IBM Maintenance Library

3270 Information Display System Physical Planning Information and Installation Manual

IBM 3271 Control Unit
IBM 3272 Control Unit
IBM 3275 Display Station
IBM 3277 Display Station
IBM 3284 Printer
IBM 3286 Printer
IBM 3288 Line Printer

SY27-2349-4

Preface

The purpose of this manual is to bring together the information that is pertinent to the physical planning and installation of certain units of the IBM 3270 Information Display System. This revision contains the information for planning and installing a 3270 Information Display System composed of these units. The units of the system included in the manual are:

- IBM 3271 Control Unit
- IBM 3272 Control Unit
- IBM 3275 Display Station
- IBM 3277 Display Station
- IBM 3284 Printer
- IBM 3286 Printer
- IBM 3288 Line Printer

This manual is divided into nine sections, arranged in the following order:

Section 1 — General information concerning system installation, configurations, cabling, related manuals that will assist in installation, and unique tools that must be available at installation. It is recommended that this section be thoroughly reviewed before installation starts.

Section 2 — Physical planning and installation instructions for the 3271 Control Unit (Remote).

Section 3 — Physical planning and installation instructions for the 3272 Control Unit (Local).

Section 4 — Physical planning and installation instructions for the 3275 Display Station (Leased Line and Dial feature).

Section 5 — Physical planning and installation instructions for the 3277 Display Station.

Section 6 — Physical planning and installation instructions for all models of the 3284 and 3286 Printers.

Section 7 — Physical planning and installation instructions for the 3288 Line Printer.

Section 8 — Physical planning and installation instructions for the IBM 3872, 3875, and 4872 Modems.

Section 9 — Physical planning for the IBM 2701 and 2703. Jumpering flowcharts for the IBM 2701 are included to assist in installation.

These are independent sections and can be separated for easier reference as individual jobs require. The diagrams are numbered consecutively within a section.

Reference to supporting documentation is by the use of asterisks (*). The manual is not intended to replace the publications cited, but to provide a condensation of physical planning and installation material to assist in installation.

Fifth Edition (April, 1976)

This edition, SY27-2349-4, is a reprint, and incorporates Technical Newsletters SN31-0148, SN31-0262, and SN31-0231. Information in this manual is subject to change from time to time. Any such change will be reported in subsequent revisions or Technical Newsletters.

Text for this manual has been prepared with the IBM SELECTRIC ® Composer.

Comments may be addressed to IBM Corporation, Department 63T, Neighborhood Road, Kingston, N.Y., 12401

© Copyright International Business Machines Corporation 1973, 1974, 1975, 1976

Contents

Section 1 3270 Display System 1-1
3270 Display System Installation Overview 1-1
3271 Control Unit, Models 1 and 2, Attached Devices and Features (Remote) 1-2
3271 Control Unit, Models 11 and 12, Attached Devices and Features (Remote) 1-3
3272 Control Unit, Attached Devices and Features (Local) 1-4
3275 Display Station, Models 1 and 2, Attached Devices and Features (Remote) 1-5
3275 Display Station, Models 11 and 12, Attached Devices and Features (Remote) 1-6
3270 Display System Cabling Schematic (2 Sheets) 1-7
3270 Display System Manuals and Companion Manuals 1-9
3270 Display System Installation Tools (2 Sheets) 1-10
Switch Indicator Unit (SIU) Model 1 Physical Locations 1-12
Switch Indicator Unit (SIU) Model 2 Physical Locations 1-13
SIU Troubleshooting Procedure 1-14

Section 2 3271 Control Unit, Models 1, 2, 11, 12 Physical Planning and Installation 2-1
3271 Control Unit, Models 1, 2, 11, 12 Physical Planning 2-1
3271 Control Unit, Models 1 and 2 Installation (5 Sheets) 2-2
3271 Control Unit, Models 11 and 12 Installation (5 Sheets) 2-7

Section 3 3272 Control Unit, Models 1 and 2 Physical Planning and Installation 3-1
3272 Control Unit Models 1 and 2 Physical Planning 3-1
3272 Control Unit, Models 1 and 2 Installation (5 Sheets) 3-2

Section 4 3275 Display Station, Models 1, 2, 11, 12 Physical Planning and Installation (Leased Line and Dial Feature) 4-1
3275 Display Station Models 1, 2, 11, 12 Physical Planning 4-1
3275 Display Station, Models 1 and 2, Leased Line Installation (10 Sheets) 4-2
3275 Display Station, Models 1 and 2, Dial Feature Installation (11 Sheets) 4-12
3275 Display Station, Models 11 and 12 Installation (6 Sheets) 4-24

Section 5 3277 Display Station, Models 1 and 2 Physical Planning and Installation 5-1
3277 Display Station, Models 1 and 2 Physical Planning 5-1
3277 Display Station Installation (7 Sheets) 5-2

Section 6 3284/3286 Printer, Models 1, 2, and 3, Physical Planning and Installation 6-1
3284/3286 Printers, Models 1, 2, and 3 Physical Planning 6-1
3284/3286 Printers, Models 1 and 2 Installation (11 Sheets) 6-2
3284/3286 Printers, Model 3 Installation (7 Sheets) 6-14

Section 7 3288 Line Printer, Model 2, Physical Planning and Installation 7-1
3288 Printer, Model 2, Physical Planning 7-1
3288 Printer, Model 2, Installation (5 Sheets) 7-2

Section 8 IBM Modems Physical Planning and Installation, 3872 Modem, 3875 Modem, 4872 Modem 8-1
3872 Physical Planning, Installation and Alignment (2 Sheets) 8-1
3875 Physical Planning, Installation and Alignment (3 Sheets) 8-3
4872 Physical Planning, Installation and Alignment (5 Sheets) 8-6

Section 9 Transmission Control Units, 2701 Physical Planning and Jumpering Flowcharts . . 9-1
2701 Physical Planning and Cabling Schematic 9-1
2701 Jumpering Flowchart - 3270 Display System (5 Sheets) 9-2
2703 Physical Planning and Cabling Schematic 9-7

Appendix A Plug Types A-1

Appendix B Power Cord Style Specification and Plug Installation B-1

Glossary G-1

Section 1. 3270 Display System

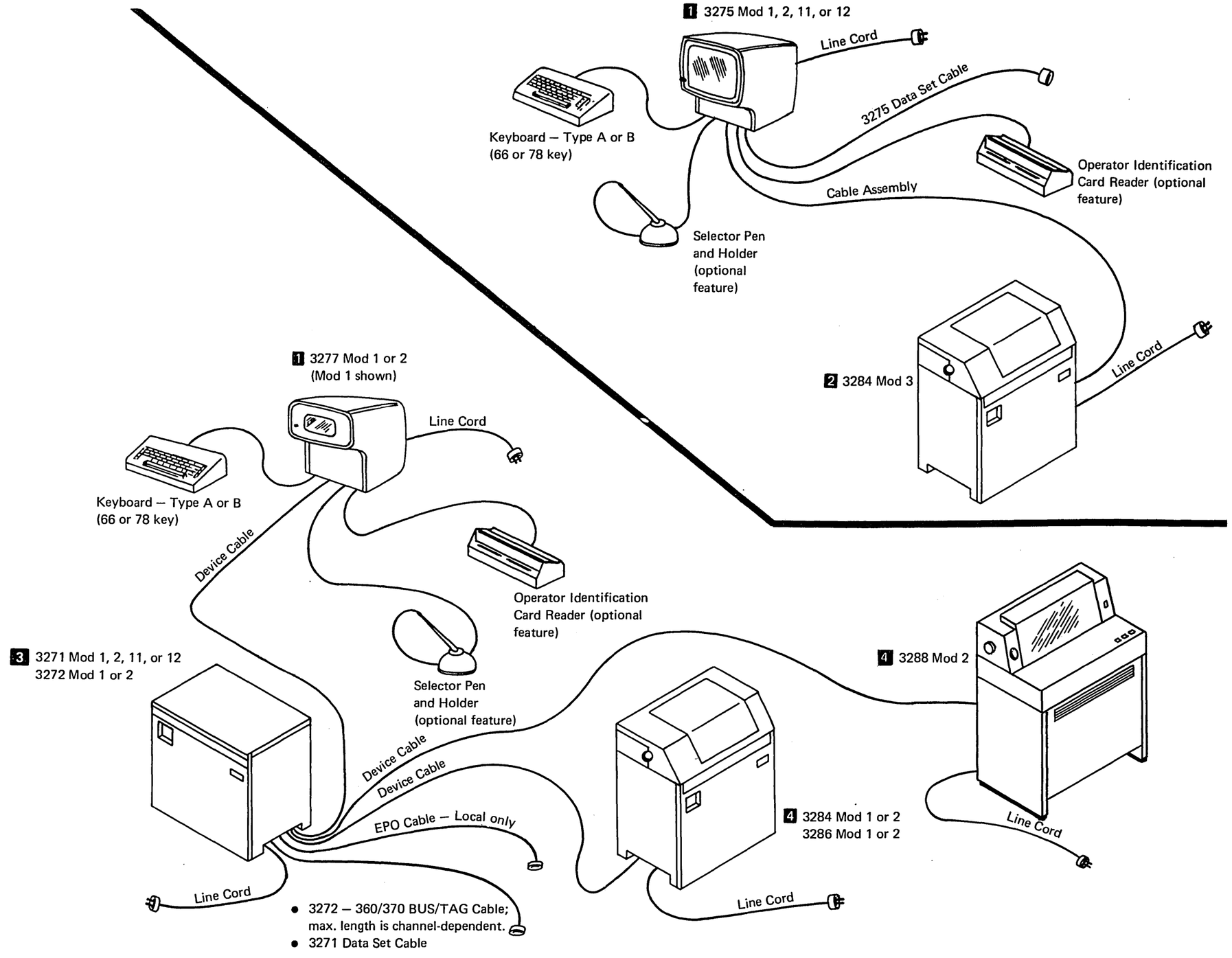
1 Display Stations
- 3275 Model 1 or 11 — 480 Character — Standalone (Remote)
- 3275 Model 2 or 12 — 1920 Character — Standalone (Remote)
- 3277 Model 1 — 480 Character — Clustered
- 3277 Model 2 — 1920 Character — Clustered

2 Dedicated Printer
- 3284 Model 3 — Attaches to 3275 Display Stations, Models 1 and 2 only.

3 Control Units
- 3271 Model 1 or 11 — 480 Char. — Remote
- 3271 Model 2 or 12 — 1920 Char. — Remote
- 3272 Model 1 — 480 Char. — Local
- 3272 Model 2 — 1920 Char. — Local

Note: Model 1 or 11 control units may attach to only Model 1 3277 Display Stations and Printers. Model 2 or 12 control units may attach Model 1 or Model 2 3277 Display Stations and Printers. A mixture of up to 32 such devices may be installed, one of which must be a Display Station, the model number of which agrees with that of the control unit, with an attached keyboard.

4 Printers
- 3284 Model 1
- 3284 Model 2
- 3286 Model 1
- 3286 Model 2
- 3288 Model 2



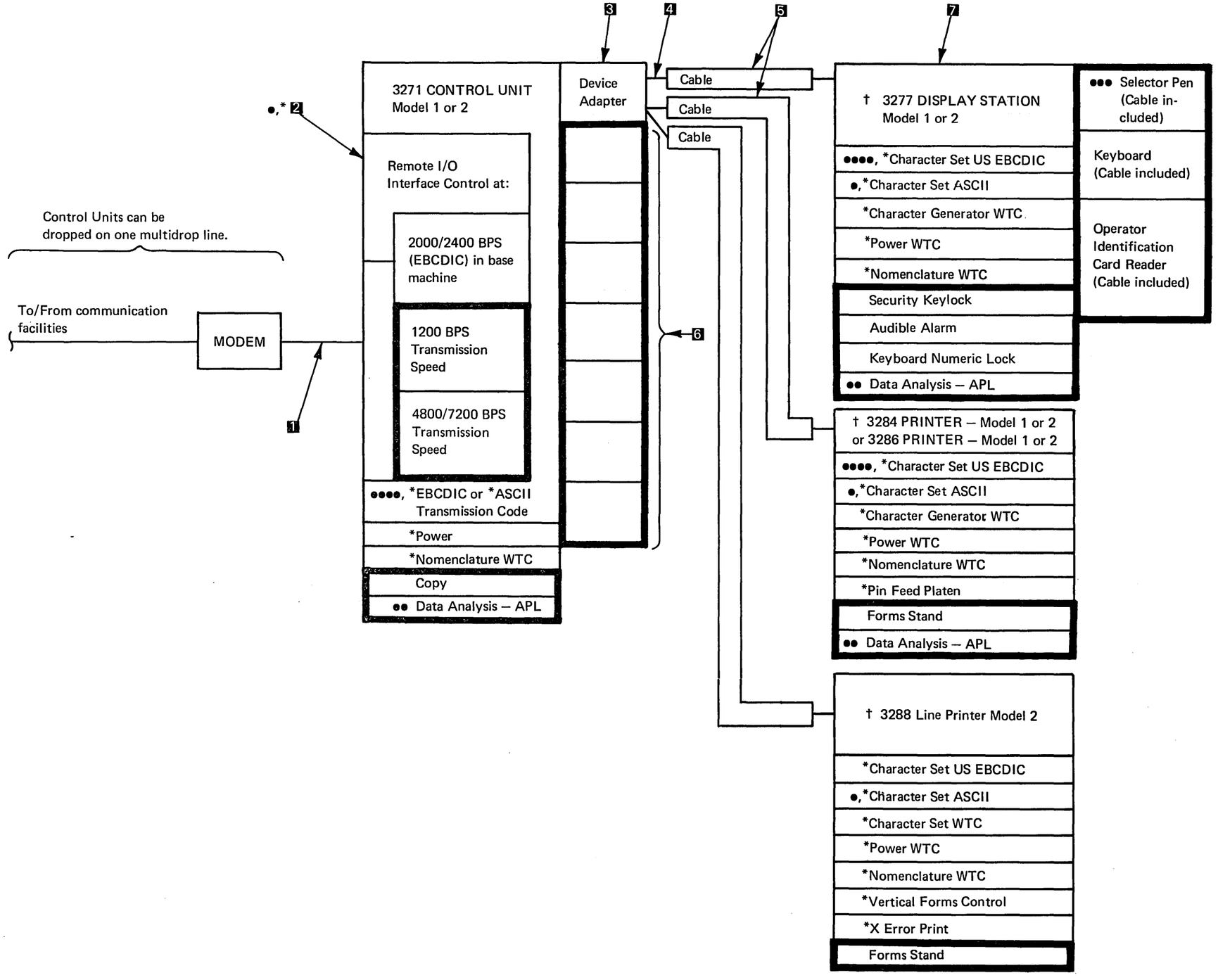
3271 Control Unit, Models 1 and 2, Attached Devices, and Features (Remote)

Explanation references:

1. Up to 40 feet of cable. To order this cable, refer to 3270 Display System Cabling Schematic in this manual.
2. ASCII Transmission Code — Only available in USA or Canada — Replaces EBCDIC Code.
3. Included with the basic control unit.
4. Up to 32 devices may be attached.
5. Up to 2000 feet may be installed.
6. Device Adapter — One required for each 4 devices to be attached.
7. One display station with a keyboard special feature must be attached and within visual distance of the control unit. The display station and control unit Model numbers must agree.

Legend:

- Special Features
- * Specify Feature — No Cost
- † Only Model 1 Display Stations and printers can be attached to a Model 1 Control Unit. Any model device can be attached to a Model 2 Control Unit.
- WTC Only available in WTC countries.
- ● Only available in USA or Canada.
- ●● The Data Analysis — APL special feature functions only with a Model 2 3271 Control Unit and a Model 2 3277 Display Station, or a Model 2 3284 or 3286 Printer.
- ●●● The Selector Pen Feature is not supported when the Data Analysis — APL Feature is enabled.
- ●●●● Only the U.S. EBCDIC character set is used when the Data Analysis — APL Feature is installed.

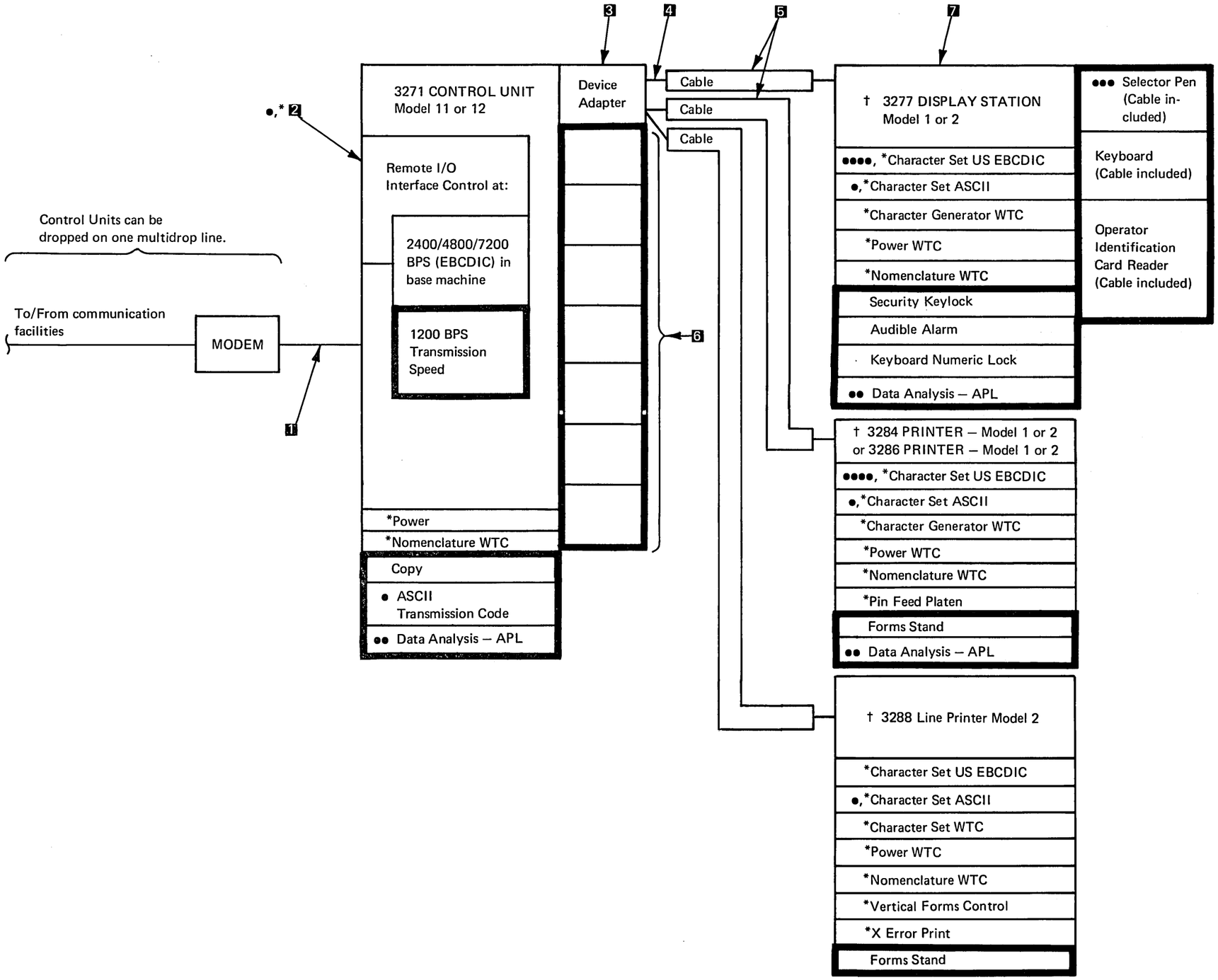


Explanation of references:

1. Up to 40 feet of cable. To order this cable, refer to 3270 Display System Cabling Schematic in this manual.
2. ASCII Transmission Code — Only available in USA or Canada — Replaces EBCDIC Code.
3. Included with the basic control unit.
4. Up to 32 devices may be attached.
5. Up to 2000 feet may be installed.
6. Device Adapter — One required for each 4 devices to be attached.
7. One display station with a keyboard special feature must be attached and within visual distance of the control unit. The display station and control unit Model numbers must agree.

Legend:

- Special Features
- * Specify Feature — No Cost
- † Only Model 1 Display Stations and printers can be attached to a Model 11 Control Unit. Any model device can be attached to a Model 12 Control Unit.
- WTC Only available in WTC countries.
- ● Only available in USA or Canada.
- ●● The Data Analysis — APL special feature functions only with a Model 12 3271 Control Unit and a Model 2 Display Station, or a Model 2 3284 or 3286 Printer.
- ●●● The Selector Pen Feature is not supported when the Data Analysis — APL Feature is enabled.
- ●●●● Only the U.S. EBCDIC character set is used when the Data Analysis — APL Feature is installed.



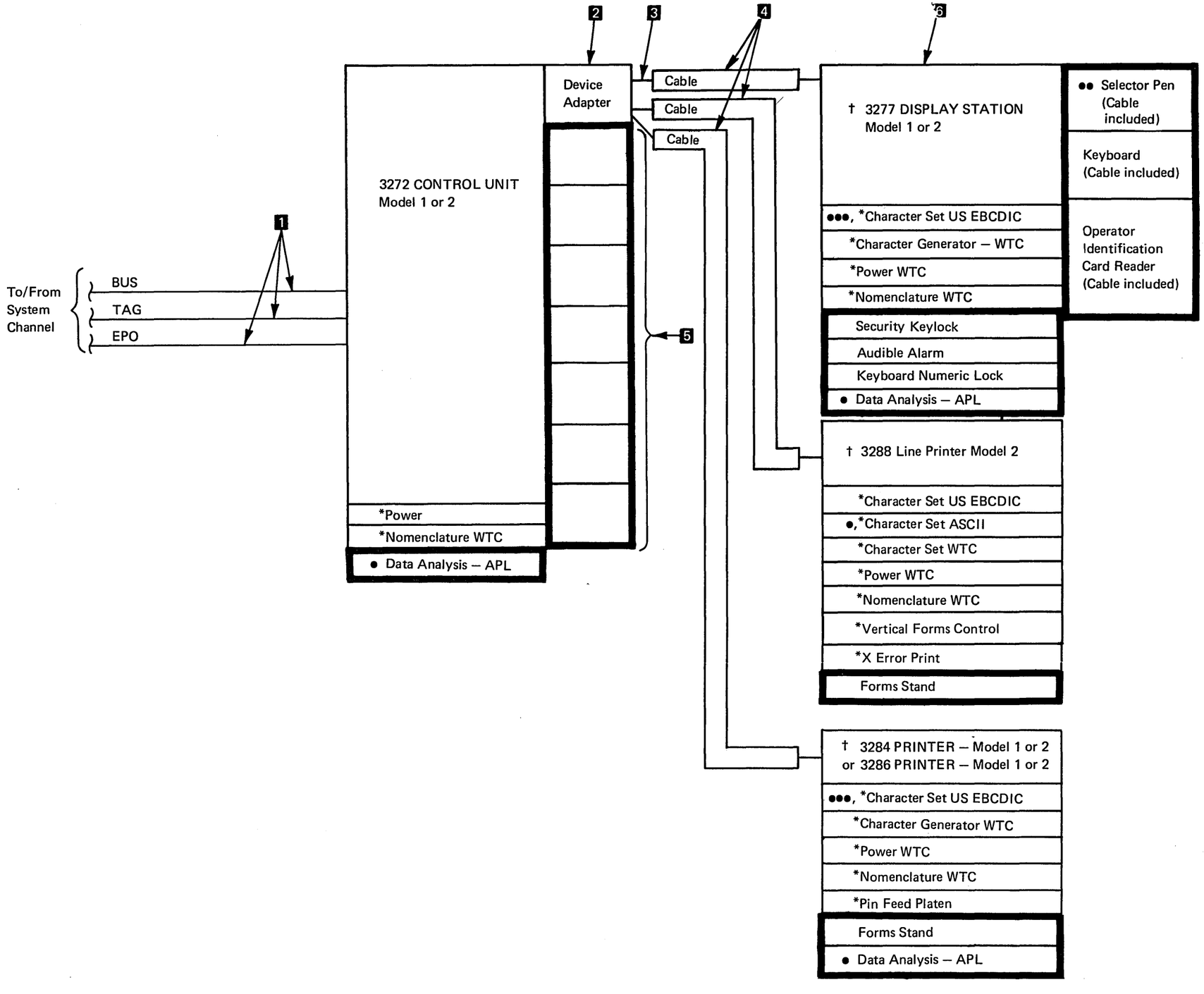
3272 Control Unit, Attached Devices, and Features (Local)

Explanation of references:

1. 3 cables needed
2. Included with the basic control unit.
3. Up to 32 devices may be attached.
4. Up to 2000 feet of cable may be installed.
5. Device Adapter — One required for each 4 devices to be attached.
6. One display station with a keyboard special feature must be attached and within visual distance of the control unit. The display station and control unit model numbers must be the same.

