48 Managing WAN Switching Modules

Introduction

The WAN Switching Modules (WSMs on the OmniSwitch and WSXs on the Omni Switch/Router) are a family of modules that enable the creation of WANs by providing connectivity between geographically-distanced LANs. These modules support a variety of protocols, including Frame Relay, synchronous Point to Point Protocol (PPP), and Integrated Services Digital Network (ISDN).

Note

All WSM software features discussed in this also apply to the Omni Switch/Router WSX.

WSMs extend the power and flexibility of LAN switching over greater geographic distances using either a Frame Relay network, ISDN network or leased line connection, such as T1. In a Frame Relay network configuration, WSMs provide a cost-effective link that is capable of supporting multiple virtual circuits. In a leased line configuration, WSMs provide dedicated bandwidth to a single remote site. In an ISDN line configuration, the WSM supports both inbound and outbound call circuits for interconnection to remote WAN Switching Modules or other devices that support standard PPP over ISDN. In addition, an ISDN configuration supports bandwidth on demand and backup of failed lines.

The family of WSM and WSX modules provides either 2, 4, or 8 ports, which provide a range of access rates from 9.6 kbps to 2 Mbps. Management, data handling, compression, and multi-protocol encapsulation are compatible with the current Frame Relay and PPP standards.

VLAN architectures are preserved and consistent on both sides of a WAN link. WSMs support Alcatel Frame Relay trunking. As a result, VLAN groups on one side of a Frame Relay link are compatible with those on the other side. In addition, the WSM/WSX is capable of both Frame Relay and PPP transparent bridging, and IP and IPX routing.

VLAN architectures are preserved and consistent on both sides of a WAN link. The WSM supports standard RFC 1490 multiprotocol over Frame Relay and synchronous PPP for bridging and routing interoperability with numerous other WAN networking devices. In addition, the WSM supports Alcatel Frame Relay trunking, so multiple VLAN groups on one side of a Frame Relay link can be transported across the WAN.

Supported Physical Interfaces

The WSM and WSX family of products support numerous physical interface (port) types. The port types available with the WSM and WSX family are:

Universal Serial Port

The Universal Serial Port (USP) provides connectivity to legacy synchronous serial port devices. With the addition of an adapter cable, it supports RS-232, RS-449, RS-530, V.35 and X.21 Data Terminal Equipment (DTE) and Data Carrier Equipment (DCE) interfaces at speeds up to 2.048 Mbps. USPs support access via Frame Relay or synchronous PPP. The WSM/WSX automatically detects the cable type connected and will configure the correct physical interface to use.

ISDN Basic Rate Interface Port

The ISDN Basic Rate Interface (BRI) port supports either a U or S/T interface (jumper selectable) for interfacing to public or private ISDN networks. Synchronous PPP is supported on the two bearer (B) channels. Multiple ISDN switch protocol variations are supported on the delta (D) channel (used for signaling). Each B channel runs at 64 kbps, and the D channel runs at 16 kbps.

Fractional T1 Port

The fractional T1 port connects directly to North American and Japanese circuit switch digital data public or private networks without requiring an external Digital Service Unit/Channel Service Unit (DSU/CSU)*. The port provides an integral DSU/CSU function with both short-haul (i.e., short distance) and long-haul (i.e., long distance) capabilities. The port allows the user to configure a range of time slots from 1 to 24 time slots used to allow for full T1 (all 24 time slots used) or a fractional T1 (less than 24 time slots) service. The fractional T1 port can support access via Frame Relay or synchronous PPP.

***Note**

For public digital networks, check with your service provider. They may allow only connections that use a configured short-haul interface via a network-provided Channel Service Unit (CSU).

Fractional E1 Port

The fractional E1 port connects directly to ITU-T standard circuit switch digital data public or private networks without requiring an external DSU/CSU*. The port provides an integral DSU/CSU function with both short-haul (i.e., short distance) and long-haul (i.e., long distance) capabilities. The port allows you to configure for full E1 (all 30 or 31 time slots used) or fractional E1 (1-29 time slots) service. The fractional E1 port supports access via either Frame Relay or synchronous PPP.

***Note**

For public digital networks, check with your service provider. They may allow only connections that use a configured short-haul interface via a network-provided Channel Service Unit (CSU).

Supported Protocols

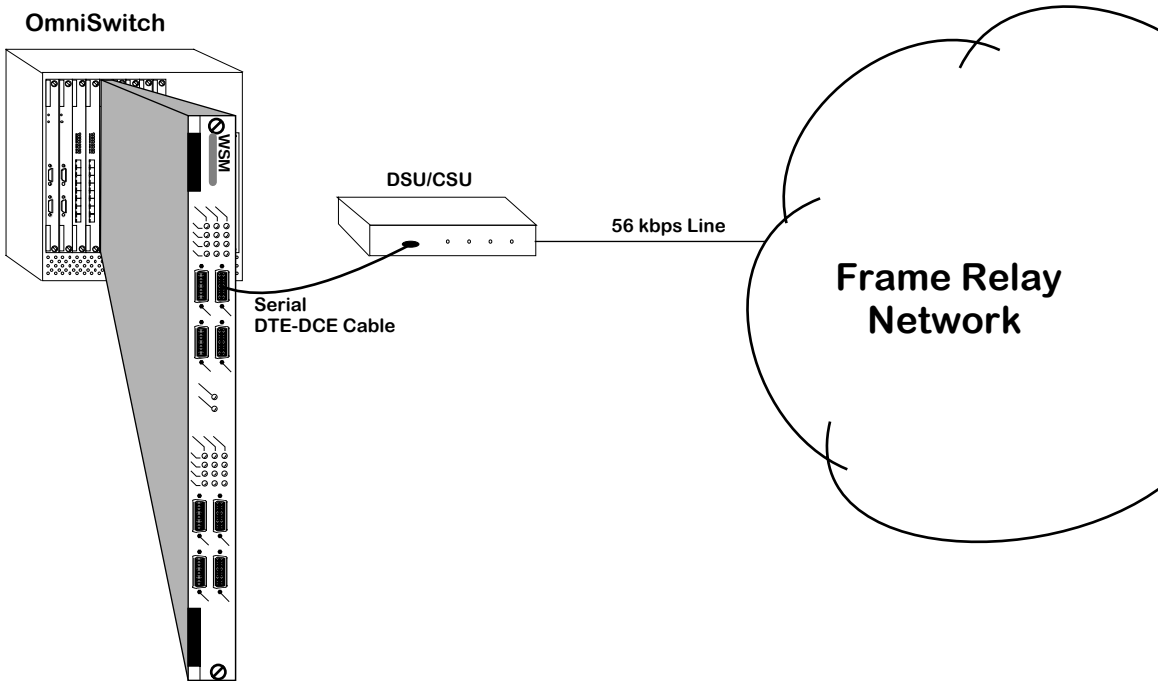
The WAN switching modules support both Frame Relay and synchronous Point-To-Point Protocol (PPP). For ISDN signalling protocols, the modules support D-channel signalling (see Chapter 52, “Managing ISDN Ports”) For more details on implementing these protocols, see Chapter 49, “Managing Frame Relay,” and chapter 50, “Point-to-Point Protocol.”

Application Examples

This section provides several examples of the types of WAN networking possible using WAN switching modules.

Frame Relay WSM/WSX Using Serial Ports

In a typical configuration, the WSM/WSX occupies either a slot in a switch chassis or a submodule in an OmniStack. Because it is compatible with OmniSwitch any-to-any switching and VLAN architecture, you can switch other topologies in the LAN to Frame Relay or PPP. The WSM/WSX connects to a DSU/CSU or T1 multiplexer through a serial cable. The following diagram shows a typical WSM/WSX setup using a 56 kbps Frame Relay line (up to 2 Mbps access rates are supported).



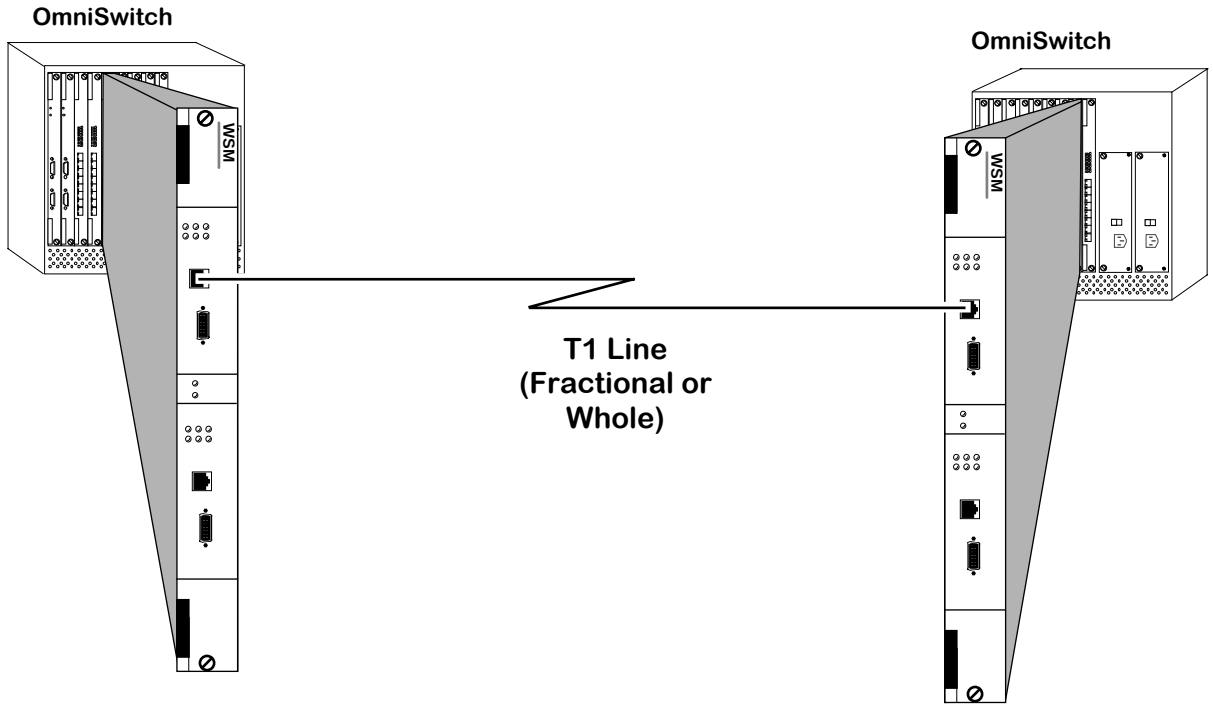
WSM/WSX Frame Relay Configuration Using Serial Ports

For serial ports, the WSM/WSX supports automatic detection of cable types. It also supports internal, external, and split clocking.

Software in the switch allows you to configure access rate, clocking and protocol-related parameters. Additional software commands allow you to view status at the WSM/WSX board, port, or protocol level. Extensive statistics are provided at each level, including a breakdown of traffic by frame type (Ethernet, IP, IPX, or BPDU) at the virtual circuit or PPP connection level.

