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J1421A/J1422B/J1426A/J1427A 10G SpectralBER

Clock Source/MTS/BITS and Transmitter Module User's Manual (Part No. J1420-90015)

Where to Find it - Online and Printed Information:

System installation (hardware/software)	VXIbus Configuration Guide* This Manual SpectralBER Installation & System Reference Manual
Module configuration/control	SpectralBER Installation & System Reference Manual This Manual
SCPI information	Agilent SpectralBER Remote Control Manual
VXI programming	Agilent SpectralBER UID Online Help
VXI example programs	Agilent SpectralBER UID Online Help Agilent SpectralBER Remote Control Manual VXI function reference Agilent SpectralBER UID Online Help
Soft Front Panel information	SpectralBER Installation & System Reference Manual Agilent SpectralBER UID Online Help
VISA language information	Agilent VISA User's Guide

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Legal and Safety Information

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Agilent Product: J1421A, J1422B,J1426A, J1427A **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.

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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.

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Laser Safety Warning

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

The Agilent J1422B, Agilent J4230A, Agilent J4231A and Agilent 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 J1422B/J4230A/31A/32A Transmitter 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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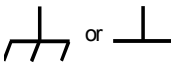
Safety Symbols



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 Protective Earth 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 Company 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 a 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 a 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 "DECLARATION OF CONFORMITY" 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 Receiver and Transmitter Modules are **not** user replaceable.

In both 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:	Clock Source Module
Model Number:	J1421A
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 825-1(1993) / EN 60825-1(1994) (LEDs)
Canada / CSA-C22.2 No. 1010.1-93

The product herewith complies with the requirements of the Low Voltage Directive 73/23/EEC, and carries the CE mark accordingly.

South Queensferry, Scotland. 24 ***February 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 Limited**
Manufacturer's Address:	Telecomms Networks Test Division South Queensferry West Lothian, EH30 9TG Scotland, United Kingdom

Declares that the product

Product Name:	Transmitter Module 9.953Gb/s
Model Number:	J1422B
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 60 825-1(1993) / EN 60825-1(1994)

The product herewith complies with the requirements of the General Product Safety Directive 92/59/EEC and the EMC Directive 89/336/EEC and carries the CE-marking accordingly.
This product was tested in a typical configuration.

South Queensferry, Scotland. October 20 2000



Robert Tait / Product Regulations Manager

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DECLARATION OF CONFORMITY

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

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

Declares that the product

Product Name:	2MHz MTS Module
Model Number:	J1426A
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 825-1(1993) / EN 60825-1(1994) (LEDs)

The product herewith complies with the requirements of the General Product Safety Directive 92/59/EEC and the EMC Directive 89/336/EEC and carries the CE-marking accordingly.
This product was tested in a typical configuration.

South Queensferry, Scotland. October 20 2000

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DECLARATION OF CONFORMITY

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

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

Declares that the product

Product Name:	1.5Mb/s BITS Module
Model Number:	J1427A
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 825-1(1993) / EN 60825-1(1994)

The product herewith complies with the requirements of the General Product Safety Directive 92/59/EEC and the EMC Directive 89/336/EEC and carries the CE-marking accordingly.
This product was tested in a typical configuration.

South Queensferry, Scotland. October 20 2000



Robert Tait / Product Regulations Manager

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Chapter 1
Module Overview

Introduction

This manual provides you with information about the following modules:

- Agilent J1421A Clock Source Module
- Agilent J1422B Transmitter Module
- Agilent J1426A 2 MHz MTS Module
- Agilent J1427A 1.5 Mb/s BITS Module

Description

The J1421A, J1422B, J1426A, and the J1427A are register-based C-size VXI modules. The J1421A is a two-slot module and the J1422B is a three-slot module. The J1426A and J1427A are one-slot modules.

The Agilent J1421A Clock Source has the following characteristics:

- Generates a 10 Gb/s or 2.5 Gb/s clock source which can be offset by up to ±20 ppm.
- Accepts an external reference source of 156 MHz, 622 MHz, or 2.5 GHz.
- Accepts an external clock input at 10 GHz or 2.5 GHz.
- Can be slaved to a 156 MHz clock recovered from the J1420B Receiver module.

The Agilent J1422B Transmitter Module has the following characteristics:

- ITU-T 1550 nm wavelength optical output.
- Transmits SDH/SONET STM-64/OC-192 and STM-16/OC-48 framed signals.
- Concatenated payloads, channelized payloads down to VC-3/STS-1.
- Error injection.
- Alarm generation.
- Pointer control.
- Generates J0/J1 trace messages.
- APS control.
- Signal and path overhead edit.

The Agilent J1426A 2 MHz MTS Module has the following characteristics:

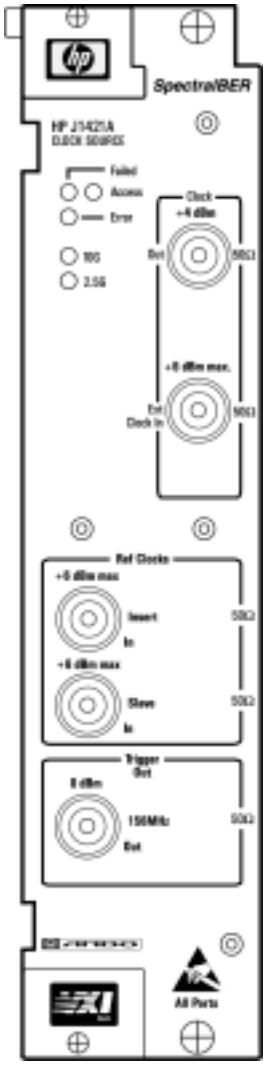
- Supplies a 156 MHz output signal from a 2 MHz reference clock input.

The Agilent J1427A 1.5 Mb/s BITS Module has the following characteristics:

- Supplies a 156 MHz output signal from a 1.5 Mb/s reference clock input.

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Front Panel Features (Agilent J1421A)



Agilent J1421A

Clock

Clock Out (APC-3.5 Connector)

This port outputs clock signals generated by the module. It outputs either 9.95328 GHz or 2.48832 GHz clocks. The output level is nominally +4 dBm.

Ext Clock In (APC-3.5 Connector)

This port accepts line clock inputs at 9.95328 GHz or 2.48832 GHz. The required input level is nominally +4 dBm.

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Ref Clocks

Ref Clock In Insert (SMA Connector)

This is an external reference clock input. It can accept 2.48832 GHz, 622.08MHz, or 155.52MHz. The required input level is nominally 0 dBm).

Ref Clock In Slave (SMA Connector)

This is a reference clock input. Connect this port to the J1420B Receiver Module to synchronize the Clock Source Module with received data, by using the Receiver 155.52 MHz Ref Clock. The input level is nominally 0 dBm.

Trigger Out

Trigger Out 156MHz (SMA Connector)

This is the internal reference clock output at 155.52 MHz. The output amplitude is nominally 0 dBm.

LEDs

Failed (Red) – Turned on when Fail is detected during a module self test. When the self-test is successful, this LED is turned off.

Access (Green) – Turned on when the module is accessed via the VXIbus.

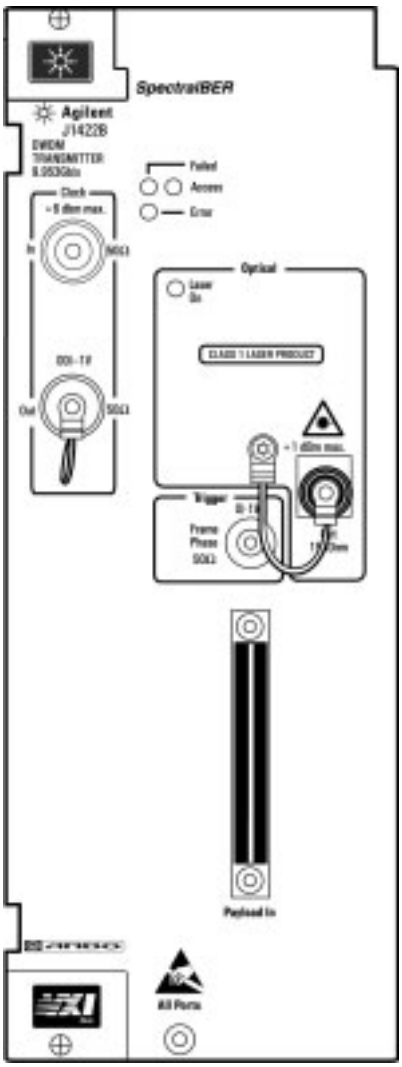
Errors (Red) – Turned on when a module error message exists, a SCPI command error for example. The LED is turned off after the error message is read.

