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SpectralBER System

2.5 Gb/s and below Installation and System Reference Manual (Part No. J4221-90052)

Where to Find it - Online and Printed Information:

System installation (hardware/software) ..	VXIbus Configuration Guide* This Manual
Module configuration/control	This Manual J4225A/26A/27A DWDM Receiver and J4230A/31A/32A/33A/34A/35A Clock Source/DWDM Transmitter Module User's Manuals
SCPI information	SpectralBER System Remote Control Manual
VXI programming	SpectralBER UID Online Help
VXI example programs	SpectralBER UID Online Help SpectralBER System Remote Control Manual This Manual
VXI function reference	SpectralBER UID Online Help
Soft Front Panel information	This Manual J4225A/26A/27A DWDM Receiver and J4230A/31A/32A/33A/34A/35A Clock Source/DWDM Transmitter Module User's Manuals SpectralBER UID Online Help
VISA language information	VISA User's Guide

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

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Legal and Safety Information

Agilent Technologies Warranty Statement

Agilent Product: SpectralBER System **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.

8. Agilent will be liable for damage to tangible property per incident up to the greater of $300,000 or the actual amount paid for the product that is the subject of the claim, and for damages for bodily injury or death, to the extent that all such damages are determined by a court of competent jurisdiction to have been directly caused by a defective Agilent product.

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.

U.S. Government Restricted Rights

The Software and Documentation have been developed entirely at private expense. They are delivered and licensed as "commercial computer software" as defined in DFARS 252.227- 7013 (Oct 1988), DFARS 252.211-7015 (May 1991) or DFARS 252.227-7014 (Jun 1995), as a "commercial item" as defined in FAR 2.101(a), or as "Restricted computer software" as defined in FAR 52.227-19 (Jun 1987)(or any equivalent agency regulation or contract clause), whichever is applicable. You have only those rights provided for such Software and Documentation by the applicable FAR or DFARS clause or the Agilent standard software agreement for the product involved.

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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Laser Safety Warning

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

The Agilent J1422B, 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 J1421A/J1422B/J1426A/J1427A 10G SpectralBER ClockSource/MTS/BITS and Transmitter Module User's Manual or the J4230A/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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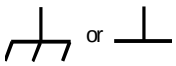
Safety Symbols



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 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 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 Controller
Model Number:	J4223A
Product Options:	This declaration covers all options of the above product as detailed in TCF A-5951-9852-01.

EMC:

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

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

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

Safety:

The product conforms to the following safety standards:

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

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

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

W.R. Pearson / Quality Manager

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DECLARATION OF CONFORMITY

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

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

Declares that the product

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

EMC:

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

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

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

Safety:

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IEC 60825-1(1993) / EN 60825-1:1994

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

EMC:

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

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

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

Safety:

The product conforms to the following safety standards:

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

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

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DECLARATION OF CONFORMITY

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

EMC:

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

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

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

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IEC 60825-1(1993) / EN 60825-1:1994

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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 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.

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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 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

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 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:	SpectraIBER 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:

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

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South Queensferry, Scotland. ***01 May 2000*** WJR Pearson

W.R. Pearson / Quality Manager

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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 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.

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

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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 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

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*** WRPearson

W.R. Pearson / Quality Manager

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

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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:	SpectraIBER 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
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Chapter 1
Getting Started with SpectralBER

This chapter contains general information on the composition of Agilent SpectralBER 2.5 Gb/s and below System.

It uses the E8404A C-Size Mainframe with enhanced monitoring capabilities. The enhanced monitoring capabilities allow you to monitor power supply voltages, mainframe temperatures, fan operation and backplane operation. Refer to the appropriate *VXI C-Size Mainframe User and Service Manual* for specific details of each mainframe.

Product Overview

A SpectralBER 2.5 Gb/s and below System is a C-Size VXI based system comprising:

- Agilent VXI C-Size Mainframe.
- Agilent E1406A Command Module.
- Agilent J4223A DWDM Controller.
- Agilent J4230A/31A/32A/33A/34A/35A Transmitter Modules and/or Agilent J4225A/26A/27A Receiver Modules in any combination.

The system can be controlled from a PC or workstation using any of the following:

- SCPI Commands
- Universal Instrument Drivers
- A Soft Front Panel

In a SpectralBER 2.5 Gb/s and below System each VXI mainframe must contain a Command Module and a DWDM Controller, to provide the required control of the register-based Transmitter/Receiver modules.

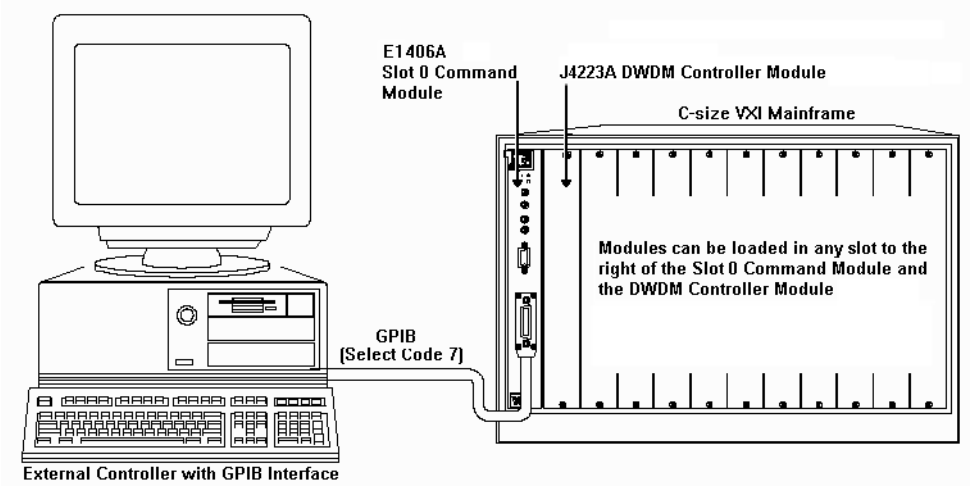
Each Transmitter and Receiver module occupies 2 VXI slots. In one 13 slot C-Size VXI Mainframe therefore, in addition to the single slot Command and DWDM Controller modules, a maximum of 5 Modules can be accommodated, either Transmitters, Receivers or a mixture of both.

Note To be EMC compliant, all unused slots in the VXI Mainframe must be filled with an EMC Filler Panel (Agilent Part No. E8400-60202).

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VXI Mainframe & Command Module

Details of the VXI Mainframe and the Command Module are in the manuals suppled with those components. (Refer to the *VXI C-Size Mainframe User and Service Manual* and the *Command Module Users Manual)*.



Controller/Module Communication

To communicate with modules, SCPI commands are sent from the external controller to the Command Module in slot 0. The commands are passed to the DWDM Controller Module and from there to individual modules using commander/servant module addressing, see “Addressing” below.

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Addressing

Addressing used in the SpectralBER system is outlined below:

Element	Comments
External Controller	Assigned an GPIB interface select code - normally 7.
Slot 0 Command Module	a. Assigned an GPIB primary address - normally 9. (Subsequent VXI Mainframes each require different addresses). b. Assigned a VXIbus logical address - normally 0.
Commander (DWDM Controller)	a. Assigned a VXIbus logical address - its value must be a multiple of 8, and is set using switches on the module. The commander's GPIB secondary address is derived from the logical address by dividing the logical address value by 8. b. Assigned a VXIbus servant area - its value is set by a second series of switches located on the module, and defines the address range in which servants can be addressed for that commander. Normally, the servant area address range is 5 (maximum for a SpectralBER system).
Register Based Servant (Tx/Rx Modules)	Assigned a VXIbus logical address - its value must fall within the following two boundaries: the first boundary is defined by adding 1 to its commander's logical address, the second boundary is defined by adding together the commander's servant area value and logical address value. *For example, if a commander has a logical address of 24, and a servant area of 5, the servant area address range is 25 through 29.* Note that the servant area address range must not include commander modules.

Error Reporting

When an error occurs, an error indicator lights on the DWDM Controller module, and an error message stored in the system error queue. The message can be read using the **SYSTem:ERRor?** command.

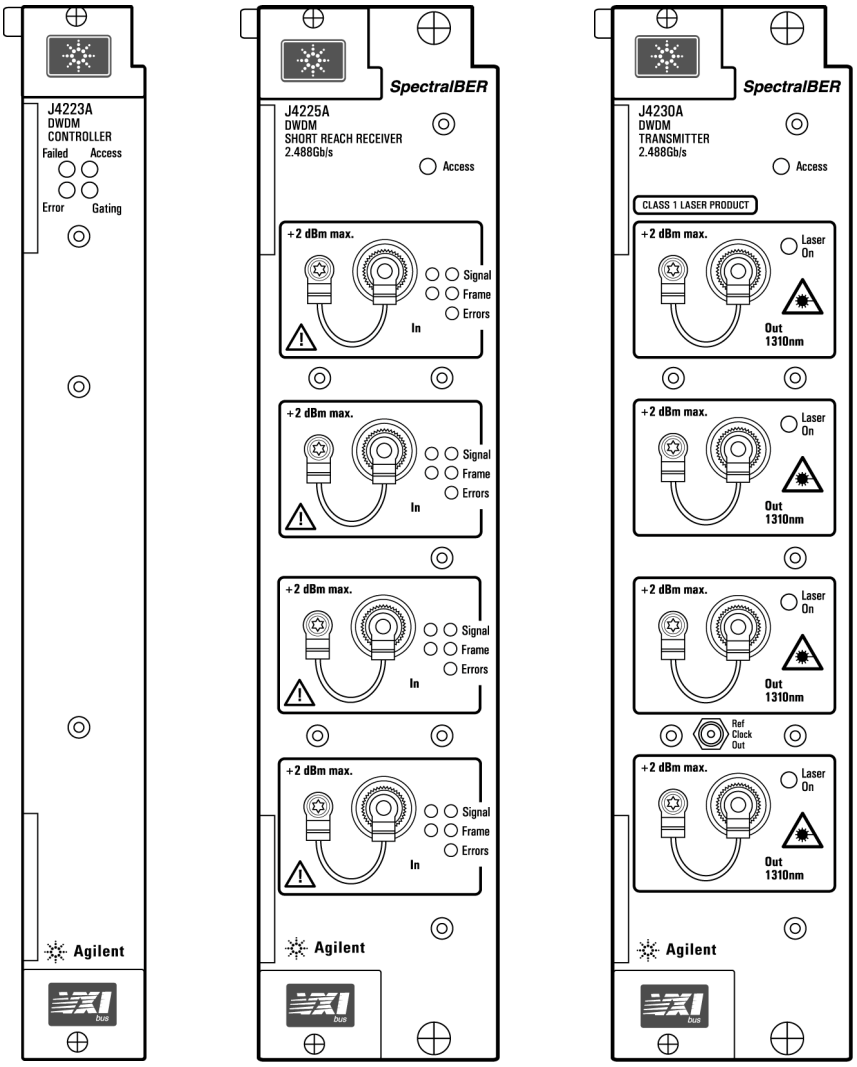
It is recommended that error messages are read from this queue as they occur, since the error condition may affect the integrity of a measurement. The error indicator extinguishes when the error message is read.

Up to 30 error messages can be held in the queue. Messages are read on a first in first out basis; when a message is read it is removed from the queue. If the error queue becomes full and another error condition is detected, the last entry in the queue is replaced with error message 350 QUEUE OVERFLOW. No more errors are recorded while this condition exists.

If the error queue is empty, the message +0 NO ERROR is returned to an error queue inquiry.