Back-to-Back WSM/WSX Using T1 Ports

WAN switching modules may be connected "back-to-back" without an intervening Frame Relay network or switch. Because the T1 port internally provides a DSU/CSU function, an external DSU/CSU is not required. Such connections are made by using private leased lines, such as T1 lines, instead of public Frame Relay networks, usually over large geographic distances.



Back-to-Back Configuration Using Fractional T1 Ports

Combined Frame Relay with ISDN Backup

In a typical configuration, the WSM/WSX occupies either a slot in a switch chassis or a submodule on an OmniStack. Because it is compatible with OmniSwitch any-to-any switching and VLAN architecture, you can switch other topologies in the LAN to Frame Relay or PPP. The WSM/WSX connects to a DSU/CSU or T1 multiplexer through a serial cable. The following diagram shows a typical WSM/WSX setup using a 56 kbps Frame Relay line (up to 2 Mbps access rates are supported)

Refer to the Chapter 49, “Managing Frame Relay,” and Chapter 55, “Backup Services,” for details on how to implement this configuration.

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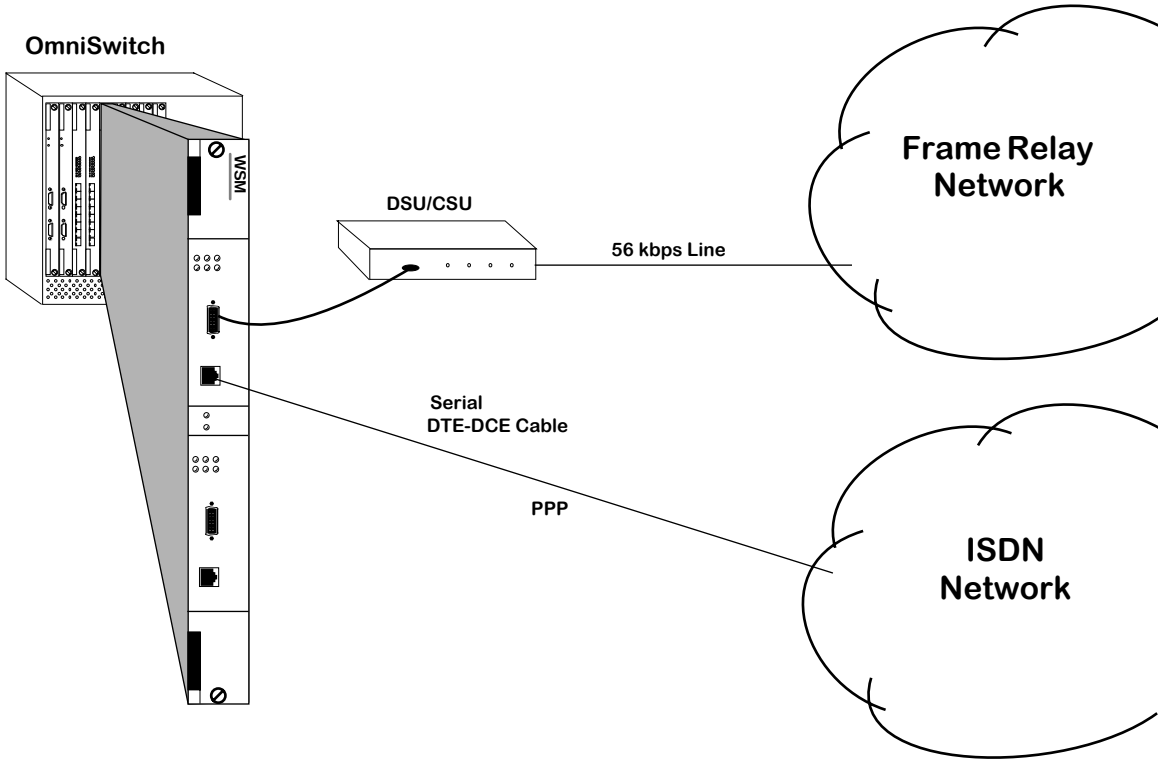


OmniSwitch WAN Modules

The OmniSwitch currently supports five Wide Area Network modules:

- WSM-S Provides two, four, or eight serial ports that support Frame Relay or PPP.
- WSM-SC Provides 4 or 8 serial ports that support the frame relay or PPP protocol. In addition, hardware compression is also supported.
- WSM-FT1/E1 Provides one or two T1/E1 ports and one or two serial ports that support Frame Relay or PPP.
- WSM-BRI Provides one USP (Universal Serial Port) and one ISDN-BRI port that support Frame Relay or PPP.
- WSM-M013 Provides two or four channelized DS3 ports.

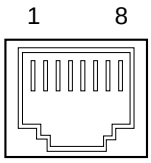
The Omni Switch/Router currently supports five Wide Area Network modules:

- WSX-S-2W Provides two serial ports that support the frame relay or PPP protocol.
- WSX-SC Provides 4 or 8 serial ports that support the frame relay or PPP protocol. In addition, hardware compression is also supported.
- WSX-FT1/E1-SC Provides one or two T1/E1 ports and one or two serial ports that support the frame relay or PPP protocol
- WSX-BRI-SC Provides one or two UPS (Universal Serial Port) and 1 or 2 ISDN-BRI ports that support Frame Relay or PPP
- WSX-M013 Provides two or four channelized DS3 ports

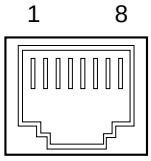
The WSX-S-2W, WSX-SC, WSX-FT1/E1-SC, and WSX-BRI-SC modules for the Omni Switch/Router are described in Chapter 3, “Omni Switch/Router Switching Modules.” The WSX-M013 module for the Omni Switch/Router and the WSM-M013 module for the OmniSwitch are described in Chapter 56, “Managing Channelized DS3.” All other WAN modules for the OmniSwitch are described in the sections that follow.

WAN Pinouts

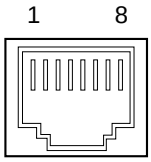
The figures and tables below and on the following pages illustrate the pinouts used on OmniSwitch WAN modules. Please note that the signal commonly knows as “remote loop-back” (LL) is not supported on the WAN serial port (see *WAN Serial Port Specifications* on page 48-9). See Appendix B, “Custom Cables,” for information on cables used to connect the serial connector to different interface types.



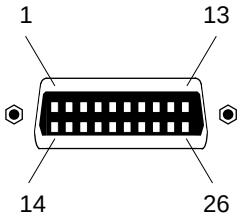
WAN BRI Port Specifications (S/T Interface)	
Pin Number	**Standard Signal Name**
1	Not Used
2	Not Used
3	Rcv + from TE
4,	Rcv - from TE
5	Xmt + from TE
6	Xmt - from TE
7	Not Used
8	Not Used



WAN BRI Port Specifications (U Interface)	
Pin Number	**Standard Signal Name**
1	Not Used
2	Not Used
3	Xmt to /Rcv from Network
4,	Xmt to /Rcv from Network
5	Not Used
6	Not Used
7	Not Used
8	Not Used



WAN T1/E1 Port Specifications	
Pin Number	**Standard Signal Name**
1	Rx_Ring
2	Rx_Tip
3	Chassis GND
4	Tx_Ring
5	Tx_Tip
6	Chassis GND
7	Chassis GND (A jumper is provided for connecting Pins 7 and 8 to the chassis ground, if required.)
8	Chassis GND (A jumper is provided for connecting Pins 7 and 8 to the chassis ground, if required.)



WAN Serial Port Numbering

WAN Serial Port Specifications							
		Alcatel SPI		EIA-530		RS-449	
Generic Signal Name	Source	Mnemonic	Pin	Mnemonic	Pin	Mnemonic	Pin
Shield	--	Shield	1	--	1	--	1
Signal Ground	--	AB	7	AB	7	SG	19
Transmitted Data	DTE	TD(A)	2	BA(A)	2	SD(A)	4
		TD(B)	14	BA(B)	14	SD(B)	22
Received Data	DCE	RD(A)	3	BB(A)	3	RD(A)	6
		RD(B)	16	BB(B)	16	RD(B)	24
Transmit Clock	DCE	TC(A)	15	DB(A)	15	ST(A)	5
		TC(B)	12	DB(B)	12	ST(B)	23
Receive Clock	DCE	TC(A)	17	DD(A)	17	RT(A)	8
		TC(B)	9	DD(B)	9	RT(B)	26
Ext. Transmit Clock	DTE	XC(A)	24	DA(A)	24	TT(A)	17
		XC(B)	11	DA(B)	11	TT(B)	35
Request To Send	DTE	RS(A)	4	CA(A)	4	RS(A)	7
		RS(B)	19	CA(B)	19	RS(B)	25
Clear To Send	DCE	CS(A)	5	CB(A)	5	CS(A)	9
		CS(B)	13	CB(B)	13	CS(B)	27
Data Set Ready	DCE	DR(A)	6	CC(A)	6	DM(A)	11
		DR(B)	22	CC(B)	22	DM(B)	29
Data Terminal Ready	DTE	TR(A)	20	CD(A)	20	TR(A)	12
		TR(B)	23	CD(B)	23	TR(B)	30
Data Carrier Detect	DCE	CD(A)	8	CF(A)	8	RR(A)	13
		CD(B)	10	CF(B)	10	RR(B)	31
Local Loopback	DTE	LL	18	LL	18	LL	10
Remote Loopback	DTE	RL	21	RL	21	RL	14
Ring Indicator	DCE	RI/TM	25	--	--	--	--
Test Mode	DCE	RI/TM	25	TM	25	TM	18
Cable Type 4	--	CTP4	18		n/c		n/c
Cable Type 3	--	CTP3	26		n/c		n/c
Cable Type 2	--	CTP2	13				
Cable Type 1	--	CTP1	22				
Cable Type 0	--	CTP0	10				

continued on next page...

WAN Serial Port Specifications (cont.)							
		X.21/X.26		V.35		RS232	
Generic Signal Name	Source	Mnemonic	Pin	Mnemonic	Pin	Mnemonic	Pin
Shield	--	--	1	--	A	--	1
Signal Ground	--	G	8	102	B	AB	7
Transmitted Data	DTE	T(A) T(B)	2 9	103(A) 103(B)	P S	BA	2
Received Data	DCE	R(A) R(B)	4 11	104(A) 104(B)	R T	BB	3
Transmit Clock	DCE	--	--	114(A) 114(B)	Y AA	DB	15
Receive Clock	DCE	S(A) S(B)	6 13	115(A) 115(B)	V X	DD	17
Ext. Transmit Clock	DTE	B(A) B(B)	7 14	113(A) 113	U W	DA	24
Request To Send	DTE	C(A) C(B)	3 10	105	C	CA	4
Clear To Send	DCE	--	--	106	D	CB	5
Data Set Ready	DCE	--	--	107	E	CC	6
Data Terminal Ready	DTE	--	--	108	H	CD	20
Data Carrier Detect	DCE	I(A) I(B)	5 12	109	F	CF	8
Local Loopback	DTE	--	--	141	L	LL	18
Remote Loopback	DTE	--	--	140	N	RL	21
Ring Indicator	DCE	--	--	125	J	CE	22
Test Mode	DCE	--	--	142	NN	TM	25
Cable Type 4	--		n/c		n/c		
Cable Type 3	--		n/c		n/c		
Cable Type 2	--						
Cable Type 1	--						
Cable Type 0	--						

WSM-S/SC

The WAN Switching Module (WSM) supports 2, 4, or 8 serial ports, each of which can provide access rates from 9.6 Kbps to 2 Mbps. The two-port version is known as the WSM-S-2. The four-port version is known as the WSM-SC-4. And the eight-port version is known as the WSM-SC-8. The WSM-SC-4 and WSM-SC-8 support STAC hardware compression and three types of clocking (internal, external, and split). However, the WSM-S-2 does *not* support hardware compression.

