

30 Managing WAN Switching Modules

Introduction

The OmniStack WAN Switching Modules (OSWSMs) are a family of submodules 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).

The OSWSM extends 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, the OSWSM provides a cost-effective link that is capable of supporting multiple virtual circuits. In a leased line configuration, the OSWSM provides dedicated bandwidth to a single remote site. In an ISDN line configuration, the OSWSM supports both inbound and outbound call circuits for interconnection to remote OSWSMs 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 OSWSM submodules provides 2 or 4 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. The OSWSM supports 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 OSWSM is capable of both Frame Relay and PPP transparent bridging, and IP and IPX routing.

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

◆ Note ◆

The OmniStack's front panel is divided into several areas labeled S1, S2, S3, etc. These areas relate to the conceptual division of the switch into several modules. S1 is the management module (referred to as the MPM), S2 is the uplink module (if the switch supports an uplink module), and S3, S4, etc. are the device connection (i.e., Ethernet port) modules.

As a result, WAN uplink ports, when they exist, will always be in slot 2 in an OmniStack switch.

Supported Physical Interfaces

The OSWSM family of products support numerous physical interface (port) types. The port types available with the OSWSM family are described below.

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 Communication Equipment (DCE) interfaces at speeds up to 2.048 Mbps. USPs support access via Frame Relay or synchronous PPP. The OSWSM 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).

◆ 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).

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 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.

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.

◆ 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).

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.

Supported Protocols

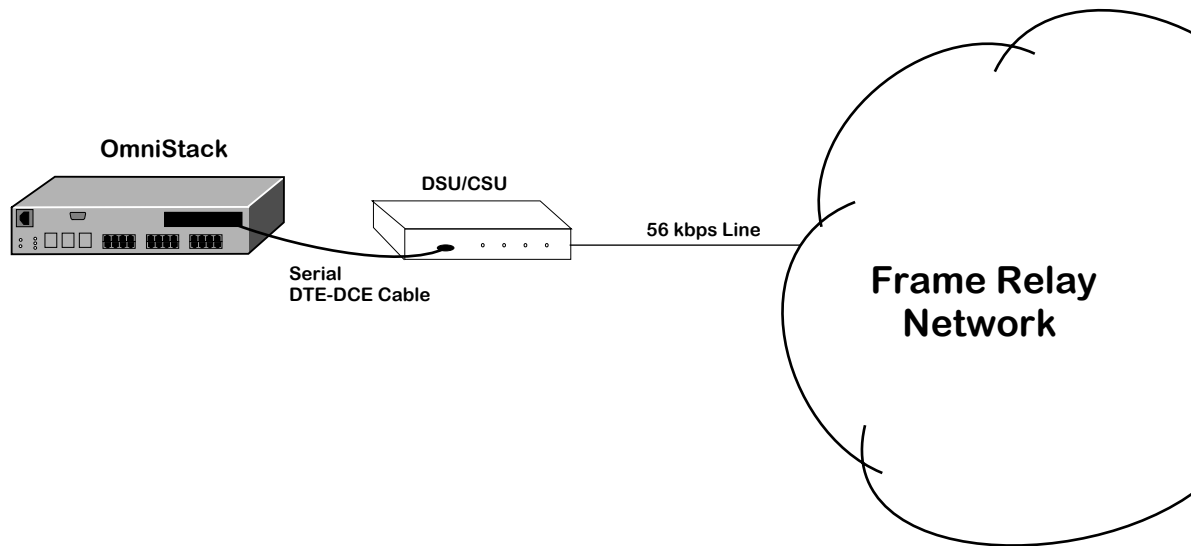
The WAN switching modules support both Frame Relay and synchronous Point-To-Point Protocol (PPP). For details on implementing these protocols, see Chapter 31, “Managing Frame Relay,” and Chapter 32, “Point-to-Point Protocol.” For ISDN signalling protocols, the modules support D-channel signalling (see Chapter 34, “Managing ISDN Ports”).

Application Examples

This section provides several examples of WAN networking configurations using WAN switching modules.

Frame Relay OSWSM Using Serial Ports

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



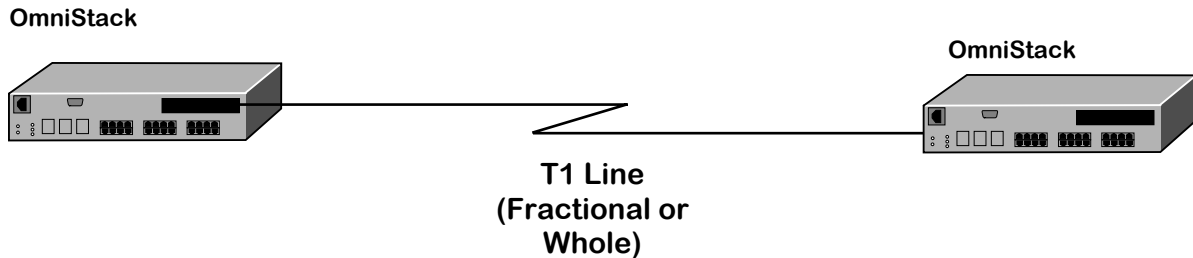
OSWSM Frame Relay Configuration Using Serial Ports

For serial ports, the OSWSM 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 OSWSM 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 OSWSM Using T1 Ports

