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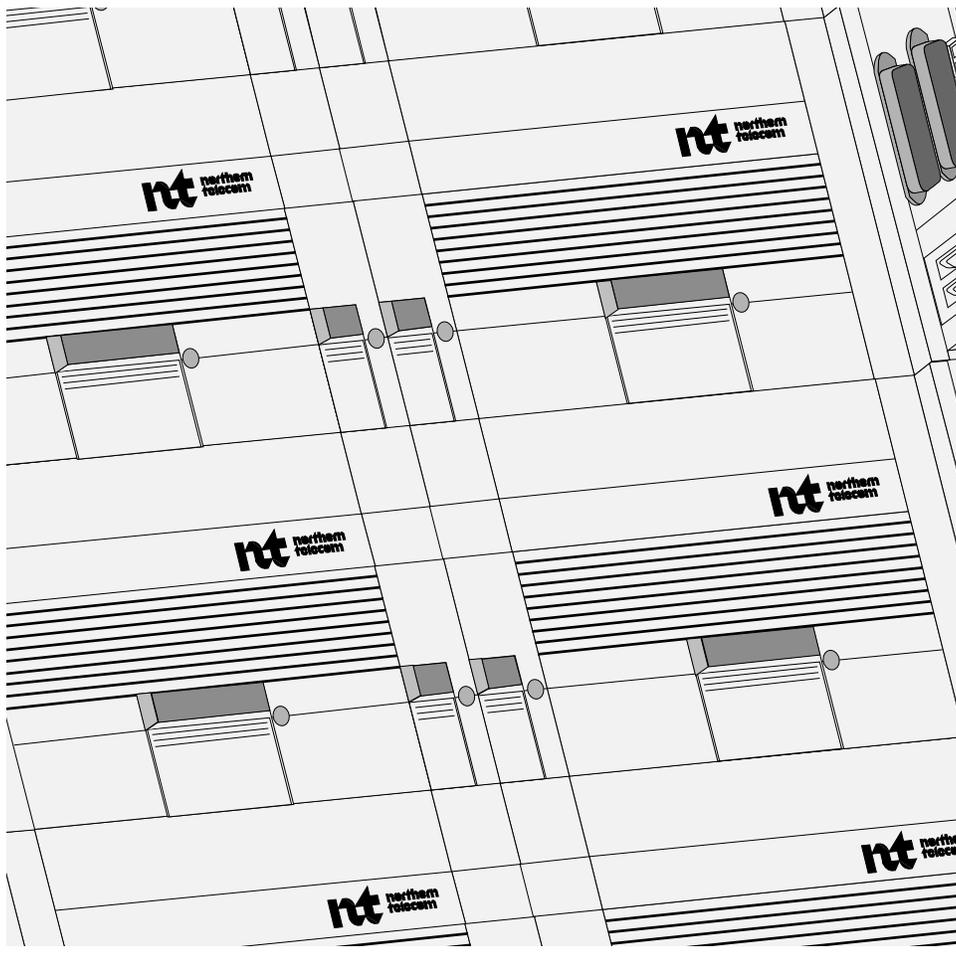
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SONET Products

AccessNode

Mapper Layouts Planning Guide

Issue 3.0 October 1999



NORTEL
NETWORKS™

SONET Products

AccessNode

Mapper Layouts Planning Guide

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June 1996

AN12 Standard 01.01 release of this document. This document has been newly developed for AN12; certain information contained in this document was previously found in the following documents:

- *Engineering and Ordering Information*, 323-3001-032
- *Signal Flow and Circuit Pack Description*, 323-3001-102, in *Description*, Volume 2A
- *Commissioning and Testing*, Volume 3

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About this document

This document contains information you need to plan and engineer a site for the installation of DS1, DS3, STS-1, OC-3, and OC-12 mappers in AccessNode equipment.

Audience

This document is intended for experienced engineers or system planners who are familiar with the system requirements for installing telecommunications equipment.

How to use this document

The following table lists the topics contained in this planning document. Refer to the topics in the order presented.

Topic	See
Introduction	page 1-1
Equipping rules and restrictions for the ABM shelf	page 2-1
Equipping rules and restrictions for the TBM shelf	page 3-1
Preparing the worksheets	page 4-1
Tables and sample mapper layouts	page 5-1
Appendix A: Worksheets	page 6-1

References in this document

The following documents are referenced in this NTP. You should have these documents on hand while you work through this document.

Engineering, Configuration, and Ordering Guide, Volume 1

- *Engineering and Ordering Information*, 323-3001-032
- *Site Installation Planning and Engineering*, 323-3001-200

Description, Volume 2A

- *Configuration and Equipment Description*, 323-3001-100
- *Signal Flow and Circuit Pack Description*, 323-3001-102
- *Protection Switching Description*, 323-3001-103

Description, Volume 2B

- *Line and Loop Testing Overview*, 323-3001-115
- *System Specifications*, 323-3001-180

Operations, Administration, and Provisioning, Volume 4B

- *Provisioning and Operations Procedures*, 323-3001-310

Separately-bound documents

- *AccessNode/AccessNode Express Mix & Match DFA Reconfiguration Quick Reference Guide*

Introduction

Use this document when planning an AccessNode system and preparing tributary mapper (circuit pack) layouts.

Chapter contents

This chapter contains the following information:

Topic	See
Before you begin	page 1-2
Planning and recording your mapper layout	page 1-2
About the worksheets	page 1-3
Topics of subsequent chapters	page 1-4

Before you begin

Before planning your AccessNode system, you should have some basic background and understanding of AccessNode system topologies and applications.

You can find this information in the following documents: *Configuration and Equipment Description*, 323-3001-100, *Signal Flow and Circuit Pack Description*, 323-3001-102, and *Protection Switching Description*, 323-3001-103, in *Description*, Volume 2A.

This document contains the provisioning rules and system limitations you need when planning your mapper layouts, as well as examples to show you how to complete the worksheets.

Filling in these worksheets correctly aids you in determining critical information about your system, such as:

- system capability in terms of maximum add and drop capacity through any kind of tributary: OC-3, STS-1, DS1, DS3
- when to add an additional ring node in a central office where more than 168 DS1s are to be dropped
- the best configuration to implement according to bandwidth requirements and the system's limitations
- how many circuit packs to order

Planning and recording your mapper layout

This section discusses how to plan and record your mapper layout.

Process overview

Start by reviewing the appropriate chapters in this guide for your shelf type:

- Access bandwidth manager (ABM) shelves: Chapters 2, 4, and 5
- Transport bandwidth manager (TBM) shelves: Chapters 3, 4, and 5

Use the forms in Appendix A to record where the DS1 and DS3 mappers and their corresponding input/output cards are installed in the common-equipment shelf. Three mapper layout forms are provided within the procedure: one for ABM–ABM applications, one for TBM–ABM applications, and one for TBM–TBM applications. To guide you in filling out these forms, a sample of a completed form also is provided in Appendix A.

Review Chapter 5 in this guide before expanding your system.

Example

Plan your layout carefully because although it is possible to move mappers after the mappers are in service, the effort is substantial, and service is affected.

For example, if you have to move a DS1 mapper carrying GR-303 and DS1 tandem traffic from an odd slot to an even slot (or vice versa), you must delete all GR-303 and DS1 tandem line terminations before the move, then reprovision them.

Tributary terminology in this document

This document discusses tributary concepts as follows: mappers and circuit packs refer to the hardware that support tributaries; facilities are the network connections used by the AccessNode system(s).

Table 1-1 shows the facilities supported by each mapper or circuit pack.

Table 1-1
Facilities supported by AccessNode hardware

This mapper/circuit pack	Supports these facilities
DS1 mapper	14 DS1s
DS3 mapper	3 DS3s
STS-1 interface	3 STS-1s
OC-3 circuit pack	3 STS-1s or 1 STS-3c (concatenated)

About the worksheets

Appendix A contains blank worksheets for fiber-fed systems, for DS1-fed systems, for VTBM rings, and for single-ended systems. When filling out a worksheet, follow the step-by-step instructions in Chapter 4 and use the worksheets that are suited to the system type you are planning.

- The first worksheet is the *Host Messaging Unit LAPD Port Calculation Worksheet*.

This form is used to determine the number of messaging ports needed for each network element. This information is needed to know the number of hosts to which each network element can connect.

- The next worksheets are the *Tributary Equipment Worksheets*. Three versions of the tributary equipment layout form are provided:
 - ABM–ABM form
 - TBM–ABM form
 - TBM–TBM form

These forms are used to record where the mappers and their corresponding input/output cards are installed in the ABM or the TBM shelf.

The tributary equipment layout forms also help if you have a point-to-point system that requires you to set up STS connections manually. STS connections are set up later, just before end-to-end tests described in *Commissioning and Testing*, Volume 3.

To guide you in filling out these forms, a sample of a completed form is also provided.

- The last form is the *OMC Link Information Worksheet*. It is used to record the OMC link information required for DS1-fed AccessNode (DFA) systems only.

Note: Before completing any of the worksheets, you should make photocopies of the blank worksheets in Appendix A for future use. Also, for your own records, photocopy all worksheets after you complete them.

Once you have planned and recorded the mapper layout, you can use this information throughout site and system tests, as well as during provisioning procedures.

Topics of subsequent chapters

Subsequent chapters in this document cover the following topics:

- Chapter 2 explains the equipping rules and restrictions for the modules that are installed in the ABM shelves.
- Chapter 3 explains the equipping rules and restrictions for the modules that are installed in the TBM shelves.
- Chapter 4 provides step-by-step task lists, by specific configuration, for you to follow when filling out the mapper layout worksheets.
- Chapter 5 contains the mapper layouts for example configurations for you to reference when filling out the blank worksheets. It also contains reference tables outlining shelf capacities, and group and slot associations.
- Appendix A provides blank mapper worksheets that can be photocopied, including a completed sample worksheet.

Equipping rules and restrictions for the ABM shelf

This chapter contains equipping rules and restrictions for the OC-12 STS-1 Reorder and Protection ASIC (SRP), OC-12 virtual tributary bandwidth manager (VTBM), OC-3, DS1, and DS3 circuit packs and cards that install in the access bandwidth manager (ABM) shelf. It also covers equipping rules and restrictions for DS1-fed (DFA) systems.

Chapter contents

To find information on a specific module, refer to the appropriate page.

Topic	See
ABM shelf functions	page 2-2
ABM feeder circuit packs	page 2-3
Tributary slot usage and traffic-handling capacity of the ABM shelf	page 2-6
DS1 tributary cards in an ABM shelf	page 2-7
DS3 tributaries in an ABM shelf	page 2-14
OC-3 tributaries (NT7E01) in an ABM shelf	page 2-18
Default and non-default mappings for ABM shelf functions	page 2-21

This chapter discusses the feeder circuit packs first, because the type of feeder in the shelf determines the maximum number of tributary circuit packs that the shelf can support. The equipping rules and slot locations of the tributary circuit packs are discussed in the latter part of the chapter.

You should become familiar with the rules and restrictions in this chapter before attempting to fill in the tributary mapper layout worksheets in Appendix A. For more descriptive-level information on these circuit packs, refer to *Signal Flow and Circuit Pack Description*, 323-3001-102, in *Description*, Volume 2A.

For equipping rules and restrictions of these circuit packs and cards in the transport bandwidth manager shelf, see Chapter 3, “Equipping rules and restrictions for the TBM shelf.”

ABM shelf functions

There are four ABM shelf functions. These functions vary depending on whether the OC-3/OC-12 SRP or the OC-12 VTBM circuit packs are installed in the shelf.

- For AccessNode ABM shelves that contain the OC-3 SRP or OC-12 interface circuit pack, the shelf functions are **RFT** and **FCOT**.
- For AccessNode ABM shelves that contain the OC-12 VTBM circuit pack, the shelf functions are **RFT_BLSR** and **FCOT_BLSR**.

Table 2-1 summarizes the ABM shelf functions and lists the AccessNode systems which they support.

Table 2-1
System support of ABM shelf functions

Feeder type	Shelf function	Max DS1s	Supports these systems
OC-3 SRP	RFT	56	point-to-point, single-ended
OC-12 SRP	RFT	98	point-to-point, single-ended
	FCOT	98	point-to-point, single-ended
OC-12 VTBM	RFT_BLSR	98	VTBM ring
	FCOT_BLSR	98	VTBM ring

These shelf functions are selected in the OPC Commissioning Manager and are differentiated by the type of feeder circuit packs they contain (the OC-12 SRP or the OC-12 VTBM). For information about using the Commissioning Manager, see *Commissioning and Testing*, Volume 3.

The equipping rules and restrictions for these four shelf functions are discussed in the following sections.

ABM feeder circuit packs

This section discusses the placement and engineering limitations for the ABM feeder circuit packs.

OC-12 SRP interface circuit pack (NT7E02) as an ABM feeder

The OC-12 interface circuit pack installs in the lower level of an ABM shelf. This circuit pack is installed in pairs, which provides nonrevertive protection switching. The two OC-12 interface circuit packs act as the primary interface to the fiber optic feeder.

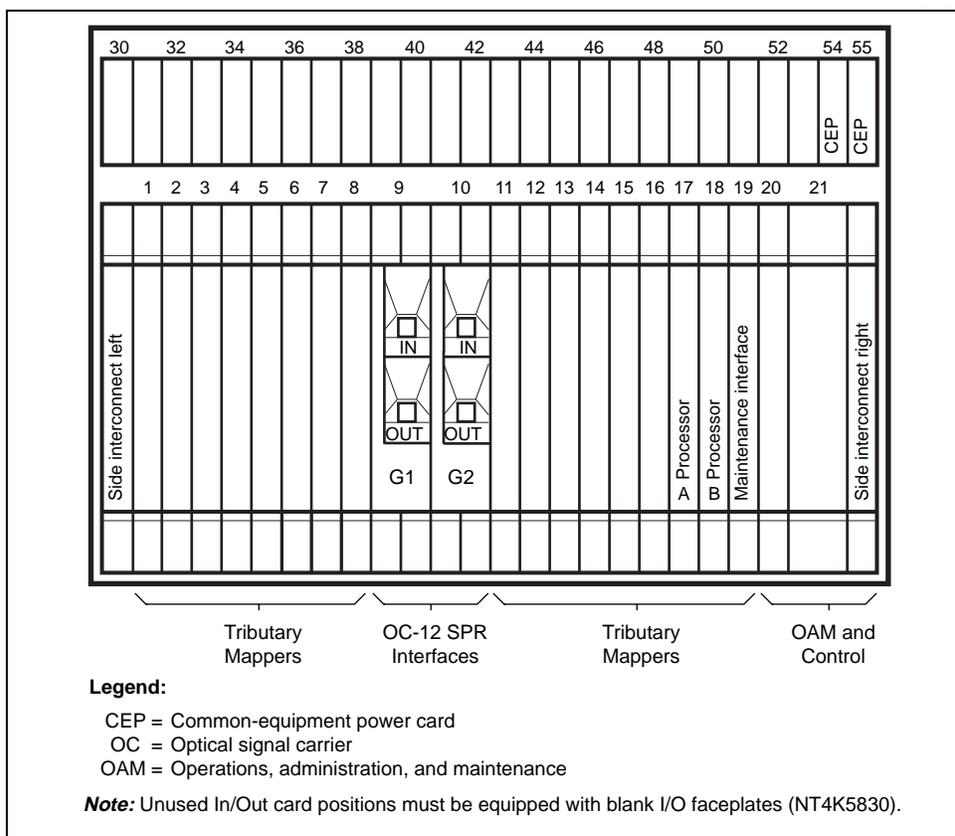
The following ABM shelf functions can use the OC-12 SRP interface:

- RFT
- FCOT

In an ABM shelf, the OC-12 interface circuit packs are always installed in slots 9 and 10, as shown in Figure 2-1.

Figure 2-1
Location of OC-12 interface circuit packs in the ABM shelf

PC-15894



OC-12 VTBM circuit pack (NT7E05) as an ABM feeder

The OC-12 VTBM circuit pack is used as the interface to the primary fiber optic feeder in network elements in fiber-fed systems that have VTBM ring topology.

Two interface cards are required in each network element. One card handles traffic (working and protection) traveling to and from the east direction of the node, and the other card handles traffic (working and protection) traveling to and from the west direction of the node.

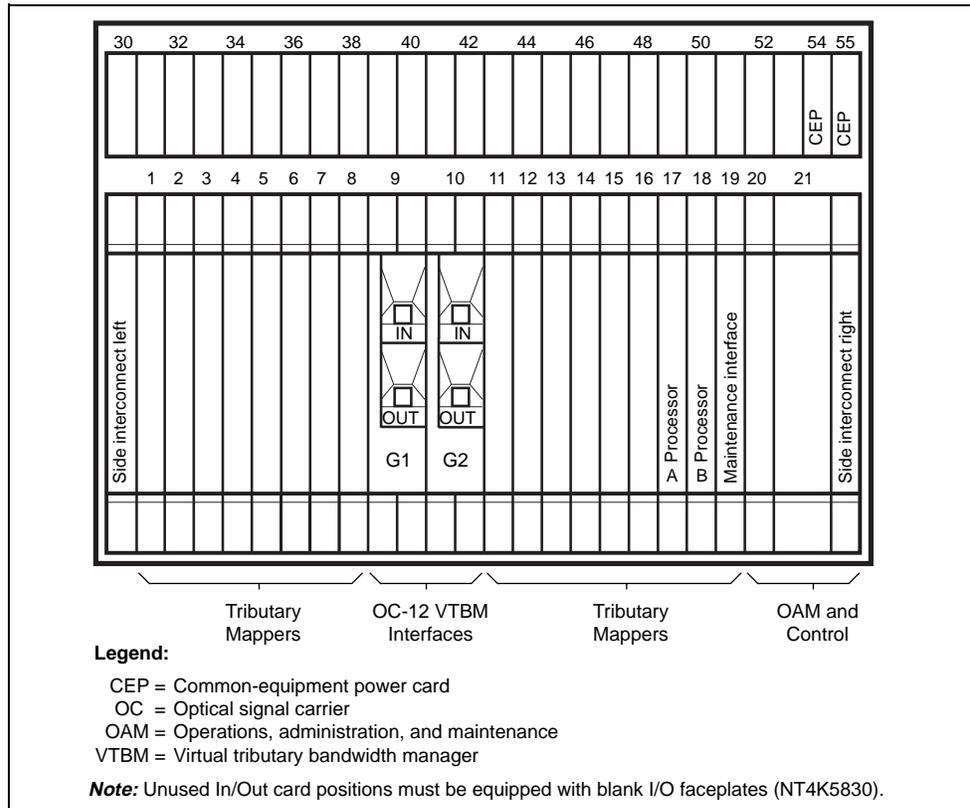
The following ABM shelf functions can use the OC-12 VTBM interface circuit pack:

- RFT_BLSR
- FCOT_BLSR

In a network element in an AccessNode fiber-fed ring system, the OC-12 VTBM circuit packs (G1 and G2) are always installed in slots 9 and 10, as shown in Figure 2-2.

Figure 2-2
Location of OC-12 VTBM interface circuit packs in the ABM shelf

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OC-3 interface circuit pack (NT7E01) as an ABM feeder

The OC-3 interface circuit pack is like the OC-12 interface circuit pack, with the exception that it processes a maximum of three (rather than 12) STS-1 signals in each direction (transmit and receive).

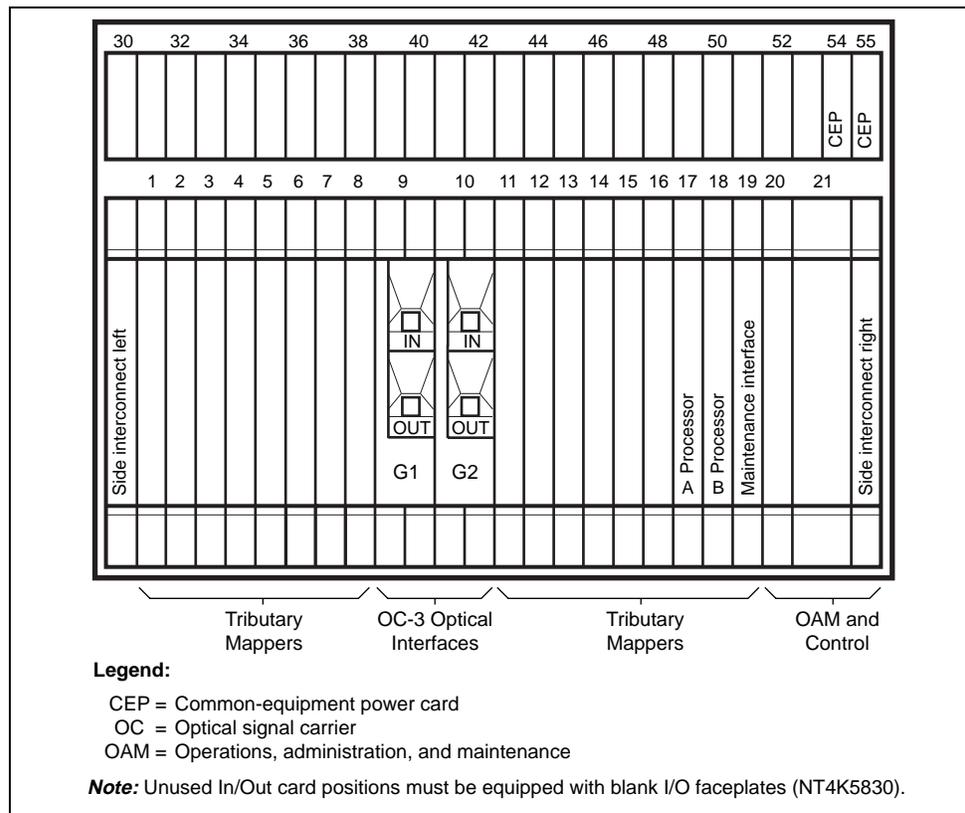
The OC-3 interface circuit packs install in pairs, which provide nonrevertive protection switching. The OC-3 interface circuit pack can be installed in a single-ended network element as a primary fiber optic feeder, or in an OC-12 network element as an OC-3 tributary. The following ABM shelf functions can use the OC-3 interface circuit pack:

- RFT
- FCOT

If OC-3 interface circuit packs serve as the primary fiber optic feeder for a network element, they are installed in slots nine and ten in the ABM shelf in as shown in Figure 2-3.

Figure 2-3
Location of OC-3 interface circuit packs used as network feeders in the ABM shelf

PC-15896



For information on the OC-3 interface circuit pack as the interface to the primary fiber optic feeder, see the information on the OC-12 interface circuit pack, beginning on page 2-3. All the information about the OC-12 interface circuit pack is also true of the OC-3 interface circuit pack, except that the OC-3 handles three STS-1s rather than 12. OC-3 interface circuit packs support the following STS-1s in the optical bandwidth: STS-1 #1, STS-1 #2, and STS-1 #3.

Tributary slot usage and traffic-handling capacity of the ABM shelf

In an ABM shelf, slots 1 to 8 hold the modules that handle DS1, DS3, and OC-3 tributaries. Also, if the shelf contains an operations controller module, it occupies slots 5 to 8.

Table 2-2 shows the possible slot locations for DS1, DS3, and OC-3 interface circuit packs, as well as the designated slots for the operations controller (OPC). Use this table to calculate the available mix of circuit packs for each ABM shelf.

Table 2-2
Possible uses of slots 1 to 8 in an ABM shelf

1	2	3	4	5	6	7	8
				OPC module			
OC-3		OC-3 (Protection)		OC-3		OC-3 (Protection)	
Protection		DS3		DS3		DS3	
DS1	DS1	Protection	DS1	DS1	DS1	DS1	DS1
Note: If a DS3 mapper is installed in slot 3, slot 5, or slot 7, the slot to the right must remain empty.							

For information on the traffic-handling capacity of a system, see *Engineering and Ordering Information*, 323-3001-032, in the *Engineering, Configuration, and Ordering Guide*, Volume 1. That document contains tables listing the possible combinations of tributaries (DS1s, DS3s, and OC-3s) that an ABM shelf can support.

Restrictions in case of a mix of DS1s, DS3s, and OC-3s in the ABM

If an ABM shelf contains a mix of DS1 mappers, DS3 mappers, and tributary OC-3 interface circuit packs, the following restrictions apply to the OC-3 tributaries:

- If a DS1/VT protection mapper has been provisioned (slot 3), you cannot provision a tributary OC-3 interface circuit pack in that slot.
- If the shelf contains one or more DS3 mappers, you cannot provision a tributary OC-3 interface circuit pack in slot 1 regardless of whether slots 1 and 2 are used for DS3 protection.

DS1 tributary cards in an ABM shelf

After you know the feeder type for your system, shelf function, and the maximum number of DS1s it can support, read the following sections to determine where to place the tributary cards in the ABM shelf.

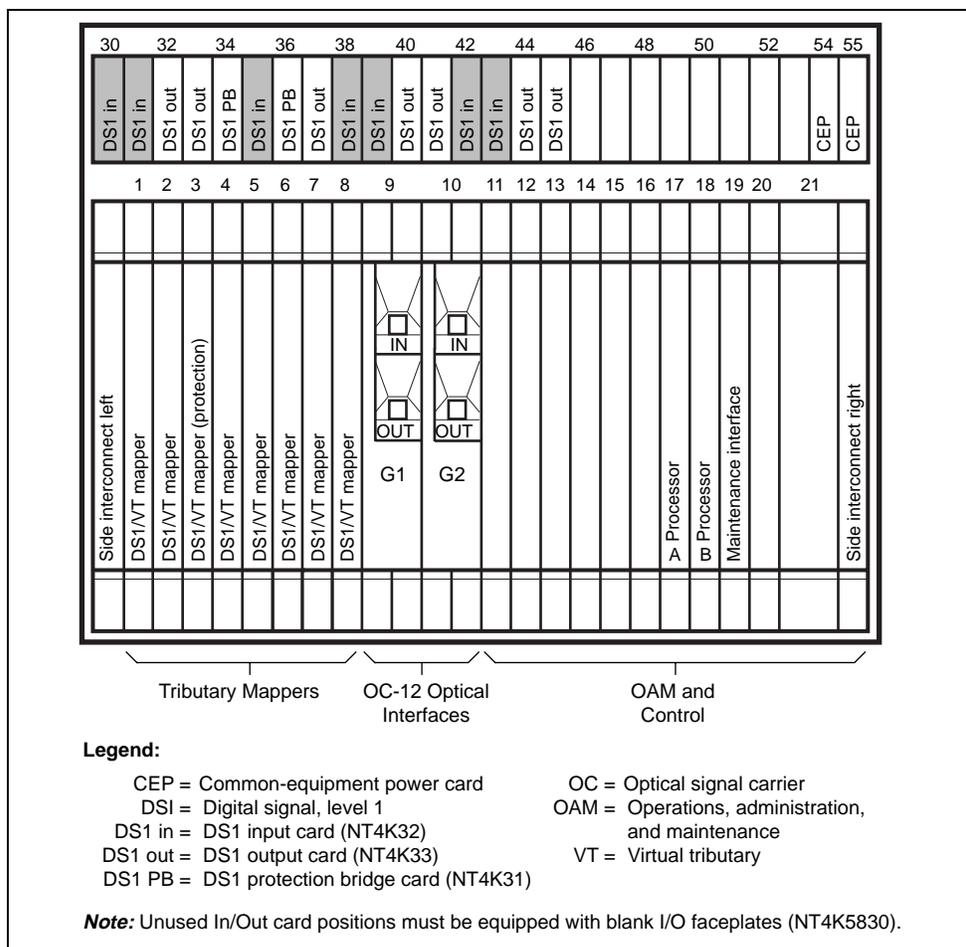
The DS1 cards work together as a DS1 circuit-pack group and are explained in the following order:

- DS1 input card
- DS1 output card
- DS1 protection bridge card
- DS1 mapper

Figure 2-4 shows the slots in which these cards can be installed in an ABM shelf.

Figure 2-4
DS1 card locations in an ABM shelf

PC-15912



Group and slot associations for DS1 in ABM

For each working DS1 mapper in the lower level of the shelf, there must be one DS1 input card and one DS1 output card equipped in the upper level.

The circuit-pack group includes a DS1/VT mapper in the lower level of the shelf, and its two associated I/O cards in the upper level. The slots for each circuit-pack group are linked by fixed connections in the backplane.

Table 2-3 shows the groupings and lists the names of the groups.

Table 2-3
DS1 circuit-pack groups in the ABM shelf

Group	DS1/VT mapper	DS1 input card	DS1 output card
Group 1	slot 1	slot 30	slot 32
Group 2	slot 2	slot 31	slot 33
Group 4	slot 4	slot 35	slot 37
Group 5	slot 5	slot 38	slot 40
Group 6	slot 6	slot 39	slot 41
Group 7	slot 7	slot 42	slot 43
Group 8	slot 8	slot 44	slot 45
Protection	slot 3	DS1 protection bridge cards in slots 34 and 36	
Note: In an RFT in a point-to-point fiber-fed system, you can install groups 5, 6, 7, and 8 only if the FCOT in the system does not contain an operations controller (OPC) module in slots 5 to 8.			

DS1 input card (NT4K32)

The DS1 input card installs in the upper level of an ABM shelf. Each DS1 input card handles 14 DS1 channels of input, that is, all the DS1 input to a DS1/VT mapper. Input DS1 signals enter the AccessNode, go to the DS1 input card, then to the associated DS1/VT mapper.

Figure 2-4 shows the slots in which DS1 input cards can be installed in an ABM shelf. Each DS1 input card is a member of a DS1 circuit-pack group.

**CAUTION****Untraceable failures**

Install DS1 input cards only in their intended slots, and only if DS1/VT mappers are installed in the associated lower-level slots. If you install a DS1 input card in the wrong slot, or install one without an associated mapper, failures could occur, and the resulting logs and alarms might not point to the improperly installed card.

DS1 output card (NT4K33)

The DS1 output card installs in the upper level of an ABM shelf. Each DS1 output card handles 14 DS1 channels of output, that is, all the DS1 output from a DS1/VT mapper. Output DS1 signals go from the DS1/VT mapper to the associated DS1 output card, and then out of the AccessNode.

Figure 2-4 on page 2-7 shows the slots in which DS1 output cards can be installed in an ABM shelf. Table 2-3 on page 2-8 shows the groupings and lists the names of the groups.

**CAUTION****Untraceable failures**

DS1 output cards should be installed only in the intended slots, and only if DS1/VT mappers are installed in the associated lower-level slots. If you install a DS1 output card in the wrong slot, or install one without an associated mapper, failures may occur, and the resulting logs and alarms may not point to the improperly installed card.

DS1 protection bridge card (NT4K31)

The DS1 protection bridge card (DS1 PB) installs in the upper level of an ABM shelf. You install the DS1 protection bridge cards in the upper-level slots that are associated with the lower-level slot that contains the protection mapper.

In an ABM shelf, the DS1 protection bridge cards install in slots 34 and 36, as shown in Figure 2-6 on page 2-15. Slots 34 and 36 are associated with slot 3 in which the protection mapper is installed.



CAUTION

Untraceable failures

Install DS1 protection bridge cards only in their intended slots, and only if a protection DS1/VT mapper is installed in the associated lower-level slot (in this case, slot 3). If you install a DS1 protection bridge card in the wrong slot, or install one without an associated protection mapper, failures can occur, and the resulting logs and alarms might not point to the improperly installed card.

DS1/VT mapper (NT7E04)

The DS1/VT mapper installs in the lower level of an ABM shelf.

The DS1/VT mapper provides interface circuitry between the DS1 input and output cards and the primary transport optical interface circuit pack (OC-12 interface circuit pack or OC-3 interface circuit pack), or, in a DS1-fed RFT, between the DS1 input and output cards and the timing and cross-connect (TXC) card.

Each DS1/VT mapper can process up to 14 DS1 transmit and 14 DS1 receive signals independently. The DS1/VT mapper generates an STS-1 output from up to 14 DS1 signals. Each DS1 is mapped as a VT1.5, and the VT1.5s are multiplexed into an STS-1. The STS-1 goes to the optical interface circuit pack or to the timing and cross-connect card by way of the shelf backplane.

DS1/VT mapper (NT7E04CA)

The NT7E04CA model of the DS1/VT mapper supports TR-08 DS1s. The NT7E04CA mapper can operate in the following modes:

- byte-synchronous mode
- bit-synchronous
- bit-asynchronous mode (asynchronous mode)

The byte-synchronous mode is required to handle TR-08 DS1s. This mode allows easy identification of the 24 DS0s in a VT1.5. This mode also maintains the timing and phase of the signal throughout the network, and preserves superframe information.

Loopbacks can be performed for link maintenance and fault detection. The line build-out (LBO) range selection is controlled by software and can be set to one of the following:

- short (0–46 m or 0–150 ft)
- medium (46–137 m or 150–450 ft)
- long (137–200 m or 450–655 ft)

Both alternate mark inversion (AMI) line coding and bipolar 8-bit zero code suppression (B8ZS) line coding are accepted.

Slot locations for the DS1/VT mappers in an ABM shelf

In an ABM shelf, you can provision and install working DS1/VT mappers in slots 1, 2, 4, 5, 6, 7, and 8.

Note: You can provision and install working mappers in the same set of slots, regardless of whether OC-12 interface circuit packs or OC-3 interface circuit packs are interfacing to the optical feeder. However, if the shelf is equipped with OC-3 interface circuit packs, the traffic to and from the shelf can use a maximum of three STS-1s. The traffic to and from a DS1/VT mapper takes up half of an STS-1, so a shelf equipped with OC-3 interface circuit packs can support up to six working mappers. For more details, see “DS1 tributary cards in an ABM shelf”, beginning on page 2-7.

You can install an optional protection mapper in slot 3. (You cannot install a working DS1/VT mapper in slot 3.) If a protection mapper is installed, the protection arrangement is 1:n revertive.

Note: Core software supports protection switching for the mappers in an FCOT. The software to support protection switching for DS1/VT mappers in an RFT is in an optional software feature package.

Figure 2-5 on page 2-12 shows an ABM shelf containing seven working DS1/VT mappers and a protection mapper. This ABM shelf handles 98 DS1s.

Mapper layout of ABM handling 98 DS1s

Figure 2-5 shows an ABM shelf that handles 98 DS1s. The shelf could be used in a fiber-fed point-to-point system as an RFT or an FCOT. (If the shelf were used in an FCOT in a fiber-fed point-to-point system, the system would be served by an operations controller housed in a collocated FCOT or OPC shelf.) The shelf contains the following equipment:

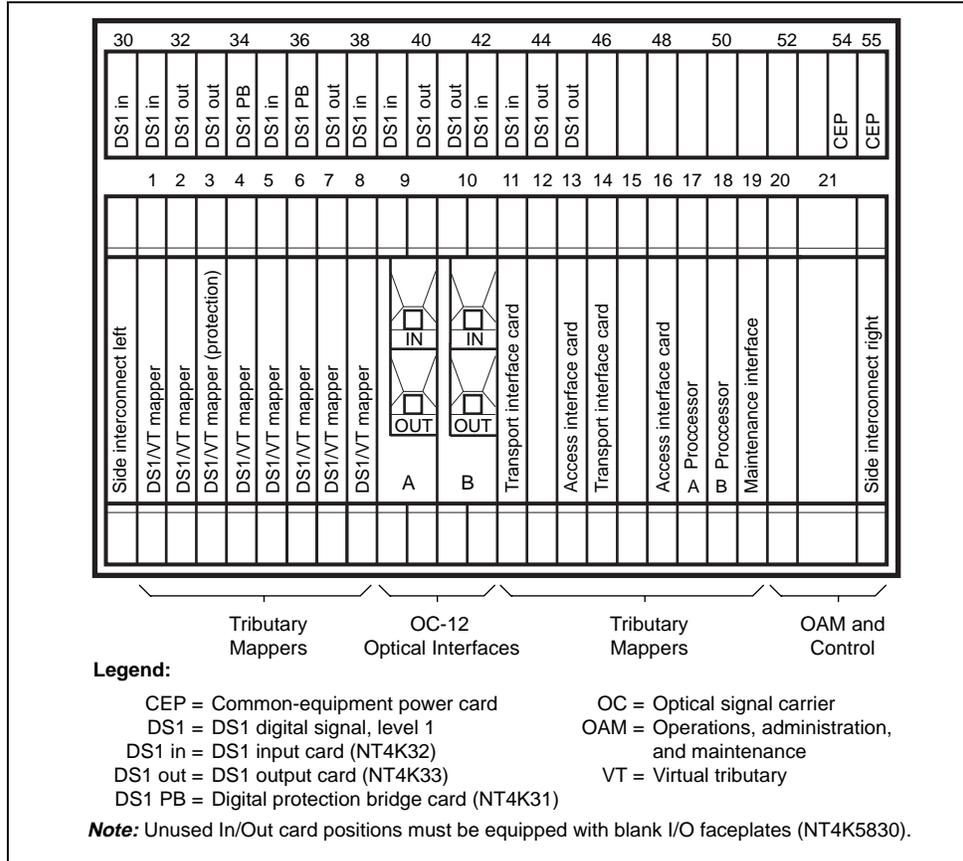
- seven working DS1/VT mappers (in slots 1, 2, 4, 5, 6, 7, and 8)
- one protection DS1/VT mapper (in slot 3)
- seven DS1 input cards (in slots 30, 31, 35, 38, 39, 42, and 43)
- seven DS1 output cards (in slots 32, 33, 37, 40, 41, 44, and 45)
- two DS1 protection bridge cards (in slots 34 and 36)
- two OC-12 interface circuit packs (in slots 9 and 10)
- two transport interface cards (in slots 11 and 14)
- two access interface cards (in slots 14 and 16)

2-12 Equipping rules and restrictions for the ABM shelf

- two processor cards (in slots 17 and 18)
- one maintenance interface card (in slot 19)
- two common-equipment power cards (in slots 54 and 55)

Figure 2-5
Access bandwidth manager shelf handling 98 DS1s with protection

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Restrictions in the case of DS1/VT mappers in a DS1-fed system

In a DS1-fed RFT, you can install working DS1/VT mappers only in slots 1, 2, and 4, and an optional protection mapper in slot 3. All traffic-carrying DS1s must be handled by the mappers in slots 1 and 2. The traffic for a fully loaded 672-line RFT uses 28 DS1s.

