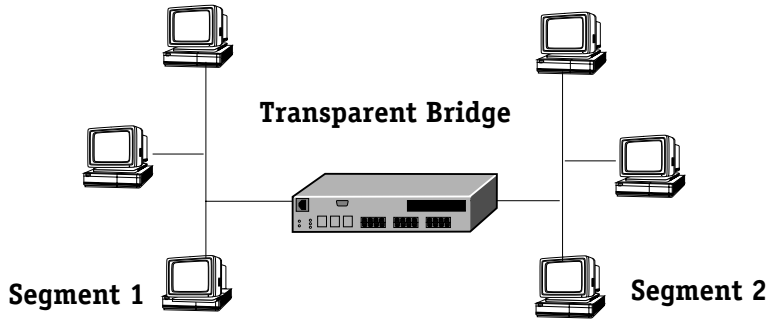
15 Configuring Bridging Parameters

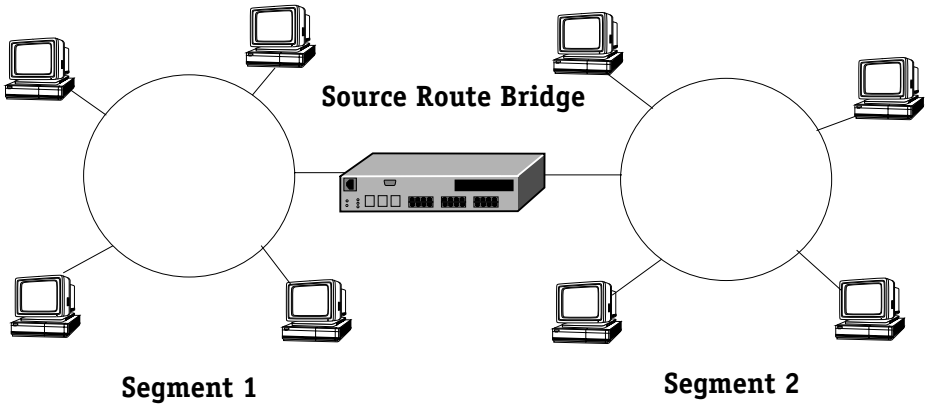
This chapter describes how to configure and maintain bridging parameters. Bridges are devices that interconnect LANs using one (or more) of the available standards such as transparent bridging, source route bridging, or source route to transparent bridging. Bridges primarily operate at Layer 2 of the OSI reference model, which controls data flow, transmission errors, physical addressing, and access to physical medium.

There are different types of bridging that are used to manage networks:

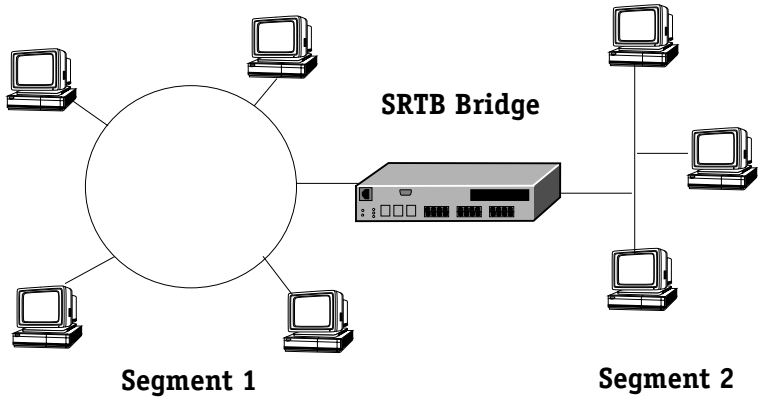
- **Transparent Bridging**. Used mainly in Ethernet environments, packets are usually forwarded without any changes being made to the packet. An ethernet environment is shown in the diagram below:



- **Source Route Bridging**. Used mainly in Token Ring environments, packets are transmitted along routes predetermined by explorer frames sent along multiple paths. Source Route Bridging modifies the routing information of the packet as it traverses the network. A token ring environment is shown in the diagram below:



- **Source Route to Transparent Bridging**. Used in mixed Ethernet and Token Ring environments, this protocol provides easy translation between transparent and source route bridging. A mixed ethernet and token ring environment is shown in the diagram below:



Spanning tree and fast spanning tree are also used to prevent physical loops in the network from creating excess traffic by blocking packet transmission on one or more ports.

This chapter describes the commands used for configuring various bridging commands for the above mentioned protocols, as well as diagnostic and spanning tree information.

Configuration Overview

When configuring bridging parameters, you will need to perform at least some of the following steps:

Step 1. Select a group

The bridging menu commands operate only on the currently selected group. You can select a group with the **selgp** command. For information on using these commands, see *Selecting a Default Group* on page 15-6.

Step 2. Configure Bridging Parameters

There are several commands that allow you to configure and view basic bridging functions such as static MAC addresses, bridge forwarding tables, MAC information and statistics, and remote Trunking stations. Many of these commands are useful in diagnosing network problems, as they allow you to find specific MAC addresses and the port on which they were learned. For information on these commands, see *Bridging Commands* on page 15-7.

Step 3. Enable Spanning Tree (Optional)

Spanning tree is an algorithm that helps prevent broadcast storms by blocking ports in the network from transmitting data. If you plan to use spanning tree, you can use the spanning tree commands to configure and view IEEE and IBM Spanning Tree. For information on using spanning tree commands, see *Configuring Spanning Tree* on page 15-22.

Step 4. Configure Source Routing (Optional)

Traditional source routing is the practice of including routing information in the packet header. This serves to supply the route that the frame should take from source to destination.
. Configure Source Route to Transparent Bridging (Optional)

If your network is a combination of Ethernet and Token Ring, you may want to use Source Route to Transparent Bridging (SRTB) to link these different network media. For information on SRTB, see *Configuring Source Route to Transparent Bridging* on page 15-41.

Bridge Management Menu

To view the Bridge Management Menu, enter the **br** command at the system prompt. If you are in verbose mode, the following table appears outlining the commands available to you. If you are not in verbose mode, enter a **?** at the prompt to display the Bridge Management Menu.

Command	Bridge Management Menu
fls	**Display Flood Limit of selected Group**
flc	**Configure Flood Limit on selected Group**
sts	**Display Spanning Tree parameters on selected Group**
stc	**Configure Spanning Tree parameters on selected Group**
stps	**Display Spanning Tree Port parameters on selected VLAN**
stpc	**Configure Spanning Tree Port parameters on selected VLAN**
srs	**Display Source Routing parameters on selected Group**
src	**Configure Source Routing parameters on selected Group**
srsf	**Enable or disable Source Routing SAP Filter Support**
srtbcfg	**View and configure Source Route to Transparent Bridging**
srtbrif	**View learned RIF from Source Route to Transparent Bridging Table**
srtbclrrif	**View and Clear learned RIF from Source Route to Transparent Bridging Table**
fwt	**Display Bridge Forward table on selected VLAN**
fs	**Display Bridge Static Address**
fc	**Configure Bridge Static Address**
bps	**Display Bridge Port Statistics on selected VLAN**
macinfo	**Locate learned Bridge MAC address in this chassis**
macstat	**Show statistics of Bridge MAC address**
macclrstat	**Clear statistics of Bridge MAC address**
selgp	**A Group can be selected for the bridge operations or to generate MIB reports**
rts	**Display remote Trunking Stations discovered**
dbrmap	**View the Domain Bridge Mapping table**
+ / -	**Select next / previous VLAN**

Details on commands included in the Bridge Management Menu commands are given in the following sections:

Setting the Default Group. These commands allow you to choose which group you are modifying or viewing, and include the **selgp, +,** and **-** commands. For more information, see:

- *Selecting a Default Group* on page 15-6
- *Using the + or - to Change Groups* on page 15-6 for more information.

Bridging Commands. These commands allow you to view bridge forward tables, create and view static address tables, display bridge port statistics, view MAC address information, view remote trunking stations, and view the domain bridge mapping table. Commands in this section include **fwt**, **fs**, **fc**, **bps**, **macinfo**, **macstat**, **macclrstat**, **rts**, and **dbrmap**. For more information, see:

- *Displaying Bridge Forwarding Table* on page 15-7
- *Configuring a Static Bridge Address* on page 15-9
- *Displaying Static Bridge Addresses* on page 15-12
- *Displaying Bridge Port Statistics* on page 15-13
- *Displaying Media Access Control (MAC) Information for a Specific MAC address* on page 15-15
- *Display Statistics of Bridge MAC Addresses* on page 15-16
- *Clear Statistics of Bridge MAC Addresses* on page 15-17
- *Display Remote Trunking Stations* on page 15-17
- *View the Domain Bridge Mapping Table* on page 15-18.

Setting Flood Limits. These commands allow you to configure and view flood limits for a specific group using the **flc** and **fls** commands. For more information, see:

- *Setting Flood Limits for a Group* on page 15-20
- *Displaying Group Flood Limits* on page 15-21

Configuring Spanning Tree. These commands allow you to configure and view IEEE and IBM Spanning Tree for a specific group, and include the **stc**, **sts**, **stpc**, **stps**, and **fstps** commands. For more information, see:

- *Configuring Spanning Tree Parameters* on page 15-24
- *Display Spanning Tree Bridge Parameters* on page 15-27
- *Configuring Spanning Tree Port Parameters* on page 15-29
- *Displaying Spanning Tree Port Parameters* on page 15-31

Configuring Source Routing. These commands allow you to configure and view Source Routing for a specific ring, as well as set a SAP filter for outgoing traffic. These commands include the **src**, **srs**, and **srsf** commands. For more information, see

- *Configuring Source Routing* on page 15-33.
- *SAP Filtering* on page 15-38.

Configuring Source Route to Transparent Bridging. These commands allow you to configure and view source routing to transparent bridging for networks with bridges connecting Ethernet and Token Ring segments, and include the **srtbcfg**, **srtbrif**, and **srtbclrrif**. For more information, see:

- *Enabling SRTB for a Group* on page 15-42
- *Disabling SRTB for a Group* on page 15-43
- *Viewing the RIF Table* on page 15-44
- *Clearing the RIF Table* on page 15-45.

Selecting a Default Group

Most commands in the Bridge Management Menu allow you to specify a group when entering the command at the system prompt. If you do not specify a group when entering a command, the bridge operations are performed on the currently selected group.

♦ Note ♦

You can view the current groups in the switch by entering **gp** at any prompt.

