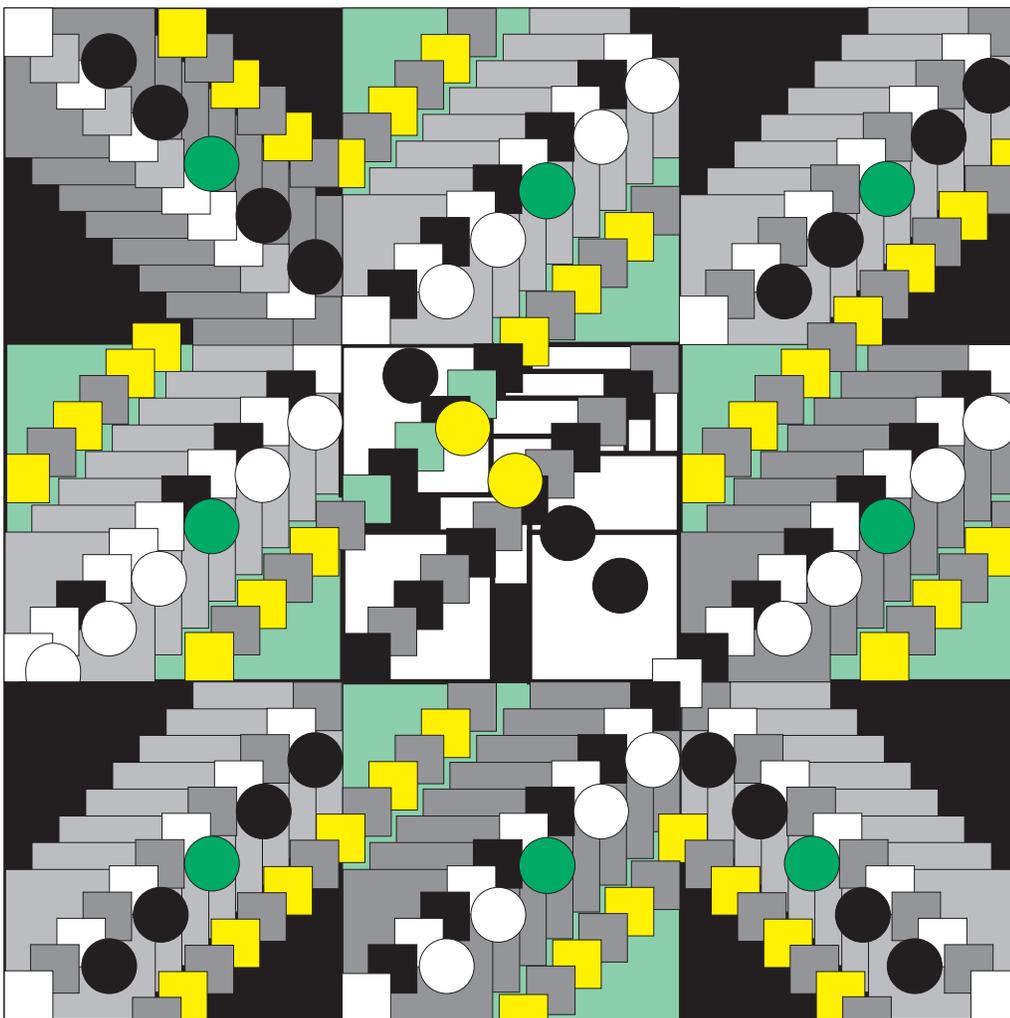2220 Nways BroadBand Switch
Models 300, 500, and 501

IBM

Planning Series
Physical Lines Interface Specifications
External Cable References

2220 Nways BroadBand Switch
Models 300, 500, and 501

IBM

Planning Series
Physical Lines Interface Specifications
External Cable References

┌─ **Note** ───┐

  Before using the information given in this booklet be sure to read the general information in .

└──┘

Seventh Edition (March 1999)

The information contained in this booklet is subject to change from time to time. Any such changes will be reported in subsequent revisions.

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Contents

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About this Manual

This manual provides the specifications of the various line interfaces used to attach Nways Switches to external communication lines. These specifications are related to the :

- Standards supported at the physical interface level

- Standards supported for a given protocol

- Local management of the different types of lines and protocols, at the network-to-network (NNI) and user-to-network (UNI) level.

Who Should Use This Manual

This manual is intended for teleprocessing specialists, system programmers, network administrators and network specialists responsible for preparing the information that will be needed during the installation and integration of the Nways Switch.

The required knowledge and training depends on the task to be performed. For example, people having to use the network management station (NMS) or the change control server (CCS) must know how to use an IBM RISC System/6000*, POWERstation*, or POWERserver*, depending on the type of station used. In addition, they should be trained on using the IBM AIX/6000 operating system, IBM NetView for AIX, IBM NetView Distribution Manager for AIX, and IBM NetView Distribution Management Agent/6000 (NetView DMA/6000).

People having to use a Nways Switch configuration station should be experienced users of the IBM OS/2*, running on IBM PS/2* stations or the equivalent.

How this Manual Is Organized

The book consists of this entity called *2220 Nways BroadBand Switch Physical Lines Interface Specifications, External Cable References*, GA33-0379 and several separate booklets:

1. The *2220 Nways BroadBand Switch Physical Lines Interface Specifications, External Cable References*, GA33-0379 contains the specifications at the physical level (layer 1) of the interface between the line interface couplers (LICs) and the external lines.

   It also describes the cables used to attach the external lines.

2. Separate booklets are available, each booklet being related to a specific protocol and containing the specifications at the logical level (layer 2) for the subject protocol:

   - *2220 Nways BroadBand Switch ATM Interface Specifications*, GA33-0378
   - *2220 Nways BroadBand Switch Frame Relay Interface Specifications*, GA33-0374
   - *2220 Nways BroadBand Switch HDLC Interface Specifications*, GA33-0375
   - *2220 Nways BroadBand Switch CES Interface Specifications*, GA33-0376
   - *2220 Nways BroadBand Switch ISDN Interface Specifications*, GA33-0447
   - *2220 Nways BroadBand Switch X.25 Interface Specifications*, GA33-0413.

Each booklet can be extracted from the binder for easy replacement and updating.

Chapter 1. Physical Line Attachment (Layer 1) Specifications

This chapter summarizes the specifications at the physical level (layer 1) of the attachments to the various types of lines supported by the Nways Switch LICs. It gives information on:

- Type and number of line connectors
- Standards supported:
  - At the electrical or optical level between the line and the LIC
  - For alarms
  - For framing, when applicable.
- Types of coding supported
- Available operating speeds and the corresponding access rate or payload when applicable.

This chapter is divided into several sections, each of them relating to one or more types of lines.

1.1 T1, E1, and J1 Line Attachments

Table 1-1 summarizes the line attachment physical characteristics according to the type of line.

Table 1-1 (Page 1 of 2). T1, E1, and J1 Line Attachment Physical Characteristics and Supported Standards

Characteristics	T1	E1	J1
Fractional Support	FT1	FE1	FJ1
LIC Types	514 and 544	515, 516, 545, 546, 563, and 567	514
Line Speeds	1544 kbps	2048 kbps	1544 kbps
Payloads	• T1: From one channel at 1.536 Mbps to 24 channels at 64 kbps • QSIG: primary rate access 23B+D (23 channels at 64 kbps plus D channel)	• E1: from one channel at 1.984 Mbps to 31 channels at 64 kbps • ISDN/QSIG: primary rate access 30B+D (30 channels at 64 kbps plus D channel)	• J1: From one channel at 1.536 Mbps to 24 channels at 64 kbps • ISDN: primary rate access 23B+D (23 channels at 64 kbps plus D channel)
Clock Extraction	Yes	Yes	No

Connector Types	RJ48C/CA48C DB15/CA31A	**LIC515 and 545**
		    75-ohm line impedance, BNC type connector
		LIC516, 546, 563, and 567
		    Open wires 120-ohm line impedance, RJ48 type connector
			ISO IO173

Number of Line Attachments	**LIC514**
	    4 line attachments
	LIC544
	    8 line attachments
		LIC515, 516, 563, and 567
		    4 line attachments
		LIC545 and 546
		    8 line attachments
			LIC514
			    4 line attachments
			LIC544
			    8 line attachments

Table 1-1 (Page 2 of 2). T1, E1, and J1 Line Attachment Physical Characteristics and Supported Standards			
Characteristics	**T1**	**E1**	**J1**
Physical Interfaces	• **Interface type:** – DS1 for LIC514 – DS1 for LIC544 with external CSU – DSX1 for LIC544 (Maximum length of cable to DSU-end is 36 m or 110 ft) • **Standards:** AT&T 62411 ANSI T1.403 EIA IA.547	**LIC515, 516, 545, and 546** ITU-T G.703 **LIC563 and 567** ITU-T I.431 ETS 300 011	• **Interface type:** – NTT interface – DS1 – DSX1 (maximum length of cable to DSU-end is 36 m or 110 ft). • **Standards:** – JT-I411a – JT-I431a – ANSI T1.403 – NTT HSDLCS
Line Codes	• B8ZS • AMI	• HDB3	• B8ZS • AMI
Frame Formats	D4 (SF), D5 (ESF) for: • T1.403 • T1.407 • AT&T 62411	• ITU-T G.703 unstructured • ITU-T G.704 with or without CRC • ITU-T G.706 support for frame alignment/CRC procedure	NTT-I interface format
Alarm	• T1.M1 • AT&T 62411	ITU-T G.732	ITU-T G.732
Compatibilities	• DACS (transparent) from AT&T • DDS/M24 (transparent) from AT&T • G.704/702 compatibility for inter-PBX signaling.	G.704/702 compatibility for inter-PBX signaling	NTT interface multiple access service
Signaling Types	• None • PBX CAS • PBX CCS Transparent	• None • PBX CAS • PBX CCS Transparent • PBX Q signaling (QSIG)	• None • PBX CAS • PBX CCS Transparent

1.2 T3, E3, E2, or J2 Line Attachments

Table 1-2 summarizes the line attachment physical characteristics according to the type of line.

Table 1-2 (Page 1 of 2). T3, E3, E2, and J2, Physical Characteristics and Supported Standards			
Characteristics	**T3**	**E3**	**E2**	**J2**
Fractional Support	No fractional T3	No fractional E3	No fractional E2	**LIC523**:No**LIC562**:Yes (J2 MA/SR)
LIC Type	513	523	523	523, 562
Speed	44 736 kbps	34 368 kbps	8448 kbps	**LIC523**:6312 kbps **LIC562**:1,536 Mbps

Table 1-2 (Page 2 of 2). T3, E3, E2, and J2, Physical Characteristics and Supported Standards				
Characteristics	**T3**	**E3**	**E2**	**J2**
Payload	Clear channel: 1 x 42 209.7 kbps	Clear channel: **G.751** 1 x 34 099.5 kbps **G.753** 1 x 34 176 kbps	Clear channel: **G.742** 1 x 8328.45 kbps **G.745** 1 x 8368.30 kbps	Clear channel: **LIC523**:1 x 6144 kbps
Clock Extraction	Yes	Yes	Yes	Yes
Connector Type	BNC	BNC	BNC	BNC
Number of Line Attachments	1 line attachment	1 line attachment	1 line attachment	1 line attachment
Physical Interfaces	• DS3 • T1.107/107a	ITU-T G.703	ITU-T G.703	• JT-G703-a • T-1411a • NTT I interface
Line Codes	B3ZS	HDB3	HDB3	B8ZS

Frame Formats	M-framed, non subrated:
	 • ANSI T1.107/107a
	 • C-bit parity:
	   – Clear channel
	   – Multiplex
		• G.751
		 • G.753
		
		 See note
			• G.742
			 • G.745
			
			 See note
				• G.704
				 • NTT I interface

Alarm	T1 or M1			
Note: The use of tributary and payload justification is not supported on clear channel lines.				

1.3 SONET STS-3c and SDH STM-1 Line Attachments

Table 1-3 summarizes the line attachment physical characteristics according to the type of line.

Table 1-3 (Page 1 of 2). SONET STS-3c and SDH STM-1 Line Attachments					
Characteristics	**Optical Single Mode Fiber**		**Optical Multi Mode Fiber**	**Electrical**	
LIC Type	**554** **555**	Range up to 20 or 40 km or 12.42 to 24.84 mi (8μ fiber) Range up to 10 or 20 km or 12.42 mi (8μ fiber)	**556** Range up to 2 km or 1.24 in (8μ fiber)	**553**	Range up to 150 m (450 ft)
Line Speed	155.520 Mbps				
Payload	149.760 Mbps				
Clock Extraction	Yes				
Connector Type	**LIC554** **LIC555**	SC (SC to FC/PC adapter supplied) SC	SC	**LIC553**	BNC 75 ohms.
Number of Line Attachments	1 line attachment				
Physical Interfaces	Not Applicable		Not Applicable	ITU-T G.703	
Line Code	Not Applicable		Not Applicable	CMI	

Table 1-3 (Page 2 of 2). SONET STS-3c and SDH STM-1 Line Attachments			
Characteristics	Optical Single Mode Fiber	Optical Multi Mode Fiber	Electrical
Laser	1310 nm, class 1 (ITU-T G.957)	The LIC556 uses a diode, not a laser	Not applicable
Minimum Transmitted Power	LIC554 -8 dBm LIC555 -15 dBm	-19 dBm	Not applicable
Maximum Receiver Sensitivity	LIC554 -34 dBm LIC555 -28 dBm	-30 dBm	Not applicable
Optical Power Budget	LIC554 26 dBm LIC555 13 dBm	11 dBm	Not applicable
Frame Formats	SONET STS-3c (T1-105) SDH STM-1 (ITU-T G.708/G.709) ATM cells in VC-4		
Cell Delineation	I.432		
Rate decoupling	I.432, I.361, and ATM Forum 3.0/3.1		
Idle Cell Character	Not supported		
Cell Discard Policies	ANSI, ANSI unassigned ATM Forum, ATM Forum unassigned CCITT, CCITT unassigned		

1.4 ATM DS3 and E3 Line Attachments

Table 1-4 summarizes the line attachment physical characteristics according to the type of line.

Table 1-4 (Page 1 of 2). ATM DS3 and E3 Line Attachment Physical Characteristics and Supported Standards		
Characteristics	DS3	E3
Fractional Support	No fractional DS3	No fractional E3
LIC Type	551	552
Line Speed	44.736 Mbps	34.368 Mbps
Payload	1 × 42.209 Mbps	1 × 33.920 Mbps
Clock Role	DTE or DCE	DTE or DCE
Connector Type	75–ohm line impedance, BNC type connector	75–ohm unbalanced line impedance, BNC type connector
Number of Line Attachments	2 line attachments	2 line attachments
Physical Interfaces	DS3	ITU-T G.703
Line Codes	B8ZS	HDB3
Frame Formats	C-bit parity multiplex	ITU-T G.832
Transmission Convergence Layer	• PLCP • HEC	Not applicable
Cell Payload Scrambling	• PLCP: No • HEC: Yes	Not applicable

Table 1-4 (Page 2 of 2). ATM DS3 and E3 Line Attachment Physical Characteristics and Supported Standards		
Characteristics	**DS3**	**E3**
Cell Discard Policies	ANSI, ANSI unassigned ATM Forum, ATM Forum unassigned CCITT, CCITT unassigned	
Idle Cell Character	Not supported	

1.5 X.21, V.35, V.36, and V.24 (RS-232) Line Attachments

The line interface characteristics are as follows according to the type of line:

- Interface role: DTE or DCE.

- Clock role (internal or external) and speed. Available speeds are given in Table 1-5 on page 1-6.

- NRZ-I: can be yes or no.

Note: Each interface supports only leased lines, full-duplex mode.

Table 1-5. X.21, V.35, V.36, and V.24 (RS-232) Line Interface Characteristics

	X.21	V.35	V.36	V.24 (RS-232)
LIC Types	511 or 522	511 or 522	522	511

Internal Clock Speeds	For LIC511 only:
	
	  2400 bps
	  4800 bps
	  9600 bps
	  19200 bps
	  38400 bps
	  56000 bps
	  64000 bps
	  256000 bps
	
	For LIC522 only:
	
	  512 kbps
	  1024 kbps
	  1536 kbps
	  2048 kbps (default)
				2400 bps
				4800 bps
				9600 bps
				19200 bps

External Clock Speeds	From 56 to 2048 kbps (default is 2048 kbps)			From 56 to 256 kbps (default is 256 kbps)
Clock Role	DTE or DCE is determined by the cable type, not by the configuration parameter			
Clock Extraction	LIC522 only (only from the first line attached to the LIC)		No	No
Physical Interface Standards	ITU-T X.21	ITU-T V.35	ITU-T V.36	ITU-T V.24
Connector Types and Number	**LIC511** Two DB15 connectors for connection of two LCBs (See note)			
	LIC512 Four RJ45 connectors **LIC522** Four RJ45 connectors			

Note:

The interface standards are defined for the end of the active remote connector (ARC) cables connected to the line connection boxes (LCBs) or line connection box expansions (LCBEs):

- Every LCB supports the attachment of one LCBE.
- The maximum number of lines on one LIC511 is 60 (15 per LCB or LCBE).
- The actual maximum number of lines depends on their speed (number of lines × line speed ≤ 2.048kbps).

1.6 JJ-20 TTC Line Attachment

Table 1-6 summarizes the line attachment physical characteristics of the JJ-20 TTC line attachment to Japanese private branch exchange (PBX).

Table 1-6 (Page 1 of 2). JJ-20 TTC Line Attachment Physical Characteristics and Supported Standards

Characteristics	JJ-20 TTC
LIC Type	517
Line Speed	2048 kbps
Payload	- Clear channel: 2048 kbps (unframed) - Channelized: 30 × 64 kbps (framed)
Clock Extraction	No (The extracted RCV clock is only used for receive data sampling, not for reference clock)
Clock Role	DTE (internal)

Table 1-6 (Page 2 of 2). JJ-20 TTC Line Attachment Physical Characteristics and Supported Standards	
Characteristics	**JJ-20 TTC**
Connector Type	ISO 4903 (DB15 Female)
Number of Line Attachments	4 line attachments
Physical Interface	JJ-20.11 electrical and physical conditions
Code	CMI
Frame Format	JJ-20.11
Alarm	JJ-20.10
Compatibility	JJ-20.12 compatibility for inter-PBX signaling
signaling Type	• Framed: PBX CAS • Unframed: none

1.7 HSSI Line Attachments

The HSSI line interface is supported by the LIC530. This interface can be either DTE or DCE.

Internal Clock Speeds Available

The following clock speeds are available in the internal clocking mode:

Table 1-7. HSSI Clock Speeds (LIC530)		
Clock Speed	**Corresponding T1 Speed**	**Corresponding E1 Speed**
6.144 Mbps	4xT1	3xE1
12.288 Mbps	8xT1	6xE1
18.432 Mbps	12xT1	9xE1
24.576 Mbps	16xT1	12xE1
30.720 Mbps	20xT1	15xE1
36.864 Mbps	24xT1	18xE1
43.006 Mbps	28xT1	21xE1
49.152 Mbps	32xT1	24xE1

External Clock Speeds Available

The HSSI line interface is able to accommodate any external clock speed up to 49.152 Mbps.

Note: Clock extraction is available only at 49.152 Mbps.

Chapter 2. External Cable Reference

This chapter gives information about the Nways Switch line interface couplers (LICs) and cables:

- A description of the LICs

- IBM reference of each cable listed by like type. For the same type cable, each length has a reference.

- IBM reference for the cable kits, which can be used to make cables to fit your exact needs if none of the IBM cables will fit.

- Cable and wire plug specifications and connector pin assignments, which is helpful for your custom-made cables.

2.1 2220 External Cables

Figure 2-1 on page 2-2 shows the cables that are common to all Nways Switches. The communication line cables for the LICs are described in later sections.
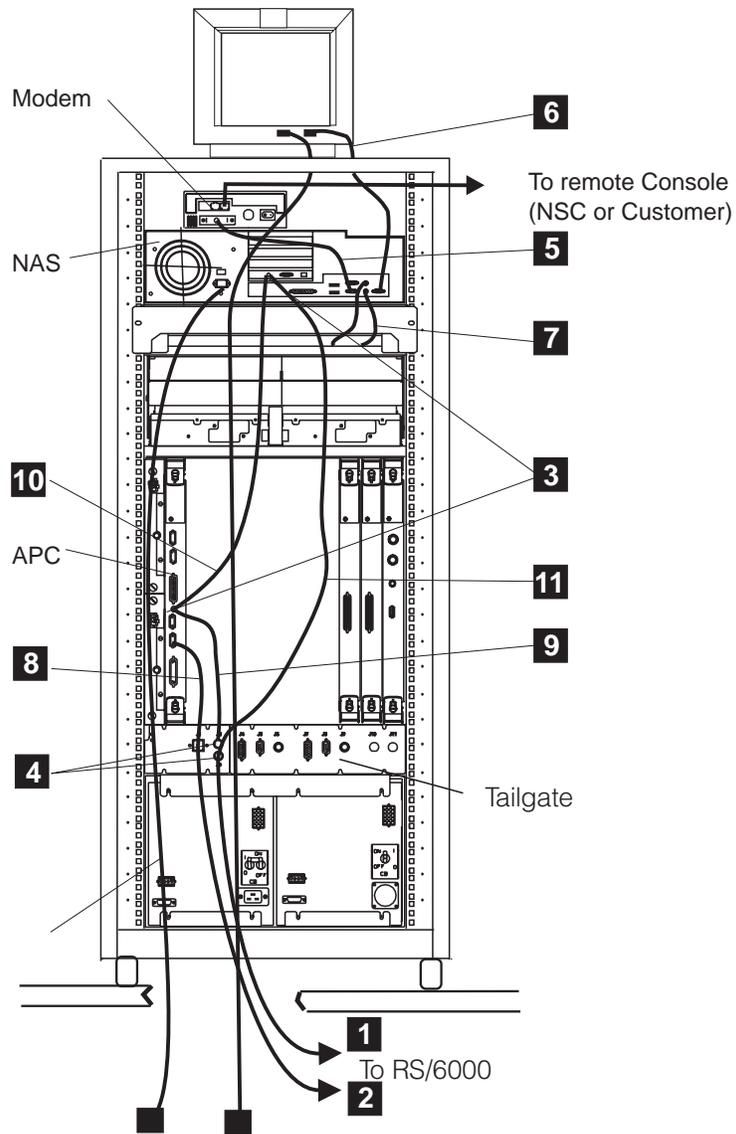
Figure 2-1. Nways Switch Administration Station Cables (Here Installed in 29 U Rack)

Cable between the 2220 and the RISC System/6000

2220 Tailgate Connectors
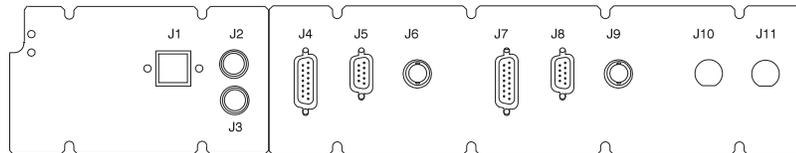
Figure   2-2. 2220 Tailgate Connectors

Two types of Ethernet cable can be used to connect the 2220 to the RISC System/6000:

- Ethernet 10Base2 or Thin Ethernet See Figure 2-3 and **1** in Figure 2-1 on page 2-2.
- Ethernet 10BaseT. See Figure 2-4 and **2** in Figure 2-1 on page 2-2.

10Base2 Cable or Thin Ethernet Cable
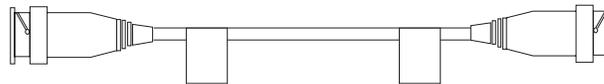
Figure   2-3. 10Base2 or Thin Ethernet Cable

Cable impedance: 50 Ohms. Connector type: BNC.

Note: If you use a cable that is not supplied by IBM, IBM does not guarantee EMC compliance for the 2220 machine.

10BaseT Cable

P1   P2
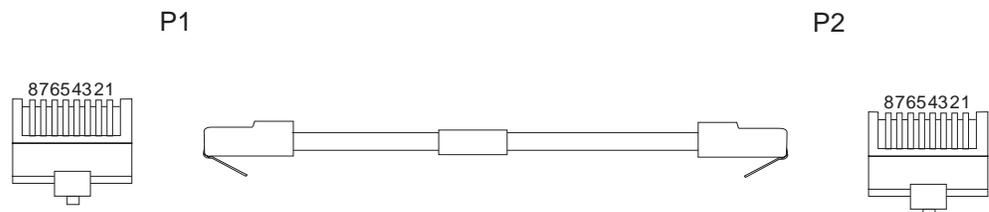
Figure   2-4. 10BaseT Cable

Cable impedance: 100 Ohms. Connector type: RJ 45.

Note: If you use a cable that is not supplied by IBM, IBM does not guarantee EMC compliance for the 2220 machine.

Interchange Circuits for the 10BaseT Cable

Connector
P1

Connector
P2

```
+ Receive      3  o——§—————————————o  3
- Receive      6  o——§—————————————o  6
+ Transmit     1  o————————§————————o  1
- Transmit     2  o————————§————————o  2
```

Legend: § A Twisted Pair
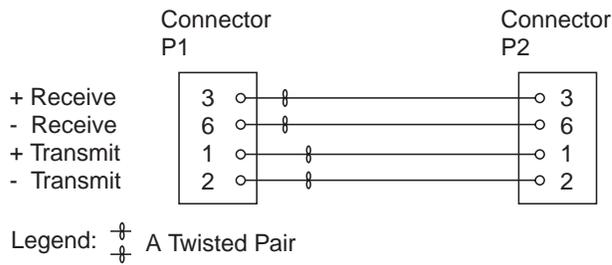
Figure   2-5. 10BaseT Cable Pin Assignments (Between the 2220 Tailgate and the RISC System/6000)

Table 2-1. Standard Cables between the 2220 and the RISC System/6000			
Cable Type	**Length**	**Part Number**	**Feature Code**
10BaseT	9 m (29 ft 6 in.)	57G7998	5370
10Base2	9 m (29 ft 6 in.)	80G0589	

T-Connectors

Refer to Figure 2-1 on page 2-2 reference **3** .

When the Nways Switch administration station type B is installed with an APC typeƀB, T-connectors are installed **3** .
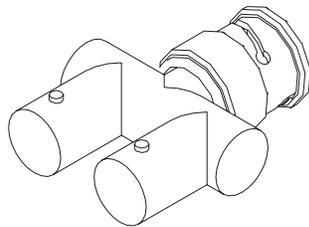
Figure   2-6. T-Connector (PN 80G0638)

BNC Caps

Refer to Figure 2-1 on page 2-2 reference **4** .

BNC caps (PN 80G0639) must be installed in **4** if there is no link via Ethernet 10Base2 **1** .
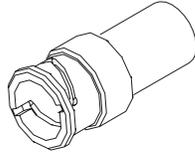
Figure 2-7. BNC Cap

Cable from the Nways Switch Administration Station, to the Tailgate and to the APC Card

Refer to Figure 2-1 on page 2-2 reference **10** , and **11** .
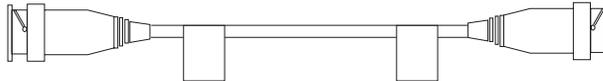
Figure 2-8. Cable from the Nways Switch Administration Station, to the Tailgate, and to the APC Card

Table 2-2. Cables from the Nways Switch Administration Station, to the Tailgate , and to the APC Card

Cable Reference	Cable Type	Length	Part Number
10 **11**	10Base2	15 m (50 ft)	25L9980

Cables between the APC Card and the Tailgate

Refer to Figure 2-1 on page 2-2 reference **8** , and **9** .

Figure 2-9. Cable between the APC Card and the Tailgate Position (J2)
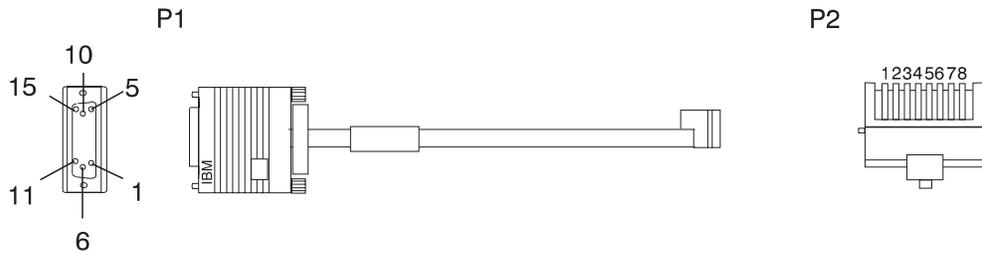
Figure 2-10. Cable between the APC Card and the Tailgate Position (J1)

Interchange Circuits for the Cable between the Nways Switch Administration Station and the Tailgate Position (J1)
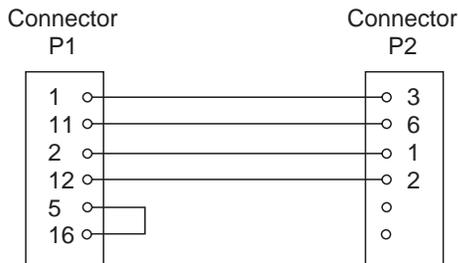
Figure 2-11. Cable Pin Assignment

Table 2-3. Cables between the APC Card and the Tail Gate

Cable Reference	Cable Type	Length	Part Number
8	10BaseT	0.45 m (1.5 ft)	80G0635
9	10Base2	0.55 m (1.83 ft)	80G0637

Cable between the Nways Switch Administration Station and the Modem

Refer to Figure 2-1 on page 2-2 reference **5** .

P1   P2

Connector
Female

Connector
Male
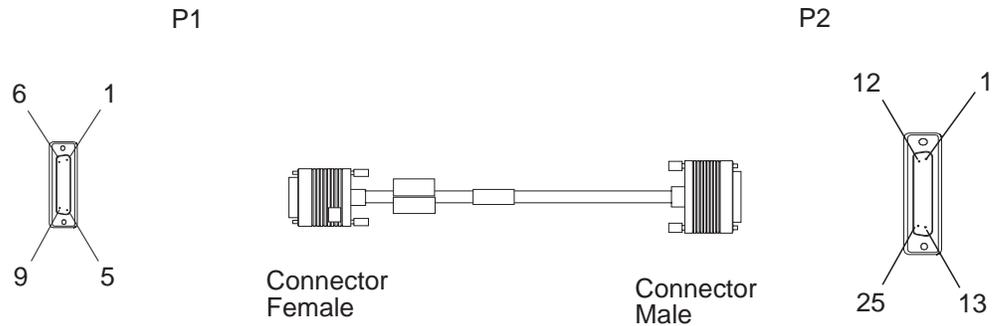
Figure 2-12. Cable between the Nways Switch Administration Station and the Modem

Interchange Circuits for the Cable between the Nways Switch Administration Station and the Modem

Connector
P1

Connector
P2


```
1  o─────────o  8
2  o─────────o  3
3  o─────────o  2
4  o─────────o  20
6  o─────────o  6
7  o─────────o  4
8  o─────────o  5
9  o─────────o  22
```
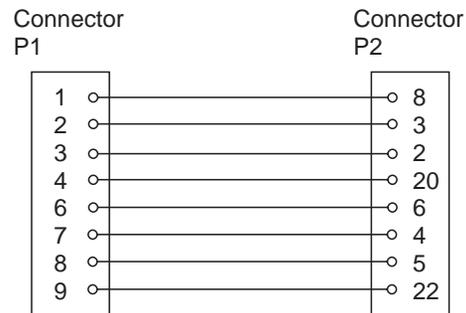
Figure 2-13. Modem Cable Pin Assignments

Table 2-4. Cable between the Nways Switch Administration Station and the Modem		
Cable Type	**Length**	**Part Number**
Standard Fixed	4 m (13 ft)	80G0597

Cable between the Nways Switch Administration Station and the Display

Refer to Figure 2-1 on page 2-2 reference **6** . This cable is shipped with the display.

Cable between the Nways Switch Administration Station and the Keyboard

Refer to Figure 2-1 on page 2-2 reference **7** . This cable is shipped with the keyboard.

External Cables Used for Clock Synchronization on the 2220

2220 Tailgate Connectors
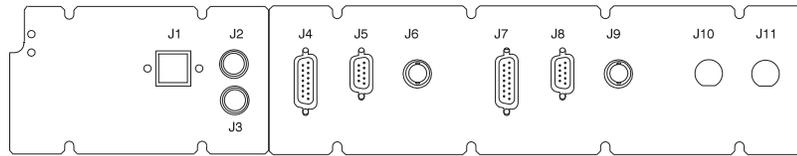
Figure   2-14. 2220 Tailgate Connectors

External Cable for External Oscillator

A coaxial cable is used with the following characteristics:

- Impedance: 50 Ohms

- Connector type: BNC

- Maximum length: 3 m (9 ft 9 in.).
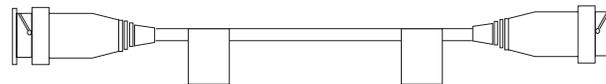
Figure   2-15. External Cable for External Oscillator

External Cables for Office Clock

The length of these cables must not exceed 30 meters (97.5 feet).