10G (Green) – Turned on when a 9.95328 GHz clock is being generated in normal operation. The LED is not on when using an external input.

2.5G (Green) – Turned on when a 2.48832 GHz clock is being generated in normal operation. The LED is not on when using an external input.

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Front Panel Features (Agilent J1422B)



Agilent J1422B

Clock

Clock In (APC-3.5 Connector)

This port takes the line clock from the J1421A Clock Source Module. The input level is nominally +4 dBm.

Clock Out (APC-3.5 Connector)

The output at this port is split from the line clock inserted at the Clock In port. The output level is nominally 0 dBm. Use this port if you need to run multiple Transmitter modules.

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Trigger Out

Frame Pulse (SMA Connector)

This outputs 8 kHz repeated frame pulses, synchronized with STM-64/OC-192 frame signals. The level is nominally 0/−1 V.

Optical

Optical Out (Universal Optical Connector)

This port outputs the optical STM-64/OC-192 data signals. The wavelength is in the 1550 nm band. The output power is 0 ± 1 dBm for the standard module and 2.5 ± 0.5 dBm for the option 001 module.

LEDs

Failed (Red) – Turned on when Fail is detected during a module self test. When the self-test is successful, this LED is turned off.

Access (Green) – Turned on when the module is accessed via the VXIbus.

Errors (Red) – Turned on when a module error message exists, a SCPI command error for example. The LED is turned off after the error message is read.

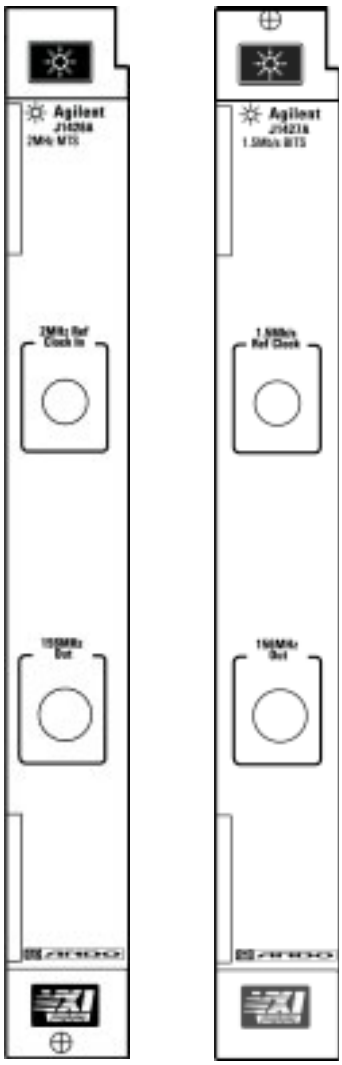
Laser On (Green) – Turned on when an optical signal is present at the Optical Out port.

Payload In

This connector is for future use.

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Front Panel Features (Agilent J1426A/J1427A)



Agilent J1426A/J1427A

Clock In

2 MHz Ref Clock In J1426A

(BNC 75 Ω Connector)

This port takes an external 2 MHz MTS input, the input level of which is between 0.75 and 1.5 Vp-p.

1.5 Mb/s Ref Clock J1427A

(BANTAM 100 Ω Balanced Connector)

This port takes an external 1.5 Mb/s BITS input, the input level of which is between 2.7 and 3.3 Vp-p.

Clock Out (J1426A/J1427A)

(SMA Connector)

The output at this port is a 156 MHz clock. The output level is nominally 0.7 Vp-p.

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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 (JP = Japan) 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.

Accessories

The following additional accessories are supplied with the J1421A and J1422B modules.

J1421A	System Software (CD-ROM) Semi rigid cable (Clock Source to Transmitter) Semi rigid cable (Receiver to Clock Source)
J1422B	System Software (CD-ROM)
J1426A/ J1427A	Semi rigid cable (Ref Clock to Clock Source)

Manuals

A set of manuals can be obtained by ordering the J1423A Manual Set. The manual set is comprised of the following:

- J1420B User's Manual
- J1421A/J1422BJ1426A/J1427A User's Manual
- Remote Control Manual
- Installation & System Reference Manual

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. 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 22
- "Operator Maintenance" on page 23

DO NOT operate damaged equipment: If there is any possibility that the safety protection features built into this product have been compromised, either through physical damage, excessive moisture, or for any other reason, DISCONNECT THE POWER and do not use the product until its safe

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operation can be verified by trained service personnel. If necessary, return the product to a Agilent Technologies Sales and Service Office for service and repair to ensure that 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 attempt to service or make adjustments alone: Under certain conditions, dangerous voltages may exist even when the equipment is switched off. To avoid dangerous electrical shock, trained service personnel must not attempt to service or make adjustments unless in the presence of someone capable of rendering first aid and resuscitation.

ESD Precautions

Caution **This module contains components that are sensitive to electrostatic discharge. To prevent damage to components, carefully follow the precautions described below.**

The smallest static charge the average person 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. Static damage will not often immediately cause a malfunction but will significantly reduce a component's life. By closely following the precautions below you 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.
- Before handling the module, select a work area where potential static sources have been minimized. Avoid working in carpeted areas and using nonconductive 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 and pick up the module with the other. Before installing the module, touch the metal surface of the VXI Mainframe with your free hand to ensure that you, the module and the VXI Mainframe have the same static potential. This also applies whenever you connect/disconnect cables on the front panel.

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Operator Maintenance

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

Maintenance that can be done by operators:

- Cabinet cleaning
- Optical connector cleaning

Cleaning

Cabinet Cleaning

Clean the cabinet with a damp cloth only.

Optical Connector Cleaning

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

Description	Agilent Part Number
Air 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 fiber may result.**

1. Switch off the VXI Mainframe, then remove the power cord from the AC main power socket.
2. Remove the adapters from the Out ports.
3. Using the air brush, clean the ferrules in both the standard flexible connector and the adapter.

Caution **If the optical fiber in the fixed connector requires further cleaning, the module will have to be disassembled – something that should only be carried out by trained service personnel.**

4. Dampen a piece of cleaning paper with isopropyl alcohol and clean the barrel of the adapter. Using a new piece of paper, clean the face of

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the adapter. Repeat, using a new piece of paper each time.

5. Lightly press the adhesive side of the tape (provided) against the front of the adapter, then remove quickly—repeat twice. This removes any particles of cleaning paper that may be remain.

6. Replace the adapters on the flexible connector.

Storage and Shipment

The module may be stored in or shipped to environments that meet the following conditions:

Temperature:	–20 °C to +60 °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 extreme temperatures that could cause interior condensation.

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 its 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-walled carton made of 350-pound test material is adequate.
- Use a layer of shock absorbing material 70 to 100 mm (3 to 4 inches) 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 using its model number and full serial number.