To select a group, enter the **selgp** command as follows:

```
selgp <group number>
```

where **<group number>** is the number of the group you wish to modify or view. For example, to select Group 2 you would enter **selgp** and the number **2**as shown:

```
selgp 2
```

A message confirming the selection of the new group ID followed by the group description.

```
Group number: 2 is now selected (New GROUP (#1)).
```

Using the + or - to Change Groups

At any time from the system prompt, you can select a different group by typing a plus (**+**) to move up one group, or a minus (**-**) to move back one group. For example, if you are currently working on Group 4 and wish to change to Group 3, you would enter a **-** at the system prompt. The following message displays to confirm the change:

```
Currently GROUP 3 is selected (New GROUP (#3))
```

Bridging Commands

The Bridge Management menu provides several commands that are useful in pinpointing problems in the network. The commands allow you to lookup specific MAC addresses and where they were learned, create and view static bridge addresses, view information on remote trunking stations, view MAC address statistics for a group or a port, or look up information on domain mappings. Many times a network problem can be tracked down by viewing MAC address information, finding out where it came from, and where it forwards data.

The following sections detail the specific bridging commands that perform these functions.

Displaying Bridge Forwarding Table

You can display the MAC addresses and their forwarding and filtering information for a given group. The information in the table is used by the transparent bridging function in determining how to propagate a received frame.

To display the information for a group in the switch follow these steps:

1. Enter the **fwt** command at the system prompt as follows:

   fwt <group number>

   where **<group number>** is the number of the group for which you want to view MAC addresses. For example, to view MAC addresses for group 2, you would enter:

   fwt 2

   As a variation of this command, you can enter the **fwt** command without a group ID. This will display MAC addresses for the currently selected group in this switch. For information on selecting a group, see *Selecting a Default Group* on page 15-6.

2. Once you have entered the group number you will be prompted for a slot and port, as shown:

   Enter Slot/Interface (return for all ports):

3. Enter the slot and interface (port) number and press **<return>**. For example, to view MAC addresses for port 2 on slot 3, enter 3/2 as shown:

   Enter Slot/Interface (return for all ports): 3/2

   The following screen appears listing the MAC addresses on this port:

```
Total number of MAC addresses learned for VLAN 2: 8
                                 Non-Canonical          Group  CAM      Last   Exp    ATM
Sl/If/Srvc/In    MAC Address     MAC Address       T    ID   Indx  S  Seen   Timer  VCI
---------------- --------------- ----------------- -- ------- ----- -- ------ ------ -------
 3/1/ Brg/  1 0020DA:A373B0 00045B:C5CE0D E       2 305A  T     11    300
 3/1/ Brg/  1 0020DA:8656F0 00045B:616A0F E       2 3060  T     11    300
 3/1/ Brg/  1 00045B:ED48C0 00045B:2251A1 E       2 3080  T     29    300
 3/1/ Brg/  1 000077:8DDBB9 00045B:65EE22 E       2 3010  T     29    300
 3/1/ Brg/  1 000039:F5520C 0009E4:3ED444 E       2 300E  T     35    300
 3/1/ Brg/  1 009027:17F7EB 00045B:2D43EF E       2 3018  T     59    300
 3/1/ Brg/  1 0020DA:0C41E5 00045B:ED48C0 E       2 3078  T     26    300
 3/1/ Brg/  1 0020DA:9645A1 0000EE:B1DB9B E       2 304E  T     18    300
```

Field Descriptions

The following section explains the fields displayed with the **fwt** command.

Sl/In/Srvc/In. The slot number (**Sl**), interface (port) number (**In**), type of service (**Src**), and service instance (**In**). For example, a bridge service on port 1 of slot 3 would be:

3/1/Brg/1

Services provide connection options for switches in a LAN, between LANs, or in a WAN. Other possible services include trunking, routing, and LANE. It is possible to have more than one instance of a service if there are more than one connections on a single port.

MAC Address. The learned MAC address for this port.

Non-Canonical MAC address. The non-canonical version of the learned MAC address. The non-canonical MAC address is different from a canonical MAC address in that the order in which the address information is sent is different. Ethernet uses canonical address, while other media (token ring, FDDI) use non-canonical.

T. The protocol type of this MAC address. There are three possibilities:

E	Ethernet
F	FDDI
T	Token Ring

Group ID. The associated group ID for this learned MAC address.

CAM Indx. The index number to the Content-Addressable Memory (CAM), where the MAC addresses are stored, in hexadecimal form.

S. The source of the MAC address (how it was learned). There are two possibilities:

T	Transparent Bridge
S	Source Route Frame.

Last Seen. The time in seconds since this MAC address was last seen on this port.

Exp. Timer. There are three possibilities for this column:

Value	The configured ageing timer, in seconds, for this MAC address is shown. Once this time period is exceeded, the MAC address is removed from the CAM.
STATIC	This MAC address was manually assigned to this group and will not age out.
OPSWT	This MAC address was learned on an optimized switch port and will not age out.

ATM VCI. The ATM Virtual Channel Identifier (VCI) for this MAC address entry. The VCI is shown for any media that uses Virtual Circuits (ATM, LANE).

Configuring a Static Bridge Address

You can configure static bridge address information by entering the **fc** command. A static bridge address is a fixed MAC address bridge that does not change or age out.

To configure a static MAC address follow these steps:

1. Enter the **fc** command as follows:

   fc <groupNumber>

   where **<groupNumber>** is the number of the group for which you want to create a static bridge MAC address. For example, to set up a static bridge address for Group 2, you would enter the following:

   fc 2

   As a variation of this command, you can enter the **fc** command at the system prompt with no group number. This will allow you to set up a static bridge address on the currently selected group. For information on selecting a group, see *Selecting a Default Group* on page 15-6.

   The system displays the following:

```
Bridge Static Address for Group 2 (New GROUP (#2))

 Index     MAC Address     Slot/Intf/Service/Inst     Static Status
                                   (A)                    (B)
--------  ----------------  ------------------------  ----------------
    1     21A33E:00B001      3/   1/     Brg/1          permanent

The entries can be modified by specifying the index and column.
For Static Status, use 2 to delete, 3 for Permanent,
4 for Delete on Reset, 5 for Delete on Timeout
To add an entry: Use command 'add MAC addr, receiving port, static status'.
        Receiving port and Status must be provided.
        Port could either be slot/intf or virtual port begin with v.
        For non-canonical MAC format add 'nc' before MAC.
        ie: add 123456:7890AB, 2/3, 3 or add nc001122:334455, v99, 3
        NOTE: add command will be executed immediately.
           save|cancel|next only applies to existing entry.
add|save|cancel|next :
```

2. To add an entry, use the format as described in the above screen:

   add [MAC Addr], [Slot/Intf], [Static Status]

   For example, to add a permanent non-canonical MAC address of 123456:123456 to port 2 of slot 3, you would enter the following:

   add nc123456:123456, 3/2, 3

   When you complete the operation by pressing **<return>**, an entry with MAC address 123456:123456, on slot 2, port 3, with a **Static Status** of **Permanent** is created.

3. Type **save** at the **fc** command prompt to save the entry. If you do not save the entry before exiting the **fc** command, the static bridge address is not created.

♦ Note ♦

The newly created static bridge address will not show up in the **fc** command table until you have exited the **fc** command by typing **cancel** at the command prompt.

Field Descriptions

The following section describes the fields in the **fc** command table.

Index. A number assigned to the row to identify a previously created static bridge address, when modifying the address.

MAC address. The canonical MAC address for this static bridge.

Slot/Intf/Service/Inst. The slot number, interface (port) number, type of service, and service instance. For example, a bridge service on port 1 of slot 3 would be:

3/1/Brg/1

Static Status. The status of the static MAC address as determined when created. The **Status** will be one of the following:

Invalid	This entry was deleted within the current session.
Permanent	This entry is in use and will remain so until it is deleted from the table. See *Deleting a Static Bridge Address* on page 15-11 for specific information.
deleteOnReset	This entry is in use and will remain so until the bridge is reset.
deleteOnTimeOut	This entry is currently in use and will remain so until it is aged out.

Modifying a Static Bridge Address

Once you have created a static bridge address, you can modify its interface assignment or its status. To modify a static bridge address:

1. Enter the **fc** command as documented above. The Bridge Static Address table will display as shown:

```
Bridge Static Address for Group 2 (Default GROUP (#2))

 Index    MAC Address     Slot/Intf/Service/Inst    Static Status
                                  (A)                   (B)
--------  ----------------  ----------------------------  ----------------------
    1     21A33E:00B001      3/   1/     Brg/1          permanent
    2     001122:223344      3/   2/     Brg/1          deleteOnReset

The entries can be modified by specifying the index and column.
For Static Status, use 2 to delete, 3 for Permanent,
4 for Delete on Reset, 5 for Delete on Timeout
To add an entry: Use command 'add MAC addr, receiving port, static status'.
        Receiving port and Status must be provided.
        Port could either be slot/intf or virtual port begin with v.
        For non-canonical MAC format add 'nc' before MAC.
        ie: add 123456:7890AB, 2/3, 3 or add nc001122:334455, v99, 3
        NOTE: add command will be executed immediately.
           save|cancel|next only applies to existing entry.
add|save|cancel|next :
```

2. To modify an entry, use the index number for the specific static bridge address (listed in the leftmost column), the column letter for the column you want to change, an equal sign, and a new value. For example, to change the **Static Status** of the first address's in the table from **permanent** to **deleteOnReset**, you would enter a **1** (the static bridge address **Index** number), a **b** (the column letter for **Static Status**), an equal sign (**=**), and the number **4** (the value for **deleteOnReset**), as shown:

   ```
   1b=4
   ```

3. Press **<return>** to complete the operation.

4. Type **save** at the **fc** command prompt to save the changes.

Deleting a Static Bridge Address

Deleting a previously created static bridge address is much the same process as modifying a Static Bridge Address. To delete a Static Bridge Address, follow these steps:

1. Enter the **fc** command as documented above. The Bridge Static Address table will display as shown:

```
Bridge Static Address for Group 2 (Default GROUP (#2))

 Index    MAC Address     Slot/Intf/Service/Inst    Static Status
                                   (A)                  (B)
--------  ----------------------  ------------------------------  --------------------
    1     21A33E:00B001     3/   1/     Brg/1        permanent
    2     001122:223344     3/   2/     Brg/1        deleteOnReset

The entries can be modified by specifying the index and column.
For Static Status, use 2 to delete, 3 for Permanent,
4 for Delete on Reset, 5 for Delete on Timeout
To add an entry: Use command 'add MAC addr, receiving port, static status'.
        Receiving port and Status must be provided.
        Port could either be slot/intf or virtual port begin with v.
        For non-canonical MAC format add 'nc' before MAC.
        ie: add 123456:7890AB, 2/3, 3 or add nc001122:334455, v99, 3
        NOTE: add command will be executed immediately.
           save|cancel|next only applies to existing entry.
add|save|cancel|next :
```

2. To delete an entry, use the index number for the specific static bridge address, the column letter **b** (the column letter for **Static Status**), an equal sign (**=**), and a **2** (the value for **Delete**).

