD Precautions

Caution **The module contains components sensitive to electrostatic discharge. To prevent component damage, carefully follow the handling precautions presented below.**

The smallest static voltage most people can feel is about 3500 volts. It takes less than one tenth of that (about 300 volts) to destroy or severely damage static sensitive circuits. Often, static damage does not immediately cause a malfunction but significantly reduces the component's life. Adhering to the following precautions will reduce the risk of static discharge damage.

- Keep the module in its conductive storage box when not installed in the VXI Mainframe. Save the box for future storage of the module.
- Before handling the module, select a work area where potential static sources are minimized. Avoid working in carpeted areas and non-conductive chairs. Keep body movement to a minimum. Agilent Technologies recommends that you use a controlled static workstation.
- Handle the module by its front panel. Avoid touching any components or edge connectors. When you install the module, keep one hand in contact with the protective bag as you pick up the module with your other hand. Then, before installing the module, make contact with the metal surface of the VXI Mainframe with your free hand to bring you, the module and the VXI Mainframe to the same static potential. This also applies whenever you connect/disconnect cables on the front panel.

Operators Maintenance

WARNING **NO OPERATOR SERVICEABLE PARTS INSIDE. REFER SERVICING TO QUALIFIED PERSONNEL. TO PREVENT ELECTRICAL SHOCK DO NOT REMOVE COVERS.**

Maintenance appropriate for the operator is:

- Cabinet cleaning and Optical Connector Cleaning

Cleaning

Cabinet Cleaning

Clean the cabinet using a damp cloth only.

Optical Connector Cleaning

It is recommended that the optical connectors be cleaned at regular intervals using the following materials:

Description	Part Number
Blow Brush	9300-1131
Isopropyl Alcohol	8500-5344
Lens Cleaning Paper	9300-0761
Adhesive Tape Kit	15475-68701

Caution **Do not insert any tool or object into the IN or OUT ports of the module as damage to or contamination of the optical fibre may result.**

1. Switch off the VXI Mainframe, then remove the power cord from the ac mains power socket.
2. Remove the adapters from the **In** ports.
3. Using the blow brush with the brush removed blow through the ferrule of the standard flexible connector and the adapter.

Caution **If the optical fibre of the fixed connector requires further cleaning this entails disassembly of the module which should only be carried out by suitably trained service personnel.**

4. Apply some isopropyl alcohol to a piece of the cleaning paper and clean the barrel of the adapter. Using a new piece of cleaning paper, clean the face of the adapter. Repeat this operation, using a new piece of cleaning paper each time.
5. Lightly press the adhesive side of the tape provided against the front of the adapter, then remove it quickly - repeat twice. This removes any particles of cleaning paper which may be present.
6. Replace the adapters on the flexible connector.

Storage and Shipment

The module may be stored or shipped in environments within the following limits:

Temperature: −10 °C to +70 °C

Altitude: Up to 15,200 meters (50,000 feet)

Humidity: up to 95% relative humidity to 40 °C.

The module should also be protected from temperature extremes which could cause condensation within the module.

Repackaging for Shipment

Original Packaging

Containers and materials identical to those used in factory packaging are available from Agilent Technologies offices. If the module is being returned to Agilent Technologies for servicing, attach a tag indicating the type of service required, return address, model number, and full serial number. Mark the container FRAGILE to ensure careful handling. In any correspondence, refer to the module by model number and full serial number.

Other Packaging

The following general instructions should be followed when repackaging with commercially available materials:

- Wrap module in heavy paper or plastic. If the module is being shipped to Agilent Technologies, attach a tag indicating the type of service required, return address, model number and full serial number.
- Use a strong shipping container. A double wall carton made of 350 pound test material is adequate.
- Use a layer of shock absorbing material 70 to 100 mm (3 to 4 inch) thick, around all sides of the module to provide firm cushioning and prevent movement inside the container. Protect the Front Panel controls and Rear Panel connectors with cardboard.
- Seal shipping container securely.
- Mark shipping container FRAGILE to ensure careful handling.
- In any correspondence, refer to the module by model number and full serial number.

Module Weight

3.1 kg (6.8 lb)

Dimensions

261 mm (10.3 in) high, 60 mm (2.36 in) wide, 360 mm (14 in) deep

Chapter 2
Installation

Initial Inspection

WARNING **TO AVOID HAZARDOUS ELECTRICAL SHOCK, DO NOT PERFORM ELECTRICAL TESTS WHEN THERE ARE SIGNS OF SHIPPING DAMAGE TO ANY PORTION OF THE OUTER ENCLOSURE (COVERS, PANELS, METERS).**

Inspect the shipping container for damage. If the shipping container or cushioning material is damaged, it should be kept until the contents of the shipment have been checked for completeness and the module has been checked both mechanically and electrically. Procedures for checking electrical operation are given in Chapter 4. If the contents of the shipment are incomplete, if there is mechanical damage or defect, notify the nearest Agilent Technologies office. If the module does not pass the electrical performance tests given in Chapter 4, notify the nearest Agilent Technologies office. If the shipping container is also damaged, or the cushioning material shows signs of stress, notify the carrier as well as the nearest Agilent Technologies office. Keep the shipping materials for the carrier's inspection. The Agilent Technologies office will arrange for repair or replacement without waiting for claim settlement.

Operating Environment

The modules are designed for indoor use only. **DO NOT** operate the product in an explosive atmosphere or in the presence of flammable gasses or fumes.

The modules may be operated in environments within the following limits:

Temperature: 0^{o} C to $+40^{o}$ C.

Altitude: up to 3050m (10,000ft).

Humidity: up to 95% relative humidity to 40 ^{o}C.

The modules should be protected from temperature extremes which may cause condensation.