Legend:

- ▬▬ Special Features
- * Specify Feature — No Cost
- † Only Model 1 Display Stations and Printers can be attached to a Model 1 Control Unit. Any model device can be attached to a Model 2 Control Unit.
- WTC Only available in World Trade Corporation Countries.
- ● The Data Analysis — APL special feature functions only with a Model 2 3272 Control Unit and a Model 2 3277 Display Station, or a Model 2 3284 or 3286 Printer.
- ●● The Selector Pen Feature is not supported when the Data Analysis — APL Feature is enabled.
- ●●● Only the U.S. EBCDIC character set is used when the Data Analysis — APL Feature is installed.

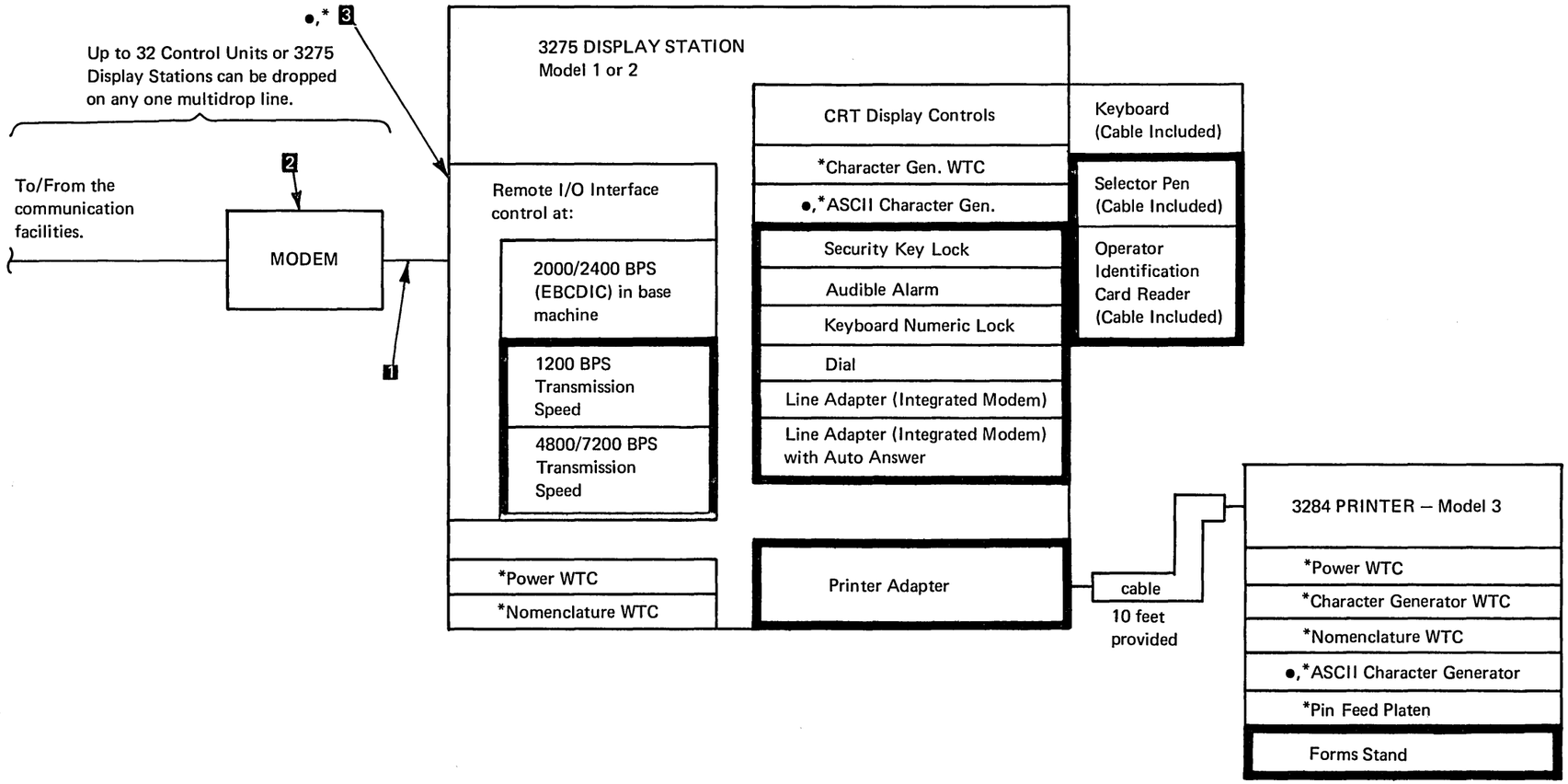


Explanation of references:

1. Up to 40 feet of cable. To order this cable refer to 3270 Display System Cabling Schematic in this manual.
2. A Data Access Arrangement (DAA) is required when using the IBM 600/1200 BPS Line Adapter to connect a 3275, equipped with the Dial Feature, to a switched telephone line.
3. ASCII Transmission Code – Replaces EBCDIC Code – Only available in USA and Canada.

Legend:
- Special Features
- o Only available in USA and Canada
- * Specify Feature – No Cost

WTC Only available in WTC countries



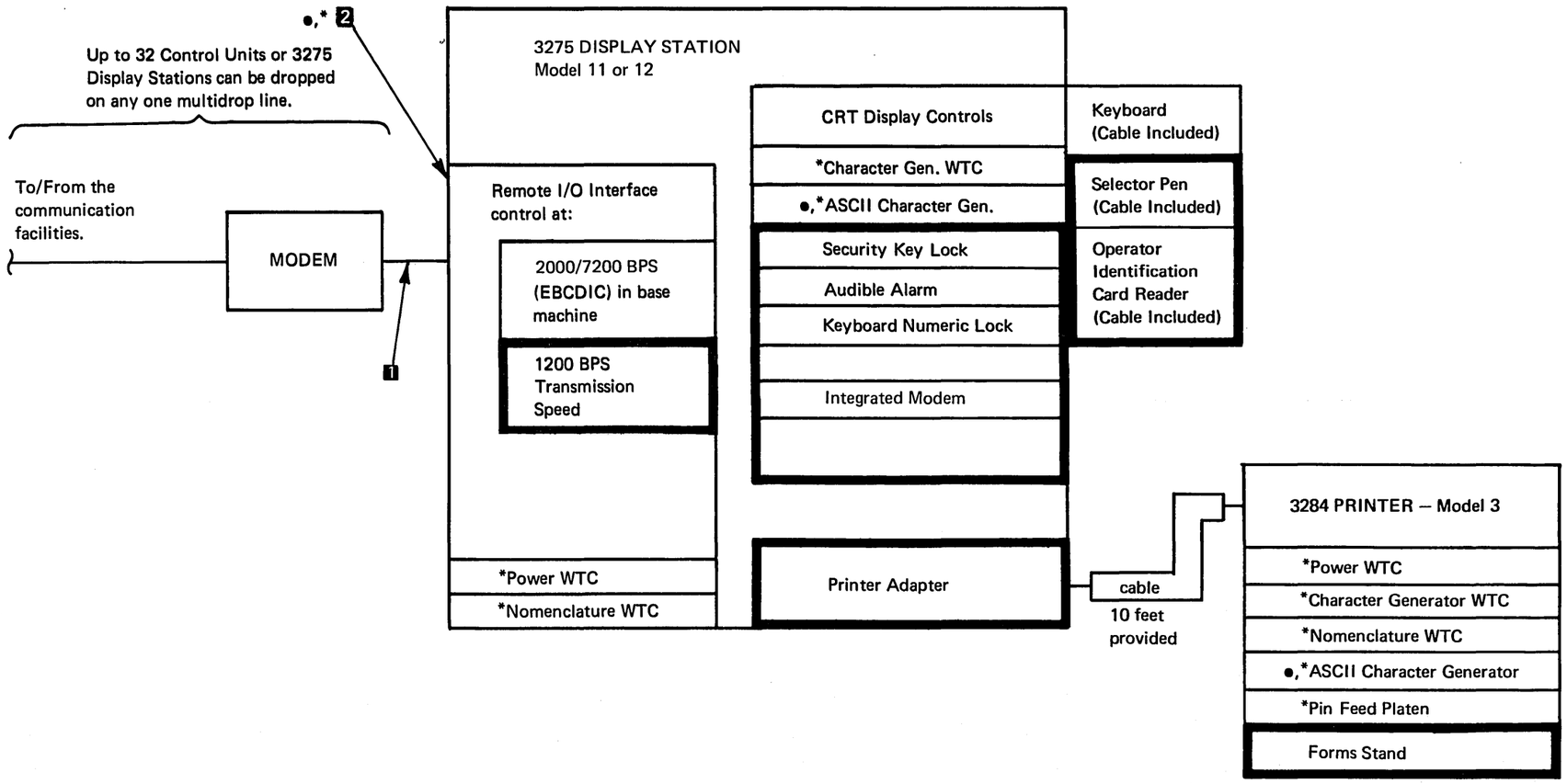
Explanation of references:

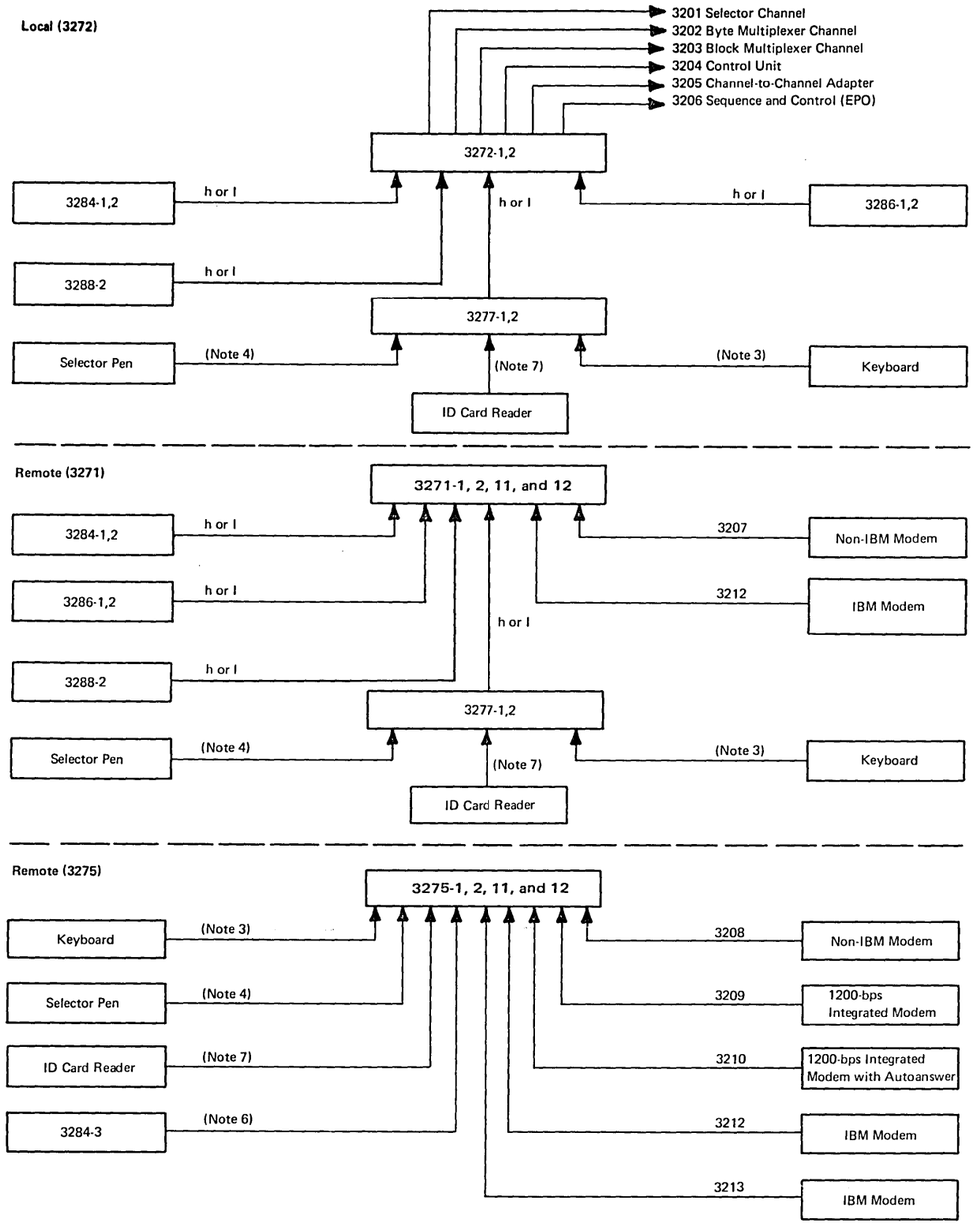
1 Up to 40 feet of cable. To order this cable refer to 3270 Display System Cabling Schematic in this manual.

2 ASCII Transmission Code – Replaces EBCDIC Code – Only available in USA and Canada.

Legend:

▬ Special Features
● Only available in USA and Canada
* Specify Feature – No Cost
WTC Only available in WTC countries





3270 Display System Cabling Schematic (Sheet 1 of 2)

Group No.	*No. of Cables*	*From*	*To*	*Max Length (ft)*	*Notes*
h or 1	1	3277, 3284, 3286	3271, 3272	2,000	5
h or 1	1	3288	3271-2 and 12, 3272-2	2,000	5
3201	2	3272	Selector Channel	–	1
3202	2	3272	Byte Multiplexer Channel	–	1
3203	2	3272	Block Multiplexer Channel	–	1
3204	2	3272	Control Unit	–	1
3205	2	3272	Channel-to-Channel Adapter	–	1, 8
3206	1	3272	Channel	150	2
3207	1	Modem	3271	40	9, 10
3208	1	Modem	3275	40	9, 10
3209	1	Nonswitched or Switched Lines/DAA Type CDT	3275	40	9, 11
3210	1	DAA Type CBS	3275	40	9, 12, 13
3212	1	Modem	3271, 3275	40	14
3213	1	Modem	3275	40	15

Notes:

1. Total cable length of 200 feet (unless modified by general control-to-channel cabling schematic) available to attach up to eight control units.
2. Sequence and control (EPO).
3. Fixed cable length of 2-1/2 feet supplied with keyboard (SF #4630 through #4635).
4. Fixed cable length of 2 feet supplied with selector pen (SF #6350).
5. Customer supplied, installed, and maintained; maximum length not to exceed 2,000 feet. Cables may be ordered through IBM Branch Office via MES (Miscellaneous Equipment Specification). See page 1-6 for cable specifications and IBM part numbers. If the customer elects to construct his own cable and/or procure commercial parts, refer to *IBM System/370 Installation Manual - Physical Planning,* Form GC22-7004, section entitled "Cable Installation Practice for 3270." For completion of MES order form, see the following example:

Machine/Program Type/Serial/Suffix	*Feature Code RPQ Reference No. ECA or CEM Number*	*Description of MES Parts*				*Qty*	*Part or B/M Number*
		RPQ Region Number		*(Indicate Model Changes From/To)*			
Cable Group	*Length*	*From*		*To*			
		Unit	*No.*	*Unit*	*No.*		
h	2,000	3277	8	3271	1	1	2577672
1	2,000	3277	9	3271	1	1	1833108

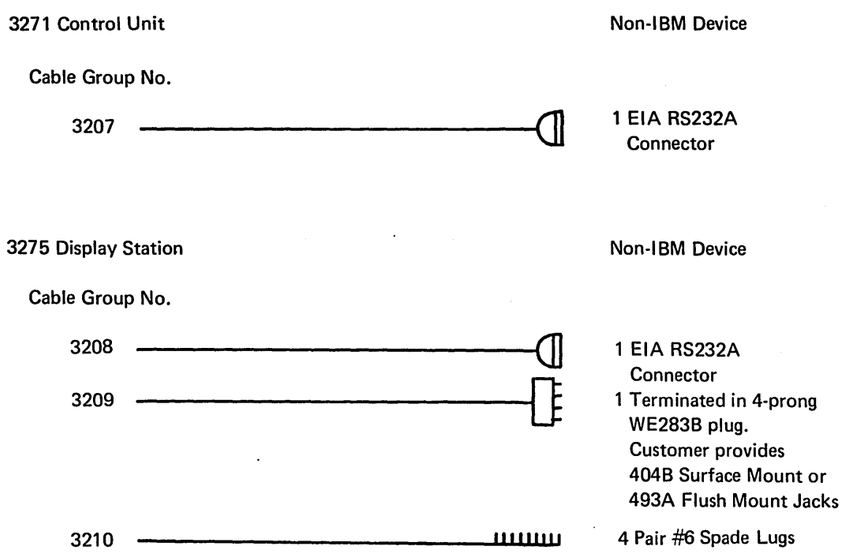
If the installation includes a multiple number of one machine type, include an identifying number in the "No." column in addition to the machine type.

6. Fixed cable length of 10 feet supplied with 3284-3.
7. Fixed cable length of 2-1/2 feet supplied with ID card reader (SF #4600).
8. To channel-to-channel adapter (SF #1850).
9. See "Cables from Non-IBM Devices" for cable specifications.
10. For nonswitched or switched external modem.
11. For switched lines without autoanswer or nonswitched lines (SF #5500).
12. For machines with switched networks and autoanswer, order SF #5501.
13. It is the customer's responsibility to have this cable connected to the communications facility.
14. One group 3212 required for each IBM modem attached. See the following chart for modem types:

To Unit	*Modem*
3271	3872-1 3874-1 3875-1 4872-1, 3
3275	4872-1, 3

15. One group 3213 required to attach one IBM 3872-1, 3874-1, or 3875-1 Modem.

3270 Display System Cabling Schematic (Sheet 2 of 2)



Cable Group Number	IBM Preassembled Cable Assembly	Customer Assembled Cables	
		Bulk IBM Part No.	Connector Group
h	2577672	*323921	1836418
1	1833108	**5252750 (See below)	1836419

*Part 323921-Commercial Designation RG62A/U

Conductor	AWG Size	OD Inches (mm)	UL Rating	Insulation Type	Cover
Copperweld Solid	#22	0.242 (6,1)	750 V	Flame-Retardant Polyethylene	PVC, Color Black, Shield Copper Braid

Source: IBM or approved equivalent.

**Part 5252750

Conductor	AWG Size	OD Inches (mm)	UL Rating	Insulation Type	Cover
Copperweld Solid	#22	0.260 (6,6)	750 V	Flame-Retardant Polyethylene	PVC (UL Style 493) Color Black, Shield Copper Braid Polyester Tape***

Source: IBM or approved equivalent.

***Must be 0.001 inch (0,03 mm) thick between shield and cover.

3270 Display System — General

Operator's Guide GA27-2742 (-4 or later)
Introduction GA27-2739 (-5 or later)
Component Description GA27-2749 (-5 or later)
Problem Determination Guide GA27-2750 (-3 or later)
Layout Sheet GX27-2951

3270 Display System — Troubleshooting Guides

3271 MLTG — Base SY27-2311
3271 MLTG — SDLC SY27-2409
3272 MLTG — Base SY27-2312
3275 MLTG — Leased Line SY27-2313
3275 MLTG — Dial Feature SY27-2329
3275 MLTG — SDLC SY27-2410
3277 MLTG — Base SY27-2314
3284/3286 Models 1 and 2 MLTG — Base SY27-2315
3284/3286 Model 2 MLTG 3270 Data Analysis — APL Feature SY27-2420
3284 Model 3 MLTG — Base SY27-2316
3286 Model 3 MLTG — Base SY27-2317
3288 Model 2 MLTG — Base SY27-2401

3270 Display System — Parts Catalogs

3271/3272 S126-0004 (-3 or later)
3275/3277 S126-0005 (-3 or later)
3284/3286 S126-0006
3286 Model 3 S126-0002
3288 Model 2 S126-0008

3270 Pre-recorded Tape Cassettes

3271 EBCDIC SY27-2318
3271 ASCII SY27-2319
3275 EBCDIC — Leased Line SY27-2320
3275 ASCII — Leased Line SY27-2321
3275 EBCDIC — Dial Feature SY27-2325
3275 ASCII — Dial Feature SY27-2326
3271/3275 Model 11 and 12 SY27-2412

Field Engineering Companion Manual

1200 Teleprocessing Diagnostic Analyzer Tester — TDAT S226-3029

General Companion Manuals

System 360 Installation Manual — Physical Planning GC22-6820
System 370 Installation Manual — Physical Planning GC22-7004
General Information — Binary Synchronous Communications GA27-3004
Introduction to the IBM 3705 Communications Controller GA27-3051
3872 Modem User's Guide GA27-3058
3875 Modem User's Guide GA33-0001
4872 Modem — Models 2 and 3 GA36-0004
IDR—M ID Reader — Motorized Theory-Maintenance, Parts Catalog SY26-4188
General Logic Probe (PN 453212) Operator's Manual SY27-0113

Online Tests (OLTs) Companion Manuals

3270 Display System Online Tests — Local D99-3270A*
3270 Display System Online Tests — Remote D99-3270B**
3270 Display Station Online Tests — SDLC Remote D99-3270D

*Order through Program Information Department (PID).
**Order through Program Information Department (PID). Order one copy for each host site and one copy for each remote site.

3270 Display System Installation Tools

The maintenance tools described in this section contribute to successful maintenance of the 3270 Display System, ensuring minimum down time for IBM customers. Comprehensive descriptions of the logic test probe and the switch indicator unit are included. These tools must be available (with the exception of the Modem Interface Test Set) for use by the CE on every trouble call for successful maintenance of the 3270 Display System.

TOOLS REQUIRED

Tool Kit

The IBM tool kit provides some of the basic tools needed to maintain the 3275 Display Station.

The standard volt-ohmmeter (VOM) is adequate for all voltage measurements. (The input impedance of 20,000 ohms per volt of the meter causes an erroneous reading when measuring the 400V dc power supply. This effect is noted when a check of that power supply is called out.) When using the VOM, all dc voltage measurements should be referenced to dc return, rather than to frame ground.

Oscilloscope

In some cases of trouble analysis, it may be necessary to use an oscilloscope. The Tektronix* model 453, or an equivalent, should be used to obtain the most satisfactory results in these cases. However, it is recommended that the logic probe, rather than an oscilloscope, be used as the basic tool.

Logic Probe

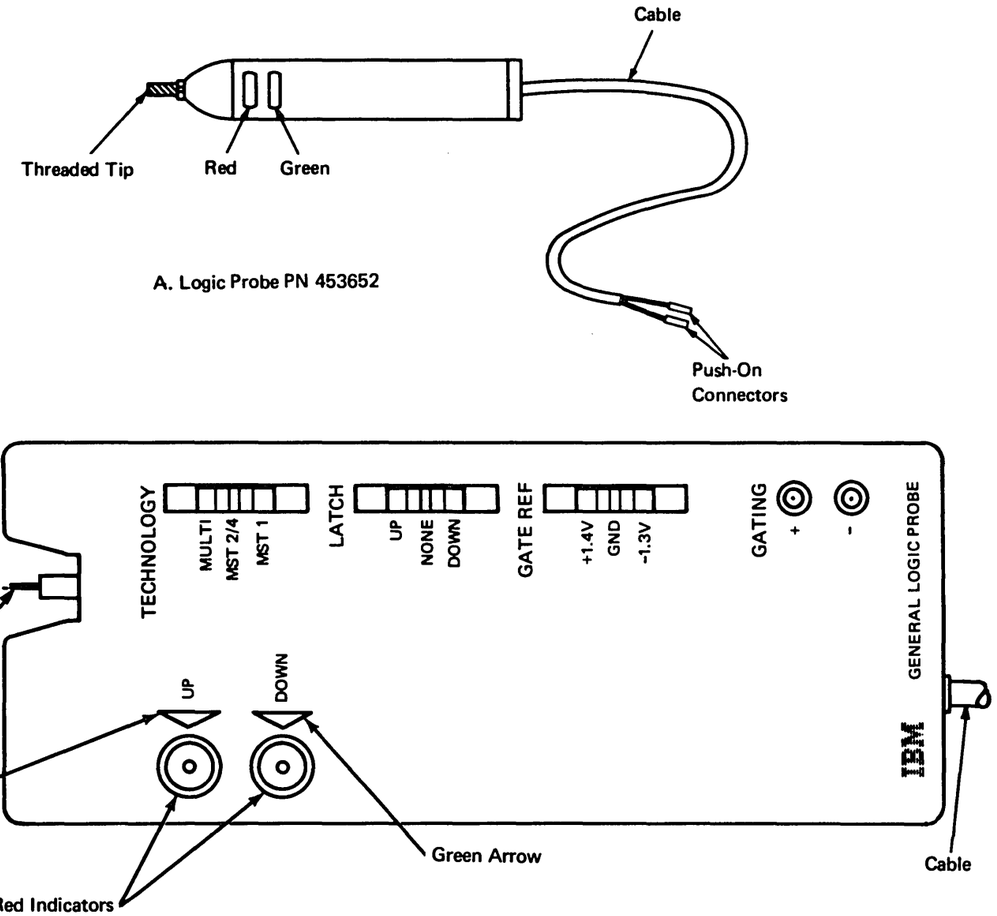
The logic probe, PN 453652 or PN 453212 (newer type), is a unique tool provided as a service aid. It is used by the CE to probe signal levels while performing troubleshooting procedures or using FEALDs. This tool should be obtained (from Mechanicsburg) by all customer engineers who service the 3270 Display System. Normal tool-ordering procedures should be followed to obtain the probe.

