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J4230A/31A/32A/33A/34A/35A DWDM Transmitter Modules

User's Manual (Part No. J4230-9002)

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 J4225A/26A/27A DWDM Receiver Modules User's Manual SpectralBER Online Help
VISA language information	VISA User's Guide

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

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Legal and Safety Information

Agilent Technologies Warranty Statement

Agilent Product: J4230A/31A/32A/33A/34A/35A **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.

3. Agilent does not warrant that the operation of Agilent products will be interrupted or error free. If Agilent is unable, within a reasonable time, to repair or replace any product to a condition as warranted, customer will be entitled to a refund of the purchase price upon prompt return of the product.

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.

7. TO THE EXTENT ALLOWED BY LOCAL LAW, THE ABOVE WARRANTIES ARE EXCLUSIVE AND NO OTHER WARRANTY OR CONDITION, WHETHER WRITTEN OR ORAL, IS EXPRESSED OR IMPLIED AND AGILENT SPECIFICALLY DISCLAIMS ANY IMPLIED WARRANTY OR CONDITIONS OF MERCHANTABILITY, SATISFACTORY QUALITY, AND FITNESS FOR A PARTICULAR PURPOSE.

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9. TO THE EXTENT ALLOWED BY LOCAL LAW, THE REMEDIES IN THIS WARRANTY STATEMENT ARE CUSTOMER'S SOLE AND EXLUSIVE REMEDIES. EXCEPT AS INDICATED ABOVE, IN NO EVENT WILL AGILENT OR ITS SUPPLIERS BE LIABLE FOR LOSS OF DATA OR FOR DIRECT, SPECIAL, INCIDENTAL, CONSEQUENTIAL (INCLUDING LOST PROFIT OR DATA), OR OTHER DAMAGE, WHETHER BASED IN CONTRACT, TORT, OR OTHERWISE.

10. FOR CONSUMER TRANSACTIONS IN AUSTRALIA AND NEW ZEALAND: THE WARRANTY TERMS CONTAINED IN THIS STATEMENT, EXCEPT TO THE EXTENT LAWFULLY PERMITTED, DO NOT EXCLUDE, RESTRICT OR MODIFY AND ARE IN ADDITION TO THE MANDATORY STATUTORY RIGHTS APPLICABLE TO THE SALE OF THIS PRODUCT TO YOU.

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Responsibilities of the Customer

The customer shall provide:
1. Access to the products during the specified periods of coverage to perform maintenance.
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.

Assistance

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

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Macintosh® is a registered trademark of Apple Computer Inc.
LabWindows™ is the registered trademark of National Instruments Corporation

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

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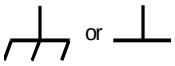
Safety Symbols



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.

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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.



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 61000-4-2:1995, 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

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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 1310nm Transmitter
Model Number:	J4230A
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
USA / CFR Ch.1 1040.10

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 / 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 1550nm Transmitter
Model Number:	J4231A
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

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USA / CFR Ch.1 1040.10

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Manufacturer's Address:	Telecomms Networks Test Division South Queensferry West Lothian, EH30 9TG Scotland, United Kingdom

Declares that the product

Product Name:	SpectralBER DWDM Transmitter
Model Number:	J4232A
Product Options:	This declaration covers all options of the above product as detailed in TCF A-5951-9852-01.

EMC:

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As Detailed in:	Electromagnetic Compatibility (EMC) Technical Construction File (TCF) No. A-5951-9852-01
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Technical Report Number:6893/2200/CBR, dated 21 August 1997

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The product conforms to the following safety standards:

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Manufacturer's Address:	Telecomms Networks Test Division South Queensferry West Lothian, EH30 9TG Scotland, United Kingdom

Declares that the product

Product Name:	SpectralBER DWDM 1310nm Transmitter
Model Number:	J4233A
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
USA / CFR Ch.1 1040.10

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

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Manufacturer's Address:	Telecomms Networks Test Division South Queensferry West Lothian, EH30 9TG Scotland, United Kingdom

Declares that the product

Product Name:	SpectralBER DWDM 1550nm Transmitter
Model Number:	J4234A
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

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IEC 60825-1(1993) / EN 60825-1:1994
USA / CFR Ch.1 1040.10

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

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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 Transmitter
Model Number:	J4235A
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

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IEC 60825-1(1993) / EN 60825-1:1994
USA / CFR Ch.1 1040.10

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

South Queensferry, Scotland. ***01 May 2000*** WJRPea

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Chapter 1
Module Overview

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

- Agilent J4230A Transmitter
- Agilent J4231A Transmitter
- Agilent J4232A Transmitter
- Agilent J4233A Transmitter
- Agilent J4234A Transmitter
- Agilent J4235A Transmitter

Description

The modules are register-based C-size double slot VXI modules.

Optical Wavelength

Each module has four optical output ports with the following wavelengths:

- 1310 nm for all Agilent J4230A and J4233A optical ports.
- 1550 nm for all Agilent J4231A and J4234A optical ports.
- ITU-T 1550 nm for the Agilent J4232A and J4235A optical ports. These modules can provide a different wavelength for each optical port. (The wavelengths conform to the ITU standard and have 50 GHz spacing.)

Signal Structure

Each port can transmit different signal structures as follows:

Framed

Modules	SDH	Payload	SONET	Payload
All	STM-16c	VC-4-16c	OC-48c	OC-48c SPE
J4233A/34A/35A	STM-4c	VC-4-4c	OC-12c	OC-12c SPE
	STM-1	VC-4	OC-3c	OC-3c SPE

Unframed

PRBS patterns at 2.488320 Gb/s (All modules), 1.244160 Gb/s (J4233A/34A/35A only), 622.08 Mb/s (J4233A/34A/35A only) and 155.52 Mb/s (J4233A/34A/35A only) as follows:

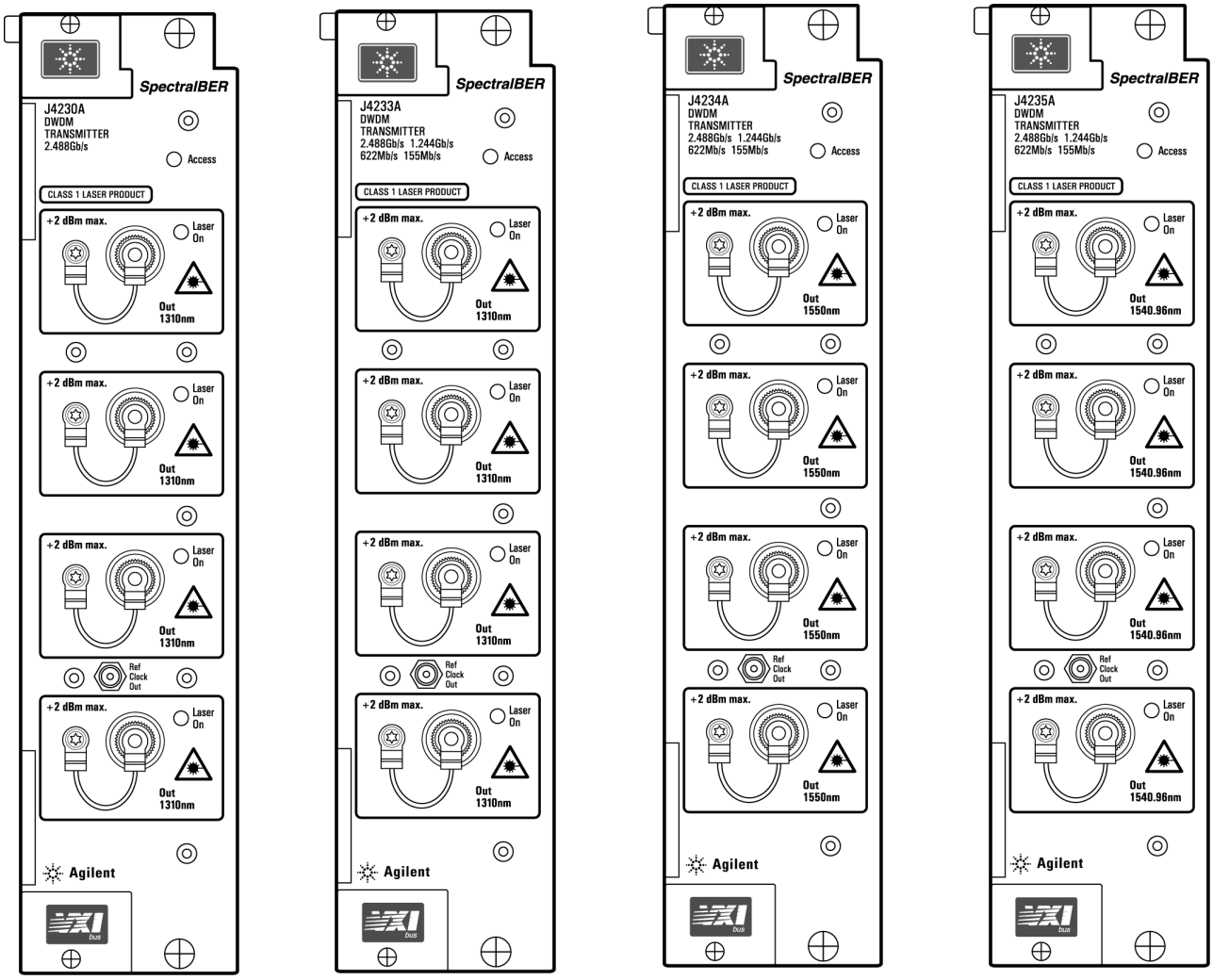
- PRBS 2^{23}-1 (inverted)
- PRBS 2^{15}-1 (inverted)
- PRBS 2^{11}-1
- PRBS 2^{9}-1

Error Add

B1, B2 or bit errors, either single or at 1 x 10^{-7}, 1 x 10^{-8} or 1 x 10^{-9}.

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Front Panel Features



J4230A **J4233A** **J4234A** **J4235A**

Optical Out Ports

The modules each have four optical ports, the wavelengths and maximum optical power for each port is listed below:

- 1310 nm, +2 dBm for the J4230A and J4233A
- 1550 nm, +2 dBm for the J4231A and J4234A (+4 dBm for Option 001)
- ITU-T 1550 nm, +2 dBm for J4233A and J4235A

Ref Clock Out Port

The modules provides a 78 MH/z external clock output.

LEDs

Access This LED lights when the module is being accessed over the VXIbus backplane.

Laser On This yellow LED lights when the optical output is enabled.

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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, especially when ordering replacement parts.

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 Company 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 3
- "Safety Symbols" on page 4
- "ESD Precautions" on page 20
- "Operators Maintenance" on page 20

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.

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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
- Optical Connector Cleaning

Cleaning

Cabinet Cleaning

Clean the cabinet using a damp cloth only.

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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 **Out** 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.

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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 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

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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

This module is designed for indoor use only. **DO NOT** operate the product in an explosive atmosphere or in the presence of flammable gasses or fumes.

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

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Cooling Requirements

The transmitter 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 provided from the backplane of the VXI Mainframe that houses the modules during normal operation. Power consumption of each module is 106 W.

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

J4230A, J4231A

dc volts	dc Current	Dynamic Current
+24 V	1.0 A	420 mA
+12 V	0.85 A	63 mA
+5 V	9.4 A	1.1 A
-2 V	2.1 A	500 mA
-5.2 V	2.8 A	270 mA
-12 V	1.5 A	71 mA
-24 V		

J4233A, J4234A, J4235A

dc volts	dc Current	Dynamic Current
+24 V	1.2 A	930 mA
+12 V	860 mA	100 mA
+5 V	9.2 A	1.63 A
-2 V	2.1 A	50 mA
-5.2 V	2.6 A	290 mA
-12 V	1.5 A	60 mA
-24 V		

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Preparation for Use



Caution **Receiver module optical input ports can be damaged if they are connected directly to the optical output ports of either Agilent J4231A Option 001 or Agilent J4234A Option 001.**

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).**

Power Requirements

The modules are powered by dc voltages provided from the backplane of the VXI Mainframe that houses the modules during normal operation. Power consumption of each module is 106 W.

Connecting to a Network

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 20.**

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

SMA Adapters

These adapters (1250-1462) are available and can be screwed on to the Ref Clock Out port to protect the threads of the connector.

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Installing and Removing Modules

Caution **Review the "ESD Precautions" on page 20 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 address switches as appropriate before installing modules. Refer to the following paragraphs.