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System Modules



Typical 2.5 Gb/s and below System Modules

DWDM Controller (J4223A)

The Agilent J4223A is a single width C-Sized module that provides the processor capability for the SpectralBER System. It provides the control for the Transmitter modules and the control and results gathering capability for the Receiver modules. The interface to the system is via SCPI commands sent to the Command Module which communicates with the DWDM Controller.

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Transmitter Modules (J4230A/31A/32A/33A/34A/35A)

The Agilent J4230A, J4231A, J4232A, J4233A, J4234A and J4235A 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. The Agilent J4232A and J4235A 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

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

Unframed

Module	Signal Rate	PRBS Patterns
All	2.488320 Gb/s	PRBS 2^{23}-1 (inverted) PRBS 2^{15}-1 (inverted) PRBS 2^{11}-1 PRBS 2^{9}-1
J4233A/34A/35A Only	1.244160 Gb/s 622.08 Mb/s 155.52 Mb/s	

Error Add

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

For more information about these modules, refer to the appropriate *DWDM Transmitter Module User's Manuals* and the *Specification* document supplied in the *System Manuals* Binder.

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Receiver Modules (J4225A/26A/27A)

The Agilent J4225A (Short Reach), J4226A (Long Reach) and J4227A (Long Reach) are registered-based C-Size double slot VXI modules. Each module has four optical input ports, each port can receive optical signals with wavelengths between 1200 nm and 1600 nm.

In a 2.5 Gb/s (Agilent J4225A and J4226A) and 2.5 Gb/s, 622 Mb/s or 155.5 Mb/s (Agilent J4227A) signal carrying PRBS payloads these modules make BER measurements, capture the J0 trace message, detect B1, B2 and Bit errors and detect alarms as listed below:

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

For more information about these modules, see the appropriate *DWDM Receiver Module User's Manuals* and the *Specification* document supplied in the *System Manuals* Binder.

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Chapter 2
Installation

SpectralBER 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 containers for damage. If the shipping containers or cushioning material is damaged, it should be kept until the contents of the shipment have been checked for completeness and the system has been checked both mechanically and electrically. Procedures for checking electrical operation are given in the individual module User's Manuals. If the contents of the shipment are incomplete, if there is mechanical damage or defect, notify the nearest Agilent Office. If the system does not pass the electrical performance tests given in the individual module User's Manual, notify the nearest Agilent 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 office. Keep the shipping materials for the carrier's inspection. The Agilent office will arrange for repair or replacement without waiting for claim settlement.

Operating Environment

This system is designed for indoor use only. **DO NOT** operate the product in an explosive atmosphere or in the presence of flammable gases or fumes. The system may be operated in environments within the following limits:

Temperature: 0 ^{o}C to +40 ^{o}C (+5 ^{o}C to +35 ^{o}C 10 Gb/s System).

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

Humidity: up to 95% (30% to 85% 10 Gb/s System) relative humidity to 40 ^{o}C.

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

Caution **The module is designed for use in Installation Category II and Pollution Degree 2 per IEC 61010 and 644 respectively.**

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Cooling Requirements

VXI modules are cooled by air drawn through the back of the VXI Mainframe and exhausted from the sides. Both mainframes E8403A and E8404A provide adequate cooling for SpectralBER modules. Details of cooling requirements will be found in the *Transmitter* and *Receiver Modules User's Manual.*

Caution **Do not restrict the air flow into or out of the VXI Mainframe.**

Power Requirements

VXI modules are powered from the VXI Mainframe. The E8404A provides adequate power for SpectralBER modules. Full details of mainframe power requirements will be found in the *E8404A VXI C-Size Mainframe User and Service Manual.*

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Installing Hardware

Installing a GPIB Interface in your External Controller

The SpectralBER system requires an external controller (PC or Workstation) fitted with a GPIB interface. If you have not already done so, install a GPIB interface card and it's associated software in your external controller.

The following paragraphs describe installing an Agilent GPIB Interface. If installing any other manufacturer's GPIB Interface follow the installation instructions supplied with that interface.

1. Install the GPIB card in your external controller. (See the *GPIB Interface Installation Guide* for instructions.)

2. Install the GPIB software supplied with the GPIB interface in your external controller. (See the *I/O Libraries Installation and Configuration Guide* for instructions.)

Note As an example, instructions in a *GPIB Interface Installation Guide* show how to install a GPIB card in a PC. See Figure 2-1 below.

Caution **To avoid possible damage, wear an ESD wrist strap and observe ESD precautions installing (or removing) external controller cards.**

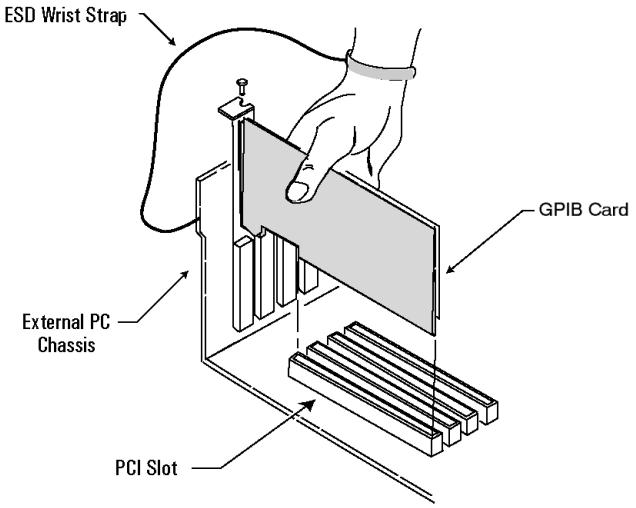


Figure 2-1. Example of Installing a GPIB Card

3. Turn the external controller ON and verify proper operation of the external controller.

Note Before you can use the external controller GPIB card with a VXI system, you must configure the interface. See "Install I/O Libraries" on page 44.

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Installing a VXI Mainframe

Install the VXI Mainframe (E8404A) using the information in Chapter 1 of the appropriate *Mainframe User and Service Manual.*

Installing a Module

Caution

Review "Connections" on page 34 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 and the module manuals for details.

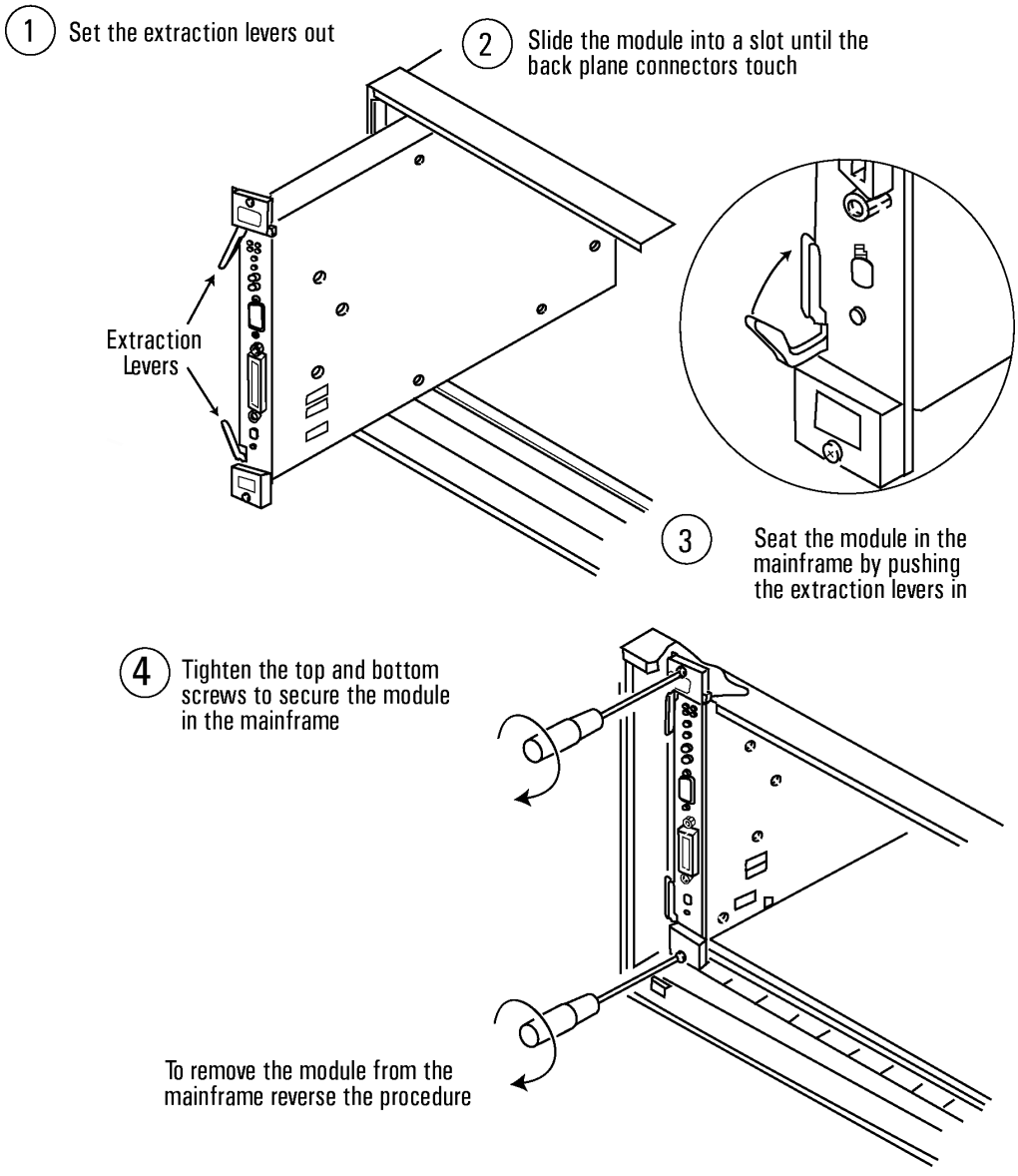


Figure 2-2. Installing a Module in a VXI Mainframe

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Installing Modules

Installing a Command Module

Install an Agilent Technologies E1406A Command Module in each VXI Mainframe using Chapter 1 of the *E1406A Command Module User's Manual.*

Installing a DWDM Controller Module

Install an Agilent Technologies J4223A DWDM Controller module in each VXI Mainframe using the following guidelines.

Set the Logical Address

This module is a commander, and therefore must have a logical address that is a multiple of 8. (This module is factory preset to logical address 8.)

If necessary you assign a new logical address to the module by setting a series of switches which you access through a slot in the clamshell enclosure, see Figure 2-3 on page 32. The switches are binary weighted, from *0* (LSB) to *7* (MSB). The weightings are marked on the cover.

Note

The logical address must not conflict with the logical address of any other module in the mainframe.

Set the Servant Area

The servant area of the DWDM Controller is factory preset to 7.

If necessary you assign a new servant area to the module by setting a series of switches which you access through a slot in the clamshell enclosure, see Figure 2-3 on page 32. The switches are binary weighted, from *0* (LSB) to *7* (MSB). The weightings are marked on the cover.

Module Location

The DWDM Controller module is usually located in a slot to the right of E1406A Command Module and to the left of any transmitter or receiver modules, however the precise slot you use is not important.

Install the Module

Refer to the instructions under "Installing a Module" on page 30 to install the module.