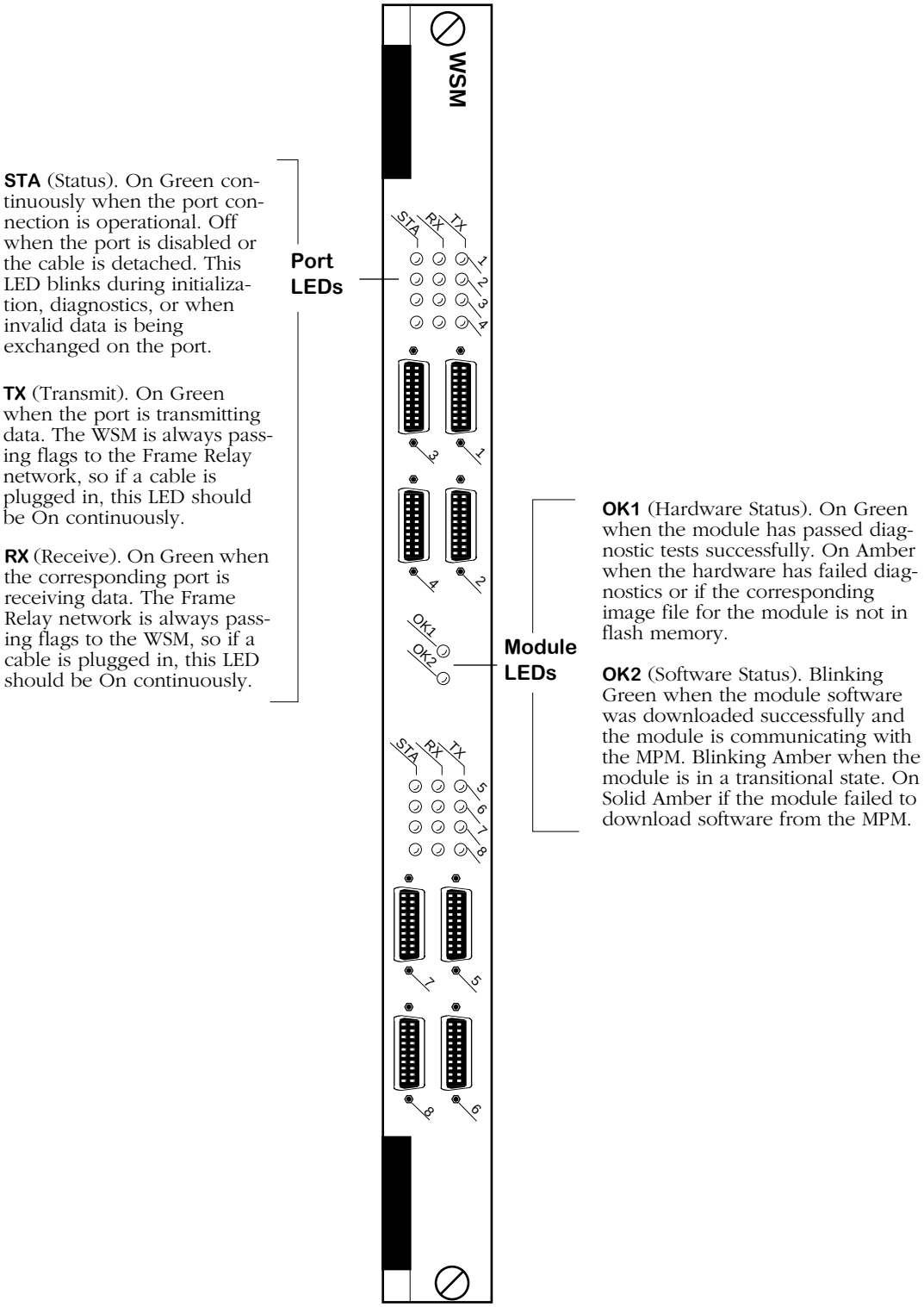
The WSM can sense and auto-configure for any of five serial cable types (RS-232, V.35, X.21, RS-530, and RS449). A WSM port is normally considered a physical DTE device. It can be turned into a physical DCE device—for speed or clocking purposes— by plugging in a DCE cable. The WSM board senses whether a DCE or DTE cable is connected.

Software in the switch allows you to configure parameters for the Frame Relay or Point-to-Point Protocol (PPP). Software commands allow you to view the status of the WAN connection at the WSM board, port, or virtual circuit level. Extensive statistics are provided at each level. Software commands for Frame Relay are described in Chapter 49, "Managing Frame Relay"; commands for PPP are described in Chapter 50, "Point to Point Protocol."

The WSM is actually a submodule, or daughtercard, that attaches to a High-Speed Module (HSM). The HSM contains memory and processing power for switching modules that operate at speeds greater than 10 Mbps. You plug your cable into the WSM submodule, but it is the HSM module that connects to the switch's backplane.

WSM Technical Specifications	
Number of ports	2, 4, or 8
Connector Type	High-density 26-pin shielded serial
Protocols Supported	Frame Relay and Point-to-Point (PPP)
Data Rates Supported	9.6, 19.2, 56, 64, 128, 256, 512, 768, 1024, 1536, 2048 Kbps
Compression (WSM-SC-2 and WSM-SC-8 only)	Hardware-based using STAC 9705
Clocking	Internal, External, or Split (i.e., "loop timing")
Virtual Circuits Supported	Permanent Virtual Circuits (PVCs)
MAC Addresses Supported	1,024; 2,048 with CAM upgrade option
Connections Supported	Physical Data Terminal Equipment (DTE) or Data Communication Equipment (DCE)
Cable Supported	DTE or DCE in the following types: R2-232, V.35, X.21, RS-530, RS-449

The module includes one row of LEDs for each port. The LEDs for a given port display in the row labeled with the port number. If the WSM module includes a total of eight ports, then the module contains two sets of four rows of LEDs. The second set of LEDs displays above the second set of ports.



WSM Frame Relay Module With Eight Ports

WSM-FT1/FE1

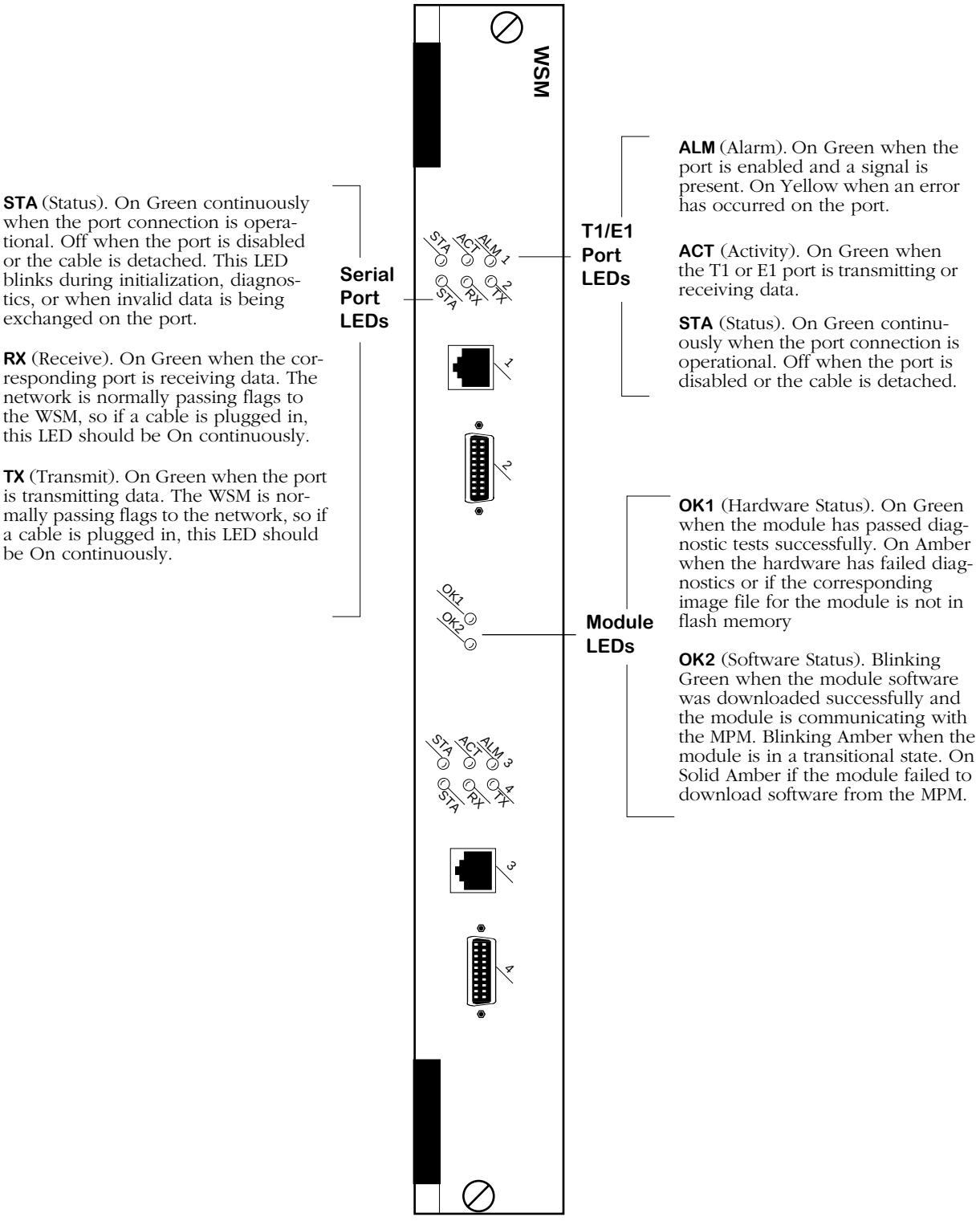
The WSM-FT1/FE1 module contains one or two T1 or E1 ports and one or two serial ports. T1 and E1 ports use RJ-48C connectors. The T1 version of this module is referred to as the WSM-FT1-SC; the E1 version is referred to as the WSM-FE1-SC. You can configure these ports to run either Frame Relay or the Point-to-Point Protocol (PPP).