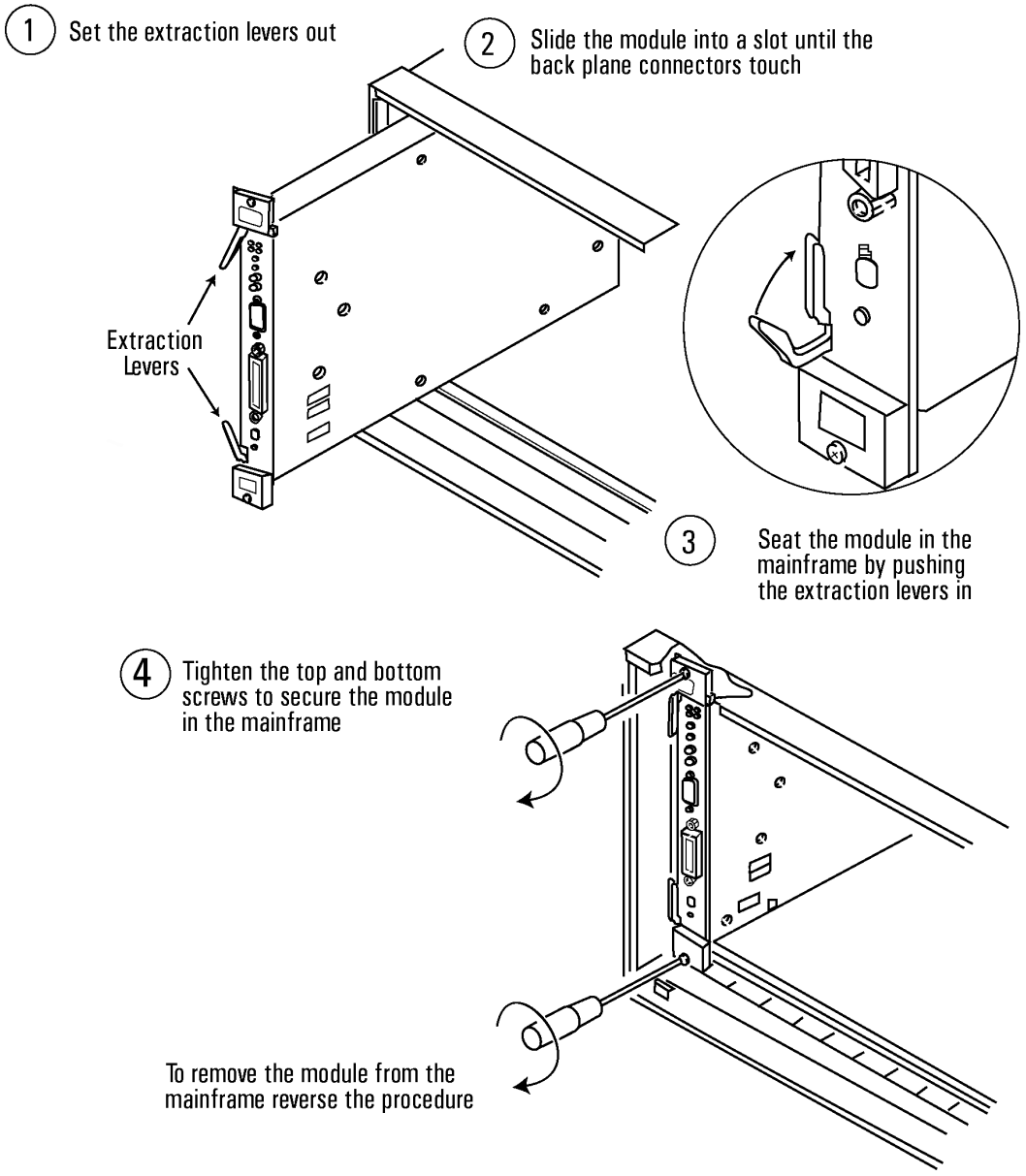


Figure 2-1. Installing and Removing a Module

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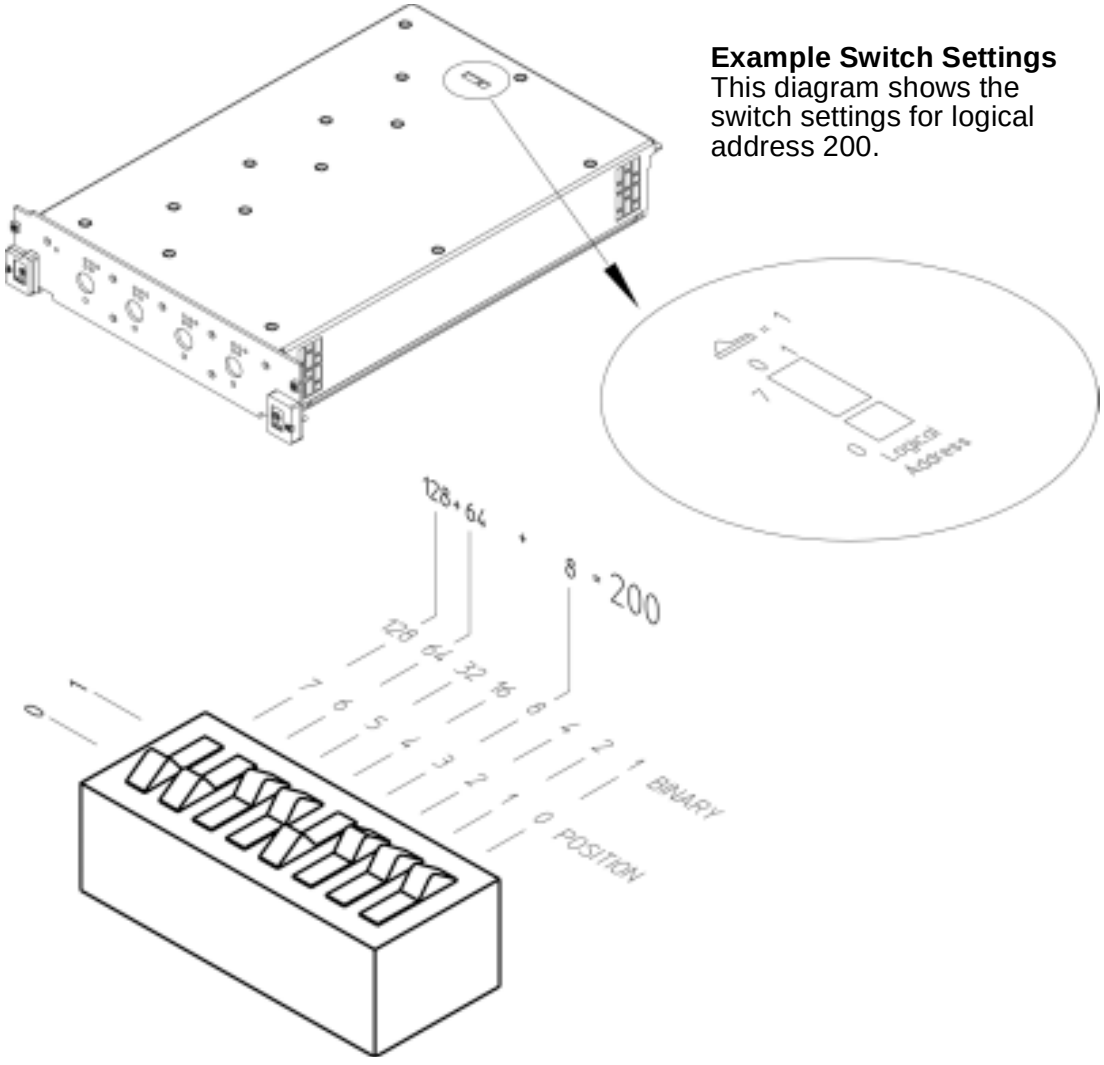
Addressing

Transmitter modules are servants to the J4223A DWDM Controller (commander module).The logical address of each transmitter module must be within the servant area of the DWDM Controller.