Figure Figure 2-16 applies to tailgate connectors J4 and J7. Figure Figure 2-17 applies to tailgate connectors J5 and J8. Figure Figure 2-18 on page 2-10 defines external cable pin assignments.
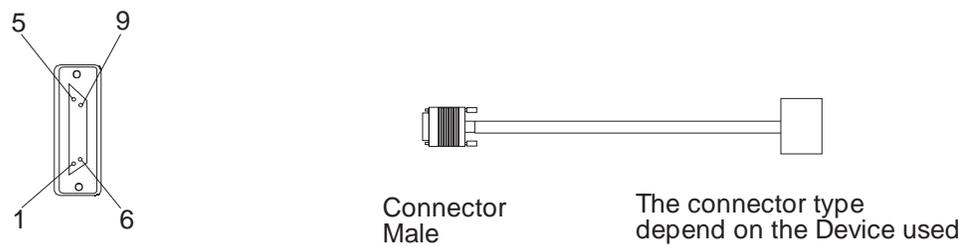
Figure   2-16. Cable for Connection to Tailgate Connectors J4 and J7
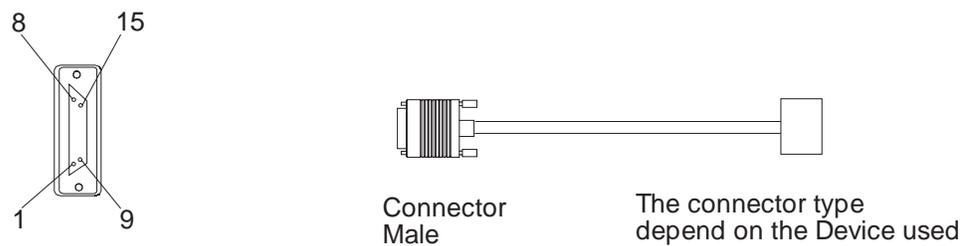
Figure   2-17. Cable for Connection to Tailgate Connectors J5 and J8

External Cable Pin Assignments for Tailgate Connectors J4, J5, J7, and J8

Tailgate
Connector J4

1	Office Clock In 120 1 P 1
2	Office Clock In 75 1 P 1
3	Office Clock In 120 2 P 2
4	Office Clock In 120 2 N 2
5	Office Clock CC In 1 P 1
6	Office Clock CC In 1 N 2
9	Office Clock In 120 1 N 1
10	Office Clock In 75 1 N 1
11	Office Clock In 120 2 N 2
12	Office Clock In 75 2 N 2
13	Office Clock CC In 1 N 1
14	Office Clock CC In 1 N 2

Tailgate
Connector J7

1	Office Clock In 120 1 P 2
2	Office Clock In 75 1 P 2
3	Office Clock In 120 2 P 1
4	Office Clock In 75 2 P 1
5	Office Clock CC In 2 N 1
6	Office Clock CC In 2 P 2
9	Office Clock In 120 1 N 2
10	Office Clock In 75 1 N 2
11	Office Clock In 120 2 N 1
12	Office Clock In 75 2 N 1
13	Office Clock CC In 2 N 1
14	Office Clock CC In 2 N 2

Tailgate
Connector J5

1	Office Clock CC Out 1 N 1
4	Office Clock Out 120 1 N 1
5	Office Clock Out 75 1 N 1
6	Office Clock CC Out 1 P 1
8	Office Clock Out 120 1 N 1
9	Office Clock Out 75 1 P 1

Tailgate
Connector J8

1	Office Clock CC Out 1 N 2
4	Office Clock Out 120 1 N 2
5	Office Clock Out 75 1 N 2
6	Office Clock CC Out 1 P 2
8	Office Clock Out 120 1 N 2
9	Office Clock Out 75 1 P 2

Legend:
Office Clock In 120 1 N 1

- Connection to Clock 1 or 2
- Polarity N (negative) or P (positive)
- Interface number (1 or 2)
- Impedance (120 or 75 Ohms)
- In, Out

Office Clock CC

- Composite Clock
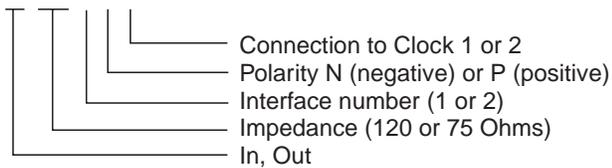
Figure 2-18. External Cable Pin Assignments (Between the 2220 Tailgate and the External Device)

2220 and LCB Ground Wires

2220-500 Grounding Via a Ground Wire

A ground wire **A** must be installed on the 2220-500. Refer to Figure 2-19, Figure 2-20 on page 2-12, Figure 2-21 on page 2-13. Figure 2-22 on page 2-13 shows ground wire **A** from 2220-500 to premises grouding system.
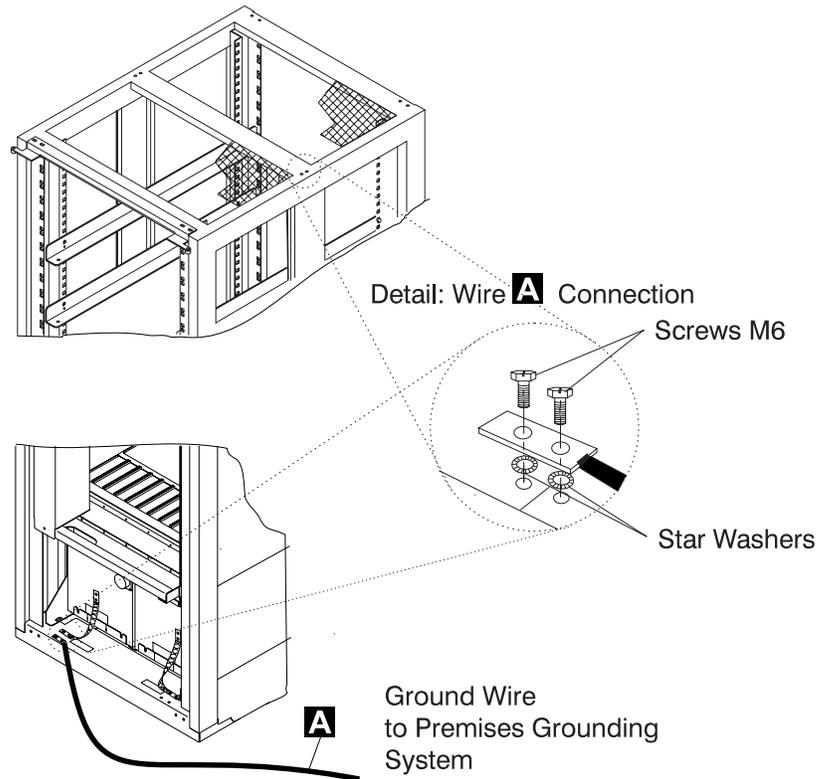
Figure 2-19. Grounding of the 2220-500 to the Premises Grounding System in a 37 U Rack

Detail: Wire **A** Connection

Screws M6

Star Washers

Front View

Ground Wire
to Premises Grounding
System

A
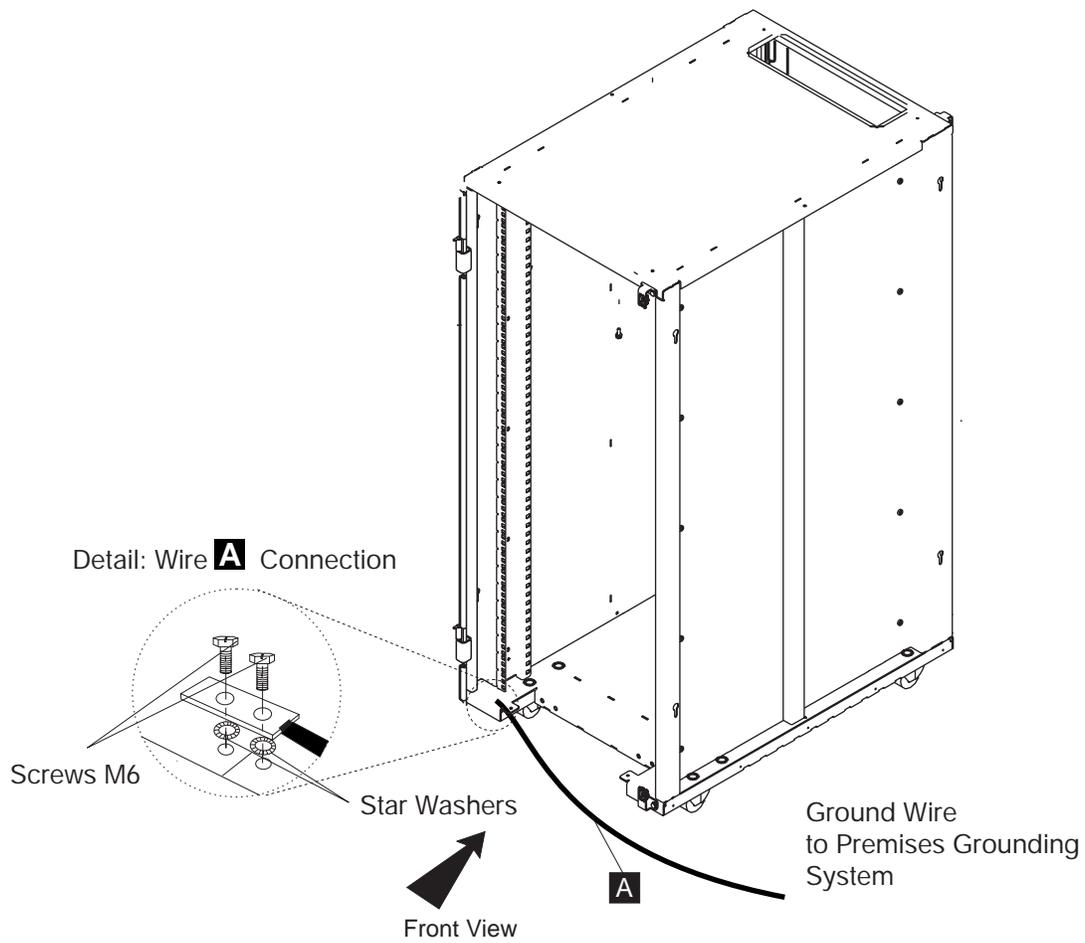
Figure 2-20. Grounding of the 2220-500 to the Premises Grounding System in a 29 U Rack
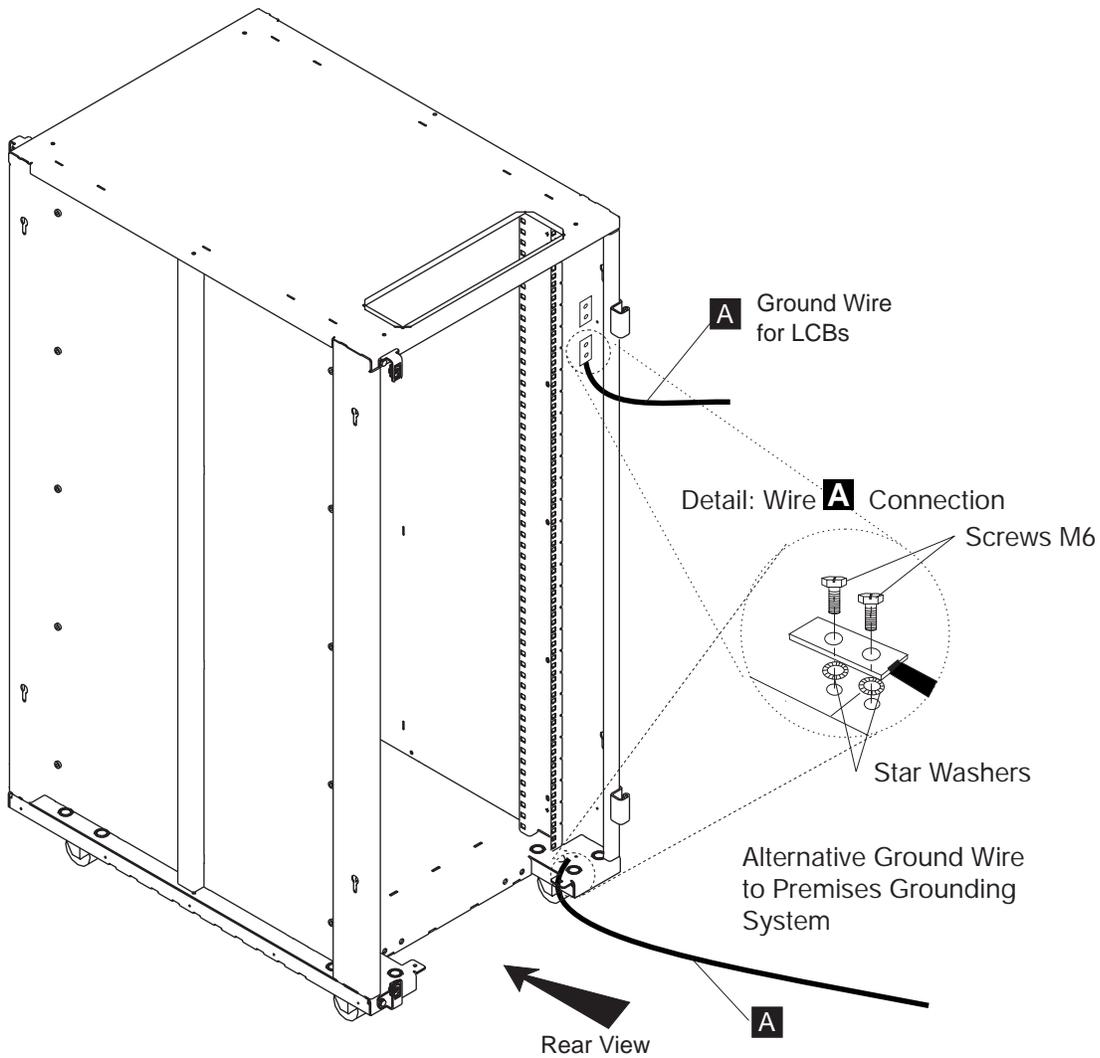
Figure   2-21. LCB and Alternative Ground Wire in 29 U Rack

Note: If necessary, the ground wire **A** can be connected to the top of the 2220-500 frame.
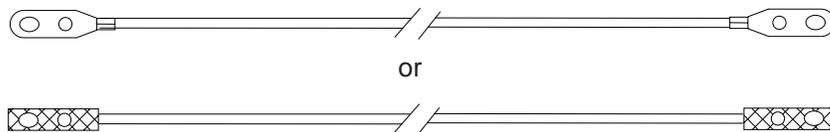
Figure   2-22. Ground Wire A from the 2220-500 to the premises grounding system

Table 2-5. Ground Wire between the 2220 and the Premises Grounding System		
Cable Type	**Length**	**Part Number**
Standard Fixed	10 m (33 ft)	80G3815

2220-501 Grounding Via a Ground Wire

If a 2220-501 is installed, a ground wire **B** must be installed between the 2220-500 and the 2220-501. Refer to Figure 2-23. Figure Figure 2-24 shows ground wire **B** Between the 2220-500 and the 2220-501.
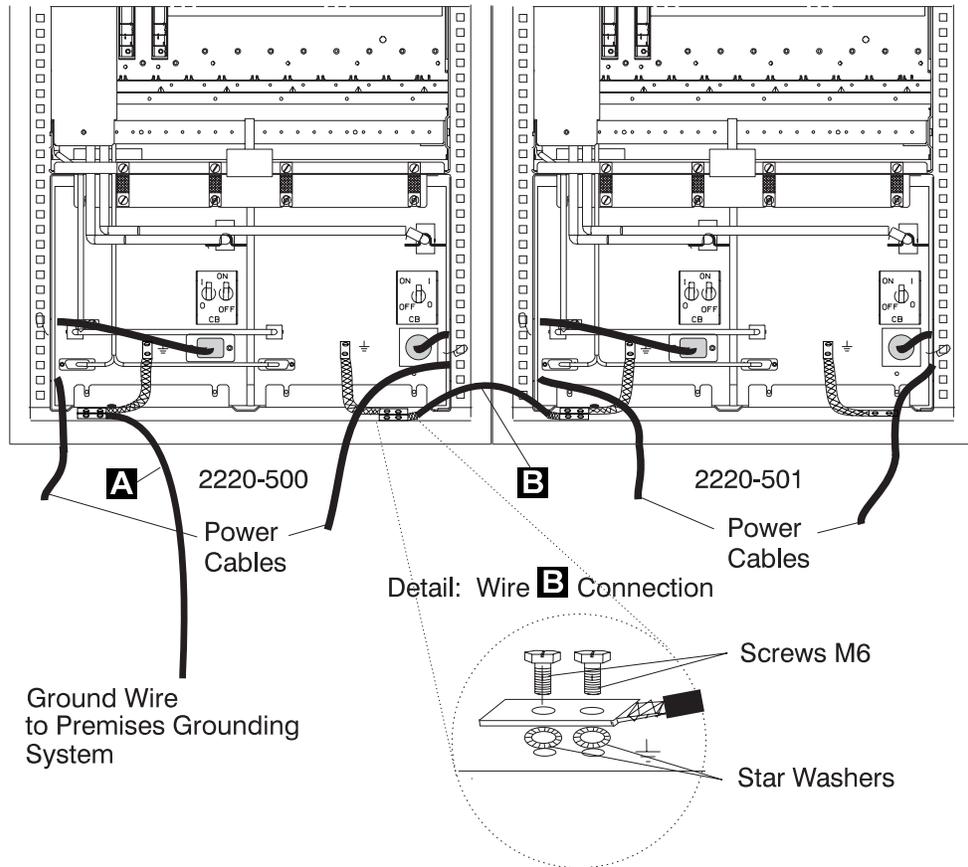
Figure 2-23. Grounding Connection Between the 2220-500 and the 2220-501

Figure 2-24. Ground Wire B Between the 2220-500 and the 2220-501

Table 2-6. Ground Wire between the 2220-500 and the 2220-501		
Cable Type	**Length**	**Part Number**
Standard Fixed	0.42 m (1.4 ft)	80G3715

Line Connection Box Grounding Via a Ground Wire

When the line connection box (LCB) is not installed in the 2220 rack, or when a rack with a frame that is *not* connected to the premises grounding system is used, a ground wire must be installed to insure this connection. Refer to Figure 2-25 on page 2-15.

Bottom View

or Ground Wire

To Premises Grounding System
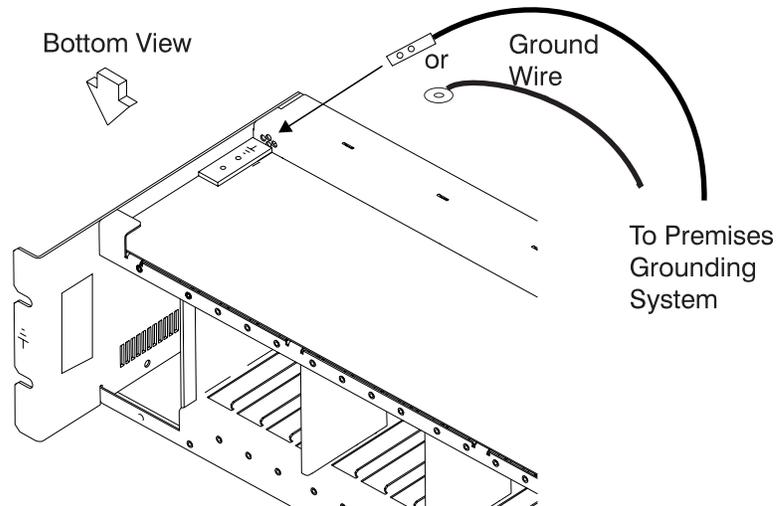
Figure 2-25. LCB Grounding Using Ground Wire

IBM does not provide the ground wire, nor the screws and washers. In order to ensure appropriate grounding, the ground wire must be made using the following table. The holes have a diameter of 6 mm (.23 in.) for screws of 5 mm (.19 in.). (refer to Figure 2-22 on page 2-13).

	U.S. and Canada	Other Countries
When the cable is protected by a tray.	AWG 12	2.5 mm2
When the cable is not protected.	AWG 10	4 mm2

Connection of Ground Wire to LCB

Screw M5

Lock Washer

Star Washer

Ground Wire

LCB
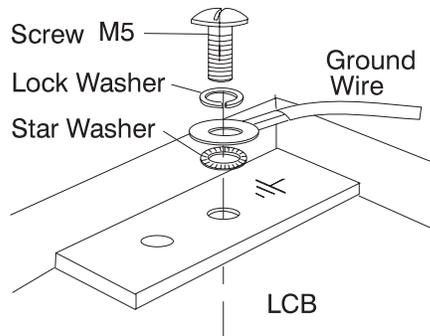
Figure 2-26. Standard Connection
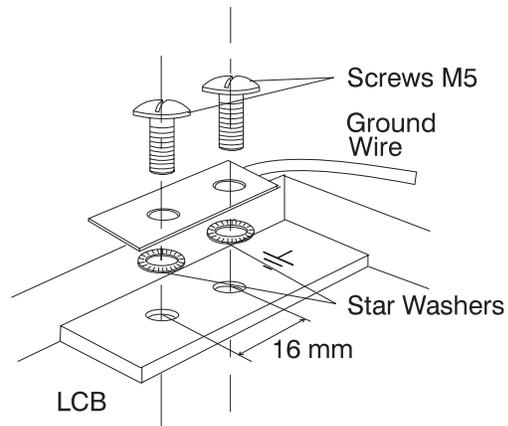
Figure 2-27. Bellcore Specification Connection

2.2 DTE and DCE Cable Definitions

The terms DTE, for data terminal equipment, and DCE, for data circuit-terminating equipment (usually a modem), are used throughout this chapter. Figure 2-28 and Figure 2-29 define these terms.
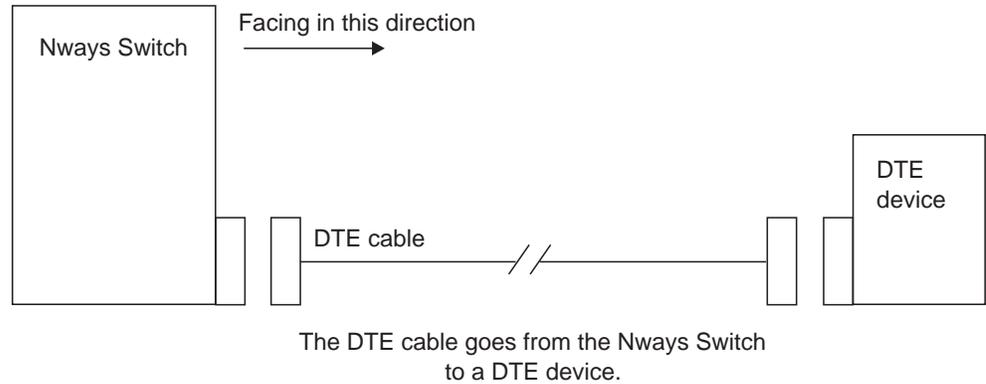
Figure 2-28. DTE Cable
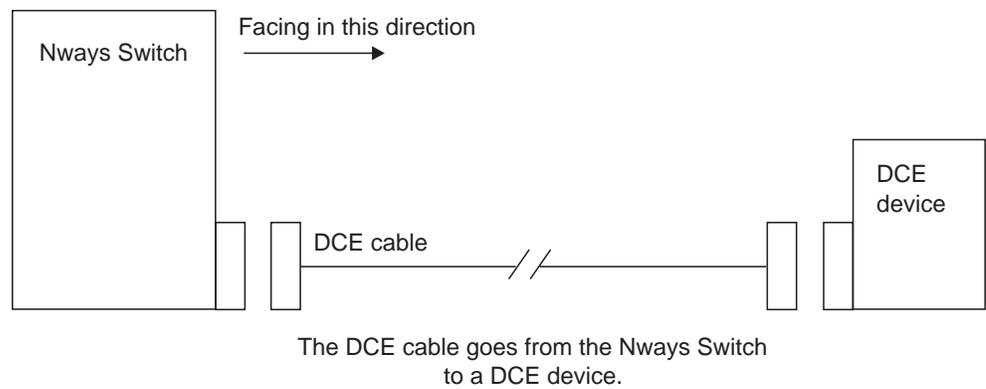
Figure 2-29. DCE Cable

2.3 LIC511
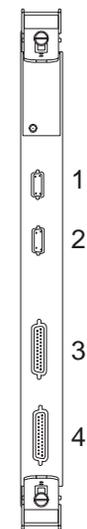
LIC511

LIC511 Interface	Description
Number	2
Characteristics	Used to connect a pairs of Line Connection Boxes (LCBs). Each pair of LCBs supports up to 60 ports with X.21, V.35, and V.24/EIA-232 interfaces.
Speed	Maximum port speed on an LCB is 256 kbps.
Feature Code	5511

LIC511 Wrap Test
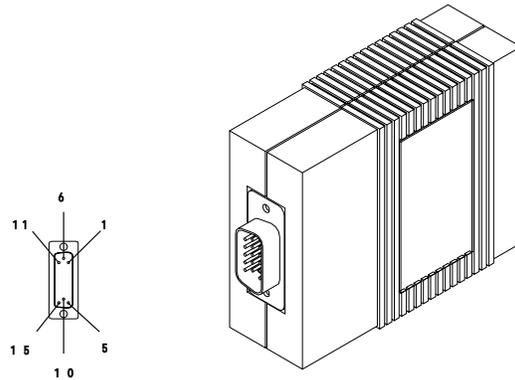
Figure   2-30. LIC511 Wrap Plug (Part Number 58G9425)
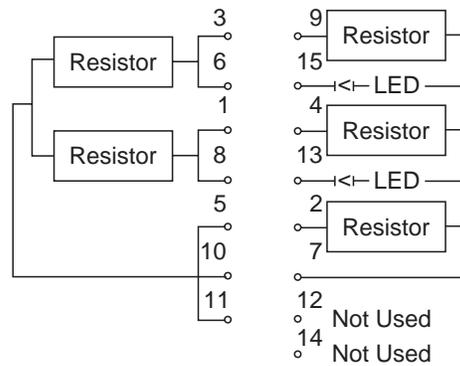
Figure   2-31. LIC511 Wrap Plug Pin Assignment

LIC511 to Line Connection Box Base Cables

Legend: ⌇ Twisted Pair
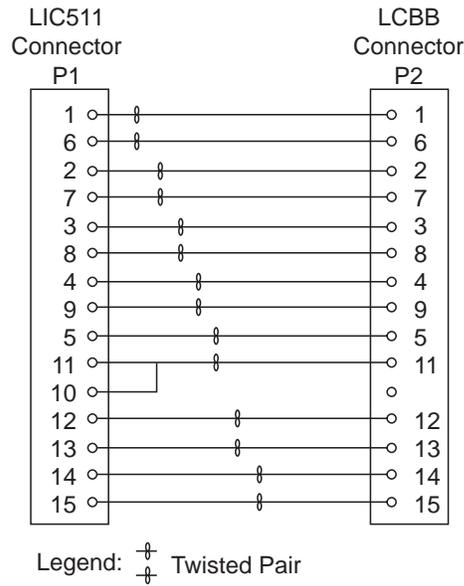
Figure   2-32. Interchange Circuits for LIC511 Attachment Cables
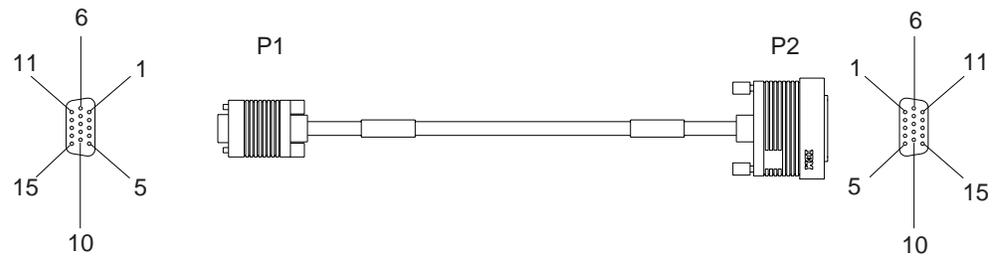
Figure   2-33. LIC511 Attachment Cable

Table 2-7. LIC511 Attachment Standard Cables			
Length m (ft)	**Feature Code**	**Part Number World-Wide**	**Part Number World-Wide Except Canada**
1 (3)	5620	58G5601	58G5705
5 (50)	5622	58G5603	58G5707
105 (330)	5625	80G3993	58G5710

Line Connection Box Base to Line Connection Box Expansion Cable

Pin Number	Signal Name	Pin Number	Signal Name
	Table 2-8. Interchange Circuits for the LCBB-to-LCBE Cable		
1	+IO-GR6IN	23	Not used
2	+IO-GR7IN	24	– LCB EXT present
3	+IRE0-LOCBUS 0	25	– LCB EXT present
4	+IRE0-LOCBUS 2	26	– 48V EXT sense
5	+IRE0-LOCBUS 4	27	Not used
6	+IRE0-LOCBUS 6	28	Not used
7	+IO-GR4OUT	29	Not used
8	+IO-GR5OUT	30	– Select presence GR6/7
9	+IO-GR6OUT	31	+ IO–GR5IN
10	+IO-GR7OUT	32	+ IO–GR4IN
11	–48V RIN EXT	33	Not used
12	+5V backup	34	Not used
13	(For sending purposes)	35	Not used
14	–48V PWR EXT	36	Not used
15	Select presence GR4/5	37	Not used
16	+CLOCK 768 EXT	38	Ground
17	Not used	39	Ground
18	Not used	40	Not used
19	+IRE0-LOCBUS 1	41	Not used
20	+IRE0-LOCBUS 3	42	Not used
21	+IRE0-LOCBUS 5	43	Not used
22	+IRE0-LOCBUS 7	44	– Select LCB EXT VPD
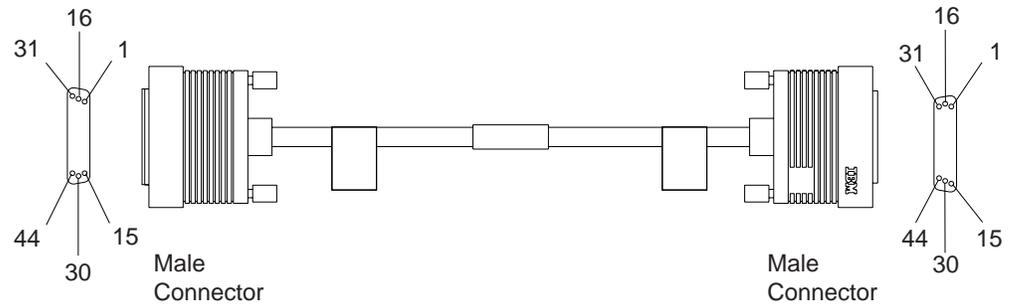
Figure 2-34. LCBB-to-LCBE Cable. This cable is 35 cm (1.15 feet) long.

The LCBB-to-LCBE cable part number is 17G5789 and it is shipped with the LCBE feature.

2.4 Active Remote Connector Assembly and Cable List

ARCs and Cables

Table 2-9. Arc and Cable Types

ARC Type	Description	Cable Length m (ft)	Feature Code	Part Number
V.24	ARC V.24 (cassette only)		5024	
	V.24 cable to attach 2220 to DCE	5 (16)	5042	58G5613
	V.24 cable to attach 2220 to DCE	12 (40)	5043	58G5615
	24 cable to attach 2220 to DTE	15 (50)	5045	80G3725
V.35	ARC V.35 (cassette only)		5035	
	V.35 cable to attach 2220 to DCE	5 (16)	5052	58G5623
	V.35 cable to attach 2220 to DCE	15 (50)	5053	58G5625
	V.35 cable to attach 2220 to DTE	15 (50)	5055	80G3726
X.21	ARC X.21 (cassette only)		5021	
	X.21 cable to attach 2220 to DCE	5 (16)	5072	58G5633
	X.21 cable to attach 2220 to DCE	15 (50)	5073	58G5635
	X.21 cable to attach 2220 to DTE	15 (50)	5075	58G5636
	X.21 cable to attach 2220 to DCE (transfix, France only)	15 (50)	5077	58G5638

Important Note: With an ARC (feature 5021, 5024, or 5035) an associated cable has to be ordered. ARC or cable feature code alone can be ordered for parts replacement purposes.

