HP J4221A/J4222A SpectralBER

Installation and System Reference Manual

Where to Find it - Online and Printed Information:

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

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

Legal and Safety Information

Hewlett-Packard Warranty StatemenT

HP Product: J4221A, J4222A **Duration Of Warranty:** 1 year

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

2. HP warrants that HP 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 HP receives notice of such defects during the warranty period, HP will replace software media which does not execute its programming instructions due to such defects.

3. HP does not warrant that the operation of HP products will be interrupted or error free. If HP 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.

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The customer shall provide:
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3. Access to and use of all information and facilities determined necessary by Hewlett-Packard 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.)
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5. Consumables such as paper, disks, magnetic tapes, ribbons, inks, pens, gases, solvents, columns, syringes, lamps, septa, needles, filters, frits, fuses, seals, detector flow cell windows, etc.

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

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Laser Safety Warning

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

The HP J4230A, HP J4231A and HP 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 HP J430A/31A/32A Transmit Modules User's Manual before installing or using these modules.

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

ALWAYS DEACTIVATE THE LASER BEFORE CONNECTING OR DISCONNECTING OPTICAL CABLES.

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

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

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

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

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

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

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

CLASS 1 LASER PRODUCT translates as follows:

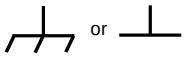
Finnish - LUOKAN 1 LASERLAITE

Finnish/Swedish - KLASS 1 LASER APPARAT

Safety Symbols

Instruction manual symbol affixed to product. Indicates that the user must refer to the manual for specific WARNING or CAUTION information to avoid personal injury or damage to the product.

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



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

Alternating current (AC)

Direct current (DC).

Indicates hazardous voltages.

WARNING Calls attention to a procedure, practice, or condition that could cause bodily injury or death.

CAUTION Calls attention to a procedure, practice, or condition that could possibly cause damage to equipment or permanent loss of data.

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.

Warnings

The following general safety precautions must be observed during all phases of operation, service, and repair of this product. 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 product. Hewlett-Packard Company assumes no liability for the customer's failure to comply with these requirements.

Ground the equipment: For Safety Class 1 equipment (equipment having a protective earth terminal), an uninterruptible safety earth ground must be provided from the mains power source to the product input wiring terminals or supplied power cable.

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

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 use repaired fuses or short-circuited fuse holders.

Keep away from live circuits: Operating personnel must not remove equipment covers or shields. Procedures involving the removal of covers or shields are for use by service-trained personnel only. Under certain conditions, dangerous voltages may exist even with the equipment switched off. To avoid dangerous electrical shock, DO NOT perform procedures involving cover or shield removal unless you are qualified to do so.

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

DO NOT service or adjust alone: Do not attempt internal service or adjustment unless another person, capable of rendering first aid and resuscitation, is present.

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

Operating Location: Sheltered location where air temperature and humidity are controlled within this product's specifications and the product is protected against direct exposure to climatic conditions such as direct sunlight, wind, rain, snow, sleet, and icing, water spray or splash, hoarfrost or dew. (Typically, indoor.) Pollution environment for which this product may be operated is IEC 664 Pollution degree 2.

Module connectors and test signal cables connected to them cannot be operator accessible. Cables and connectors are considered inaccessible if a tool (e.g., screwdriver, wrench, socket, etc.) or a key (equipment in a locked cabinet) is required to gain access to them. Additionally, the operator cannot have access to a conductive surface connected to any cable conductor (High, Low or Guard).

Assure the equipment under test has adequate insulation between the cable connections and any operator-accessible parts (doors, covers, panels, shields, cases, cabinets, etc.). Verify there are multiple and sufficient protective means (rated for the voltages you are applying) to assure the operator will NOT come into contact with any energized conductor even if one of the protective means fails to work as intended. For example, the inner side of a case, cabinet, door, cover or panel can be covered with an insulating material as well as routing the test cables to the module's front panel connectors through non-conductive, flexible conduit such as that used in electrical power distribution.

Statement of Compliance

This module has been designed and tested in accordance with IEC Publication 1010-1 + A1:1992 Safety requirements for Electrical Equipment for Measurement, Control and Laboratory Use, and has 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 module 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.

Australian EMC Regulations

The C-Tick mark is a registered trademark of the Spectrum Management Agency of Australia. 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

This product has been designed to meet the protection requirements of the European Communities Electromagnetic Compatibility (EMC) directives:

CISPR11 Level A
EN50082-1:1992

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. Also ensure that any spare slots in the VXI Mainframe are fitted with blanking plates (HP E8400-60202).

Fuse Information

Fuses on the HP J4225/26A DWDM Receiver Modules and the HP J4230A/31A/32A DWDM Transmitter Modules are **not** user replaceable.

In both the HP DWDM Receiver and the DWDM Transmitter Modules the fuses are:

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

* NB = Normal Blow

Declaration of Conformity

according to ISO/IEC Guide 22 and EN45014

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

Declares that the product

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

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 21August 1997

Supplementary Information:

The product conforms to the following safety standards:

EN 61010-1(1993)
IEC 61010-1(1990) +A1(1992) +A2(1995)
CSA-C22.2 No. 1010.1-93
EN 60825-1(1994) / IEC 825-1(1993)

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

South Queensferry, Scotland	***30 July 1999***	W R Pearson
Location	***Date***	***W.R. Pearson / Quality Manager***

Europe Contact:
Your Local Hewlett-Packard Sales and Service Office or Hewlett-Packard GmbH, Department 2Q / Standards Europe
Herrenberger Strasse 130, D7030 Boblingen (Fax: +49-7031-143143)

Declaration of Conformity

according to ISO/IEC Guide 22 and EN45014

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

Declares that the product

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

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 21August 1997

Supplementary Information:

The product conforms to the following safety standards:

EN 61010-1(1993)
IEC 61010-1(1990) +A1(1992) +A2(1995)
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Declaration of Conformity

according to ISO/IEC Guide 22 and EN45014

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

Declares that the product

Product Name:	HP SpectralBER DWDM Transmitter
Model Number:	HP J4230A
Product Options:	This declaration covers all options of the above product as detailed in TCF A-5951-9852-01

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 21August 1997

Supplementary Information:

The product conforms to the following safety standards:

EN 61010-1(1993)
IEC 61010-1(1990) +A1(1992) +A2(1995)
CSA-C22.2 No. 1010.1-93
CFR Ch.1 1040.10
EN 60825-1(1994) / IEC 825-1(1993)

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

South Queensferry, Scotland	***30 July 1999***	W R Pearson
Location	***Date***	***W.R. Pearson / Quality Manager***

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Declaration of Conformity

according to ISO/IEC Guide 22 and EN45014

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

Declares that the product

Product Name:	HP SpectralBER DWDM Transmitter
Model Number:	HP J4231A
Product Options:	This declaration covers all options of the above product as detailed in TCF A-5951-9852-01

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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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 21August 1997

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CSA-C22.2 No. 1010.1-93
CFR Ch.1 1040.10
EN 60825-1(1994) / IEC 825-1(1993)

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Declaration of Conformity

according to ISO/IEC Guide 22 and EN45014

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

Declares that the product

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

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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CSA-C22.2 No. 1010.1-93
CFR Ch.1 1040.10
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Location	***Date***	***W.R. Pearson / Quality Manager***

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Contents

Chapter 1
Getting Started with HP SpectralBER

This chapter contains general information on the composition of an HP SpectralBER system, J4221A or J4222A and its Transmitter and Receiver modules. The difference between the two systems is in the HP VXI C-Size Mainframe monitoring capabilities as highlighted in the table below:

HP SpectralBER Model Number	HP VXI C-Size Mainframe			HP Command Module	HP DWDM Controller
	Model Number	Power Supply	Monitor		
HP J4221A	HP E8403A	1 kW	***Basic***	HP E1406A	HP J4223A
HP J4222A	HP E8404A	1 kW	***Enhanced***	HP E1406A	HP J4223A

Refer to the appropriate *VXI C-Size Mainframe User and Service Manual* for specific details of each mainframe.

Descriptions in this manual relate to both HP SpectralBER Systems. (The designation HP SpectralBER refers to both systems.)

Product Overview

HP SpectralBER is a C-Size VXI based system comprising:

- HP VXI C-Size Mainframe.
- HP Command Module.
- HP DWDM Controller.
- HP Optical Transmit and/or Receive modules.

