30-000   Multiline Communications Adapter

CONTENTS

30

30-010 INTRODUCTION

The multiline communications adapter (MLCA) is a processor controlled attachment giving System/34 the ability to concurrently control one to four communications lines. On each communications line, the System/34 can function as a primary station (SDLC only) or as a terminal in a point-to-point or multipoint network. The hardware associated with each line is described as line 1, line 2, line 3, or line 4. The MLCA feature uses attachment controller 2 (see MLCA controller in all communication references).

Data is transmitted and received serial-by-bit and serial-by-character over voice-grade (or equal to) communications networks (switched or nonswitched), or over DDSA. The system may be connected to a half-duplex or duplex network, but the adapter operates in half-duplex mode only; that is, data transmission is in only one direction at a time.

During transmit operations, data is sent from main storage to buffers in MLCA controller storage. Then, each byte to be transmitted is sent to the communications adapter where the data is put in serial form and sent 1 bit at a time to the modem or digital adapter. The modem or digital adapter then sends the bits to the receiving terminal over the communications network.

During receive operations, the communications adapter receives each bit from the modem and assembles the bits into bytes (deserializes). Each byte of data is then sent to buffers in MLCA controller storage. Data is then sent from the buffers into main storage for processing.

30-100 LOCATIONS

Figures 30-1 through 30-7 show the locations of the major parts used in the multiline communications adapter.

2

A-B3
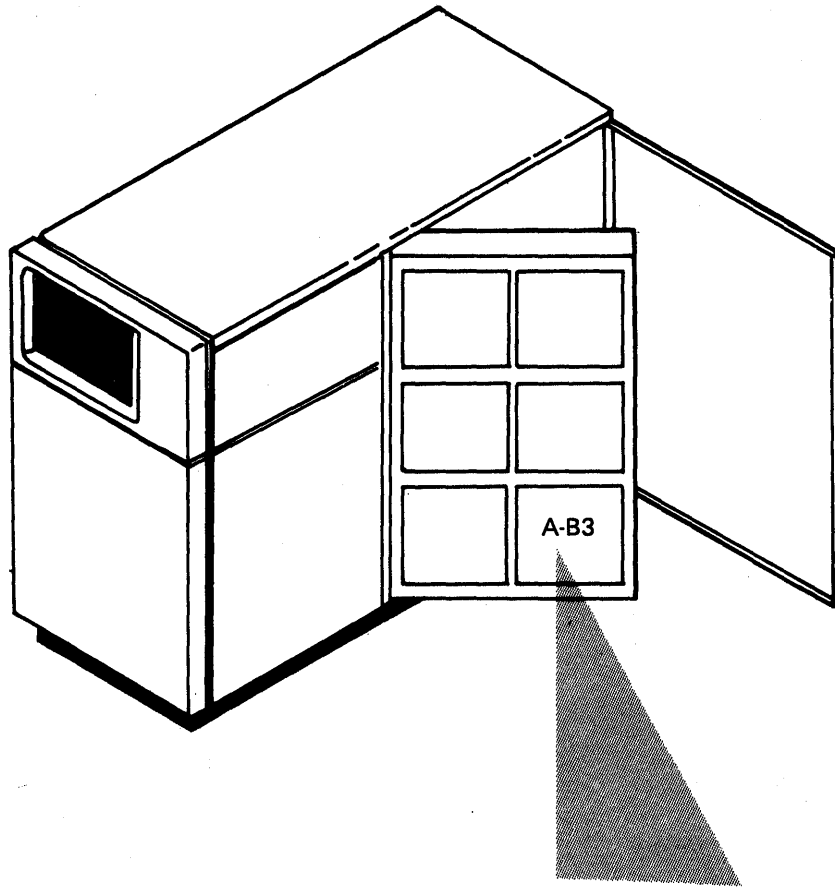
MLCA
Attachment

Figure 30-1. MLCA Attachment Location on A-Gate

Multiline Communications Adapter   3

Line Plates for:
1200 BPS Integrated Modem for
World Trade Public
Switched Network
or
4800 Switched Network
(incorporated protective coupler,
coupler adapter, or World
Trade coupler)

Line 1   Line 2   Line 3   Line 4

IBM 4800 BPS Integrated
Modem Operator Panels
(only two per system)

D-B6, D-B7, and D-B8
Cable Locations for
MLCA

Line 2   Line 3
Line 1   Line 4

(see 30-410)

Figure 30-2. Cable Tower and Line Plates

4

30-100

A-B3 Board

Column headers: A B C D E F G H J K L M N P Q R S T U V

- CABLE CE SW
- CHANNEL CABLE 1 IN / CHANNEL CABLE 2 IN / CHANNEL CABLE 3 IN / CABLE CE IND
- SPARE
- MLCA CONTROLLER CHANNEL
- MLCA CONTROLLER DATA FLOW
- STORAGE / SPARE
- CA 1
- CA 2
- CA 3
- CA 4
- SPARE
- LA 1 / LA 3
- LA 2 / LA 4
- 4800 BPS MODEM A
- 4800 BPS MODEM A
- 4800 BPS MODEM A
- 4800 BPS MODEM B
- 4800 BPS MODEM B
- 4800 BPS MODEM B
- INTERNAL CHANNEL / CLOCK TERMINATOR / 4800 BPS CABLE A / 4800 BPS CABLE B
- LINE ADPT / LINE ADPT / LINE ADPT / LINE ADPT — CABLE 1 OUT / CABLE 2 OUT / CABLE 3 OUT / CABLE 4 OUT
- 4800 OP PANEL CABLE A
- 4800 OP PANEL CABLE B

Card Locations

Location	Description	
B3-C2	MLCA Controller Channel	Attachment
B3-D2	MLCA Controller Data Flow	Controller 2
B3-E2	Storage	
B3-F2	Communications Adapter 1	
B3-G2	Communications Adapter 2	
B3-H2	Communications Adapter 3	
B3-J2	Communications Adapter 4	
B3-L2	Line Adapter 1	1200 BPS Integrated Modem
B3-M2	Line Adapter 2	EIA/CCITT
B3-L4	Line Adapter 3	DDSA
B3-M4	Line Adapter 4	Analog Wide Band Adapter*
B3-U2	Internal Clock	Autocall**
B3-N2		X.21
B3-P2	4800 BPS Integrated Modem A	
B3-Q2		
B3-R2		
B3-S2	4800 BPS Integrated Modem B	
B3-T2		

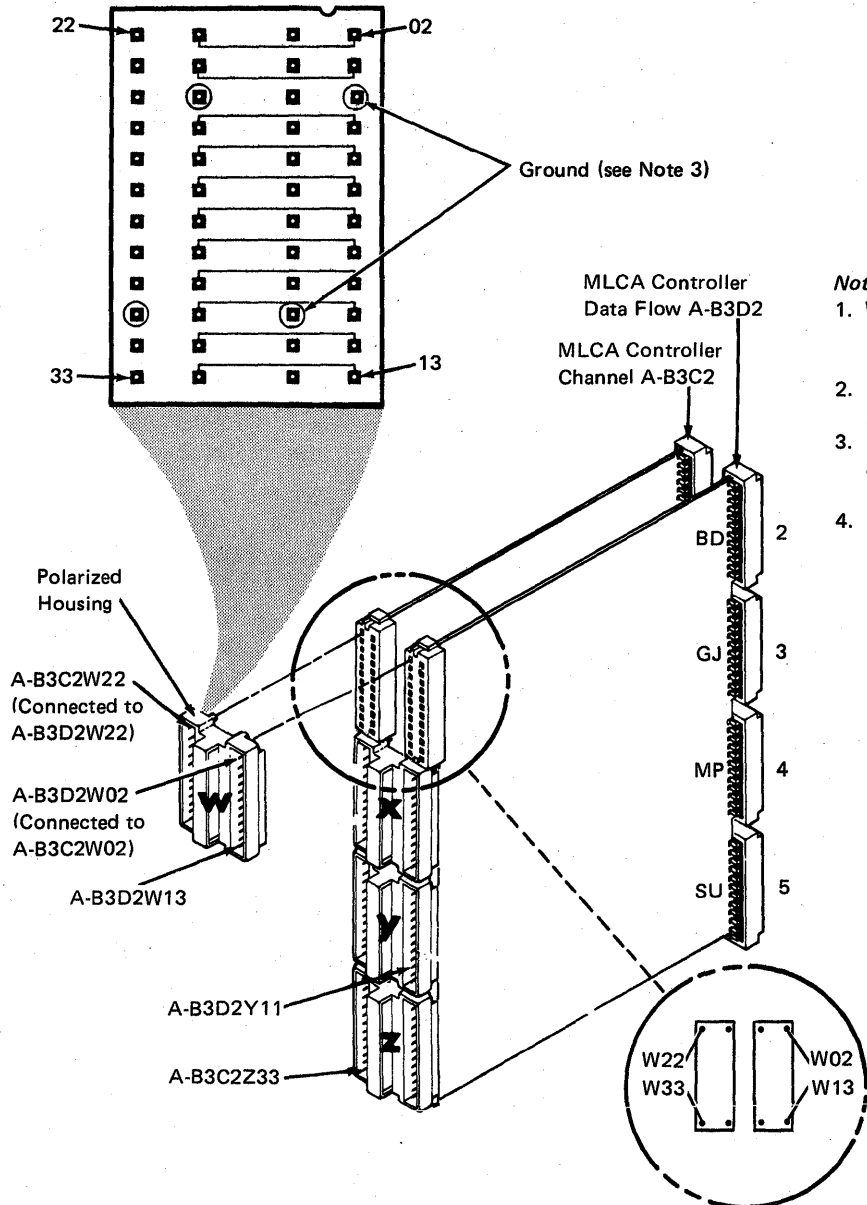*Maximum of one per system
**Maximum of two per system

Cables

- Locations A2, A3, and A4 are channel cables 1, 2, and 3 (in), respectively.

- Location U3 contains a channel terminator card.

- Location U4 is the cable out for the first (A) 4800-bps integrated modem, and location U5 is the cable out for the second (B) 4800-bps integrated modem.

- Location Z5 is the cable out to the first (A) 4800-bps integrated modem operator panel, and location Z6 is the cable out to the second (B) 4800-bps integrated modem operator panel.

- Locations V2, V3, V4, and V5 are the cables out for line adapters 1, 2, 3, and 4, respectively.

Figure 30-3. MLCA Card and Cable Locations

22 ———► 02

Ground (see Note 3)

33 ———► 13

MLCA Controller
Data Flow A-B3D2

MLCA Controller
Channel A-B3C2

BD 2

GJ 3

MP 4

SU 5

Polarized
Housing

A-B3C2W22
(Connected to
A-B3D2W22)

A-B3D2W02
(Connected to
A-B3C2W02)

A-B3D2W13

W

A-B3D2Y11

X

Y

A-B3C2Z33

Z

W22   W02
W33   W13

Notes:
1. W and Z shrouds and top connectors on cards C2 and D2 are turned 180° from those on the X and Y connectors.
2. All the top card connector pins can be probed.
3. Pins 04 and 31 of the top card connectors are tied together by an internal plane to ground.
4. Pin W26 is connected to +5 volts.

Figure 30-4. MLCA Controller Top Card Connectors

6
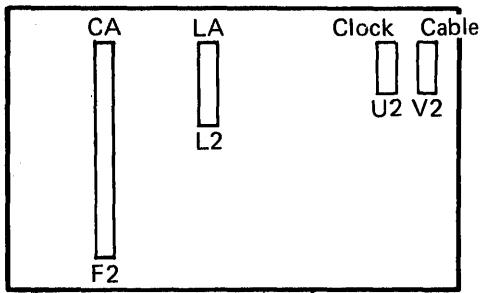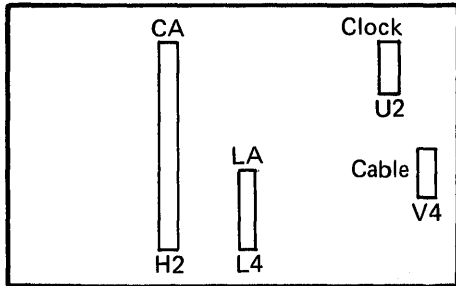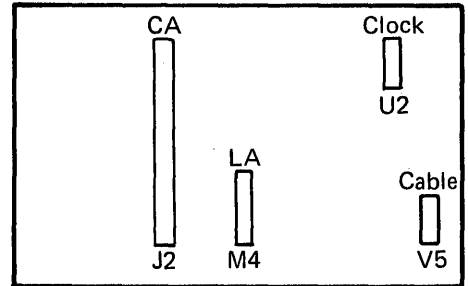
CA   Communications Adapter
LA   Line Adapter
   ● EIA/CCITT
   ● 1200 BPS Integrated Modem
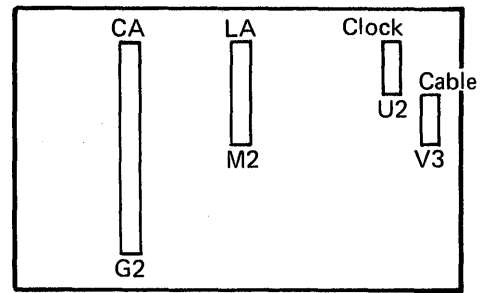   ● DDSA
   ● Analog Wideband (one per system, max.)
   ● Autocall (two per system, max.)
   ● X.21

Figure 30-5. Communications Lines (A-B3 Board)
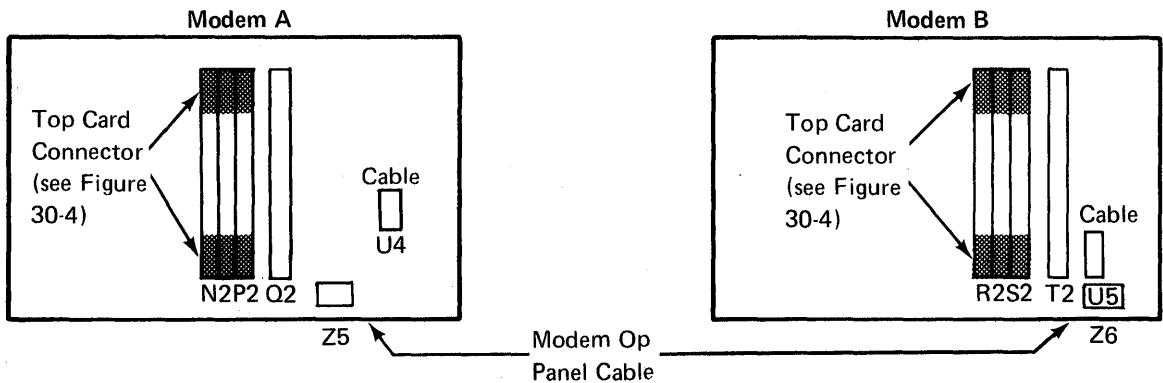
Note: Either modem can be attached to any line and any communications adapter.

Figure 30-6. 4800 BPS Integrated Modem (A and B) (A-B3 Board)

30-110   External Cables

The cable tower locations of the external cables are
shown in Figure 30-7. See the individual line adapter
sections for internal cable locations.

DDSA
1200 BPS Integrated Modem for World Trade
  Public Switched Network (PSN)
4800 BPS Integrated Modem for Switched
  Network
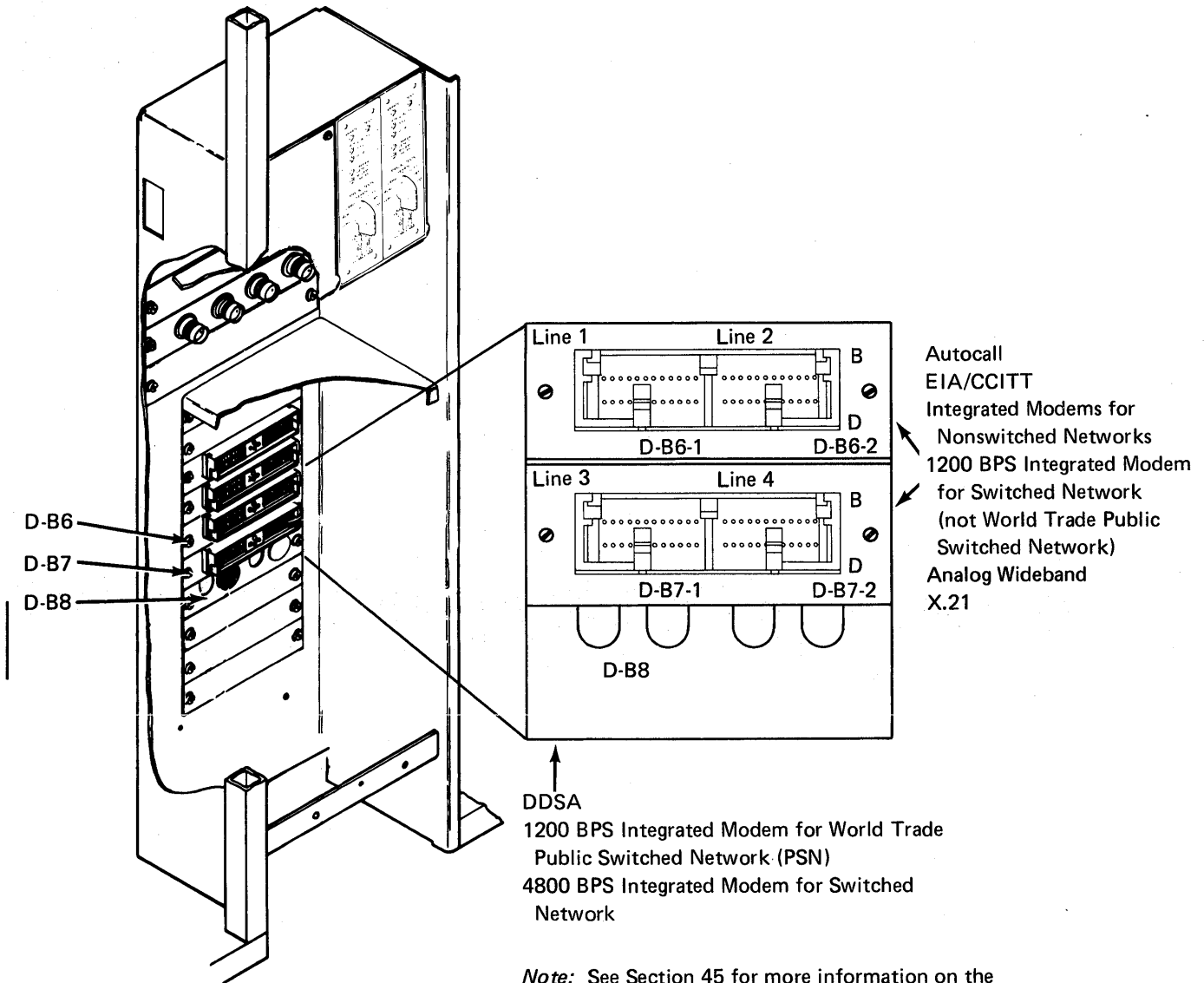
Note: See Section 45 for more information on the
cable connector and the lightning protect card.

Figure 30-7. Cable Tower Locations for External Cables

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30-200 ADAPTER CARD

The communications adapter cards are the common interface between System/34 and all modems. Each card has six switches; set them for each line as instructed in Figure 30-8.