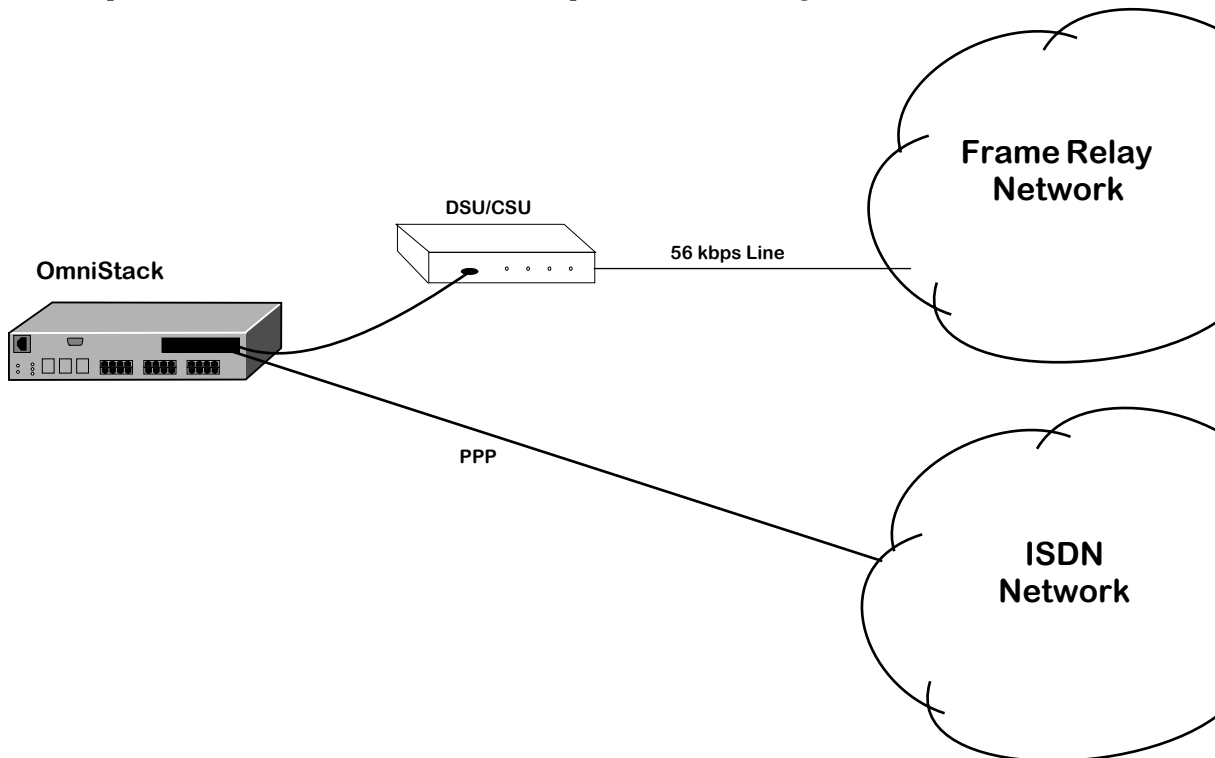
WAN switching modules may be connected “back-to-back” without an intervening Frame Relay network or switch. Because the T1 port internally provides a DSU/CSU function, an external DSU/CSU is not required. Such connections are made by using private leased lines, such as T1 lines, instead of public Frame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



Back-to-Back Configuration Using Fractional T1 Ports

Combined Frame Relay with ISDN Backup

This example shows an OSWSM-BRI submodule backing up its serial port via its ISDN port. The serial port connects to a DSU/CSU through a serial cable; this serial connection supports Frame Relay, but it could also support PPP. The other port, the ISDN port, connects to the ISDN network through a PPP connection. The services configured on the ISDN port exactly match those configured on the Frame Relay serial port so that if a failure does occur the ISDN port can transparently support the same services as the serial port. Refer to Chapter 37, “Backup Services,” for details on how to implement this configuration.



ISDN Port Backs Up Frame Relay Connection

WAN Modules

The OmniStack currently supports four (4) Wide Area Network submodules, which are as follows:

- OSWSM-FT1/E1 Provides one T1/E1 port and one Universal Serial Port (USP) that support Frame Relay or PPP.
- OSWSM-BRI Provides one USP (Universal Serial Port) and one ISDN-BRI port. The USP supports Frame Relay or PPP; the ISDN-BRI port supports only PPP.
- OSWSM-S Provides two or four Universal Serial Ports (USPs) that support Frame Relay or PPP.
- OSWSM-M013 Provides 2 channelized DS3 ports (described in Chapter 38, “Managing the OSWSM-M013 Module.”)

Except for the OSWSM-M013, these submodules are illustrated and described on the following pages.

OSWSM-FT1/FE1-SC: WAN T1 or E1 Submodule

The OSWSM-FT1/FE1 module contains one T1 or E1 port and one universal serial port. T1 and E1 ports use RJ-48C connectors. The T1 version of this module is referred to as the OSWSM-FT1-SC, and the E1 version is referred to as the OSWSM-FE1-SC. You can configure the serial and T1/E1 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 circuit device, such as a PBX.