In a DS1-fed RFT, a working mapper in slot 4 can carry only an OMC DS1, that is, a DS1 carrying an operations maintenance channel (OMC). You install a mapper in slot 4 to support the OMC DS1 only if you need the full capacity of the mappers slots 1 and 2—that is, a total of 28 DS1s—to handle traffic.

The mappings for DS1s in a DS1-fed RFT conform to a default map. For information on the default map, see Table 2-7 on page 2-27.

In an ABM OPC shelf supporting OMC-DS1 connections to DS1-fed RFTs, you can install a working DS1/VT mapper only in slot 1, and an optional protection mapper in slot 3.

Note: These mapper restrictions differ for a Mix & Match DFA system (CDS, UE9000 and ANX VMs controlled by one ABM shelf). Refer to the *AccessNode/AccessNode Express Mix & Match DFA Reconfiguration Quick Reference Guide* for additional information.

Restrictions in the case of DS1/VT mappers carrying TR-08 DS1s

In cases in which an RFT is connected to a DMS SuperNode switch, you can designate some of the DS1s as TR-08 DS1s. For a description of TR-08, see *Configuration and Equipment Description*, 323-3001-100, in *Description*, Volume 2A. For instructions on how to designate DS1s as TR-08 type, see *Provisioning and Operations Procedures*, 323-3001-310, in *Operations, Administration, and Provisioning*, Volume 4B.

TR-08 DS1s can be handled only by the pair of DS1/VT mappers whose traffic is carried in the STS-1 (of the SONET payload) that is mapped to the first port of the transport interface card (TIC). For information on mapping, see “Default mappings for DS1s,” beginning on page 2-22.

Note 1: Four VT1.5s are required to carry the traffic to and from each copper-distribution shelf in the RFT that is designated as a TR-08 interface. One of the four VT1.5s for each TR-08 interface carries the maintenance and alarm messages in its VT overhead. The TIC can access those TR-08 messages only in the overhead of the first, fifth, ninth, thirteenth, seventeenth, twenty-first, and twenty-fifth VT1.5s carried in the STS-1. This corresponds to the following DS1 mapper ports: G1 (left) ports one, five, nine, and thirteen; G2 (right) ports three, seven, and eleven.

Note 2: For TR-08 restrictions on a Mix & Match DFA system (CDS, UE9000 and ANX VMs controlled by one ABM shelf), see the *AccessNode/AccessNode Express Mix & Match DFA Reconfiguration Quick Reference Guide*.

The NT7E04CA model of the DS1/VT mapper can handle TR-08 traffic, but the other models cannot. A shelf can contain a mixture of mappers, some that can handle TR-08 traffic, and some that cannot. If any one of the working mappers handles TR-08 traffic, then the optional protection mapper, if equipped, must also be a NT7E04CA.

Restrictions in case of a mix of DS1s, DS3s, and OC-3s in the shelf

If an ABM shelf contains a mix of DS1/VT mappers, DS3 mappers, and OC-3 interface circuit packs, the following restrictions apply to the DS1/VT mappers:

- If a DS3 mapper has been provisioned in the slot for the DS1 protection mapper (slot 3), you cannot provision any DS1/VT mappers in the shelf.
- If an OC-3 protection mapper has been provisioned in the slot for the DS1/VT protection mapper (slot 3), you cannot provision any DS1/VT mappers in the shelf.
- If the shelf contains one or more DS3 mappers, you cannot provision DS1/VT mappers in slots 1 and 2, regardless of whether those slots are used for DS3 protection.
- If a working DS3 mapper has been provisioned in slot 3, slot 5, or slot 7, you cannot provision a DS1/VT mapper in the even-numbered slot to the right of that slot.

I/O cards associated with the DS1/VT mappers

Each DS1/VT mapper is associated with two I/O cards installed in associated slots in the upper level of the shelf. For each working mapper, the associated cards are a DS1 input card and a DS1 output card. For the protection mapper, the associated cards are DS1 protection bridge cards. Each mapper and its two associated I/O cards compose a circuit-pack group.

Table 2-3 on page 2-8 shows the groupings and lists the names of the groups.

DS3 tributaries in an ABM shelf

This section discusses the placement options and engineering limitations of DS3 tributaries in ABM shelves.

DS3 protection switch card (NT4K60)

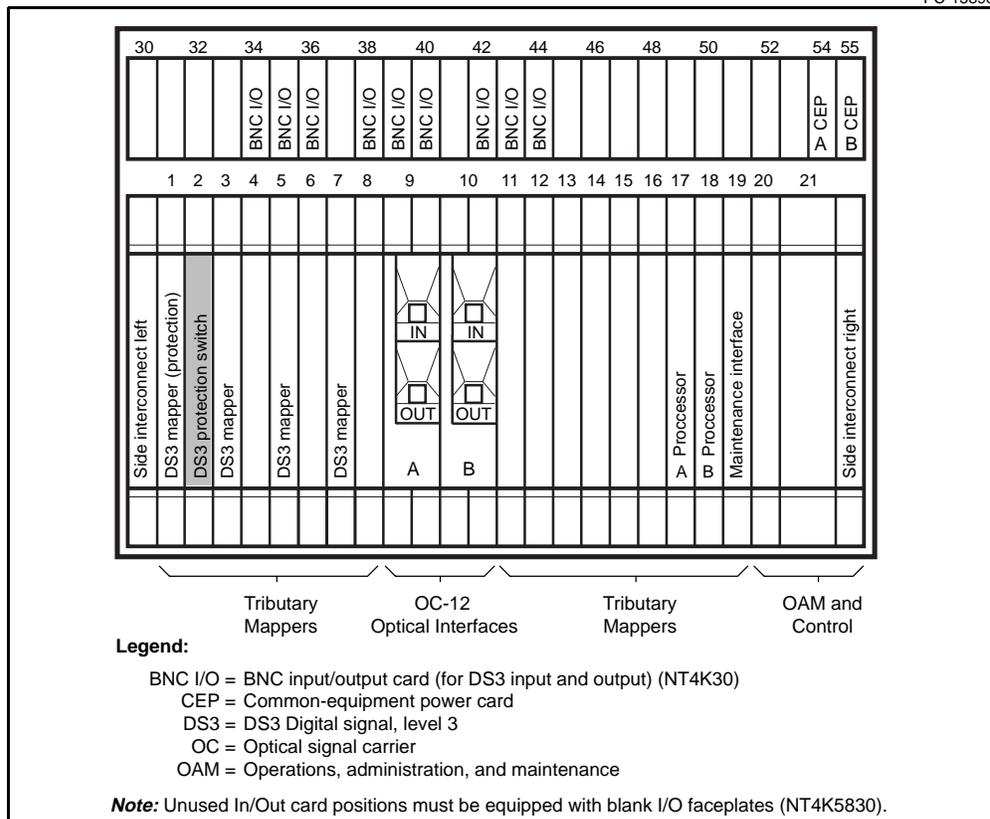
The DS3 protection switch card installs in the lower level of an ABM shelf. There are two versions of the DS3 protection switch card: the NT4K60BA, which is used in TBM TN_BLSR shelves only, and the NT4K60CA—which is used in all other ABM and TBM shelves.

If a fault occurs in a working DS3 mapper, the DS3 protection switch card routes the traffic away from the faulty mapper and to a protection mapper. It reroutes the traffic by switching the connections to the BNC I/O cards. On the DS3 protection switch card there are separate connections and relays for each direction of traffic.

In the ABM shelf, the DS3 protection switch card installs in slot 2 in the lower level of the shelf. Figure 2-6 shows an ABM shelf with a DS3 protection switch card.

Figure 2-6
Where the DS3 protection switch card installs in the ABM shelf

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DS3 mapper (NT7E08)

The DS3 mapper installs in the lower level of an ABM shelf.

The DS3 mapper provides interface circuitry between one, two, or three BNC I/O cards and the optical interface circuit pack (OC-12 interface circuit pack or OC-3 interface circuit pack).

Each DS3 channel (44.736 Mb/s) maps into an STS-1 signal (51.84 Mb/s), which goes to the optical interface circuit pack by way of the backplane.

Note: DS3s are supported only by fiber-fed systems (either point-to-point or VTBM rings). DS3s are not supported by DS1-fed systems or by single-ended systems.

Slot locations for the DS3 mapper in the ABM shelf

In an ABM shelf, you can provision and install working DS3 mappers in slots 3, 5, and 7.

Note: You can provision and install working mappers in the same set of slots, regardless of whether the shelf is equipped with OC-12 interface circuit packs or OC-3 interface circuit packs. However, if the shelf is equipped with OC-3 interface circuit packs, the traffic to and from the shelf can use a maximum of three STS-1s. A DS3 mapper can handle up to three DS3s, and each DS3 takes up an entire STS-1. For more DS3 mapping details, see “Default mappings for DS3s” on page 2-23.

You can install an optional protection mapper in slot 1. Along with the protection mapper, you must install a DS3 protection switch card in slot 2. The protection arrangement is revertive (1: n). (If a DS3 mapper is installed in slot 1, then it is a protection unit, and only a DS3 protection switch card can be installed in slot 2.)

Note: The software to support protection switching for DS3 mappers is in the optional software feature package that supports DS3 interfaces.

Mapper layout of ABM handling nine DS3s

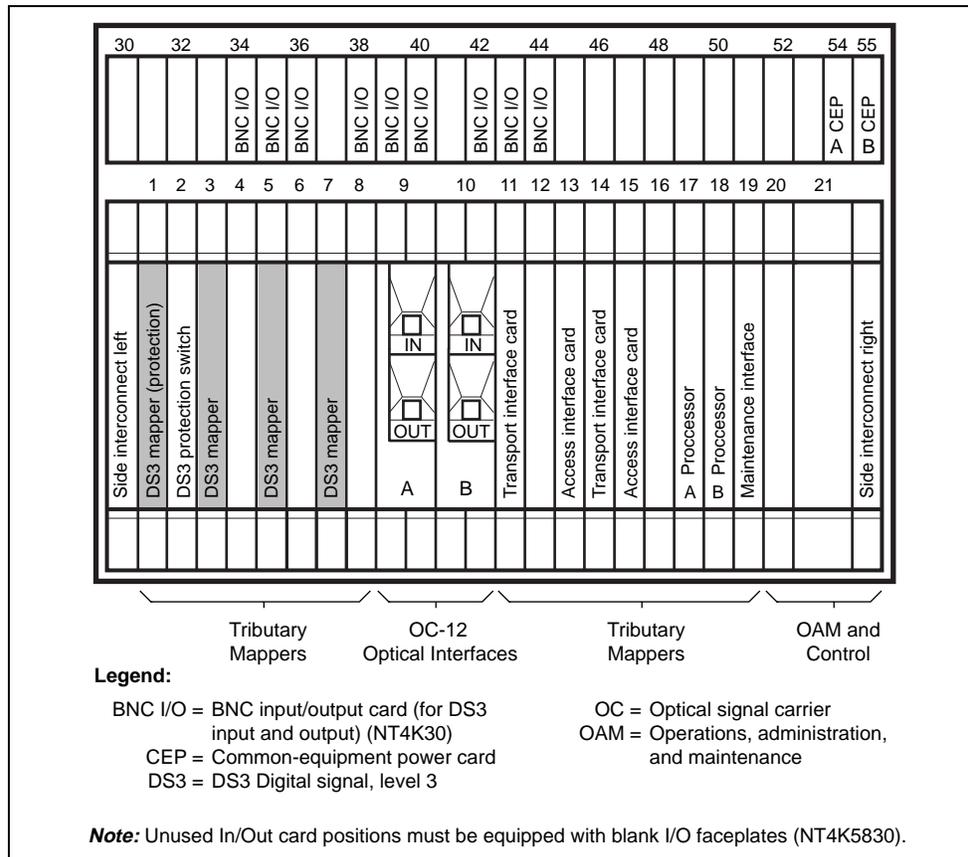
Figure 2-7 shows an ABM shelf containing three working DS3 mappers and a protection mapper. This ABM shelf handles a total of nine DS3 facilities. The shelf can be used in an RFT or in an FCOT.

If the shelf were used in an FCOT in a basic fiber-fed system, the system would be served by an operations controller housed in a collocated FCOT or OPC shelf. The shelf contains the following equipment:

- one protection DS3 mapper (in slot 1)
- one DS3 protection switch card (in slot 2)
- three working DS3 mappers (in slots 3, 5, and 7)
- nine BNC I/O cards (in slots 34, 35, 36, 38, 39, 40, 42, 43, and 44)
- two OC-12 interface circuit packs (in slots 9 and 10)
- two transport interface cards (in slots 11 and 14)
- two access interface cards (in slots 13 and 16)
- two processor cards (in slots 17 and 18)
- one maintenance interface card (in slot 19)
- two common-equipment power cards (in slots 54 and 55)

Figure 2-7
Access bandwidth manager shelf handling nine DS3s with protection

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DS3 restrictions for a mix of DS1s, DS3s, and OC-3s in an ABM shelf

If an ABM shelf contains a mix of DS3 mappers, DS1/VT mappers, and tributary OC-3 interface circuit packs, the following restrictions apply to the DS3 mappers:

- If a DS1/VT mapper has been provisioned in the slot for the DS3 protection mapper (slot 1), you cannot provision any DS3 mappers in the shelf.
- If a tributary OC-3 interface circuit pack has been provisioned in the slot for the DS3 protection mapper (slot 1), you cannot provision any DS3 mappers in the shelf.
- If the shelf contains one or more DS1/VT mappers, you cannot provision a DS3 mapper in slot 3, regardless of whether that slot is occupied by a DS1 protection mapper.
- If a DS1/VT mapper has been provisioned in slot 4, slot 6, or slot 8, you cannot provision a DS3 mapper in the odd-numbered slot to the left of that slot.

I/O cards associated with the DS3 mappers

Each DS3 mapper is associated with up to three BNC I/O cards installed in associated slots the upper level of the shelf. Each mapper and the associated BNC I/O cards compose a DS3 circuit-pack group. Table 2-4 shows the groupings and lists the names of the groups.

Table 2-4
DS3 circuit-pack groups in the ABM shelf

Group	DS3/STS mapper	BNC I/O cards
Group1	Slot 3	Slots 34, 35, 36
Group 2	Slot 5	Slots 38, 39, 40
Group 3	Slot 7	Slots 42, 43, 44
Protection	Slot 1	Protection Switch Slot 2

OC-3 tributaries (NT7E01) in an ABM shelf

The OC-3 interface circuit packs install in pairs, which provide nonrevertive protection switching. The OC-3 interface circuit pack can be installed in a single-ended network element as a primary fiber optic feeder, or in an OC-12 network element as an OC-3 tributary. The following ABM shelf functions can use the OC-3 interface circuit pack:

- RFT
- FCOT

The following sections explain the slot locations and equipping rules for OC-3 circuit packs installed as OC-3 tributaries.

An AccessNode system can support OC-3 tributaries only if the primary fiber optic feeder is an OC-12 feeder.

An OC-3 interface circuit pack that handles a tributary takes up two slots: slots 1 and 2, 3 and 4, 5 and 6, or 7 and 8. The odd-numbered slot identifies the location of the circuit pack.

An ABM shelf can support two protected OC-3 tributaries or two unprotected OC-3 tributaries. A single OC-3 optical interface circuit pack in slot 1 can support one unprotected OC-3 tributary. To provide 1+1 protection for that tributary, you can install an additional OC-3 interface circuit pack in slot 3.

Likewise, a single OC-3 optical interface circuit pack in slot 5 can support a second unprotected OC-3 tributary. To provide 1+1 protection for that tributary, you can install an additional OC-3 interface circuit pack in slot 7. If you do not install protection OC-3 circuit packs in slots 3 and 7, you can install

other circuit packs (DS1 mappers or DS3 mappers) in those slots. If this is done, you must give special attention to installing the DS1/DS3 protection circuit packs.

Note: You should not install an OC-3 interface circuit pack in a protection position (slot 3 or slot 7) unless you have also installed a companion OC-3 interface circuit pack in the adjacent slots to its left.

Mapper layout of ABM shelf handling two protected OC-3 tributaries

Figure 2-8 shows an example of an ABM shelf that handles two protected OC-3 tributaries. The shelf in the example could be used in an RFT in a system that has an OC-12 fiber-optic feeder.

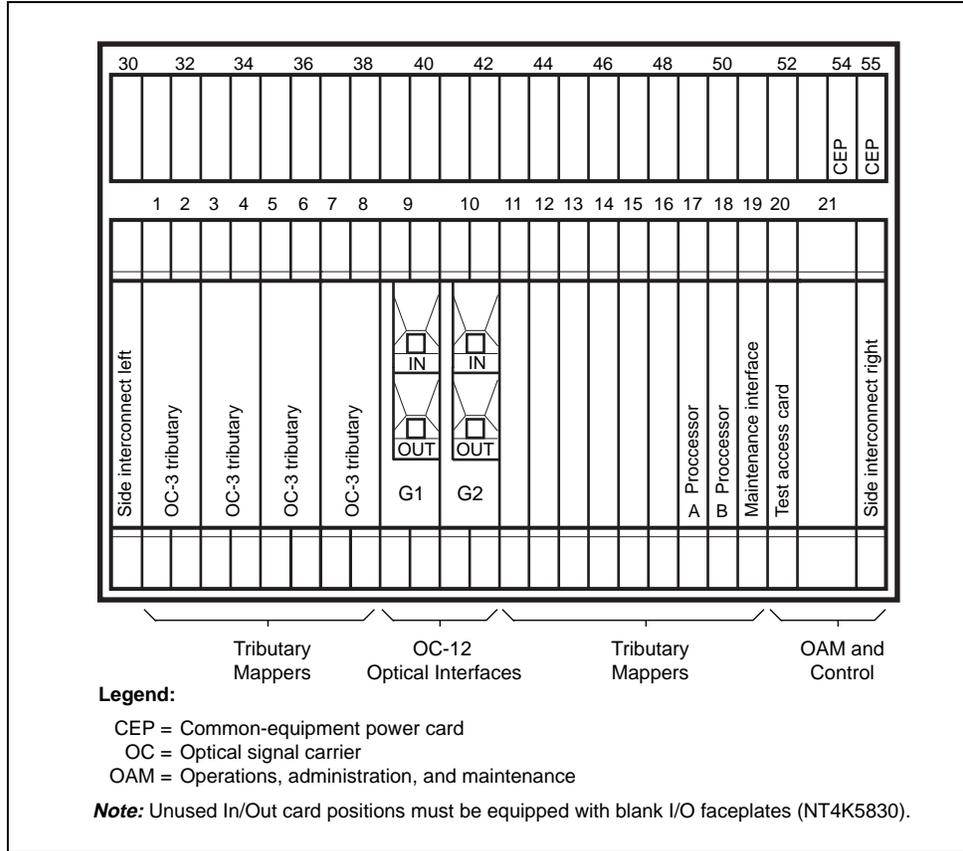
Note: An AccessNode system can support OC-3 tributaries only if the primary fiber optic feeder is an OC-12 SRP or OC-12 VTBM feeder.

This shelf contains the following equipment:

- two common-equipment power cards (in slots 54 and 55)
- two OC-12 interface circuit packs (in slots 9 and 10) that interface to the fiber-optic feeder
- two processor cards (in slots 17 and 18)
- one maintenance interface card (in slot 19)
- two pairs of OC-3 optical interface circuit packs (in slots 1 to 8) that interface to OC-3 tributaries

Figure 2-8
Access bandwidth manager shelf handling two protected OC-3 tributaries

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Equipping rules

Installing the OC-3 tributaries into ABM FCOT bays requires compliance to special equipping rules and mounting location restrictions for the OC-3 tributaries. Follow these equipping rules when installing the OC-3 tributaries in the AccessNode ABM FCOT bays:

- STS-1 cross-connections must be set up by the user.
- No asymmetrical or linear add/drop multiplexer (ADM) is provided.
- No orderwire is provided on OC-3 tributaries.
- No support for OC-3 tributaries on an OC-3 FCOT or RFT is provided. Also a DS1 fed or a DFA AccessNode can not support OC-3 tributaries.
- Only non-diverse route SONET datacomm is provided.
- OC-3 tributaries can be configured in protected or unprotected mode.
- The OC-12 network element (NE) containing the OC-3 tributary may not take its timing from the tributary.

- A single-ended AccessNode off an RFT must be in the same span-of control as the RFT.
- If two section data communications channels (SDCCs) are to be enabled on two OC-3 tributaries in an RFT, then one host or one SDCC on the primary optics must be disabled.
- OC-3 to TIC STS-1 cross-connections are not supported except in the case of a single-ended AccessNode where the TIC 1 is default mapped to the STS-1 #1 in the OC-3.

**CAUTION****Service-affecting action**

Do not place an OC-3 optical pack into slot 17 if the TBM shelf contains any DS1 lines. Doing so may cause DS1 traffic to be lost.

This is because slots 17 and 18 share the backplane with DS1 protection slots and placing the OC-3 optical pack in these slots interrupts the DS1 clock signals.

Default and non-default mappings for ABM shelf functions

This section explains the default and non-default mappings for the ABM shelf functions.

Note: There is no default map for ABM shelves with OC-12 VTBM circuit packs. Refer to the following section, “Mappings for network elements with OC-12 VTBM or OC-3 interfaces” for more information.

The AccessNode OPC tool, Connection Manager, provides default mappings for point-to-point, single-ended, and DS1-fed systems that must be selected if you want to use default mappings. There are no non-default mappings for single-ended and DS1-fed systems.

For information on the Connection Manager, see *Provisioning and Operations Procedures*, 323-3001-310, in *Operations, Administration, and Provisioning*, Volume 4B.

Mappings for network elements with OC-12 VTBM or OC-3 interfaces

A default map is not available for OC-12 VTBM interface circuit packs in either the FCOT or the associated RFT. If the FCOT and RFT are equipped with OC-12 VTBM interface circuit packs, you must use the Connection Manager to set up appropriate STS-1 connections.

For information on setting up STS-1 connections, see *Provisioning and Operations Procedures*, 323-3001-310, in *Operations, Administration, and Provisioning*, Volume 4B.

The following rules apply to network elements with OC-3 interface circuit packs:

- If the FCOT and RFT in a basic fiber-fed system are equipped with feeder OC-3 interface circuit packs, only the following STS-1s are available: numbers 1, 2, and 3.
- An RFT in a single-ended system is fed by an OC-3 tributary. Therefore, only the following STS-1s are available: numbers 1, 2, and 3.

For more information on specifying non-default mappings, see “Specifying non-default maps” on page 2-28.

Default mappings for DS1s

A map specifies which part of the OC-12 or OC-3 optical feeder signal will carry traffic going to and from each slot in a shelf. The mapping of traffic for the FCOT and RFT determines how the circuit packs in the FCOT and RFT are paired.

Example

If a mapper in slot 6 in the common-equipment shelf in the FCOT sends and receives traffic through a certain portion of the optical feeder signal, that mapper is paired with the circuit pack in the RFT that sends and receives traffic through the same portion of the optical signal.

The OC-12 or OC-3 optical signal between the FCOT and RFT is composed of STS-1s. The traffic to and from a DS1 mapper occupies the top half or the bottom half of an STS-1. Each mapper can handle both directions of up to 14 DS1s. Each DS1 is mapped into a VT1.5. Each STS-1 has capacity for 28 VT1.5s.

The maps that are in effect for the network elements in a system may be either of the following:

- default maps
- non-default maps

Default maps

While you are commissioning a network element, you can direct the network element to provision a default map for itself. The network element will then provision the appropriate default mappings. The map that you get depends on the type of network element that you are working on.

The following default maps exist for the ABM shelf functions:

- FCOT
- RFT
- RFT in a DS1-fed system
- RFT in a single-ended system

To set up the default mappings, you use the Connection Manager. For information on setting up default mappings, see *Provisioning and Operations Procedures*, 323-3001-310, in *Operations, Administration, and Provisioning*, Volume 4B.

You may want to specify a non-default map. For example, an ABM shelf that is equipped with OC-12 interface circuit packs can support 98 DS1s, but only if you specify a non-default map. For information on non-default maps, see “Specifying non-default maps” on page 2-28.

Default mappings for DS3s

A map specifies which part of the OC-12 or OC-3 optical feeder signal will carry traffic going to and from each slot in a shelf. The mapping of traffic for the FCOT and RFT determines how the circuit packs in the FCOT and RFT are paired off.

Example

For example, if a mapper in slot 6 in the common-equipment in the FCOT sends and receives traffic through a certain portion of the optical feeder signal, that mapper is paired with the circuit pack in the RFT that sends and receives traffic through the same portion of the optical signal.

The OC-12 or OC-3 optical signal between the FCOT and RFT is composed of STS-1s. The traffic to and from a DS3 mapper occupies up to three STS-1s. (Each mapper can handle both directions of up to three DS3s. Each DS3 occupies one STS-1.)

The maps that are in effect for the network elements in a system may be either of the following:

- default maps
- non-default maps

Default maps for DS3s

While you are commissioning a network element, you can direct the network element to provision a default map for itself. The network element will then provision the appropriate default mappings. The map that you get depends on the type of network element on which you are working. There are two default maps for an ABM shelf:

- one for an ABM shelf in an FCOT
- one for an ABM shelf in an RFT

To set up the default mappings, you use the Connection Manager. For information on setting up default mappings, see *Provisioning and Operations Procedures*, 323-3001-310, in *Operations, Administration, and Provisioning*, Volume 4B.

You may want to specify a non-default map. For example, a transport bandwidth manager shelf can support nine DS3s, but only if you specify a non-default map. For information on non-default maps, see the section titled “Specifying non-default maps” on page 2-28.

Default mappings

Table 2-5 through Table 2-8 show the default maps for the ABM shelf functions.

Table 2-5 shows the default map for DS1s and DS3s in an ABM FCOT shelf function.

Table 2-5
Default map for DS1s and DS3s for the ABM FCOT shelf function

Slot number	STS carrying		
	DS1s to/from a DS1/VT mapper in the slot	DS1s to/from a transport interface card in the slot	DS3s to/from a DS3 mapper in the slot
1	STS #1 low		
2	STS #1 high		
3	See note 1		STS #4, 7, and 8
4	STS #4 high		
5	STS #5 low		STS #5, 9, and 10
6	STS #5 high		
7	STS #6 low		STS #6, 11, and 12
8	STS #6 high		
11 and 14 port 2		STS #2 (UDLC DS1s) See note 2	

Note 1: There is no default mapping for DS1s going to and from a DS1 mapper in slot 3 because only the protection mapper can be installed in that slot.

Note 2: The UDLC traffic in STS #2 is mapped to the transport interface cards in the RFT. The UDLC traffic is mapped to port 2 in slot 11 and to port 2 in slot 14, because either of the two transport interface circuit packs may be the working unit.

Note 3: An FCOT in a single-ended system is fed by an OC-3 tributary. Therefore, only the following STS-1s are available: numbers 1, 2, and 3. This means that the default map does not support DS3s in a single-ended system. You cannot specify a non-default map for an RFT in a single-ended system because you do not run the Configuration Manager when commissioning a single-ended system. Therefore you never have the option of activating STS-1 Connection Services.

Note 4: If the FCOT and RFT in a basic fiber-fed system are equipped with OC-3 interface circuit packs, only the following STS-1s are available: numbers 1, 2, and 3. This means that the default maps do not support DS3s in such a system. However, in an OC-12 or OC-12 VTBM system, you can specify a non-default map that allows DS3s. See “Specifying non-default maps” on page 2-28 for more information.

Table 2-6 shows the default map for DS1s in an ABM RFT shelf function.

Table 2-6
Default map for DS1s and DS3s for the ABM RFT shelf function

Slot number	STS carrying:		
	DS1s to/from a DS1/VT mapper in the slot	DS1s to/from a transport interface card in the slot	DS3s to/from a DS3 mapper in the slot
1	STS #3 low		
2	STS #3 high		
3	See note 1		STS #4, 7, and 8
4	STS #4 high		
5	STS #5 low		STS #5, 9, and 10
6	STS #5 high		
7	STS #6 low		STS #6, 11, and 12
8	STS #6 high		
11 and 14 (port 1)		STS #1 (GR-303 DS1s and tandem DS1s) See note 2	
11 and 14 (port 2)		STS #2 (UDLC DS1s) See note 3	

Note 1: There is no default mapping for DS1s going to and from a DS1 mapper in slot 3 because only the protection mapper can be installed in that slot.

Note 2: The DS1s in STS #1 carry tandem traffic and GR-303 traffic. The assignment of the DS1s is flexible. The Subscriber Carrier Module-100 Access (SMA) module assigns DS1s as follows. All 28 DS1s in the STS can be tandem DS1s. Alternatively, up to 20 of the 28 DS1s can be GR-303 DS1s, with the other 8 tandem. For the Expanded Subscriber Carrier Module-100 Access (ESMA) module, all 28 DS1s can be either tandem or GR-303, with any mix of the two.

Note 3: The UDLC traffic in STS #2 is mapped to the transport interface cards in the RFT. The UDLC traffic is mapped to port 2 in slot 11 and to port 2 in slot 14, because either of the two transport interface circuit packs may be the working unit.

Note 4: If the FCOT and RFT in a basic fiber-fed system are equipped with OC-3 interface circuit packs, only the following STS-1s are available: numbers 1, 2, and 3. This means that the default maps do not support DS3s in such a system. However, in a basic fiber-fed system, you can specify a non-default map that allows DS3s. See “Specifying non-default maps” on page 2-28 for more information.

The default map shown in Table 2-7 applies only within the ABM shelf of a DS1-fed RFT (RFT shelf function). In a DS1-fed system, the traffic is mapped into STS-1s only while it is within the shelf. The traffic is carried by DS1s between the RFT and the terminating/intermediate network point.

Table 2-7
Default map for DS1s in an ABM DS1-fed RFT (RFT shelf function)

DS1/VT mapper in slot number	DS1s from the mapper to the transport interface cards by way of	DS1s from the transport interface card to the mapper by way of	Port 1 or 2 on transport interface cards
in slot 1	STS #1 low	STS #3 low	Port 1 (lower half)
in slot 2	STS #1 high	STS #3 high	Port 1 (upper half)
in slot 3			
in slot 4 See note 1	STS #2 low	STS #4 low	Port 2 (upper half)
<p>Note: A mapper is installed in slot 4 only if the DS1-fed RFT is operating at full capacity, that is, using all 28 of the DS1s that the mappers in slots 1 and 2 can handle. The mapper in slot 4 cannot handle any traffic-carrying DS1s. It can handle only an OMC DS1, that is, a DS1 carrying an operations maintenance channel (OMC) for the RFT. If there are fewer than 28 traffic-carrying DS1s, the OMC DS1 can be handled by the mapper in slot 1 or the mapper in slot 2, and a mapper in slot 4 is unnecessary.</p>			

The default map in Table 2-7 dictates that all DS1s designated as TR-08 type, tandem type, and GR-303 type must be handled by the DS1/VT mappers in slots 1 and 2.

To designate a DS1 as GR-303, TR-08, VLCM, or tandem, you use the Facilities Assignment function of the Connection Manager in the OPC user interface. There is no default mapping for DS1s going to and from a DS1/VT mapper in slot 3 because only the protection mapper can be installed in that slot.

Note: For default mapping information on a Mix & Match DFA system (CDS, UE9000 and ANX VMs controlled by one ABM shelf), refer to the *AccessNode/AccessNode Express Mix & Match Reconfiguration Quick Reference Guide*.

Table 2-8 shows the default map for an ABM shelf in a single-ended system.

Table 2-8
Default map for single-ended AccessNode ABM RFT

Slot number	STS carrying:	
	from a DS1 mapper	from a transport interface card
1	STS #3 low	
2	STS #3 high	
11 and 14		STS #1 (GR-303 and tandem) STS #2 (UDLC only)
<p>Note 1: An RFT in a single-ended system is fed by an OC-3 tributary. Therefore, only the following STS-1s are available: numbers 1, 2, and 3. (STS #2 is reserved for UDLC traffic only since it is mapped to TIC port 2.) This means that the default map does not support DS3s in a single-ended system.</p> <p>You cannot specify a non-default map for an RFT in a single-ended system because you do not run the Configuration Manager when commissioning a single-ended system. Therefore you never have the option of activating STS-1 Connection Services.</p> <p>Note 2: If the FCOT and RFT in a basic fiber-fed system are equipped with OC-3 interface circuit packs, only the following STS-1s are available: numbers 1, 2, and 3. This means that the default maps do not support DS3s in such a system. However, in a basic fiber-fed system, you can specify a non-default map that allows DS3s. See “Specifying non-default maps” on page 2-28 for more information.</p>		

Specifying non-default maps

To specify a non-default map for a network element in any system except a DS1-fed RFT or a single-ended RFT, you use the Connection Manager, an OPC tool.

Note: You cannot specify a non-default map for the RFT if it is in a DS1-fed system or a single-ended system.

If you have OC-12 virtual tributary bandwidth manager (VTBM) interface circuit packs in the FCOT or the RFT, you must use the Connection Manager to specify the mappings since a default map does not exist. You use the Connection Manager to set up appropriate STS connections for the DS1, DS3, and OC-3 tributaries.

Note: STS-3c connections can be added only for OC-3 tributaries on a VTBM ring.

For information on using the Connection Manager and setting up STS-1 connections, see *Provisioning and Operations Procedures*, 323-3001-310, in *Operations, Administration, and Provisioning*, Volume 4B.

The following examples show how you use the Connection Manager to specify a non-default map.

- You can specify that the G1, G2 pair of DS1 mapper groups should be mapped to STS #3 of the feeder bandwidth in the ABM shelf at the RFT and in the ABM shelf at the FCOT. If you install DS1/VT mappers in slots 1 and 2 of each shelf, traffic flows between those mappers.
- You can specify that STS-1 #4, STS-1 #7, and STS-1 #8 should be mapped to DS3 G2 in the ABM shelf in the RFT and to DS3 G1 in the transport bandwidth manager shelf in the FCOT. If you install DS3 mappers in slot 5 of the ABM shelf and slot 11 of the TBM shelf, traffic flows between those DS3 mappers.

Equipping rules and restrictions for the TBM shelf

This chapter contains equipping rules and restrictions for the cards that install in the transport bandwidth manager (TBM) shelf, including:

- OC-12 STS-1 Reorder and Protection ASIC (SRP) circuit pack
- OC-12 virtual tributary bandwidth manager (VTBM) circuit pack
- OC-3 interface circuit pack
- DS1/VT circuit pack
- DS3/STS circuit pack
- STS-1 interface circuit pack

Chapter contents

This chapter discusses the feeder circuit packs first, because the type of feeder in the shelf determines the maximum number of tributary circuit packs that the shelf can support. The equipping rules and slot locations of the tributary circuit packs are discussed in the latter part of the chapter. To find information on a specific module, refer to the appropriate page.

Topic	See
TBM shelf functions	page 3-2
TBM feeder circuit packs	page 3-3
DS1 tributary cards in a TBM shelf	page 3-11
DS3 tributaries in a TBM shelf	page 3-25
STS-1 tributaries in a TBM shelf	page 3-31
OC-3 tributaries (NT7E01) in a TBM shelf	page 3-34
Default and non-default mappings for TBM shelf functions	page 3-39

You should become familiar with the rules and restrictions in this chapter before attempting to fill in the mapper layout worksheets in Appendix A. For more descriptive-level information on these circuit packs, see *Configuration and Equipment Description*, 323-3001-100, in *Description*, Volume 2A.

TBM shelf functions

The three TBM shelf functions vary depending on whether the OC-3/OC-12 SRP or the OC-12 VTBM circuit packs are installed in the shelf.

- **FCOT**—This is an AccessNode TBM shelf equipped with either the OC-12 SRP or OC-3 SRP interface circuit packs used only in non-VTBM configurations. It can support a maximum of 126 DS1s, or a mix of DS1s, DS3s, STS-1 tributaries, and OC-3 tributaries.
- **FCOT_BLSR**—This is an AccessNode TBM shelf equipped with the OC-12 VTBM circuit pack used only in bidirectional line-switched (BLSR) VTBM ring configurations. It can support a maximum of 154 DS1s or a mix of DS1s, DS3s, and OC-3 tributaries.
- **TN_BLSR**—This is an AccessNode TBM shelf equipped with the OC-12 VTBM circuit pack, and is used only in BLSR ring configurations. It can support up to 168 DS1s, or a mix of DS1s, DS3s, STS-1 tributaries, and OC-3 tributaries. It can serve as a primary or secondary gateway in a matched nodes configuration. For more information on primary and secondary gateways, see the Matched Nodes topic in *Configuration and Equipment Description*, 323-3001-100, in *Description*, Volume 2. A TN_BLSR can be created in the following two ways:
 - by commissioning an AccessNode TBM shelf as a TN_BLSR shelf function with the OPC Commissioning Manager tool.
 - by transforming an TransportNode TBM shelf to an AccessNode TBM shelf. These TN_BLSR shelves are referred to as transformed nodes.