Weight

J1421A 3.5 kg (7.7 lb)

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	J1422B	4.5 kg (9.9 lb)
	J1426A	1.4 kg (3.1 lb)
	J1427A	1.4 kg (3.1 lb)
Dimensions	**J1421A**	261 mm (10.3 in) height, 60 mm (2.36 in) width, 360 mm (14 in) depth
	J1422B	261 mm (10.3 in) height, 90 mm (3.54 in) width, 360 mm (14 in) depth
	J1426A	261 mm (10.3 in) height, 30 mm (1.18 in) width, 360 mm (14 in) depth
	J1427A	261 mm (10.3 in) height, 30 mm (1.18 in) width, 360 mm (14 in) depth

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Chapter 2
Installation

Initial Inspection

WARNING **TO AVOID HAZARDOUS ELECTRICAL SHOCK, DO NOT PERFORM ELECTRICAL TESTS IF YOU SEE ANY INDICATIONS OF SHIPPING DAMAGE TO ANY PORTION OF THE OUTER ENCLOSURE (COVERS, PANELS, METERS).**

Inspect the shipping container for damage. If the container or packing material has been damaged, it should be kept until the contents of the shipment have been inspected for completeness and all module functionality has been verified. Procedures for checking electrical operation are given in Chapter 4. If the shipment is incomplete or if there is damage or defects have been found, notify your nearest Agilent Technologies office. If the module does not pass the electrical performance tests described in Chapter 4, notify your nearest Agilent Technologies office. If the shipping container is damaged, or the packing material shows signs of wear, notify the carrier and your 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 a claim settlement.

Operating Environment

These modules are designed for indoor use only. **DO NOT** operate the product in the presence of flammable gases.

These modules may be operated in environments that satisfy the following conditions:

Temperature: 5°C – 35°C
Altitude: up to 3,050m (10,000ft).
Humidity: 30% – 85% relative humidity
The modules should be protected from extreme temperatures that could cause condensation.

Caution **The modules is designed for use in Installation Category II and Pollution Degree 2 (IEC 61010 and 644).**

Caution **VENTILATION: When installing the modules in a cabinet, make sure there is sufficient ventilation.**

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Preparation for Use

Caution

Damage can occur to the Agilent J1420B optical input port if it is connected directly to the Agilent J1422B optical output port.

If the module is not going to be used for a long period, fit the optical connector cover.

Power Requirements

Modules are powered by DC voltage provided from the backplane of the VXI Mainframe that houses the modules during normal operation.

Power consumption of each module:

J1421A	57 W
J1422B	100 W
J1426A	22W
J1427A	22W

Connecting Modules

WARNING

If this equipment is not used as specified, the protection provided by the equipment could be impaired. This instrument must be used in a normal condition only (in which all means for protection are intact).

Caution

Turn off all power to instruments and field wiring before installing or removing any module.

Regard all connectors as being at the same potential as the highest voltage applied to any connector.

Use Static Safe handling techniques. Only install with metal covers attached. Do not touch module connector contacts.

Before connecting or disconnecting, make sure you are properly grounded. Touch the metal surface of the VXI Mainframe with your free hand to ensure that you, the module and the mainframe have the same static potential. Modules remain susceptible to ESD damage while being installed in the VXI Mainframe. Additional ESD information is required when servicing. See "ESD Precautions."

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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
DIN	81000SI
SC	81000KI
ST	81000VI

SMA Adapters

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

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Installing and Removing the Module

Caution **Review the "ESD Precautions" on page 22 before installing or removing the module and switch the Mainframe OFF to prevent irreparable damage to the module or to the VXI Mainframe.**

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

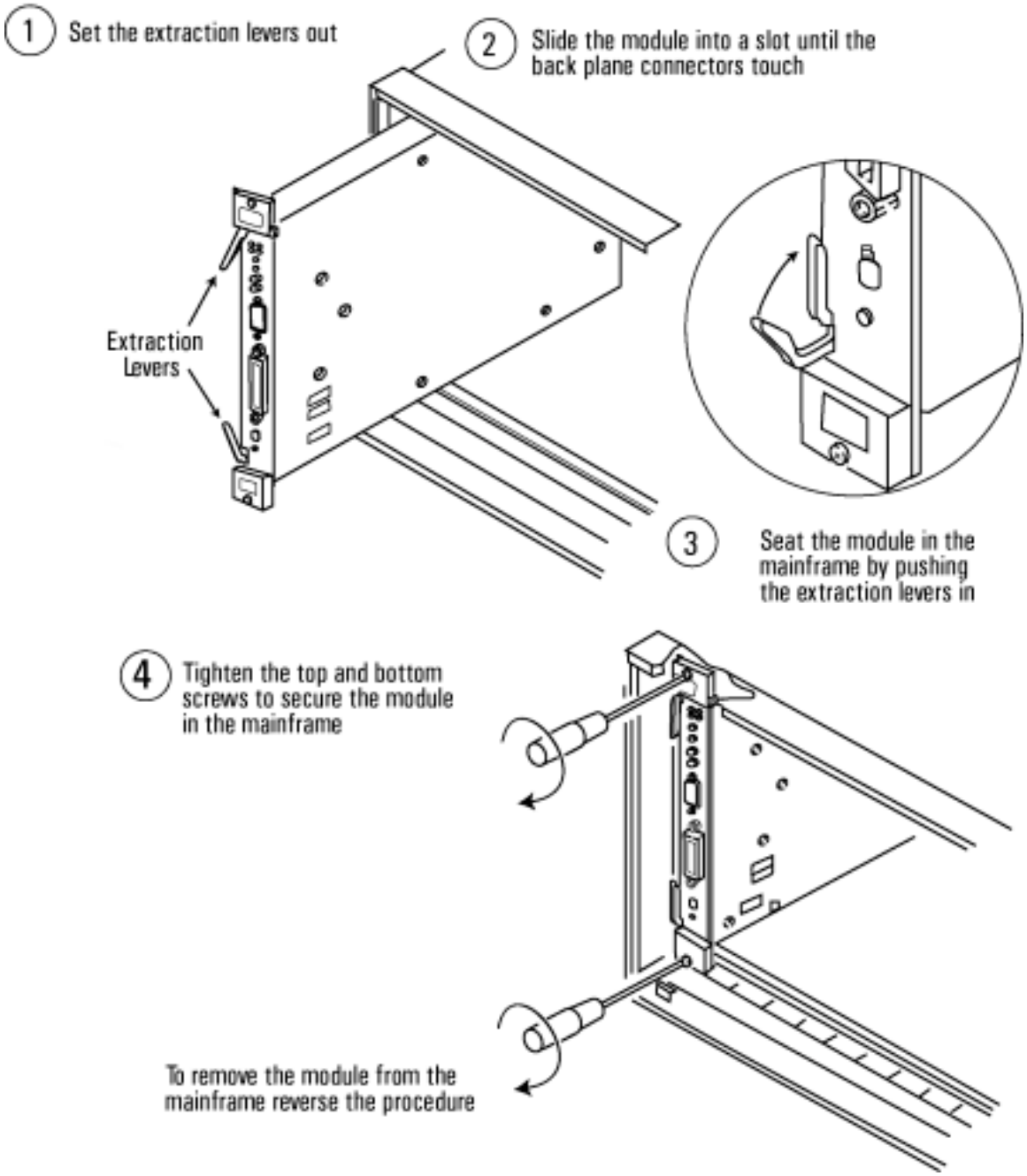


Figure 2-1. Installing and Removing a Module

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Addressing

An Agilent 10 Gb/s System is a “virtual instrument” in VXI terms, consisting of a number of message based servants. The servants can be any mix of Clock Source, Transmitters and/or Receivers.

To create the VXI instrument, the normal VXI rules as regards logical address settings must be observed. Each servant Clock Source, Transmitter and/or Receiver must have its logical address set such that it is unique within the VXI Mainframe and within the servant area setting of the Slot 0 Command Module. The logical addresses of the servant modules are set by switches on the modules. A typical configuration is shown in the “Installation” chapter of the *Installation & System Refernce Manual.*

Assign a logical address to the Clock Source or Transmitter module by setting the DIP switches that are accessed on the rear panel of the module (see diagram below). Switches 0 (LSB) to 7 (MSB) are marked on the clamshell enclosure.