It can be controlled from a PC or workstation using:

- SCPI commands
- Universal Instrument Drivers
- or manually using a soft front panel.

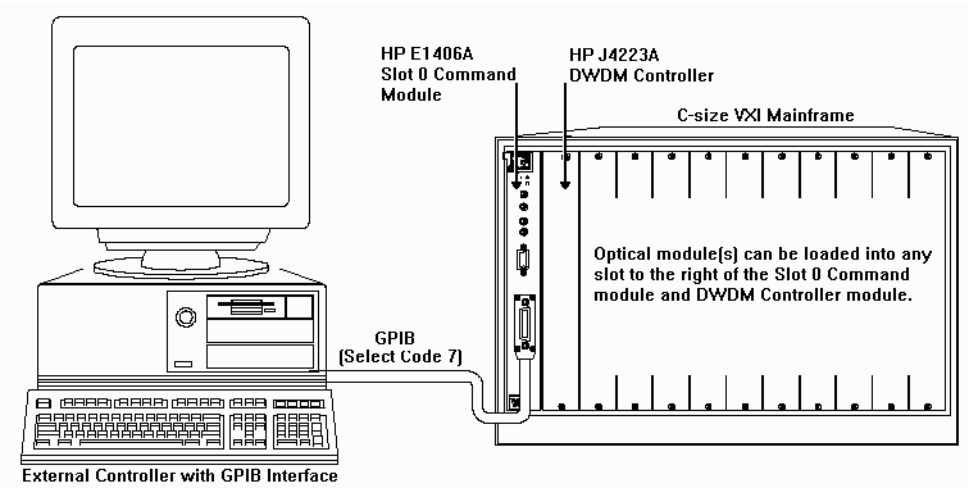
Each VXI mainframe must contain a Command Module and a DWDM Controller, to provide the required control of the register based Transmitter / Receiver modules.

Each Transmitter and Receiver module occupies 2 VXI slots, therefore in the 13 slot C-Size VXI Mainframe, in addition to the single slot Command and DWDM Controller modules, a maximum of 5 Transmit and/or Receive Modules can be accommodated.

To meet EMC compliance, all unused slots in the VXI Mainframe must be filled with a EMC Filler Panel, HP Part No. E8400-60202.

VXI Mainframe & Command Module

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



External Controller /Module Communication

To communicate with modules, SCPI commands are applied to the Command Module in slot 0. The commands are passed to the DWDM Controller module and from there to specific modules using commander/servant module addressing; see "Addressing" below.

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 located 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 number of servants that the commander can control. Normally, the servant area value is set to 5 (maximum for SpectralBER).
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

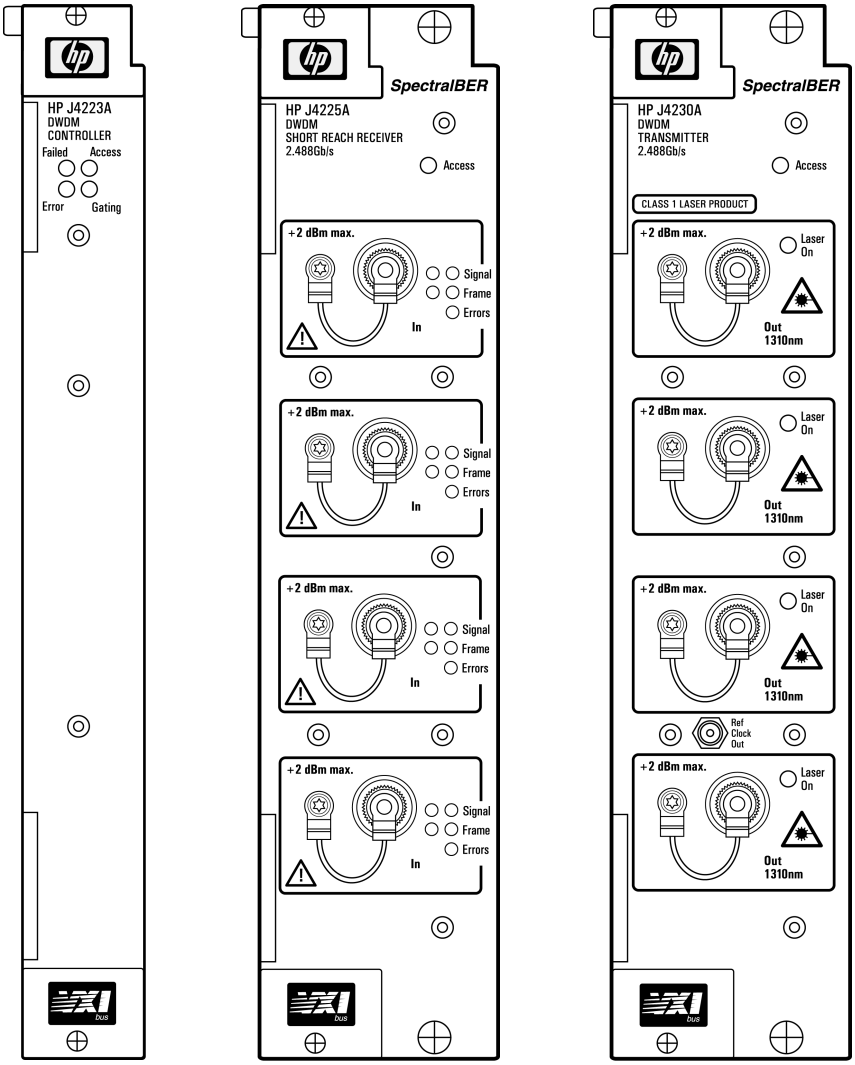
When an error occurs, an error indicator lights on the DWDM Controller module, and an error message stored in the system error queue. The message can be read using the **SYSTem:ERRor?** command, or by using the soft panels.

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 (FIFO); 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.

SpectralBER Modules



DWDM Controller

The HP 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.

Transmitter Modules

The HP J4230A, HP J4231A and HP J4232A are registered-based C-Size double slot VXI modules. Each module has four optical output ports with the following wavelengths:

- 1310 nm for all HP J4230A optical ports.
- 1550 nm for all HP J4231A optical ports.
- ITU-T 1550 nm for the HP J4232A optical ports. This module can provide a different wavelength for each optical port. These wavelengths conform to the ITU standard and have 50 GHz spacing.

These modules can optically transmit B1, B2 and Bit errors and a J0 trace message in a 2.4 Gb/s concatenated (SDH STM-16c or SONET OC-48c) signal carrying PRBS payloads.

Receiver Modules

The HP J4225A (Short Reach) and HP J4226A (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.

These modules detect alarms (see list below), make BER measurements and capture the J0 trace message in a 2.4 Gb/s concatenated (SDH STM-16c or SONET OC-48c) signal carrying PRBS payloads.

- Loss of Signal (LOS)
- Out of Frame (OOF)
- Loss of Frame (LOF)
- Pattern Sync Loss

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

Chapter 2
Installation

Install External Controller I_O Cards

1. Install your (PC or Workstation) External Controller GPIB card into your External Controller. See the applicable Controller GPIB Card Installation Guide for instructions.

Caution **To avoid potential damage to your Controller, we suggest you wear an ESD wrist strap and observe all ESD precautions when installing (or removing) External Controller I_O cards.**

2. 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 30

Installing a GPIB PC Card

For example, instructions in the *HP 82350 PCI HP-IB Interface Installation Guide* show how to install an HP 82350A card into a PCI slot in the PC. See Figure 2-1 below.

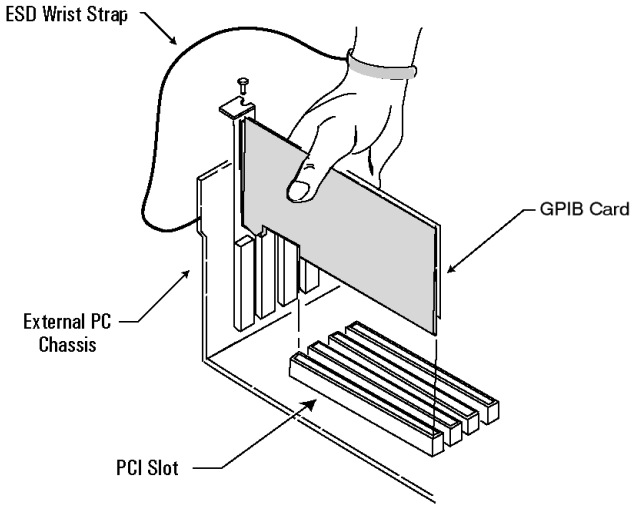


Figure 2-1. Example of Installing a GPIB Card

HP SpectralBER Shipment Cartons

Your HP SpectralBER System is shipped to you as follows:

- 1 Carton for each C-Size VXI Mainframe ordered (includes all documentation and software).
- 1 Carton for each E1406A Command Module ordered (includes documentation and software).
- 1 Carton containing the J4223A DWDM Controller module.
- 1 Carton for each Transmitter and/or Receiver module ordered.