This module includes an integrated CSU/DSU to enable direct connection to a T1/E1 device, such as a PBX.

You can configure physical port parameters through software commands. Configuration options include frame format, facility datalink, and line coding. In addition, the switch can store up to 24 hours of local and remote statistics. See Chapter 53, "Managing T1 and E1 Ports," for more information on software-configurable parameters.

WSM-FT1/E1 Technical Specifications	
Number of ports	4 total 1 or 2 T1 or E1 ports 1 or 2 Universal Serial ports
Connector Types	T1/E1: RJ-45C Serial: High-density, 26-pin shielded
Standards Supported	RFCs 1406, 1213, 1659
Frame Formats	T1: Superframe, Extended Superframe, Unframed E1: E1, E1-CRC, E1-MF, E1-CRC-MF, Unframed
Line Coding	T1: B8ZS or AMI E1: HDB3 or AMI
Data Rates Supported	T1: 1.544 Mbps E1: 2.048 Mbps Serial: 56, 64, 128, 256, 384, 512, 768, 1024, 1536, 1544, 2048 Kbps
Facility Datalink Protocol	ANSI T1.403 and AT&T 54016
MAC Addresses Supported	1,024; 2,048 with CAM upgrade option
Connections Supported	Physical Data Terminal Equipment (DTE) or Data Communication Equipment (DCE)
Cable Supported	Serial Ports DTE or DCE of the following types: R2-232, V.35, X.21, RS-530, RS-449

This module includes one set of LEDs for each port. The LEDs for a given port display above the port. If the WSM module includes four ports, then the module contains two sets of LEDs. The second set of LEDs displays above the third and fourth ports.



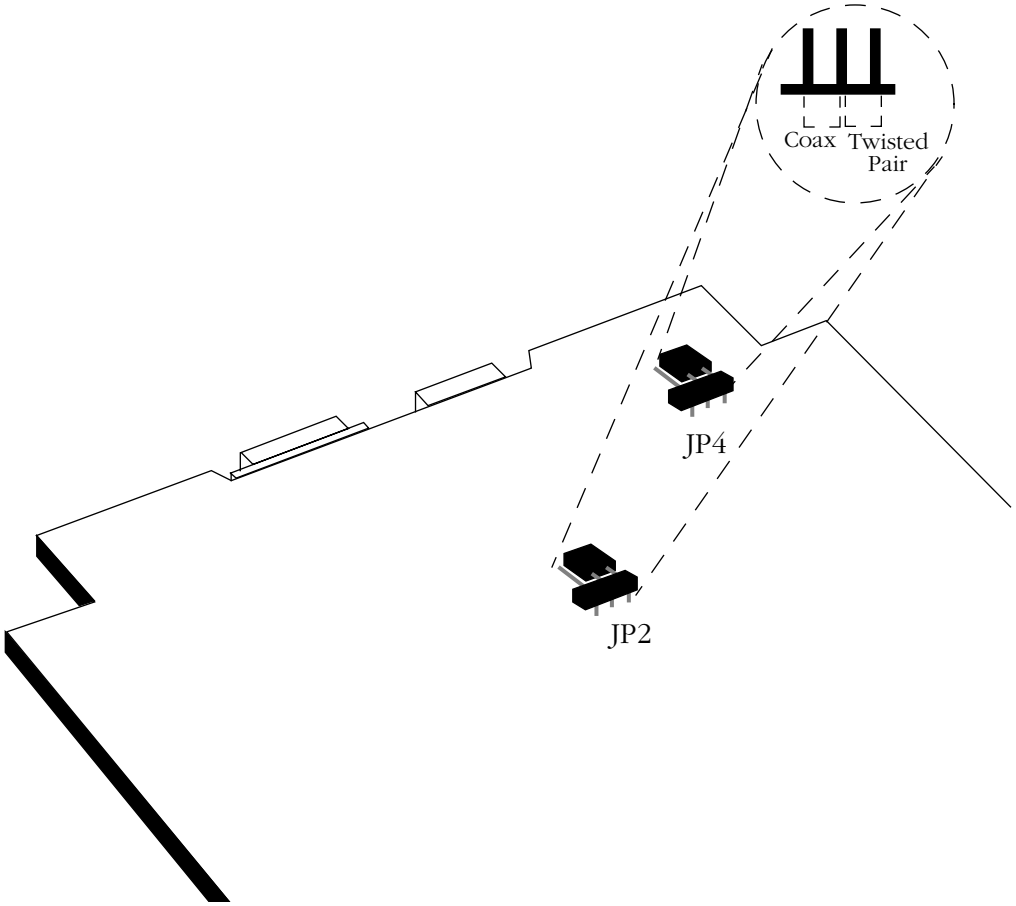
Fractional T1/E1 Module

Cabling/Jumper Settings

The E1 version of this module supports both twisted pair (120 ohm) and coaxial (75 ohm) cable types. Because of this you must set a pair of jumpers (JP2 and JP4) on the back of the board to correspond to the type of cable you are using. For more detailed information on the types of cables to use with this module, see Appendix B, "Custom Cables." The illustration below shows the correct jumper positions.

Note:

JP3 is reserved. Do not set a jumper across JP3.



Cable Termination Jumpers for WSM-FE1-SC

WSM-BRI

The ISDN Basic Rate Interface WAN Switching Module (WSM-BRI) supports 1 serial port and 1 BRI port. A WSM-BRI is actually a submodule, or daughtercard, that attaches to a High-Speed Switching Module (HSM-2). A maximum of two WSM-BRI modules can be installed into one HSM-2 module, providing a total of 2 serial ports and 2 BRI ports in one switch slot.

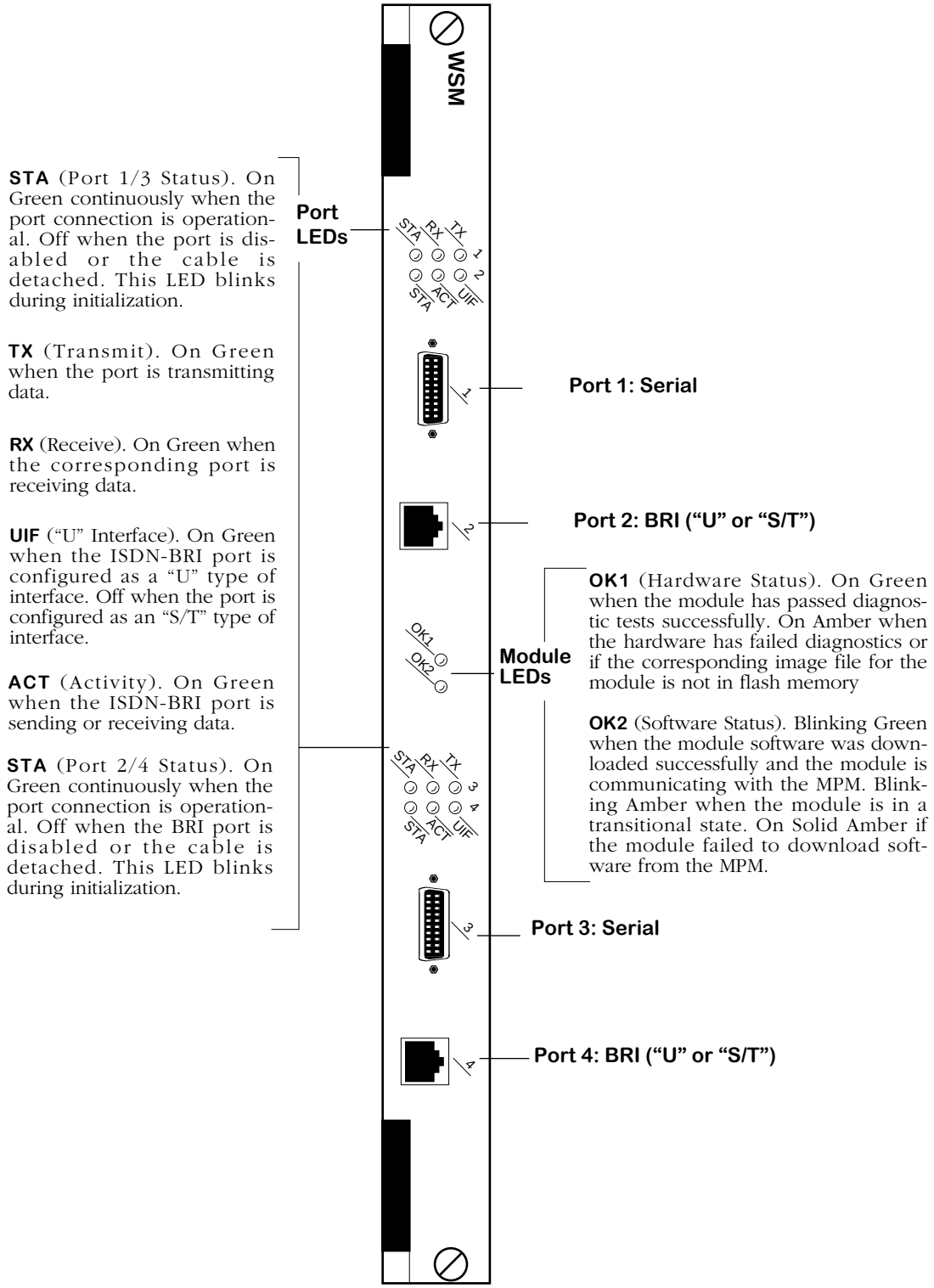
The serial port on a WSM-BRI module is essentially the same as the serial ports found on the WSM-S module. A WSM-BRI serial port can detect, and configure itself, for any of five serial cable types (RS-232, V.35, X.21, RS-530, and RS449). A WSM-BRI serial port is normally considered a physical DTE device, but it can be turned into a physical DCE device—for speed or clocking purposes—by simply plugging in a DCE cable. The board internally senses whether a DCE or DTE cable is connected and configures itself appropriately.

The BRI port on the WSM-BRI board can be configured as either a "U" or an "S/T" type of interface (the board is shipped set to "U"). Either type of interface supports two "B" channels operating at 56/64 Kbps and one "D" channel operating at 16 Kbps.

Software running in the switch allows you to configure the operation of the Point-to-Point Protocol (PPP) over the serial port or the BRI port. The serial port can also support the Frame Relay protocol. The software commands used to configure PPP are described in Chapter 50, "Point-to-Point Protocol." The software commands used to configure Frame Relay are described in Chapter 49, "Managing Frame Relay." The software commands used to configure the WAN "links" that support PPP connections are described in Chapter 51, "WAN Links." Finally, the software commands used to manage the ISDN ports are described in Chapter 52, "Managing ISDN Ports."