Switch/Indicator Unit (SIU)

The Switch/Indicator Unit is a portable maintenance aid used for testing. The 20 switches on the SIU are used to exercise the circuitry; the results are observed by using the 20 LED indicators. When ordering the SIU, also order the correct overlays.

*Trademark of Tektronix, Incorporated

There are two models of the SIU. The Model 1 (PN 2570250) is used with 3271s, 3272s, and 3275s (BSC), Models 1 and 2. The Model 2 (PN 1830679) is used with 3271s and 3275s (SDLC), Models 11 and 12.



A. Logic Probe PN 453652

B. General Logic Probe PN 453212

Diagram 1-1. Logic Probes

Cassette Tape

This cassette tape is prerecorded with the test routines for testing the 3271 and 3275.

Teleprocessing Diagnostic Analyzer Tester (TDAT) or Equivalent

The IBM 1200 TDAT (IBM Domestic and Canada only) is a portable maintenance aid used to test the 3271 and 3275. It is used in conjunction with an IBM Test Tape (cassette) to install and maintain all 3271/3275s. The TDAT part number is 453679.

Cassette Recorder Adapter Unit (CRAU)

The IBM CRAU (PN 1744195) is a portable maintenance aid used in conjunction with the prerecorded cassette tape to test the 3271/3275 Models 11 and 12. The SIU Model 2 and the Norelco recorder are part of this unit providing, only a tape playback function. CRAU operates at the 1200-bps data rate only.

IDR FE Test Card

The IDR FE Test Card (PN 2143816) is a magnetically encoded, plastic test card that conforms to American Banking Association specifications with respect to size, format, and coding. A 37-character test message is encoded on the magnetic stripe on the back of the card. A start-of-record (SOR) character precedes the message, and an end-of-card character and a check character follow the message. The SOR character initiates the read operation but is not transferred to the 3270 unit. The card is used to check the performance of the operator identification card reader. Two test cards are shipped with each card reader.

Modem Interface Test Set, PN 463637 (Nu Data Model 921-S)

The Modem Interface Test Set (order from Mechanicsburg) connects in series with the CCITT/EIA data set cable and the 25-pin data set connector (3271/3275). This enables the CE to monitor, measure, or control the 24 leads of a data set interface cable. This tool contains seven LED indicators for a quick display of the significant CCITT/EIA lines.

PROBE USAGE (Diagram 1-1)

Logic Probe PN 453652

The logic probe (PN 453652) is a unique tool provided as a service aid. It is used to probe signal levels while performing troubleshooting procedures or using FEALDs. This tool should be obtained (from Mechanicsburg) by all customer

engineers who service 3270 units. Normal tool-ordering procedures should be followed to obtain the probe.

Description

The logic probe is a self-contained device which consists, externally, of an anodized aluminum tube with a RED and a GREEN indicator incorporated near its probe end. A cable containing two wires with SLT-type push-on terminals leads out of the sealed top end of the device. A plastic head with a threaded stud is at the probe end. RED and GREEN indicators tell the state of the net being probed. The three signal states that can be distinguished are (1) a solid up-level (RED), (2) a solid down-level (GREEN), and (3) a pulse or pulses (alternating RED and GREEN). The two wires with the push-on connectors attach to pins on the back of the logic board being probed. The wires carry the operating voltages (+5V dc and ground) to the probe. An oscilloscope probe tip is screwed onto the threaded stud at the tip of the probe. This provides the input signals to the device.

Usage

To use the logic probe, a probe tip must be attached to the threaded stud at the tip end. An SLT probe tip (PN 453163, or similar) should be used. The two wires at the top of the probe should be attached to the back of the logic board being probed. The leads are clearly labeled GND and +6V. Connect the GND lead to any D08 pin on the board, and connect the +6V lead to any D03 pin (+5V dc). The leads are connected to the board by pushing the connector at the end of each lead on the designated pin. When the last wire is connected, the RED indicator should light.

Connect the oscilloscope probe tip to the pin designated in the troubleshooting procedures, or as determined in logic. To attach the probe to a pin, grasp the probe at the portion of the body nearest the tip and press straight on the desired pin. Remove the tip by grasping the probe body and pulling so that the tip is withdrawn parallel to the pin.

The following conditions can be observed using the logic probe:

1. RED indication:
   a. Probe not attached to a pin (a floating condition).
   b. Plus signal on the net being probed.
2. GREEN indicator - Ground (negative) signal on the net being probed.
3. RED and GREEN indication - A pulsing signal (alternately plus and ground) is present on the net being probed. This condition can appear as alternate RED and GREEN indicators or as both indicators on simultaneously (depending on the frequency of the pulsing signal). Single pulses can also be seen.

Probe Checkout

Note: This checkout procedure applies to the older-style logic probe (PN 453652). GLP checkout is described in *General Logic Probe Manual,* SY27-0113, which accompanies the GLP.

Power must be applied to the 3270 unit during this procedure.

1. Attach probe tip to probe. Use SLT probe tip PN 453163 or similar.
2. Connect probe GND lead wire to any D08 pin.
3. Connect probe +6V lead wire to any D03 pin. Probe's red indicator should light as soon as this wire is attached.
4. Touch probe tip to any D03 pin. Probe's red indicator should remain lighted.
5. Touch probe tip to any D08 pin. Probe's green indicator should light and remain lighted as long as probe is on D08 pin.
6. Remove probe tip from D08 pin. Probe's red indicator should light again.

Probe Repair

The logic probe is not field-repairable. If trouble is experienced during probe checkout, check for the following conditions:

1. Power is applied to the 3270 unit.
2. Probe leads are on proper source pins.
3. Proper pins are being probed.

If the above conditions are met and the probe fails to operate correctly, obtain a new probe before trouble-shooting the display station.

General Logic Probe Kit PN 453212

General Logic Probe Kit (PN 453212) contains a newly designed probe which electrically replaces logic probe PN 453652. A description of the probe and usage may be found in *General Logic Probe Manual,* Form No. SY27-0113.

IMPORTANT: This manual was written to support logic probe PN 453652. Use of the general logic probe, PN 453212, establishes the need to convert RED to UP and GREEN to DOWN levels. Notations are provided on each page to assist in this conversion.

Switch Indicator Unit (SIU) Model 1 Physical Locations

Switch/Indicator Unit (SIU), Model 1

The switch/indicator unit (PN 2570250) is a portable maintenance aid used to test the IBM 3271, 3272, and 3275 Models 1 and 2. The 20 switches on the SIU are used to exercise the display station circuitry; the results are observed by using the 20 indicators.

IMPORTANT: SIU overlays must be ordered since they are not shipped with the SIU. A complete set of overlays may be ordered from B/M 2621480.

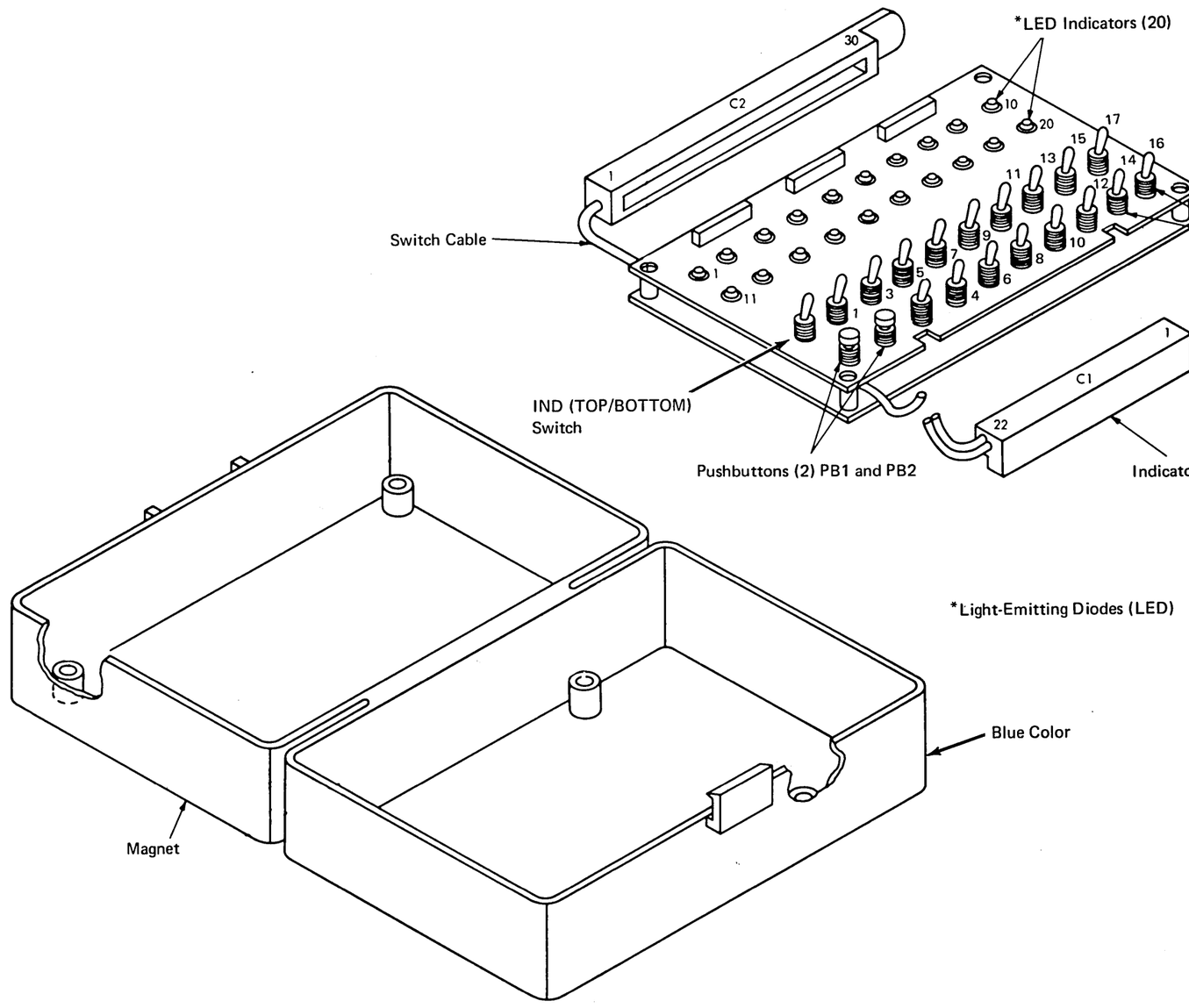


Diagram 1-2. Switch Indicator Unit, Model 1

SWITCH/INDICATOR UNIT (SIU), Model 2

Introduction

The switch/indicator unit (SIU) (PN 1830679) is a portable maintenance aid that is used to manually test the IBM 3271/3275 Models 11 and 12. Up to 20 switches on the SIU are available for exercising circuitry; up to 20 indicators are available for monitoring. In addition, 4 hexadecimal LEDs provide Test Routine Completion Codes when running tape tests.

Note: SIU overlays are not shipped with the SIU. A complete set of overlays may be ordered from:
B/M 1655219 3275 (SNA-IF)
B/M 1655220 3271 (SNA-IF)
B/M 1655221 3271 (MLPXR)

No overlay is available for ASCII machines. Refer to appropriate 3271 or 3275 Troubleshooting Guide for use of EBCDIC overlay on ASCII machines.

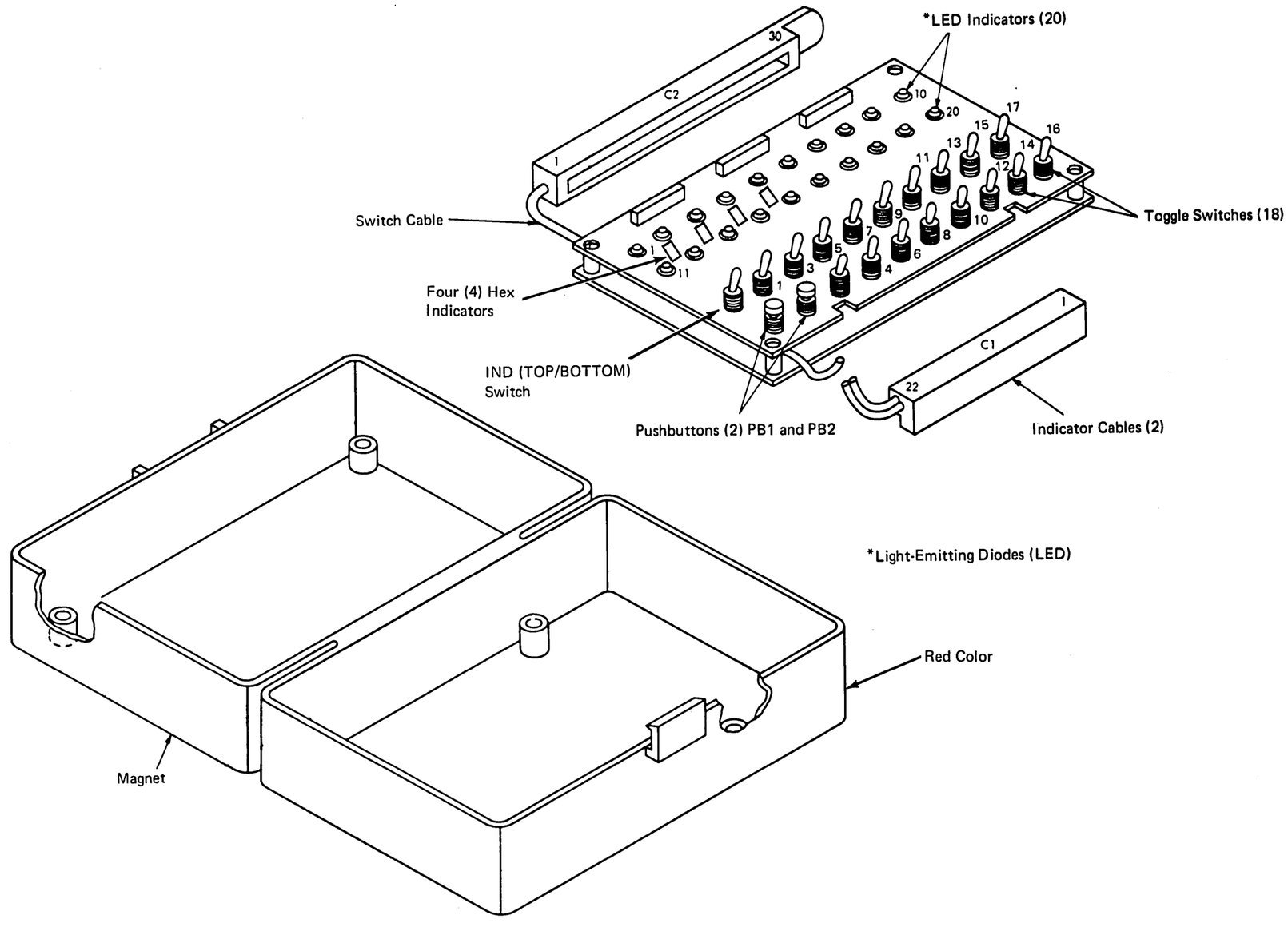
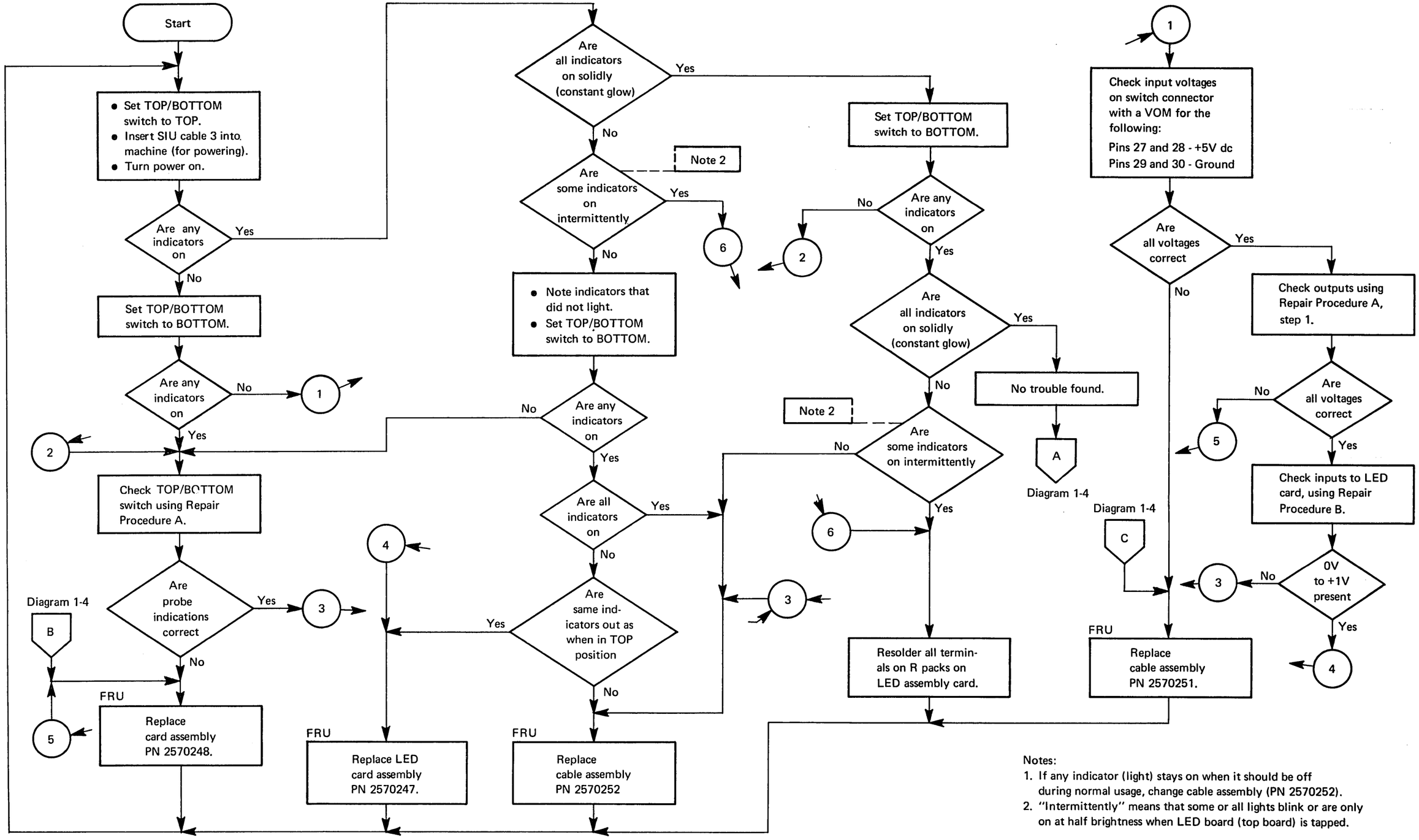


Diagram 1-2A. Switch/Indicator Unit (Model 2)



Notes:

1. If any indicator (light) stays on when it should be off during normal usage, change cable assembly (PN 2570252).
2. "Intermittently" means that some or all lights blink or are only on at half brightness when LED board (top board) is tapped.

Diagram 1-3. SIU-LED Checkout Flowchart

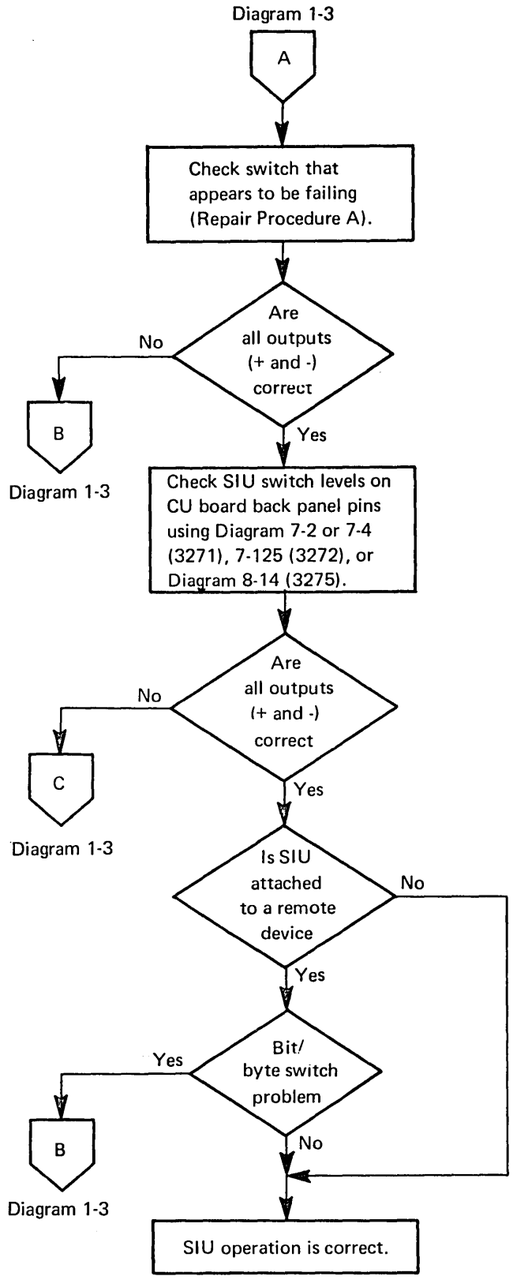


Diagram 1-4. SIU-Switch Checkout Flowchart

REPAIR PROCEDURE A (Switch Repair)

Use logic probe to check levels. See Diagram 1-5, Table 2, for probe points and Diagram 1-6 for physical locations.

1. TOP/BOTTOM switch - probe levels are opposite.
   a. TOP position - Pin 1 is GREEN.
      Pin 2 is RED.
   b. BOTTOM position - Pin 1 is RED.
      Pin 2 is GREEN.
2. PB 1 - probe levels are opposite.
   a. Pin 4 - PB 1 not depressed, probe is RED.
      PB 1 depressed, probe is GREEN.
   b. Pin 5 - PB 1 not depressed, probe is GREEN.
      PB 1 depressed, probe is RED.
3. PB 2 - probe levels depend upon the setting of Switch 2 (pin 6 only).
   a. Pin 7 - PB 2 not depressed, probe is GREEN.
      PB 2 depressed, probe is RED.
   b. Pin 6 (Switch 2 up) - PB 2 not depressed, probe is RED.
      PB 2 depressed, probe is GREEN.
   c. Pin 6 (Switch 2 down) - Probe is always RED.
4. Pin 9 is approximately +1.5 to +2.0V dc measured with a VOM. The logic probe will be RED and GREEN on remote devices (3271 and 3275).
5. Switches 1 through 17 (as listed in Table 2) should be RED (+) when up and GREEN (-) when down as checked by the logic probe.

REPAIR PROCEDURE B (LED Repair)

Use VOM for diagnosis of failure. See Diagram 1-5, Table 1, for metering points and Diagram 1-6 for physical locations. Check failing LED indicator connector (as listed in Table 1) for the following conditions:

1. If LED is not lighted, 0 to +1V dc indicates LED is open. Replace indicator.
2. If LED is not lighted, +3 to +4V dc indicates cable assembly (PN 2570252) is open. Replace cable.