Initial Inspection

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

Inspect the shipping container for damage. If the shipping container or cushioning material is damaged, it should be kept until the contents of the shipment have been checked for completeness and the module has been checked both mechanically and electrically. Procedures for checking electrical operation are given in Chapter 3. If the contents of the shipment are incomplete, if there is mechanical damage or defect, notify the nearest Hewlett-Packard Office. If the module does not pass the electrical performance tests given in Chapter 3, notify the nearest Hewlett-Packard office. If the shipping container is also damaged, or the cushioning material shows signs of stress, notify the carrier as well as the nearest Hewlett-Packard office. Keep the shipping materials for the carrier's inspection. The Hewlett-Packard 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 gasses or fumes.

This module may be operated in environments within the following limits:

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

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

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

The module 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 1010 and 644 respectively.**

Cooling Requirements

VXI modules are cooled by air drawn through the back of the mainframe and exhausted from the sides. Both mainframes E8403A and E8404A provide adequate cooling for HP SpectralBER modules. Full details of mainframe cooling requirements will be found in the *E8403A* or *E8404A VXI C-Size Mainframe User and Service Manual.*

Caution **When installing the module in a cabinet, the air flow into and out of the module must not be restricted.**

Power Requirements

VXI modules are powered from the VXI Mainframe. Both mainframes E8403A and E8404A provide adequate power for HP SpectralBER modules. Full details of mainframe power requirements will be found in the *E8403A* or *E8404A VXI C-Size Mainframe User and Service Manual.*

Installing the Mainframe

Install the C-Size VXI Mainframe (either HP E8403A or HP E8404A) using the information in Chapter 1 of the appropriate *Mainframe User and Service Manual.*

Installing a Module in a VXI Mainframe

Caution **Review "Connections" on page 26 before installing or removing modules. Do not install or remove a module while the VXI Mainframe is powered-up. Doing so may cause irreparable damage to the module or the VXI Mainframe.**

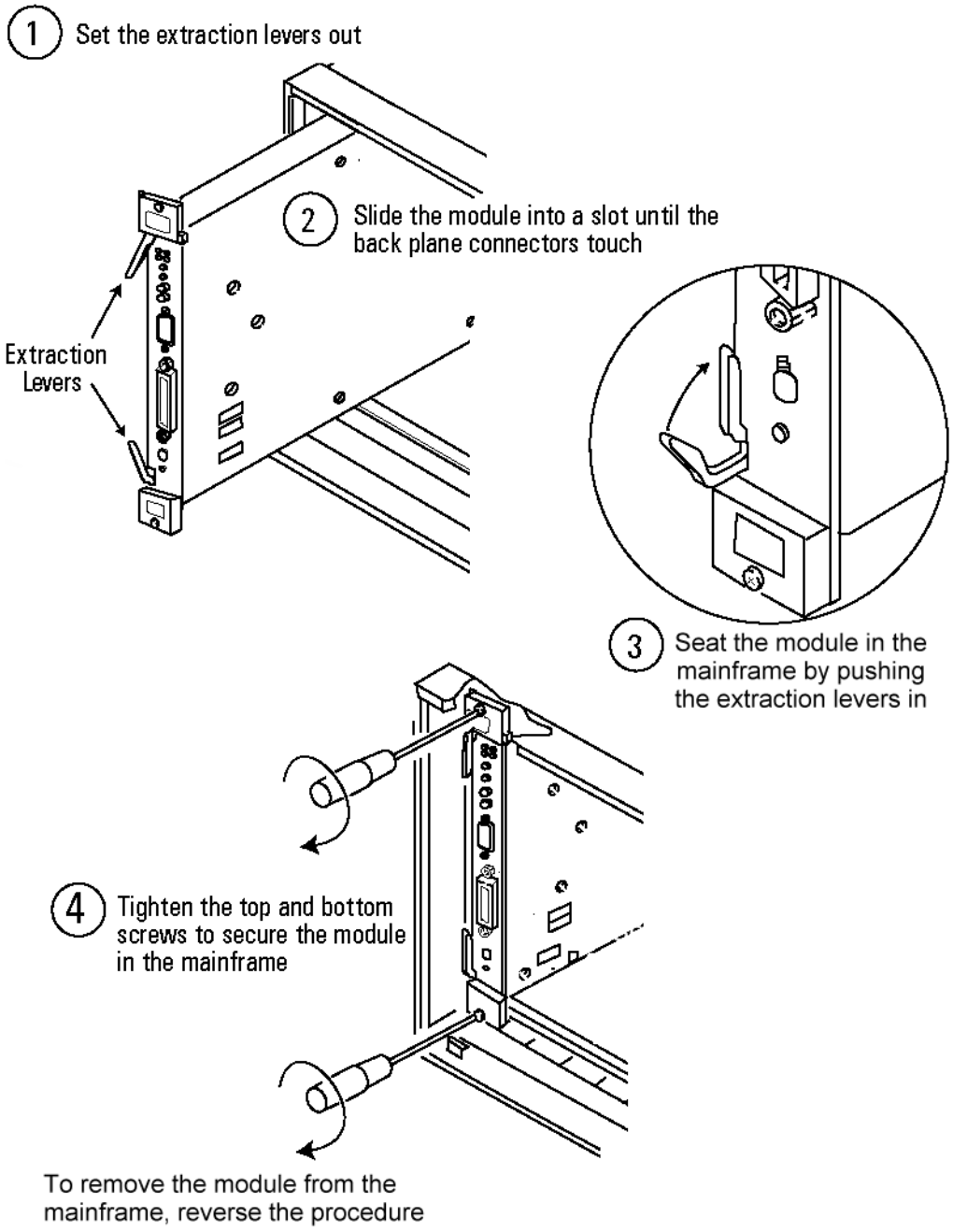


Figure 2-2. Installing a Module in a VXI Mainframe

Installing the Command Module

Install the HP E1406A Command Module in the VXI Mainframe using Chapter 1 of the *HP E1406A Command Module User's Manual.*

Installing the DWDM Controller Module

Install the HP J4223A DWDM Controller in the VXI Mainframe using the following guidelines.

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.

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 24. The switches are binary weighted, from *0* (LSB) to *7* (MSB). The weightings are marked on the clamshell enclosure.

Note The value you select must not conflict with the logical address of any other module.

Servant Area

The servant area of the DWDM Controller is factory preset to 5, the maximum number of optical transmitters and/or receivers that can be accommodated in the mainframe.

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 24. The switches are binary weighted, from *0* (LSB) to *7* (MSB). The weightings are marked on the clamshell enclosure.