Line 1 A-B3F2
Line 2 A-B3G2
Line 3 A-B3H2
Line 4 A-B3J2

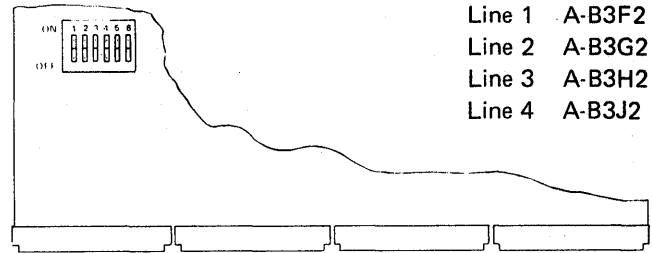| Switch	Condition	Meaning
1	On	Continuous carrier (the 'request to send' line is always on). This option can be used only on a 4-wire nonswitched line on a point-to-point network or on a multipoint control station.
	Off	Not continuous carrier (set off for DDSA or autocall).
2	On	The line speed is equal to or less than 9600 bps (set on for autocall).
	Off	The line speed is greater than 9600 bps (analog wideband or 56K-bps DDSA).
3	On	Enable rate select interface lead for EIA, autocall, analog wideband, X.21, or 4800-bps integrated modem (allows microcode control over the rate select interface lead).
	Off	For DDSA or 1200-bps integrated modem.
4	On	Not NRZI coding.
	Off	NRZI coding used.
		Note: The customer can use BSC and/or SDLC on the same communications line. Therefore, the following information is important to the setting of the NRZI switch (switch 4) on the adapter card: • The NRZI switch setting must match the option chosen in the configuration for diagnostics to work correctly. • If the customer is operating with only BSC or with DDSA, select not NRZI (switch 4 is set on). • Select not NRZI for autocall. • BSC microcode disables the NRZI function regardless of the switch setting. • Only SDLC uses NRZI, but the selection of NRZI depends on the following: – If the customer is operating with SDLC (or with SDLC and BSC on the same communications line), the switch setting and the configuration record must be set for SDLC operation. – The NRZI switch setting depends on the remote device and on the modem being used. For SDLC, all data terminal equipment communicating with each other must select the same coding option (NRZI or not NRZI). Contact your IBM marketing representative for identification of those modems that have pattern sensitive synchronization problems, and to determine which coding option should be used. When PTT mandatory modems are used in World Trade, refer to the *IBM World Trade Signal Converter Handbook*, ZZ19-6066. This manual will help determine which coding option should be used.

Figure 30-8 (Part 1 of 2). Communications Adapter Card

Switch	Condition	Meaning		
5-6		Device address selection	Jumper adapter microinterrupt request to interrupt level	
		5 6 Device Address	Jumper (see note)	Interrupt level
		Off Off 10	A-B3XXJ09 to A-B3C2M05	3
		Off On 20	A-B3XXJ09 to A-B3C2M05	3
		On On 40	A-B3XXJ09 to A-B3C2M05	3
		On Off 80	A-B3XXJ09 to A-B3C2P05	2
		Each communications line must use a different device address. With the exception of the high-speed line, the lines may use any address, but the device address must be the same as the address selected in the line's configuration record. If a high-speed line is installed (line speed greater than 9600 bps), this line must use device address 80. A general rule to follow is to start with address 10 and use address 80 last. Note: If an X.21 switched line is installed on one or more of the communications line, device address 40 may not be used. The device address of the communications adapter in the unit definition table (UDT) and in the configuration record is X'8X'; where 8 is the MLCA controller address (X'80') from the control storage processor, and X is either 1, 2, 4, or 8 for the communications line adapter address (10, 20, 40, or 80) from the MLCA controller. Note: XX is communications adapter F2 (line 1), G2 (line 2), H2 (line 3), or J2 (line 4).		

Figure 30-8 (Part 2 of 2). Communications Adapter Card

30

30-300   1200 BPS INTEGRATED MODEM

30-310   Locations

Four different 1200-bps integrated modems can be used with MLCA on System/34. Each modem is contained on one card and all are plug compatible in the same card socket. The modem that is used relies on the network type. An internal clock card (A-B3U2) must be installed with the 1200-bps integrated modem to supply business machine clocking.

Figures 30-9 through 30-11 show the terminate connections of the internal cables used with the different modems. For switched networks, the cables are terminated at the cable tower; for World Trade public switched networks, the cables are terminated at the line plate; and for nonswitched networks, the cables are terminated at the lightning protect card at the cable tower. Figures 30-9 through 30-11 show only the parts for line 1. If the 1200-bps integrated modem is installed on line 2, 3, or 4, see Figures 30-5 and 30-7 for hardware locations.

Note: If the 1200-bps integrated modem is installed on line 2, 3, or 4, see Figures 30-5 and 30-7 for hardware locations.

SH	Switch Hook
SG	Signal Ground
DA	Data Modem Ready
CCT	Coupler Cut Through
OH	Off Hook
RI	Ring Indicate
DT	Data Tip
DR	Data Ring
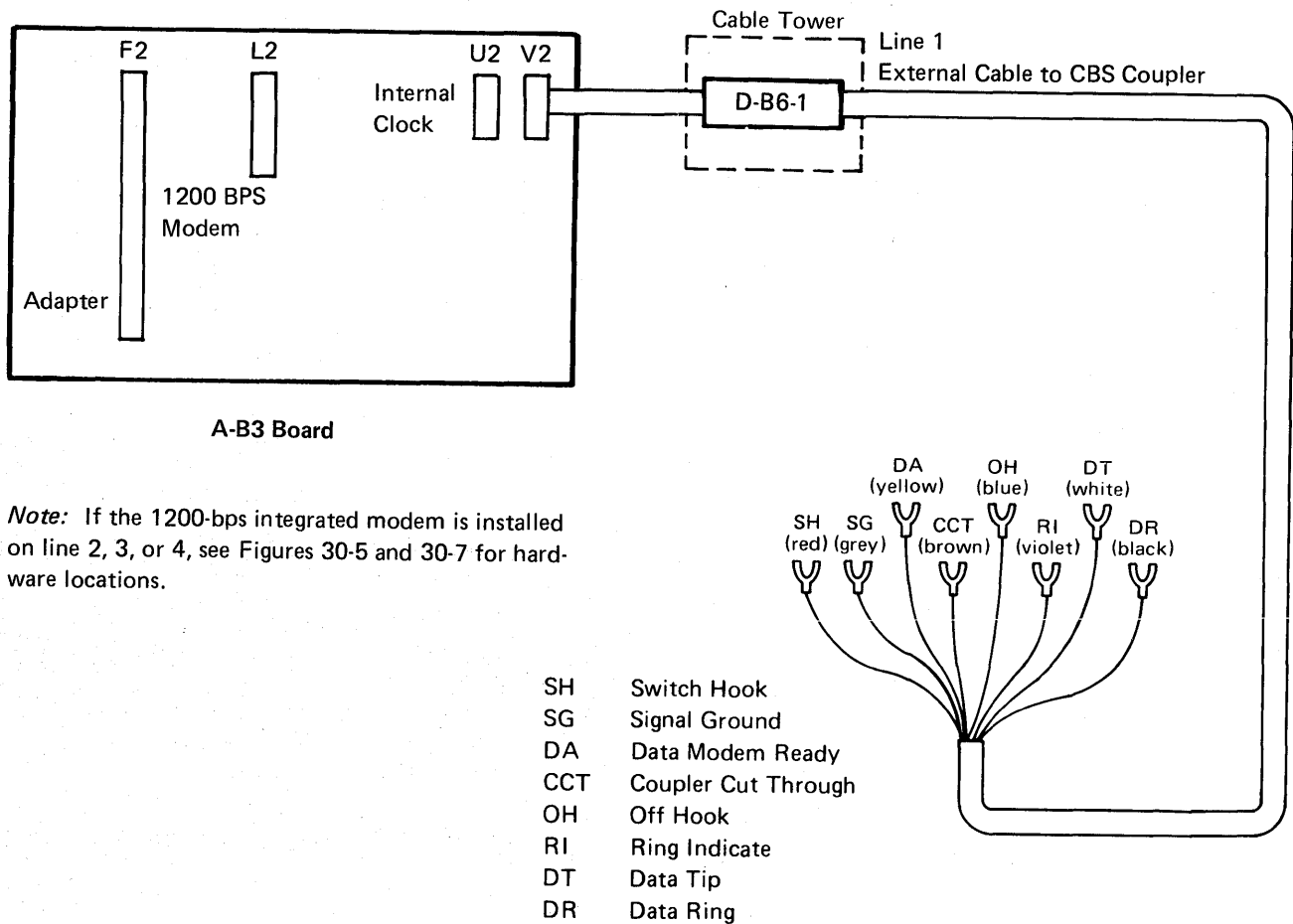
Figure 30-9. 1200 BPS Integrated Modem–Switched Network (Line 1)
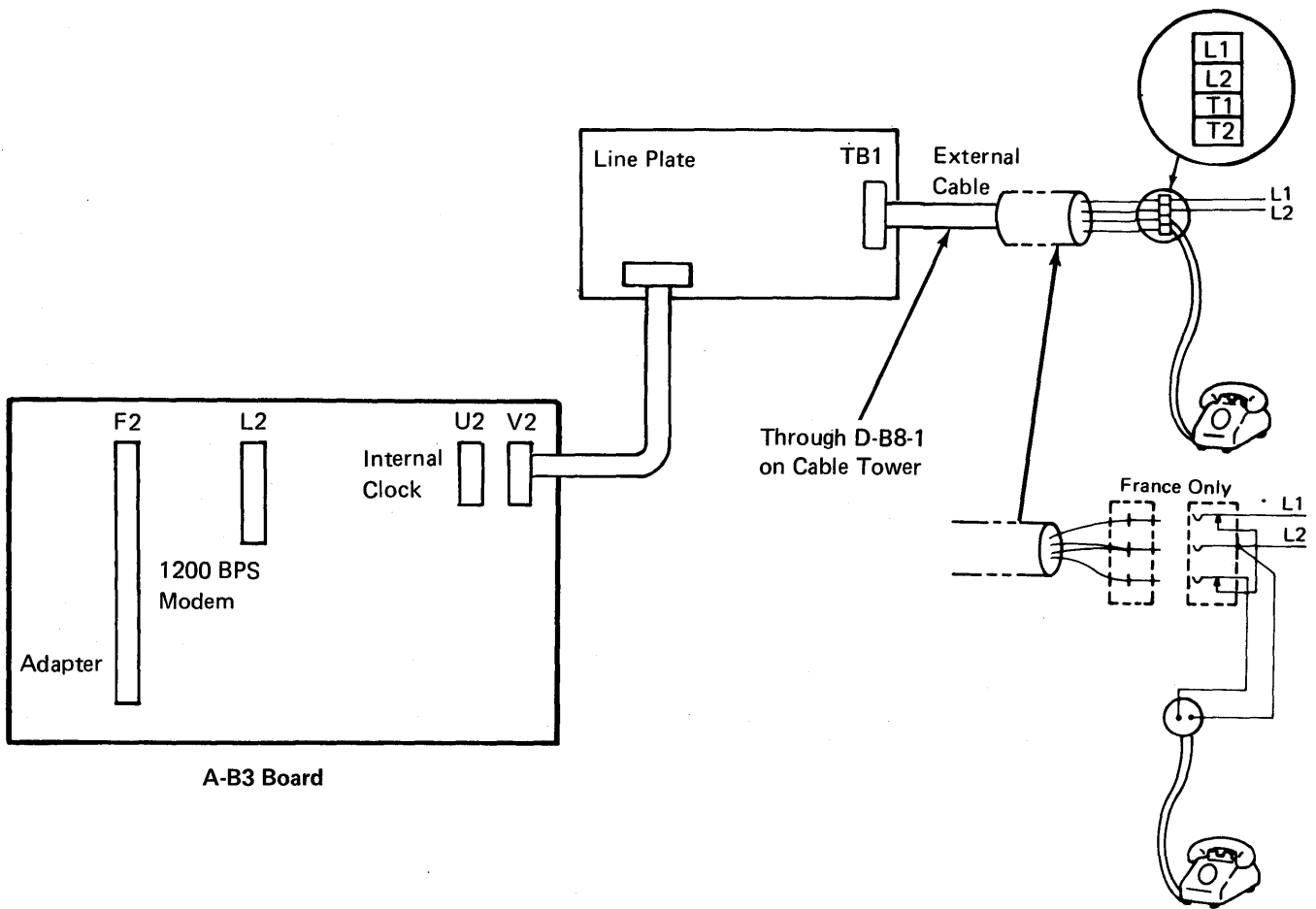
12   30-300

External Cable

Line Plate	Cable	Telephone Plug
TB1-6	Handset 2 (T2)	Black
TB1-7	Handset 1 (T1)	Yellow
TB1-8	Telephone 1 (L2)	White
TB1-9	Telephone 2 (L1)	Red

Note: If the 1200-bps integrated modem is installed on line 2, 3, or 4, see Figures 30-5 and 30-7 for hardware locations.

Figure 30-10. 1200 BPS Integrated Modem—World Trade Public Switched Network (Line 1)

Figure 30-11. 1200 BPS Integrated Modem—Nonswitched Network (Line 1)

Because of different networks, the 1200-bps modem card can be one of four different cards. Each of these cards has at least 16 switches that must be set as described in Figures 30-12 through 30-15.
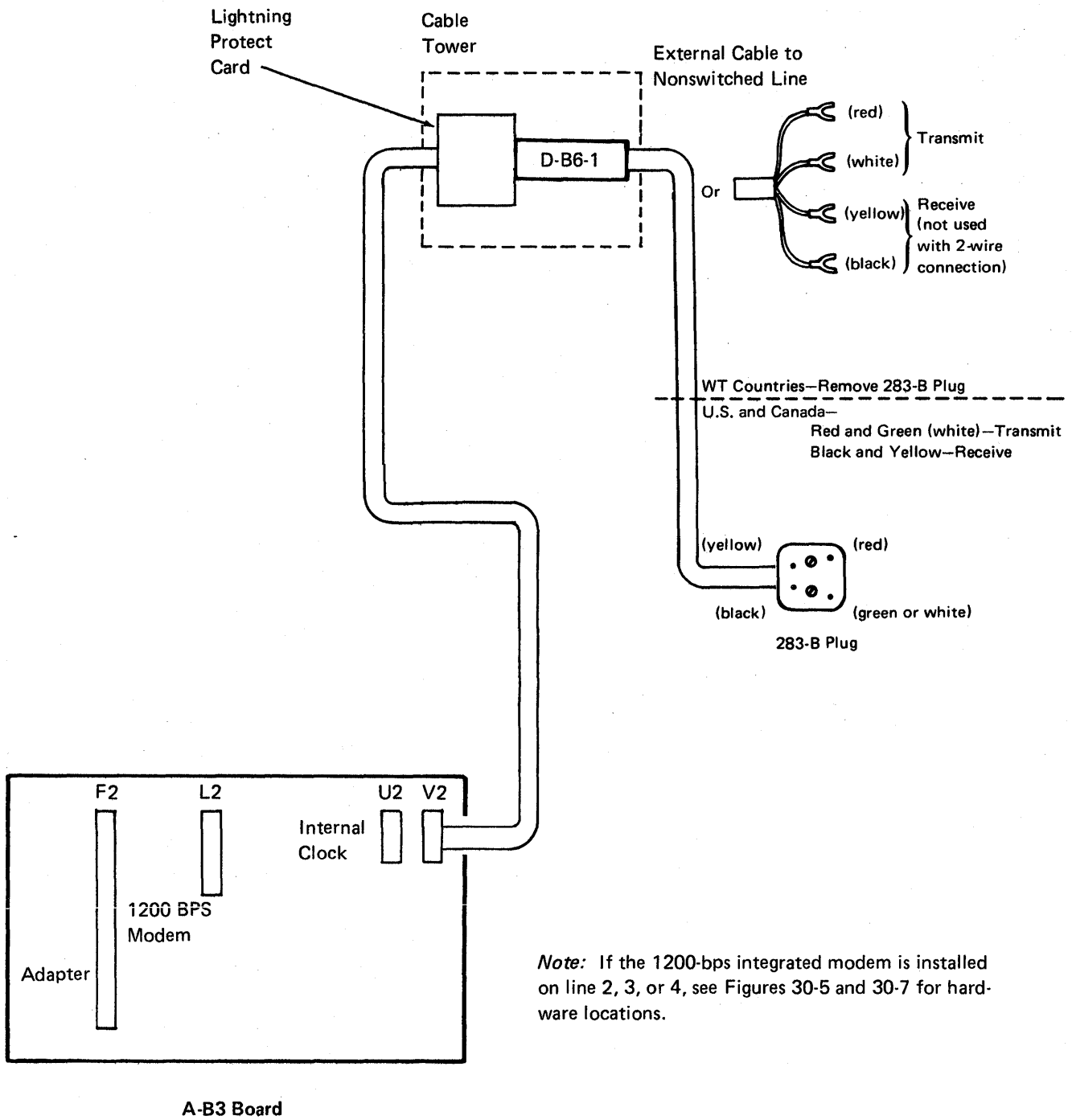

Switches

R	H	8
P	G	7
N	F	6
M	E	5
L	D	4
K	C	3
J	B	2
I	A	1

Line 1   A-B3L2
Line 2   A-B3M2
Line 3   A-B3L4
Line 4   A-B3M4
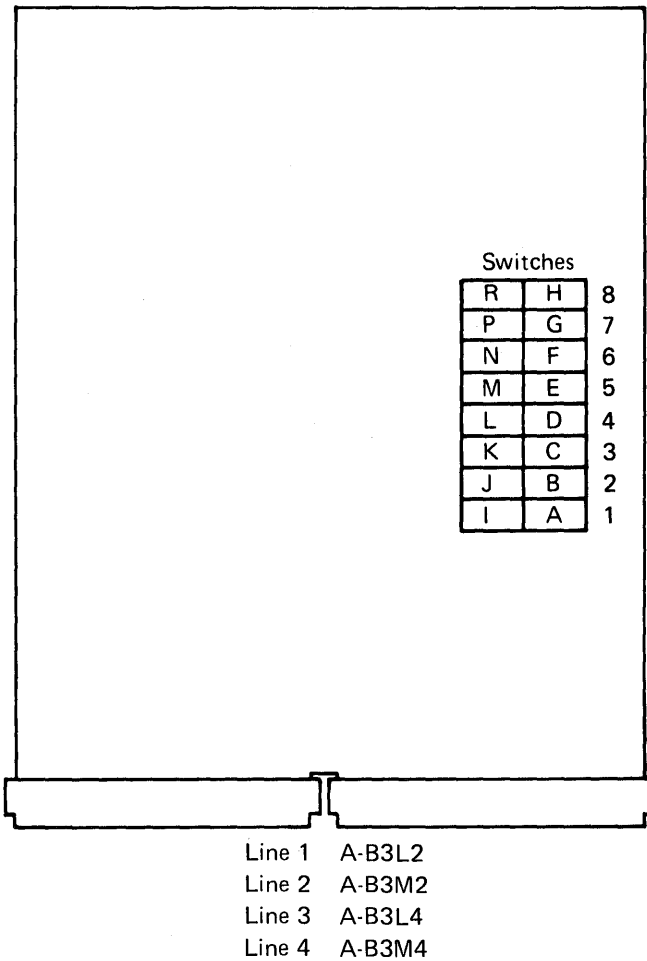
Set switches J and K on and switches L, M, N, P, and R off. Set the transmit level switches A through I, as shown in the table at the right.

Note: Switches N and P are set off for a clear-to-send delay of 230 ms, and switch L is set off for an echo clamp delay of 150 ms.

Figure 30-12. Switch Settings for Switched Network

Transmit Level

Set the transmit level to match the level specified on the CBS data coupler. A bullet (●) in the table below indicates that the switch must be on to make a selection. Set the switches to the needed transmit level.