Caution **Before assigning a logical address to a transmitter 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 a transmitter 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.

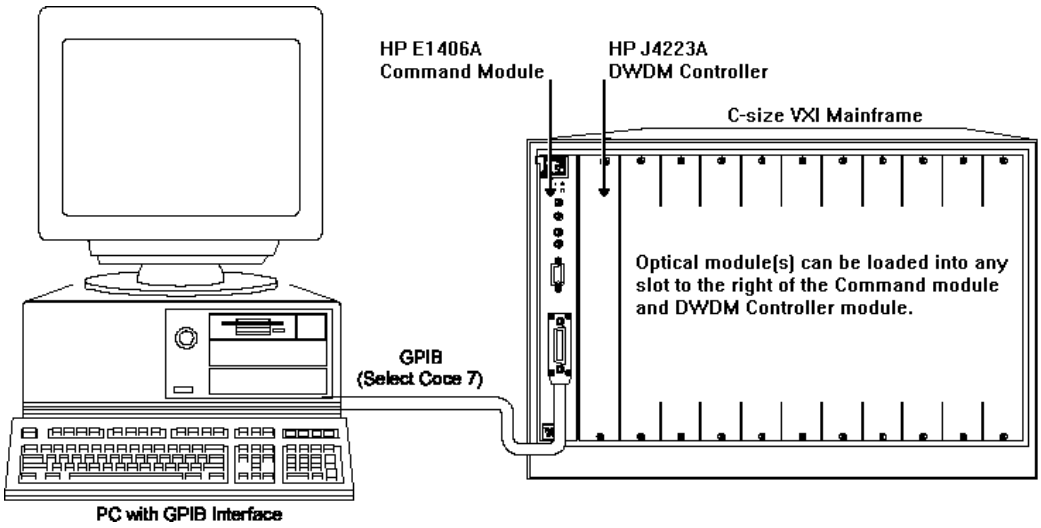


Example Switch Settings
This diagram shows the switch settings for logical address 200.

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Module Slot Location

It is recommended that modules be loaded as shown below. Refer to the *Installation & System Reference Manual* for more system installation information.



Note

It is not necessary to install the modules in the VXI rack in order of ascending logical address, however if you do install them this way the SCPI supersystem commands used to control a module will reflect the physical position of the module in the VXI Mainframe.

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.*

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

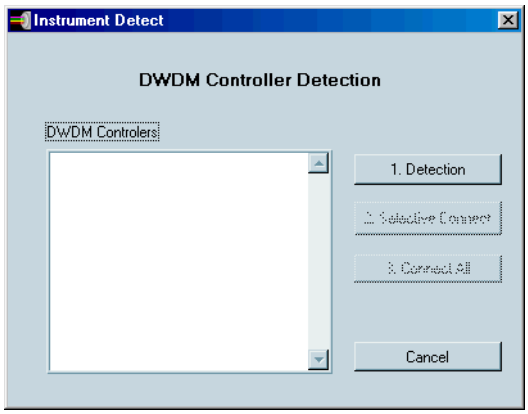


Figure 2-2. Instrument Detect Window

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.

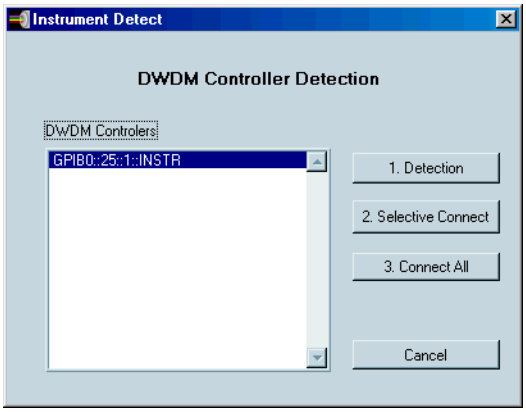


Figure 2-3. Instrument Found

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.

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Verify the Installation

Figure 2-4 shows a Typical Soft Front Panel.

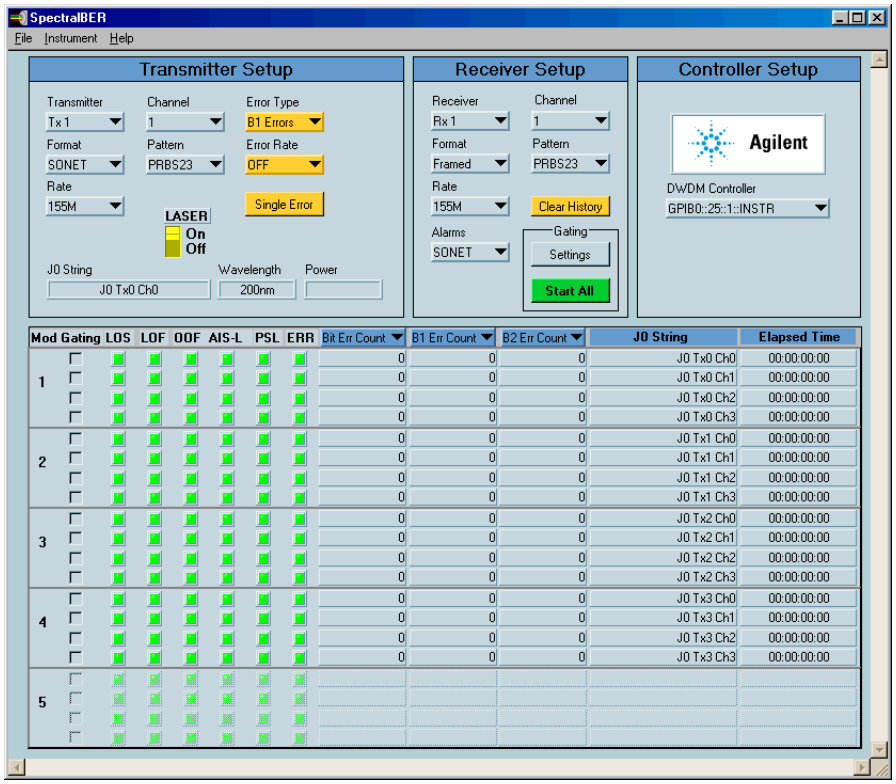


Figure 2-4. A Typical Soft Front Panel

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.