These TBM shelf functions are selected using the Commissioning Manager OPC tool. For information about the Commissioning Manager, see *Commissioning and Testing*, Volume 3.

Table 3-1 summarizes these shelf functions.

Table 3-1
TBM shelf functions

Feeder type	Shelf function	Supports these systems	Max DS1s
OC-3 SRP	FCOT	point-to-point, single-ended	56
OC-12 SRP	FCOT	point-to-point, single-ended	126
OC-12 VTBM	FCOT_BLSR	VTBM ring	154
	TN_BLSR	VTBM ring	168

The equipping rules and restrictions for these three shelf functions are discussed in the following sections.

TBM feeder circuit packs

This section discusses the placement and engineering limitations for the TBM feeder circuit packs.

OC-12 SRP circuit pack as a TBM feeder

The OC-12 interface circuit pack (NT7E02) installs in the lower level of a TBM shelf. This circuit pack is installed in pairs, which provides nonrevertive protection switching.

The two OC-12 interface circuit packs act as the primary interface to the fiber optic feeder. This TBM shelf function (an FCOT) is used in point-to-point AccessNode configurations and can handle a maximum of 126 DS1s.

In a TBM shelf, the OC-12 interface circuit packs are always installed in slots 9 and 10, as shown in Figure 3-1 on page 3-4.

Mapper layout of TBM equipped as an FCOT

An AccessNode TBM shelf (see Figure 3-1) contains the following equipment:

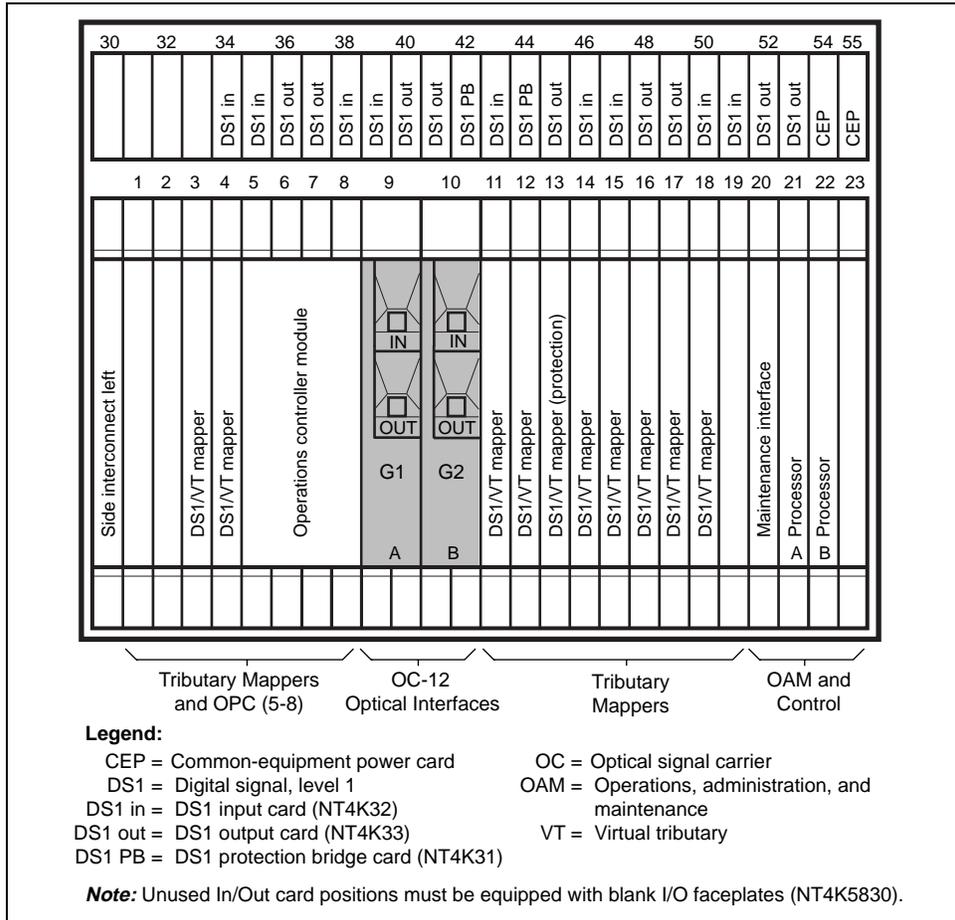
- nine working DS1/VT mappers (in slots 3, 4, 11, 12, 14, 15, 16, 17, and 18)
Note: Slots 1 and 2 in this TBM shelf are reserved for DS3 protection and cannot be used to provision DS1/VT mappers.
- one operations controller module (in slots 5 through 8)
- two OC-12 interface circuit packs (in slots 9 and 10)
- one protection DS1/VT mapper (in slot 13)

3-4 Equipping rules and restrictions for the TBM shelf

- one maintenance interface card (in slot 20)
- two processor cards, one required and one optional (in slots 21 and 22)
- nine DS1 input cards (in slots 34, 35, 38, 39, 43, 46, 47, 50, and 51)
- nine DS1 output cards (in slots 36, 37, 40, 41, 45, 48, 49, 52, and 53)
- two DS1 protection bridge cards (in slots 42 and 44)
- two common-equipment power cards (in slots 54 and 55)

Figure 3-1
A TBM shelf equipped as an FCOT

PC-15913



Equipping three-shelf bays

The TBM three-shelf bay has a limitation of 336 DS1s per bay, due to cabling restrictions. Since an FCOT shelf can support up to 126 DS1s, you can distribute the DS1s to optimize the bandwidth usage between the three shelves as required per specific application.

OC-12 VTBM circuit pack as a TBM feeder

The OC-12 VTBM circuit pack (NT7E05) interfaces with the primary fiber optic feeder for network elements in fiber-fed systems that are configured in the VTBM bidirectional line-switched (BLSR) rings.

Note: The OC-12 VTBM circuit pack cannot be used in linear AccessNode systems.

Two OC-12 VTBM units are required for protection switching, but the unit pair does not perform the normal 1+1 revertive method of protection switching. Instead, one unit handles the working and protection channels traveling in the east-to-west direction of the ring, and the other unit handles the working and protection channels traveling in the west-to-east direction.

In a TBM shelf, the OC-12 VTBM circuit packs (G1 and G2) are installed in slots 9 and 10.

Two TBM shelf functions with OC-12 VTBM

The OC-12 VTBM interface circuit pack can be installed in an AccessNode TBM shelf creating either an FCOT_BLSR or a TN_BLSR. The OC-12 VTBM can also be installed in a TransportNode TBM shelf that is being transformed with AccessNode software for use in an AccessNode VTBM ring (also called a TN_BLSR).

These two TBM shelf functions are discussed in more detail in the following order.

- **FCOT_BLSR**
- **TN_BLSR**
 - AccessNode TBM shelf
 - transformed TransportNode TBM shelf

TBM shelf equipped as an FCOT_BLSR with 154 DS1s

This is a TBM shelf equipped with the OC-12 VTBM circuit pack. The shelf's mapper layout (Figure 3-2 on page 3-6) is similar to that of the TBM FCOT shelf function, however, slots 1 and 2 are no longer reserved for DS3 protection and can be provisioned with two additional DS1 mappers. This allows the FCOT_BLSR to support up to 154 DS1s in BLSR ring configurations.

This shelf function can support a mix of DS1s, DS3s, and OC-3 tributaries. The shelf in Figure 3-2 is equipped with the following cards:

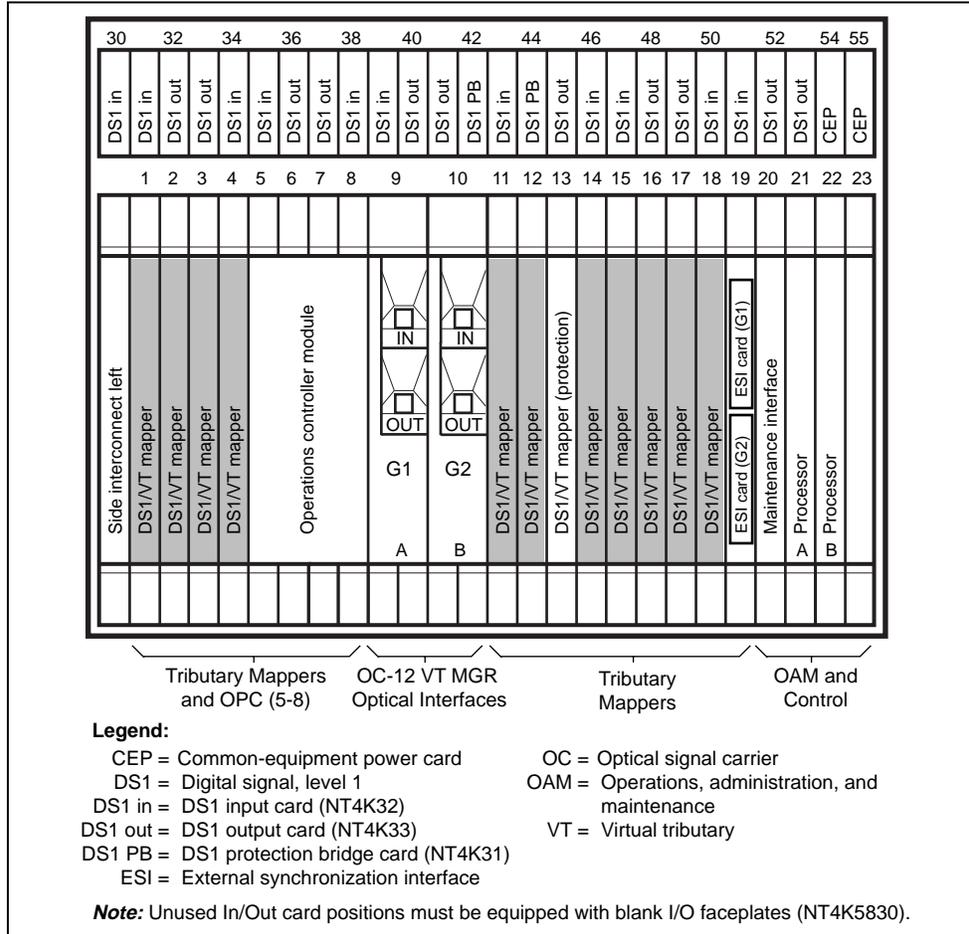
- 11 working DS1/VT mappers (in slots 1, 2, 3, 4, 11, 12, 14, 15, 16, 17, and 18)
- one operations controller module (in slots 5 to 8)

3-6 Equipping rules and restrictions for the TBM shelf

- two OC-12 VTBM circuit packs (in slots 9 and 10)
- one protection DS1/VT mapper (in slot 13)
- two external synchronization interface cards (in their carrier, in slot 19)
- one maintenance interface card (in slot 20)
- two processor cards–NT4K52FB–one required and one optional (in slots 21 and 22)
- 11 DS1 input cards (in slots 30, 31, 34, 35, 38, 39, 43, 46, 47, 50, and 51)
- 11 DS1 output cards (in slots 32, 33, 36, 37, 40, 41, 45, 48, 49, 52, and 53)
- two DS1 protection bridge cards (in slots 42 and 44)
- two common-equipment power cards (in slots 54 and 55)

Figure 3-2
TBM shelf equipped as an FCOT_BLSR with 154 DS1s

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Equipping three-shelf bays

The TBM three-shelf bay has a limitation of 336 DS1s per bay, due to cabling restrictions.

Since an FCOT_BLSR shelf can support up to 154 DS1s, you can distribute the DS1s in any way between the three shelves.

TBM shelf equipped as a TN_BLSR

This shelf function introduces a new mapper layout that supports one additional DS1 mapper (for a total of 12) to be installed in the shelf, allowing this TBM shelf to handle up to a maximum of 168 DS1s in BLSR configurations. It can also support a mix of DS1s, DS3s, STS-1 tributaries, and OC-3 tributaries as explained in this chapter.

A TBM shelf can be equipped as TN_BLSR in one of the following methods:

- as an AccessNode TBM shelf commissioned with the OPC Commissioning Manager tool as TN_BLSR
- as a newly transformed TransportNode TBM shelf

Either method requires the shelf to be commissioned with the OPC commissioning tool as a TN_BLSR shelf function.

Equipping rules for the TN_BLSR

This TBM shelf is equipped with the OC-12 VTBM circuit pack. The tributary card locations differ from previously described configurations. It supports only a single processor, which can be either the NT4K52BC processor (widely used in TransportNode applications) or the NT4K52FB (most commonly used in AccessNode applications).

This configuration requires the cards in the following slot locations:

- additional DS1/VT mappers in slots 1 and 2
- the DS1 protection mapper in slot 19
- the external synchronization interface (ESI) in slot 23

Install only one processor (NT4K52BC or NT4K52FB). No protection bridge cards are required. Also, you can install STS-1 tributaries into TN_BLSR TBM shelves.

Equipping three-shelf bays

The TransportNode TBM shelf has a limitation of 336 DS1s per bay, due to cabling restrictions. Since a TN_BLSR shelf can have up to 168 DS1s, you can equip and commission no more than two shelves as TN_BLSRs ($168 \times 2 = 336$). The third shelf, when present, must be equipped to support only DS3s or OC-3s.

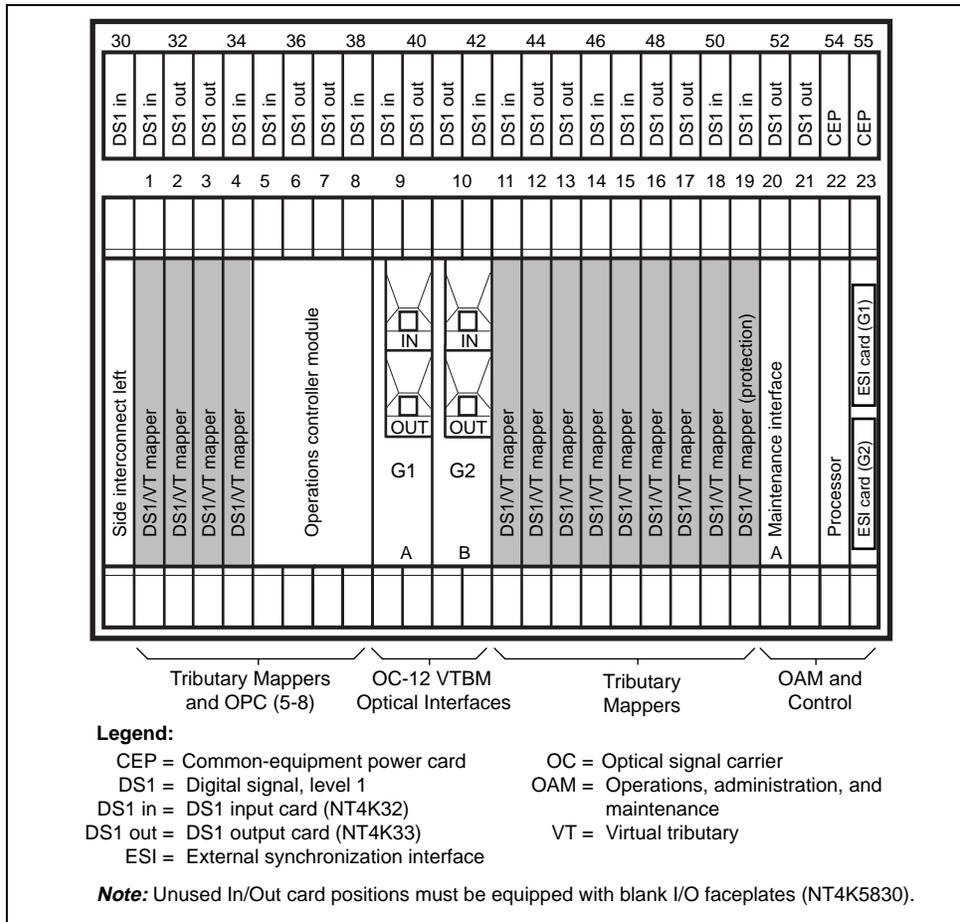
Mapper layout of TBM equipped as TN_BLSR with 168 DS1s

The TN_BLSR shelf shown in Figure 3-3 is fully equipped with the following cards for maximum DS1 support:

- 12 working DS1/VT mappers (in slots 1, 2, 3, 4, 11, 12, 13, 14, 15, 16, 17, and 18). For asynchronous transport, install DS1/VT mapper version NT7E04BA. For TR-08 support, as well as byte synchronous and asynchronous transport, install the DS1/VT mapper version NT7E04CA.
- one operations controller module (in slots 5 to 8)
- two OC-12 VTBM circuit packs (in slots 9 and 10)
- one protection DS1/VT mapper (in slot 19)
- one maintenance interface card (in slot 20)
- one processor card (NT4K52BC or NT4K52FB) (in slot 21)
- two external synchronization interface cards in one carrier (in slots 23-1 and 23-2). This is required only in the node receiving external timing for the ring.
- 12 DS1 input cards (in slots 30, 31, 34, 35, 38, 39, 42, 43, 46, 47, 50, and 51)
- 12 DS1 output cards (in slots 32, 33, 36, 37, 40, 41, 44, 45, 48, 49, 52, and 53)
- two common-equipment power cards (in slots 54 and 55)

Figure 3-3
TN_BLSR equipped with maximum of 168 DS1s

PC-15900

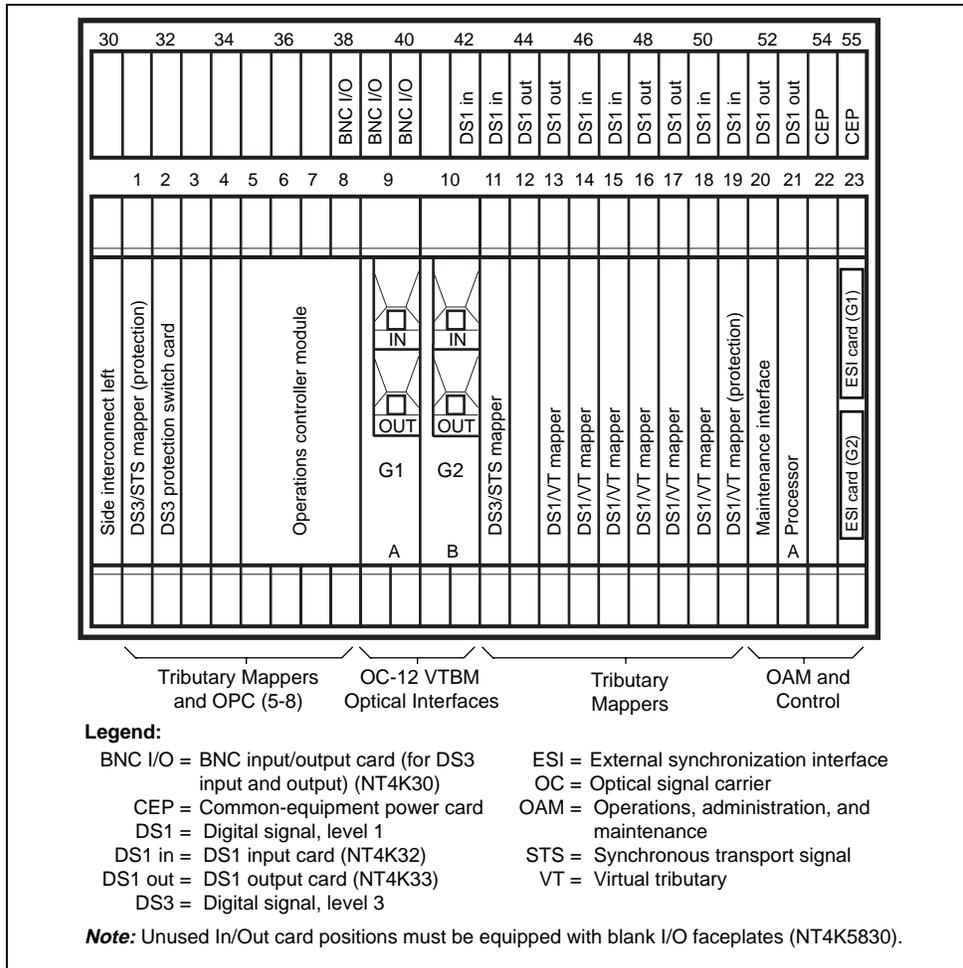


3-10 Equipping rules and restrictions for the TBM shelf

- one TransportNode maintenance interface card (in slot 20)
- one processor card (NT4K52BC or NT4K52FB) (in slot 21)
- three DS3 BNC I/O cards (in slots 38-40)
- two external synchronization interface cards in one carrier (in slots 23-1 and 23-2). Only the node receiving external timing for the ring requires these cards.
- six DS1 input cards (in slots 42, 43, 46, 47, 50, and 51)
- six DS1 output cards (in slots 44, 45, 48, 49, 52, and 53)
- two common-equipment power cards (in slots 54 and 55)

Figure 3-4
TN_BLSR equipped with DS1/DS3 mix

PC-15903



When a TN_BLSR shelf contains the DS3 protection circuit packs (in slots 1 and 2), slots 3 and 4 cannot be used for DS1 working mappers. This is because TN_BLSR shelves use the NT4K60BA protection switch card, which reserves slot 3 for STS-1 protection circuit pack.

All other ABM and TBM shelf functions use the NT4K60CA protection switch card, which does not perform STS-1 protection switching.

DS1 tributary cards in a TBM shelf

After you know the feeder type for your system and the maximum number of DS1s it can support, read the following sections to determine where to place the DS1 tributary cards in the TBM shelf.

I/O cards associated with the DS1 mappers

Each DS1 mapper is associated with two I/O cards installed in respective slots in the upper level of the shelf. For each working mapper, the associated cards are a DS1 input card and a DS1 output card. For the protection mapper, the associated cards are DS1 protection bridge cards. Each mapper and its two associated I/O cards compose a circuit-pack group. Table 3-2 through Table 3-4 beginning on page 3-20 show the groupings and slot associations, and list the names of the groups for each of the three shelf functions.

The DS1 cards work together as a DS1 circuit-pack group and are explained in the following order:

- DS1 input card
- DS1 output card
- DS1 protection bridge card
- DS1 mapper

For each working DS1 mapper in the lower level of the shelf, there must be one DS1 input card and one DS1 output card in the upper level, and vice versa.

DS1 input card (NT4K32)

The DS1 input card installs in the upper level of a TBM shelf. Each DS1 input card handles all 14 DS1 input channels to a DS1 mapper. The DS1 signals enter the AccessNode through the DS1 input card and are transmitted to the associated DS1 mapper.

Figure 3-5 on page 3-13 shows the slots in which DS1 input cards can be installed in a TBM shelf that contains the OC-12 SRP optical interface, used for linear configurations. Each DS1 input card is a member of a DS1 circuit-pack group.

If the TBM contains the OC-12 VTBM circuit pack, you can install additional DS1 input cards in slots 30 and 31 to coincide with any additional DS1 mappers planned for slots 1 and 2. Refer to Figure 3-6 on page 3-14 for the mapper layout of the TN_BLSR.

For TN_BLSR shelves, you replace the power bridge cards in slots 42 and 44 with working DS1 input and DS1 output cards, and move the DS1 protection mapper to slot 19.

DS1 output card (NT4K33)

The DS1 output card installs in the upper level of the TBM shelf. Each DS1 output card handles all 14 DS1 output channels from a DS1 mapper. DS1 signals are transmitted from the DS1 mapper to the associated DS1 output card, and then out of the AccessNode.

Figure 3-5 on page 3-13 shows the slots in which DS1 output cards can be installed in a TBM shelf supporting OC-12 SRP optics. Table 3-2 on page 3-20 shows the groupings and lists the names of the groups.

If the TBM contains OC-12 VTBM optics, you can install additional DS1 output cards in slots 32 and 33 to coincide with any additional DS1 mappers planned for slots 1 and 2. Refer to Figure 3-6 on page 3-14 for the mapper layout of the TN_BLSR.

Figure 3-5 shows the slots in which DS1 input cards can be installed in a TBM shelf that contains the OC-12 SRP optical interface.

Figure 3-5
DS1 input/output card locations in an FCOT

PC-15916

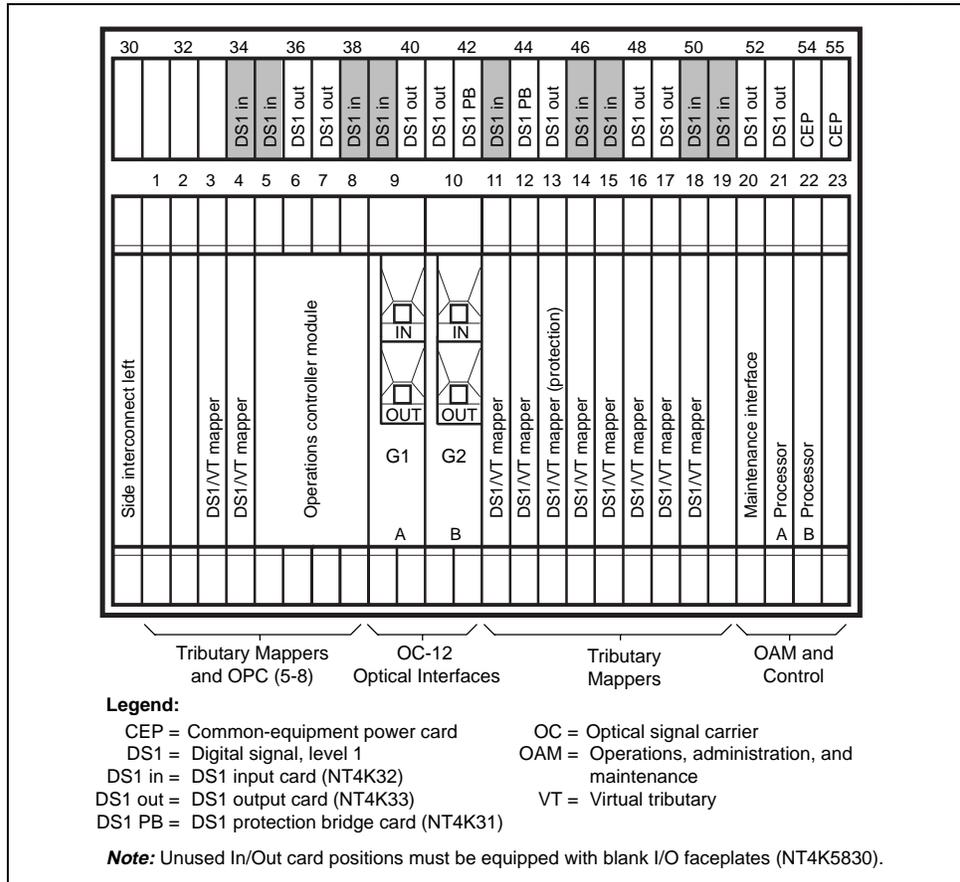
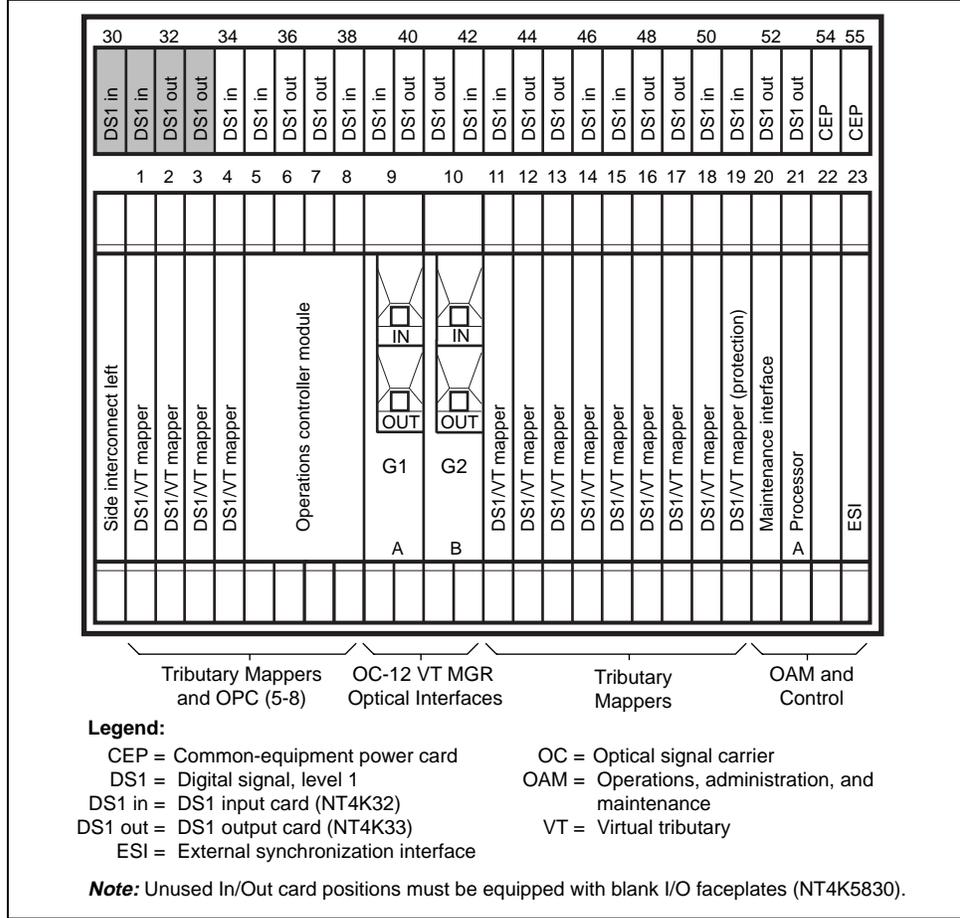


Figure 3-6 shows the mapper layout of the TN_BLSR shelf.

Figure 3-6
DS1 input/output card locations in a TN_BLSR

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DS1 protection bridge card (NT4K31)

The DS1 protection bridge card (DS1 PB) installs in the upper level of a TBM shelf. You install the DS1 protection bridge cards in the upper-level slots that are associated with the lower-level slot that contains the protection mapper.

In the FCOT or FCOT_BLSR shelf functions, install the DS1 protection bridge cards in slots 42 and 44 (Figure 3-5 on page 3-13). Slots 42 and 44 are associated with slot 13, in which the protection mapper is installed.

Note: There are no DS1 protection bridge cards in a TN_BLSR, since the DS1 protection mapper in slot 19 has direct connection to the DS1 protection I/O bus.

DS1 mapper (NT7E04BA)

The DS1 mapper installs in the lower level of a TBM shelf.

The DS1 mapper provides interface circuitry between the DS1 input and output cards and the optical interface circuit pack (OC-12 interface circuit pack or OC-3 interface circuit pack).

Note: In the TN_BLSR, the NT7E04BA DS1 mapper supports only asynchronous operation. The NT7E04CA mapper, explained in the next section, supports synchronous and asynchronous operation in TN_BLSRs.

DS1 mapper (NT7E04CA)

The NT7E04CA model of the DS1 mapper supports TR-08 DS1s. The NT7E04CA mapper can operate in the following modes:

- byte-synchronous mode
- bit-synchronous (not used)
- bit-asynchronous mode (asynchronous mode)

Byte-synchronous mode must be used if the mapper is to handle TR-08 DS1s. The byte-synchronous mode allows easy identification of the 24 DS0s in a VT1.5. This mode maintains the timing and phase of the signal throughout the network, and preserves superframe information.

Note: In TN_BLSR shelves, you must install the NT7E04CA version of the DS1 mapper to support synchronous and asynchronous operation.

Loopbacks can be performed for link maintenance and fault detection. The line build-out (LBO) range selection is controlled by software and can be set to the following:

- short (0–46 m or 0–150 ft)
- medium (46–137 m or 150–450 ft)
- long (137–200 m or 450– 655 ft).

Both alternate mark inversion (AMI) line coding and bipolar 8-bit zero code substitution (B8ZS) line coding are accepted.

Slot locations for the DS1 mappers in an FCOT

In a TBM shelf used in linear configurations, you can provision and install working DS1 mappers in slots 3, 4, 11, 12, 14, 15, 16, 17, and 18.

Figure 3-7 shows a TBM shelf with DS1 mappers in these slots.

Note: You can provision and install working mappers in the same set of slots, regardless of whether OC-12 interface circuit packs or OC-3 interface circuit packs are serving as the primary optical transport interface. However, if the shelf is equipped with OC-3 interface circuit packs in slots 9 and 10, the traffic to and from the shelf can use a maximum of three STS-1s. The traffic to and from a DS1/VT mapper takes up half of an STS-1, so a shelf equipped with OC-3 interface circuit packs can support up to six working mappers. For more details, see “DS1 tributary cards in a TBM shelf”, beginning on page 3-11.

You can install an optional protection mapper in slot 13. (You cannot install a working DS1 mapper in slot 13.) If a protection mapper is installed, the protection arrangement is 1:n revertive.

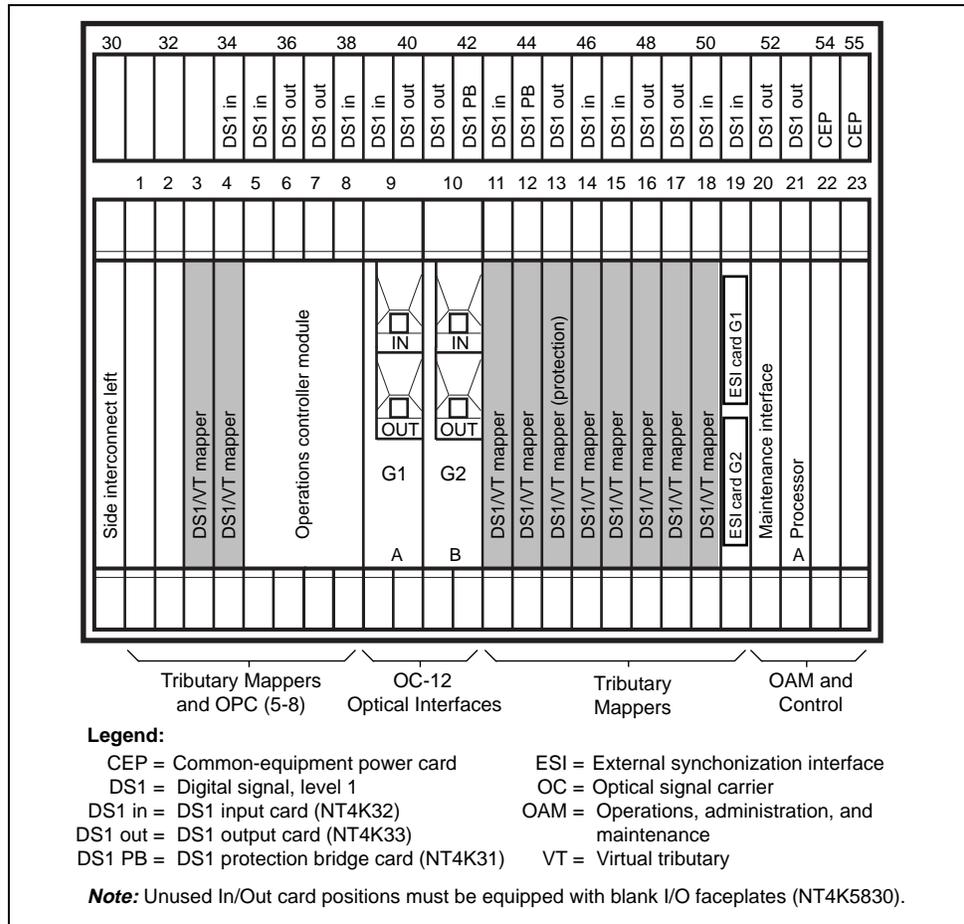
Transport bandwidth manager shelf handling 126 DS1s

Figure 3-7 shows a TBM shelf (shelf function is FCOT) handling DS1s in a DS1 multiplexer application. This shelf contains the following equipment:

- nine working DS1 mappers (in slots 3, 4, 11, 12, 14, 15, 16, 17, and 18)
- one operations controller module (in slots 5 to 8)
- two OC-12 interface circuit packs (in slots 9 and 10)
- one protection DS1 mapper (in slot 13)
- two external synchronization interface cards (in their carrier, in slot 19)
- one maintenance interface card (in slot 20)
- two processor cards, one required and one optional (in slots 21 and 22)
- nine DS1 input cards (in slots 34, 35, 38, 39, 43, 46, 47, 50, and 51)
- nine DS1 output cards (in slots 36, 37, 40, 41, 45, 48, 49, 52, and 53)
- two DS1 protection bridge cards (in slots 42 and 44)
- two common-equipment power cards (in slots 54 and 55)

Figure 3-7
DS1 mapper slot locations in an FCOT handling 126 DS1s

PC-15917



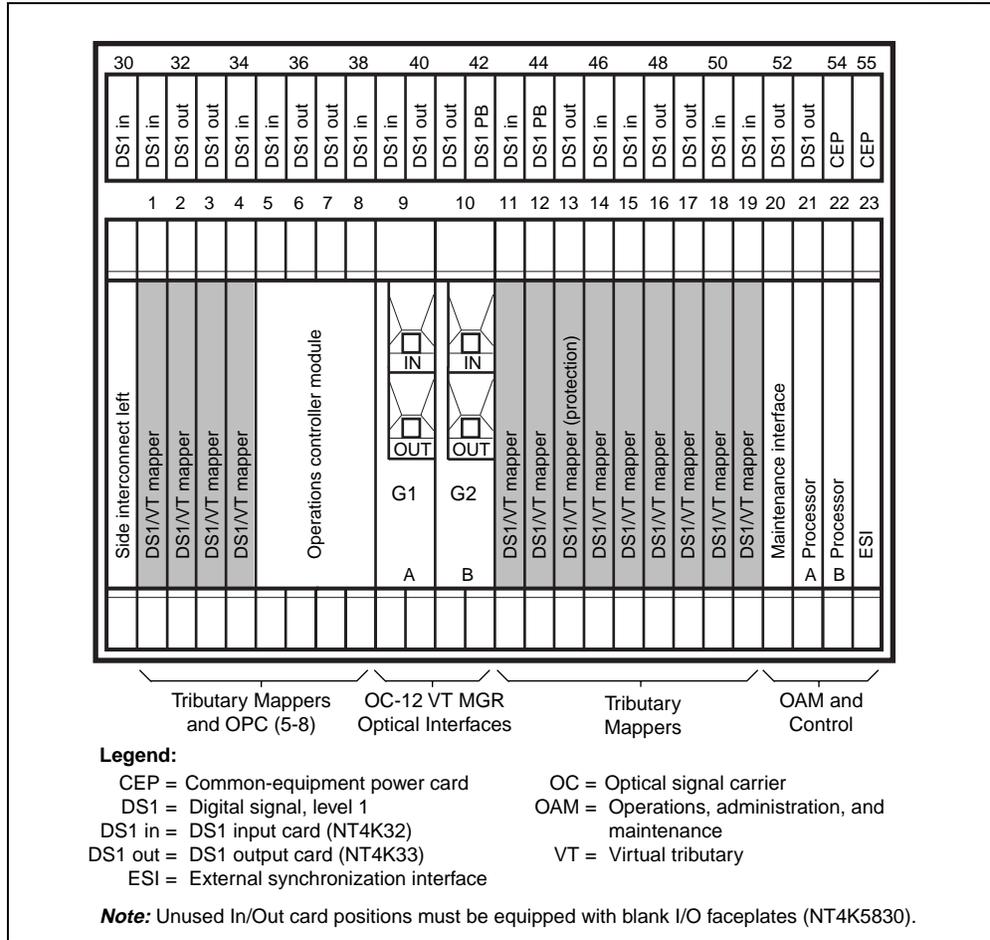
Slot locations for the DS1 mappers in an FCOT_BLSR

For a TBM FCOT_BLSR shelf equipped with the OC-12 VTBM interface, the following equipping rules apply:

- DS1 mappers may be installed in slots 1 and 2 when there are no DS3s installed in the shelf, and their associated I/O cards in slots 30 through 33. Figure 3-8 on page 3-18 shows a FCOT_BLSR containing DS1 mappers in slot 1 and 2.
- The optional protection mapper is equipped in slot 13.