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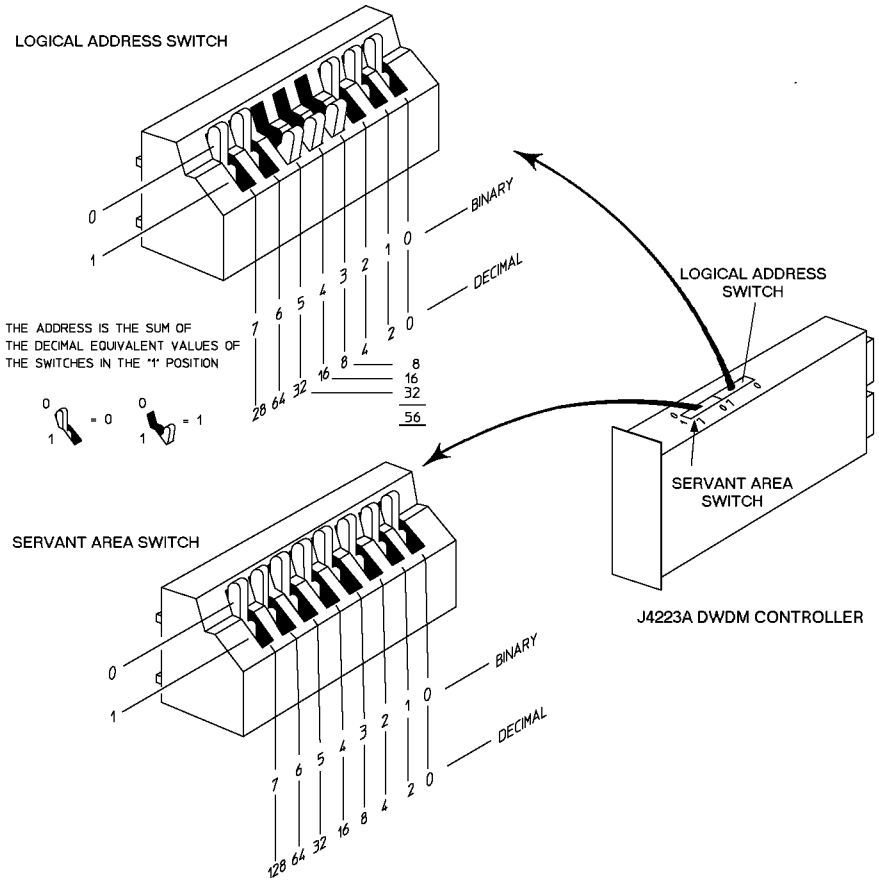


Figure 2-3. Setting DWDM Controller Address Switches

Installing Transmitters and/or Receivers

Install the Transmitters and/or Receivers in the VXI Mainframe using the information in Chapter 2 of the appropriate *Module User's Manual.*

SpectralBER Module Addressing

SpectralBER is a "virtual instrument" in VXI terms, consisting of a message based commander (the DWDM Controller) and up to 5 register based servants. The servants can be any mix of Transmitters and/or Receivers.

To create the VXI instrument, the normal VXI rules as regards logical address settings must be observed. Each servant 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 SpectralBER DWDM Controller. The logical addresses of the servant modules are set by switches on the modules. (Refer to the appropriate module User's Manual for details.) The logical address and servant area of the Commander are also set by switches, See "Installing a DWDM Controller Module" on page 31..

The logical address setting of the servant modules determines which SCPI supersystem (TMODule<m> or RMODule<m>, as defined in the *SpectralBER Remote Control Manual*) will control which module. The

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Transmitter module with the lowest logical address will be controlled by the :TMOD1 system. The :TMOD2 system will control the module with the next logical address and so on. The Receiver systems are allocated in the same way with :RMOD1 controlling the Receiver module with the lowest logical address and each subsequent Receiver being allocated in order of ascending logical address. A typical configuration is shown in Table 2-1:

Table 2-1. A Typical SpectralBER Mainframe Configuration

VXI Slot	Module	Logical Address	Servant Area	SCPI Supersystem
0	Slot 0 Controller (E1406A Command Module)	0[a.]	255[a]	
1	SpectralBER Commander (J4223A DWDM Controller)	8[a]	7[a.]	
2/3	SpectralBER Transmitter	9	---	:TMOD1
4/5	SpectralBER Transmitter	10	---	:TMOD2
6/7	SpectralBER Receiver	11	---	:RMOD1
8/9	SpectralBER Receiver	12	---	:RMOD2
10/11	SpectralBER Receiver	13	---	:RMOD3

a.Factory Default Setting

The example system above is addressed using SCPI commands as follows:

To set up channel 3 of the Transmitter module in Slots 2/3:

OUTPUT 70901; :TMOD1:SOUR3:DATA:TEL:PAY:PATT PRBS23

The 5 digit GPIB address (70901) is determined by:

Digit 1 (i.e. 7) GPIB select code on the controlling computer

Digits 2 & 3 (i.e. 09) GPIB primary address of the Slot 0 Controller

Digits 4 & 5 (i.e. 01) GPIB secondary address of the Commander. (The module Logical Address divided by 8.)

To setup channel 4 of the Receiver module in Slots 10/11:

OUTPUT 70901;:RMOD3:SENS4:DATA:TEL:PAY:PATT PRBS23

Full details of SpectralBER SCPI programming are in the *SpectralBER System Remote Control Manual*.

Module Location

It is not necessary to install the modules in the VXI rack in order of ascending logical address as in the example above, 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.

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Caution **Damage can occur to the optical input ports of the J4225A, J4226A and J4227A if they are connected directly to the optical output ports of the J4231A or J4234A Option 001.**



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

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 for protection are intact).**

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" in the module manuals.

Verify Module Installation

You can verify module installation using the soft front panel. (Soft front panel software installation information will be found in "Installing SpectralBER System Software" on page 43.)

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 2-4.:

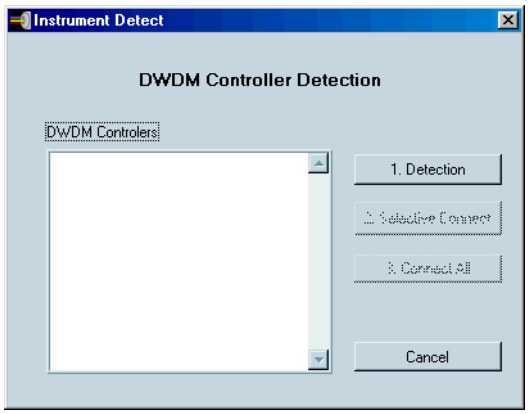


Figure 2-4. Instrument Detect Window

2. Click on the **1. Detection** button to detect all configured instruments connected to the external controller as shown in Figure 2-5. (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.

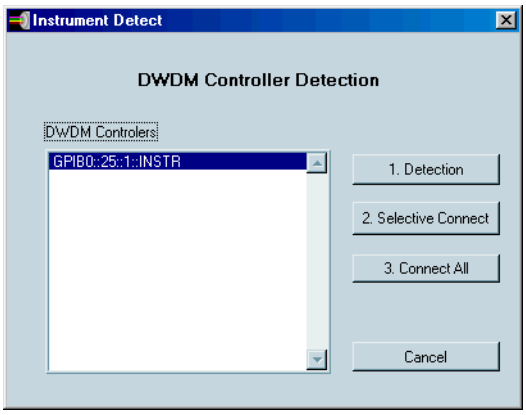


Figure 2-5. Instrument Found

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 2-6 shows a Typical Soft Front Panel.

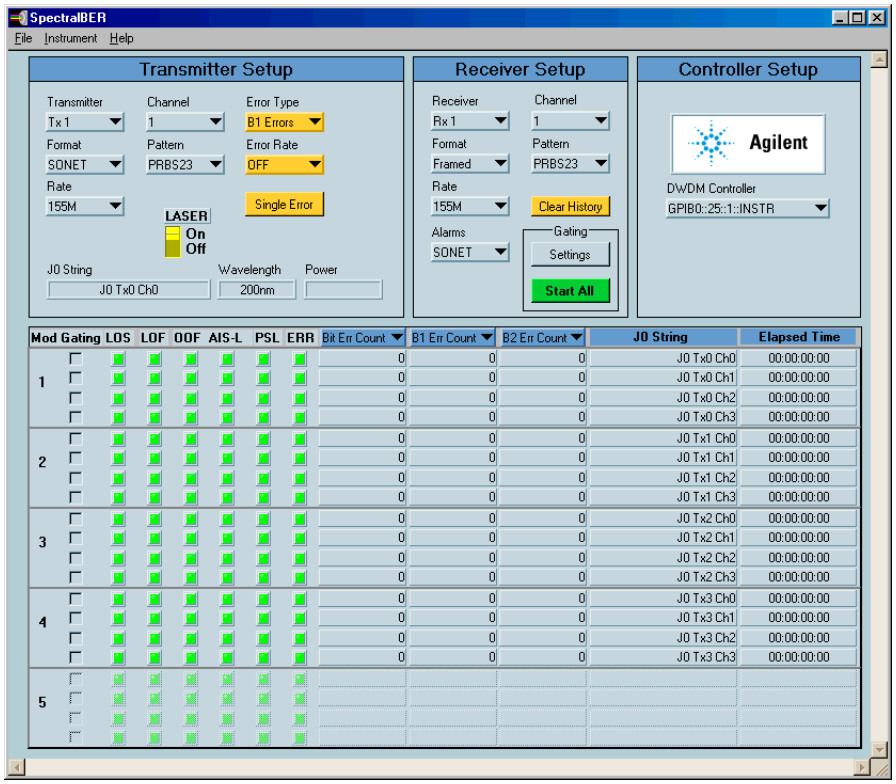


Figure 2-6. A Typical Soft Front Panel

A display similar to the one in Figure 2-6 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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Multiple Mainframe SpectralBER System

Your SpectralBER system supports multiple VXI Mainframes from one external controller. Additional mainframes are needed when your configuration requires more than 5 Transmit and/or Receive modules (the maximum number of Transmit and/or Receive nodules that can be accommodated in a single mainframe).

Each VXI Mainframe in the SpectralBER system requires an E1406A Command Module and a J4223A DWDM Controller Module. A typical system configuration consisting of 2 VXI Mainframes is shown in Figure 2-7 and the corresponding address map in Table 2-2 .

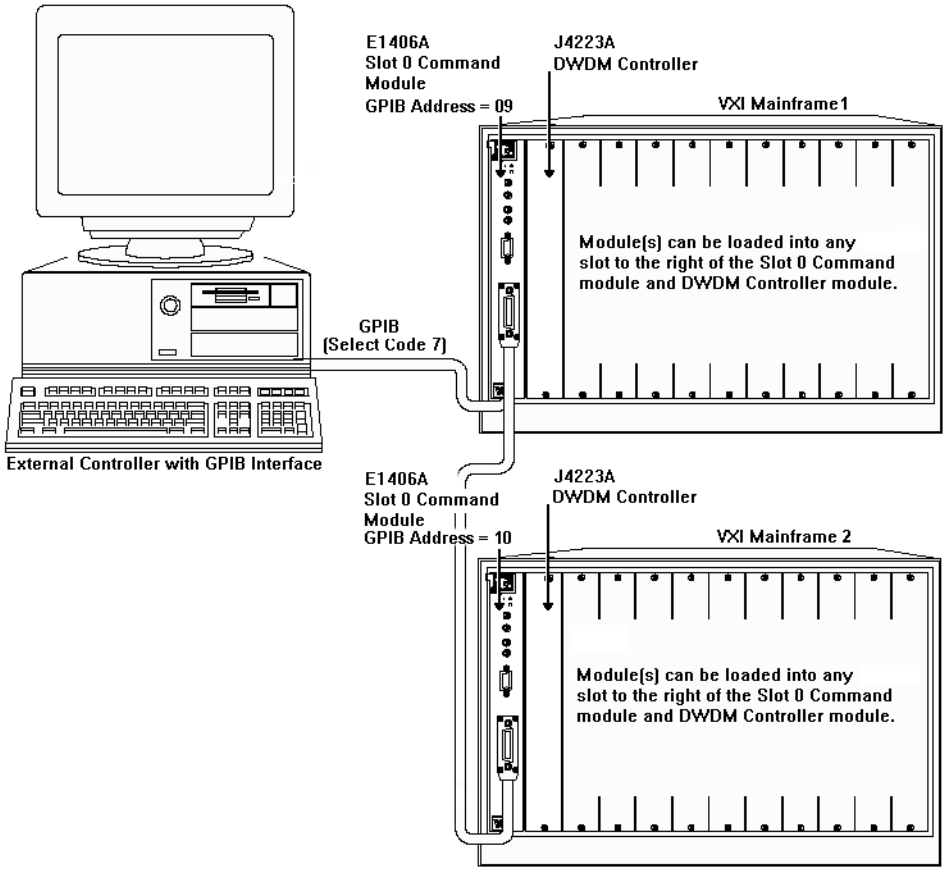


Figure 2-7. Typical SpectralBER Multiple Mainframe System

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Table 2-2. Typical SpectralBER Multiple Mainframe System Address Map