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```
                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
```


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Chapter 3
Module Control

Introduction

The DWDM Transmitter 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 transmitter part of the Soft Front Panel.

If you want to control modules using the Soft Front Panel, you will need to install the appropriate soft front panel software. For more information about installing 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.*

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Chapter 4
Verification Tests

Introduction

This chapter contains information to verify the J4230A/31A/32A/33A/34A/35A DWDM Transmitter 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 45.

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 Verification 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
Frequency Counter	Range:	0 to 200 MHz	5335A Option 010
Lightwave Multimeter	800 nm to 1700 nm		8153A
Power Meter Sensor Module	800 nm to 1700 nm	+3 dBm to -70 dBm	81536A
Multi Wavelength Meter	Wavelength accuracy :	3 ppm (0.005 nm at 1550 nm)	86120B
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)
Cable	SMA to SMA	0.5 meter	E1675-64210
Adapter	SMA (female) to BNC (male)		1250-2015

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Calibration Cycle

The Verification Tests can be checked at any time.

Performance Test Record

The results of the 2.488 Gb/s Verification Tests can be recorded on the “Verification Test Record” on page 44. These results can be used to verify that a module is operational or if further performance testing is required.

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Transmitter Clock Test

Specifications

Table 4-2. Transmitter Clock Specifications (All Modules)

Internal Frequency:	2.48832 GHz ±3.5 ppm
Measured Frequency:	77.76 MHz ±3.5 ppm (±272.26 Hz)
Aging:	±1 ppm/year (±77.76 Hz)
Level:	unbalanced TTL (J4230A/31A/32A)
	ac coupled, nominal ECL (J4233A/34A/35A)

Description

This test verifies that the 2.4 GHz internal Clock is within its specified limits, by measuring a divided-down version of the clock at the **Ref Clock Out** port. The **Ref Clock Out** port has a SMA-type connector that outputs an unbalanced clock signal. The limits take in to account the accuracy, stability and ageing of the clock and assume that the module is within its calibration cycle.

Equipment Required

Frequency Counter:	5335A Option 010
Cable, SMA to SMA (0.5 meter):	E1675-64210
Adapter, SMA (female) to BNC (male):	1250-2015

Procedure

1. Connect the **Ref Clock Out** port to the Frequency Counter.
2. Check that the measured clock frequency is 77,760000 MHz ±3.5 ppm. (Equivalent to an internal clock frequency of 2.48832 GHz ±11.2 kHz.)
3. Disconnect the Frequency Counter.

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Transmitter Optical Power and Wavelength Test

Specifications

Table 4-3. J4230A, J4233A
Optical Power and Wavelength Specifications

Wavelength:	1310 nm ±20 nm
Power Output:	Maximum: +2 dBm Minimum: –1 dBm Typical: +1 dBm
Safety Class:	Class 1

Table 4-4. J4231A, J4234A
Optical Power and Wavelength Specifications

Wavelength:	1550 nm ±5 nm
Power Output:	
Std.	Maximum: +2 dBm Minimum: –1 dBm Typical: +1 dBm
Option 001	Maximum : +4 dBm Minimum : +1 dBm Typical: +3 dBm
Safety Class:	Class 1

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Table 4-5. J4232A, J4235A
Optical Power and Wavelength Specifications

Option:	Wavelength:	Option:	Wavelength:
001	1536.61 nm ±0.07 nm	031	1548.51 nm ±0.07 nm
002	1537.01 nm ±0.07 nm	032	1548.91 nm ±0.07 nm
003	1537.40 nm ±0.07 nm	033	1549.32 nm ±0.07 nm
004	1537.90 nm ±0.07 nm	034	1549.72 nm ±0.07 nm
005	1538.19 nm ±0.07 nm	035	1550.12 nm ±0.07 nm
006	1538.59 nm ±0.07 nm	036	1550.52 nm ±0.07 nm
007	1538.98 nm ±0.07 nm	037	1550.92 nm ±0.07 nm
008	1539.38 nm ±0.07 nm	038	1551.32 nm ±0.07 nm
009	1539.77 nm ±0.07 nm	039	1551.72 nm ±0.07 nm
010	1540.17 nm ±0.07 nm	040	1552.12 nm ±0.07 nm
011	1540.56 nm ±0.07 nm	041	1552.52 nm ±0.07 nm
012	1540.96 nm ±0.07 nm	042	1552.92 nm ±0.07 nm
013	1541.35 nm ±0.07 nm	043	1553.33 nm ±0.07 nm
014	1541.75 nm ±0.07 nm	044	1553.73 nm ±0.07 nm
015	1542.14 nm ±0.07 nm	045	1554.13 nm ±0.07 nm
016	1542.54 nm ±0.07 nm	046	1554.53 nm ±0.07 nm
017	1542.94 nm ±0.07 nm	047	1554.94 nm ±0.07 nm
018	1543.33 nm ±0.07 nm	048	1555.34 nm ±0.07 nm
019	1543.73 nm ±0.07 nm	049	1555.75 nm ±0.07 nm
020	1544.12 nm ±0.07 nm	050	1556.15 nm ±0.07 nm
021	1544.53 nm ±0.07 nm	051	1556.55 nm ±0.07 nm
022	1544.91 nm ±0.07 nm	052	1556.95 nm ±0.07 nm
023	1545.32 nm ±0.07 nm	053	1557.36 nm ±0.07 nm
024	1545.72 nm ±0.07 nm	054	1557.76 nm ±0.07 nm
025	1546.12 nm ±0.07 nm	055	1558.17 nm ±0.07 nm
026	1546.52 nm ±0.07 nm	056	1558.57 nm ±0.07 nm
027	1546.92 nm ±0.07 nm	057	1558.98 nm ±0.07 nm
028	1547.32 nm ±0.07 nm	058	1559.39 nm ±0.07 nm
029	1547.72 nm ±0.07 nm	059	1559.79 nm ±0.07 nm
030	1548.12 nm ±0.07 nm	060	1560.20 nm ±0.07 nm
		061	1560.61 nm ±0.07 nm

Power Output:

Maximum:	+2 dBm
Minimum:	–1 dBm
Typical:	+1 dBm

Safety Class: Class 1

Description

This test verifies the Optical Output Power and Wavelength at each of the Transmitter optical **Out** ports.

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Equipment Required

Lightwave Multimeter	8153A
Power Meter Sensor Module:	81536A
Optical Attenuator	8156A
Multi-wavelength Meter	81620B
Optical Cables:	11871A (x 2)
FC/PC Optical Connectors:	81000FI (x 2)

Procedure

J4230A, J4233A Transmitter Modules

WARNING **At switch-on, the Transmitter Lasers are enabled in the ON condition. Ensure that at any unused optical "Out" ports are fitted with an optical cover BEFORE switching on.**