Level in Decibels	Transmit Level Switches								
	A	B	C	D	E	F	G	H	I
0	●								
-1		●							
-2			●						
-3				●					
-4					●				
-5						●			
-6	●						●		
-7		●					●		
-8			●				●		
-9				●			●		
-10					●		●		
-11						●	●		
-12	●							●	
-13		●						●	
-14			●					●	
-15				●				●	
-16					●			●	
-17						●		●	
-18	●								●

30

Switches

R	H	8
P	G	7
N	F	6
M	E	5
L	D	4
K	C	3
J	B	2
I	A	1

Line 1   A-B3L2
Line 2   A-B3M2
Line 3   A-B3L4
Line 4   A-B3M4

Figure 30-13. Switch Settings for Nonswitched Network

Set switches A through I, M, and R off. The remaining switches are set for:

- 4-wire nonswitched line (set J off and K on)

- 2-wire nonswitched line (set J on and K off)

Also attach the following jumpers:

Line 1   A-B3L2G02 to A-B3L2G09
         A-B3L2J05 to A-B3L2J13
Line 2   A-B3M2G02 to A-B3M2G09
         A-B3M2J05 to A-B3M2J13
Line 3   A-B3L4G02 to A-B3L4G09
         A-B3L4J05 to A-B3L4J13
Line 4   A-B3M4G02 to A-B3M4G09
         A-B3M4J05 to A-B3M4J13

- Clear-to-send delay of:
  - 30 ms; set N off and P on (recommended for a 4-wire nonswitched line).
  - 80 ms; set N on and P off (use only for a special short 2-wire nonswitched line).
  - 230 ms; set N and P off (recommended for a switched line or a 2-wire nonswitched line).

Note: The clear-to-send delay must always be longer than the echo clamp delay.

- Echo clamp delay of:
  - 0 ms; L can be set on or off because the 0-ms delay is automatically selected if the 30-ms clear-to-send delay is selected.
  - 50 ms; set L on nonswitched or switched line).
  - 150 ms; set L off (recommended for a switched line or a 2-wire nonswitched line).

Switches

R	H	8
P	G	7
N	F	6
M	E	5
L	D	4
K	C	3
J	B	2
I	A	1

V
U
T
S

Line 1   A-B3L2
Line 2   A-B3M2
Line 3   A-B3L4
Line 4   A-B3M4

Set switches N, S, T, U, and V on and switch P off.

Set the transmit level switches A through H and R as shown in the table at the right.

The remaining switches are set for:
- 4-wire nonswitched line (set I on and M off)
- 2-wire nonswitched line (set I off and M on)

Also attach the following jumpers:

Line 1   A-B3L2G02 to A-B3L2G09
          A-B3L2J05 to A-B3L2J13
Line 2   A-B3M2G02 to A-B3M2G09
          A-B3M2J05 to A-B3M2J13
Line 3   A-B3L4G02 to A-B3L4G09
          A-B3L4J05 to A-B3L4J13
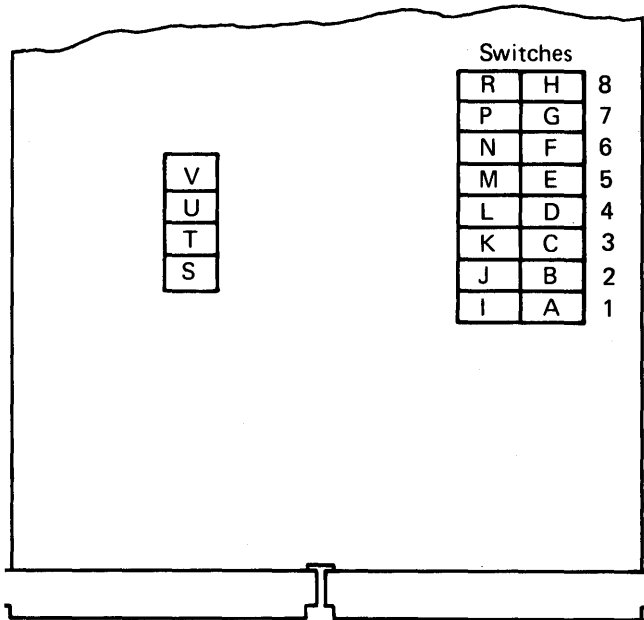Line 4   A-B3M4G02 to A-B3M4G09
          A-B3M4J05 to A-B3M4J13

- Clear-to-send delay of:
  - 30 ms; set K on and J off (recommended for a 4-wire nonswitched line).
  - 80 ms; set K off and J on (use only for a special short 2-wire nonswitched line).
  - 230 ms; set K and J off (recommended for a switched line or a 2-wire nonswitched line).

Note: The clear-to-send delay must always be longer than the echo clamp delay.

Figure 30-14. Switch Settings for World Trade Nonswitched Network

Transmit Level

A bullet (•) in the table below indicates that a switch must be on to make a selection. Set the switches to the needed transmit level.

Level in Decibels	Transmit Level Switches								
	A	B	C	D	E	F	G	H	R
0	•								
-1		•							
-2			•						
-3				•					
-4					•				
-5						•			
-6	•						•		
-7		•					•		
-8			•				•		
-9				•			•		
-10					•		•		
-11						•	•		
-12	•							•	
-13		•						•	
-14			•					•	
-15				•				•	
-16					•			•	
-17						•		•	
-18	•								•

- Echo clamp delay of:
  - 0 ms; L can be set on or off because the 0-ms delay is automatically selected if the 30-ms clear-to-send delay is selected.
  - 50 ms; set L on (nonswitched or switched line).
  - 150 ms; set L off (recommended for a switched line or a 2-wire nonswitched line).

30

Multiline Communications Adapter   17

Switches

R	H	8
P	G	7
N	F	6
M	E	5
L	D	4
K	C	3
J	B	2
I	A	1

Line 1 A-B3L2
Line 2 A-B3M2
Line 3 A-B3L4
Line 4 A-B3M4

Set switches I, J, K, N, P on and switches L and M off. Set the transmit level switches A through H and R as shown in the table at the right while performing the adjustments in 30-360.

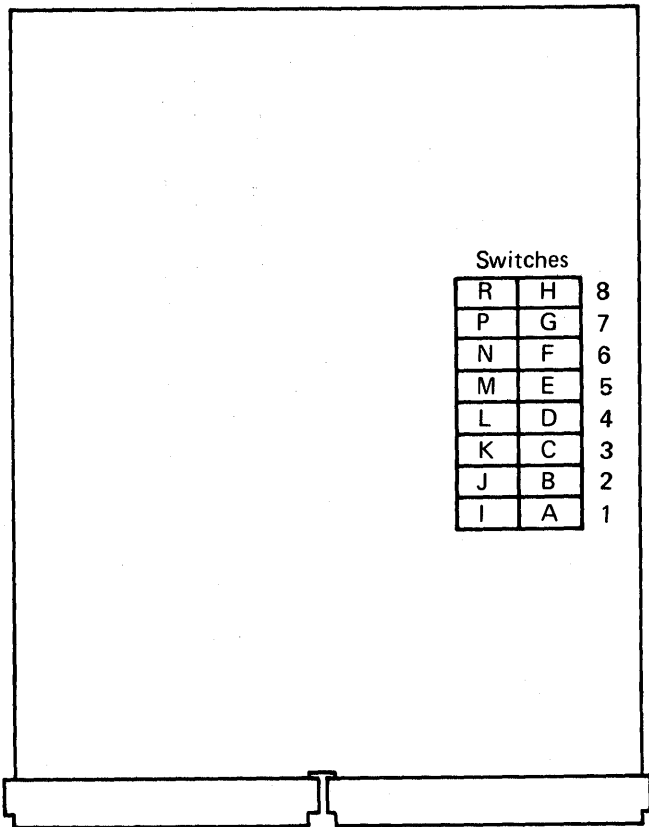**Figure 30-15. Switch Settings for World Trade Public Switched Network (PSN)**

Transmit Level

A bullet (•) in the table below indicates that t switch must be on to make a selection. Set th switches to the needed transmit level.

Level in Decibels	Transmit Level Switches								
	A	B	C	D	E	F	G	H	R
0	•								
-1		•							
-2			•						
-3				•					
-4					•				
-5						•			
-6	•						•		
-7		•					•		
-8			•				•		
-9				•			•		
-10					•		•		
-11						•	•		
-12	•							•	
-13		•						•	
-14			•					•	
-15				•				•	
-16					•			•	
-17						•		•	
-18	•								•

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30

30-360 Line Plate Adjustment

The line plate adjustment is needed only when the network is a World Trade public switched network (PSN).

The DC level of the telephone line must be adjusted between 20 milliamperes and 70 milliamperes. In addition, the level in data status (modem connected to the line) must be as close as possible to the level in talk status (telephone set connected to the line). Therefore, the level is adjusted in two steps:

1. The data station is set to talk status (line plate relay not activated). A jumper is selected determined by the voltage level observed between both wires of the line.

2. The data set is set to data status (line plate relay activated). The voltage level is checked, and a jumper is selected to obtain a voltage level nearest to that observed in talk status.

The line plates are located under the top cover. See Figure 30-2.

> **DANGER**
> Voltage is present on the line plate from the telephone lines.

_____
_____
_____
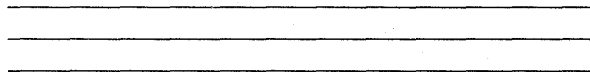
Preparatory Line Plate Adjustments

1. Install input voltage jumpers K, M, and N.

2. When the telephone set is used, install jumper G. When the telephone set is not used, install jumper H.

Line Plate Adjustments with Telephone Set Installed

1. Connect a DC voltmeter (50-Vdc scale) across TP1 (+) and TP2 (-). See Figure 30-16 for the locations of TP1 and TP2.

   Note: Polarity can be reversed with some telephone companies.

2. Set the data station to talk status and pick up the handset.

3. Record the voltage level observed on the meter.

4. Select one jumper position A through F on the line plate by using the line plate jumper table that follows. Select the jumper that matches the voltage level observed in step 3. Ignore jumpers in parentheses at this time.

5. Set the data station to data status by returning the system telephone to its cradle and then installing a jumper from the 'data terminal ready' line to ground to activate the relay on the line plate:

Line 1	A-B3L2B02	to	A-B3L2D08
Line 2	A-B3M2B02	to	A-B3M2D08
Line 3	A-B3L4B02	to	A-B3L4D08
Line 4	A-B3M4B02	to	A-B3M4D08

6. Dial the system from a local telephone. Leave the telephone handset that you are dialing from off the cradle (off the hook).

7. Observe the meter. If the voltage level is different from the level observed in step 3, attempt the jumper position(s) given between parentheses in the line plate jumper table. Select the position that gives the voltage level nearest to that observed in step 3.

8. Return the handset to the cradle (on the hook) and the data station to talk status. (Remove the jumpers that were installed to activate the line plate relay.)

Line Plate (PSN Coupler)

Line Current Adjustment

Line Plate

External Cable

Line Plate	Cable	Telephone Plug
TB1-6	Handset 2 (T2)	Black
TB1-7	Handset 1 (T1)	Yellow
TB1-8	Telephone 1 (L2)	White
TB1-9	Telephone 2 (L1)	Red

Figure 30-16. World Trade PSN Line Plate and Cable Connections

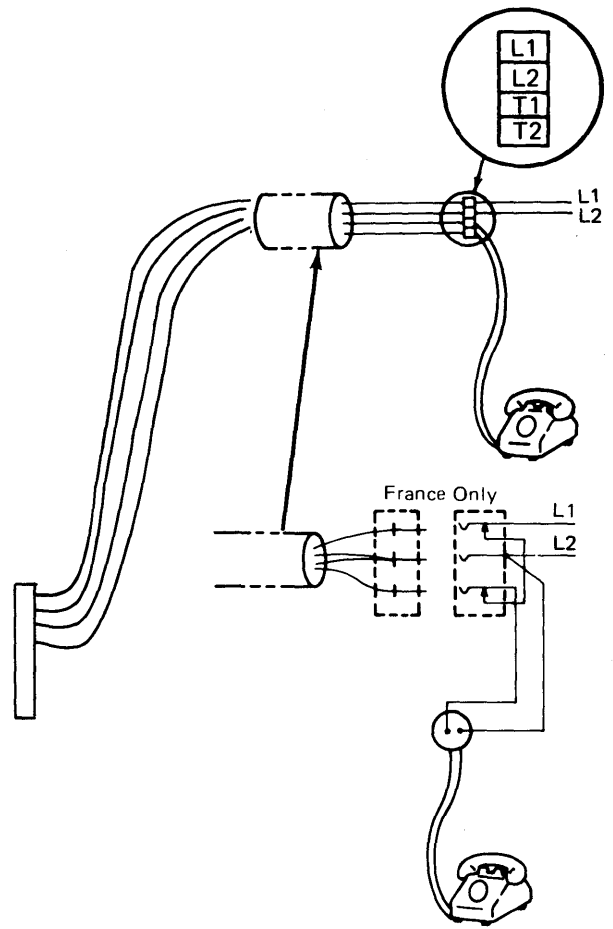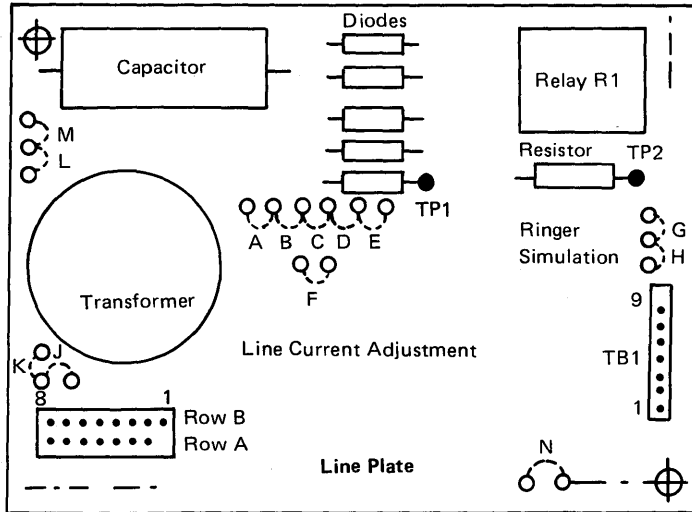*Line Plate Adjustments without Telephone Set Installed*

1. Connect a DC voltmeter (50-Vdc scale) across TP1 (+) and TP2 (-). See Figure 30-16 for the locations of TP1 and TP2.

    Note: Polarity can be reversed with some telephone companies.

2. Install jumper D on the line plate.

3. Set the data station to data status by installing one of the following jumpers to activate the relay on the line plate:

Line 1	A-B3L2B02	to	A-B3L2D08
Line 2	A-B3M2B02	to	A-B3M2D08
Line 3	A-B3L4B02	to	A-B3L4D08
Line 4	A-B3M4B02	to	A-B3M4D08

4. Dial the system from a local telephone. Leave the telephone off the cradle (off the hook) and observe:
    a. The system answers the telephone call with a high-pitched answer tone on the telephone line.
    b. The DSR light on the CE panel comes on. Set the Comm Dply switch on the CE panel to On. Select the desired line number with the Comm Select switch.

    If either of these conditions does not occur, perform diagnostics on the communications line.

5. Observe the voltage level of the meter. It must be between 4 Vdc and 37 Vdc. If it is not, attempt jumper position E, C, B, or A.

6. Remove the jumpers that were installed to activate the line plate relay.

Line Plate Jumper Table

Voltage Level	Jumper to Be Selected
0.5-2	F
2-3.5	E (F)
3.5-4	E (C)
4-6	E (C,D)
6-8	C (E,D,B)
8-9	C (E,D,B,A)
9-14	D (E,C,B,A)
14-26	B (C,D,A)
26-37	A (D,B)
37-50	A (B)

The jumper positions given between parentheses are used to select the jumper when in data status. Use only the indicated jumper positions.

Modem Transmit Level

1. Disconnect the cable from the 2X8 connector on the line plate.

2. Connect a decibel meter, set to 600-ohm termination, across DT (data tip) and DR (data ring) at the modem:

	Data Tip	Data Ring
Line 1	A-B3L2D06	A-B3L2D08
Line 2	A-B3M2D06	A-B3M2D08
Line 3	A-B3L4D06	A-B3L4D08
Line 4	A-B3M4D06	A-B3M4D08

3. Perform steps 2 through 10 of paragraph 30-370.

4. Set the transmit output level switches of the modem to match the level specified by the PTT, taking into account the added loss of the line plate (approximately 1.5 dB).

30-370 Couplers and Transmit Level Limiting Check

The level control circuit of the CBS data coupler (or similar coupler) can be set to a lower signal level than the transmit level on the modem. When this is the case, overloading of the level control circuit causes slow recovery after change of direction and a possible loss of the received signal. The modem transmit level must be decreased enough to prevent overloading the coupler.

The following steps give the procedure to check transmit level limiting.

1. Connect a decibel meter across the DT (data tip) and DR (data ring) terminals of the modem at the external coupler interface. Set the meter to Bridging (no terminating resistance).

2. Set the Mode Selector switch to the Proc Run position (CE panel).

3. Set the Address/Data switches to 0000.

4. Set the MSIPL switch to the Diskette position (CE panel).

5. Set the CSIPL switch to the Diskette position (CE panel).

6. Set all other CE panel switches to their down positions.

7. Insert diskette DIAGB1.

8. Press the Load switch (operator panel).

9. Select the data communications exerciser test (transmit test).

10. Select 16 or 32 as data to be transmitted. Select the Scope Loop A Cmd as the test run option.

11. If this is a new installation, dial the system from a local telephone. If you are troubleshooting a problem, have your system dialed from the remote system. Leave the telephone handset off the cradle (off the hook).

12. Observe the meter. The transmit signal level meter reading should equal the level of the coupler ± 1 dB. If the reading decreases in less than three seconds, the coupler is limiting the transmit level. If the reading remains constant, that level is being transmitted to the line.

13. If the coupler is limiting the transmit signal level, adjust the transmit level switches on the modem card until the transmit level is below the controlled level in the coupler. (Limiting no longer takes place.) The correct level is one decibel below the lower level reading in step 12. Stop here if this is a new installation.

14. Check to see that another modem receives a suitable signal level when this modem transmits by doing the following:
    a. Have another person at the remote station connect a decibel meter across the DT (data tip) and DR (data ring) terminals of the modem at the coupler interface.
    b. Ensure that the meter is set to Bridging (no terminating resistance).
    c. Observe the meter. The receive level at the remote station should be 16 dB less than the transmit level. However, an acceptable level could be from -31 dB up to the same level as the transmit level.

30

30-400 4800 BPS INTEGRATED MODEM (3864 COMPATIBLE)

Two 4800-bps integrated modems can be installed for MLCA. These modems, described as A and B, can be connected to any communications adapter card (communications line) by the use of discrete board feature wires between the modem and the communications adapter card for that line. The modem is available in two models: U.S. and World Trade nonswitched network modem (Model 1) and U.S. and World Trade switched network modem (Model 2).

U.S. and World Trade Nonswitched Network Modem (Model 1)

The U.S. and World Trade nonswitched network modem (Model 1) operates on 4-wire lines point-to-point or multipoint as a tributary or control modem. A lightning protect card is also supplied.

Point-to-Point Operation: Both the transmit and receive sections of the modems are permanently on between data transmissions. A holding signal is sent over the line to maintain synchronization and equalization.

Multipoint Operation: In the multipoint configuration, one data station is the control station and the other data stations are tributary stations. Between data transmissions, the transmit section of the modem at the control station and the receive section of the modem at the tributary stations are permanently on. A holding signal is sent over the line to maintain synchronization and equalization.

Note: Both models of the 4800-bps integrated modem are set to take and execute all LPDA (line problem determination aid) commands. Some LPDA tests run under MDIs, and others are supplied as stand-alone tests under TU select.

U.S. and World Trade Switched Network Modem (Model 2)

The U.S. and World Trade switched network modem (Model 2) operates on 2-wire switched networks. Auto-answer is a basic function of the switched network modem. The modem is attached to the communications line by way of the following:

- Coupler adapter for external couplers similar to CBS (Canada only)

- Incorporated protective coupler (U.S. only)

- WT coupler (World Trade except Canada)

Switched Operation: The local (or remote) operator makes the manual connection by dialing the other data station telephone number.