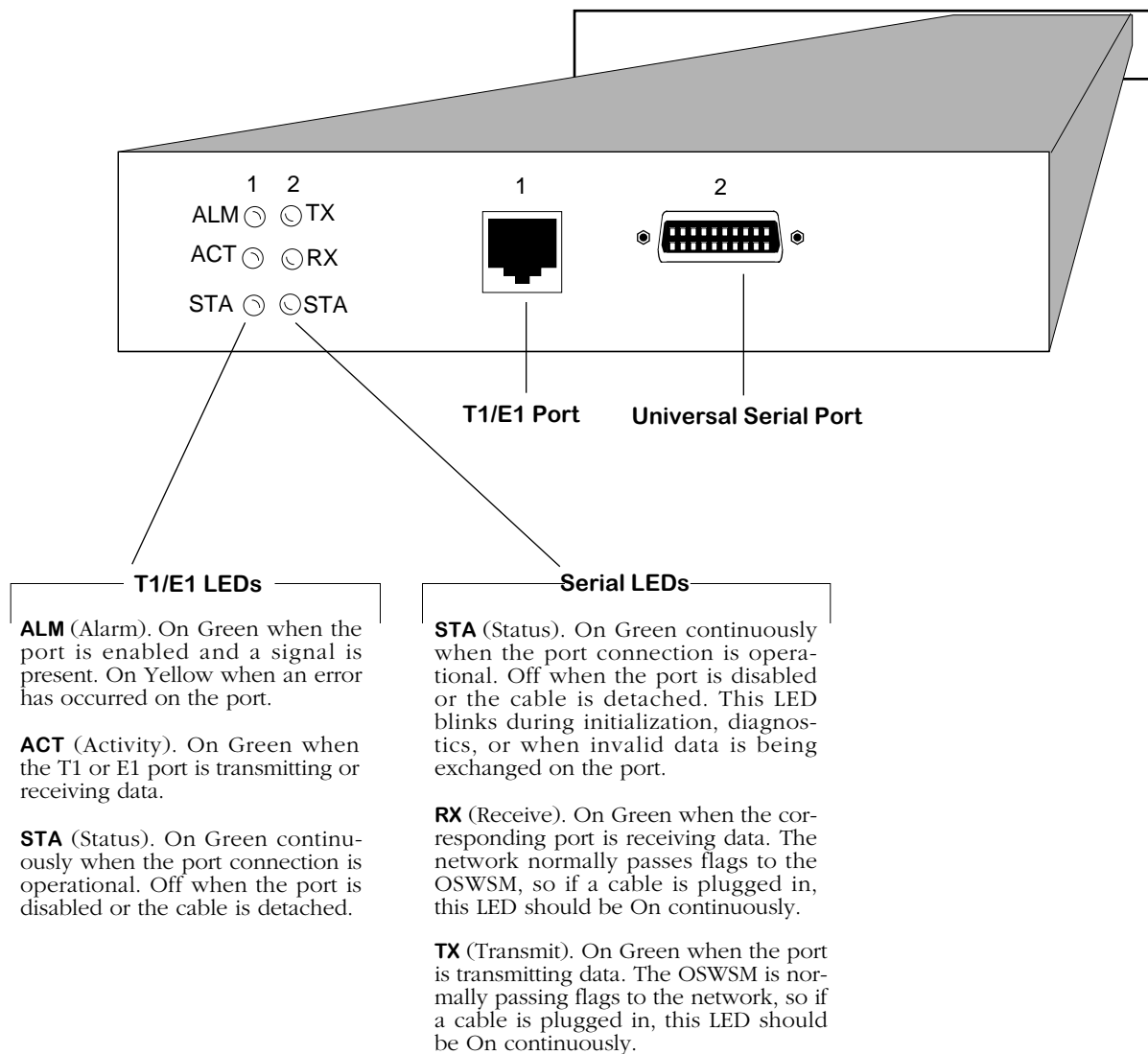
Configuring the T1/E1 Ports

You can configure physical T1/E1 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 35, “Managing T1 and E1 Ports,” for more information on software-configurable T1/E1 parameters.

OSWSM-FT1/E1 Technical Specifications	
Number of ports	2 total 1 T1 or E1 port 1 Universal Serial port
Connector Types	T1/E1: RJ-48C 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
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

Front Panel

The front panel of the OSWSM-FT1/FE1 contains one RJ-48C connector, one serial port, port LEDs, and connecting screws for securing the submodule to the OmniStack switch chassis. The following illustration describes the front panel.