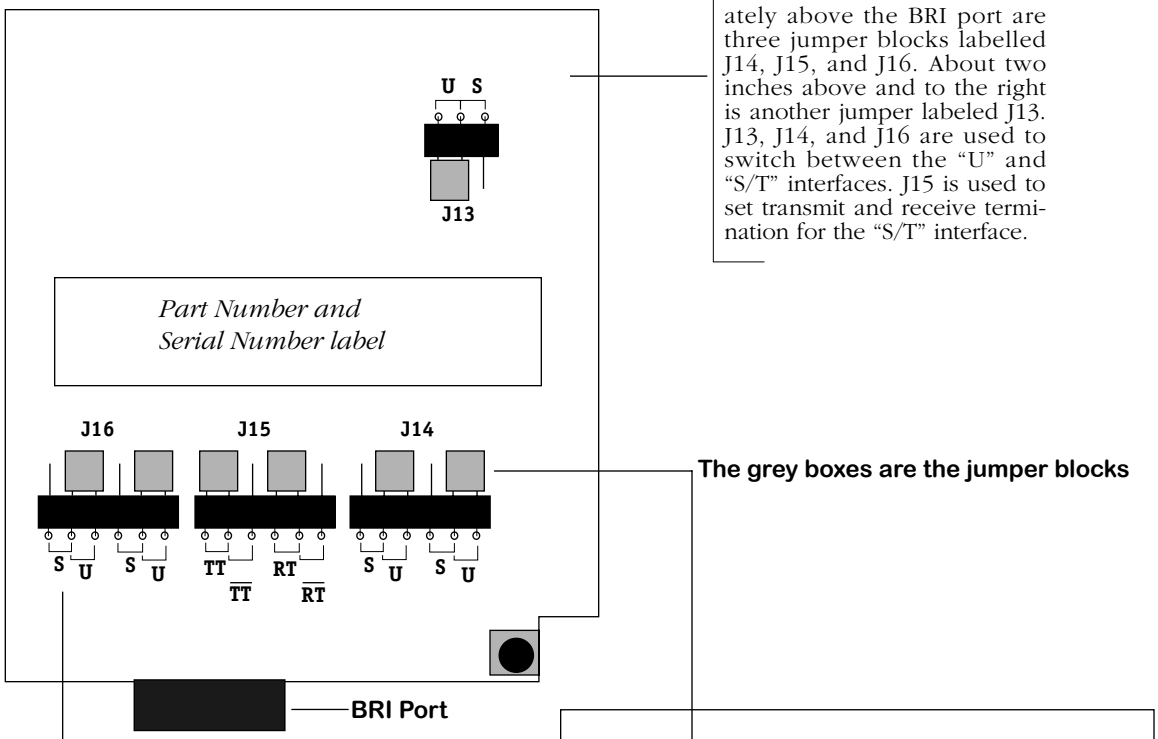
WSM-BRI Technical Specifications	
Number of ports	1 serial, 1 Basic Rate Interface (BRI)
Serial Connector Type	High-density 26-pin shielded serial
BRI Connector Type	RJ-45
Protocols Supported	Point-to-Point Protocol (PPP); Frame Relay (supported on the serial port only)
Data Rates Supported	2 "B" Channels at 56/64 Kbps 1 "D" Channel at 16 Kbps
Compression	Hardware-based using STAC 9705
MAC Addresses Supported	1,024; 2,048 with CAM upgrade option
Serial Port Connections Supported	Physical Data Terminal Equipment (DTE) or Data Communication Equipment (DCE)
Serial Cables Supported	DTE or DCE in the following types: R2-232, V.35, X.21, RS-530, RS-449
BRI Port Connections Supported	"U" interface or "S/T" interface (jumper-selectable; "U" is shipping default)
Switch Types Supported	National ISDN-1, AT&T 5ESS, Northern Telecom DMS100, ETSI Euro-ISDN Net3
ISDN Standards Supported	Q.921, Q.931, I.430, T1.601

The WSM-BRI module includes one set of LEDs for each port. The LEDs for a given port display in the set labeled with the port number. If the HSM module contains two WSM-BRI daughter cards, the second set of ports (one Serial and one BRI) are numbered as Ports 3 and 4 respectively, and include their own separate set of LEDs that function exactly like those related to Ports 1 and 2.



Two WSM-BRI Modules Installed in One HSM

Jumper Configuration for the "U" Interface (this is how the board is shipped)

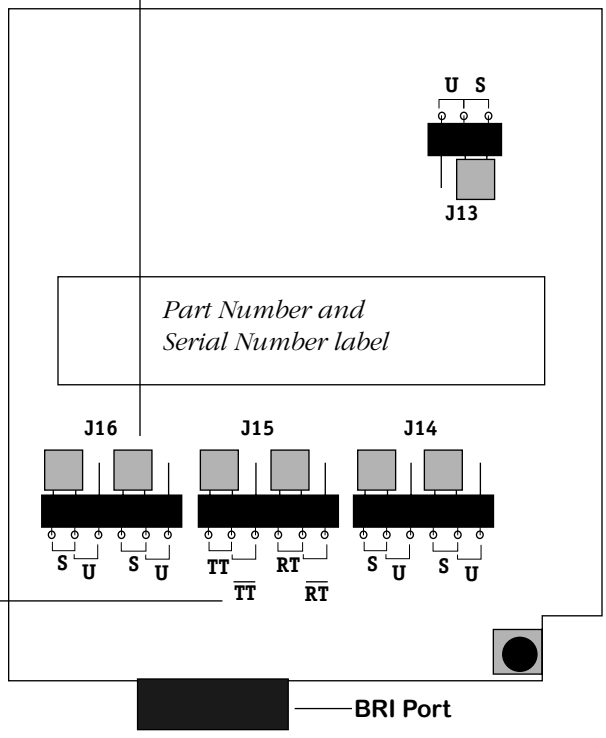


This is a simplified view of the bottom lower-right quadrant of the WSM-BRI board. Immediately above the BRI port are three jumper blocks labelled J14, J15, and J16. About two inches above and to the right is another jumper labeled J13. J13, J14, and J16 are used to switch between the "U" and "S/T" interfaces. J15 is used to set transmit and receive termination for the "S/T" interface.

The grey boxes are the jumper blocks

The small labels next to the jumper pins at J13, J14, and J16 indicate which pins must be bridged to set the BRI port to either the "U" or the "S/T" interface.

Small labels under the pins at J15 indicate which pins must be bridged to set Transmit Termination (tt) and Receive Termination (rt) to the "on" or "off" position (the two sets of letters with a line over them indicate the "off" settings).



Jumper Configuration for the "S/T" Interface (transmit/receive termination are set to "on")

Cable Interfaces for Universal Serial Ports

The WSM/WSX automatically senses the cable type that you plug into one of its Universal Serial Ports. It can sense whether the cable type is DCE or DTE and whether it is one of the following interfaces:

- RS-232
- RS-449
- RS-530
- V.35
- X.21 (European)

All cable types (except RS-232) are capable of access rates from 9.6 kbps to 2 Mbps. The RS-232 cable is not compatible with speeds greater than 64 kbps. Each cable type is illustrated and described in Appendix B, "Custom Cables."

The WSM/WSX port is normally considered a physical DTE device. It is possible to turn it into a physical DCE device simply by plugging in a DCE cable. The WSM/WSX board internally senses whether a DCE or DTE cable is connected.

DTE/DCE Type and Transmit/Receive Pins

The RS-232 protocol, which is employed at the physical level for all cable types, always defines Transmit and Receive pins in relation to the DTE. So, the type of cable you attach (DCE or DTE) determines the direction of data flow on your connector's Transmit and Receive pins.

If the WSM/WSX port is a physical DTE, which is probably the most common configuration, then data is received on Receive pins and transmitted on Transmit pins. If you are using a WSM/WSX port as a physical DCE, then data is transmitted on the receive pins and received on the transmit pins.

Data Compression

Data compression allows you to get more data through the Frame Relay pipeline, further enhancing cost benefits. A typical data compression ratio on the WSM/WSX board at the hardware level is 4:1. In addition, the compression processor (STAC 9705) has its own memory (DRAM) that can store up to 100 compression histories (on a 4-port WSM/WSX) without degrading performance. An 8-port WSM/WSX can store up to 200 compression histories without performance degradation.

The WSM/WSX will only compress data if you enable compression through software and the bridge/router on the other end of the connection supports standard Frame Relay (FRF.9) or PPP (STAC-LZS) compression. (An OmniSwitch-to-OmniSwitch connection would support compression.) Negotiation is necessary because if compressed data is sent to a bridge/router that does not support compression, this bridge/router will not recognize the data and will automatically drop the unrecognizable frames.

If you enable compression, the WSM/WSX will query the Frame Relay or PPP device on the other end of the circuit to determine whether it supports compression. If it does, the WSM/WSX will compress all data except frame DLCMI (management) data and PPP control messages. If it does not support compression, data on that connection will be sent uncompressed. Refer to either Chapter 49, “Managing Frame Relay,” or Chapter 50, “Point-To-Point Protocol,” for information on enabling compression.

Note

Compression is not supported on the OmniSwitch WSM-S-2 and the Omni Switch/Router WSX-S-2W modules.

Loopback Detection

Loopback Detection is a common method for Carrier Service Providers to test clients’ circuits in the event of suspected line transmission problems. For both Frame Relay and PPP, loopback detection involves periodically transmitting a message and looking for that message to be received. When implementing Loopback Detection, it is important to keep two issues in mind: the message must not violate any standards; the message must be unique in such a way that it can be differentiated from a message sent by a remote node.

The messages are transmitted in one of two fixed intervals. When the port is in normal mode, the message is transmitted once every second. When two consecutive messages are received that match the transmitted message, the port is considered to be in loopback. Once in loopback mode, the message is transmitted once every 100 milliseconds. After ten consecutive messages are transmitted without receiving a match, the port is returned to normal mode. Consequently, it takes up to 2 seconds to detect the loopback condition and an additional second to exit it.

The message sent on a Frame Relay port uses standard 1490 encapsulation with a SNAP header. The OUI (Organizationally Unique Identifier) of the SNAP header is the Alcatel OUI, so encapsulation is standard, but the message is proprietary. The message is transmitted using the lowest available DLCI, or 32 if there are no DLCI's operating on the port. Because the message is merely attempting to determine the state of the physical port, the state of the DLCI, whether active, inactive or non-existent, is not important; the Frame Relay switch will discard any data for non-existent or inactive DLCIs.

The message sent on a PPP port uses the standard LCP Echo message.

Uniqueness of messages is accomplished by including a word in the message that is based upon the configuration of the port and a free-running timer. For PPP, uniqueness is enhanced by negotiating the LCP magic number option.

The WAN Port Software Menu

User interface commands for the WSM board are on a separate menu that is accessed through the **wan** command. The WAN Port menu is a submenu of the Interface menu. Typing **wan** at any system prompt displays the following menu:

```
Command     Wide Area Networking Menu
----------  -------------------------------------------------
wpmodify    Modify a given WAN port's parameters
wpdelete    Delete a given port's parameters, and restore defaults
wpview      View WAN port parameters for a given slot and port
wpstatus    View WAN port status of entire chassis, slot, or individual port
fr          Enter the Frame Relay submenu
ppp         Enter the PPP submenu
isdn        Enter the ISDN-specific submenu
link        Enter the link-specific submenu

Main        File        Summary     VLAN        Networking
Interface   Security    System      Services    Help
```

Note

The ISDN menu will only appear on systems with a least one WSM-BRI module installed.