1. Switch on the VXI mainframe and check that all the Transmitter Module **Laser On** LEDs are ON (indicating that the lasers are enabled)

2. Connect the Transmitter module, **Channel 1** optical **Out** port to the 8153A (ensure that all connections are tight and that the cable has no twists).

3. Set up the 8153A as follows:
   a. Press **PARAM** key to display wavelength [λ]
   b. Using ←,→ ↑ and ↓ keys, set the wavelength to 1310 nm.
   c. Press **PARAM** key to display Time [t]
   d. Using ←,→ ↑ and ↓ keys, set the time to 20 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.

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

5. Check that the optical power reading is between −1 dBm and +2 dBm.

6. Disconnect the optical cable from the 8153A and connect it to the 81620B.

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7. Press PRESET on the 81620B.

8. Check that the wavelength is 1310 nm ±20 nm.

9. Repeat steps 2 to 8 for **Channel 2, 3** and **4** optical **Out** ports.

J4231A, J4234A Transmitter Modules

WARNING **At switch-on, the Transmitter Lasers are enabled in the ON condition. Ensure that at any unused optical "Out" ports are fitted with an optical cover BEFORE switching on.**

1. Switch on the VXI mainframe and check that all the Transmitter Module **Laser On** LEDs are ON (indicating that the lasers are enabled).

2. Connect the Transmitter module **Channel 1** optical **Out** port to the 8153A (ensure that all connections are tight and that the cable has no twists).

3. Set up the 8153A as follows:
   a. Press PARAM key to display wavelength [λ]
   b. Using ←, →, ↑ and ↓ keys, set the wavelength to 1550 nm.
   c. Press PARAM key to display Time [t]
   d. Using ←, →, ↑ and ↓ keys, set the time to 20 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.

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

5. Check that the optical power reading is between −1 dBm and +2 dBm. For Option 001 modules, check that the optical power reading is between +1 dBm and +4 dBm.

Note The 8153A measures +3 dBm maximum input optical power. For Option 001 modules with optical output power > +3 dBm, the Power Meter reading will go out of range. Insert the 8156A Optical attenuator between the optical Out port and the 8153A. This will add a 4 dB insertion loss into the optical signal path. Check that the optical power reading is now between -3 dBm and 0 dBm. (Equivalent to optical power in the range +1 dBm to +4 dBm, through an insertion loss of 4 dB.)

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6. Disconnect the optical cable from the 8153A and connect it to the 81620B.

7. Press PRESET on the 81620B.

8. Check that the wavelength is 1550 nm ±5 nm.

9. Repeat steps 2 to 8 for **Channel 2, 3** and **4** optical **Out** ports.

J4232A, J4235A Transmitter Modules

WARNING **At switch-on, the Transmitter Lasers are enabled in the ON condition. Ensure that at any unused optical "Out" ports are fitted with an optical cover BEFORE switching on.**

1. Switch on the VXI mainframe and check that all the Transmitter Module **Laser On** LEDs are ON (indicating that the lasers are enabled).

2. Connect the Transmitter module **Channel 1** optical **Out** port to the 8153A (ensure that all connections are tight and that the cable has no twists).

3. Set up the 8153A as follows:
   a. Press PARAM key to display wavelength [λ]
   b. Using ←,→ ↑ and ↓ keys, set the wavelength to the wavelength shown on the **Out** port of the module.
   c. Press PARAM key to display Time [t]
   d. Using ←,→ ↑ and ↓ keys, set the time to 20 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.

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

5. Check that the optical power reading is between −1 dBm and +2 dBm.

6. Disconnect the optical cable from the 8153A and connect it to the 81620B.

7. Press PRESET on the 81620B.

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8. Check that the wavelength is within the limits shown in the specifications in Table 4-5, “J4232A, J4235A Optical Power and Wavelength Specifications”, on page 39.

9. Repeat steps 2 to 8 for **Channel 2, 3** and **4** optical **Out** ports.

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Verification Test Record

J4230A, J4231A, J4232A, J4233A, J4234A, J4235A
SpectralBER DWDM Transmitter Modules

Location: *Serial No.:*

Tested by:

Temperature: *Certified by:*

Humidity: *Date:*

Page	Test Description		Result		
			Min.	**Actual**	**Max.**
	Transmitter Clock Test				
	Step 2	77,760,000 MHz	77,759,650 MHz		77,760,350 MHz
	Transmitter Optical Power & Wavelength Test J4230A, J4233A				
	Step 1	**Laser** LEDs		On/Off	
	Step 5	>–1 dBm <+2 dBm	–1 dBm		+2 dBm
	Step 8	1310 nm	1290 nm		1330 nm
	Step 9	Repeat 2 to 8		Pass/Fail	
	Transmitter Optical Power & Wavelength Test J4231A, J4234A				
	Step 1	**Laser** LEDs		On/Off	
	Step 5	Standard: >–1 dBm <+2 dBm Option 001: =1 dBm to +4 dBm	 –1 dBm +1 dBm		 +2 dBm +4 dBm
	Step 8	1550 nm	1545 nm		1555 nm
	Step 9	Repeat 2 to 8		Pass/Fail	
	Transmitter Optical Power & Wavelength Test J4232A, J4235A				
	Step 1	**Laser** LEDs		On/Off	
	Step 5	>–1 dBm <+2 dBm	–1 dBm		+2 dBm
	Step 8	See Table 4-5. on page 39		Pass/Fail	
	Step 9	Repeat 2 to 8		Pass/Fail	

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Chapter 5
Performance Tests

Introduction

This chapter contains information to enable you to performance test the warranted specifications of the J4230A/31A/32A/33A/34A/35A DWDM Transmitter modules in the J4221A and J4222A DWDM SpectralBER system. The Performance Tests apply to all data rates generated by the Transmitter modules and are controlled manually using a PC or Workstation soft front panel. If no soft front panel is available, or if only a basic operational check is required, refer to Chapter 4 “Verification Tests” on page 35.