Caution **The modules are designed for use in Installation Category II and Pollution Degree 2 per IEC 1010 and 644 respectively.**

When installing a module in a cabinet, the convection into and out of the module must not be restricted.

Cooling Requirements

The receiver modules are cooled by air drawn through the back of the E8404A VXI Mainframe and exhausted from the side. Each module occupies 2 slots, has an airflow of 6 litres/sec/slot, and a back pressure of 0.2 mm H2O (at a temperature rise of 10 degrees C).

The E1406A Slot 0 controller and the DWDM controller each occupy 1 slot each. At a temperature rise of 10 degrees C, the Slot 0 controller has an airlow of 1.5 litres/sec with a back pressure of 0.3 mm H2O. The DWDM controller's airflow is 0.4 litres/sec with a back pressure of 0.1 mm H2O.

Power Requirements

The modules are powered by dc voltages which are provided from the backplane of the VXI Mainframe that houses the modules during normal operation. Power consumption of each module is 89 W.

The maximum current drawn from VXIbus dc voltage rails is as follows:

J4225A, J4226A

dc volts	dc Current	Dynamic Current
+24 V	1.1 A	680 mA
+12 V	1.1 A	77 mA
+5 V	8.4 A	710 mA
-2 V	50 Ma	31 mA
-5.2 V	2.7 A	340 mA
-12 V	180 mA	55 mA
-24 V		

J4227A

dc volts	dc Current	Dynamic Current
+24 V	1.1 A	680 mA
+12 V	1.1 A	77 mA
+5 V	8.4 A	710 mA
-2 V	50 Ma	31 mA
-5.2 V	2.7 A	340 mA
-12 V	180 mA	55 mA
-24 V		

Preparation for Use

Caution **Damage can occur to optical input ports if optical input power exceeds +2 dBm see page 14.**

Caution **If a module is not used as specified, the protection provided by the equipment could be impaired. The module must be used in a normal condition only (in which all means of protection are intact).**

Connecting Modules

Caution **Before connecting or disconnecting, ensure that you are grounded, or make contact with the metal surface of the VXI Mainframe with your free hand to bring you, the module, and the mainframe to the same static potential. Modules remain susceptible to ESD damage while the module is installed in the VXI Mainframe. Additional ESD information is required when servicing see "ESD Precautions" on page 16.**

Optical Interface Adapters

FC/PC optical interface adapters are supplied with the module. Alternative optical interface adapters that can be used with this module are listed below:

Interface Type	Part Number
Biconic	81000WI
D4	81000GI
Diamond HMS-10/HP	81000AI
DIN 47256	81000SI
SC	81000KI
SMA	81000JI
ST	81000VI

Installing and Removing Modules

Caution **Review the "ESD Precautions" on page 16 before installing or removing modules and switch the Mainframe OFF to prevent irreparable damage to the module or to the VXI Mainframe.**

Note Set the modules address switches before installing modules. Refer to the following paragraphs.