Table 2-10. Arc Wrap Plug

ARC Type	ARC Wrap Plug Part Number
V.24	80G3742
V.35	80G3743
X.21	80G3744

Table 2-11. Cable Wrap Plug

Cable Description	Cable Wrap Plug Part Number
V.24 cable to attach a 2220 to a DCE	61F4522
V.24 cable to attach a 2220 to a DTE	80G3745
V.35 cable to attach a 2220 to a DCE	61F4526
V.35 cable to attach a 2220 to a DTE	80G3746
X.21 cable to attach a 2220 to a DCE	61F4529
X.21 cable to attach a 2220 to a DTE	61F4530

ARC Front Assembly
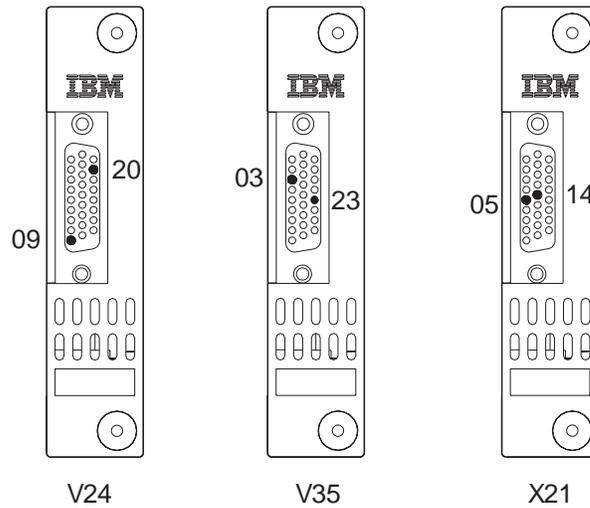
Figure 2-35. ARC Front Connector

ARC Wrap Plug Pin Assignment
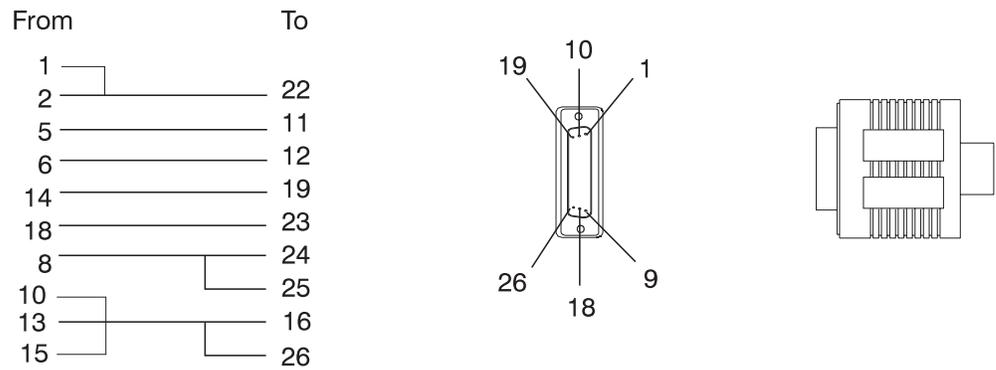
Figure 2-36. ARC V.24 Wrap Plug Pin Assignment (Part Number 80G3742)
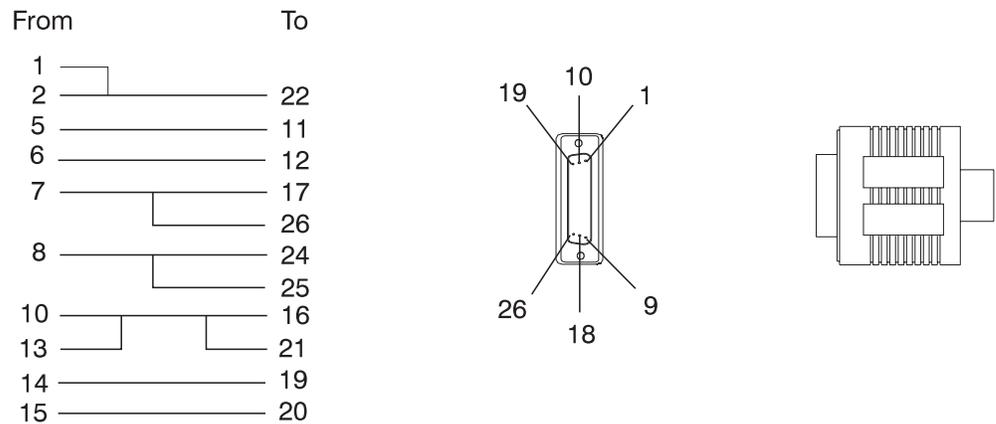
Figure 2-37. ARC V.35 Wrap Plug Pin Assignment (Part Number 80G3743)

From   To
6 ——————— 12
7 ——————— 26
8 ——————— 24
15 —————— 20
9 ——————— 17
18 —————— 25
10 —————— 16
13 —————— 23

19 10 1

26   9

18
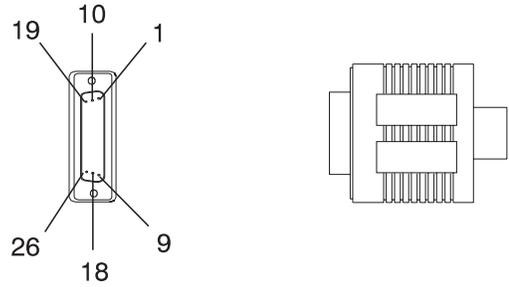
Figure   2-38. ARC X.21 Wrap Plug Pin Assignment (Part Number 80G3744)

ARC Cable V.24 Attachment to DCE
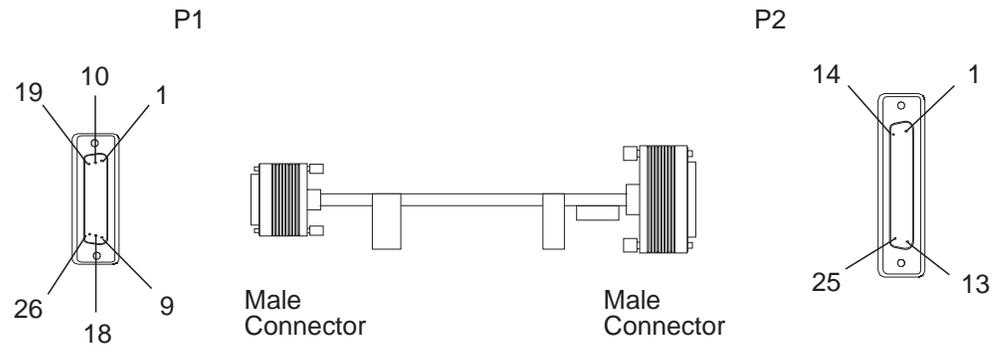
Figure   2-39. V.24 Cable: ARC to DCE

Interchange Circuits

ARC Connector P1	V.24 Connector P2	
1	8	Received Line Signal Detector
2	5	Clear to Send
4	21	Remote Loopback
5	20	Data Terminal Ready
6	2	Transmitted Data
8	11	New Synchro/Rcv Clk
	14	
11	6	Data Set Ready
12	3	Received Data
14	18	Local Loopback
10		
15		
16	7	Signal Ground
26		
18	23	Data Signal Rate Selector
19	25	Test Mode
22	4	Request to Send
23	22	Ring Indicator
24	15	Transmitter Signal Element Timing
25	17	Receiver Signal Element Timing

Figure   2-40. V.24 Cable: ARC-to-DCE Pin Assignment

ARC Cable V.24 Attachment to DTE

P1   P2

19 10 1
26 18 9

Male Connector

Female Connector

25 13
14 1
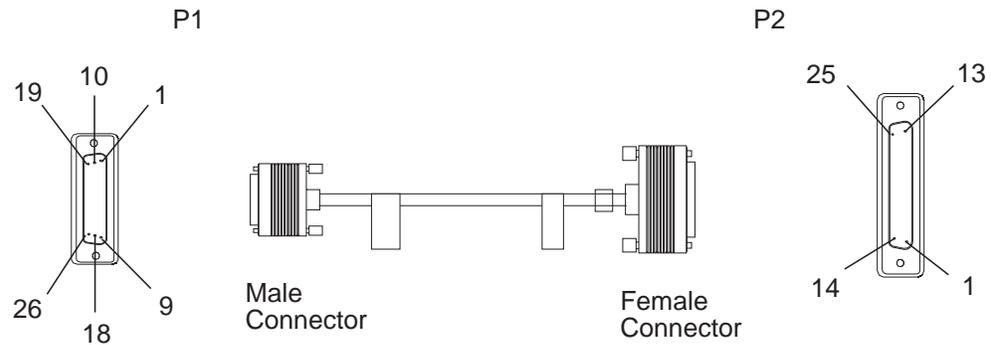
Figure 2-41. V.24 Cable: ARC to DTE

Interchange Circuits


```
ARC              V.24
Connector        Connector
P1               P2

 2 o----------o  4   Request to Send
 5 o          o
11 o----------o  6   Data Set Ready
 6 o----------o  3   Received Data
12 o----------o  2   Transmitted Data
 8 o----------o 15   Transmitter Signal Element Timing
 3 o----------o 17   Receiver Signal Element Timing
10 o          o
15 o----------o  7   Signal Ground
16 o          o
26 o          o
22 o----------o  5   Clear to Send
14 o----------o  8   Received Line Signal Detector
```
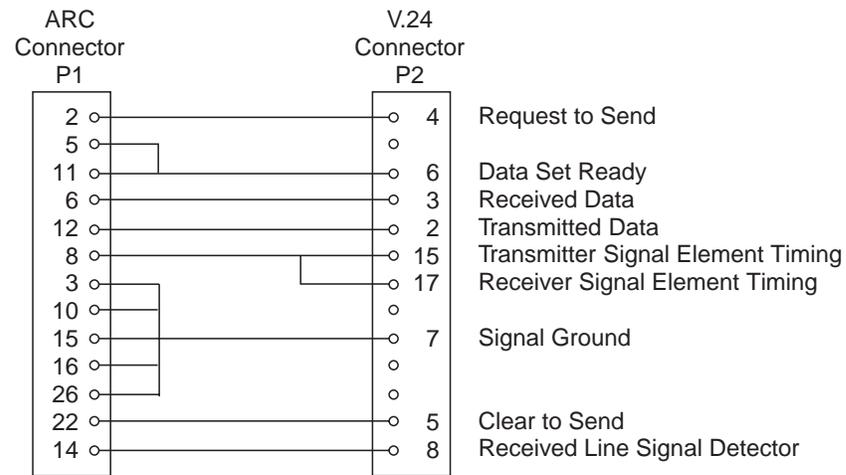
Figure 2-42. V.24 Cable: ARC-to-DTE Pin Assignment

ARC Cable V.35 Attachment to DCE
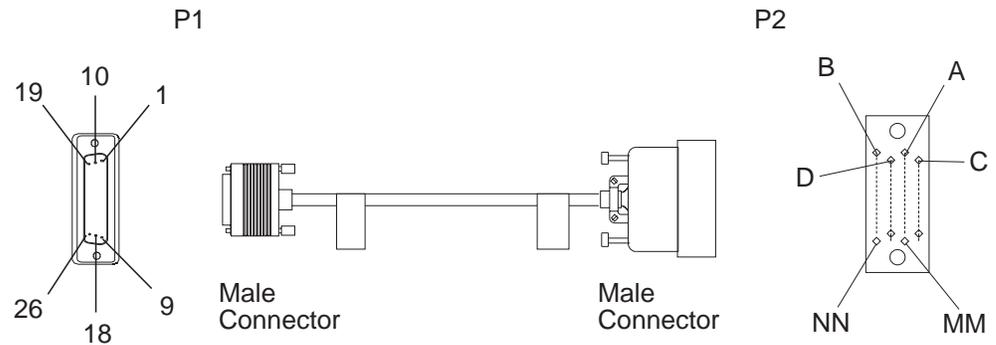
Figure   2-43. V.35 Cable: ARC to DCE

Interchange Circuits

ARC Connector P1	V.24 Connector P2	
1	F	Received Line Signal Detector
2	D	Clear to Send
4	N	M Test (CDE normal only)
5	H	Data Terminal Ready
6	P	Transmitted Data (A)
15	S	Transmitted Data (B)
7	AA	Transmit Timing (B)
24	Y	Transmit Timing (A)
8	HH	Transmit Clock Wrap A/Transmit Clock A
26	KK	Transmit Clock Wrap B/Transmit Clock B
11	E	Data set Ready
12	R	Receive Data A
20	T	Receive Data B
14	K	Local Loop (DCE normal only)
10		
16	B	Signal Ground
21		
17	X	Receive Timing (B)
25	V	Receive Timing (A)
19	NN	Test Indicator
22	C	Request to Send

Legend: ⊕ Twisted Pair

Figure   2-44. V.35 Cable: ARC-to-DCE Pin Assignment

ARC Cable V.35 Attachment to DTE
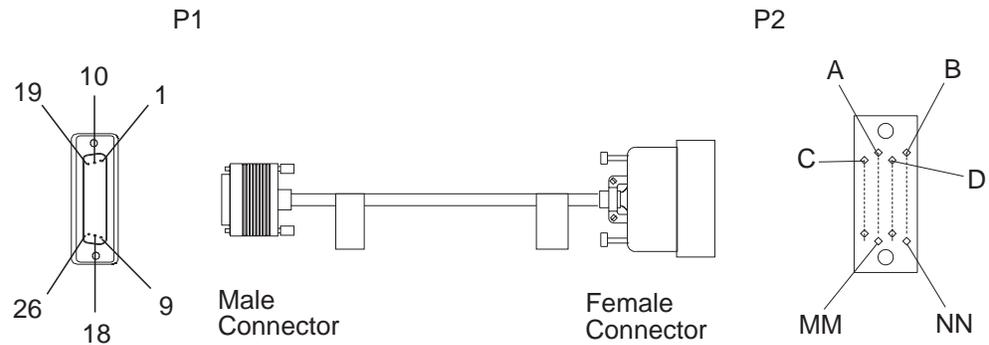
Figure 2-45. V.35 Cable: ARC to DTE

Interchange Circuits

ARC Connector P1		V.35 Connector P2	
2		C	Request to Send
5		E	
11			
6		R	Receive Data (A)
15		T	Receive Data (B)
8		Y	Transmit Timing (A)
26		AA	Transmit Timing (B)
9		X	Receive Timing (B)
18		V	Receive Timing (A)
12		P	Transmitted Data (A)
20		S	Transmitted Data (B)
3			
10		B	Signal Ground
16			
21			
14		F	Data Carrier Detect
22		D	Clear to Send

Legend: ⌇ Twisted Pair
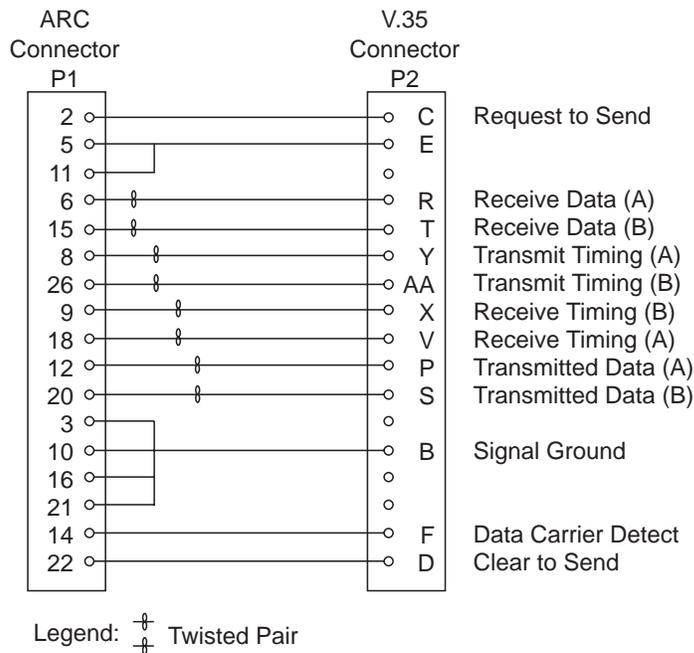
Figure 2-46. V.35 Cable: ARC-to-DTE Pin Assignment

ARC Cable X.21 Attachment to DCE

P1

P2

Male Connector

Male Connector
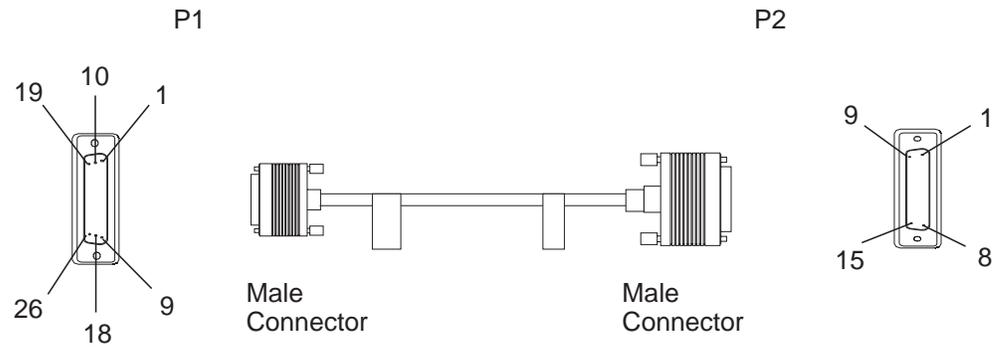
Figure 2-47. X.21 Cable: ARC to DCE

Interchange Circuits

ARC Connector P1		X.21 Connector P2	
6		2	Transmit (A)
15		9	Transmit (B)
7		13	Signal Timing (B)
24		6	Signal Timing (A)
8		7	Transmit Clock Wrap (A)
26		14	Transmit Clock Wrap (B)
9		10	Control (B)
18		3	Control (A)
12		4	Receive (A)
20		11	Receive (B)
10			
16		8	Ground
22			
23			
17		12	Indication (B)
25		5	Indication (A)

Legend: ⌇ Twisted Pair
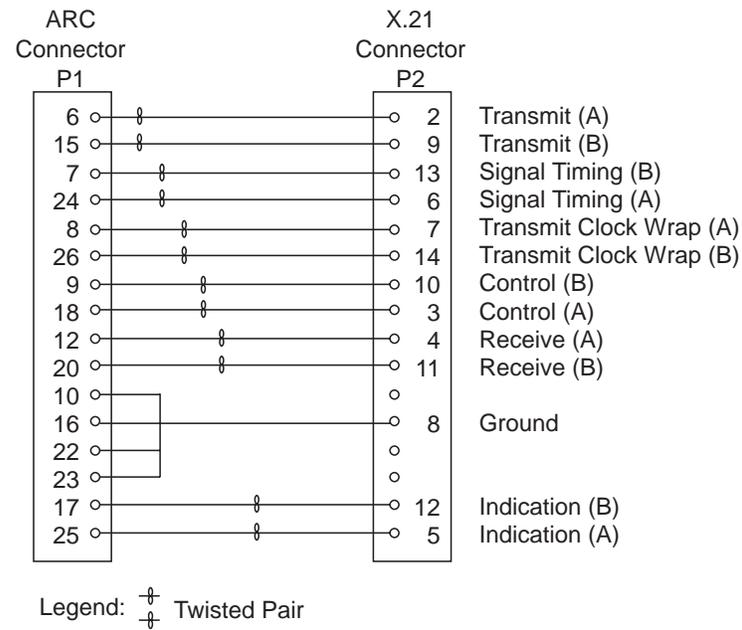
Figure 2-48. X.21 Cable: ARC-to-DCE Pin Assignment

ARC Cable X.21 Attachment to DTE

P1   P2

Male Connector   Female Connector
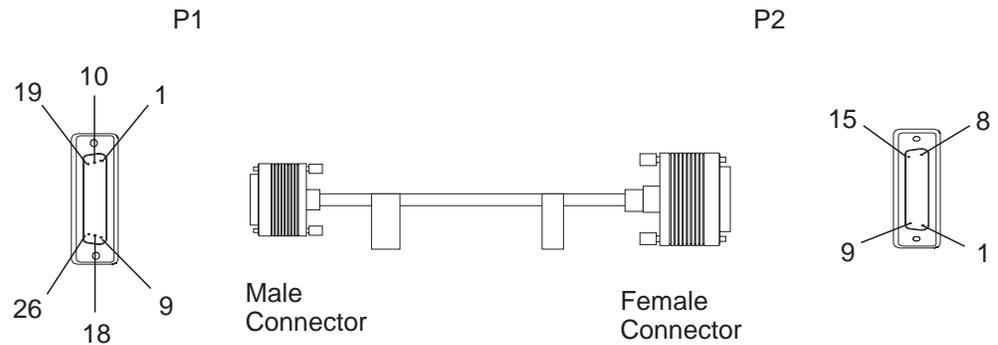
Figure   2-49. X.21 Cable: ARC to DTE

Interchange Circuits

ARC Connector P1   X.21 Connector P2

6	4 Receive (A)
15	11 Receive (B)
7	14 Transmit Clock B/Transmit Clock Wrap B
24	7 Transmit Clock A/Transmit Clock Wrap A
8	6 Signal Timing (A)
26	13 Signal Timing (B)
9	12 Indication (B)
18	5 Indication (A)
12	2 Transmit (A)
20	9 Transmit (B)
10	
16	8 Ground
23	
17	10 Control (B)
25	3 Control (A)

Legend: Twisted Pair
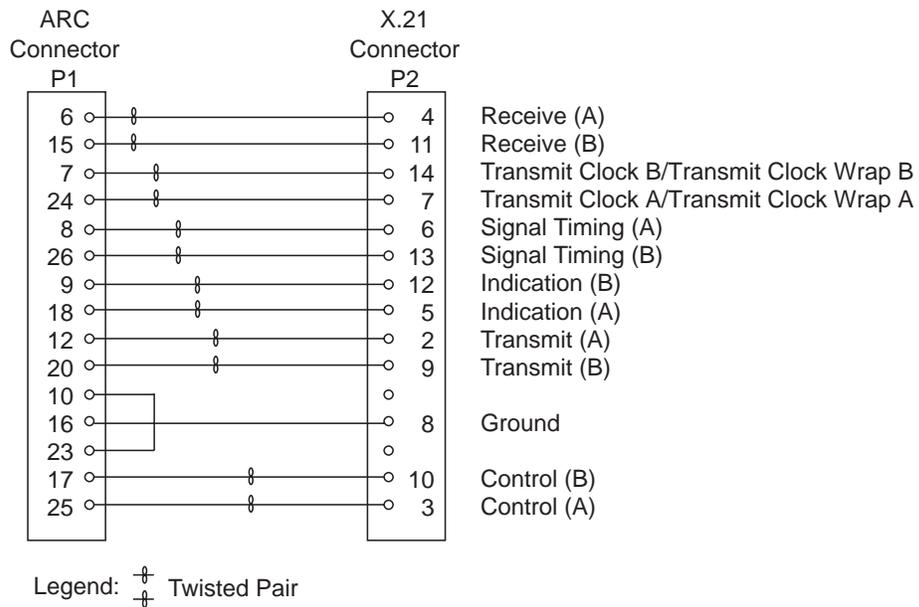
Figure   2-50. X.21 Cable: ARC-to-DTE Pin Assignment

ARC Cable X.21 Transfix Attachment
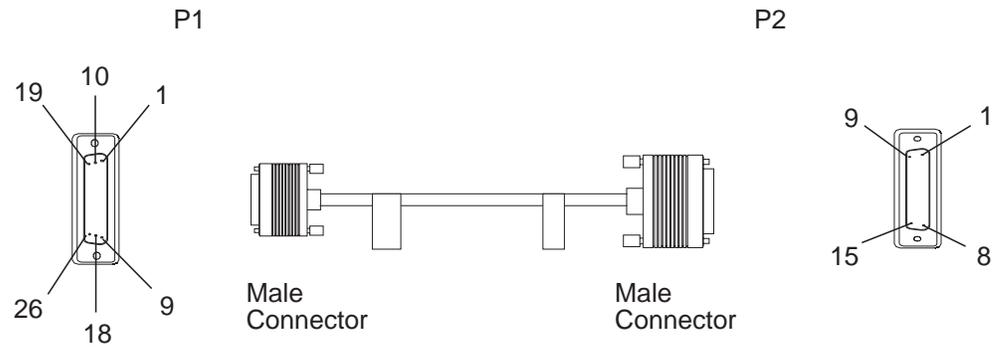
Figure 2-51. X.21 Cable: ARC to Transfix

Interchange Circuits

ARC Connector P1		X.21 Connector P2	
6		2	Transmit (A)
15		9	Transmit (B)
7		13	Signal Timing (B)
24		6	Signal Timing (A)
8		7	Transmit Clock Wrap (A)
26		14	Transmit Clock Wrap (B)
9			
17			
12		4	Receive (A)
20		11	Receive (B)
4			
10			
16		8	Ground
22			
23			
18			
25			

Legend: ⌇ Twisted Pair
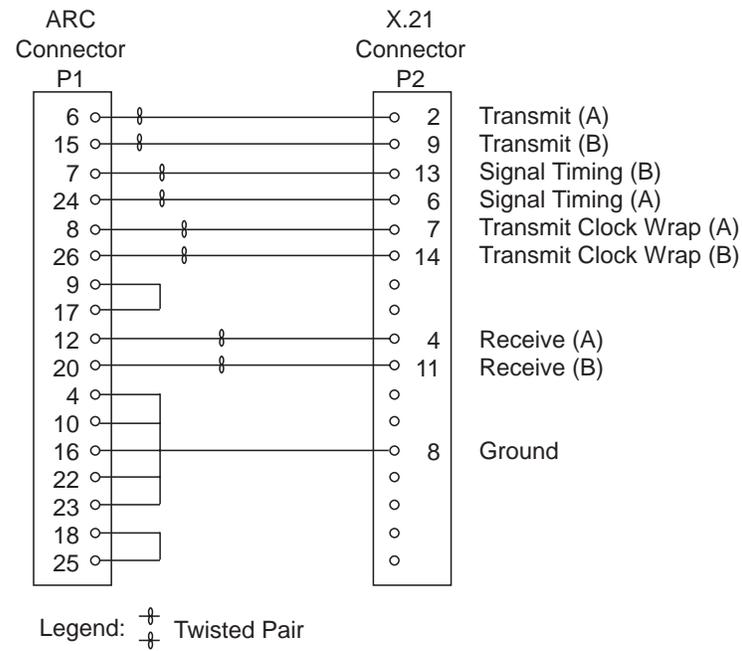
Figure 2-52. X.21 Cable: ARC to Transfix Pin Assignment

Adapter for ARC3A1 or ARC3A2 (V.35 DCE) for France Only

This adapter (Part Number 58G5965) is connected between the DCE and the ARC V.35 in **France** only.

Table 2-12. Adapter Part Number 1749352 for the V.35 DCE			
Wire Number	**Wire Color**	**Connector P1**	**Connector P2**
T1	none	B	B
1	black	C	C
T2	none	D	D
2	brown	L	L
T3	none	F	F
3	red	N	N
T4	none	E	E
4	orange	H	H
T5	none	R	R
5	blue	T	T
T6	none	V	V
6	violet	X	X
T7	none	P	P
7	grey	S	S
T8	none	Y	Y
8	white	AA	AA
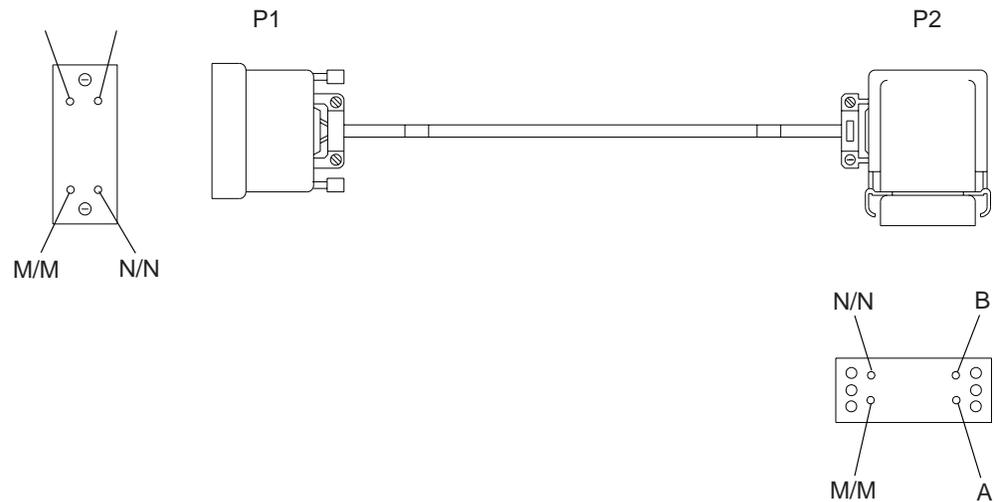
Figure   2-53. Adapter Part Number 1749352

Adapter for ARC3B (V.35 DTE) for France Only

This adapter (Part Number 58G5998) is connected between the DTE and the ARC V.35 in **France** only.

Wire Number	Wire Color	Connector P1	Connector P2
1	black	F	F
2	white	C	C
3	red	D	D
4	green	E	E
5	orange	R	R
6	blue	T	T
7	white black	P	P
8	red black	S	S
9	green black	V	V
10	orange black	X	X
11	blue black	Y	Y
12	black white	AA/a	AA/a
13	red white	H	H
14	green white	B	B
15	blue white	L	L

Table 2-13. Adapter Part Number 65X9899 for the V.35 DTE
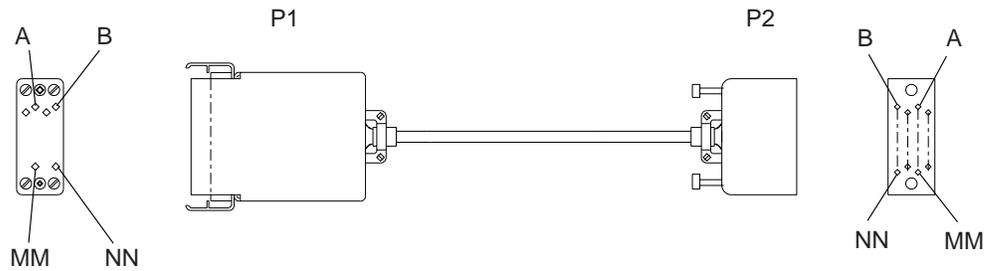
Figure 2-54. Adapter Part Number 65X9899
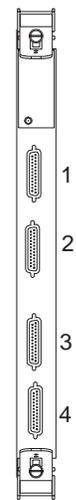
2.5 LIC512

LIC512 Interface	Description
Number	4
Characteristics	V.35 or X.21 (any mix allowed)
Speed	Up to 2.048 Mbps
Transfer mode	Full-duplex
Feature Code	5512

LIC512

LIC512 Wrap Plug

LIC512 Wrap Plug V.35/X.21
The Part Number of the wrap plug is 57G8096.

From	To
1	17
2	18
	32
4	21
5	22
6	36
7	37
8	25
9	26
10	41
11	40
16	33
19	35
20	34
23	39
24	38
29	43

16 31 1 44 15 30
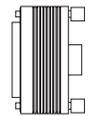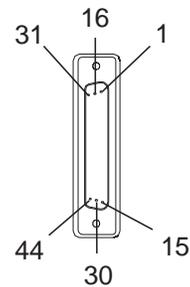
Figure 2-55. LIC512 Wrap Plug Pin Assignment

V.35 Attachment Cable: LIC512 to DTE
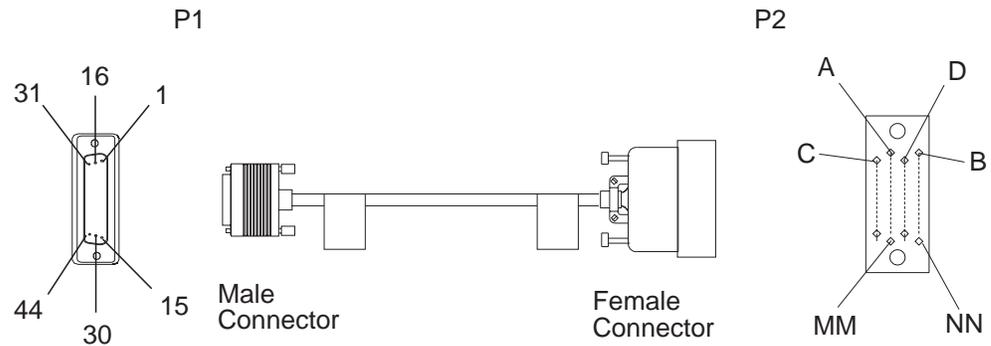
Figure   2-56. V.35 Cable: LIC512 to DTE

Interchange Circuits

LIC512 Connector P1		V.35 Connector P2	
1		E	Data Set Ready
17			
3		B	Signal Ground
33		F	Data Carrier Detect
4		R	Receive Data (A)
5		T	Receive Data (B)
6		AA	Transmit Timing (B)
7		Y	Transmit Timing (A)
18		C	Request to Send
21		P	Transmitted Data (A)
22		S	Transmitted Data (B)
32		D	Clear to Send
34		X	Receive Timing (B)
35		V	Receive Timing (A)
36			
37			
27			
29			

Legend: Twisted Pair
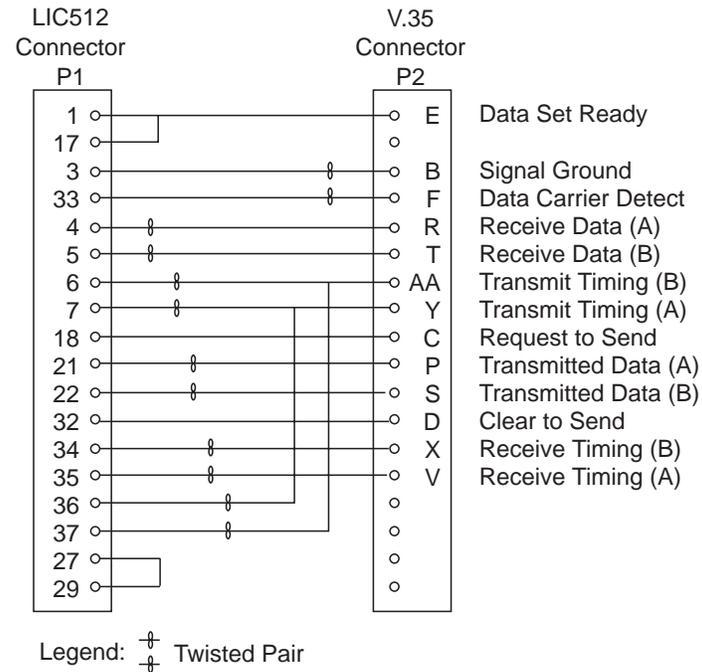
Figure   2-57. V.35 Cable: LIC512 to DTE Pin Assignment for Cable Up to 30 meters (100 feet)

```
        LIC512                          V.35
       Connector                      Connector
          P1                             P2
         ┌───┐                          ┌───┐
       1 │ o─┼──────────────────────────┼─o H │  Data Terminal Ready
       3 │ o─┼──────────────┨───────────┼─o B │  Signal Ground
      33 │ o─┼──────────────┨───────────┼─o F │  Data Carrier Detect
       4 │ o─┼──────┨───────────────────┼─o R │  Receive Data (A)
       5 │ o─┼──────┨───────────────────┼─o T │  Receive Data (B)
       6 │ o─┼──────────┨───────────────┼─o AA│  Transmit Timing (B)
       7 │ o─┼──────────┨───────────────┼─o Y │  Transmit Timing (A)
      17 │ o─┼──────────────────────────┼─o E │  Data Set Ready
      18 │ o─┼──────────────────────────┼─o C │  Request to Send
      21 │ o─┼──────────┨───────────────┼─o P │  Transmitted Data (A)
      22 │ o─┼──────────┨───────────────┼─o S │  Transmitted Data (B)
      32 │ o─┼──────────────────────────┼─o D │  Clear to Send
      34 │ o─┼──────────┨───────────────┼─o X │  Receive Timing (B)
      35 │ o─┼──────────┨───────────────┼─o V │  Receive Timing (A)
      36 │ o─┼──────────────┨───────────┼─o U │  Terminal Timing (A)
      37 │ o─┼──────────────┨───────────┼─o W │  Terminal Timing (B)
      12 │ o─┐                          │ o   │
      27 │ o─┤                          │ o   │
      29 │ o─┘                          │ o   │
         └───┘                          └───┘

         Legend:  ┨  Twisted Pair
```

*Figure   2-58. V.35 Cable: LIC512 to DTE Pin Assignment for Cable Longer than 30 meters
(100 feet)*

V.35 Attachment Cable: LIC512 to DCE
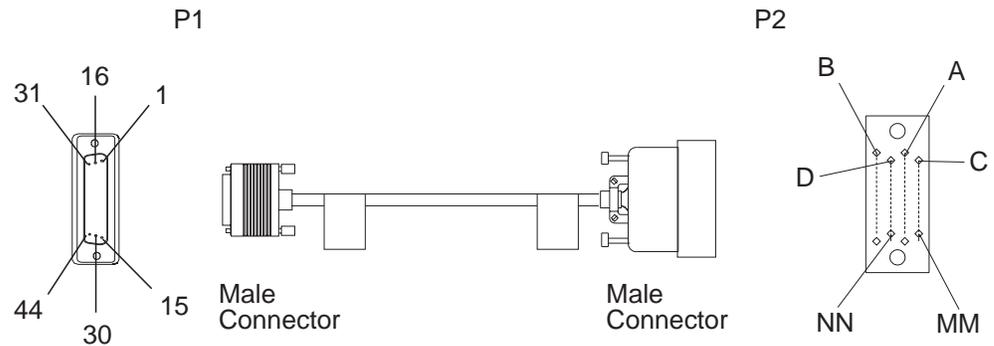
Figure   2-59. V.35 Cable: LIC512 to DCE