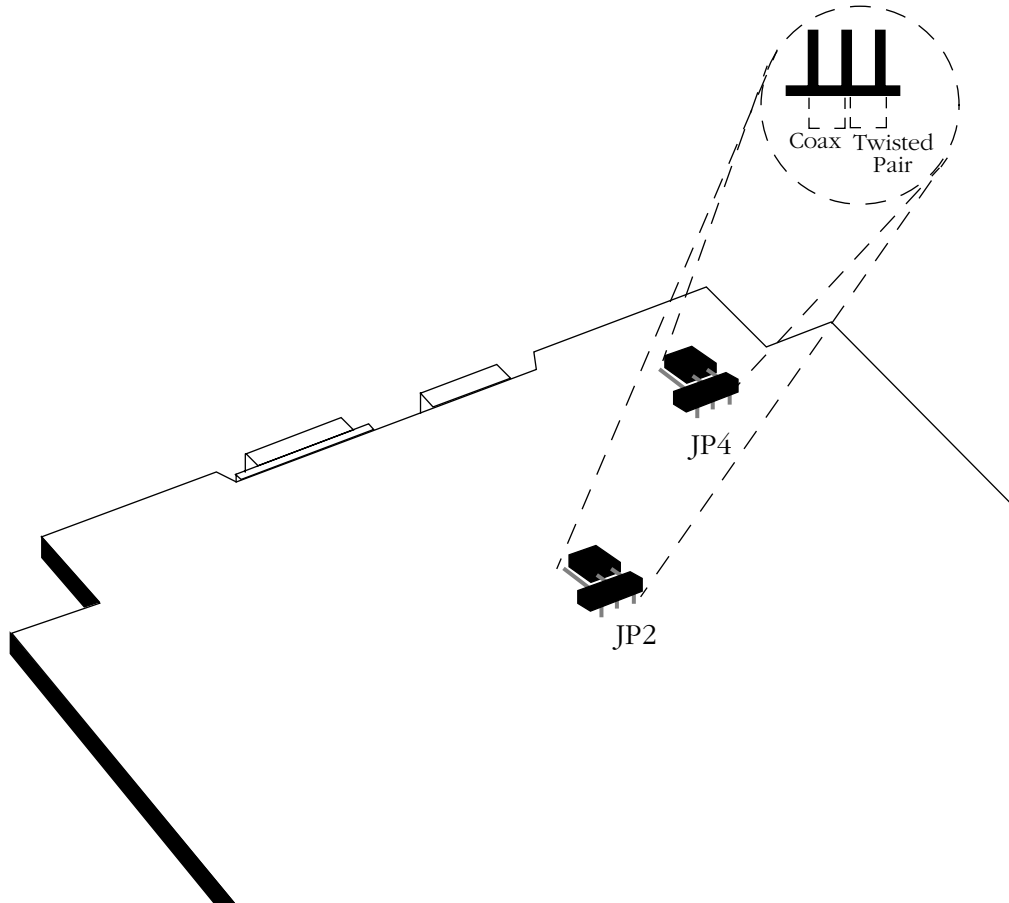
T1/E1 With Serial Port Submodule

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 OSWSM-FE1-SC

OSWSM-BRI: ISDN Submodule

The ISDN Basic Rate Interface WAN Switching Module (OSWSM-BRI) supports 1 serial port and 1 BRI port.

An OSWSM-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). An OSWSM-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.

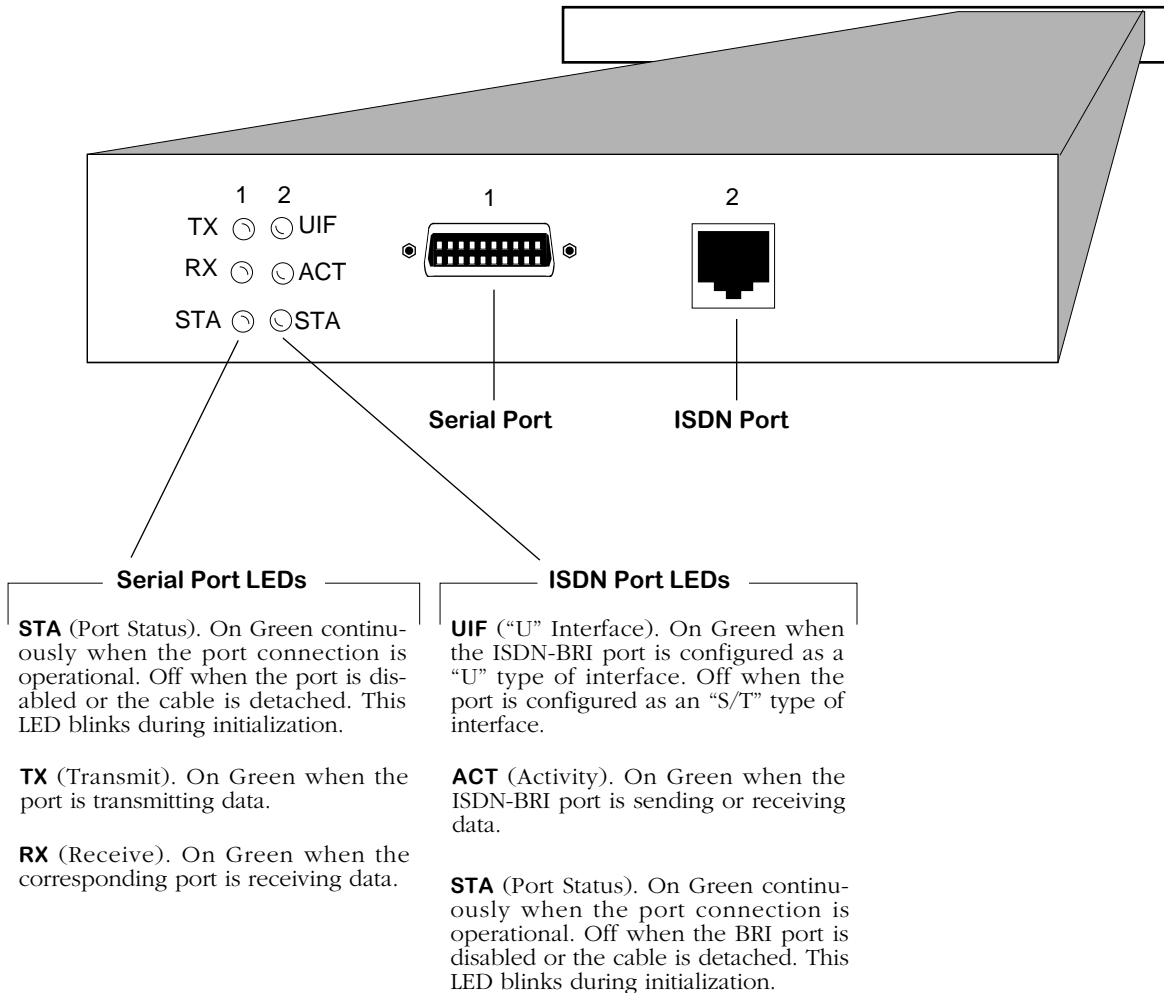
The BRI port on the OSWSM-BRI board can be configured as either a “U” or an “S/T” type of interface (the board is shipped set to “U”). Either type of interface supports two “B” channels operating at 56/64 Kbps and one “D” channel operating at 16 Kbps.