Figure 3-8
DS1 mapper locations in a FCOT_BLSR

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Slot locations for the DS1 mappers in a TN_BLSR

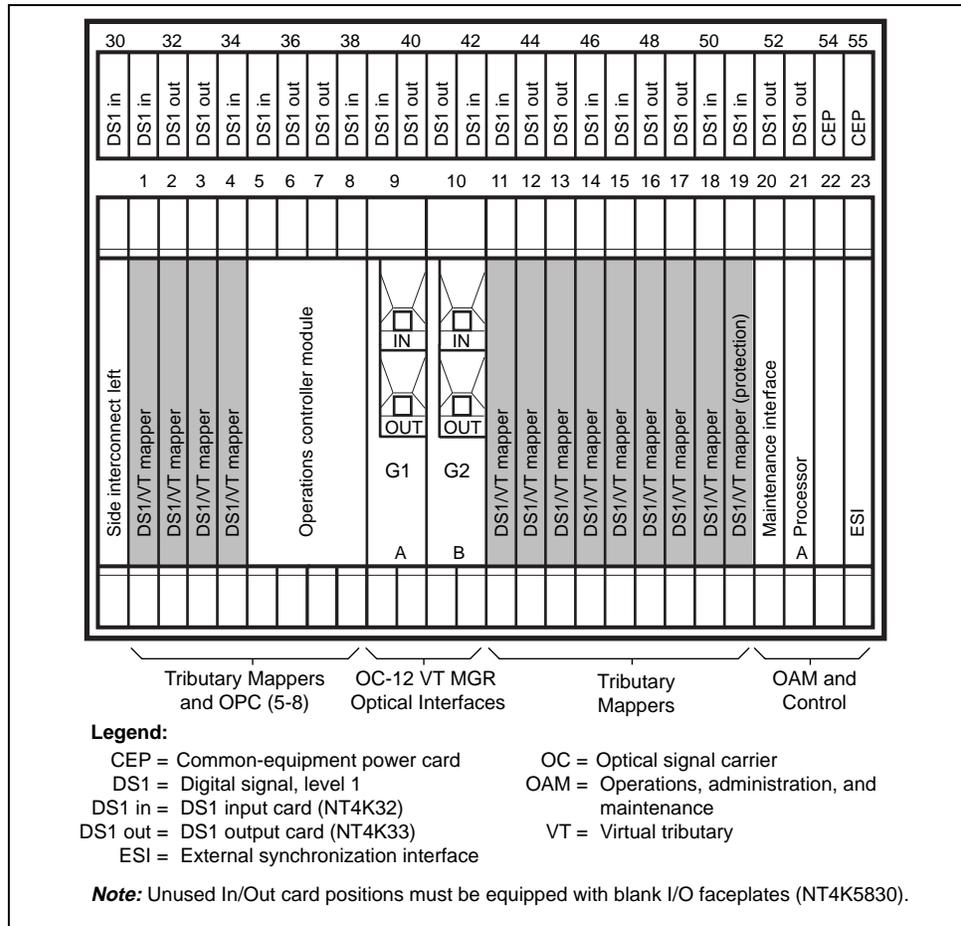
For a TBM TN_BLSR shelf equipped with the OC-12 VTBM interface, the following equipping rules apply:

- DS1 mappers may be installed in slots 1 and 2 when no DS3s are installed in the shelf, and their associated I/O cards in slots 30 through 33. Figure 3-9 shows a TN_BLSR containing DS1 mappers in slot 1 and 2.
- The optional protection mapper is equipped in slot 19.

Note: For a TN_BLSR configuration, no protection bridge cards are required. For more information on the DS1 protection bridge card, see “DS1 protection bridge card (NT4K31)” on page 3-14.

Figure 3-9
DS1 mapper locations in a TN_BLSR

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Group and slot associations

The circuit-pack group includes a DS1 mapper in the lower level of the shelf, and its two associated I/O cards in the upper level. The slots for each circuit-pack group are linked by fixed connections in the backplane. Tables 3-2 through 3-4 show the association between mappers in the lower level of the common equipment shelf and input/output cards in the upper level for DS1 related circuit packs.

For example, DS1 circuit pack group G1 refers to the group of modules including the working DS1 mapper circuit pack in slot 1 and its corresponding DS1 input and output cards in slots 30 and 32, respectively.

Similarly for FCOT and FCOT_BLSR shelves, DS1 circuit pack group P refers to the group of modules including the protection DS1 mapper circuit pack in slot 13 and the DS1 protection bridge cards in slots 42 and 44. (TN_BLSR shelves do not require I/O cards for the DS1 protection mapper.)

DS1 group numbers for FCOT shelves

Table 3-2 shows the DS1 circuit pack groups for the FCOT shelf function. This shelf can support up to 126 DS1s when not equipped with DS3 or OC-3 tributaries.

Table 3-2
DS1 group numbers for FCOT shelves

TBM shelf slot	1	2	3	4	11	12	13	14	15	16	17	18	19
DS1 group	—	—	g3	g4	g5	g6	P	g8	g9	g10	g11	g12	-
DS1 mapper slot			3	4	11	12	13	14	15	16	17	18	
DS1 input slot			34	35	38	39	42p	43	46	47	50	51	
DS1 output slot			36	37	40	41	44p	45	48	49	52	53	

Note: The symbol “p” in the DS1 input and output slots denotes a protection bridge card.

DS1 group numbers for the FCOT_BLSR shelf

Table 3-3 shows the DS1 circuit pack groups for a FCOT_BLSR shelf. This shelf can support up to 154 DS1s when not equipped with DS3 or OC-3 tributaries.

FCOT_BLSR shelves can contain two additional DS1 working groups (as compared to an FCOT shelf) when DS3 protection circuit packs are not used in slots 1 and 2. The two additional DS1 working groups are g1 (slots 1, 30, and 32) and g2 (slots 2, 31, and 33).

Table 3-3
DS1 group numbers for a 154-DS1 FCOT_BLSR shelf

TBM shelf slot	1	2	3	4	11	12	13	14	15	16	17	18	19
DS1 group	g1	g2	g3	g4	g5	g6	P	g8	g9	g10	g11	g12	-
DS1 mapper slot	1	2	3	4	11	12	13	14	15	16	17	18	
DS1 input slot	30	31	34	35	38	39	42p	43	46	47	50	51	
DS1 output slot	32	33	36	37	40	41	44p	45	48	49	52	53	

Note: The symbol “p” in the DS1 input and output slots denotes a protection bridge card.

DS1 group numbers for the TN_BLSR shelf

Table 3-4 shows the DS1 circuit pack groups for a TN_BLSR shelf. This shelf can support up to 168 DS1s when not equipped with DS3 or OC-3 tributaries. The slot usage of TN_BLSR shelves differs from the other AccessNode TBM shelf functions in the following ways:

- three additional DS1 working groups exist compared to the FCOT shelf function: g1 (slots 1, 30, 32), g2 (slots 2, 31, 33), and g7 (slots 13, 42, 44)
- one additional DS1 working group exists compared to the FCOT_BLSR shelf function: g7 (slots 13, 42, 44)
- the DS1 protection group P is in slot 19 compared to slot 13 in the FCOT and FCOT_BLSR shelf functions, and no protection bridge cards required.

Table 3-4
DS1 group numbers for a 168-DS1 TN_BLSR shelf

TBM shelf slot	1	2	3	4	11	12	13	14	15	16	17	18	19
DS1 group	g1	g2	g3	g4	g5	g6	g7	g8	g9	g10	g11	g12	P
DS1 mapper slot	1	2	3	4	11	12	13	14	15	16	17	18	19
DS1 input slot	30	31	34	35	38	39	42	43	46	47	50	51	—
DS1 output slot	32	33	36	37	40	41	44	45	48	49	52	53	—

Note: The symbol “p” in the DS1 input and output slots denotes a protection bridge card.

Slot usage and traffic-handling capacities of TBM shelves

Table 3-5 through Table 3-7 summarize the possible uses of slots in the following three types of TBM shelves:

- FCOT
- FCOT_BLSR
- TN_BLSR

Note: If an operations controller module (OPC) is installed, it occupies slots 5 to 8 for all three shelf functions.

Slot usage and traffic-handling capacity for FCOT

In an FCOT, slots 1 to 8 and slots 11 to 18 hold the modules that handle DS1 tributaries, DS3 tributaries, and OC-3 tributaries. Use Table 3-5 to plan the mix of modules for a TBM shelf that can support up to 126 DS1s in linear configurations.

Table 3-5
Possible uses of slots in a TBM FCOT

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18		
				OPC module															
OC-3		OC-3		OC-3		OC-3						OC-3		OC-3		OC-3		OC-3	
Protection										DS3						DS3		DS3	
		DS1		DS1						DS1		DS1	Prot	DS1	DS1	DS1	DS1	DS1	

Note 1: Because of fiber routing restrictions, a TBM shelf can accommodate only four tributary OC-3 circuit packs. Therefore, you can install four unprotected circuit packs, or two unprotected circuit packs and one protected pair, or two protected pairs. Possible locations of unprotected circuit packs are slots 1, 5, 11, and 15. Possible locations of protected pairs are slots 1 and 3, slots 5 and 7, slots 11 and 13, and slots 15 and 17.

Note 2: If a DS3 mapper is installed in slot 11, slot 15, or slot 17, then slot 12, 14, or 18 must remain unequipped.

Slot usage and traffic-handling capacity of FCOT_BLSR

In an FCOT_BLSR, slots 1 through 8 and slots 11 through 18 hold the modules that handle DS1, DS3, and OC-3 tributaries. In an FCOT_BLSR, slots 1 and 2 can be equipped with DS1/VT mappers. Use Table 3-6 to plan the mix of modules in an FCOT_BLSR.

Table 3-6
Possible uses of slots in an FCOT_BLSR

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18		
				OPC module															
OC-3		OC-3		OC-3		OC-3						OC-3		OC-3		OC-3		OC-3	
DS3 Prot.										DS3						DS3		DS3	
DS1	DS1	DS1	DS1					DS1		DS1	Prot	DS1	DS1	DS1	DS1	DS1	DS1		

Note 1: Slots 1 and 2 can be used to provision DS1 /VT mappers if no DS3s are in the shelf.

Note 2: If a DS3 mapper occupies slot 11, slot 13, slot 15, or slot 17, the slot to the right must remain empty.

Note 3: One protection DS1/VT mapper occupies slot 13.

Slot usage and traffic-handling capacity of TN_BLSR

In a TN_BLSR shelf, slots 1 through 8 and slots 11 through 19 hold the modules that handle DS1, DS3, STS-1, and OC-3 tributaries. Notice that in an FCOT_BLSR slots 1 through 4 can be equipped with DS1/VT mappers when no DS3 mappers are installed in the shelf. Use Table 3-7 to plan a TN_BLSR to plan the mix of modules in an FCOT_BLSR. When planning a TN_BLSR, start with the highest slot position first (slot 19) and work from right to left.

Table 3-7
Possible uses of slots in a TN_BLSR

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19		
				OPC module																
OC-3		OC-3		OC-3		OC-3						OC-3		OC-3		OC-3		OC-3		
		STS1 Prot										STS1				STS1				
DS3 Prot.												DS3				DS3				
DS1	DS1	DS1	DS1									DS1	DS1	DS1	DS1	DS1	DS1	DS1	DS1	Prot
<p>Note 1: Slots 1 through 4 can be used to provision DS1 /VT mappers if no DS3s are in the shelf. (In addition to occupying slots 1 and 2, the DS3 protection circuit packs reserve slots 3 and 4 to perform STS protection switching.)</p> <p>Note 2: If a DS3 mapper occupies slot 11, slot 13, slot 15, or slot 17, the slot to the right must remain empty.</p> <p>Note 3: One protection DS1/VT mapper occupies slot 19.</p>																				

For TN_BLSR shelves, slot usage differs from the standard AccessNode TBM shelf arrangement in the following ways:

- three additional DS1 working groups exist: g1 (slots 1, 30, 32), g2 (slots 2, 31, 33), g7 (slots 13, 42, 44)
- the DS1 protection group P is in slot 19, with no protection bridge cards required
- a different DS3 protection switching circuit pack (NT4K60BA) is used—this circuit pack reserves slots 3 and 4 in addition to occupying slots 1 and 2
- the maintenance interface card (MIC) is in slot 20, the processor card is in slot 21 (only one processor is supported), and the external synchronous interface (ESI) card is in slot 23

Restriction on the number of DS1 mappers in a transport three-shelf bay

Although an individual TBM shelf can accommodate up to 12 working DS1 mappers, the maximum number of working DS1 mappers in a transport three-shelf bay is 24. There is only enough room for cabling to 24 mappers.

If you have 24 mappers in a bay, you can distribute them as you wish, either equally (8 per shelf) or unequally as appropriate for the commissioned shelf functions.

Restrictions in the case of DS1 mappers carrying TR-08 DS1s

When an FCOT is connected to a DMS switch, some of the DS1s can be designated as TR-08 DS1s. For a description of TR-08, see *Configuration and Equipment Description*, 323-3001-100, in *Description*, Volume 2A. For instructions on how to designate DS1s as TR-08 type, see *Provisioning and Operations Procedures*, 323-3001-310, in *Operations, Administration, and Provisioning*, Volume 4B.

TR-08 DS1s can be handled only by the pair of DS1 mappers whose traffic is carried in the STS-1 (of the SONET payload) that is mapped to the first port of the transport interface card (TIC) in the RFT. For more details, see “Default and non-default mappings for TBM shelf functions”, beginning on page 3-39.

Note: Four VT1.5s are required to carry the traffic to and from each copper-distribution shelf in the RFT that is designated as a TR-08 interface. One of the four VT1.5s for each TR-08 interface carries the maintenance and alarm messages in its VT overhead. The TIC can access those TR-08 messages only in the overhead of the first, fifth, ninth, thirteenth, seventeenth, twenty-first, and twenty-fifth VT1.5s carried in the STS-1. This corresponds to the following DS1 mapper ports: G1 (left) ports one, five, nine, and thirteen; G2 (right) ports three, seven, and eleven.

The NT7E04CA model of the DS1 mapper can handle TR-08 traffic, but the other models cannot. A shelf can contain a mixture of mappers, some that can handle TR-08 traffic, and some that cannot. If any one of the working mappers handles TR-08 traffic, then the optional protection mapper, if equipped, must also be capable of handling TR-08 traffic.

DS1/VT restrictions in case of a mix of DS1s, DS3s, STS-1s, and OC-3s in the TBM

If a TBM shelf contains a mix of DS1/VT mappers, DS3 mappers, STS-1 interfaces, and tributary OC-3 interface circuit packs, the following restrictions apply to the DS1/VT mappers:

- If a working DS3 mapper has been provisioned in slot 11, slot 13, slot 15, or slot 17 of any TBM shelf, do not provision a DS1/VT mapper in the even-numbered slot to the right of that slot.
- If a tributary OC-3 interface circuit pack has been provisioned in slot 13 of FCOT and FCOT_BLSR shelves (used for the DS1/VT protection mapper), do not provision any DS1/VT mappers in the shelf.



CAUTION

Service-affecting action

Do not place an OC-3 optical pack into slot 17 if the TBM shelf contains any DS1 traffic. Doing so may cause DS1 traffic to be lost.

This is because slots 17 and 18 share the backplane with DS1 protection slots and placing the OC-3 optical pack in these slots interrupts the DS1 clock signals.

DS3 tributaries in a TBM shelf

This section discusses the placement options and engineering limitations of DS3 tributaries in TBM shelves.

DS3/STS protection switch card (NT4K60)

The DS3/STS-1 protection switch card installs in the lower level of a TBM shelf. There are two versions of the DS3/STS-1 protection switch card: the NT4K60BA, which is used in TBM TN_BLSR shelves only, and the NT4K60CA—which is used in all other ABM and TBM shelves.

It is an optional card that must be installed if protection switching is to be provided for the working DS3/STS-1 interfaces.

If a fault occurs in a working DS3 or STS-1 interface, the protection switch card routes the traffic away from the faulty mapper and to a protection mapper. It reroutes the traffic by switching the connections to the BNC I/O cards.

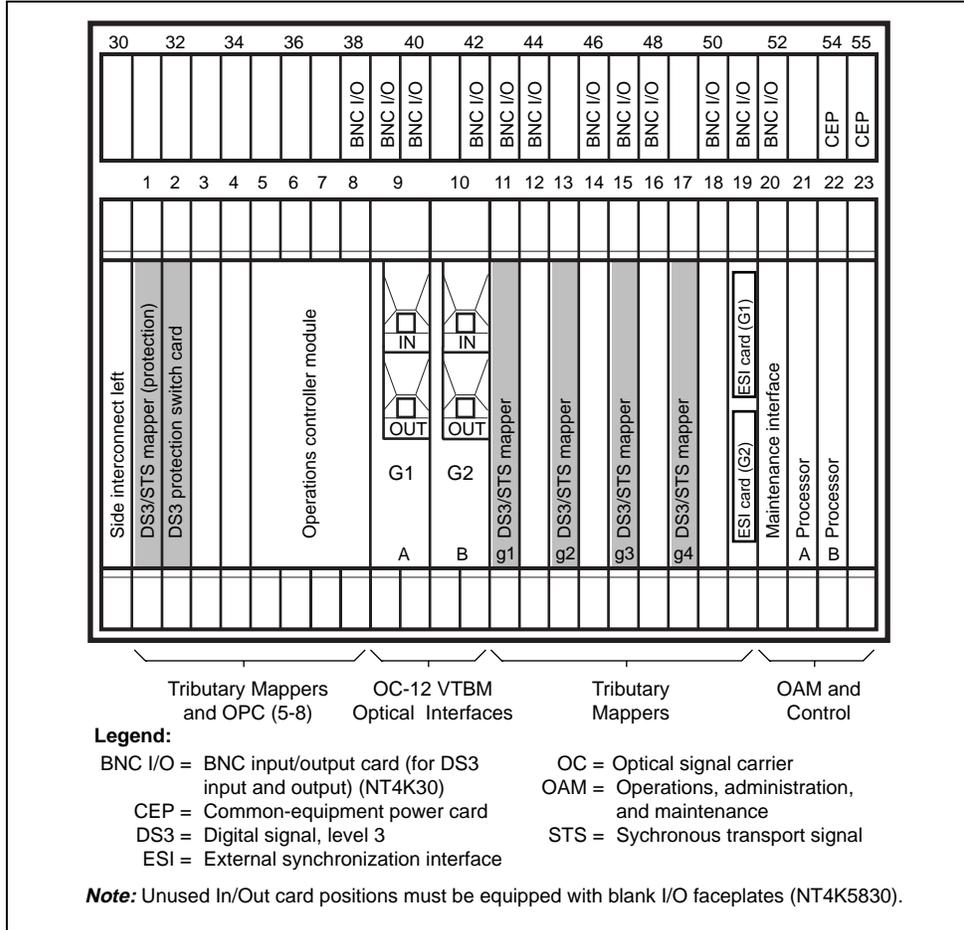
On the DS3/STS-1 protection switch card there are separate connections and relays for each direction of traffic.

In the TBM shelf, the DS3/STS-1 protection switch card installs in slot 2 in the lower level of the shelf.

Figure 3-10 shows a TBM shelf with a DS3/STS-1 protection switch card and four DS3 working mappers in slots 11, 13, 15, and 17.

Figure 3-10
Where the DS3 protection switch card installs in the TBM shelf

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DS3 mapper (NT7E08)

The DS3 mapper installs in the lower level of a TBM shelf that is an FCOT, an FCOT_BLSR, or TN_BLSR.

The DS3 mapper provides interface circuitry between one, two, or three BNC I/O cards and the optical interface circuit pack (OC-12 interface circuit pack or OC-3 interface circuit pack). Each DS3 channel (44.736 Mb/s) maps into an STS-1 signal (51.84 Mb/s), which goes to the optical interface circuit pack by way of the backplane.

DS3 channels are STS-managed, so they cannot be divided into VT-managed channels.

Each DS3 mapper is associated with up to three BNC I/O cards installed in associated slots in the upper level of the shelf.

Each mapper and the associated BNC I/O cards compose a DS3 circuit-pack group. Table 3-8 on page 3-31 shows the groupings and lists the names of the groups.

In a TBM shelf, you can provision and install working DS3 mappers in following slots depending on shelf function:

- FCOT: slots 11, 15, and 17

Note: You can provision and install working mappers in these slots of FCOT shelves regardless of whether OC-12 interface circuit packs or OC-3 interface circuit packs are interfacing to the optical feeder. However, if the shelf is equipped with OC-3 interface circuit packs, the traffic to and from the shelf can use a maximum of three STS-1s. A DS3 mapper can handle up to three DS3s, and each DS3 takes up an entire STS-1. For more details, see the information on mappings for DS3s, beginning on page 3-41.

- FCOT_BLSR: slots 11, 13*, 15, and 17 (* with no DS1 mappers in shelf)
- TN_BLSR: slots 11, 13, 15, and 17

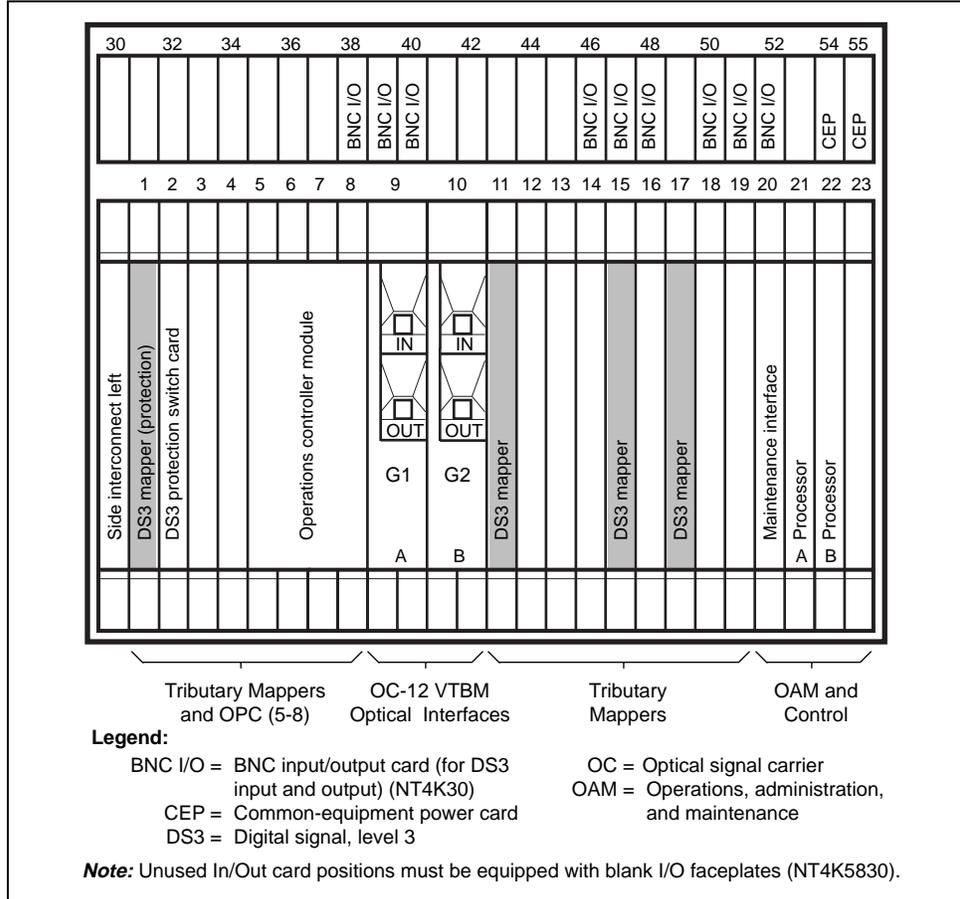
You can install an optional protection mapper in slot 1. Along with the protection mapper, you must install a DS3 protection switch card in slot 2. The protection arrangement is revertive (1: n). (If a DS3 mapper is installed in slot 1, then it is a protection unit, and only a DS3 protection switch card can be installed in slot 2.)

Transport bandwidth manager FCOT shelf handling DS3s

Figure 3-11 shows a TBM shelf containing three working DS3 mappers and a protection mapper supporting nine DS3s.

Figure 3-11
A TBM FCOT or FCOT_BLSR shelf with three protected DS3s

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If a working mapper is installed in a slot, then do not install any circuit pack in the adjacent even-numbered slot.

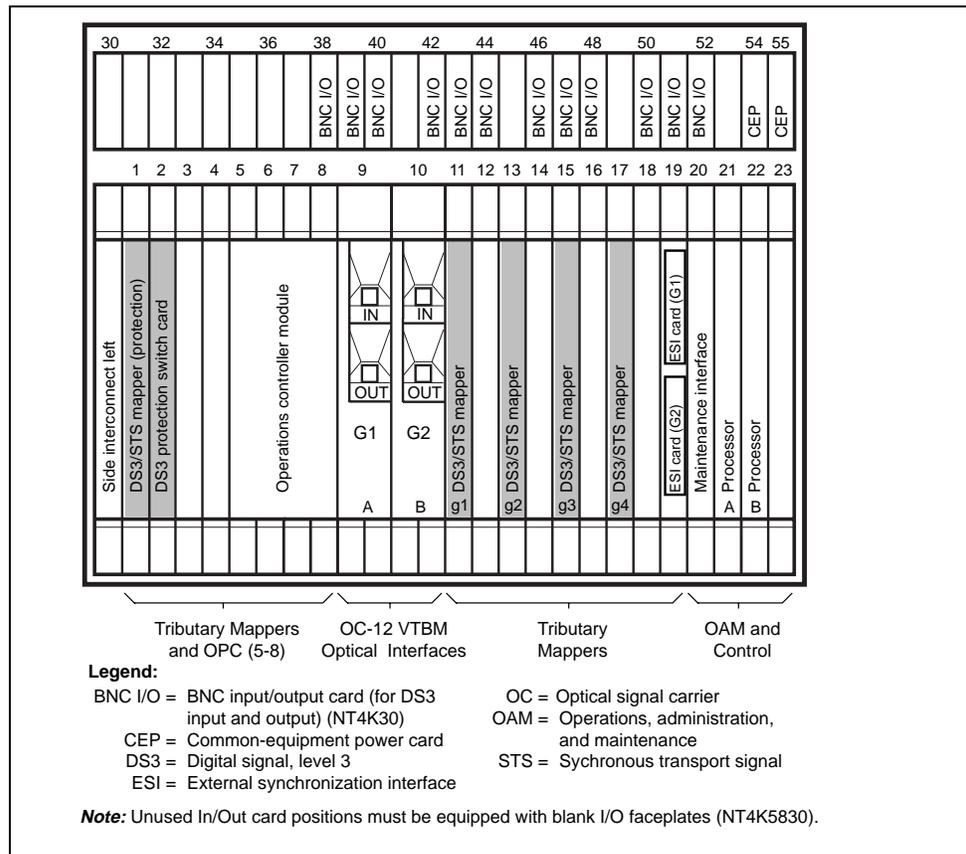
Transport bandwidth manager shelf as FCOT_BLSR with DS3s

Figure 3-12 shows a TBM shelf that handles four working DS3 mappers and a protection mapper supporting 12 DS3s. This shelf contains the following equipment:

- two common-equipment power cards (in slots 54 and 55)
- one operations controller module (in slots 5 to 8)
- two OC-12 VTBM interface circuit packs (in slots 9 and 10)
- two processor cards (in slots 21 and 22)
- one maintenance interface card (in slot 20)
- two external synchronization interface cards (in their carrier, in slot 19)
- four working DS3 mappers (in slots 11, 13, 15, and 17)
- 12 BNC I/O cards (in slots 38, 39, 40, 42, 43, 44, 46, 47, 48, 50, 51, and 52)
- one DS3 protection mapper (in slot 1)
- one NT4K60CA DS3 protection switch card (in slot 2)

Figure 3-12
Transport bandwidth manager shelf as FCOT_BLSR with DS3s

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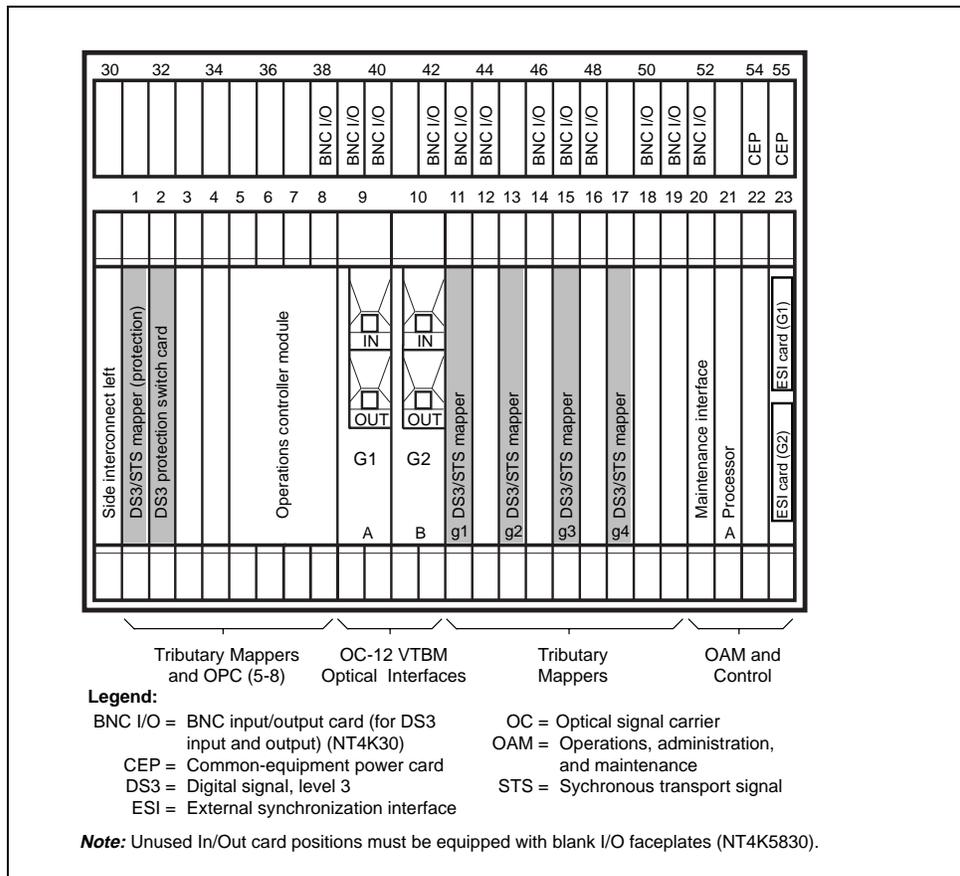
Transport bandwidth manager shelf as TN_BLSR with DS3s

Figure 3-13 shows a TBM shelf that handles four working DS3 mappers and a protection mapper supporting 12 DS3s.

- two common-equipment power cards (in slots 54 and 55)
- one operations controller module (in slots 5 to 8)
- two OC-12 VTBM interface circuit packs (in slots 9 and 10)
- one processor cards (in slot 21)
- one maintenance interface card (in slot 20)
- two external synchronization interface cards (in their carrier, in slot 23)
- four working DS3 mappers (in slots 11, 13, 15, and 17)
- 12 BNC I/O cards (in slots 38, 39, 40, 42, 43, 44, 46, 47, 48, 50, 51, and 52)
- one DS3 protection mapper (in slot 1)
- one NT4K60BA DS3 protection switch card (in slot 2)

Figure 3-13
Transport bandwidth manager shelf as TN_BLSR with DS3s

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Group and slot associations

Table 3-8 shows the DS3 circuit pack groups for FCOT/FCOT_BLSR shelf functions. It also shows the association between mappers in the lower level of the shelf, and input/output cards in the upper level.

Table 3-8
DS3 group numbers for FCOT, FCOT_BLSR, and TN_BLSR shelves

Shelf function	Group or I/O slot	Mapper slot																		
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
FCOT	Group	P	S	—	—							g1	—	g2*	—	g3	—	g4	—	—
FCOT_BLSR	I/O slots	—	—									38		42*		46		50		
TN_BLSR		—	—									39		43*		47		51		
		—	—									40		44		48		52		

Note 1: * This group is available for FCOT_BLSR shelves that have no DS1s provisioned. This group is not available for FCOT shelves. It is available for TN_BLSR shelves whether or not DS1s are installed in the shelf.

Note 2: The feeder occupies slots 9 and 10. If an OPC is installed, it occupies slots 5 through 8.

Note 3: The symbol “P” in slot 1 denotes a protection mapper; the symbol “S” in slot 2 denotes a protection switch card.

DS3 restrictions in case of a mix of DS1s, DS3s, STS-1s, and OC-3s in a TBM

If a TBM shelf contains a mix of DS3 mappers, DS1/VT mappers, STS-1 interfaces, and tributary OC-3 interface circuit packs, the following restrictions apply to the DS3 mappers:

- If a working DS1/VT mapper has been provisioned in slot 12, slot 16, or slot 18, you cannot provision a DS3 mapper in the odd-numbered slot to the left of that slot.
- If a tributary OC-3 interface circuit pack has been provisioned in the slot for the DS3 protection mapper (slot 1), you cannot provision any DS3 mappers in the shelf.

STS-1 tributaries in a TBM shelf

The STS-1 interface installs in the lower level of a TBM shelf that is an TN_BLSR.

The STS-1 interface provides interface circuitry between one, two, or three BNC I/O cards and the optical interface circuit pack (OC-12 interface circuit pack or OC-3 interface circuit pack).

I/O cards associated with the STS-1 interfaces

Each STS-1 interface is associated with up to three BNC I/O cards installed in associated slots in the upper level of the shelf.

Each mapper and the associated BNC I/O cards compose an STS-1 circuit-pack group. Table 3-8 on page 3-31 shows the groupings and lists the names of the groups.

Slot locations for the STS-1 interface in a TBM shelf

In a TBM shelf, you can provision and install working STS-1 interfaces in following slots depending on shelf function:

- TN_BLSR: slots 11, 13, 15, and 17

You can install an optional protection mapper in slot 3. Along with the protection mapper, you must install a DS3/STS-1 protection switch card in slot 2. The protection arrangement is revertive (1: n). (If an STS-1 interface is installed in slot 3, then it is a protection unit, and only a DS3/STS-1 protection switch card can be installed in slot 2.)