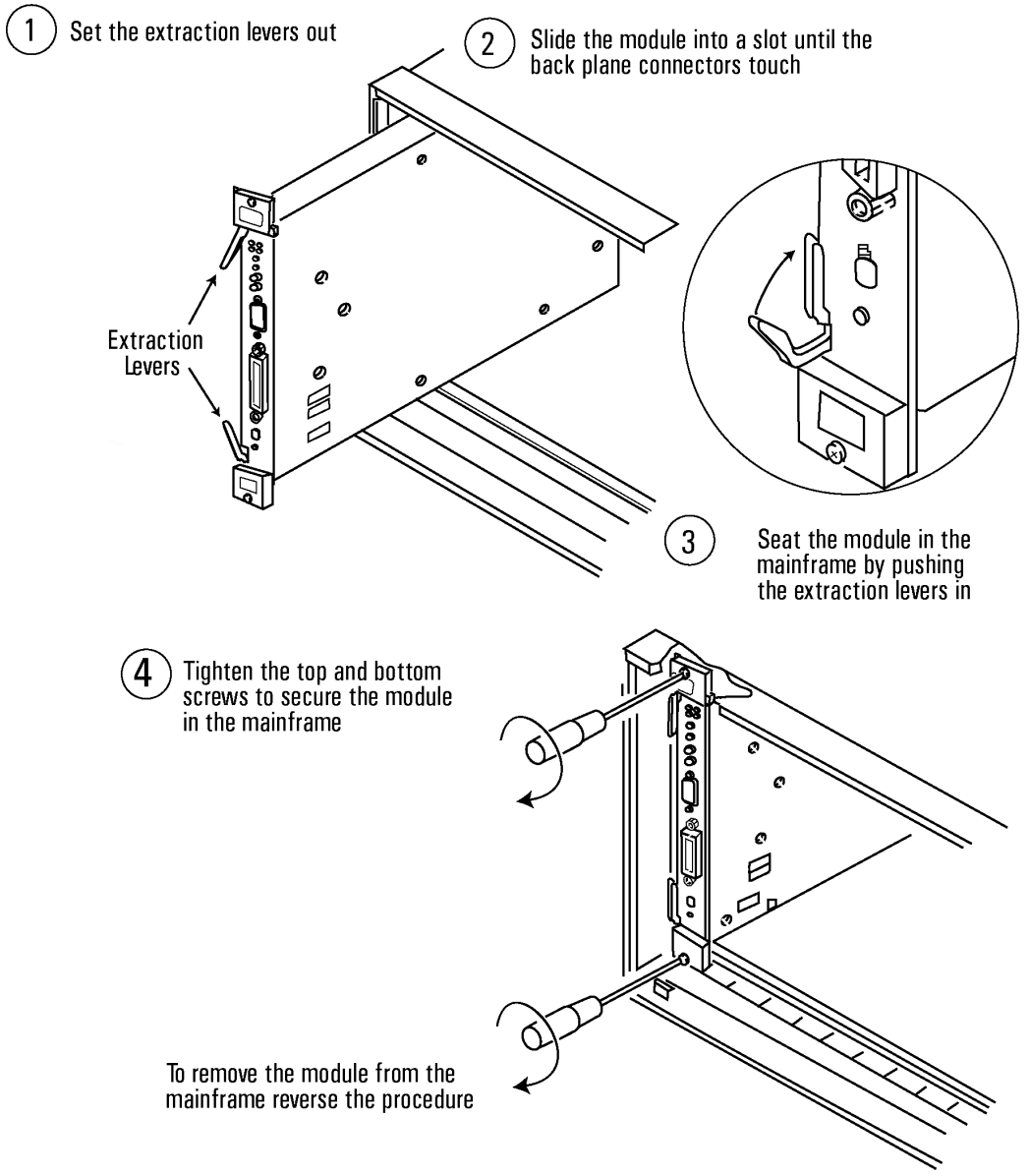


Figure 2-1. Installing and Removing a Module

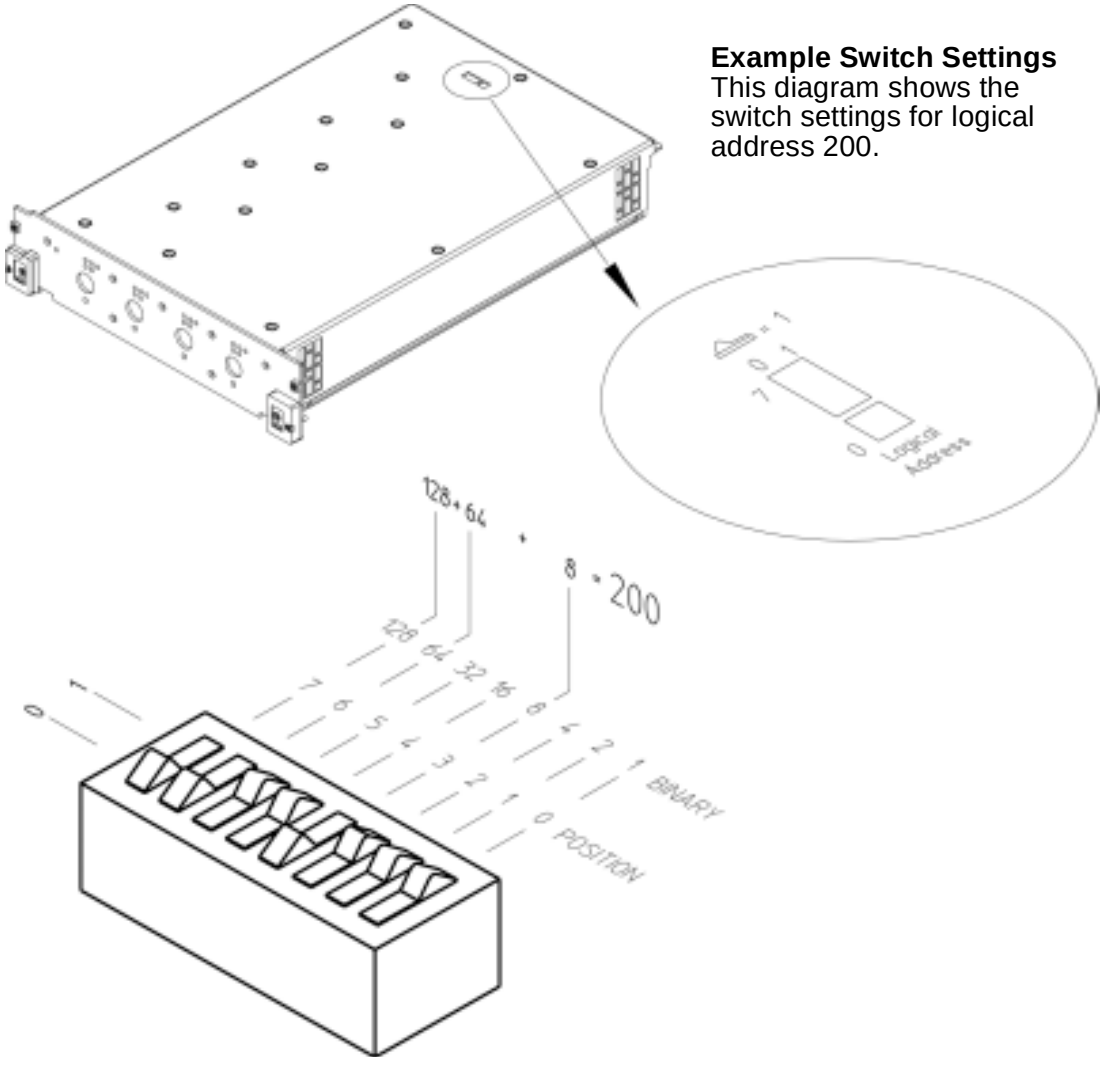
Addressing

The DWDM Receiver Modules are servants to the J4223A DWDM Controller (commander module).The logical address of each DWDM Receiver Module must be within the servant area of the DWDM Controller.

Caution **Before assigning a logical address to a Receiver module, check the logical address and servant area switch settings of the DWDM Controller module, for details see the *Installation & System Reference Manual*.**

You assign a logical address to an DWDM Receiver Module by setting a series of switches which you access through a slot in the module's clamshell enclosure, see the diagram below. The switches are binary weighted, the weightings *0* (LSB) to *7* (MSB) are marked on the clamshell enclosure.