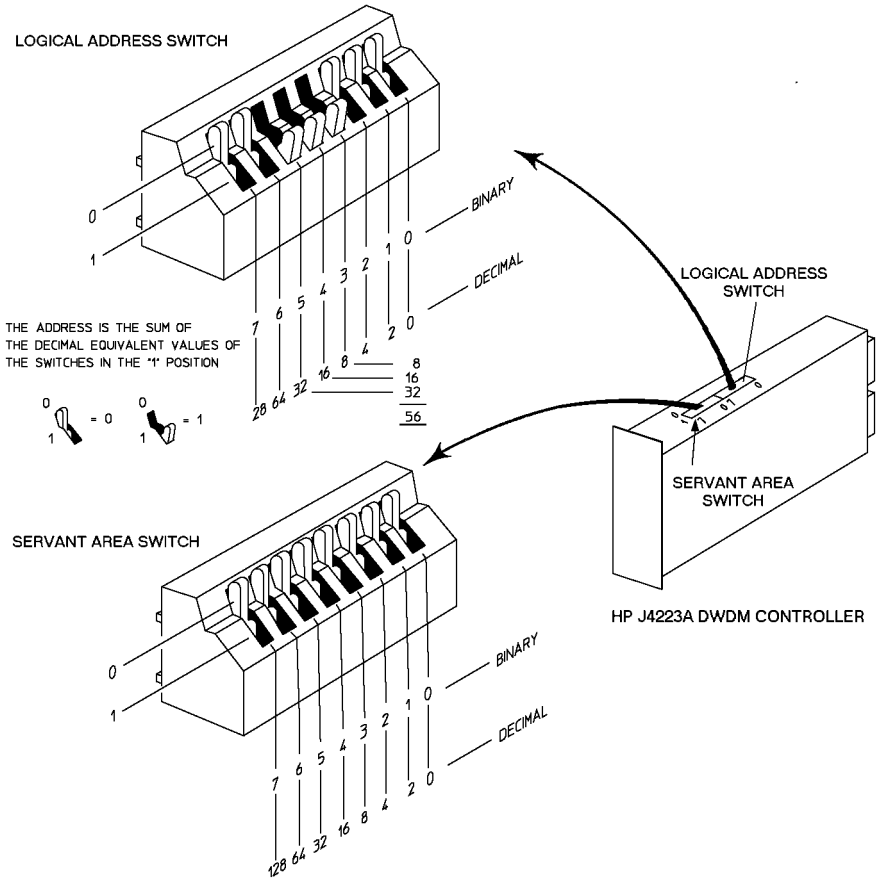


Figure 2-3. Setting DWDM Controller Address Switches

Module Location

The DWDM Controller module is usually located in a slot to the right of HP1406A Command Module and to the left of any transmitter or receiver modules, however the precise slot you use is not important.

Install Module

Refer to the instructions under “Installing a Module in a VXI Mainframe” on page 22 to install the module.

Install Transmit or Receive Modules

Install the Transmit and/or Receive modules in the VXI Mainframe using the information in Chapter 1 of the appropriate *Module User’s Manual.*

Note That any other, non SpectralBER VXI modules can be accommodated in the VXI Mainframe with the SpectralBER modules.

HP SpectralBER Module Addressing

HP SpectralBER is a “virtual instrument” in VXI terms, consisting of one Message Based Commander (the DWDM Controller) and up to 5 register based servants. The servants can be any mix of Transmitter and/or Receiver modules.

To create the VXI instrument, the normal VXI rules as regards Logical Address settings must be observed. Each servant Transmitter and Receiver must have its Logical Address set such that it is unique within the VXI Mainframe and is within the Servant Area setting of the HP 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 of the Commander and its Servant Area are also set by switches, see “Installing the DWDM Controller Module” on page 23

The Logical Address setting of the Servant modules determines which SCPI supersystem (TMODule<m> or RMODule<m>, as defined in the *HP SpectralBER Remote Control Manual*) will control which module. The Transmitter module with the lowest Logical Address will be controlled by the :TMOD1 system. The :TMOD2 system will control the module with the next lowest 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 HP SpectralBER Mainframe Configuration

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

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 Controlling Computer

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

Digits 3 & 4 (i.e. 01) Secondary GPIB address of HP SpectralBER Commander. This is the module Logical Address divided by 8.

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

OUTPUT 70901;:RMOD2:SENS4:DATA:TEL:PAY:PATT PRBS23

Full details of HP SpectralBER SCPI programming will be found in the *HP SpectralBER 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 above example, however it is recommended that this is done so that the SCPI supersystem commands used to control a module more closely reflect the physical position of the module in the VXI Mainframe.

Connections

Caution **Damage can occur to the optical input ports of the HP J4225A and HP J4226A if they are connected directly to the optical output ports of the HP J4231A 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 “Install HP SpectralBER Software” on page 29.

Figure 2-4 shows a typical soft front panel and how to verify which modules are installed in a VXI Mainframe.

When you click on the **Channel Map** button, the Channel Map is displayed which has details of the total number and type of modules installed, their location and their logical addresses, it also provides module SCPI supersystem number data i.e. TMODn or RMODn in the Module ID column.

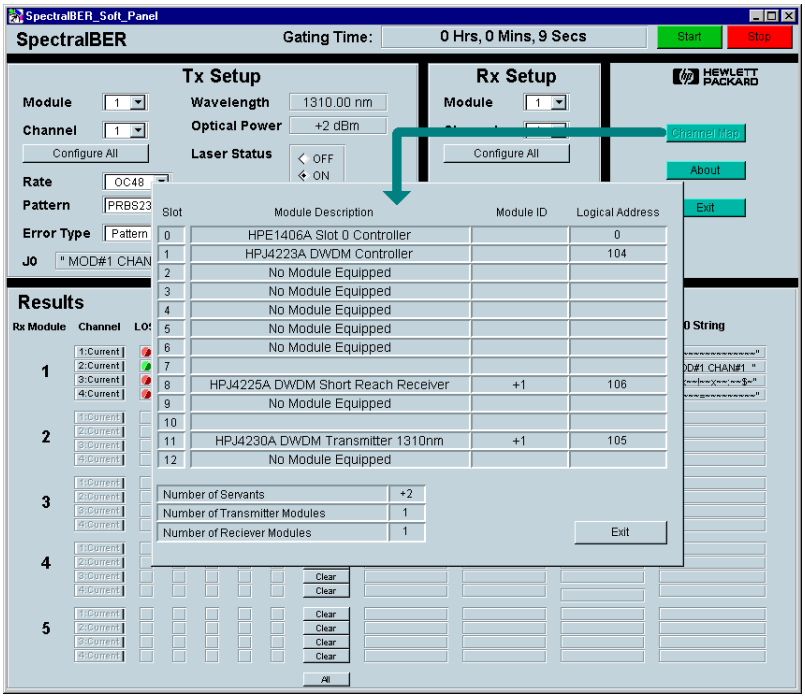


Figure 2-4. Verify Module Installation

Multiple Mainframe HP SpectralBER Systems

Your HP 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 HP SpectralBER system requires an HP E1406A Command Module and an HP J4223A DWDM Controller Module. A typical system configuration consisting of 2 VXI Mainframes is shown in Figure 2-5 and the corresponding address map in Table 2-2 .

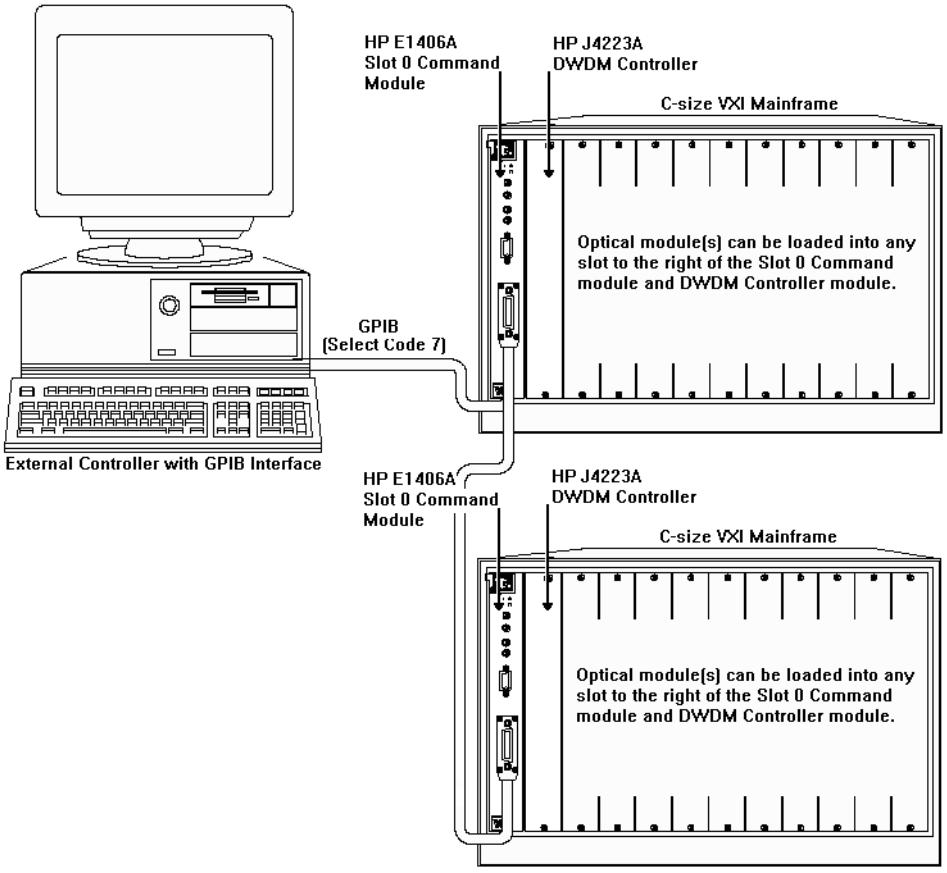


Figure 2-5. Typical HP SpectralBER Multiple Mainframe System

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

VXI Mainframe	Module	GPIB Address*	SCPI System	Logical Address	Servant Area
1	HP E1406A Command Module	70900	---	0	255
	HP J4223A DWDM Controller	70901	---	8	5
	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	---