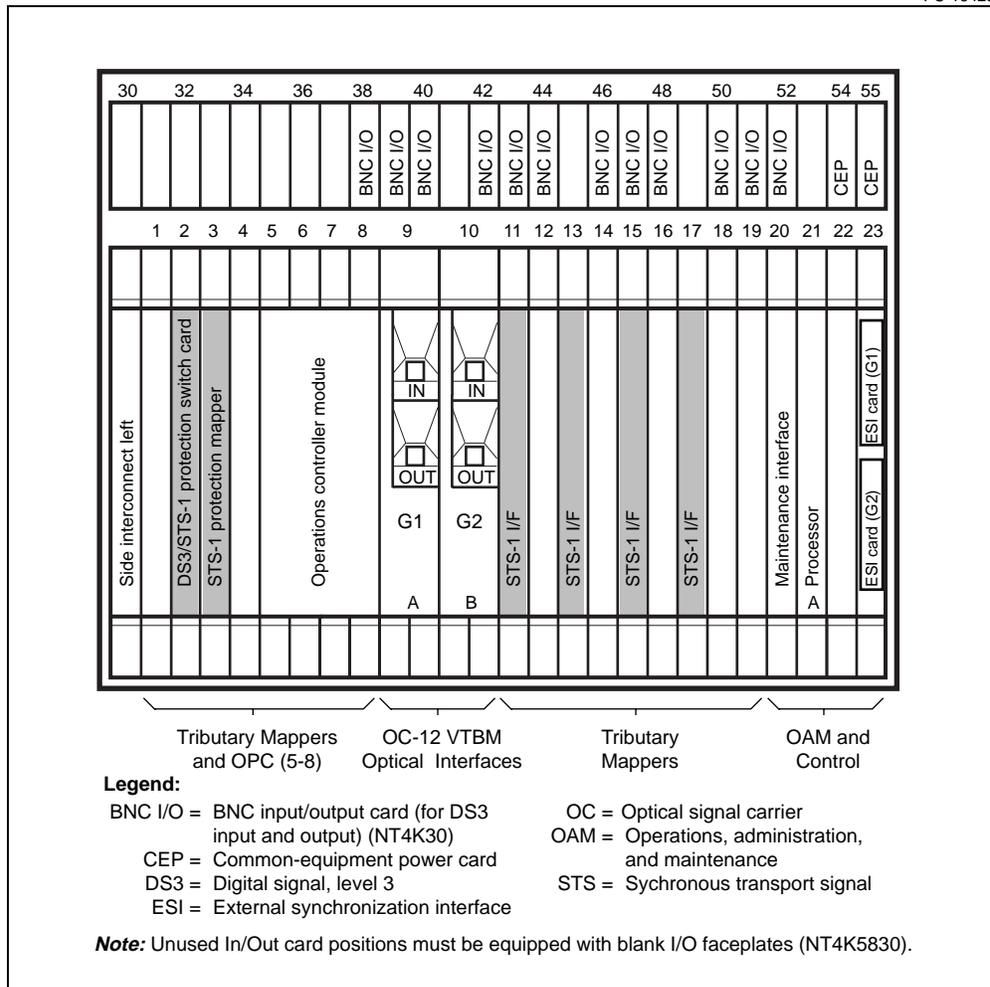
Transport bandwidth manager shelf as TN_BLSR with STS-1s

Figure 3-14 shows a TBM shelf that handles four working STS-1 interfaces and a protection mapper supporting 12 STS-1s.

- two common-equipment power cards (in slots 54 and 55)
- one operations controller module (in slots 5 to 8)
- two OC-12 VTBM interface circuit packs (in slots 9 and 10)
- one processor cards (in slot 21)
- one maintenance interface card (in slot 20)
- two external synchronization interface cards (in their carrier, in slot 23)
- four working STS-1 interfaces (in slots 11, 13, 15, and 17)
- 12 BNC I/O cards (in slots 38, 39, 40, 42, 43, 44, 46, 47, 48, 50, 51, and 52)
- one STS-1 protection mapper (in slot 3)
- one NT4K60BA DS3/STS-1 protection switch card (in slot 2)

Figure 3-14
Transport bandwidth manager shelf as TN_BLSR with STS-1s

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Group and slot associations

Table 3-9 shows the DS3 circuit pack groups for FCOT/FCOT_BLSR shelf functions. It also shows the association between mappers in the lower level of the shelf, and input/output cards in the upper level.

Table 3-9
STS-1 group numbers for TN_BLSR shelves

Shelf function	Group or I/O slot	Mapper slot																		
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
TN_BLSR	Group		S	P	—							g1	—	g2*	—	g3	—	g4	—	—
	I/O slots	—	—	—								38		42*		46		50		
		—	—	—								39		43*		47		51		
—		—	—								40		44		48		52			

Note 1: * This group is available for FCOT_BLSR shelves that have no DS1s provisioned. This group is not available for FCOT shelves. It is available for TN_BLSR shelves whether or not DS1s are installed in the shelf.

Note 2: The feeder occupies slots 9 and 10. If an OPC is installed, it occupies slots 5 through 8.

Note 3: The symbol “P” in slot 3 denotes a protection mapper; the symbol “S” in slot 2 denotes a protection switch card.

STS-1 restrictions in case of a mix of DS1s, and STS-1s in a TBM

If a TBM shelf contains a mix of STS-1 interfaces, DS1 mappers, and tributary OC-3 interface circuit packs, the following restriction applies to the STS-1 interfaces:

- If a working DS1 mapper has been provisioned in slot 12, slot 14, slot 16, or slot 18, you cannot provision an STS-1 interface in the odd-numbered slot to the left of that slot.
- If a tributary OC-3 interface circuit pack has been provisioned in the slot for the STS-1 interface protection (slot 3), you cannot provision any STS-1 interfaces in the shelf.
- If a working DS1 mapper has been provisioned in slot 12, 14, 16 or 18, or if the protection DS1 mapper has been provisioned in slot 19, you cannot provision an STS-1 interface card in slot 17 of the TBM TN_BLSR shelf.

OC-3 tributaries (NT7E01) in a TBM shelf

The OC-3 interface circuit pack installs in the lower level of a TBM shelf. These circuit packs install in pairs, which are in nonrevertive protection-switching arrangements. The OC-3 interface circuit pack can serve as either the primary fiber optic feeder for the network element, or as an OC-3 tributary. An AccessNode system can support OC-3 tributaries only if the primary fiber optic feeder is an OC-12 feeder.

The following sections explain the equipping rules for OC-3 circuit packs that interface with OC-3 tributaries. These equipping rules apply to all three TBM shelf functions: FCOT, FCOT_BLSR, and TN_BLSR.

Equipping rules

Installing the OC-3 tributaries into TBM FCOT bays requires compliance to special equipping rules and mounting location restrictions for the OC-3 tributaries. Follow these equipping rules when installing the OC-3 tributaries in the AccessNode TBM FCOT bays:

- STS-1 cross-connections must be set up by the user.
- No asymmetrical or linear add/drop multiplexer (ADM) is provided.
- No orderwire is provided on OC-3 tributaries.
- No support for OC-3 tributaries on an OC-3 FCOT or RFT is provided. Also a DS1 fed or a DFA can not support OC-3 tributaries.
- Only non-diverse route SONET datacomm is provided.
- OC-3 tributaries can be configured in protected or unprotected mode.
- The OC-12 network element (NE) containing the OC-3 tributary may not take its timing from the tributary.
- A single-ended AccessNode off an RFT must be in the same span-of control as the RFT.
- If two section data communications channels (SDCCs) are to be enabled on two OC-3 tributaries in an RFT, then one host or one SDCC on the primary optics must be disabled.
- OC-3 to TIC STS-1 cross-connections are not supported except in the case of a single-ended AccessNode where the TIC 1 is default mapped to the STS-1 #1 in the OC-3.



CAUTION

Service-affecting action

Do not place an OC-3 optical pack into slot 17 if the TBM shelf contains any DS1 lines. Doing so may cause DS1 traffic to be lost. This is because slots 17 and 18 share the backplane with DS1 protection slots and placing the OC-3 optical pack in these slots interrupts the DS1 clock signals.

Slot locations of an OC-3 interface circuit pack in the TBM shelf

An OC-3 interface circuit pack occupies two single slots in a TBM shelf. Slots 1 and 2, 3 and 4, 5 and 6, 7 and 8, 11 and 12, 13 and 14, 15, and 16, or 17 and 18 can be equipped with OC-3 tributaries. The odd-numbered slot identifies the location of the circuit pack.

A TBM shelf can support up to four protected OC-3 tributaries or four unprotected OC-3 tributaries. For example, an OC-3 optical interface circuit pack in slots 1 and 2 can support an unprotected OC-3 tributary. To provide 1+1 protection for this tributary, you can install a protection OC-3 interface circuit pack immediately to the right in slots 3 and 4.

OC-3 interface circuit packs placed in slots 5, 11, and 15 can handle three more OC-3 tributaries. Protection units for these tributaries can be installed in slots 7, 13, and 17, respectively.

Note: Do not install an OC-3 interface circuit pack in a protection position (slot 3, slot 7, slot 13, or slot 17) unless you have also installed a working OC-3 interface circuit pack immediately to the left.

OC-3 group numbers

Table 3-10 shows the OC-12 and OC-3 circuit pack groups for TBM shelves.

Table 3-10
Group numbers for OC-12 and OC-3 optical interface circuit packs

Mapper and shelf function		Mapper slot																		
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
OC-3	ABM tributary	G3	G4	G1S	G2S															
	TBM tributary	G3	G4	G1S	G2S			G5	G6	G7	G8									

Transport bandwidth manager shelf handling protected OC-3 tributaries

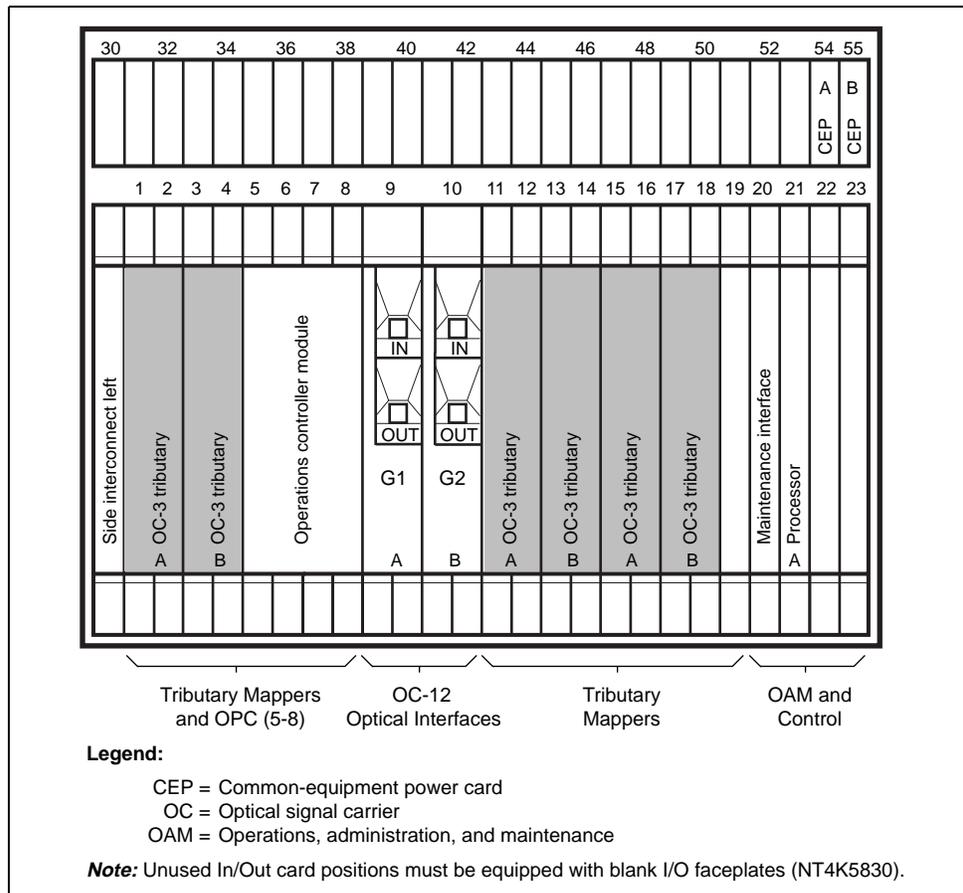
Figure 3-15 shows a TBM shelf that handles three protected OC-3 tributaries.

The shelf shown in Figure 3-15 contains the following equipment:

- three pairs of OC-3 interfaces (in slots 1/2, 11/12, and 15/16) that interface to OC-3 tributaries
- three pairs of OC-3 protection mappers (in slots 3/4, 13/14, and 17/18)
- one operations controller module (in slots 5 to 8)
- two OC-12 interface circuit packs (in slots 9 and 10) that interface to the fiber-optic feeder
- two external synchronization interface cards (in their carrier, in slot 19)
- one maintenance interface card (in slot 20)
- two processor cards (in slots 21 and 22)
- two common-equipment power cards (in slots 54 and 55)

Figure 3-15
Transport bandwidth manager shelf handling three protected OC-3 tributaries

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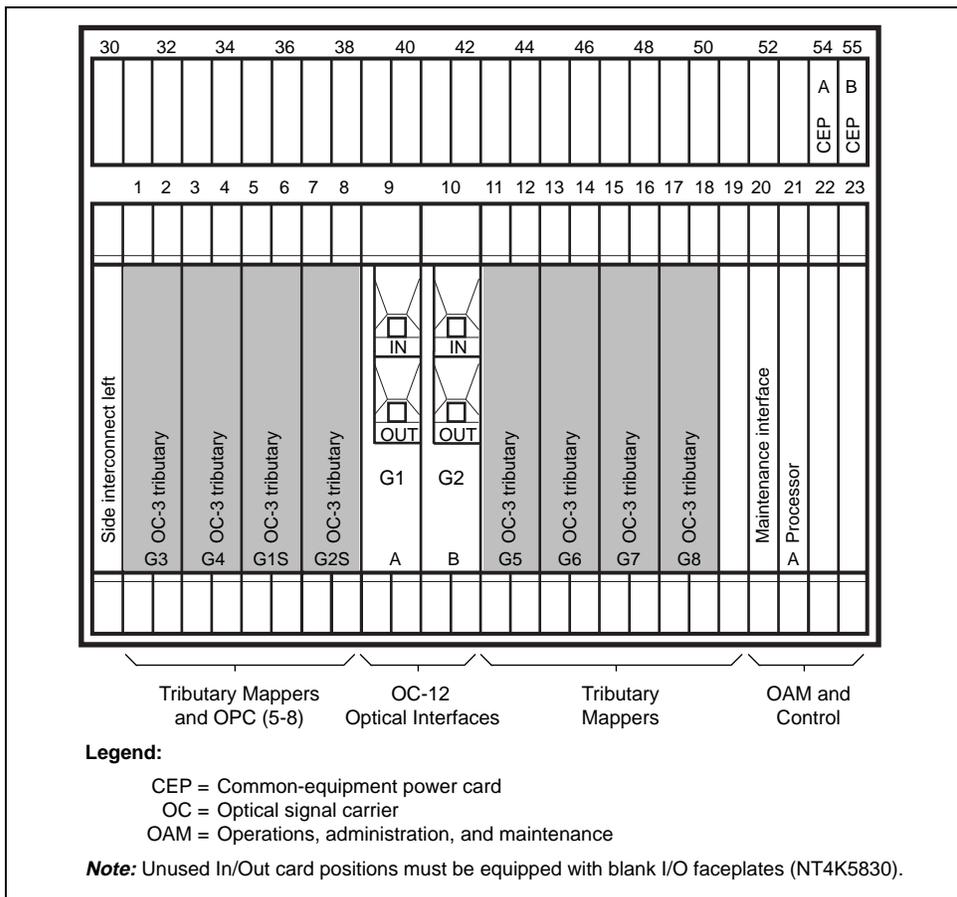


3-38 Equipping rules and restrictions for the TBM shelf

Figure 3-16 shows a TBM shelf equipped with the maximum number of OC-3 interface circuit packs allowed.

Figure 3-16
A TBM shelf equipped to maximum capacity with tributary OC-3 interface circuit packs

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OC-3 restrictions in case of a mix of DS1s, DS3s, STS-1s, and OC-3s in the TBM

If a TBM shelf contains a mix of DS1 mappers, DS3 mappers, STS-1 interfaces, and OC-3 interfaces, the following restrictions apply to the OC-3 interfaces:

- If a DS1 protection mapper has been provisioned (slot 13), you cannot provision an OC-3 interface in that slot.
- If the shelf contains one or more DS3 mappers, you cannot provision an OC-3 interface in slot 1 regardless of whether slots 1 and 2 are used for DS3 protection.



CAUTION

Service-affecting action

Do not place an OC-3 optical pack into slot 17 if the TBM shelf contains any DS1 traffic. Doing so may cause DS1 traffic to be lost.

This is because slots 17 and 18 share the backplane with DS1 protection slots and placing the OC-3 optical pack in these slots interrupts the DS1 clock signals.

Default and non-default mappings for TBM shelf functions

This section explains the default and non-default mappings for the TBM shelf functions.

Note: There is no default map for TBM shelves with OC-12 VTBM interface circuit packs. Refer to the following section, “Mappings for TBM shelves with OC-12 VTBM or OC-3 interfaces” for more information.

Mappings for TBM shelves with OC-12 VTBM or OC-3 interfaces

A default map is not available for OC-12 VTBM interface circuit packs in either the FCOT or the associated RFT. If the FCOT and RFT are equipped with OC-12 VTBM interface circuit packs, you must use the Connection Manager to set up appropriate STS-1 connections.

If the FCOT and RFT are equipped with feeder OC-3 interface circuit packs, only STS-1s numbers 1, 2, and 3 are available.

For information on setting up STS-1 connections, see *Provisioning and Operations Procedures*, 323-3001-310, in *Operations, Administration, and Provisioning*, Volume 4B.

For more information on specifying non-default mappings, see “Specifying non-default maps” on page 3-43.

Mappings for DS1s

A map specifies which part of the OC-12 or OC-3 optical feeder signal carries traffic going to and from each slot in a shelf. The mapping of traffic for the FCOT and RFT determines how the circuit packs in the FCOT and RFT are paired.

Example

If a mapper in slot six in the common-equipment shelf in the FCOT sends and receives traffic through a certain portion of the optical feeder signal, that mapper is paired with the circuit pack in the RFT that sends and receives traffic through the same portion of the optical signal.

The OC-12 or OC-3 optical signal between the FCOT and RFT is composed of STS-1s. The traffic to and from a DS1 mapper occupies the top half or the bottom half of an STS-1. Each mapper can handle both directions of up to 14 DS1s. Each DS1 is mapped into a VT1.5. Each STS-1 has capacity for 28 VT1.5s.

The maps that are in effect for the network elements in a system may be either of the following:

- default maps
- non-default maps

Default maps

While you are commissioning a network element, you can direct the network element to provision a default map for itself from the Connection Manager tool's default map option. The network element then provisions the appropriate default mappings. The map that you get depends on the type of network element with which you are working.

The only default map for the TBM shelf is for a TBM shelf in an FCOT. Table 3-11 on page 3-42 shows this default map.

You may want to specify a non-default map (for example, to support VTBM ring nodes). For information on non-default maps, see "Specifying non-default maps" on page 3-43.

Default mappings for DS3s

A map specifies which part of the OC-12 or OC-3 optical feeder signal carries traffic going to and from each slot in a shelf. The mapping of traffic for the FCOT and RFT determines how the circuit packs in the FCOT and RFT are paired.

Example

For example, if a mapper in slot 6 in the common-equipment shelf in the FCOT sends and receives traffic through a certain portion of the optical feeder signal, that mapper is paired with the circuit pack in the RFT that sends and receives traffic through the same portion of the optical signal.

The OC-12 or OC-3 optical signal between the FCOT and RFT is composed of STS-1s. The traffic to and from a DS3 mapper occupies up to three STS-1s. (Each mapper can handle both directions of up to three DS3s. Each DS3 occupies one STS-1.)

The maps that are in effect for the network elements in a system may be either default maps or non-default maps.

Default maps for DS3s

While you are commissioning a network element, you can direct the network element to provision a default map for itself. The network element then provisions the appropriate default mappings. The map that you get depends on the type of network element with which you are working. The only default map for the TBM shelf is an FCOT. Table 3-11 on page 3-42 shows this default map.

To set up the default mappings, you use the Connection Manager. For information on setting up default mappings, see *Provisioning and Operations Procedures*, 323-3001-310, in *Operations, Administration, and Provisioning*, Volume 4B.

You may want to specify a non-default map. For example, a TBM shelf can support nine DS3s, but only if you specify a non-default map. For information on non-default maps, see “Specifying non-default maps” on page 3-43.

Default mappings

Table 3-11 shows the default map for a TBM shelf. If the FCOT and RFT are equipped with feeder OC-3 interface circuit packs, only the following STS-1s are available: numbers 1, 2, and 3.

Table 3-11
Default map for DS1s and DS3s in the TBM FCOT shelf function

Slot number	STS carrying	
	DS1s to/from a DS1 mapper in the slot	DS3s to/from a DS3 mapper in the slot
1		
2		
3	STS #1 low. (See note 1)	
4	STS #1 high	
11 (See note 2)	STS #3 low	
12	STS #3 high	
13	(See note 3)	
14	STS #4 high	
15	STS #5 low	STS #5, 9, and 10
16	STS #5 high	
17	STS #6 low	STS #6, 11, and 12
18	STS #6 high	

Note 1: The DS1s in STS #1 carry tandem traffic and GR-303 traffic. The assignment of the DS1s is flexible. The Subscriber Carrier Module-100 Access (SMA) assigns DS1s as follows. All 28 DS1s in the STS can be tandem DS1s. Alternatively, up to 20 of the 28 DS1s can be GR-303 DS1s, with the other 8 tandem. For the ESMA, all 28 DS1s can be either tandem or GR-303, with any mix of the two.

Note 2: If default maps are in effect, STS #2 cannot carry traffic between the TBM shelf in an FCOT and the access bandwidth manager shelf in an RFT. To use STS #2, you must specify a non-default map. You must delete the default connection of STS #2 to slots 11 and 14 at the RFT, and then add the desired connections to STS #2 at the FCOT and at the RFT. See “Specifying non-default maps” on page 3-43.

Note 3: There is no default mapping for DS1s going to and from a DS1 mapper in slot 13 because only the protection mapper can be installed in that slot.

Note 4: If the FCOT and RFT are equipped with feeder OC-3 interface circuit packs, only the following STS-1s are available: numbers 1, 2, and 3. This means that the default maps do not support DS3s in such a system. However, you can specify a non-default map that supports DS3s. For information on non-default maps, see “Specifying non-default maps” on page 3-43.

Specifying non-default maps

To specify non-default maps, you use the Connection Manager, an OPC tool.

If you have OC-12 virtual tributary bandwidth manager (VTBM) interface circuit packs in either the FCOT or the RFT, you must use the Connection Manager to specify the mappings since a default map does not exist. You use the Connection Manager to set up appropriate STS connections for the DS1, DS3, and OC-3 tributaries.

Note: STS-3c connections can be added only for OC-3 tributaries on a VTBM ring.

For information on using the Connection Manager and setting up STS connections, see *Provisioning and Operations Procedures*, 323-3001-310, in *Operations, Administration, and Provisioning*, Volume 4B.

The following examples show how you use the Connection Manager to specify a non-default map:

- You can specify that the G1, G2 pair of DS1 mapper groups should be mapped to STS #3 of the feeder bandwidth in the ABM shelf at the RFT and in the ABM shelf at the FCOT. If you install DS1 mappers in slots 1 and 2 of each shelf, traffic flows between those mappers.
- You can specify that STS-1 #4, STS-1 #7, and STS-1 #8 should be mapped to DS3 G2 in the ABM shelf in the RFT and to DS3 G1 in the transport bandwidth manager shelf in the FCOT. If you install DS3 mappers in slot 5 of the ABM shelf and slot 11 of the TBM shelf, traffic flows between those DS3 mappers.

Preparing the worksheets

Follow the procedures in this chapter to prepare DS1, DS3, STS-1, OC-3, and OC-12 mapper layout worksheets.

Requirements

Before attempting to fill out the mapper worksheets, you should have a sound understanding of the shelves, circuits, topologies, and applications in various bay and shelf arrangements of AccessNode network elements.

For a complete description of these arrangements, refer to *Configuration and Equipment Description*, 323-3001-100, and *Signal Flow and Circuit Pack Description*, 323-3001-102, in *Description*, Volume 2A.

How to use this chapter

To perform procedures in this chapter, begin with Procedure 4-1, which will guide you to the correct procedure appropriate for your configuration.

Procedure	Task	See
4-1	Selecting your worksheets	page 4-2
4-2	Preparing VTBM worksheets	page 4-5
4-3	Preparing point-to-point worksheets	page 4-8
4-4	Preparing single-ended RFT worksheets	page 4-10
4-5	Preparing DS1-fed system worksheets	page 4-12

If you can not successfully complete these procedures, contact your next level of support.

Procedure 4-1

Selecting your worksheets

Follow this procedure to begin to fill in the mapper layout worksheets for your AccessNode system. Use the blank planning worksheets, found in Appendix A, to lay out your DS1, DS3, STS-1, and/or OC-3 tributary equipment.

Tributary equipment layout worksheet

There are three versions of this form:

- ABM-ABM (page 6-7)
- TBM-ABM (page 6-9)
- TBM-TBM (page 6-11)

Use the appropriate version to plan where DS1, DS3, STS-1, and OC-3 equipment and corresponding input/output cards are to be installed in the common-equipment shelf. This information ensures an orderly expansion of the system over its life, so as to avoid out-of-service rearrangements later.

OMC Link Information Worksheet

This form is located on page 6-13. It is used to record the OMC link information and is required for DS1-fed AccessNode (DFA) systems only.

Keep the following considerations in mind:

- A DS3 mapper circuit pack is a single-width circuit pack that installs in an odd-numbered slot. The adjacent slot to the right cannot be used. The mapper layout figures indicate this limitation by showing each DS3 mapper as a double-width circuit pack.
- If you are preparing a VTBM ring or point-to-point system with a single-ended or DS1-fed RFT for commissioning, first prepare your worksheet for commissioning a VTBM ring or point-to-point system; then, prepare your worksheet for commissioning the single-ended or DS1-fed system.
- DS3 tributaries are supported in VTBM rings and in point-to-point systems (with the exception of Series 800A outside plant cabinets). They are *not* supported in single-ended or DS1-fed RFTs.
- OC-3 tributaries are supported in VTBM rings and OC-12 point-to-point systems. They are *not* supported in OC-3 point-to-point, single-ended, or DS1-fed systems.

—continued—

Procedure 4-1 (continued)
Selecting your worksheets

Action

Step	Action															
1	Refer to Table 4-1, "System topologies for AccessNode" on page 4-4 to decide which type of system you are planning. Table 4-1 describes the four basic AccessNode system topologies, and the circuit types they support.															
2	Next, from the table shown below, go to the appropriate procedure:															
	<table border="1"><thead><tr><th>If your system is</th><th>Then follow</th><th>On page</th></tr></thead><tbody><tr><td>VTBM ring</td><td>Procedure 4-2</td><td>4-5</td></tr><tr><td>point-to-point</td><td>Procedure 4-3</td><td>4-8</td></tr><tr><td>single-ended</td><td>Procedure 4-4</td><td>4-10</td></tr><tr><td>DS1-fed</td><td>Procedure 4-5</td><td>4-12</td></tr></tbody></table>	If your system is	Then follow	On page	VTBM ring	Procedure 4-2	4-5	point-to-point	Procedure 4-3	4-8	single-ended	Procedure 4-4	4-10	DS1-fed	Procedure 4-5	4-12
If your system is	Then follow	On page														
VTBM ring	Procedure 4-2	4-5														
point-to-point	Procedure 4-3	4-8														
single-ended	Procedure 4-4	4-10														
DS1-fed	Procedure 4-5	4-12														

—continued—

4-4 Preparing the worksheets

Procedure 4-1 (continued)
Selecting your worksheets

Table 4-1
System topologies for AccessNode

This type of system	Supports	And requires
Bidirectional line-switched ring (BLSR)	GR-303, DS1 tandem, DS1 transport, DS3 transport circuits, STS-1 (TN-BLSR only) and OC-3 tributaries	FCOT node requires an ABM or TBM shelf. An RFT node requires an ABM shelf.
Point-to-point This system can be configured for a UDLC, GR-303, combined, or multiplex system application, described below.	DS1 tandem, DS1 transport, DS3 transport circuits, OC-3 tributaries	
	A universal digital loop carrier (UDLC) system application contains UDLC circuits.	ABM shelf at both the FCOT and RFT
	A digital multiplex switch (GR-303) system application contains GR-303 circuits.	ABM or a TBM shelf at the FCOT, and an ABM shelf at the RFT
	A combined application contains GR-303 and UDLC circuits.	ABM shelf at both the FCOT and RFT. (DS3 transport circuits are not supported with an OPC installed at the FCOT, because no slots are available)
	A multiplex system application contains transport DS1s or DS3s. It terminates no DS0 or DS1 tandem circuits.	ABM or a TBM shelf at the FCOT, and an ABM shelf at the RFT
Single-ended system	GR-303, DS1 tandem, and DS1 transport circuits	ABM shelf at the RFT. A TBM or ABM shelf at the central office houses the OPC.
DS1-fed (DFA) system	GR-303, DS1 tandem, and DS1 transport circuits Note: For details on traffic supported on a Mix & Match DFA system (CDS, UE9000 and ANX VMs controlled by one ABM shelf), see the <i>AccessNode/AccessNode Express Mix & Match DFA Reconfiguration Quick Reference Guide</i> .	ABM shelf at the RFT. A TBM or ABM shelf at the central office houses the OPC.

—end—

Procedure 4-2

Preparing VTBM worksheets

For VTBM ring systems, a node can terminate tributary facilities from more than one other node in the ring. In this case, use the following procedure for each node in the ring:

- Prepare one copy of the Tributary Equipment Layout Form for each ring node network element.

Note: You must know the planned STS-1 and VT1.5 connections between nodes in the ring to complete the Equipment Layout forms.

- Collect layout data from all completed copies of the form onto a summary copy, to obtain a complete picture of the equipment layout at the node.

Requirements

To fill out the VTBM worksheets, you need to know the following about your ring configuration:

- How many RFTs in the ring: _____
- How many FCOTs in the ring: _____

Keep the following rules in mind when filling out VTBM worksheets:

- If you are preparing a VTBM ring or point-to-point system with a single-ended or DS1-fed RFT for commissioning, first prepare your worksheet for commissioning a VTBM ring or point-to-point system; then, prepare your worksheet for commissioning the single-ended or DS1-fed system.
- For VTBM rings, connections are VT managed as opposed to STS managed. This means that ports on a single DS1 mapper at the FCOT can be connected to some ports on different DS1 mappers in RFTs around the ring.
- DS3 tributaries are supported in VTBM rings and in point-to-point systems (with the exception of Series 800A outside plant cabinets). They are also *not* supported in single-ended or DS1-fed RFTs.
- OC-3 tributaries are supported in VTBM rings and OC-12 point-to-point systems. They are *not* supported in OC-3 point-to-point, single-ended, or DS1-fed systems.
- STS-1 tributaries are supported for TN_BLSR shelf functions.

—continued—

Action

Step	Action
------	--------

- 1 Photocopy the Tributary Equipment Layout Form appropriate for your configuration. The form for ABM—ABM configurations is on page 6-7, the form for TBM—ABM configurations is on page 6-9, and the form for TBM—TBM configurations is on page 6-11.

(A sample of a completed Tributary Equipment Layout Form is provided on page 6-5.)

Note: For VTBM ring configurations, planning should be done using multiple RFT forms and some FCOT forms according to nodes in the ring. Mapper planning must be performed according to the number of VT and STS connections that are required between the RFTs and the FCOT of the ring configuration.

- 2 Keep the equipment layout figure and Tributary Equipment Layout Form together for future reference.

Shelf serial number

- 3 On the Tributary Equipment Layout Form, record the shelf serial number for the FCOT or OPC shelf, and RFT. The serial number appears on the underside of the label plate (flip-up cover) on the common-equipment shelf.

The format of the serial number is 'An h hhhhhh', where 'n' is a positive integer and 'h' is a hexadecimal number.

Example: A2 e 040302f

Group number

- 4 On the Tributary Equipment Layout Form, record the group number of each tributary for each slot in the main shelf where the DS1, DS3, and/or OC-3 and STS-1 equipment is to be installed in your configuration. Refer to Table 5-12 on page 5-11 to Table 5-14 on page 5-13 for details.

Slot position

- 5 On the Tributary Equipment Layout Form, record the slot position of the DS1, STS-1, and/or DS3 input/output cards, required by your system. Refer to Table 5-2 on page 5-3 to Table 5-3 on page 5-4 for details.

Note: Table 5-2 to Table 5-3 show the association for every possible mapper and I/O card. Not all mappers and I/O cards are available in every configuration.

—continued—

Procedure 4-2 (continued)
Preparing VTBM worksheets

Step	Action
-------------	---------------

Future growth

- 6** If your system is not provisioned for maximum capacity, and you know your future configuration, then record the slot positions of the mappers you will install at a later date.
(Identify the future mappers using an asterisk "*".)
- 7** If your system is fiber-fed and you plan to make it a mixed configuration (a combination of two or more of DS1, DS3, OC-3 or STS-1), the mappers should be added in a specific order to avoid rearrangement of circuit packs later. Refer to Table 5-15 on page 5-15 or Table 5-16 on page 5-16 to determine the slot sequence in which the mappers should be added.
- 8** If DS1s for TR-08 systems are planned, a special type of DS1 mapper is required (NT7E04CA) for both the working and protection mapper. Therefore record which slots will be designated for TR-08 services. If two mappers are required for TR-08, they must be in consecutive odd/even slots.
- 9** Repeat steps 1–8 for each node in the ring.

—end—

Procedure 4-3 Preparing point-to-point worksheets

For point-to-point systems, use the following procedure to prepare your worksheets.

Action

Step	Action
1	<p>For point-to-point systems, locate your system configuration in the equipment layout figures, starting on page 5-20 in Chapter 5, "Tables and sample mapper layouts". Photocopy the applicable equipment layout figure.</p> <ul style="list-style-type: none">• If you have an OC-3-fed point-to-point system, see Table 5-17 on page 5-17; in the right-hand column it lists the page numbers for equipment layout figures corresponding to various OC-3 feeder arrangements.• If you have an OC-12-fed point-to-point system with OC-3 tributaries, determine your system configuration, by referring to Table 5-8 on page 5-7 through Table 5-11 on page 5-10.
2	<p>Photocopy the Tributary Equipment Layout Form appropriate for your configuration. The form for ABM–ABM configurations is on page 6-7 and the form for TBM–ABM configurations is on page 6-9.</p> <p>(A sample of a completed Tributary Equipment Layout Form is provided on page 6-5.)</p>
3	<p>For single-ended systems, either form can be used since mapper planning is performed for the RFT only.</p>
4	<p>Keep the equipment layout figure and Tributary Equipment Layout Form together for future reference.</p>

Shelf serial number

- 5 On the Tributary Equipment Layout Form, record the shelf serial number for the FCOT or OPC shelf, and RFT. The serial number appears on the underside of the label plate (flip-up cover) on the common-equipment shelf. The format of the serial number is 'An h hhhhhh', where 'n' is a positive integer and 'h' is a hexadecimal number.

Example: A2 e 040302f

Group number

- 6 On the Tributary Equipment Layout Form, record the group number of each tributary for each slot in the main shelf where the DS1, DS3, and/or OC-3 tributary equipment is to be installed in your configuration. Refer to Table 5-2 on page 5-3 to Table 5-6 on page 5-6 for details.

—continued—

 Procedure 4-3 (continued)
Preparing point-to-point worksheets

Step	Action
------	--------

Slot position

- 7** On the Tributary Equipment Layout Form, record the slot position of the DS1 and/or DS3 input/output cards, required by your system. Refer to Table 5-2 on page 5-3 to Table 5-6 on page 5-6 for details.

Note: Table 5-2 to Table 5-6 show the association for every possible mapper and I/O card. Not all mappers and I/O cards are available in every configuration.

Future growth

- 8** If your system is not provisioned for maximum capacity, and you know your future configuration, then record the slot positions of the mappers you will install at a later date.

(Identify the future mappers using an asterisk “*”).

- 9** If your system is fiber-fed and you plan to make it a mixed configuration (a combination of two or more of DS1, DS3, or OC-3), the mappers should be added in a specific order to avoid rearrangement of circuit packs later. Refer to Table 5-15 on page 5-15 or Table 5-16 on page 5-16 to determine the slot sequence in which the mappers should be added.

- 10** If DS1s for TR-08 systems are planned, a special type of DS1 mapper is required (NT7E04CA) for both the working and protection mapper. Therefore record which slots will be designated for TR-08 services. If two mappers are required for TR-08, they must be in consecutive odd/even slots.

—end—

Procedure 4-4

Preparing single-ended RFT worksheets

For single-ended RFT systems, use the following procedure to prepare your worksheets.

A single-ended RFT accommodates DS1 mapper equipment using the same layout as an RFT in an OC-3 point-to-point integrated or combined application. Although there is no competing tributary equipment (DS3 or OC-3), mapper planning is suggested. (A system upgrade is possible.)

Action

Step	Action
1	For single-ended systems, locate the system configuration in the equipment layout figures, starting on page 5-1 in Chapter 5, "Tables and sample mapper layouts". Photocopy the applicable equipment layout figure, paying attention to the RFT portion of the figure and the note limiting mapper usage in an OC-3 system.
2	Photocopy the Tributary Equipment Layout Form appropriate for your configuration. The form for ABM–ABM configurations is on page 6-7 and the form for TBM–ABM configurations is on page 6-9. (A sample of a completed Tributary Equipment Layout Form is provided on page 6-5.) Note: For single-ended systems, either form can be used since mapper planning is performed for the RFT only.
3	Keep the equipment layout figure and Tributary Equipment Layout Form together for future reference.