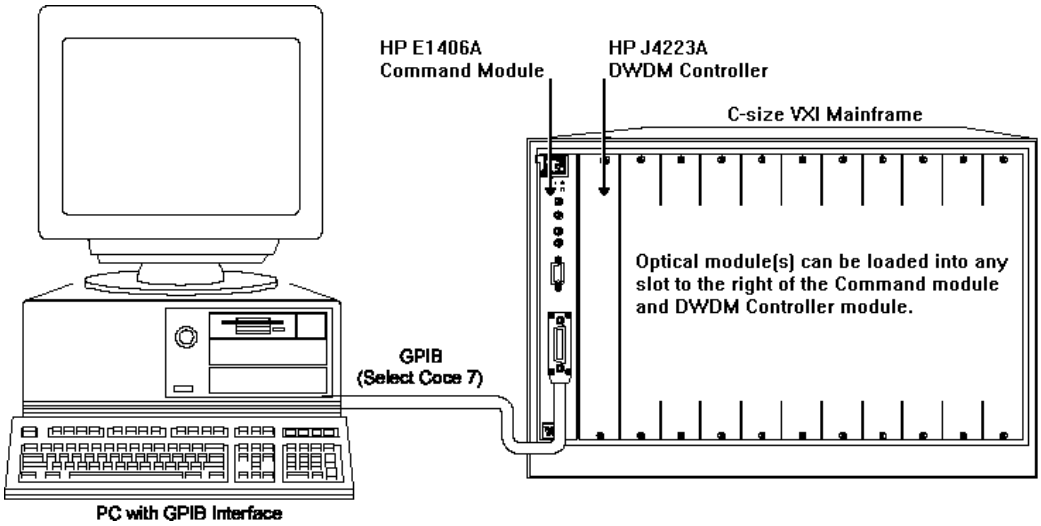
Note The value you select must not conflict with the logical address of any other module(s) serving the DWDM Controller module.



Example Switch Settings
This diagram shows the switch settings for logical address 200.

Module Slot Location

It is recommended that modules be loaded as shown below.



Verify Module Installation

You can verify module installation using the soft front panel. (Soft front panel software installation information will be found in the *Installation & System Reference Manual*.)

Starting the Soft Front Panel

Windows 95/98/2000/NT — In the directory *C:\Vxipnp\winNT(win95)\MultirateSpectralBER* double click on the file *multirate.exe*, or double click on the application icon.

Solaris — Execute the command *multirate.exe.*

1. From the menu bar, select **Instrument** → **Detect**… to display the Instrument Detect window shown in Figure 2-2.:

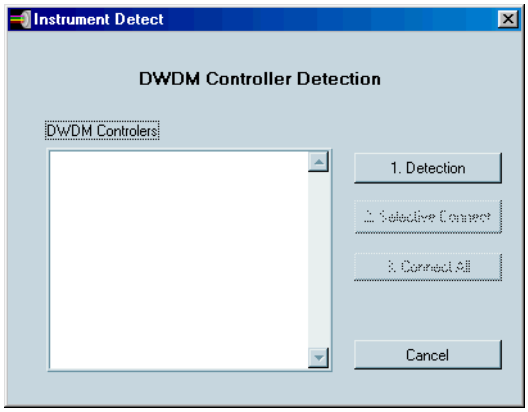


Figure 2-2. Instrument Detect Window

2. Click on the **1. Detection** button to detect all configured instruments connected to the external controller as shown in Figure 2-3. (In this case one DWDM Controller, GPIB0::25::INSTR.)

Note This means that VISA has detected one VXI board 0 (zero) with a logical address of 25.

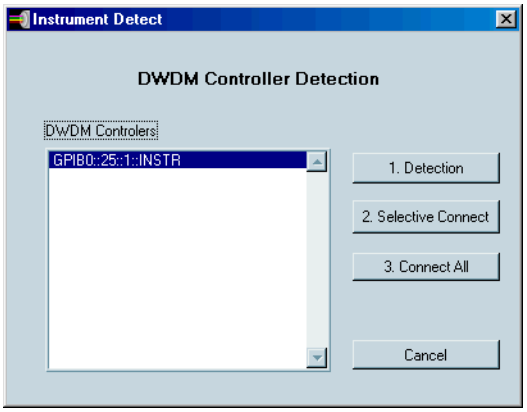


Figure 2-3. Instrument Found

3. Either select one of the VXI Mainframes (if more than one is detected) and click on **2. Selective Connect**, or click on **3. Connect All** to start the Soft Front Panel.

Verify the Installation

Figure 2-4 shows a Typical Soft Front Panel.