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 32, “Point-to-Point Protocol.” The software commands used to configure Frame Relay are described in Chapter 31, “Managing Frame Relay.” The software commands used to configure the WAN “links” that support PPP connections are described in Chapter 33, “WAN Links.” Finally, the software commands used to manage the ISDN ports are described in Chapter 34, “Managing ISDN Ports.”

OSWSM-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
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

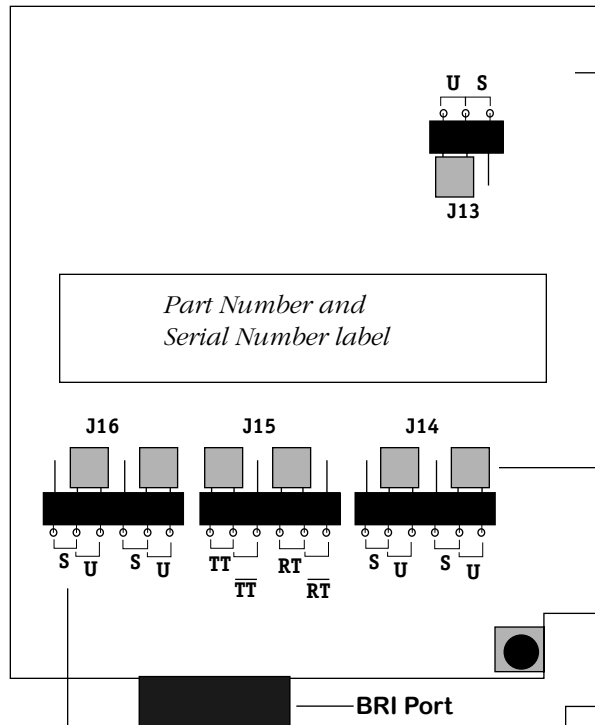
Front Panel

The front panel of the OSWSM-BRI contains one serial port, one ISDN BRI port, port LEDs, and connecting screws for securing the submodule to the OmniStack switch. The following illustration describes the front panel.



ISDN-BRI With Serial port Submodule

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

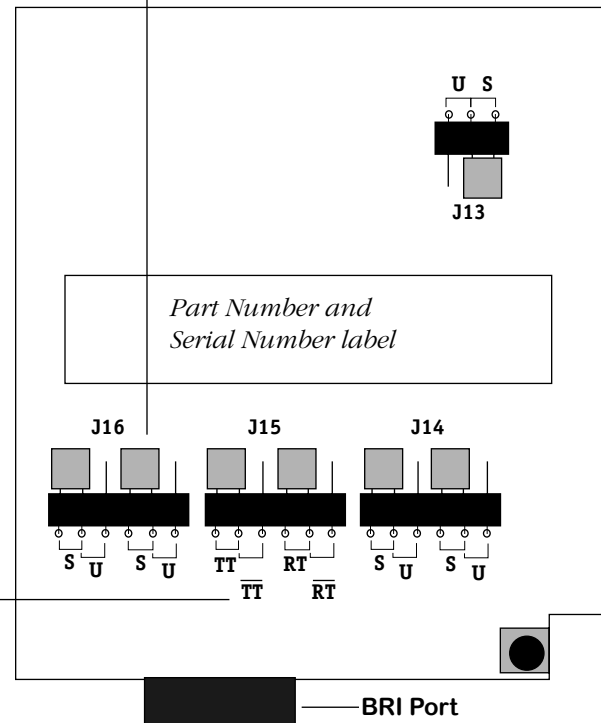


This is a simplified view of the bottom lower-right quadrant of the OSWSM-BRI board. Immediately above the BRI port are three jumper blocks labelled J14, J15, and J16. About two inches above and to the right is another jumper labeled J13. J13, J14, and J16 are used to switch between the "U" and "S/T"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

OSWSM-S: Two or Four Serial Port WAN Submodule

The WAN Switching Module (OSWSM-S) supports 2 or 4 serial ports, each of which can provide access rates from 9.6 Kbps to 2 Mbps and support three types of clocking (internal, external, and split). The 4-port version of the submodule (i.e., the OSWSM-SC-4) also supports STAC hardware compression.

