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User's Guide

High Density Source Bank
SSB-9200



ILX Lightwave
Photonic Test & Measurement Instrumentation

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FEEDBACK

To ensure that you get the most out of your ILX Lightwave product, we ask that you direct any product operation or service related questions or comments to ILX Lightwave Customer Support. You may contact us in whatever way is most convenient:

Telephone	800-459-9459
FAX	(406) 586-9405
E-mail	support@ilxlightwave.com
CS webpage	http://ilx.custhelp.com/cgi-bin/ilx.cfg/php/enduser/home.php
Mail	31950 East Frontage Road Bozeman, Montana, USA 59715

When you contact us, please have the following information:

Model Number _____

Serial Number _____

End-user name and telephone/fax: _____

Name: _____

Company: _____

Phone: _____

Fax: _____

4. Description or sketch of what is connected to the ILX Lightwave instrument.

_____

5. Description of the problem _____

If ILX Lightwave determines that a return to the factory will be necessary, you will be issued a Return Authorization (RA) number. Please mark this number on the outside of the shipping box.

NOTE: The shipping box and packing material have been designed specifically for the SSB-9200 and should be saved for possible transportation at a later date.

Failure to use the original packing and shipping materials when transporting the unit will void all unit warranties.

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WARRANTY ILX LIGHTWAVE CORPORATION warrants this instrument to be free from defects in material and workmanship for a period of one year from date of shipment. During the warranty period we will repair or replace the unit, at our option, without charge.

Limitation This warranty does not apply to shipping damage, fuses, lamps, defects caused by abuse, modifications, or to use of the product for which it was not intended.

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1) Obtain a return authorization number from the factory.
2) Attach a tag to the instrument identifying the owner and indicating the required service or repair. Include the instrument serial number (the model number followed by a sequenced four-digit number on the rear panel).
3) Contact ILX Lightwave for packing and shipping instructions. The original shipping container must be used.

NOTE: The shipping box and packing material have been designed specifically for the SSB-9200 and should be saved for possible transportation at a later date.

Failure to use the original packing and shipping materials when transporting the unit will void all unit warranties.

4) Send the instrument, transportation pre-paid to ILX Lightwave, referencing the return authorization number. We suggest that you insure the shipment.

Repairs will be made and the instrument returned transportation pre-paid. Repairs are warranted for the remainder of the original warranty or for 90 days, whichever is greater.

Claims for Shipping Damage When you receive the instrument, inspect it immediately for any damage or shortages on the packing list. If the instrument is damaged, contact ILX Lightwave immediately for the proper procedure for filing claims with the carrier or responsible party. ILX Lightwave will be able to supply you with information about repair costs should repair be necessary.

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PRODUCT SAFETY INFORMATION

Definition of symbols



Important operating and maintenance (servicing) instructions.



Risk of electrical shock.



Static-sensitive device, use proper grounding provisions.

Power ON symbol



Standby Symbol

Cautions and Warnings

CAUTION: Original setup of SSB-9200 will be performed by an ILX Lightwave qualified technician.



NO USER SERVICEABLE PARTS INSIDE, REFER SERVICING TO QUALIFIED SERVICE PERSONNEL

CAUTION: Only a trained operator is allowed to access interior components of the SSB-9200 for normal installation and maintenance such as cleaning, replacing and upgrading FOS-9200xxx Modules. Interior components are accessed using a screwdriver to open the rear door and a key to unlock the front door.



WARNING: When accessing interior of the SSB-9200, disconnect AC Mains power by unplugging power cord from AC Mains Socket or appliance inlet connector located on the rear door of the unit.



WARNING: Equipment may produce high leakage currents when the safety ground is faulty. Ensure that the power supply cord is connected to a properly grounded mains receptacle.



WARNING

TO PREVENT FIRE OR SHOCK HAZARD,
DO NOT EXPOSE THIS EQUIPMENT TO MOISTURE

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LASER SAFETY FOR THE SSB-9200

The SSB-9200 is classified as a Class 3b laser product. It is suggested that an employee training program be implemented regarding laser safety. Any personnel or technicians that will be working with the SSB-9200 or its output should be trained in basic laser safety. The protocols outlined in ANSI Z136.1 and/or EN 60825-1 are recommended.

CAUTION: Any disconnected fiber connector should not, at any time, be viewed directly or with direct optical aids (magnifying optics, etc.).



Use of an IR sensitive card is highly recommended for detecting IR laser light from the output of the SSB-9200.

The optically multiplexed output should not be disconnected at any time while the unit is energized.

Safety Precautions in Place

Remote Interlock Connector

The SSB-9200 is equipped with a remote interlock connector. This allows the user the option of connecting the interlock circuit of the SSB-9200 to an external switch. A jumper is supplied if the user does not wish to implement this remote interlock. The interlock is a safety feature, when the jumper is removed power to the electronics is disrupted. If not using the interlock feature, the jumper should remain installed.

NOTE: The voltage at the interlock terminals is 24 VAC.

Key Control

The SSB-9200 is equipped with a key switch. This assures that the unit cannot be energized if the key is turned to the off position and removed.

Power Indicator

The power indicator LED is a caution that laser light can be emitted from any of the optical outputs at any time while the LED is on.

Optical Output Cover

The fiber connector covers should always be in place if a fiber is not connected to the SSB-9200 output. This is intended to prevent accidental exposure to laser light as well as protect the internal optical connector from contamination.

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Laser Warning Labels

The SSB-9200 is labeled to warn the user of the potential hazards of this system. The front panel is labeled to identify all of the optical output ports and to identify the appropriate laser classification of the system. The interior is labeled to warn of the possible hazards present if the system is serviced when energized.

IEC Triangle

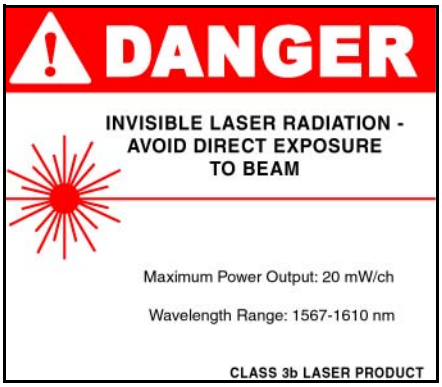


Visible and/or invisible laser radiation. Avoid direct eye exposure to the beam.

IEC Output Warning Label



CDRH Classification Label (example)



Interior Caution Label



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CONTENTS

END USER LICENSE AGREEMENT (EULA) v
PRODUCT SAFETY INFORMATION vii
LASER SAFETY FOR THE SSB-9200 viii
Safety Precautions in Place viii
Remote Interlock Connector viii
Key Control viii
Power Indicator viii
Optical Output Cover viii
Laser Warning Labels ix

CHAPTER 1 INTRODUCTION

Company and Technology Overview 1-1
Product Overview 1-1
Features of the SSB-9200 1-2
Available Options and Accessories 1-2
Summary of Instruction Manual 1-3

CHAPTER 2 INSTALLATION

SSB-9200 Installation Requirements 2-1
Unpacking and Inspecting 2-2
Unpacking the SSB-9200 2-3
SSB-9200 Power Supply Installation 2-4
Optical Connector Installation 2-5
Mounting the SSB-9200 in a rack 2-5
Turning ON or OFF 2-6

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CHAPTER 3 BASICS

Unit Components 3-1
Exterior 3-1
Interior 3-3
SSB-9200 System Characteristics 3-5
SSB-9200 Clearances 3-5
SSB-9200 System Specifications 3-6
Internal Modulation (Digital) 3-6
Internal Modulation (Analog) 3-6
External Modulation (Digital) 3-6
External Modulation (Analog) 3-6
Computer Interface 3-6
FOS-9200xxx Source Module Specifications 3-7
Electrical and Optical Specifications 3-7
Variable Optical Attenuator Specifications 3-8
Module Matrix 3-9
Graphical User Interface (GUI) Overview 3-11

CHAPTER 4 GRAPHICAL USER INTERFACE

View Window 4-2
System Status Window 4-2
Help/Status Window 4-2
Menu Keys 4-2
Submenu Keys 4-2
The Menu Tree 4-3
Comb Menu 4-4
Sources Menu 4-5
Zoom Menu 4-6
Source Table Menu 4-7
System Table Menu 4-8
Submenu Navigation, Selection, and Editing 4-9

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Selecting a Menu 4-9
Selecting a Submenu 4-9
Toggle Keys 4-9
Numeric Editing 4-9
Insert Mode 4-9
Overwrite Mode 4-10
Delete Key 4-10
Backspace Key 4-10
Arrow Keys and Rotary Knob 4-10
Text Editing 4-11
Insert Mode 4-11
Overwrite Mode 4-11
Delete Key 4-12
Backspace Key 4-12
Arrow Keys and Rotary Knob 4-12
The Help Key 4-12
Table Navigation, Selection, and Editing 4-12
Using the Back Key 4-12

CHAPTER 5 USING THE SSB-9200

Selecting Sources 5-1
Sources 5-1
Comb 5-2
View/Zoom Graph 5-2
View/Source Table 5-2
View/System Table 5-2
Setting Parameters 5-3
LASER OFF/ON 5-3
SET POWER dBm/mW 5-4
BEAM BLOCK 5-5
SLOT X WAVELENGTH (FREQUENCY) 5-6
VOA ATTEN 5-7
Power Loss Value 5-8
Shift Wavelength (Frequency) 5-9
Optical MUX Temperature 5-10

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Comb Sort 5-11
Y Axis 5-12
File Setup 5-13
Saving a Setup 5-13
Restoring, Deleting, and Renaming Setups 5-14
Changing Power Units 5-15
Changing Wavelength Units 5-15
Color Setup 5-16
Changing the GPIB Address 5-17
Channel Navigate Submenu 5-18
Navigate to a Slot Number 5-18
Using Page Left and Page Right 5-18

CHAPTER 6 COHERENCE/MODULATION

Modulation Circuits 6-1
Editing MOD1, MOD2, COHERENCE and TTL Circuits 6-4
Modulation of FOS-9200xxx laser sources 6-6

CHAPTER 7 REMOTE OPERATION

GPIB Common Commands 7-1
Description of GPIB Common Commands 7-1
Command: *CLS 7-1
Command: *ESE 7-2
Command: *ESE? 7-2
Command: *ESR? 7-3
Command: *IDN? 7-3
Command: *RST 7-4
SCPI Commands 7-6
Command: SOURce:CHANnel:FREQuency 7-6
Command: SOURce:CHANnel:FREQuency? 7-6
Command: SOURce:CHANnel:STATe 7-6

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Command: SOURce:CHANnel:STATe? 7-7
Command: SOURce:ALL:STATe 7-7
Command: SOURce:CHANnel:POWer 7-7
Command: SOURce:CHANnel:POWer? 7-7
Command: SOURce:ALL:POWer 7-8
Command: SOURce:CHANnel:POWer:LIMits? 7-8
Command: SOURce:CHANnel:WAVelength 7-8
Command: SOURce:CHANnel:WAVelength? 7-8
Command: SOURce:CHANnel:WAVelength:LIMits? 7-9
Command: SOURce:CHANnel:BBLock 7-9
Command: SOURce:CHANnel:BBLock? 7-9
Command: SOURce:CHANnel:FG:SOURce 7-9
Command: SOURce:CHANnel:FG:SOURce? 7-10
Command: :SOURce:CHANnel:AM:DEPTh 7-10
Command: :SOURce:CHANnel:AM:DEPTh? 7-10
Command: :SOURce:FGx:STATe 7-11
Command: :SOURce:FGx:STATe? 7-12
Command: :SOURce:FG:FREQ 7-12
Command: :SOURce:FG:FREQ? 7-12
Command: :SOURce:FG:SHAPe 7-13
Command: :SOURce:FG:SHAPe? 7-13
Command: UNIT:POWer 7-13
Command: UNIT:POWer? 7-13
Command: UNIT:WAVlength 7-14
Command: UNIT:WAVlength? 7-14
Command: UNIT:FREQuency 7-14
Command: UNIT:FREQuency? 7-14
Command: DISPlay:UPDAte 7-15
Command: DISPlay:UPDAte? 7-15
Command: OUTPUT:ATTENUATION 7-15
Command: SYSTEM:ERROR? 7-15
Command: SYSTEM:CHANLIST? 7-15
Command: SYSTem:RECall “x” 7-16
Command: SYSTEM:REMOTE 7-16
Command: SYSTEM:REMOTE? 7-16
Command: SYSTem:SAVe “x” 7-16

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CHAPTER 8 MAINTENANCE

Cleaning Fiber Optic Connectors 8-1
Cleaning FOS-9200xxx Connectors 8-2
Cleaning Optical Fiber Cable Connectors 8-3
Replacement of FOS-9200xxx Modules 8-5

CHAPTER 9 GUI ERRORS AND WARNINGS

WARNING Messages 9-1
WARNING: Power is below the calibration limit. 9-1
WARNING: Power is above the calibration limit. 9-1
SYSTEM LEVEL ERRORS 9-1
ERROR: Can’t read setup file. 9-1
ERROR: Can’t write setup file. 9-1
ERROR: Can’t write GPIB address file. 9-1
CONFIGURATION ERRORS 9-2
ERROR: No laser sources modules found. 9-2
ERROR: No Beam Block hardware is installed. 9-2
ERROR: No Polarizer hardware is installed. 9-2
ERROR: No Variable Optical Attenuator is installed. 9-2
USER INPUT ERRORS 9-3
ERROR: The pressed key is not valid in this context. 9-3
ERROR: Value entered is not within the allowed range. 9-3
ERROR: Minus sign is only allowed at the start of the number. 9-3
ERROR: No space for more digits in this number. 9-3
ERROR: Invalid setup file name. 9-3
ERROR: A setup file already exists by that name. 9-3
ERROR: A laser is not present in that slot number. 9-3
ERROR: No laser has that ITU channel as its center frequency. .. 9-3

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LIST OF FIGURES

FIGURE 3-1 Front door of the SSB-9200 3-1
FIGURE 3-2 Rear panel of the SSB-9200 3-2
FIGURE 3-3 Interior of the SSB-9200 viewed from front 3-3
FIGURE 3-4 Interior of the SSB-9200 viewed from back..... 3-4
FIGURE 3-5 Single Source Module Slot Reference Numbers..... 3-9
FIGURE 3-6 Dual Source Module Slot Reference Numbers 3-10
FIGURE 4-1 GUI at power up 4-1
FIGURE 4-2 COMB - 42 Laser Sources Selected 4-4
FIGURE 4-3 SOURCES..... 4-5
FIGURE 4-4 Zoom 4-6
FIGURE 4-5 Source Table 4-7
FIGURE 4-6 System Table 4-8
FIGURE 6-1 Coherence/Modulation Block Diagram..... 6-3

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LIST OF TABLES

Table 1-1 Parameter Settings 1-2
Table 1-2 SSB-9200 Options 1-2
Table 2-1 Contents of the SSB-9200 Shipping Box 2-2
Table 3-1 FOS-9200xxx Source Module Specifications 3-7
Table 4-1 Comb Menu Parameters 4-4
Table 4-2 Sources Menu Parameters 4-5
Table 4-3 Zoom Menu Parameters 4-6
Table 4-4 TOGGLE TYPE SUBMENUS 4-9
Table 4-5 VALID EDIT KEYS 4-10
Table 4-6 Alphanumeric Keypad Definition 4-11
Table 4-7 VALID EDIT KEYS 4-11
Table 5-1 Example SET LASER OFF/ON 5-3
Table 5-2 Example SET POWER dBm/mW 5-4
Table 5-3 Example SET BEAM BLOCK 5-5
Table 5-4 Example SET WAVELENGTH 5-6
Table 5-5 Example VOA ATTEN 5-7
Table 5-6 Example Power Comparison Value 5-8
Table 5-7 Example Shift Wavelength 5-9
Table 5-8 Example Optical MUX Temperature 5-10
Table 5-9 Example COMB SORT 5-11
Table 5-10 Example AUTO SCALE 5-12
Table 5-11 Example Y AXIS MIN/MAX 5-12
Table 5-12 Example DRAW GRIDS OFF/ON 5-12
Table 5-13 Example SAVING A SETUP 5-13
Table 5-14 Example RESTORING A SETUP 5-14
Table 5-15 Example POWER UNITS 5-15
Table 5-16 Example WAVELENGTH UNITS 5-15
Table 5-17 Default COLOR SETUP 5-16
Table 5-18 Example COLOR SETUP 5-16
Table 5-19 Example GPIB ADDRESS 5-17
Table 5-20 Example CHANNEL NAVIGATE 5-18
Table 6-1 Modulation Circuits 6-1
Table 6-2 Example Setting Modulation Circuits 6-5
Table 6-3 Example Set TTL MOD OFF/ON 6-6
Table 7-1 GPIB Common Commands 7-1
Table 7-2 ESE Register Bit Values 7-2
Table 7-3 ESR Register Bit Values 7-3
Table 7-4 Command: *RST Values 7-4
Table 7-5 Function Generator State 7-11

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CHAPTER 1 INTRODUCTION

COMPANY AND TECHNOLOGY OVERVIEW

ILX Lightwave is a market and technology leader in the manufacture of photonic test and measurement instrumentation. ILX Lightwave's global customer base is comprised of leading manufacturers of fiber optic telecommunications systems and components.

ILX Lightwave serves its customers from five strategically located manufacturing, sales and service centers in the United States, Canada, Japan and Europe. In keeping with its commitment to product leadership and business growth, ILX Lightwave continuously introduces new products that are designed to offer its customers long-term benefits such as manufacturing yield enhancement, greater productivity or reduced cost of ownership.

PRODUCT OVERVIEW

The SSB-9200 High Density Source Bank supports up to 100 laser source modules in a single unit. Each SSB-9200 is configured to meet individual customer requirements.

The FOS-9200xxx laser source module is a highly stable, flexible laser product specifically designed for Wavelength Division Multiplexing (WDM) test environments. This series of fiber optic source modules offers a comprehensive array of customer specified spectral and power alternatives in S, C, L-band and service channel wavelengths. Each module features calibrated power and wavelength adjustments. Modules are designed specifically for use in the SSB-9200 system mainframe and provide a solution for multi-channel test applications, component testing, product qualification or stability testing.

All capabilities of the system can be controlled through the user front panel interface or through GPIB using a SCPI command set.

The SSB-9200 is designed so that as new options become available, ILX Lightwave personnel can upgrade units in the field, minimizing down time. Refer to Table 1-2 for a list of available options.

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FEATURES OF THE SSB-9200

The SSB-9200 allows the user to control up to 100 laser sources using the Graphical User Interface or through the GPIB interface using the SCPI command language.

Table 1-1 Parameter Settings

PARAMETER	SETTING
POWER	1-30 mW (0-14.8 dBm)
WAVELENGTH TUNING	± 0.85 nm, ± 100 GHz
OPTIONAL LASER SOURCE SHUTTER	Beam Block open, shuttered
SYSTEM VOA ATTENUATION	0-40 dB
MODULATION	Analog/Digital or Coherence

Laser Source Parameters can be set through a variety of graphical views or through a table view (spreadsheet).