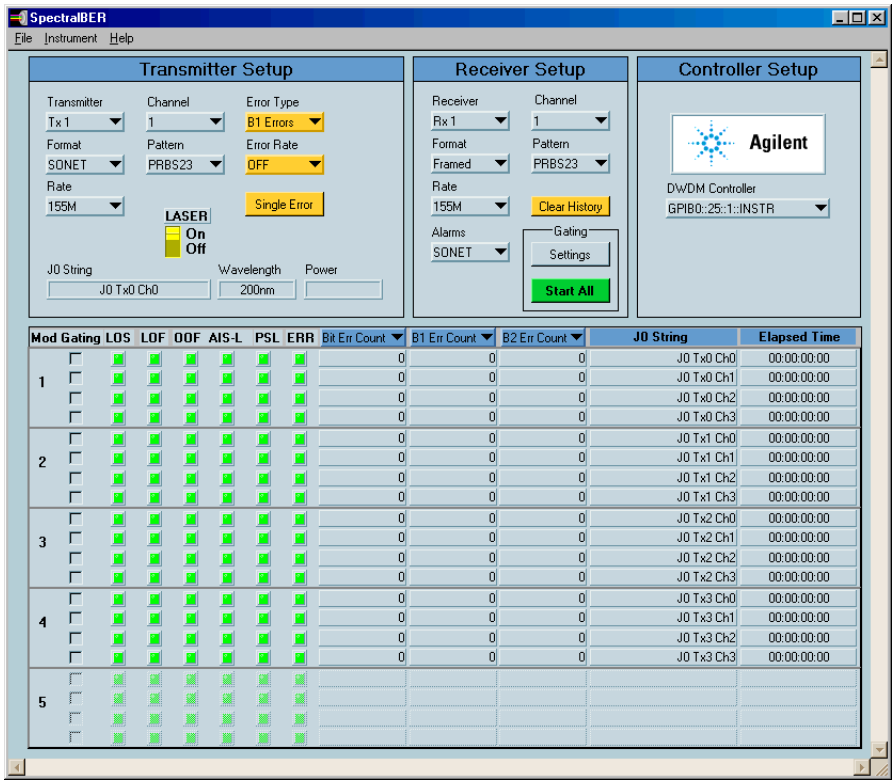


Figure 2-4. A Typical Soft Front Panel

A display similar to the one in Figure 2-4 verifies the installation. The fact that the Transmitter, Receiver and DWDM Controller Setup areas are live (not greyed out) shows that the modules are installed correctly.

A further check of the installation if required, which will also give the location and logical addresses of the various parts of the system, follows.

1. Connect an RS232 Cable between the controlling computer and the Command Module. (There is an RS232 Cable supplied with the Command Module.)

2. From the Windows Start Menu, select **Programs→Accessories→Communications→Hyper Terminal**.

3. Cycle the power on the VXI Mainframe. The Command Module Resource Manager will output to the hyperterminal, a summary similar to the one below. The summary identifies the Command Module logical address and servant area, the logical addresses and locations of each module in the mainframe and the Commander / Servant hierarchy.

```
                Testing ROM
          Testing 512K Bytes RAM
                   Passed
                Testing CPU
           CPU Self Test Passed
              HPIB Address: 09
                 Talk/Listen
        Command Module ladd = 0
    Command Module servant area = 255
Command Module VME bus timeout -- ENABLED
Searching for static devices in mainframe 0
      SC device at ladd   0 in slot  0
      SC device at ladd   8 in slot  1
      SC device at ladd   9 in slot  3
      SC device at ladd  10 in slot  5
Searching for dynamic devices in mainframe 0
       Searching for pseudo devices
 Configuring Commander / Servant hierarchy
        ladd =   0, cmdr ladd =  -1
        ladd =   8, cmdr ladd =   0
        ladd =   9, cmdr ladd =   8
        ladd =  10, cmdr ladd =   8
```

Chapter 3
Module Control

Introduction

The DWDM Receiver modules can be controlled from a PC or workstation using SCPI commands, Universal Instrument Drivers (UIDs) or manually using the Soft Front Panel. This chapter describes the Receiver part of the Soft Front Panel.

If you want to control modules using the Soft Front Panel, you will need install the appropriate soft front panel software. For more information about installing Agilent SpectralBER software, controlling modules manually or using UIDs, see the *Installation & System Reference Manual*.

For more information on SCPI commands, see the *SpectralBER System (2.5 Gb/s and below) Remote Control Manual.*

Chapter 4
Verification Tests

Introduction

This chapter contains verification information to test J4225A/26A/27A DWDM Receiver modules at 2.488 Gb/s only. The Verification Tests are designed to be used when no Soft Front Panel control is available, or to verify that a module has limited functional operation. If the Verification Tests indicate that a module is out of specification, or if full warranted specification testing is required, refer to Chapter 5 “Performance Tests” on page 35.

Note The warranted specifications are supplied as part of the documentation package provided with the system.

Recommended Test Equipment

Table 4-1 lists the equipment required for performance testing of the system. Alternative equipment that meets or exceeds the critical specification of the listed equipment may be substituted. (Recommended models are those typically used in Agilent Service Centers.)

Table 4-1. Recommend Test Equipment

Instrument	Critical Specification		Recommended Model
Lightwave Multimeter	800 to 1700 nm		8153A
Power Meter Sensor Module	800 to 1700 nm	+3 dBm to –40 dBm	81536A
DWDM Transmitter Module			J4230A/31A/32A/33A/34A/35A
Optical Attenuator	Wavelength: Range: Insertion Loss:	1200 to 1600 nm 0 to 30 db 4 db	8156A
FC/PC Optical Interface Connector	Unique		81000FI (x 4)
Optical Cable	Unique		11871A (x 2)

Calibration Cycle

The Verification Tests can be checked at any time.

Verification Test Record

The results of the Verification Tests can be recorded on the “Verification Test Record” on page 34. The results can be used to verify that a module is functional or if further performance testing is required.

Receiver Optical Sensitivity Test

Specifications

Table 4-2. J4225A, J4227A Receiver Module Sensitivity

Data Rate:	2.488 Gb/s
Wavelength:	1200 to 1600 nm
Maximum Input Power:	–3 dBm (for BER =1E–10)
Sensitivity:	–19 dBm (for BER =1E–10)

Table 4-3. J4226A Receiver Module Sensitivity

Data Rate:	2.488 Gb/s
Wavelength:	1200 to 1600 nm
Maximum Input Power:	–8 dBm (for BER =1E–10)
Sensitivity:	–28 dBm (for BER =1E–10)

Description

This test verifies the Input Sensitivity range of the optical **In** ports for the J4225A and J4227A Short Reach Receiver modules and J4226A Long Reach Receiver module by attenuating the Transmitter output and checking for errors in back-to-back mode.

Equipment Required

Lightwave Multimeter:	8153A
Power Meter Sensor Module	81536A
Optical Attenuator:	8156A
Optical Cables:	11871A (x 2)
FC/PC Optical Connectors:	81000FI (x 4)
DWDM Transmitter Module:	J4230A/31A/32A/33A/34A/35A

Procedure

1. Switch on the VXI mainframe.

2. Check that at power-on, the **Access** LED on all modules are either **ON** or **Flashing**. Check that the Transmitter **Laser** LEDs are ON).