◆ Note ◆

The 2-port version of the OSWSM module, called the OSWSM-S-2, does not support hardware compression.

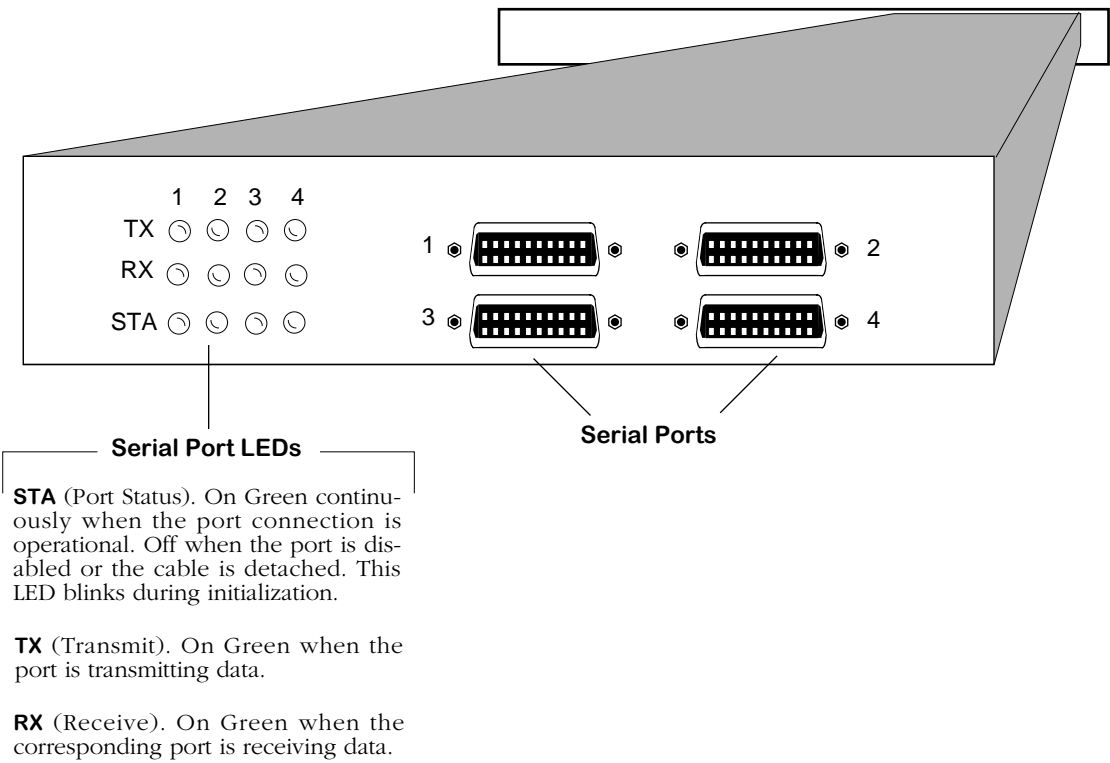
The OSWSM can sense and auto-configure for any of five serial cable types (RS-232, V.35, X.21, RS-530, and RS449). An OSWSM port is normally considered a physical DTE device. It can be turned into a physical DCE device—for speed or clocking purposes—by plugging in a DCE cable. The OSWSM board senses 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 OSWSM board, port, or virtual circuit level. Extensive statistics are provided at each level. Software commands for Frame Relay are described in Chapter 31, “Managing Frame Relay”; commands for PPP are described in Chapter 32, “Point to Point Protocol.”

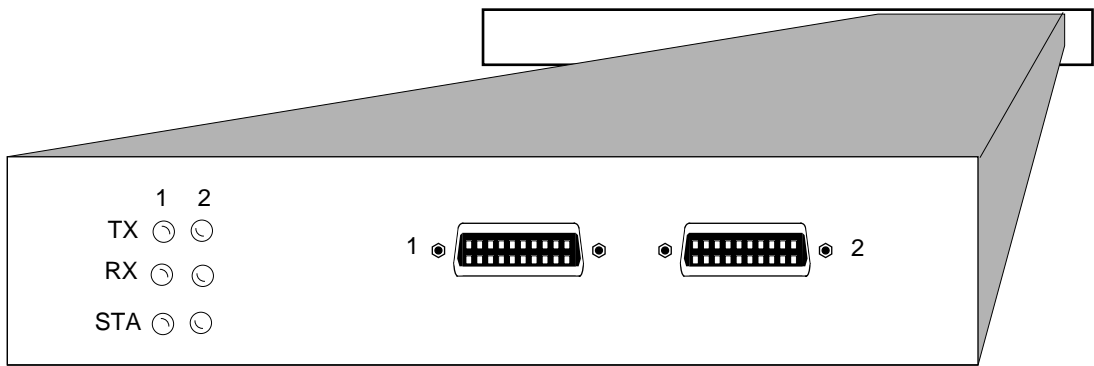
OSWSM Technical Specifications	
Number of ports	2 or 4
Connector Type	High-density 26-pin shielded serial
Protocols Supported	Frame Relay and Point-to-Point (PPP)
Data Rates Supported	9.6, 19.2, 56, 64, 128, 256, 512, 768, 1024, 1536, 2048 Kbps
Compression	Hardware-based using STAC 9705 (4-port version only)
Clocking	Internal, External, or Split (i.e., “loop timing”)
Virtual Circuits Supported	Permanent Virtual Circuits (PVCs)
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

Front Panel

The front panel of the OSWSM-S contains two or four serial ports, port LEDs, and connecting screws for securing the submodule to the OmniStack switch. The following illustration describes the front panel.