Note The factory default logical address of the J1421A and J1422B is 8 and 16 respectively (GPIB secondary address 01 and 02 respectively). The setting selected must not conflict with the logical address of any other module in the system. The J1426A and J1427A are not GPIB modules and therefore have no address switches.

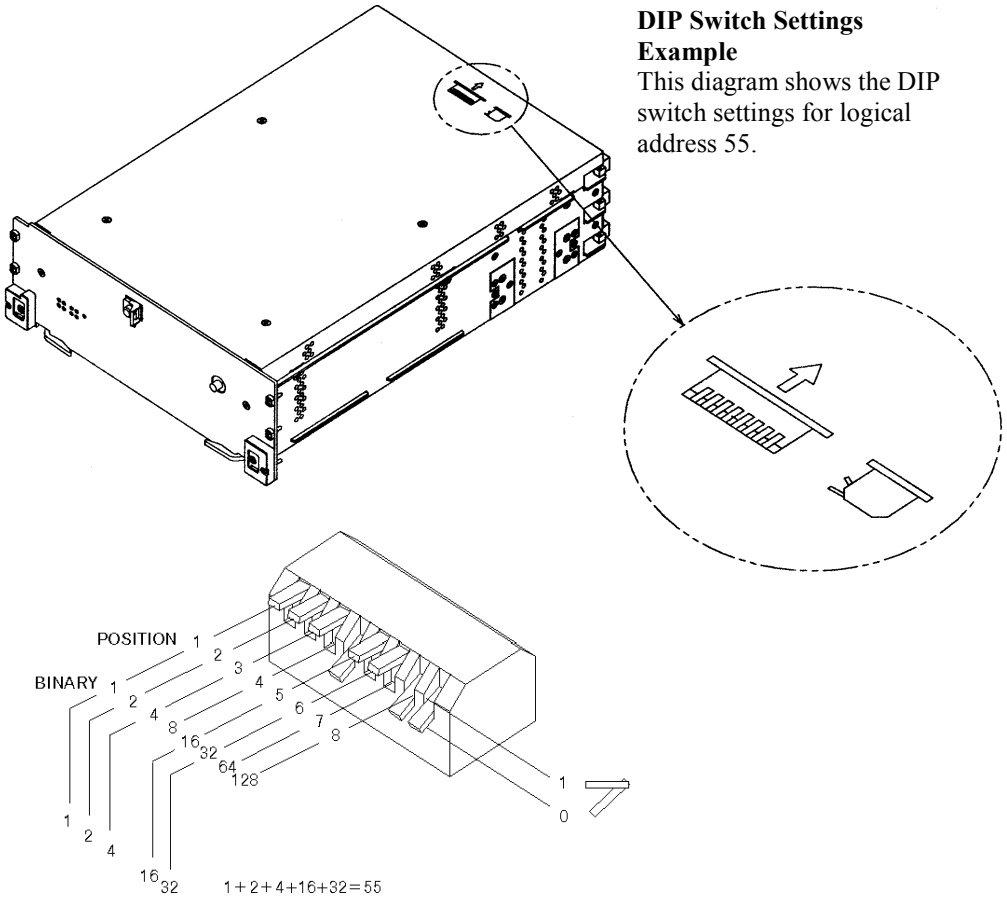
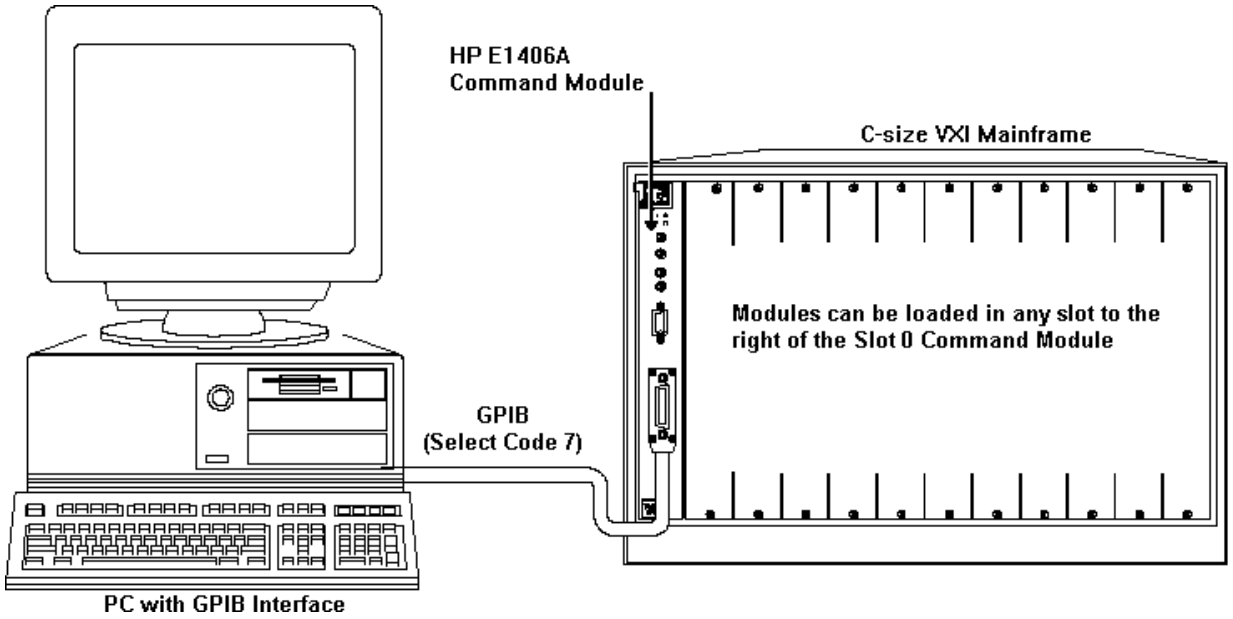


Figure 2-2. Setting the Logical Address Switches

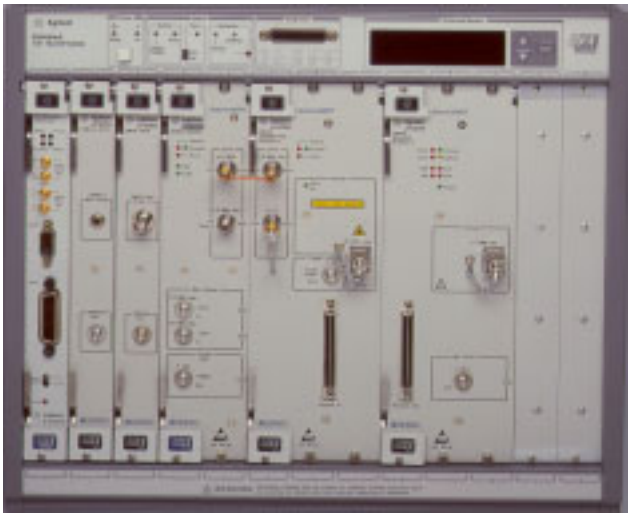
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Module Slot Location

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



The following example shows the two timing source modules, a Clock Source module, a Transmitter module and a Receiver module mounted in a VXI Mainframe.



Verifying Module Installation

Refer to the *Installation & System Reference Manual* Chapter 2 for a procedure to verify module installation.