3. Connect the Transmitter module, **Channel 1** optical **Out** port to the 8153A through the Optical Attenuator. (Ensure that all connectors are tight and that the cables have no twists.)

4. Set up the 8153A as follows:
   a. Press **PARAM** key to display wavelength [λ]
   b. Using ←,→ ↑ and ↓ keys, set the wavelength to 1310 nm (or 1550 nm depending on the Transmitter module).
   c. Press **PARAM** key to display Time [t]
   d. Using ←,→ ↑ and ↓ keys, set the time to 200 ms.
   e. Press **PARAM** key to display REF.
   f. Using ←,→ ↑ and ↓ keys, set the REF to 0.00 dBm.
   g. Press **PARAM** key to display CAL.
   h. Using ←,→ ↑ and ↓ keys, set the CAL to 0.000 dBm.
   i. Press the **ZERO** key on the Power Meter to calibrate - the Power Meter is now ready.

5. Press **MODE** to select the Power Level measurement on the 8153A.

6. Set the Optical Attenuator wavelength to 1310 nm (or 1550 nm depending on the Transmitter module) and set the attenuation to obtain an optical power reading of −3 dBm for the J4225A and J4227A (or −8 dBm for the J4226A) on the 8153A.

7. Disconnect the Optical Attenuator from the 8153A and connect to Receiver module, **Channel 1** optical **In** port.

8. Check that **Signal** present and **Frame** synchronization alarms on the Receiver module are present (Green LEDs are ON) and that no **Errors** are detected (Red LED is OFF.)

9. Increase the Optical attenuation until the **Errors** LED is ON. Decrease the attenuation until the **Errors** LED goes OFF.

10. Reconnect the Optical Attenuator to the 8153A and check that the optical power reading is < −19 dBm for the J4225A and J4227A (or <−28 dBm for the J4226A).

11. Repeat steps 3 to 10 for all **Channel 2**, **3** and **4** optical **In** ports on this module.

12. Disconnect the test equipment.

Verification Test Record

J4225A, J4226A, J4227A
SpectralBER DWDM Receiver Module

Location:	*Serial No.:*
	Tested by:
Temperature:	*Certified by:*
Humidity:	*Date:*

Page	Test Description		Result		
			Min.	**Actual**	**Max.**
	Receiver Optical Sensitivity Test				
	Step 2	Access LEDs		Pass/Fail	
	Step 8	Signal/Frame LED ON Errors LED OFF		Pass/Fail	
	Step 9	Errors LED		Pass/Fail	
	Step 10	< –19 dBm or < –28 dBm	–19 dBm or –28 dBm	Pass/Fail Pass/Fail	
	Step 11	Repeat 2 to 10		Pass/Fail	

Chapter 5
Performance Tests

Introduction

This chapter contains the information to test the warranted specifications of the J4225A/26A/27A DWDM Receiver modules in a J4221A or J4222A SpectralBER system and applies to all specified data rates. The system is controlled via a PC or Workstation soft panel. If no soft panel is available, or if only a basic operational check is required, refer to Chapter 4 “Verification Tests” on page 31.

Note The warranted specifications are supplied as part of the documentation package provided with the system.

Recommended Test Equipment

Table 5-1 lists the equipment required for performance testing. Alternative equipment that meets or exceeds the critical specification of the listed equipment may be substituted. (Recommended models are those typically used in Agilent Service Centers.)

Table 5-1. Recommend Test Equipment

Instrument	Critical Specification		Recommended Model
Lightwave Multimeter	800 nm to 1700 nm		8153A
Power Meter Sensor Module	800 nm to 1700 nm	+3 dBm to –40 dBm	81536A
DWDM Transmitter Module			J4230A/32A/33A//34A/35A
Optical Attenuator	Wavelength: Range: Insertion Loss:	1200 to 1600 nm 0 to 30 dB 4 dB	8156A
FC/PC Optical Interface Connector	Unique		81000FI (x 4)
Optical Cable	Unique		11871A (x 2)

Calibration Cycle

Depending on use and environmental conditions, performance should be checked once a year, using the following performance tests.

Performance Test Record

The results of the performance tests can be recorded on the “Performance Test Record” on page 42. The Performance Test Record lists all the tested specifications and the acceptable limits. The results recorded at Incoming Inspection can be used for comparison during periodic maintenance, troubleshooting or after repair or adjustment.

Receiver Optical Sensitivity Test

Specifications

Table 5-2. J4225A Receiver Module Sensitivity

Data Rate:	2.488 Gb/s
Wavelength:	1200 to 1600 nm
Maximum Input Power:	–3 dBm (for BER =1E–10)
Sensitivity:	–19 dBm (for BER =1E–10)

Table 5-3. J4226A Receiver Module Sensitivity

Data Rate:	2.488 Gb/s
Wavelength:	1200 to 1600 nm
Maximum Input Power:	–8 dBm (for BER =1E–10)
Sensitivity:	–28 dBm (for BER =1E–10)

Table 5-4. J4227A Receiver Module Sensitivity

Data Rate:	2.488 Gb/s, 1.244 Gb/s, 622 Mb/s, 155 Mb/s
Wavelength:	1200 to 1600 nm
Maximum Input Power:	–3 dBm (for BER =1E–10)
Sensitivity:	–19 dBm (for BER =1E–10)

Description

This test verifies the Input Sensitivity range of the optical **In** ports for the J4225A and J4227A Short Reach Receiver modules and J4226A Long Reach Receiver module by attenuating the Transmitter output and checking for errors in back-to-back mode.

Equipment Required

Lightwave Multimeter:	8153A
Power Meter Sensor Module	81536A
Optical Attenuator:	8156A
Optical Cables:	11871A (x 2)
FC/PC Optical Connectors:	81000FI (x 4)
DWDM Transmitter Module:	J4230A/31A/32A/33A/34A/35A*

* For rates other than 2.488 GHz, a J4233A, J4234A or J4235A Transmitter Module must be used.