AVAILABLE OPTIONS AND ACCESSORIES

Other options available with the SSB-9200 High Density Source Bank System include the following:

Table 1-2 SSB-9200 Options

DESCRIPTION	MODEL NUMBER
Source Shutter	SS-810
Variable Attenuation Module	FOA9200VOA0
n Channel Optical Multiplexer ($16 \leq n \leq 50$)	FOA9200MUXn
Customer Supplied Multiplexer	FOA9200MUXCS

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SUMMARY OF INSTRUCTION MANUAL

Thank you for purchasing an ILX Lightwave SSB-9200 High Density Source Bank. This manual describes the maintenance and operation of the SSB-9200. We recommend that you read this manual before operating the SSB-9200.

Chapter 2 Installation

This chapter describes set-up procedures that must be completed before operating the SSB-9200, beginning with unpacking and inspection instructions. Various requirements for the SSB-9200 are discussed, including rack mount installation.

Chapter 3 Basics

Before using the SSB-9200 the user should become familiar with the physical components of the unit. This chapter describes the exterior and interior components and provides specifications for the components of the SSB-9200.

Chapter 4 Graphical User Interface

This chapter describes the graphical user interface.

Chapter 5 Using the SSB-9200

This chapter describes how to operate the SSB-9200 using the graphical user interface.

Chapter 6 Coherence/Modulation

This chapter describes Coherence/Modulation.

Chapter 7 Remote Operation

This chapter describes the SCPI commands available for operation of the SSB-9200 over the IEEE-488.2 GPIB interface.

Chapter 8 Maintenance

This chapter provides information on maintenance of the SSB-9200.

Chapter 9 GUI Errors and Warnings

This chapter provides information on error messages and warnings.

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CHAPTER 2 INSTALLATION

When you receive your SSB-9200, minimum installation is required. This chapter describes the steps that need to be taken before operating your unit. In summary, the following steps should be performed in the order in which they are listed:

1) Unpack and inspect the SSB-9200.

2) Only an ILX Lightwave qualified technician should install the Power Supplies. Refer to SSB-9200 Power Supply Installation, Chapter 2, page 2-4.

3) If mounting the SSB-9200 in a rack, refer to Mounting the SSB-9200 in a rack, Chapter 2, page 2-5.

SSB-9200 INSTALLATION REQUIREMENTS

Before the SSB-9200 is installed, some considerations about a location for the unit (and a remote control terminal) must be taken into account. The SSB-9200 can be installed and operated successfully in indoor environments with operating temperatures of +15°C to +35°C and less than 90% non-condensing relative humidity at all elevations above sea level. The sound pressure level emitted by the SSB-9200 does not exceed 69 dBA.

Power Requirements

The SSB-9200 High Density Source Bank Platform is designed to operate at either 100-115VAC (50Hz/60Hz, 10A) or 220-240VAC (50Hz/60Hz, 5A) with at most 10% deviation from the nominal voltage.

NOTE: The mains supply voltage is factory set and cannot be changed by the user.

NOTE: To ensure safety, use only the power supply cord supplied with the unit and properly grounded mains receptacle. All electrical cables connected to the SSB-9200 must be no longer than 3 meters to ensure that CE Compliance is maintained.

WARNING: Equipment damage and/or electrical shock can occur if the electrical outlet is not wired correctly. Ensure that the power supply cord is connected to a properly grounded mains receptacle.



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Physical Space

The SSB-9200 can be installed in a standard 19” (48.3cm) rack or on a desktop or tabletop. If a personal computer is to be used for a remote controller, space will be required for the Central Processing Unit (CPU), keyboard, mouse and display screen. A minimal front and back clearance of 22.5” (57.2cm) each is required for servicing the SSB-9200.

UNPACKING AND INSPECTING

The SSB-9200 is shipped in one custom box with all FOS-9200xxx laser source modules installed. The components shipped with your unit are listed on the packing slip and in Table 2-1.

NOTE: The shipping box and packing material have been designed specifically for the SSB-9200 and should be saved for possible transportation at a later date.

Failure to use the original packing and shipping materials when transporting the unit will void all unit warranties.

Table 2-1 Contents of the SSB-9200 Shipping Box

ITEM	DESCRIPTION OF PACKAGING
Packing Slip	on the top of the outside of the shipping box
SSB-9200	wrapped in plastic bag inside shipping box
Instruction Manual and Power Cord	in a plastic bag located in compartment under unit inside of the shipping box
(2) Power Supplies	wrapped in ESD protective packaging and in front and rear sidewall compartments of shipping box

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Unpacking the SSB-9200

1) Inspect the “TILTWATCH®” and the “SHOCKWATCH®” meters on the box exterior.

2) In the event that either or both of these indicators verify mishandling of the unit in shipping, contact ILX Lightwave before continuing.

CAUTION:  Due to the weight and dimensions of the SSB-9200, it is recommended that unpacking is done near the installation site and at least two people lift the unit out of the shipping box.

3) Using a 1/2” wrench, unbolt top and front of shipping box.

4) Open the shipping box and slide the SSB-9200 out of the box and remove the plastic bag.

5) Remove power supplies located in front and rear sidewall compartments of shipping box Handle with care and do not remove from ESD protective packaging.

6) Check the contents of the shipment against the packing slip. If any parts are missing, or if you have any questions concerning the contents of the packing slip, contact ILX Lightwave.

7) Visually inspect the unit for any obvious signs of damage caused by shipping. Contact ILX Lightwave if there are any problems.

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SSB-9200 POWER SUPPLY INSTALLATION

NOTE: Only an ILX Lightwave qualified technician should install the Power Supplies.

1) Turned off the SSB-9200 power and disconnect the power cord from the back of the unit.

2) Using a slotted screwdriver turn the six compression fasteners located on the rear panel counterclockwise to open the rear door of unit.

3) Connect ESD strap to wrist and then to an appropriate earth ground.

CAUTION: The components of the SSB-9200 must be handled as static-sensitive devices. Grounding provisions should be used any time the devices are not in conductive packaging. Emphasis on cleanliness must be maintained and appropriate precautionary measures taken to minimize accumulation of skin oil, particulates, fibers and organic contaminants.



Failure to adhere to anti-static grounding provisions will void all unit warranties.

4) Locate power supply enclosure, the large opening in the 5th row from the top.

5) Using a phillips screwdriver remove the 4 screws that secure the power supply safety cover to the power supply enclosure.

6) Remove power supplies from ESD protective packaging.

CAUTION: Install Power Supplies directly into the power supply enclosure. Do not place on a work surface, bump into another surface or contaminate with any foreign material.



7) Slide power supply card, connector first, into the bottom guides and seat the card fully into motherboard connectors.

8) Slide a second power supply card, connector first, into the top guides and seat the card fully into the motherboard connectors.

9) Using a phillips screwdriver and the original 4 screws, attach the power supply safety cover to the power supply enclosure.

10) Remove ESD strap from earth ground.

11) Using a slotted screwdriver turn the six compression fasteners located on the rear panel clockwise to close the rear door of unit.

12) Reconnect the power cord to the back of the SSB-9200 unit.

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OPTICAL CONNECTOR INSTALLATION

The SSB-9200 is shipped with the optical connectors installed. Refer to MAINTENANCE, Chapter 8 for cleaning procedures and module replacement.

NOTE: Proper fiber management and optical connections are essential to achieve the specified optical power stability of the SSB-9200.

CAUTION: The components of the SSB-9200 must be handled as static-sensitive devices. Grounding provisions should be used any time the devices are not in conductive packaging. Emphasis on cleanliness must be maintained and appropriate precautionary measures taken to minimize accumulation of skin oil, particulates, fibers and organic contaminants.



Failure to adhere to anti-static grounding provisions will void all unit warranties.

MOUNTING THE SSB-9200 IN A RACK

The SSB-9200 can be installed in a standard 19” (48.3cm) rack.

Rack Mounting Kit RM-138 is available from ILX Lightwave. This kit contains support brackets which fasten to the inside of a rack enclosure to support the SSB-9200 at the bottom along each side.

CAUTION: Due to the weight and dimensions of the SSB-9200, it is recommended that at least two people lift the unit onto the rack. The SSB-9200 must be installed on a shelf capable of supporting its weight.



1) Remove the four feet from the bottom of the SSB-9200 using a phillips screwdriver.

2) Install four 10-32 Speed Nuts to each vertical column of the rack.

3) Mount the Support Brackets to the vertical columns with four 10-32 x 3/8” Pan Head Screws.

4) Install four 10-32 Speed Nuts to the front vertical columns.

5) Slide the SSB-9200 into place and seat against front vertical columns.

6) Install eight 10-32 x 1/2” Screws into the slots of the SSB-9200 front handles.

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TURNING ON OR OFF

The SSB-9200 must be plugged in to a primary power source (an AC grounded 3-wire wall socket) in order to function.

Ensure that the power cord is plugged in to the power entry module on the rear panel of the unit and also plugged into the wall socket.

Insert key into power switch located on the front door. Turn the key clockwise to the ON position indicated by the “Power On” | symbol.

To power down the system turn the key counterclockwise to the Standby position indicated by the “Standby” ⏻ symbol and remove the key.

Disconnect Device

WARNING: When accessing interior of the SSB-9200, disconnect AC Mains power by unplugging power cord from AC Mains Socket or appliance inlet connector located on the rear door of the unit.



Circuit Breaker

The circuit breaker is a 2–pole rocker actuated device which provides over current protection. The circuit breaker can also be used as a secondary manual ON/OFF switch.

| = ON (normal position)

○ = OFF or over current condition (breaker tripped)

The circuit breaker ratings are 240 VAC 20 A.

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CHAPTER 3 BASICS

UNIT COMPONENTS

Exterior

The major exterior components of the SSB-9200 are located on the front door and the back panel. The front door components are illustrated in FIGURE 3-1.

The fiber output ports of the SSB-9200 are equipped with screw-on covers. These covers should remain in place anytime that a fiber is disconnected from the front panel of the SSB-9200. This will reduce laser exposure and will keep the internal connectors free of contamination.



FIGURE 3-1 Front door of the SSB-9200

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The back panel components are illustrated in FIGURE 3-2.

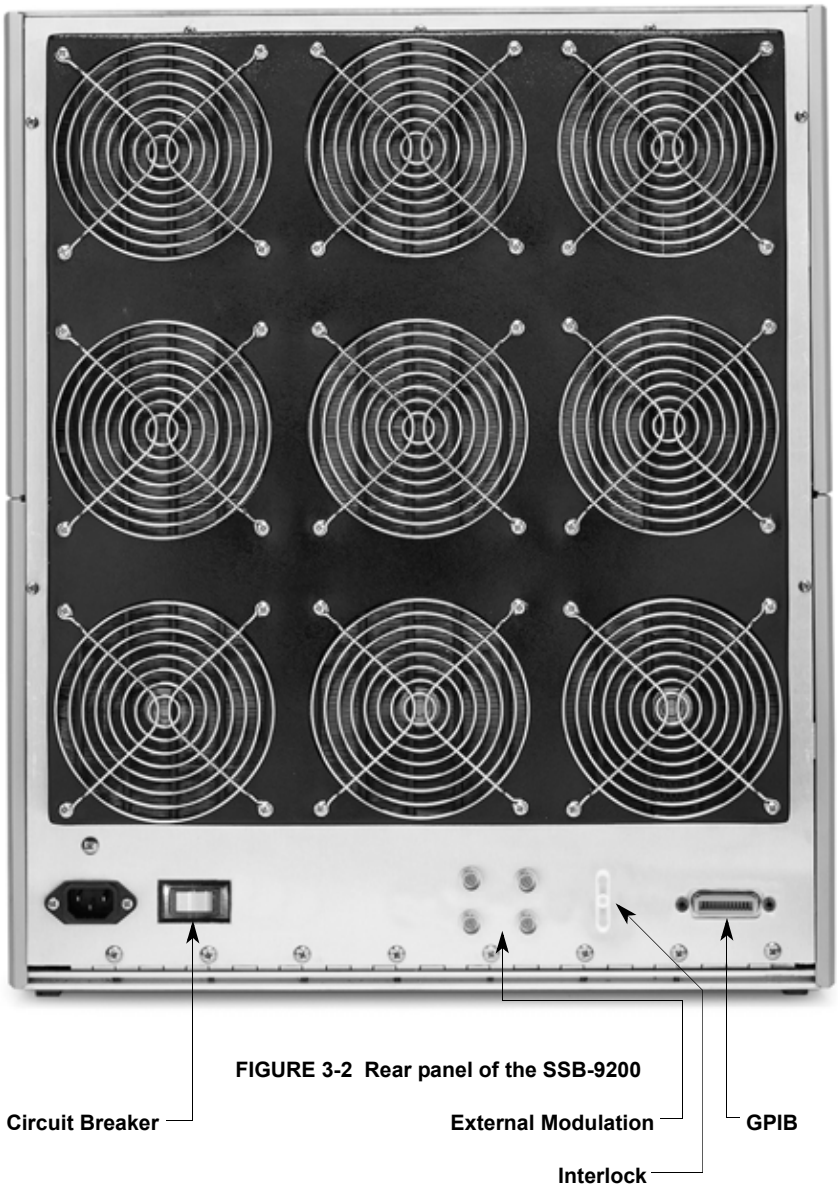


FIGURE 3-2 Rear panel of the SSB-9200

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Interior

The interior of the SSB-9200 is accessible from the front and rear doors. The Interior components are illustrated in FIGURE 3-3 and FIGURE 3-4.

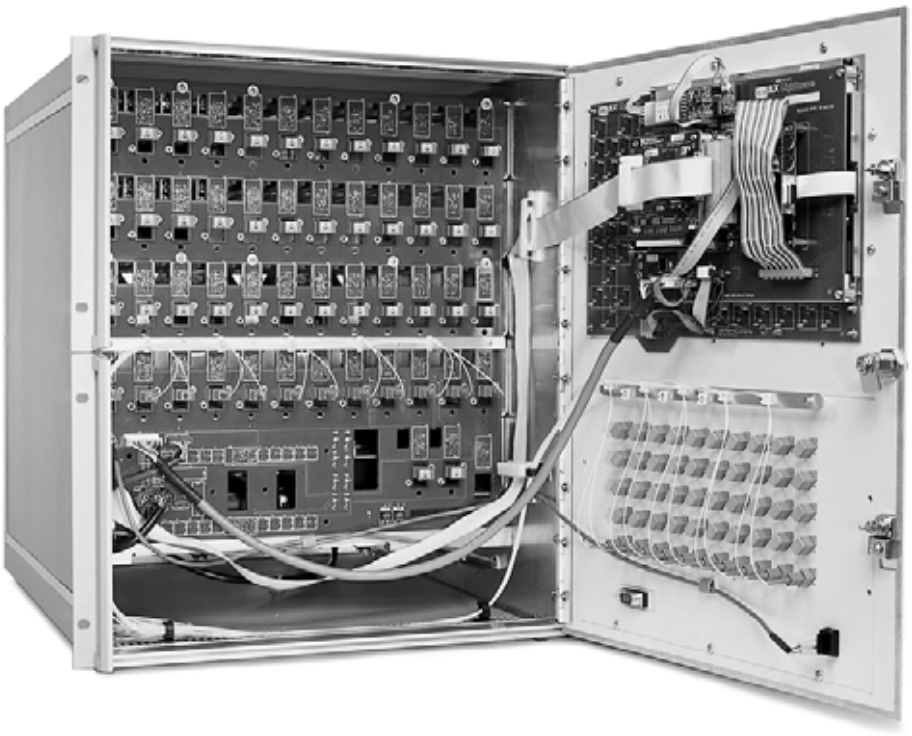


FIGURE 3-3 Interior of the SSB-9200 viewed from front

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FIGURE 3-4 Interior of the SSB-9200 viewed from back

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SSB-9200 SYSTEM CHARACTERISTICS

Power Input:	
Standard:	100-115VAC (50Hz/60Hz, 10 A)
Optional:	220-240VAC (50Hz/60Hz, 5 A)
Rack Mounting:	19” (48.3cm)
Weight:	135lbs (61.2Kg)
Height:	21” (53.3cm)
Depth:	27.5” (69.85cm)
Width:	17.75” (45.1cm)
Maximum Relative Humidity:	<90% relative humidity, non-condensing
Operating temperature range:	+15ºC to +35ºC
Storage temperature range:	-20ºC to +60ºC
Maximum altitude:	3,000 meters
Chassis Ground	Banana jack

Suitable for continuous operation
Ordinary Protection (Not protected against harmful ingress of moisture)
Class 1 Equipment (Grounded Type)
Pollution Degree II
Installation (Overvoltage) Category II for transient overvoltages
Sound Pressure Level emitted by the SSB-9200 does not exceed 69dBA
Indoor use only

The SSB-9200 High Density Source Bank Platform is designed to operate at either 100-115VAC (50Hz/60Hz,10A) or 220-240VAC (50Hz/60Hz,5A) with at most 10% deviation from the nominal voltage.

NOTE: The mains supply voltage is factory set and cannot be changed by the user.

To ensure safety, use only the power supply cord supplied with the unit and properly grounded mains receptacle.

This CE listed equipment (factory set for 220-240VAC operation) is classified as Pluggable Equipment Type B and is intended for connection to the building power supply wiring via industrial plugs and socket outlets complying with IEC 309 or with national standards for similar applications. For safety the user must use the supplied power supply cord with the industrial plug.

SSB-9200 CLEARANCES

Clearances around the SSB-9200 are required for servicing. Minimal clearances for the SSB-9200 are 22.5” (57.2cm) for the front and 22.5” (57.2cm) for the back. There is no service access from the top, bottom or sides of the unit.

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SSB-9200 SYSTEM SPECIFICATIONS

In order to ensure that your SSB-9200 system continues to meet its published specifications, ILX Lightwave recommends annual calibration.

Internal Modulation (Digital)

Waveform	Square Wave
Frequency	200 Hz to 200 kHz
Duty Cycle	50% ± 1%
Modulation Depth	100%
Rise/Fall time	< 1.0 µs
Channel to Channel Synchronization	<100 ns

Internal Modulation (Analog)

Two independent function generators, assignable to individual channels

Waveform	Square Wave, Sine Wave, Triangle Wave
Frequency	200 Hz to 200 kHz
Modulation Transfer Function	20 mA/V

External Modulation (Digital)

Level	TTL
Frequency	200 Hz to 200 kHz
Polarity	+5V = laser off 0V = laser on
Optical Delay	<1 µs
Jitter	<50 ns
Modulation Depth	100%
Rise/Fall time	< 1.0 µs
Channel to Channel Synchronization	<100 ns
Connector	BNC female on back panel

External Modulation (Analog)

Level	2V pp	
Frequency	Sine wave	< 200 kHz
	Square wave	< 200 kHz

Computer Interface

GPIB/IEEE-488.2
Hardware meets ANSI/IEEE Std. 488.2 - 1987
Software meets ANSI/IEEE Std. 488.2 - 1987
SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT1, C0, E1, E2

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FOS-9200XXX SOURCE MODULE SPECIFICATIONS

Electrical and Optical Specifications

The electrical and optical performance specifications for the series of FOS-9200xxx Laser Optic Source Modules are shown below. Please allow suitable warm-up time—typically one hour—to ensure optical and electrical stability.