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Connecting Modules

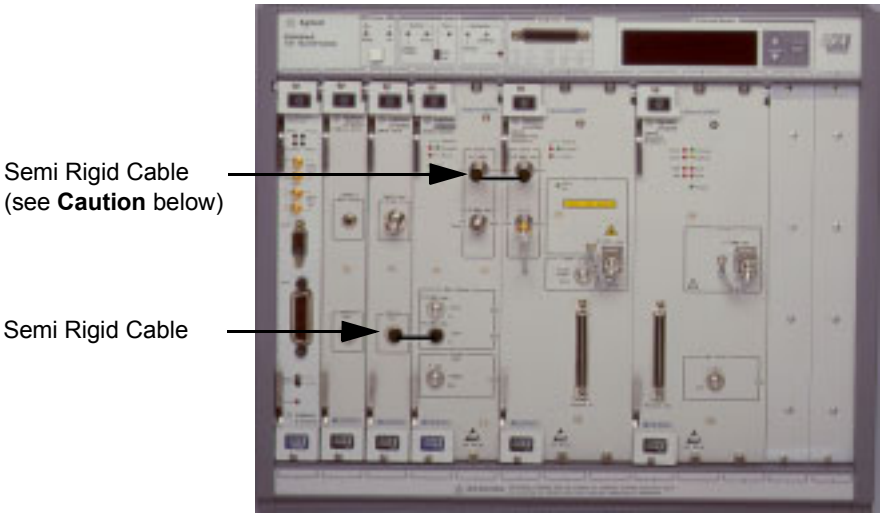
Electrical Connection

The J1422B Transmitter Module does not have an internal clock generator. Connect one of the timing source modules (if required) the J1421A Clock Source Module and the J1422B Transmitter as follows:

1. Connect the source clock (MTS or BITS) to the Timing Source module (Ref In).

2. Connect the Timing Source module (Clock Out) to the Clock Source module (Ref Clock In Insert). Use the semi rigid cable provided as shown below.

3. Connect the Clock Source module (Clock Out) to the J1422B Transmitter Module (Clock In). Use the semi rigid cable provided as shown below.



Caution **Use the cable provided to connect the J1421A Clock Source and J1422B Transmitter modules. The line clock signal from the Clock Source is at 10 GHz.**

Note Optimum performance of Precision 3.5 mm connectors is achieved when they are tightened to a torque of 90 Ncm (5 lb-inch).

Optical Connection

Connect the optical cable to the Transmitter **Optical Out** connector, connect the other end of the optical cable to the Receiver **Optical In** connector or to the device to be tested.

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Chapter 3
Module Control

Introduction

SpectralBER modules can be controlled from a PC or workstation using SCPI commands, Universal Instrument Drivers (UIDs) or manually using 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 Agilent SpectralBER software, controlling modules manually or using UIDs, see the *Installation & System Reference Manual*.

For more information on using SCPI commands, see the *Remote Control Manual*.

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Chapter 4
Verification Tests

Introduction

This chapter contains information to verify the J1421A Clock Source, the J1422B Transmitter, the J1426A 2 MHz MTS Reference Clock and the J1427A 1.5 Mb/s (BITS) Reference Clock modules, 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.

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. Recommended Test Equipment

Instrument	Critical Specification		Recommended Model
Frequency Counter	Range: Input Level:	10 Hz to 20 GHz +6 dBm	Agilent 5343A
Frequency Synthesizer[1]			Agilent 3335A Option 001
75 Ohm Unbal/110 Bal Convertor[2]			Agilent 15508B
Lightwave Multimeter	800 to 1700 nm		Agilent 8153A
Power Meter Sensor Module	800 to 1700 nm	+3 to –70 dBm	Agilent 81536A
Multi Wavelength Meter	Wavelength accuracy :	3 ppm (0.005 nm at 1550 nm)	Agilent 86120B
Optical Attenuator	Wavelength: Range: Insertion Loss:	1200 to 1600 nm 0 to 30 dB 4 dB	Agilent 8156A
FC/PC Optical Interface Connector	Unique		Agilent 81000FI (x 4)
Optical Cable	Unique		Agilent 11871A (x 2)
Cable[1]	BNC to BNC	75 Ohm, 1 meter	Agilent 15525A
Cable	SMA to SMA	0.5 meter	Agilent E1675-64210
Adapter	SMA (female) to BNC (male)		Agilent 1250-2015

1. This test equipment is only required if a J1426A 2 MHz MTS reference clock module or a J1427A 1.5 Mb/s BITS reference clock module is fitted.
2. This test equipment is only required if a J1427A 1.5 Mb/s BITS reference clock module is fitted.

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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 40. These results can be used to verify that a module is operational or if further performance testing is required.

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J1421A Clock Source

Specifications

Table 4-2. Clock Module Specifications

Internal Clock Frequency:	9.953288000 GHz ±4.6 ppm (±45,785 Hz)
156 MHz Trigger Out	155.520000 MHz

Description

This test verifies that the 9.953288 GHz internal Clock is within its specified limits, by measuring the clock at the **Clock Out** port. The limits take in to account the accuracy, stability and ageing of the clock and assume that the module is within its calibration cycle. The Trigger signal is checked by measuring the frequency at the **Trigger Out** port. Both **Clock Out** and **Trigger Out** ports are SMA type connectors.

Equipment Required

Frequency Counter:	5343A
Cable, SMA to SMA (0.5 meter):	E1675-64210
Adapter, SMA (female) to BNC (male):	1250-2015

Procedure

1. Switch on the VXI mainframe and check that the Clock Source module **10G** LED is ON.
2. Connect the **Clock Out** port to the 500 MHz - 26.5 GHz input on the Frequency Counter.
3. Select 500 MHz - 26.5 GHz setting on the Frequency Counter.
4. Check that the measured clock frequency is 9.953288000 GHz ±4.6 ppm. (±45,785 Hz.)
5. Disconnect the **Clock Out** port from the Frequency Counter.
6. Connect the **Trigger Out** port to the 10 Hz to 500 MHz input on the Frequency Counter.
7. Select 10 Hz - 500 MHz setting and 50 Ohm setting on the Frequency Counter.
8. Check that the measured frequency is nominally 155.52 MHz.
9. Disconnect the Frequency Counter.

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J1422B Transmitter Module

Specifications

Table 4-3. J1422B Transmitter Specifications

Wavelength:	1528 to 1563 nm (typically 1557 nm)
Power Output: STD	Maximum: +1 dBm Minimum: –1 dBm Typical: +0 dBm
Option 001	Maximum: +3 dBm Minimum: +2 dBm Typical: +2.5 dBm
Safety Class:	Class 1
Clock Frequency	9.953288000 GHz ±4.6 ppm (45,785 Hz)
Frame Pulse	8000 Hz (typical)

Description

This test verifies the wavelength and output power of the Transmitter optical **Out** port. The test also verifies that the **Clock Out** port is functional.

Equipment Required

10G Clock Source	J1421A
Lightwave Multimeter	8153A
Power Meter Sensor Module:	81536A
Optical Attenuator	8156A
Multi-wavelength Meter	86120B
Optical Cables:	11871A (x 2)
FC/PC Optical Connectors:	81000FI (x 2)
Frequency Counter	5343A
Cable SMA to SMA (0.5 meter)	E1675-64210
Adapter, SMA (female) to BNC (male)	1250-2015

Procedure

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.**

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Optical Wavelength and Output Power

1. Switch on the VXI mainframe and check that the Transmitter Module **Laser On** LED is ON (indicating that the laser is enabled)

2. Connect the **Clock Out** port on the J1421A Clock Source to the **Clock In** port on the J1422B Transmitter Module.

3. Connect the Transmitter module, optical **Out** port to the Agilent 86120B (ensure that all connections are tight and that the cable has no twists).

4. Press [PRESET] on the Agilent 86120B.

5. Check that the wavelength is between 1527 nm and 1563 nm. Note the wavelength.

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

7. Set up the Agilent 8153A as follows:
   a. Press PARAM key to display wavelength [λ]
   b. Using [←],[→] [↑] and [↓] keys, set the wavelength to the wavelength measured on the Agilent 86120B. (typically 1557 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.

8. Press [MODE] to select the Power Level measurement on the Agilent 8153A.

9. Check that the optical power reading is between −1 dBm and +1 dBm. (For Option 001, the reading should be between +2 dBm and +3 dBm.)