Interchange Circuits

P1		P2	
1		E	Data Set Ready
2		F	Data Carrier Detect
3		B	Signal Ground
17		H	Data Terminal Ready
4		P	Transmitted Data (A)
5		S	Transmitted Data (B)
18		D	Clear to Send
19		Y	Transmit Timing (A)
20		AA	Transmit Timing (B)
21		R	Receive Data (A)
22		T	Receive Data (B)
34		W	Terminal Timing (B)
35		U	Terminal Timing (A)
36		V	Receive Timing (A)
37		X	Receive Timing (B)
29			
42			
32		C	Request to Send

Legend: ⌇ Twisted Pair
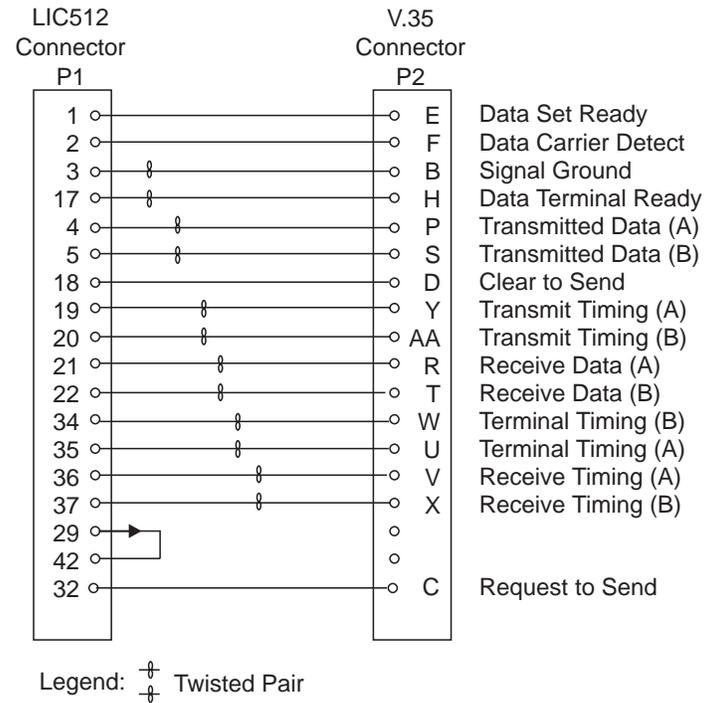
Figure   2-60. V.35 Cable: LIC512 to DCE Pin Assignment

X.21 Attachment Cable: LIC512 to DTE

P1   P2

Male Connector

Female Connector
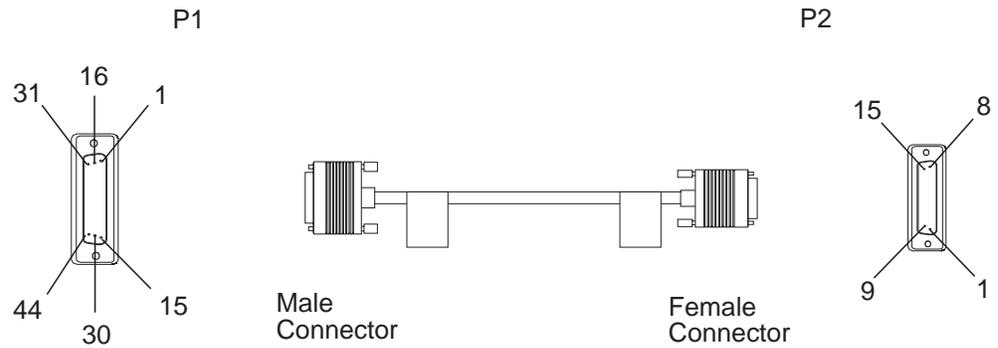
Figure   2-61. X.21 Cable: LIC512 to DTE

Interchange Circuits

LIC512
Connector
P1

X.21
Connector
P2

P1		P2	
3		8	Signal Ground
8		4	Receive (A)
9		11	Receive (B)
10		3	Control (A)
11		10	Control (B)
23			
24			
25		2	Transmit (A)
26		9	Transmit (B)
38		13	Signal Timing (B)
39		6	Signal Timing (A)
40		12	Indication (B)
41		5	Indication (A)
13			
27			
29			

Legend: Twisted Pair
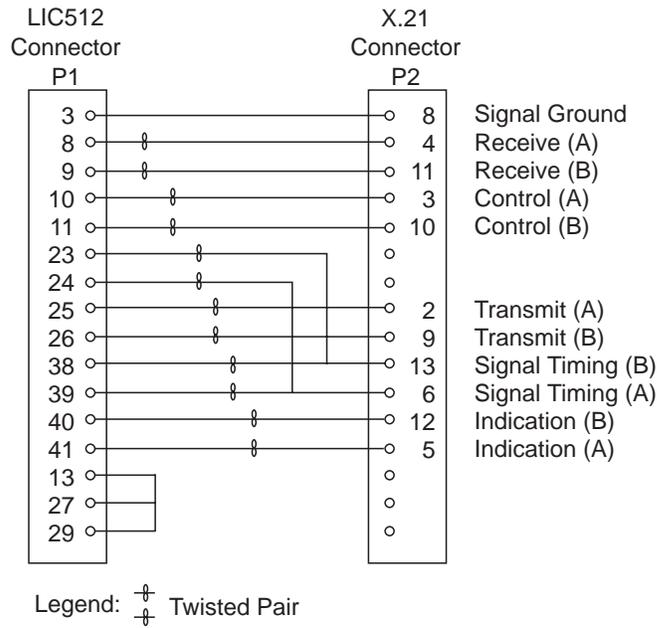
Figure   2-62. X.21 Cable: LIC512 to DTE Pin Assignment

X.21 Attachment Cable: LIC512 to DCE
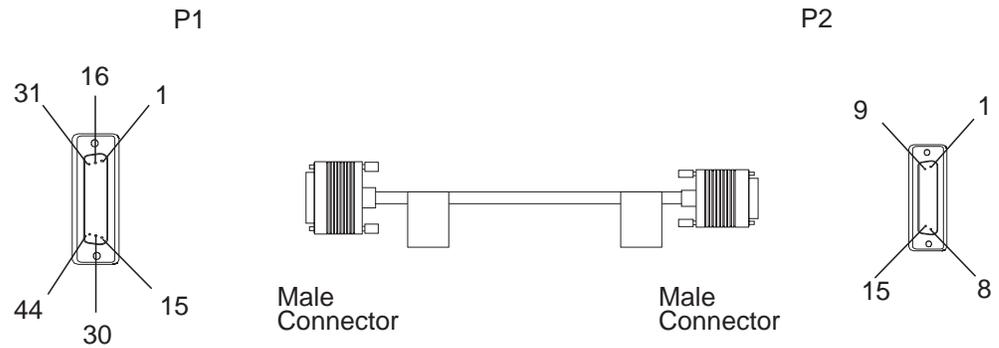
Figure 2-63. X.21 Cable: LIC512 to DCE

Interchange Circuits

Legend: Twisted Pair
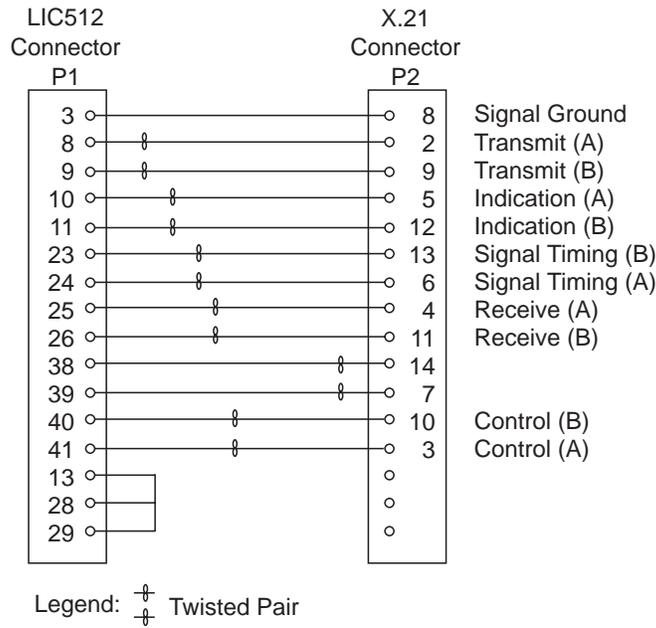
Figure 2-64. X.21 Cable: LIC512 to DCE Pin Assignment

X.21 Attachment Cable (TRANSFIX): LIC512 to DCE

P1   P2

Male   Male
Connector   Connector
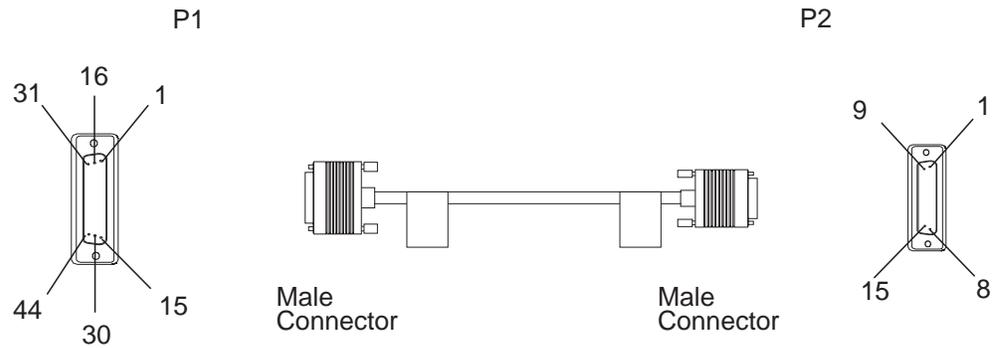
Figure   2-65. X.21 TRANSFIX Cable: LIC512 to DCE

Interchange Circuits

LIC512 Connector P1		X.21 Connector P2	
3		8	Signal Ground
8		2	Transmit (A)
9		9	Transmit (B)
23		13	Signal Timing (B)
24		6	Signal Timing (A)
25		4	Receive (A)
26		11	Receive (B)
13			
29			
42			
10			
41			
11			
40			

Legend: Twisted Pair
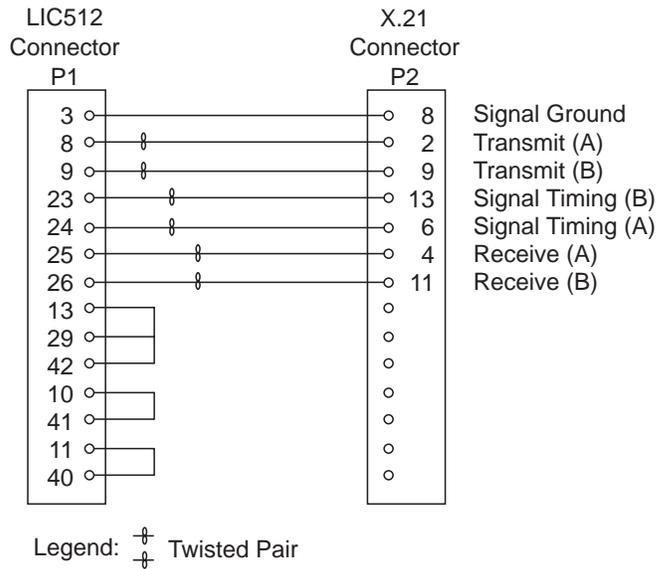
Figure   2-66. X.21 TRANSFIX Cable: LIC512 to DCE Pin Assignment

LIC512 Cable List

Table 2-14. LIC512 V.35 Standard Cables					
				Part Number	
Cable Type	**To**	**Length m (ft)**	**Feature Code**	**World-Wide Except U.S. and Canada**	**World-Wide**
V.35 (see note 1)	DTE	15 (50)	5210	80G0854	80G3954
V.35 (see note 2)	DCE	15 (50)	5214	57G8006	80G3951
Note:					
1. For a **French DTE**, the DTE adapter (Part Number 58G5998 / FFB/M 80G1164) must be connected between the cable and the DTE.					
2. For a **French DCE**, the DCE adapter (Part Number 58G5965 / FFB/M 80G1169) must be connected between the cable and the DCE.					

Table 2-15. LIC512 X.21 Standard Cables				
Cable Type	**To**	**Length m (ft)**	**Feature Code**	**Part Number**
X.21	DTE	10 (33)	5216	80G2202
X.21	DCE	10 (33)	5217	80G2213
X.21 TRANSFIX	DCE	2 (7)	5229	80G2219

2.6 LIC513

LIC513 Interface	Description
Number	1 (using two BNC cables)
Characteristics	T3
Speed	44.736 Mbps
Transfer Mode	Full-duplex
Feature Code	5513

Legend:
⊕   Input
⊙► Output
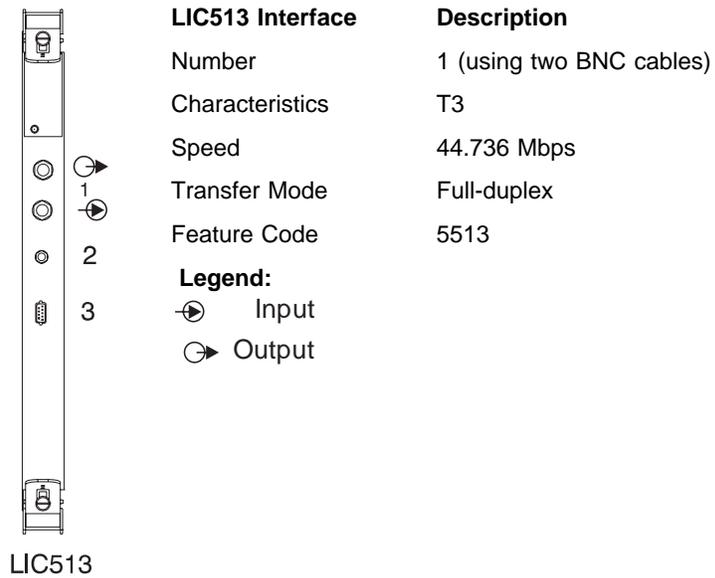
LIC513

LIC513 Wrap Plug

The Part Number of the wrap plug is 57G8093.
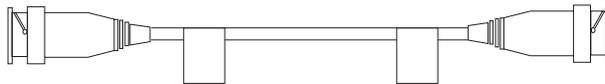
Figure   2-67. LIC513 Wrap Plug (75 ohms)

LIC513 Cable
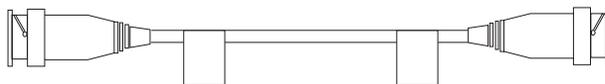
Figure   2-68. LIC513 Coaxial Cable (75 ohms)
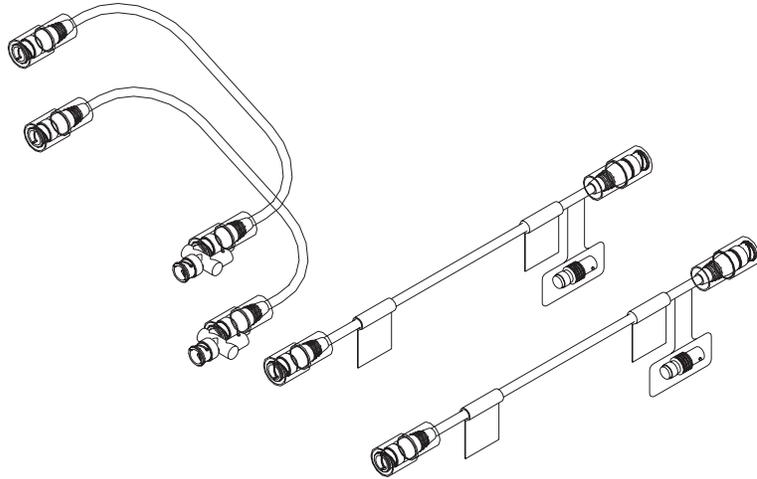
Figure   2-69. LIC513 Redundant Cable Set (75 ohms)

Note: If a cable not supplied by IBM is used, IBM does not guarantee electromagnetic compatibility (EMC) compliance for the 2220.

If the connector does not have an insulating shield, read the general electrical safety statement before connection in the *2220 Nways BroadBand Switch Models 300, 500 and 501, Safety Information*, GA33-0401.

LIC513 Cable List

Table   2-16. LIC513 Standard Cables

Cable Type	Length m (ft)	Feature Code	Part Number
BNC (75 ohms)	15 (50)	5250	80G0714

LIC513 Cable Kit

Table   2-17. LIC513 Cable Kit

	Feature code	Part Number
LIC 513 Cable Kit	5704	57G8095

This kit consists of two cables and a T-connector, for connection of two LIC513 in the redundant mode.

Figure   2-70. LIC513 Cable Kit (75 ohms)

LIC513 Customer Cables

Be very careful when selecting cables. Note that:

- Only 75–ohm coaxial cables must be used (93–ohm or 50—ohm coaxial cables are not acceptable).

- Shielding must include an aluminium foil shield, plus a braid shield (minimum 90 % coverage).

- BNC connectors must be connected to cables with 360–degree shield.

Note: If a cable not supplied by IBM is used, IBM does not guarantee electromagnetic compatibility (EMC) compliance for the 2220.

2.7 LIC514
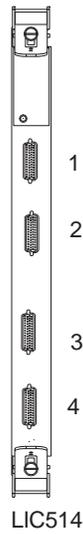
LIC514 Interface	Description
Number	4
Characteristics	T1 or J1
Speed	Up to 1.536 Mbps
Feature Code	5514

LIC514

LIC514 Wrap Plug

The Part Number of the wrap plug is 57G8097.

From   To
11 ——————— 15
13 ——————— 17
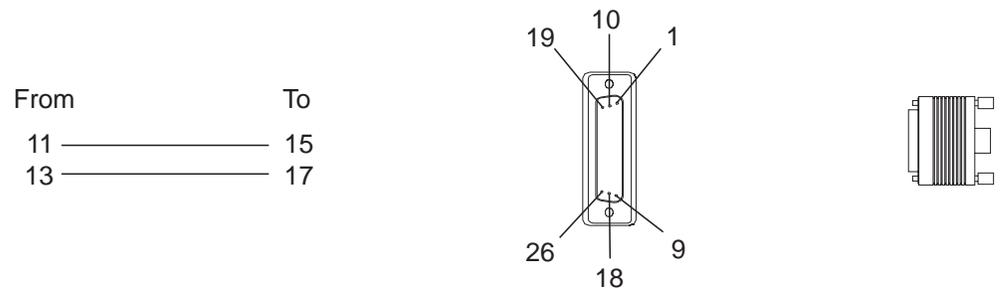
Figure   2-71. LIC514 Wrap Plug Pin Assignment

LIC514 RJ-45 and RJ-48 Cable

P1   P2
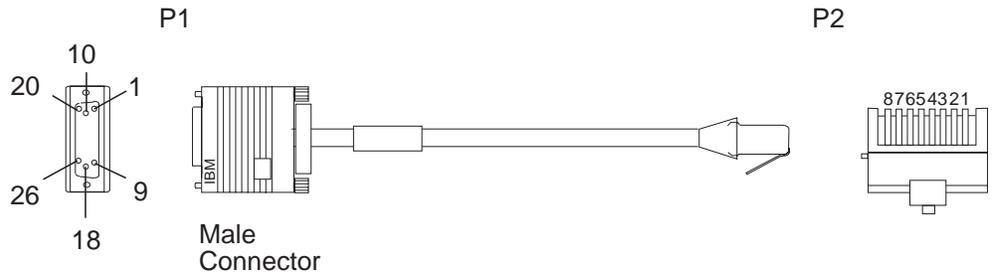
Figure   2-72. LIC514 RJ-48 T1 and J1 Cable

Interchange Circuit for RJ-48 T1 Cable
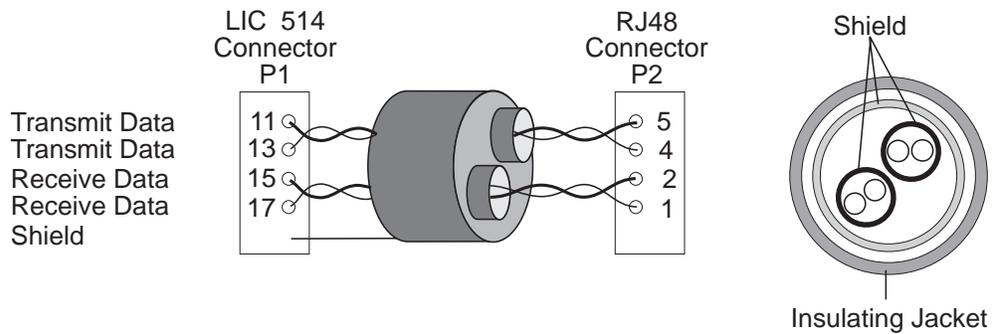
Figure   2-73. LIC514 RJ-48 T1 Cable Pin Assignment

Interchange Circuit for RJ-45 J1 Cable (Japan only)
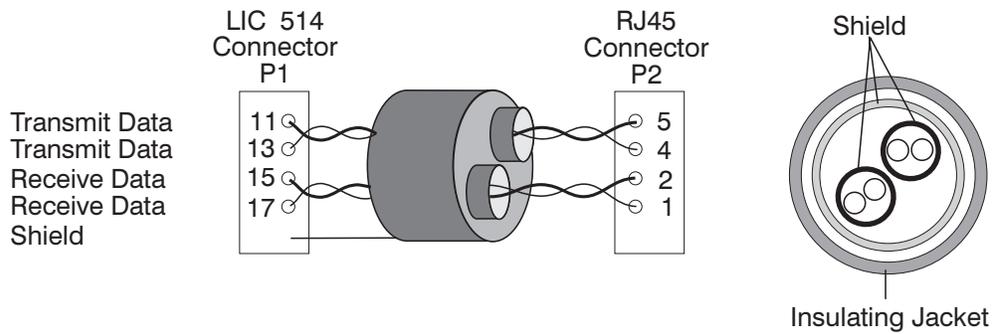
Figure   2-74. LIC514 RJ-45 J1 Cable Pin Assignment

LIC514 DB15 Cable

P1   P2

9   1   9   1

15   8   Male Connector   Female Connector   15   8
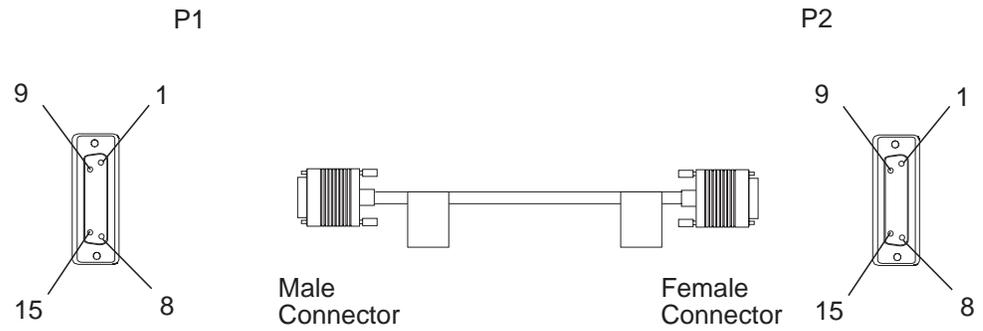
Figure   2-75. LIC514 DB15 Cable

Interchange Circuit

LIC 514 Connector P1   Connector P2   Shield

Transmit Data   11   1
Transmit Data   13   9
Receive Data   15   11
Receive Data   17   3
                   19   4

Shield/Signal Ground   2

Insulating Jacket
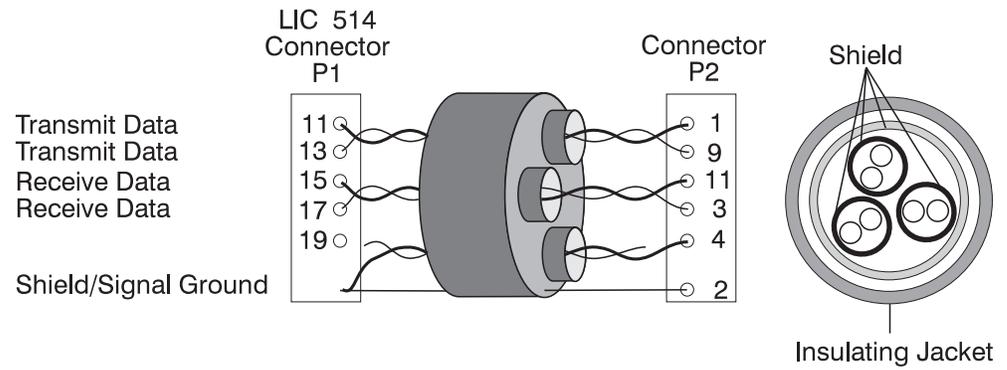
Figure   2-76. LIC514 DB15 Cable Pin Assignment

LIC514 RJ-48 Connector Kit

Table 2-18. LIC514 RJ-48 Connector Kit		
	Feature Code	**Part Number**
Connector Kit	5701	57G8075

Bulk Cable Specifications

- Two twisted pairs, AWG 24, 100 ohms (see Figure 2-73 on page 2-46 and Figure 2-74 on page 2-46).

- Shielding on each twisted pair plus overall shielding.

- 1500 V overvoltage minimum between signal wires and shielding.

- Shielding connected to P1 connector shell but unconnected at P2.

- Maximum length 30 meters (100 feet).

Connector P2

The RJ-48 connector must conform to ISO 8877, ANSI 408, and EIA/TIA 547 standards.

Note: If a cable not supplied by IBM is used, IBM does not guarantee electromagnetic compatibility (EMC) compliance for the 2220.

If the connector does not have an insulating shield, read the general electrical safety statement before connection, refer to the *2220 Nways BroadBand Switch Models 300, 500 and 501, Safety Information*, GA33-0401 manual.

LIC514 DB15 Connector Kit

Table 2-19. LIC514 DB15 Connector Kit		
	Feature Code	**Part Number**
Connector Kit	5701	57G8075

Bulk Cable Specifications

- Three twisted pairs AWG 24, 100 ohms (see Figure 2-76 on page 2-47).

- Shielding on each twisted pair plus overall shielding.

- Maximum length 30 meters (100 feet).

Connector P2

The SubD 15-pin connector must conform to ISO 4903,

6703 and ETSI 300-11 standards.

Note: If a cable not supplied by IBM is used, IBM does not guarantee electromagnetic compatibility (EMC) compliance for the 2220.

If the connector does not have an insulating shield, read the general electrical safety statement before connection, refer to the *2220 Nways BroadBand Switch Models 300, 500 and 501, Safety Information*, GA33-0401 manual.

LIC514 Cable List

Table 2-20. LIC514 Standard Cables

Cable Type	Length m (ft)	Feature Code	Part Number
RJ-48 T1	15 (50)	5241	57G8020
RJ-45 J1 (Note 1)	15 (50)	5245	57G8042
DB15	15 (50)	5243	57G8023

Notes:

1. Japan only, shipment triggered by the Japan country code.

2. RJ48 and DB15 cables can function in DS1 or DSX1 mode.
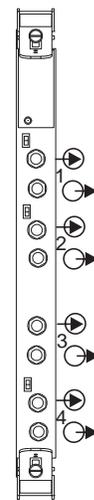
2.8 LIC515

LIC515 Interface	Description
Number	4 (using two BNC cables for each interface)
Characteristics	E1 (75 ohms)
Speed	Up to 2.048 Mbps
Feature Code	5515

Legend:
⊕ Input
○▶ Output

LIC515

LIC515 Wrap Plug

ThePart Number of the wrap plug is 57G8093.
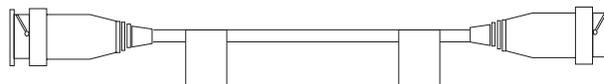
Figure   2-77. LIC515 Wrap Plug (75 ohms)

LIC515 Cable
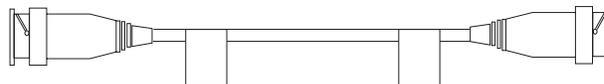
Figure   2-78. LIC515 Coaxial Cable (75 ohms)

Note: If a cable not supplied by IBM is used, IBM does not guarantee
electromagnetic compatibility (EMC) compliance for the 2220.

LIC515 Cable List

Table 2-21. LIC515 Cables			
Cable Type	**Length m (ft)**	**Feature Code**	**Part Number**
BNC (75 ohms)	15 (50)	5250	80G0714

Refer to A.6, "Telecommunication Connectivity Notices" on page A-3.

The maximum attenuation of the associated cables must not exceed 6dB when
mesured at 1024 Khz for the 2Mb adapter. The frequency/attenuation
characteristics follow the root F law.

IBM LIC515 cables meet these characteristics.

LIC515 Customer Cables

Be very careful when selecting cables. Note that:

- Only 75–ohm coaxial cables are to be used (93–ohm or 50–ohm coaxial cables are not acceptable).

- Shielding must include an aluminium foil shield, plus a braid shield (minimum 90% coverage).

- BNC connectors must be connected to cable with a 360–degree shield .

Switches and Jumpers on Module Card

Cable shields can be connected to the ground using the switches and jumpers located on the module card.

Receive
The four switches located in the front of the LIC515 are used to connect the **receive** cables shield to the ground. When the switch is used in the up position, there is connection to the ground. In the down position, there is no connection to the ground.

Transmit
Module card are provided with the **transmit** cables shield connected to the ground. There are four jumpers on the module card that are used to connect the **transmit** cable shield to ground.

Modules are provided with jumpers installed with connections to the ground (see Figure 2-79).

In countries where the transmit shield connection to ground is required, use the following procedure to change the jumper positions:

1. Remove the five screws **1** . Then remove the cover of the module.
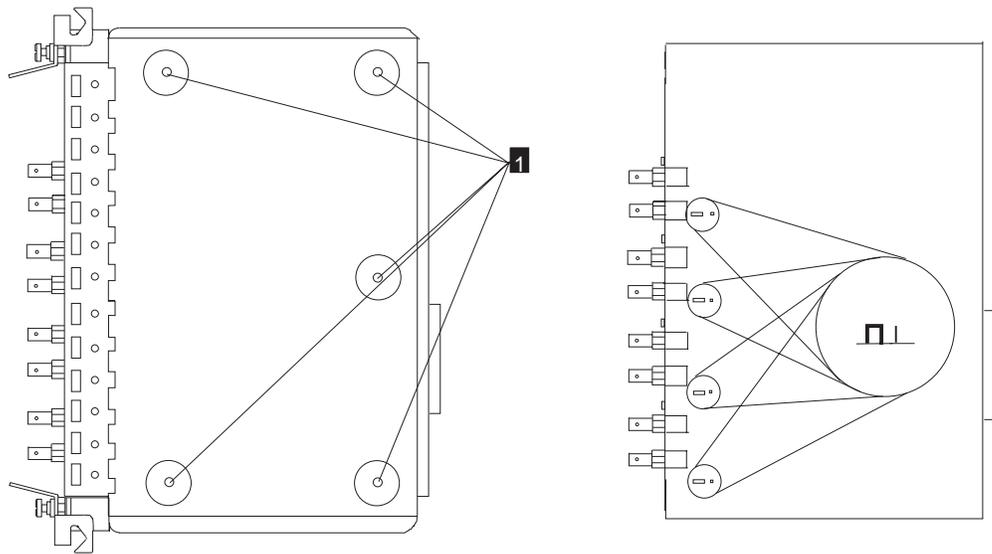
Figure   2-79. LIC515 Module Opening and Jumper Positions

2. Change the jumper position from position A to position B.

(A)

(B)

No Connection
to ground

Connection
to ground
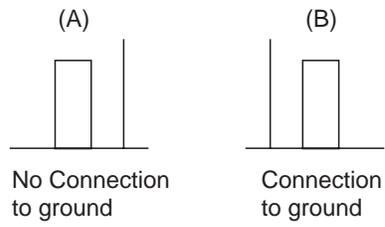
3. Re-install the cover of the module using the previously removed screws **1** .

2.9 LIC516
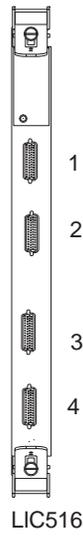
LIC516 Interface	Description
Number	4
Characteristics	E1 (120 ohms)
Speed	2.048 Mbps
Feature Code	5516

LIC516

LIC516 Wrap Plug

The Part Number of the wrap plug is 57G8097.