Table 1

LED Indicator Connector Pins	Function
1	+5V dc (RED)
2	LED 20
3	LED 10
4	LED 19
5	LED 9
6	LED 18
7	LED 8
8	LED 17
9	LED 7
10	LED 16
11	LED 6
12	LED 15
13	LED 5
14	LED 14
15	LED 4
16	LED 13
17	LED 3
18	LED 12
19	LED 2
20	LED 11
21	LED 1
22	Not Used

Table 2

Switch Connector Pins	Function
1 }	TOP/BOTTOM
2 }	Switch
3	Not Used
4	PB 1
5	PB 1
6	PB 2
7	PB 2
8	Not Used
9	1.5 to 2.0V dc (VOM)
10	Switch 1
11	Switch 2
12	Switch 3
13	Switch 4
14	Switch 5
15	Switch 6
16	Switch 7
17	Switch 8
18	Switch 9
19	Switch 10
20	Switch 11
21	Switch 12
22	Switch 13
23	Switch 14
24	Switch 15
25	Switch 16
26	Switch 17
27	+5V dc (RED)
28	+5V dc (RED)
29	GND (GREEN)
30	GND (GREEN)

Diagram 1-5. SIU Connector Pin Listings

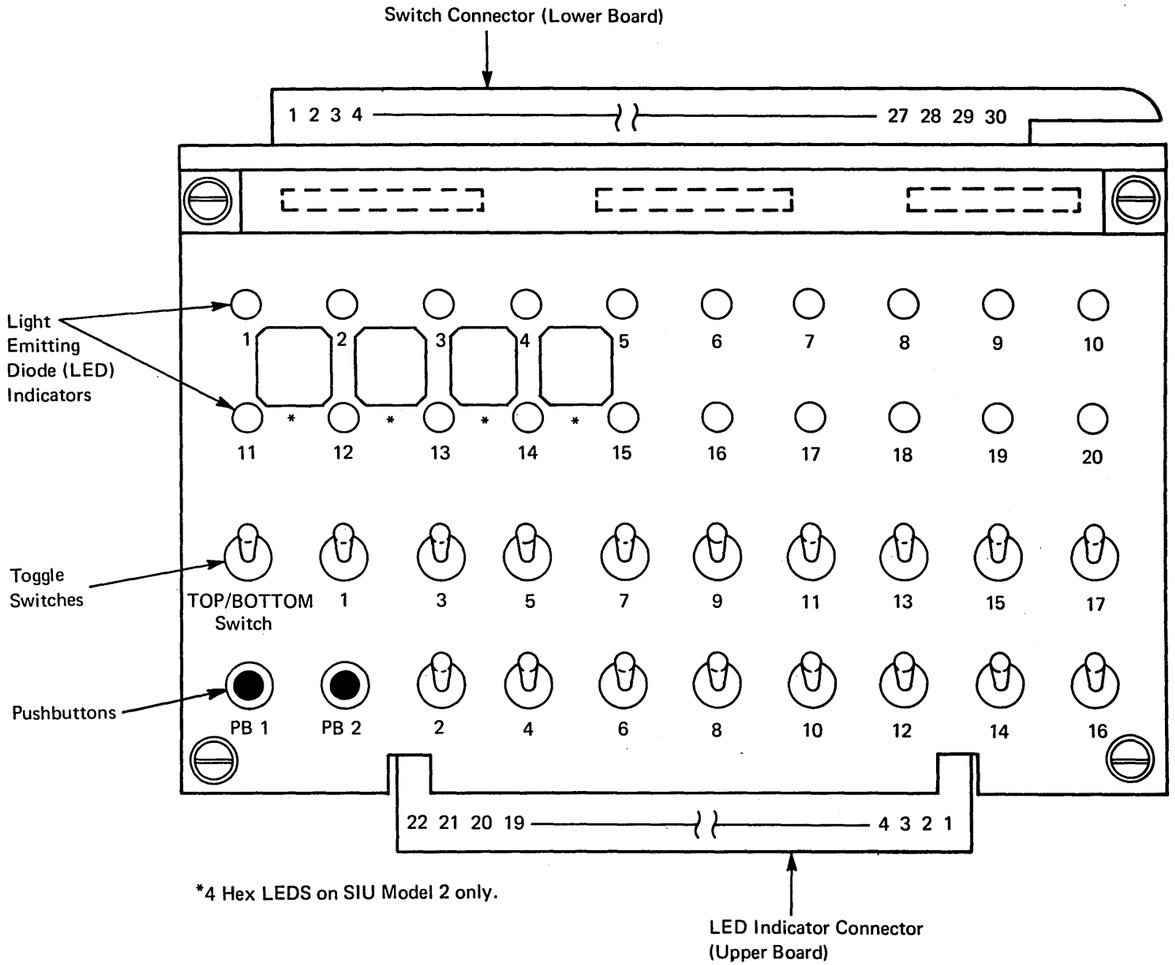
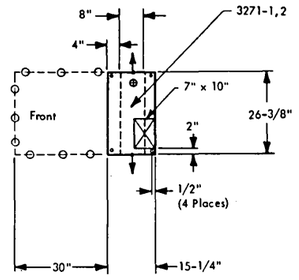
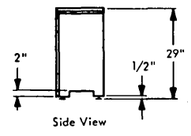


Diagram 1-6. SIU Checkout Physical Locations

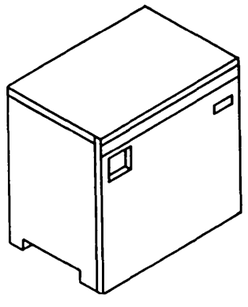
3271 CONTROL UNIT, MODELS 1, 2, 11, AND 12

PLAN VIEW





Inches	Centimeters
1/2	1
2	5
4	10
7	18
8	20
10	25
15-1/4	39
26-3/8	67
29	74
30	76



SPECIFICATIONS

Dimensions:

	F	S	H
Inches	26-3/8	15-1/4	29
(cm)	(67)	(39)	(74)

Service Clearances:

	F	R	Rt	L
Inches	30	0	0	0
(cm)	(76)	(0)	(0)	(0)

Weight: 98 lb (44 kg)

	Models 1 and 2	*Models 11 and 12*
Heat Output:		
BTU/hr	595	630
(kcal/hr)	(150)	(159)
Airflow:	Convection only	Convection only
Power Requirements:		
kVA	0.18	0.20
Phases	1	1

Voltage			*Plug Type***	
*50 Hz**	*60 Hz*	*Ampacity*	*Locking*	*Nonlocking*
100	100*	–	–	–
110		–	–	–
	115	15	B	A
123.5		–	–	–
200	200*	–	–	–
	208	15	G	F
220		–	–	–
	230	15	G	F
235		–	–	–

Power Cord Style*** A4
Power Cord Length 9 ft (274 cm)

Environment Operating:

Temperature	50° - 110°F (10° - 43°C)
Rel Humidity	8%–80%
Max Wet Bulb	85°F (29°C)

Environment Nonoperating:

Temperature	50° - 125°F (10° - 52°C)
Rel Humidity	8%–80%
Max Wet Bulb	85°F (29°C)

Notes:

*World Trade voltage.

**See Appendix A for receptacle schematic and identification. In World Trade countries other than Canada, only the power cord is supplied with the machine.

***See Appendix B for power cord style specifications.

3271 CONTROL UNIT INSTALLATION PROCEDURES (BSC MACHINES ONLY)

Prerequisites

The following items are prerequisites to the installation of the IBM 3271 Control Unit Models 1 and 2. None of these items is to be performed by the installing Customer Engineer, but he should check to ensure that they have been accomplished and may have to provide information to the personnel involved.

1. The transmission control unit (2701, 2703, etc.) that attaches the 3271 Models 1 and 2 to the host system must be properly jumpered for the 3271 and for the features installed.
2. A data set must be properly installed within 40 feet of the proposed location of the 3271, with the signal cable connected to it, and the cable shield grounded.
3. Data sets on both ends of the transmission line must be properly strapped (jumpered) for the 3271 and for the features installed. On all data sets (except the IBM 3872 and 3875), the jumper that ties signal ground to frame ground should be used.
4. A proper 3-wire connector (2 voltage, plus ground) power receptacle must be available within 8 feet of the proposed location of the 3271.
5. A telephone, which can be connected to an outside line, should be available within easy reach of the proposed location of the 3271.
6. Verify that the 3270 OLT's have been properly included in the host system's OLT library.
7. Ensure that the latest technical bulletins have been reviewed before starting installation.
8. Ensure that switch indicator unit (SIU), logic probe (either type), and test tape (TDAT, CRAU, or equivalent) are available on site for installation.

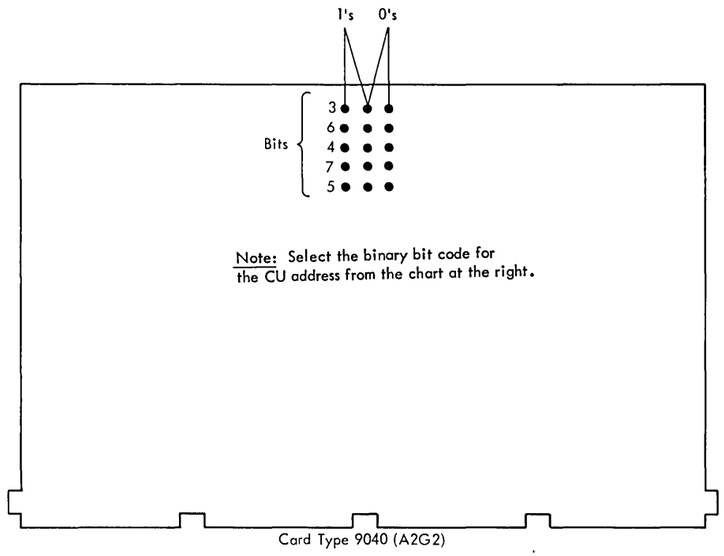
Installation

1. Unpack, according to the Unpacking/Packing Instructions, PN 7371304, shipped with the control unit. Inspect the shipment for possible damage incurred in transit. Report any damage at once. Check machine-history documentation with customer to ensure that 3271 features and power match what the customer has ordered.
2. Check off all items received against those listed on the shipping Bill of Materials. Report any shortage at once.
3. Adjust four unit levelers to 0.5 inch (12.7 mm) below control unit (Diagram 2-3).
4. Remove front cover, open logic gate, and check for loose cards (Diagram 2-4).
5. *Check, and, if necessary, connect jumpers as indicated in Diagram 2-1 (for control unit operating with EBCDIC code) or Diagram 2-2 (for control unit operating with ASCII code).*
6. Plug in data set cable. See cable installation drawing, part number 2570002.
7. Connect SIU; see par. 7.4*. Set ON LINE/OFF LINE switch on SIU to OFF LINE.
8. Check that customer-supplied voltage agrees with the voltage decal in the 3271.
9. Remove "shipped and uninstalled" seal and then plug in ac power cable.
10. Set PWR ON/OFF switch to ON.
11. Check that SYNC SEARCH and SYSTEM READY indicators are lit.

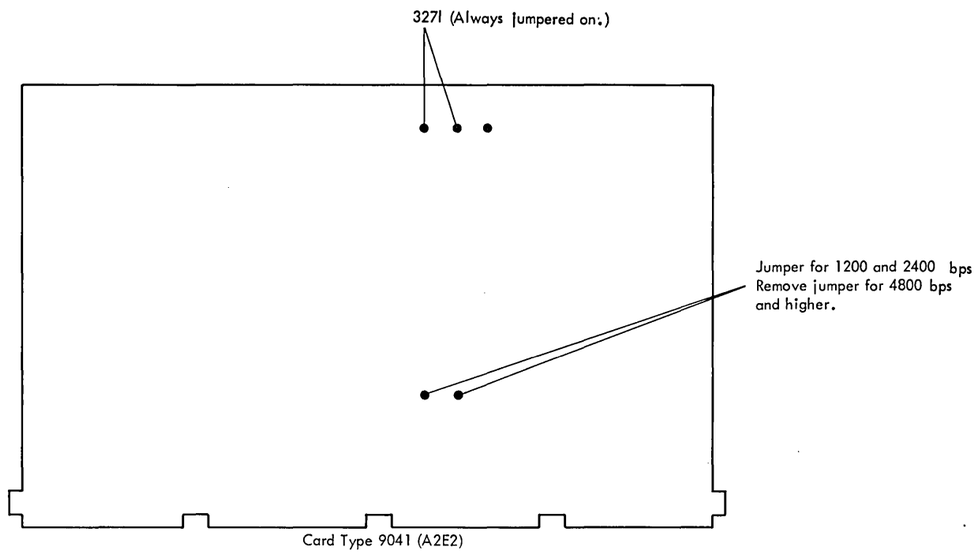
    Note: The transmission control unit must be online at the CPU site; otherwise, the SYSTEM READY indicator will not light.

    a. If the SYSTEM READY indicator does not light, and the transmission control unit is online, disconnect the data set cable from the 3271 and scope pin 8 for a square wave.
    b. If the SYNC SEARCH indicator does not light, perform troubleshooting described in Diagram 4-10.*
12. Connect a checked-out 3277.
13. Perform the following checkout procedures as specified in Diagram 1-1,* sheets 1–5, beginning with "Reset Checkout of Multiplexer Portion".
14. Put ON LINE/OFF LINE switch in ON LINE position.
15. The following checkout procedures are listed in the order of preference. Perform *the first* of the following procedures for which the facilities are available. If the procedure fails, check out the logic probe (par. 7.3.3),* and perform the troubleshooting procedures called out.
    a. Perform the first three tape tests (see Section 2),* using the IBM 1200 TDAT (IBM Domestic), IBM CRAU (World Trade Corporation), or equivalent, and the cassette tape supplied.
    b. Run the Check (CHK) and Keyboard (KEY) portions of the OLTs from the customer's host CPU.
    c. Allow the customer to run his own programs from the host CPU to check out the CU. If a problem is encountered, use the TPTC for troubleshooting. If the tests with TPTC run correctly, suspect the customer program.
    d. Connect the IBM 1200 TDAT to communicate with the TPTC (IBM Domestic and Canada only) according to the instructions in the IBM Maintenance Library Manual, *1200 Teleprocessing Diagnostic Analyzer Tester*, S226-3029. Request only the Check (CHK) and Keyboard (KEY) portions of the OLTs from the TPTC.
16. If the checkout procedure (step 15) ran successfully, turn power off and remove the switch/indicator unit. (If TDAT was used, remove it and install the data set cable.) Replace the front cover. Installation is complete.

*These references may be found in the IBM 3271 Control Unit Models 1 and 2 Troubleshooting Guide SY27-2311.



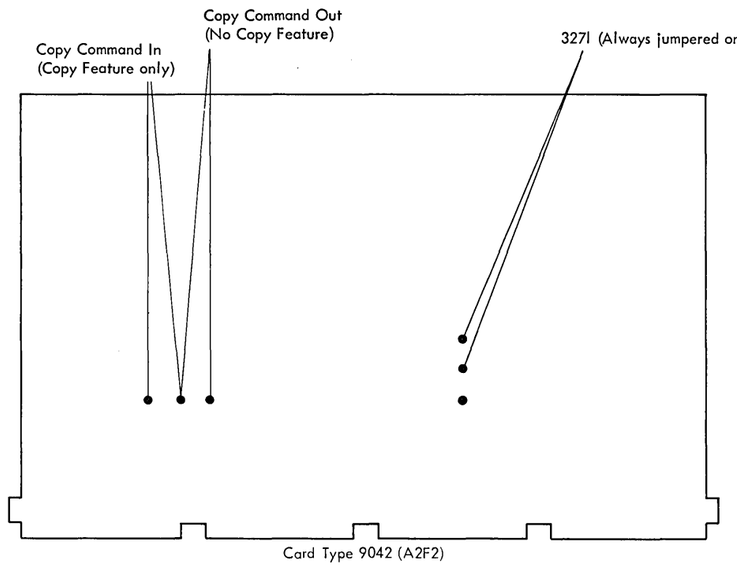
Card Type 9040 (A2G2)



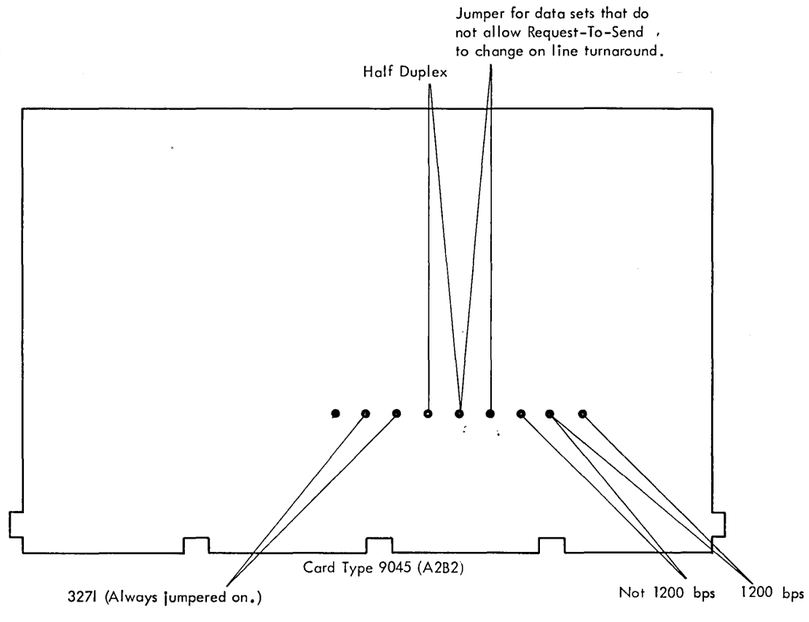
Card Type 9041 (A2E2)

CU Address	Binary Bits 3	4	5	6	7
0	0	0	0	0	0
1	0	0	0	0	1
2	0	0	0	1	0
3	0	0	0	1	1
4	0	0	1	0	0
5	0	0	1	0	1
6	0	0	1	1	0
7	0	0	1	1	1
8	0	1	0	0	0
9	0	1	0	0	1
10	0	1	0	1	0
11	0	1	0	1	1
12	0	1	1	0	0
13	0	1	1	0	1
14	0	1	1	1	0
15	0	1	1	1	1

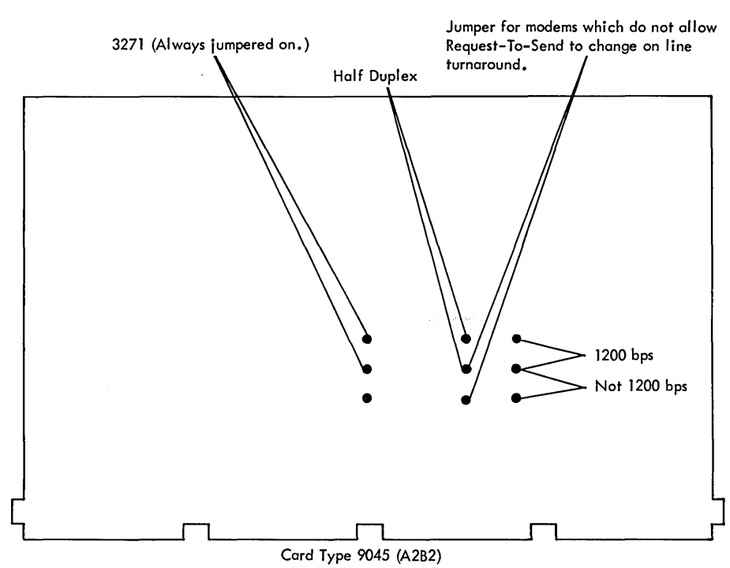
CU Address	Binary Bits 3	4	5	6	7
16	1	0	0	0	0
17	1	0	0	0	1
18	1	0	0	1	0
19	1	0	0	1	1
20	1	0	1	0	0
21	1	0	1	0	1
22	1	0	1	1	0
23	1	0	1	1	1
24	1	1	0	0	0
25	1	1	0	0	1
26	1	1	0	1	0
27	1	1	0	1	1
28	1	1	1	0	0
29	1	1	1	0	1
30	1	1	1	1	0
31	1	1	1	1	1



Card Type 9042 (A2F2)



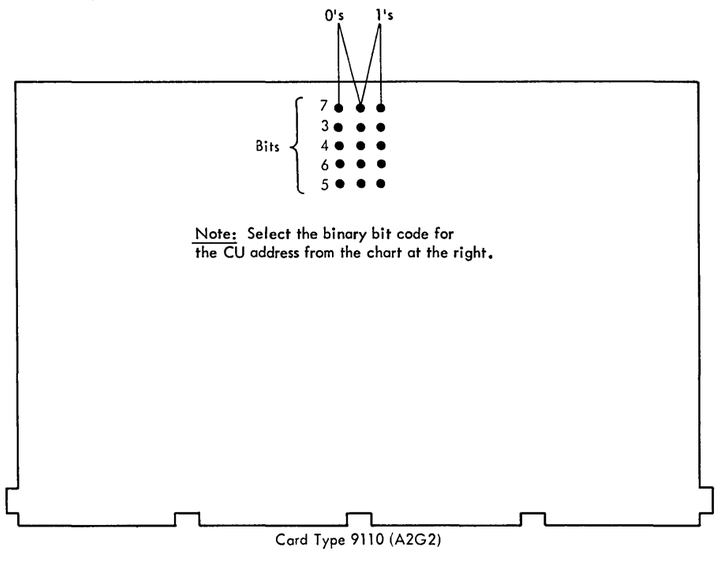
Card Type 9045 (A2B2)

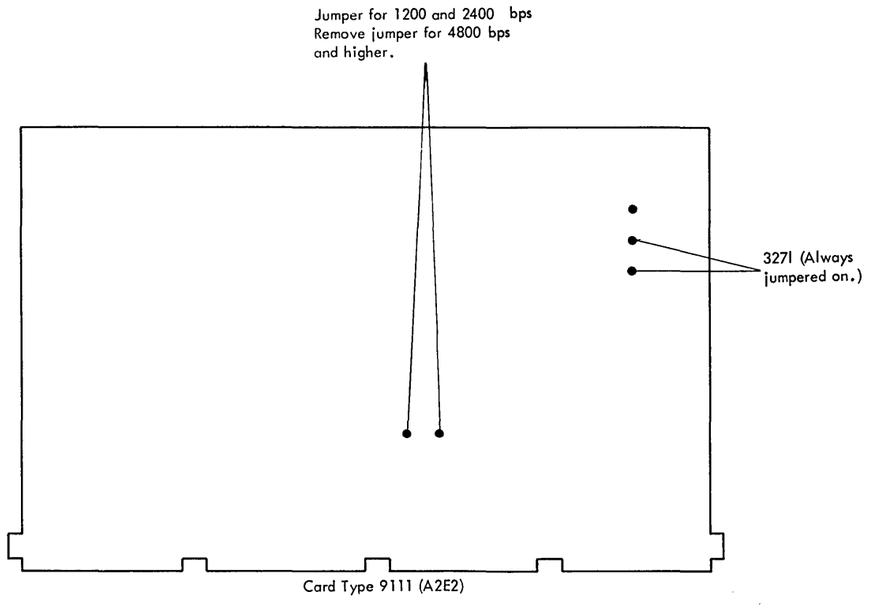


Card Type 9045 (A2B2)
New Jumpering for 9045 Card, PN 8523662

CAUTION
Jumper pins can bend or break, or jumpers can be pulled off pins. Exercise care when inserting or removing jumpered cards or cards next to jumpered cards.