VXI Mainframe	Module	GPIB Address[a]	SCPI Supersystem	Logical Address	Servant Area
1	E1406A Command Module	70900	---	0[b.]	255[b.]
	J4223A DWDM Controller	70901	---	8[b.]	7[b]
	Transmit Module 1	---	:TMOD1	9	---
	Transmit Module 2	---	:TMOD2	10	---
	Transmit Module 3	---	:TMOD3	11	---
	Receive Module 1	---	:RMOD1	12	---
	Receive Module 2	---	:RMOD2	13	---
2	E1406A Command Module	71000	---	0[b.]	255[b.]
	J4223A DWDM Controller	71001	---	8[b.]	7[b.]
	Transmit Module 1	---	:TMOD1	9	---
	Transmit Module 2	---	:TMOD2	10	---
	Receive Module 1	---	:RMOD1	11	---
	Receive Module 2	---	:RMOD2	12	---
	Receive Module 3	---	:RMOD3	13	---

a.Each Mainframe Command Module must have a unique primary GPIB address.
b.Factory Default Setting

Verifying Multiple Mainframe Installation

You can verify module installation using the Soft Front Panel. (Soft front panel software installation information will be found in “Installing SpectralBER System Software” on page 43.)

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 2-8.:

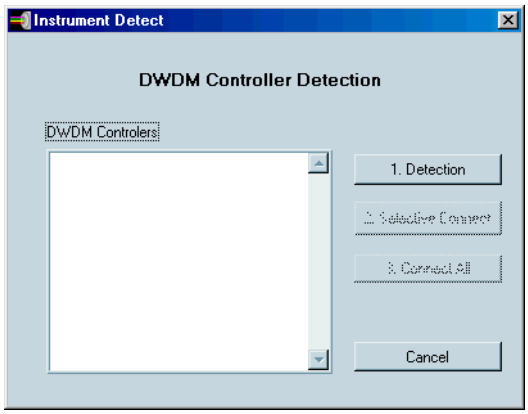


Figure 2-8. Instrument Detect Window

2. Click on the **1. Detection** button to detect all configured instruments connected to the external controller as shown in Figure 2-5. (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.

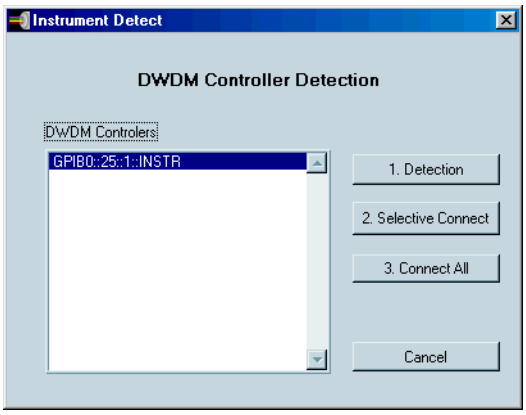


Figure 2-9. Instrument Found

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 2-10 shows a Typical Soft Front Panel.