From   To
11 ——————— 15
13 ——————— 17
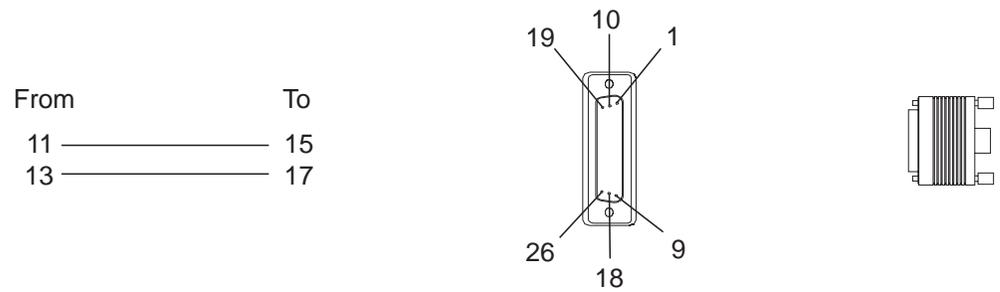
Figure   2-80. LIC516 Wrap Plug Pin Assignment

LIC516 E1 Cable

P1   P2

Male Connector
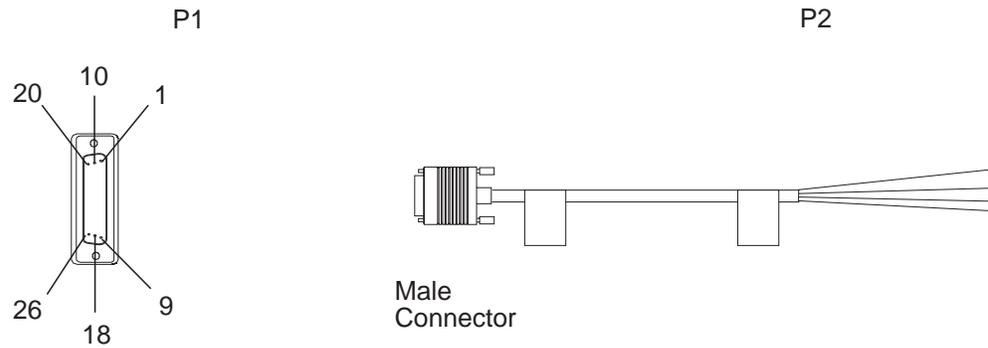
Figure 2-81. LIC516 E1 Cable

LIC 516
Connector
P1

Tip Transmit   11
Ring Transmit   13
Tip Receive   15
Ring Receive   17
Shield

Shield

Insulating Jacket
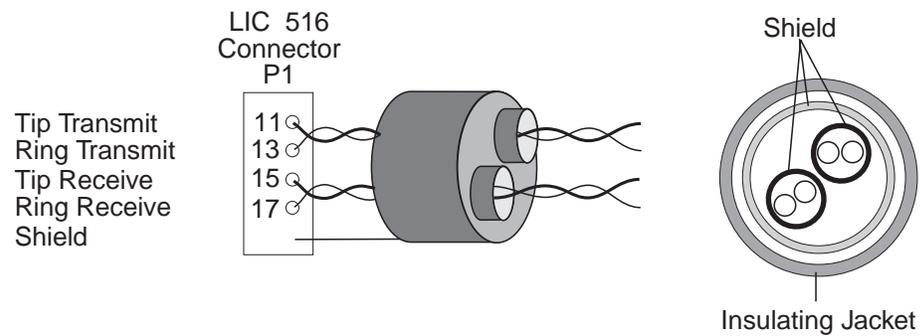
Figure 2-82. LIC516 E1 Cable Pin Assignment

LIC516 E1 Cable List

Table 2-22. LIC516 Cables				
			Part Number	
Cable Type	**Length m (ft)**	**Feature Code**	**World—Wide Except Germany**	**World—Wide**
E1	15 (50)	5260	57G8029	80G3983

Homologation and Notes

LIC516 complies with the following EU directives:

EMC   - 89/336/EEC

LVD   - 73/23/EEC

Telecommunications - 91/263/EEC

If the telephone service requires an ISO/IEC 10173 plug to connect the LIC516 adapter card, the IBM Service Engineer install it on the flyleads of the cable supplied.

2.10 LIC517
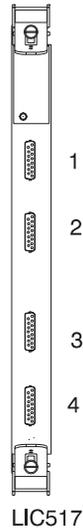
LIC517 Interface	Description
Number	4
Characteristics	TTC (JJ20-xx, Japanese PBX only)
Speed	2.048 Mbps
Transfer mode	Full-duplex
Feature Code	5517

LIC517

LIC517 Wrap Plug

LIC517 Wrap Plug
The Part Number of the wrap plug is 80G2221.

From   To

5 ——————— 7
13 ——————— 15

9   1

15   8
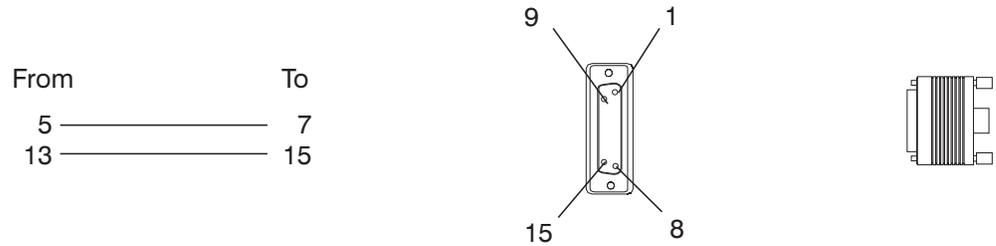
Figure   2-83. LIC517 Wrap Plug Pin Assignment

Attachment Cable: LIC517 to DCE

P1   P2

9   1   9   1

15   8   Male   Male   15   8
                      Connector   Connector
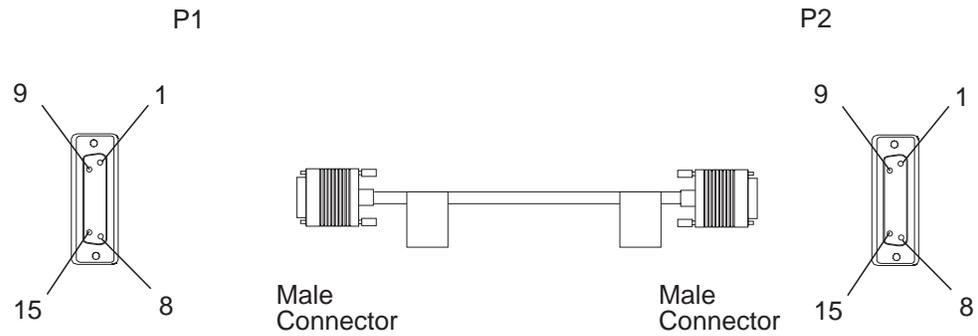
Figure   2-84.   Cable: LIC517 to DCE

Interchange Circuits

LIC 517
Connector   Connector   Shield
P1   P2

Receive A   7   2
Receive B   15   9
Transmit A   5   4
Transmit B   13   11
Signal Ground   8   1

Shield/Signal Ground

Insulating Jacket
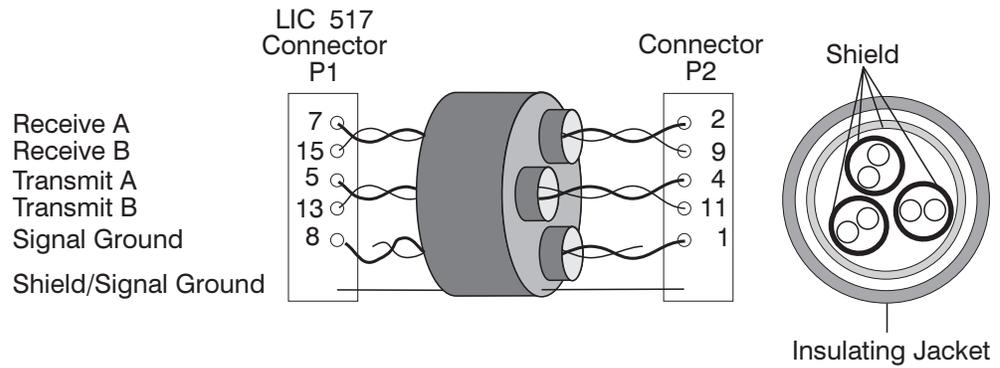
Figure   2-85.   Cable: LIC517 to DCE Pin Assignment

LIC517 Cable List

Table 2-23. LIC517 Standard Cables			
Cable Type	**Length m (ft)**	**Feature Code**	**Part Number**
JJ-20	15 (50)	5735	80G0823

2.11 LIC522
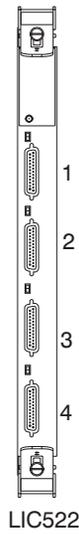
LIC522 Interface	Description
Number	4
Characteristics	V.35, V.36, or X.21 (any mix allowed)
Speed	Up to 2.048 Mbps
Transfer mode	Duplex
Feature Code	5522

LIC522

LIC522 Wrap Plug

LIC522 Wrap Plug V.35/V.36/X.21
The Part Number of the wrap plug is 57G8096.

From	To
1	17
2	18
	32
4	21
5	22
6	36
7	37
8	25
9	26
10	41
11	40
16	33
19	35
20	34
23	39
24	38
29	43
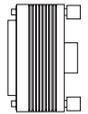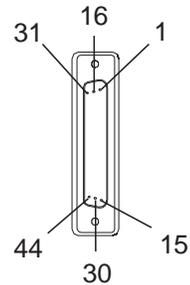
Figure   2-86. LIC522 Wrap Plug Pin Assignment

V.35 Attachment Cable: LIC522 to DTE
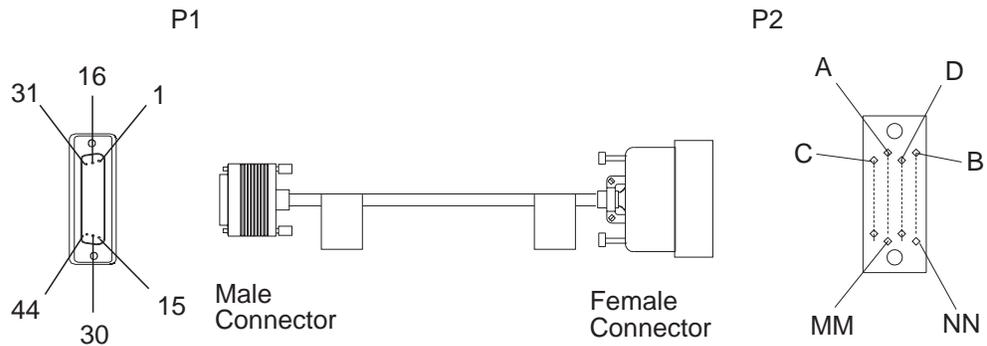
Figure 2-87. V.35 Cable: LIC522 to DTE

Interchange Circuits

1 — E	Data Set Ready
17	
3 — B	Signal Ground
33 — F	Data Carrier Detect
4 — R	Receive Data (A)
5 — T	Receive Data (B)
6 — AA	Transmit Timing (B)
7 — Y	Transmit Timing (A)
18 — C	Request to Send
21 — P	Transmitted Data (A)
22 — S	Transmitted Data (B)
32 — D	Clear to Send
34 — X	Receive Timing (B)
35 — V	Receive Timing (A)
36	
37	
27	
29	

Legend: ⧧ Twisted Pair
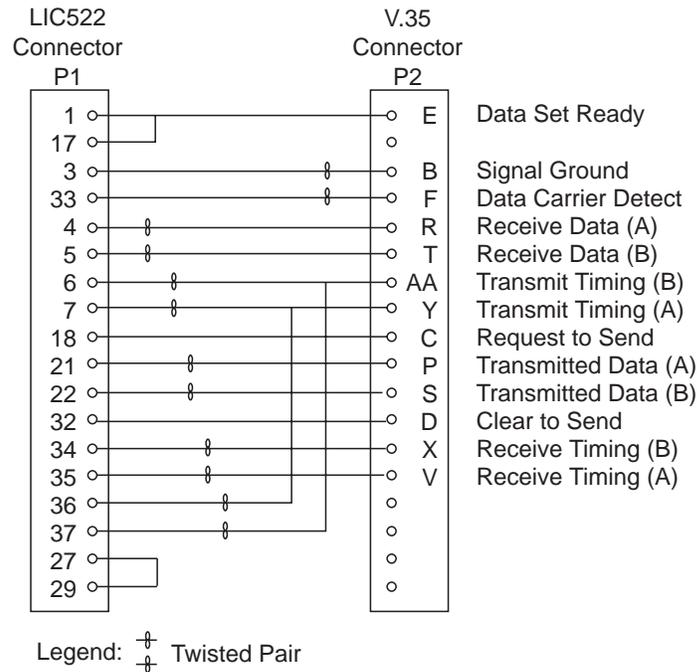
Figure 2-88. V.35 Cable: LIC522-to-DTE Pin Assignment for Cable Up to 30 meters (100 feet)

```
LIC522                      V.35
Connector                 Connector
   P1                         P2

    1 o------------------------o H     Data Terminal Ready
    3 o-------------⌇----------o B     Signal Ground
   33 o-------------⌇----------o F     Data Carrier Detect
    4 o------⌇-----------------o R     Receive Data (A)
    5 o------⌇-----------------o T     Receive Data (B)
    6 o----------⌇-------------o AA    Transmit Timing (B)
    7 o----------⌇-------------o Y     Transmit Timing (A)
   17 o------------------------o E     Data Set Ready
   18 o------------------------o C     Request to Send
   21 o----------⌇-------------o P     Transmitted Data (A)
   22 o----------⌇-------------o S     Transmitted Data (B)
   32 o------------------------o D     Clear to Send
   34 o----------⌇-------------o X     Receive Timing (B)
   35 o----------⌇-------------o V     Receive Timing (A)
   36 o--------------⌇---------o U     Terminal Timing (A)
   37 o--------------⌇---------o W     Terminal Timing (B)
   12 o----┐                   o
   27 o----┤                   o
   29 o----┘                   o
```

Legend: ⌇ Twisted Pair

Figure 2-89. V.35 Cable: LIC522-to-DTE Pin Assignment for Cables Longer than 30 meters (100 feet)

V.35 Attachment Cable: LIC522 to DCE
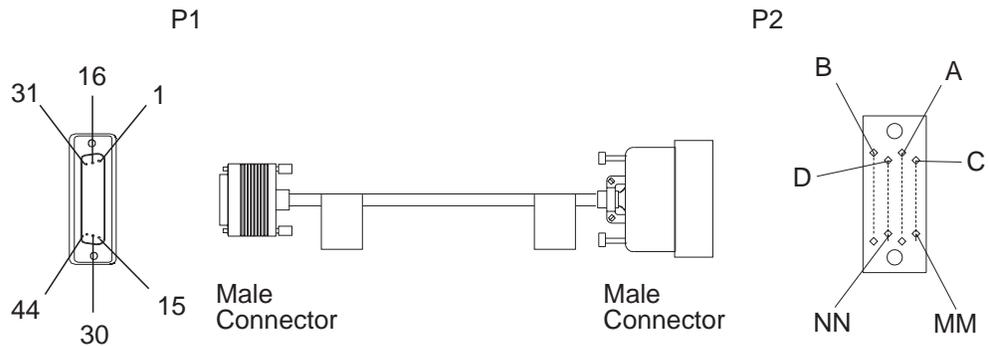
Figure   2-90. V.35 Cable: LIC522 to DCE

Interchange Circuits

LIC522 Connector P1		V.35 Connector P2	
1		E	Data Set Ready
2		F	Data Carrier Detect
3		B	Signal Ground
17		H	Data Terminal Ready
4		P	Transmitted Data (A)
5		S	Transmitted Data (B)
18		D	Clear to Send
19		Y	Transmit Timing (A)
20		AA	Transmit Timing (B)
21		R	Receive Data (A)
22		T	Receive Data (B)
34		W	Terminal Timing (B)
35		U	Terminal Timing (A)
36		V	Receive Timing (A)
37		X	Receive Timing (B)
29			
42			
32		C	Request to Send

Legend: ⌀ Twisted Pair
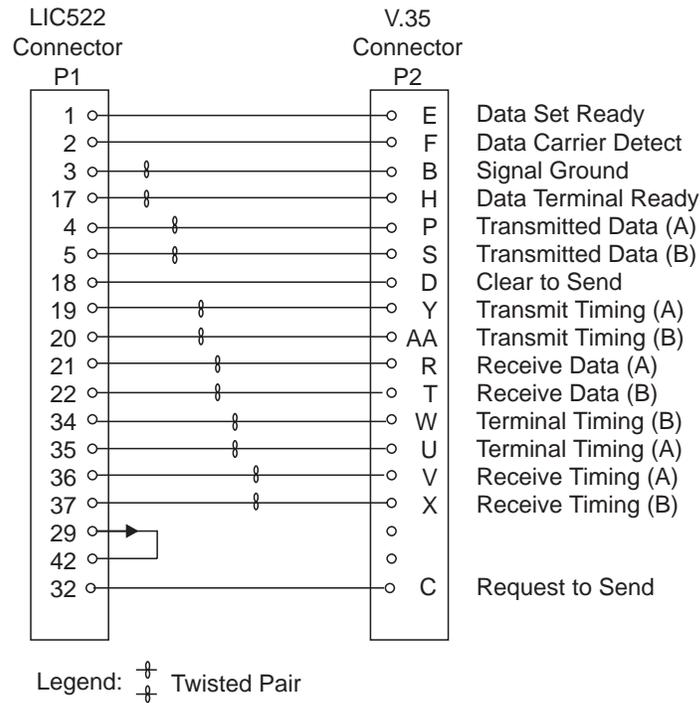
Figure   2-91. V.35 Cable: LIC522-to-DCE Pin Assignment

V.36 Attachment Cable: LIC522 to DTE
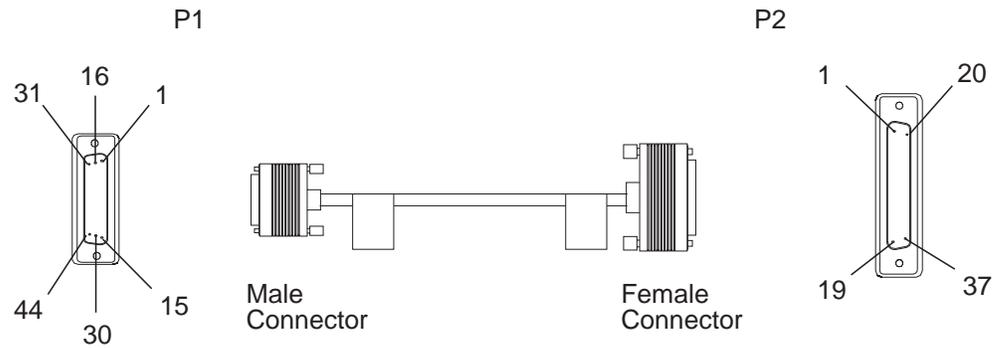
Figure   2-92. V.36 Cable: LIC522 to DTE

Interchange Circuits

Legend: Twisted Pair
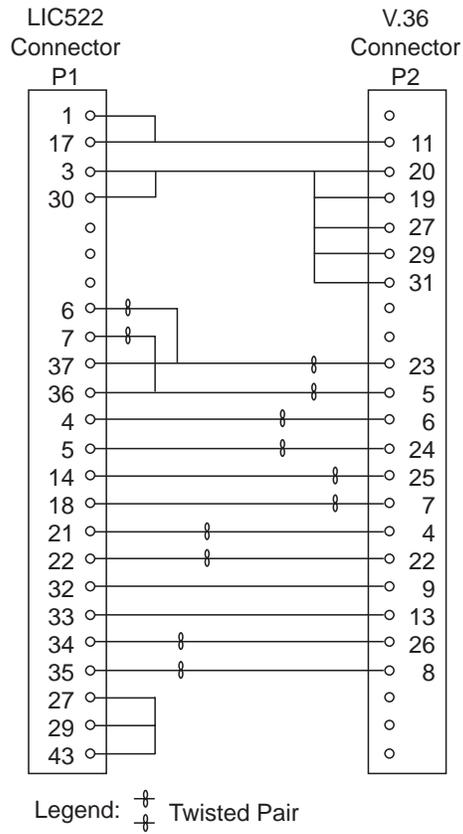
Figure   2-93. V.36 Cable: LIC522-to-DTE Pin Assignment

V.36 Attachment Cable: LIC522 to DCE

P1

31   16   1

44   15

30

Male
Connector

Male
Connector

P2

19   37

1   20
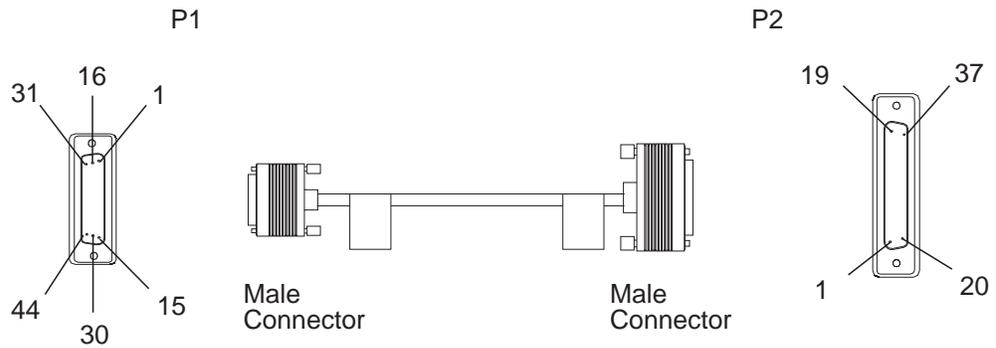
Figure   2-94. V.36 Cable: LIC522 to DCE

Interchange Circuits

LIC522
Connector
P1

V.36
Connector
P2

P1		P2	
1		11	DSR
30		29	DSR
2		13	Carrier Detect
15		31	Carrier Detect
3		37	Signal Ground
		19	
		25	
		30	
4		4	Transmitted Data (A)
5		22	Transmitted Data (B)
14		27	CTS
18		9	CTS
16		18	Test Indicator
17		12	DTR
19		5	TSET (DCE)
20		23	TSET (DCE)
21		6	Receive Data
22		24	Receive Data
32		7	RST
33		10	Local Loopback
34		35	TSET (DTE)
35		17	TSET (DTE)
36		8	RSET
37		26	RSET
28			
29			
43			

Legend: ⊗ Twisted Pair

TSET: Transmitter Signal Element Timing
RSET: Receiver Signal Element Timing

Figure   2-95. V.36 Cable: LIC522-to-DCE Pin Assignment

X.21 Attachment Cable: LIC522 to DTE

P1   P2

31   16   1   15   8

44   15   Male   Female   9   1
     30   Connector   Connector
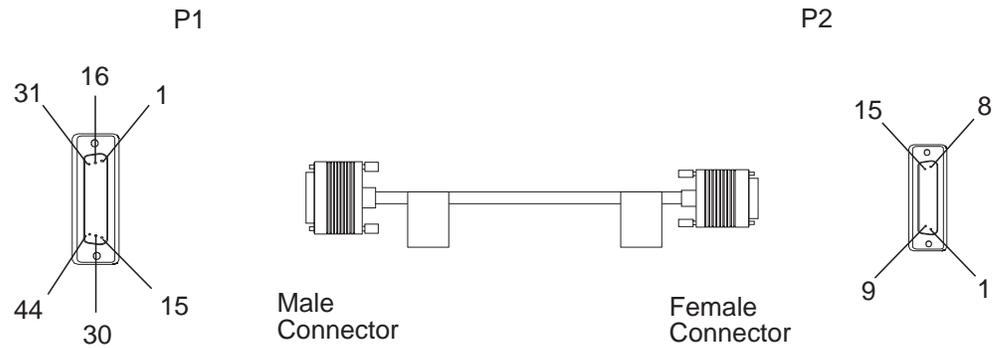
Figure   2-96. X.21 Cable: LIC522 to DTE

Interchange Circuits

LIC522   X.21
Connector   Connector
P1   P2

P1		P2	
3		8	Signal Ground
8		4	Receive (A)
9		11	Receive (B)
10		3	Control (A)
11		10	Control (B)
23			
24			
25		2	Transmit (A)
26		9	Transmit (B)
38		13	Signal Timing (B)
39		6	Signal Timing (A)
40		12	Indication (B)
41		5	Indication (A)
13			Signal Ground
27			
29			

Legend: ⊖ Twisted Pair
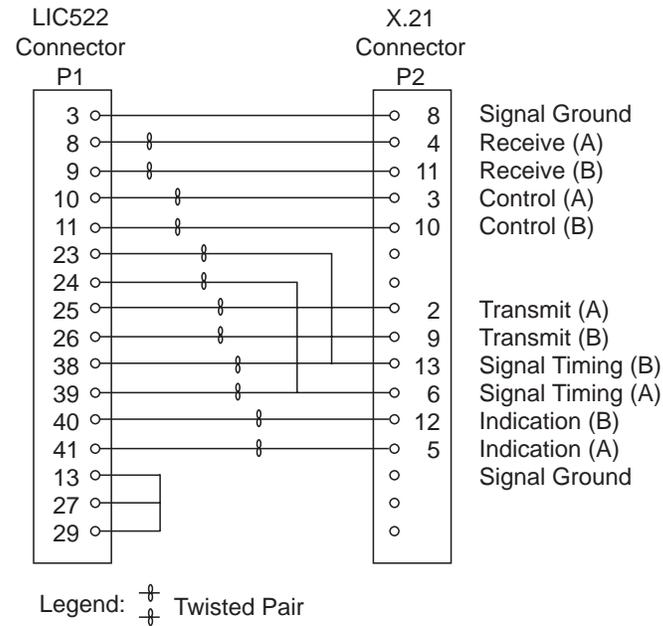
Figure   2-97. X.21 Cable: LIC522-to-DTE Pin Assignment

X.21 Attachment Cable: LIC522 to DCE

P1   P2
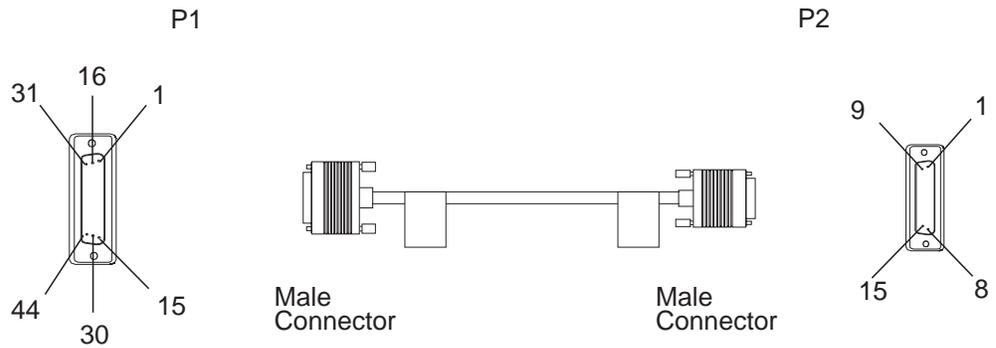
Figure   2-98. X.21 Cable: LIC522 to DCE

Interchange Circuits


```
LIC522                          X.21
Connector                       Connector
  P1                              P2

   3 o─────────────────────────o 8   Signal Ground
   8 o──────8──────────────────o 2   Transmit (A)
   9 o──────8──────────────────o 9   Transmit (B)
  10 o─────────8───────────────o 5   Indication (A)
  11 o─────────8───────────────o 12  Indication (B)
  23 o─────────────8───────────o 13  Signal Timing (B)
  24 o─────────────8───────────o 6   Signal Timing (A)
  25 o────────────────8────────o 4   Receive (A)
  26 o────────────────8────────o 11  Receive (B)
  38 o───────────────────────8──o 14
  39 o───────────────────────8──o 7
  40 o──────────────────8───────o 10  Control (B)
  41 o──────────────────8───────o 3   Control (A)
  13 o─────┐                      o
  28 o─────┤                      o
  29 o─────┘                      o
```

Legend: ╪ Twisted Pair
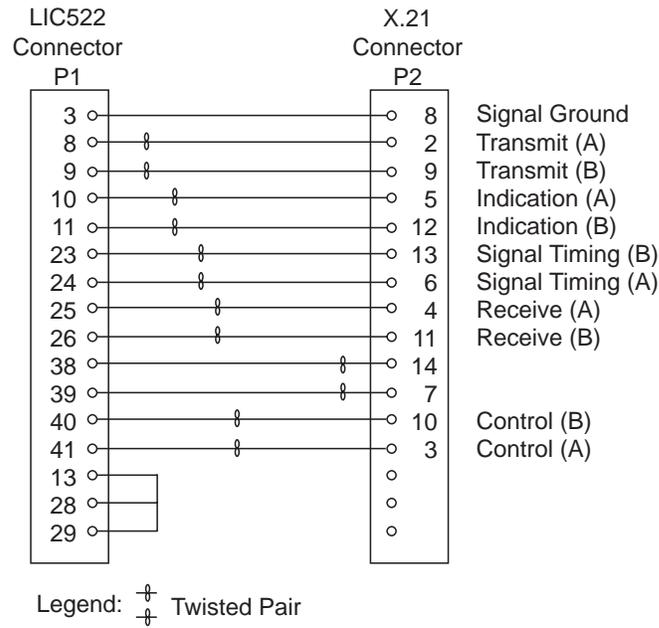
Figure   2-99. X.21 Cable: LIC522-to-DCE Pin Assignment

X.21 Attachment Cable (TRANSFIX): LIC522 to DCE

P1   P2

Male   Male
Connector   Connector
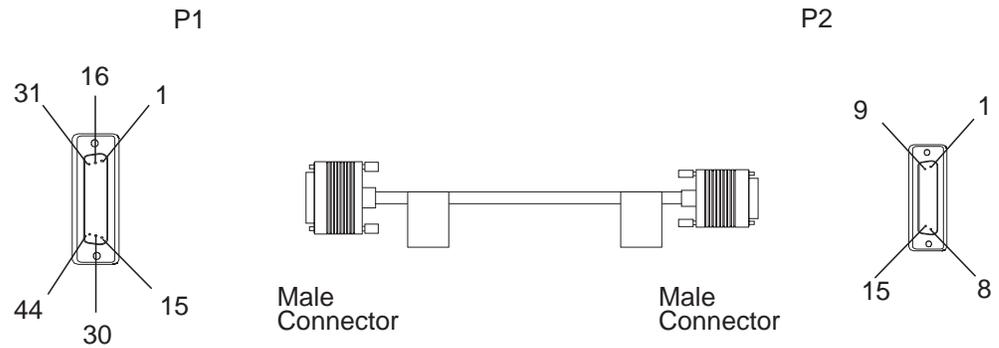
Figure   2-100. X.21 TRANSFIX Cable: LIC522 to DCE

Interchange Circuits

LIC522   X.21
Connector   Connector
P1   P2

P1	P2	
3	8	Signal Ground
8	2	Transmit (A)
9	9	Transmit (B)
23	13	Signal Timing (B)
24	6	Signal Timing (A)
25	4	Receive (A)
26	11	Receive (B)
13		Signal Ground
29		
42		
10		
41		
11		
40		

Legend: Twisted Pair
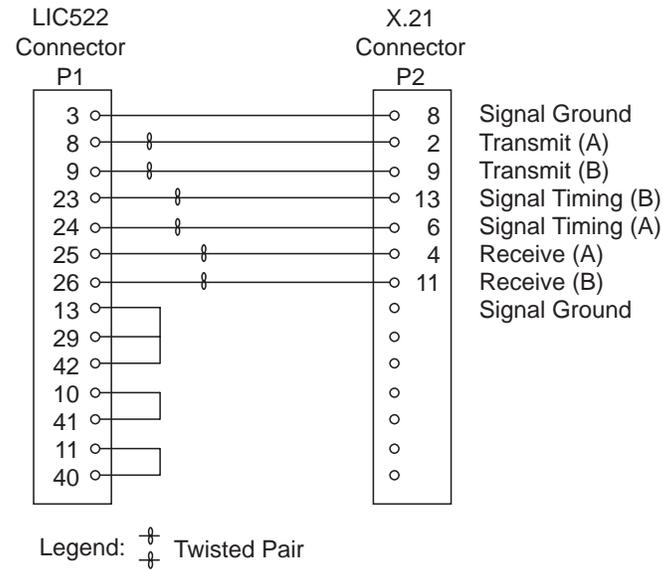
Figure   2-101. X.21 TRANSFIX Cable: LIC522-to-DCE Pin Assignment

LIC522 Cable List

Table 2-24. LIC522 V.35 Standard Cables				Part Number	
				World—Wide Except U.S. and Canada	World—Wide
Cable Type	To	Length m (ft)	Feature Code		
V.35 (see note 1)	DTE	15 (50)	5210	80G0854	80G3954
V.35 (see note 2)	DCE	15 (50)	5214	57G8006	80G3951

Note:

    1. For a **French DTE**, the DTE adapter (Part Number 58G5998 / FFB/M 80G1164) must be connected between the cable and the DTE.

    2. For a **French DCE**, the DCE adapter (Part Number 58G5965 / FFB/M 80G1169) must be connected between the cable and the DCE.

Table 2-25. LIC522 V.36 and X.21 Standard Cables				
Cable Type	To	Length m (ft)	Feature Code	Part Number
V.36	DTE	15 (50)	5271	80G0813
V.36	DCE	15 (50)	5276	80G0819
X.21	DTE	10 (33)	5216	80G2202
X.21	DCE	10 (33)	5217	80G2213
X.21 TRANSFIX	DCE	2(7)	5229	80G2219

Switches on LIC522 Module Card

The LIC522 is a low speed LIC providing ITU interfaces such as V.35, V.36, or X.21.By correctly selecting cables and appropriate soft setting, the LIC522 module card can be used as a DTE or a DCE.

- When it is used as DCE the switch located on the front module is disabled.

- When it is used as DTE the switch located on the front module is enabled and can solve certain sampling problems that might occur on DCE side when attached to certain modems.

LIC522

Switches

ON: The Switch is Active

OFF: The Switch is Not Active
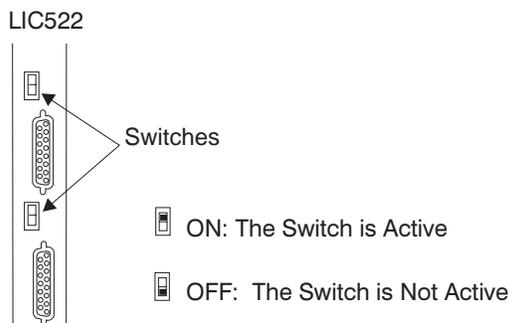
Figure 2-102. LIC522 Switches on Front Module

- When the switch is set OFF (down position), it is not active. This is the default position.

- When the switch is set ON (up position) it is active. It provokes a shift of the transmit data send by the LIC522 to the DCE.

Note: This switch must be set ON only when there is sampling problem on data reception on the DCE.

2.12 LIC523

LIC523 Interface	Description
Number	1 (using two BNC cables)
Characteristics	E2, E3, or J2 (75 ohms)
Speed	E3 at 34.368 Mbps, E2 at 8.448 Mbps, J2 at 6.312 Mbps
Transfer mode	Full-duplex
Feature Code	5523

Legend:

⊖► Input

⊙► Output
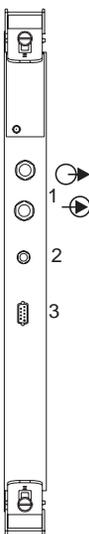
LIC523

LIC523 Wrap Plug

ThePart Number of the wrap plug is 57G8093.
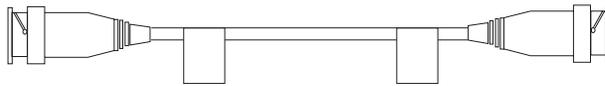
Figure   2-103. LIC523 Wrap Plug (75 ohms)

LIC523 Cable

Figure   2-104. LIC523 Coaxial Cable (75 ohms)

Note: If a cable not supplied by IBM is used, IBM does not guarantee
electromagnetic compatibility (EMC) compliance for the 2220 machine.