Shelf serial number

- 4 On the Tributary Equipment Layout Form, record the shelf serial number for the FCOT or OPC shelf, and RFT. The serial number appears on the underside of the label plate (flip-up cover) on the common-equipment shelf. The format of the serial number is 'An h hhhhhh', where 'n' is a positive integer and 'h' is a hexadecimal number.

Example: A2 e 040302f

Group number

- 5 On the Tributary Equipment Layout Form, record the group number of each tributary for each slot in the main shelf where the DS1, DS3, and/or OC-3 tributary equipment is to be installed in your configuration. Refer to Table 5-2 on page 5-3 to Table 5-6 on page 5-6 for details.

—continued—

Procedure 4-4 (continued)

Preparing single-ended RFT worksheets

Step	Action
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Slot position

- 6** On the Tributary Equipment Layout Form, record the slot position of the DS1 and/or DS3 input/output cards, required by your system. Refer to Table 5-2 on page 5-3 to Table 5-6 on page 5-6 for details. Table 5-2 to Table 5-6 show the association for every possible mapper and I/O card. Not all mappers and I/O cards are available in every configuration.

Future growth

- 7** If your system is not provisioned for maximum capacity, and you know your future configuration, then record the slot positions of the mappers you will install at a later date.
(Identify the future mappers using an asterisk "**".)
- 8** If your system is fiber-fed and you plan to make it a mixed configuration (a combination of two or more of DS1, DS3, or OC-3), the mappers should be added in a specific order to avoid rearrangement of circuit packs later. Refer to Table 5-15 on page 5-15 or Table 5-16 on page 5-16 to determine the slot sequence in which the mappers should be added.
- 9** If DS1s for TR-08 systems are planned, a special type of DS1 mapper is required (NT7E04CA) for both the working and protection mapper. Therefore, record which slots will be designated for TR-08 services. If two mappers are required for TR-08, they must be in consecutive odd/even slots.

—end—

Procedure 4-5 Preparing DS1-fed system worksheets

For DS1-fed systems, use the following procedure to prepare your worksheets.

Action

Step	Action
1	For DS1-fed systems, photocopy the DS1 mapper layout figure on page 5-20. Although there is no competing tributary equipment (DS3 or OC-3), mapper planning is suggested. (A system upgrade is possible.)
2	Make one copy of the OMC Link Information Form on page 6-13 for each new DS1-fed RFT. Record OMC link information on the form according to instructions on the form. Maintain a copy of the form at both the RFT and also at the OPC shelf.
3	Photocopy the Tributary Equipment Layout Form appropriate for your configuration. The form for ABM–ABM configurations is on page 6-7 and the form for TBM–ABM configurations is on page 6-9. (A sample of a completed Tributary Equipment Layout Form is provided on page 6-5.) Note: For single-ended systems, either form can be used since mapper planning is performed for the RFT only.
4	Keep the equipment layout figure and Tributary Equipment Layout Form together for future reference.

Shelf serial number

- 5 On the Tributary Equipment Layout Form, record the shelf serial number for the FCOT or OPC shelf, and RFT. The serial number appears on the underside of the label plate (flip-up cover) on the common-equipment shelf. The format of the serial number is 'An h hhhhhh', where 'n' is a positive integer and 'h' is a hexadecimal number.

Example: A2 e 040302f

Group number

- 6 On the Tributary Equipment Layout Form, record the group number of each tributary for each slot in the main shelf where the DS1, DS3, and/or OC-3 tributary equipment is to be installed in your configuration. Refer to Table 5-2 on page 5-3 to Table 5-6 on page 5-6 for details.

—continued—

Procedure 4-5 (continued)

Preparing DS1-fed system worksheets

Step	Action
-------------	---------------

Slot position

- 7** On the Tributary Equipment Layout Form, record the slot position of the DS1 and/or DS3 input/output cards, required by your system. Refer to Table 5-2 on page 5-3 to Table 5-6 on page 5-6 for details. Table 5-2 to Table 5-6 show the association for every possible mapper and I/O card. Not all mappers and I/O cards are available in every configuration.

Future growth

- 8** If your system is not provisioned for maximum capacity, and you know your future configuration, then record the slot positions of the mappers you will install at a later date.
(Identify the future mappers using an asterisk "**".)
- 9** If your system is fiber-fed and you plan to make it a mixed configuration (a combination of two or more of DS1, DS3, or OC-3), the mappers should be added in a specific order to avoid rearrangement of circuit packs later. Refer to Table 5-15 on page 5-15 or Table 5-16 on page 5-16 to determine the slot sequence in which the mappers should be added.
- 10** If DS1s for TR-08 systems are planned, a special type of DS1 mapper is required (NT7E04CA) for both the working and protection mapper. Therefore, record which slots will be designated for TR-08 services. If two mappers are required for TR-08, they must be in consecutive odd/even slots.

—end—

Tables and sample mapper layouts

This chapter provides capacity tables and example mapper layouts. Refer to them when filling out the blank worksheets found in Appendix A.

Chapter contents

This chapter contains the following information:

Topic	On
Group and slot associations for DS1, DS3, STS-1, OC-3, and OC-12	page 5-2
Placement options for shelf configurations	page 5-6
Planning for future growth	page 5-15
RFT ABM shelf configurations	page 5-18
FCOT TBM shelf configurations	page 5-33

Group and slot associations for DS1, DS3, STS-1, OC-3, and OC-12

The group number you enter in a command string depends on the shelf type and function, the mapper type, and its slot location. Table 5-1 lists the group and slot associations for the different mappers and shelves.

Table 5-1
Group and slot association matrix

Mapper and shelf function		Mapper slot																		
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
DS1	DS1-fed ABM	G1	G2	P	G4	G5	G6													
	ABM FCOT or FCOT_BLSR	G1	G2	P	G4	G5	G6	G7	G8											
	TBM FCOT			G3	G4							G5	G6	P	G8	G9	G10	G11	G12	
	TBM FCOT_BLSR	G1	G2	G3	G4							G5	G6	P	G8	G9	G10	G11	G12	
	TBM TN_BLSR	G1	G2	G3	G4							G5	G6	G7	G8	G9	G10	G11	G12	P
DS3	ABM	P	S	G1		G2		G3												
	TBM FCOT	P	S									G1		-		G3		G4		
	TBM FCOT_BLSR or TN_BLSR	P	S									G1		G2*		G3		G4		
STS-1	TN_BLSR		S	P								G1		G2		G3		G4		
OC-3	ABM tributary		G3		G4		G1S		G2S											
	TBM tributary		G3		G4		G1S		G2S			G5		G6		G7		G8		
	Feeder										G1	G2								
OC-12	Feeder										G1	G2								
OC-12 VTBM	Feeder										G1	G2								
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19

* For DS3 TBM FCOT_BLSR fiber-fed shelves, this group is available only if no DS1s are provisioned for that shelf.

Group and slot associations for DS1, DS3, or STS-1 I/O cards

For some tasks, you must also know the slot numbers of the input and output cards. The following table shows which table to use to determine the I/O slot(s) for the mapper you need.

If you are provisioning this equipment	For this shelf type	Then see
DS1 equipment	access bandwidth manager (ABM)	Table 5-2
	transport bandwidth manager (TBM)	Table 5-3
DS3 equipment	ABM	Table 5-4
	TBM	Table 5-5
STS-1 equipment	TBM	Table 5-6

For DS1, DS3, and STS-1 circuit packs, Tables 5-2 through 5-6 show the association between mappers in the lower level of the common equipment shelf and input/output cards in the upper level.

For example, DS1 circuit pack group G1 refers to the group of modules including the working DS1/VT mapper circuit pack in slot 1 and its corresponding DS1 input and output cards in slots 30 and 32. Similarly, DS1 circuit pack group P refers to the group of modules including the protection DS1/VT mapper circuit pack in slot 3 and the DS1 protection bridge cards in slots 34 and 36.

DS1 I/O numbers

Table 5-2 lists the DS1 circuit pack groups for the ABM shelf functions. It also shows the association between mappers in the lower level of the shelf, and input cards and output cards in the upper level.

Table 5-2
ABM DS1 mapper, group, and I/O numbers

Shelf function	Group or I/O slot	Mapper slot																			
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	-	
RFT	Group	g1*	g2*	P*	g4*	g5*	g6*	g7	g8												
RFT_BLSR	Input slot	30*	31*	34p*	35*	38	39	42	43												
FCOT	Output slot	32*	33*	36p*	37*	40	41	44	45												
FCOT_BLSR																					

Note 1: * DS1 equipment allowed in a DS1-fed ABM shelf.
Note 2: The symbol "p" in the DS1 input and output slots denotes a protection bridge card.
Note 3: The feeder occupies slots 9 and 10. If an operations controller (OPC) is installed, it occupies slots 5 through 8.

5-4 Tables and sample mapper layouts

Table 5-3 lists the DS1 circuit pack groups for the different TBM shelf functions. It also shows the association between mappers in the lower level of the shelf, and input cards and output cards in the upper level.

Table 5-3
TBM DS1 mapper, group, and I/O numbers

Shelf function	Group or I/O slot	Mapper slot																		
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
FCOT	Group			g3	g4							g5	g6	P	g8	g9	g10	g11	g12	
	Input slot			34	35							38	39	42p	43	46	47	50	51	
	Output slot			36	37							40	41	44p	45	48	49	52	53	
FCOT_BLSR	Group	g1*	g2*	g3	g4							g5	g6	P	g8	g9	g10	g11	g12	
	Input slot	30*	31*	34	35							38	39	42p	43	46	47	50	51	
	Output slot	32*	33*	36	37							40	41	44p	45	48	49	52	53	
TN_BLSR	Group	g1*	g2*	g3	g4							g5	g6	g7	g8	g9	g10	g11	g12	P
	Input slot	30*	31*	34	35							38	39	42	43	46	47	50	51	-
	Output slot	32*	33*	36	37							40	41	44	45	48	49	52	53	-

Note 1: * FCOT_BLSR and TN_BLSR shelves can contain two additional DS1 working groups (compared to a fiber central office terminal (FCOT)) when DS3 protection mappers are not used in slots 1 and 2. The two additional DS1 working groups are g1 (slots 1, 30, 32) and g2 (slots 2, 31, 33).

Note 2: The symbol "p" in the DS1 input and output slots denotes a protection bridge card.

Note 3: The feeder occupies slots 9 and 10. If an OPC is installed, it occupies slots 5 through 8.

DS3 I/O numbers

Table 5-4 lists the DS3 circuit pack groups for the ABM shelf functions. It also shows the association between mappers in the lower level of the shelf, and input cards and output cards in the upper level.

Table 5-4
ABM DS3 mapper, group, and I/O numbers

Shelf function	Group or I/O slot	Mapper slot																			
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	-	
RFT	Group	P	S	g1	—	g2	—	g3	—												
RFT_BLSR	I/O slots	—	—	34		38		42													
FCOT		—	—	35		39		43													
FCOT_BLSR		—	—	36		40		44													
<p>Note 1: The feeder occupies slots 9 and 10. If an OPC is installed, it occupies slots 5 through 8.</p> <p>Note 2: The symbol “P” in slot 1 denotes a protection mapper; the symbol “S” in slot 2 denotes a protection switch card.</p>																					

Table 5-5 lists the DS3 circuit pack groups for the TBM shelf functions. It also shows the association between mappers in the lower level of the shelf, and input/output cards in the upper level.

Table 5-5
TBM DS3 mapper, group, and I/O numbers

Shelf function	Group or I/O slot	Mapper slot																			
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	
FCOT	Group	P	S	—	—																
FCOT_BLSR		g1	—	g2	—	g3	—	g4	—	—											
TN_BLSR	I/O slots	—	—																		
		—	—																		
		—	—																		
<p>Note 1: * This group is available for FCOT_BLSR shelves that have no DS1s provisioned.</p> <p>Note 2: The feeder occupies slots 9 and 10. If an OPC is installed, it occupies slots 5 through 8.</p> <p>Note 3: The symbol “P” in slot 1 denotes a protection mapper; the symbol “S” in slot 2 denotes a protection switch card.</p>																					

STS-1 I/O numbers

Table 5-6 lists the STS-1 circuit pack groups for the TBM shelf functions. It also shows the association between mappers in the lower level of the shelf, and input/output cards in the upper level.

Table 5-6
TBM STS-1 interface, group, and I/O numbers

Shelf function	Group or I/O slot	Mapper slot																		
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
TN_BLSR	Group		S	P	—							g1	—	g2	—	g3	—	g4	—	—
	I/O slots	—	—									38		42		46		50		
		—	—									39		43		47		51		
		—	—									40		44		48		52		

Note 1: The feeder occupies slots 9 and 10. If an OPC is installed, it occupies slots 5 through 8.

Note 2: The symbol “P” in slot 3 denotes a protection mapper; the symbol “S” in slot 2 denotes a protection switch card.

Placement options for shelf configurations

This section shows the placement options and shelf capacities for the following ABM and TBM shelves. This includes the following shelf functions:

- RFT
- RFT_BLSR
- FCOT
- FCOT_BLSR
- TN_BLSR

ABM placement options and capacities

This section shows the placement options and shelf capacities for the following ABM shelf functions:

- RFT
- RFT_BLSR
- FCOT
- FCOT_BLSR

Table 5-7 shows the placement options for the OPC and supported mappers in an ABM shelf. These placement options apply to all ABM shelf functions: RFT, FCOT, RFT_BLSR, and FCOT_BLSR.

Table 5-7
Placement options for OPC and mappers in an ABM shelf

1	2	3	4	5	6	7	8
				OPC			
OC-3		P		OC-3		P	
P		DS3		DS3		DS3	
DS1	DS1	P	DS1	DS1	DS1	DS1	DS1

Table 5-8 lists the ABM shelf capacities for an OC-12 or OC-12 VTBM system. These capacities apply to all ABM shelf functions: RFT, FCOT, RFT_BLSR, and FCOT_BLSR.

Table 5-8
ABM shelf capacity for an OC-12 system

If you have this type of shelf	And want to use these types of lines	Then you can have this many facilities			And will use this protection scheme			
		DS1	DS3	OC-3	DS1	DS3	OC-3	
ABM without OPC	DS1 only	98	0	0	1:7	0	0	
	DS3 only	0	9	0	0	1:3	0	
	OC-3 only	0	0	2	0	0	1+1	
	DS1/DS3		14	6	0	1:1	1:2	0
			42	3	0	1:3	1:1	0
	DS1/OC-3	42	0	1	1:3	0	1+1	
DS3/OC-3	0	3	1	0	1:1	1+1		
ABM with OPC	DS1 only	42	0	0	1:3	0	0	
	DS3 only	0	3	0	0	1:1	0	
	OC-3 only	0	0	1	0	0	1+1	
Note: Up to 28 of the DS1s can be tandem DS1s.								

TBM placement options and capacities

This section shows the placement options and shelf capacities for the following TBM shelf functions:

- FCOT
- FCOT_BLSR
- TN_BLSR

Table 5-9 shows the placement options for OPC and mappers in an OC-12 TBM FCOT shelf.

Table 5-9
Placement options for OPC and mappers in a TBM FCOT shelf

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18				
				OPC module																	
OC-3		OC-3		OC-3		OC-3						OC-3		OC-3		OC-3		OC-3			
Protection										DS3						DS3				DS3	
		DS1		DS1						DS1		DS1		Prot		DS1		DS1		DS1	
<p>Note 1: If a DS3 mapper is installed in slot 11, slot 15, or slot 17, the slot to the right must remain empty.</p> <p>Note 2: If an OC-3 circuit pack is installed in slots 13 or 17, you cannot have any DS1s in the shelf, and vice versa.</p>																					

Table 5-10 lists the TBM shelf capacities for an OC-12 TBM FCOT shelf.

Table 5-10
TBM FCOT shelf capacity for an OC-12 system

If you have this type of shelf	And want to use these types of lines (Note 1)	Then you can have this many facilities			And will use this protection scheme		
		DS1	DS3	OC-3	DS1	DS3	OC-3
TBM without OPC	DS1 only	126	0	0	1:9	0	0
	DS3 only	0	9	0	0	1:3	0
	OC-3 only	0	0	3	0	0	1+1
	DS1/DS3	42	9	0	1:3	1:3	0
		98	3	0	1:7	1:1	0
		126	0	1	1:9	0	1+1
	DS1/OC-3 (Note 2)	98	0	2	1:7	0	1+1
		42	0	2	1:3	0	1+1
		0	9	1	0	1:3	1+1
	DS3/OC-3	0	6	2	0	1:2	1+1
		42	9	1	1:3	1:3	1+1
	DS1/DS3/OC-3	0	6	2	0	1:2	1+1
98		3	1	1:7	1:1	1+1	
126		0	3	1:9	0	1+1	
TBM with OPC	DS1 only	126	0	0	1:9	0	0
	DS3 only	0	9	0	0	1:3	0
	OC-3 only	0	0	3	0	0	1+1
	DS1/DS3	42	9	0	1:3	1:3	0
		98	3	0	1:7	1:1	0
		126	0	1	1:9	0	1+1
	DS1/OC-3 (Note 2)	98	0	2	1:7	0	1+1
		42	0	2	1:3	0	1+1
		0	9	1	0	1:3	1+1
	DS3/OC-3	0	6	2	0	1:2	1+1
		42	9	1	1:3	1:3	1+1

Note 1: 28 of the DS1s can be tandem DS1s.

Note 2: If you place an OC-3 optical card in slot 13 or 17, you can not have any DS1s and vice versa.

5-10 Tables and sample mapper layouts

Table 5-11 shows the placement options for OPC and mappers in a TBM OC-12 FCOT_BLSR shelf used with VTBM ring systems.

Table 5-11
Possible uses of slots in an FCOT_BLSR

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18				
				OPC module																	
OC-3		OC-3		OC-3		OC-3				OC-3		OC-3		OC-3		OC-3					
DS3 Pr										DS3				DS3				DS3			
<i>DS1</i>	<i>DS1</i>	<i>DS1</i>	<i>DS1</i>									<i>DS1</i>	<i>DS1</i>	<i>Prot</i>	<i>DS1</i>	<i>DS1</i>	<i>DS1</i>	<i>DS1</i>	<i>DS1</i>	<i>DS1</i>	
<p>Note 1: If a DS3 mapper is installed in slot 11, slot 15, or slot 17, the slot to the right must remain empty.</p> <p>Note 2: Slots 1 and 2 can be used to provision DS1 /VT mappers if there are no DS3s in the shelf.</p> <p>Note 3: One protection DS1 mapper occupies slot 13.</p>																					

Table 5-12 lists the TBM shelf capacities for a TBM OC-12 FCOT_BLSR shelf used with VTBM ring systems.

Table 5-12
TBM FCOT_BLSR shelf for an OC-12 VTBM system

If you have this type of shelf	And want to use these types of lines (Note 1)	Then you can have this many facilities			And will use this protection scheme			
		DS1	DS3	OC-3	DS1	DS3	OC-3	
TBM without OPC	DS1 only	154	0	0	1:11	0	0	
	DS3 only	0	12	0	0	1:3	0	
	OC-3 only	0	0	4	0	0	1+1	
	DS1/DS3		98	3	0	1:7	1:1	0
			70	6	0	1:5	0	1+1
			42	9	0	1:3	0	1+1
	DS1/OC-3 (Note 2)		154	0	1	1:11	0	1+1
			98	0	2	1:7	0	1+1
			0	9	1	0	1:3	1+1
	DS3/OC-3		0	6	2	0	1:2	1+1
			42	9	1	1:3	1:3	1+1
			0	6	2	0	1:2	1+1
TBM with OPC	DS1 only	154	0	0	1:11	0	0	
	DS3 only	0	12	0	0	1:4	0	
	OC-3 only	0	0	3	0	0	1+1	
	DS1/DS3		42	9	0	1:4	1:3	0
			98	3	0	1:7	1:1	0
	DS1/OC-3 (Note 2)	98	0	1	1:7	0	1+1	
	DS3/OC-3	0	6	1	0	1:2	1+1	

Note 1: Up to 28 of the DS1s can be tandem DS1s.
Note 2: If you place an OC-3 optical card in slot 13 or 17, you cannot have any DS1s and vice versa.

5-12 Tables and sample mapper layouts

Table 5-13 shows the placement options for OPC and mappers in a TBM OC-12 TN_BLSR shelf used with VTBM ring systems.

Table 5-13
Possible uses of slots in a TN_BLSR

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19			
				OPC module																	
OC-3		OC-3		OC-3		OC-3				OC-3		OC-3		OC-3		OC-3					
DS3 Pr										DS3		DS3		DS3		DS3					
		STS-1 PR										STS1		STS1		STS1		STS1			
<i>DS1</i>	<i>DS1</i>	<i>DS1</i>	<i>DS1</i>									<i>DS1</i>	<i>Prot</i>								
<p>Note 1: Slots 1 through 4 can be used for DS1 mappers if there are no DS3s OR STS-1s in the shelf.</p> <p>Note 2: If a DS3 or STS-1 interface is installed (in slot 11, slot 13, slot 15, or slot 17), the slot to the right (that is, slot 12, slot 14, slot 16, or slot 18) must remain empty.</p> <p>Note 3: One protection DS1 mapper occupies slot 19. There are no I/O cards needed for this protection mapper.</p>																					

Table 5-14 lists the TBM shelf capacities for a TBM OC-12 TN_BLSR shelf used with VTBM ring systems.

Table 5-14
TBM TN_BLSR shelf for an OC-12 VTBM system

If you have this type of shelf	And want to use these types of lines (Note 1)	Then you can have this many facilities				And will use this protection scheme			
		DS1	DS3	STS-1	OC-3	DS1	DS3	STS-1	OC-3
TBM without OPC	DS1 only	168	0	0	0	1:12	0	0	0
	DS3 only	0	16	16	0	0	1:4	1:4	0
	STS-1 only	0	16	16	0	0	1:4	1:4	0
	OC-3 only	0	0	0	4	0	0	0	1+1
	DS1/DS3	28	9	9	0	1:2	1:3	1:3	0
		84	3	3	0	1:6	1:1	1:1	0
	DS1/STS-1	28	9	9	0	1:2	1:3	1:3	0
		84	3	3	0	1:6	1:1	1:1	0
	DS1/OC-3	168	0	0	1	1:12	0	0	1+1
		112	0	0	2	1:8	0	0	1+1
		56	0	0	3	1:4	0	0	1+1
	DS3/OC-3	0	9	9	1	0	1:3	1:3	1+1
		0	6	6	2	0	1:2	1:2	1+1
	STS-1/OC-3	0	9	9	1	0	1:3	1:3	1+1
		0	6	6	2	0	1:2	1:2	1+1
	DS1/DS3/OC-3	84	3	3	1	1:6	1:1	1:1	1+1
		28	3	3	2	1:2	1:1	1:1	1+1
	DS1/STS-1/OC-3	84	3	3	1	1:6	1:1	1:1	1+1
		28	3	3	2	1:2	1:1	1:1	1+1
	STS-1/DS3/OC-3		3	3	2		1:1	1:1	1+1
		3	6	1		1:1	2:1	1+1	
		6	3	1		2:1	1:1	1+1	

—continued—

Table 5-14 (continued)
TBM TN_BLSR shelf for an OC-12 VTBM system

If you have this type of shelf	And want to use these types of lines (Note 1)	Then you can have this many facilities				And will use this protection scheme			
		DS1	DS3	STS-1	OC-3	DS1	DS3	STS-1	OC-3
TBM with OPC	DS1 only	168	0		0	1:12	0	0	0
	DS3 only	0	16		0	0	1:4	1:4	0
	STS-1 only	0	16		0	0	1:4	1:4	0
	OC-3 only	0	0	0	3	0	0	0	1+1
	DS1/DS3	28	9		0	1:2	1:3	1:3	0
		84	3		0	1:6	1:1	1:1	0
	DS1/STS-1	28	9		0	1:2	1:3	1:3	0
		84	3		0	1:6	1:1	1:1	0
	DS1/OC-3 (Note 2)	112	0	0	1	1:8	0	0	1+1
	DS3/OC-3	0	6		1	0	1:2	1:2	1+1
STS-1/OC-3	0	6		1	0	1:2	1:2	1+1	
STS-1/DS3/OC-3		3	3	1		1:1	1:1		
TBM w/wo OPC	STS-1/DS3		9	3			1:3	1:1	
			6	6			1:2	1:2	
			3	9			1:1	1:3	
	STS-1/DS3/DS1	28	6	3		1:2	1:2	1:1	
		28	3	6		1:2	1:1	1:2	
		56	3	3		1:4	1:1	1:1	
<p>Note 1: Up to 28 of the DS1s can be tandem DS1s.</p> <p>Note 2: If you place an OC-3 optical card in slot 17, you cannot have any DS1s and vice versa.</p>									
—end—									

Planning for future growth

Refer to Table 5-15 and 5-16 before adding mapper equipment to an existing configuration.

Table 5-15 shows the tributary slot planning for OC-3 fed systems.

Table 5-15
Tributary slot planning for OC-3 fed systems

Present configuration	Future configuration	Recommended sequence for adding mapper equipment	
		FCOT slots	RFT slots
ABM-ABM			
DS1 universal	DS1/DS3 universal	3p, 5, 6, 1, 2	3p, 5, 6, 1, 2
DS3 universal	DS1/DS3 universal	1p, 7	1p, 7
TBM-ABM			
DS1 integrated	DS1/DS3 integrated	3, 4, 13p, 15, 16, 11, 12	3p, 5, 6, 1, 2
DS3 integrated	DS1/DS3 integrated	1p, 17	1p, 7
Note: The symbol "p" denotes the protection mapper.			

Table 5-16 shows the tributary slot planning for OC-12 fed systems.

**Table 5-16
Tributary slot planning for OC-12 fed systems**

Present configuration	Future configuration	Recommended sequence for adding mapper equipment	
		FCOT slots	RFT slots
ABM–ABM without OC-3 tributaries			
DS1 combined	DS1/DS3 combined	3p, 5, 6, 7, 8, 1, 2, 4	3p, 4, 1, 2, 5, 6
DS1 universal	DS1/DS3 universal	3p, 5, 6, 7,8, 1, 2, 4	3p, 4, 5, 6, 1, 2, 7, 8
DS3 universal	DS1/DS3 universal	1p, 7, 5, 3	1p, 7, 5, 3
ABM–ABM with OC-3 tributaries			
DS1 combined	DS1/DS3 combined	3p, 7, 8, 1, 2, 5, 6, 4	3p, 4, 1, 2, 5, 6
DS1 universal	DS1/DS3 universal	3p, 5, 6, 1, 2, 7, 8, 4	3p, 4, 5, 6, 1, 2, 7, 8
DS3 universal	DS1/DS3 universal	1p, 7, 5, 3	1p, 7, 5, 3
TBM–ABM (FCOT)		FCOT slots	RFT slots
DS1 integrated	DS1/DS3 integrated	3, 4, 13p, 14, 15, 16, 11, 12, 17, 18	3p, 4, 5, 6, 1, 2, 7, 8
DS3 integrated	DS1/DS3 integrated	1p, 17, 15, 11	1p, 7, 5, 3
TBM–ABM (FCOT_BLSR)		FCOT slots	RFT slots
DS1 integrated	DS1/DS3 integrated	1, 2, 3, 4, 13p, 14, 15, 16, 11, 12, 17, 18	3p, 4, 5, 6, 1, 2, 7, 8
DS3 integrated	DS1/DS3 integrated	1p, 17, 15, 13, 11	1p, 7, 5, 3
TBM–ABM (TN_BLSR) (note 2)		FCOT slots	RFT slots
DS1 integrated	DS1/DS3 integrated	19P, 18, 17, 16, 15, 14, 13, 12, 11, 2,1	3p, 4, 5, 6, 1, 2, 7, 8
DS3 integrated	DS1/DS3 integrated	1p, 11, 13, 15, 17	1p, 7, 5, 3
<p>Note 1:The symbol “p” denotes the protection mapper.</p> <p>Note 2:TN_BLSR shelves require the following planning sequence: for DS1 mappers, plan from the highest slot (slot 19) to the lowest slot; for DS3 mappers, plan from the lowest slot (slot 1) to the highest. You cannot cross slots between these mapper types; for example, you cannot have DS1 mappers in slots 11 and 12, and then have a DS3 mapper in slot 13.</p>			

Table 5-17 shows the ABM and TBM shelf functions for OC-3 point-to-point systems. These include the following shelf functions:

- ABM RFT
- ABM FCOT
- TBM FCOT

Table 5-17
OC-3 signal capacity (point-to-point systems only)

DS1/DS3 Configuration	DS1 tandem (FCOT only)	DS1 transport (FCOT/RFT)	DS3 transport (FCOT/RFT)	Shown on page
ABM–ABM combined configurations without an OPC				
DS1	28	28	0	18
DS1/DS3	28	0	1	21
ABM–ABM universal configurations without an OPC				
DS1	0	56	0	25
	28	28	0	25
DS1/DS3	0	28	1	26
	28	0	1	27
DS3	0	0	2	28
ABM–ABM universal configurations with an OPC				
DS1	0	42	0	25
	28	14	0	25
DS3	0	0	2	28
TBM–ABM integrated configurations, with or without an OPC				
DS1	28	56	0	29
DS1/DS3	28	28	1	30
DS3	28	0	2	32
TBM–ABM multiplexer configurations, with or without an OPC				
DS1	0	56	0	29
DS1/DS3	0	28	1	30
DS3	0	0	2	32
Note: The DS1 tandem capacity includes the combined total of Integrated (IDLC) DS1s and Tandem DS1s. See the notes on page 9 for slot locations of mappers allocated for these services under the default map.				

In point-to-point ABM–ABM configurations, the default map at the FCOT supports IDLC and DS1 tandem services on DS1 mappers in slots 1 and 2 of OC-3-fed combined configurations, or slots 7 and 8 in OC-12-fed combined configurations.

Note: For TBM to ABM configurations, make sure that the TBM shelf configuration you choose can be supported by the ABM shelf at the other end.

RFT ABM shelf configurations

In Table 5-7 on page 5-7, the ABM shelf in the RFT can be equipped to support OC-3 tributaries. Slots 1–2 can support an OC-3 tributary, slots 5–6 can support a second OC-3 tributary.

Slots 3–4 and 7–8 can be equipped with backup OC-3 circuit packs to provide 1+1 protection. If these slots are not occupied by OC-3 circuit packs, DS1 or DS3 mapper cards can be used. However, if a protection slot is occupied with an OC-3 circuit pack, the working slot can not be occupied by a DS1 or a DS3 circuit pack.

Several shelf configurations of the ABM OPC shelf and STS bandwidth usage comparison are illustrated in Figure 5-1 to Figure 5-13, beginning on page 5-20.

Note: These tables do not list all possible configurations, but include most of the fully-loaded configurations.

Note that the FCOT ABM shelf configurations are the same except when an OPC occupies slots 5-8.

This section presents the following tributary layouts.

Note: This section does not present every possible layout combination, but rather a sampling of available layouts.

Tributary layout for	See	on
Tributary layout for ABM–ABM DS1-fed AccessNode (DFA) configurations	Figure 5-1	page 5-20
Tributary layout for combined ABM–ABM mixed DS1/DS3 configurations (no OPC)	Figure 5-2	page 5-21
Tributary layout for universal ABM–ABM DS1 configurations (no OPC)	Figure 5-3	page 5-22
Tributary layout for universal ABM–ABM DS3 configurations (no OPC)	Figure 5-4	page 5-23
Tributary layout for combined ABM–ABM OC-3 configurations	Figure 5-5	page 5-24
Tributary layout for combined ABM–ABM OC-3/DS1 configurations (no OPC)	Figure 5-6	page 5-25
Tributary layout for combined ABM–ABM OC-3/DS1 configurations	Figure 5-7	page 5-26
Tributary layout for combined ABM–ABM DS1/OC-3 configurations	Figure 5-8	page 5-27
Tributary layout for combined ABM–ABM DS3/OC-3	Figure 5-9	page 5-28
Tributary layout for TBM–ABM DS1 configurations (with or without an OPC)	Figure 5-10	page 5-29
Tributary layout for TBM–ABM mixed DS1/DS3 configurations (with or without OPC)	Figure 5-11	page 5-30
Tributary layout for TBM–ABM mixed DS1/DS3 configurations (with or without OPC)	Figure 5-12	page 5-31
Tributary layout for TBM–ABM DS3 configurations (with or without an OPC)	Figure 5-13	page 5-32

Figure 5-1
Tributary layout for ABM–ABM DS1-fed AccessNode (DFA) configurations

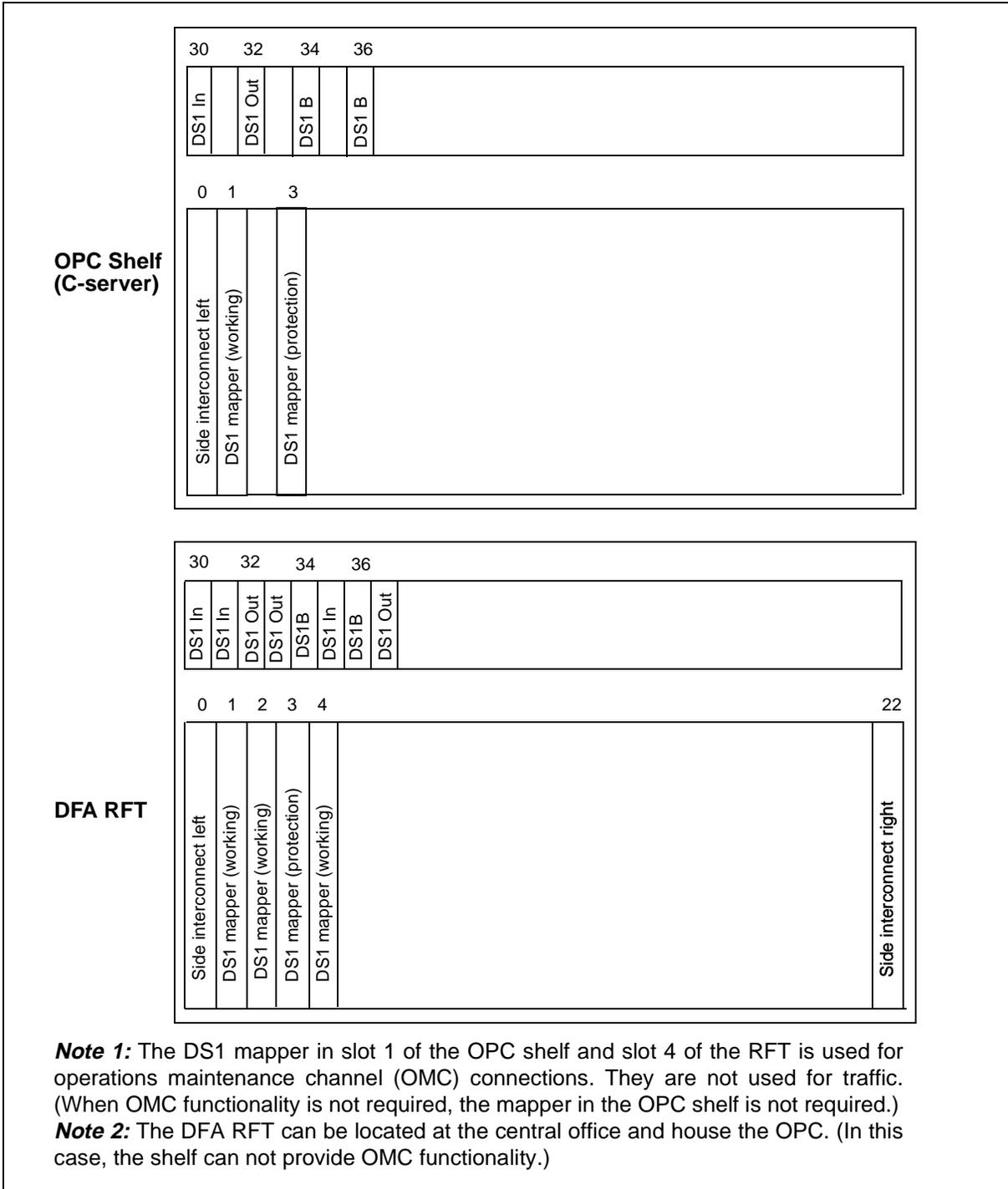


Figure 5-2
Tributary layout for combined ABM–ABM mixed DS1/DS3 configurations (no OPC)