Procedure

1. Switch on the VXI mainframe.
2. Check that at power-on, the **Access** LED on all modules are either **ON** or **Flashing**. Check that the Transmitter **Laser** LEDs are ON).
3. On the system soft panel, select the **START ALL** key to start the measurement period.
4. Connect the Transmitter module, **Channel 1** optical **Out** port to the 8153A through the Optical Attenuator. (Ensure that all connectors are tight and that the cables have no twists.)
5. Set up the 8153A as follows:
   a. Press **PARAM** key to display wavelength [λ]
   b. Using ←,→ ↑ and ↓ keys, set the wavelength to 1310 nm (or 1550 nm depending on the Transmitter module).
   c. Press **PARAM** key to display Time [t]
   d. Using ←,→ ↑ and ↓ keys, set the time to 200 ms.
   e. Press **PARAM** key to display REF.
   f. Using ←,→ ↑ and ↓ keys, set the REF to 0.000 dBm.
   g. Press **PARAM** key to display CAL.
   h. Using ←,→ ↑ and ↓ keys, set the CAL to 0.000 dBm.
   i. Press the **ZERO** key on the Power Meter to calibrate - the Power Meter is now ready.
6. Press **MODE** to select a Power Level measurement on the 8153A.
7. Set the Optical Attenuator wavelength to 1310 nm (or 1550 nm depending on the Transmitter module) and set the attenuation to obtain an optical power reading of –3 dBm for the J4225A and J4227A (or –8 dBm for the J4226A) on the 8153A.
8. Disconnect the Optical Attenuator from the 8153A and connect to Receiver module, **Channel 1** optical **In** port.
9. Check that **Signal** present and **Frame** synchronization alarms on the Receiver module are present (Green LEDs are ON) and that no **Errors** are detected (Red LED is OFF.)
10. Increase the Optical attenuation until the **Errors** LED is ON. Decrease the attenuation until the **Errors** LED goes OFF.
11. Reconnect the Optical Attenuator to the 8153A and check that the optical power reading is < –19 dBm for the J4225A and J4227A (or <–28 dBm for the J4226A) on the 8153A.
12. Repeat steps 3 to 11 (J4227A) for 1.244 Gb/s, 622 Mb/s and 155 Mb/s.
13. Repeat steps 3 to 12 for all **Channel 2**, **3** and **4** optical **In** ports.
14. Disconnect the test equipment.

System Tests

Specifications

Table 5-5. System Specifications (J4225A, J4226A)

Rate:	2.488 Gb/s
Frame Format	Framed : SDH or SONET : STM-16c or OC-48c) : 2.488 Gb/s Unframed : 2.488 Gb/s
Pattern	PRBS 23, 15, 11, 9
Error Add	Bit, B1, B2
Error Rate	Single, 1.0e-7, 1.0e-8, 1.0e-9

Table 5-6. System Specifications (J4227A)

Rate:	2.488 Gb/s, 1.244 Gb/s, 622 Mb/s, 155 Mb/s
Frame Format	Framed : SDH or SONET : STM-16c or OC-48c) : 2.488 Gb/s STM-4c or OC-12c) : 622 Mb/s STM-1c or OC-3c) : 155 Mb/s Unframed : 2.488 Gb/s, 1.244 Gb/s, 622 Mb/s, 155 Mb/s
Pattern	PRBS 23, 15, 11, 9
Error Add	Bit, B1, B2
Error Rate	Single, 1.0e-7, 1.0e-8, 1.0e-9

Description

This section contains information to enable you to perform back to back system tests. Tests such as data rate, frame format, pattern and error measurement are made using the J4225A/26A/27A DWDM Receiver Modules and a DWDM Transmitter module (J4230A/31A/32A/33A/34A/35A).

Note The frame format is automatically determined by the rate selected. Framed operation is not available at 1.244 Gb/s.

Note The measurement gating period may be controlled using the **START ALL/ STOP ALL** key (which gates all Rx modules and channels simultaneously, or using the **Mod Gating** selection which gates only the individual channel. For these tests, the **START ALL / STOP ALL** key will be used.

Equipment Required

Lightwave Multimeter:	8153A
Optical Attenuator:	8156A
Power Meter Sensor Module	1536A
Optical Cables:	11871A (x 2)
FC/PC Optical Connectors:	81000FI (x 4)
DWDM Transmitter Module:	J4230A/31A/32A/33A/34A/35A*

* For rates other than 2.488 GHz, a J4233A, J4234A or J4235A Transmitter Module must be used.

Procedure

Initial Set-up

1. Switch on the VXI mainframe.

2. Check that at power-on, the **Access** LEDs on all modules are either **ON** or **Flashing**. Check that the Transmitter **Laser** LEDs are **ON**.

3. On the system soft panel, select the **START ALL** key to start the measurement period.

4. Connect the Transmitter module, **Channel 1** optical **Out** port to the 8153A through the Optical Attenuator. (Ensure that all connectors are tight and that the cables have no twists.)

5. Set up the 8153A as follows:
   a. Press **PARAM** key to display wavelength [λ]
   b. Using ←, →, ↑ and ↓ keys, set the wavelength to 1310 nm (or 1550 nm depending on the Transmitter module).
   c. Press **PARAM** key to display Time [t]
   d. Using ←, →, ↑ and ↓ keys, set the time to 200 ms.
   e. Press **PARAM** key to display REF.
   f. Using ←, →, ↑ and ↓ keys, set the REF to 0.000 dBm.
   g. Press **PARAM** key to display CAL.
   h. Using ←, →, ↑ and ↓ keys, set the CAL to 0.000 dBm.
   i. Press the **ZERO** key on the Power Meter to calibrate - the Power Meter is now ready.