Table 3-1 FOS-9200xxx Source Module Specifications

OUTPUT POWER	
Level at full power	≥10dBm, 13dBm or 14.8dBm
Stability[a] 15 minutes 24 hours	 ± 0.005dB ± 0.03dB
LASER SOURCE ATTENUATION	
Calibrated range	10dB
Typical range	15dB
Accuracy	± 0.1dB from max power to 5dB down
WAVELENGTH	
Available Centers	S, C, L-band, service channels
Stability 15 minutes 24 hours	 ± 0.003nm ± 0.005nm
Tuning range	± 0.85nm
Spectral Width Coherence control off Coherence control on	 < 30MHz 1GHz typical
Wavelength Accuracy	±50pm
Optical Isolation	>30dB
RIN	-145dB/Hz
Side Mode Suppression Ratio	>40dB
Signal to Background Ratio	30dB
Modulation	200Hz-200kHz

a. At constant temperature with suitable warm-up time. Some modules may require longer than the typical one hour warm-up tme.

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VARIABLE OPTICAL ATTENUATOR SPECIFICATIONS

Insertion Loss	1.5dB (typical)
Backreflection	< -40dB
Relative Attenuation	0 - 40dB
Wavelength dependence	0.15dB @ 10dB
Max. Optical Input Power	2W
Repeatability	< ± 0.05dB
Linearity[1]	0.3dB
Response Time[2]	0 - xdB (x ≤ 40) < 1 sec 550ms typical for 3dB change

For more detail please see original equipment manufacturer specifications.

1. Maximum residual between measured attenuation data and a linear fit over 0-40dB attenuation
2. The time between 10% and 90% of the change in optical power.

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MODULE MATRIX

FOS-9200xxx Single Source Module slot reference numbers viewed from rear of SSB-9200 are shown in FIGURE 3-5. FOS-9200xxx Dual Source Module slot reference numbers viewed from rear of SSB-9200 are shown in FIGURE 3-6.

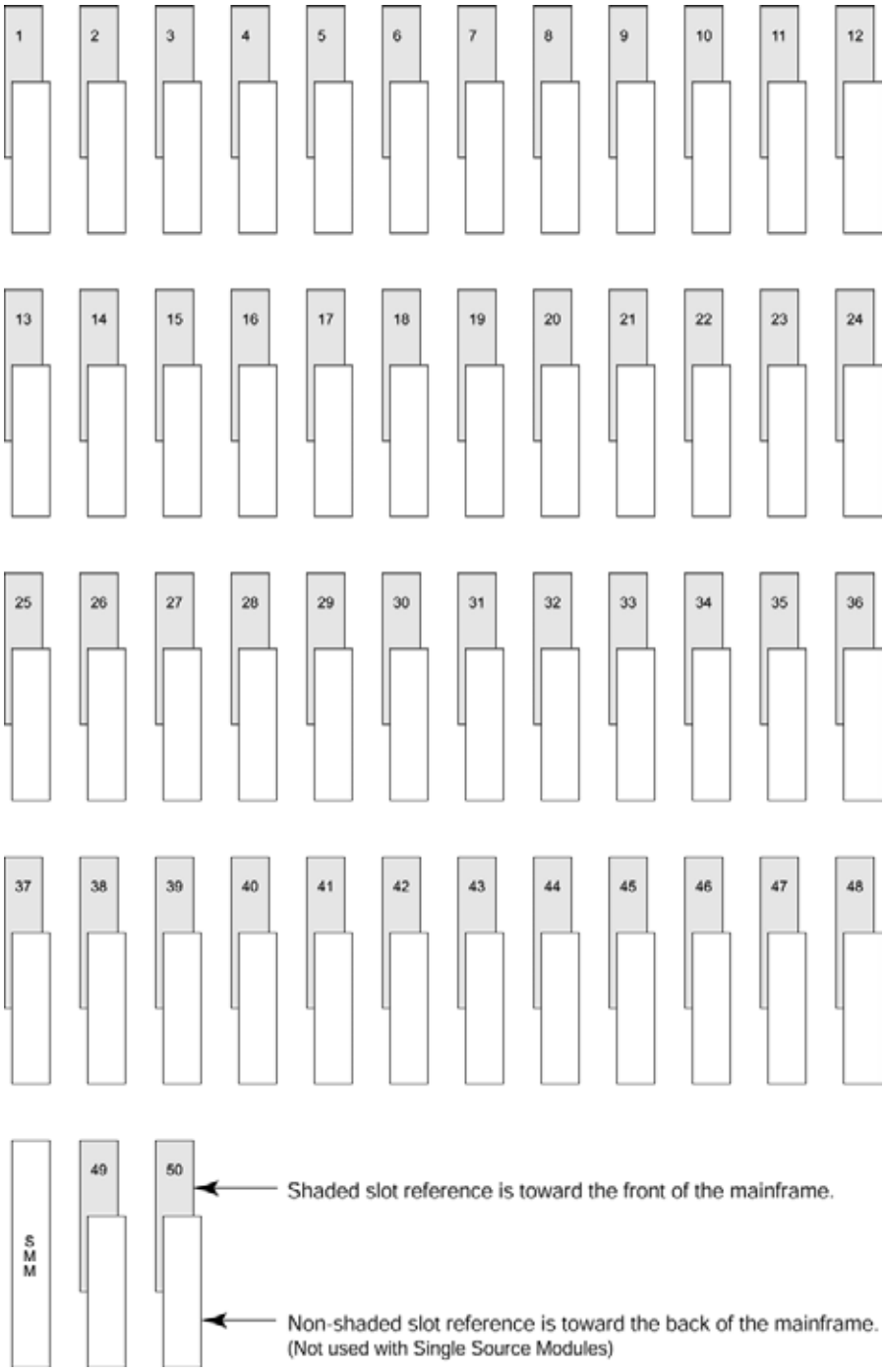


FIGURE 3-5 Single Source Module Slot Reference Numbers

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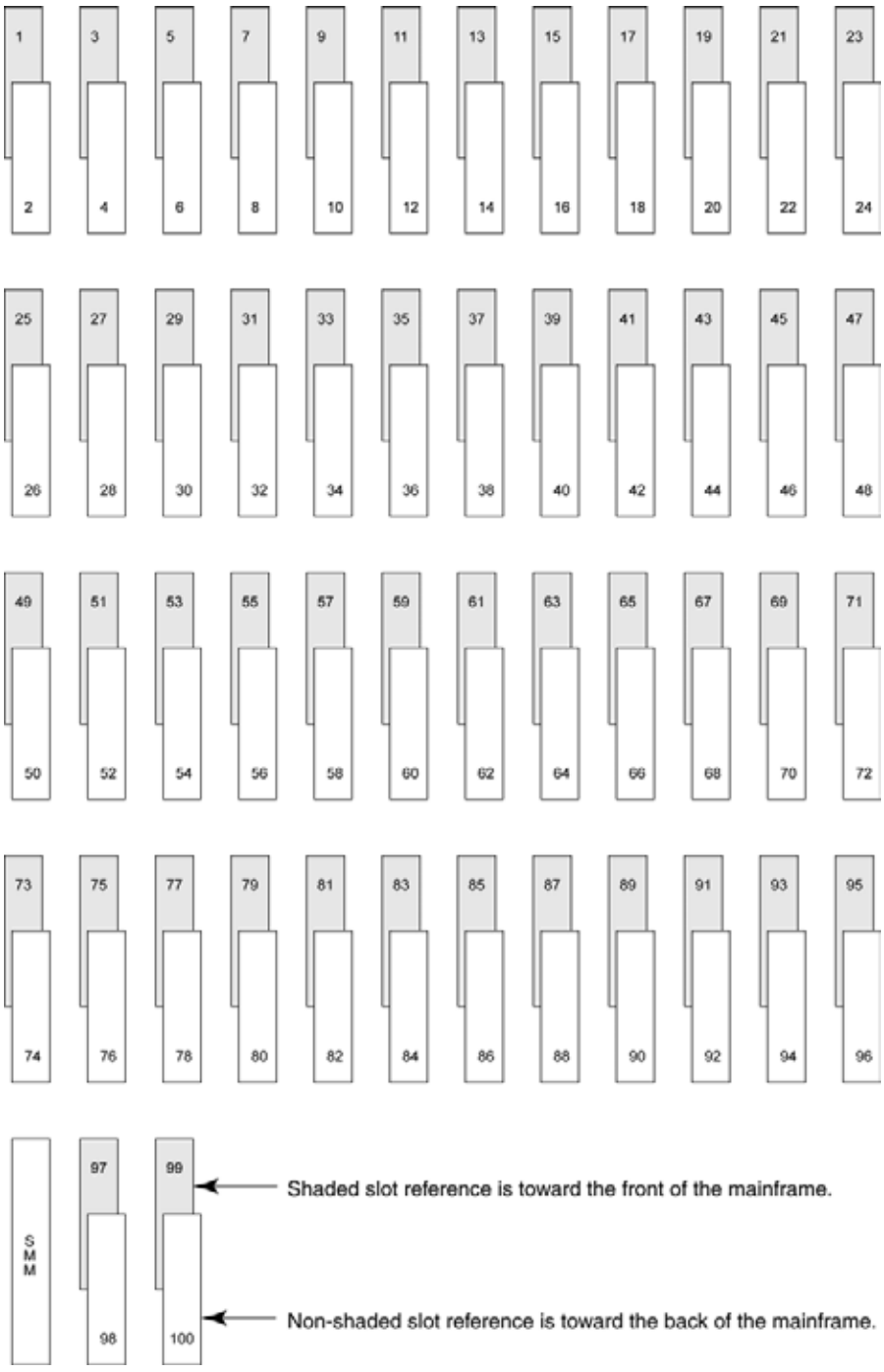


FIGURE 3-6 Dual Source Module Slot Reference Numbers

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GRAPHICAL USER INTERFACE (GUI) OVERVIEW

The three graph views are **COMB**, **ZOOM**, and **SOURCES**. The two table views are **SOURCE TABLE** and **SYSTEM TABLE.** Refer to CHAPTER 4 GRAPHICAL USER INTERFACE for a detailed description.

On power up the system goes into a default configuration. The initial view is **COMB**. From **COMB** the user can edit the entire “comb” of laser sources. The laser sources are set to the power and wavelength values in use before the SSB-9200 was last powered down. Lasers are off and beam blocks (if present) are open.

In **ZOOM**, a close-in view of a single laser source and its neighbors is presented to allow fine adjustments to single laser sources.

In **SOURCES** the user can edit individual laser sources or groups of laser sources.

The two table views give tabular rather than graphical views of laser sources.

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CHAPTER 4 GRAPHICAL USER INTERFACE

The Graphical User Interface (GUI) consists of a color display, rotary control knob, menu/sub-menu keys, UP/DOWN/LEFT/RIGHT cursor keys, an alphanumeric keypad, ENTER key and HELP key. GUI at power up is shown in FIGURE 4-1.

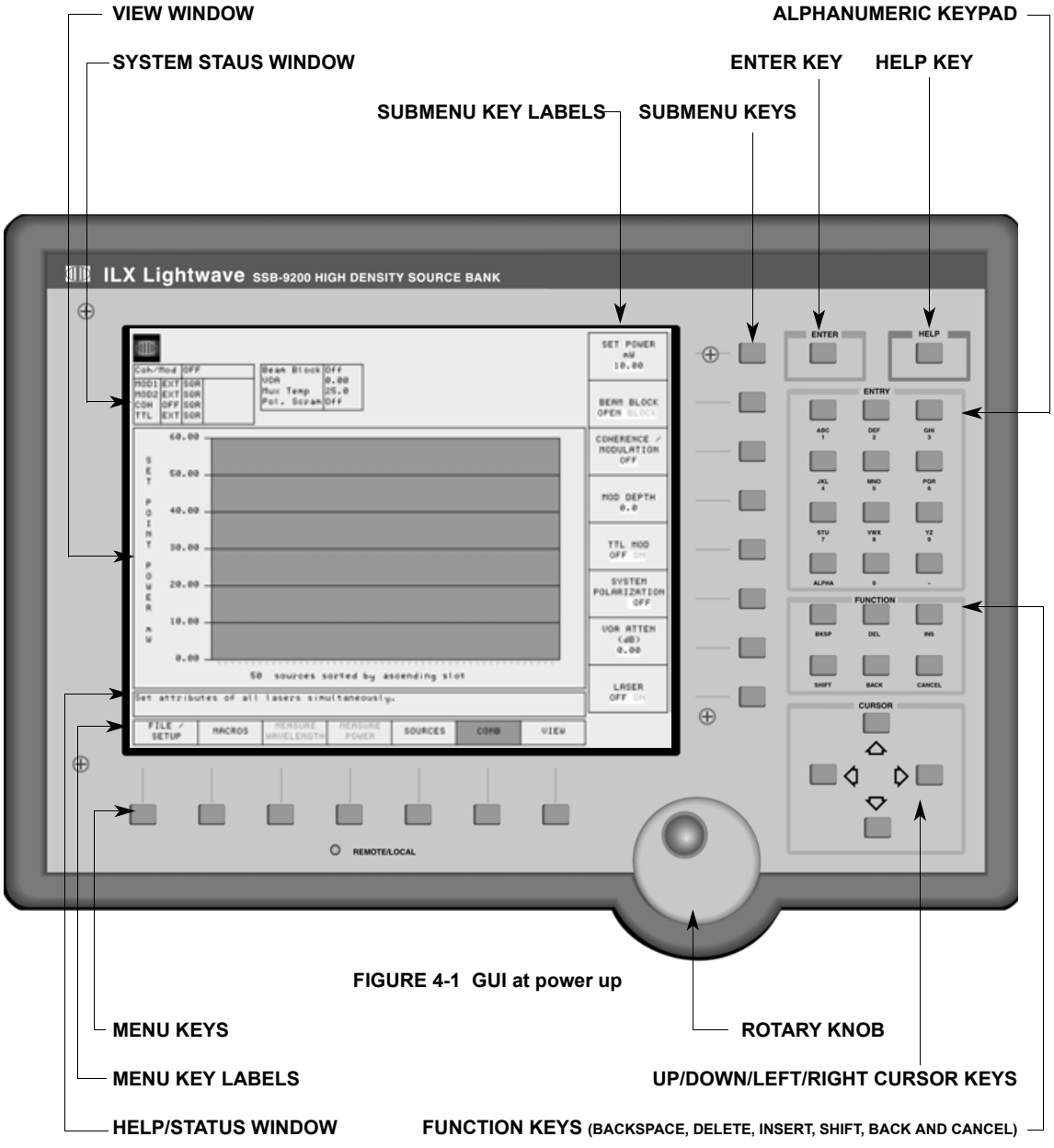


FIGURE 4-1 GUI at power up

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View Window

The rectangle that displays a graph or table is called the View window. The three graph views (graphical representations of laser source outputs) are Comb, Sources and Zoom. The two table views are Source Table and System Table. The colored squares just below the graph indicate the presence of laser sources that are not turned on (or at zero power).

System Status Window

The area just above the View Window is called the System Status window. Depending on the View, there are two or three status boxes in the System Status Window.

Help/Status Window

The rectangle just below the View Window is called the Help/Status Window. This is the area where help text, warnings and errors are displayed.

Menu Keys

The seven rectangles located below the Help/Status window are the menu key labels. These identify the functions of the menu keys. Pressing a menu key causes a new set of submenus to be displayed.

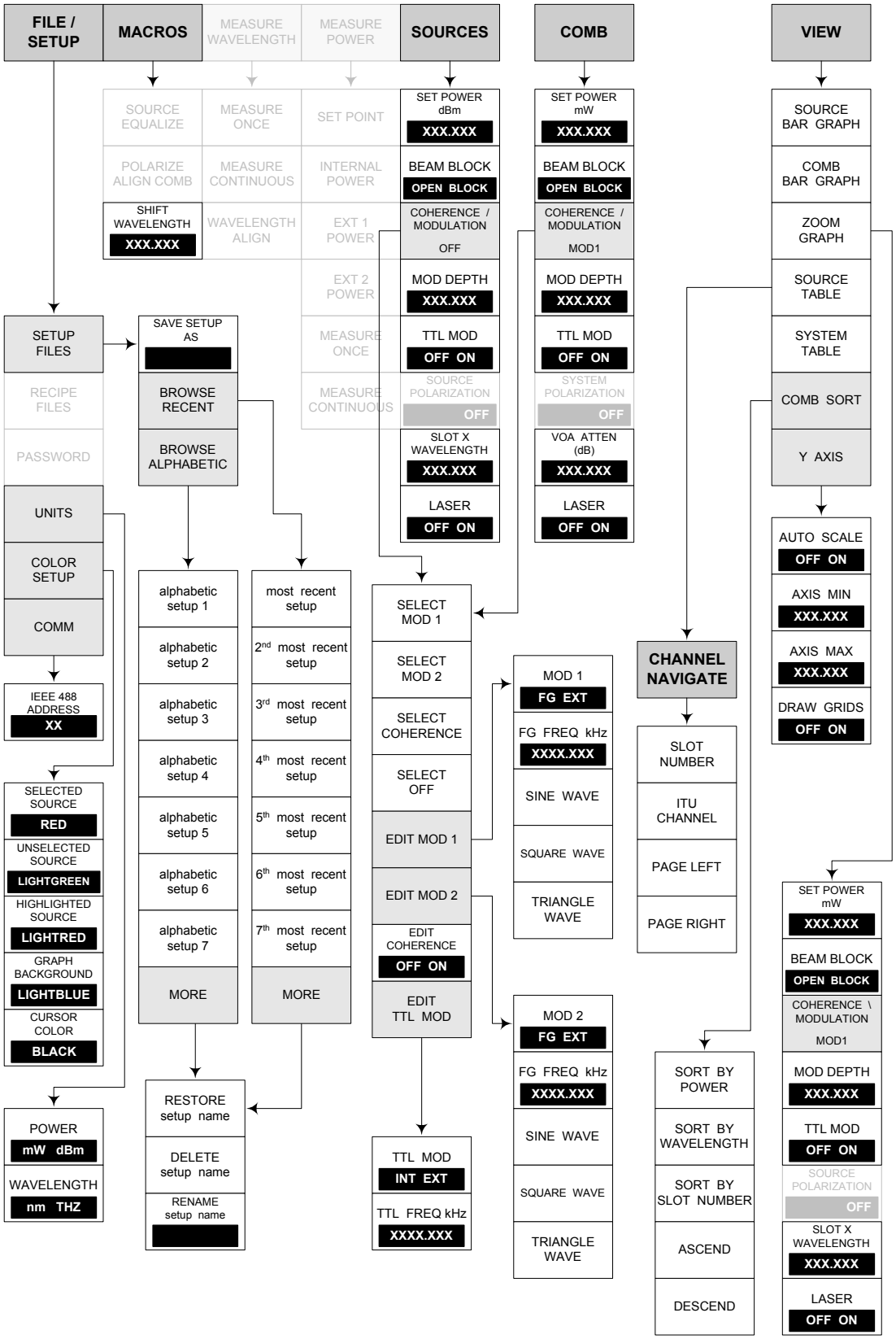
Submenu Keys

The eight rectangles on the right edge of the display are the submenu key labels. These identify the functions of the submenu keys located on the front panel. The four types of submenus are numeric, text, toggle and transition.