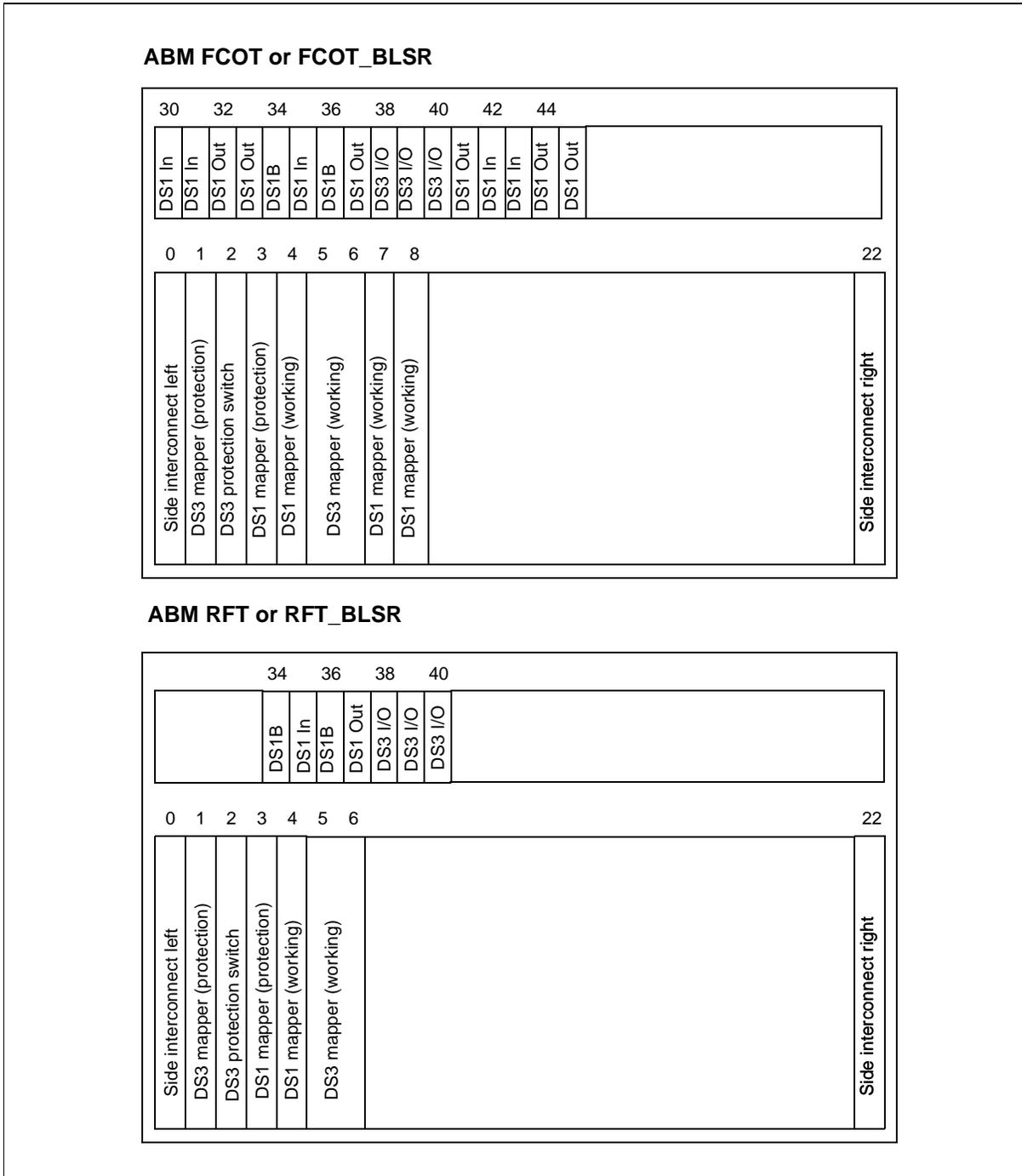


Figure 5-4
Tributary layout for universal ABM–ABM DS3 configurations (no OPC)

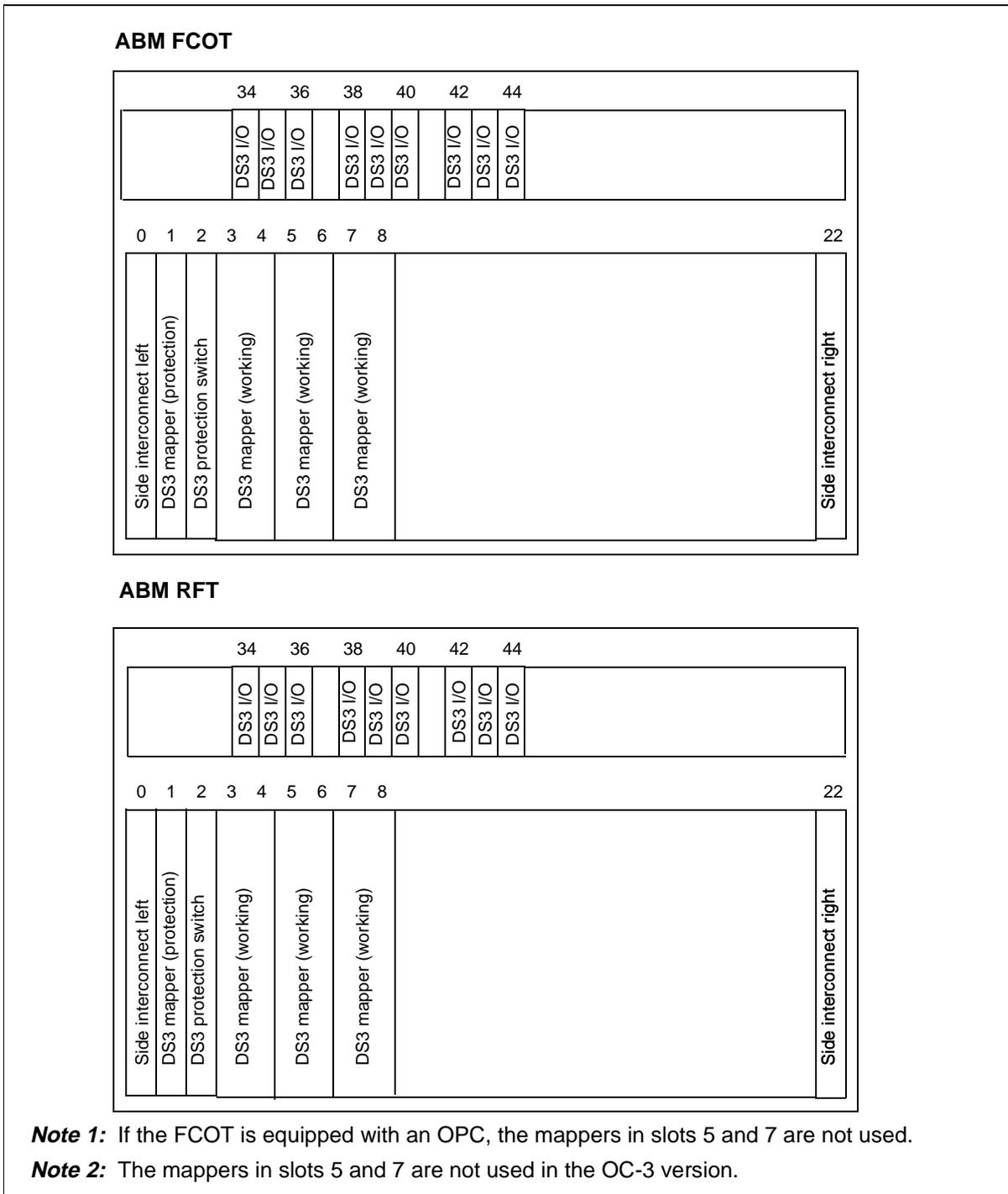


Figure 5-5
Tributary layout for combined ABM-ABM OC-3 configurations

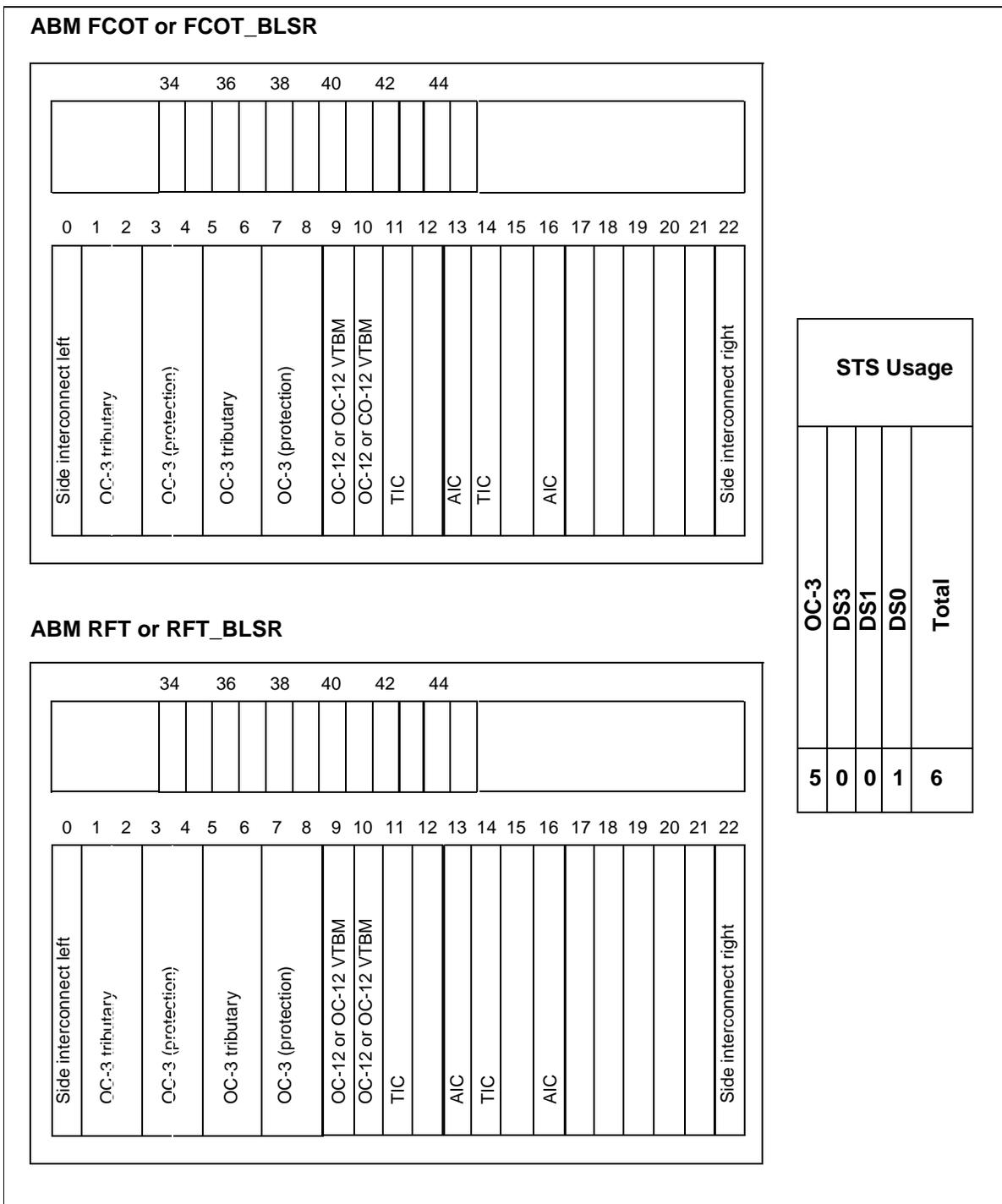


Figure 5-6
Tributary layout for combined ABM-ABM OC-3/DS1 configurations (no OPC)

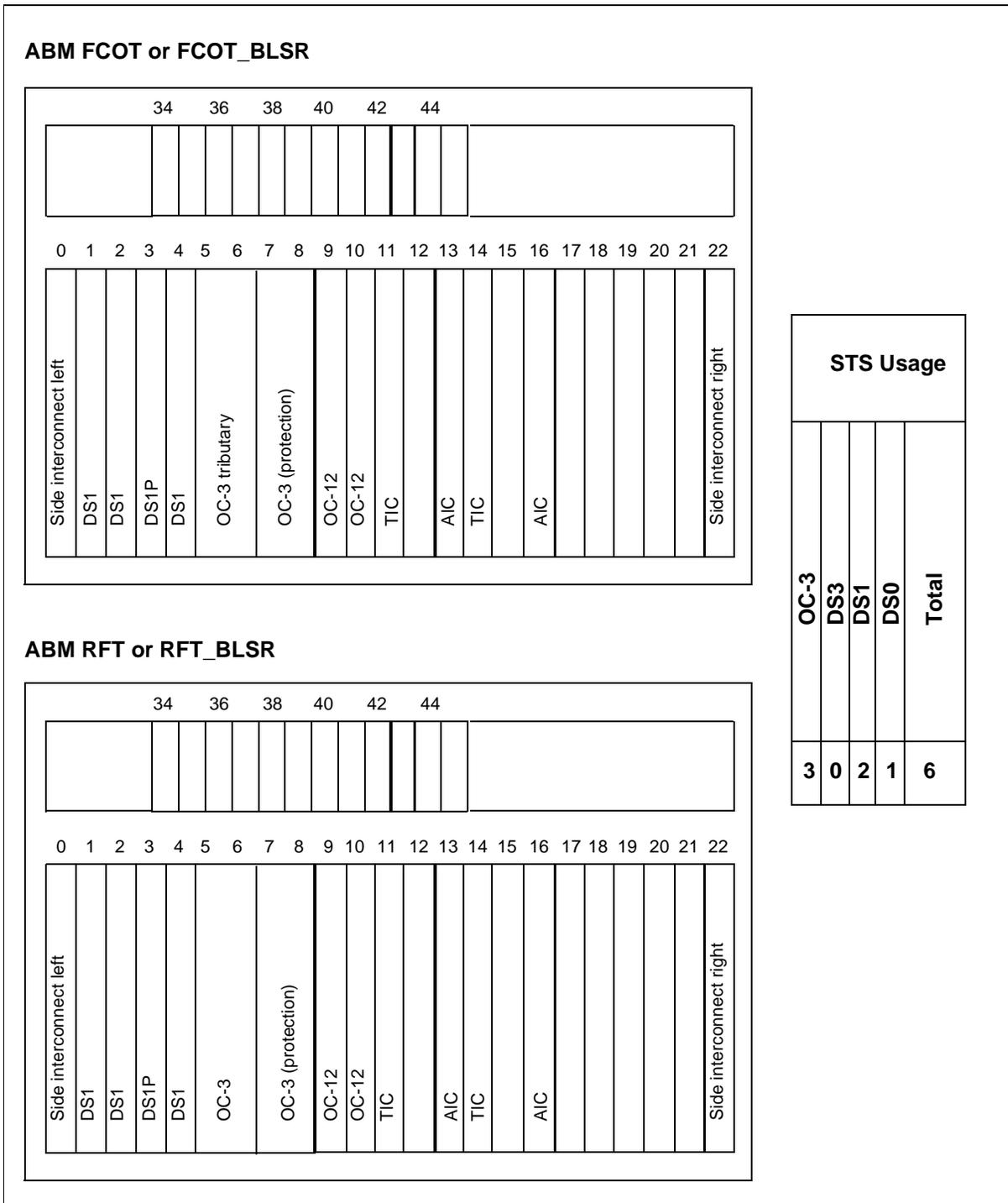


Figure 5-7
Tributary layout for combined ABM-ABM OC-3/DS1 configurations

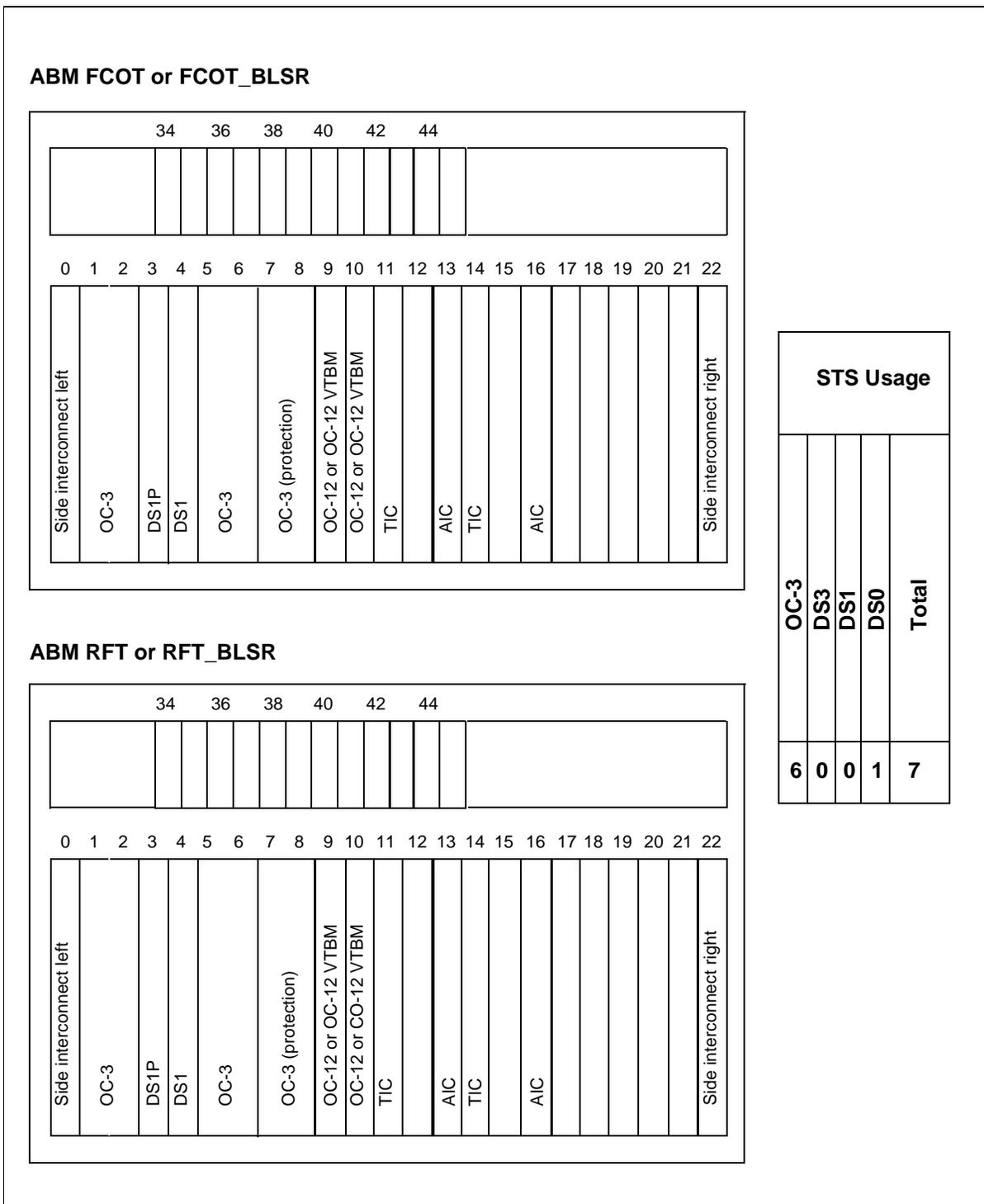


Figure 5-8
Tributary layout for combined ABM–ABM DS1/OC-3 configurations

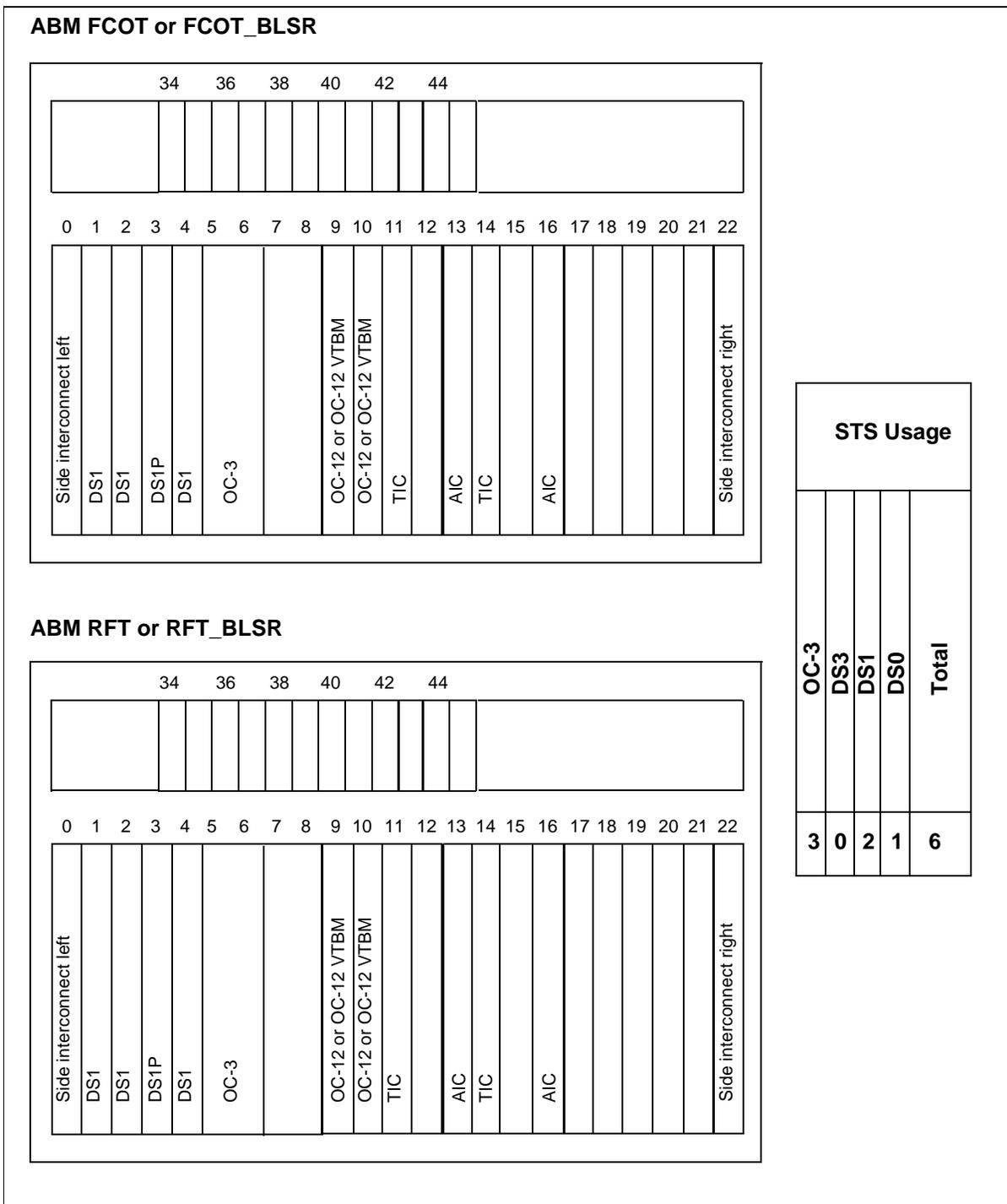


Figure 5-9
Tributary layout for combined ABM-ABM DS3/OC-3

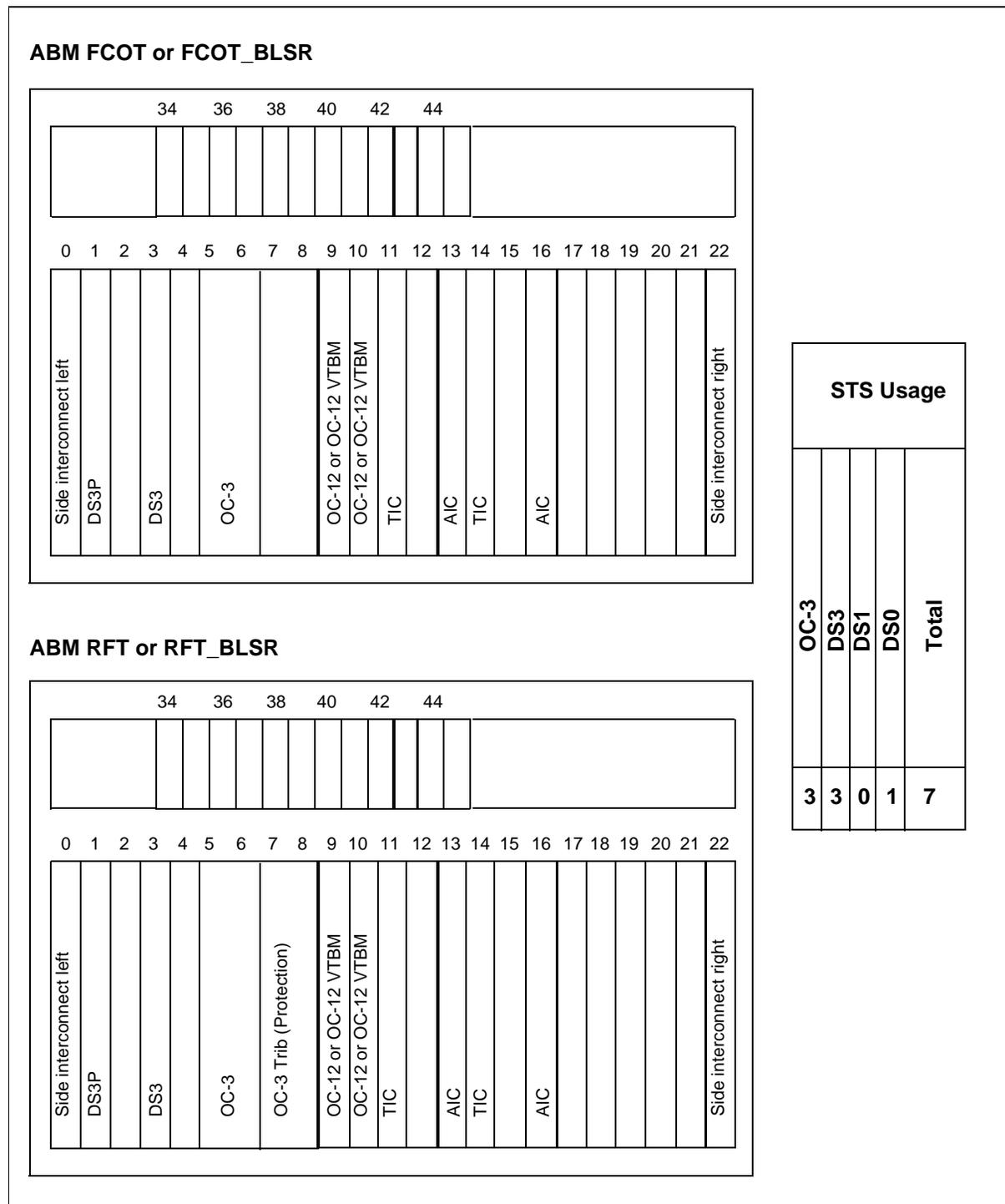


Figure 5-10
Tributary layout for TBM–ABM DS1 configurations (with or without an OPC)

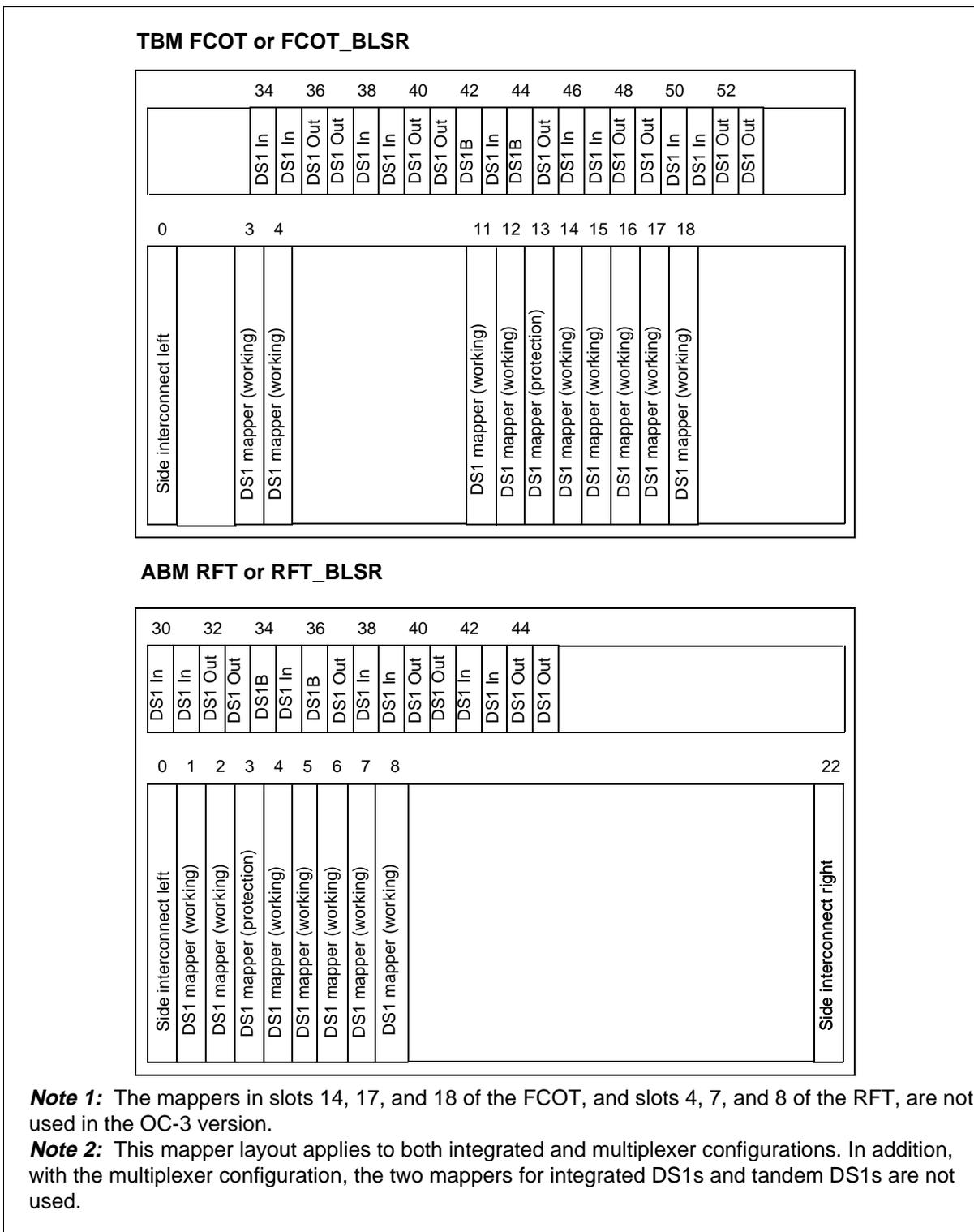


Figure 5-11
Tributary layout for TBM–ABM mixed DS1/DS3 configurations (with or without OPC)

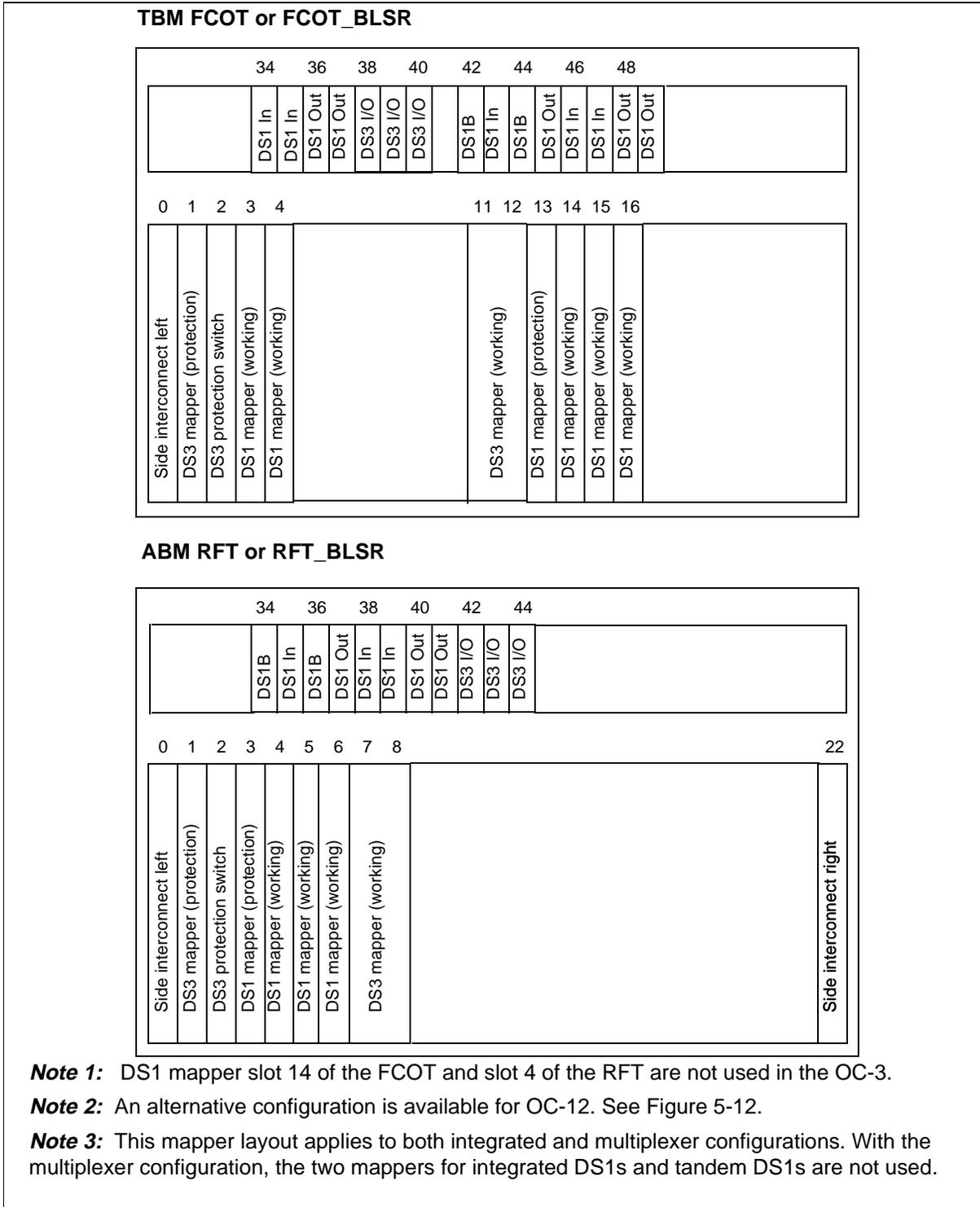


Figure 5-12
Tributary layout for TBM–ABM mixed DS1/DS3 configurations (with or without OPC)

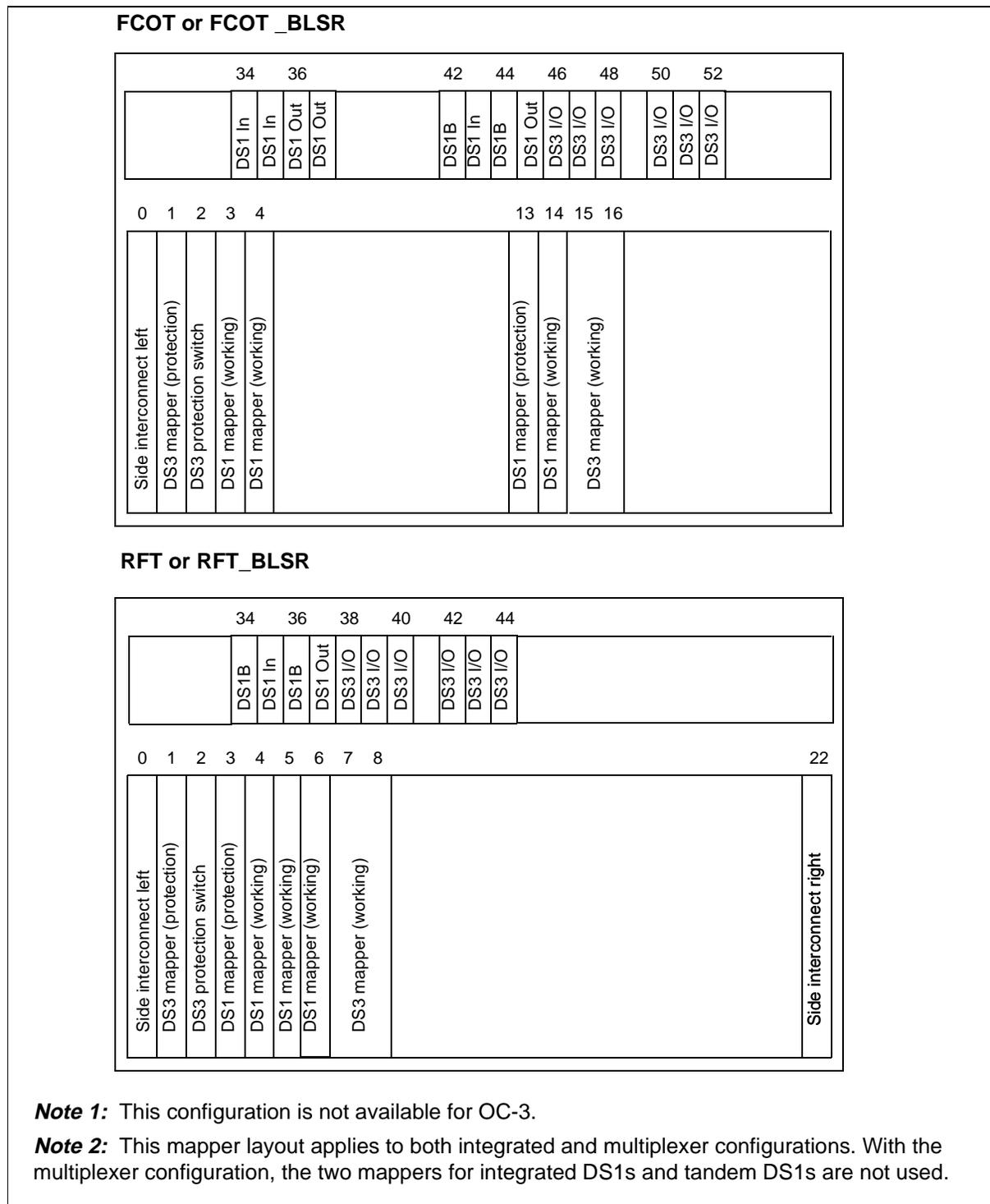
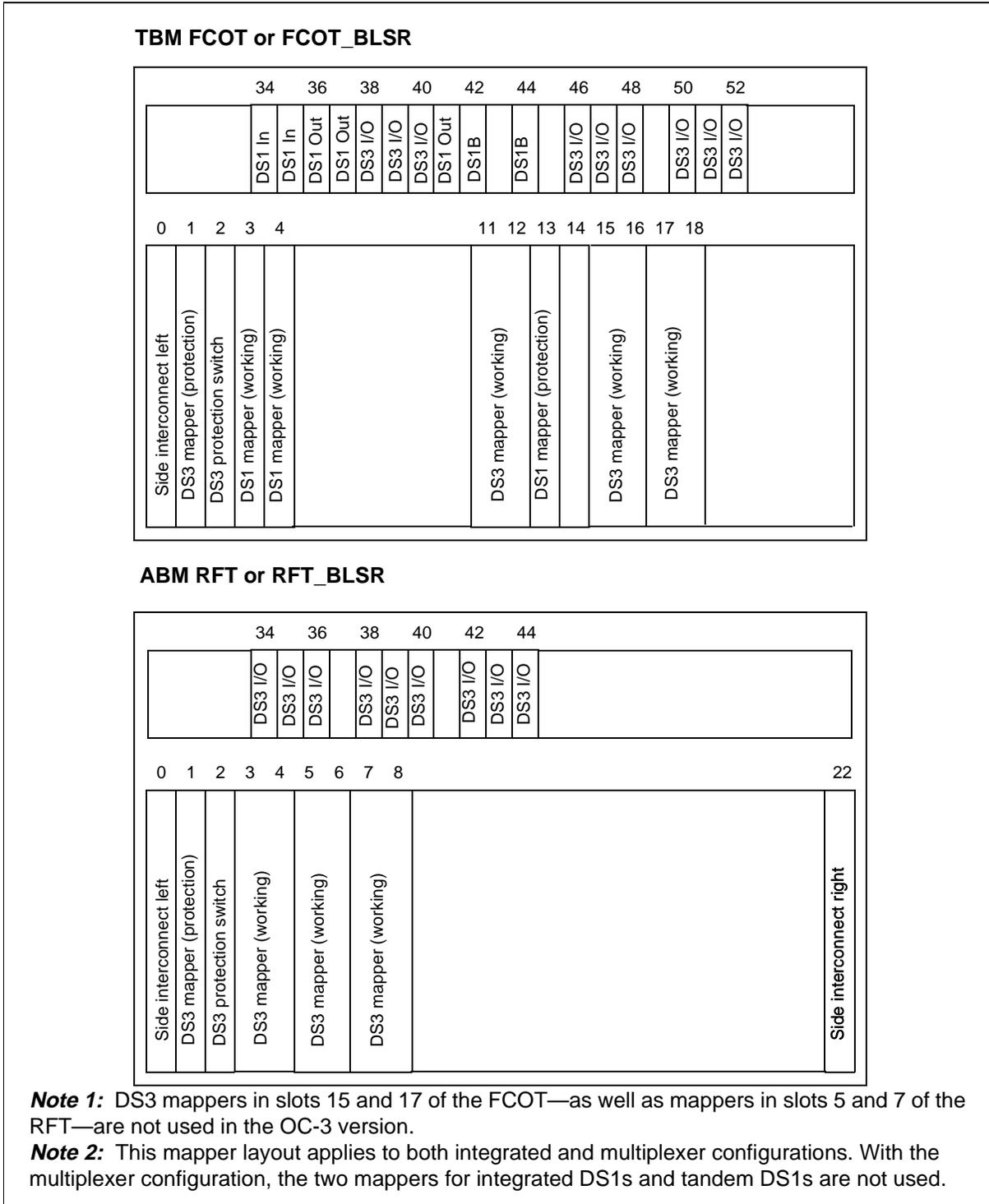


Figure 5-13
Tributary layout for TBM–ABM DS3 configurations (with or without an OPC)



FCOT TBM shelf configurations

Tributary slots in the FCOT can be equipped with OC-3 circuit packs to support OC-3 tributary to Digital Cross-connects. If slots 5-8 are occupied by an OPC, the number of OC-3 tributaries that a point-to-point S/DMS AccessNode can support is reduced. DS1 and DS3 mapper cards can be supported simultaneously.