   For example, to delete the first address in the table, you would enter a **1** (the static bridge address **Index** number), a **b** (the column letter for **Static Status**), an equal sign (**=**), and the number **2** (the value for **Delete**), as shown:

   ```
   1b=2
   ```

3. Press **<return>** to complete the operation.

4. Type **save** at the **fc** command prompt to save the changes. The **Static Status** will change to **Invalid**. Once you exit the **fc** command, the Static Bridge Address is removed from the table.

Displaying Static Bridge Addresses

You can view static bridge address information by entering the **fs** command. To display the information, enter the **fs** command as follows:

```
fs <group number>
```

where **<group number>** is the number of the group for which you want to view static bridge MAC addresses. For example, to view MAC addresses for Group 1, you would enter the following:

```
fs 1
```

This command will display a table similar to the following:

```
Bridge Static Address Summary for Group 1 (Default GROUP (#1))

      MAC Address          Slot/Intf/Service/Inst     Static Status
---------------------  ------------------------------  ----------------
002A3113:0012EA          3/   1/      Brg/   1        permanent
```

As a variation of this command, you can enter the **fs** command at the system prompt with no group number. This will allow you to view the static bridge addresses on the currently selected group. For information on selecting a group, see *Selecting a Default Group* on page 15-6.

The descriptions for the variables in the table displayed with the **fs** command are the same as those in the table displayed with the **fc** command. For details on these variables, see *Configuring a Static Bridge Address* on page 15-9.

Displaying Bridge Port Statistics

You can display statistics on bridge ports with the **bps** command. To view bridge port statistics enter the **bps** command as follows:

bps <group number>

where **<group number>** is the number of the group for which you want to view bridge port statistics. For example, to view statistics for Group 1, you would enter the following:

bps 1

This command will display a table similar to the following:

Frames discarded due to full Forwarding Database:0

Port Statistics for Group 1

Slot/Intf Service/Inst	Frames In	Frames Out	In Frames Discards	MTU Exceeded Discards	Delay Exceeded Discards	Flood Limit Discards
2/ 1/ Brg/ 1	0	0	0	0	0	0
2/ 2/ Brg/ 1	0	0	0	0	0	0
3/ 1/ Brg/ 1	3354	85	0	0	0	0
3/ 2/ Brg/ 1	0	0	0	0	0	0
3/ 3/ Brg/ 1	0	0	0	0	0	0
3/ 4/ Brg/ 1	0	0	0	0	0	0
3/ 5/ Brg/ 1	0	0	0	0	0	0
3/ 6/ Brg/ 1	0	0	0	0	0	0
3/ 7/ Brg/ 1	0	0	0	0	0	0
3/ 8/ Brg/ 1	0	0	0	0	0	0

/VLAN/Bridge %

As a variation on this command, you can enter **bps** at the prompt without a group number. This will display the port statistics for the currently selected group. For information on selecting a group, see *Selecting a Default Group* on page 15-6.

Field Descriptions

The following section describes the fields displayed in the above table.

Frames discarded to full Forwarding Database. The number of frames that were not transmitted because the forwarding database is full. The forwarding database holds all known MAC address for this bridge and is used to learn the next hop MAC address for the packet(s) in question.

Slot/Intf/Service/Inst. The slot number (**Sl**), interface (port) number (**Intf**), type of service (**Service**), and service instance (**Inst**). For example, a bridge service on port 1 of slot 3 would be:

3/1/Brg/1

Services provide connection options for switches in a LAN, between LANs, or in a WAN. Other possible services include trunking, routing, and LANE. It is possible to have more than one instance of a service if there are more than one connections on a single port.

Frames In. The number of frames received on the associated port.

Frames Out. The number of frames sent on the associated port.

In Frames Discards. The number of received frames discarded due to error.

MTU Exceeded Discards. The number of frames that were discarded because they exceeded the Maximum Transmission Unit (MTU) size. The MTU is set to the default of the media type (ethernet, token ring, etc.) and is not configurable.

Delay Exceeded Discards. Frames that were delayed, usually due to collisions, but that were ultimately transmitted.

Flood Limit Discards. The number of frames that were discarded because they exceeded the flood limit set for the port or the group in which this port is a member. This flood limit is set with the **flc** command for groups or the **modvp** command for ports. For more information on setting flood limits, see *Setting Flood Limits* on page 15-20 for the **flc** command, or Chapter 17, “Managing Groups and Ports,” for the **modvp** command.

Displaying Media Access Control (MAC) Information for a Specific MAC address

Media Access Control (MAC) information for the switch can be examined by using the **macinfo** command. You can view specific MAC address information, or choose a slot and view all MAC addresses associated with the selected slot.

To view MAC information for a specific address:

1. Enter **macinfo** at the system prompt and press **<return>**.
2. You will be prompted with the following message:

   Enter MAC address ([XXYYZZ:AABBCC] or return for none):

   Enter the MAC address you are interested in viewing, and press **<return>**.
3. You will be prompted with the following message:

   Is this MAC in Canonical or Non-Canonical form (C or N) [C]:

   Enter **c** for Canonical or **n** for Non-Canonical (the default is at the end of the prompt in brackets) and press **<return>**. A table similar to the following is shown:

Slot/Intf/Srvc/Inst	Group ID	CAM Index	Set by	MAC Type	Last Seen	Exp Timer	ATM VCI	Protocol
3/ 1/ Brg/ 1	1	0346	TB	ETH	11	15		

Field Descriptions

The following section explains the fields displayed using the **macinfo** command that are not previously explained in other sections.

Set by. This field lists what type of bridging was used to learn this MAC address. There are two possibilities:

TB	This MAC address was learned using Transparent Bridging.
SR	This MAC address was learned using Source Routing.

MAC Type. The media type of this MAC address. There are three possibilities:

E	Ethernet
F	FDDI
T	Token Ring

Protocol. If Group Mobility is enabled, this field will list the type of packet encapsulation used when this MAC address was learned. For more information on Group Mobility, see Chapter 17, “Managing Ports and Groups.”

Displaying Media Access Control (MAC) Information for all MAC addresses

Media Access Control (MAC) information for the switch can be examined by using the **macinfo** command. You can view all MAC addresses associated with the selected slot.

To view MAC information for all addresses:

1. Enter **macinfo** at the system prompt and press **<return>**. You will be prompted with the following message:

   Enter MAC address ([XXYYZZ:AABBCC] or return for none):

2. Press **<return>**. You will be prompted with the following message:

   Enter Slot Number (1-3):

   Enter the slot number for the slot for which you are interested in viewing MAC addresses. The possible options are displayed on the right in parenthesis. A screen similar to the following is shown:

```
Total number of MAC addresses learned for VLAN 2: 8
                                  Non-Canonical          Group  CAM      Last   Exp
Sl/If/Srvc/In     MAC Address     MAC Address      T     ID    Indx  S  Seen   Timer
---------------- ---------------- ---------------- -- --------- ----- -- -------- ---------
3/1/ Brg/  1 0020DA:A373B0 00045B:C5CE0D E         2 305A  T       11      300
3/1/ Brg/  1 0020DA:8656F0 00045B:616A0F E         2 3060  T       11      300
3/1/ Brg/  1 00045B:ED48C0 00045B:2251A1 E         2 3080  T       29      300
3/1/ Brg/  1 000077:8DDBB9 00045B:65EE22 E         2 3010  T       29      300
3/1/ Brg/  1 000039:F5520C 0009E4:3ED444 E         2 300E  T       35      300
3/1/ Brg/  1 009027:17F7EB 00045B:2D43EF E         2 3018  T       59      300
3/1/ Brg/  1 0020DA:0C41E5 00045B:ED48C0 E         2 3078  T       26      300
3/1/ Brg/  1 0020DA:9645A1 0000EE:B1DB9B E         2 304E  T       18      300
```

Descriptions of the fields displayed with the **macinfo** command are identical to those displayed using the **fwt** command. See *Displaying Bridge Forwarding Table* on page 15-7 for more information.

Display Statistics of Bridge MAC Addresses

The **macstat** command allows you to view a list of MAC address statistics for this switch on a slot-by-slot basis. To view MAC address statistics, enter the **macstat** command at the system prompt as shown:

macstat <slot>

where **<slot>** is the slot number on the switch for which you want to see statistics. For example, to view statistics for MAC addresses on slot 3, you would enter:

macstat 3

A table similar to the following is shown:

Slot	Discarded	Aged	Learned	in CAM
3	0	4	7	37

As a variation of this command, you can enter **macstat** at the prompt with no slot specified. This will display the statistics for all slots in the switch.

Field Descriptions

The following section describes the fields displayed using the **macstat** command.

Slot. The slot number of the switch to which the MAC address statistics apply.

Discarded. The number of MAC addresses that have been discarded on this slot due to the CAM being full.

Aged. The number of MAC addresses that have exceeded the age limit and been removed from the CAM by this slot.

Learned. The number of MAC address that have been learned on this slot.

in CAM. The total number of MAC addresses currently stored in the Content-Addressable Memory (CAM) of this module.

Clear Statistics of Bridge MAC Addresses

MAC address statistics for a slot can be cleared using the **macclrstat** command. To clear statistics, enter the **macclrstat** command at the system prompt as shown:

```
macclrstat <slot>
```

where **<slot>** is the slot number of the switch for which you want to clear MAC address statistics. For example, to clear statistics for slot 3, you would enter:

```
macclrstat 3
```

Once you have enter the command, a message appears to confirm the action.

As a variation of this command, you can enter **macclrstat** without specifying a slot. This will clear MAC statistics for all slots.

Display Remote Trunking Stations

The **rts** command displays a table of the remote trunking stations learned by this switch. A remote trunking station is a switch that has set up a trunking service to convey media through a network. Trunking services allow for media to be masked so that it appears to be a different type (for example, trunking ethernet over an ATM backbone). To display the remote trunking stations this switch has learned, follow these steps:

1. Enter the **rts** command as shown

   ```
   rts <groupNumber>
   ```

   where **<groupNumber>** is the number of the group on the local switch for which you want to view known trunking stations. For example, to view remote trunking stations for Group 1, you would enter the following:

   ```
   rts 1
   ```

   As a variation of this command, you can enter the **rts** command without a group number. This will show all the remote trunking stations for all groups in this switch.