- Numeric submenu contains a numeric field the user can edit.
- Text submenu contains an alphanumeric field that the user can edit.
- Toggle submenu allows the user to select between one of two states.
- Transition submenu displays a new set of submenus.

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THE MENU TREE



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COMB MENU

Comb allows the user to change parameters of all laser sources as a group. The complete group of laser sources will be displayed by ascending order in the View Window as shown in FIGURE 4-2. Selected laser sources are indicated by colored columns in the View Window.

Table 4-1 Comb Menu Parameters

LASER SOURCE PARAMETER	SETTING
SET POWER dBm/mW	0-30mw, 0-14.8dBm
BEAM BLOCK	OPEN or BLOCK
COHERENCE/MODULATION	Selectable
MOD DEPTH	0-100%
TTL MOD	OFF or ON
VOA ATTEN	0-40 dB
LASER	OFF or ON

Laser Source parameters are applied to all of the laser sources.

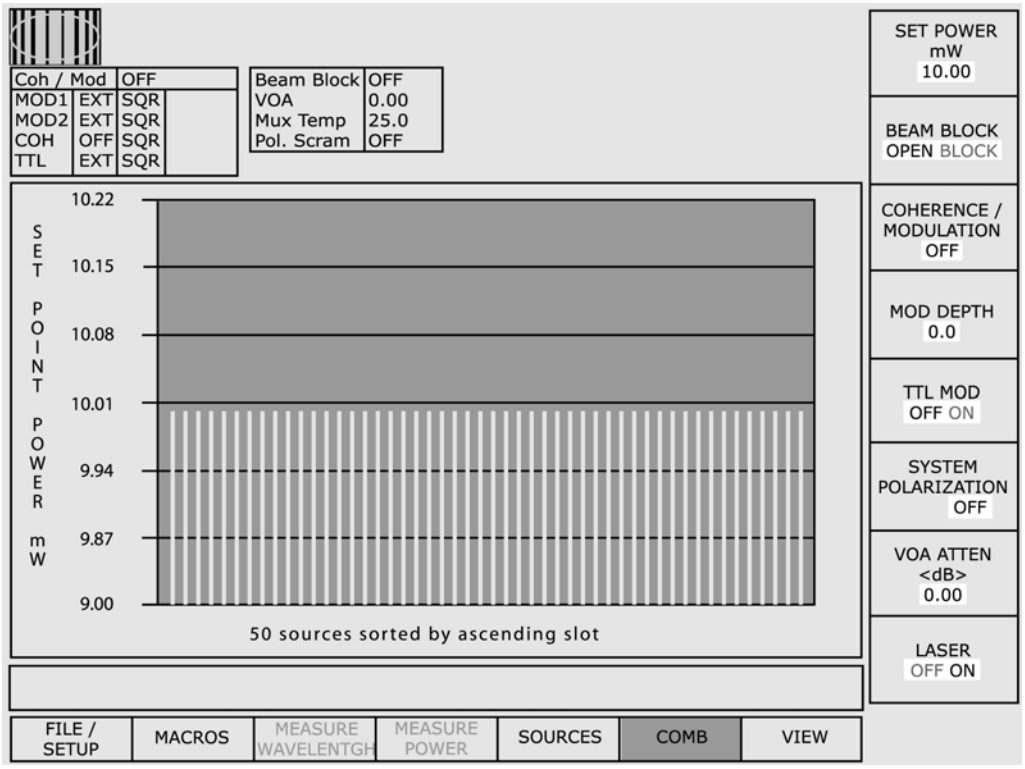


FIGURE 4-2 COMB - 42 Laser Sources Selected

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SOURCES MENU

Sources allows the user to set parameters for one or more Laser Sources. In the View Window selected sources, unselected sources and highlighted sources are indicated by a unique color. Refer to Color Setup, Chapter 5, page 5-16. Select or deselect a source by moving the cursor to the source and press ENTER.

Table 4-2 Sources Menu Parameters

LASER SOURCE PARAMETER	SETTING
SET POWER dBm/mW	0-30mw, 0-14.8dBm
BEAM BLOCK	OPEN or BLOCK
COHERENCE/MODULATION	Selectable
MOD DEPTH	0-100%
TTL MOD	OFF or ON
SET WAVELENGTH	Depends on source
LASER	OFF or ON

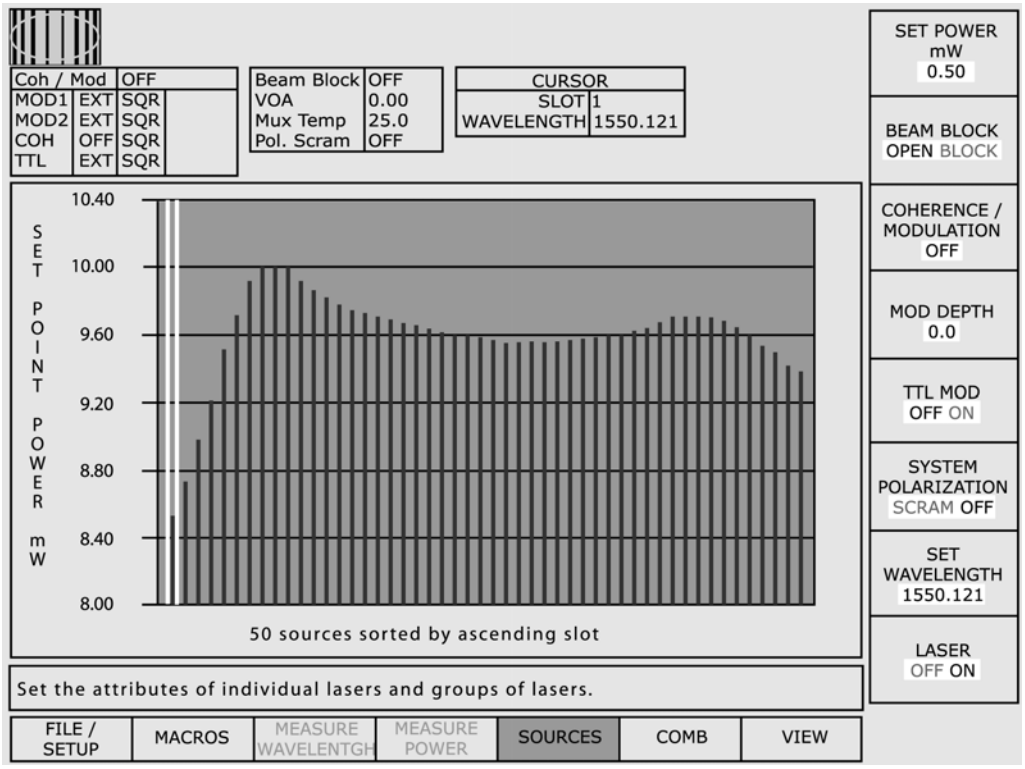


FIGURE 4-3 SOURCES

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ZOOM MENU

Zoom allows the user to position a single source at the center of the View Window and scale the X-axis for a close-up. The yellow horizontal bracket at the top of the view window indicates the wavelength range over which the selected source can be tuned. (This range is ± 0.85 nm from the center wavelength of the source. An example of **Zoom** is shown in FIGURE 4-4.

In **Zoom**, the LEFT and RIGHT arrow keys scroll the laser sources to the center of the View Window.

Table 4-3 Zoom Menu Parameters

LASER SOURCE PARAMETER	SETTING
SET POWER dBm/mW	0-30mw, 0-14.8dBm
BEAM BLOCK	OPEN or BLOCK
COHERENCE/MODULATION	Selectable
MOD DEPTH	0-100%
TTL MOD	OFF or ON
SET WAVELENGTH	Depends on source
LASER	OFF or ON

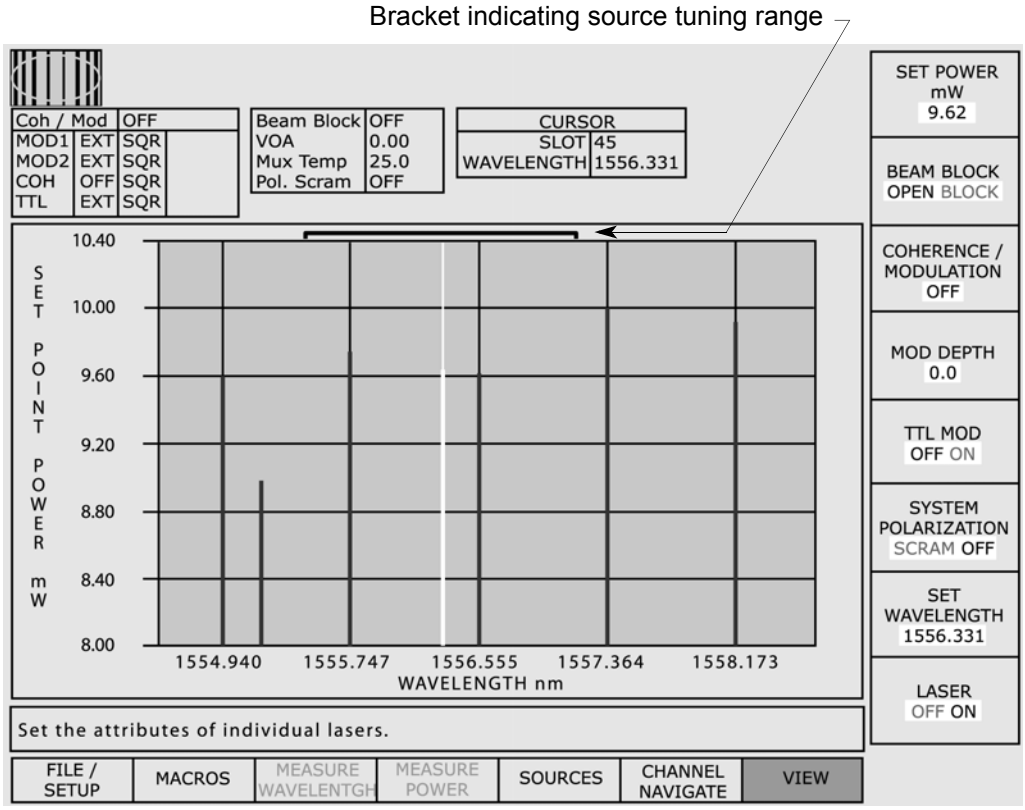


FIGURE 4-4 Zoom

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SOURCE TABLE MENU

Source Table displays settings in a table format that can be edited by the user. Values are set for one source at a time. All fields that can be edited are indicated by a black background. The field selected for editing is indicated by a white background. To change a value, move the cursor to the field that you would like to edit. Type in the desired value and press the ENTER key.

An example of **Source Table** is shown in FIGURE 4-5.

To move through the table, use the LEFT and RIGHT arrow keys to move across a row and the UP and DOWN arrow keys to move through a column. **Source Table** supports scrolling, so pressing the RIGHT (LEFT) arrow key while the cursor is at the right most (left most) displayed laser source, the table wraps to the beginning (end) of the selection cycle.

The settings for the Variable Optical Attenuator (VOA) and the Optical MUX are located in the System Status Window in the upper left corner of the display.

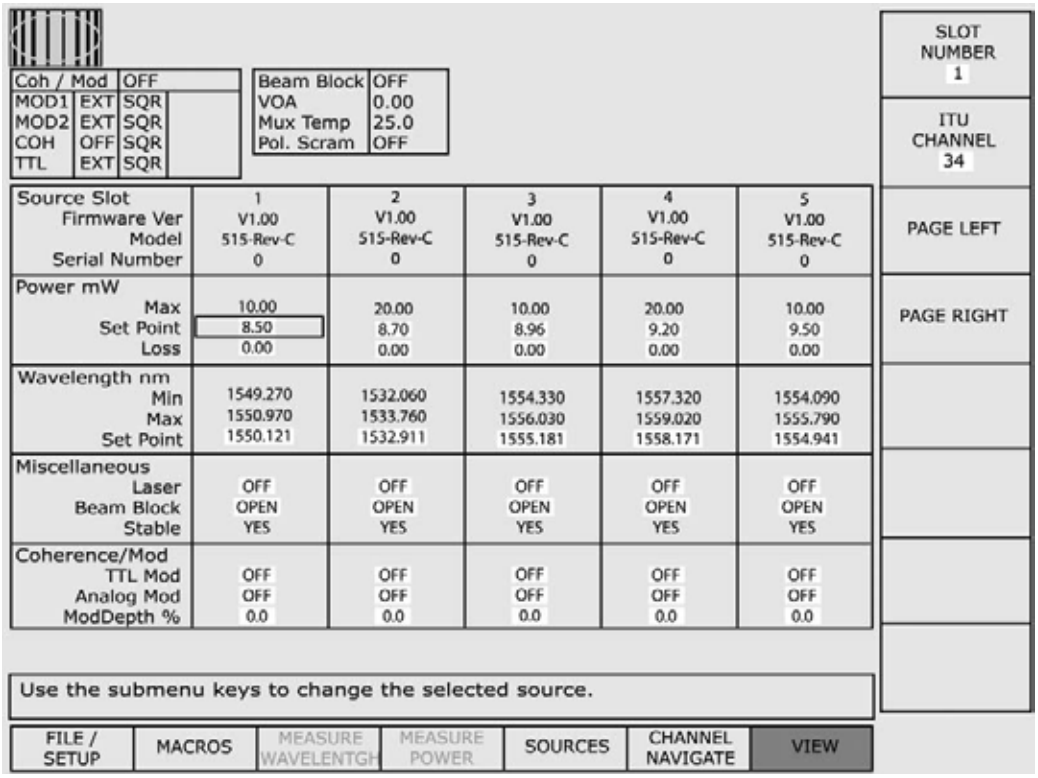


FIGURE 4-5 Source Table

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SYSTEM TABLE MENU

System Table lists parameters of the Function Generators, Variable Optical Attenuator, Optical MUX and other system features. Values can be set for one function generator at a time. All fields that can be edited are indicated by a black background. The field selected for editing is indicated by a white background. To change a value, move the cursor to the field that you would like to edit. Type in the desired value and press the ENTER key.

An example of **System Table** is shown in FIGURE 4-6.

To move through the table, use the LEFT and RIGHT arrow keys to move across a row and the UP and DOWN arrow keys to move through a column. **System Table** does not support scrolling.

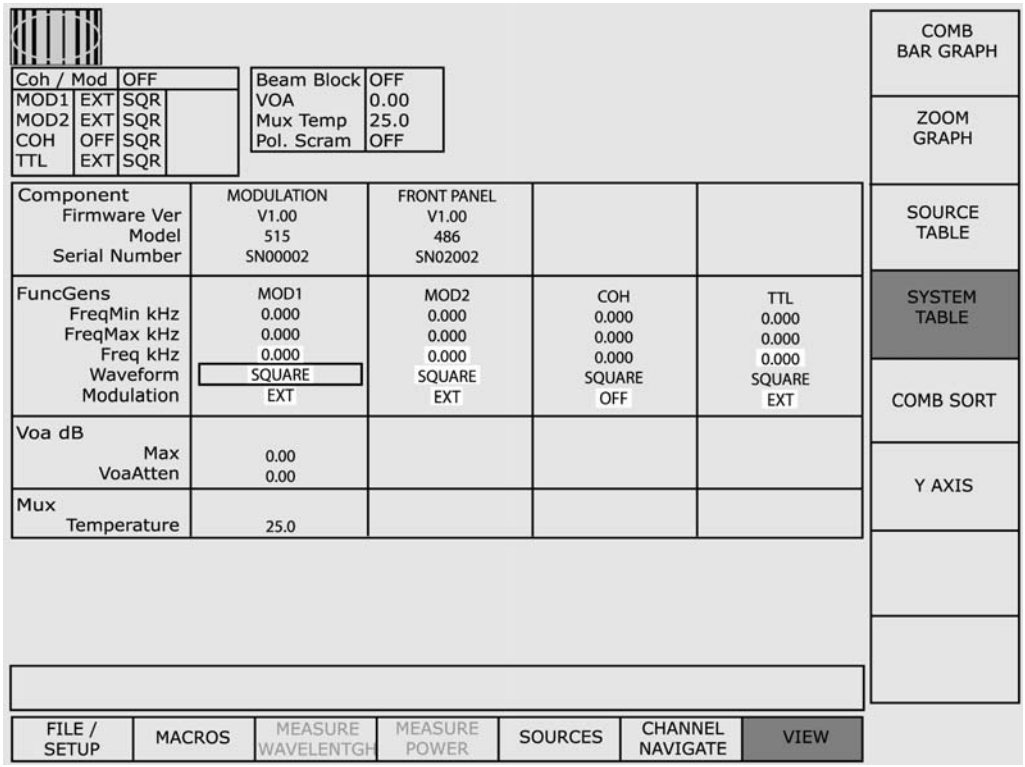


FIGURE 4-6 System Table

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SUBMENU NAVIGATION, SELECTION, AND EDITING

Selecting a Menu

Menu keys are used to select a set of submenus.

Selecting a Submenu

Press the key to the right of the submenu key label to highlight the desired feature. To deselect a submenu, press the CANCEL key. If no key is pressed after the submenu key for 10 seconds, the submenu is automatically deselected.

Once a submenu is selected, the user can edit available parameters. Press the ENTER key to set the new value. If the value is not valid, an error message is displayed and the old value is displayed in the submenu. The submenu then becomes deselected.

Toggle Keys

Toggle Keys allow the user to choose between two states by pressing the same key repeatedly. Each key press switches between the two states. The Toggle Keys in submenus are shown in Table 4-4.

Table 4-4 TOGGLE TYPE SUBMENUS

SUBMENU	STATE
BEAM BLOCK	OPEN or BLOCK
DRAW GRIDS	OFF or ON
AUTO SCALE	OFF or ON
MOD1	FG or EXT
TTL MOD	OFF or ON
LASER	OFF or ON

Numeric Editing

There are two modes for numeric editing, Insert and Overwrite. To switch between editing modes, press the INSERT key while a numeric submenu or cell is selected. The editing mode is indicated by the type of cursor displayed. A triangle indicates insert, an underscore indicates overwrite. Valid Edit Keys are listed in Table 4-5.

Insert Mode

When a number key (0 through 9) is pressed, the number is inserted to the left of the cursor.

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Overwrite Mode

When a number key (0 through 9) is pressed, the number overwrites the digit above the cursor. If the cursor is at the decimal point, the key press is ignored.

Table 4-5 VALID EDIT KEYS

EDITING KEYS	ACTION
0 through 9	used to change values
- (minus sign)	1st character of a number only
DELETE	deletes the number over the cursor
BACKSPACE	deletes the number to the left of the cursor
LEFT ARROW	moves the cursor left
RIGHT ARROW	moves the cursor right
UP ARROW	increments the number above the cursor
DOWN ARROW	decrements the number above the cursor
ROTARY KNOB	counterclockwise turn decrements clockwise turn increments

Delete Key

Deletes the number over the cursor. If the cursor is under the decimal point, the number to the right of the decimal point is deleted.

Backspace Key

Deletes the number to the left of the cursor. If the cursor is to the left of the decimal point, the number left of the decimal point is deleted.

Arrow Keys and Rotary Knob

The LEFT and RIGHT arrow keys move the cursor left and right. The UP and DOWN arrow keys increment and decrement the number above the cursor.

Turning the rotary knob counterclockwise decrements the number. Turning the rotary knob clockwise increments the number.