If the connector does not have an insulating shield, read the general electrical
safety statement before connection, refer to the *2220 Nways BroadBand Switch
Models 300, 500 and 501, Safety Information*, GA33-0401 manual.

LIC523 Cable List

Table 2-26. LIC523 Standard Cables			
Cable Type	**Length m (ft)**	**Feature Code**	**Part Number**
BNC (75 ohms)	15 (50)	5250	80G0714

.

The maximum attenuation of the associated cables must not exceed:

* 6 dB when mesured at 4424 Khz for the 8 Mb adapter

* 12 dB when mesured at 1718 Khz for the 34 Mb adapter.

The frequency/attenuation characteristics follows the root F law.

The IBM cables available meet these characteristics.

Transmit
The **transmit** cable shield is connected to the signal ground of the adapter card.

Should thesignal ground require disconnecting from the outer shield of the transmit
cable, a separate cable with the shield disconnected must be provided by the
customer.

Receive
The **receive** cable shield has no connection to the signal ground of the adapter
card.

The receive cable shield of the LIC523 may be connected to frame ground via a
jumper on the module card (see "Jumper on Module Card" on page 2-70).

LIC523 Customer Cables

Be very careful when selecting cables. Note that:

* Only 75–ohm coaxial cables must be used (93–ohm or 50–ohm coaxial cables
are not acceptable).

* Shielding must include an aluminium foil shield, plus a braid shield (minimum
90% coverage).

- BNC connectors must be connected to cable with 360–degree shield (unless special requirement see "Transmit").

Jumper on Module Card

On the module card, one jumper is used to connect the **receive** shield to the ground .

The Modules are provided with no jumpers installed (see Figure 2-105).

In countries where a **receive** cable-shield connection to the ground is required, use the following procedure to install a jumper:

1. Remove the five screws **1** . Then remove the cover of the module.

2. Install a jumper in position JP1 (note that the JP20 position is not used).

3. Re-install the cover of the module using the previously removed screws **1** .
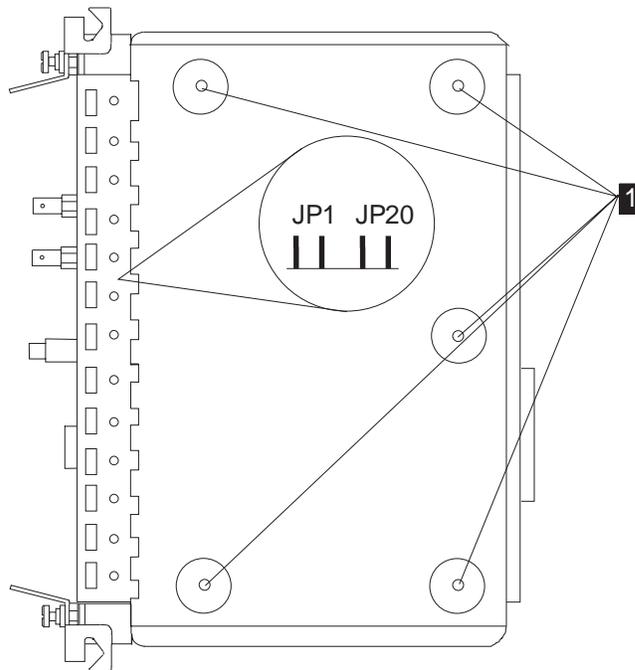
Figure   2-105. LIC523 Module Opening and Jumper Positions

Note: When jumper JP1 is installed, the receive shield is connected to the ground.
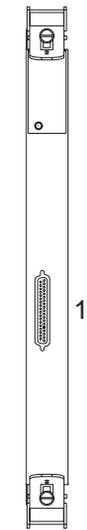
2.13 LIC530

LIC530 Interface	Description
Number	1
Characteristics	HSSI
Speed	Up to 51.84 Mbps
Transfer mode	Full-duplex
Feature Code	5530

LIC530

LIC530 Wrap Plug

The Part Number of the wrap plug is 57G8098.

From	To
1	8
22	29
2	6
23	27
3	10
24	31
9	17
30	38
48	51
53	58
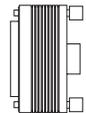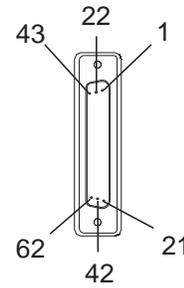
Figure   2-106. LIC530 Wrap Plug Pin Assignment

HSSI Cable Attachment: LIC530 to DTE
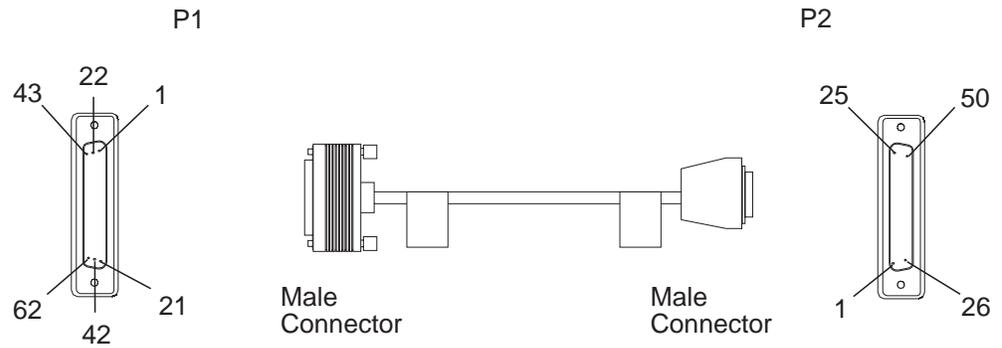
Figure 2-107. HSSI Cable: LIC530 to DTE

Interchange Circuits

P1		P2
1		9
22		34
2		8
23		33
3		4
24		29
4		14
25		39
6		3
27		28
7		15
28		40
8		2
29		27
10		11
31		36
12		16
33		41
13		20
34		45
14		21
35		46
15		22
36		47
16		23
37		48
17		12
38		37
18		24
39		49
19		6
40		31
44		1
46		26
48		13
50		38
52		19
54		44
56		25
51		
58		

Legend: ⚮ Twisted Pair
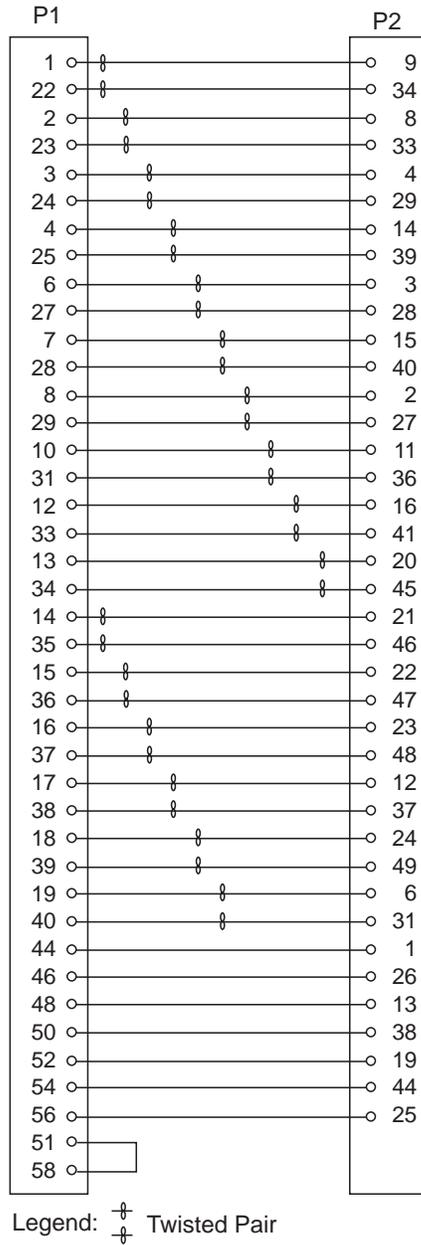
Figure   2-108. HSSI Cable: LIC530-to-DTE Pin Assignment

HSSI Cable Attachment: LIC530 to DCE

P1   P2

43   22   1   25   50

62   21   1   26
42

Male   Male
Connector   Connector
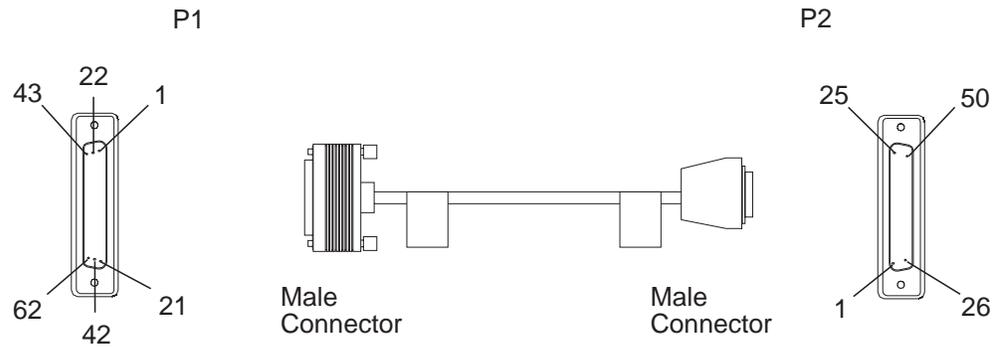
Figure   2-109. HSSI Cable: LIC530 to DCE

Interchange Circuits
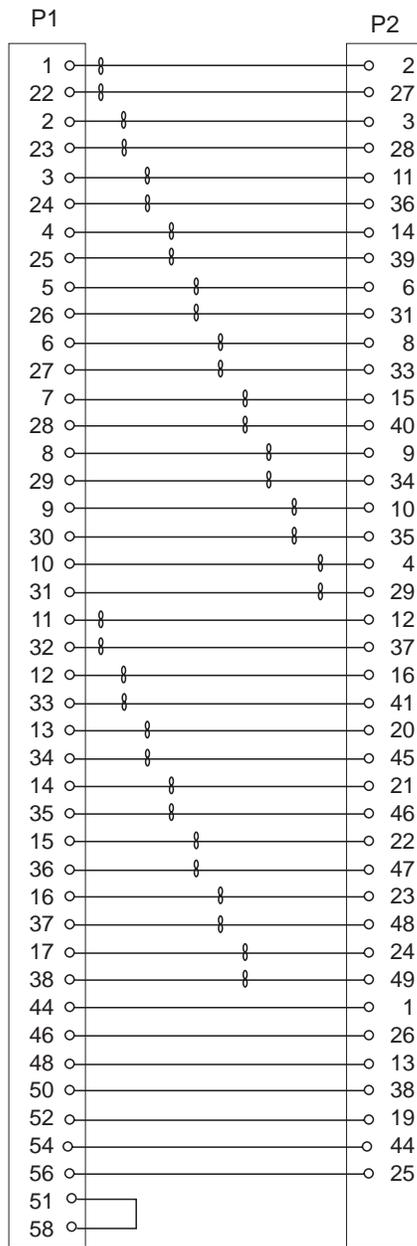
Legend: ⦂ Twisted Pair

Figure   2-110. HSSI Cable: LIC530-to-DCE Pin Assignment

HSSI Cable Attachment: LIC530 to LIC530 DCE/DTE
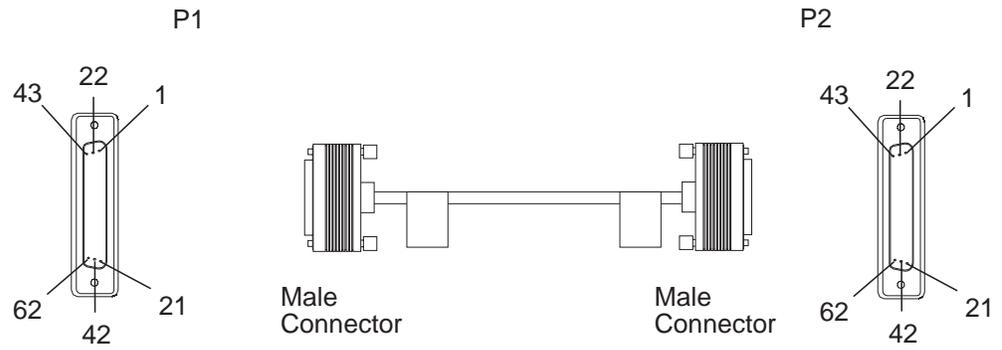
Figure 2-111. HSSI Cable: LIC530 to LIC530 DCE/DTE

Interchange Circuits
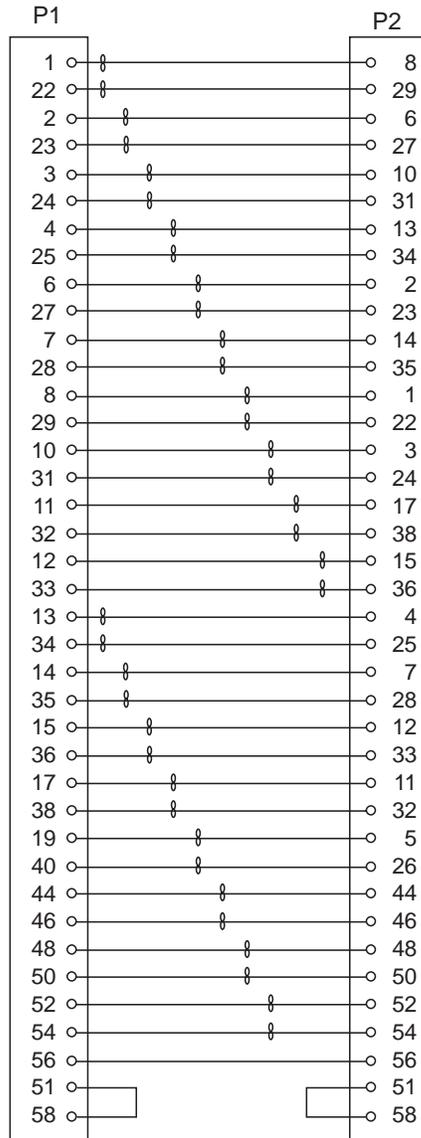
Figure 2-112. HSSI Cable: LIC530-to-LIC530 DCE/DTE Pin Assignement

LIC530 Cable List

Table 2-27. LIC530 Standard Cables				
Cable Type	**To**	**Length m (ft)**	**Feature Code**	**Part Number**
HSSI	DTE	15 (50)	5281	57G8040
HSSI	DCE	15 (50)	5283	57G8044
HSSI	DTE/DCE	15 (50)	5706	80G0596

2.14 LIC544
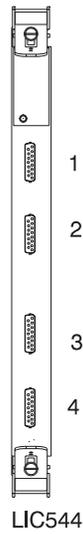
LIC544 Interface	Description
Number	8
Characteristics	T1 / J1
Speed	Up to 1.544 Mbps
Feature Code	5544

LIC544

LIC544 Wrap Plug

LIC544 Wrap Plug
The Part Number of the wrap plug is 57G8097.

From		To
11	——————	15
13	——————	17
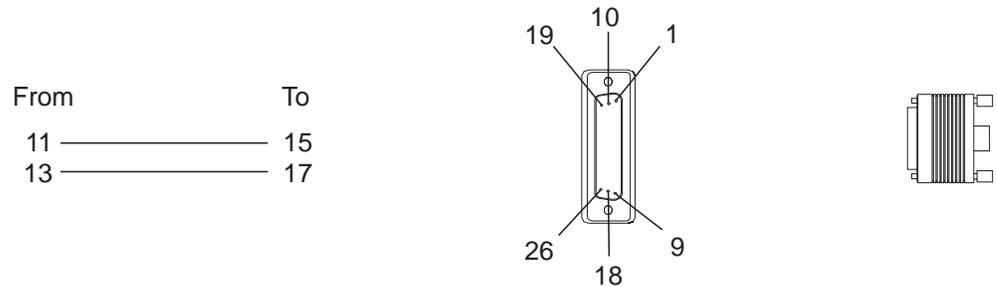
Figure   2-113. LIC544 Wrap Plug Pin Assignment

Note:

This wrap plug must be installed on the cable on port A or B (Part Number 80G2225).

Cable Provided with LIC544
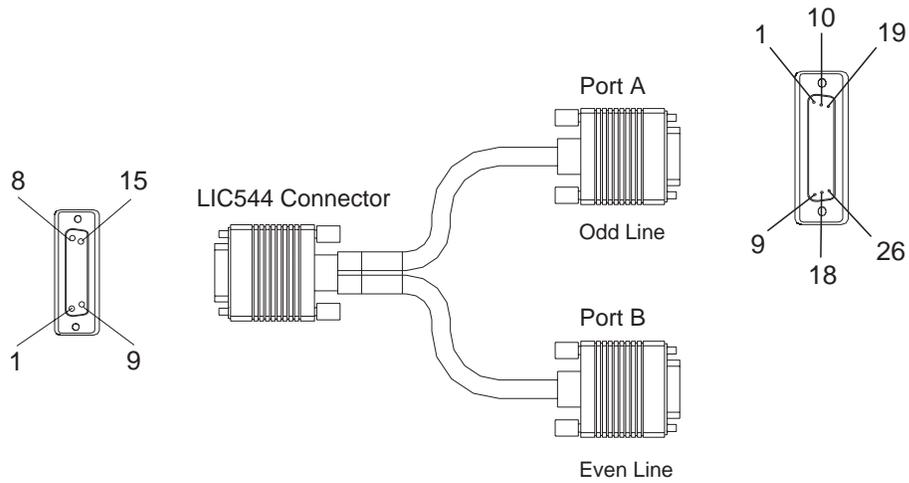
Figure   2-114. LIC544 Y Cable (PN 80G2225) for T1/J1 Connection (4 Cables)

Interchange Circuits
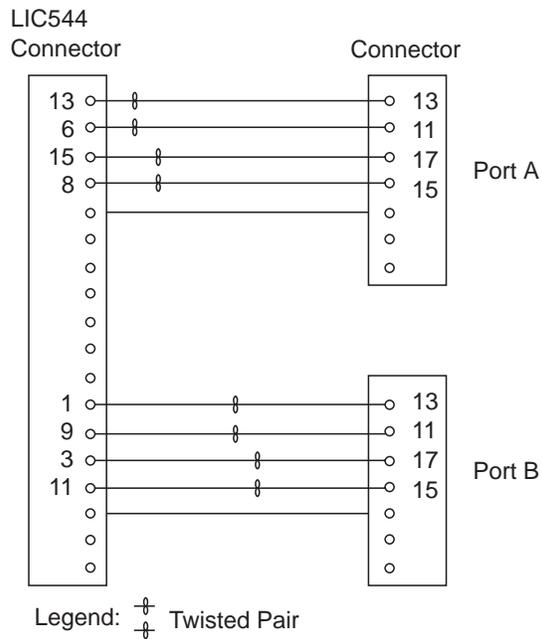
Figure   2-115. LIC544 Cable Pin Assignment

LIC544 External Cable List

Table 2-28. LIC544 Standard Cables			
Cable Type	**Length m (ft)**	**Feature Code**	**Part Number**
RJ-48 T1	15 (50)	5241	57G8020
RJ-45 J1 (Note 1)	15 (50)	5245	57G8042
DB15	15 (50)	5243	57G8023
Note: For Japan only, shipment is triggered by the Japan country code.			

2.15 LIC545
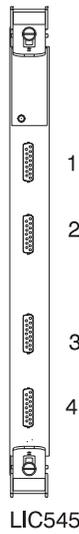
LIC545 Interface	Description
Number	8
Characteristics	E1 75 ohms
Speed	Up to 2.048 Mbps
Feature Code	5545

1
2
3
4

LIC545

LIC545 Wrap Plug

The Part Number of the wrap plug is 57G8093.
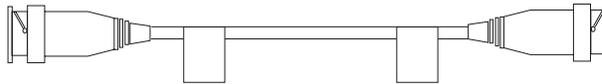
Figure   2-116. LIC545 Wrap Plug (75 ohms)

Cable provided by IBM with the LIC545
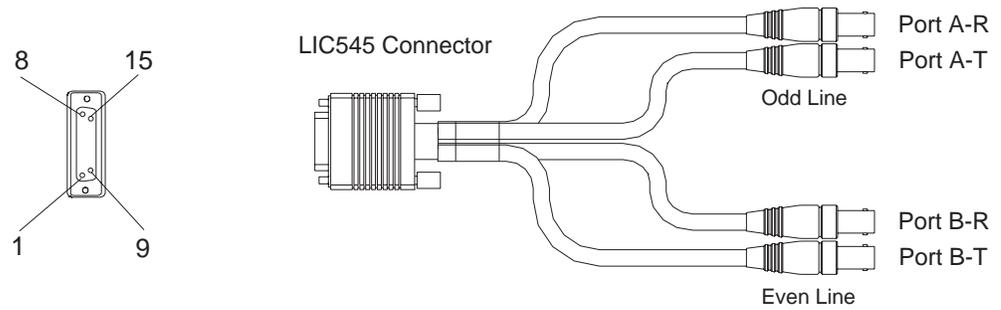
Figure 2-117. Cable (PN 80G2226) Provided with the LIC545 (4 Cables)

Interchange Circuits
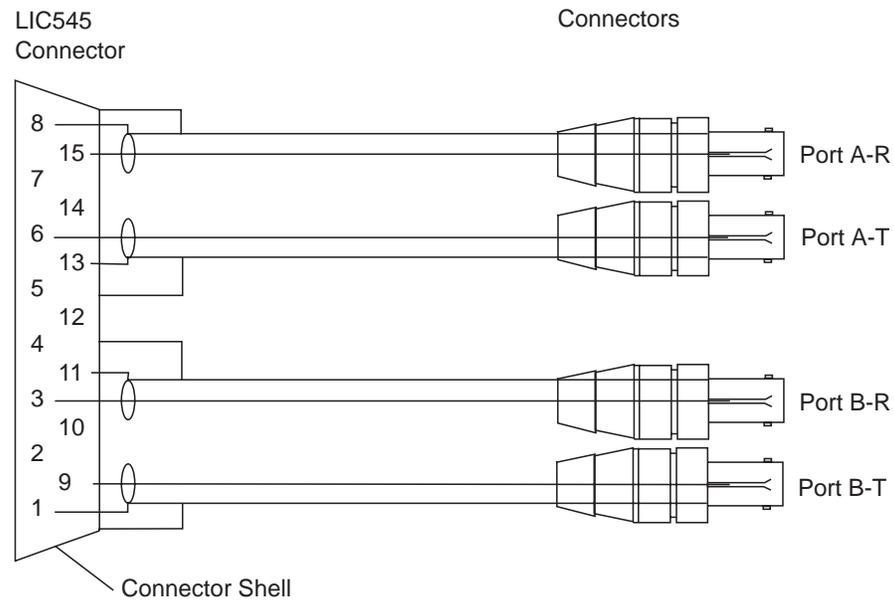
Figure 2-118. LIC545 IBM Cable Pin Assignment

Note: If you want the cable shield NOTto be connected to the ground, you must wire as described below in "Cable Not Provided by IBM" on page 2-84.

Cable Not Provided by IBM

LIC545
Connector

Connectors

Port A-R

Port A-T

Port B-R

Port B-T
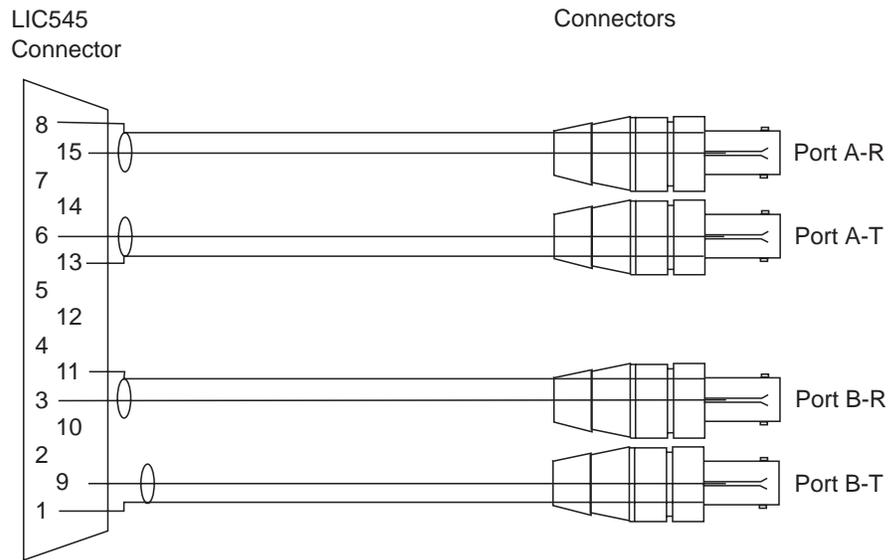
Figure   2-119. LIC545 Cable Pin Assignment

Cable shields can however be connected to the ground using the switches located on the front module card.

Receive

The eight switches located in the front of the LIC545 are used to connect the **receive** cables shield to ground. When the switch is used in the up position, there is connection to the ground. In ther down position, there is no connection to the ground.
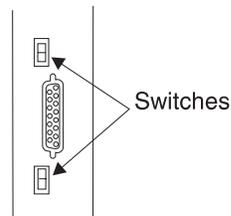
Switches

Figure   2-120. LIC545 Switches

Transmit

Module cards are provided with the **transmit** cable shield connected to the ground. There are eight jumpers on the module card that are used to connect the transmit cable shield to the ground.

In countries where the transmit shield connection tothe ground is NOT required, use the following procedure to change the jumper positions.

1. Remove the five screws **1** . Then remove the cover of the module.
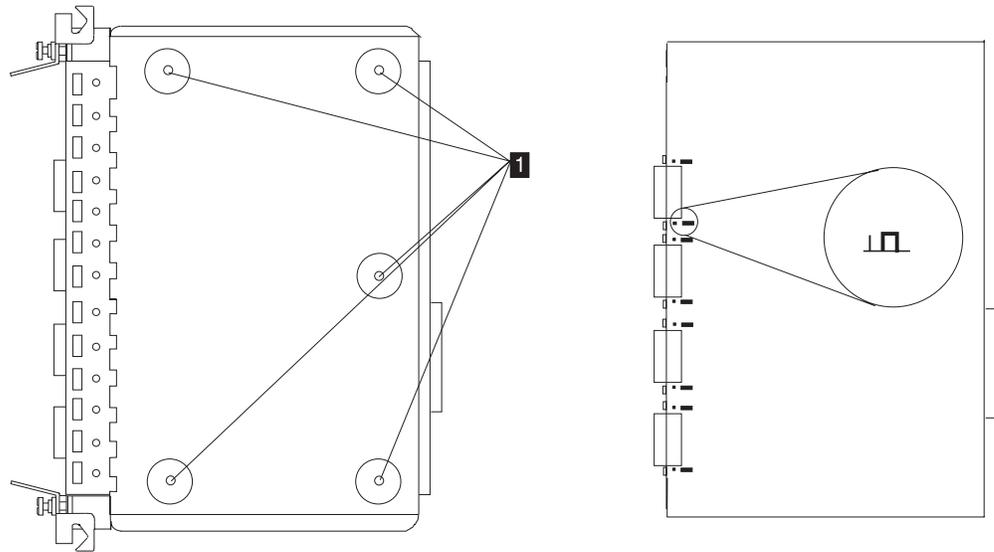
Figure 2-121. LIC545 Module Openning and Jumper Positions

2. Change the jumper position.
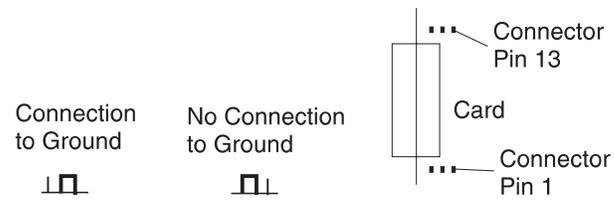
Figure 2-122. LIC545 Shield Pin and Jumper Position

3. Re-install the cover of the module using the previously removed screws **1** .

LIC545 External Cable List

Note: If a cable not supplied by IBM is used, IBM does not guarantee electromagnetic compatibility (EMC) compliance for the 2220.

If the connector does not have an insulating shield, read the general electrical safety statement before connection in the *2220 Nways BroadBand Switch Models 300, 500 and 501, Safety Information*, GA33-0401 manual.

Table 2-29. LIC545 Standard Cables			
Cable Type	**Length m (ft)**	**Feature Code**	**Part Number**
BNC (75 ohms)	15 (50)	5250	80G0714

The maximum attenuation of the associatedd cables must not exceed 6 dB when measured at 1074 Khz for the 2 Mb adapter. The frequency/attenuation characteristics shall follows the root F law.

IBM LIC545 cables meet these characteristics.

2.16 LIC546
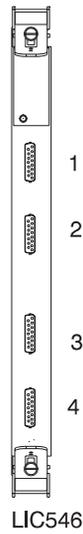
LIC546 Interface	Description
Number	8
Characteristics	E1 (120 ohms)
Speed	Up to 2.048 Mbps
Feature Code	5546

LIC546

LIC546 Wrap Plug

LIC546 Wrap Plug
The Part Number of the wrap plug is 57G8097.

From	To
11 ————————	15
13 ————————	17
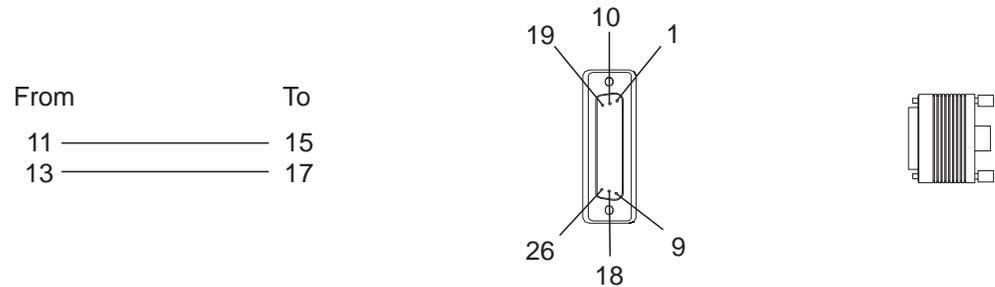
Figure   2-123. LIC546 Wrap Plug Pin Assignments

Note:

This wrap plug must be installed on the cable on port A or B (Part Number 80G2225).

Cable Provided with the LIC546
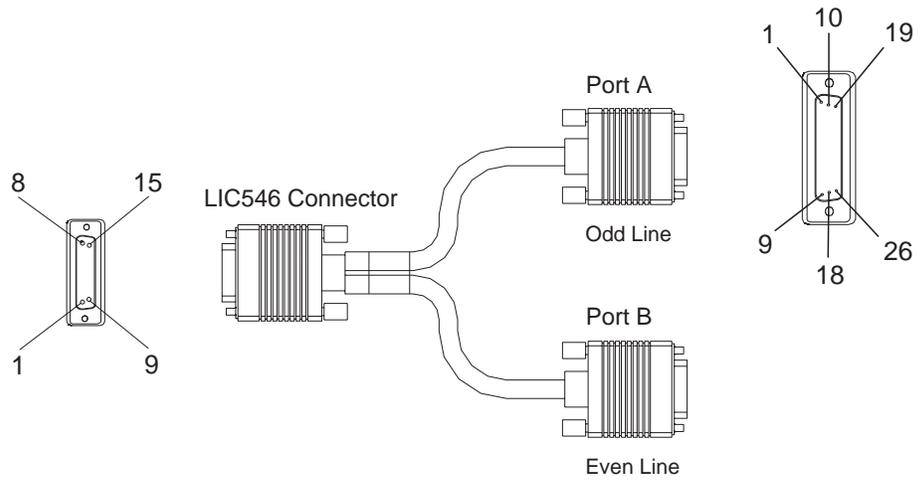
Figure 2-124. Y Cables (PN 80G2225) Provided with the LIC546

Interchange Circuits
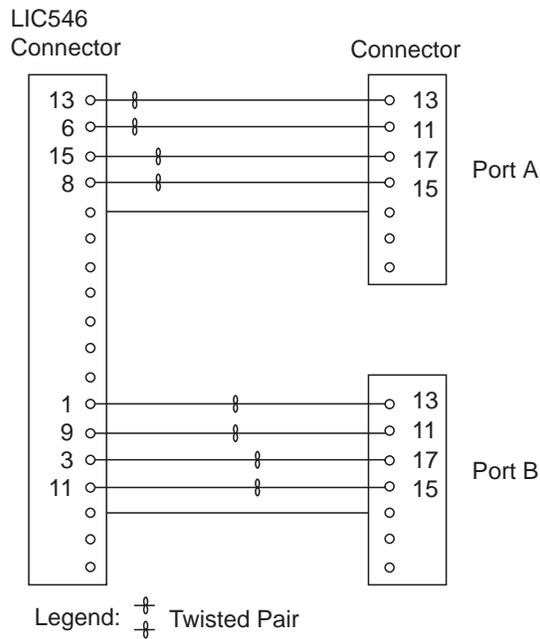
Figure 2-125. LIC546 Cable Pin Assignment

LIC546 External Cable List

Note: If a cable not supplied by IBM is used, IBM does not guarantee the electromagnetic compatibility (EMC) compliance for the 2220.

If the connector does not have an insulating shield, read the general electrical safety statement before connection in the *2220 Nways BroadBand Switch Models 300, 500 and 501, Safety Information*, GA33-0401.