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 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 5-1. Recommend Test Equipment

Instrument	Critical Specification		Recommended Model
Frequency Counter	Range:	0 to 200 MHz	5335A Option 010
Lightwave Multimeter	800 nm to 1700 nm		8153A
Power Meter Sensor Module	800 nm to 1700 nm	+3 dBm to -70 dBm	81536A
Multi Wavelength Meter	Wavelength accuracy :	3 ppm (0.005 nm at 1550 nm)	86120B
Optical Attenuator	Wavelength: Range: Insertion Loss	1200 -1600 nm 0 to 30 dB 4 dB	8156A
FC/PC Optical Interface Connector	Unique		81000FI (x 4)
Optical Cable	Unique		11871A (x 2)
Cable	SMA to SMA	0.5 meter	E1675-64210
Adapter	SMA (female) to BNC (male)		1250-2015

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Calibration Cycle

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

Performance Test Record

The results of the performance tests can be recorded on the "Performance Test Record" on page 55. 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 following repair or adjustment.

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Transmitter Clock Test

Specifications

Table 5-2. Transmitter Clock Specifications

Internal Frequency:	2.48832 GHz ±3.5 ppm (All Modules) 1.24416 GHz ±3.5 ppm (J4233A/34A/35A) 622.08 MHz ±3.5 ppm (J4233A/34A/35A) 155.52 MHz ±3.5 ppm (J4233A/34A/35A)
Measured Frequency:	77.76 MHz ±3.5 ppm (±272.26 Hz)
Aging:	±1 ppm/year (±77.76 Hz)
Level:	unbalanced TTL (J2330A/31A/32A)
	ac coupled, nominal ECL (J4233A/34A/35A)

Description

This test verifies that the 2.5 GHz internal Clock is within its specified limits, by measuring a divided-down version of the clock at the **Ref Clock Out** port. The **Ref Clock Out** port has a SMA-type connector that outputs an unbalanced clock signal. The limits take in to account the accuracy, stability and ageing of the clock and assume that the module is within its calibration cycle.

Equipment Required

Frequency Counter:	5335A Option 010
Cable, SMA to SMA (0.5 meter):	E1675-64210
Adapter, SMA (female) to BNC (male):	1250-2015

Procedure

1. Connect the **Ref Clock Out** port to the Frequency Counter.
2. Select **Rate : 2.488G** on the Soft Front Panel.
3. Check that the measured clock frequency is 77,760000 MHz ± 3.5 ppm. (Equivalent to an internal clock frequency of 2.48832 GHz ±11.2 kHz.)

J4233A/34A/35A Modules Only

4. Repeat steps 2 and 3 for **Rates : 1.244G, 622M** and **155M**.
5. Disconnect the Frequency Counter.

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Transmitter Optical Power and Wavelength Test

Specifications

Table 5-3. J4230A, J4233A
Optical Power and Wavelength Specifications

Wavelength:	1310 nm ±20 nm
Power Output:	Maximum: +2 dBm Minimum: –1 dBm Typical: +1 dBm
Rate	2.488G (All); 1.244G; 622M; 155M (J4233A)
Safety Class:	Class 1

Table 5-4. J4231, J4234A
Optical Power and Wavelength Specifications

Wavelength:	1550 nm ±5 nm
Power Output:	
Std.	Maximum: +2 dBm Minimum: –1 dBm Typical: +1 dBm
Option 001	Maximum : +4 dBm Minimum : +1 dBm Typical: +3 dBm
Rate	2.488G (All); 1.244G; 622M; 155M J4234A)
Safety Class:	Class 1

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Table 5-5. J4232A, J4235A
Optical Power and Wavelength Specifications

Option:	Wavelength:	Option:	Wavelength:
001	1536.61 nm ±0.07 nm	031	1548.51 nm ±0.07 nm
002	1537.01 nm ±0.07 nm	032	1548.91 nm ±0.07 nm
003	1537.40 nm ±0.07 nm	033	1549.32 nm ±0.07 nm
004	1537.90 nm ±0.07 nm	034	1549.72 nm ±0.07 nm
005	1538.19 nm ±0.07 nm	035	1550.12 nm ±0.07 nm
006	1538.59 nm ±0.07 nm	036	1550.52 nm ±0.07 nm
007	1538.98 nm ±0.07 nm	037	1550.92 nm ±0.07 nm
008	1539.38 nm ±0.07 nm	038	1551.32 nm ±0.07 nm
009	1539.77 nm ±0.07 nm	039	1551.72 nm ±0.07 nm
010	1540.17 nm ±0.07 nm	040	1552.12 nm ±0.07 nm
011	1540.56 nm ±0.07 nm	041	1552.52 nm ±0.07 nm
012	1540.96 nm ±0.07 nm	042	1552.92 nm ±0.07 nm
013	1541.35 nm ±0.07 nm	043	1553.33 nm ±0.07 nm
014	1541.75 nm ±0.07 nm	044	1553.73 nm ±0.07 nm
015	1542.14 nm ±0.07 nm	045	1554.13 nm ±0.07 nm
016	1542.54 nm ±0.07 nm	046	1554.53 nm ±0.07 nm
017	1542.94 nm ±0.07 nm	047	1554.94 nm ±0.07 nm
018	1543.33 nm ±0.07 nm	048	1555.34 nm ±0.07 nm
019	1543.73 nm ±0.07 nm	049	1555.75 nm ±0.07 nm
020	1544.12 nm ±0.07 nm	050	1556.15 nm ±0.07 nm
021	1544.53 nm ±0.07 nm	051	1556.55 nm ±0.07 nm
022	1544.91 nm ±0.07 nm	052	1556.95 nm ±0.07 nm
023	1545.32 nm ±0.07 nm	053	1557.36 nm ±0.07 nm
024	1545.72 nm ±0.07 nm	054	1557.76 nm ±0.07 nm
025	1546.12 nm ±0.07 nm	055	1558.17 nm ±0.07 nm
026	1546.52 nm ±0.07 nm	056	1558.57 nm ±0.07 nm
027	1546.92 nm ±0.07 nm	057	1558.98 nm ±0.07 nm
028	1547.32 nm ±0.07 nm	058	1559.39 nm ±0.07 nm
029	1547.72 nm ±0.07 nm	059	1559.79 nm ±0.07 nm
030	1548.12 nm ±0.07 nm	060	1560.20 nm ±0.07 nm
		061	1560.61 nm ±0.07 nm
Power Output:			
	Maximum: +2 dBm		
	Minimum: –1 dBm		
	Typical: +1 dBm		
Rate:	2.488G (All), 1.244G, 622M; 155M (J4235A)		
Safety Class:	Class 1		

Description

This test verifies the Optical Output Power and Wavelength at each of the Transmitter optical **Out** ports.

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Equipment Required

Lightwave Multimeter	8153A
Power Meter Sensor Module:	81536A
Optical Attenuator	8156A
Multi-wavelength Meter	81620B
Optical Cables:	11871A (x 2)
FC/PC Optical Connectors:	81000FI (x 2)

Procedure

J4230A, J4233A Transmitter Modules

WARNING **At switch-on, the Transmitter Lasers are enabled in the ON condition. Ensure that at any unused optical "Out" ports are fitted with an optical cover BEFORE switching on.**

1. Switch on the VXI mainframe and check that all the Transmitter Module **Laser On** LEDs are ON (indicating that the lasers are enabled).

2. Using the Soft Front Panel, select the following parameters:

Transmitter Setup	