The numeric value for the field is restricted between the maximum and the minimum allowed for that parameter. Attempting to change the value beyond the allowed range sets the field value to the maximum or minimum value allowed.

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Text Editing

There are two modes for text editing, Insert and Overwrite. To switch between editing modes, press the INSERT key while a numeric submenu or cell is selected. The editing mode is indicated by the type of cursor displayed. A triangle indicates insert, an underscore indicates overwrite. Valid Edit Keys are listed in Table 4-7.

Insert Mode

When an alphanumeric key (0 through 9) is pressed, the corresponding character is inserted to the left of the cursor.

Overwrite Mode

When an alphanumeric key (0 through 9) is pressed, the corresponding character overwrites the digit above the cursor.

One press of a key, a number is inserted or overwritten. Two key presses, the first letter and so on. Refer to example of pressing the 1 (ABC) keypad in Table 4-6.

Table 4-6 Alphanumeric Keypad Definition

NUMBER OF KEY PRESSES	CHARACTER
1	1
2	A
3	B
4	C

Table 4-7 VALID EDIT KEYS

EDITING KEYS	ACTION
0 through 9	used to change characters
DELETE	deletes the character over the cursor
BACKSPACE	deletes the character to the left of the cursor
LEFT ARROW	moves the cursor left
RIGHT ARROW	moves the cursor right
UP ARROW	increments the character above the cursor
DOWN ARROW	decrements the character above the cursor
ROTARY KNOB	counterclockwise turn decrements clockwise turn increments

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Delete Key

Deletes the character under the cursor.

Backspace Key

Deletes the character to the left of the cursor.

Arrow Keys and Rotary Knob

The LEFT and RIGHT arrow keys move the cursor left and right. The UP and DOWN arrow keys increment and decrement the character above the cursor.

Turning the rotary knob counterclockwise decrements the character. Turning the rotary knob clockwise increments the character.

The order of characters are 0 through 9 followed by A through Z with wrap around. That is, incrementing 9 yields A, incrementing Z yields 0, decrementing 0 yields Z, etc.

Pressing the ENTER or CANCEL key terminates text editing. If no key is pressed for 10 seconds the command is cancelled.

THE HELP KEY

Help text is displayed with each key press. There are a few instances where help text is erased (after error or warning message was displayed). If this occurs, press the HELP key to re-display the help text.

TABLE NAVIGATION, SELECTION, AND EDITING

Table Cells that can be edited have a black background.

The RIGHT and LEFT arrow keys move the cursor to the next column to the right or left. Turning the rotary knob right or left has the same effect. Scrolling past the left or right end of the table wraps to the beginning (end) of the table. Similarly the UP and DOWN arrow keys move the cursor up and down between cells within the column.

USING THE BACK KEY

The BACK key provides a convenient way to move back through the menu tree. The BACK key can be used to go back a maximum of ten steps. Backward steps cannot be reversed.

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CHAPTER 5 USING THE SSB-9200

This chapter explains how to use the SSB-9200.

SELECTING SOURCES

Sources can be selected and edited in **SOURCES**, **COMB**, **VIEW/ZOOM GRAPH**, **VIEW/SOURCE TABLE** and **VIEW/SYSTEM TABLE**. All laser source commands are applied to the sources that are selected within a view. In the View Window selected sources, unselected sources and highlighted sources are indicated by a unique color. Refer to Color Setup, Chapter 5, page 5-16.

Sources

In **Sources**, parameters can be set for an individual source or an arbitrary group of sources. When the cursor is moved to an unselected source, the submenu keys apply to that source only. When the cursor is moved to a selected source, all sources that are selected will change to a highlighted color, the submenu keys apply to all of the selected sources.

To select, restore previous selected sources and de-select all sources use the UP (DOWN) arrow keys. Press the UP arrow key at the beginning selection of sources to select all sources. Press the DOWN arrow key to restore the beginning selection. Press the DOWN arrow key again to clear all. Press the UP arrow key to restore the beginning selection. A selection that is manually changed is now the beginning selection.

To select a group of sources, move the cursor over each source using the LEFT and RIGHT arrow keys, then press the ENTER key. The ENTER key toggles the selection state (selected or deselected) of the source at the cursor. You can de-select a selected source by moving the cursor over it and pressing the DELETE key.

You can use **block selection** to select (deselect) a sequential block of sources by pressing the INSERT (DELETE) key. The cursor color changes to indicate **block selection**. Move the cursor with the LEFT (RIGHT) arrow keys or rotary knob. Each source the cursor passes over is selected (deselected). To end **block selection**, press the INSERT (DELETE) key or CANCEL.

The values displayed in the submenus reflect the values of a source or group of selected sources. If the values are not all the same, **MIXED** is displayed. When the cursor is moved to an unselected source the values displayed are for that source only.

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Comb

In **Comb**, parameters are set for all of the laser sources as a group, not individually. The cursor is not displayed in **Comb**.

View/Zoom Graph

In **View/Zoom Graph**, only the source at the center of the graph is selected. To change the selected source, use the LEFT and RIGHT arrow keys to scroll through all sources or use the Channel Navigate submenu. Refer to Channel Navigate Submenu, Chapter 5, page 5-18.

Only one source is selected at a time in **View/Zoom Graph**.

View/Source Table

In **View/Source Table**, the laser source at the cursor is selected. The number at the top of each column indicates the slot location for each source. Refer Module Matrix, Chapter 3, page 3-9. All fields that can be edited are indicated by a black background. The field selected for editing is indicated by a white background.

To change parameters in **View/Source Table**, use the arrow keys and/or the rotary knob to navigate to the desired laser source or use the Channel Navigate submenu. Refer to Channel Navigate Submenu, Chapter 5, page 5-18.

View/System Table

View/System Table is used to set parameters of the Function Generators, Variable Optical Attenuator (VOA), Optical MUX and other system features. **View/System Table** does not support scrolling.

To change a parameter, move through the table, using the arrow keys to place the cursor in the field that you would like to edit. All fields that can be edited are indicated by a black background. Press the ENTER key. The field selected for editing is indicated by a white background. Type in the desired value and press the ENTER key.

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SETTING PARAMETERS

To modify parameter values, use one of the following editing techniques:

- Numeric Editing described in Numeric Editing, Chapter 4, page 4-9.
- Text Editing described in Text Editing, Chapter 4, page 4-11.
- Toggle Keys described in Toggle Keys, Chapter 4, page 4-9

Press the ENTER key after editing to set the new value.

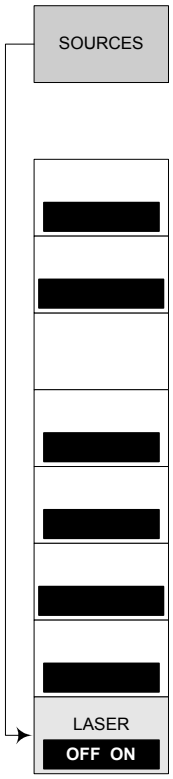
Editing sessions are automatically cancelled:

- If no keys are pressed within 10 seconds.

or

- The CANCEL key is pressed.

LASER OFF/ON



LASER OFF/ON turns on drive current to the laser. The **LASER OFF/ON** setting has no effect on power levels or beam block state. At power up, the default state is Laser OFF. **LASER OFF/ON** can be accessed from Sources, Comb, View/Zoom Graph and View/Source Table.

To change **LASER OFF/ON**, first select Sources, Comb, or View/Zoom Graph. Select laser sources. Press the **LASER OFF/ON** submenu key. Each successive press of the submenu key toggles the value between OFF and ON. Press the ENTER key while the desired value is highlighted.

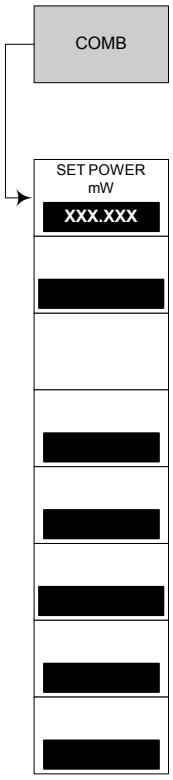
To change the **LASER OFF/ON** setting in View/Source Table, use the arrow keys and/or the rotary knob to navigate to the desired laser source and press ENTER. Use the arrow keys or the rotary knob to toggle the value between OFF and ON. Press the ENTER key while the desired value is highlighted.

Table 5-1 Example SET LASER OFF/ON

ACTION	RESULT
Press SOURCES Menu Key	Brings up Submenu
Use rotary knob to place cursor on a source and press ENTER Key	One source selected
Press **LASER OFF/ON** Submenu Key	Selection is Highlighted
Successive pressing of Submenu Key	Toggles the selected source between OFF and ON
Press ENTER Key	Sets the Laser to OFF or ON
Press CANCEL or No key press within 10 seconds	Cancels the process

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SET POWER dBm/mW



Power is set by controlling laser temperature and current. The set power is maintained through an electronic feedback loop. In addition, the user can adjust the power to a calibrated offset that compensates for losses external to the SSB-9200.
Refer to Power Loss Value, Chapter 5, page 5-8.

Units of power are either mW or dBm. To change between mW and dBm refer to Changing Power Units, Chapter 5, page 5-15. At power up, settings return to the values at shut down.

SET POWER can be accessed from Sources, Comb, View/Zoom Graph and View/Source Table.

To edit **SET POWER**, first select Sources, Comb or View/Zoom Graph. Select laser sources. Press the **SET POWER** submenu key. The submenu is highlighted and the cursor is displayed. Use numeric editing to change the value. Help text provides the range of valid values.

To edit **SET POWER** in View/Source Table, use the arrow keys and/or the rotary knob to navigate to the desired laser source and the Power Set Point cell, then press ENTER. Use numeric editing to change the value.

If the rotary knob is used to change the laser power value, the source(s) power changes immediately. Pressing the CANCEL key causes all selected sources to return to their original power settings. Power should not be set below 0.1 mW since the laser sources are not calibrated to power levels in this range. A warning message is issued at low power settings and the SSB-9200 will set the laser power as closely as possible to the desired power level.

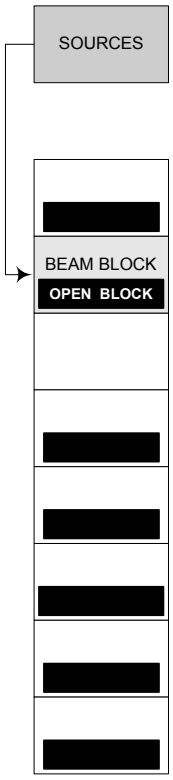
If the set power value exceeds the maximum power level of a source, an error message “Value entered is not in the allowed range” is displayed and the power is set to the maximum.

Table 5-2 Example SET POWER dBm/mW

ACTION	RESULT
Press COMB Menu Key	Brings up Submenu
Use rotary knob to place cursor on a source and press ENTER Key	One source selected
Press **SET POWER** Submenu Key	Selection is Highlighted, Cursor and units of Power displayed
Use Numeric Editing	Changes Power Value for the selected source
Press ENTER Key	Sets the new Power Value
Press CANCEL or No key press within 10 seconds	Cancels the process

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BEAM BLOCK



The **BEAM BLOCK** option interrupts (BLOCKS) individual laser outputs without altering the laser drive current. **BEAM BLOCK** is accomplished by the use of a fiber switch inserted in the output path. When the switch opens, a segment of fiber is displaced and creates a break in the path. Since the laser stays on, no warm-up or settling time is required when output is resumed.

BEAM BLOCK is not available for PM aligned output.

At power up the **BEAM BLOCK** state is OPEN.

BEAM BLOCK can be accessed from Sources, Comb, View/Zoom Graph and View/Source Table.

A beam block in the blocked position is indicated with stripes on the laser bars. If no laser source has a beam block, the BLOCK option is not available.

To set **BEAM BLOCK**, first select Sources, Comb or View/Zoom Graph. Select laser sources. Press the **BEAM BLOCK** submenu key. Each successive press of the key sets the **BEAM BLOCK** to OPEN or BLOCK. If “MIXED” is displayed, press the ENTER key while the desired value is highlighted.

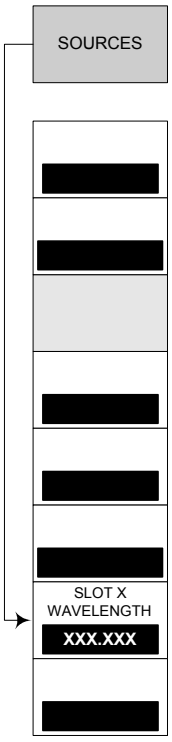
To set the **BEAM BLOCK** in View/Source Table, use the arrow keys and the rotary knob to navigate to the desired laser source and the Beam Block cell, then press ENTER. If the laser source does not have a beam block, NONE is displayed.

Table 5-3 Example SET BEAM BLOCK

ACTION	RESULT
Press SOURCES Menu Key	Brings up Submenu
Use rotary knob to place cursor on a source and press ENTER Key	One source selected
Press **BEAM BLOCK** Submenu Key	Selection is Highlighted
Successive pressing of Submenu Key	Sets the **BEAM BLOCK** to OPEN or BLOCK

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SLOT X WAVELENGTH (FREQUENCY)



SLOT 'X' WAVELENGTH (FREQUENCY) changes the wavelength of the laser source at the cursor, but not of any other selected source. This is the one exception to the rule that laser source commands are applied to all selected sources. SLOT 'X' is the slot number located at the cursor.

Wavelength units are either nanometers (nm) or terahertz (THz). To change wavelength units refer to Changing Wavelength Units, Chapter 5, page 5-15.

At power up, wavelength (frequency) is set to the values at shut down.

SLOT X WAVELENGTH (FREQUENCY) can be accessed from Sources, View/Zoom Graph and View/Source Table.

To edit **SLOT X WAVELENGTH (FREQUENCY)**, first select Sources or View/Zoom Graph. Select laser sources. Press the **SLOT X WAVELENGTH (FREQUENCY)** submenu key. The cursor is displayed in the submenu and the wavelength can be edited using numeric editing. Help text provides the range of valid values.

To edit **SLOT X WAVELENGTH (FREQUENCY)** in View/Source Table, use the arrow keys and the rotary knob to navigate to the desired laser source and the Wavelength Set Point cell, then press ENTER. Use numeric editing to change the value.

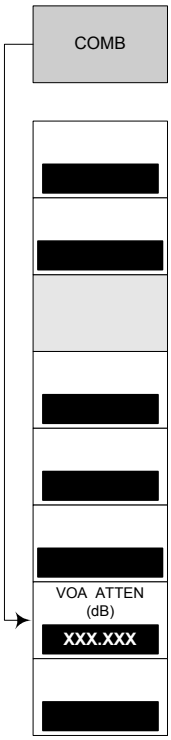
If the rotary knob is used to set the wavelength (frequency) value, the laser source wavelength will change immediately. Pressing the CANCEL key will cause the wavelength to return to the original wavelength setting.

Table 5-4 Example SET WAVELENGTH

ACTION	RESULT
Press SOURCES Menu Key	Brings up Submenu
Use rotary knob to place cursor on a source and press ENTER Key	One source selected
Press **SLOT X WAVELENGTH** Submenu Key	Selection is Highlighted, Cursor and Wavelength Values displayed
Use Numeric Editing	Changes Wavelength Value for the selected source
Press ENTER KEY	Sets the new Wavelength Value
Press CANCEL or No key press within 10 seconds	Cancels the process

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VOA ATTEN



The VOA (Variable Optical Attenuator) varies the attenuation of the entire Comb of laser sources. This system option is available only with a MUX. A single VOA is placed after the MUX so all channels going through the MUX are also routed through the VOA. The attenuation range is 0 to 40 dB.

At power up, **VOA ATTEN** is set to the state at shut down.

VOA ATTEN can be accessed from Comb and View/System Table.

To edit **VOA ATTEN**, first select Comb. Press the **VOA ATTEN** submenu key. The cursor is displayed in the submenu and the VOA can be edited using numeric editing. Help text provides the range of valid values.

To edit **VOA ATTEN** in View/System Table, use the arrow keys and/or the rotary knob to navigate to the desired laser source and the **VOA ATTEN** cell, then press ENTER. VOA can be edited using numeric editing.

If a VOA is not installed, **VOA ATTEN** cannot be edited.

Table 5-5 Example VOA ATTEN

ACTION	RESULT
Press COMB Menu Key	Brings up Submenu
Press **VOA ATTEN** Submenu Key	Selection is Highlighted, Cursor displayed
Use Numeric Editing	Changes VOA Value
Press ENTER KEY	Sets the new VOA Value
Press CANCEL or No key press within 10 seconds	Cancels the process

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POWER LOSS VALUE

The **Power Loss Value** is used by the SSB-9200 as an offset to the Power Set point. This feature is typically used to offset system losses that do not vary from one measurement to the next. It is not necessary to use this feature unless optical power loss compensation is desired.

At power-up, the power loss values are set to zero. **POWER LOSS** is accessed only from View/Source Table. To save power loss values, refer to Saving a Setup, Chapter 5, page 5-13.

To use the **POWER LOSS** feature, first set the desired power level of one source using SET POWER. Measure the actual power received from that source at some referece location in your test set-up.

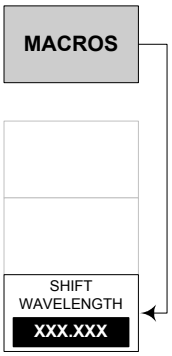
Enter the difference in the **POWER LOSS** cell from the View/Source Table using numeric editing. The SSB-9200 will increase the power level of the source so that the measured value equals the power set point. If the combined set power and power loss value is greater than the maximum power limit of the laser, an error message “Power adjusted for loss is above the calibration limit” is displayed.

Table 5-6 Example Power Comparison Value

ACTION	RESULT
Set desired power level	
Press VIEW Menu Key	Brings up Submenu
Press SOURCE TABLE Submenu Key	Brings up Submenu
Use arrow keys or rotary knob to navigate to Power Comp cell and press ENTER	Selection is Highlighted and Cursor is displayed
Measure actual power using a power meter at a point in the test setup	
Use NUMERIC EDITING to enter the *measured* power	changes **Power Loss Value**
Press ENTER KEY	Saves the new **Power Loss Value**
Press CANCEL or No key press within 10 seconds	Cancels the process
Repeat the power measurement at the same point in the test setup	Measured power level should now equal the desired power setting

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SHIFT WAVELENGTH (FREQUENCY)



SHIFT WAVELENGTH (FREQUENCY) changes the wavelength (frequency) of one or more laser sources by a user specified value. The factory setting for all sources is the center wavelength. Each source may be adjusted up to ± 0.85 nm from center. The wavelength can be set for individual sources with SLOT X WAVELENGTH (FREQUENCY), Chapter 5, page 5-6. In addition, **SHIFT WAVELENGTH (FREQUENCY)** can be used to shift the wavelength of one or more sources by a given amount.

At power up, wavelength settings return to the values at shutdown.

SHIFT WAVELENGTH (FREQUENCY) is accessed through the Macros Menu.

To **SHIFT WAVELENGTH (FREQUENCY)** of a source or group of sources, first select the sources in Sources or Comb. Press the Macros menu key, then press the **SHIFT WAVELENGTH (FREQUENCY)** submenu key. The cursor is displayed in the submenu and **SHIFT WAVELENGTH (FREQUENCY)** can be edited using numeric editing. Help text provides the range of valid values.