At the start of data communications from local to remote:

1. The local transmit section initializes the remote receive section of the modem.

2. The local receive section of the modem is clamped off.

3. The remote transmit section of the modem is clamped off.

At the start of data communications from remote to local:

1. The remote transmit section initializes the local receive section of the modem.

2. The remote receive section of the modem is clamped off.

3. The local transmit section of the modem is clamped off.

Between data communications, the transmit section of the modems is off and a delay is necessary to change the direction of the signal over the line. The turn-around time is 50 milliseconds (with short initialization delay at 4800 bps).

Backup Speed

The modem normally operates at 4800 bps. If necessary, a backup speed of 2400 bps can be used.

When the speed on a communications line is switched, an initialization sequence is started automatically. The time of the sequence compares to the ready-for-sending delay.

Multipoint Network: In a multipoint network configuration, the operator at the control station can select the backup speed through programming and the secondary stations will change speed automatically. The secondary stations cannot initialize a change in line speed.

Switched Network: In a switched network, speed control is possible from either station.

Nonswitched Point-to-Point Network: In a nonswitched point-to-point network, the control modem is jumpered for local speed control and the secondary modem is jumpered for remote speed control. The operator at the control modem station can select the backup speed through programming and the secondary modem station will automatically change speed. The station with the secondary modem cannot initialize a change in line speed.

Maintenance: In case of line problems where full-speed operation is not possible, attempt a backup speed of 2400 bps.

Backup-speed operation is useful at installation time as a diagnostic aid when full-speed operation is not acceptable. If the network operates correctly at backup speed, the programming, the modem, and the DTE hardware are probably correct.

Because equalization is done during the request-to-send/ready-for-sending delay, no user action is needed for new equalization when selecting half or full speed.

The half-speed operation indicates a condition of limited or poor communications link. Low error rate and good data quality when operating at half speed (if full-speed operation does not operate correctly or if data quality is limited) indicate that the communications link may be the problem. However, the wrap test at full speed should be completed with no failures indicated before the communications link is suspected.

30

Figures 30-17 through 30-19 show the locations of the
major parts used with the 4800-bps integrated modem.
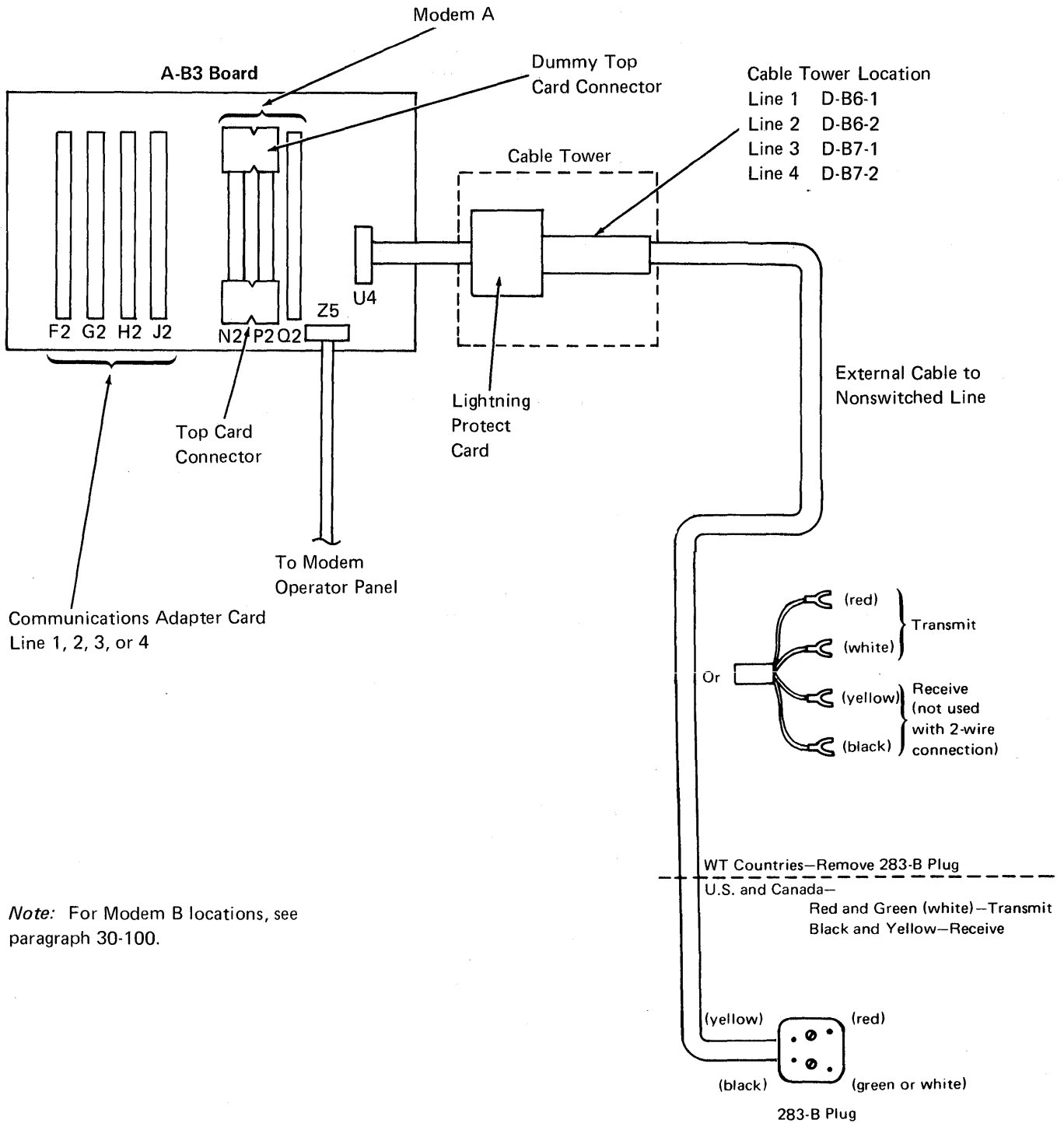
Figure 30-17. 4800 BPS Integrated Modem—Nonswitched Network (Modem A)

Modem A

A-B3 Board

Top Card
Connector

F2 G2 H2 J2   N2 P2 Q2   Z5 U4

To Coupler Adapter
or
Incorporated Protective Coupler
or
WT Coupler

Top Card
Connector

To Modem
Operator Panel

Communications Adapter Card
Line 1, 2, 3, or 4
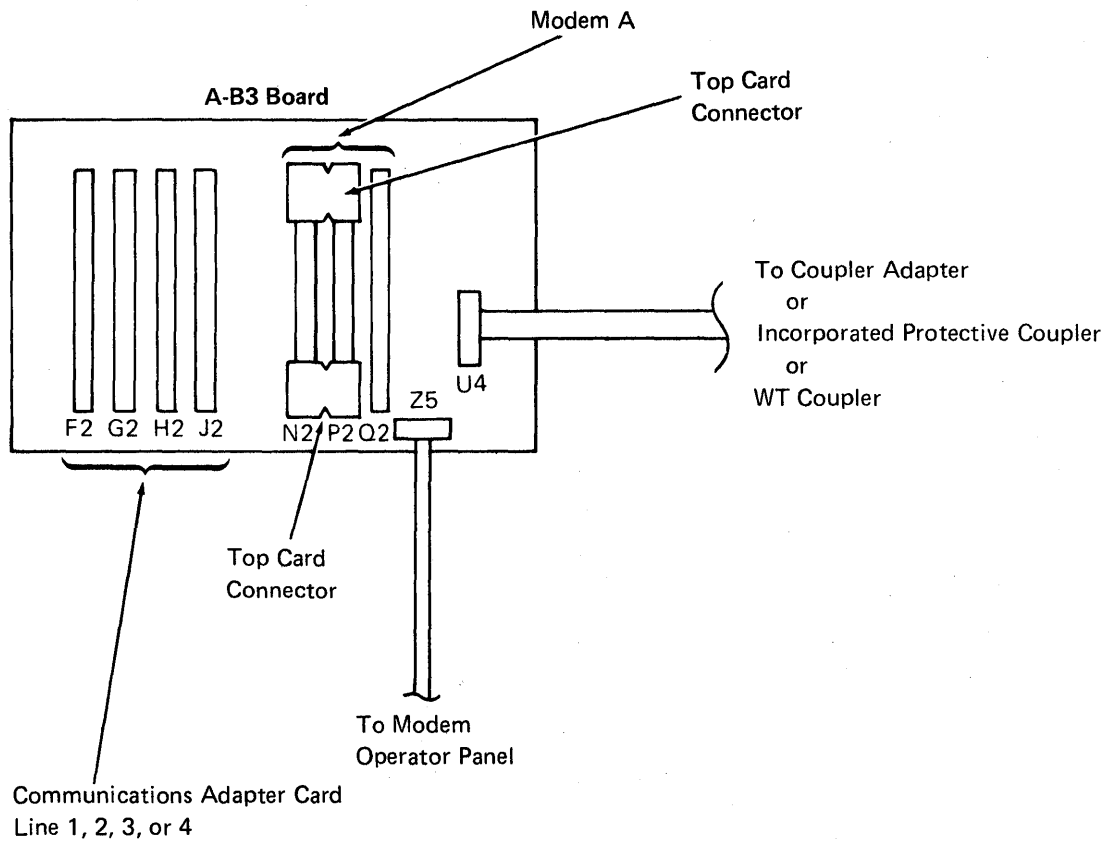
Figure 30-18. (Part 1 of 4). 4800 BPS Integrated Modem—Switched Network (Modem A)

30

Through D-B8
Cable Tower
Opening

External Cable to
CBS or Equivalent
Data Coupler

To
A-B3U4

Coupler Adapter

DA   OH   DT
(yellow)   (blue)   (white)

SH   SG   CCT   RI   DR
(red) (grey) (brown) (violet) (black)

SH	Switch Hook
SG	Signal Ground
DA	Data Modem Ready
CCT	Coupler Cut Through
OH	Off Hook
RI	Ring Indicate
DT	Data Tip
DR	Data Ring
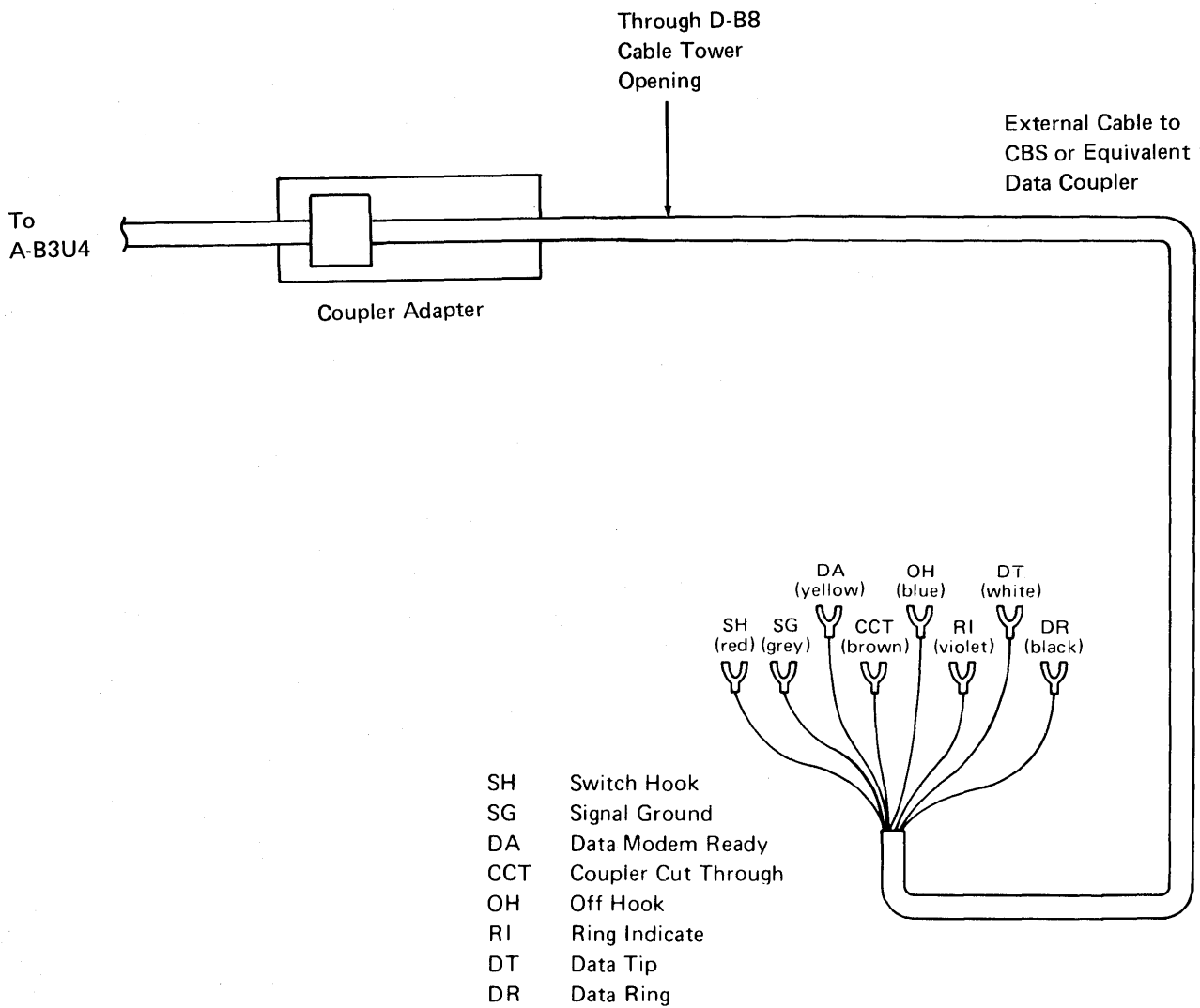
Figure 30-18. (Part 2 of 4). 4800 BPS Integrated Modem—Switched Network (Modem A) (Canada Only)

Coupler

Coupler Adapter

Through D-B8
Cable Tower Opening

To
A-B3U4

Incorporated
Protective
Coupler

MI (yellow)

MIC (black)

PC (brown)

PR (gray)

T (green)

R (red)

Telephone Line
Connection to
Jacks RJ45S or
RJ45M and
RJ41S or RJ41M
(jack must be set
to programmed
position)

30
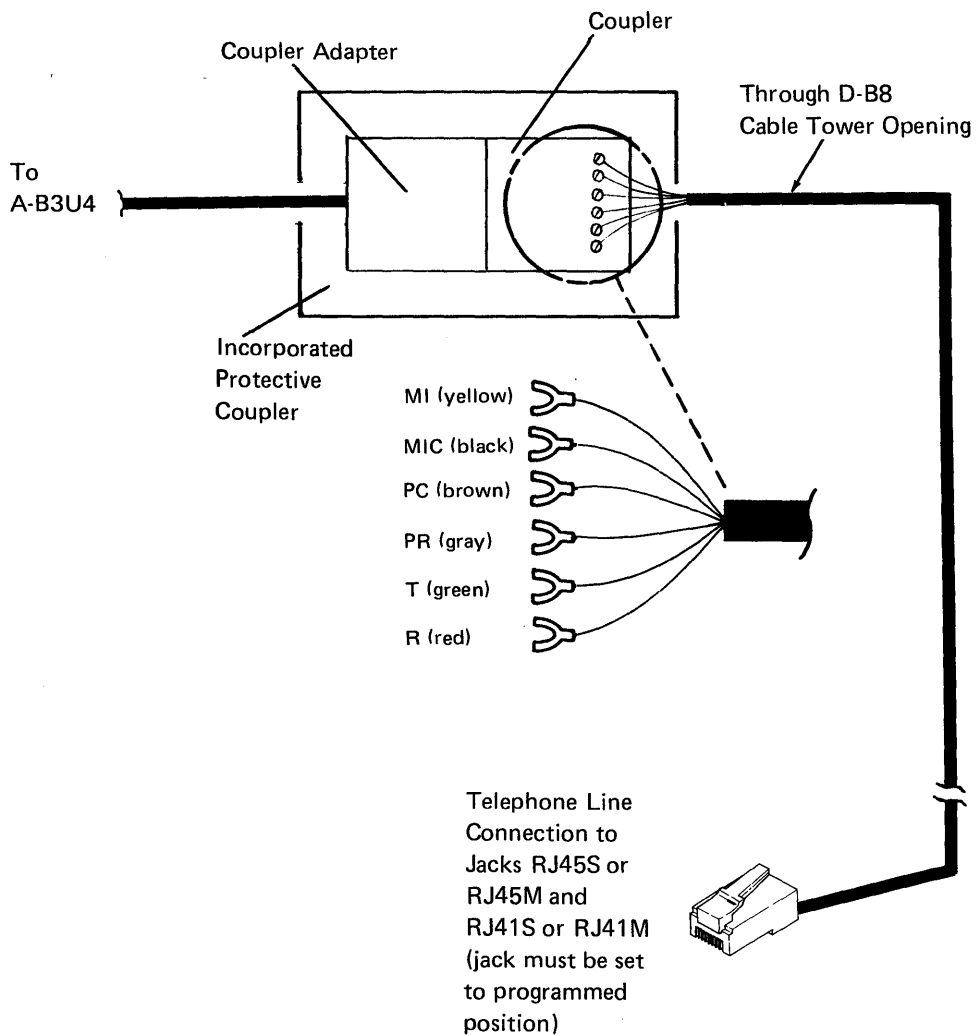
Figure 30-18. (Part 3 of 4). 4800 BPS Integrated Modem–Switched Network (Modem A) (U.S. Only)
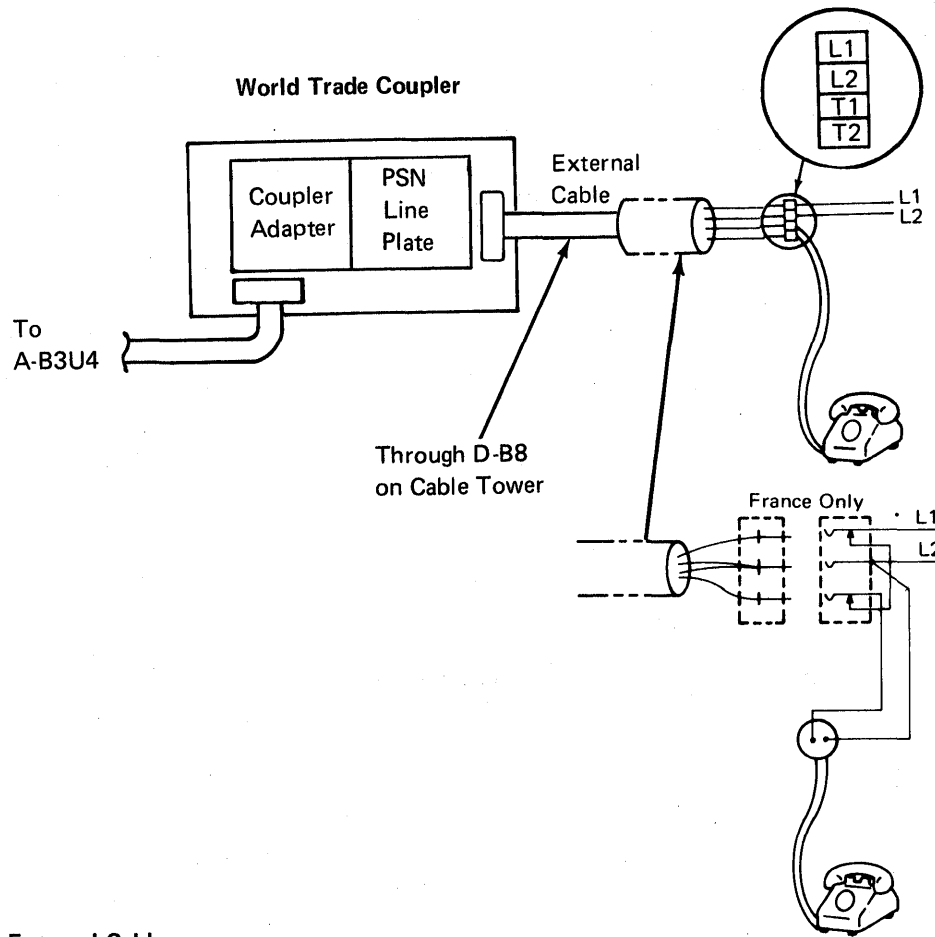
World Trade Coupler