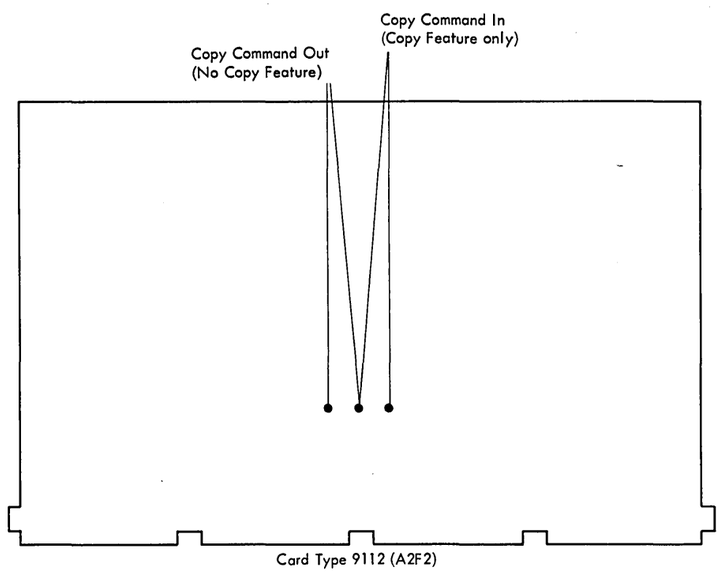
Diagram 2-1. CU Card Jumpering — EBCDIC

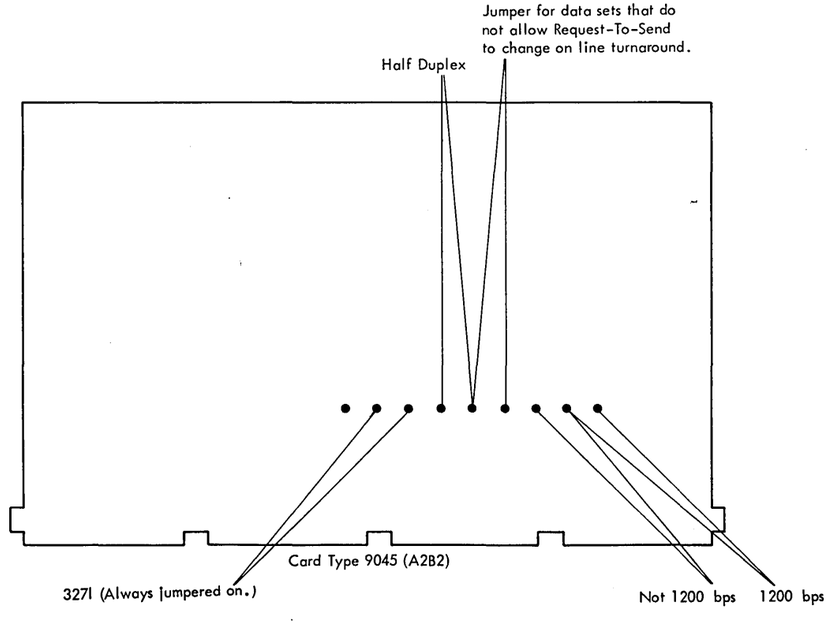


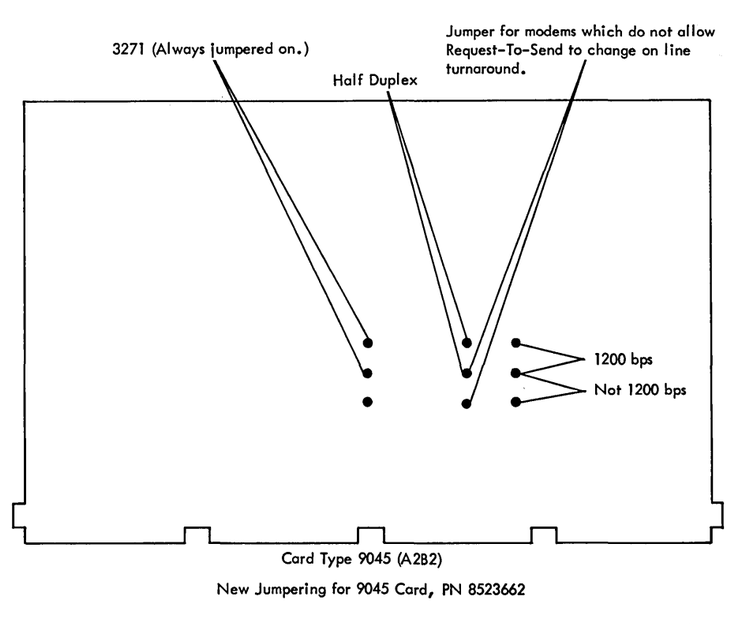


CU Address	Binary Bits 3	4	5	6	7
0	0	0	0	0	0
1	0	0	0	0	1
2	0	0	0	1	0
3	0	0	0	1	1
4	0	0	1	0	0
5	0	0	1	0	1
6	0	0	1	1	0
7	0	0	1	1	1
8	0	1	0	0	0
9	0	1	0	0	1
10	0	1	0	1	0
11	0	1	0	1	1
12	0	1	1	0	0
13	0	1	1	0	1
14	0	1	1	1	0
15	0	1	1	1	1

CU Address	Binary Bits 3	4	5	6	7
16	1	0	0	0	0
17	1	0	0	0	1
18	1	0	0	1	0
19	1	0	0	1	1
20	1	0	1	0	0
21	1	0	1	0	1
22	1	0	1	1	0
23	1	0	1	1	1
24	1	1	0	0	0
25	1	1	0	0	1
26	1	1	0	1	0
27	1	1	0	1	1
28	1	1	1	0	0
29	1	1	1	0	1
30	1	1	1	1	0
31	1	1	1	1	1







CAUTION
Jumper pins can bend or break, or jumpers can be pulled off pins. Exercise care when inserting or removing jumpered cards or cards next to jumpered cards.

Diagram 2-2. CU Card Jumpering — ASCII

United States	French	German	Italian	Spanish	Y-Conn. Pin	Net Number	Source Pin	Function
SYSTEM READY	SYSTEME PRET	SYSTEM BEREIT	SISTEMA IN LINEA	SISTEMA PREP	A2A3D11	ER505AB4	A2B2B12	Lights when data set carrier is on and the 3271 is online.
SYNC SEARCH	RECH SYNC	SYNC SUCHEN	RICERCA SINCR	BUSQ SINCRO	A2A3D09	ER302AV4	A2C2S11	Lights when CU is attempting to establish communications on the TP line.
SEL'D	SELECTE	SELEKT	SEL'TO	SELEC	A2A3D12	ER302AG4	A2C2U02	Lights when the CU interface is communicating with the TCU.
XMIT	TRANSM	SENDEN	TRASM	TRANSM	A2A3B09	ER405AT2	A2D2P13	Lights when the CU is transmitting to the TCU.
STATUS	ETAT ERREUR	STATUS	ERRORE	ESTADO	A2A3D13	ER103AN4	A2E2D06	Lights when an error status condition exists in the CU.
POWER	TENSION	NETZ	FM	ENERGIA	---	---	---	---
ON	SOUS	EIN	ACCESO	ON	---	---	---	Connects ac power to the CU.
OFF	HORS	AUS	SPENTO	OFF	---	---	---	Disconnects ac power from the CU.

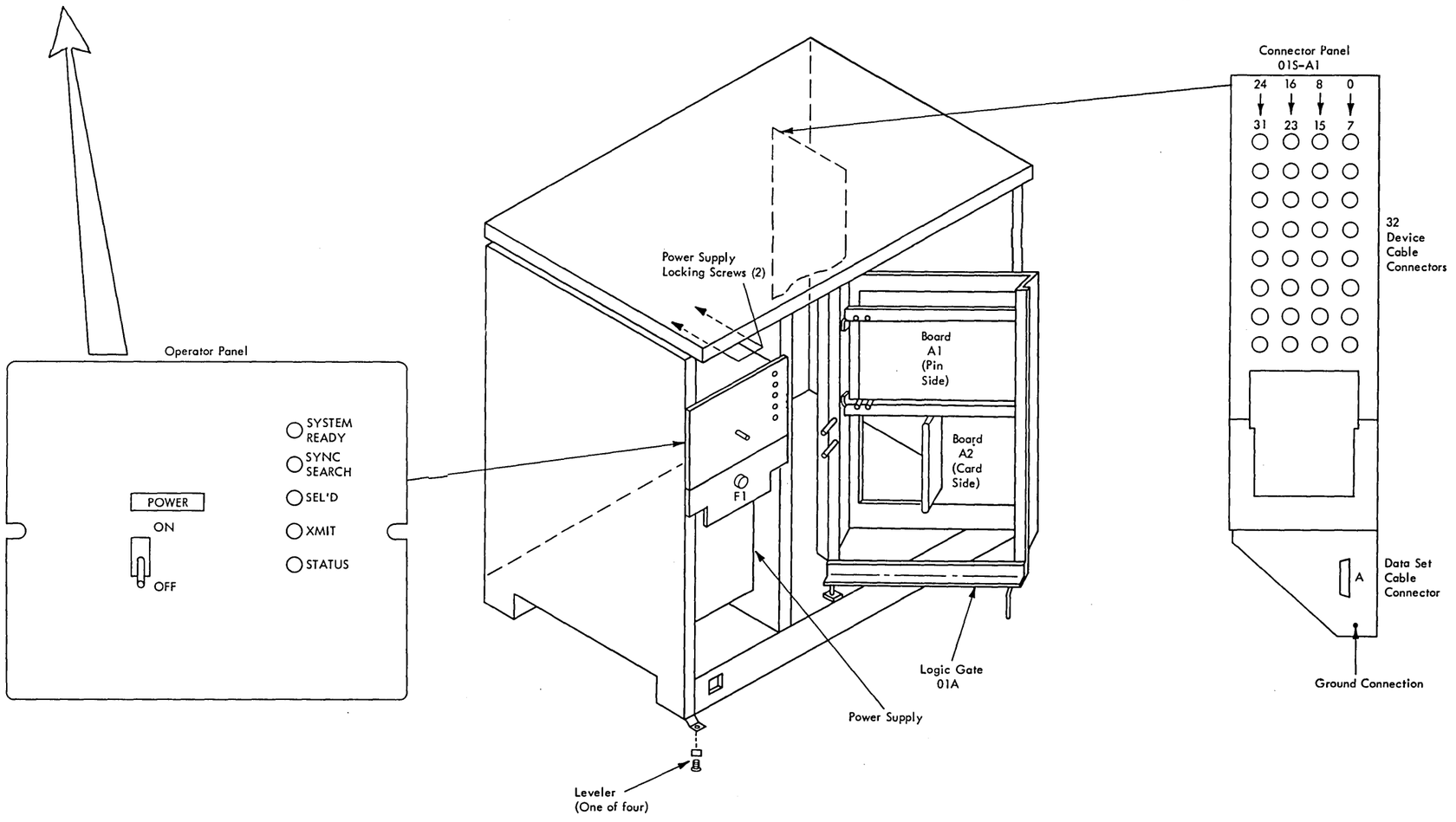
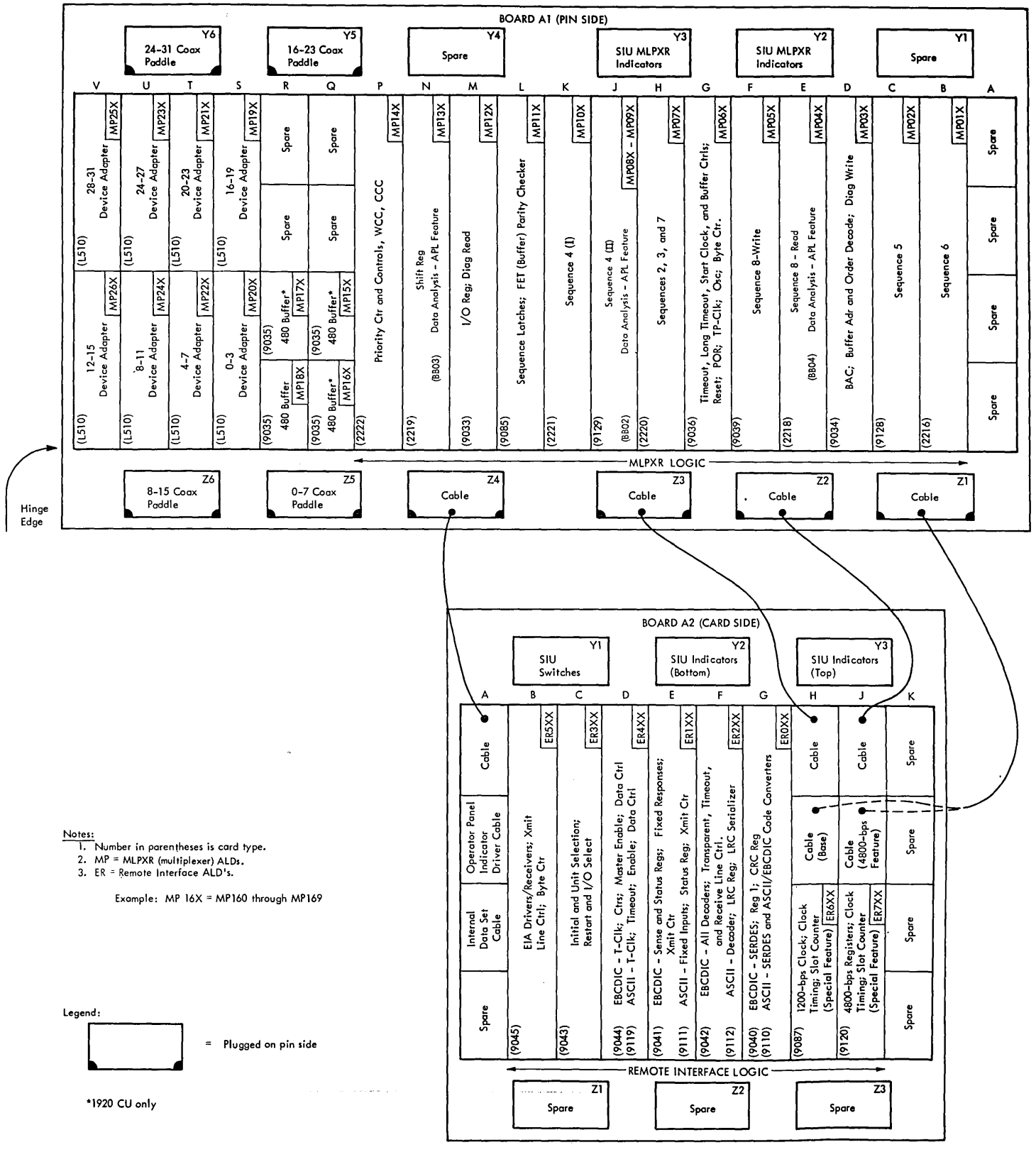


Diagram 2-3. CU Locations



Notes:
1. Number in parentheses is card type.
2. MP = MLPXR (multiplexer) ALDs.
3. ER = Remote Interface ALD's.

Example: MP 16X = MP160 through MP169

Legend:

= Plugged on pin side

*1920 CU only

Diagram 2-4. Board Layout and Card Locations (Gate A)

3271 CONTROL UNIT INSTALLATION PROCEDURES (SDLC MACHINES ONLY)

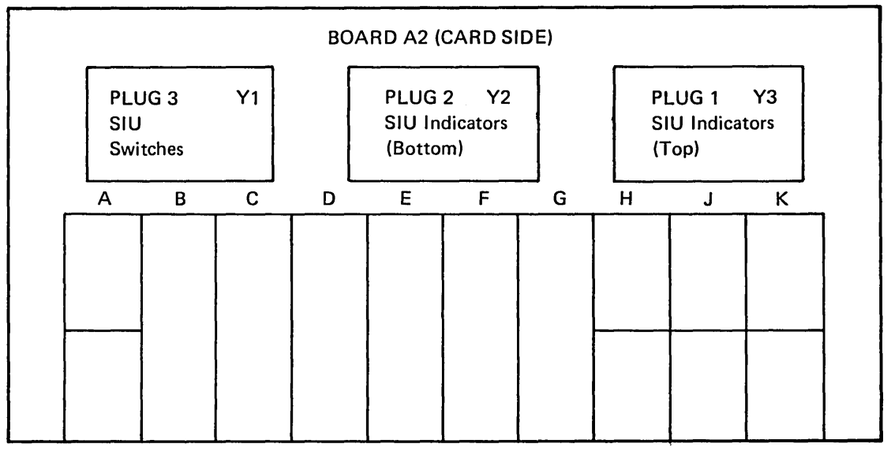
Prerequisites

The following items are prerequisites to the installation of the IBM 3271 Control Unit Models 11 and 12. None of these items is to be performed by the installing Customer Engineer, but he should check to ensure that they have been accomplished and may have to provide information to the personnel involved.

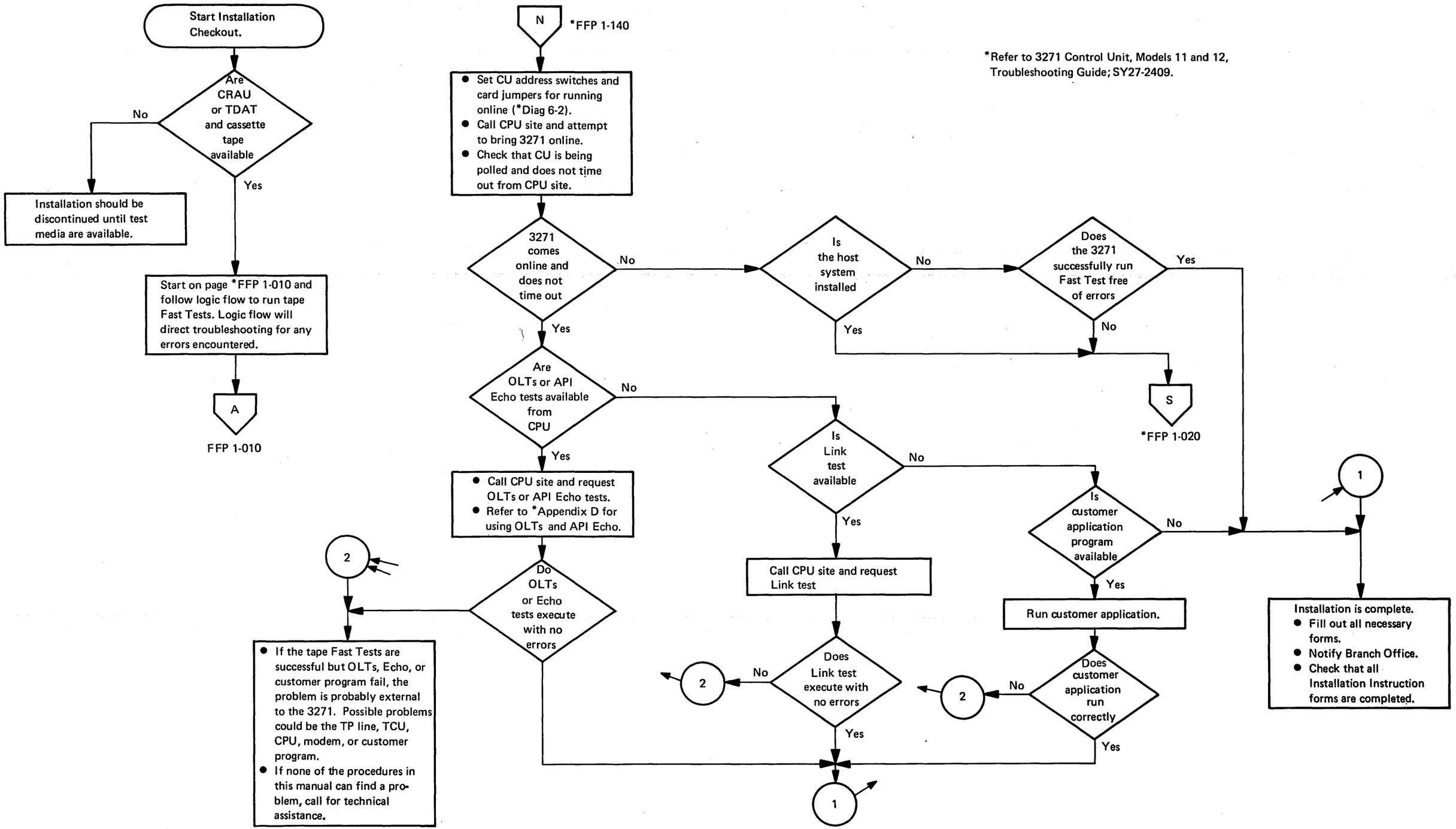
1. The transmission control unit (3704 or 3705) that attaches the 3271 Models 11 and 12 to the host system must be properly jumpered for the 3271 and for the features installed.
2. A data set must be properly installed within 40 feet of the proposed location of the 3271, with the signal cable connected to it, and the cable shield grounded.
3. Data sets on both ends of the transmission line must be properly strapped (jumpered) for the 3271 and for the features installed. On all data sets (except the IBM 3872 and 3875), the jumper that ties signal ground to frame ground should be used.
4. A proper 3-wire connector (2 voltage, plus ground) power receptacle must be available within 8 feet of the proposed location of the 3271.
5. A telephone, which can be connected to an outside line, should be available within easy reach of the proposed location of the 3271.
6. Verify that the 3270 OLTs have been properly included in the host system's OLT library.
7. Ensure that the latest technical bulletins have been reviewed before starting installation.
8. Ensure that switch indicator unit (SIU), logic probe (either type), and test tape (TDAT, CRAU) are available on site for installation.

Installation

1. Unpack, according to the Unpacking/Packing Instructions, PN 7371304, shipped with the control unit. Inspect the shipment for possible damage incurred in transit. Report any damage at once. Check machine-history documentation with customer to ensure that 3271 features and power match what the customer has ordered.
2. Check off all items received against those listed on the shipping Bill of Materials. Report any shortage at once.
3. Adjust four unit levelers to 0.5 inch (12.7 mm) below control unit.
4. Remove front cover, open logic gate, and check for loose cards.
5. Plug in data set cable. See cable installation drawing, PN 2570002.
6. Connect SIU. Set ON LINE/OFF LINE switch on SIU to OFF LINE.
7. Check that customer-supplied voltage agrees with the voltage decal in the 3271.
8. Remove "shipped and uninstalled" seal and then plug in ac power cable.
9. Set PWR ON/OFF switch to ON.
10. Follow flowchart, Sheet 2.

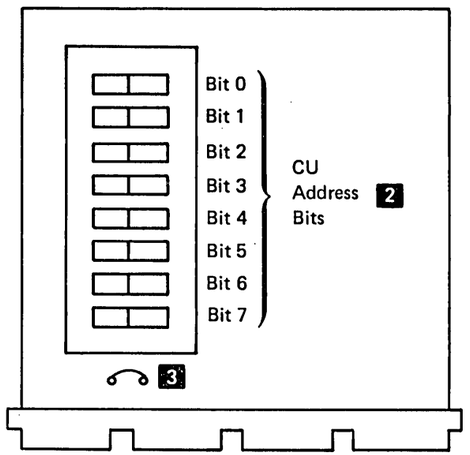


3271 Control Unit Models 11 and 12 Installation (Sheet 1 of 5)

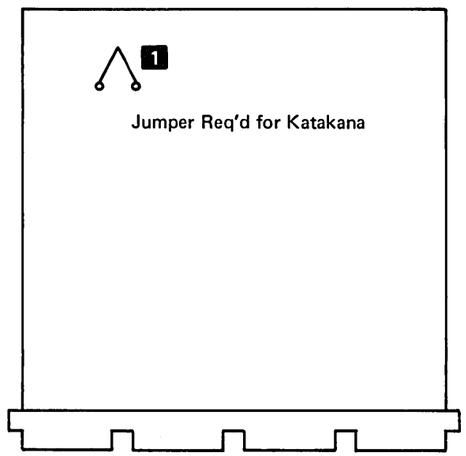


*Refer to 3271 Control Unit, Models 11 and 12, Troubleshooting Guide; SY27-2409.

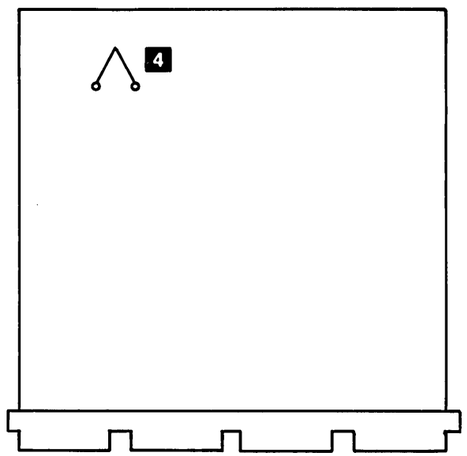
Diagram 2-5. 3271 Installation Checkout Flowchart



Z168 Card Type A-A2-K2 in 3271



9034 Card Type A-A1-D2



Z170 Card Type A-A2-G2 in 3271

Notes:

1. No jumper required unless Katakana.
2. Two addresses are illegal Hex "00" and "FF"; any other addresses are legal.
3. No jumper required unless NRZI.
4. No jumper required unless ASCII.