Table 5-7 Example Shift Wavelength

ACTION	RESULT
Select the sources in Sources or Comb	Selected sources indicated in red
Press MACROS Menu Key	Brings up Submenu
Press **SHIFT WAVELENGTH** Submenu Key	Selection is Highlighted, Cursor displayed
Use Numeric Editing	Changes **SHIFT WAVELENGTH** Value
Press ENTER KEY	Sets the new **SHIFT WAVELENGTH** Value
Press CANCEL or No key press within 10 seconds	Cancels the process

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OPTICAL MUX TEMPERATURE

The temperature control circuit required for an optical MUX or AWG MUX is supplied by the MUX manufacturer. MUX temperature is preset at the factory for optimum performance according to the original manufacturer's specifications. These specifications will be included with the Instruction Manual for each SSB-9200.

At power up, the MUX temperature settings return to the values at shut down. Optical MUX temperature is accessed only from View/System Table.

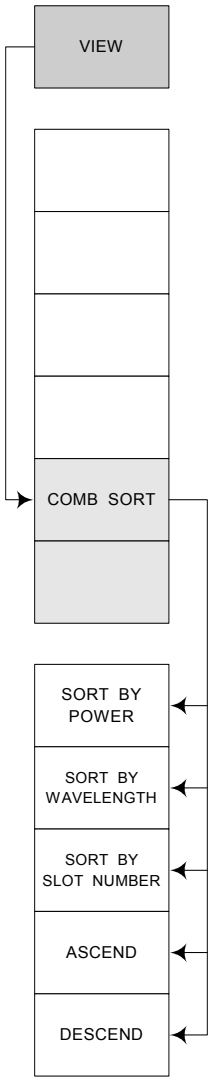
To set the **OPTICAL MUX TEMPERATURE**, select View/System Table. Navigate to the Temperature cell and use numeric editing to change temperature to the desired setting. Press ENTER to accept the new temperature.

Table 5-8 Example Optical MUX Temperature

ACTION	RESULT
Press VIEW Menu Key	Brings up Submenu
Press SYSTEM TABLE Submenu Key	Brings up Submenu
Use arrow keys or rotary knob to navigate to Temperature cell and press ENTER	Selection is Highlighted and Cursor is displayed
Use NUMERIC EDITING	Changes **Optical MUX Temperature**
Press ENTER KEY	Saves the new **Optical MUX Temperature**
Press CANCEL or No key press within 10 seconds	Cancels the process

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COMB SORT



COMB SORT allows the user to sort the entire comb of sources using a specific sort criteria. At power up, sources are sorted in the same state as at shut down. **COMB SORT** is accessed only through the View menu.

To set the sort criteria, first select VIEW, then COMB SORT. Three submenus labeled SORT BY POWER, SORT BY WAVELENGTH and SORT BY SLOT NUMBER specify the sort criteria for the lasers. The light blue submenus are the current sort criteria. Press the submenu key next to the desired sort criteria. The submenu selection is highlighted white. Press the ENTER key while the desired value is highlighted.

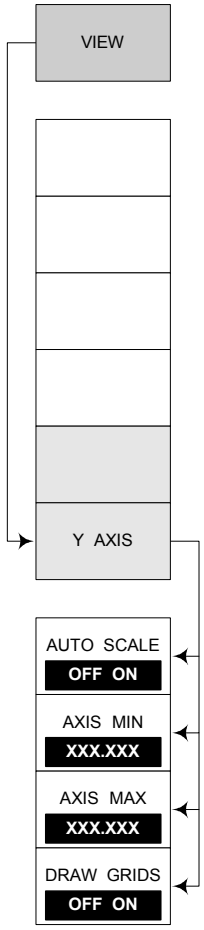
The two submenus labeled ASCEND and DESCEND specify the sort order of the lasers. The order in which the lasers are displayed is changed to follow the sort criteria.

Table 5-9 Example COMB SORT

ACTION	RESULT
Press VIEW Menu Key	Brings up Submenu
Press **COMB SORT** Menu Key	Brings up Submenu showing the current sort order
Press ASCEND Submenu Key	Selection is Highlighted
Press ENTER KEY	Sets the new sort criteria
Press SORT BY POWER Sub-menu Key	Selection is Highlighted
Press ENTER KEY	Sets the new sort criteria
Press CANCEL or No key press within 10 seconds	Cancels the process

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Y AXIS



View/Y Axis allows the user to edit the Y Axis scale and gridlines.

To automatically scale the Y Axis based on the maximum or minimum value of set power, first select View/Y Axis, then press the **AUTO SCALE/ OFF ON** submenu key. Each successive press of the submenu key toggles between OFF and ON. Subsequent changes in power settings will implement **AUTO SCALE** as required to keep all values within the range of the Y Axis.

AXIS MIN and **AXIS MAX** allow the user to specify a maximum and minimum value that will not change, even if a power setting falls outside the range set by the user. **AXIS MIN** and **AXIS MAX** can be edited using numeric editing.

DRAW GRIDS/OFF ON allows the user to turn the horizontal gridlines OFF and ON. To change **DRAW GRIDS/OFF ON**, select View/Y Axis. Press the **DRAW GRIDS/OFF ON** submenu key. Each successive press of the submenu key toggles between OFF and ON.

Table 5-10 Example AUTO SCALE

ACTION	RESULT
Press VIEW Menu Key	Brings up Submenu
Press **AUTO SCALE** Submenu Key	Selection is Highlighted
Successive pressing of Submenu Key	Sets **AUTO SCALE** to OFF or ON

Table 5-11 Example Y AXIS MIN/MAX

ACTION	RESULT
Press VIEW Menu Key	Brings up Submenu
Press **AXIS MIN** or **AXIS MAX** Sub-menu Key	Selection is Highlighted and Cursor displayed
Use Numeric Editing	Changes Y Axis Value
Press ENTER KEY	Sets the new Y Axis Value
Press CANCEL or No key press within 10 seconds	Cancels the process

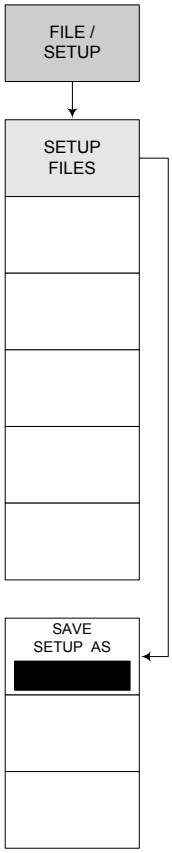
Table 5-12 Example DRAW GRIDS OFF/ON

ACTION	RESULT
Press VIEW Menu Key	Brings up Submenu
Press **DRAW GRIDS** Submenu Key	Selection is Highlighted
Successive pressing of Submenu Key	Sets **AUTO SCALE** to OFF or ON

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FILE SETUP

Saving a Setup



To save a setup, select FILE/SETUP menu, press the SETUP FILES submenu key, then press the **SAVE SETUP AS** submenu key. The submenu is highlighted and the cursor is displayed. Valid setup name characters are 0 through 9 and A through Z.

Modify the value using text editing and press ENTER.

If a setup already exists by the chosen name, the setup will not be saved. An error message “A setup file already exists by that name” is displayed.

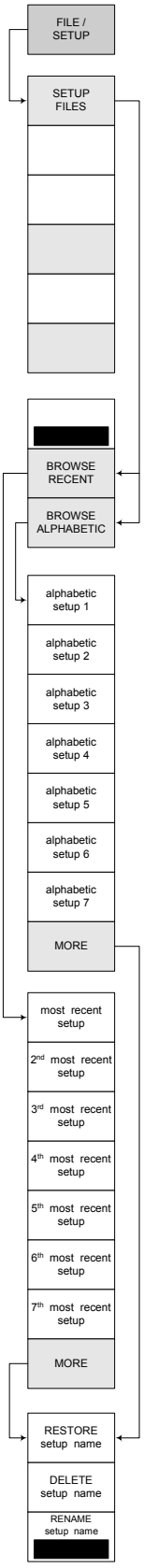
To view a list of stored setups in alphabetical order, press the key to the right of the BROWSE ALPHABETIC submenu. To view a list of stored setups in order of most recent access, press the key to the right of the BROWSE RECENT submenu.

Table 5-13 Example SAVING A SETUP

ACTION	RESULT
Press FILE/SETUP Menu Key	Brings up Submenu
Press SETUP FILES Submenu Key	Brings up Submenu
Press **SAVE SETUP AS** Submenu Key	Selection is Highlighted and Cursor is displayed
Use TEXT EDITING	New setup name is displayed
Press ENTER KEY	Saves the File Setup
Press CANCEL or No key press within 10 seconds	Cancels the process

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Restoring, Deleting, and Renaming Setups



To **Restore, Delete or Rename** a setup, select FILE/SETUP menu, press the SETUP FILES submenu key, then press BROWSE RECENT or BROWSE ALPHABETIC submenu. Setups can be selected by pressing the key to the right of the submenu with the setup name in it. If there are more than seven saved setups, MORE will appear in submenu 8. Pressing MORE submenu key will cause the next list of setups to be displayed.

To delete a selected setup, press the key to the right of the DELETE SETUP submenu. After the setup is deleted, the BROWSE RECENT or BROWSE ALPHABETIC submenu is re-displayed.

To restore a selected setup, press the key to the right of the RESTORE SETUP submenu. “Setup restore in process” is displayed in the status window until the restore is complete.

To rename a selected setup, press the key to the right of the RENAME SETUP submenu. Modify the value using text editing and press ENTER. If a setup already exists with the new name, the setup will not be renamed. An error message “A setup file already exists by that name” is displayed. After the setup is renamed, the BROWSE RECENT or BROWSE ALPHABETIC submenu is re-displayed.

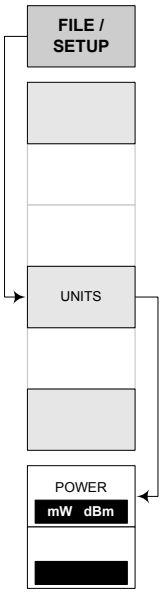
Table 5-14 Example RESTORING A SETUP

ACTION	RESULT
Press FILE/SETUP Menu Key	Brings up Submenu
Press SETUP FILES Submenu Key	Brings up Submenu
Press BROWSE RECENT Submenu Key	Selection is Highlighted and Cursor is displayed
Press ENTER KEY	Restores the selected Setup
Press CANCEL or No key press within 10 seconds	Cancels the process

WARNING: If laser sources are turned on when a setup is saved, these lasers will be turned on when that setup is restored!

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CHANGING POWER UNITS

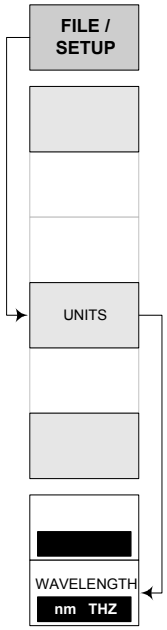


To set power units, select FILE/SETUP, press the UNITS submenu key, then press the POWER submenu key. Each successive press of the submenu key toggles between mW or dBm. The default power unit is dBm.

Table 5-15 Example POWER UNITS

ACTION	RESULT
Press FILE/SETUP Menu Key	Brings up Submenu
Press UNITS Submenu Key	Brings up Submenu
Press POWER Submenu Key	Selection is Highlighted
Successive pressing of Submenu Key	Toggles between mW and dBm

CHANGING WAVELENGTH UNITS



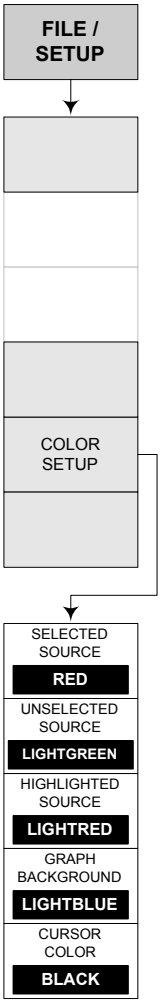
To set Wavelength Units, select FILE/SETUP, press the UNITS submenu key, then press the WAVELENGTH submenu key. Each successive press of the key toggles between nm and THz.

Table 5-16 Example WAVELENGTH UNITS

ACTION	RESULT
Press FILE/SETUP Menu Key	Brings up Submenu
Press UNITS Submenu Key	Brings up Submenu
Press WAVELENGTH Submenu Key	Selection is Highlighted
Successive pressing of Submenu Key	Toggles between nm and THz

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COLOR SETUP



Color may be selected for the graph background, cursor, selected source, unselected source and highlighted source. Once a color is selected for an item, it is no longer available for the remaining items. For example, BLACK cannot be used for both the cursor and the graph background.

The sixteen color pallet consists of BLACK, BLUE, BROWN, CYAN, DARKGRAY, GREEN, MAGENTA, RED, WHITE, YELLOW, LIGHTBLUE, LIGHTCYAN, LIGHTGRAY, LIGHTGREEN, LIGHTMAGENTA AND LIGHTRED.

Table 5-17 Default COLOR SETUP

ITEM	COLOR
SELECTED SOURCE	RED
UNSELECTED SOURCE	LIGHTGREEN
HIGHLIGHTED SOURCE	LIGHTRED
GRAPH BACKGROUND	LIGHTBLUE
CURSOR COLOR	BLACK

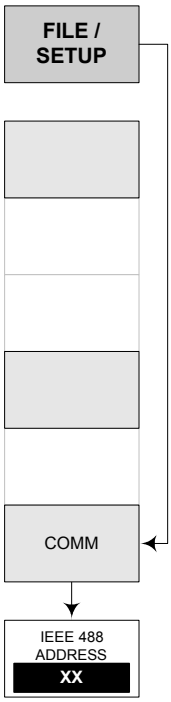
To edit **COLOR SETUP**, select FILE/SETUP menu, press the **COLOR SETUP** submenu key, then press the submenu key for the item to change, the submenu is highlighted. Use the arrow keys and/or the rotary knob to select color choice, then press ENTER.

Table 5-18 Example COLOR SETUP

ACTION	RESULT
Press FILE/SETUP Menu Key	Brings up Submenu
Press COLOR SETUP Sub-menu Key	Brings up Submenu
Press SELECTED SOURCE Submenu Key	Selection is Highlighted
Use arrow keys or rotary knob to select color	Scrolls through available colors
Press ENTER KEY	Selected color is applied
Press CANCEL or No key press within 10 seconds	Cancels the process

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CHANGING THE GPIB ADDRESS



GPIB allows control over a GPIB interface bus from a remote location.

To edit the GPIB address value, select FILE/SETUP menu, press COMM submenu key, then press IEEE 488 ADDRESS submenu key. The submenu is highlighted and the cursor is displayed. Help text provides the range of valid values.

Modify the value using numeric editing and press ENTER.

Setting the GPIB address to an incorrect value will result in loss of communications over the GPIB interface.

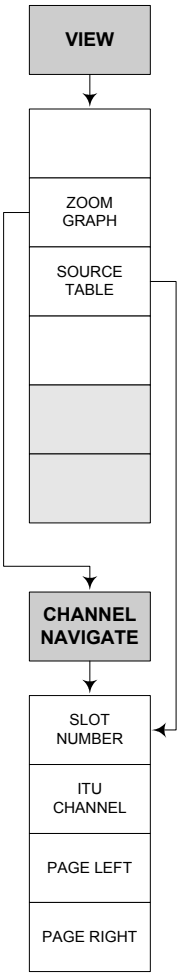
Table 5-19 Example GPIB ADDRESS

ACTION	RESULT
Press FILE/SETUP Menu Key	Brings up Submenu
Press COMM Submenu Key	Brings up Submenu
Press IEEE 488 ADDRESS Submenu Key	Selection is Highlighted and Cursor is displayed
Use NUMERIC EDITING	New GPIB address is displayed
Press ENTER KEY	Saves the GPIB address
Press CANCEL or No key press within 10 seconds	Cancels the process

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CHANNEL NAVIGATE SUBMENU

The CHANNEL NAVIGATE submenu can be accessed from View/Zoom Graph or View/Source Table.



Navigate to a Slot Number

To navigate to a slot number, first select View/Zoom Graph. The Comb Menu Key label is changed to the CHANNEL NAVIGATE Menu Key Label. Press the CHANNEL NAVIGATE Menu Key, then press the **SLOT NUMBER** submenu key. The submenu is highlighted and the cursor is displayed. Modify the value using numeric editing and press ENTER. Help text provides the range of valid values. If the slot number is set to a slot that does contain a laser source, the slot number will not be changed. An error message “A laser is not present in that slot number” is displayed.

Using Page Left and Page Right

When the key to the right of the PAGE LEFT or PAGE RIGHT submenu is pressed, the cursor is moved to the left or right by four laser sources. If there are less than four sources installed, the cursor will move as far to the left or right as possible. If PAGE LEFT or PAGE RIGHT is pressed when the cursor is less than four slots from the start or end of the graph, the graph is scrolled.

.

Table 5-20 Example CHANNEL NAVIGATE

ACTION	RESULT
Press VIEW Menu Key	Brings up Submenu
Press ZOOM GRAPH Submenu Key	Brings up Submenu and COMB Menu Key Label is changed to CHANNEL NAVIGATE Menu Key Label
Press CHANNEL NAVIGATE Menu Key	Brings up Submenu
Press **SLOT NUMBER** Submenu Key	Selection is Highlighted and Cursor is displayed
Use NUMERIC EDITING	Selected Slot Number is displayed
Press ENTER KEY	Source at selected Slot Number is viewed
Press CANCEL or No key press within 10 seconds	Cancels the process

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CHAPTER 6 COHERENCE/MODULATION

Coherence/Modulation is used to modulate laser drive current. Modulation of the drive current broadens the linewidth of the laser and may also be used in various applications such as channel identification. On power up, Coherence/Modulation is set to the state(s) that existed at the previous shut down. Coherence/Modulation is accessed from Sources, Comb, View/Zoom Graph and View/Source Table.

Modulation Circuits

At the system level, there are four modulation control circuits available in the SSB-9200: MOD1, MOD2, COHERENCE and TTL. Each circuit has two choices of function generator input that the user can select. The choices for each circuit are:

Table 6-1 Modulation Circuits

CIRCUIT	FUNCTION GENERATOR
MOD1	INTERNAL FUNCTION GENERATOR 1 or EXTERNAL INPUT
MOD2	INTERNAL FUNCTION GENERATOR 2 or EXTERNAL INPUT
COHERENCE	INTERNAL COHERENCE CONTROL FUNCTION GENERATOR or OFF (GROUND)
TTL	INTERNAL TTL DIGITAL FUNCTION GENERATOR or EXTERNAL INPUT

The MOD1 circuit can be set to the Internal Function Generator 1 with a choice of frequencies and waveforms or it can be set to the external input. When external input is selected, Function Generator 1 is turned off. The same is true of the MOD2 circuit.

The COHERENCE circuit can be set to the Internal Coherence Control Function Generator or it can be set to OFF (Ground). The Coherence Control Function Generator frequency (100 kHz) and waveform (Sine) are set at the factory to generate a linewidth of approximately 1 GHz and cannot be modified by the user.