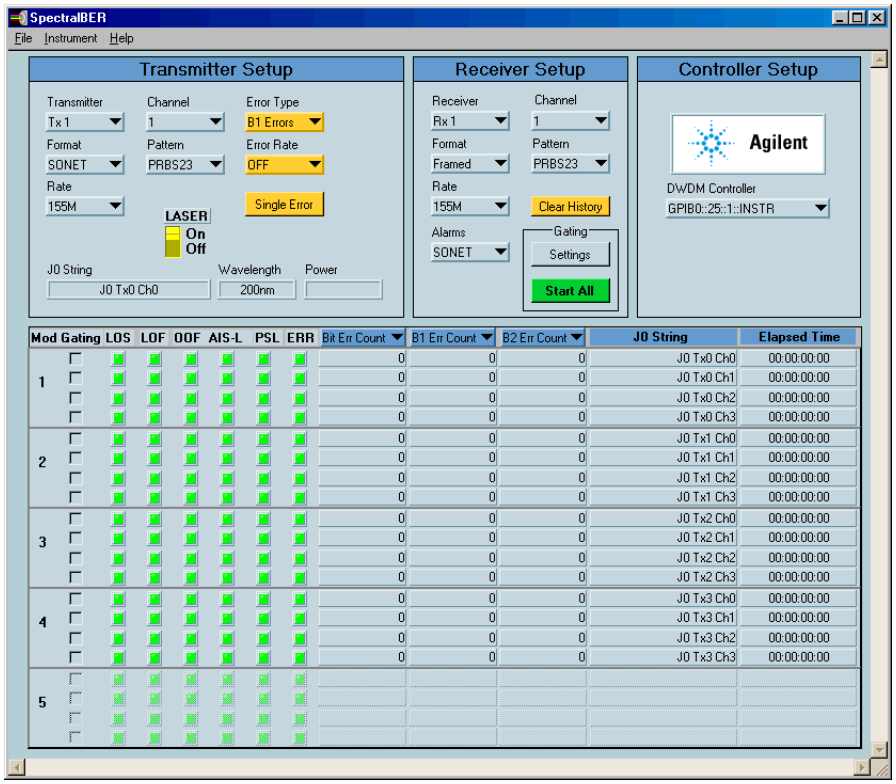


Figure 2-10. A Typical Soft Front Panel

A display similar to the one in Figure 2-10 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
```

4. Repeat the above procedure for each mainframe in the system.

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Installing SpectralBER System Software

Software Description

SpectralBER system software is supplied on a CD. The software supports Windows95/98/NT/2000. For each system it comprises:

- Instrument Firmware
- Universal Instrument Driver
- Soft Front Panel
- Firmware Upgrade Utility

Instrument Firmware

The Instrument Firmware is the SpectralBER code installed in the DWDM Controller.

Universal Instrument Driver

The Universal Instrument Driver (UID) is built on top of, and uses the services provided by VISA. The driver can be used with any GPIB card for which the manufacturer has provided a VISA DLL. It includes a "Function Panel" (.fp) file which allows it to be used with visual programming environments such as HP-VEE, LabWindows, and LabVIEW.

Soft Front Panel

The Soft Front Panel provides a graphical user interface for the SpectralBER system. It is used to verify system communications and functionality when the system is first installed and can be used as a learning tool to demonstrate system control and capability. It is also a useful tool for debugging software under development.

Firmware Upgrade Utility

The Firmware Upgrade Utility is provided so that you can easily upgrade the instrument firmware.

Platforms and Operating Systems

SpectralBER is compatible with; WIN95/98, WINNT 4.0, WIN2000 and SUN.

Hardware Requirements (Windows Platforms)

When running SpectralBER software under Microsoft Windows, the following hardware is recommended:

- Pentium or higher processor.
- 16 MB RAM minimum, 32 MB RAM recommended (Windows 95/98).
- 32 MB RAM minimum, 64 MB RAM recommended (Windows NT/2000).
- 20 MB free hard disk space.
- CD-ROM drive.
- 1024 x 768 pixel 256-color display or better.
- GPIB card that supports Microsoft Windows 95/98/NT/2000.

Other Software Requirements

- I_O Libraries for Instrument Control (VISA and SICL), supplied with your GPIB Interface card.
- Any other application programs such as C or C++ that you wish to use to program the VXI system.

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Install Application Programs

If you have not already done so, install the application programs to program the VXI system, such as C, C++ for example, according to the instructions supplied with the software.

Install I/O Libraries

If you have not already done so, install the software (VISA and SICL) using the media and instructions supplied with your GPIB Interface card.

Install SpectralBER System Software

SpectralBER System Software is on the CD supplied with your SpectralBER System. The CD has four directories, two that correspond to the platforms supported:

- Windows 95/98/2000/NT
- Solaris

The two other directories on the CD contain:

- Manuals (in *pdf* format)
- Adobe Acrobat Reader (required to read the *pdf* files)

The two platform directories each contain the System Software appropriate to the particular platform.

Windows 95/98/2000/NT

The System Software for Windows 95/98/NT/2000 consists of:

- Universal Instrument Driver (UID)
- SpectralBER soft front panel
- SpectralBER Upgrade Utility
- SpectralBER Instrument Firmware

Install SpectralBER System Software for Windows 95/98/2000/NT

1. Insert the CD in your drive, the CD should auto run.
2. Follow the instructions on the screen to install the software.

Note The installation automatically installs a run-time version of LabWindows[1].

If the CD does not auto run:

1. Using MS Explorer access the *win95nt* directory on the CD.
2. Read the *Readme* file.
3. Run the *hpj422xa.exe* file to install the System Software.

1. LabWindows is a product of National Instruments Corporation.

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Verify System Software Installation

You can verify software and hardware installation using the Soft Front Panel, See “Verify Module Installation” on page 34.

Solaris

The System Software for Solaris consists of:

- Universal Instrument Driver (UID)
- SpectralBER soft front panel
- SpectralBER Upgrade Utility
- SpectralBER Instrument Firmware

Install SpectralBER System Software for Solaris

Note Root permissions are required to install the driver.

From the *solaris/driver* directory on the CD:

1. Read the *Readme* file.
2. Copy the *hp422xa_pkg.tar* to */tmp*.
3. cd to */tmp*.
4. *tar -xvf ./hp422xa_pkg.tar*
5. After the package has been extracted, install it with the command *pkgadd -d /tmp/hp422xa_pkg*.

Note: Uninstall facilities are also provided.

From the *solaris/panel* directory on the CD:

6. Read the *Readme* file.
7. *./install.*
8. Follow the on screen instructions.

Note The installation automatically installs a run-time version of LabWindows[1].

Verify System Software Installation

You can verify software and hardware installation using the Soft Front Panel, See “Verify Module Installation” on page 34.

Using the System Software

Refer to The Soft Front Panel (GUI) on page 55, Using the Universal Instrument Driver on page 55 and Example Programs using SCPI on page 63.

1. LabWindows is a product of National Instruments Corporation.

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Configuring a SpectralBER System

The following assumes that you already have a GPIB card installed and configured. If you do not have a GPIB card installed or are unsure how to do this, consult your GPIB documentation. Perform the following procedure for each VXI Mainframe that you wish to use with SpectralBER.

Configuring your VXI Interface

Note This section assumes that you are using an Agilent GPIB card with the Agilent I/O Libraries. (Consult the National Instruments documentation if you are using National Instruments hardware and software.)

1. Launch the I/O Config utility that comes with the I/O Libraries.
2. In the **Available Interface Types** window, select VXI Command Module and press **Configure**. (The default VISA Interface Name should be acceptable.)
3. It is likely that you will only have one GPIB card in your controller, in which case you should choose GPIB0. If you have more than one card, ensure that you choose whichever one your mainframe is connected to.
4. The GPIB Primary address can be found by looking at the DIP switches on the controller module. Each controller module must have a unique address (the default is 9) to allow it to be identified on the GPIB bus.
5. Press **OK** and you will see the new interface added to the list of interfaces.

Note Late information about configuring a SpectralBER system will be found on the SpectralBER System Software CD in the *readme* file.

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Chapter 3
The Soft Front Panel (GUI)

Introduction

The Agilent SpectralBER system can be controlled from a PC or workstation using either SCPI commands, Universal Instrument Drivers or manually using the Soft Front Panel (Graphical User Interface). This chapter describes using the Soft Front Panel.

For more information on using SCPI commands, see Example Programs using SCPI on page 63 and *Remote Control Manual*. For more information on the Universal Instrument Drivers, see Using the Universal Instrument Driver on page 55.

The Soft Front Panel provides a graphical user interface for the SpectralBER System. As well as being another method of controlling the system, it is used to verify system communications and functionality when the system is first installed, See “Verify Module Installation” on page 34. It can also be used as a learning tool to demonstrate system control and capability.

In addition, it is a useful tool for debugging software under development. For example, the soft front panel can interrogate the system for its current status. The modules are not forced to defined states before displaying the current system status such as module states, number of modules, and their logical addresses etc.

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Starting the Soft Front Panel

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

Solaris Execute the command *multirate.exe.*

1. From the menu bar, select **Instrument** → **Detect…** to display the Instrument Detect window shown in Figure 3-1.

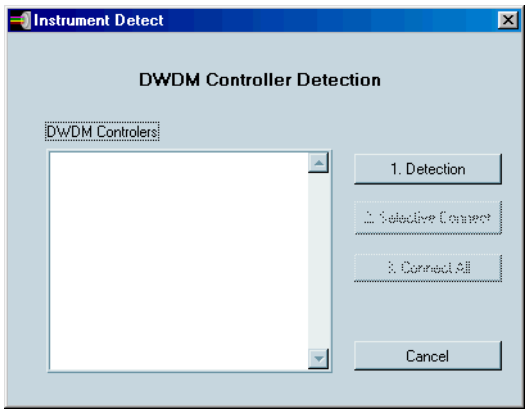


Figure 3-1. Instrument Detect Window

2. Click on the **1. Detection** button to detect all configured instruments connected to the external controller as shown in Figure 3-2. (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.

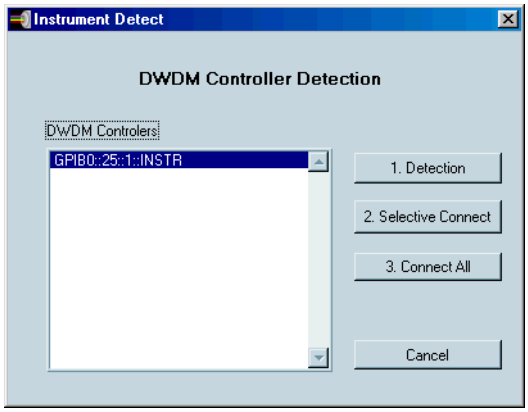


Figure 3-2. Instrument Found

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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The Soft Front Panel

Figure 3-3 illustrates a typical Soft Front Panel and it's main features. It is divided into four areas; Transmitter Setup, Receiver Setup, Controller Setup and Results. The following pages describe the four areas in more detail.

Note The Soft Front Panel has been optimized for use at a screen resolution of 1024 by 768 pixels. A lesser resolution may detract from its usability.

Note Any change to the soft front panel is actioned immediately. So changing the value of a field automatically changes the instrument settings.

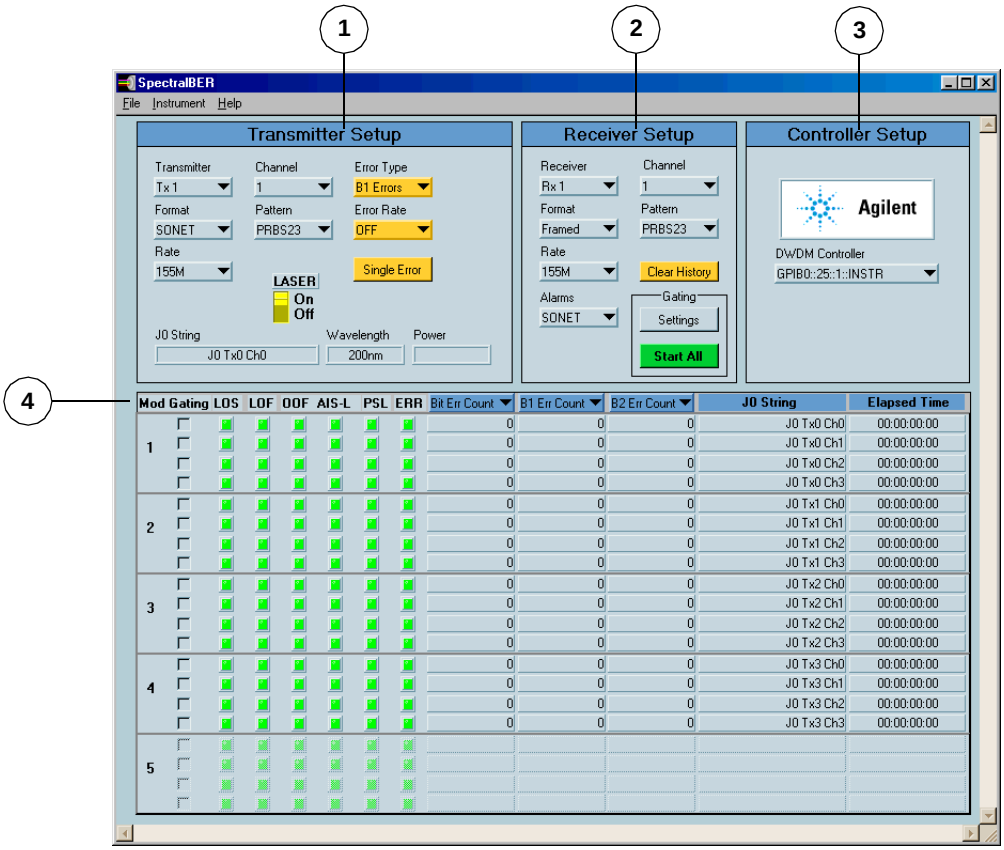


Figure 3-3. A Typical 2.5 Gb/s and below System Soft Front Panel

1. Transmitter Setup, see Figure 3-4.
2. Receiver Setup, see Figure 3-5.
3. Controller Setup, see Figure 3-7.
4. Results Display, see Figure 3-8.

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Transmitter Setup

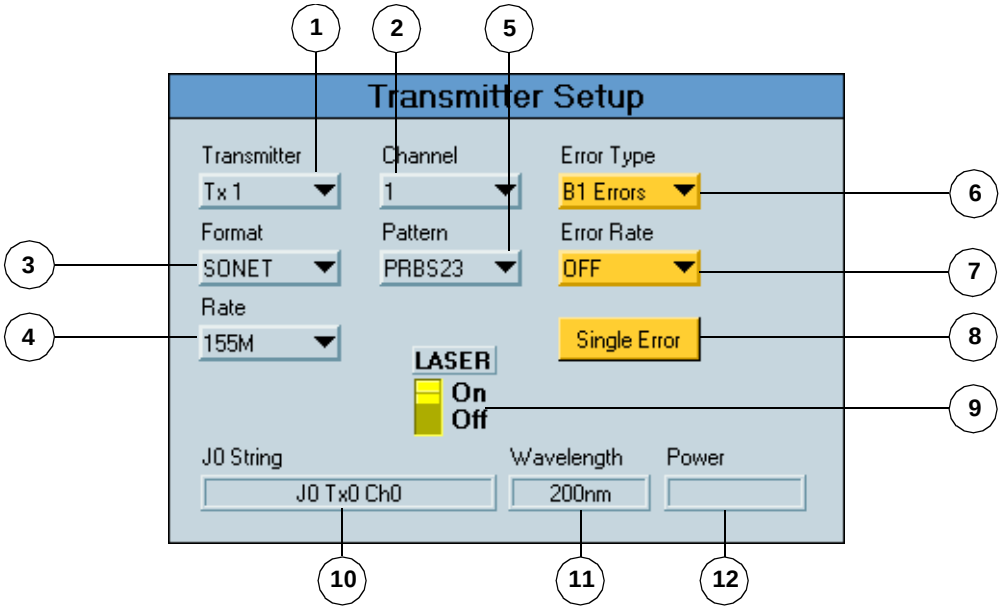


Figure 3-4. Transmitter Setup Area

1 Select the transmitter to set up.

2 Select the channel to set up.

3 Select the framing format.

4 Select the transmission rate.

5 Select a pattern.

6 Select the error type.

7 Select the error rate.

8 Inject a single error.

9 Switch the laser **On** or **Off**.

10 Edit the J0 String.

11 View the wavelength.

12 View the power level.

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Receiver Setup

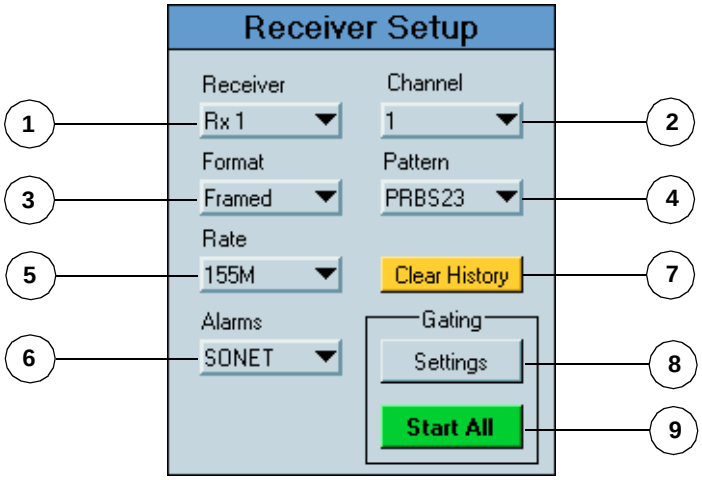


Figure 3-5. Receiver Setup Area

1 Select the Receiver to setup.

2 Select the channel, to setup.

3 Select framed/unframed format.

4 Select a pattern.

5 Select the signal rate.

6 Select SONET or SDH alarms.

7 Clear history.

8 Gating Settings, see Figure 3-6.

9 Start all the channels (that have been set up) gating. The **Start** button changes to yellow and displays **Stop**, when the channels are gating. To start individual channels gating, see **1** in Figure 3-8.

Gating Setup

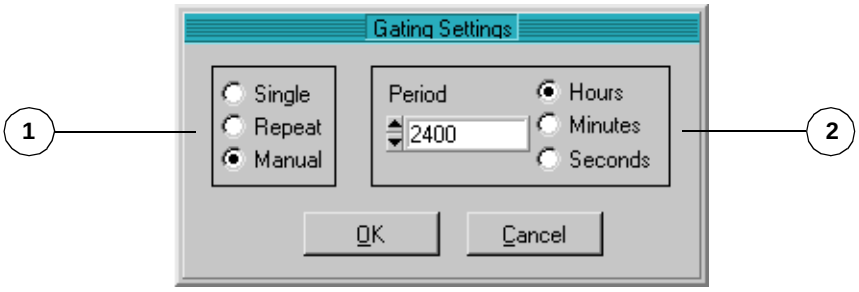


Figure 3-6. Gating Settings Area

1 Select **Single** to run a measurement for the selected time Period.
Select **Repeat** to run a measurement for the selected time Period over and over again.
Select **Manual** to run a measurement for an unlimited period of time (Period controls are unavailable).

2 Select or enter the gating Period for the selected channel (**2** in Figure 3-5).

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Controller Setup

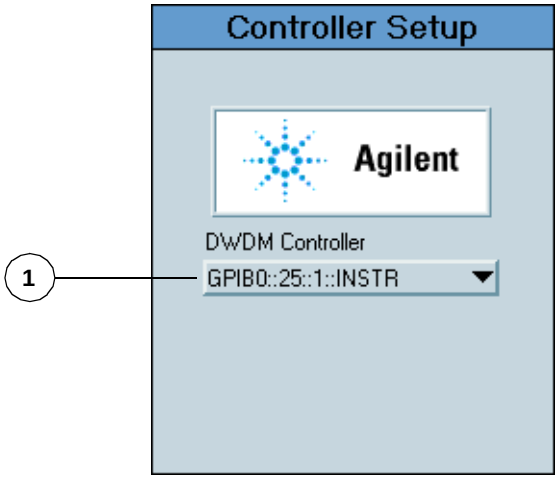


Figure 3-7. Controller Setup Area

1 Select a DWDM Controller from a list of connected controllers.

Results

Referring to Figure 3-8. The left side of the area displays alarm conditions. Green indicates no error, Red indicates an error and Yellow indicates that there has been an error during the present gating period. (The Clear History button in the Receiver Controls area clears the history, see **7** in Figure 3-5.) The right side of the area displays the current Bit Count/Ratio, B1 Count/Ratio, B2 Count/Ratio, J0 String and the Elapsed Time.

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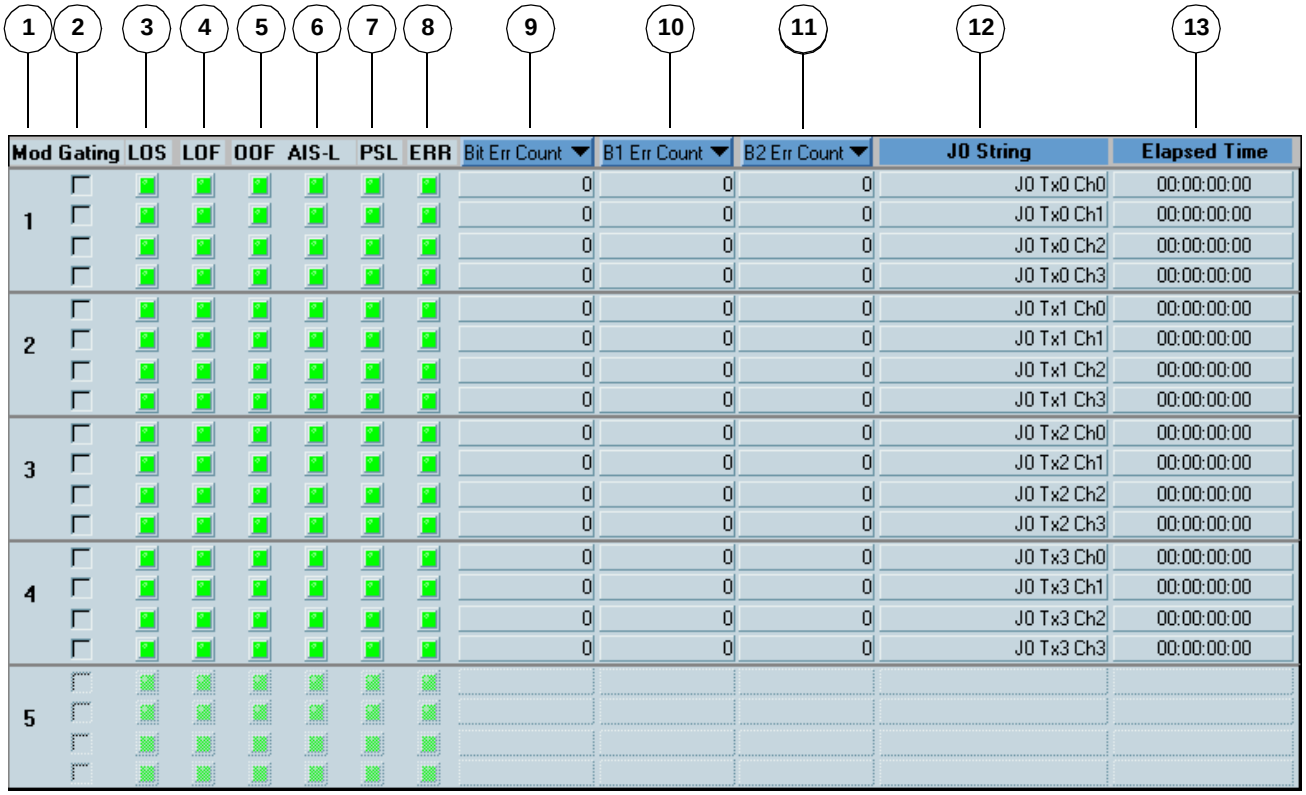


Figure 3-8. Results Area

1 Module (Receiver) number.

2 Gating control for individual channels. (Click in a box to start that channel gating.)

3 LOS (Loss Of Signal) indicators* for each channel.

4 LOF (Loss Of Frame) indicators* for each channel.

5 OOF (Out Of Frame) indicators* for each channel.

6 AIS-L (Alarm Indication Signal - Line) indicators* for each channel if SONET was selected in the Receiver Setup (**6** in Figure 3-5). MS-AIS (Multiplex Section - Alarm Indication Signal) if SDH was selected in the Receiver Setup (**6** in Figure 3-5).

7 PSL (Pattern Sync Loss) indicators for each channel.

8 ERR (Error) indicators for each channel.

9 Bit Error Count/Ratio (toggle between Count and Ratio).

10 B1 Error Count/Ratio (toggle between Count and Ratio).

11 B2 Error Count/Ratio (toggle between Count and Ratio)

12 Display of the received J0 string.

13 Display of the elapsed time.

* Green indicates no error/alarm, Red indicates an error/alarm and Yellow indicates that there has been an error/alarm during the present gating period. (Starting a new gating period clears existing error and alarm conditions.)

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Chapter 4
Using the Universal Instrument Driver

Introduction

The Agilent SpectralBER system can be controlled from a PC or workstation using either SCPI commands, Universal Instrument Drivers or manually using a graphical user interface (soft front panel). This chapter describes using the Universal Instrument Driver.

For more information on using SCPI commands, see Chapter 5 "Example Programs using SCPI" on page 63 and the *Remote Control Manual.* For more information on the Graphical User Interface, see Chapter 3 "The Soft Front Panel (GUI)" on page 55.

The Universal Instrument Driver (UID) HPJ422xa complies with the following:

- VXIplug&play WIN 95 and WIN NT System Frameworks.
- VISA revision G02.02 (Multi Rate System).
- HPJ422xa Firmware.

The following information is common to all programs that use the HPJ422xa instrument drivers. More detailed information will be found in the on-line help file that complements this manual. The on-line help file (hpj422xa.hlp) presents more application programming examples, a cross-reference between instrument commands and driver functions, and detailed documentation of each function.

Note Under Solaris, view the *hp422xa.hlp* file with the command: *hyperlink* or *hyperhelp hp422xa.hlp* or *vi hp422xa.txt.*

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VISA, VXIplug&play and the UID

The HPJ422xa Universal Instrument Driver (UID) conforms to the VXIplug&play driver standard except that there is no VXIplug&play compatible soft front panel and no knowledge base file.

1. It is built on top of, and uses the services provided by VISA. VISA supports GPIB and VXI protocols. The driver can be used with any GPIB card for which the manufacturer has provided a VISA DLL.

2. It includes a "Function Panel" (.fp) file which allows it to be used with visual programming environments such as HP-VEE, LabWindows, and LabVIEW.

3. It includes a comprehensive on-line help file to complement this manual. The help file presents application programming examples, a cross-reference between instrument commands and drive functions, and detailed documentation of each function.

4. The source code is included so that the driver can be modified if desired. The source conforms to VXIplug&play standards. Modifications should only be made by people who are familiar with the VXIplug&play standard.

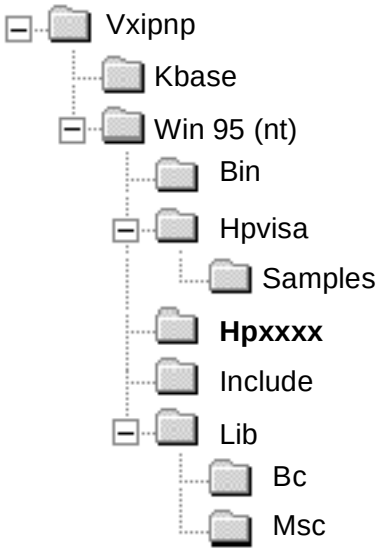
5. It includes a Visual Basic include file (.bas) which contains the function calls in Visual Basic syntax, so that driver functions can be called from Visual Basic. If you use Visual Basic with this driver, you should be familiar with C/C++ function declarations. In particular, care must be taken when working with C/C++ pointers.

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Directory Structure

Windows

The setup program which installs the HPJ422xa instrument driver creates the standard directory structure for VXIplug&play drivers if it does not already exist. The structure for the Windows 95 and Windows NT Vxipnp subdirectory tree is:



Windows Directory Structure

In the directory example above, Hpxxxx is a place holder for the actual directory named Hpj422xa containing the instrument driver. There is a directory for each instrument driver.

Solaris

The VXI*plug&play* specification requires that the environment variable *VXIPNPPATH* be defined in the */etc/profile* file.

The base directory for each instrument is:

$VXIPNPPATH/hpux/<inst_name>

All shared library files with the *.sl* extension go in:

$VXIPNPPATH/hpux/bin

All *.h* files go in:

$VXIPNPPATH/hpux/include

All other HP VISA files go in:

$VXIPNPPATH/hpux/hpvisa

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Opening an Instrument Session

Introduction

To control an instrument from a program, a communication path between the computer/controller and the instrument must be opened. This path is known as an instrument session and is opened with the function:

```
ViStatus hpj422xa_init( ViRsrc InstrDesc, ViBoolean id_query, ViBoolean reset, ViPSession vi );
```

or

```
ViStatus HPJ142xb_init( ViRsrc InstrDesc, ViBoolean id_query, ViBoolean reset, ViPSession vi );
```

Instruments are assigned a handle when the instrument session is opened. The handle is used to identify this particular instrument in all subsequent calls to driver functions.

The parameters of function hpj422xa_init include:

ViRsrc InstrDesc the address of the instrument.

ViBoolean id_query a Boolean flag which indicates if in-system verification should be performed. Passing VI_TRUE (1) will perform an in-system verification. Passing VI_FALSE (0) will not. If you set id_query to false it is possible to use the generic functions of the instrument driver with other instruments.

ViBoolean reset a Boolean flag which indicates if the instrument should be reset when it is opened. Passing VI_TRUE (1) will perform a reset when the session is opened. Passing VI_FALSE (0) will not perform a reset.

ViPSession vi a pointer to an instrument session. vi is the handle which addresses the instrument and is the first parameter passed in all driver functions.

Successful completion of this function returns VI_SUCCESS.

For more information see “Examples” on page 59.

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Examples

The address strings for the various interfaces are given below. In each string, 'INSTR' is a VISA resource type. If you want to be compatible with future releases of VISA you must include the INSTR parameter in the syntax.

Note In the following examples **hpjnnnxa** is a place holder for and can be substituted with **hpj422xa**.

GPIB Addressing

Used when programming instruments using a GPIB interface:

GPIB[board]::logical address[::secondary address][::INSTR]

Visual C++ Programming Example