2. The following prompt is shown:

   Enter service's Slot/Station (return for all services):

   Enter the slot and station (port) number for the local switch for which you wish to view remote trunking services. For example, to list the trunking station at port 1 of slot 3, you would enter:

   3/1

   If you do not enter a specific slot and station, the system automatically sends information on all services for the remote trunking stations associated with this group.

3. Once you have entered a slot and station, a table similar to the following is shown:

Remote Trunking Stations

Slot/Station	Group ID	Remote MAC
3/ 1	1	0020DA:022061
3/ 1	1	0020DA:05EAD1

Field Descriptions

The following sections describes the fields displayed by the **rts** command.

Slot/Station. The slot number and station (port) number associated with the remote trunking station.

Group ID. The group number of the switch that is associated with this remote trunking station.

Remote MAC. The Media Access Control address of the remote trunking service.

View the Domain Bridge Mapping Table

The **dbrmap** command allows you to display the mapping between a packet's destination MAC address and the remote Domain Bridge behind which it originated. To view this table:

1. Enter the **dbrmap** command as shown:

   dbrmap <groupNumber>

   where **<groupNumber>** is the number of the group for which you want to see domain mappings of MAC addresses. For example, to view the mapping table for group 2, you would enter:

   dbrmap 2

As a variation of this command, you can enter the **dbrmap** command without specifying a group. This will display mapping information for all groups on this switch.

2. A prompt asking for a canonical MAC address is displayed, as shown:

   Enter canonical MAC address ([XXYYZZ:AABBCC] or return to display everything):

   Enter the MAC address you want to see the Domain Mapping for, or press **<return>** without entering a MAC address to see the mappings for all MAC addresses associated with this group.

3. A screen similar to the following is shown:

```
DOMAIN BRIDGE MAPPING
Group 2

Destination MAC    Group ID   Age   Slot / Intf   Domain MAC
00:20:da:7d:ef:44  2          14    8 /  1        00:20:da:6c:fb:85
00:20:da:7d:ef:45  2          120   8 /  1        00:20:da:6c:fb:85
00:20:da:7d:ef:46  2          220   8 /  1        00:20:da:6c:fb:86
```

Field Descriptions

The fields displayed by the **dbrmap** command are described below.

Destination MAC. The destination MAC address learned from a domain bridge port.

Group ID. The destination MAC's group number.

Age. The time, in seconds, since the destination MAC address was last seen.

Slot/Intf. The slot and interface number on this switch where the destination MAC address was learned.

Domain MAC. The remote domain MAC address behind which this destination MAC address was learned.

Setting Flood Limits

The flood limit is the number of bytes per second of flooded data that may be transmitted on a port on a group. This limit is a mechanism for controlling broadcast storms on the network.

The default flood limit for a port, regardless of the media type, is 192,000 bytes per second. You can change this default by configuring the flood limit on a per port or a per Group basis.

The **modvp** command (described in Chapter 17, "Managing Groups and Ports") allows you to set the flood limit on a per port basis. The **flc** command (described in the following section) allows you to set the flood limit on a per Group basis. Configuring the flood limit for a Group is particularly useful when you need to disable flood limits for all ports in a single Group.

Setting Flood Limits for a Group

The **flc** command allows you to set flood limits for a Group. To set the flood limit for a Group

1. Enter the following at the system prompt follow these steps:

   flc <groupNumber>

   where **<groupNumber>** is the number of the group for which you are setting the flood limit. For example, to set the flood limit on Group 2 you would specify:

   flc 2

   As a variation of this command, you can enter the **dbrmap** command without specifying a group. This will display mapping information for all groups on this switch.

   The following prompt displays:

   Enter flood limit override value (bytes/second) for Group 2 (192000):

2. Enter the flood limit for this Group and press **<Return>**.

♦ Note ♦

A value of negative one (**-1**) disables flood limits for the Group.

When new ports are added to a group, they will use the flood limit specified through **flc**. If a value has not been specified through **flc** for this Group, then the default port value (192000) is used.

♦ Note ♦

Flood limits set through **modvp** (set on a per-port basis) override the flood limit set through **flc**.

Displaying Group Flood Limits

The **fls** command allows you to view the current flood limits set for groups. The limits are set using the **flc** command. To display flood limits for all Groups, enter

```
fls <groupNumber>
```

where **<groupNumber>** is the number of the group for which you are viewing the flood limit. For example, to set the flood limit on Group 2 you would specify:

```
flc 2
```

A message similar to following is shown:

```
Flood Limit Override for Group 2(Group Name 1) is 190000 bytes per second.
```

A value will only be displayed for a Group on which **flc** has been used to set a flood limit.

As a variation of this command, you can enter **fls** at the system prompt without specifying a group number. This will return flood limit information for each group configured for this switch.

Configuring Spanning Tree

Spanning tree is an algorithm developed to help prevent the occurrence of broadcast storms in a network. A packet can be broadcast multiple times in a network if the network is physically configured with loops.

If packets are broadcast to all ports (or flooded) in an attempt to deliver the data, networks with physical loops will rebroadcast packets repeatedly and cause a network to become severely congested. This congestion will adversely affect network performance.

Spanning Tree prevents broadcast storms by establishing a loop-free topology throughout the network. This is done by blocking ports in the physical topology that could result in flooded traffic being looped.

Alcatel supports both the IEEE and IBM versions of spanning tree. The IBM Spanning Tree protocol is only supported by IBM Token Ring environments that make use of functional addresses for the transmission of Bridge Protocol Data Units (BPDUs). The following are the primary differences between the IEEE 802.1d and IBM Spanning Tree algorithms:

- The Hello BPDU in IBM Spanning Tree is sent to the bridge functional address, X'C00000000100'. In the IEEE 802.1d Spanning Tree, it is sent to the Group address X'800143000000'.
- The Port ID in IBM Spanning Tree consists of a ring identifier and a bridge number. In 802.1d, it consists of a port priority and port number.
- IBM Spanning Tree has no learning process. Therefore, a port can be in one of three states—blocking, listening, or forwarding.
- IBM Spanning Tree does not support the Topology Change Notification (TCN) protocol.
- When you enable IBM Spanning Tree, the switch automatically sets defaults for the maximum age, forward delay, and hello time. In the interests of screen consistency, it is possible to change these defaults with the UI. In IBM Spanning Tree specification, these values are fixed, and should remain at the set defaults.
- When you enable IBM Spanning Tree, some additional defaults are set:
  - All virtual ports attached to the group with a physical port speed of 4 or 16 Mb are set to use Functional Addresses rather than Group Addresses.
  - All virtual ports attached to the group with a physical port speed that is not 4 or 16 Mb are set to manual forwarding.
  - As other virtual ports are attached to the group, the above two rules are applied.

  Virtual ports in a manual forwarding state do not participate in either the IEEE or IBM versions of spanning tree. Any IEEE Spanning Tree frame received on a port in a manual forwarding state is forwarded to all other virtual ports in the same group also in a manual forwarding state. This is done to prevent loops from occurring in the network topology that could arise from applying the second default condition automatically.

- IBM SRT bridges send an IEEE-style STE RIF over Token Ring networks. Alcatel does not support this frame, and any frame of this type received by the switch is discarded.
- Alcatel switches do not support using the same Functional Address (FA) for both data and spanning tree frames. The FA for IBM Spanning Tree is programmed into the MPM CAM, and all data frames with this FA are claimed by the MPM. Therefore, any data with the same FA as the IBM Spanning Tree FA will not be able to pass through the switch. There are two workarounds for this situation:
  - If you are *not* using IBM Spanning Tree and you want to prevent the specific FA from being programmed into the MPM CAM, then enter the command *faBpGrpDisable* into the MPM.cmd file, before the *cmInIt* command, with a value of 1.
  - If you are using IBM Spanning Tree and need the FA (0300 0000 0800), and you are using all Alcatel switches (or other third party switch that allows you to change the IBM Spanning Tree FA), you can enter the command *faBpGrpOverride* into the MPM.cmd file with a new value for the lower 32-bit part of the address (0000 0800).

♦ Note ♦

If you change a group to IBM Spanning Tree, all non-Token Ring ports are put into manual forwarding state. Messages are displayed indicating these port state changes; in addition, SNMP traps are sent to indicate these changes. (Manual forwarding state is where the port is put into forwarding state and the Spanning Tree algorithm is disabled.) Token Ring ports will be set to use functional addresses.

The following sections give specific information on using the spanning tree commands.

♦ Important Note ♦

Spanning Tree on the OmniStack is only supported if the ports are in “bridge” mode. Spanning Tree will not work if the ports are set to “AutoSW” mode. See Chapter 17, “Managing Groups and Ports” for more information.

Configuring Spanning Tree Parameters

The **stc** command allows you to configure parameters for the spanning tree. To configure spanning tree parameters:

1. Enter the **stc** command as follows:

   stc <groupNumber>

   where **<groupNumber>** is the number of the group in the switch for which you are configuring spanning tree. For example, to configure spanning tree for Group 2, you would enter:

   stc 2

2. The system shows you the current values and allows you to change them through a series of prompts, the first of which is shown below:

   Spanning Tree Parameters for Group 2 (New GROUP (#2))

   Spanning Tree is OFF for this Group, set to ON ? (y/n) :

   Enter **y** to enable spanning tree or **n** to leave it disabled and press **<return>**. This field allows you to toggle spanning tree On or OFF by typing the appropriate response. Answering Yes (**y**) selects the option opposite the currently selected option.

   ♦ Important Note ♦

   Remember to read the prompt carefully before responding. If spanning tree has already been activated for this group, this prompt will ask you if you would like to turn it *off*.

3. The following prompt is displayed asking whether you would like to use IEEE or IBM Spanning Tree:

   IEEE spanning tree for this Group, set to IBM ? (y/n) :

   Enter **n** to use IEEE Spanning Tree, or **y** to use IBM Spanning Tree, and press **<return>**. Select either the IEEE 802.1d Spanning Tree or IBM Spanning Tree. Answering Yes (**y**) changes the spanning tree type to the type not currently in use for this Group. The system automatically sets defaults for later **stc** prompts, such as **Bridge Hello Time** and **Bridge Max Age**, based on the spanning tree type you select here.