Possible shelf configurations and the STS usage comparisons of an FCOT TBM OPC shelf are shown in Figure 5-14 to Figure 5-20 beginning on page 5-34.

Note: This is not a complete list of all possible configurations.

This section provides the following tributary mapper layouts:

Tributary layout title	See	on
Tributary layout for TBM OC-3 configurations with an OPC	Figure 5-14	page 5-34
Tributary layout for selected TBM OC-3/DS1 configurations with an OPC	Figure 5-15	page 5-35
Tributary layout for selected TBM OC-3/DS3/DS1 configurations with an OPC	Figure 5-16	page 5-36
Tributary layout for selected TBM OC-3/DS3 configurations with an OPC	Figure 5-17	page 5-37
Tributary layout for selected TBM OC-3/DS3 configurations with an OPC	Figure 5-18	page 5-38
Tributary layout for selected TBM OC-3/DS3/DS1 configurations with an OPC	Figure 5-19	page 5-39
Tributary layout for selected TBM OC-3/DS3/DS1 configuration without an OPC	Figure 5-20	page 5-40

Figure 5-14
Tributary layout for TBM OC-3 configurations with an OPC

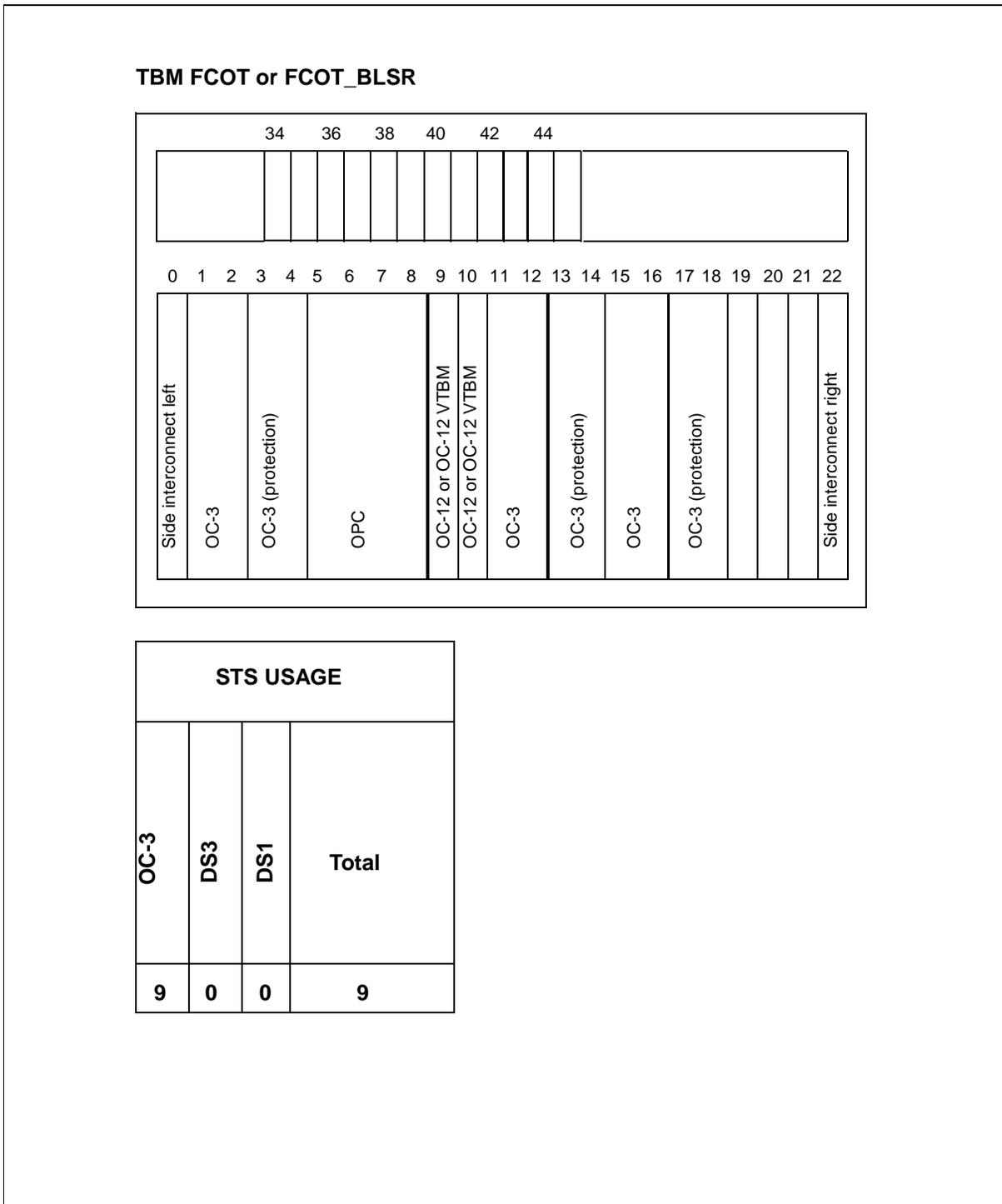


Figure 5-15
Tributary layout for selected TBM OC-3/DS1 configurations with an OPC

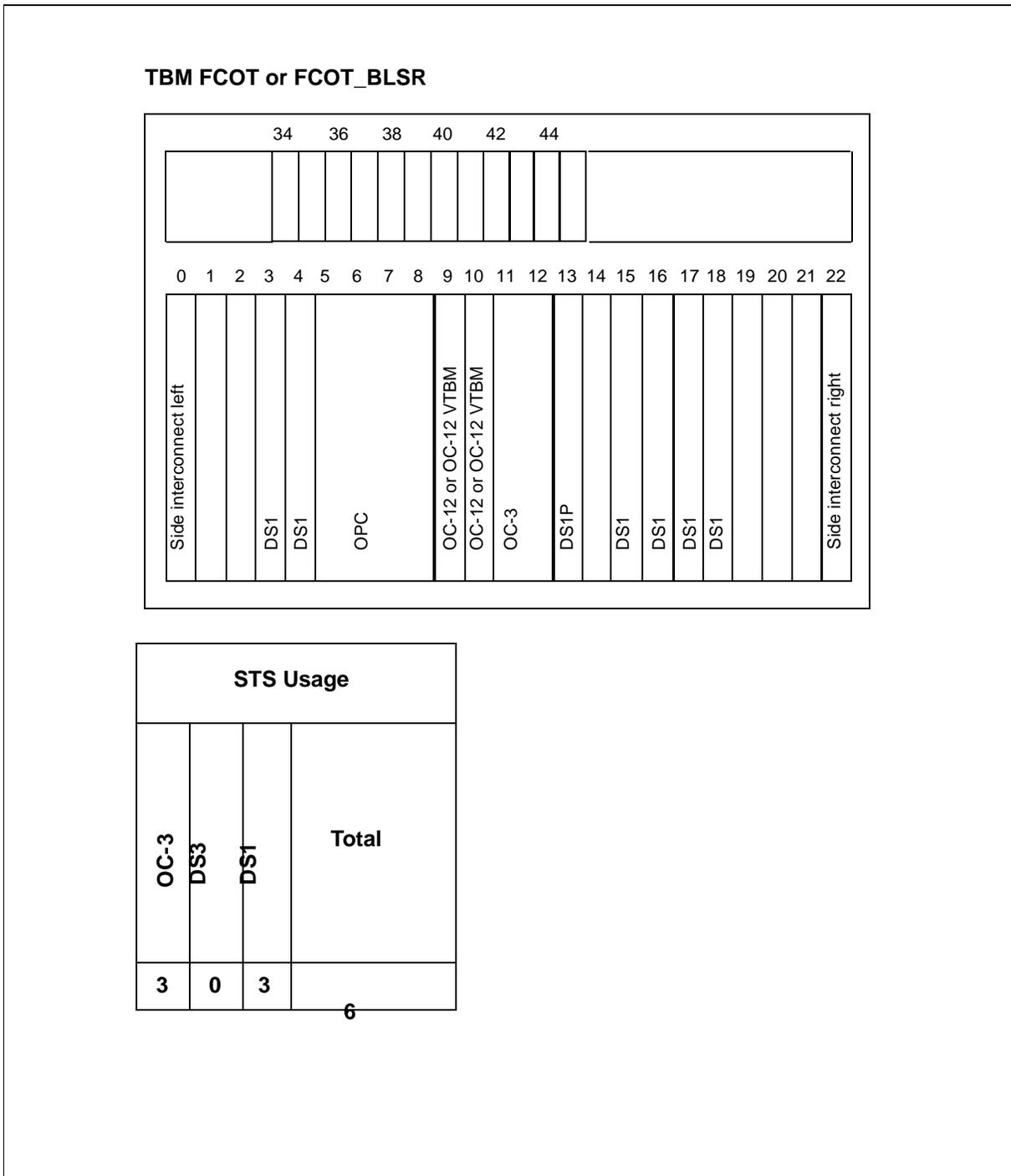


Figure 5-16
Tributary layout for selected TBM OC-3/DS3/DS1 configurations with an OPC

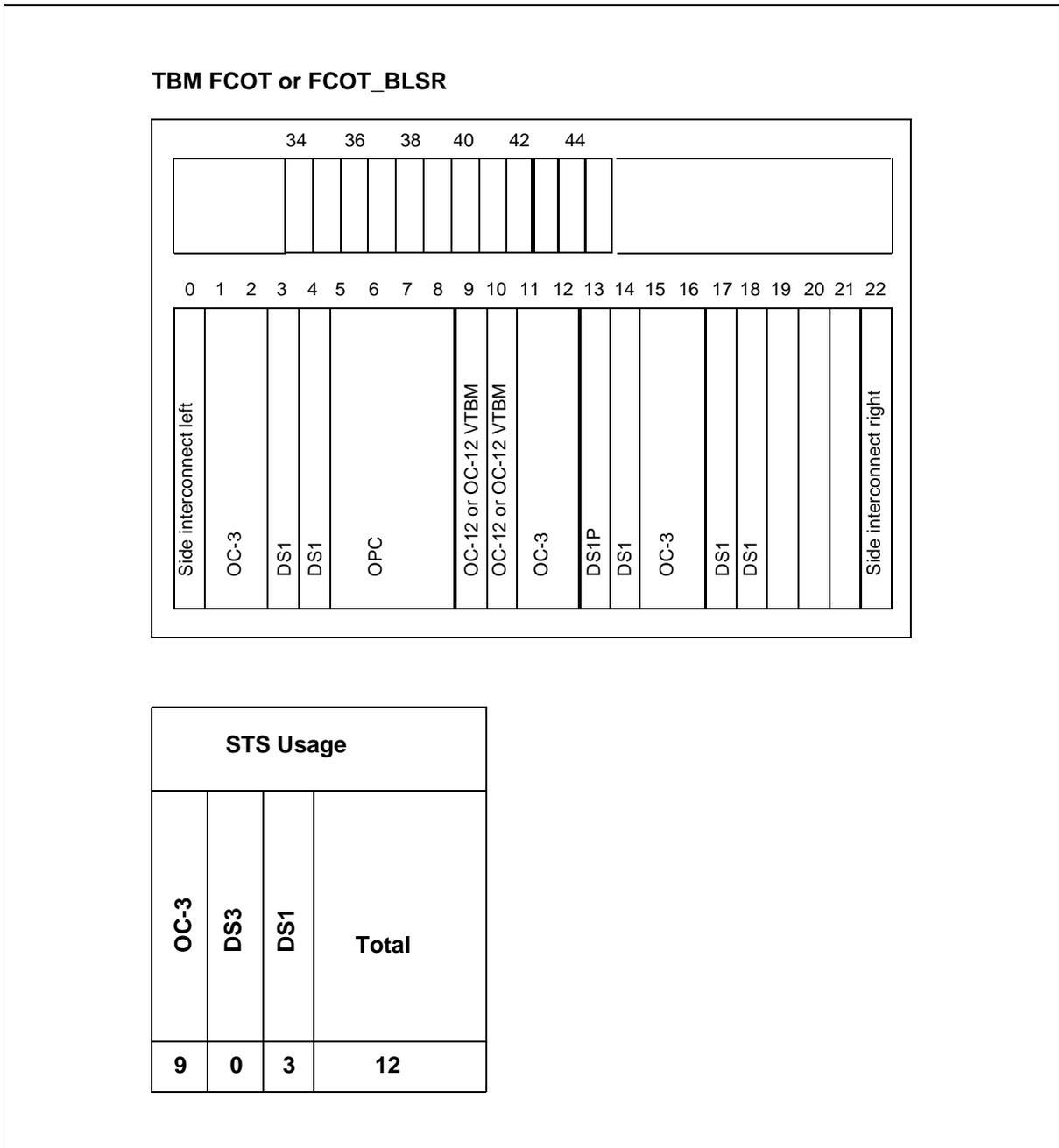


Figure 5-17
Tributary layout for selected TBM OC-3/DS3 configurations with an OPC

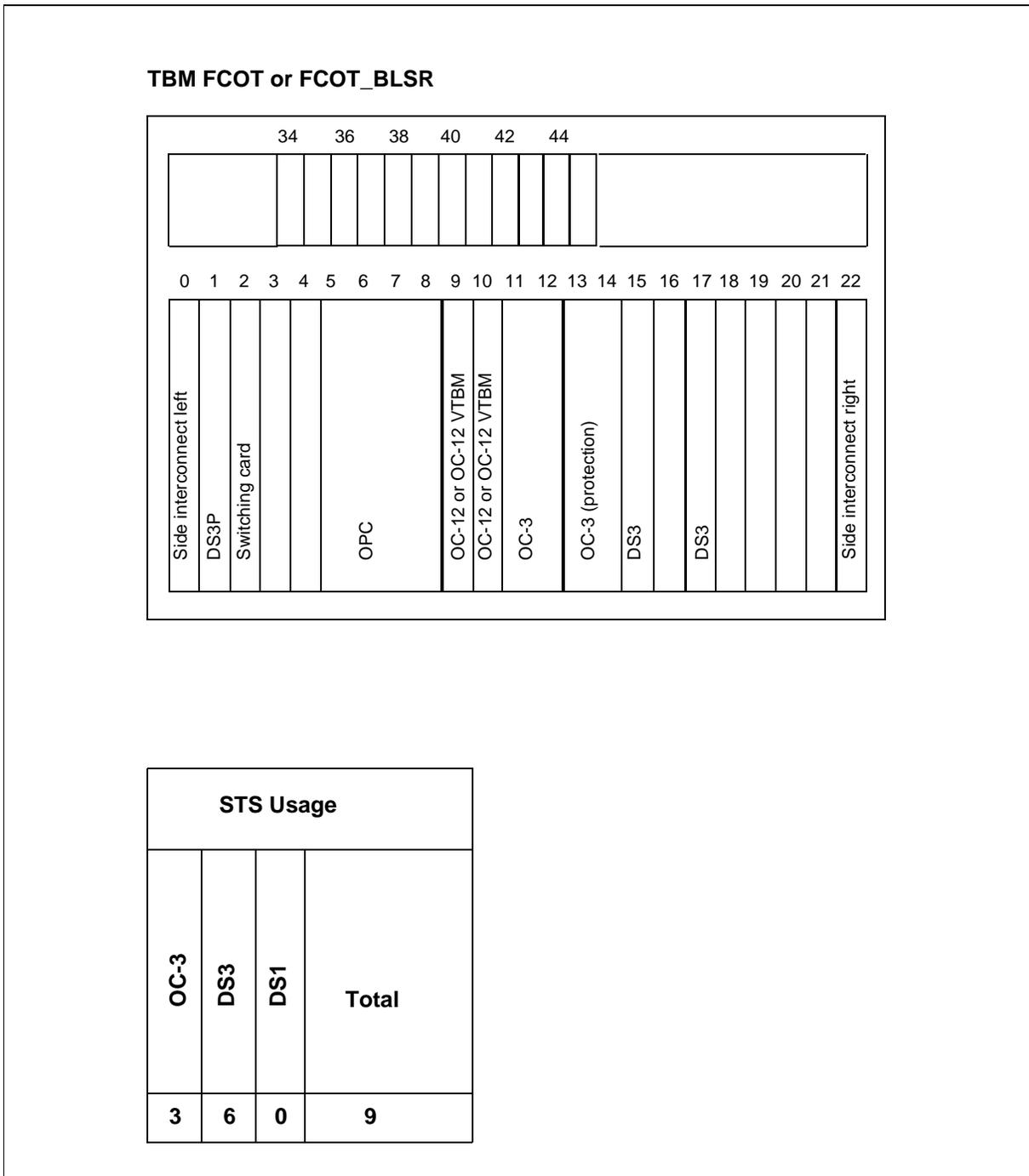


Figure 5-18
Tributary layout for selected TBM OC-3/DS3 configurations with an OPC

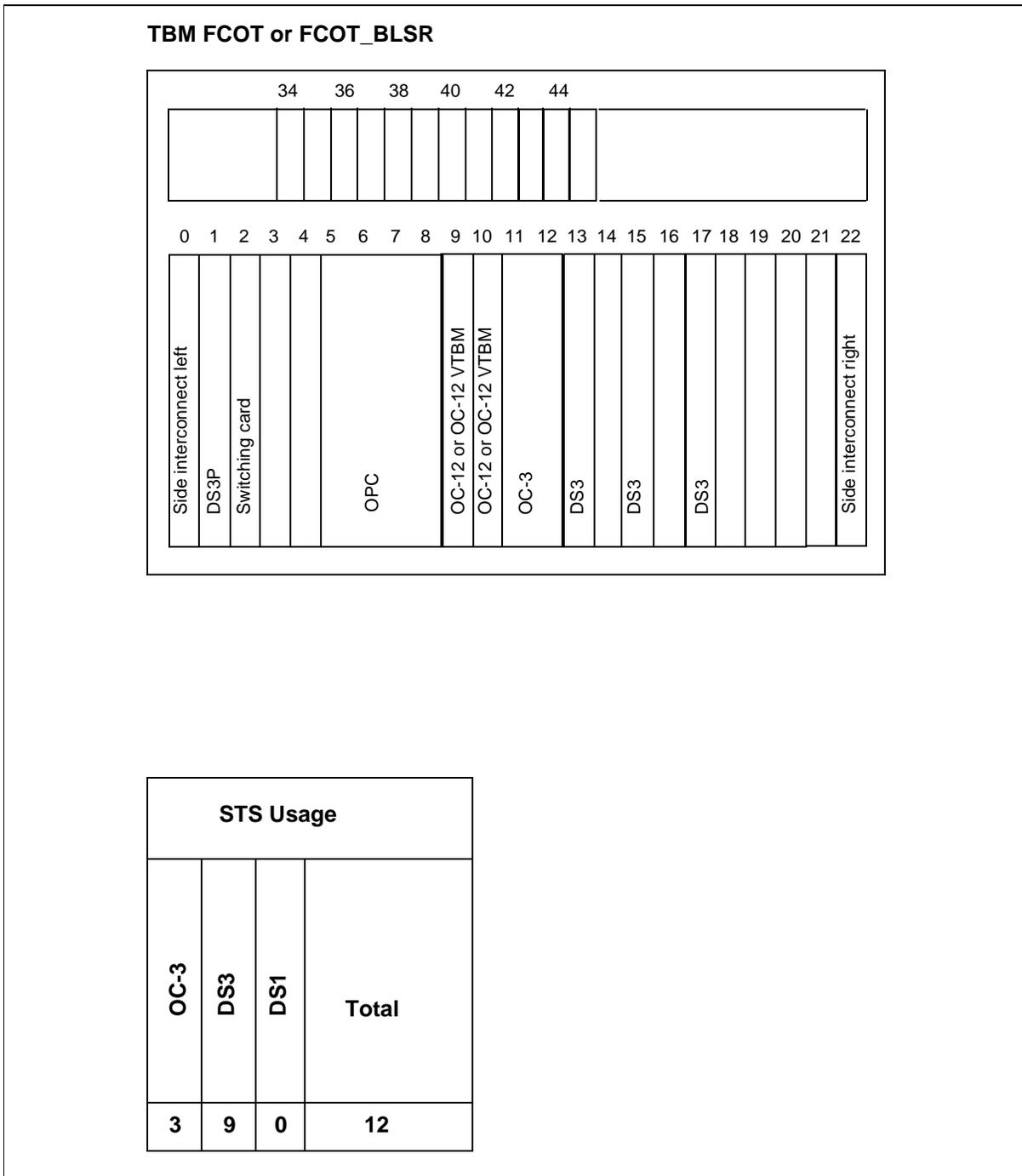
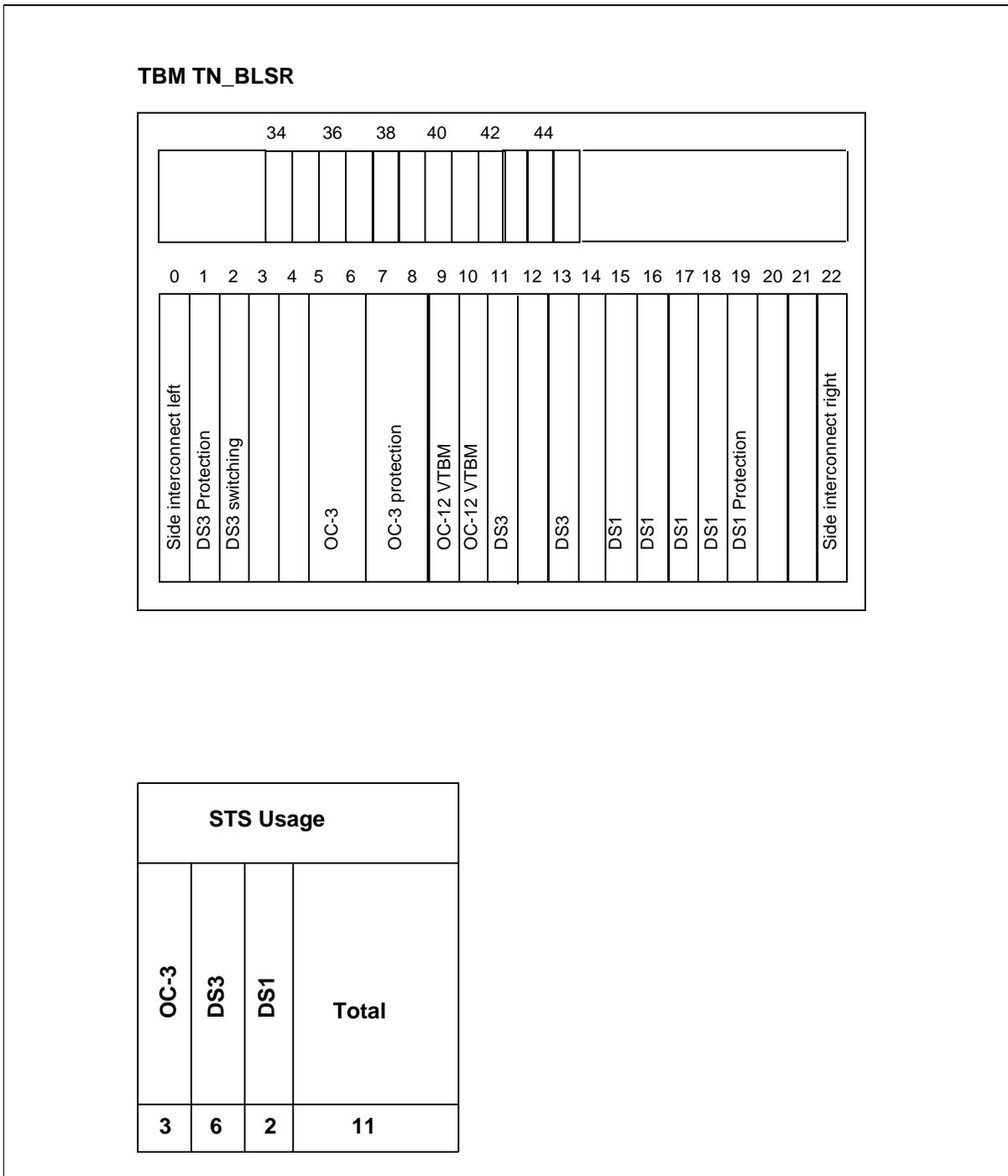


Figure 5-20
Tributary layout for selected TBM OC-3/DS3/DS1 configuration without an OPC



Appendix A: Worksheets

This appendix provides blank worksheets. Remove those you need from this binder, photocopy them before filling in any fields, then return the originals to this appendix for future use.

Also, for your own records, photocopy worksheets after you complete them.

Chapter contents

This chapter contains a sample and four blank worksheets on the following pages.

Topic	See
Host Messaging Unit LAPD Port Calculation Worksheet	page 6-3
Example worksheet	page 6-4
Sample Tributary Equipment Worksheet/ABM–ABM configuration	page 6-5
Tributary Equipment Worksheet/ABM–ABM configuration	page 6-7
Tributary Equipment Worksheet/TBM–ABM configuration	page 6-9
Tributary Equipment Worksheet/TBM–TBM configuration	page 6-11
OMC Link Worksheet	page 6-13

Complete the Host Messaging Unit LAPD Port Calculation Worksheet on page 6-3 before using the remaining worksheets as needed in this chapter. The LAPD Port Calculation Worksheet determines the number of Host Messaging Units (HMU) required for each network element.

Host Messaging Unit LAPD Port Calculation Worksheet

Use a copy of this worksheet to calculate the number of LAPD (link access protocol—D channel) ports needed for SONET Data Communications Channel links in each ABM or TBM network element.

This form helps determine the number of interface groups to which the network element can be connected. See example form on next page.

SDCC links are routed by the host messaging unit (HMU) of the access processor card (APC) using LAPD ports.

Each SDCC link uses a different number of HMU LAPD ports depending on whether diverse routing is enabled for the feeder optics, the number of OC-3 tributaries in the network element, and the number of host switches.

The maximum number of HMU LAPD ports for each network element is 31.

RFT, RFT_BLSR, FCOT, FCOT_BLSR, TN_BLSR, or OPC shelf
(Shelf serial number _____)

Link type	Entry	HMU ports	HMU ports enabled
SDCC links for OC-3 tributaries (diverse routing is not available)		X 3 =	
SDCC links for OC-3/OC-12 feeder (without diverse routing)		X 3 =	
SDCC links for OC-3/OC-12 feeder (with diverse routing)		X 6 =	
Point-to-point only: OC-3/OC-12 feeder (without diverse routing)	1= yes 0=no	X 2=	
Point-to-point only: OC-3/OC-12 feeder (with diverse routing)	1= yes 0=no	X 4=	
Subtotal HMU LAPD ports:			
GR-303 interface groups		X 4 =	
Total HMU LAPD ports: (maximum of 31)			

Example worksheet

<p>This example worksheet shows how to calculate the number of LAPD ports needed for SONET Data Communications Channel links in each ABM or TBM network element.</p>			
<p>Assume a network element in a point-to-point system has two OC-3 tributaries and an OC-12 feeder with diverse routing.</p> <ul style="list-style-type: none"> • The two OC-3 tributaries would require six HMU LAPD ports (three ports for each tributary). • The OC-12 feeder with diverse routing would require six HMU LAPD ports. • The feeder in a point-to-point configuration uses an additional 4 ports. <p>The sum of the tributary and feeder port requirements is 16; subtracting 16 from the maximum of 31 means 15 HMU LAPD ports are available for interface group connections.</p> <p>Since each interface group requires four HMU LAPD ports, this means that the network element can connect up to three interface groups (requiring 12 ports), and the network element uses a total of 28 HMU LAPD ports.</p>			
<p>RFT, RFT_BLSR, FCOT, FCOT_BLSR, TN_BLSR, or OPC shelf (Shelf serial number <u>A2 e 040203f</u>)</p>			
Link type	Entry	HMU ports	HMU ports enabled
SDCC links for OC-3 tributaries (diverse routing is not available)	2	X 3 =	6
SDCC links for OC-3/OC-12 feeder (without diverse routing)		X 3 =	
SDCC links for OC-3/OC-12 feeder (with diverse routing)	1	X 6 =	6
Point-to-point only: OC-3/OC-12 feeder (without diverse routing)	1= yes 0=no	X 2=	
Point-to-point only: OC-3/OC-12 feeder (with diverse routing)	1= yes 0=no 1	X 4=	4
Subtotal HMU LAPD ports:			16
GR-303 interface groups	3	X 4 =	12
Total HMU LAPD ports: (maximum of 31)			28

Sample Tributary Equipment Worksheet/ABM–ABM configuration

Use a copy of this worksheet to record the slot location for DS1, DS3 and OC-3 circuit packs and their corresponding input/output cards, for ABM–ABM configurations.

FCOT or OPC shelf (Shelf serial number A2 e 040303f)

	Slot #							
Circuit pack	1	2	3	4	5	6	7	8
DS1 mapper			<i>p</i>		<i>g5</i>	<i>g6</i>		
DS1 input card			<i>34</i>		<i>38</i>	<i>39</i>		
DS1 output card			<i>36</i>		<i>40</i>	<i>41</i>		
DS3 mapper								
DS3 I/O cards								
OC-3 Tribs								

RFT (Shelf serial number A2 e 044403f)

	Slot #							
Circuit pack	1	2	3	4	5	6	7	8
DS1 mapper			<i>p</i>		<i>g5</i>	<i>g6</i>		
DS1 input card			<i>34</i>		<i>38</i>	<i>39</i>		
DS1 output card			<i>36</i>		<i>40</i>	<i>41</i>		
DS3 mapper								
DS3 I/O cards								
OC-3 Tribs								

Note: This form is filled out for an OC-12 ABM–ABM DS1 universal configuration without an OPC. The system is not going to be provisioned for maximum DS1/DS3 capacity but will eventually be expanded. To accommodate possible DS3 mappers that could be installed at a later date (should the system be expanded to a DS1/DS3 mix), the DS1 mappers in slot 1 and 2 were not used.

Tributary Equipment Worksheet/ABM–ABM configuration

Use a copy of this worksheet to record the slot location for DS1, DS3, and OC-3 circuit packs and their corresponding input/output cards, for ABM–ABM configurations.

FCOT, FCOT_BLSR, or OPC shelf (Shelf serial number _____)

	Slot #							
Circuit pack	1	2	3	4	5	6	7	8
DS1 mapper								
DS1 input card								
DS1 output card								
DS3 mapper								
DS3 I/O cards								
OC-3 Tribs								

RFT or RFT BLSR (Shelf serial number _____)

	Slot #							
Circuit pack	1	2	3	4	5	6	7	8
DS1 mapper								
DS1 input card								
DS1 output card								
DS3 mapper								
DS3 I/O cards								
OC-3 Tribs								

Tributary Equipment Worksheet/TBM-ABM configuration

Use a copy of this worksheet to record the slot location for DS1, DS3, STS-1, and OC-3 circuit packs, and their corresponding input/output cards, for TBM-ABM configurations.

FCOT, FCOT_BLSR, TN_BLSR or OPC shelf (Shelf serial number _____)													
	Slot #												
Circuit pack	1	2	3	4	11	12	13	14	15	16	17	18	19
DS1 mapper													
DS1 input card													
DS1 output card													
DS3 mapper													
STS-1 mapper													
DS3 I/O cards													
OC-3 Tribs													

RFT or RFT_BLSR (Shelf serial number _____)													
	Slot #												
Circuit pack	1	2	3	4	5	6	7	8	-	-	-	-	-
DS1 mapper													
DS1 input card													
DS1 output card													
DS3 mapper													
DS3 I/O cards													
OC-3 Tribs													

Note: STS-1 mappers are only valid for TN_BLSR configurations.

Tributary Equipment Worksheet/TBM–TBM configuration

Use a copy of this worksheet to record the slot location for DS1, DS3, STS-1, and OC-3 circuit packs, and their corresponding input/output cards, for TBM–TBM ring configurations.

FCOT_BLSR, TN_BLSR or OPC shelf (Shelf serial number _____)

	Slot #												
Circuit pack	1	2	3	4	11	12	13	14	15	16	17	18	19
DS1 mapper													
DS1 input card													
DS1 output card													
DS3 mapper													
STS-1 mapper													
DS3 I/O cards													
OC-3 Tribs													

FCOT_BLSR, TN_BLSR or OPC shelf (Shelf serial number _____)

	Slot #												
Circuit pack	1	2	3	4	11	12	13	14	15	16	17	18	19
DS1 mapper													
DS1 input card													
DS1 output card													
DS3 mapper													
STS-1 mapper													
DS3 I/O cards													
OC-3 Tribs													

Note: STS-1 mappers are only valid for TN_BLSR configurations.

OMC Link Worksheet

Use a copy of this form to correlate the OMC link information between the OPC shelf and DFA RFT in DFA systems. Also use it to record the facility parameters of the DS1 used as the OMC link.

<link #>	OPC shelf		DFA RFT	
	<locn><bw><link name> (see Note 1)	DS1 parameters (see Note 2)	<locn><bw><link name> (see Note 1)	DS1 parameters (see Note 2)
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

Note 1: Each OMC link has four parameters that define it. They are:

<link #> the link number, 1 to 10

<locn> the group and port number of the DS1 facility assigned as the link

<bw> the bandwidth of the OMC link (# of DS0s), 3 to 6

<link name> a symbolic 20-character name for the link (this is optional)

Note 2: The DS1 (facility) parameters of each OMC link must be the same as the parameters for the transport DS1 carrying the OMC link from the OPC shelf and DFA RFT. These parameters include: line build-out, line coding, frame format, alarm encoding, and synchronization. Get this information and record it on this form.

—end—

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U

Universal application. See Application, universal

V

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