```
/* example uses default GPIB board number for a single interface board */
ViSession vi;
ViStatus vistat;
if ((vistat = hpjnnnxa_init("GPIB0::AA::INSTR", 0, 0, &vi)) != VI_SUCCESS)
{
 /* handle error here, vistat contains return error code */
}
```

Visual BASIC Programming Example

```
Dim vi As Long
Dim errStatus As Long
errStatus = hpjnnnxa_init("GPIB0::AA::INSTR", 0, 0, vi)
```

Closing an Instrument Session

Sessions (vi) opened with the hpjnnnxa_init() function are closed with the function:

hpjnnnxa_close(ViSession vi);

When no further communication with an instrument is required, the session must be explicitly closed (hpjnnnxa_close() function). VISA does not remove sessions unless they are explicitly closed. Closing the instrument session frees all data structures and system resources allocated to that session.

Error Handling

Events and errors within a instrument control program can be detected by polling the instrument. The example programs poll (query) the instrument after each function to determine if an error or other event has occurred. Polling is used in application development environments (ADEs) that do not support asynchronous activities where callbacks can be used. The example programs set up and use polling as shown below.

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1. Declare a variable to contain the function completion code.

   ViStatus errStatus;

Every driver function returns the completion code ViStatus. If the function executes with no I/O errors, driver errors, or instrument errors, ViStatus is 0 (VI_SUCCESS). If an error occurs, ViStatus is a negative error code. Warnings are positive error codes, and indicate the operation succeeded but special conditions exist.

2. Enable automatic instrument error checking following each function call.

   hpjnnnxa_errorQueryDetect(vi, VI_TRUE);

When enabled, the driver queries the instrument for an error condition before returning from the function. If an error occurred, errStatus (Step 1) will contain a code indicating that an error was detected (hpjnnnxa_INSTR_ERROR_DETECTED).

3. Check for an error (or event) after each function.

   errStatus = hpjnnnxa_cmd(vi, "MEAS:FREQ");
   check(vi, errStatus);

After the function executes, errStatus contains the completion code. The completion code and instrument id are passed to an error checking routine. In the above statement, the routine is called 'check'.

4. Create a routine to respond to the error or event. The following routine is used to read errors.

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Example

```
void check (ViSession vi, ViStatus errStatus)
{
 /* variables for error code and message */
 ViInt32 inst_err;
 ViChar err_message[256];

 /* VI_SUCCESS is 0 and is defined in VISATYPE.h */
 if(VI_SUCCESS > errStatus)
 {
   /* send a device clear - to ensure communication with the instrument */
   hpjnnnxa_dcl(vi);

   /* hpjnnnxa_INSTR_ERROR_DETECTED defined in hpjnnnxa.h */
   if(hpjnnnxa_INSTR_ERROR_DETECTED == errStatus)
   {
    /* query the instrument for the error */
    hpjnnnxa_error_query(vi, &inst_err, err_message);

    /* display the error */
    printf("Instrument Error : %ld, %s\n", inst_err, err_message);
   }
   else/* driver error */
   {
    /* get the driver error message */
    hpjnnnxa_error_message(vi, errStatus, err_message);

    /* display the error */
    printf("Driver Error : %ld, %s\n", errStatus, err_message);
   }
   /* optionally reset the instrument, close the instrument handle */
   hpjnnnxa_reset(vi);
   hpjnnnxa_close(vi);
   exit(1);
 }
 return;
}
```


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Chapter 5
Example Programs using SCPI

Introduction

The Agilent SpectralBER system can be controlled from a PC or workstation using either SCPI commands, Universal Instrument Drivers or manually using a Graphical User Interface (or soft front panel). This chapter provides examples of how SCPI commands can be used to control the system.

For more information on using SCPI commands, see Example Programs using SCPI on page 63 and the *Remote Control Manual*. For more information on the Graphical User Interface, see The Soft Front Panel (GUI) on page 55. For more information on the Universal Instrument Drivers, see Using the Universal Instrument Driver on page 55.

The examples given here are written in “C”, but the general principles and sequence of SCPI commands apply to and can be adapted easily to other programming languages.

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Start Group Gating

This program illustrates the sequence of SCPI commands required to start a 2.5 Gb/s and below System gating.

```
/*"start_group_gating.c"
  This example program starts the SpectralBER system gating.
                    Note: You must change the address to suit your system.) */

#include <conio.h>
#include <stdio.h>
#include "c:\vxipnp\win95\include\visa.h"    /* Change the file path to suit.
                             Note: This header file is supplied with Visa. */

void main () {

  ViSession defaultRM, vi;

  /* Open session to GPIB device (Change the address to suit)*/
  viOpenDefaultRM (&defaultRM);
  viOpen (defaultRM, "GPIB0::09::01::INSTR", VI_NULL,VI_NULL, &vi);

  /* Initialize device */
  viPrintf (vi, "*RST\n");

  /* Enable Synchronous Command Pulse system */
  viPrintf (vi, ":INIT3:CONT ON\n");

  /* Enable 100ms Heartbeat control system */
  viPrintf (vi, ":INIT2:CONT ON\n");

  /* Enable 100ms Heartbeat generation */
  viPrintf (vi, ":OUTP5:TTLT0:STAT 1\n");

  /* Disable Command Pulse generation */
  viPrintf (vi, ":OUTP5:TTLT1:STAT 0\n");

  /* Set Measurement Period to 60 seconds */
  viPrintf (vi, ":RMODALL:SENSALL:GATE:PER 60\n");

  /* Set Synchronous Command to ONCE */
  viPrintf (vi, ":RMODALL:SENSALL:GATE:COMM ONCE\n");

  /* Issue a Command Trigger to START */
  viPrintf (vi, ":RMODALL:SENSALL:GATE:IMM\n");

  /* Close session */
  viClose (vi);
  viClose (defaultRM);
}
```


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Stop Group Gating

This program illustrates the sequence of SCPI commands required to stop a 2.5 Gb/s and below System gating.

```
/*"stop_group_gating.c"
  This example program stops the SpectralBER system gating.
                    Note: You must change the address to suit your system.) */

#include <conio.h>
#include <stdio.h>
#include "c:\vxipnp\win95\include\visa.h"      /* Change the file path to suit
                           Note: This header file is supplied with Visa. */

void main () {

  ViSession defaultRM, vi;

 /* Open session to GPIB device (Change the address to suit)*/
  viOpenDefaultRM (&defaultRM);
  viOpen (defaultRM, "GPIB0::09::01::INSTR", VI_NULL,VI_NULL, &vi);

  /* Initialize device */
  viPrintf (vi, "*RST\n");

  /* Set Synchronous Command to STOP */
  viPrintf (vi, ":RMODALL:SENSALL:GATE:COMM STOP\n");

  /* Issue a Command Trigger to STOP */
  viPrintf (vi, ":RMODALL:SENSALL:GATE:IMM\n");

  /* Allow gating to stop before executing the following termination commands*/
  /* Disable 100ms Heartbeat generation */
  viPrintf (vi, ":OUTP5:TTLT0:STAT 0\n");

  /* Disable 100ms Heartbeat control system */
  viPrintf (vi, ":INIT2:CONT OFF\n");

  /* Disable Synchronous Command system */
  viPrintf (vi, ":INIT3:CONT OFF\n");

  /* Ensure Heartbeat system is IDLE */
  viPrintf (vi, ":ABORT2\n");

  /* Ensure Synchronous Command System is IDLE*/
  viPrintf (vi, ":ABORT3\n");

  /* Close session */
  viClose (vi);
  viClose (defaultRM);
}
```


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Start Single Channel Gating

This program illustrates the sequence of SCPI commands required to start a single channel 2.5 Gb/s and below System gating.

```
/*"start_single_gating.c"
  This example program starts single channels of the SpectralBER system gating.
                    Note: You must change the address to suit your system.) */
#include <conio.h>
#include <stdio.h>
#include "c:\vxipnp\win95\include\visa.h"    /* Change the file path to suit.
                             Note: This header file is supplied with Visa. */

void main () {

  ViSession defaultRM, vi;

  /* Open session to GPIB device (Change the address to suit)*/
  viOpenDefaultRM (&defaultRM);
  viOpen (defaultRM, "GPIB0::09::01::INSTR", VI_NULL,VI_NULL, &vi);

  /* Initialize device */
  viPrintf (vi, "*RST\n");

  /* Enable Synchronous Command Pulse system */
  viPrintf (vi, ":INIT3:CONT ON\n");

  /* Enable 100ms Heartbeat control system */
  viPrintf (vi, ":INIT2:CONT ON\n");

  /* Enable 100ms Heartbeat generation */
  viPrintf (vi, ":OUTP5:TTLT0:STAT 1\n");

  /* Disable Command Pulse generation */
  viPrintf (vi, ":OUTP5:TTLT1:STAT 0\n");

/* Module 1 Port 1 */
  /* Set Measurement Period to 60 seconds */
  viPrintf (vi, ":RMOD1:SENS1:GATE:PER 60\n");

  /* Set Synchronous Command to ONCE */
  viPrintf (vi, ":RMOD1:SENS1:GATE:COMM ONCE\n");

  /* Issue a Command Trigger to START */
  viPrintf (vi, ":RMOD1:SENS1:GATE:IMM\n");

/* Module 2 Port 4 */
  /* Set Measurement Period to 60 seconds */
  viPrintf (vi, ":RMOD2:SENS4:GATE:PER 60\n");

  /* Set Synchronous Command to ONCE */
  viPrintf (vi, ":RMOD2:SENS4:GATE:COMM ONCE\n");
```


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```
  /* Issue a Command Trigger to START */
  viPrintf (vi, ":RMOD2:SENS4:GATE:IMM\n");
  /* Close session */
  viClose (vi);
  viClose (defaultRM);
}
```


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Stop Single Channel Gating

This program illustrates the sequence of SCPI commands required to stop a single channel 2.5 Gb/s and below System gating.

```
/*"stop_single_gating.c"
  This example program stops single channels of the SpectralBER system gating.
                    Note: You must change the address to suit your system.) */

#include <conio.h>
#include <stdio.h>
#include "c:\vxipnp\win95\include\visa.h"      /* Change the file path to suit
                           Note: This header file is supplied with Visa. */

void main () {

  ViSession defaultRM, vi;

 /* Open session to GPIB device (Change the address to suit)*/
  viOpenDefaultRM (&defaultRM);
  viOpen (defaultRM, "GPIB0::09::01::INSTR", VI_NULL,VI_NULL, &vi);

  /* Initialize device */
  viPrintf (vi, "*RST\n");

/* Module 1 Port 1 */
  /* Set Synchronous Command to STOP */
  viPrintf (vi, ":RMOD1:SENS1:GATE:COMM STOP\n");

  /* Issue a Command Trigger to STOP */
  viPrintf (vi, ":RMOD1:SENS1:GATE:IMM\n");

/* Module 2 Port 4 */
  /* Set Synchronous Command to STOP */
  viPrintf (vi, ":RMOD2:SENS4:GATE:COMM STOP\n");

  /* Issue a Command Trigger to STOP */
  viPrintf (vi, ":RMOD2:SENS4:GATE:IMM\n");

/* Allow gating to stop before executing the following termination commands */
  /* Disable 100ms Heartbeat generation */
  viPrintf (vi, ":OUTP5:TTLT0:STAT 0\n");

  /* Disable 100ms Heartbeat control system */
  viPrintf (vi, ":INIT2:CONT OFF\n");

  /* Disable Synchronous Command system */
  viPrintf (vi, ":INIT3:CONT OFF\n");

  /* Ensure Heartbeat system is IDLE */
  viPrintf (vi, ":ABORT2\n");

  /* Ensure Synchronous Command System is IDLE*/
  viPrintf (vi, ":ABORT3\n");
  /* Close session */
  viClose (vi);
  viClose (defaultRM);
}
```