   ♦ Important Note ♦

   Remember to read the prompt carefully before responding. If IEEE Spanning Tree is what you would like to use, the correct response to this prompt is *no*. A yes response changes it to IBM Spanning Tree.

4. The following prompt is shown allowing you to set the priority:

New Priority (0..65535) (current value is 32768[0x8000]) :

Enter the **Priority** value as a number between 0 and 65535, or press **<return>** to accept the default listed in parenthesis. A value of 0 is the highest priority. Bridge priority is utilized by the spanning tree algorithm to decide which bridge will be the root bridge. You can set the bridge priority by entering a decimal number from 0 to 65,535. 0 is the highest priority.

♦ Note ♦

To make sure that the proper negotiation occurs for the switch to become the Spanning Tree root bridge, always set the priority for the switch accordingly. Do not rely on MAC addresses to determine which switch becomes the root bridge.

5. The following prompt is displayed allowing you to set the Bridge Hello Time:

New Bridge Hello Time (1..10 secs) (current value is 2) :

Enter the **Bridge Hello Time** as a number between 1 and 10, or press **<return>** to accept the default listed in parenthesis. The amount of time between the transmission of Configuration Bridge Protocol Data Units (BPDUs) on any designated port. Enter a value between 1 and 10 seconds. Shortening the time will make the protocol more robust, while lengthening the time lowers the overhead of the algorithm as the interval between transmission of configuration messages is larger.

6. The following prompt is displayed allowing you to set the Bridge Maximum Age:

New Bridge Max Age (6..40 secs) (current value is 6) :

Enter the **Bridge Max Age Time** as a number between 6 and 40, or press **<return>** to accept the default listed in parenthesis. The maximum age of Spanning Tree Protocol information learned from the network on any port before it is discarded, in seconds. Enter a value between 6 and 40 seconds. A smaller value causes Spanning Tree to reconfigure more often.

7. The following prompt is displayed allowing you to set the Bridge Forward Delay:

New Bridge Forward Delay (4..30 secs) (current value is 4) :

Enter the **Forward Delay Time** as a number between 4 and 30, or press **<return>** to accept the default listed in parenthesis. This time value controls how fast a port changes its spanning state when moving towards the Forwarding state. The value determines how long the port stays in each of the Listening and Learning states, which precede the Forwarding state. This value is also used when a topology change has been detected and is underway to age out all dynamic entries in the Forwarding Database. Enter a value between 4 and 30 seconds. A value that is too small can cause temporary loops in the network due to data being forwarded before the reconfiguration message has reached all nodes on the network.

8. The following prompt is displayed allowing you to set the Ageing Time:

```
Ageing Time (10..1000000 sec)                    (current value is     300) :
```

Enter the **Ageing Time** as a number between 10 and 1000000, or press **<return>** to accept the default listed in parenthesis. The timeout period in seconds for aging out dynamically learned forwarding information. Enter a new Ageing Time between 10 and 1000000 seconds.

9. The following prompt is displayed allowing you to set the Auto-Tracker VLAN Ageing Time:

```
Auto-Tracker VLAN Ageing Time (10..1000000 sec) (current value is    1200) :
```

Enter the **Auto-Tracker VLAN Ageing TIme** as a number between 10 and 1000000, or press **<return>** to accept the default listed in parenthesis. The length of time in seconds to remember which VLAN a port belonged to even after the port has been aged out of the Bridge Filtering Database. The MAC and port information are preserved for the set length of time. In the case of IPX it should be set to greater than the server Keep Alive Timer in order to prevent the server from losing communication with the station. The default is 1200 seconds.

10. The final prompt is displayed asking you if you would like to save the new parameters:

```
Save the new Spanning Tree Bridge parameters ? y/n :
```

Enter **y** to save the parameters, or **n** to discard them. If you chose to save the parameters, a confirmation message similar to the following is shown:

```
Port 5/1 set to Forwarding!
Port 5/2 set to Forwarding!
Port 5/3 set to Forwarding!
```

As a variation of this command you can enter the **stc** command without specifying a group. This will allow you to set up spanning tree for the previously selected group. For information on selecting a group see *Selecting a Default Group* on page 15-6.

Display Spanning Tree Bridge Parameters

The **sts** command allows you to display spanning tree bridge parameters. To display spanning tree parameters, enter **sts** command as shown:

sts <groupNumber>

where **<groupNumber>** is the number of the group in the switch for which you want to view spanning tree bridge parameters. For example, to view parameters for Group 2, you would enter:

sts 2

A screen similar to the following is displayed:

```
                Spanning Tree Parameters for Group 2 (New GROUP (#2))
Spanning Tree Status      :                    ON
Bridge Protocol Use       :              IEE E 802.1D
Priority                  :                 32768   (0x8000)
Bridge ID                 :  8000-0020DA:022860
Designated Root           :  8000-0020DA:022860
Cost to Root Bridge       :                     0
Root Port                 :                  None
Hold Time                 :                     1
Topology Changes          :                     1
Last Topology Change      :  1 hours, 25 minutes, 54 seconds ago
Bridge Aging Timer        :                   300

      Current Parameters                                Parameters system uses when
                                                        attempt to become root
-------------------------------------------------- --------------------------------------------------
Max Age                          20 secs    System Max Age                20 secs
Forward Delay                    15 sec     System Forward Delay          15 secs
Hello Time                        2 secs    System Hello Time              2 secs
```

As a variation of this command, you can enter **sts** at the system prompt without specifying a group. This will display bridge parameters for the currently selected group. For information on selecting a group, see *Selecting a Default Group* on page 15-6.

Field Descriptions

The following sections explains the fields displayed using the **sts** command.

Spanning Tree Status. The status of spanning tree is either **ON** or **OFF**.

Bridge Protocol Used. The bridge spanning tree protocol is set up through the **stc** command. This protocol can be IEEE 802.1D or IBM Spanning Tree. The type of spanning tree protocol used will affect other bridge parameters, such as **Maximum Age**, **Forwarding Delay**, and **Hello Time**. See *Configuring Spanning Tree Parameters* on page 15-24 for more information on the differences between IEEE and IBM Spanning Tree.

Priority. Bridge priority is utilized by the spanning tree algorithm to decide which bridge will be the root bridge. You can set the bridge priority by entering a decimal number from 0 to 65,535. Zero is the highest priority.

Bridge ID. The bridge identification number is a number created by concatenating the bridge **Priority** with its six-byte MAC address.

Designated Root. The bridge identifier of the root of the spanning tree as determined by the spanning tree protocol. It is created by concatenating the root bridge **Priority** with its six-byte MAC address.

Cost to Root Bridge. The cost of the path to the root bridge as seen from this bridge. Cost represents the distance of the group from the root bridge, in number of hops. If this is the root bridge, this number is 0.

Root Port. The slot number, port number, and service type of the root port. The root port is the bridge's preferred path to the root bridge.

Hold Time. This time value determines the interval length during which no more than two Configuration Bridge BPDUs shall be transmitted, in seconds.

Topology Changes. The total number of topology changes detected by this bridge since the management entity was last reset or initialized. Topology changes happen when spanning tree reconfigures to prevent logical loops from occurring.

Last Topology Change. The time since the last time a topology change was detected by the bridge entity.

Bridge Aging Timer. The timeout period in seconds for aging out dynamically learned forwarding information.

Max Age. The maximum age (in seconds) of spanning tree protocol information learned from the network on any port before it is discarded.

Forward Delay. This time value (in seconds) controls how fast a port changes its spanning tree state when moving towards the Forwarding state. The value determines how long the port stays in each of the Listening and Learning states, which precede the Forwarding state. This value is also used when a topology change has been detected and is underway to age out all dynamic entries in the Forwarding Database.

Hello Time. The amount of time (in seconds) between the transmission of Configuration Bridge Protocol Data Units (BPDUs) on any port when it is the root of the spanning tree, or trying to become so.

Configuring Spanning Tree Port Parameters

The **stpc** commands allows you to configure port parameters (as opposed to bridge parameters) for spanning tree. To configure port parameters

1. Enter the **stpc** command as shown:

   stpc <groupNumber>

   where **<groupNumber>** is the number of the group in the switch for which you want to configure spanning tree port parameters. For example, to configure parameters for Group 1, you would enter:

   stpc 1

   As a variation of this command, you can enter the **stpc** command without specifying a group. This will allow you to configure the port parameters on the currently selected group. For information on how to select a group, see *Selecting a Default Group* on page 15-6.

   A screen similar to the following is displayed:

Spanning Tree Port Configuration for Group 1 (Default GROUP (#1))

Index	Slot/Intf/Service/Inst	Port Priority (a)	Path Cost (b)	Enable Spanning Tree (c)	tx FA (d)	Manual Mode (e)
1	2/ 1/ Brg/ 1	128	10	y	NA	n
2	2/ 2/ Brg/ 1	128	10	y	NA	n
3	3/ 1/ Brg/ 1	128	10	y	NA	n
4	3/ 2/ Brg/ 1	128	10	y	NA	n
5	3/ 3/ Brg/ 1	128	10	y	NA	n
6	3/ 4/ Brg/ 1	128	10	y	NA	n
7	3/ 5/ Brg/ 1	128	10	y	NA	n
8	3/ 6/ Brg/ 1	128	10	y	NA	n
9	3/ 7/ Brg/ 1	128	10	y	NA	n
10	3/ 8/ Brg/ 1	128	10	y	NA	n
11	3/ 9/ Brg/ 1	128	10	y	NA	n
12	3/ 10/ Brg/ 1	128	10	y	NA	n
13	3/ 11/ Brg/ 1	128	10	y	NA	n
14	3/ 12/ Brg/ 1	128	10	y	NA	n
15	3/ 13/ Brg/ 1	128	10	y	NA	n
16	3/ 14/ Brg/ 1	128	10	y	NA	n

save|cancel|next|prev :

2. To modify a parameter, enter the index (row) number, column letter (**a**, **b**, **c**, **d**, or **e**), an equal sign (=), and then the new parameter, as follows.

   <index><column>=<new parameter>

   For example, if you wanted to enable transmit Functional Address (**tx FA** in column **d**) for the slot identified by **index 10**, then you would enter:

   10d=y

Field Descriptions

The following section explains the fields displayed by the **stpc** command.

Index

A number assigned as an identifier for the port.

Slot/Intf/Service/Inst

The slot number (**Slot**), interface (port) number (**Intf**), type of service (**Service**), and service instance (**Inst**). For example, a bridge service on port 1 of slot 3 would be:

3/1/Brg/1

Services provide connection options for switches in a LAN, between LANs, or in a WAN. Other possible services include trunking, routing, and LANE. It is possible to have more than one instance of a service if there are more than one connections on a single port.