Clock Out

10. Connect the **Clock Out** port to the 500 MHz - 26.5 GHz input on the Frequency Counter.

11. Select 500 MHz - 26.5 GHz setting on the Frequency Counter.

12. Check that the measured clock frequency is 9.953288000 GHz ±4.6 ppm. (±45,785 Hz.)

13. Disconnect the **Clock Out** port from the Frequency Counter.

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J1426A 2 MHz MTS Reference Clock Module

Specifications

Table 4-4. J1426A Reference Clock Module Specifications

Clock Input Rate: Amplitude:	 2.028 MHz ±20 ppm 0.75 Vp to 1.5 Vp
Clock Output Frequency:	 155.52 MHz

Description

This test verifies that a 155.52 MHz clock signal is output at the **156 MHz Out** port when a 2 MHz reference clock signal is applied at the **2 MHz Ref Clock In** port. The 156 MHz Out port is an SMA type connector and the 2 MHz Ref Clock In port is a BNC connector.

Equipment Required

Frequency Counter	5343A
Frequency Synthesizer	3335A Option 001
Cable, BNC to BNC, (1 meter)	15525A
Cable, SMA to SMA (0.5 meter):	E1675-64210
Adapter, SMA (female) to BNC (male):	1250-2015

Procedure

1. Insert the J1426A 2 MHz MTS reference clock module into the VXI mainframe and switch on.
2. Connect the **156 MHz Out** port to the 10 Hz - 500 MHz input on the Frequency Counter.
3. Select 10 Hz - 500 MHz setting and 50 Ohm setting on the Frequency Counter.
4. Check that the signal at the **156 MHz Out** port is a nominal 155.52 MHz free-running clock signal.
5. Connect the **2 MHz Ref Clock In** port to the Output port on the Frequency Synthesizer.
6. Set the Frequency Synthesizer to output a 4 dBm level signal at a frequency of 2.0480 MHz ±20 ppm (2.048040 MHz to 2.047960 MHz).
7. Check that the measured frequency at the **156 MHz Out** port is 155.52 MHz ±20 ppm (155.523000 MHz to 155.517000 MHz).

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J1427A 1.5 Mb/s (BITS) Reference Clock Module

Specifications

Table 4-5. J1427A Reference Clock Module Specifications

Clock Input Rate: Amplitude:	 1.544 MHz ±20 ppm 2.7 Vp to 3.3 Vp
Clock Output Frequency:	 155.52 MHz

Description

This test verifies that a 155.52 MHz clock signal is output at the **156 MHz Out** port when a 1.544 Mb/s reference data signal is applied at the **1.5 Mb/s Ref Clock** port. The 156 MHz Out port is an SMA type connector and the 1.5 Mb/s Ref Clock port is a 100 Ohm Bantam connector.

Equipment Required

Frequency Counter	5343A
Frequency Synthesizer	3335A Option 001
75 Ohm Unbal/110 Ohm Bal Convertor	15508B
Cable, SMA to SMA (0.5 meter):	E1675-64210
Adapter, SMA (female) to BNC (male):	1250-2015

Procedure

1. Insert the J1427A 1.5 Mb/s BITS reference clock module into the VXI mainframe and switch on.
2. Connect the **156 MHz Out** port to the 10 Hz - 500 MHz input on the Frequency Counter.
3. Select 10 Hz - 500 MHz setting and 50 Ohm setting on the Frequency Counter.
4. Check that the signal at the **156 MHz Out** port is a nominal 155.52 MHz free-running clock signal.
5. Connect the 75 Ohm Unbal/110 Ohm Bal Convertor between the Frequency Synthesizer and the **1.5 Mb/s Ref Clock** port.
6. Set the Frequency Synthesizer to output a 10 dBm signal at a frequency of 155.52 MHz ±20 ppm (155.523000 MHz to 155.517000 MHz).
7. Check that the measured frequency at the **156 MHz Out** port is 155.52 MHz ±20 ppm (155.523000 MHz to 155.517000 MHz).

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Verification Test Record

J1421A Clock Source
J1422B Transmitter Module
J1426A 2 MHz MTS Reference Clock
J1427A 1.5 Mb/s (BITS) Reference Clock

Location: *Serial No.:*

Tested by:

Temperature: *Certified by:*

Humidity: *Date:*

Page	Test Description		Result		
			Min.	**Actual**	**Max.**
	J1421A Clock Module				
	Step 1	**Laser** LED		On/Off	
	Step 4	**Clock Out**	9.953235215 GHz		9.953325785
	Step 8	**Trigger Out**		Pass/Fail	
	J1422B Transmitter Module				
	Step 1	**Laser** LED		On/Off	
	Step 5	Wavelength	1527 nm		1563 nm
	Step 9	>–1 dBm <+1 dBm	–1 dBm		+1 dBm
	Step 9	>+2 dBm <+3 dBm	+2 dBm		+3 dBm
	Step 12	**Clock Out**	9.953235215 GHz		9.953325785
	J1426A 2 MHz MTS				
	Step 4	155.52 MHz		Pass/Fail	
	Step 7	156 MHz Out	155.523000 MHz		155.517000 MHz
	J1427A 1.5 Mb/s BITS				
	Step 4	155.52 MHz		Pass/Fail	
	Step 7	156 MHz Out	155.523000 MHz		155.517000 MHz

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Chapter 5
Performance Tests

Introduction

This chapter contains Performance Tests to test the warranted specifications of the J1421A Clock Source and the J1422B Transmitter module, using PC or Workstation soft panel control. If no soft panel control is available, or if only a basic operational check is required, refer to Chapter 4 "Verification Tests". (The J1426A 2 MHz MTS Reference Clock and the J1427A 1.5 Mb/s (BITS) Reference Clock modules can also be tested, but do not require soft panel control.)

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: Input Level:	10 Hz to 20 GHz +6 dbm	Agilent 5343A
Signal Source	Range: Level:	10 MHz to 10 GHz +10 dBm	Agilent 83711B
Frequency Synthesizer[1]			Agilent 3335A Option 001
75 Ohm Unbal/110 Bal Convertor[2]			Agilent 15508B
Lightwave Multimeter	800 nm to 1700 nm		Agilent 8153A
Power Meter Sensor Module	800 nm to 1700 nm	+3 dBm to -70 dBm	Agilent 8153A
Multi Wavelength Meter	Wavelength accuracy :	3 ppm (0.005 nm at 1550 nm)	Agilent 86120B
Optical Attenuator	Wavelength: Range: Insertion Loss:	1200 to 1600 nm 0 to 30 dB 4 dB	Agilent 8153A
FC/PC Optical Interface Connector	Unique		Agilent 81000FI (x 4)
Optical Cable	Unique		Agilent 11871A (x 2)
Cable[1]	BNC to BNC	75 Ohm, 1 meter	Agilent 15525A
Cable	SMA to SMA	0.5 meter	Agilent E1675-64210
Adapter	SMA (female) to BNC (male)		Agilent 1250-2015

1. This test equipment is only required if a J1426A 2 MHz MTS reference clock module or a J1427A 1.5 Mb/s BITS reference clock module is fitted.
2. This test equipment is only required if a J1427A 1.5 Mb/s BITS reference clock module is fitted.

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Calibration Cycle

Depending upon 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 56. 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 the periodic maintenance, troubleshooting or after repair.

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J1421A Clock Module

Specifications

Table 5-2. Clock Module Specifications

Clock Output	10G 2.5G
Clock Timing Source	
Internal	9.953288000 GHz ±4.6 ppm 2.488320000 GHz ±4.6 ppm
Frequency Offset	±20 ppm
Insert	2.488320000 GHz ±20 ppm 622.080000 MHz ±20 ppm 155.520000 MHz ±20 ppm
Slave	155.520000 MHz ±20 ppm
External	9.953288000 GHz ±20 ppm 2.488320000 GHz ±20 ppm
Trigger Out	155.520000 MHz nominal

Description

This test verifies that the internal Clock is within its specified limits, by measuring the clock at the **Clock Out** port. The limits take in to account the accuracy, stability and ageing of the clock and assume that the module is within its calibration cycle. The tests also checks that the clock module operates using the following timing sources: Insert, Slave and External, by applying the appropriate signal and measuring at the **Clock Out** port. The Trigger signal is checked by measuring the frequency at the **Trigger Out** port.