WAN 4-Port Serial Port Submodule



See LED descriptions in above illustration of 4-port submodule.

WAN 2-Port Serial Port Submodule

Cable Interfaces for Universal Serial Ports

The OSWSM 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 OSWSM 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 OSWSM 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 OSWSM 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 an OSWSM 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 OSWSM 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 OSWSM) without degrading performance.

The OSWSM 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 OmniStack-to-OmniStack connection could 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. By default, compression is on for Frame Relay and off for PPP.

If you enable compression, the OSWSM 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 OSWSM 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 31, "Managing Frame Relay," or Chapter 32, "Point-To-Point Protocol," for information on enabling compression.

◆ Note ◆

Compression is not supported on the 2-port serial OmniStack OSWSM modules (OSWSM-S-2).

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 OSWSM 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			
wpmmodify	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 Interface	File Security	Summary System	VLAN Services	Networking Help

◆ Note ◆

The ISDN menu will only appear on systems with an OSWSM-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 OSWSM board, it is automatically configured to the default settings. By default, the OSWSM uses the 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 **wpmmodify** command.

Modifying a Port

Use the **wpmmodify** command to modify an OSWSM port, as shown below:

```
wpmmodify <slot>/<port>
```

in which **<slot>** is the slot number where the OSWSM board is located, and **<port>** is the port number on the OSWSM 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 2 is a serial port. To modify serial port 2/1, enter:

```
wpm 2/1
```

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 1,544,000 bps, and a full E1 line would have an access rate of 2,048,000 bps. 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 OSWSM port you are configuring is a physical DCE port (i.e., DCE cable plugged into the OSWSM 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.

◆ **Note** ◆

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

External Clocking

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 OSWSM port). External clocking is the default option when the OSWSM is a physical DTE device (i.e., controlled by an external DCE device).

When the OSWSM is acting as a physical DTE and

- the speed is greater than 256 kbps, or
- excessive FCS errors or Aborts are being detected coming from the OSWSM at the remote port or line monitor

then it is recommended that the external DCE (usually a CSU/DSU) be set to take a transmit data clock from the external DTE transmit clock (TXCE).

You can set up the external DCE this way by configuring its DTE, or dataport, configuration options. Set the “Transmit Clock Source” to “External.” In this mode of operation, the transmit clock is output by the DCE device and the OSWSM turns it around on the external transmit clock back to the DCE, eliminating any phase misalignment between transmit clock and transmit data.

If the external DCE does not provide a DTE configuration option for the transmit clock source, then try setting the “Transmit Clock *Polarity*” to “Invert.” Note that Invert is the clock polarity for Transmit (not Receive) and should only be used when excessive FCS errors or Aborts are detected.

Internal Clocking

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

Split Clocking

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

◆ Important Note ◆

Do not **wpmmodify** 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 36, “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 ◆

A port must be set to either Frame Relay or PPP before any other protocol-related parameters can be set.

ISDN-BRI Port Example

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

wpm 2/2

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 34, “Managing ISDN Ports.” For more details on managing PPP ports, see Chapter 32, “Point-to-Point Protocol.” For more information on managing WAN links, see Chapter 33, “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 2 is a fractional T1 port. To modify fractional T1 port 2/1, enter:

wpm 2/1

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 ◆

A port must be set to either Frame Relay or PPP before any other protocol-related parameters can be set.

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 ($4 \times 64 = 256$).

Viewing Configuration Parameters for the OSWSM

You can view all current parameters for an OSWSM port or an individual virtual circuit using the **wpview** command. These parameters will be either the default parameters or parameters you modified using the **wpmmodify** 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 OSWSMs in the Chassis

To view port parameters for all OSWSM 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 OSWSM-BRI module in slot 2.

Slot/Port	Port Type	Intf. Type	Admin/ Oper/ State	Protocol	Speed BPS	Clocking
=====	=====	=====	=====	=====	=====	=====
2/1	Serial	*NONE*	UP/DN	FR	0	External
2/2	ISDN	ISDN-ST	UP/UP	PPP	N/A	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 **wpmmodify** command. For detailed information on these values, see *Modifying a Port* on page 30-18. 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 30-30.

Viewing Parameters for all Ports in a Single OSWSM

To view port parameters for all ports on a particular OSWSM, enter the **wpview** command, followed by the number of the slot. In the following three examples, the port parameters are displayed for a 2-port OSWSM ISDN-BRI board, a 4-port serial OSWSM board, and a 2-port OSWSM T1 board.

ISDN-BRI Board Example

To display the parameters for all ports on the ISDN-BRI OSWSM board in slot 2, enter:

wpview 2

or

wpv 2

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 4-port serial OSWSM board in slot 2, enter:

```
wpview 2
```

or

```
wpv 2
```

A screen similar to following displays:

Port	PortType	Intf. Type	Admin/ Oper/ State	Protocol	Speed 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	*NONE*	UP/DN	FR	0	External

T1 Board Example

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

```
wpview 2
```

or

```
wpv 2
```

A screen similar to following displays:

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

Note

E1 boards provide a similar display, except the port type and interface type display as **E1** and speed displays as **2048000**.