Table 2-2. Typical HP SpectralBER Multiple Mainframe System Address Map (continued)

VXI Mainframe	Module	GPIB Address*	SCPI System	Logical Address	Servant Area
2	HP E1406A Command Module	71000	---	0	255
	HP J4223A DWDM Controller	71001	---	8	5
	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	---

** Each Mainframe Command Module must have a unique primary GPIB address.*

Verifying Multiple Mainframe Installation

You can verify module installation using soft front panels, see “Verify Module Installation” on page 27 To verify a multiple mainframe system, open a soft front panel for each mainframe.

Install HP SpectralBER Software

Platforms and Operating Systems

HP SpectralBER is compatible with; WIN, WIN95 or higher, WINNT 4.0 or higher, SUN and HP-UX 9.x, 10.01 and 10.20.

Hardware

Recommended requirements for running the HP SpectralBER Soft Front Panel under Windows 95/NT are as follows. (Consult your chosen platform documentation for specific hardware requirements.)

- GPIB card that supports Microsoft Windows® 95/NT
- Memory for Windows® 95: 16 MB required, 32 MB recommended
- Memory for Windows® NT: 32 MB required, 64 MB recommended
- 1024x768 256-color display or better required
- CD-ROM drive

Software

- Application programs to program the VXI system, such as Visual C/C++®, HP VEE, Visual Basic®, etc.
- HP I_O Libraries for Instrument Control CD. (Supplied with your GPIB Interface card.)
- HP SpectralBER System Software CD. (Supplied with your HP SpectralBER System.)

Install Application Programs

If you have not already done so, install the application programs to program the VXI system, such as Visual C/C++®, HP VEE, Visual Basic®, etc. 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.

HP SpectralBER System Software

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

- Windows® 95/NT
- HP-UX
- Solaris®

The two other directories on the CD contain:

- Manuals (electronic copies in *pdf* format of the printed manuals that are supplied with the system)
- Adobe® Acrobat Reader (required to read the *pdf* files)

The three platform directories each contain the HP System Software appropriate to the specific platform.

Windows 95/NT

The HP System Software for Windows® 95/NT consists of:

- Universal Instrument Driver (UID)
- HP Spectralber Soft Panel
- HP Spectralber Upgrade Utility
- HP Spectralber Instrument Firmware

Note

The HP SpectralBER Soft Front Panel and the HP SpectralBER Upgrade Utility both require a run-time version of HP VEE to be installed. A copy has been provided in the Windows 95/NT directory.

Install HP SpectralBER System Software

From the *win95nt* directory:

1. Read the *Readme* file.
2. Run the hpj422xa.exe file to install the System Software.
3. If you have not already done so, install HP VEE by running the *setup.exe* file in the *hpvee\disk1* directory.

Verify System Software Installation

You can verify software and hardware installation using soft front panels, see “Verify Module Installation” on page 27 or see “Verifying Multiple Mainframe Installation” on page 29.

HP-UX

The HP System Software HP-UX consists of:

- Universal Instrument Driver (UID)
- HP Spectralber Soft Panel
- HP Spectralber Upgrade Utility
- HP Spectralber Instrument Firmware

Note The HP SpectralBER Soft Front Panel and the HP SpectralBER Upgrade Utility both require a run-time version of HP VEE to be installed. A copy has been provided HP-UX directory.

Install HP SpectralBER System Software

From the *hpux* directory:

1. Read the *Readme* file.

Note *hp422xadepot* is a compressed swinstall Depot, it may appear however, as *hpj422~1*.

Untar *hp422xadepot:*

2. Copy the *hp422xadepot* file to */tmp*.
3. cd to */tmp.*
4. *tar -xvf ./hp422xadepot*

You should now have a swinstall Depot called */tmp/hp422xa_Depot.*

Install the System Software:

5. *swinstall -s <hostname>:/tmp/hp422xa_Depot*
6. If you have not already done so, install HP VEE according to the instructions contained in the *Readme* file.

Note Instructions for using the UID functions are in the *hp422xa.hlp* file which will be installed as part of the package.

View the *hp422xa.hlp* file with the command:

hyperlink hp422xa.hlp.

Verify System Software Installation

You can verify software and hardware installation using soft front panels, see “Verify Module Installation” on page 27 or see “Verifying Multiple Mainframe Installation” on page 29.

Solaris

The HP System Software for Solaris® consists of the HP SpectralBER Universal Instrument Driver (UID).

Install HP SpectralBER System Software

From the *solaris* directory:

1. Read the *Readme* file.
2. Copy the *hp422xa_pkg.tar* file to */tmp*.
3. cd to */tmp*.
4. *tar -xvf ./hp422xa_pkg.tar*

Once the package has been extracted you can install it using the following command.

5. *pkgadd -d /tmp/hp422xa_pkg*

Note

For instructions on using the UID functions, refer to the online *hp422xa.hlp* file which will be installed as part of the package.

Verify System Software Installation

You can verify software and hardware installation using soft front panels, see “Verify Module Installation” on page 27 or see “Verifying Multiple Mainframe Installation” on page 29.

Configuring a HP SpectralBER System

The following assumes that you already have a GPIB card installed and configured. If you do not or are unsure how to do this consult your GPIB documentation.

Two steps are required to configure the HP SpectralBER software:

1. Configure the VXI Interface.
2. Configure HP VEE to recognize the instrument.

Perform both steps for each VXI Mainframe that you wish to use with HP SpectralBER.

Configuring your VXI Interface

This section assumes that you are using a HP GPIB card with the HP I_O Libraries. (If you are using National Instruments GPIB hardware and software, consult the National Instruments documentation.)

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 - note this address, it will be used when configuring HP VEE.)

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.

Configuring HP VEE

To configure HP VEE you will need to know the logical address of the DWDM Controller. The default address (8) can be changed, see "Setting DWDM Controller Address Switches" on page 24.

1. Launch the HP VEE I/O Configuration Utility by typing veerun -ioconfig.

2. Select **Find Instruments**. HP VEE will display a list of the instruments it has detected.

3. Select the instrument that corresponds to the DWDM Controller in the mainframe of interest. The addresses listed are compiled as follows:

<GPIB select code><Two digit primary GPIB address>< Secondary GPIB address>

   Typically, for HP GPIB cards the select code is 7. The default primary address is 09 and the secondary address is the logical address of the DWDM Controller divided by 8. As the default logical address of the DWDM Controller is 8, the secondary address would be 8 ÷ 8 = 1.

4. Therefore; select instrument newDevice(@70901) from the list.

5. Now select **Edit Instrument** and change the device name to: SpectralBER.
   It is essential to get this name correct (including case).

6. Ensure that the interface type is set to HP-IB. Select **Advanced I/O Config** and press the **Plug&Play Driver** tab. Change the selected driver to Hpj422xa.

   You can control HP SpectralBER using GPIB-VXI addressing (recommended) or using just GPIB. (If you choose GPIB addressing some soft front panel functionality will be disabled.)

GPIB-VXI Addressing

7. To use GPIB-VXI addressing, change the address parameter of the init() call to:

<Address noted from above>::<Logical address of DWDM Controller>::INSTR

The default logical address of the DWDM Controller is 8. A *typical* address string would therefore be:
GPIB-VXI0::8::INSTR.

GPIB Addressing

8. To use GPIB addressing, change the address parameter of the init() call to:

<VISA address of GPIB card>::<Primary GPIB address>::<Secondary GPIB address>::INSTR

Following from the example above, the address string would be:
GPIB0::9::01::INSTR.