Table 2-30. LIC546 Standard Cables			
Cable Type	**Length m (ft)**	**Feature Code**	**Part Number**
E1	15 (50)	5260	57G8029

2.17 LIC551

LIC551 Interface	Description
Number	2 (using two BNC cables)
Characteristics	ATM T3
Speed	45 Mbps
Transfer mode	Full-duplex
Feature Code	5551

Legend:

⊕ Input

⊖ Output
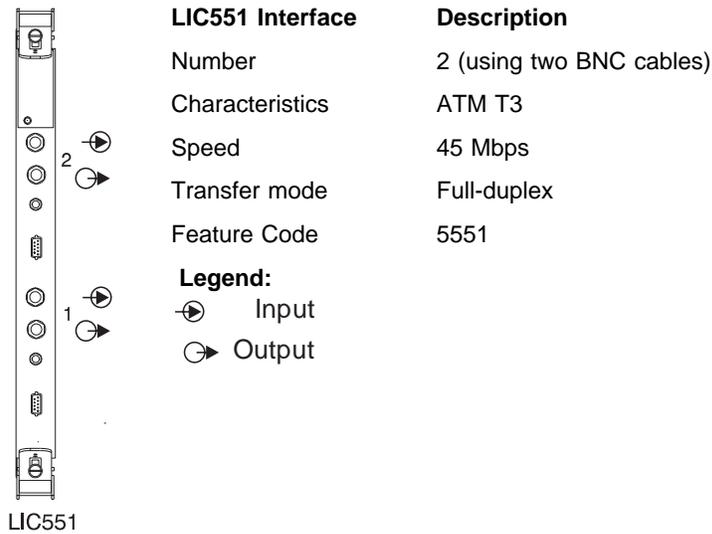
LIC551

LIC551 Cable

Figure   2-126. LIC551 Coaxial Cable (75 ohms)

Note: If a cable not supplied by IBM is used, IBM does not guarantee the
electromagnetic compatibility (EMC) compliance for the 2220.

If the connector does not have an insulating shield, read the general electrical
safety statement before connection in the *2220 Nways BroadBand Switch Models
300, 500 and 501, Safety Information*, GA33-0401.

LIC551 Cable List

Table 2-31. LIC551 Standard Cables			
Cable Type	**Length m (ft)**	**Feature Code**	**Part Number**
BNC (75 ohms)	15 (50)	5250	80G0714

2.18 LIC552

LIC552 Interface	Description
Number	2 (using two BNC cables)
Characteristics	ATM E3
Speed	34 Mbps
Transfer mode	Full-duplex
Feature Code	5552

Legend:

⊕→   Input

◯→   Output
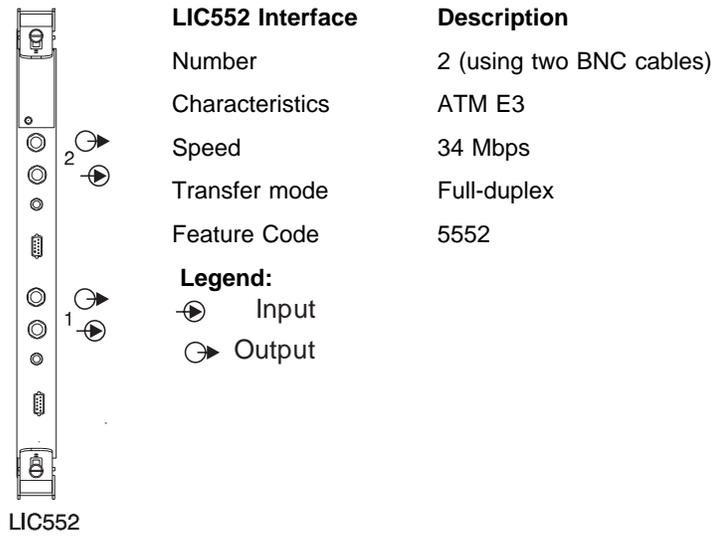
LIC552

LIC552 Cable

Figure   2-127. LIC552 Coaxial Cable (75 ohms)

Note: If a cable not supplied by IBM is used, IBM does not guarantee the electromagnetic compatibilty (EMC) compliance for the 2220.

If the connector does not have an insulating shield, read the general electrical safety statement before connection in the *2220 Nways BroadBand Switch Models 300, 500 and 501, Safety Information*, GA33-0401.

LIC552 Cable List

Table   2-32. LIC552 Standard Cables

Cable Type	Length m (ft)	Feature Code	Part Number
BNC (75 ohms)	15 (50)	5250	80G0714

2.19 LIC553

LIC553 Interface	Description
Number	1
Characteristics	ATM SONET/SDH electrical SMF (Single—Mode Fiber)
Speed	155 Mbps
Feature Code	5553

Legend:
⊕   Input
⊕►   Output
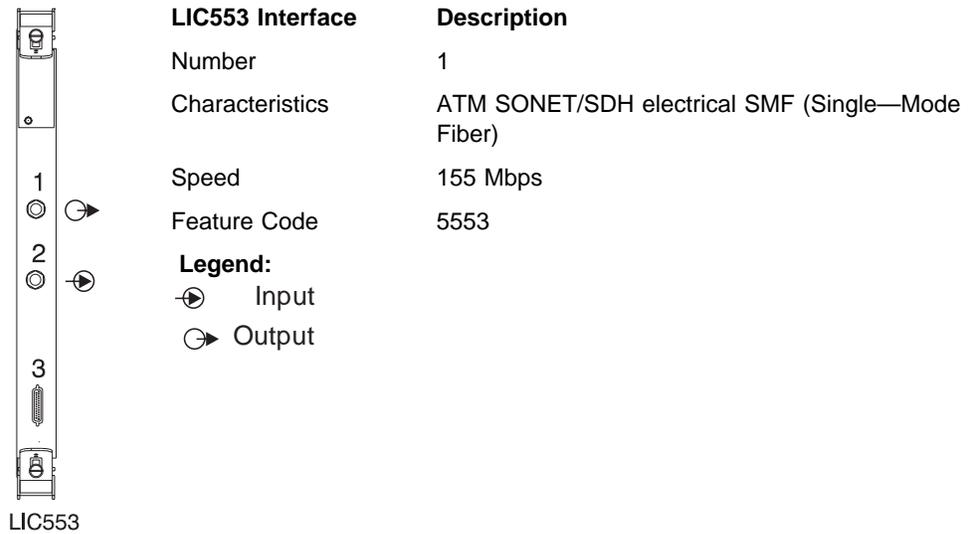
LIC553

LIC553 Cable

Figure   2-128. LIC553 Coaxial Cable (75 ohms)

Note: If a cable not supplied by IBM is used, IBM does not guarantee electromagnetic compatibility (EMC) compliance for the 2220 machine.

If the connector does not have an insulating shield, read the general electrical safety statement before connection, refer to the *2220 Nways BroadBand Switch Models 300, 500 and 501, Safety Information*, GA33-0401 manual.

LIC553 Cable List

Table 2-33. LIC553 Standard Cables			
Cable Type	**Length m (ft)**	**Feature Code**	**Part Number**
BNC (75 ohms)	15 (50)	5250	80G0714

2.20 LIC554
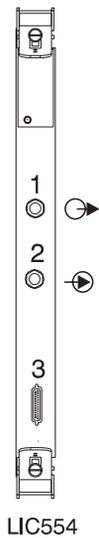
LIC554 Interface	Description
Number	1
Characteristics	ATM OC3 Optical SMF (Single—Mode Fiber)
Speed	155 Mbps
Transfer mode	Single mode
Feature Code	5554

Legend:

⊕ Input

⊙→ Output

LIC554

LIC554 Information

The LIC554 module is designed to be plugged into the Nways BroadBand Switch. It uses a laser transmitter for long-distance links.

The interface conforms to the ATM Forum for OC-3 Single Mode LANs.

Laser Information

The LIC554 is designed for single—mode fiber and operates at a nominal wavelength of 1300 nm.

The laser is a Class 1 Laser Product and complies with the following safety standards:

IEC 825-1: 1993   EN 60825-1: 1994
IEC 825-2: 1993   EN 60825-2: 1994

IEC 950: 1991 + Amdt 1: 1992 + Amdt 2: 1993
EN 60950: 1992 + Amdt 1: 1993 + Amdt 2: 1993

The compliance label on the LIC554 is shown in Figure 2-129.

```
CLASS 1 LASER PRODUCT  ·  LUOKAN 1 LASERLAITE
APPAREIL A LASER DE CLASSE 1  ·  LASER KLASSE 1
```
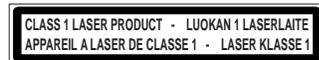
Figure   2-129. Class 1 Laser Label on the LIC554

This product complies with U.S. regulations on lasers (CFR 21-J).

The laser emission complies with Class 1 specifications.

LIC554 Technical Information

To use the technical information presented in this section and validate your link, refer to the *Planning for Enterprise Systems Connection Links*, GA23-0367.

Optical Specifications

Table 2-34. LIC554 SC Single Mode Transmitters: Optical Specifications

Parameter	Minimum Value	Typical Value	Maximum Value	Unit
Optical Power Output (P_O)				
8 micron cable	−8	—	−2	dBm avg
Center Wavelength (λ_c)	1260	1300	1368	nm
Modulation Frequency	—	155.52	—	MHz

Optical Power Budget

Table 2-35. Optical Power Budget for LIC554 Port-to-Port Connections

Fiber Cable: Type and Size	Minimum Transmitted Power	Maximum Receiver Sensitivity	Optical Power Budget	Maximum Link Distance
Single—mode 8 micron	−8 dBm	−34 dBm	26 dBm	Up to 40 km (24.8 miles)

LIC554 Wrap Plug

The wrap plug (cable and attenuator) has the Part Number 80G3913. The cable Part Number is: 80G4776. The attenuator Part Number is 80G3914.

Figure 2-130. LIC554 Wrap Plug (Cable and Attenuator)

LIC554 Cable
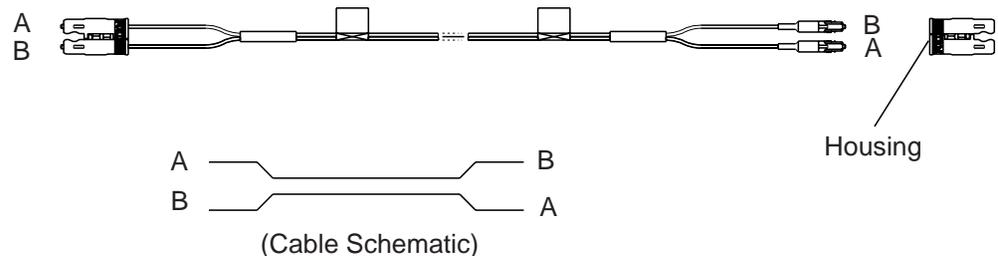
Figure 2-131. LIC554 Optical Cable

LIC554 Converter

A converter made with two short cables plus an FC/PC/SC duplex coupler connects to the SC duplex cable.
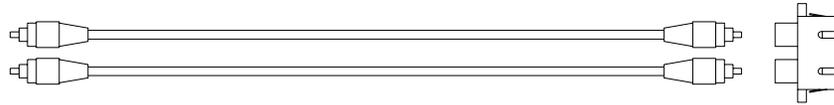
Figure   2-132. LIC554 Converter (Two Cables and a Coupler) Part Number 80G3799

LIC554 Cable List

Table 2-36. LIC554 Standard Cables			
Cable Type	**Length m (ft)**	**Feature Code**	**Part Number**
Optical cable	10 (40)	5720	19G4757

2.21 LIC555

LIC555 Interface	Description
Number	1
Characteristics	ATM OC3 Optical SMF (Single Mode Fiber)
Speed	155 Mbps
Transfer mode	Single mode
Feature Code	5555

Legend:

⊕ Input

◯▸ Output

LIC555

LIC555 Information

The LIC555 module is designed to be plugged into the Nways BroadBand Switch. It uses a laser transmitter for long-distance links.

The interface conforms to the ATM Forum for OC-3 Single Mode LANs.

Laser Information

The LIC555 is designed for single—mode fiber and operates at a nominal wavelength of 1300 nm.

The laser is a Class 1 Laser Product and complies with the following safety standards:

IEC 825-1: 1993   EN 60825-1: 1994
IEC 825-2: 1993   EN 60825-2: 1994

IEC 950: 1991 + Amdt 1: 1992 + Amdt 2: 1993
EN 60950: 1992 + Amdt 1: 1993 + Amdt 2: 1993

The compliance label on the LIC555 is shown in Figure 2-133.

```
CLASS 1 LASER PRODUCT  ·  LUOKAN 1 LASERLAITE
APPAREIL A LASER DE CLASSE 1  ·  LASER KLASSE 1
```
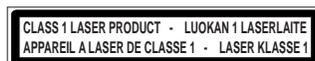
Figure   2-133. Class 1 Laser Label on the LIC555

This product complies with U.S. regulations on lasers (CFR 21-J).

The laser emission complies with Class 1 specifications.

LIC555 Technical Information

To use the technical information presented in this section and validate your link, refer to the *Planning for Enterprise Systems Connection Links*, GA23-0367.

Optical Specifications

Table 2-37. LIC555 SC Single Mode Transmitters: Optical Specifications

Parameter	Minimum Value	Typical Value	Maximum Value	Unit
Optical Power Output (P_O)				
8 micron cable	−15	—	−8	dBm avg
Center Wavelength (λ_c)	1261	1300	1360	nm
Modulation Frequency	—	155.52	—	MHz

Optical Power Budget

Table 2-38. Optical Power Budget for LIC555 Port-to-Port Connections

Fiber Cable: Type and Size	Minimum Transmitted Power	Maximum Receiver Sensitivity	Optical Power Budget	Maximum Link Distance
Single—mode 8 micron	−15 dBm	−28 dBm	13 dBm	Up to 20 km (12.4 miles)

LIC555 Wrap Plug

The Part Number of the wrap plug is 80G3796.

Figure 2-134. LIC555 Wrap Plug

LIC555 Cable
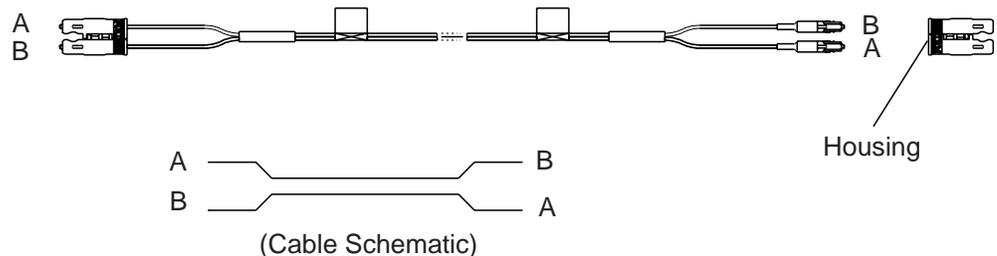
Figure 2-135. LIC555 Optical Cable

LIC555 Cable List

Table 2-39. LIC555 Standard Cables			
Cable Type	**Length m (ft)**	**Feature Code**	**Part Number**
Optical cable	10 (40)	5720	19G4757

2.22 LIC556

LIC556 Interface	Description
Number	1
Characteristics	ATM OC3 Optical MMF (Multi—Mode Fiber)
Speed	155 Mbps
Transfer mode	Full-duplex
Feature Code	5556

Legend:
⊕►   Input
◯► Output

LIC556

LIC556 Information

The LIC556 module is designed to be plugged into the Nways BroadBand Switch. It uses a LED transmitter for short-distance links.

The interface conforms to the ATM Forum for OC-3 multi-mode fiber.

LED Information

The LIC556 is designed for multi—mode fiber, and operates at a nominal wavelength of 1300 nm.

The LED is a Class 1 LED Product and complies with the following safety standards:

IEC 825-1: 1993	EN 60825-1: 1994
IEC 825-2: 1993	EN 60825-2: 1994

IEC 950: 1991 + Amdt 1: 1992 + Amdt 2: 1993
EN 60950: 1992 + Amdt 1: 1993 + Amdt 2: 1993

The compliance label on the LIC556 is shown in Figure 2-136.

CLASS 1 LED PRODUCT · LUOKAN 1 LEDLAITE
APPAREIL A DEL DE CLASSE 1 · LED KLASSE 1

Figure 2-136. Class 1 LED Label on the LIC556

The LED emission complies with Class 1 LED specifications.

LIC556 Technical Information

To use the technical information presented in this section and validate your link, refer to *Planning for Enterprise Systems Connection Links*, GA23-0367.

Optical Specifications

Table 2-40. LIC556 Multi Mode Transmitters: Optical Specifications

Parameter	Minimum Value	Typical Value	Maximum Value	Unit
Optical Power Output (P_O)				
62.5/125 micron cable	−19	—	−14	dBm avg
Center Wavelength (λ_c)	1270	1300	1380	nm
Modulation Frequency	—	155.52	—	MHz

Optical Power Budget

Table 2-41. Optical Power Budget for LIC556 Port-to-Port Connections

Fiber Cable: Type and Size	Minimum Transmitted Power	Maximum Receiver Sensitivity	Optical Power Budget	Maximum Link Distance
Single mode 62.5/125 micron	−19 dBm	−30 dBm	11 dBm	Up to 2 km (1.24 miles)

LIC556 Wrap Plug

The Part Number of the wrap plug is 81G3185.
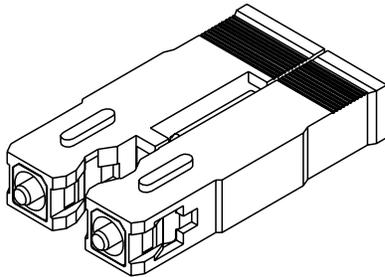
Figure 2-137. LIC556 Wrap Optical Cable

LIC556 Cable
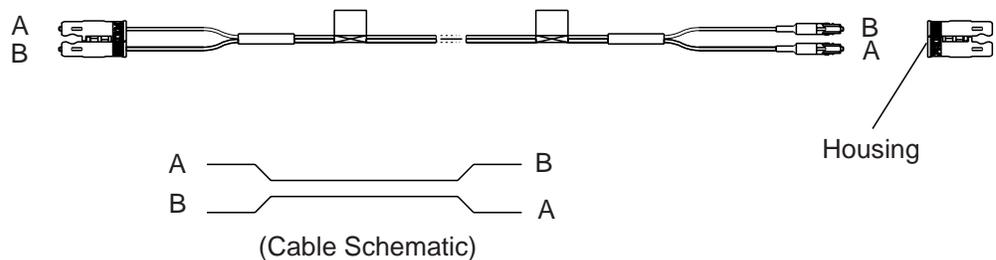
Figure 2-138. LIC556 Optical Cable

LIC556 Cable List

Table 2-42. LIC556 Standard Cables			
Cable Type	**Length m (ft)**	**Feature Code**	**Part Number**
Optical cable	10 (40)	5710	19G4866

2.23 LIC562

LIC562

LIC562 Interface	Description
Number	1 (using two BNC cables)
Characteristics	J2
Speed	3, 4.5, 6 Mbps
Transfer Mode	Full-duplex
Feature Code	5562

Legend:
⊕ Input
↪ Output

LIC562 Wrap Plug

The Part Number of the wrap plug is 57G8093.
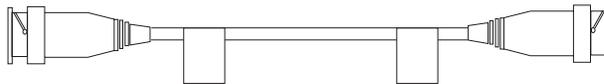
Figure   2-139. LIC562 Wrap Plug (75 ohms)

LIC562 Cable
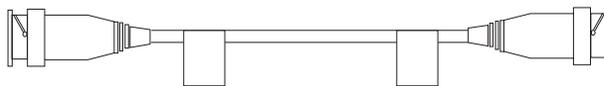
Figure   2-140. LIC562 Coaxial Cable (75 ohms)

Note: If a cable not supplied by IBM is used, IBM does not guarantee electromagnetic compatibility (EMC) compliance for the 2220.

If the connector does not have an insulating shield, read the general electrical safety statement before connection in the *2220 Nways BroadBand Switch Models 300, 500 and 501, Safety Information*, GA33-0401.

LIC562 Cable List

Table 2-43. LIC562 Standard Cables			
Cable Type	**Length m (ft)**	**Feature Code**	**Part Number**
BNC (75 ohms)	15 (50)	5250	80G0714

LIC562 Customer Cables

Be very careful when selecting cables. Note that:

- Only 75–ohm coaxial cables must be used (93–ohm or 50—ohm coaxial cables are not acceptable).

- Shielding must include an aluminium foil shield, plus a braid shield (minimum 90 % coverage).

- BNC connectors must be connected to cables with 360–degree shield.

Note: If a cable not supplied by IBM is used, IBM does not guarantee electromagnetic compatibility (EMC) compliance for the 2220.

2.24 LIC563
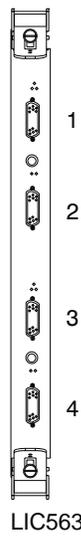
LIC563 Interface	Description
Number	4
Characteristics	2 E1 (120 ohms, European ISDN standard) and 2 trunk backup ISDN
Speed	2.048 Mbps
Transfer mode	
Feature Code	5563

LIC563

LIC563 Wrap Plug

The Part Number of the wrap plug is 57G8097.

From	To
11 —————— 15	
13 —————— 17	
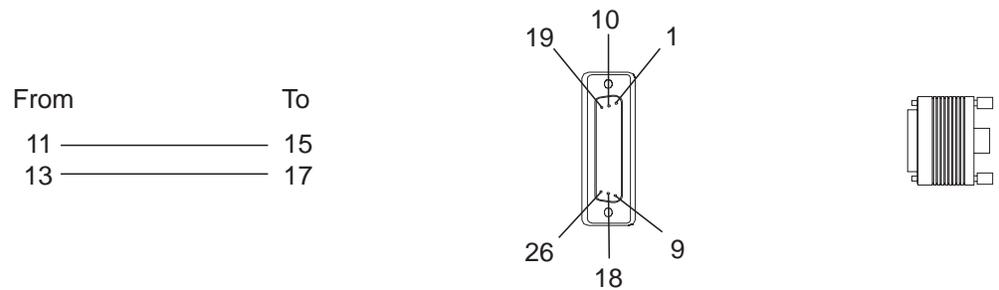
Figure   2-141. LIC563 Wrap Plug Assignment

LIC563 E1 Cable

P1

P2

Male
Connector
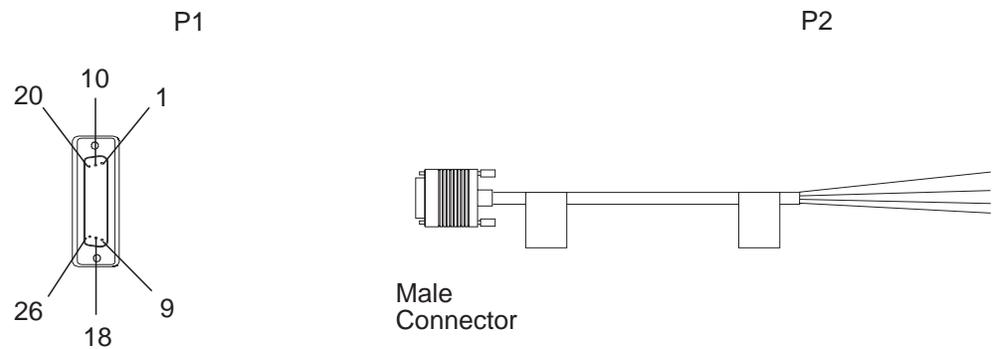
Figure   2-142. LIC563 E1 Cable
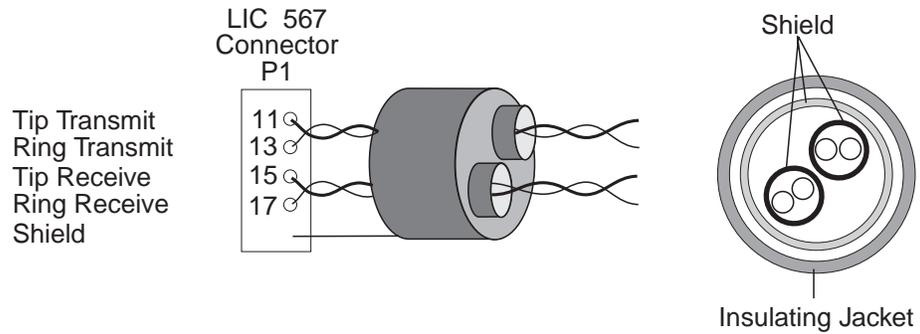
Figure 2-143. LIC563 E1 Cable Pin Assignment

LIC563 E1 Cable List

Table 2-44. LIC563 Cables				
Cable type	**Length m (ft)**	**Feature Code**	**Part Number**	
			World—Wide Except Germany	**World—Wide**
E1	15 (50)	5260	57G8029	80G3983

Homologation and Notes

The LIC563 complies with the following EU directives:

EMC — 89/336/EEC

LVD — 73/23/EEC

Telecommunications — 91/263/EEC

If the telephone service requires an ISO/IEC 10173 plug to connect the LIC567 adapter card,the IBM service engineerwill install it on the flyleads of the cable that is supplied.

2.25 LIC567
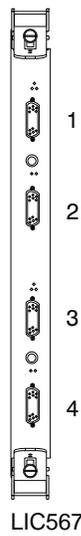
LIC567 Interface	Description
Number	4
Characteristics	E1 (120 ohms, European ISDN standard)
Speed	2.048 Mbps
Transfer mode	
Feature Code	5567

LIC567

LIC567 Wrap Plug

The Part Number of the wrap plug is 57G8097.

From   To
11 —————— 15
13 —————— 17
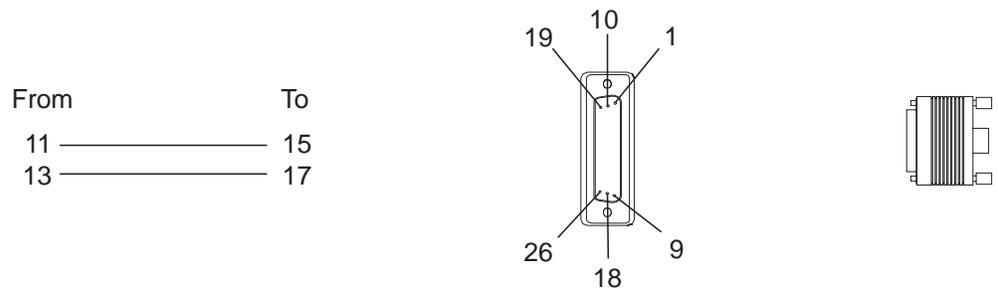
Figure   2-144. LIC567 Wrap Plug Assignment

LIC567 E1 Cable

P1

P2

Male
Connector
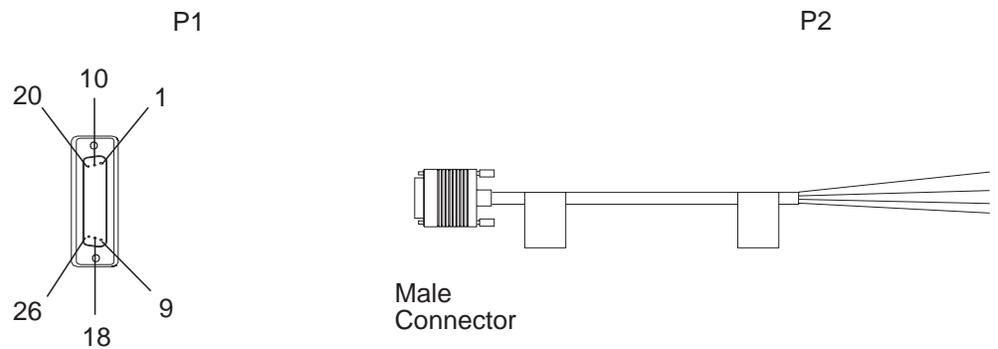
Figure   2-145. LIC567 E1 Cable
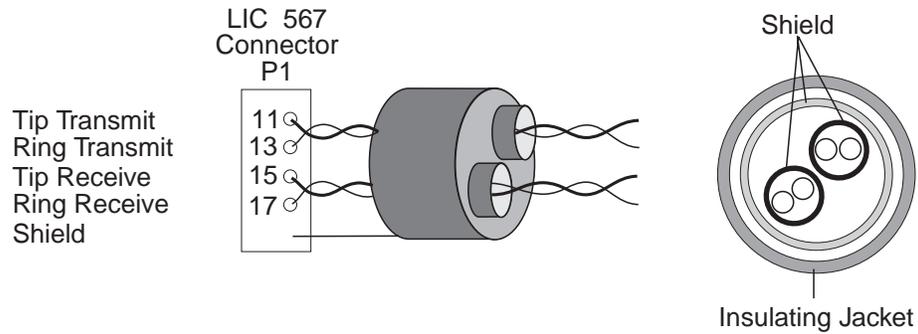
Figure 2-146. LIC567 E1 Cable Pin Assignment

LIC567 E1 Cable List

Table 2-45. LIC567 Cables				
Cable type	**Length m (ft)**	**Feature Code**	**Part Number**	
			World—Wide Except Germany	**World—Wide**
E1	15 (50)	5260	57G8029	80G3983

LIC567 Connector Kit

Table 2-46. LIC567 Connector Kit		
Designation	Feature Code	Part Number
LIC567 Connector Kit	5701	57G8075

Bulk Cable Specifications
* Two AWG 24 twisted pairs, 120 ohms (see Figure 2-144 on page 2-106).

* Shielding on each twisted pair plus overall shielding.

* Maximum length 122 meters (400feet).

Connector P2
* Not predefined. Depends on the customer equipment.

* ETSI 300–11 standard.

Note: If a cable not supplied by IBM is used, IBM does not guarantee the electromagnetic compatibility (EMC) for the 2220.

Homologation and Notes

The LIC567 complies with the following EU directives:

EMC   — 89/336/EEC

LVD   — 73/23/EEC

Telecommunications — 91/263/EEC

If the telephone service requires an ISO/IEC 10173 plug to connect the LIC567 adapter card,the IBM service engineerwill install it on the flyleads of the cable that is supplied.

Appendix A. Notices

A.1 Notices

References in this publication to IBM products, programs, or services do not imply that IBM intends to make these available in all countries in which IBM operates. Any reference to an IBM product, program, or service is not intended to state or imply that only IBM's product, program, or service may be used. Any functionally equivalent product, program, or service that does not infringe any of IBM's intellectual property rights may be used instead of the IBM product, program, or service. Evaluation and verification of operation in conjunction with other products, except those expressly designated by IBM, is the user's responsibility.

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A.2 Product Page/Warranties

The following paragraph does not apply to the United Kingdom or to any country where such provisions are inconsistent with local law.

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Some states do not allow disclaimer of express or implied warranties in certain transactions, therefore this statement may not apply to you.

A.3 European Union (EU) Statement

This product is in conformity with the protection requirements of EU Council Directive 89/336/EEC on the approximation of the laws of the Member States relating to electromagnetic compatibility. IBM can not accept responsibility for any failure to satisfy the protection requirements resulting from a non-recommended modification of the product, including the fitting of non-IBM option cards.

A.4 Year 2000 Statement

This product is Year 2000 ready. When used in accordance with its associated documentation, it is capable of correctly processing, providing, and/or receiving date data within and between the 20th and 21st centuries, provided all other products (for example, software, hardware, and firmware) used with the product properly exchange accurate date data with it.

For more information, refer to:

A.5 Electronic Emission Notices

Federal Communications Commission (FCC) Statement

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to the Part 15 of FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

Properly shielded and grounded cables and connectors must be used in order to meet FCC emission limits. IBM is not responsible for any radio or television interference caused by using other than recommended cables and connectors or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate this equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Industry Canada Compliance Statement

This Class A digital apparatus complies with Canadian ICES-003.

Avis de conformité aux normes d'Industrie Canada

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

Japanese Voluntary Control Council for Interference (VCCI) Statement

This product is a Class A Information Technology Equipment and conforms to the standards set by the Voluntary Control Council for Interference by Information Technology Equipment (VCCI). In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

> この装置は、情報処理装置等電波障害自主規制協議会（ＶＣＣＩ）の基準に
> 基づくクラスＡ情報技術装置です。この装置を家庭環境で使用すると電波妨害を
> 引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求
> されることがあります。

Harmonics Compliance (JEIDA)

This product conforms to the Harmonics Guideline (JEIDA). The input current of this product is less than or equal to 20 A per phase.

Korean Communications Statement

Please note that this device has been certified for business use with regard to electromagnetic interference. If you find this is not suitable for your use, you may exchange it for one of residential use.

Taiwanese Class A Warning Statement

This is a Class A product. In a domestic environment this product may cause radio interference in which case the user will be required to take adequate measures.

```
        警告使用者:
這是甲類的資訊產品，在
居住的環境中使用時，可
能會造成射頻干擾，在這
種情況下，使用者會被要
求採取某些適當的對策。
```

Safety Notices for United Kingdom

1. The IBM 2220 Nways BroadBand Switch is manufactured according to the International Safety Standard EN 60950 and as such is approved in the UK under the General Approval Number NS/G/1234/J/100003 for indirect connection to the public telecommunication network.

2. The network adapter interfaces housed within the IBM 2220 Nways BroadBand Switch are approved separately, each one having its own independent approval number. These interface adapters, supplied by IBM, do not use or contain excessive voltages. An excessive voltage is one that exceeds 42.4 V peak ac or 60 V dc. They interface with the IBM 2220 Nways BroadBand Switch using Safety Extra Low Voltages (SELV) only. In order to maintain the separate (independent) approval of the IBM adapters, it is essential that other optional cards, not supplied by IBM, do not use mains voltages or any other excessive voltages. Seek advice from a competent engineer before installing other adapters not supplied by IBM.

Safety Notice for Australia

In Australia, the LIC545 and LIC546 must be connected only to Safety Extra Low Voltage (SELV) networks.

If an attachment to a Telephone Network Voltage (TNV) network is required, you must use a LIC515 instead of a LIC545, and a LIC516 instead of a LIC546.

A.6 Telecommunication Connectivity Notices

Notice to Users of Machines Installed in the U.S.

This equipment complies with Part 68 of the FCC rules. On the LIC module of this equipment is a label that contain, among other information, the FCC registration number. If requested, this information must be provided to the telephone company.

If this equipment causes harm to the telephone network, the telephone company will notify you in advance that temporary discontinuance of the service may be required. If advance notice is not practical, the telephone company will notify you as soon as possible. Also, you will be advised of your right to file a complaint with the FCC if you feel it is necessary.

The telephone company may make changes in its facilities, equipment, operations, or procedures, that could affect the operation of the equipment. If this happens, the telephone company will provide advance notice in order for you to make the necessary modifications to maintain uninterrupted service.