You can start most of the commands by typing the first three (3) letters of the command name. For example, to use the **wpview** command, type **wpv**.

The following sections describe the use of commands on the WAN Port menu.

Setting Configuration Parameters

When you plug in a WSM board, it is automatically configured to the default settings. By default, the WSM uses Frame Relay protocol. In addition, the access rate for serial ports defaults to 64 kbps for RS-232 cables. The access rate for other cable types defaults to 2 Mbps. You can change these settings, as well as several other settings, such as clocking and protocol type, with the **wpmodify** command.

Modifying a Port

Use the **wpmodify** command to modify a port, as shown below:

```
wpmodify <slot>/<port>
```

in which **<slot>** is the slot number where the WSM board is located, and **<port>** is the port number on the WSM board that you want to modify. When this command is entered, the system automatically senses what type of port is being configured, and displays the appropriate screen for that type of port.

Make changes by entering the line number for the option you want to change, an equal sign (=), and the value for the new parameter. When you have finished entering the new values, type **save** at the prompt to save the new parameters. The following sections describe the options you can alter through this menu. The following three examples show a typical setup screen for a serial port, an ISDN-BRI port, and a fractional T1 port, respectively.

Serial Port Example

In this example, port 1 on slot 5 is a serial port. To modify serial port 5/1, enter:

```
wpm 5/1
```

A screen similar to following displays:

```
1)  Admin Status ..................................... UP
    {(U)p, (D)own}
2)  Speed in BPS ..................................... 2048000
    {9600, 19200, 56000, 64000, 128000, 256000, 512000, 768000}
    {1024000, 1544000, 2048000}
3)  Clocking ......................................... Split
    {(I)nternal, (E)xternal, (S)plit}
4)  Protocol Type .................................... Point to Point
    {(F)rame Relay, (P)PP(Point to Point)
(save/quit/cancel)
:
```

Admin Status

The options for the Admin Status are **UP** and **DN**. If **UP**, the port has been enabled and can transmit data as long as its Operational Status is also **UP**. If set to **DN**, the port will not pass data even, if its physical connection is good.

Speed in BPS

This option specifies the access rate for the Frame Relay or PPP line to the service provider. This parameter is the speed of the entire connection, not an individual virtual circuit. For example, if you have a 56 kbps line to your service provider, this field should be set to 56000. A full T1 line would have an access rate of 1,536,000 bps, and a full E1 line would have an access rate of up to 1984 kbps. For either T1 or E1, you can also have a fractional service with an access rate that is a multiple of 64 kbps.

Enter a value that is the same as one of the values displayed below this field.

Note

If the WSM port you are configuring is a physical DCE port (i.e., DCE cable plugged into the WSM port) that can control the access rate and clocking, always enter a value for this field. This value will be used in computing congestion control parameters, such as the Committed Information Rate (CIR). If the port is a DTE, this setting will have no effect, except for informational purposes.

Clocking

This field sets the type of clocking used to clock transmit and receive data on the serial port. If the clock goes out-of-phase, you will receive errors. If you set this value to External, clocking will be controlled by the external DCE (a DSU or other DCE device on the other end of the cable from the WSM port). External clocking is the default option when the WSM is a physical DTE device (i.e., controlled by an external DCE device).

Note

The clocking value is only relevant if the WSM port is a physical DCE port (i.e., DCE cable plugged into the WSM port). If the WSM port is a physical DTE port, clocking will default to External.

Also, if the WSM is acting as a DTE and the speed is greater than 256 kbps, it is recommended that the external DCE be set to take a transmit data clock from the external DTE transmit clock (TXCE).

If you set this value to Internal, clocking is controlled by the internal DCE (the WSM). Internal clocking should only be selected if the WSM is a physical DCE device and you are using an RS-232 cable. Internal clocking is the default setting when the WSM is a physical DCE device and an RS-232 DCE cable is connected to this port.

Split clocking, which is also known as "loop timing," uses an additional control signal (TXCE) to keep the WSM and external DTE clocking synchronized. In split clocking, the external DTE takes the incoming transmit clock from the WSM and loops it back to TXCE. The WSM then uses this signal to clock in data from the external DTE device. Split clocking should only be used if the WSM is a physical DCE device and you are using a non-RS-232 cable, such as V.35.

♦ Important Note ♦

Split clocking is required if the access rate of the WSM port is greater than 256 kbps and it is acting as a DCE device. If split clocking is not used at these data rates, data out-of-phase errors, aborts, or CRC errors may occur.

Split clocking is the default when the WSM port is a physical DCE device and a non-RS-232 DCE cable is connected to the port.

♦ Important Note ♦

Do not **wpmodify** command to set clocking for T1 and E1 connections. To set clocking for T1 and E1 ports, use the **temod** command as described in Chapter 53, "Managing T1 and E1 Ports."

Protocol Type

The protocol type can be set to either Frame Relay or Point to Point Protocol (PPP). The default setting is Frame Relay.

♦ Important Note ♦

All ports must be configured (set to either Frame Relay or PPP) before you set any other protocol-related parameters.

ISDN-BRI Port Example

In this example: port 2 on slot 4 is an ISDN-BRI port. To modify ISDN-BRI port 5/1, enter:

```
/Interface/WAN % wpm 4/2
```

A screen similar to following displays:

```
1)  Admin Status ..........................................UP
    {(U)p, (D)own}
    (save/quit/cancel)
 :
```

Note that the only parameter you can set for an ISDN port from this screen is the Admin Status. All other parameters must be set from the ISDN, PPP, peer or WAN link menus. For more details on ISDN ports, see Chapter 52, “Managing ISDN Ports.” For more details on managing PPP ports, see Chapter 50 “Point-to-Point Protocol.” For more information on managing WAN links, see Chapter 51 “WAN Links.”

Admin Status

The options for the Admin Status are **UP** and **DN**. If **UP**, the port has been enabled and can transmit data as long as its Operational Status is also **UP**. If set to **DN**, the port will not pass data even if its physical connection is good.

Fractional T1 Port Example

In this example: port 1 on slot 8 is a fractional T1 port. To modify fractional T1 port 8/1, enter:

```
/Interface/WAN % wpm 8/1
```

A screen similar to following displays:

```
1)  Admin Status.....Enabled
    (E)nable, (D)isable}
    Speed in BPS.....1544000
    Clocking.....Local
2)  Protocol Type.....Frame Relay
    {(F)rame Relay, (P)PP(Point to Point)
3)  T1 Starting Time Slot .....1
    { T1 (1..24)
4)  T1 Number of Time Slots .....24
    { T1 (1..24)
(save/quit/cancel)
  :
```

Admin Status

The options for the Admin Status are **Enable** and **Disable**. If **Enable**, the port has been enabled and can transmit data as long as its Operational Status is also enabled. If set to **Disable**, the port will not pass data, even if its physical connection is good.

Speed in BPS

This field shows the speed for the T1/E1 port. This field is for reference only.

Clocking

This field shows the type of clocking set for the T1 port. This field is for reference only.

Protocol Type

The protocol type can be set to either Frame Relay or Point to Point Protocol (PPP).

♦ Important Note ♦

All ports must be configured (set to either Frame Relay or PPP) before you set any other protocol-related parameters.

T1/E1 Starting Time Slot

This field specifies the first time slot number to use on a T1 or E1 port. For a full T1 or E1 connection, specify time slot 1. For a fractional T1 or E1 connection, set this field to the starting time slot number as specified by your service provider.

T1/E1 Number of Time Slots

This field specifies the total number of 64 kbps time slots to use on the T1 or E1 connection. For a full T1, set this number to 24. For a full E1 connection, set this number to 30 if you are running multiframe; otherwise, set to 31. For fractional T1 or E1, you must set the number of time slots to the value specified by your service provider. For example, a 256 kbps service uses four time slots (4 x 64 = 256).

Viewing Configuration Parameters for the WSM

You can view all current parameters for a WSM port or an individual virtual circuit using the **wpview** command. These parameters will be either the default parameters or parameters you modified using the **wpmodify** command or network management software.

You have a choice of viewing parameters at the chassis, slot or port level. You receive different configuration choices depending upon which level you choose. The sections below describe both ways to use the **wpview** command.

Viewing Parameters for all WSMs in the Chassis

To view port parameters for all WSM boards in a chassis, enter the following command

wpview

or

wpv

A screen similar to following displays. (In this example, the port parameters being displayed are for a system that contains a 2-port WSM-BRI module in slot 4, an 8-port WSM module in slot 5, and a 2-port WSM in slot 8.):

Slot/Port	Port Type	Intf. Type	Admin/ Oper/ State	Protocol	Speed BPS	Clocking
4/1	Serial	*NONE*	UP/DN	FR	0	External
4/2	ISDN	ISDN-ST	UP/UP	PPP	N/A	External
5/1	Serial	V35DCE	UP/UP	PPP	2048000	Split
5/2	Serial	V35DCE	UP/UP	FR	2048000	External
5/3	Serial	X21DCE	UP/UP	FR	2048000	External
5/4	Serial	V35DCE	UP/UP	FR	2048000	External
5/5	Serial	*NONE*	UP/DN	FR	0	External
5/6	Serial	*NONE*	UP/DN	FR	0	External
5/7	Serial	*NONE*	UP/DN	FR	0	External
5/8	Serial	*NONE*	UP/DN	FR	0	External
8/1	T1	T1	UP/UP	FR	1544000	Loop
8/2	Serial	530DCE	UP/DN	FR	2048000	External

This screen lists the current values for the listed parameters.

For **Port Type**, **Intf. Type** and **Oper/State**, these parameters are the same as those set through the **wpmodify** command. For detailed information on these values, see *Modifying a Port* on page 48-22. For **Protocol**, **Speed BPS** and **Clocking**, these parameters are the same as those set through the **wpstatus** command. See *Obtaining Status and Statistical Information* on page 48-32.

Viewing Parameters for all Ports in a Single WSM

To view port parameters for all ports on a particular WSM, enter the **wpview** command, followed by the number of the slot. In the following three examples, the port parameters being displayed are for a system that contains a 2-port WSM ISDN-BRI board in slot 4, an 8-port WSM serial board in slot 5, and a 2-port WSM T1 board in slot 8.