Viewing Port Parameters

To view port parameters, enter the following command:

```
wpview slot/port
```

where **slot** is the slot number where the OSWSM board is located, and **port** is the port number on the OSWSM 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 2. To view 2/1, enter:

```
wpview 2/1
```

or

```
wpv 2/1
```

A screen similar to following displays:

```
Configuration View for Slot 2, 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
```

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 Slot

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 kbps 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 2. To view 2/2, enter:

wpview 2/2

or

wpv 2/2

A screen similar to following displays:

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

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 1,544,000 bps, and a full E1 line would have an access rate of 2,048,000 bps. 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 30-18.

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 2. To view 2/2, enter:

wpview 2/2

or

wpv 2/2

A screen similar to following displays:

Configuration View for Slot 2, Port 2.

1) Admin Status..... UP

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 an OSWSM 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 OSWSM board and **port** is the port number on the OSWSM board that you want to delete. For example, to delete port 1 on the OSWSM 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 2/2

would be correct.

Obtaining Status and Statistical Information

You can obtain general and detailed WAN port statistical information on all OSWSM boards in the switch, a single OSWSM 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 OSWSM 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 2-port OSWSM in slot 2.

Slot/Port	PortType	Intf. Type	Admin/ Oper/ State	Protocol	BPS	Speed Clocking	Utilization		
							10s	1m	5m
2/1	T1	T1	UP/UP	FR	1544000	External	80%	50%	70%
2/2	Serial	530DCE	UP/UP	FR	2048000	Split	10%	50%	40%

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

Slot/Port

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

Port Type

This column shows **Serial**, **ISDN**, **T1**, or **E1**.

Intf Type

This column indicates the physical cable type connected to this port. This cable type is automatically sensed by the OSWSM 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 OSWSM 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 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, 2-port OSWSM T1 board 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).

Speed BPS

This column indicates the speed, or access rate, between the OSWSM 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 OSWSM 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 OSWSM port gets its clocking from an externally attached DCE device (i.e., DTE cable plugged into OSWSM port) or no cable is attached. If the OSWSM port is a physical DCE device (i.e., DCE cable plugged into OSWSM port), then this value will be the actual clock rate used by the port.

Clocking

Indicates the type of clocking used on this port. The three types of clocking are described in *Clocking* on page 30-19.

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 OSWSM Board

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

```
wpstatus slot
```

where **slot** is the slot number where the OSWSM 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 are displayed for a 2-port OSWSM ISDN-BRI board, a 4-port OSWSM serial board, and a 2-port OSWSM T1 board.

ISDN-BRI Board Example

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

```
wpstatus 2
```

or

```
wps 2
```

This command displays a screen similar to the following:

WAN Port Status for slot: 2

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

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

4-Port OSWSM Board Example

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

```
wpstatus 2
```

or

```
wps 2
```

This command displays a screen similar to the following:

WAN Port Status for slot: 2

PT	Admin/ Oper Status	Intf Type	Speed BPS	Frames In	Frames Out	Octets In	Octets 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/DN	*NONE*	EXT CLK	0	0	0	0

2-Port Fractional T1 OSWSM Board Example

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

```
wpstatus 2
```

or

```
wps 2
```

This command displays a screen similar to the following:

WAN Port Status for slot: 2

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

PT

The port number on the OSWSM 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 30-30. 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. The switch can only be initialized by rebooting.

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 OSWSM port, enter the **wpstatus** command, followed by the slot number for the OSWSM 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 OSWSM board is installed and **<port>** is the port number on the OSWSM board.

Frame Relay Example

In the following example, port 1 on slot 2 is configured for Frame Relay. To obtain status information for this port, enter:

```
wpstatus 2/1
```

A screen similar to the following will be displayed:

Frame Relay Status for slot 2, port 1:	
Applicable to all port types.	Administrative/Operational Status Up/Up
	Port Type..... Universal Serial Port
	Protocol..... Frame Relay
Physical Level Information.	Speed Intf. Receive Receive Receive Transmit Signal
	BPS Type CRC Errors Aborts Overruns Overruns Errors
Displays for serial ports only	=====
	2048000 V35DCE 0 0 0 0 0
Logical (Frame Relay) Information	Control DTR RTS DSR CTS DCD
	Signal ON ON ON ON OFF
Virtual Circuit Level Information	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
	Interface failures 0
	Last interface failure time 0 days, 00:00:00
	DLCI Information:
	Admin/
	DLCI Oper DLCI Frames Frames Octets Octets
	Num Status Type In Out In 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

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 31, "Managing Frame Relay."

PPP Example

In the following example, port 1 on slot 2 is configured for Point-To-Point Protocol (PPP). To obtain status information for this port, enter:

```
wpstatus 2/1
```

A screen similar to the following will display:

WAN Port Status for slot 2, port 1:

Administrative/Operation Status:UP/UP

Port Type Universal Serial Port

Protocol PPP

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

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

PPP Management Statistics:

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

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

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

◆ 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 32, "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 35, “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 **wpmmodify** command. (See *Modifying a Port* on page 30-18 for more information on the **wpmmodify** 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 2/1, enter **temod 2/1**.
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 **wpmmodify <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 2/1, enter **wpm 2/1**. (Note: **wpm** is the abbreviated for of **wpmmodify**.)
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.