Example

- Shows how to set any of the valid CU addresses (254 total).
- Non-valid addresses are:

  All zeros 0000 0000
  All ones 1111 1111

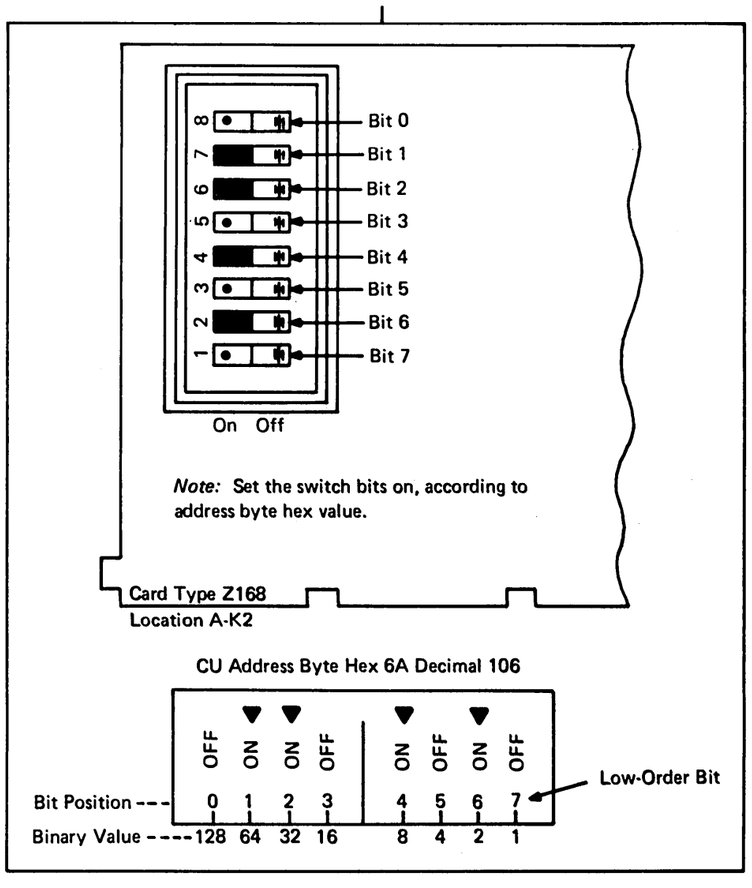


Diagram 2-6. CU Address Switch Settings and Logic Jumpering

United States	French	German	Italian	Spanish	Y-Conn Pin	Net Number	Source Pin	Function
SYSTEM READY	SYSTEME PRET	SYSTEM BEREIT	SISTEMA IN LINEA	SISTEMA PREP	A2A3D11	ER505AB4	A2B2B12	Lights when data set carrier is on and the 3271 is online.
FLAG DETEC	SYNCHRO ETABLIE	DATENMARKE	IRIZ FINE TRASMISS	DETECCION SENAL	A2A3D09	ER302AV4	A2C2S11	Lights when CU is attempting to establish communications on the TP line.
CU ACTIVE	UNITE SELECTEE	VERBINDUNG	UNITA CTL ATTIVA	UC ACTIVA	A2A3D12	ER302AG4	A2C2U02	Lights when the CU interface is communicating with the TCU.
XMIT	TRANSM	SENDEN	TRASM	TRANSM	A2A3B09	ER405AT2	A2D2P13	Lights when the CU is transmitting to the TCU.
STATUS	ETAT ERREUR	STATUS	ERRORE	ESTADO	A2A3D13	ER103AN4	A2E2D06	Lights when an error status condition exists in the CU.
POWER	TENSION	NETZ	FM	ENERGIA	---	---	---	---
ON	SOUS	EIN	ACCESO	ON	---	---	---	Connects ac power to the CU.
OFF	HORS	AUS	SPENTO	OFF	---	---	---	Disconnects ac power from the CU.

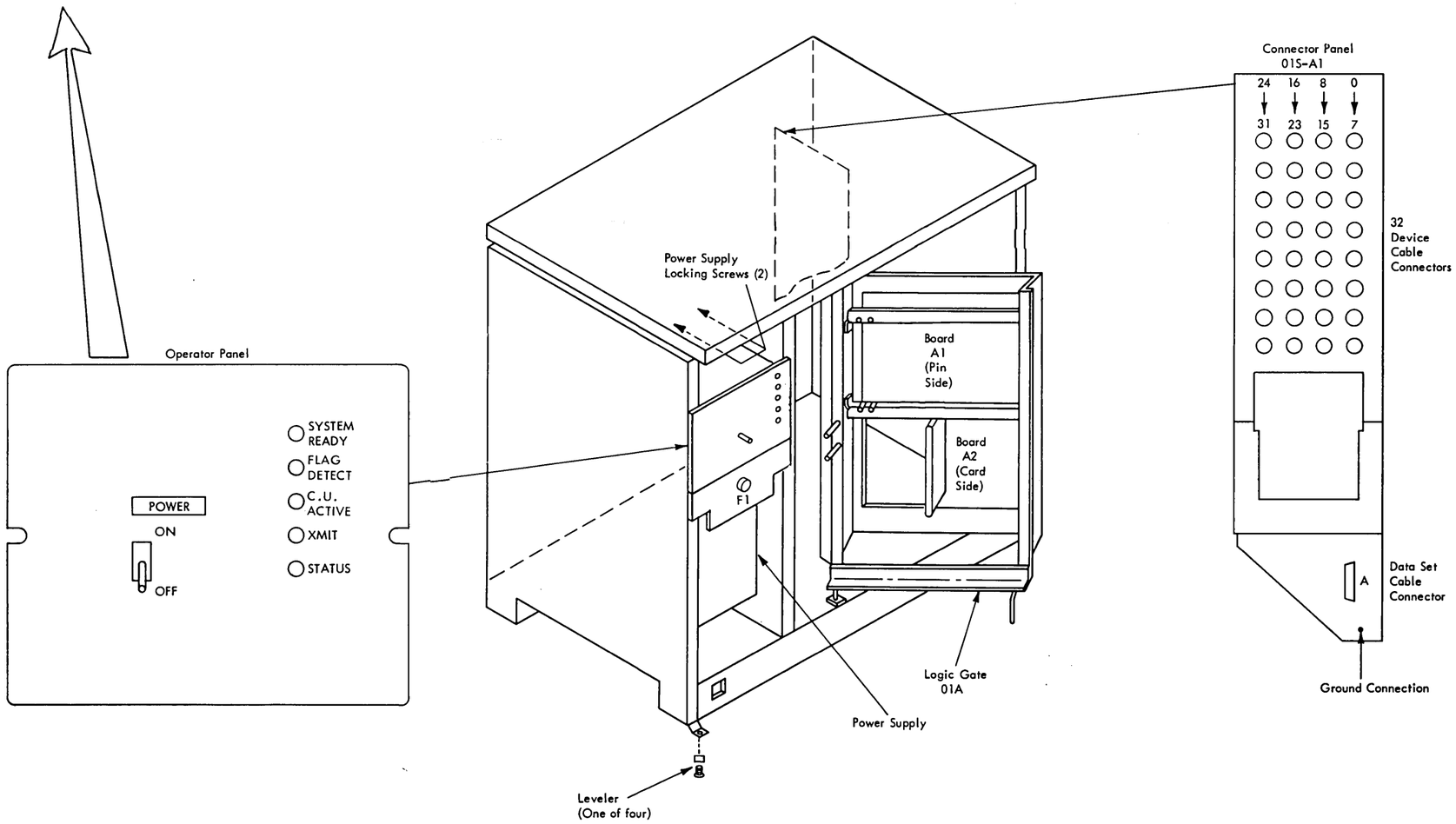
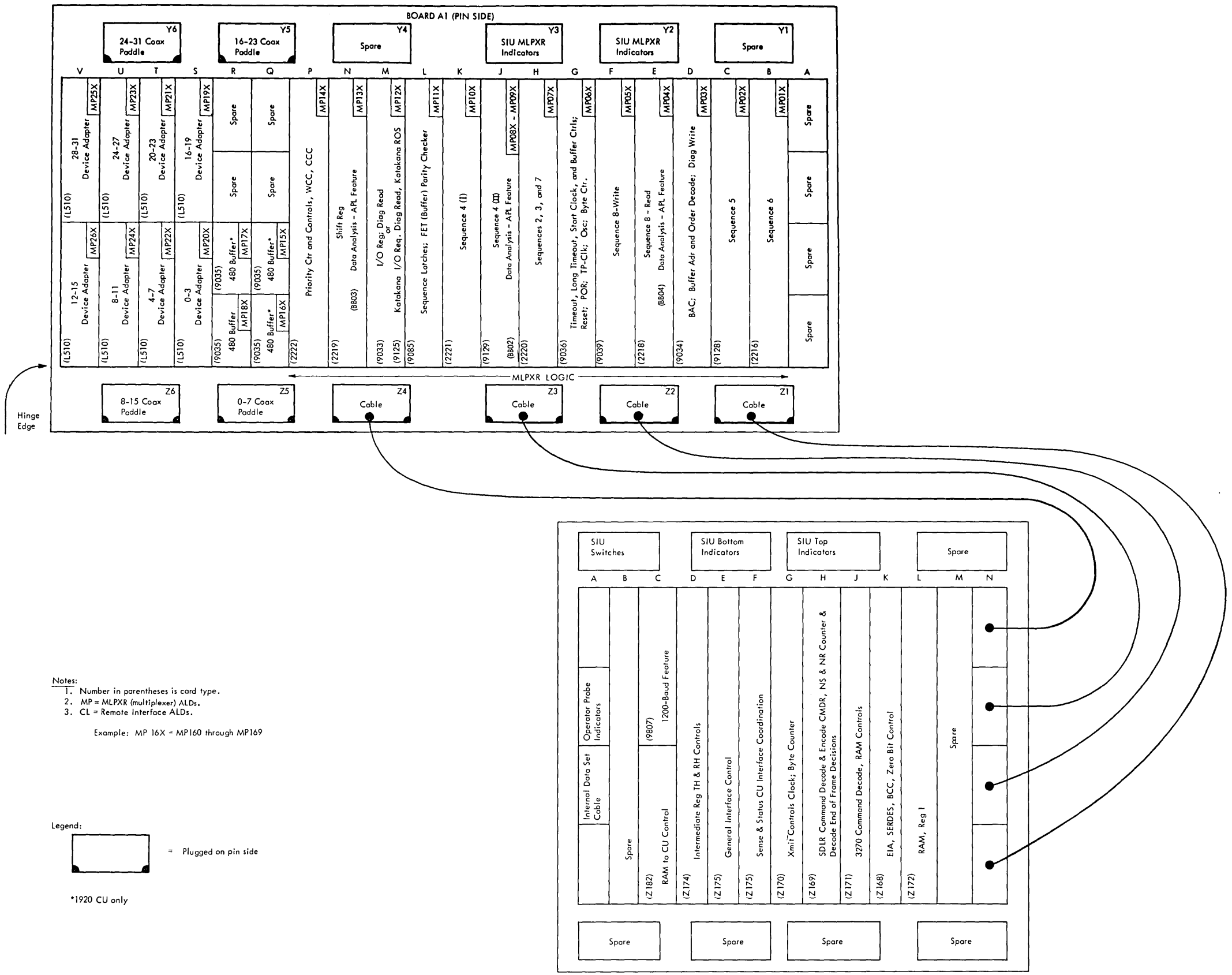


Diagram 2-7. CU Locations



Notes:
1. Number in parentheses is card type.
2. MP = MLPXR (multiplexer) ALDs.
3. CL = Remote Interface ALDs.

Example: MP 16X = MP160 through MP169

Legend:

= Plugged on pin side

*1920 CU only

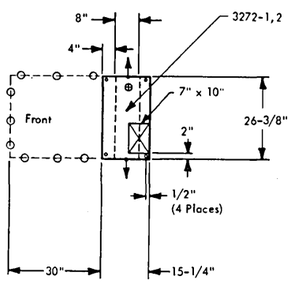
Diagram 2-8. Board Layout and Card Locations (Gate A)

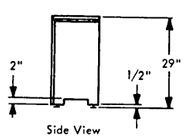
3271 Control Unit, Models 11 and 12, Installation (Sheet 5 of 5)

Section 3. 3272 Control Unit, Models 1 and 2, Physical Planning and Installation

3272 CONTROL UNIT MODELS 1 AND 2

Plan View (Template GX22-7018)





Inches	Centimeters
1/2	1
2	5
4	10
7	18
8	20
10	25
15-1/4	39
26-3/8	67
29	74
30	76

Specifications

Dimensions:

	F	S	H
Inches	26-3/8	15-1/4	29
(cm)	(67)	(39)	(74)

Service Clearances:

	F	R	Rt	L
Inches	30	0	0	0
(cm)	(76)	(0)	(0)	(0)

Weight: 95 lb (44 kg)

Heat Output: 595 BTU/hr (150 kcal/hr)

Airflow: Convection only

Power Requirements:

kVA	0.18
Phases	1
Locking:	
Plug	H or P&S, 4770
Connector	H or P&S, 4780
Receptacle	H or P&S, 4750 or 4760
Nonlocking:	
Plug	H, 5666
Connector	H or P&S, 5669
Receptacle	H or P&S, 5661 or 5662
Power Cord Length	9 feet (274 cm)

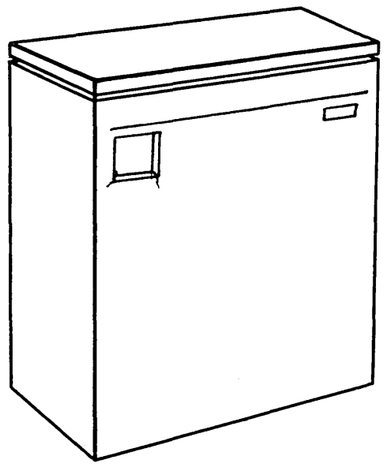
Branch Circuit Ampacity	*Branch Circuit Voltage*	*Max Cont Load (A)*
15	208	0.9
15	230	0.9

Environment Operating:

Temperature	50° - 110°F (10° - 43°C)
Rel Humidity	8%–80%
Max Wet Bulb	85°F (29°C)

Environment Nonoperating:

Temperature	50° - 125°F (10° - 52°C)
Rel Humidity	8%–80%
Max Wet Bulb	85°F (29°C)



3272 CONTROL UNIT INSTALLATION PROCEDURES

Prerequisites

1. Ensure that latest technical bulletins have been reviewed before starting installation.
2. Ensure that Switch Indicator Unit (SIU) and Logic Probe are available on installation site.
3. Verify that 3270 OLTs have been properly included for the System OLT library.
4. Check Address Priority Mode.
5. Check CPU Channel UCW. Plug card for proper jumpering.

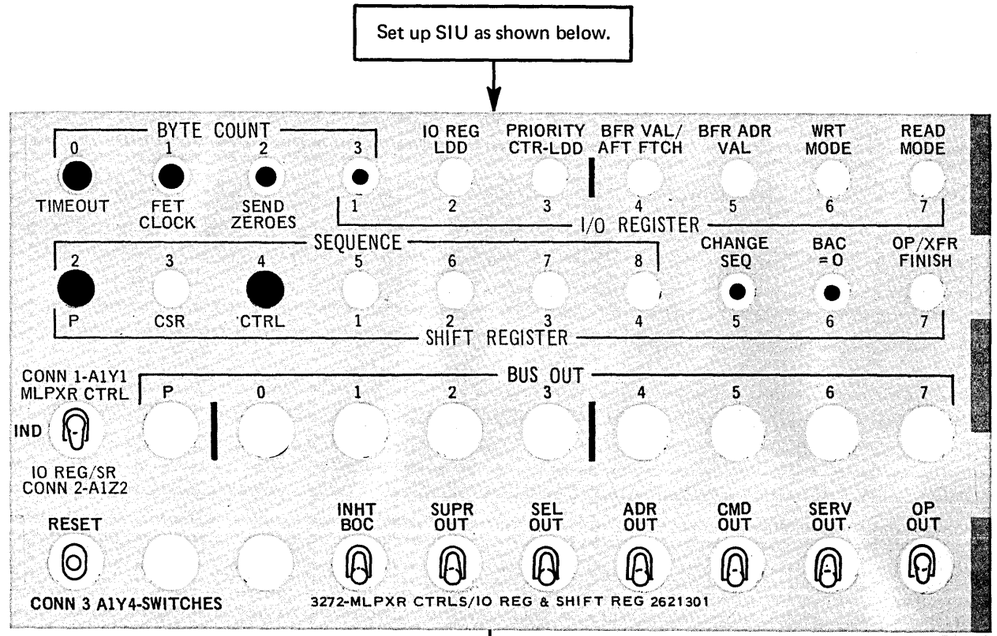
Procedure

1. Check Machine History documentation with the customer so that the 3272 features and power match what the customer has ordered.
2. Carefully move CU to assigned floor location and remove packing material.
3. Lift and remove front cover. Check for loose cards.
4. Set ON LINE/OFF LINE switch to OFF LINE and REMOTE/LOCAL switch to LOCAL (Diagram 3-1).
5. Open logic gate.
6. Connect the address, priority, and operational mode jumpers required for system attachment. Refer to Diagram 3-2 for plugging reference and Diagram 7-106* for address assignment reference.
7. Check that transformer connections are correct for line voltage that is to be used. Refer to ALD YF730, 731 (USA 60 Hz); (Diag. 3-5).

CAUTION
3272 CUs may appear to operate correctly for a time with transformer connections not matching line voltage.

8. Connect ac power cable and EPO cable. If EPO cable is not connected, the EPO plug in the 3272 must be jumpered before power can be brought up.
9. Set LOCAL MODE ON switch to ON. If unit does not power up, refer to Diagram 5-100.*
10. Perform switch/indicator unit checkout (paragraph 7.7.3).*
11. Connect one device cable and perform system reset as shown at right.
12. Perform basic erase-write operation (Diagram 2-100).*
13. Check plugging of address jumpers by performing an initial selection to the lowest and highest address available. Use only Sheet 1 of Diagram 3-100* for this check. Observe the BUS OUT indicators to assure that the correct device address appears.
14. Connect the bus and tag cables at the I/O panel (Diagram 3-3).
15. Connect all device cables and run CHK and KEY OLTs. OLT writeups can be found in the 3270 Display System On Line Tests (LOCAL) Form No. D99-3270A.
16. If CHK and KEY OLTs run error-free, the 3272 installation is complete. Fill out all appropriate forms and notify the Branch Office.

Legend:
*These references may be found in the IBM 3272 Control Unit Models 1 and 2 Troubleshooting Guide, SY27-2312.

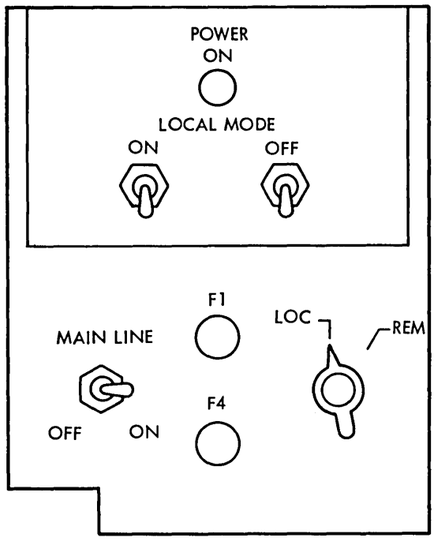


Legend:

Continuously Lighted Indicator

Pulsing Indicator—Size of dot is relative to pulse length and repetition rate. That is, the smaller the dot, the shorter the pulse and/or the lower the repetition rate.

WARNING: Pulsing indicators may be difficult to see. Shade the external light from the indicators for better viewing.



United States	French	German	Italian	Spanish
POWER ON	SOUS TENSION	NETZ EIN	ACCESO	ENERGIA CONECTDA
LOCAL MODE	CONTROLE AUTONOME	LOKAL-BETRIEB	LOCALE	MODALIDAD LOCAL
ON	SOUS	EIN	ACCESO	ON
OFF	HORS	AUS	SPENTO	OFF

Indicators/Switches Located on Gate A	ALD Location	Source Pin (Board A1)
I/O INTF DISABLED indicator	LC206	T2D13 (Wire No. 1) T2D03 (Wire No. 2)
		Probe Pin (Board A1)
ON LINE/OFF LINE switch ON LINE position	LC401	V2S04 (Wire No. 3)
ON LINE/OFF LINE switch OFF LINE position	LC401	V2U04 (Wire No. 4)
ON LINE/OFF LINE switch common position	LC401	V2U08 (Wire No. 5)

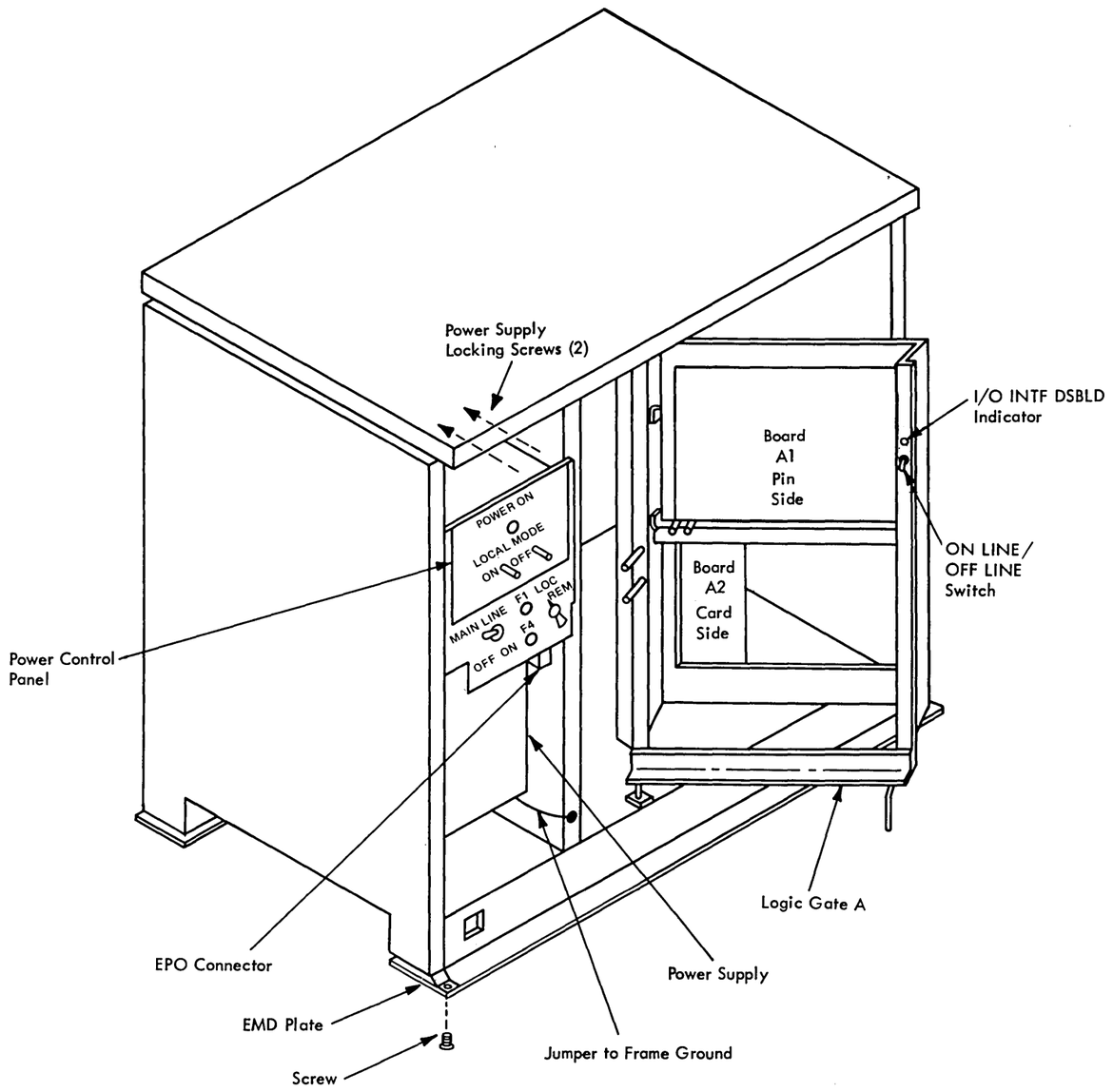
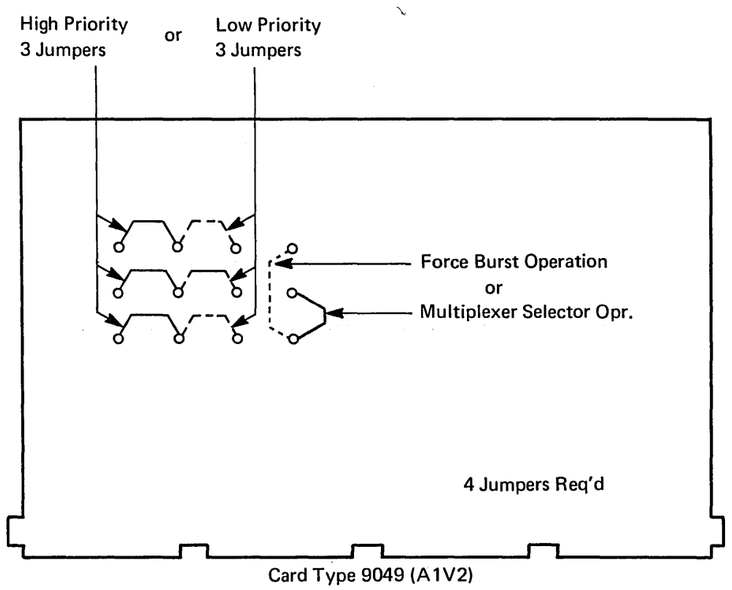
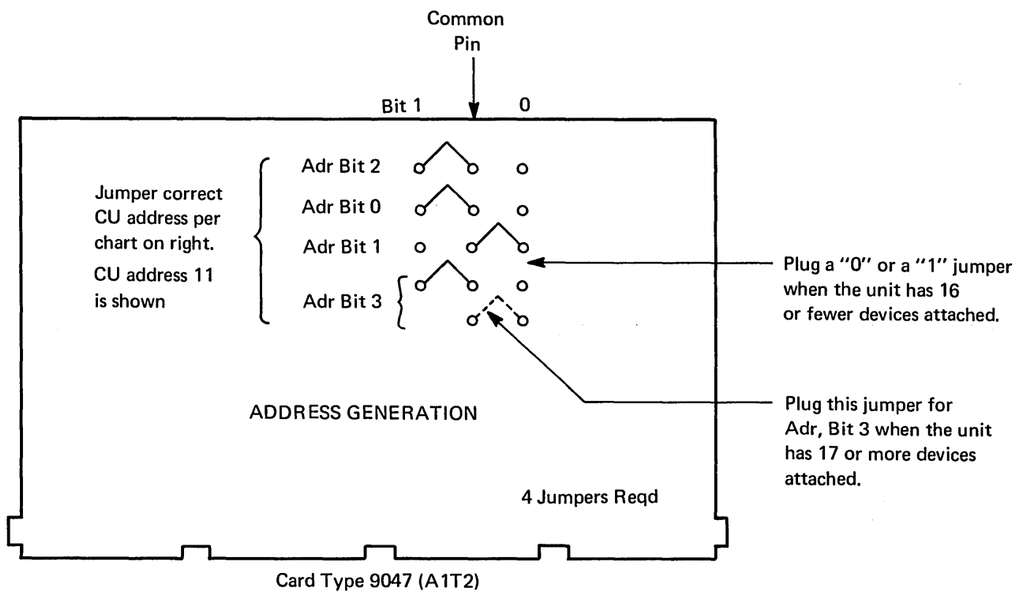