ISDN-BRI Board Example

To display the parameters for all ports on the ISDN-BRI WSM board in slot 4, enter:

```
wpview 4
```

or

```
wpv 4
```

A screen similar to following displays:

Port	PortType	Intf. Type	Admin/ Oper/ State	Protocol	Speed BPS	Clocking
1	Serial	*NONE*	UP/DN	FR	0	External
2	ISDN	ISDN-ST	UP/UP	PPP	N/A	N/A

Serial Board Example

To display the parameters for all ports on the 8-slot serial WSM board in slot 5, enter:

```
wpview 5
```

or

```
wpv 5
```

A screen similar to following displays:

```
                                  Admin/
                                  Oper/                    Speed
Port   PortType  Intf. Type       State     Protocol       BPS          Clocking
====   ======    ========        ======    ========       =======      ========
1      Serial    V35DCE          UP/UP     PPP            2048000      Split
2      Serial    V35DCE          UP/UP     FR             2048000      External
3      Serial    X21DCE          UP/UP     FR             2048000      External
4      Serial    V35DCE          UP/UP     FR             2048000      External
5      Serial    *NONE*          UP/DN     FR             0            External
6      Serial    *NONE*          UP/DN     FR             0            External
7      Serial    *NONE*          UP/DN     FR             0            External
8      Serial    *NONE*          UP/DN     FR             0            External
/Interface/WAN %
```

T1 Board Example

To display the parameters for all ports on the 2-port WSM T1 board in slot 8, enter:

```
wpview 8
```

or

```
wpv 8
```

A screen similar to following displays:

```
                                        Admin/
                                        Oper/                    Speed
Slot/Port  PortType  Intf. Type         State     Protocol       BPS          Clocking
=========  =======   ==========         ======    ========       =======      =======
 8/1       T1        T1                 UP/UP     FR             1544000      Loop
 8/2       Serial    530DCE1            UP/DN     FR             2048000      External
/Interface/WAN %
```

Note: E1 boards provide a similar display, except the port type and interface type display as "E1."

Viewing Port Parameters

To view port parameters, enter the following command:

```
wpview slot/port
```

where **slot** is the slot number where the WSM board is located, and **port** is the port number on the WSM board on which you want to view information. The following three examples show the configuration setup screens for a fractional T1 port, a universal serial port, and an ISDN-BRI port.

Fractional T1 Port Example

The following example displays the configuration view screen for a fractional T1 port (port 1) on a board in slot 8. To view 8/1, enter:

```
wpview 8/1
```

or

```
wpv 8/1
```

A screen similar to following displays:

```
Configuration View for Slot 8, Port 1.
1)  Admin Status.....UP
2)  Protocol Type.....Frame Relay
3)  T1/E1 Starting Time Slot.....1
4)  T1/E1 Number of Time Slots .....24
/Interface/Wan %
```

Admin Status

The options for the Admin Status are **UP** and **DN**. If **UP**, the port has been enabled and can transmit data as long as its Operational Status is also **UP**. If set to is **DN**, the port will not pass data even if its physical connection is good.

Protocol Type

The protocol type can be set to either Frame Relay or Point to Point Protocol (PPP). The default setting is Frame Relay.

T1/E1 Starting Time Slot

This field specifies the first time slot number to use on a T1 or E1 port. For a full T1 or E1 connection, specify time slot 1. For a fractional T1 or E1 connection, set this field to the starting time slot number as specified by your service provider.

T1/E1 Number of Time Slots

This field specifies the total number of 64 kbps time slots to use on the T1 or E1 connection. For a full T1, set this number to 24. For a full E1 connection, set this number to 30 if you are running multiframe, or 31 if you are not. For fractional T1 or E1, you must set the number of time slots to the value specified by your service provider. For example, a 256 kpbs service uses four time slots (4 x 64 = 256).

Universal Serial Port Example

The following example displays the configuration view screen for a universal serial port (port 2) on a board in slot 8. To view 8/2, enter:

```
wpview 8/2
```

or

```
wpv 8/2
```

A screen similar to following displays:

```
Configuration View for Slot 8, Port 2.
1)  Admin Status.....UP
2)  Speed in BPS .....2048000
3)  Clocking.....Split
4)  Protocol Type.....Frame Relay
/Interface/Wan %
```

Admin Status

The options for the Admin Status are **UP** and **DN**. If **UP**, the port has been enabled and can transmit data as long as its Operational Status is also **UP**. If set to **DN**, the port will not pass data even if its physical connection is good.

Speed in BPS

This field displays the access rate for the Frame Relay line to the service provider. This parameter is the speed of the entire connection, not an individual virtual circuit. For example, if you have a 56 kbps line to your service provider, this field should be set to 56000. A full T1 line would have an access rate of 1,536,000 bps, and a full E1 line would have an access rate of up to 1984 kbps. For either T1 or E1, you can also have a fractional service with an access rate that is a multiple of 64 kbps.

Clocking

This field displays either **External**, **Internal**, or **Split**. For a more detailed discussion of clocking, see *Clocking* under *Modifying a Port* on page 48-22.

Protocol Type

The protocol type can be set to either Frame Relay or Point to Point Protocol (PPP). The default setting is Frame Relay.

ISDN-BRI Port Example

The following example displays the configuration view screen for an ISDN-BRI port (port 2) on a board in slot 4. To view 4/2, enter:

```
wpview 4/2
```

or

```
wpv 4/2
```

A screen similar to following displays:

```
Configuration View for Slot 4, Port 2.
1)  Admin Status..... UP
/Interface/Wan %
```

Admin Status

The options for the Admin Status are **UP** and **DN**. If **UP**, the port has been enabled and can transmit data as long as its Operational Status is also **UP**. If set to **DN**, the port will not pass data even if its physical connection is good.

Deleting Ports

The **wpdelete** command allows you to delete configuration information for a WSM port. When you delete a this information, all WAN configuration parameters for the selected port revert back to default settings.

To delete a port configuration, enter the following command:

wpdelete slot/port

in which **slot** is the slot number for the WSM board and **port** is the port number on the WSM board that you want to delete. For example, to delete port 1 on the WSM board in slot 2, enter:

wpdelete 2/1

or

wpd 2/1

This system returns the following prompt to confirm the deletion:

This will delete Slot 2, Port 1. Continue? {(Y)es, (N)o} (N)

Enter a **Y** to confirm the deletion or press **Enter** to cancel the deletion.

Note

The **wpdelete** command requires that you indicate a slot and port number. For example,

wpdelete

would be an incorrect usage, whereas,

wpdelete 4/2

would be correct.

Obtaining Status and Statistical Information

You can obtain general and detailed WAN port statistical information on all WSM boards in the switch, a single WSM board, individual ports, and Frame Relay and PPP protocols. The **wpstatus** command is used to provide this information. This information includes types of physical interface, access rate of the Frame Relay line, and errors. In addition, the **wpstatus** command can display the number of frames received and transmitted.

Obtaining Information on All Boards in a Switch

To obtain status information on all WSM boards in a switch, you enter the **wpstatus** command without any parameters as follows:

wpstatus

or

wps

This command displays a screen similar to the following (In this example, the port parameters being displayed are for a system that contains a 2-port WSM-BRI module in slot 4, an 8-port WSM module in slot 5, and a 2-port WSM in slot 8.):

Slot/Port	PortType	Intf. Type	Admin/ Oper/ State	Protocol	BPS	Speed Clocking	Utilization 10s	1m	5m
4/1	Serial	*NONE*	UP/DN	FR	EXT CLK	External	10%	10%	10%
4/2	ISDN	ISDN-ST	UP/DN	PPP	N/A	External	40%	30%	60%
5/1	Serial	V35DCE	UP/UP	PPP	2048000	Split	30%	60%	50%
5/2	Serial	V35DCE	UP/UP	FR	2048000	Split	100%	50%	70%
5/3	Serial	X21DCE	UP/DN	FR	2048000	Split	90%	80%	60%
5/4	Serial	V35DCE	UP/UP	FR	2048000	Split	20%	50%	50%
5/5	Serial	*NONE*	UP/DN	FR	EXT CLK	External	30%	30%	50%
5/6	Serial	*NONE*	UP/DN	FR	EXT CLK	External	100%	50%	80%
5/7	Serial	*NONE*	UP/DN	FR	EXT CLK	External	70%	50%	50%
5/8	Serial	*NONE*	UP/DN	FR	EXT CLK	External	100%	80%	30%
8/1	T1	T1	UP/UP	FR	1544000	External	80%	50%	70%
8/2	Serial	530DCE	UP/UP	FR	2048000	Split	10%	50%	40%

Each row in the table corresponds to a physical port on a WSM board in the switch. The following sections describe the columns shown in this table:

Field Descriptions

The following section explains the fields and their corresponding values.

Slot/Port

The first number in this column is the slot in the switch where this WSM is installed. The second number is the port number on the WSM.

Port Type

This column shows

- **Serial**
- **ISDN**
- **T1**
- **E1**

Intf Type

This column indicates the physical cable type connected to this port. This cable type is automatically sensed by the WSM/WSX hardware. This column indicates the cable type and whether it is DCE or DTE. The following values may appear in this column:

- **V35DTE** (V.35 DTE cable)
- **V35DCE** (V.35 DCE cable)
- **232DTE** (RS-232 DTE cable)
- **232DCE** (RS-232 DCE cable)
- **X21DTE** (X.21 DTE cable)
- **X21DCE** (X.21 DCE cable)
- **530DTE** (RS-530 or RS-449 EIA DTE cable)
- **530DCE** (RS-530 or RS-449 EIA DCE cable)
- **T1**
- **E1**
- ISDN-ST
- ISDN-U

The WSM sees RS-530 and RS-449 cables the same because they are electrically identical. However, this does not affect the operation of either cable type. Both RS-530 and RS-449 cables are supported.

If no cable is connected to a universal serial port, then this column will display:

NONE

If an error has been detected on the port (e.g., cable type could not be detected), the following value displays:

ERROR!

Admin/Oper State

This column shows the Administrative and Operational State of this WSM port. The value before the slash refers to the Admin Status. If **UP**, the port has been enabled and can transmit data as long as its Operational State is also **UP**. If the Admin Status is **DN**, the port will not pass data even if its physical connection is good.

The value after the slash refers to the Operational State. If **UP**, the port is capable of passing data as long as it has been logically enabled at the Administrative level. If **DN**, the port cannot pass data due to a problem in the physical connection (e.g., cable disconnected, WSM could not detect cable type) or because the port is administratively down. If the Operational State displays **LB**, the port is currently in Loopback (test) mode.

Protocol

The protocol type can be set to either Frame Relay or Point to Point Protocol (PPP).

BPS

This column indicates the speed, or access rate, between the WSM serial port and DSU or other physical DTE device. The speed is expressed in bits per second (bps). This speed is the total bandwidth available on the line connected to this port. Virtual circuits on this port share this bandwidth.

Usually, the WSM port will be a physical DTE device and the speed will be determined by the DSU. In this case, this value will read **EXT CLK**, which means the WSM port gets its clocking from an externally attached DCE device (i.e., DTE cable plugged into WSM port) or no cable is attached. If the WSM port is a physical DCE device (i.e., DCE cable plugged into WSM port), then this value will be the actual clock rate used by the port.

Speed Clocking

Indicates the type of clocking used on this port. The three types of clocking are described in *Clocking* on page 48-24.

Utilization

Indicates the amount of port usage, expressed in bandwidth percentage, over three durations: the previous ten seconds (**10s**), the previous minute (**1m**), and the previous five minutes (**5m**).