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Set up a Transmitter

This program illustrates a sequence of SCPI commands to set up a Multi Rate System Transmitter.

```
/*"tx_set_up.c"
  This example program sets up a SpectralBER Transmitter Module.
                    Note: You must change the address to suit your system.) */

#include <conio.h>
#include <stdio.h>
#include "c:\vxipnp\win95\include\visa.h"     /* Change the file path to suit */
                           Note: This header file is supplied with HP Visa. */

void main () {

  ViSession defaultRM, vi;

 /* Open session to GPIB device (Change the address to suit)*/
  viOpenDefaultRM (&defaultRM);
  viOpen (defaultRM, "GPIB0::09::01::INSTR", VI_NULL,VI_NULL, &vi);

  /* Set all channels of the first transmitter to have a PRBS23 payload */
  viPrintf (vi, "TMOD1:SOURceALL:DATA:TELecom:PAYLoad:PATTern PRBS23\n");

  /* Set the laser on for all outputs of the first transmitter */
  viPrintf (vi, "TMODule1:OUTPutALL:STATus ON\n");

  /* Close session */
  viClose (vi);
  viClose (defaultRM);
}
```


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Set up a Receiver

This program illustrates a sequence of SCPI commands to set up a Multi Rate System Receiver.

```
/*"rx_set_up.c"
  This example program sets up a SpectralBER Receiver Module.
                    Note: You must change the address to suit your system.) */

#include <conio.h>
#include <stdio.h>
#include "c:\vxipnp\win95\include\visa.h"     /* Change the file path to suit */
                           Note: This header file is supplied with HP Visa. */

void main () {

  ViSession defaultRM, vi;

 /* Open session to GPIB device (Change the address to suit)*/
  viOpenDefaultRM (&defaultRM);
  viOpen (defaultRM, "GPIB0::09::01::INSTR", VI_NULL,VI_NULL, &vi);

 /* Set all channels of the first receiver to have a PRBS23 payload */
  viPrintf (vi, "RMODule1:SENSeALL:DATA:TELecom:PAYLoad:PATTern PRBS23\n");

    /* Close session */
  viClose (vi);
  viClose (defaultRM);
}
```


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Extract Receiver Results

This program illustrates a sequence of SCPI commands to return results from a Multi Rate System Receiver.

```
/*"results.c"
  This example program returns results from a SpectralBER Receiver Module.
                    Note: You must change the address to suit your system.) */

#include <conio.h>
#include <stdio.h>
#include "c:\vxipnp\win95\include\visa.h"     /* Change the file path to suit */
                           Note: This header file is supplied with HP Visa. */

void main () {

  ViSession defaultRM, vi;

  /* Open session to GPIB device (Change the address to suit)*/
  viOpenDefaultRM (&defaultRM);
  viOpen (defaultRM, "GPIB0::09::01::INSTR", VI_NULL,VI_NULL, &vi);

/* Returns all the payload pattern bit error counts from the first receiver */
  viPrintf (vi, "RMODule1:SENSeAll:DATA? "ECOount:PATTern"\n");

    /* Close session */
  viClose (vi);
  viClose (defaultRM);
}
```


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Read Status Registers

This program illustrates a sequence of SCPI commands to read the event status register of a Multi Rate System Receiver.

```
/*"register_read.c"
  This example program reads the event status register of a SpectralBER Receiver
Module.
                    Note: You must change the address to suit your system.) */

#include <conio.h>
#include <stdio.h>
#include "c:\vxipnp\win95\include\visa.h"     /* Change the file path to suit */
                          Note: This header file is supplied with HP Visa. */

void main () {

  ViSession defaultRM, vi;

  /* Open session to GPIB device (Change the address to suit)*/
  viOpenDefaultRM (&defaultRM);
  viOpen (defaultRM, "GPIB0::09::01::INSTR", VI_NULL,VI_NULL, &vi);

/* Returns numerically the contents of the event register of the first receiver*/
  viPrintf (vi, ":STATus:QUEStionable:RMODule1:EVENt?"\n");

    /* Close session */
  viClose (vi);
  viClose (defaultRM);
}
```


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Read History Registers

This program illustrates a sequence of SCPI commands to read the history of the event status register of a Multi Rate System Receiver.

```
/*"history_register_read.c"
  This example program reads a history register of a SpectralBER Receiver Module.
                    Note: You must change the address to suit your system.) */

#include <conio.h>
#include <stdio.h>
#include "c:\vxipnp\win95\include\visa.h"     /* Change the file path to suit */
                           Note: This header file is supplied with HP Visa. */

void main () {

  ViSession defaultRM, vi;

  /* Open session to GPIB device (Change the address to suit)*/
  viOpenDefaultRM (&defaultRM);
  viOpen (defaultRM, "GPIB0::09::01::INSTR", VI_NULL,VI_NULL, &vi);

/* Returns numerically the contents of the history register of the event register
of the first receiver*/
  viPrintf (vi, ":STATus:QUEStionable:RMODule1:HISTory?"\n");

    /* Close session */
  viClose (vi);
  viClose (defaultRM);
}
```


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Set up a Status Register Mask

This program illustrates a sequence of SCPI commands to set up a Status Register Mask for a Multi Rate System.

```
/*"mask_register.c"
  This example sets up a register mask.
                    Note: You must change the address to suit your system.) */

#include <conio.h>
#include <stdio.h>
#include "c:\vxipnp\win95\include\visa.h"     /* Change the file path to suit */
                          Note: This header file is supplied with HP Visa. */

void main () {

  ViSession defaultRM, vi;

  /* Open session to GPIB device (Change the address to suit)*/
  viOpenDefaultRM (&defaultRM);
  viOpen (defaultRM, "GPIB0::09::01::INSTR", VI_NULL,VI_NULL, &vi);

/* Sets the event enable register to summarize for channel 3 of the first
receiver */
  viPrintf (vi, ":STATus:QUEStionable:RMODule1:ENAB 4"\n");

    /* Close session */
  viClose (vi);
  viClose (defaultRM);
}
```


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Chapter 6
Firmware Upgrade Utility

The Firmware Upgrade Utility is provided so that you can easily upgrade your Agilent SpectralBER firmware.

Running the Firmware Upgrade Utility

1. Locate the executable file *upgrade_utility.exe* in the directory Hpj422xa and start the utility to display the window shown below in Figure 6-1.

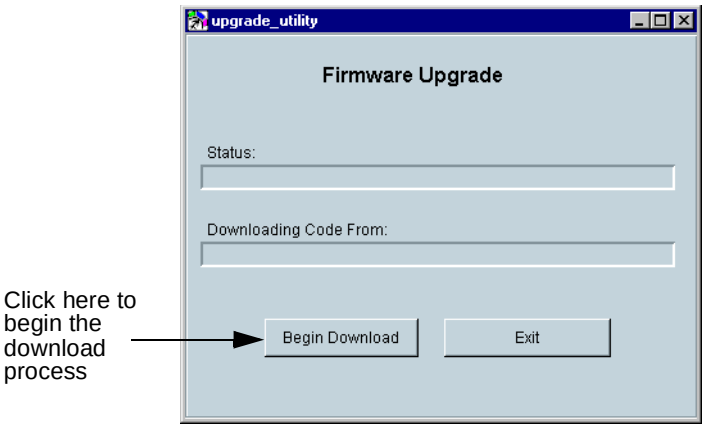


Figure 6-1. Firmware Upgrade Utility

2. Click on the **Begin Download** button to open the "Select Code File" window shown in Figure 6-2.

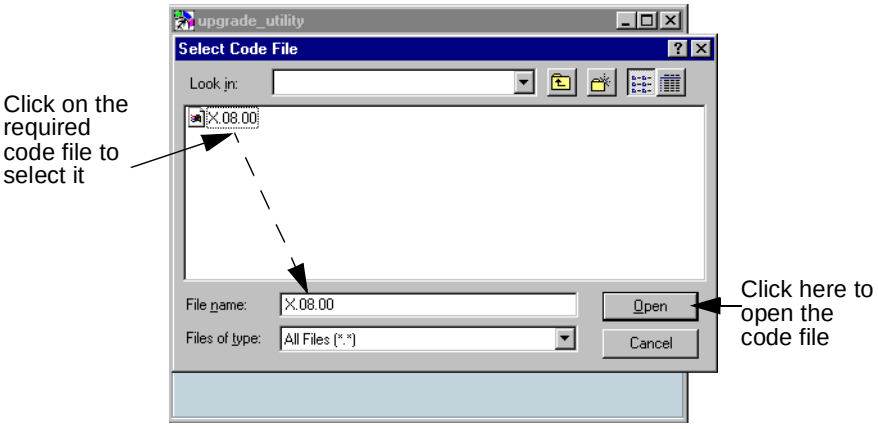


Figure 6-2. Select Code File

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3. Open the selected code file, and the window shown in Figure 6-3 is displayed.

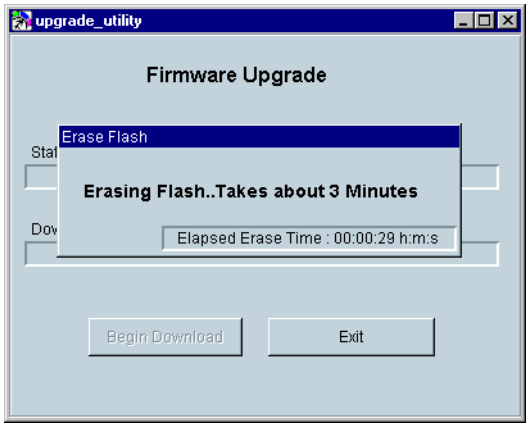


Figure 6-3. Erasing Flash

4. After a series of windows displaying the status of the operation, the **Program Flash** window showing the progress of the upgrade is displayed as shown in Figure 6-4.

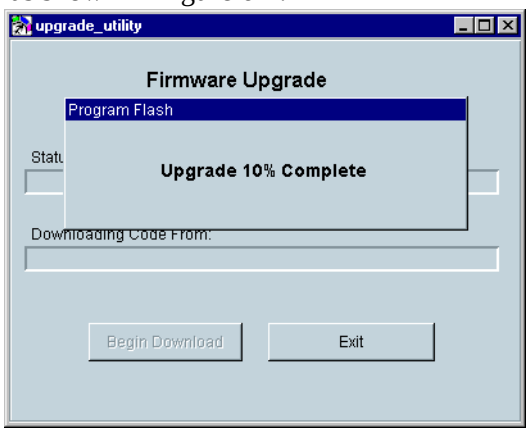


Figure 6-4. Progress Window

The upgrade will take some time to complete, depending on the specification of your external controller, then the final window as shown in Figure 6-5 is displayed, indicating successful completion of the firmware upgrade.

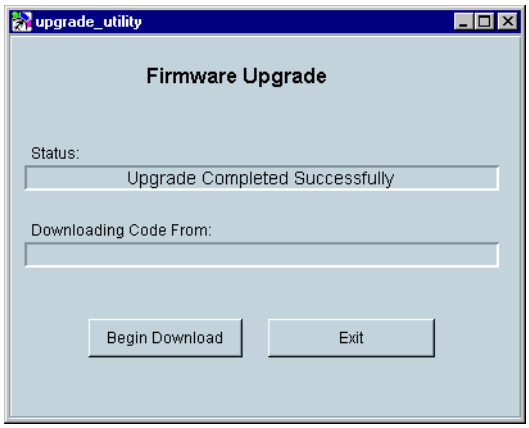


Figure 6-5. Successful Completion

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