If you experience trouble with this equipment, please contact (800) IBM-SERV for repair and warranty information. If the trouble is causing harm to the telephone network, the telephone company may request you to remove the equipment from the network until the problem is resolved.

No repair can be done by you, customer. Please contact (800) IBM-SERV.

This equipment cannot be used on telephone company-provided coin service. Connection to Party Line Service is subject to state tariffs.

Equipment Ordering Information for U.S. Machines

This section provides information about Facility Interface Codes and Service Order Codes that are needed to order the corresponding services to the carrier company. Please refer to "Notice to Users of Machines Installed in the U.S." for the legal information related to the connection of this equipment to the telephone network.

LIC514

Facility Interface Code	Service Order Code	Module type
04DU9-BN	6.0F	LIC514
04DU9-DN	6.0F	LIC514
04DU9-1KN	6.0F	LIC514
04DU9-1SN	6.0F	LIC514

The standard connecting arrangement code for this equipment is:

Connector type 8-position miniature
Connector model RJ48C
Cable length 30 m (98 ft) maximum
R.E.N Not applicable.

LIC544

Facility Interface Code	Service Order Code	Module type
04DU9-BN	6.0P	LIC544
04DU9-DN	6.0P	LIC544
04DU9-1KN	6.0P	LIC544
04DU9-1SN	6.0P	LIC544

The standard connecting arrangement code for this equipment are:

Connector type   8-position miniature
Connector model Not Applicable
Cable length   30 m (98 ft) maximum
R.E.N   Not applicable

or,

Connector type   15-position
Connector model DB15F
Cable length   30 m (98 ft) maximum
R.E.N   Not applicable

Notice to Users of Machines Installed in Canada

The Industry Canada label identifies certified equipment. This certification means that the equipment meets certain telecommunications network protective, operational and safety requirements as prescribed in the appropriate Terminal Equipment Technical Requirements document(s). The Department does not guarantee the equipement will operate to the user's satisfaction.

Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations.

Repairs to certified equipment should be coordinated by a representative designated by the supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment.

Users should ensure for their own protection that the electrical ground connections of the power utility, telephone lines and internal metallic water pipe system, if present, are connected together. This precaution may be particularly important in rural areas.

Caution: Users should not attempt to make such connections themselves, but should contact the appropriate electric inspection authority, or electrician, as appropriate.

Equipment Ordering Information for Canadian Machines
LIC514: The standard connecting arrangement code for this equipment is:

Connector type   15-position or 8-position miniature
Connector model CA81A or CA48C
Cable length   30 m (98 ft) maximum
Load number   Not applicable

Please refer to "Notice to Users of Machines Installed in Canada" for the legal information related to the connection of this equipment to the telephone network.

LIC544: The standard connecting arrangement code for this equipment is:

Connector type   15-position or 8-position miniature
Connector model CA81A or CA48C
Cable length   30 m (98 ft) maximum
Load number   Not applicable

Please refer to "Notice to Users of Machines Installed in Canada" on page A-5 for the legal information related to the connection of this equipment to the telephone network.

A.7 Trademarks and Service Marks

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AIXwindows
DB2/2
IBM
OS/2
NetView
Nways
POWERstation
RISC System/6000
ThinkPad

The following terms, denoted by a double asterisk (**), used in this publication, are trademarks of other companies as follows:

486   Intel Corporation
IDNX   Network Equipment Technologies, Incorporated

Glossary

The following are the abbreviations and technical terms used in the 2220 Nways Switch library.

2220. The IBM 2220 Nways BroadBand Switch (also called Nways Switch) is a fast packet switch enabling high-speed communications over a broadband network. It implements the functions of the IBM Networking BroadBand Services (NBBS) architecture.

2220-300. 2220 Nways Switch Model 300.

2220-500. 2220 Nways Switch Model 500.

2220-501. 2220 Nways Switch Model 501.

2220 NSM. 2220 Nways Switch Manager

AAL. ATM adaptation layer.

ABR. Availability bit rate. A best effort service with a minimum bit rate and a maximum cell loss value.

ac. Alternating current.

access services. Functions that are performed by a port adapter of the IBM 2220 Nways BroadBand Switch to:

- Support the attachment of external user devices through port lines
- Prepare user data packets
- Control the input traffic on port lines
- Manage line protocols.

active remote connector (ARC). A connector that supplies the electrical and physical interfaces between a line interface coupler type 511 (LIC511) in an Nways Switch subrack and data circuit-terminating equipment (DCE) or data terminal equipment (DTE). ARCs are housed in line connection boxes (LCBs).

adapter. An Nways Switch module that can be used, depending on its hardware type and the code that it runs, as:

  Control point adapter

  Port adapter

  Trunk adapter

  Voice server adapter.

A trunk or port adapter is associated with a line interface coupler (LIC). A voice server adapter can be associated with a voice server extension (VSE).

ADPCM. Adaptive differential pulse code modulation.

AIS. Alarm indicator signal.

AIX. Advanced Interactive Executive.

alarm and power control (APC). In an Nways Switch, a module that connects the NAS, reports alarms, and controls the power supplies.

Alert Manager. An application that processes the SNA alerts received from IBM 3746s operating in IP mode.

AMI. Alternate mark inversion.

ANSI. American National Standards Institute.

APC. Alarm and power control (module).

AR. Access rate.

ARC. Active remote connector.

asynchronous transfer mode (ATM). A high-speed, connection-oriented switching and multiplexing protocol that transmits different types of traffic (voice, video, and data) simultaneously.

ATM. Asynchronous transfer mode.

ATMAn. ATM adapter type n (module).

ATM adaptation layer (AAL). In ATM devices, a set of protocols that adapt non-ATM devices to an ATM network. There are several classes of ATM adaptation layers which represent the main traffic types (for example, data, voice, and video).

ATM network interface. A logical resource generated by the Nways Switch Control Program to provide access services to a physical ATM port or trunk line. An ATM network interface sets up and maintains predefined ATM virtual connections.

AT&T. American Telephone & Telegraph (Company).

B8ZS. Bipolar eight-zero substitution.

Bc. Burst committed.

Be. Burst in excess.

bearer service profile (BSP). A set of parameters that defines a type of ISDN traffic (speech, audio, data, or video). One BSP is associated with each ISDN numbering plan table.

BECN. Backward explicit congestion notification.

B-ICI. Broadband inter-carrier interface.

BMI. Byte multiplexer interface.

BNC. Bayonet Niell-Concelman.

bps. Bit per second.

bridge. A functional unit that interconnects two local area networks. A bridge works at the data link level (layer 2) of the OSI reference model.

broadband network. A network that uses a large frequency band to transport different kinds of traffic (such as coded voice, video, and data) at the same time.

BS. Bearer services.

BSC. Binary synchronous communication.

BSP. Bearer service profile.

BT. Burst tolerance.

bursty. Refers to transmission at variable bit rate where the time between data transmissions is not always the same.

CAC. Connection admission control.

CAS. Channel associated signaling.

CBR. Constant bit rate.

CCS. (1) Common channel signaling (2) Change control server (also called CC server).

CDB. Configuration database.

CDV. Cell delay variation.

CDVT. Cell delay variation tolerance.

cell loss priority (CLP). A priority bit in the ATM cell header. When set, it indicates that the cell can be discarded during traffic congestion.

centralized configuration database. A database prepared with the Nways Switch Configuration Tool Version 2 (NCT2) on a configuration station. It stores the parameters of a 2220 network.

CES. Circuit emulation services.

change control server (CCS or CC server). A station that runs the IBM NetView Distribution Manager for AIX to store the Nways Switch Control Program and to manage code changes.

CIR. Committed information rate.

circuit emulation services (CES). An access service that emulates a leased line. It transports information

with a constant bit rate at the source and destination. The traffic can be PCM voice, video, fax, multimedia, or real-time synchronous data (such as BSC).

CLIP. Calling line identification presentation.

CLIR. Calling line identification restriction.

CLK. Clock (module).

CLKRD. Clock redrive (module).

clock module (CLK). A module of the 2220 Model 300 or 500 that transmits clock signals to the line interface couplers (LICs). It is optional and can have a backup.

clock redrive (CLKRD). A module of the 2220 Model 501 that drives the signals from the Model 500 clock module to the adapters of the Model 501. The clock redrive is optional and can have a backup.

clock references. In an Nways Switch, the software function that controls the transmission of clock signals to the LICs where they are used for bit synchronization.

CLP. Cell loss priority.

CMIP. Common management information protocol.

CMIS. Common management information services.

CMOT. CMIP over TCP/IP.

CNM. Communication network management.

code file. A named set of records stored as a unit in a change control server. An Nways Switch code file can include data or internal code.

COLP. Connected line identification presentation.

COLR. Connected line identification restriction.

configuration station. See Nways Switch configuration station.

control point (CP). In an Nways Switch, a logical resource that provides network control functions. It can have a backup.

CP. Control point.

CPA. Control point adapter (module).

CPE. Customer premises equipment.

CP spanning tree. In a 2220 network, a distribution tree that connects the Nways Switch control points through trunk lines.

The CP spanning tree supplies a very fast and efficient way to multicast control messages such as network topology data.

CRC. Cyclic redundancy check.

CSU. Channel access unit.

CTD. Cell transfer delay.

data circuit-terminating equipment (DCE). An equipment installed on a user premises that provides all the functions required to establish, maintain, and terminate a connection, and to do the signal conversion and coding between a data terminal equipment (DTE) and a line. A DCE can be separate piece of equipment or part of other equipment.

data terminal equipment (DTE). That part of a data station that serves as data source, data sink, or both, and provides the data communication control function depending on the type of protocol used.

dB. Decibel.

dBm. Decibel based on 1 milliwatt.

DC48. Dc power input type -48V

dc. Direct current.

DCD. Dc distribution (module).

DCE. Data circuit-terminating equipment.

DDI. Direct dialing-in.

DE. Discard eligibility.

decibel (dB). (1) One tenth of a bel. (2) A unit that expresses the ratio of two power levels on a logarithmic scale. (3) A unit for measuring relative power. The number of decibels is 10 times the logarithm (base 10) of the ratio of the measured power levels; if the measured levels are voltages (across the same or equal resistance), the number of decibels is 20 times the log of the ratio.

decibel based on 1 milliwatt (dBm). A unit of absolute power measurement that is scaled such that 0 dBm equals 1 milliwatt.

dialog box. On the screen of a station, an area with entry fields and push buttons. (Also called dialog.)

DLCI. Data link connection identifier.

DNPT. Destination numbering plan table.

DSP. Digital service processor.

DSU. Data service unit.

DTE. Data terminal equipment.

DTMF. Dual-tone modulation frequency.

DTR. Data terminal ready.

dummy module. In an Nways Switch, a cover inserted in the place of a module to ensure correct air cooling inside a logic subrack. During normal operation, the dummy modules must not be removed.

E1 standard. A European standard for TDM digital transmission service at 2.048 Mbps.

E3 standard. A European standard for TDM digital transmission service at 34.368 Mbps. An E3 line can transport up to 16 E1 circuits.

E&M. Earth & mark.

ECMA. European Computers Manufacturers Association.

EIA. Electronics Industries Association.

equivalent capacity. The minimum amount of bandwidth needed by a connection to ensure that the packet loss ratio is below a specified threshold.

ESF. Extended status flags.

ETS. European telecommunication standard.

FANB. Fan box.

FAT. File allocation table.

fax. Document received from a facsimile machine. Synonym for telecopy.

FCS. Frame check sequence.

FDDI. Fiber Distributed Data Interface.

FE1. Fractional E1.

FECN. Forward explicit congestion notification.

FEP. Front-end processor.

fiber. Synonym for optical fiber.

fiber budget. The optical power loss as result of the number of connections in the optical fiber link subtracted from the working budget. The loss as a result of connections includes connector loss and splice loss. The fiber budget is expressed in decibels.

Fiber Distributed Data Interface (FDDI). A U.S. standard for 100 Mbps token-ring LANs using optical fiber cables over distances of several kilometers.

fiber optic cable.   Synonym for optical fiber.

FR.   Frame relay.

FRAD.   Frame-relay access device.

frame relay (FR).   A connection-oriented protocol to transport data frames over a fast packet-network with guaranteed end-to-end quality of service.

FRFH.   Frame-relay frame handler.

front-end processor (FEP).   A processor, such as the IBM 3745, 3746 Model 900 or 950, or 3174, that relieves a main frame from communication control tasks.

FRTE.   Frame-relay terminal equipment.

FRU.   Field replaceable unit.

FT1.   Fractional T1.

FTP.   File transfer protocol.

Gbps.   Gigabit per second (10 to the power of 9 bits per second).

GCRA.   Generic cell rate algorithm.

GFP.   Generic function protocol.

GFT.   Generic function transport.

GSM.   Group special mobile.

GUI.   Graphical user interface.

HDB3.   High-density bipolar 3.

HDLC.   High-level data link control.

high-level data link control (HDLC).   A data network protocol.

hot pluggable.   Refers to a hardware component that can be installed or removed without disturbing the operation of any other resource that is not connected to, or dependent, on this component.

HPFS.   High-performance file system.

HPRI.   High priority.

HSAn.   High-speed adapter type n (module).

HSDS.   High-speed digital services.

HSSI.   High-speed serial interface.

hub (intelligent).   A wiring concentrator, such as the IBM 8260, that supplies bridging and routing functions for LANs with different cables and protocols.

hunt group.   See X.25 hunt group.

IDNX.   Integrated Digital Network Exchange.

IE.   Information element.

ILMI.   Interim local management interface.

IMU.   Inverse multiplexing unit

Integrated Digital Network Exchange (IDNX).   A processor integrating voice, data, and image applications. It also manages transmission resources and connects to multiplexers and network management support systems. It permits integration of equipment from different vendors.

integrated services digital network (ISDN).   A digital end-to-end public or private network that supports multiple services including, but not limited to, voice and data.

IP.   Internet Protocol.

IP gateway adapter.   In an Nways Switch, a port adapter that routes the IP control between the NAS and the network management station.

ISDN.   Integrated services digital network.

ISDN network interface.   A logical resource generated by the Nways Switch Control Program to provide access services to a physical ISDN or QSIG port line. An ISDN network interface sets up and maintains connections between calling ISDN terminal equipments and called terminal equipments attached through other Nways Switches.

ISO.   International Organization for Standardization.

isochronous.   Refers to transmission at a constant bit rate where there is a clock relationship between source and destination. The bit rates are the same on the destination and source.

ITU-T.   International Telecommunication Union - Telecommunication (replaces CCITT).

jitter.   Undesirable variations in the transmission delay of a digital signal. Also called cell delay variation (CDV).

KB.   Kilobyte (storage capacity, 1024 bytes).

kbps.   Kilobit per second (1000 bits per second).

LAN.   Local area network.

LAPB.   Link access procedure for B-channel.

LAPD.   Link access procedure for D-channel.

LCB.   Line connection box.

LCBB.   Line connection box, base (LCEB and LCPB).

LCBE.   Line connection box, expansion (LCEE and LCPE).

LCEB.   Line connection enclosure, base.

LCEE.   Line connection enclosure, expansion.

LCPB.   Line connection power, base.

LCPE.   Line connection power, expansion.

LCR.   Least cost routing.

LED.   Light-emitting diode.

LICn.   Line interface coupler type n (module).

line.   In a 2220 network, any physical medium, such as a telephone wire, microwave beam, or optical fiber, that transmits information. A line can be a trunk line or a port line.

line connection box (LCB).   A metallic box that:

- Multiplexes up to 15 low-speed lines. There can be up to four LCBs per LIC type 511 for a total of 60 lines (two LCBs and 30 lines per LIC connector).

- Reduces cable lengths between Nways Switch and DCE or DTE locations.

An LCB fits in a standard 19-inch rack. Each one houses up to 15 active remote connectors (ARCs).

line interface coupler (LIC).   In an Nways Switch, a module that physically attaches trunk or port lines. Each line interface coupler is associated with a trunk or port adapter, and supports specific line interfaces.

LIV.   Link integrity verification.

LMI.   Local management interface.

local area network (LAN).   A computer network located on a user premises in a limited geographical area.

logical port.   (Also called NBBS port.) A logical resource generated by the Nways Switch Control Program to provide access services to a physical port line (or channel of a TDM port line) using HDLC, FR, or CES protocol. A logical port sets up and maintains its predefined connections.

logical trunk.   (Also called NBBS trunk.) A logical resource generated by the Nways Switch Control Program to provide transport services to a physical trunk line (or channel of a TDM trunk line). A logical trunk is mainly responsible for optimizing bandwidth and maintaining the CP spanning tree.

LSAn.   Low-speed adapter type n (module).

MA/SR.   Multi-access/sub-rate.

management access.   Refers to an Nways Switch that connects a network management station or a change control server to a 2220 network through its service bus, which is a dedicated Ethernet LAN.

MB.   Megabyte (storage capacity, 1 048 576 bytes).

Mbps.   Megabit per second (10 to the power of 6 bits per second).

MBS.   Maximum burst size.

MLT.   Multiple logical trunks.

module.   In an Nways Switch, a hardware unit plugged in a slot of the logic subrack. It houses, for example, an adapter, a line interface coupler, or a voice server extension. All modules are hot pluggable.

ms.   Millisecond (1/1000 second).

NAS.   Nways Switch administration station.

NBBS.   Networking BroadBand Services (architecture).

NBBS architecture.   See Networking BroadBand Services.

NBBS connection.   See potential connection and virtual connection.

NBBS network.   A network built with IBM 2220 Nways BroadBand Switches and conforming to the IBM Networking BroadBand Services (NBBS) architecture.

NBBS port.   See logical port.

NBBS trunk.   See logical trunk.

NCT2.   Nways Switch Configuration Tool Version 2.

NDPS.   Non-disruptive path switching.

NEM.   Nways Enterprise Manager (see 2220 Nways Switch Manager).

network control.   Functions that are performed by an Nways Switch control point to:

- Allocate and control the Nways Switch resources

- Provide topology and directory services

- Select routes

- Control congestion.

network management station (NMS).   A station that runs IBM NetView for AIX and the 2220 Nways Switch Manager. It is used to manage network topology, accounting, performance, configuration, and error reporting.

network node interface (NNI).   An interface between nodes in a communication network.

Network Support Center (NSC).   A location from which IBM remotely supports 2220 networks.

Networking BroadBand Services (NBBS).   An IBM architecture for high-speed networking that complements ATM standards and provides access services, transport services, and network control to user traffic.

NIC.   Network Information Center.

NMS.   Network management station.

NNI.   Network node interface.

NPT.   Numbering plan table.

NR.   Non-reserved.

NRT.   Non-real-time.

NRZI.   Non-return-to-zero inverted recording.

NRZ-1.   Non-return-to-zero change-on-ones recording.

NSAP.   Network service address point.

NSC.   Network Support Center.

NSM.   (See 2220 Nways Switch Manager)

NVDM.   NetView Distribution Manager for AIX.

NTT.   Nippon Telegraph & Telephone (Corporation).

numbering plan table (NPT).   A set of parameters, organized in origin NPT and destination NPT, that defines a type of called ISDN numbers. A numbering plan table is associated with each ISDN network interface.

Nways 2220 Switch Manager (2220 Switch Manager).   An IBM licensed program that runs under NetView for AIX to manage the 2220 Nways Switch operation and configuration from a network management station. It replaces the Nways Enterprise Manager (NEM) which is no longer available.

Nways BroadBand Switch.   Synonym for 2220 Nways BroadBand Switch.

Nways Enterprise Manager (NEM).   An IBM licensed program that was used under NetView for AIX in a network management station to manage Nways Switches, routers, and bridges in a 2220 network (see 2220 Nways Switch Manager).

Nways Switch.   Synonym for 2220 Nways BroadBand Switch.

Nways Switch administration station (NAS).   A station attached to each 2220 to run the Control Program, and control and service the Nways Switch locally.

Nways Switch configuration station.   A mandatory OS/2 or AIX station that runs a stand-alone version of the Nways Switch Configuration Tool Version 2 (NCT2) and stores the centralized configuration database of the NBBS network. An OS/2 station can be used as a remote user console.

Nways Switch Configuration Tool Version 2 (NCT2).   A component of the Nways Switch Control Program that is used to configure physical and logical resources. It is also used in stand-alone version under OS/2 or AIX .

Nways Switch Control Program.   The IBM licensed program that runs in the NAS and adapters of the 2220 Nways Switch. It includes a CMIP agent to work with the 2220 Switch Manager.

Nways 2220 Switch Manager for AIX.   (See Nways 2220 Switch Manager)

Nways Switch Resource Control.   A component of the Nways Switch Control Program. It is used from the NAS of an Nways Switch or from a remote user console to control resources and configuration files.

OAM.   Operation, administration, and maintenance.

OC3.   Optical carrier level 3.

ONPT.   Origin numbering plan table.

operation, administration, and maintenance (OAM).   A group of functions coded in specific ATM cells to handle alarms and loopback tests on ATM connections.

optical fiber.   In fiber optics technology, a wave guide that propagates optical signals from light-generating transmitters to light-detecting receivers.

OSI.   Open systems interconnection.

packet loss ratio.   The probability that a packet will not reach its destination or not reach it in a specified

time. It is obtained by dividing the number of packets lost in transmission by the total number transmitted.

packet transfer mode (PTM).   The native transfer mode of the NBBS architecture. PTM divides the traffic into packets of variable length.

PBX.   Private branch exchange.

PCM.   Pulse code modulation.

PCR.   Peak cell rate.

PDH.   Plesiochronous digital hierarchy.

permanent virtual circuit (PVC).   A virtual circuit that has a logical channel permanently assigned to it at each item of data terminal equipment. It is activated by a program or by a network operator request.

plesiochronous.   Refers to transmission at a nominal bit rate where the source and destination are controlled by different clocks. The bit rates are nearly the same.

PLP.   Packet layer protocol.

PNP.   Private numbering plan.

port.   See logical port.

port adapter.   In an Nways Switch, a module that provides access services to one or more port lines. Each port adapter is associated with a line interface coupler (LIC).

port line.   A communication line that connects a device on user premises to an Nways Switch and serves as a port to the 2220 network. Port lines have different protocols and interfaces.

position.   When configuring an Nways Switch, the position parameter indicates the line attachment number on the LIC module (1 to 8, depending on the LIC type).

potential connection.   A predefined connection through a 2220 network between two HDLC, CES, or frame-relay devices.

PPP.   Point-to-point protocol.

PRA.   Primary Rate Access.

private branch exchange (PBX).   A switching system located on a user premises that relays inside lines (extensions) and provides access to the public telephone network.

PRS.   Primary reference source.

PSDN.   Packet switched data network.

PSN.   Public switched network.

PSTN.   Public switched telephone network.

PTF.   Program temporary fix.

PTM.   Packet transfer mode.

PTNX.   Private telecommunications network exchange.

pulse code modulation (PCM).   A standard adopted for the digitalization of analog voice signals. In PCM, voice is sampled at a rate of 8 kHz and each sample is coded in an 8-bit frame.

PVC.   Permanent virtual circuit.

Q signaling (QSIG).   An international standard for signaling procedures in private telecommunication networks. It applies to the PBX-to-Nways Switch interface, which is called the Q reference point.

QoS.   Quality of service.

QSIG.   Q signaling.

quality of service (QoS).   In a 2220 network, a set of parameters that guarantees the characteristics of a connection, mainly its end-to-end delay, delay variation, and packet loss tolerance.

RABM.   Router and Bridge Manager.

rack.   A metallic structure, with a standard 19-inch width, that houses the hardware elements of an Nways Switch, that is, logic subrack with modules, fan boxes, and power units.

When configuring an Nways Switch, the rack parameter indicates the 2220 Model (rack A is the Model 300 or 500, and rack B is the Model 501).

RDI.   Remote defect indication.

real-time processing.   Refers to the manipulations of data that are required, or generated, by certain process while the process is in operation. Usually, the results influence the process and, perhaps, related processes.

remote user console.   A station running OS/2, TCP/IP, and Nways Switch Resource Control. It can be connected to the NAS of an Nways Switch to remotely control and service it.

resource.   In an Nways Switch, a hardware element or a logical entity created by the Control Program. Adapters, modules, and line attachments are examples of physical resources. Control points, logical trunks, logical ports, and network interfaces are examples of logical resources.

resource profile.   A record of the characteristics of an Nways Switch resource. It includes (for example) the

part number or module name, the change level, and the name and phone number of the person to contact when a problem occurs.

RETAIN. Remote Technical Assistance Information Network

RIP. Route Information Protocol.

router. An attaching device that connects two LAN segments of the same or different architectures. It can also be connected to a wide area network. A router works at the network level (layer 3) of the OSI reference model by determining the best paths for network traffic flows.

Router And Bridge Manager. An application that provides distributed management for routers such as the IBM 2210 or 2216, bridges such as the IBM 8229, and communication controllers such as the IBM 3746 in IP mode.

RS. Recommended specification.

RSF. Remote support facility.

RSN. Receive sequence number.

RT. Real-time.

RVX. RS/EIA-232, V.24/V.35, X.21.

s. Second.

SCR. Sustainable cell rate.

SDH. Synchronous digital hierarchy.

SDLC. Synchronous data link control.

SDT. Structured data transfer.

serial line internet protocol (SLIP). A TCP/IP protocol used on a point-to-point connection between two IP hosts over a serial line (for example, an RS/EIA-232 connection to a modem over a telephone line).

SLA. Serial link architecture.

SLIP. Serial line internet protocol.

slot. When configuring an Nways Switch, the slot parameter indicates the module location (1 to 12) in the logic subrack.

SNA. Systems Network Architecture.

SNMP. Simple Network Management Protocol.

SONET. Synchronous optical network.

spanning tree. See CP spanning tree.

SRC. System reference code.

SSN. Send sequence number.

station. A microcomputer that is connected to a host or a network and at which a user can run applications.

STM-1. Synchronous transport module type 1.

STS-3c. Synchronous transport signal type 3 concatenated.

SUB. Subaddress.

subrack. A metallic structure installed in an Nways Switch rack. A logic subrack holds modules. A power subrack holds power supply components.

SVC. Switched virtual circuit.

SW. Switch (module).

switch module (SW). A module of the 2220 Model 300 or 500 that interconnects the adapters through an ATM cell switch. It can have a backup.

switch redrive (SWRD). A module of the 2220 Model 501 that drives the signals from the switch module in the Model 500 to the adapters of the Model 501. It can have a backup.

SWRD. switch redrive (module)

switched virtual circuit (SVC). A connection set up from a calling address to a called address following a call establishment protocol. It is released when a clear request signal is received.

synchronous digital hierarchy (SDH). A international recommendation for the internal operation of carrier optical networks.

synchronous optical network (SONET). A U.S. standard for transmitting digital information over optical interfaces. It is closely related to the international recommendation for synchronous digital hierarchy (SDH).

T1 standard. A TDM digital transmission service with a basic rate of 1.544 Mbps. Also called DS-1.

T3 standard. A TDM digital transmission service with a basic rate of 44.736 Mbps. A T3 line can transport up to 28 T1 circuits. Also called DS-3.

TCPA. Trunk and control point adapter.

TCP/IP. Transmission Control Protocol/ Internet Protocol.

TDM.   Time division multiplexing.

TE.   Terminal equipment.

Telnet.   In TCP/IP, an application protocol that allows a user at one site to access a remote system as if the display station were locally attached. Telnet uses the Transmission Control Protocol (TCP) as the underlying protocol.

time division multiplexing (TDM).   The process of breaking the bandwidth on a communication line into a number of channels, possibly of different size.

TME.   Tivoli Management Environment.

TMN.   Telecommunication Management Network.

TPA.   Trunk or port adapter.

Transmission Control Protocol/ Internet Protocol (TCP/IP).   A set of communication protocols that support peer-to-peer connections over both local and wide area networks.

transport services.   Functions that are performed by a trunk adapter of an Nways Switch to:

- Support the attachment of trunk lines

- Maximize bandwidth utilization

- Guarantee the quality of service of a connection

- Transfer packets between Nways Switches

- Manage logical queues and schedule transmission.

trunk.   See logical trunk.

trunk adapter.   In an Nways Switch, a module that provides transport services to one or more trunk lines. Each trunk adapter is associated with a line interface coupler (LIC).

trunk line.   In a 2220 network, a high-speed line connecting two Nways Switches. It can be, for example, a copper cable, optical fiber, or radio wave guide and can be leased from telecommunication companies.

UBR.   Unspecified bit rate. A best effort service with no quality commitment.

UNI.   User network interface.

UPC.   Usage parameter control.

URL.   Uniform resource locator.

user network interface (UNI).   A standardized interface between a user and a communication network.

UTC.   Universal time, coordinated.

UUS.   User-user signaling.

VBR.   Variable bit rate.

VC.   Virtual channel.

VCC.   Virtual channel connection.

VCI.   Virtual channel identifier.

VCN.   Virtual circuit number.

virtual channel (VC).   In ATM, a unidirectional route between two ATM devices. Virtual channels always come in pairs, one in each direction. They follow virtual paths.

virtual channel connection (VCC).   In ATM, a unidirectional connection established over a virtual channel. Virtual channel connections always come in pairs, one VCC in each direction.

virtual channel identifier (VCI).   In ATM, the unique numeric tag that identifies every channel. It is defined by a 16-bit field in the ATM cell header.

virtual connection.   In frame relay, the return path of an FR potential connection.

virtual path (VP).   In ATM, a group of virtual channels that are switched together as one unit. (Also called VC service.)

virtual path connection (VPC).   In ATM, a connection established over a virtual path. Virtual path connections always come in pairs, one VPC in each direction. (Also called VP service.)

virtual path identifier (VPI).   In ATM, an 8-bit field in the ATM cell header that indicates the virtual path over which the cell is to be routed.

voice server adapter (VSA).   In an Nways Switch, a module that supplies additional voice functions to voice connections operating in pulse code modulation at 64 kbps. It can attach a voice server extension (VSE).

voice server extension (VSE).   In an Nways Switch, a module associated with a voice server adapter (VSA) to supply voice functions to an extended number of PCM voice connections.

VP.   Virtual path.

VPC.   Virtual path connection.

VPD.   Vital product data.

VPI.   Virtual path identifier.

VPN.   Virtual private network.

VSA. Voice server adapter (module).

VSEn. Voice server extension type n (module).

WAN. Wide area network.

wide area network (WAN). A network that provides communication services to a large geographic area. It can use or provide public communication facilities.

window. On the screen of a station, an area with a title bar, a menu bar, and scroll bars.

X.25 hunt group. A group of X.25 network interfaces associated with one common subscriber address. If an interface is busy, the connection searches (hunts) for the other interfaces of the group until a free one is found.

X.25 network interface. A logical resource generated by the Nways Switch Control Program to provide access services to a physical X.25 port line. An X.25 network interface sets up and maintains connections between calling X.25 subscribers and called subscribers attached to other Nways Switches.

X.25 Recommendation. An international standard for the interface between data terminal equipments and packet-switched networks.

X.25 subscriber. An X.25 end-user connected to an X.25 network interface through a DTE. A subscriber is defined by an address and a logical name.

Bibliography

This section lists prerequisite and related publications.

Nways Switch Publications

- *2220 Nways BroadBand Switch At a Glance, an Overview*, GA33-0292
- *2220 Nways BroadBand Switch Planning Guide*, GA33-0293
- *2220 Nways BroadBand Switch Configuration Guide*, GA33-0474
- *2220 Nways BroadBand Switch Physical Lines Interface Specifications, External Cable References*, GA33-0379
- *2220 Nways BroadBand Switch Frame Relay Interface Specifications*, GA33-0374
- *2220 Nways BroadBand Switch HDLC Interface Specifications*, GA33-0375
- *2220 Nways BroadBand Switch CES Interface Specifications*, GA33-0376
- *2220 Nways BroadBand Switch ATM Interface Specifications*, GA33-0378
- *2220 Nways BroadBand Switch X.25 Interface Specifications*, GA33-0413
- *2220 Nways BroadBand Switch ISDN Interface Specifications*, GA33-0447
- *How to use the NAS*, online tutorial[1]
- *2220 Nways BroadBand Switch Setup Guide*, SY33-2105 (P/N 59G0544)
- *2220 Nways BroadBand Switch Service Guide*, SY33-2121 (P/N 02L4247)
- *Nways Switch Administration Station Setup and Service Guide (Based on 7585)*, SY33–2122 (P/N 02L4248)
- *Nways Switch Administration Station Setup and Service Guide (Based on 6282)*, SY33–2123 (P/N 02L4249)
- *Nways Switch Administration Station Setup and Service Guide (Based on 6275)*, SY33–2129 (P/N 42L2846)
- *2220 Nways BroadBand Switch Models 300, 500, and 501*; *Safety Information*, GA33-0401 (P/N 80G4908)

Nways 2220 Switch Manager Publications

- *IBM Nways 2220 Switch Manager for AIX Installation Guide*, SH11-3088
- *IBM Nways 2220 Switch Manager for AIX: Performance Monitoring and Accounting*, GA33-0366
- *IBM Nways 2220 Switch Manager User's Guide*, online manual[2]

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[1] Online documentation delivered with the 2220 Nways Switch Control Program.

[2] Online documentation delivered with the Nways 2220 Switch Manager product.

Related Publications

- *Link Problem Determination Aid*, SY33-2064

- *Power Supply and Telecommunication Connections*, GA33-0054

- *IBM 7855 Guide to Operation*, GA33-0160

- *IBM 7857 Guide to Operation*, GA13-1839

- *IBM 7858 Professional Modem Guide to Operation*, GA13-1981

- For 7585 Model 001: *7585 Industrial Computer Information: Installation, Operation, Hardware Maintenance*, S06H-2298

- For 7585 Model P02: *7585 P02 Industrial Computer PCI/ISA: Information, Installation, Operation, Hardware Maintenance*, S76H-3792

- *IBM Personal Computer 300 Series, 700 Series, IntelliStation; Hardware Maintenance Manual*, S83G-7789

- *Planning for Enterprise Systems Connection Links* GA23-0367

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2220 Nways BroadBand Switch
Models 300, 500, and 501
Planning Series
Physical Lines Interface Specifications
External Cable References

Publication No. GA33-0379-06

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