If you wish HP SpectralBER software to be able to connect to an already gating instrument, then you must unselect the Perform Reset option. Now select OK to accept the Advanced Device Configuration options then OK again to accept the Device Configuration options. Select Save Config to commit the changes to disk.

For further information on configuring HP SpectralBER and on using HP SpectralBER with multiple mainframes, see the README.TXT on the HP SpectralBER System Software CD.

Chapter 3
User Interface

Introduction

The HP SpectralBER system can be controlled from a PC or workstation using SCPI commands, Universal Instrument Drivers or manually using a soft front panel. For more information on SCPI commands, see the HP SpectralBER *Remote Control Manual.*

The soft front panel provides a graphical user interface for the HP SpectralBER system. It is used to verify system communications and functionality when the system is first installed, see “Verify Module Installation” on page 27. It can also be used as a learning tool to teach system control and capability.

It is also a useful tool for debugging software under development. For example, the soft front panel interrogates the system for its current status. The modules are not forced to defined states before displaying the system set up - number of modules, their location and logical addresses etc.

This chapter describes the soft front panel.

The Soft Front Panel

The “screen shot” in Figure 3-1 illustrates a typical HP SpectralBER soft front panel and points out its various sub-panels. The following paragraphs describe the sub-panels in more detail.

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

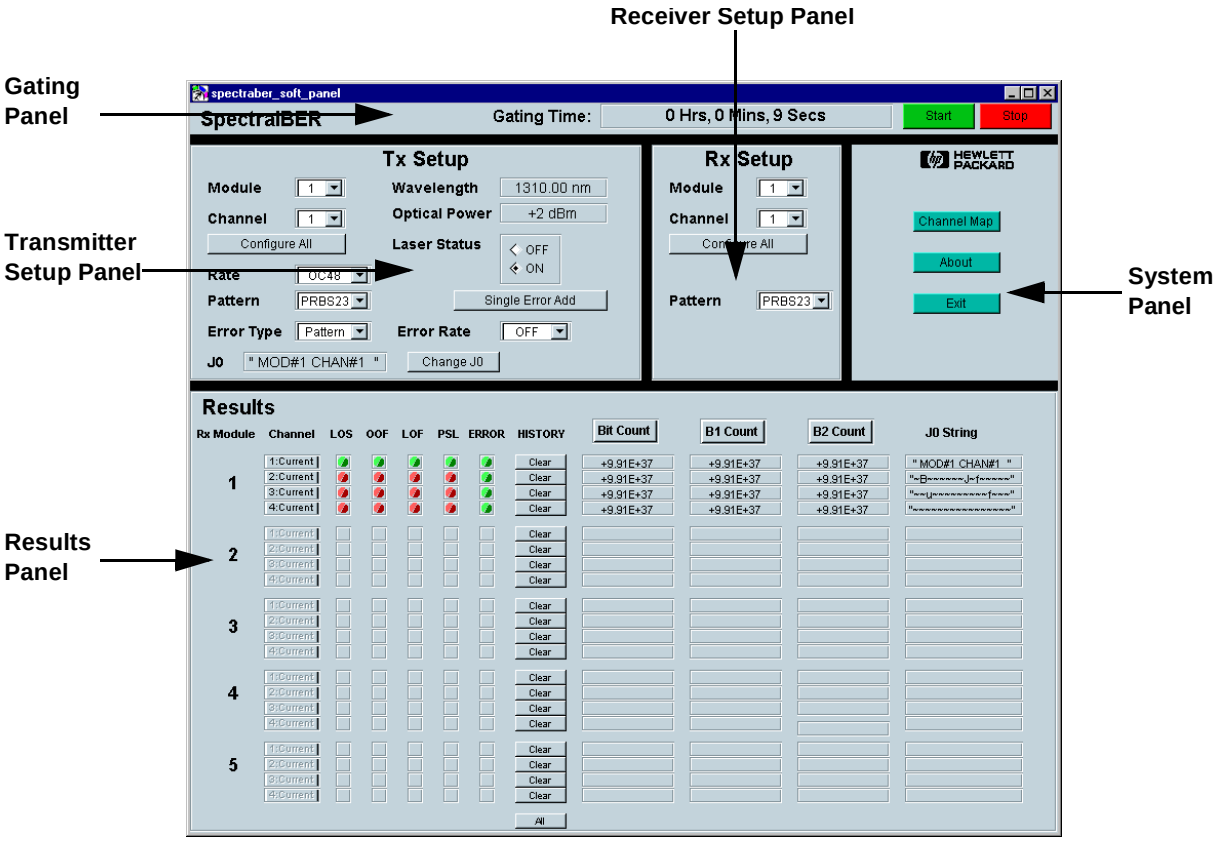


Figure 3-1. A Typical Soft Front Panel

System Panel

The System Panel provides you with basic information about the status of your system and further information (via the Channel Map) about the VXI system you are connected to.

Channel Map

The Channel Map provides VXI mainframe information; the number and type of modules installed, their location and their logical addresses, it also provides module SCPI supersystem number data i.e. TMODn, RMODn in the Module ID column.