To A-B3U4

Through D-B8 on Cable Tower

External Cable

France Only

External Cable

Line Plate	Cable	Telephone Plug
TB1-6	Handset 2 (T2)	Black
TB1-7	Handset 1 (T1)	Yellow
TB1-8	Telephone 1 (L2)	White
TB1-9	Telephone 2 (L1)	Red

Figure 30-18. (Part 4 of 4). 4800 BPS Integrated Modem—Switched Network (Modem A) (World Trade)

```
    Modem              Internal Coupler Failed
 A        B               (switched network)━━━━━┫━━▶⊂⊃┤
 ─        ─            Receive Card Check━━━━━━━━┫━━▶⊂⊃┤
 P2       S2          Front End Card Check━━━━━━━┫━━▶⊂⊃┤
 N2       R2          Processor Card Check━━━━━━━┫━━▶⊂⊃┤
 Q2       T2
```

Modem A   A-B3Q2
Modem B   A-B3T2
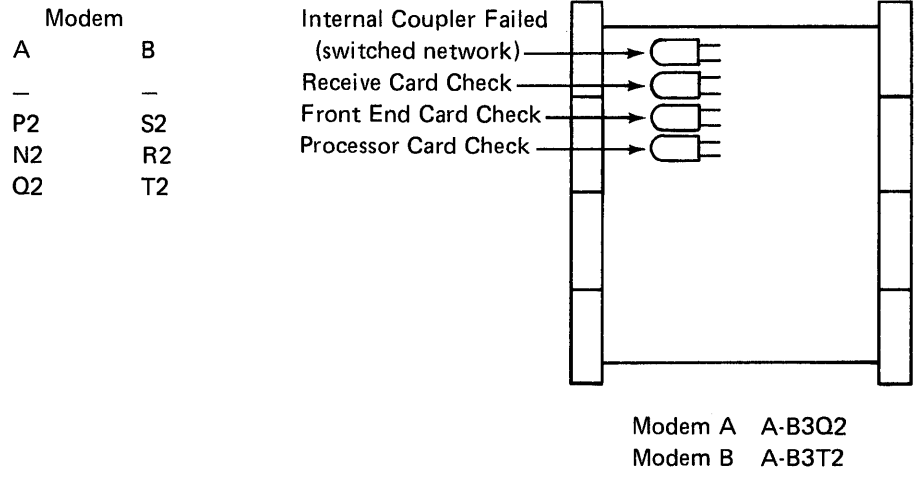
Figure 30-19. 4800 BPS Integrated Modem Processor Card LED Locations

30-410   Operator Panel

The operator panel for the 4800-bps integrated modem
and the panel indicators are shown in Figure 30-20.
Table 30-1 specifies the function of each of the controls
and indicators.

Cable Tower

OPERATE TEST

DATA QUALITY
○ GOOD
○ POOR

○ CARRIER
  DETECT
○ MODEM
  CHECK

MANUAL TESTS
OPERATE
LAMP•   •LTT
RLB•   •RT
LLB•   •ST

ADDRESS

L
I
N
E
1

L
I
N
E
2

L
I
N
E
3

L
I
N
E
4

01A-B3

Z5

Modem A   A-B3Z5
Modem B   A-B3Z6

Note: Only two integrated
modems can be installed on
a system.

Note: Address switches installed only on
nonswitched modem (used only with
multipoint).
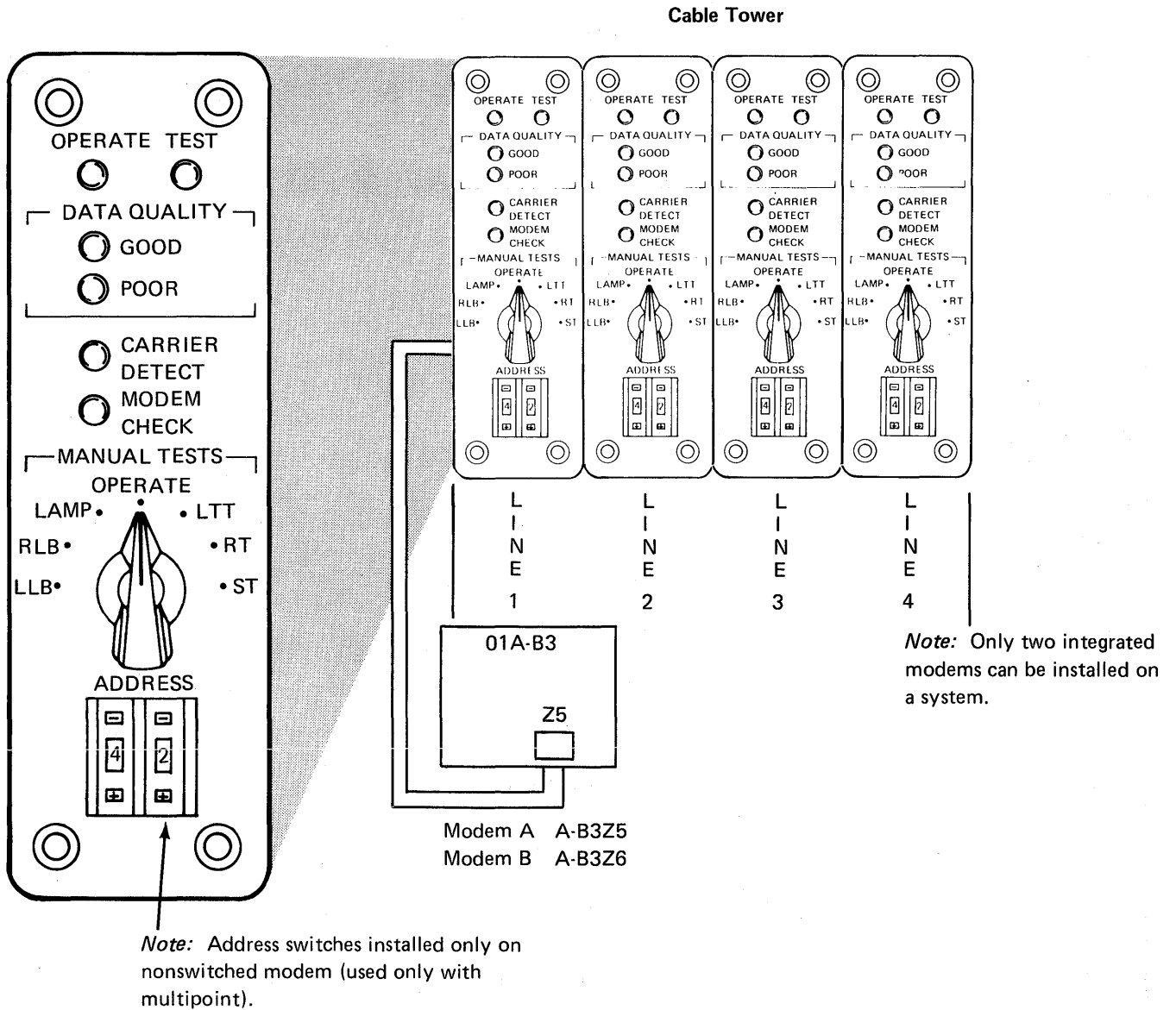
Figure 30-20. Operator Panel for 4800 BPS Integrated Modem

Table 30-1. 4800 BPS Integrated Modem Operator Panel Controls/Indicators

Controls/Indicators	Function
Operate	This indicator is on when the Manual Tests switch is in the Operate position, the DSR (data set ready) lead is on, and either the antistreaming condition is not present or the switched network connection has been made.
Test	This indicator is on when either of the following occurs:
	1. The test indicate lead is on because the Manual Tests switch is in one of the testing positions (LLB, RLB, LAMP, LTT, RT, or ST), or
	2. An LPDA test is being run locally or from a remote system.
Data Quality	*Note:* Both Data Quality indicators (Good and Poor) may be on at the same time. This is a temporary condition of less than one second. Both Data Quality indicators may be off at the same time. This condition indicates that Carrier Detect has been off during one or more periods of 256 bps.
Good	This indicator is on when data errors are not probable.
Poor	This indicator is one when data errors are probable.
Carrier Detect	This indicator is on when the Carrier Detect signal is present.
Modem Check	This indicator is on when the modem has sensed an error during transmission (see Figure 30-19 to isolate the LEDs to a FRU).
Manual Tests (rotary switch)	
LLB	Local Loop Back Test. Not used.
RLB	Remote Loop Back Test. Not used.
Lamp	When this switch is set to Lamp, all of the operator panel indicators should come on.
Operate	When this switch is set to Operate, the modem can be used for normal operation. The Operate indicator should come on (if the connection has been completed for a switched network).
LTT	Loop Transmit Test. When this switch is set to LTT, a test executes that checks the operation of the local modem, the remote modem, and the line connection.
RT	Receive Test. When this switch is set to RT, the modem is ready to operate as the receive modem during the LTT test (see 30-414 for a description of the LTT test).
ST	Self Test. When this switch is set to ST, the modem generates a test pattern that checks the operation of the local modem.
Address switches	Used in multipoint networks only (see 30-440, *Setting the Modem Address*).

30

30-414 Test Diagnostics Operation

The Manual Tests rotary switch on the 4800-bps integrated modem operator panel selects either normal operation or diagnostic test run conditions on the communications system. This section describes each switch position and the diagnostic tests available with the 4800-bps integrated modem.

Normal Operation

When the Manual Tests switch is in the Operate position and the Operate indicator is on, the modem is ready for normal operation (for switched networks, the line connection must be complete before the Operate indicator comes on). When in the operate mode, check the Data Quality indicators on the operator panel. If only the Good indicator is on, the line quality is equal to or better than the specifications for accurate data transmission. If only the Poor indicator is on, the line quality is low enough to cause a 10% block error rate. If both indicators are on, the line quality is neither good nor poor (some data transmissions are completed). If both indicators are off, the carrier detect signal has not been on during the move period (256 bps).

Lamp Test

To test all of the indicators on the operator panel to see if they are operating correctly, perform the following steps:

1. Set the Manual Tests switch to the Lamp position. All indicators on the operator panel should come on.

2. Check the operator panel indicators and exchange any bad indicator (one that is not on).

Self Test

The self test feature of the 4800-bps integrated modem checks the operation of the modem without it being connected to an operating communications line. During the test, the modem generates a test pattern and transmits it to the receive modem in a local loop to sense any errors. The test runs continuously in a loop as long as the Manual Tests switch is in the ST position. Perform the following steps to run the self test on a specific modem:

1. Set the Manual Tests switch to the ST (self test) position.

2. Observe the following conditions of the indicators on the operator panel:
    a. The Test indicator comes on.
    b. The Data Quality Good indicator flashes on and off during the self test.
    c. The Modem Check indicator does not come on during the self test.

3. If any errors are found during the self test (the modem check indicator will come on), check the LEDs on card B-A3Q2 (modem A) or B-A3T2 (modem B). If any of these LEDs are on, they indicate a failing FRU. See Figure 30-19 for the locations of LEDs on this card.

4. When you are through testing the modem, set the Manual Tests switch to the Operate position to return to normal operation.

Loop Transmit Test (Nonswitched Modems Only)

The loop transmit test checks the operation of the local modem, the remote modem, and the communications line. This test is used for nonswitched modems only. The loop transmit test cannot be used by a multipoint tributary station.

The local modem generates a test pattern and sends it to the remote modem. The remote modem receives the test pattern and transmits it back to the local modem. The local modem then compares the received test pattern with the expected test pattern to determine if an error has occurred. No operator aid is needed at the remote site.

Notes:
1. In a point-to-point configuration, only the primary modem can start this test.
2. In a multipoint configuration, only the control modem at the multipoint control station can start this test.

Perform the following steps to run the loop transmit test from a multipoint control station:

1. At the multipoint control station, set the address assigned to the modem at the tributary station on the local modem operator panel.

2. Set the Manual Tests switch on the operator panel to the LTT (loop transmit test) position.

During the test, the Test indicator is lighted at both stations. If the network is operating correctly, the Data Quality Good indicator on the local modem operator panel is also lighted. At the remote modems, the Carrier Detect and Data Quality Good indicators are also on while the test is running. The test runs as long as the Manual Tests switch is in the LTT position.

If the local modem senses an error in the received test pattern, the Modem Check indicator on the local modem comes on. The test does not isolate the FRU.

Transmit/Receive Test (Switched Modems Only)

Switched Networks: For switched modems using the transmit/receive test, the transmitting modem generates a test pattern and sends it to the receiving modem. The receiving modem checks the received pattern for errors. Operator aid is needed at both the local site and the remote site. Perform the following steps to execute the test for switched networks:

Note: Always perform the following steps in this sequence for correct operation.

1. For World Trade only, ensure that the Manual Test switch on both the local and the remote modem operator panels is set to Operate.

   For World Trade only, make the switched line connection by dialing the remote modem telephone number from the telephone at the System/34 modem. Do not return the handset to the cradle (on the hook) at this time.

2. Have the Manual Tests switch on the remote modem set to the RT (receive test) position.

3. Set the System/34 modem Manual Tests switch to the LTT (loop transmit test) position. The transmitting modem starts sending the test pattern to the receiving modem.

4. For World Trade only, return the handset to the cradle (on the hook), and go to step 6.

5. Ensure that the System/34 modem telephone is in voice mode, then make the switched-line connection by dialing the remote modem telephone number from the telephone at the System/34 modem. When you hear the answer tone, return your handset to the cradle (on the hook). The transmit/receive test then starts running.

6. During the test, the Test indicator is lighted at both modems. If the network is operating correctly, the Data Quality Good indicator on the operator panel of the remote modem comes on. The test runs as long as the switches are in the indicated positions. If the remote modem senses an error in the received pattern, the Modem Check indicator at the remote modem comes on. The test does not isolate the FRU.

To test the System/34 receive section of the modem, perform the following additional steps:

7. Set the System/34 modem Manual Test switch to the RT (receive test) position.

8. Have the remote modem Manual Test switch set to the LTT (loop transmit test) position. The transmit/receive test then starts and runs in the opposite direction.

9. Check that the remote modem test indicator and the System/34 modem Data Quality Good and Test indicators are on while the test is running.

An error causes the System/34 modem Modem Check indicator to come on. The test does not isolate any FRUs.

30

30-440   Setting the Modem Address

The modem address switch is used in multipoint configurations only. See Figure 30-20.

Tributary Modem Addressing

On a multipoint tributary modem, set the address switch to the same address as that of the attached DTE. The low-order digit (right-hand digit) of the 2-digit address must not be zero on a multipoint tributary modem. Also, each modem DTE address must be different from other modem DTE addresses in the network.

Multipoint Control Modem Addressing

A multipoint control modem address switch is active only when one of the manual tests is being run (loop transmit test).

30-450   Card Switch Settings Transmit Level

United States and Canada

Over nonswitched lines, the transmit level is 0 dBm (-10 dBm for Canadian National/Canadian Pacific Telecommunications Networks). No adjustment is needed. Ensure that the transmit level switches are set to the correct level.

Over switched lines, the modem transmit level is set to 0 dBm when the modem is connected to the line through the IBM Incorporated Protective Coupler (United States only). The IBM Incorporated Protective Coupler automatically adjusts to the correct transmit level by testing the program resistor installed in the wall socket by the common carrier. No adjustment is needed. Ensure that the transmit level switches are set to the correct level.

In Canada, the modem is connected to the line through a CBS Data Coupler or a similar coupler. The transmit level must be adjusted to the value indicated on the coupler box as shown in Figure 30-21.

Other Countries

In countries outside the U.S. and Canada, the transmit level may change as described by local PTT codes. When possible, the transmit level is set when the host unit is assembled as instructed by codes specified at ordering time.

Setting the Transmit Level

The modem transmit level is set through transmit level control switches. One set of switches is for nonswitched lines, and one set of switches is for switched lines. Set the switches by using the information given in Figure 30-21.

Model 1 Nonswitched Network

Modem A   A-B3N2
Modem B   A-B3R2

Board Connector Side

1 2 3 4
On →
Off →   ← Not Used

On →
Off →   ← Used for Nonswitched Line
1 2 3 4
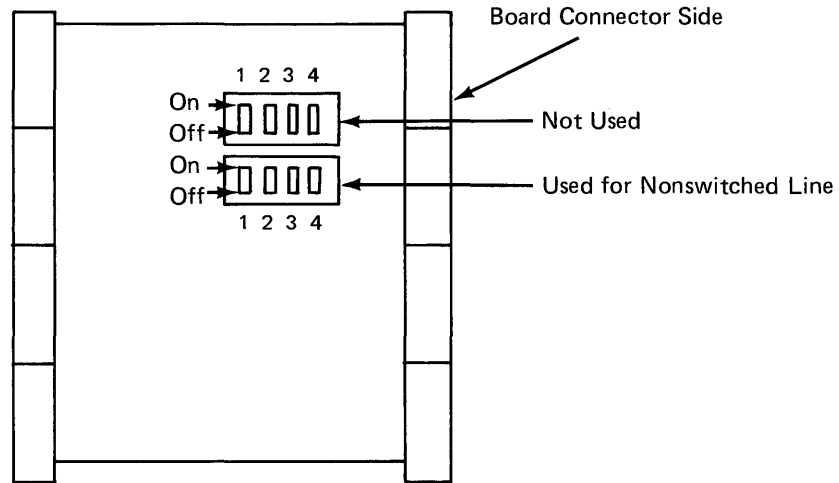
Model 2 Switched Network

Modem A   A-B3N2
Modem B   A-B3R2

Board Side Connector
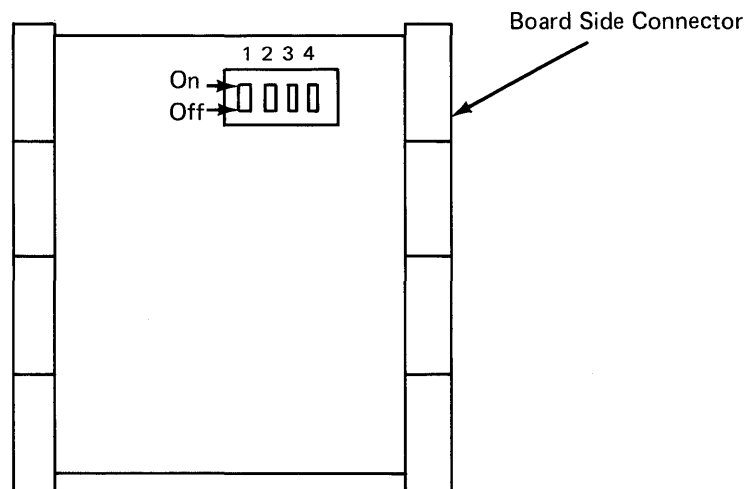
1 2 3 4
On →
Off →

Switch Setting

Note: 1 = switch in On position,
         0 = switch in Off position.

Digital Code 1 2 3 4	Output Level (dBm)
1 1 1 1	--0
0 1 1 1	-1
1 0 1 1	-2
0 0 1 1	--3
1 1 0 1	-4
0 1 0 1	-5
1 0 0 1	-6
0 0 0 1	-7
1 1 1 0	-8
0 1 1 0	-9
1 0 1 0	-10
0 0 1 0	-11
1 1 0 0	-12
0 1 0 0	-13
1 0 0 0	-14
0 0 0 0	-15

Figure 30-21. 4800 BPS Integrated Modem Front End Card Transmit Level Switches

30

30-460   Board Jumpers

Model 1 Options (Nonswitched)

For nonswitched networks, the modem is always shipped from the factory with the jumpers installed that make it a multipoint control station. If the modem is not to be used as a control station, add or remove the jumpers as needed. See Table 30-2 for the jumpers needed for Model 1 options.