Equipment Required

Frequency Counter:	Agilent 5343A
Signal Source	Agilent 83711B
Cable, SMA to SMA (0.5 meter):	Agilent E1675-64210
Adapter, SMA (female) to BNC (male):	Agilent 1250-2015

Procedure

Clock Out

1. Switch on the VXI mainframe and check that the Clock Source module **10G** LED is ON.

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2. Select the following **Clock Setup** parameters on the soft panel:

Mode:	**Internal**
Bit Rate:	**9.953 GHz**
Offset:	**0 ppm**

3. Connect the **Clock Out** port to the 500 MHz - 26.5 GHz input on the Frequency Counter.

4. Select 500 MHz - 26.5 GHz setting on the Frequency Counter.

5. Check that the measured clock frequency is between 9.953334 GHz 9.953242 GHz.

6. Set the Frequency Offset to +20 ppm.

7. Check that the measured clock frequency is between 9.953534 GHz and 9.953442 GHz.

8. Set the Frequency Offset to -20 ppm.

9. Check that the measured clock frequency is between 9.953134 GHz and 9.953042 GHz.

10. Set the Frequency Offset to 0 ppm

11. Select **Bit Rate : 2.488 GHz**

12. Check that the **2.5G** LED in ON and that the measured clock frequency is between 2.488331 GHz and 2.488309 GHz.

13. Set the Frequency Offset to +20 ppm.

14. Check that the measured clock frequency is between 2.488381 GHz and 2.488359 GHz.

15. Set the Frequency Offset to -20 ppm.

16. Check that the measured clock frequency is between 2.488281 GHz and 2.488259 GHz.

17. Set the Frequency Offset to 0 ppm

Insert Clock

18. Select the following parameters:

Mode:	**Insert**
Bit Rate:	**9.953 GHz**
Insert Freq:	**2.48832 GHz**

19. Connect the **Clock Out** port to the 500 MHz - 26.5 GHz input on the Frequency Counter.

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20. Select 500 MHz - 26.5 GHz setting on the Frequency Counter.

21. Check that the signal at the **Clock Out** port is a nominal 9.95328 GHz free-running clock signal.

22. Set the **Signal Source** to output a +6 dBm level signal at a frequency between 2.488370 GHz and 2.488270 GHz.

23. Connect the Signal Source to the **Insert** port.

24. Check that the signal at the **Clock Out** port synchronizes to the **Insert Clock** and that the measured frequency is between 9.953488 GHz and 9.953048 GHz.

25. Disconnect the **Clock Out** port from the Frequency Counter.

26. Select **Bit Rate : 622.08 MHz** and repeat steps 18 to 25 for **Insert Clock** rate of 622.080 MHz (±12 kHz).

27. Select **Bit Rate : 155.52 MHz** and repeat steps 18 to 25 for **Insert Clock** rate of 155.520 MHz (±3 kHz)

Slave Clock

28. Select the following parameters:

Mode:	**Slave**
Bit Rate:	**9.953 GHz**

29. Connect the Clock Out port to the 500 MHz - 26.5 GHz input on the Frequency Counter.

30. Select 500 MHz - 26.5 GHz setting on the Frequency Counter.

31. Check that the signal at the **Clock Out** port is a nominal 9.95328 GHz free-running clock signal.

32. Set the **Signal Source** to output a +6 dBm level signal at a frequency 155.523 MHz and 155.517 MHz.

33. Connect the Signal Source to the **Slave** port.

34. Check that the signal at the Clock Out port synchronizes to the **Insert Clock** and that the measured frequency is 9.953488 GHz and 9.953048 GHz.

External

35. Select the following parameters:

Mode	**External**
Bit Rate	**9.953 GHz**

36. Connect the Clock Out port to the 500 MHz - 26.5 GHz input on the Frequency Counter.

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37. Select 500 MHz - 26.5 GHz setting on the Frequency Counter.

38. Check that there is no signal at the **Clock Out** port.

39. Set the **Signal Source** to output a +6 dBM level signal at a frequency of between 9.953488 GHz and 9.953088 GHz.

40. Connect the Signal Source to the **Ext Clock In** port.

41. Check that the measured frequency at the **Clock Out** port is between 9.953488 GHz and 9.953088 GHz.

42. Disconnect the Signal Source from the **Ext Clock In** port.

43. Check that there is no signal at the **Clock Out** port.

44. Select **Bit Rate : 2.488 GHz**.

45. Set the **Signal Source** to output a +6 dBm level signal at a frequency of between 2.488370 GHz and 2.488270 GHz.

46. Connect the Signal Source to the **Ext Clock In** port.

47. Check that the measured frequency is between 9.953488 GHz and 9.953088 GHz.

48. Disconnect the Signal Source and the Frequency Counter.

Trigger Out

49. Select the following parameters.

Mode:	**Internal**
Bit Rate:	**9.953 GHz**
Offset:	**0 ppm**

50. Connect the **Trigger Out** port to the 10 Hz to 500 MHz input on the Frequency Counter.

51. Select 10 Hz - 500 MHz setting and 50 Ohm setting on the Frequency Counter.

52. Check that the measured frequency is nominally 155.52 MHz.

53. Disconnect the Frequency Counter.

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J1422B Transmitter Module

Specifications

Table 5-3. J1422B Transmitter Specifications

Wavelength:	1528 to 1563 nm (typically 1557 nm)
Power Output: STD	Maximum: +1 dBm Minimum: –1 dBm Typical: +0 dBm
Option 001	Maximum: +3 dBm Minimum: +2 dBm Typical: +2.5 dBm
Safety Class:	Class 1
Clock Frequency	9.953288000 GHz ±4.6 ppm 2.488320000 GHz ±4.6 ppm
Level	+6 dBm
Frame Pulse	8000 Hz (typical)

Description

This test verifies the wavelength and output power of the Transmitter optical **Out** port. The test also verifies that the **Clock Out** and the **Trigger** port (Frame Pulse) are functional.

Equipment Required

10G Clock Source	Agilent J1421A
Lightwave Multimeter	Agilent 8153A
Power Meter Sensor Module:	Agilent 81536A
Optical Attenuator	Agilent 8156A
Multi-wavelength Meter	Agilent 86120B
Optical Cables:	Agilent 11871A (x 2)
FC/PC Optical Connectors:	Agilent 81000FI (x 2)
Frequency Counter	Agilent 5343A
Cable SMA to SMA (0.5 meter)	Agilent E1675-64210
Adapter, SMA (female) to BNC (male)	Agilent 1250-2015

Procedure

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.**

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Optical Wavelength and Output Power

1. Switch on the VXI mainframe and check that the J1422B Transmitter Module **Laser On** LED is ON (indicating that the laser is enabled)

2. Check that the J1421A Clock Source module **10G** LED is ON.

3. Select the following soft panel parameters:

Clock Setup

Mode:	**Internal**
Bit Rate:	**9.953 GHz**
Offset:	**0 ppm**

Transmitter Setup

Format:	**SDH**	
Rate:	**STM64**	
Mapping:	**Internal**	
Mode:	**VC4-64C**	
Payload:	**Foreground:**	**PRBS 31 (NORM)**
	Background:	**PRBS 23 (NORM)**
Signal:	**Norm**	
Scramble:	**On**	

4. Connect the **Clock Out** port on the J1421A Clock Source to the **Clock In** port on the J1422B Transmitter Module.

5. Connect the Transmitter module, optical **Out** port to the Agilent 86120B (ensure that all connections are tight and that the cable has no twists).

6. Press PRESET on the Agilent 86120B.

7. Check that the wavelength is between 1527 nm and 1563 nm. Note the wavelength.

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

9. Set up the Agilent 8153A as follows:
   a. Press PARAM key to display wavelength [λ]
   b. Using ←, → ↑ and ↓ keys, set the wavelength to the wavelength measured on the Agilent 86120B. (typically 1557 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.