Transmitter	Tx 1
Channel	1
Format	SDH
Rate	2.488G
Pattern	PRBS 23

3. Connect the Transmitter module, **Channel 1** optical **Out** port to the 8153A (ensure that all connections are tight and that the cable has 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.
   c. Press **PARAM** key to display Time [t]
   d. Using ←,→ ↑ and ↓ keys, set the time to 20 ms.
   e. Press **PARAM** key to display REF.
   f. Using ←,→ ↑ and ↓ keys, set the REF to 0.00 dBm.

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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. Check the optical power reading is between –1 dBm and +2 dBm.
7. Disconnect the optical cable from the 8153A and connect it to the 81620B.
8. Press **PRESET** on the 81620B.
9. Check that the wavelength is 1310 nm ±20 nm.
10. For J4233A Modules repeat steps 2 to 9 at **Rates : 1.244G, 622M** and **155M**.
11. Repeat steps 2 to 10 for **Channel 2, 3** and **4** optical **Out** ports.

J4231A, J4234A Transmitter Modules

WARNING **At switch-on, the Transmitter Lasers are enabled in the ON condition. Ensure that at any unused optical "Out" ports are fitted with an optical cover BEFORE switching on.**

1. Switch on the VXI mainframe and check that all the Transmitter Module **Laser On** LEDs are ON (indicating that the lasers are enabled).
2. Using the Soft Front Panel, select the following parameters:

Transmitter Setup	
Transmitter	Tx 1
Channel	1
Format	SDH
Rate	2.488G
Pattern	PRBS 23

3. Connect the Transmitter module **Channel 1** optical **Out** port to the 8153A (ensure that all connections are tight and that the cable has no twists).
4. Set up the 8153A as follows:

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a. Press PARAM key to display wavelength [λ]
b. Using ←, → ↑ and ↓ keys, set the wavelength to 1550 nm.
c. Press PARAM key to display Time [t]
d. Using ←, → ↑ and ↓ keys, set the time to 20 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. Check that the optical power reading is between −1 dBm and +2 dBm. For Option 001 modules, check that the optical power reading is between +1 dBm and +4 dBm.

Note The 8153A measures +3 dBm maximum input optical power. For Option 001 modules with optical output power > +3 dBm, the Power Meter reading will go out of range. Insert the 8156A Optical attenuator between the optical Out port and the 8153A. This will add a 4 dB insertion loss into the optical signal path. Check that the optical power reading is now between -3 dBm and 0 dBm. (Equivalent to optical power in the range +1 dBm to +4 dBm, through an insertion loss of 4 dB.)

7. Disconnect the optical cable from the 8153A and connect it to the 81620B.

8. Press PRESET on the 81620B.

9. Check that the wavelength is 1550 nm ±5 nm.

10. For J4234A Modules repeat steps 2 to 9 at **Rates : 1.244G, 622M** and **155M**.

11. Repeat steps 2 to 10 for **Channel 2, 3** and **4** optical **Out** ports.

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WARNING **At switch-on, the Transmitter Lasers are enabled in the ON condition. Ensure that at any unused optical "Out" ports are fitted with an optical cover BEFORE switching on.**

1. Switch on the VXI mainframe and check that all the Transmitter Module **Laser On** LEDs are ON (indicating that the lasers are enabled).

2. Using the Soft Front Panel, select the following parameters:

Transmitter Setup	
Transmitter	Tx 1
Channel	1
Format	SDH
Rate	2.488G
Pattern	PRBS 23

3. Connect the Transmitter module **Channel 1** optical **Out** port to the 8153A (ensure that all connections are tight and that the cable has 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 the wavelength shown on the **Out** port of the module.
   c. Press **PARAM** key to display Time [t]
   d. Using ←, → ↑ and ↓ keys, set the time to 20 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. Check that the optical power reading is between −1 dBm and +2 dBm.

7. Disconnect the optical cable from the 8153A and connect it to the 81620B.

8. Press **PRESET** on the 81620B.

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9. Check that the wavelength is within the limits shown in the specifications in Table 5-5, “J4232A, J4235A Optical Power and Wavelength Specifications”, on page 49.

10. For J4235A Modules repeat steps 2 to 9 at **Rates : 1.244G, 622M** and **155M**.

11. Repeat steps 2 to 10 for **Channel 2, 3** and **4** optical **Out** ports.

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Performance Test Record

J4230A, J4231A, J4232A, J4233A, J4234A, J4235A
SpectralBER DWDM Transmitter Modules

Location: *Serial No.:*

Tested by:

Temperature: *Certified by:*

Humidity: *Date:*

Page	Test Description		Result		
			Min.	**Actual**	**Max.**
	Transmitter Clock Test				
	Step 3	77,760,000 MHz	77,759,650 MHz		77,760,350 MHz
	Step 4	Repeat 3		Pass/Fail	
	Transmitter Optical Power & Wavelength Test J4230A, J4233A				
	Step 1	**Laser** LEDs		On/Off	
	Step 6	>–1 dBm <+2 dBm	–1 dBm		+2 dBm
	Step 9	1310 nm	1290 nm		1330 nm
	Step 10	Repeat 2 to 9		Pass/Fail	
	Step 11	Repeats 2 to 10		Pass/Fail	
	Transmitter Optical Power & Wavelength Test J4231A, J4234A				
	Step 1	**Laser** LEDs		On/Off	
	Step 6	Standard: >–1 dBm <+2 dBm Option 001: =1 dBm to +4 dBm	 –1 dBm +1 dBm		 +2 dBm +4 dBm
	Step 9	1550 nm	1545 nm		1555 nm
	Step 10	Repeat 2 to 9		Pass/Fail	
	Step 11	Repeat 2 to 10		Pass/Fail	

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Page	Test Description		Result		
			Min.	Actual	Max.
	Transmitter Optical Power & Wavelength Test J4232A, J4235A				
	Step 1	**Laser** LEDs		On/Off	
	Step 6	>–1 dBm <+2 dBm	–1 dBm		+2 dBm
	Step 9	See Table 5-5. on page 49		Pass/Fail	
	Step 10	Repeat 2 to 9		Pass/Fail	
	Step 11	Repeat 2 to 10		Pass/Fail	

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