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The TTL circuit can be set to the Internal TTL Digital Function Generator with 100% depth of modulation (square wave), a 50% duty cycle, and a choice of frequencies or it can be set to external input. When external input is selected, the Internal TTL Digital Function Generator is turned off. The TTL level will be turned “on” when an external signal crosses a 2.0V threshold. The TTL level will be turned “off” when an external signal falls below a 0.8V threshold.

Each of these four circuits in the SSB-9200 can provide modulation for one or more sources. The BNC connectors for external input to these circuits are located on the rear panel of the SSB-9200 mainframe.

The output from all four circuits just described goes to each FOS-9200xxx laser source module. Selection among them is made at each source module. The user selects either the MOD1, MOD2, COHERENCE or OFF and also specifies the depth of modulation applied to each individual laser source as a percent of maximum modulation. The maximum peak–to–peak modulation current is 40 mA with the internal function generator and 100 mA with an external input. The responsivity of the modulation circuit is 20 mA/V and the maximum external signal allowed is 5V peak–to–peak. The drive current for each laser is different, with the maximum allowed current around 500 mA. This means that while the modulation frequency and waveform are set at the function generator, the modulation depth can be unique for each laser source.

In addition, for each laser source the user selects TTL independently of MOD1, MOD2 or COHERENCE. TTL can be on or off at each source. This means that none, one or two signals can modulate each source.

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The block diagram in FIGURE 6-1 shows the relationship between the MOD1, MOD2, COHERENCE, and TTL system circuits and the FOS-9200xxx laser source modules.

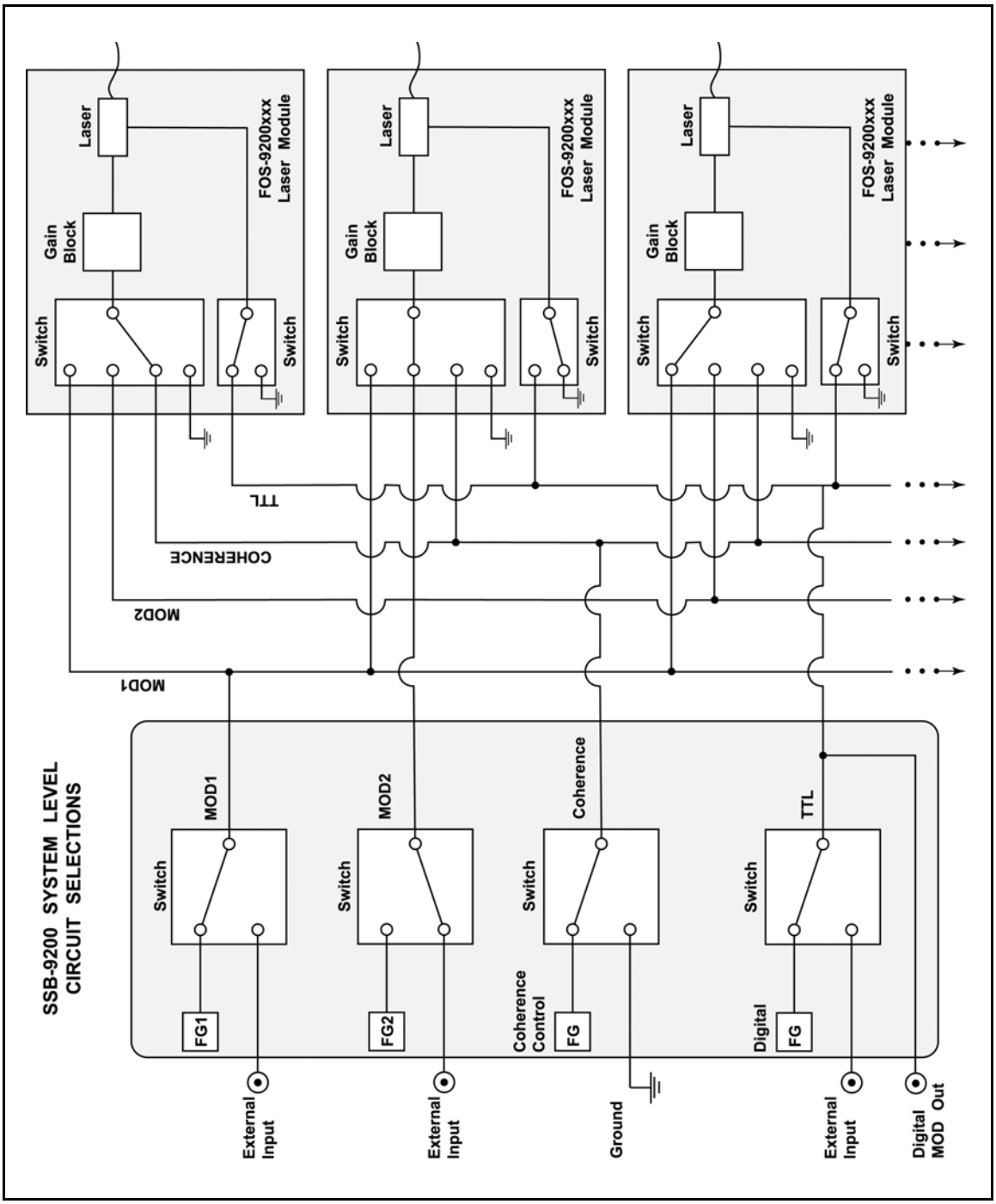


FIGURE 6-1 Coherence/Modulation Block Diagram

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Editing MOD1, MOD2, COHERENCE and TTL Circuits

Laser sources do not need to be selected when editing the MOD1, MOD2, COHERENCE, and TTL circuits. The following commands apply to system level circuits only.

To edit the MOD1 circuit from Sources, Comb, or View/Zoom Graph, select the Coherence/Modulation submenu. Press the EDIT MOD1 submenu key. Next, press MOD1/FG EXT to change between Internal Function Generator 1 (FG) and external input (EXT). Subsequent presses of the MOD1 submenu key toggle between FG and EXT. Press ENTER to accept the selection. To change the frequency of Internal Function Generator 1, use numeric editing techniques under the FG Freq submenu. A help menu displays the range of allowed frequencies. To change the waveform, choose the SINE WAVE, SQUARE WAVE, or TRIANGLE WAVE submenu key and press ENTER.

The MOD2 circuit is edited in the same way as MOD1.

To edit the COHERENCE circuit from Sources, Comb, or View/Zoom Graph, select the Coherence/Modulation submenu. Press the EDIT COHERENCE OFF/ON submenu key. Subsequent key presses toggle between OFF and ON. The OFF value turns the Internal Coherence Control Function Generator off and grounds the circuit. The ON value selects the Internal Coherence Control Function generator, which is set to a 100 kHz Sine wave and cannot be changed. Press ENTER to accept the selection.

To edit the TTL circuit from Sources, Comb, or View/Zoom Graph, select the Coherence/Modulation submenu. Press the EDIT TTL MOD submenu key. Next press TTL MOD/INT EXT to change between the Internal TTL Digital Function Generator (INT) or an external input (EXT). Subsequent key presses toggle between INT and EXT. Press ENTER to accept the selection. To change the frequency of the Internal TTL Digital Function Generator, use numeric editing techniques under the TTL Freq submenu. A help menu displays the range of allowed frequencies. The waveform is preset to a square wave with a 50% duty cycle which cannot be changed.

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The MOD1, MOD2, COHERENCE and TTL circuits are also accessible from View/System Table in the row labeled FuncGens. Values that can be changed are displayed with a black background. Use numeric or text editing to change values.

Table 6-2 Example Setting Modulation Circuits

ACTION	RESULT
Press SOURCES Menu Key	Brings up Submenu
Press Coherence/Modulation Submenu Key	Brings up Submenu
Press EDIT COHERENCE OFF/ON Submenu Key	Selection is Highlighted, toggles between OFF/ON with subsequent presses
Toggle to ON, press ENTER Key	Coherence control circuit is ON 100kHz sine wave is available
Press CANCEL or No key press within 10 seconds	Cancels the process

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Modulation of FOS-9200xxx laser sources

After defining the MOD1, MOD2, COHERENCE and TTL circuit parameters at the system level, modulation can be chosen for each laser source from Sources, Comb, View/Zoom Graph, or View/Source Table.

To select a modulation circuit for one or more sources, select Sources, Comb or View/Zoom Graph. Select laser sources. First, set TTL Modulation to the desired state by pressing the TTL MOD OFF/ON submenu key. Subsequent key presses toggle between OFF and ON. Press ENTER to accept the desired selection.

Next, choose between MOD1, MOD2, or COHERENCE modulation for one or more sources. Press the MOD DEPTH submenu key and use numeric editing techniques to enter the desired depth of modulation. The value entered is the modulation current expressed as a fraction of maximum gain. Refer to page 6-2 for discussion of maximum modulation possible. Then press the SELECT MOD1, SELECT MOD2, SELECT COHERENCE or SELECT OFF submenu key and press ENTER. This determines which modulation circuit the selected laser source(s) will use.

To edit modulation from View/Source Table, navigate to the desired laser source and make selections in the Coherence/Mod row using numeric and text editing techniques.

Table 6-3 Example Set TTL MOD OFF/ON

ACTION	RESULT
Press SOURCES Menu Key	Brings up Submenu
Use rotary knob to place cursor on a source and press ENTER Key	One source selected
Press **TTL MOD OFF/ON** Submenu Key, Toggle to ON and press ENTER	TTL Modulation is on for this source
Press MOD1 Press MOD DEPTH Submenu Key	Choose MOD1 circuit for this source
Enter 50, press ENTER, press SELECT MOD1, press ENTER	50% of modulation current is applied to source or 20mA peak–to–peak
Press CANCEL or No key press within 10 seconds	Cancels the process

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CHAPTER 7 REMOTE OPERATION

The SSB-9200 System can be controlled remotely via GPIB (IEEE-488.2). GPIB common commands are accepted as well as the Standard Commands for Programmable Instruments (SCPI) command language. The syntax of the SCPI commands are described in this chapter.

GPIB COMMON COMMANDS

The IEEE-488.2 standard has a list of reserved commands. These commands are referred to as common commands. Table 7-1shows a list of implemented common commands:

Table 7-1 GPIB Common Commands

COMMAND	DESCRIPTION
***CLS**	Clears existing errors
***ESE**	Sets Event Status Enable register
***ESE?**	Queries Event Status Enable register
***ESR?**	Queries Event Status Register
***IDN?**	Identification Query
***RST**	Resets the Instrument

DESCRIPTION OF GPIB COMMON COMMANDS

Command: *CLS

The CLear Status (***CLS**) command clears the following:

- Event Status Register (ESR)
- Error String

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Command: *ESE

The Event Status Enable (***ESE**) command allows setting a mask which enables corresponding error bits in the Event Status Register (ESR). At power on, the ESE register is set to a value of 255. This allows all error bits within the ESR to be enabled.

Table 7-2 lists the bit values of the ESE register:

Table 7-2 ESE Register Bit Values

BIT	NAME	HEX VALUE
7(MSB)	Power On	0x80
6	Not used	0x40
5	Command Error	0x20
4	Not used	0x10
3	Not used	0x08
2	Query Error	0x04
1	Not used	0x02
0(LSB)	Not used	0x01

Command: *ESE?

Returns the contents of the ESE register.

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Command: *ESR?

The Event Status Register query (***ESR?**) returns the contents of the ESR register. Table 7-3 lists the bit values of the ESR register:

Table 7-3 ESR Register Bit Values

BIT	NAME	HEX VALUE
7(MSB)	Power On	0x80
6	Not used	0x40
5	Command Error	0x20
4	Not used	0x10
3	Not used	0x08
2	Query Error	0x04
1	Not used	0x02
0(LSB)	Not used	0x01

Command: *IDN?

The identification query returns the instrument identification string. Fields are delimited by commas.

ILX LightwaveManufacturer

MmmmmModel Number

Vvvv firmware revision level

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Command: *RST

Resets the instrument to the following state:

Table 7-4 Command: *RST Values

FRONT PANEL COMMAND ("➥" DENOTES A SUBMENU)	VALUE OF ITEM AFTER *RST
File ➥Units ➥Power	"dBm"
File ➥Units ➥Wavelength	"nm"
Sources ➥Slot X ➥Wavelength*	<Calibrated Center Wavelength>
Comb ➥Set power dBm	<Maximum Calibrated Power>
Comb ➥Beam Block	Open
Comb ➥Coherence/Modulation	Off
Comb ➥Modulation Depth	0.0
Comb ➥TTL Mod	Off
Comb ➥System Polarization	Off
Comb ➥VOA Atten (dBm)	0.00
Comb ➥Laser	Off
Comb ➥Coherence/Modulation ➥Select Mod1	<Not Selected>
Comb ➥Coherence/Modulation ➥Select Mod2	<Not Selected>
Comb ➥Coherence/Modulation ➥Select Coherence	<Not Selected>

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Table 7-4 Command: *RST Values

FRONT PANEL COMMAND ("↪" DENOTES A SUBMENU)	VALUE OF ITEM AFTER *RST
Comb ↪Coherence/Modulation ↪Select Off	<Selected>
Comb ↪Coherence/Modulation ↪Edit Mod1 ↪Mod 1	FG
Comb ↪Coherence/Modulation ↪Edit Mod1 ↪FG Freq kHz	1000.000
Comb ↪Coherence/Modulation ↪Edit Mod1 ↪Sine Wave	<Not Selected>
Comb ↪Coherence/Modulation ↪Edit Mod1 ↪Square Wave	<Selected>
Comb ↪Coherence/Modulation ↪Edit Mod1 ↪Triangle Wave	<Not Selected>
Comb ↪Coherence/Modulation ↪Edit Mod2	<All "Edit Mod2" values are the same as the "Edit Mod1" values>
Comb ↪Coherence/Modulation ↪Edit Coherence	Off
Comb ↪Coherence/Modulation ↪Edit TTL Mod ↪TTL Mod	Ext
Comb ↪Coherence/Modulation ↪Edit TTL Mod ↪TTL Freq KhZ	500.000

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SCPI COMMANDS

The SCPI commands and their format are described in this section. The capitalized letters in a command field are the minimal required for the command to be recognized by the instrument.

Source commands identify individual sources within the instrument such as channels and function generators.

Command: SOURce:CHANnel:FREQuency

Format: SOUR:CHANx:FREQ y

Description: The units of the frequency parameter are defined by the :UNIT:FREQ command.

where:

x: is the channel number

y: is the frequency

Command: SOURce:CHANnel:FREQuency?

Format: SOUR:CHANx:FREQ?

Description: Returns a response string in the units defined by the:UNIT:FREQ command.

where:

x: is the channel number

Command: SOURce:CHANnel:STATe

Format: SOURCE:CHANNELx:STATE y

Description: Sets the state of a specified laser to On or OFF

where:

x: is the channel number

y: is the state.

OFF or 0 = OFF

ON or 1 = ON

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Command: SOURce:CHANnel:STATe?

Format: SOURCE:CHANNELx:STATE?

Description: Returns a response string representing the ON/OFF state of the requested laser channel.

where:

x: is the channel number

Command: SOURce:ALL:STATe

Format: :SOUR:ALL:STATe y

Description: Sets all available lasers to On or OFF state

where:

y: is the state.

OFF or 0 = OFF

ON or 1 = ON

Command: SOURce:CHANnel:POWer

Format: :SOUR:CHANx:POW y

Description: Sets power of specified channel

where:

x: is the channel number

y: is the power

Note that the units of the power value are defined by the:UNIT:POWER command

Command: SOURce:CHANnel:POWer?

Format: :SOUR:CHANx:POW?

Description: Returns power setting of specified channel

where:

x: is the channel number

Returns a response string in the units defined by the:UNIT:POWER command

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Command: SOURce:ALL:POWer

Format: :SOUR:ALL:POW y

Description: Sets all available channels to requested power

where:

y: is the power level

Note that the units of the power value are defined by the:UNIT:POWER command

Command: SOURce:CHANnel:POWer:LIMits?

Format: SOUR:CHANx:POW:LIM?

Description: Returns the upper power limit of the channel.

where:

x: is the channel number

Example: 20.00

Command: SOURce:CHANnel:WAVelength

Format: :SOURCE:CHANNELx:WAVELENGTH y

Description: Sets wavelength of the requested laser channel.

where:

x: is the channel number

y: is the wavelength

Note that the units of the wavelength parameter are defined by the :UNIT:WAV command

Command: SOURce:CHANnel:WAVelength?

Format: :SOURCE:CHANNELx:WAVELENGTH?

Description: Returns wavelength setting of the specified channel

where:

x: is the channel number

Returns a response string in the units defined by the :UNIT:WAV command

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Command: SOURce:CHANnel:WAVelength:LIMits?

Format: SOUR:CHANx:WAV:LIM?
Description: Returns comma delimited wavelength limits for the channel in the order of: MAX, CENTER, MIN

where:
x: is the channel number
Example: 1555.200, 1555.100, 1555.000

Command: SOURce:CHANnel:BBLock

Format: :SOUR :CHANx :BBL y
Description: Sets the beam block on or off for the particular channel.

where:
x: is the channel number
y: is the beam blocker state:
0 = Off (beam is open)
1 = On (beam is blocked)

Command: SOURce:CHANnel:BBLock?

Format: :SOUR :CHANx:BBL?
Description: Returns the present beam blocker state for the requested channel

where:
x: is the channel number

Command: SOURce:CHANnel:SHUTterinstalled?

Format: :SOURCE :CHANNELx:SHUTTERINSTALLED?

where:
x: is the channel number

returns:
0 = shutter is not installed
1 = shutter is installed

Command: SOURce:CHANnel:FG:SOURce

Format: :SOURCE :CHANNELx:FGENERATOR:SOURCE y
Description: Sets the Funcation generator source for the channel.

where:
x: is the channel number
y: is the Function Generator reference number
0 = No source (Modulation off)
1 = Function Generator 1
2 = Function Generator 2
3 = Coherence
4 = Digital (TTL)

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Command: SOURce:CHANnel:FG:SOURce?

Format: :SOURCE:CHANNELx:FGENERATOR:SOURCE?

Description: Returns the function generator reference number in use by the channel.

where:

x: is the channel number

Command: :SOURce:CHANnel:AM:DEPTh

Format: :SOUR:CHANx:AM:DEPT y

Description: Sets the Amplitude Modulation depth on the given channel.

where:

x: is the channel number

y: AM depth (0-100)

Command: :SOURce:CHANnel:AM:DEPTh?

Format: :SOUR:CHANx:AM:DEPT?

Description: Returns the Amplitude Modulation depth on the given channel.

where:

x: is the channel number

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Command: :SOURce:FGx:STATe

Format: :SOUR:FGx:STAT y

Description: Sets state of specified function generator

where:

x: is the function generator reference number

1 - Function Generator 1

2 - Function Generator 2

3 - Coherence

4 - Digital (TTL)

y: is 0 or 1

Implemented per the following table:

Table 7-5 Function Generator State

VALUE OF X	VALUE OF Y	SOURCE SELECTED
1	0	External Mod 1
1	1	Func Gen 1
2	0	External Mod 2
2	1	Func Gen 2
3	0	COH OFF
3	1	COH
4	0	TTL
4	1	External TTL

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Command: :SOURce:FGx:STATe?