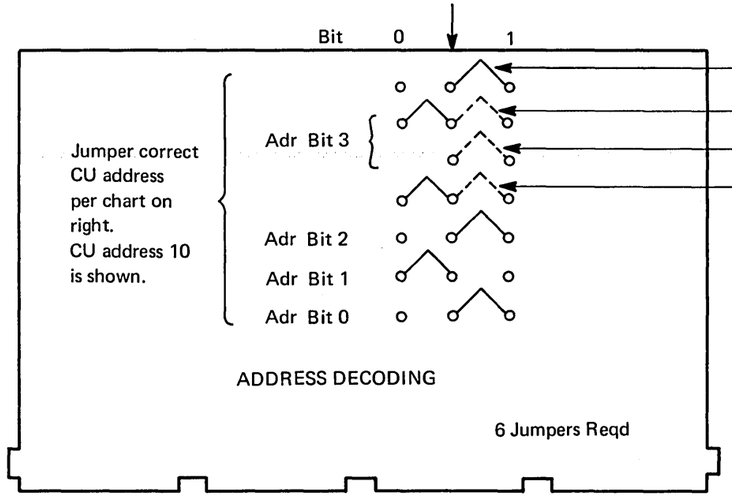
Diagram 3-1. Component Locations



Card Type 9049 (A1V2)



Card Type 9047 (A1T2)



Card Type 9048 (A1S2)

CAUTION:
Jumper pins can bend or break, or jumpers can be pulled off pins. Exercise care when inserting or removing jumpered cards or cards next to jumpered cards.

Note: CU No's 1, 3, 5, 7, 9, 11, 13, and 15 cannot be assigned to Control Units when attached devices are assigned device No. 16 or greater.

16 or Fewer Devices per CU

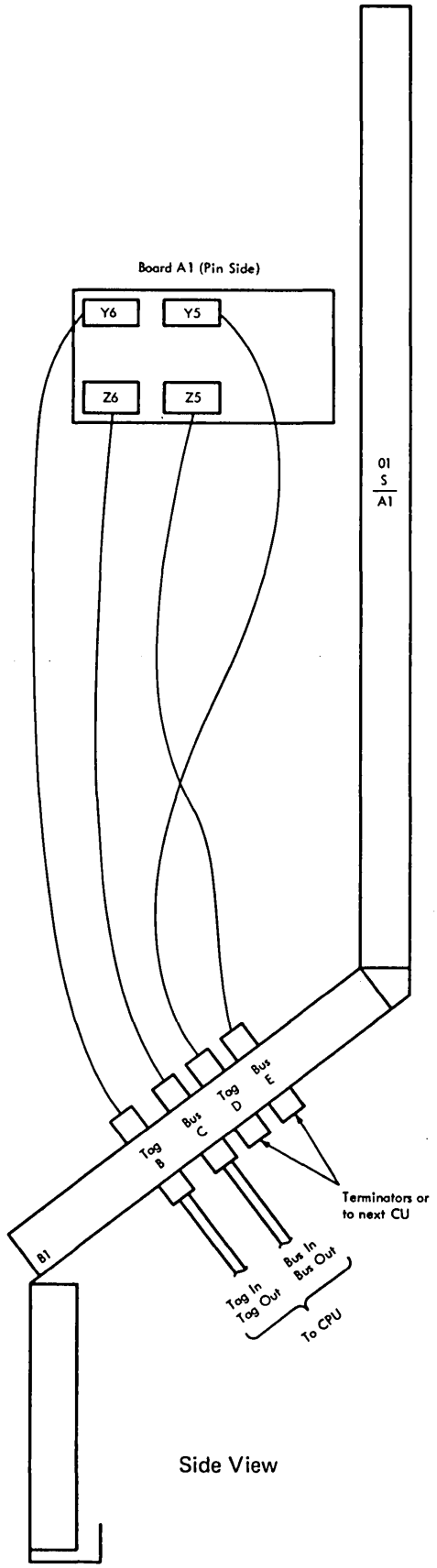
	8-Bit Local Adr Byte	
	CU	Device
CU No.	0 1 2 3	4 5 6 7
0	0 0 0 0	X X X X
1	0 0 0 1	X X X X
2	0 0 1 0	X X X X
3	0 0 1 1	X X X X
4	0 1 0 0	X X X X
5	0 1 0 1	X X X X
6	0 1 1 0	X X X X
7	0 1 1 1	X X X X
8	1 0 0 0	X X X X
9	1 0 0 1	X X X X
10	1 0 1 0	X X X X
11	1 0 1 1	X X X X
12	1 1 0 0	X X X X
13	1 1 0 1	X X X X
14	1 1 1 0	X X X X
15	1 1 1 1	X X X X

17 or More Devices per CU

	8-Bit Local Adr Byte	
	CU	Device
CU No.	0 1 2	3 4 5 6 7
*0	0 0 0	X X X X X
2	0 0 1	X X X X X
4	0 1 0	X X X X X
6	0 1 1	X X X X X
8	1 0 0	X X X X X
10	1 0 1	X X X X X
12	1 1 0	X X X X X
14	1 1 1	X X X X X

*Even CU No's show no low-order bit as it is always 0. This allows Adr Bit 3 to be used as the high-order bit position for the device address as shown in Diagram 7-106.

Diagram 3-2. CU Card Jumpering



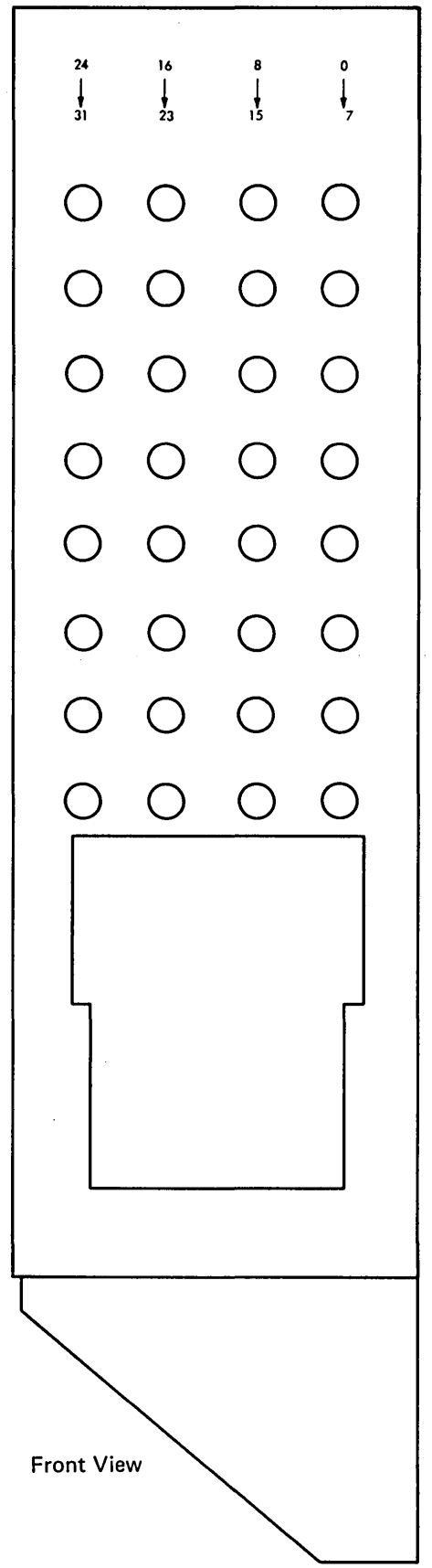


Diagram 3-3. I/O Connector Panel

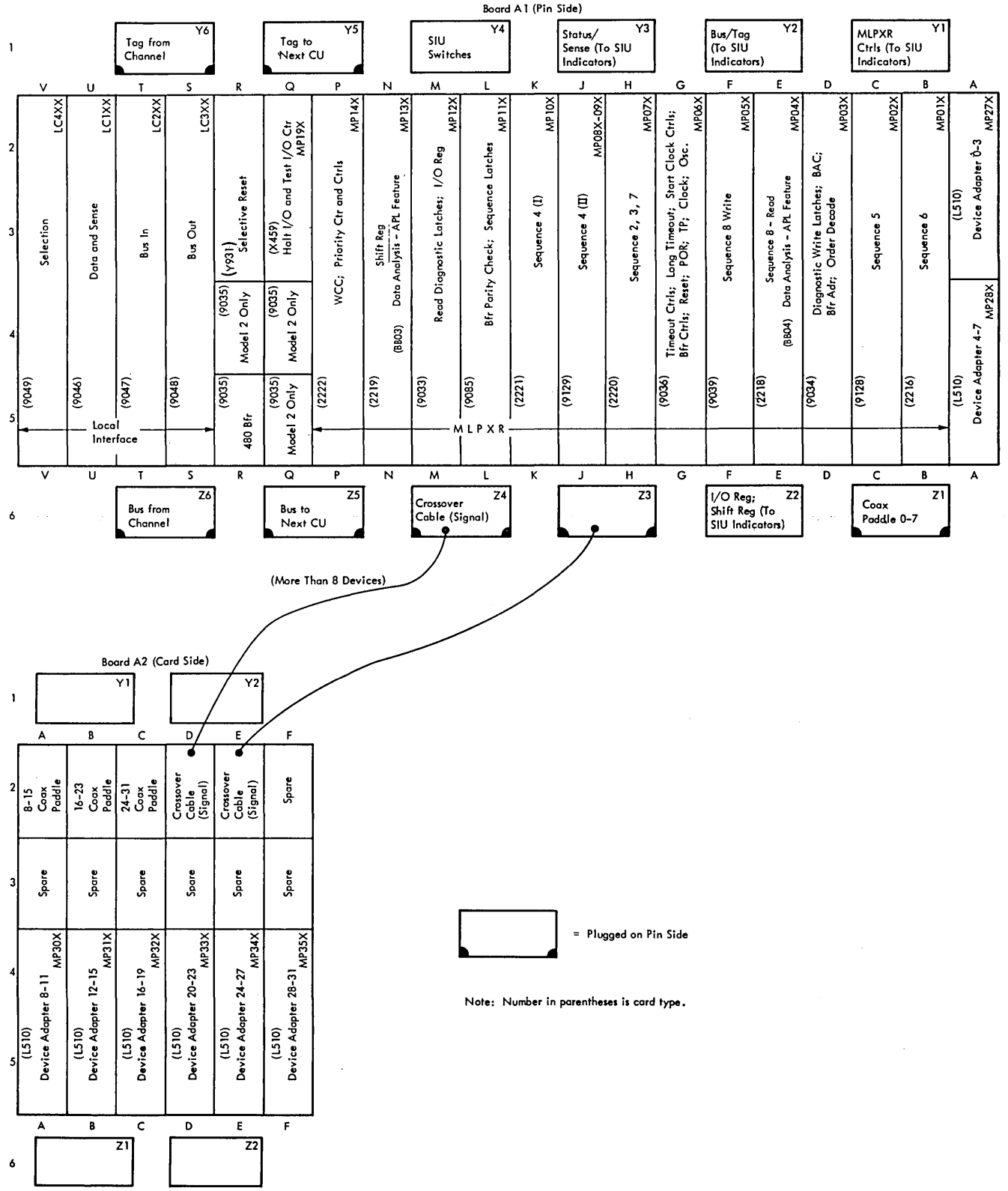
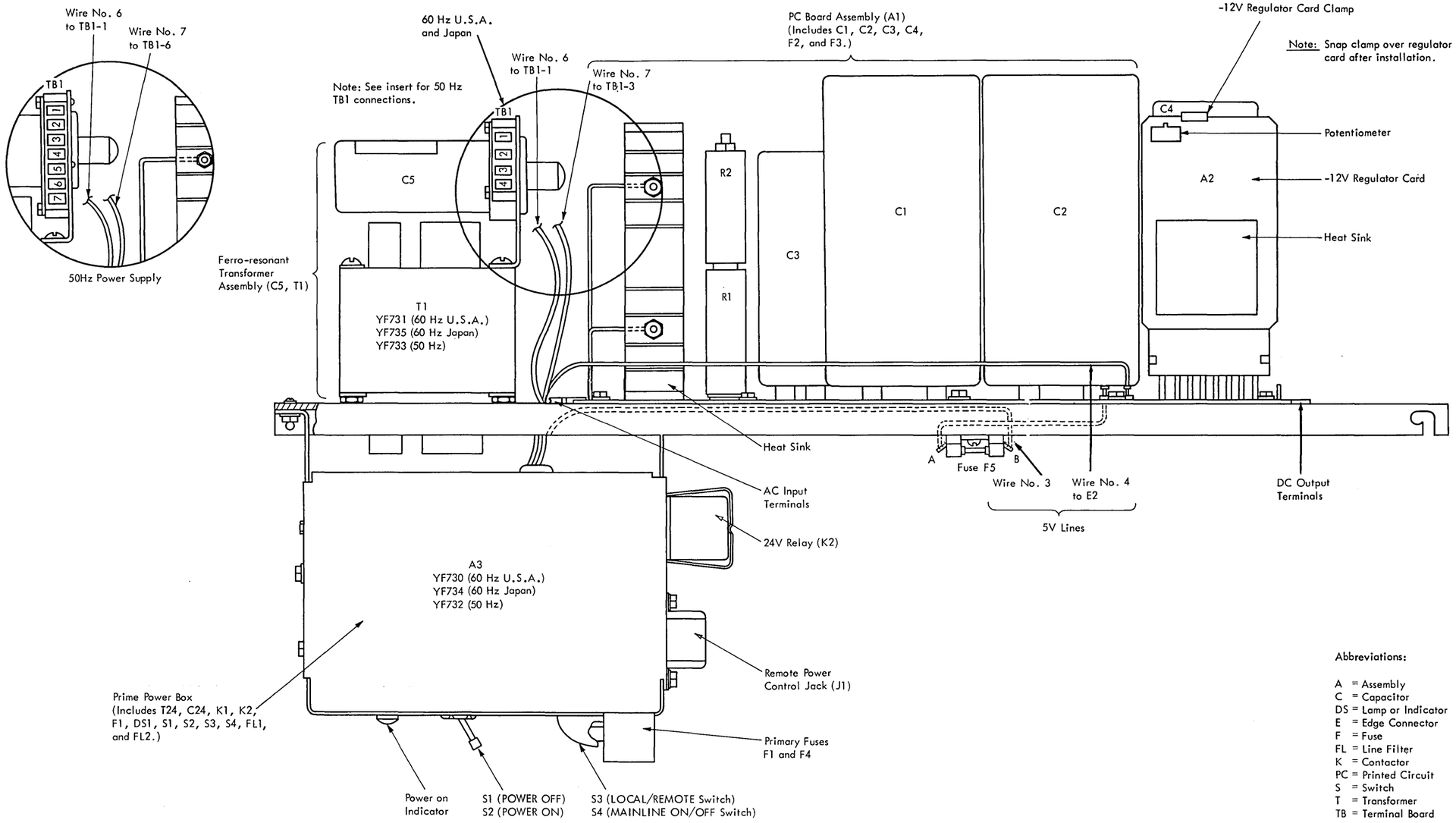


Diagram 3-4. Circuit Card Locations



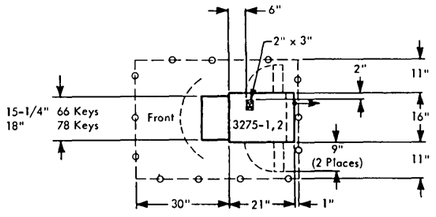
Abbreviations:

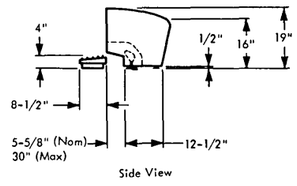
A = Assembly
C = Capacitor
DS = Lamp or Indicator
E = Edge Connector
F = Fuse
FL = Line Filter
K = Contactor
PC = Printed Circuit
S = Switch
T = Transformer
TB = Terminal Board

Diagram 3-5. Power Supply Component Locations (Side View)

3275 DISPLAY STATION MODELS 1, 2, 11, AND 12

PLAN VIEW





Side View

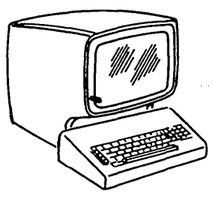
Inches	Centimeters
1/2	1
1	3
2	5
3	8
4	10
5-5/8	14
6	15
8-1/2	22
9	23
11	28
12-1/2	32
15-1/4	39
16	41
18	46
18-3/4	48
19	48
21	53
30	76

Display Unit Operating Clearances

	Inches	(cm)	
Front	0	(0)	Dimensions are minimum requirements for functional operation of the machine. These dimensions allow sufficient airflow to provide convection cooling.
Rear	1	(3)	
Right	3	(8)	
Left	3	(8)	
Top	6	(15)	

Bottom: Unit should be installed in a manner which would guarantee adequate airflow into the underside of the unit to provide convection cooling.

Note: If unit is installed with minimum clearance, service access must be provided.



SPECIFICATIONS

Dimensions:

	F	S	H
Inches	16	21*	19
(cm)	(41)	(53*)	(48)

Service Clearances:

	F	R	Rt	L
Inches	30**	1	11	11
(cm)	(76**)	(3)	(28)	(28)

Weight: 95 lb*** (43 kg***)

	Models 1 and 2	*Models 11 and 12*
Heat Output:		
BTU/hr	700	800
(kcal/hr)	(176)	(202)
Airflow:	Convection only	Convection only
Power Requirements:		
kVA	0.24	0.28
Phases	1	1

Voltage			*Plug Type††*	
50 Hz†	*60 Hz*	*Ampacity*	*Locking*	*Nonlocking*
100	100†	–	–	–
110		–	–	–
	115	15	B	A
123.5		–	–	–
220	–	–	–	–
235		–	–	–

Power Cord Style††† A4
Power Cord Length 7-1/2 ft (229 cm)

Environment Operating:

Temperature 50° - 110°F (10° - 43°C)
Rel Humidity 8%–80%
Max Wet Bulb 85°F (29°C)

Environment Nonoperating:

Temperature 50° - 125°F (10° - 52°C)
Rel Humidity 8%–80%
Max Wet Bulb 85°F (29°C)

Notes:
The 3275 is installed on a customer-supplied desk or table. Recommended keyboard height (measured at home-row keys) is 28-1/2" (72 cm) from the floor. Lighting level should not exceed 75 foot-candles (810 lumens/m^2).

*See also plan view.
**Keyboard feature adds 8-1/2" (22 cm) to front of display and can be moved up to 24" (61 cm) away from lower front of display.
***Keyboard feature adds about 10 lb (5 kg).
†World Trade voltage.
††See Appendix A for receptacle schematic and identification. In World Trade countries other than Canada, only the power cord is supplied with the machine.
†††See Appendix B for power cord style specifications.

3275 DISPLAY STATION (LEASED LINE) INSTALLATION PROCEDURES (BSC MACHINES ONLY)

This section contains the information necessary to install and check out the 3275 Display Station.

Prerequisites

The following items are prerequisites for installing the IBM 3275 Display Station Models 1 and 2. None of these items is to be done by the installing CE, but he must check that they have been accomplished and he may have to provide information to the personnel involved.

1. The transmission control unit (2701, etc) attaching the 3275 Models 1 and 2 to the host system must be properly jumpered for the 3275 and for the features installed. The CE at the TCU should refer to the TCU Installation Manual for jumpering information. (The CE at the Remote site must furnish feature data to the host CPU CE.)
2. A data set must be properly installed near the proposed location of the 3275 (40 ft max cable length should be ordered). If the IBM Line Adapter feature is installed in the 3275, the data set is a part of the 3275.
3. Data sets on both ends of the transmission line must be properly strapped (jumpered) for the 3275 and the features installed. Contact Branch Office Specialist for data set information. On all MODEMS (except the IBM 3872 and 3875), the jumper that ties signal ground to frame ground should be used. Use the External MODEM cable (PN 2564941).
4. A proper three-wire connector (two voltage wires plus a ground) must exist within 8 feet of the proposed location of the 3275.
5. A telephone, connected to an outside line, should be available within easy reach of the proposed location of the 3275.
6. Insure that the 3270 On Line Tests (OLTs) have been inserted into the OLT library at the host CPU site and configured for this 3275 Display Station. (Check features list after receiving 3275 and relay information from host CPU site CE.)
7. Insure that the following CE tools are on site for this installation: IBM 1200 TDAT PN 453679 (IBM Domestic and Canada), or IBM CRAU (World Trade only), or an equivalent tape tester; Switch Indicator Unit (SIU) PN 2570250; and a Logic Probe PN 453652. These tools *must* be available for installation checkout.

Installation Instructions

When authorization to install the 3275 is received from the Branch Office, the following instructions must be performed in the sequence listed.

Unpacking

1. Unpack according to instructions shipped with the unit. Inspect shipment for possible damage incurred in transit. Report any damage at once. Keyboard is packaged in top of shipping carton.