Model 2 Options (Switched)

Table 30-3 specifies the jumper configuration needed for Model 2 options.

Discrete wires are needed to connect the 4800-bps integrate(
modem to the communications adapter card. These wires ar
described in Figure 30-22.

Table 30-2. Model 1 Option Jumpers (Nonswitched)

Option	Modem A		Modem B	
	From	To	From	To
Network Configurations				
Multipoint Control	A-B3N2P07	A-B3N2D08	A-B3R2P07	A-B3R2D08
Multipoint Tributary	A-B3N2P07	A-B3N2D08	A-B3R2P07	A-B3R2D08
	A-B3N2P09	A-B3N2J08	A-B3R2P09	A-B3R2J08
Point-to-Point (4-wire)	Remove multipoint control jumper above		Remove multipoint control jumper above	
Speed Control				
Local Speed Control (primary or multipoint control modem) (see Note 1)	No jumpers needed		No jumpers needed	
Remote Speed Control (secondary or multipoint tributary modem) (see Note 1)	A-B3N2P09	A-B3N2D08	A-B3R2P09	A-B3R2D08
Initialization RFS Delay				
24 ms (normal)	No jumpers needed		No jumpers needed	
50 ms (long) (see Note 2)	A-B3N2P11	A-B3N2P08	A-B3R2P11	A-B3R2P08
Carrier Detect Sensitivity (Receive Level)				
Above -32 dBm (normal position for U.S. and World Trade above -32 dBm)	No jumpers needed		No jumpers needed	
Below -32 dBm (World Trade below -32 dBm)	A-B3N2P13	A-B3N2U08	A-B3R2P13	A-B3R2U08

Notes:
1. For point-to-point speed control only, both modems must *not* be set for remote speed control. Set the modem at the station that most often controls the network (the station that transmits or is polled first) to local speed control. Set the other modem for remote speed control.
2. The long delay time is needed for a multipoint tributary station that does not respond because of an overload on the line (a poor link in a multipoint network).

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Table 30-3. Model 2 Option Jumpers (Switched)

Option	Modem A		Modem B	
	From	To	From	To
Point-to-Point (2-wire) CCITT	A-B3N2P09	A-B3N2D08	A-B3R2P09	A-B3R2D08
Point-to-Point (2-wire) U.S.	No jumpers needed		No jumpers needed	
Initialization RFS Delay				
Long (normal)	No jumpers needed		No jumpers needed	
Short (see note)	A-B3N2P11	A-B3N2P08	A-B3R2P11	A-B3R2P08

Note: The short initialization RFS delay can be set by the service representative when switched network connections are limited to local calls inside one central office. Because telephone line conditions may change, this option needs testing when installed in such a local configuration.

Adapter Card*	Signal	Modem Card**
M13	DTR	B02
S10	DSR	B13
P06	RTS	D02
S09	CTS	D13
S13	CD	B12
P10	Rate Select	B04
M10	Test Control	B05
P11	Test Ind	D10
S07	Ring Ind	D12
S05	Rcv Clk	B08
S08	Xmit Clk	B07
U10	Rcv Data	B10
P13	Xmit Data	D04
M05	Sel Stby (used for diagnostics only)	B03

*Line 1	A-B3F2
Line 2	A-B3G2
Line 3	A-B3H2
Line 4	A-B3J2
**Modem	A-B3N2
Modem	B-B3R2

Figure 30-22. 4800 BPS Integrated Modem Discrete Wires

30-470   Line Plate Adjustment

The line plate adjustment is needed only when the
network is a World Trade public switched network
(PSN). This adjustment for the 4800-bps integrated
modem is the same as the adjustment performed for the
1200-bps integrated modem. See procedure 30-360 for
the steps to perform the line plate adjustment.

30-480   Couplers and Transmit Level
Limiting Check (Canada Only)

This procedure is the same as procedure 30-370. See
30-370 for problems in this area.

30

30-510   Locations

Figure 30-23 shows the parts needed for the Digital
Data Service Adapter (DDSA) for line 1. If installation is
on line 2, 3, or 4, see Figures 30-5 and 30-7 for
hardware locations.
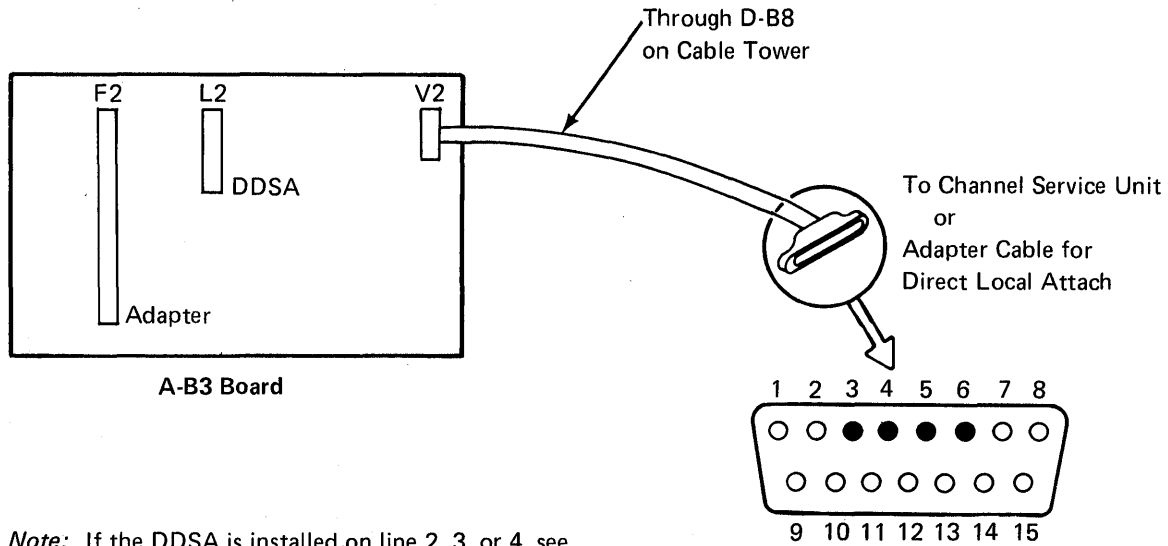
Note: If the DDSA is installed on line 2, 3, or 4, see
Figures 30-5 and 30-7 for hardware locations.

3	Received Data (DT1)
4	Received Data (DR1)
5	Transmitted Data (DT)
6	Transmitted Data (DR)

1, 2, and 7 through 15 are
not used.

Figure 30-23. Digital Data Service Adapter (Line 1)

30-550   Card Jumpers

The Digital Data Service Adapter cards have five jumper locations; attach these jumpers as instructed in Figure 30-24.
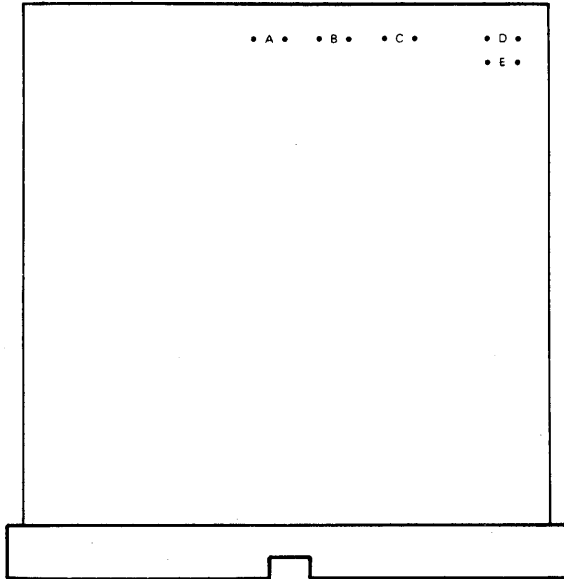

```
Line 1    A-B3L2
Line 2    A-B3M2
Line 3    A-B3L4
Line 4    A-B3M4
```

A — Needed for 2400 bps operation (see note)
B — Needed for 4800 bps operation (see note)
C — Needed for 9600 bps operation (see note)
D — Needed for 56,000 bps operation (see note)
E — Needed for multipoint operation (disables the
      channel service unit loop-back)
      Not used for point-to-point operation (enables
      the channel service unit loop-back in test mode)

Note: The bits-per-second rate must be set to the rate specified in the customer's order for service to the common carrier. Clocking is controlled by the common carrier central office or by the adapter (local direct attach). If 56,000 bps is specified, the communications adapter card switch settings and configuration for this line must be set for device address 80.

Figure 30-24. Card Jumpers for DDSA

30-610   Locations

External medium-band modems are attached to
System/34 by the EIA/CCITT (Electronic Industries
Association/International Consultative Committee on
Telegraph and Telephone) adapter card. Figure 30-25
shows the parts for the external modem configuration
for line 1. If installation is on line 2, 3, or 4, see Figures
30-5 and 30-7 for hardware locations.

The EIA/CCITT adapter card converts the signal level
and changes the voltage to the levels specified in
RS-232C and CCITT recommendation V.28.

If the external stand-alone modem is either an IBM
3863, 3864 or 3865, have the modem configuration
switch set to take all LPDA commands.

2	Transmit Data	11	Select Standby
3	Receive Data	15	Transmit Timing
4	Request to Send	17	Receive Timing
5	Clear to Send	18	Wrap
6	Data Set Ready	20	Data Terminal Ready
7	Signal Ground	22	Ring Indicator
		23	Rate Select

1, 8, 9, 10, 12, 13, 14, 16, 19, 21, 24, and 25 are not used

RS232/CCITT
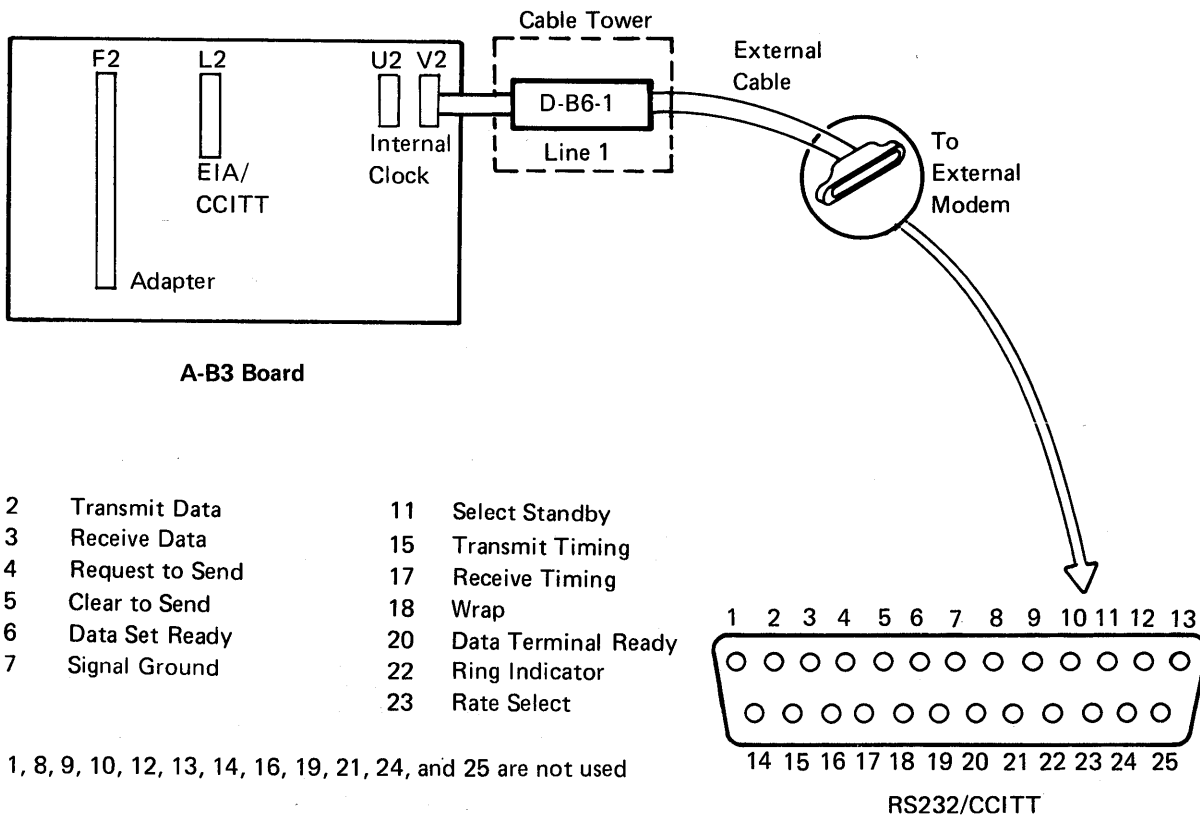
Note: If the EIA/CCITT adapter is installed on line
2, 3, or 4, see Figures 30-5 and 30-7 for hardware
locations.

Figure 30-25. EIA/CCITT Installed on Communication Line 1

30-650   Card Jumpers

The EIA/CCITT cards have 10 jumper locations, but none of the jumpers is needed.
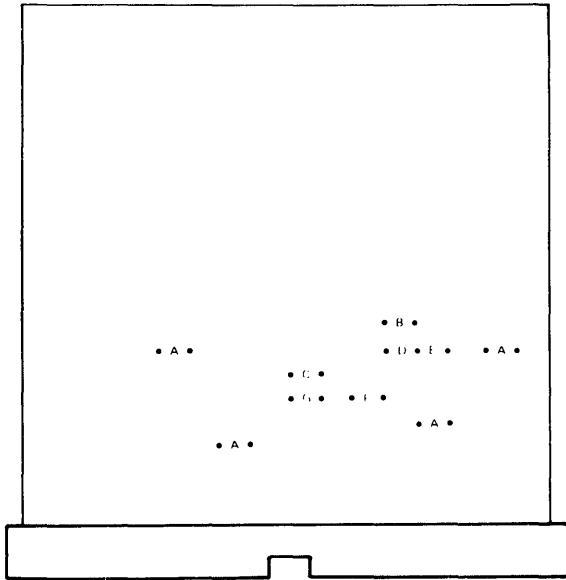
If you have a multipoint control modem that needs *new sync*, the following jumpers are added for each line:

Line 1   A-B3L2G08   to   A-B3V2D13
Line 2   A-B3M2G08   to   A-B3V3D13
Line 3   A-B3L4G08   to   A-B3V4D13
Line 4   A-B3M4G08   to   A-B3V5D13

Line 1   A-B3L2
Line 2   A-B3M2
Line 3   A-B3L4
Line 4   A-B3M4

A — Not used or missing (four locations)
B — Not used
C — Not used
D — Not used
E — Not used
F — Not used
G — Not used

30-660   EIA/CCITT Modem Control Lines

The modem control lines for the EIA/CCITT interface are active during the up level. These lines and their associated pin numbers are shown in Figure 30-26. The following paragraphs describe eight of these lines.

The 'RTS' (request to send) line controls the transmit and receive functions of the modem. When this line is active, the modem is in transmit mode; when this line is not active, the modem is in receive mode. On a 2-wire nonswitched line, 'RTS' is switched by System/34. On a 4-wire nonswitched line, 'RTS' can be switched by System/34, held permanently on by System/34, or held permanently on by the modem. On a switched line, 'RTS' is switched by System/34. The 'RTS' line is on during the transmission of each block or frame.

The 'standby' line selects the switched network backup (SNBU) line.

The 'test' line selects the modem wrap function. When the modem wrap test is running, the transmit function of the modem is sent back to the receive function of the modem.

The 'DTR' (data terminal ready) line signals the modem that the terminal is ready to send or receive data. On a switched line, 'DTR' initializes and holds the line connection.

The 'rate select' line selects the bit rate on modems with half speed. When this line is down, half speed is selected.

The 'CTS' (clear to send) line indicates that the modem is ready to transmit data. On a 4-wire nonswitched line, 'CTS' can be active all the time. On a 2-wire nonswitched or switched line, 'CTS' is turned on and off by the 'RTS' line.

The 'DSR' (data set ready) line indicates that the modem is ready. The modem is ready when power is on, when the modem is connected to the line, and when the modem is not in test mode; all three conditions must be met.

The 'ring indicator' line indicates that the modem is receiving a call.

Adapter		EIA/CCITT Interface Card			Pin numbers of the RS232/CCITT connector	Modem
B05		J07	Test (wrap)	18		
B04		J06	Rate Select	23		
B02		J02	DTR (data terminal ready)	20		
D02		G03	RTS (request to send)	4		
D04		G07	Transmit Data	2		
B03		G05	Standby	11		
B09		G08	New Sync [1]	14		
B10		G04	Receive Data	3		
D13		G10	CTS (clear to send)	5		
B08		J10	Receive Timing	17		
B13		J09	DSR (data set ready)	6		
B07		J04	Transmit Timing	15		
D12		G13	RI (ring indicator)	22		
D08		J08	Signal Ground	7		

Line 1	A-B3F2	Line 1	A-B3L2	
Line 2	A-B3G2	Line 2	A-B3M2	
Line 3	A-B3H2	Line 3	A-B3L4	
Line 4	A-B3J2	Line 4	A-B3M4	

Note: The cable wrap connector connects the following signals for testing:
   DTR to DSR
   RTS to RI
   Transmit Data to CTS
   Rate Select to Transmit Timing
   Wrap to Receive Data
   Standby to Receive Timing

---

[1] New Sync requires a board jumper

Figure 30-26. Modem Control Lines for EIA/CCITT Interface

30-700   ANALOG WIDEBAND ADAPTER

The analog wideband adapter card is used to convert
the signal levels of the communications adapter card to
the levels needed by a high-speed WE303 modem. See
Figures 30-27 through 30-29 for more information.

System/34 Communications Adapter Signals (see Note 1)

Analog Wideband Adapter Card

External Modem Signals (see Note 2)

Drivers

– Request to Send	D02	G03	+Request to Send
+Transmit Data Space	D04	J05	– Transmit Data Space
– Wrap (cable wrap only)	B05	J07	+Wrap

Receivers

– Data Set Ready	B13	J09	+Data Set Ready
– Clear to Send	D13	G10	+Clear to Send
+Receive Data	B10	J13	– Receive Data
– Transmit Timing	B07	J04	+Transmit Timing
– Receive Timing	B08	J10	+Receive Timing
– Carrier Detect	B12	J12	+Carrier Detect

Line 1 A-B3L2
Line 2 A-B3M2
Line 3 A-B3L4
Line 4 A-B3M4

Notes:
1. The communications adapter signals are at a VTL level.
2. The external modem signals are at a WE303 level.
3. The wrap connector connects the following signals for
   diagnostic testing:
   ● Wrap → Transmit Timing
   ● Transmit Timing → Receive Timing
   ● Transmit Data → Receive Data
   ● RTS → CTS
           DSR
           Carrier Detect

Figure 30-27. Analog Wideband Adapter Signal Lines

WE303

Logic 0 (high) = > sink 23 milliamperes minimum
Logic 1 (low) = > sink 5 milliamperes maximum

Notes:
1. If the WE303 input signal is low, the VTL output signal is high; if the WE303 input signal is high, the VTL output signal is low.
2. No voltage levels are shown for the WE303, because the WE303 is a current-driven device.