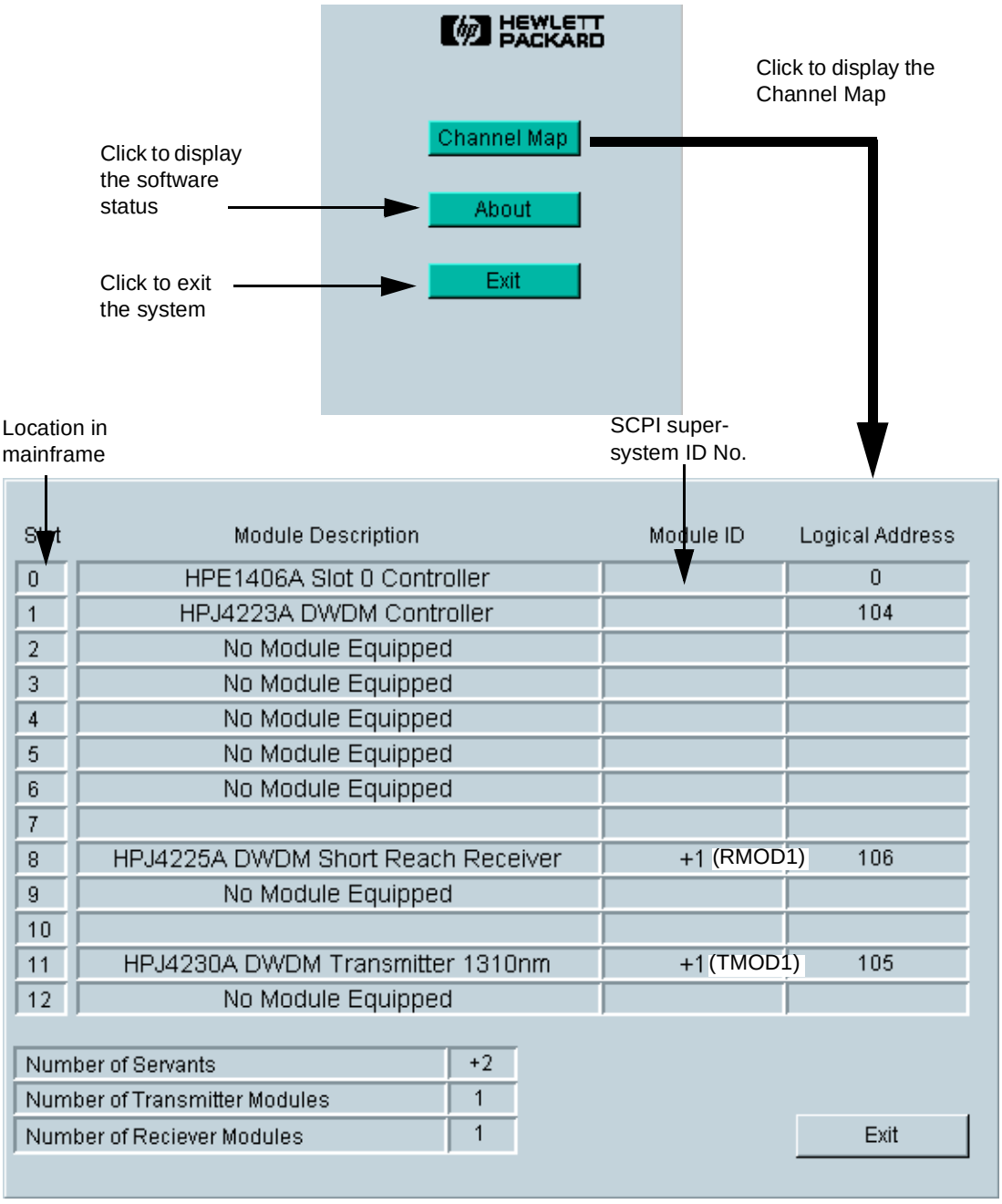


Figure 3-2. System Panel

Receiver Setup Panel

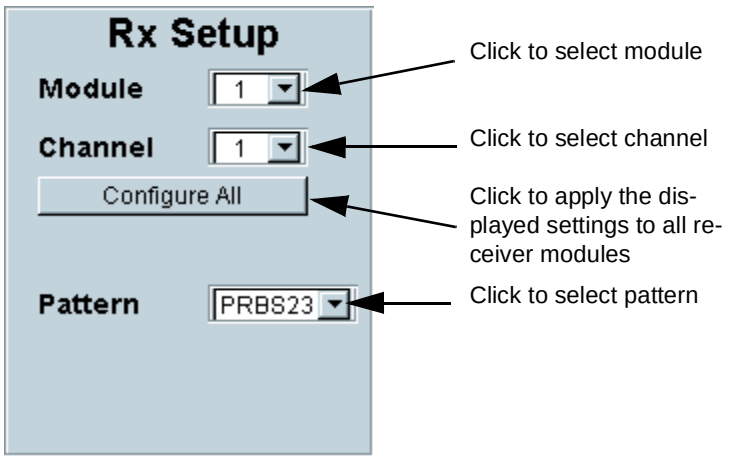


Figure 3-3. Receiver Setup Panel

Transmitter Setup Panel

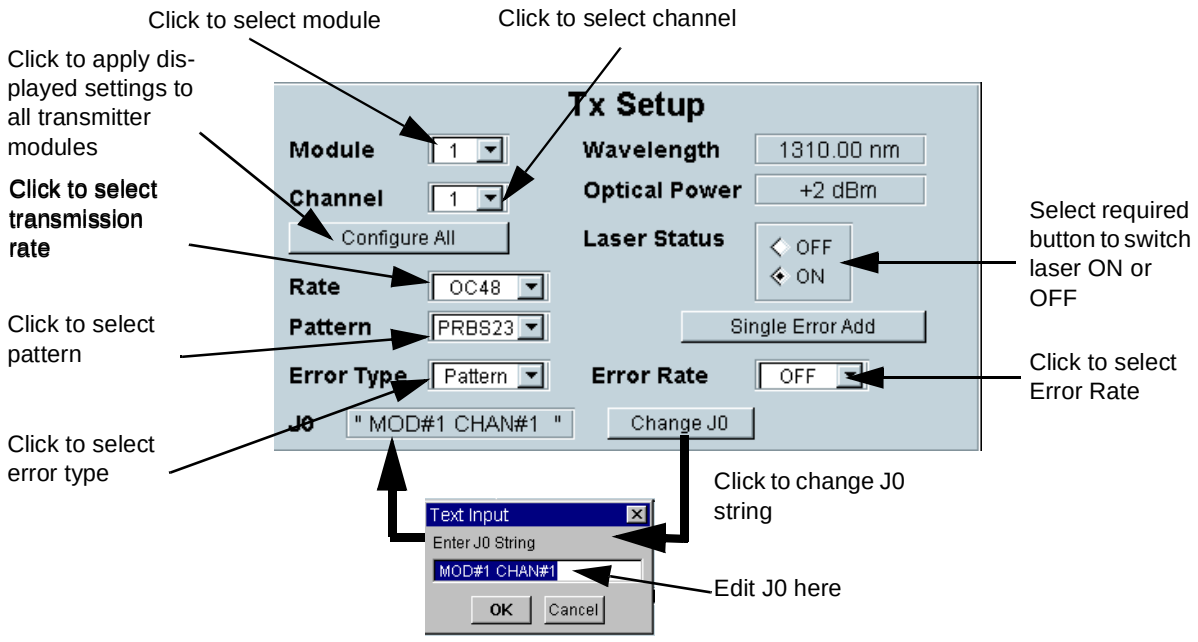


Figure 3-4. Transmitter Setup Panel

Results Panel

The left side of the panel displays results with LEDs, for LOS, OOF, LOF, PSL and ERROR. Clicking on a Channel button changes what the LEDs represent, either **Current** data or **History** data - a third state **Inactive** disables the channel and switches the LEDs OFF for that channel.

The right side of the panel displays the current status of **Bit Count/Bit Ratio**, **B1 Count/B1 Ratio**, **B2 Count/B2 Ratio** and the **J0 String**. The windows on the right side of the panel show the current status of their respective measurements.

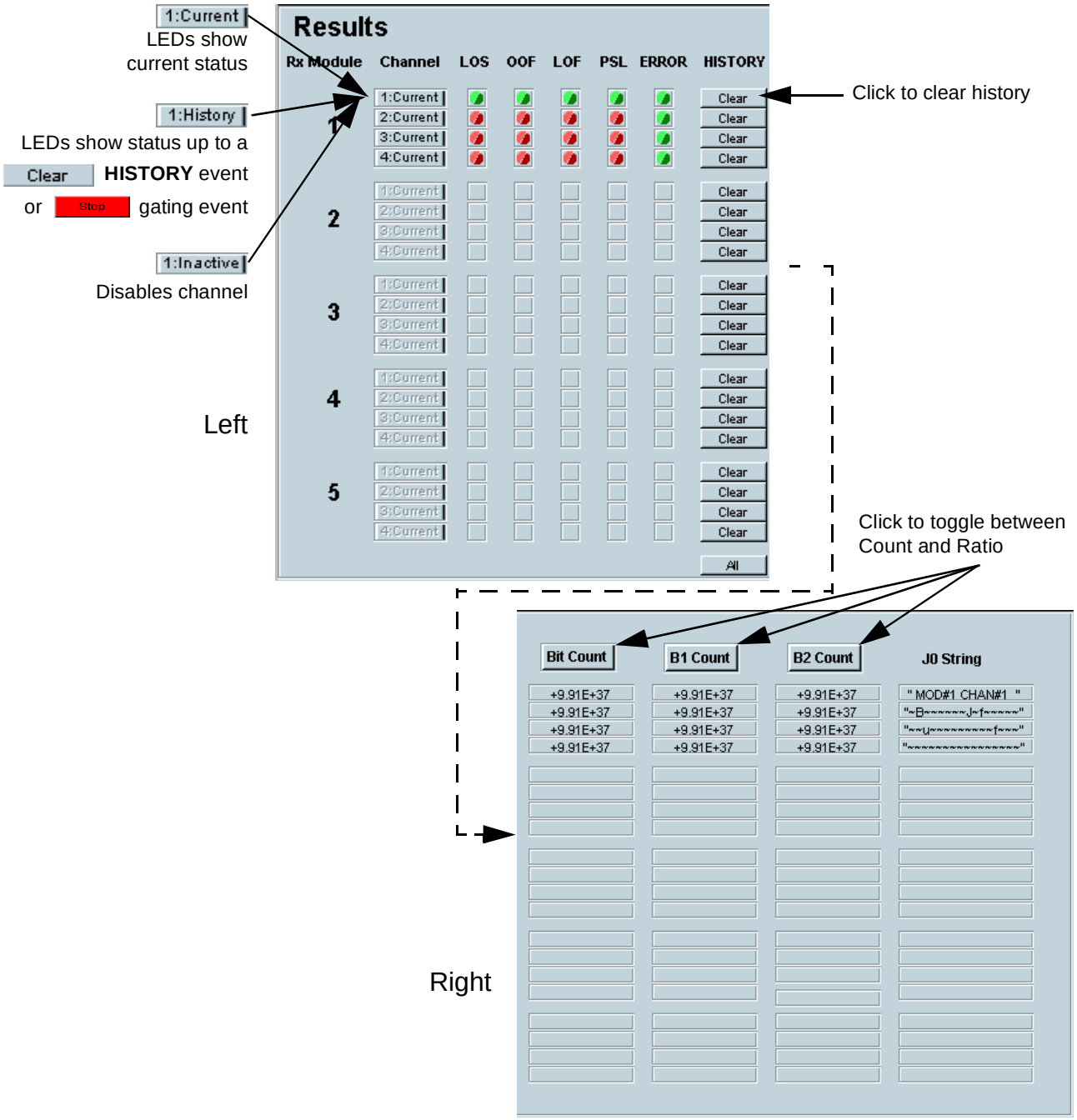


Figure 3-5. Results Panel

Gating Panel

This panel controls the gating of the mainframe and displays the elapsed gating time.