Format: SOURce:FGx:STATe?

Description: Returns state of the specified function generator

where:

x: is the function generator reference number

1 - Function Generator 1

2 - Function Generator 2

3 - Coherence

4 - Digital (TTL)

Response: Returns a response string represented by the table for the :sour:fg:state command.

Command: :SOURce:FG:FREQ

Format: :SOUR:FGx:FREQ y

Description: Sets the modulation frequency of the Function Generator

where:

x: is the function generator reference number

1 - Function Generator 1

2 - Function Generator 2

3 - Coherence

4 - Digital (TTL)

y: Frequency

Note that the units of the frequency value are defined by the :UNIT:FREQ command.

Command: :SOURce:FG:FREQ?

Format: :SOUR:FGx:FREQ?

Description: Returns frequency of specified function generator

where:

x: is the function generator reference number

Note that the units of the returned frequency value are defined by the :UNIT:FREQ command.

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Command: :SOURce:FG:SHAPe

Format: :SOUR:FGx:SHAPe y

Description: Sets the waveform shape of the function generator.

where:

x: is the function generator reference number

y: is the shape

SINE - Sine wave

SQU - Square wave

TRI - Triangle wave

Command: :SOURce:FG:SHAPe?

Format: :SOUR:FGx:SHAPe?

Description: Returns the waveform shape in use by the function generator.

where:

x: is the function generator reference number

Command: UNIT:POWer

Format: :UNIT:POWER x

Description: Sets the units for laser power that are used internally by the instrument for GPIB commands. Remains in effect until power is removed or another unit command is issued.

where:

x: W - Watts

MW - milliwatts

DBM - dBm

Command: UNIT:POWer?

Format: :UNIT:POWER?

Description: Returns the units for laser power used internally by the instrument.

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Command: UNIT:WAVlength

Format: :UNIT:WAVELENGTH x

Description: Sets the units for laser wavelength that are used internally by the instrument for GPIB commands. Remains in effect until power is removed or another unit command is issued.

where:

x: M - Meters
MET - Meters
MM - millimeters
UM - micrometers
NM - nanometers (default)

Command: UNIT:WAVlength?

Format: :UNIT:WAVELENGTH?

Description: Returns the units for laser wavelength used internally by the instrument.

Command: UNIT:FREQuency

Format: :UNIT:FREQUENCY x

Description: Sets the frequency units that are used internally by the instrument for GPIB commands. Remains in effect until power is removed or another unit command is issued.

where:

x: HZ - Hertz
HERT - Hertz
KHZ - kiloHertz
MHZ - megaHertz
GHZ - gigaHertz
THZ - THertz

Command: UNIT:FREQuency?

Format: :UNIT:FREQUENCY?

Description: Returns the frequency units used internally by the instrument.

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Command: DISPlay:UPDAte

Format: :DISP:UPDATE x

Description: Allows enabling or disabling of display updates upon GPIB commands being received by the instrument.

where:

x: 0 - Off (Display will not update on received GPIB command)
1 - On (Display will update) (default)

Command: DISPlay:UPDAte?

Format: :DISP:UPDATE?

Description: Returns current display update state

Command: OUTPUT:ATTENUATION

Format: :OUTPUT:ATTENUATION x

Description: Sets output attenuation (VOA).

where:

x: Attenuation level in dB

Command: SYSTEM:ERROR?

Format: :SYSTEM:ERROR?

Description: Returns a string with error information from the last occurring error. If no previous error exists, the string: No Error is returned

Command: SYSTEM:CHANLIST?

Format: :SYST:CHANLIST?

Description: Returns a string of comma delimited numbers representing the channels available in the instrument. The GPIB programmer can refer to this list for commands that require a channel parameter.

Be sure to allocate enough memory for the response string. The length of the response string can be long for instruments that are fully populated with channels.

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Command: SYSTem:RECall “x”

Format: SYST:REC “x”

where:

x: is the recall system settings variable name.

NOTE: The quotation marks around the variable are required.

WARNING: If laser sources are turned on when a setup is saved, these lasers will be turned on when that setup is recalled!

Command: SYSTEM:REMOTE

Format: :SYSTEM:REMOTE x

where:

x: ON
OFF

Description: When the command is issued with ON, the front panel Remote light will turn on and the SSB-9200 will not respond to front panel key presses. The keys will remain locked out until either a GPIB remote OFF command is issued or the power is cycled.

Command: SYSTEM:REMOTE?

Format: :SYSTEM:REMOTE?

Description: Returns the Remote/Local state.

Command: SYSTem:SAVe “x”

Format: SYST:SAV “x”

where:

x: is the save system settings variable name.

NOTE: The quotation marks around the variable are required.

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CHAPTER 8 MAINTENANCE

In order to ensure that your SSB-9200 system continues to meet its published specifications, ILX Lightwave recommends annual calibration.

CLEANING FIBER OPTIC CONNECTORS

Use the following procedure to clean the fiber optic connectors on the SSB-9200 High Density Source Bank. Exercise extreme care while working with the fiber and module.

CAUTION:



There are no Laser safety hazards in excess of Class I Laser if the system is de-energized. The interior of the SSB-9200 is considered a Class I environment unless unusual service measures are being performed.

Cleaning of the optical connectors and replacement of FOS-9200xxx Modules must be performed with the unit powered down. To power down the system turn the key in the power switch counterclockwise to the Standby position, remove the key and disconnect the power cord.

During installation and maintenance activities, be careful not to bend or break the optical fiber cables. DO NOT bend in smaller than 1” radius.

CAUTION:



The components of the SSB-9200 must be handled as static-sensitive devices. Grounding provisions should be used any time the devices are not in conductive packaging. Emphasis on cleanliness must be maintained and appropriate precautionary measures taken to minimize accumulation of skin oil, particulates, fibers and organic contaminants.

Failure to adhere to anti-static grounding provisions will void all unit warranties.

CAUTION:



Any disconnected fiber connector should not, at any time, be viewed directly or with direct optical aids (magnifying optics, etc.).

Use of an IR sensitive card is highly recommended for detecting IR laser light from the output of the SSB-9200.

The optically multiplexed output should not be disconnected at any time while the unit is energized.

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Cleaning FOS-9200xxx Connectors

Materials required:

Slotted screwdriver
ESD Strap
CLETOP or other fiber optic cleaner

NOTE: Disconnect one optical fiber cable at a time.

Clean one module at a time.

1) Ensure that the power is turned off on the SSB-9200 and disconnect the power cord from the back of the unit.

2) Unlock the front door by turning the key in the lock located in the center left side of the front panel clockwise.

3) Push, lift and turn the two latches to open the front door.

4) Connect ESD strap to wrist and then to appropriate earth ground at front door.

5) Disconnect the optical fiber cable connected to one of the modules. Place the disconnected end of the optical fiber cable in the connector clip located on the fiber routing bar.

6) Using a slotted screwdriver turn the six compression fasteners located on the rear panel counterclockwise to open the rear door of unit.

7) Connect ESD strap to wrist and then to appropriate earth ground at rear door.

8) Remove restraint bar from the row of modules.

9) Slide the module that has its optical fiber cable disconnected out of its slot.

10) Clean the tip using the CLETOP or other fiber optic cleaner.

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11) Carefully slide the module into the slot until it firmly seats against the motherboard.

12) Reconnect the optical fiber cable to the module.

13) Continue cleaning all modules, one at a time.

14) Replace the restraint bar from the row of modules.

15) Remove ESD strap from earth ground at rear door.

16) Using a slotted screwdriver turn the six compression fasteners located on the rear panel clockwise to close the rear door of unit.

17) Turn and push the two latches to close the front door.

18) Lock the front door by turning the key in the lock located in the center left side of the front panel counterclockwise.

19) Reconnect the power cord to the back of the SSB-9200 unit.

Cleaning Optical Fiber Cable Connectors

Materials required:

ESD Strap
CLETOP or other fiber optic cleaner

1) Ensure that the power is turned off on the SSB-9200 and disconnect the power cord from the back of the unit.

2) Unlock the front door by turning the key in the lock located in the center left side of the front panel clockwise.

3) Push, lift and turn the two latches to open the front door.

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4) Connect ESD strap to wrist and then to appropriate earth ground.

CAUTION:



The components of the SSB-9200 must be handled as static-sensitive devices. Grounding provisions should be used any time the devices are not in conductive packaging. Emphasis on cleanliness must be maintained and appropriate precautionary measures taken to minimize accumulation of skin oil, particulates, fibers and organic contaminants. For convenience, a wrist strap ground jack is located below the circuit breaker on the rear panel.

Failure to adhere to anti-static grounding provisions will void all unit warranties.

5) Disconnect the end of an optical fiber cable connected to a module.

6) Clean the tip using the CLETOP or other fiber optic cleaner.

7) Reconnect the end to the same module.

8) Disconnect the end of the same optical fiber cable connected to the Front Panel.

9) Clean the tip using the CLETOP or other fiber optic cleaner.

10) Reconnect the end to the original location on the Front Panel.

11) Continue cleaning all optical fiber cable connectors, one at a time.

12) Remove ESD strap from earth ground.

13) Turn and push the two latches to close the front door.

14) Lock the front door by turning the key in the lock located in the center left side of the front panel counterclockwise.

15) Reconnect the power cord to the back of the SSB-9200 unit.

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Replacement of FOS-9200xxx Modules

Materials required:

Slotted screwdriver
ESD Strap
ESD Bag
Replacement FOS-9200xxx Module
Optical Fiber tip cover
CLETOP or other fiber optic cleaner

1) Ensure that the power is turned off on the SSB-9200 and disconnect the power cord from the back of the unit.

2) Unlock the front door by turning the key in the lock located in the center left side of the front panel clockwise.

3) Push, lift and turn the two latches to open the front door.

4) Connect ESD strap to wrist and then to appropriate earth ground at front door.

CAUTION:



The components of the SSB-9200 must be handled as static-sensitive devices. Grounding provisions should be used any time the devices are not in conductive packaging. Emphasis on cleanliness must be maintained and appropriate precautionary measures taken to minimize accumulation of skin oil, particulates, fibers and organic contaminants. For convenience, a wrist strap ground jack is located below the circuit breaker on the rear panel.

Failure to adhere to anti-static grounding provisions will void all unit warranties.

5) Disconnect the optical fiber cable connected to one of the modules. Place the disconnected end of the optical fiber cable in the connector clip located on the fiber routing bar.

6) Using a slotted screwdriver turn the six compression fasteners located on the rear panel counterclockwise to open the rear door of unit.
7) Connect ESD strap to wrist and then to appropriate earth ground at rear door.

8) Locate the FOS-9200xxx Module that needs replacement.

9) Remove restraint bar from the row of Modules that contains the FOS-9200xxx Module to be replaced.

10) Slide the Module out of the slot.

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11) Cover the tip of the optical fiber at the end of the optical connector on the FOS-9200xxx Module.

12) Insert the module into the ESD bag, for storage or shipment back to ILX Lightwave.

13) Remove the replacement module from its ESD Bag.

14) Remove the cover from the tip of the optical fiber on the replacement FOS-9200xxx Module.

15) Clean the tip using the CLETOP or other fiber optic cleaner.

16) Verify that the optical connector is firmly mounted to the FOS-9200xxx Module

17) Carefully Slide the replacement module into the slot until it firmly seats against the motherboard.

18) Replace the restraint bar from the row of Modules that contains the replacement FOS-9200xxx Module.

19) Remove ESD strap from earth ground at rear door.

20) Using a slotted screwdriver turn the six compression fasteners located on the rear panel clockwise to close the rear door of unit.

21) Connect ESD strap to wrist and then to appropriate earth ground at front door.

22) Reconnect the optical fiber cable to the module.

23) Remove ESD strap from earth ground.

24) Turn and push the two latches to close the front door.

25) Lock the front door by turning the key in the lock located in the center left side of the front panel counterclockwise.

26) Reconnect the power cord to the back of the SSB-9200 unit.

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CHAPTER 9 GUI ERRORS AND WARNINGS

WARNING MESSAGES

WARNING: Power is below the calibration limit.

This warning is displayed when a user sets a laser's power below the minimum level at which it has been calibrated.

WARNING: Power is above the calibration limit.

This warning is displayed when a user sets a laser's power above the maximum level at which it has been calibrated.

SYSTEM LEVEL ERRORS

System level errors are errors that represent problems with system hardware. When these errors occur, the user should be encouraged to contact ILX Lightwave Technical Support.

ERROR: Can't read setup file.

This error is displayed when a file system error occurs while reading a Setup File.

ERROR: Can't write setup file.

This error is displayed when a file system error occurs while saving the current configuration of the 9200 as a Setup File.

ERROR: Can't write GPIB address file.

This error is displayed when a file system error occurs while the user is attempting to set the GPIB (IEEE 488) address.

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CONFIGURATION ERRORS

This type of error occurs when a user attempts to operate a hardware device within the 9200 that is not installed. The user should be encouraged to verify that the required hardware is installed before calling ILX Lightwave Technical Support.

ERROR: No laser sources modules found. Power down and add modules now.

This error is displayed when the 9200 powers up and finds no laser source modules. If source modules are installed, the user should call ILX Lightwave technical support.

ERROR: No Beam Block hardware is installed.

This error is displayed when a user presses the BEAM BLOCK submenu key and the selected laser source(s) do not have beam blocks.

ERROR: No Polarizer hardware is installed.

This error is displayed when the user presses the SOURCE POLARIZATION submenu key is Sources view and the selected laser source(s) do(es) not have polarization scrambling hardware. It is also displayed in Comb view if the SYSTEM POLARIZATION submenu key is pressed and a System Polarization Scrambler is not installed.

ERROR: No Variable Optical Attenuator is installed.

This error is displayed when the user presses the VOA ATTEN submenu key in the Comb view and no Variable Optical Attenuator is installed.

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USER INPUT ERRORS

This type of error occurs when the user makes a mistake using the GUI.

ERROR: The pressed key is not valid in this context.

This error is displayed when a key is pressed that is not valid in the current context of the GUI. The keystroke is ignored.

ERROR: Value entered is not within the allowed range.

The numeric value entered is not within the allowed range. The user should consult the help text for the valid range and re-enter a value within that range.

ERROR: Minus sign is only allowed at the start of the number.

This error is displayed when a user attempts to insert a minus sign (or overwrite an existing digit with a minus sign) somewhere other than left of the number. It is also displayed if the user attempts to insert a minus sign (or overwrite an existing digit with a minus sign) when there is already a minus sign at the left of the number.

ERROR: No space for more digits in this number.

This error is displayed when the user attempts to insert too many characters into an editable numeric or text field. The character is not inserted.

ERROR: Invalid setup file name.

This error is displayed when the user attempts to save the current configuration of the 9200 as a Setup File but does not provide a name to save it as.

ERROR: A setup file already exists by that name.

This error is displayed when a user attempts to save the current configuration of the 9200 as a Setup File and the selected name is already in use by another Setup File. The user must either delete the existing Setup File with the same name first or choose a different name for the new Setup File.

ERROR: A laser is not present in that slot number.

This error is displayed when the user is navigating to a source by specifying it's slot number and no laser source is in the specified slot.

ERROR: No laser has that ITU channel as its center frequency.

This error is displayed when the user is navigating to a source by specifying it's ITU channel number and no laser has that ITU channel number as it's center frequency.

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INDEX

A

Attenuation 7

B

BEAM BLOCK 5

C

Coherence/Modulation 1

Color Setup
- cursor 16
- graph background 16
- highlighted source 16
- selected source 16
- unselected source 16

Components
- Exterior 1
- Interior 1

Customer Service i

E

Editing
- Numeric Editing
  - Arrow Keys 10
  - Backspace Key 10
  - Delete Key 10
  - Insert Mode 9
  - Overwrite Mode 9
  - Rotary Knob 10
- Page Left and Page Right 18
- Selecting a Menu 9
- Selecting a Submenu 9
- Text Editing
  - Arrow Keys 12
  - Backspace Key 12
  - Delete Key 12
  - Insert mode 11
  - Overwrite Mode 11
  - Rotary Knob 12
- Toggle Keys 9

Error Messages
- Configuration 2
- System Level 1
- User Input 3

G

GPIB Commands
- *CLS 1
- *ESE 2
- *ESE? 2
- *ESR? 3
- *IDN? 3
- *RST 4

H

Help Key 12

I

Inspecting 2

Installation
- Mounting in a rack 4
- Power Supply 4
- Requirements 1

L

LASER ON/OFF 3

M

Maintenance
- Optical Connector Cleaning 1

Menu Tree 3

Modulation Circuits 1

Module Matrix 9

O

Optical MUX Temperature 10

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P

Power Units 15

Power, Set 4

S

SCPI Commands
- :DISPlay:UPDAte 15
- :DISPlay:UPDAte? 15
- :OUTPUT:ATTENUATION 15
- :SOURce:ALL:POWer 8
- :SOURce:ALL:STATe 7
- :SOURce:CHANnel:AM:DEPTh 10
- :SOURce:CHANnel:AM:DEPTh? 10
- :SOURce:CHANnel:BBLock 9
- :SOURce:CHANnel:BBLock? 9
- :SOURce:CHANnel:FG:SOURce 9
- :SOURce:CHANnel:FG:SOURce? 10
- :SOURce:CHANnel:FREQuency 6
- :SOURce:CHANnel:FREQuency? 6
- :SOURce:CHANnel:POWer 7
- :SOURce:CHANnel:POWer:LIMits? 8
- :SOURce:CHANnel:POWer? 7
- :SOURce:CHANnel:STATe 6
- :SOURce:CHANnel:STATe? 7
- :SOURce:CHANnel:WAVelength 8
- :SOURce:CHANnel:WAVelength:LIMits? 9
- :SOURce:CHANnel:WAVelength? 8
- :SOURce:FG:FREQ 12
- :SOURce:FG:FREQ? 12
- :SOURce:FG:SHAPe 13
- :SOURce:FG:SHAPe? 13
- :SOURce:FGx:STATe 11
- :SOURce:FGx:STATe? 12
- :SYSTEM:CHANLIST? 15
- :SYSTEM:ERROR? 15
- :SYSTem:RECall “x” 16
- :SYSTEM:REMOTE 16
- :SYSTEM:REMOTE? 16
- :SYSTem:SAVe “x” 16
- :UNIT:FREQuency 14
- :UNIT:FREQuency? 14
- :UNIT:POWer 13
- :UNIT:POWer? 13
- :UNIT:WAVlength 14
- :UNIT:WAVlength? 14

Selecting Sources
- Comb View 2
- Source Table View 2
- Sources View 1
- System Table View 2
- Zoom View 2

SET POWER dBm/mW 4

SET WAVELENGTH 6

Sorting Sources
- Setting the Sort Criteria 11
- Setting the Sort Order 11

Specifications
- 515 Source Module 7
- Computer Interface 6
- External Modulation
  - Digital 6
- Internal Modulation
  - Analog 6
  - Digital 6
- SSB-9200 5
- Variable Optical Attenuator 8

U

Unpacking 3

V

Views
- Comb 4
- Source Table 7
- Sources 5
- System Table 8
- Zoom 6

VOA ATTEN 7

W

Wavelength Units 15

Wavelength, Set 6

Y

Y Axis
- Auto Scale 12

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