Port Priority

The value of the priority field contained in the first (in network byte order) octet of the (2 octet long) Port ID. This value allows you to specify a particular port as more favorable if the bridge has more than one port connected in a loop.

Path Cost

The contribution of this port to the path cost towards the spanning tree root bridge that includes this port. 802.1D-1990 recommends that the default value of this parameter be in inverse proportion to the speed of the attached LAN. Path cost is a measure of the distance of the listed port from the root bridge, in number of hops.

Enable Spanning Tree

Whether or not spanning tree is enabled, either **y** or **n**.

tx FA

Transmit Functional Address. Values are:

NA	Function Addresses are not applicable because this port is not using spanning tree.
y	Transmit Functional Address instead of normal Spanning Tree Multicast Address.
n	Transmit normal Spanning Tree Multicast Address. This is the default setting.

Manual Mode

Allows you to manually set the state for each port (forwarding or blocking) or defer the port's state configuration to the spanning tree protocol, which will either be IEEE 802.1d or IBM. This column is especially helpful if you are using the IBM Spanning Tree protocol with non-Token Ring (e.g., FDDI or Ethernet) ports that do not support this IBM Spanning Tree. In this situation you can manually set those ports to a forwarding (or blocking) state since the IBM Spanning Tree protocol will not be able to control these ports. The possible settings for this column are:

f	The port is in forwarding state and remains so unless you change it.
b	The port is in blocking state and remains so unless you change it.
n	The state of the port is determined by the IEEE 802.1d Spanning Tree protocol. This option is not recommended because it means this Group will have a hybrid spanning tree algorithm that mixes the IEEE 802.1d and IBM Spanning Tree.

Displaying Spanning Tree Port Parameters

The **stps** command allows you to view the current spanning tree port parameters. To view the port parameters, enter the **stps** command as shown:

```
stps <groupNumber>
```

where **<groupNumber>** is the number of the group in the switch for which you want to view spanning tree port parameters. For example, to view parameters for Group 1, you would enter:

```
stps 1
```

A screen similar to the following is shown:

```
Spanning Tree Port Summary for Group 1 (Default GROUP (#1))

Slot  Service                          Path  Desig  Des  Rt   Swt  Fw   Root Bridge ID
Intf  Inst      Pri  State   MAC       Cost  Cost   Pt   Pt   Pt   Tx   Desig BridgeID
----- --------- ---- ------- --------- ----- ------ ---- ---- ---- ---- ------------------------
3/1   Brg/ 1    128  FORWD   C473C4    10    10     No   Yes  No   0    0010-0020DA:81D5B0
                                                                       8000-0020DA:0C41E1
```

As a variation to this command, you can enter **stps** at the system prompt without specifying a group number. This will allow you to view the port parameters on the currently selected group. For information on how to select a group, see *Selecting a Default Group* on page 15-6.

Field Descriptions

The following section explains the fields displayed by the **stps** command.

Slot/Intf. The slot and interface (port) number of the port.

Service/Inst. The service type and instance of the service connected to the port.

Pri. The value (from 0 to 256) of the priority of the port, 0 being the highest priority.

State. The port's current state as defined by application of the spanning tree protocol. This state controls what action a port takes on reception of a frame. The **State** values are:

Disabled	This port has been disabled.
Blocking	This port is not participating in transmitting data to prevent loops.
Listening	This port is preparing to transmit data, but is temporarily disabled to prevent loops.
Learning	This port is preparing to transmit data, but is temporarily disabled to prevent loops. This is different from Listening in that the port is acquiring data to facilitate data transmission.
Forwarding	This port is transmitting data.

Some of these values are not available if you are using IBM Spanning Tree. For information on the differences between IEEE and IBM Spanning Tree, see *Configuring Spanning Tree Parameters* on page 15-24.

Path Cost. The contribution of this port to the path cost towards the spanning tree root. The spanning tree root will include this port.

Desig Cost. The path cost to the designated port of the segment connected to this port. If this is the root bridge this value is 0.

Des Port. The unique port identifier of the bridge port believed to be the designated port for the LAN associated with the port.

Rt Pt. This field indicates if this port is the root port. The root port is the port that offers the lowest cost path to the root bridge.

Swt Pt. This field indicates if this port is in Optimized Switch Mode. Optimized Switch Mode is appropriate for dedicated connections to a single workstation or server. For more information, see Chapter 17, “Managing Groups and Ports.”

FWD Transition. The number of times this port has changed from the Learning state to the Forwarding state.

Root Bridge ID. The bridge identification number of the root bridge.

Desig Bridge ID. The unique bridge identifier of the designated bridge for this port (LAN).

Configuring Source Routing

The **srs** and **src** commands allow you to display and configure the source routing parameters for the selected group.

Configuring Source Routing/Virtual Rings

The **src** command allows you to set the parameters for source routing. In addition, it also displays current source routing parameters for your switch. The syntax for the **src** command is as follows:

src <group number>

If you do not enter a group number, then Group No. 1 (the default group) will be entered. For example, to configure the source routing parameters on Group No. 1, enter

src

at the system prompt. A screen similar to the following is displayed.

```
Source Routing Parameters for Group 1 (Default GROUP (#1))

    Slot   Type/          Ring          Bridge      Largest    HopCnt    Port      Block
    Intf   Inst/Srvc      Number        Number      frame      In  Out   Type      ARE
    ----   ------------  ------------  ----------  ---------  --- -----  -------  ---------
1.  2/ 1   Brg/ 1/ na      1 (0x001)   10 (0xA)      590      6    6    SRT       n
2.  3/ 1   Brg/ 1/ na (V)  2 (0x002)   10 (0xA)     4472      7    7    SRT       n
3.  3/ 2   Brg/ 1/ na      4 (0x004)   10 (0xA)     4472      7    7    SRT       n
4.  3/ 3   Brg/ 1/ na      5 (0x005)   10 (0xA)     4472      6    6    SRT       n
5.  3/ 4   Brg/ 1/ na      3 (0x003)   10 (0xA)     4472      7    7    SRT       n
6.  3/ 5   Brg/ 1/ na (V)  2 (0x002)   10 (0xA)     4472      7    7    SRT       n
7.  3/ 6   Brg/ 1/ na (V)  3 (0x003)   10 (0xA)     4472      7    7    SRT       n

Enter index of the entry to configure (e.g. 1) <RETURN> to exit :
```

The fields displayed by the **src** command are described in the subsection below. To set parameters, enter the index entry (the left-most number) in the row with the port you want to configure. See *Source Routing/Virtual Ring Configuration Steps* on page 15-34 to configure source routing and virtual token rings.

Source Routing/Virtual Ring Parameters

Slot Intf. The slot and interface (port) for this token ring.

Type. The type of service of this token ring. The type of service can be one of the following.

Brg. Indicates that bridging has been configured on this ring.

Lne. Indicates that an 802.5 LANE client service is configured on this ring.

Inst. This field is used to identify the instance of the service if there is more than one service for the **Slot/Intf** field.

Srvc. This field indicates the service number. If a port has more than one service configured on it, then each service will be identified by a different service number.

Ring Number. The ring number assigned to the token ring for participation in source routing. If a **(V)** appears in front of this field, then a virtual ring is configured.

Bridge Number. A unique number to identify the source routing bridge number used to participate in source routing. This number will be the same for each port on the same group.

Largest frame. The maximum size of the INFO field that this virtual port can send and receive.

Hop Cnt In. The maximum inbound hop count for Spanning Tree Explorer (STE) and All Routes Explorer (ARE) frames (the default is **7**). This value is checked on all inbound STE or ARE frames. If the hop count is exceeded, the frame will be dropped.

Hop Cnt Out. The maximum outbound hop count for Spanning Tree Explorer (STE) and All Routes Explorer (ARE) frames (the default is **7**). This value is checked on outbound STE or ARE frames. If the hop count is exceeded, the frame will be dropped.

Port Type. This can be either source route (**SR**) or source route transparent (**SRT**) bridge port.

Block ARE. Indicates whether the All Routes Explorer (ARE) will be treated as Spanning Tree Explorer (STE). Normally ARE does not acknowledge blocked ports the way STE does. This behavior can cause unnecessary congestion.

Source Routing/Virtual Ring Configuration Steps

Perform the steps below to configure source routing parameters.

1. At the system prompt, enter

src

A screen similar to the following displays. (See *Source Routing/Virtual Ring Parameters* on page 15-34 for descriptions of these fields.)

Source Routing Parameters for Group 1 (Default GROUP (#1))

	Slot Intf	Type/ Inst/Srvc	Ring Number	Bridge Number	Largest frame	HopCnt In	HopCnt Out	Port Type	Block ARE
1.	2/ 1	Brg/ 1/ na	1 (0x001)	10 (0xA)	590	6	6	SRT	n
2.	3/ 1	Brg/ 1/ na (V)	2 (0x002)	10 (0xA)	4472	7	7	SRT	n
3.	3/ 2	Brg/ 1/ na	4 (0x004)	10 (0xA)	4472	7	7	SRT	n
4.	3/ 3	Brg/ 1/ na	5 (0x005)	10 (0xA)	4472	6	6	SRT	n
5.	3/ 4	Brg/ 1/ na	3 (0x003)	10 (0xA)	4472	7	7	SRT	n
6.	3/ 5	Brg/ 1/ na (V)	2 (0x002)	10 (0xA)	4472	7	7	SRT	n
7.	3/ 6	Brg/ 1/ na (V)	3 (0x003)	10 (0xA)	4472	7	7	SRT	n

Enter index of the entry to configure (e.g. 1) <RETURN> to exit :

2. Enter the index entry (the left-most number) of the ring you want to configure. A screen similar to the following displays.

```
Ring Number (1 - 4095, 0 to disable)   (0x004):
```

3. Enter a ring number from **1** to **4095** or enter **0** to remove the port from all rings. The current ring (in hexadecimal) is displayed in parentheses. The following screen displays.

```
Virtual Ring (y/n)                     (n):
```

4. Enter **y** to configure the port for a virtual token ring or **n** to configure the port for a physical ring. (The default is **n**.) A screen similar to the following displays.

```
Bridge Number (1 - 15, 0 to disable)   (0xA):
```

5. Enter a bridge number from **1** to **15** or enter **0** to remove the port from all bridges. The current bridge (in hexadecimal) is displayed in parentheses. A screen similar to the following displays.

```
Max Outbound Hop Count                 (7):
```