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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.

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

11. Check that the optical power reading is between –1 dBm and +1 dBm (For Option 001, the reading should be between +2 dBm and +3 dBm.)

12. Select **Bit Rate : 2.488 GHz** and repeat steps 5 to 11.

13. Disconnect the optical test equipment.

Clock Out

14. Select **Bit Rate : 9.953 GHz**.

15. Connect the **Clock Out** port to the 500 MHz - 26.5 GHz input on the Frequency Counter.

16. Select 500 MHz - 26.5 GHz setting on the Frequency Counter.

17. Check that the measured clock frequency is nominally 9.953288 GHz.

18. Select **Bit Rate : 2.488 GHz.**

19. Check that the measured frequency is nominally 2.48832 GHz

20. Disconnect the **Clock Out** port from the Frequency Counter.

Trigger Out

21. Connect the **Frame Pulse** port to the 10 Hz - 500 MHz input on the Frequency Counter.

22. Select 10 Hz - 500 MHz setting on the Frequency Counter.

23. Check that the measured frequency is typically 8000 Hz. (It may be necessary to set the input to 1 M Ohm setting.)

24. Disconnect the Test

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J1426A 2 MHz MTS Reference Clock Module

Specifications

Table 5-4. J1426A Reference Clock Module Specifications

Clock Input	
Rate:	2.028 MHz ±20 ppm
Amplitude:	0.75 Vp to 1.5 Vp
Clock Output	
Frequency:	155.52 MHz

Description

This test verifies that a 155.52 MHz clock signal is output at the **156 MHz Out** port when a 2 MHz reference clock signal is applied at the **2 MHz Ref Clock In** port. The 156 MHz Out port is an SMA type connector and the 2 MHz Ref Clock In port is a BNC connector.

Equipment Required

Frequency Counter:	Agilent 5343A
Frequency Synthesizer	Agilent 3335A Option 001
Cable, BNC to BNC, (1 meter)	Agilent 15525A
Cable, SMA to SMA (0.5 meter):	Agilent E1675-64210
Adapter, SMA (female) to BNC (male):	Agilent 1250-2015

Procedure

1. Insert the J1426A 2 MHz MTS reference clock module into the VXI mainframe and switch on.
2. Connect the **156 MHz Out** port to the 10 Hz - 500 MHz input on the Frequency Counter.
3. Select 10 Hz - 500 MHz setting and 50 Ohm setting on the Frequency Counter.
4. Check that the signal at the **156 MHz Out** port is a nominal 155.52 MHz free-running clock signal.
5. Connect the **2 MHz Ref Clock In** port to the Output port on the Frequency Synthesizer.
6. Set the Frequency Synthesizer to output a 4 dBm level signal at a frequency of 2.0480 MHz ±20 ppm (2.048040 MHz to 2.047960 MHz).
7. Check that the measured frequency at the **156 MHz Out** port is 155.52 MHz ±20 ppm (155.523000 MHz to 155.517000 MHz).

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J1427A 1.5 Mb/s (BITS) Reference Clock Module

Specifications

Table 5-5. J1427A Reference Clock Module Specifications

Clock Input	
Rate	1.544 MHz ±20 ppm
Amplitude	2.7 Vp to 3.3 Vp
Clock Output	
Frequency	155.52 MHz

Description

This test verifies that a 155.52 MHz clock signal is output at the **156 MHz Out** port when a 1.544 Mb/s reference data signal is applied at the **1.5 Mb/s Ref Clock** port. The 156 MHz Out port is an SMA type connector and the 1.5 Mb/s Ref Clock port is a 100 Ohm Bantam connector.

Equipment Required

Frequency Counter:	Agilent 5343A
Frequency Synthesizer	Agilent 3335A Option 001
75 Ohm Unbal/110 Ohm Bal Convertor	Agilent 15508B
Cable, SMA to SMA (0.5 meter):	Agilent E1675-64210
Adapter, SMA (female) to BNC (male):	Agilent 1250-2015

Procedure

1. Insert the J1427A 1.5 Mb/s BITS reference clock module into the VXI mainframe and switch on.
2. Connect the **156 MHz Out** port to the 10 Hz - 500 MHz input on the Frequency Counter.
3. Select 10 Hz - 500 MHz setting and 50 Ohm setting on the Frequency Counter.
4. Check that the signal at the **156 MHz Out** port is a nominal 155.52 MHz free-running clock signal.
5. Connect the 75 Ohm Unbal/110 Bal Convertor between the Frequency Synthesizer and the **1.5 Mb/s Ref Clock** port.
6. Set the Frequency Synthesizer to output a 10 dBm signal at a frequency of 155.52 MHz ±20 ppm (155.523000 MHz to 155.517000 MHz).
7. Check that the measured frequency at the **156 MHz Out** port is 155.52 MHz ±20 ppm (155.523000 MHz to 155.517000 MHz).

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Performance Test Record

J1421A Clock Source
J1422B Transmitter Modules
J1426A 2 MHz MTS Reference Clock
J1427A 1.5 Mb/s (BITS) Reference Clock

Location: *Serial No.:*

Tested by:

Temperature: *Certified by:*

Humidity: *Date:*

Page	Test Description			Result	
			Min.	Actual	Max.
	J1421A Clock Module				
		Clock Out			
	Step 1	10G Laser LED		On/Off	
	Step 5	9.953 GHz Clock	9.953242 GHz		9.953334 GHz
	Step 7	+20 ppm Offset	9.953442 GHz		9.953534 GHz
	Step 9	-20 ppm Offset	9.953042 GHz		9.953134 GHz
	Step 12	2.5G Laser LED		On/Off	
	Step 12	2.488 GHz Clock	2.488309 GHz		2.488331 GHz
	Step 14	+20 ppm Offset	2.488359 GHz		2.488281 GHz
	Step 16	-20 ppm Offset	2.488259		2.488281 GHz
		Insert			
	Step 21	9.953 MHz		Pass/Fail	
	Step 24	2.488 MHz Insert		Pass/Fail	
	Step 25	622.08 MHz Insert		Pass/Fail	
	Step 26	155.52 MHz Insert		Pass/Fail	
		Slave Clock			
	Step 30	9.953 MHz		Pass/Fail	
	Step 33	155 MHz Clock		Pass/Fail	
		External Clock			
	Step 37	No Signal		Pass/Fail	
	Step 40	9.953 MHz		Pass/Fail	

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Page	Test Description			Result	
			Min.	Actual	Max.
	Step 42	No Signal		Pass/Fail	
	Step 46	2.488 GHz		Pass/Fail	
		Trigger Out			
	Step 51	155.52 MHz		Pass/Fail	
	J1422B Transmitter Module				
	Step 1	Laser LED		On/Off	
	Step 2	10G LED		On/Off	
		9.953 GHz			
	Step 7	Wavelength	1527 nm		1563 nm
	Step 11	>–1 dBm <+1 dBm	–1 dBm		+1 dBm
	Step 11	>+2 dBm <+3 dBm	+ 2 dBm		+3 dBm
		2.488 GHz			
	Step 12	Wavelength	1527 nm		1563 nm
	Step 12	>–1 dBm <+1 dBm	–1 dBm		+1 dBm
		Clock Out			
	Step 17	9.953 GHz		Pass/Fail	
	Step 19	2.488 GHz		Pass/Fail	
		Trigger Out			
	Step 23	Frame Pulse 8 kHz		Pass/Fail	
	J1426A 2 MHz MTS				
	Step 4	155.52 MHz		Pass/Fail	
	Step 7	156 MHz Out	155.523000 MHz		155.517000 MHz
	J1427A 1.5 Mb/s BITS				
	Step 4	155.52 MHz		Pass/Fail	
	Step 7	156 MHz Out	155.523000 MHz		155.517000 MHz

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