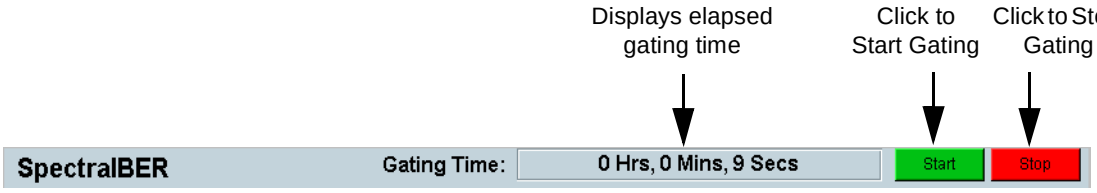


Figure 3-6. Gating Panel

Chapter 4
Example Programs

Introduction

The HP SpectralBER system can be controlled from a PC or workstation using SCPI commands, Universal Instrument Drivers or manually using a soft front panel.

This chapter provides examples of how SCPI commands can be used to control the system. For more information on SCPI commands, see the HP SpectralBER *Remote Control Manual*.

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

Start Gating

This program illustrates the sequence of SCPI commands required to start the system gating.

```
/*"start_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 HP Visa. */

void main () {

  ViSession defaultRM, vi;

  /* Open session to GPIB device at address 0913
                                                (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");

  /* Set Maximum Measurement Period */
  viPrintf (vi, ":SOUR5:PULS2:PER 8640000\n");

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

  /* Enable Synchronous Pulse generation */
  viPrintf (vi, ":OUTP5:TTLT1:STAT 1\n");

  /* Set Synchronous Command to ONCE */
  viPrintf (vi, ":TRIG3:COMM ONCE\n");

  /* Issue a Synchronous Pulse to START */
  viPrintf (vi, ":OUTP5:TTLT1:IMM\n");

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

Stop Gating

This program illustrates the sequence of SCPI commands required to stop the system gating.

```
/*"stop_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 HP Visa. */

void main () {

  ViSession defaultRM, vi;

  /* Open session to GPIB device at address 0913
                                                (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, ":TRIG3:COMM STOP\n");

  /* Issue a Synchronous Pulse to STOP */
  viPrintf (vi, ":OUTP5:TTLT1:IMM\n");

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

  /* Disable Synchronous Command Pulse 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);
}
```

Chapter 5
Firmware Upgrade Utility

The Firmware Upgrade Utility is provided so that you can easily upgrade your HP SpectralBER firmware. Upgraded code will be made available by Hewlett-Packard from time-to-time as required.

Running the Firmware Upgrade Utility

1. Locate the executable file from the directory indicated in the "Readme" file on the CD. Start the utility to display the window below in Figure 5-1.

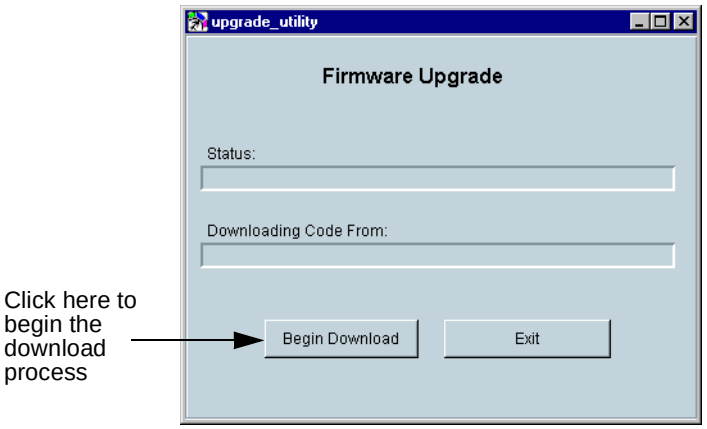


Figure 5-1. Firmware Upgrade Utility

2. Click on the **Begin Download** button to open the "Select Code File" window shown in Figure 5-2.

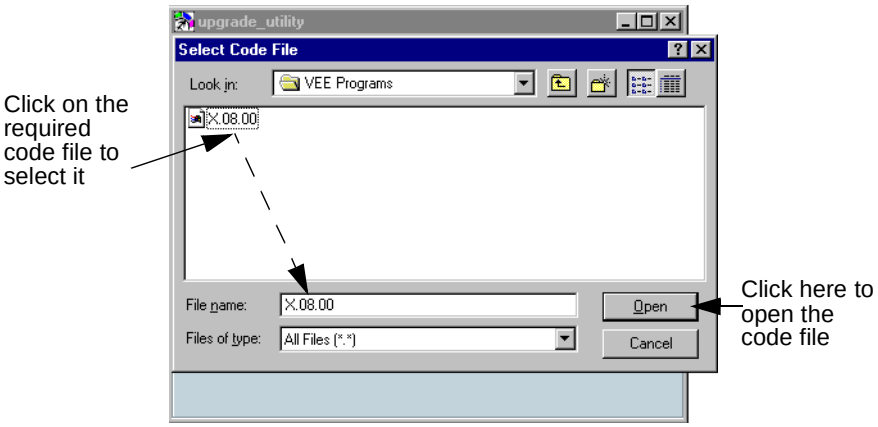


Figure 5-2. Select Code File

3. Open the selected code file, and the window shown in Figure 5-3 is displayed.

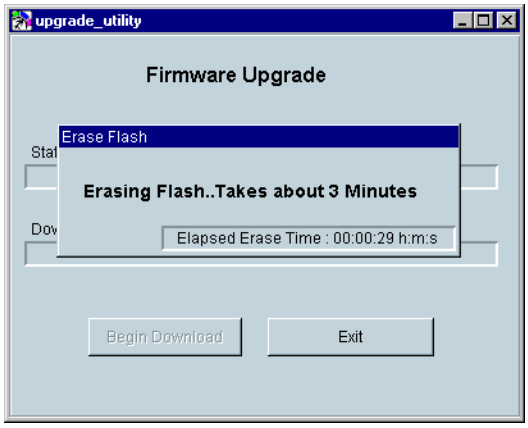


Figure 5-3. Erasing Flash

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 5-4.

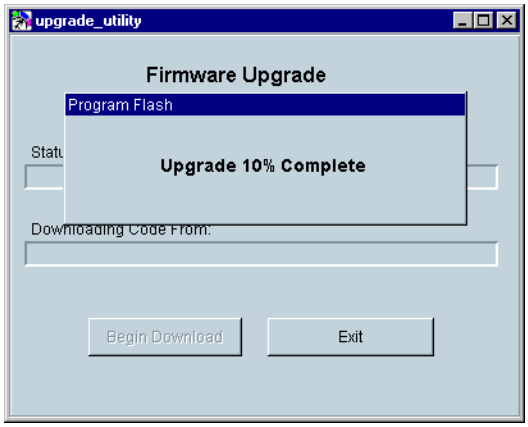


Figure 5-4. Progress Window

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

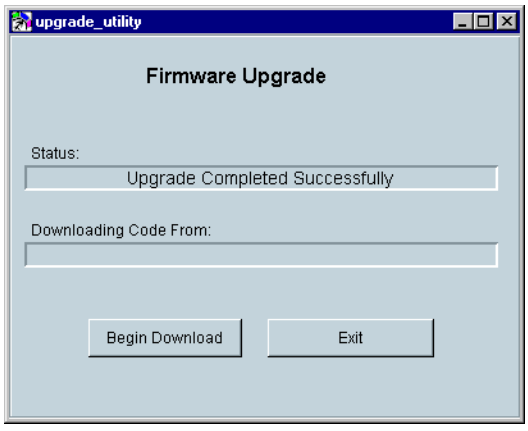


Figure 5-5. Successful Completion

Index