6. Enter the maximum number of outbound hop counts, which can be from 0 to 14, for this port. (The current number is displayed in parentheses.) A screen similar to the following displays.

```
Max Inbound Hop Count                  (7):
```

7. Enter the maximum number of inbound hop counts, which can be from 0 to 14, for this port. (The current number is displayed in parentheses.) A screen similar to the following displays.

```
Largest Frame size                     (4472):
```

8. Enter the largest frame size (in bytes) allowed on this port. On early-generation modules, the largest possible value is 4472. On Bigfoot modules, the largest possible value is 17800. The following screen displays.

```
Turn Transparent Bridging ON (y/n)     (y):
```

9. Enter **n** for pure source routing or **y** for source route transparent bridging (SRTB). (The default is **y**.) The following screen displays.

```
Block ARE on non-forward state (y/n)   (n):
```

10. If you answer **Yes** to this option, blocked ports will be treated in a non-forwarding state by ARE. (The default is **n**.) The following screen displays.

```
Save the new configuration? (y/n)      (n):
```

11. Enter **y** to save the new settings or **n** to discard them. (The default is **n**.) The following screen displays.

```
Enter index of the entry to configure (e.g. 1) <RETURN> to exit :
```

12. Enter the index entry (the left-most number) to configure another ring or press **<Return>** to exit.

Displaying Source Routing Parameters

The **srs** command displays the current parameters for source routing. To use this command, enter

```
srs
```

at the system prompt. A screen similar to the following will be displayed.

```
Source Routing Parameters for Group 1 (Default GROUP (#1))

    Slot   Type/          Ring        Bridge      Largest   HopCnt    Port     Block
    Intf   Inst/Srvc      Number      Number      frame     In  Out   Type     ARE
    ----   ------------   ----------  ----------  --------- --- ----- -------  ---------
1.  2/ 1   Brg/ 1/ na      1 (0x001)  10 (0xA)      590     6    6    SRT      n
2.  3/ 1   Brg/ 1/ na (V)  2 (0x002)  10 (0xA)     4472     7    7    SRT      n
3.  3/ 2   Brg/ 1/ na      4 (0x004)  10 (0xA)     4472     7    7    SRT      n
4.  3/ 3   Brg/ 1/ na      5 (0x005)  10 (0xA)     4472     6    6    SRT      n
5.  3/ 4   Brg/ 1/ na      3 (0x003)  10 (0xA)     4472     7    7    SRT      n
6.  3/ 5   Brg/ 1/ na (V)  2 (0x002)  10 (0xA)     4472     7    7    SRT      n
7.  3/ 6   Brg/ 1/ na (V)  3 (0x003)  10 (0xA)     4472     7    7    SRT      n

Enter index of the entry to see details (e.g. 1) <RETURN> to exit :
```

To display detailed information for a particular port, enter the index entry (the left-most number) of the row with the port you want to display. If you entered an index number, a screen similar to the following will be displayed.

```
Selected entry is attached to Group 1 (Default GROUP (#1)) )

Bridge Num:       0xa                 Ring Num:                  0x4
Hop Count In/Out:       7 / 7         Max Frame:                 4472
LF Mode:          3 bits              Span Mode:                 Auto-Span

SRFs In/Out:        4532/    3048     Invalid RI field:                0
AREs In/Out:       21078/    3262     Dup Segments:                    0
STEs In/Out:        3242/    1056
Dup LAN IDs:           0              LAN ID Mismatches:               0
Hop Count Exceeded - Inbound/Outbound:                  0/          0

Enter index of the entry to see details (e.g. 1) <RETURN> to exit :
```

Enter an index number to display detailed parameters for another port or press **<Return>** to exit. The fields displayed by the **srs** command are described below.

Slot Intf. The slot and interface (port) for this token ring.

Type. The type of service of this token ring. The type of service can be one of the following.

Brg. Indicates that bridging has been configured on this ring.

Lne. Indicates that an 802.5 LANE client service is configured on this ring.

Inst. This field is used to identify the instance of the service if there is more than one service for the **Slot/Intf** field.

Srvc. This field indicates the service number. If a port has more than one service configured on it, then each service will be identified by a different service number.

Ring Number. The ring number assigned to the token ring for participation in source routing. If a **(V)** appears in front of this field, then a virtual ring is configured.

Bridge Number. A unique number to identify the source routing bridge number used to participate in source routing. This number will be the same for each port on the same group.

Largest frame. The maximum size of the INFO field that this virtual port can send and receive.

Hop Cnt In. The maximum inbound hop count for Spanning Tree Explorer (STE) and All Routes Explorer (ARE) frames (the default is **7**). This value is checked on all inbound STE or ARE frames. If the hop count is exceeded, the frame will be dropped.

Hop Cnt Out. The maximum outbound hop count for Spanning Tree Explorer (STE) and All Routes Explorer (ARE) frames (the default is **7**). This value is checked on outbound STE or ARE frames. If the hop count is exceeded, the frame will be dropped.

Port Type. This can be either source route (**SR**) or source route transparent (**SRT**) bridge port.

Block ARE. Indicates whether the All Routes Explorer (ARE) will be treated as Spanning Tree Explorer (STE). Normally ARE does not acknowledge blocked ports the way STE does. This behavior can cause unnecessary congestion.

♦ Note ♦

The fields listed below are only displayed if you selected to display detailed information for a single port.

Bridge Num. See the description for the **Bridge Number** field above.

Ring Num. See the description for the **Ring Number** field on the previous page.

Hop Count In/Out. See the description for the **Hop Cnt In** and **Hop Cnt Out** fields above

Ring Num. See the description for the **Ring Number** field on the previous page.

LF Mode. The length of the frame size negotiation field. Currently set to 3 bits.

Max Frame. See the description for the **Largest frame** field above.

Span Mode. Determines how this virtual port will handle a Spanning Tree Explorer (STE) frames. Values include the following:

Auto-span. Can only be returned by a bridge that both implements the Spanning Tree Protocol and has use of the protocol enabled on this virtual port. If the virtual port is in the forwarding state, the frame will be accepted or propagated. Otherwise it will be silently discarded. [Any others?]

SRFs In/Out. The number of Specifically Routed Frames that have been received/transmitted.

AREs In/Out. The number of All Route Explorer (ARE) frames that have been received/transmitted.

STEs In/Out. The number of Spanning Tree Explorer (STE) frames that have been received/transmitted.

Dup LAN IDs. The number of frames discarded due to Duplicate LAN IDs.

Invalid RI field. The number of explorer frames that have been discarded because the routing information field contained an invalid value.

Dup Segments. The number of frames that have been discarded by this virtual port because routing descriptor field contained a duplicate segment identifier.

LAN ID Mismatches. The number of ARE and STE frames that were discarded because of a LAN ID mismatch.

Hop Count Exceeded - Inbound/Outbound. The total inbound and outbound hop count for source router STE and ARE frames. See *Configuring Source Routing/Virtual Rings* on page 15-33 to configure the inbound and outbound hop counts.

SAP Filtering

The Service Advertising Protocol (SAP) filter is a method for allowing the user to decide what type of source routed packets are allowed to be transmitted out of the switch. When the filters are configured, they examine the DSAP (destination) and SSAP (source) fields in an outgoing packet, compare them to the filter values to see if they match, and then either allows or blocks packet transmission.

There are two types of filters that can be configured: a "permit" filter and a "deny" filter. If a packet matches the value in a deny filter, and the value is not 0, then the packet is discarded. If a permit filter is configured, and a packet does *not* match the filter value, then the packet is discarded. Only two of each type of filter can be configured.

To use this feature, it must first be enabled, then configured. Once a filter is enabled and configured, it can be viewed as part of the source routing statistics. These procedures are covered in the following sections:

- For information on enabling the SAP filter see *Enabling SAP Filtering* on page 15-38.
- For information on configuring SAP filters, see *Configuring SAP Filtering* on page 15-39.
- For information on viewing SAP filters, see *Viewing SAP Filtering* on page 15-40.

Enabling SAP Filtering

To use the **srsf** command to enable SAP filtering, follow the steps below:

1. Enter the **srsf** command at the system prompt.
2. The following message is displayed:

   SAP Filter support is OFF, set it to ON? (n) :

   Enter **y** and press **<return>**.
3. Another message is displayed confirming the activation of the SAP filtering feature:

   SAP Filter Support is now "ON"

Disabling SAP filtering

To disable the SAP feature, use the **srsf** command as shown:

1. Enter the **srsf** at the system prompt.
2. The following message is displayed:

   SAP Filter support is ON, set it to OFF? (n) :

   Enter **y** and press **<return>**.
3. The following message is displayed:

   Remove all SAP Filter values? (n) :

   Enter a **y** to remove the configured filters, or an **n** to keep configured filters, and press **<return>**. See *Configuring SAP Filtering* on page 15-39 for information on how to set up a SAP filter.
4. Another message is displayed confirming the deactivation of the SAP filtering feature:

   SAP Filter Support is now "OFF"

Configuring SAP Filtering

Once SAP filtering is activated, it is necessary to configure the filter value. This value is compared to the value of the packets DSAP and SSAP fields. Filters consist of 4 alphanumeric bits, 2 for the DSAP and 2 for SSAP. After enabling SAP filtering, another column is added to the src command, and four prompts are added to the ring configuration options.

To configure the filter value:

1. Enter the **src** command at the system prompt. The following screen is displayed:

```
Source Routing Parameters for Group 1 (Default GROUP (#1))

    Slot  Type/          Ring        Bridge      Largest  HopCnt  Port   Block   SAP
    Intf  Inst/Srvc      Number      Number      frame    In Out  Type   ARE     Filter
    ----- -------------- ----------- ----------- -------- --- --- ------ ------- ---------
1.  2/ 1  Brg/ 1/ na     1 (0x001)   10 (0xA)    590      6   6   SRT    n
2.  3/ 1  Brg/ 1/ na (V) 2 (0x002)   10 (0xA)    4472     7   7   SRT    n
3.  3/ 2  Brg/ 1/ na     4 (0x004)   10 (0xA)    4472     7   7   SRT    n
4.  3/ 3  Brg/ 1/ na     5 (0x005)   10 (0xA)    4472     6   6   SRT    n
5.  3/ 4  Brg/ 1/ na     3 (0x003)   10 (0xA)    4472     7   7   SRT    n
6.  3/ 5  Brg/ 1/ na (V) 2 (0x002)   10 (0xA)    4472     7   7   SRT    n
7.  3/ 6  Brg/ 1/ na (V) 3 (0x003)   10 (0xA)    4472     7   7   SRT    n

Enter index of the entry to configure (e.g. 1) <RETURN> to exit :
```

2. Enter the index number (on the far left) for the ring you want to filter.
3. Several prompts for configuring the ring are displayed. Follow the prompts and enter the values required, or accept the current values if the ring is already configured. The following prompt is shown:

   Output SAP Deny Filter 1 (0000):

   Enter the SAP value that the first deny filter should screen. Any packet matching this filter will be rejected. Excepting the default of **0000** is the same as not having a filter.