VTL

+5.5 V ——— Most positive up level
+2.4 V ——— Least positive up level

Most positive down level ——— +0.8 V
Least positive down level ——— 0.0 V
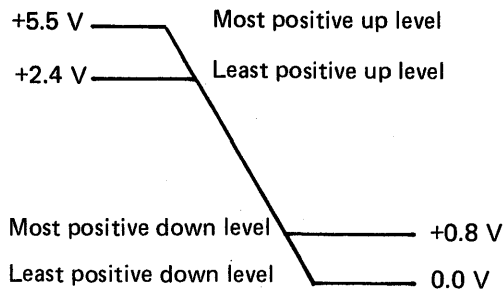
Current at up level = 8 milliamperes loaded to the source of the signal
Current at down level = 1.45 milliamperes maximum supplied to the source

Figure 30-28. Normal Input Signals

WE303

Current load =100 ohms ± 10% to ground:
    Logic 0 (high) = > 23 milliamperes minimum
    Logic 1 (low) = > 5 milliamperes maximum

VTL

+5.5 V ——— Most positive up level
+2.4 V ——— Least positive up level

Most positive down level ——— +0.8 V
Least positive down level ——— 0.0 V
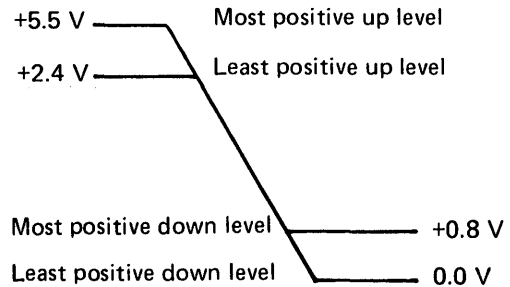
Current at up level = 10 milliamperes maximum
Current at down level = sink 4.8 milliamperes maximum

Figure 30-29. Normal Output Signals

30-710 Locations

Figure 30-30 shows the parts for the external modem configuration for line 1. If installation is on line 2, 3, or 4, see Figures 30-5 and 30-7 for hardware locations.

A-B3 Board

C	Clear to Send
D	Request to Send
E	Send Data
F	Data Set Ready (coaxial center conductor)
F	Ring Indicator (coaxial shield conductor—not used)
J	Transmit Clock
K	Receive Data
L	Receive Clock
M	Carrier Detect (coaxial center conductor)
M	Data Terminal Ready (coaxial shield conductor—not used)

A, B, G, and H are not used
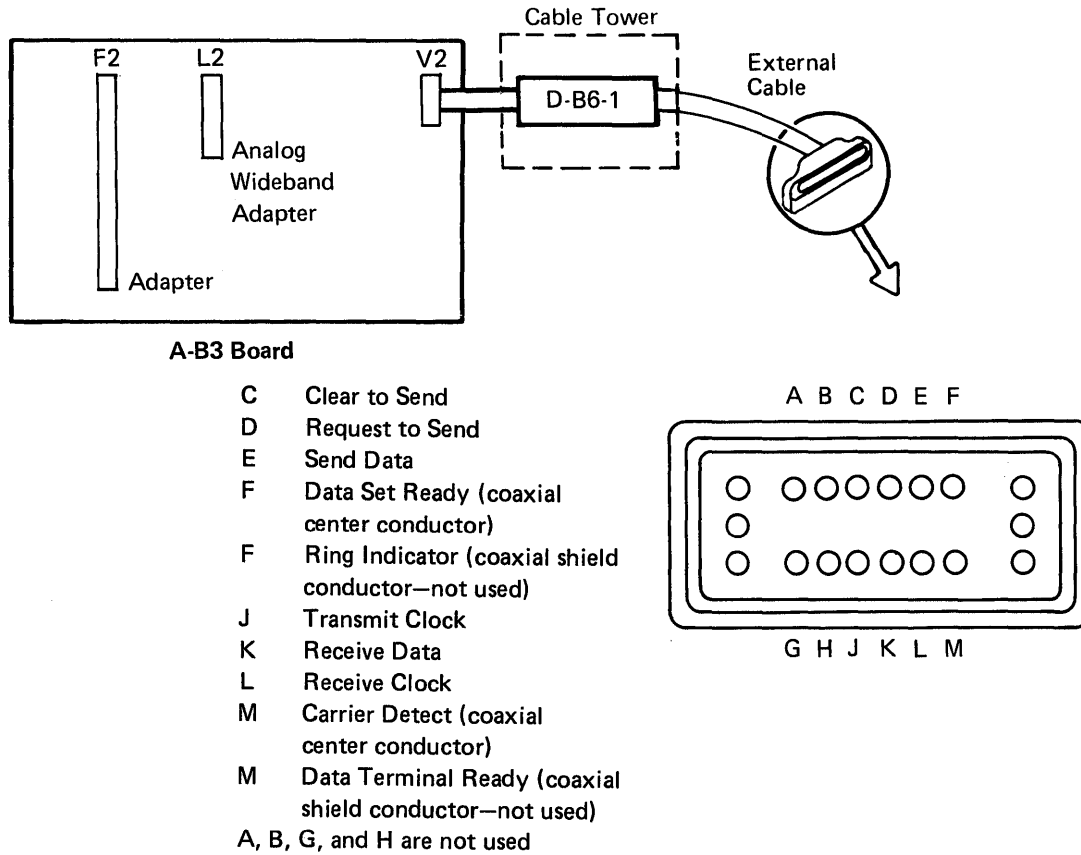
Note: If the wideband adapter is installed on line 2, 3, or 4, see Figures 30-5 and 30-7 for hardware locations.

Figure 30-30. Analog Wideband Adapter Locations (Line 1)

30-750 Card Jumpers

The analog wideband adapter card needs 14 jumpers installed to run WE303 mode; attach these jumpers as instructed in Figure 30-31. (Only one wideband card can be installed on the system.)
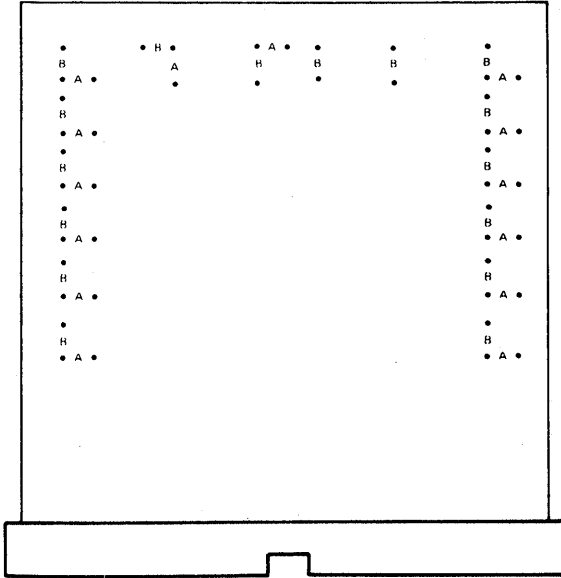
Line 1   A-B3L2
Line 2   A-B3M2
Line 3   A-B3L4
Line 4   A-B3M4

A   Needed (14 locations)
B   Not used

Note: The communications adapter card switch settings and configuration for this line must be set for device address 80; ensure that the jumper for microinterrupt request to interrupt level 2 is installed on this communications line (see 30-200).

Figure 30-31. Card Jumpers for Analog Wideband Adapter

30-800 AUTOCALL ADAPTER

30-810 Locations

Figure 30-32 shows the parts needed for the autocall
adapter installed on line 1. If installation is on line 2, 3,
or 4, see Figures 30-5 and 30-7 for hardware locations.

2	Digit Present (DPR)
3	Abandon Call and Retry (ACR)
4	Call Request (CRQ)
5	Present Next Digit (PND)
6	Power Indication (PWI)
7	Signal Ground
8	Diagnostic Wrap Return Line for NB1 (not used in normal operation)
13	Distant Station Connected (DSC)
14	Digit Signal (NB1)
15	Digit Signal (NB2)
16	Digit Signal (NB4)
17	Digit Signal (NB8)
22	Data Line Occupied (DLO)
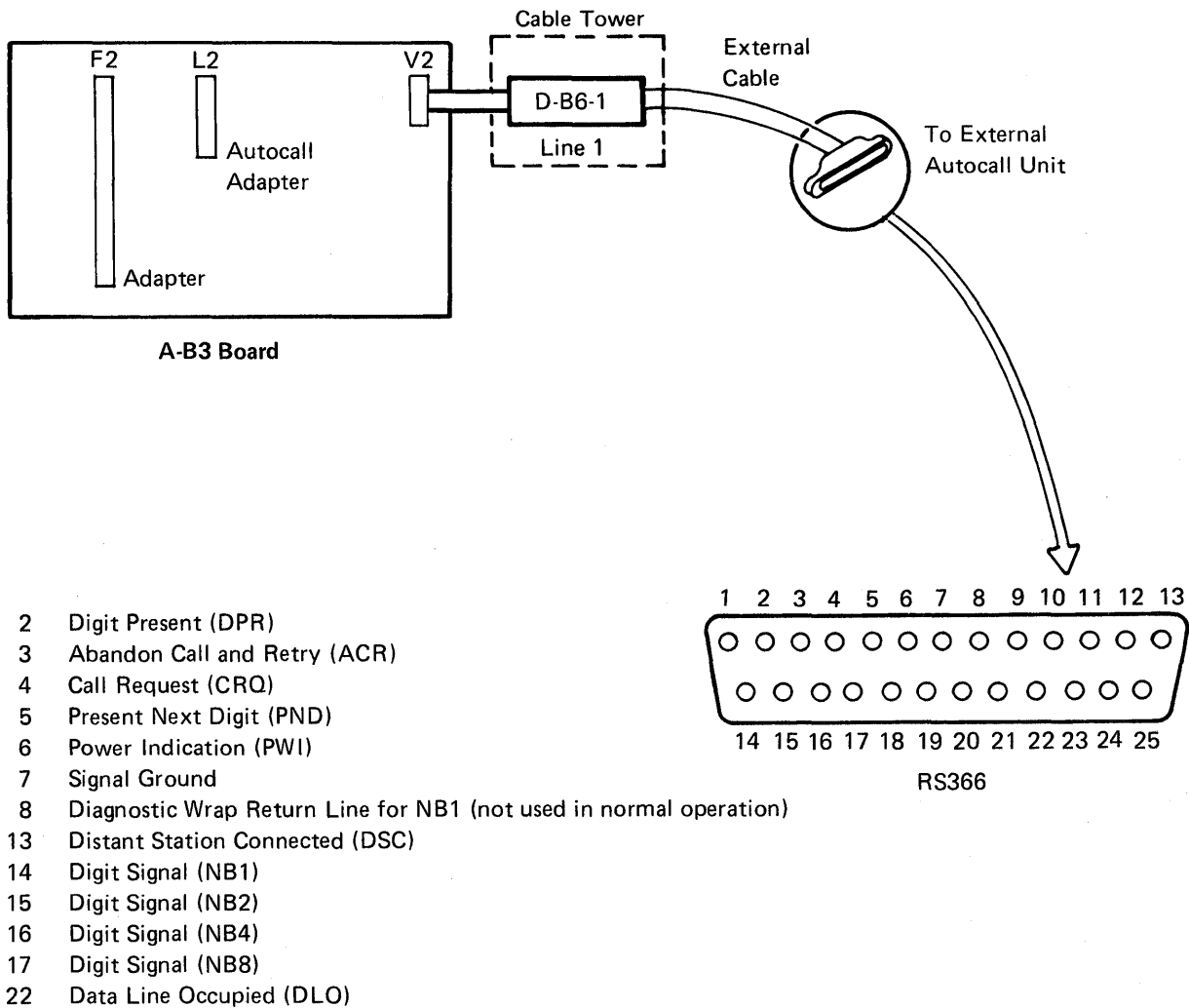
Note: For testing purposes, pin 6 is tied to pin 11, and pin 16
is tied to pin 18 at the end of the cable.

Figure 30-32. Autocall Adapter Installed on Communication Line 1

The autocall control lines and their associated pin numbers are shown in Figure 30-33. The autocall wrap connector is shown in Figure 30-34.

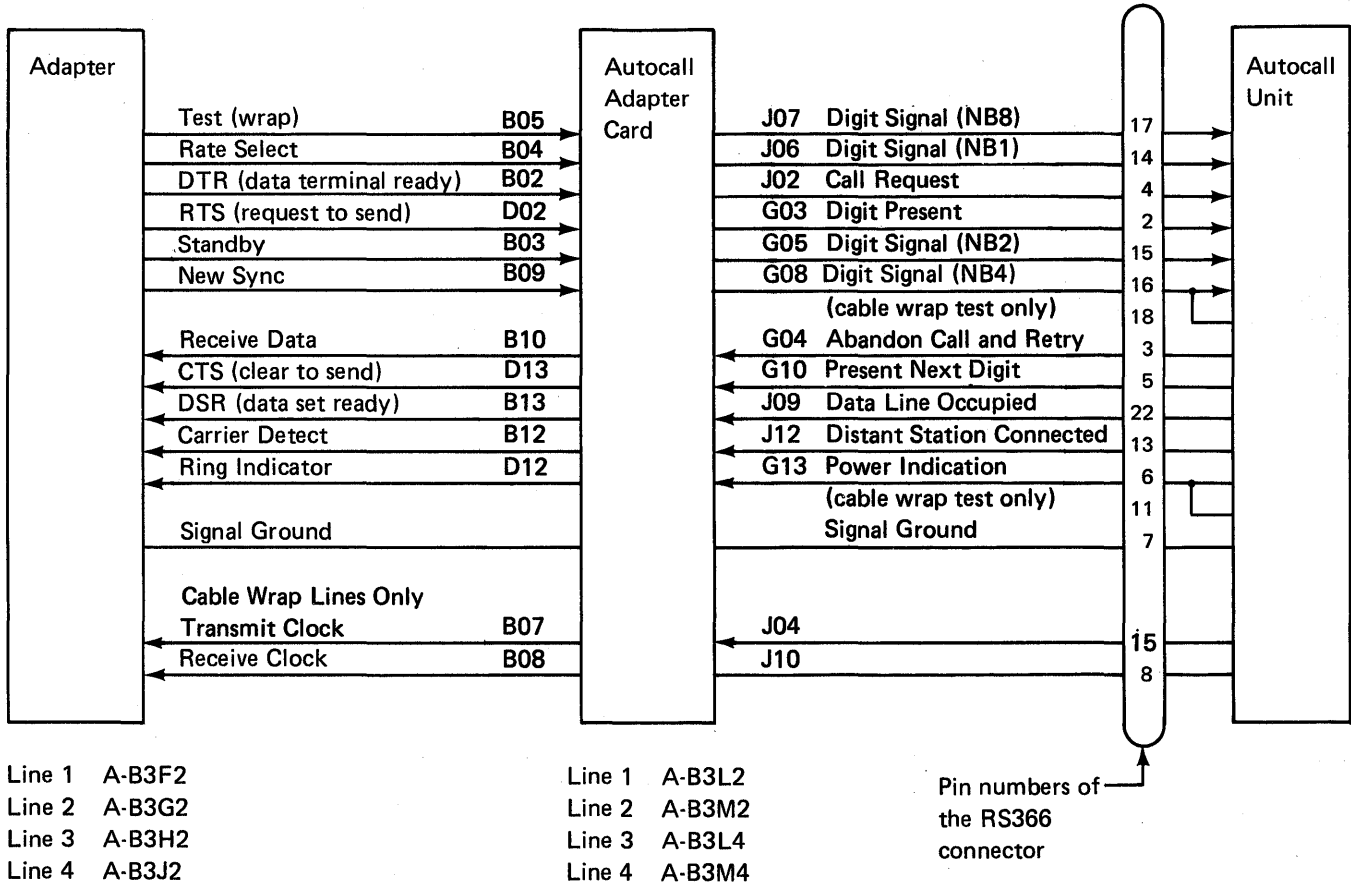| Adapter			Autocall Adapter Card				Autocall Unit
Test (wrap)	B05			J07	Digit Signal (NB8)	17	
Rate Select	B04			J06	Digit Signal (NB1)	14	
DTR (data terminal ready)	B02			J02	Call Request	4	
RTS (request to send)	D02			G03	Digit Present	2	
Standby	B03			G05	Digit Signal (NB2)	15	
New Sync	B09			G08	Digit Signal (NB4)	16	
					(cable wrap test only)	18	
Receive Data	B10			G04	Abandon Call and Retry	3	
CTS (clear to send)	D13			G10	Present Next Digit	5	
DSR (data set ready)	B13			J09	Data Line Occupied	22	
Carrier Detect	B12			J12	Distant Station Connected	13	
Ring Indicator	D12			G13	Power Indication	6	
					(cable wrap test only)	11	
Signal Ground					Signal Ground	7	
Cable Wrap Lines Only							
Transmit Clock	B07			J04		15	
Receive Clock	B08			J10		8	

Line 1   A-B3F2
Line 2   A-B3G2
Line 3   A-B3H2
Line 4   A-B3J2

Line 1   A-B3L2
Line 2   A-B3M2
Line 3   A-B3L4
Line 4   A-B3M4

Pin numbers of the RS366 connector

Figure 30-33. Autocall Control Lines

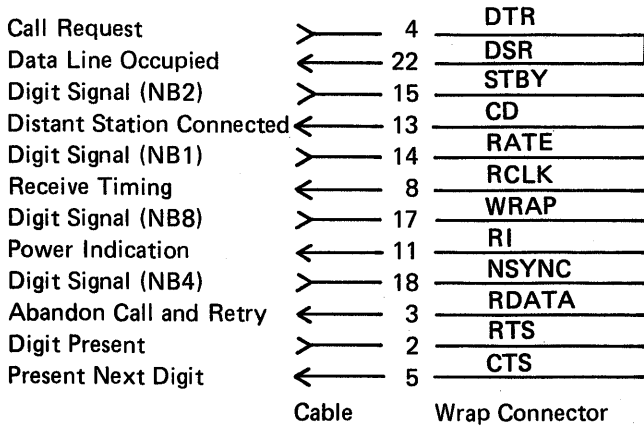| Call Request	>	4	DTR
Data Line Occupied	<	22	DSR
Digit Signal (NB2)	>	15	STBY
Distant Station Connected	<	13	CD
Digit Signal (NB1)	>	14	RATE
Receive Timing	<	8	RCLK
Digit Signal (NB8)	>	17	WRAP
Power Indication	<	11	RI
Digit Signal (NB4)	>	18	NSYNC
Abandon Call and Retry	<	3	RDATA
Digit Present	>	2	RTS
Present Next Digit	<	5	CTS

Cable   Wrap Connector

Figure 30-34. Autocall Cable Wrap Connector

30-850 Card Jumpers

The autocall adapter cards are the same as the
EIA/CCITT cards. The cards have 10 jumper locations
(see Figure 30-35), but none of the jumpers is needed.
However, you must connect one of the following board
jumpers to supply the digit signal (NB4):

Line 1	A-B3L2G08	to	A-B3V2D13
Line 2	A-B3M2G08	to	A-B3V3D13
Line 3	A-B3L4G08	to	A-B3V4D13
Line 4	A-B3M4G08	to	A-B3V5D13
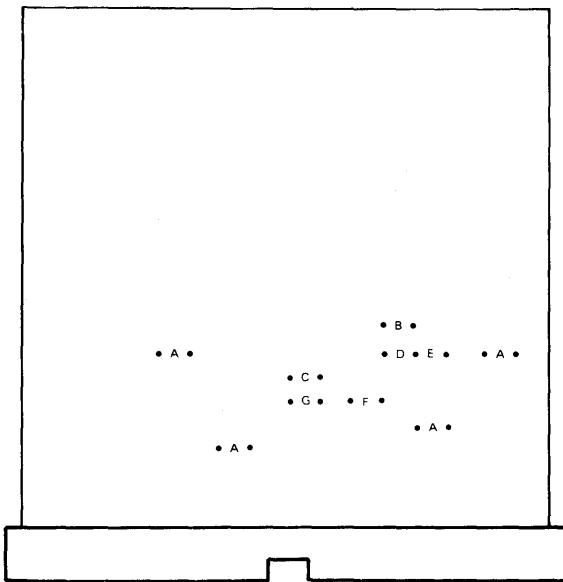
Line 1	A-B3L2
Line 2	A-B3M2
Line 3	A-B3L4
Line 4	A-B3M4

A — Not used or missing (four locations)
B — Not used
C — Not used
D — Not used
E — Not used
F — Not used
G — Not used

Note: The communications adapter card switch settings for
this line must have switch 3 in the On position.