6. Press **MODE** to select the Power Level measurement on the 8153A.

7. Set the Optical Attenuator to wavelength to 1310 nm (or 1550 nm depending on the Transmitter module) and set the attenuation to obtain an optical power reading of –3 dBm for the J4225A and J4227A (or –8 dBm for the J4226A) on the 8153A.

8. Disconnect the Optical Attenuator from the 8153A and connect to Receiver module, **Channel 1** optical **In** port.

9. Check that **Signal** present and **Frame** synchronization conditions are present (Green LEDs are ON) and that no **Errors** are detected (Red LED is OFF.)

Data Rate

10. Using the system soft panel, select the following parameters:.

Transmitter	Setting	Receiver	Setting
Transmitter	Tx 1	Receiver	Rx 1
Channel	1	Channel	1
Format	SDH	Format	Framed
Rate	2.488 Gb/s	Rate	2.488 Gb/s
Pattern	PRBS 23	Pattern	PRBS 23
		Alarms	SDH

11. On the system soft panel, select **STOP ALL** and then **START ALL** to re-start the measurement period.

12. Check that the **LOS, LOF, OOF, MS-AIS, PSL** and **ERR** soft panel alarms are Green.

13. For the J4227A Module select **622M** and **155M** rates in turn, on both Transmitter and Receiver Modules.

14. Check that the **LOS, LOF, OOF, MS-AIS, PSL** and **ERR** soft panel alarms are **Green**.

15. Repeat steps 10 to 14 for **Framed : SONET and Alarms : SONET**.

16. Repeat steps 10 to 13 for **Unframed** format.

17. Check that the **LOS**, **LOF**, **OOF, AIS-L, PSL** and **ERR** soft panel alarms are Green.

Pattern

18. Set the parameters shown in step 10.

19. On the system soft panel, select **STOP ALL** and then **START ALL** to re-start the measurement period.

20. Select **Unframed** format on both Transmitter and Receiver.

21. Check that the **LOS**, **LOF**, **OOF, MS-AIS, PSL** and **ERR** alarms are **Green.**

22. Select **PRBS 15, 11, 9** in turn, on both Transmitter and Receiver.

23. Check that the **LOS**, **LOF**, **OOF, MS-AIS, PSL** and **ERR** alarms are **Green.**

Error Add

24. Set the parameters shown in step 10.

25. On the system soft panel, select STOP ALL and then **START ALL** to re-start the measurement period.

26. Check that the **LOS, LOF, OOF, AIS, PSL** and **ERR** soft panel Alarms are all Green.

27. Select **Error Type : Bit** and **Error Rate : Single Error.**

28. Check that the soft panel shows **Bit Count : 1** and that the red **ERR** indicator is **ON**.

29. Press **Error Rate : Single Error** twice and check that the **Bit Count** increases to **3**.

30. Select **STOP ALL** to end the gating and the press **START ALL** to begin a new gating period.

31. Select **Error Rate : 1e-7** and change **Bit Count** to **Bit Ratio**.

32. After 10 seconds gating, select **STOP ALL** and check that the **ERR** indicator is **Red** and the **BIT Ratio** is typically **1.00 E-07.**

33. Select **Error Add : B1** and **Error Add : B2** and repeat steps 25 to 33.

34. Repeat steps 1 to 33 for **Channel 2**, **3** and **4** of the Receiver module.

Performance Test Record

J4225A, J4226A, J4227A
SpectralBER DWDM Receiver Modules

Location: *Serial No.:*

Tested by:

Temperature: *Certified by:*

Humidity: *Date:*

Page	Test Description		Result		
			Min.	**Actual**	**Max.**
	Receiver Optical Sensitivity Test				
	Step 2	Access LEDs		Pass/Fail	
	Step 9	Signal/Frame LED ON Errors LED OFF		Pass/Fail	
	Step 10	Errors LED		Pass/Fail	
	Step 11	< –19 dBm or < –28 dBm	–19 dBm or –28 dBm	Pass/Fail Pass/Fail	
	Step 12	Repeat 3 to 11		Pass/Fail	
	Step 13	Repeat 3 to 12		Pass/Fail	
	System Tests				
	Step 2	Access LEDs		Pass/Fail	
	Step 9	Signal/Frame LED ON Errors LED OFF		Pass/Fail	
	Step 12	2.488G SDH Alarms		Pass/Fail	
	Step 14	622M SDH Alarms		Pass/Fail	
	Step 14	155M SDH Alarms		Pass/Fail	

Page	Test Description		Result		
			Min.	Actual	Max.
	Step 15	2.488G SONET Alarms		Pass/Fail	
	Step 15	622M SONET Alarms		Pass/Fail	
	Step 15	155M SONET Alarms		Pass/Fail	
	Step 17	2.488G Unframed Alarms		Pass/Fail	
	Step 17	622M Unframed Alarms		Pass/Fail	
	Step 17	155M Unframed Alarms		Pass/Fail	
	Step 21	PRBS 23 Alarms		Pass/Fail	
	Step 23	PRBS 15 Alarms		Pass/Fail	
	Step 23	PRBS 11 Alarms		Pass/Fail	
	Step 23	PRBS 9 Alarms		Pass/Fail	
	Step 28	Bit Error : Single		Pass/Fail	
	Step 29	Bit Count: 3		Pass/Fail	
	Step 32	Bit Error : Ratio		Pass/Fail	
	Step 33	B1 Error : Single		Pass/Fail	
	Step 33	B1 Error : Ratio		Pass/Fail	
	Step 33	B2 Error : Single		Pass/Fail	
	Step 33	B2 Error : Ratio		Pass/Fail	
	Step 34	Repeat Steps 1 to 34			

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