Obtaining Information on the Ports for a Single WSM Board

To obtain status information on a single WSM board, enter the **wpstatus** command and the slot number for the WSM board, as follows:

```
wpstatus slot
```

where **slot** is the slot number where the WSM board is installed. For example, if you wanted to obtain status information for the board in slot 4. In the following three examples, the port parameters being displayed are for a system that contains a 2-port WSM ISDN-BRI board in slot 4, an 8-port WSM serial board in slot 5, and a 2-port WSM T1 board in slot 8.)

ISDN-BRI Board Example

In this example, the board in slot 4 is a 2-port ISDN-BRI WSM board. To view the status of slot 4, enter:

```
wpstatus 4
```

or

```
wps 4
```

This command displays a screen similar to the following:

```
WAN Port Status for slot: 4


     Admin/
     Oper    Intf      Speed     Frames      Frames      Octets      Octets
PT   Status  Type      BPS       In          Out         In          Out
==   ======  =======   =======   =========   =========   =========   =========
1    UP/DN   *NONE*    EXT CLK           0           0           0           0
2    UP/DN   ISDN-ST   N/A               0           0           0           0
/Interface/WAN %
```

Each row in the table corresponds to a port on the WSM you requested information on.

8-Port WSM Board Example

In this example, the board in slot 5 is an 8-port WSM board. To view the status of slot 5, enter:

```
wpstatus 5
```

or

```
wps 5
```

This command displays a screen similar to the following:

```
WAN Port Status for slot: 5


   Admin/
    Oper     Intf      Speed       Frames     Frames     Octets       Octets
PT Status   Type      BPS         In         Out        In           Out
== ======= ======  ========== ========  ========  ========  ==========
1  UP/UP   V35DCE   2048000          3         17        36         276
2  UP/UP   V35DCE   2048000        175        926      2034       25617
3  UP/UP   X21DCE   2048000        123        931      1722       55717
4  UP/UP   V35DCE   2048000        776        189     14430        7531
5  UP/DN   *NONE*   EXT CLK          0          0         0           0
6  UP/DN   *NONE*   EXT CLK          0          0         0           0
7  UP/DN   *NONE*   EXT CLK          0          0         0           0
8  UP/DN   *NONE*   EXT CLK          0          0         0           0
/Interface/WAN %
```

2-Port Fractional T1 WSM Board Example

In this example, the board in slot 8 is a 2-port Fractional T1 WSM board. To view the status of slot 8, enter:

```
wpstatus 8
```

or

```
wps 8
```

This command displays a screen similar to the following:

```
/Interface/WAN % wps 8

WAN Port Status for slot: 8

     Admin/
     Oper    Intf      Speed      Frames     Frames     Octets       Octets
PT   Status  Type      BPS        In         Out        In           Out
==   ======  ======= ========= ========== ========== ==========  ==========
1    UP/DN   T1        1544000          0          0          0           0
2    UP/UP   530DCE    2048000      45695      47761   10596229     2560992
/Interface/WAN %
```

Field Descriptions

The following section explains the fields and their corresponding values.

PT

The port number on the WSM board for which statistics are displayed.

Admin/Oper Status, Int Type, Speed Bps

These columns are described in the section, *Obtaining Information on All Boards in a Switch* on page 48-32. Please refer to this section for detailed information.

Frames In

The total number of frames received on this port since the last time the switch was initialized.

Frames Out

The total number of frames sent on this port since the last time the switch was initialized.

Octets In

The total number of octets, or bytes, received on this port since the last time the switch was initialized. This statistic includes the data and Frame Relay or PPP header fields, but does not include CRC or flag characters.

Octets Out

The total number of octets, or bytes, sent on this port since the last time the switch was initialized. This statistic includes the data and Frame Relay or PPP header fields, but does not include CRC or flag characters.

Viewing Information on a Single Port

To obtain status information on a single WSM port, enter the **wpstatus** command, followed by the slot number for the WSM board and the port number for which you want to receive information, as follows:

wpstatus <slot>/<port>

or

wps <slot>/<port>

where **<slot>** is the slot number where the WSM board is installed and **<port>** is the port number on the WSM board.

Frame Relay Example

In the following example, port 1 on slot 4 is configured for Frame Relay. To obtain status information for this port, enter:

```
wpstatus 4/1
```

A screen similar to the following will be displayed:

```
Frame Relay Status for slot 4, port 1:

Administrative/Operational Status ..... Up/Up
Port Type ..... Universal Serial Port
Protocol ..... Frame Relay

Speed    Intf.    Receive      Receive      Receive      Transmit     Signal
BPS      Type     CRC Errors   Aborts       Overruns     Overruns     Errors
======== ======== ========== ========== ========== ========== ========
2048000  V35DCE            0          0          0          0        0

Control  DTR   RTS   DSR   CTS   DCD
Signal   ON    ON    ON    ON    OFF

Frame Relay Information:
UniCast      Discarded  Error
Octets       Frames     Frames    Count
========== ========== ========= ==========
IN             941079         0          0
Out             21334         0          0
IN+OUT         962413         0          0

Administrative/Operational Phase .... Up/Up

Last Error Type ..... No Error Since Reset
Last Error Time ..... 0 days, 00:00:00:00
Interface failures ..... 0
Last interface failure time ..... 0 days, 00:00:00:00

DLCI Information:
          Admin/
DLCI Num  Oper Status  DLCI Type    Frames In  Frames Out  Octets In  Octets Out
========  ===========  ==========  ==========  ==========  =========  =========
0         UP/UP        Configured        1021        1021      16044       1494
31        UP/UP        Learned          17716         136    2746651      12663
32        UP/DN        Learned              0           0          0          0
```

Applicable to all port types.

Physical Level Information.

Displays for serial ports only

Logical (Frame Relay) Information

Virtual Circuit Level Information

This command displays three (3) layers of information. The top section provides information on the physical interface. The middle section provides information on the logical, or Frame Relay, interface. The bottom section provides information on the virtual circuits associated with this physical port.

For detailed descriptions of the fields, refer to Chapter 49 “Managing Frame Relay.”

PPP Example

In the following example, port 1 on slot 4 is configured for Point-To-Point Protocol (PPP). To obtain status information for this port, enter:

```
wpstatus 5/1
```

A screen similar to the following will display:

```
/Interface/WAN % wps 5/1
WAN Port Status for slot 5, port 1:
Administrative/Operation Status: .....UP/UP
Port Type .....Universal Serial Port
Protocol .....PPP

Speed    Intf.      Receive      Receive      Receive      Transmit     Signal
BPS      Type       CRC Errors   Aborts       Overruns     Underruns    Errors
=======  =======    ==========   =========    ==========   =========    ======

2048000  V35DCE             0            0            0            0         0

Control    DTR   RTS   DSR   CTS   DCD
Signals    ON    ON    ON    ON    ON

PPP Management Statistics:

                          IP      IPX     BCP     CCP
Admin                     Oper    Oper    Oper    Oper
Status     Mode           state   state   state   state
=====      =======        ======  ======  =====   =====
UP         Normal         Open    Close   Open    Open

LCP Pkts   IPCP Pkts      IPX Pkts     BCP Pkts     CCP Pkt
IN/OUT     IN/OUT         IN/OUT       IN/OUT       IN/OUT
========   =========      =======      ========     =======
3/4        2/2            4/0          2/2          3/3

           Packets    Packets    Packets    Octets     Octets
           In         Out        In+Out     In         Out        %In    %Out
           ========   ========   ========   ========   =======    ====   =====
Total           284       5809       6093     100333     344187
Ethernet          0       1337       1337          0     157846       0      45
8025              0          0          0          0          0       0       0
FDDI              0          0          0          0          0       0       0
IP              281        282        563     100216      22931      99       6
IPX               0          0          0          0          0       0       0
BPDU              3       4190       4193        117     163410       0      47

STAC-LZS       Compressed     Compressed     Uncompressed     Compression
Compression:   Frames         Octets         Octets           Ratio
               ==========     ==========     ==============   ============
In                    284           8635             100333          11.6:1
Out                  5809          96794             449230           4.6:1
In+Out               6093         105429             549563           5.2:1

/Interface/WAN %
```

Note

The section devoted to compressed data traffic statistics will be displayed only if the port has been configured for STAC-LZS compression.

For detailed descriptions of the fields, refer to Chapter 50, "Point-to-Point Protocol."

Configuring 31 Timeslots on a WAN E1 Port

On WSM E1 ports, the unframed format is not supported since WSMs only support standard E1 framing for PPP or Frame Relay (the "unframed" format is only supported for unstructured Circuit Emulation T1 or E1 ports). WSM E1 ports *must* be set to one of the standard E1 Framing types (E1, E1-CRC, E1-MF, E1-MF-CRC) with the **temod** command. (See Chapter 53, "Managing T1 and E1 Ports," for more information on the **temod** command.)

Most E1 services only allow a maximum of 30 usable timeslots since timeslot 0 is always used for Frame Synchronization (which is why you cannot use unframed for Frame Relay or PPP ports since you *must* specify how timeslot 0 is used) and timeslot 16 is usually used for multiframe sequencing.

The WSM can support 31 timeslots for cases where timeslot 16 is not used for multiframe control. When you configure the timeslots for a WSM E1 port, you specify a starting timeslot followed by a number of timeslots by using the **wpmodify** command. (See *Modifying a Port* on page 48-22 for more information on the **wpmodify** command.)

Normally, the WSM will use a default configuration that skips timeslot 16 automatically. In this way, it will select the E1 frame to generate E1 timeslot 0 (the "synchronization" timeslot), but leave timeslot 16 (the "multiframe control" timeslot) free. The WAN port configuration software when configured for 31 timeslots will then use all timeslots from 1 to 31 to give you a full E1 where timeslot 16 is also used for data. Again, this should only be done for facilities that do not require E1 Multi-Frame. For those types of E1 lines, they can support a maximum of 30 timeslots. Only those E1 lines that do not require E1 multiframe can be configured in the method described below.

To configure a WAN E1 port for 31 timeslots, follow the steps below:

1. Enter **temod <slot>/<port>** at the system prompt, where **<slot>** is the slot number of the module with the E1 port and **<port>** is the port number of the E1 port. For example, to configure WSM E1 port 4/2, enter **temod 4/2**.

2. Enter **2=4** at the prompt to set the frame type to E1 or enter **2=5** at the prompt to set the frame type to E1-CRC.

3. Enter **save** at the prompt to save your settings.

4. Enter **wpmodify <slot>/<port>** or **wpm <slot>/<port>** at the system prompt, where **<slot>** is the slot number of the module with the E1 port and **<port>** is the port number of the E1 port. For example, to configure WSM E1 port 4/2, enter **wpm 4/2**. (Note: **wpm** is the abbreviated for of **wpmodify**.)

5. Enter **3=1** to set the starting timeslot to 1.

6. Enter **4=31** to set the number of timeslots to 31.

7. Enter **save** at the prompt to save your settings.