4. Press **<return>**. The second deny filter prompt is displayed:

   Output SAP Deny Filter 2 (0000):

   Enter the SAP value that the first deny filter should screen. Any packet matching this filter will be rejected. Excepting the default of **0000** is the same as not having a filter.

5. Press **<return>**. The first permit filter prompt is displayed:

   Output SAP Permit Filter 1 (0000):

   Enter the SAP value that the first permit filter should screen. Any packet *not* matching this filter will be rejected. Excepting the default of **0000** is the same as not having a filter.

6. Press **<return>**. The second permit filter prompt is displayed:

   Output SAP Permit Filter 2 (0000):

   Enter the SAP value that the first permit filter should screen. Any packet *not* matching this filter will be rejected. Excepting the default of **0000** is the same as not having a filter.

7. Press **<return>**. A final message asking to save the new configuration is displayed:

   Save the new configuration? (y/n) :

   Enter a **y** to save the configuration, or an **n** to cancel the operation.

Viewing SAP Filtering

To see how many SAP filters are configured for a specific ring, enter the **srs** command at the system prompt. A screen similar to the following appears:

```
Source Routing Parameters for Group 1 (Default GROUP (#1))

    Slot  Type/          Ring      Bridge    Largest  HopCnt  Port   Block  SAP
    Intf  Inst/Srvc      Number    Number    frame    In Out  Type   ARE    Filter
    ----- -------------- --------- --------- -------- --- --- ------ ------ ------
1.  2/ 1  Brg/ 1/ na     1 (0x001) 10 (0xA)  590      6   6   SRT    n      1
2.  3/ 1  Brg/ 1/ na (V) 2 (0x002) 10 (0xA)  4472     7   7   SRT    n      2
3.  3/ 2  Brg/ 1/ na     4 (0x004) 10 (0xA)  4472     7   7   SRT    n
4.  3/ 3  Brg/ 1/ na     5 (0x005) 10 (0xA)  4472     6   6   SRT    n
5.  3/ 4  Brg/ 1/ na     3 (0x003) 10 (0xA)  4472     7   7   SRT    n
6.  3/ 5  Brg/ 1/ na (V) 2 (0x002) 10 (0xA)  4472     7   7   SRT    n
7.  3/ 6  Brg/ 1/ na (V) 3 (0x003) 10 (0xA)  4472     7   7   SRT    n

Enter index of the entry to configure (e.g. 1) <RETURN> to exit :
```

The last column (**SAP Filter**) lists how many SAP filters are in place for the ring. See *Configuring SAP Filtering* on page 15-39 for information on configuring the SAP filter.

Configuring Source Route to Transparent Bridging

In order to provide switching between source-routed token ring networks supporting the IBM Spanning Tree, and transparently bridged networks (primarily Ethernet supporting 802.1d Spanning Tree), commands have been provided in the bridging menu to enable Source Route to Transparent Bridging (SRTB) on a configured group basis.

It is important not to confuse SRTB with source-route transparent (SRT) bridging. SRT bridging is the defined method for bridging on source-routed networks. In SRT bridging, all bridges run the 802.1d Spanning Tree. SRT bridges have the ability to forward a frame based on source-routing information if a Routing Information Field (RIF) is present. Frames without a RIF are bridged transparently. SRT does not provide the ability to switch between a pure source-routed network and a transparent network.

SRTB allows source-routed token ring networks and transparently bridged networks to exist in the same group, and supports connectivity between end systems on the token ring network and the end systems on the transparently bridged network.

The SRTB functions in the following network environments:

- Between token ring and Ethernet networks.
- Between token ring networks and Ethernet LAN emulation (LANE).
- Between token ring LAN emulation and Ethernet networks.

♦ Note ♦

Ethernet networks include 10Mbit, 10/100 MB, and Gigabit networks.

Enabling SRTB for a Group

The **srtbcfg** command allows you to display configured groups and the status of SRTB (either **on** or **off**), and to enable or disable SRTB for a specific group. To display groups and the status of SRTB:

1. Enter the **srtbcfg** command at the system prompt, as shown

   ```
   srtbcfg
   ```

   A screen similar to the following is displayed:

   ```
   Group    1: SRTB is OFF
   Group    2: SRTB is ON
            Default Explorer: STE Ethernet Ring ID: 291(x123)
   Group    3: SRTB is ON
            Default Explorer: ARE Ethernet Ring ID: 561(x231)

   /VLAN SRTB>
   ```

2. To enable SRTB for a group, enter the **srtbcfg** command at the system prompt, as shown:

   ```
   srtbcfg <groupNumber>
   ```

   where **<groupNumber>** is the number of the group for which SRTB is to be enabled. For example, to enable SRTB for Group 1, you would enter the following:

   ```
   srtbcfg 1
   ```

3. Once you have entered the command, a screen similar to the following is displayed:

   ```
   Group    1: SRTB is OFF
     Would you like to turn on SRTB ? (n) :
   ```

   Enter **y** to enable SRTB for this group.

4. Once you have enabled SRTB, the following prompt appears:

   ```
   Enter Ring ID for Ethernet segment(s) (0 - 0x0)? :
   ```

   Create a ring ID for the Ethernet segment assigned to this group. This number can be in decimal or hexadecimal form, but it must be unique. For example, if you have a token ring segment with a ring ID of 2, then you could not assign the number 2 to an Ethernet ring ID.

5. Once you have assigned an Ethernet token ID, the following prompt appears:

   ```
   Send Multicast/unknown frames as STE or ARE ? (STE) :
   ```

   Choose to employ Spanning Tree Explorer (STE) frames or All Route Explorer (ARE) frames by entering **ste** or **are**. Explorer frames are sent to learn MAC addresses when there is no record in the RIF table. ARE frames ignore port blocks set up by spanning tree to avoid loops, while STE frames adhere to the spanning tree configuration. The default is **STE**.

6. Once you have selected the frame type, you are returned to the menu prompt. By reentering the **srtbcfg** command as you did in step 1, you can now see that SRTB has been activated for group 1, as shown:

```
Group   1: SRTB is ON
        Default Explorer: STE Ethernet Ring ID: 871(x321)
Group   2: SRTB is ON
        Default Explorer: STE Ethernet Ring ID: 291(x123)
Group   3: SRTB is ON
        Default Explorer: ARE Ethernet Ring ID: 561(x231)
```

The ring ID and default explorer frame are shown as well.

Disabling SRTB for a Group

To turn SRTB off for a group, enter the **srtbcfg** command as shown

```
srtbcfg <groupNumber>
```

where **<groupNumber>** is the number of the group for which you want to disable SRTB. For example, to disable SRTB on Group 3, you would enter:

```
srtbcfg 3
```

The following prompt appears:

```
Group   3: SRTB is ON
        Default Explorer: ARE Ethernet Ring ID: 561(x231)
Would you like to turn off SRTB ? (n) :
```

Enter **y** to disable SRTB. Once you have done this you are returned to the system prompt. To view the changes to the group, enter the **srtbcfg** command to display a screen similar to the following:

```
Group   1: SRTB is ON
        Default Explorer: STE Ethernet Ring ID: 871(x321)
Group   2: SRTB is ON
        Default Explorer: STE Ethernet Ring ID: 291(x123)
Group   3: SRTB is OFF
```

Viewing the RIF Table

A Routing Information Field (RIF) is stored for each MAC address learned on a token ring port. One RIF is stored for each MAC address. The maximum size of each RIF is 32 bytes (long enough to traverse 15 bridge hops)

Once a RIF is learned for a MAC address, it is maintained until the MAC address is aged out of the CAM. You can view a list of RIFs using the **srtbrif** command. To view the RIF table follow these steps:

1. Enter the **srtbrif** command at the menu prompt. The following prompt is displayed:

   Enter MAC address ([XXYYZZ:AABBCC] or return for none) :

   Enter the MAC address for which you want to see the RIF and press **<return>**, or enter a **<return>** without a MAC address to list all RIFs.

2. Once you enter a MAC address (or **<return>**), the following prompt appears:

   Enter Group ID (return for all Group) :

   Enter a group ID and press **<return>**, or enter a **<return>** without a group ID to list the RIFs for all groups.

3. Once you enter the group ID (or **<return>**), a screen similar to the following appears:

Port	Group ID	Non-Canonical MAC Address	CAM Indx	Len	RIF
4/ 1/Brg/ 1	2	10009E:4B7DE1	010E	6	0610:1231:0010:

Field Descriptions

The following section describes the fields shown using the **srtbrif** command.

Port. This field lists the slot, port number, service type, and instance number for where the RIF was learned for this MAC address.

Group ID. The group number with which this RIF is associated.

Non-Canonical MAC Address. The MAC address for this RIF. It is shown in non-canonical form.

CAM Indx. The index number in the Content-Addressable Memory (CAM), where the MAC addresses are stored, in hexadecimal form.

Len. The length of the RIF packet, in bytes.

RIF. The RIF address for this MAC address.

Clearing the RIF Table

If there is a topology change in your network, you most likely will need to clear one or more RIFs from the table so that SRTB can relearn them. You can clear specific entries for MAC addresses in the RIF table, or flush the entire table with the **srtbclrrif** command. To clear an entry in the RIF table:

1. Enter the **srtbclrrif** command at the system prompt. The following prompt appears:

   Enter MAC address ([000000:000036] or return for none) :

   Enter the MAC address for the RIF entry you wish to clear in canonical or non-canonical form, and press **<return>**. If you enter **<return>** without a MAC address, you will flush the entire table of RIF entries.

2. Once you have entered the MAC address, the following prompt appears:

   Is this MAC in Canonical or Non-Canonical (C or N) [N] :

   If you entered the MAC address in canonical form, enter a **c**. If you entered the MAC address in non-canonical form, enter an **n**. If you respond incorrectly, the RIF entry will not be deleted.

3. Once you entered the distinction of canonical or non-canonical, the following prompt appears to verify the deletion on the RIF entry:

   RIF clear successfully!