Figure 30-35. Autocall Adapter Card Jumpers

30-900   X.21 LINE ADAPTER

30-910   Locations

The X.21 network interfaces to the System/34 multiline
communications adapter (MLCA) by using a 2-wide
3-high X.21 line adapter card. See Figure 30-36 for line
1 hardware configuration. If line 2, 3, or 4 is installed,
see Figures 30-5 and 30-7 for hardware locations.

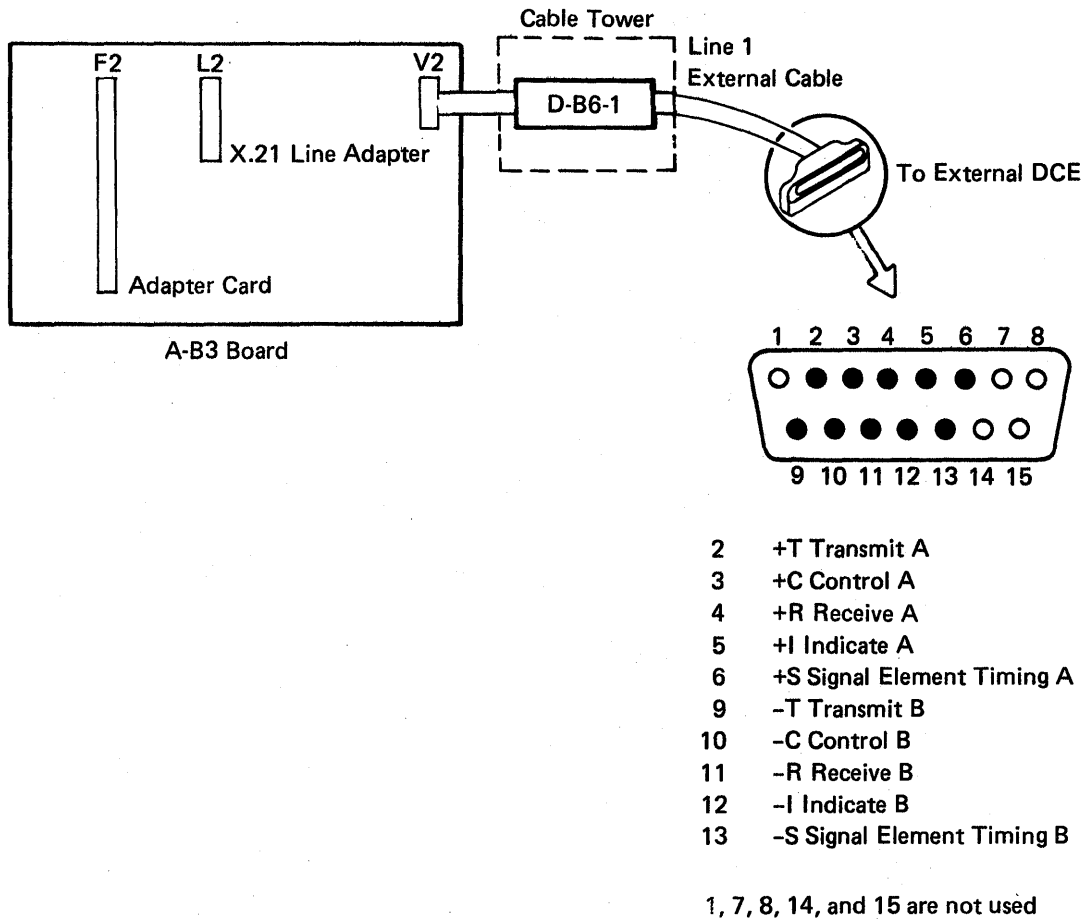|		
2	+T Transmit A
3	+C Control A
4	+R Receive A
5	+I Indicate A
6	+S Signal Element Timing A
9	-T Transmit B
10	-C Control B
11	-R Receive B
12	-I Indicate B
13	-S Signal Element Timing B

1, 7, 8, 14, and 15 are not used

Figure 30-36. X.21 Line Adapter (Line 1)

30-920 X.21 Control/Data Lines

The control/data lines to and from the data communications equipment (DCE) use differential drivers and receivers.

The control lines are defined as:

- +C Control A and -C Control B

- +I Indicate A and -I Indicate B

- +S Signal Element Timing A and -S Signal Element Timing B

The data lines are defined as:

- +T Transmit A and -T Transmit B

- +R Receive A and -R Receive B

See Figure 30-37 for a definition of the logic levels, and Figure 30-38 for the X.21 control/data lines and connector pin numbers.

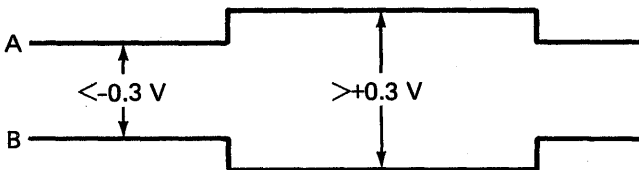|	$V_A\text{-}V_B < -0.3\ V$	$V_A\text{-}V_B > +0.3\ V$
Data lines	1	0
Control lines	Off	On

A ————

$< -0.3\ V$ $> +0.3\ V$

B ————

Figure 30-37. X.21 Logic Levels

+C Control A or -C Control B (System/34 to DCE): These lines control the DCE when data is transmitted on the '+T transmit A' or '-T transmit B' line.

+T Transmit A or -T Transmit B (System/34 to DCE): These binary signals are generated by System/34 and are encoded with data to be transmitted by the DCE to one or more remote DTEs. Before data can be sent, commands are transmitted on these lines from System/34 to the public data network to establish a data link (call establishment).

+I Indicate A or -I Indicate B (DCE to System/34): These lines control System/34 during call establishment when the call control response data from the public data network is received on the '+R receive A' or '-R receive B' line.

+R Receive A or -R Receive B (DCE to System/34): These binary signals are generated by the DCE from the encoded data received from one or more remote DTEs. Before data can be received, these lines contain the call control response data from the public data network when a data link (call establishment) is being established.

+S Signal Element Timing A or -S Signal Element Timing B (DCE to System/34): These lines supply System/34 with timing pulses of equal on and off duration. All changes in the condition of the control, transmit, indicate, and receive lines should occur when the '+S signal element timing A' or '-S signal element timing B' line goes from the off to the on condition.
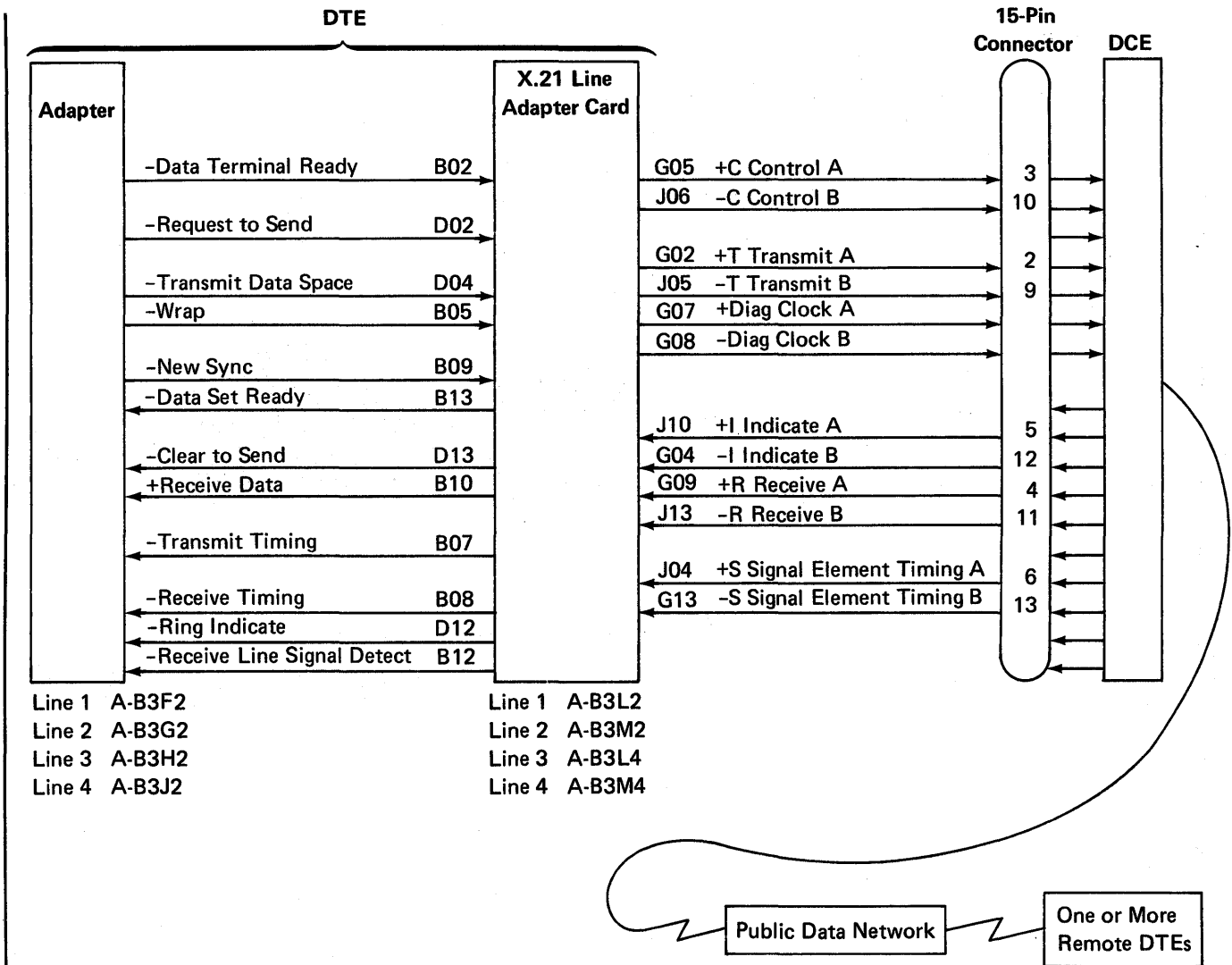
30

Figure 30-38. X.21 Control/Data Lines

DTE

Adapter

−Data Terminal Ready	B02	
−Request to Send	D02	
−Transmit Data Space	D04	
−Wrap	B05	
−New Sync	B09	
−Data Set Ready	B13	
−Clear to Send	D13	
+Receive Data	B10	
−Transmit Timing	B07	
−Receive Timing	B08	
−Ring Indicate	D12	
−Receive Line Signal Detect	B12	

X.21 Line Adapter Card

15-Pin Connector   DCE

G05	+C Control A	3
J06	−C Control B	10
G02	+T Transmit A	2
J05	−T Transmit B	9
G07	+Diag Clock A	
G08	−Diag Clock B	
J10	+I Indicate A	5
G04	−I Indicate B	12
G09	+R Receive A	4
J13	−R Receive B	11
J04	+S Signal Element Timing A	6
G13	−S Signal Element Timing B	13

Line 1 A-B3F2
Line 2 A-B3G2
Line 3 A-B3H2
Line 4 A-B3J2

Line 1 A-B3L2
Line 2 A-B3M2
Line 3 A-B3L4
Line 4 A-B3M4

Public Data Network

One or More Remote DTEs

30-950 Card Jumpers

The X.21 line adapter card has six jumper locations. See Figure 30-39 for instructions as to which jumpers are needed to match your machine configuration.

```
•A • B •      • C • D •      • E • F •

•G • H •      • J • K •      • L • M •
```
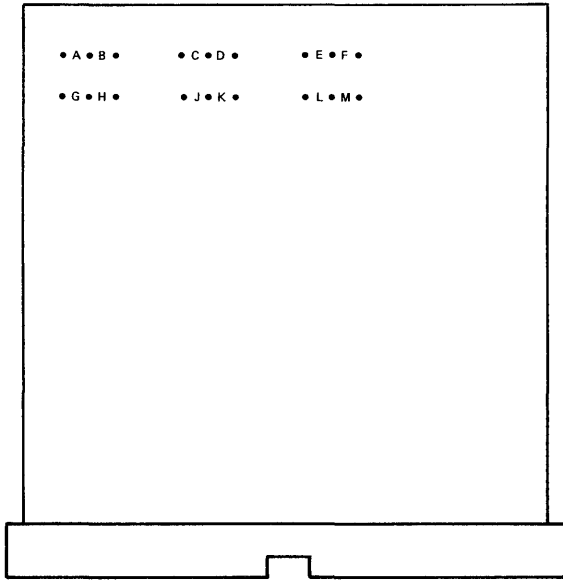
Line 1   A-B3L2
Line 2   A-B3M2
Line 3   A-B3L4
Line 4   A-B3M4

A — Not used
B — X.21 is installed
C — Not used
D — X.21 is installed
E — X.21 is installed
F — Not used
G — X.21 is installed
H — Not used
J — Native option; select this option when a switched mode network is installed.
K — BIS option; select this option when a nonswitched network is installed.
L — Switched mode network is installed
M — Nonswitched mode network is installed

Figure 30-39. X.21 Line Adapter Card Jumpers

30

30-960   Board Jumpers

When the X.21 line adapter is installed, the following
board jumpers are required on the A-B3 board. See
Figure 30-40 for a list of board jumpers needed for
each line installed.

Line Number	A-B3 Board Jumpers	Description
1	F2S10 to F2P11[1] A4B11 to L2D11 F2U11 to L2D09 L2G08 to V2D13	-DSR to -TI -Data Prot to -Reset 1ms Osc to Diag Clk Diag Clk B to Cable Socket
2	G2S10 to G2P11[1] A4B11 to M2D11 G2U11 to M2D09 M2G08 to V3D13	Same as Line 1
3	H2S10 to H2P11[1] J1E13 to L4D11 H2U11 to L4D09 L4G08 to V4D13	Same as Line 1
4	J2S10 to J2P11[1] J1E13 to M4D11 J2U11 to M4D09 M4G08 to V5D13	Same as Line 1

[1]The -DSR to -TI jumper is installed only on a switched mode network
configuration.

Figure 30-40. A-B3 Board Jumper Wires for X.21

30-970   Diagnostic Wrap Function

A diagnostic cable wrap can be performed at either of two locations:

- DCE cable wrap (DCE end of the external cable)

- Cable tower wrap (System/34 cable tower)

The same diagnostic TU is used to check either of the two cable wrap functions. The functions of the two different wraps are described as follows:

- DCE Cable Wrap—Checks that the control/data lines between System/34 and the DCE can be activated. Set up the DCE cable wrap as follows:
  - Connect the external cable from System/34 to the DCE.
  - Set the DCE diagnostic switch to the wrap position.
  - Power on the DCE.
  - Run the communication MDIs in dedicated mode.

See Figure 30-41 for a diagram of the DCE cable wrap.
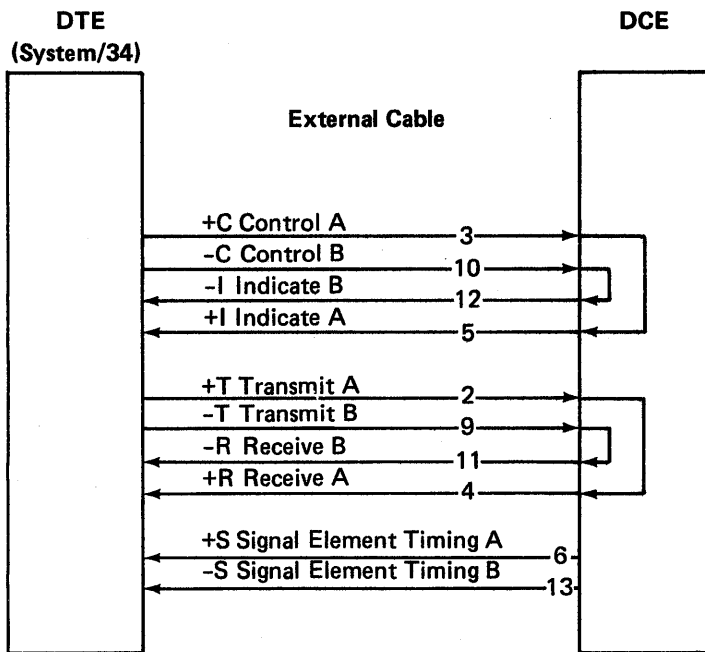
Note: The '+S signal element A' and '−S signal element B' lines are not wrapped but supply clock pulses to the DTE during the cable wrap.

Figure 30-41. DCE Cable Wrap

- Cable Tower Wrap—Checks that the control/data lines
  between the X.21 line adapter and the cable tower
  can be activated. Set up the cable tower wrap as
  follows:
  - Disconnect the external cable from the cable tower
    connector.
  - Connect the B end of the communications wrap
    card (IBM part 4236797) to the cable tower
    connector.
  - Run the communications MDIs in dedicated mode.

See Figure 30-42 for a diagram of the cable tower
wrap.

Note: When the DCE is not connected, System/34
supplies clock pulses on the '+diag clock A' and '-diag
clock B' lines.

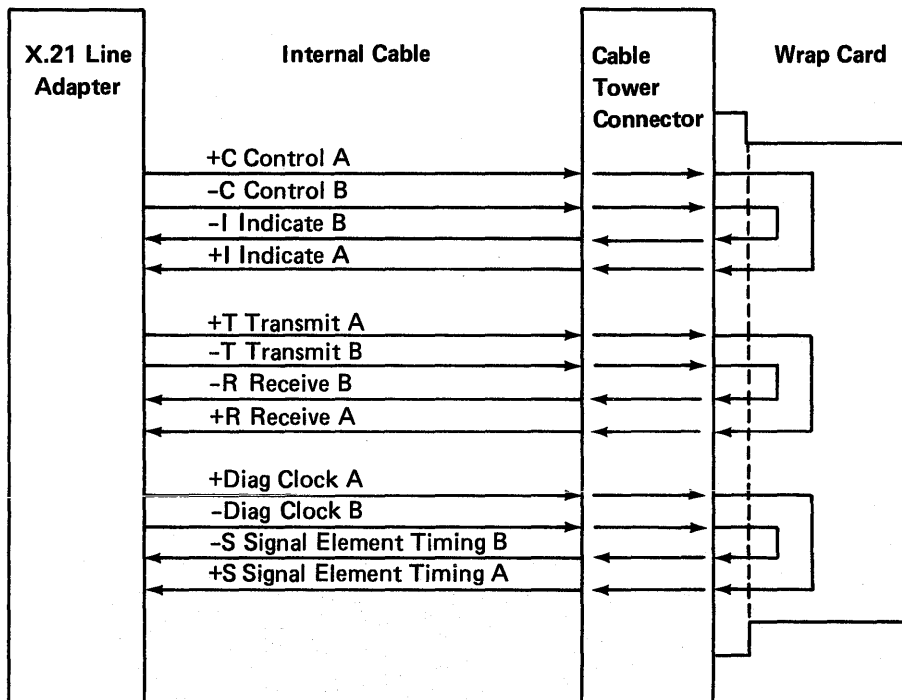| X.21 Line Adapter	Internal Cable	Cable Tower Connector	Wrap Card
	+C Control A		
	-C Control B		
	-I Indicate B		
	+I Indicate A		
	+T Transmit A		
	-T Transmit B		
	-R Receive B		
	+R Receive A		
	+Diag Clock A		
	-Diag Clock B		
	-S Signal Element Timing B		
	+S Signal Element Timing A		

Figure 30-42. Cable Tower Wrap