DANGER
The 3275 Display Station weighs about 95 pounds without keyboard. Two men *are required* to remove the unit from the shipping carton. Two people should be available to move this unit. If the display station must be moved by one person, separate the upper chassis from the lower chassis and move them individually. The 3275 cannot be separated until it is out of the carton. See steps 1–7 of paragraph 5.3.2.6 (Diagram 5-32)* to separate the two chassis.

2. Check off all received items against those listed on the shipping Bill of Materials. Report all shortages at once.

CAUTION
Exercise extreme care when inserting or removing jumpered cards or cards located next to jumpered cards. Jumper pins may bend or break, or jumpers may be pulled off the pins on the card.

Card Jumpering

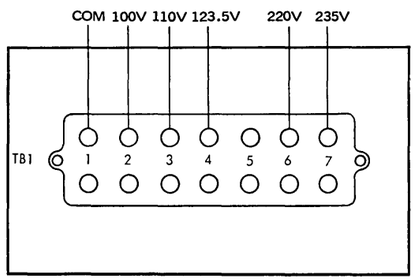
1. Remove the left side cover (Diagram 4-1), using instructions for removal located on Diagram 5-31.*
2. Jumper correct control unit (CU) address on card B-L2. Use Diagram 4-4 (EBCDIC) or Diagram 4-5 (ASCII) for physical jumpering. See Diagram 6-25* for coding of CU and device addressing.
3. Check for correct jumpering of the following cards on Diagram 4-4 (EBCDIC) or Diagram 4-5 (ASCII).
   B-M2
   B-K2
   B-H2
4. If the IBM Line Adapter feature is installed, B-N2 must be checked for correct jumpers and alignment. See Diagram 4-3 or 1200 BPS Line Adapter Reference manual.
   Jumpering options:
   a. For 2-wire operation:
      (1) Jumper B-N2D05 to B-N4G09.
      (2) Jumper B-N2B02 to N4J11.
   b. For 4-wire operation:
      (1) Remove above jumpers.
      (2) Jumper B-N2B03 to B-N2D05.
5. On completion of jumpering checks:
   a. Check for loose cards and cables.
   b. Insert security key in security keylock if this feature is installed (see 1 on Diagram 4-1).

Cable Insertion

1. Remove front cover (Diagram 4-1), using instructions on Diagram 5-31.* Check that the OFF-PUSH button is pushed in (see 2 on Diagram 4-1).
2. Connect the following cables, if applicable. Note that cable sockets are identified by function. Socket names are embossed on the chassis, beneath each socket.
   a. Keyboard cable (see 3 on Diagram 4-1).
   b. Card Reader cable (see 4 on Diagram 4-1).
   c. Printer cable (see 5 on Diagram 4-1).
3. Adjust I/O cable retainer to ensure a tight connector fit for the above cables. Connect shield ground leads from above cables under the wing screw beneath the cable sockets (see 6 on Diagram 4-1).

Power Requirements Check

1. Check that the source voltage provided by the customer agrees with display station wiring, using the following information (see 8 on Diagram 4-1, Sheet 2):
   a. Domestic USA models use 115V ac (±10%), 60-Hz, single-phase, line voltage. No internal adjustments are required for Domestic (USA) display stations.
   b. World Trade models use 100, 110, 123.5, 220, or 235V ac (±10%), 50-Hz single-phase; or 100V ac (±10%), 60-Hz single-phase line voltage. For 50-Hz models only, check that the ferro connectors on terminal block TB-1 agree with the line voltage provided. If it is necessary to change taps on the ferro, update the voltage decal.



Ferro

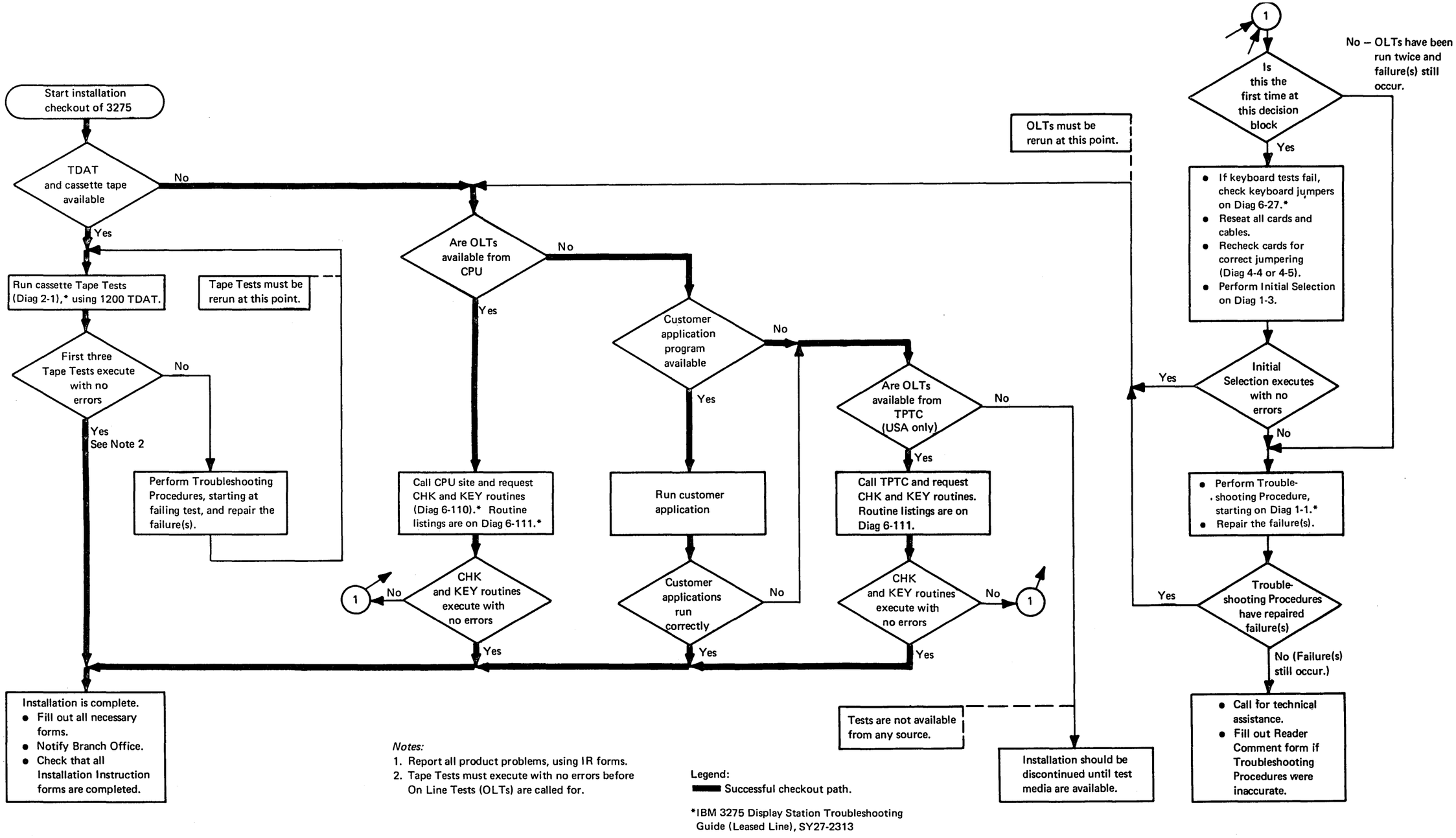
2. Remove seal from power cord plug. Plug female end of cable into 3275 prime power box receptacle (see 7 on Diagram 4-1). Plug male end of cable to the customer's power source.

Power-On Basic Checkout

1. Turn power on. Connect and check out Switch Indicator Unit (SIU) as described in Diagram 8-14.* Perform Display Logic Checkout Procedure 1 (Diagram 1-2).* Check out Logic Probe before using. Perform initial selection with ADR OVRD in NORMAL position (Diagram 1-3).* Turn power off and remove SIU.
2. Plug Data Set cable or Line Adapter Feature cable into the socket labeled I/O (see 9 on Diagram 4-1). Always adjust I/O Cable Retainer to ensure a tight connector fit. Connect shield ground to common ground, which is the wing screw beneath the cable sockets. Replace front cover.

Checkout Procedure (Flowchart on Sheet 2)

1. Put ON LINE/OFF LINE switch to ON LINE position.
2. The following checkout procedures are listed in the order of preference. Perform *the first* of the following procedures for which the facilities are available. If the procedure fails, check out the Logic Probe and perform the troubleshooting procedures in the front of this manual:
   a. Perform the first three tape tests (Diagram 2-1),* using the IBM 1200 TDAT (IBM Domestic and Canada), IBM CRAU (World Trade Corporation), or equivalent, and the cassette tape supplied.
      Information for setup of the IBM 1200 TDAT is contained in the IBM Maintenance Library Manual, *1200 Teleprocessing Diagnostic Analyzer Tester,* Form No. S226-3029.
   b. Run the Check (CHK) and Keyboard (KEY) portions of the OLT's from the customer's host CPU.
   c. Allow the customer to run his own programs from the host CPU to check out the CU. If a problem is encountered, use the TPTC for troubleshooting. If tests with TPTC run correctly, suspect the customer program.
   d. Connect the IBM 1200 TDAT to communicate with the TPTC (IBM Domestic and Canada only) according to the instructions in the IBM Maintenance Library Manual, *1200 Teleprocessing Diagnostic Analyzer Tester,* Form No. S226-3029. Request only the Check (CHK) and Keyboard (KEY) portions of the OLT's from the TPTC.
3. If the checkout procedure ran successfully, turn power off and remove switch/indicator unit. (If TDAT was used, remove it and install the data set cable.) Replace the front cover. Installation is complete.



Notes:
1. Report all product problems, using IR forms.
2. Tape Tests must execute with no errors before On Line Tests (OLTs) are called for.

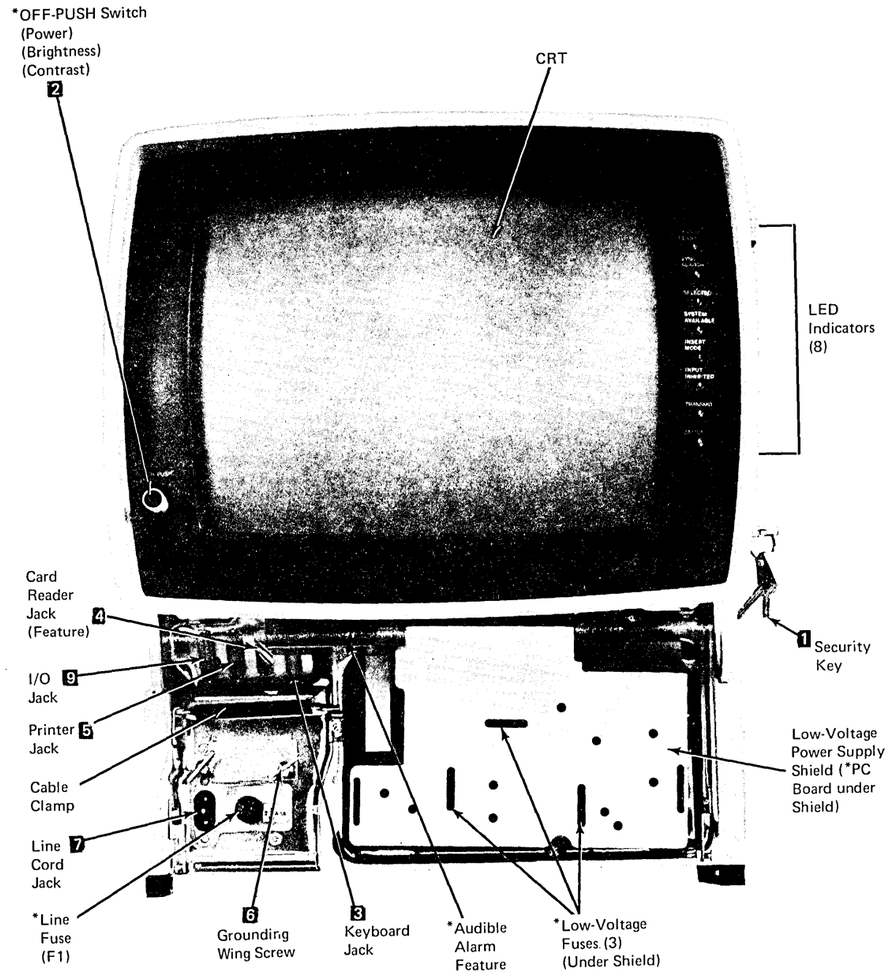
Legend:
Successful checkout path.

*IBM 3275 Display Station Troubleshooting Guide (Leased Line), SY27-2313

3275 Display Station, Models 1 and 2, Leased Line, Installation (Sheet 2 of 7)

3275 Display Station, Models 1 and 2, Leased Line, Installation (Sheet 3 of 10)

Photographs and drawings are provided in this section to aid in locating field-replaceable units, adjustable components, voltage measurement points, and references for installation.



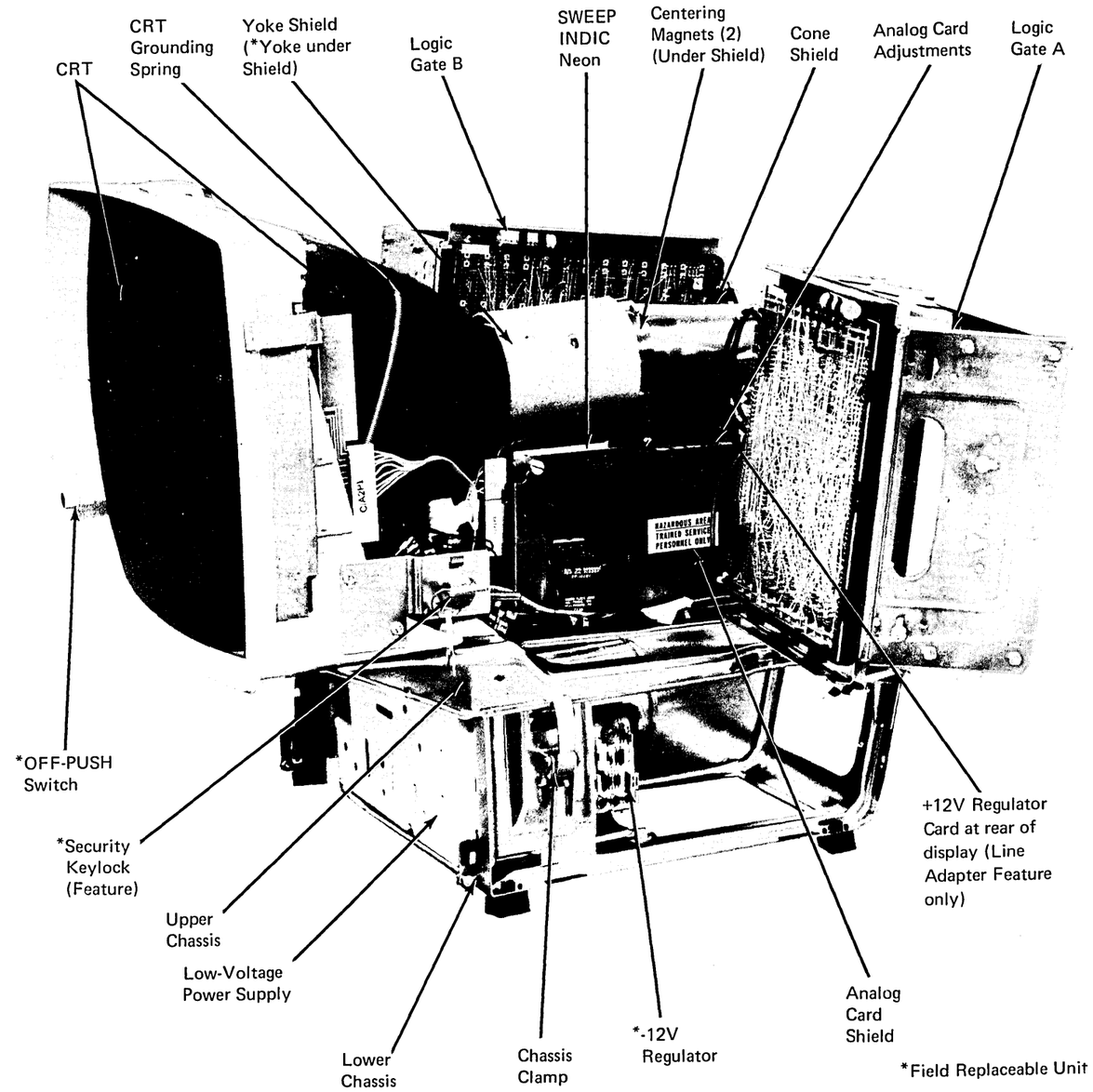


Diagram 4-1. Locations (Sheet 1 of 3)

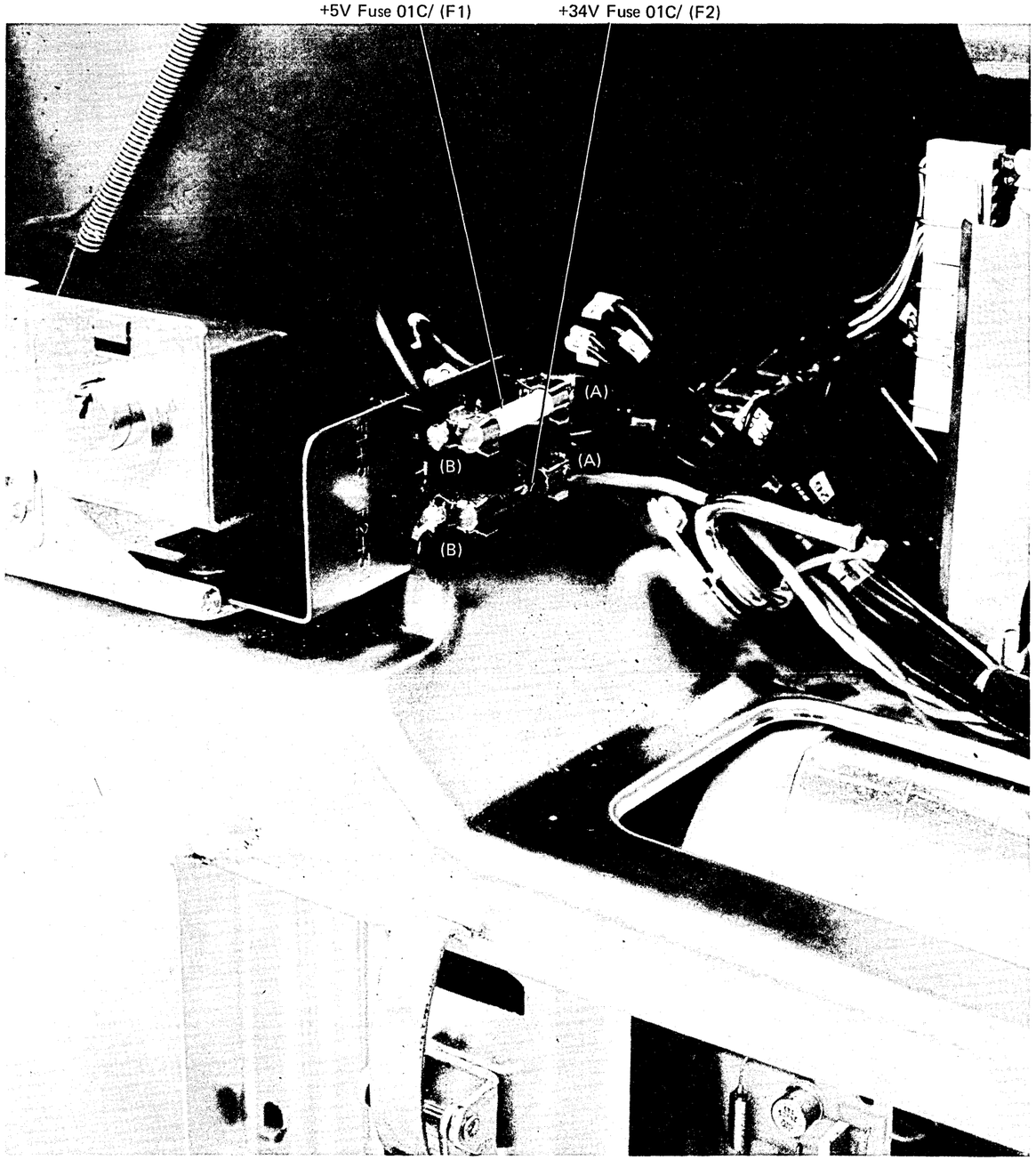


Diagram 4-1. Locations (Sheet 2 of 3)

NOTE: This view shows the area to the right and behind the keylock, shown in Diagram 4-1, sheet 1.

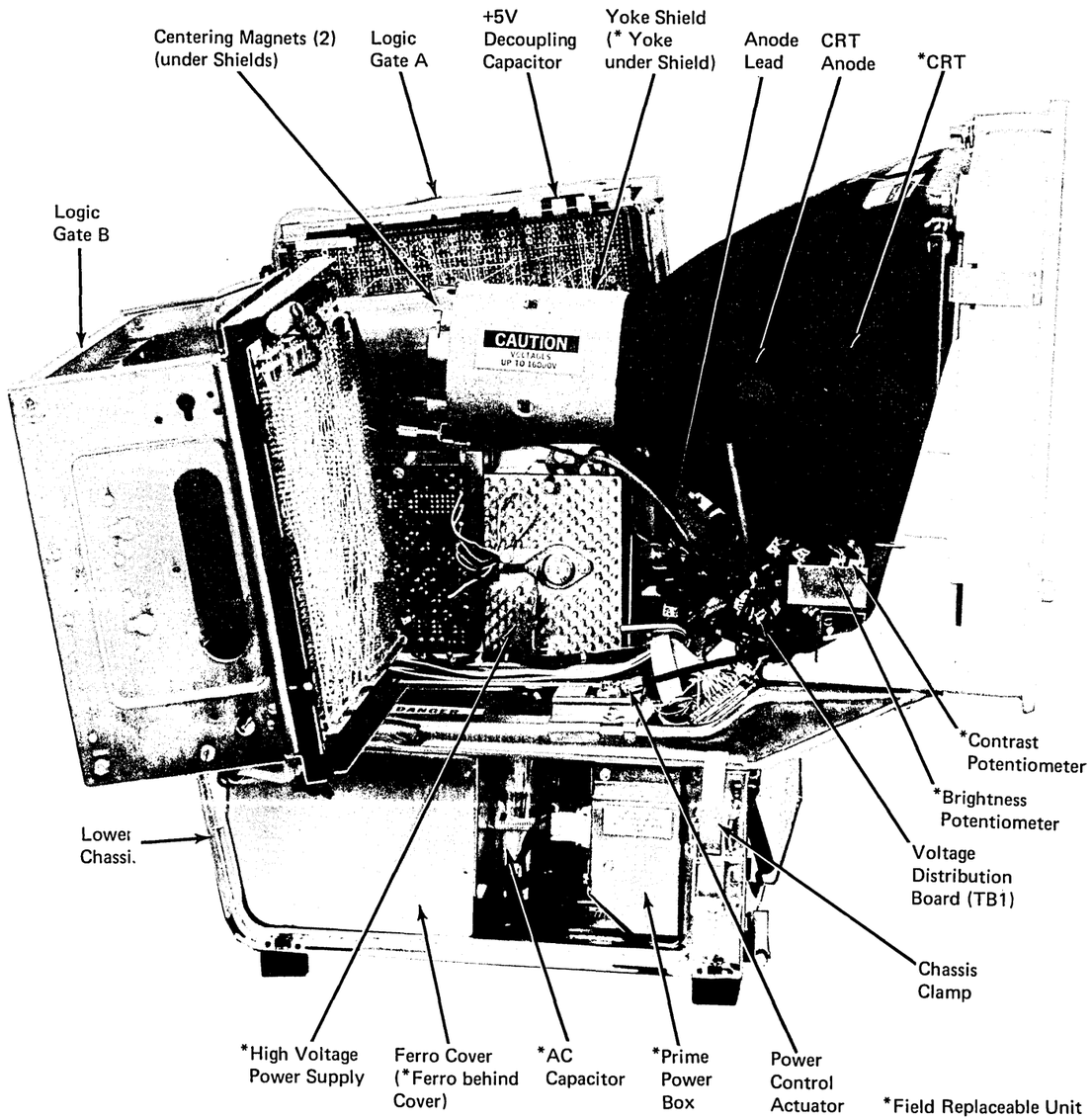
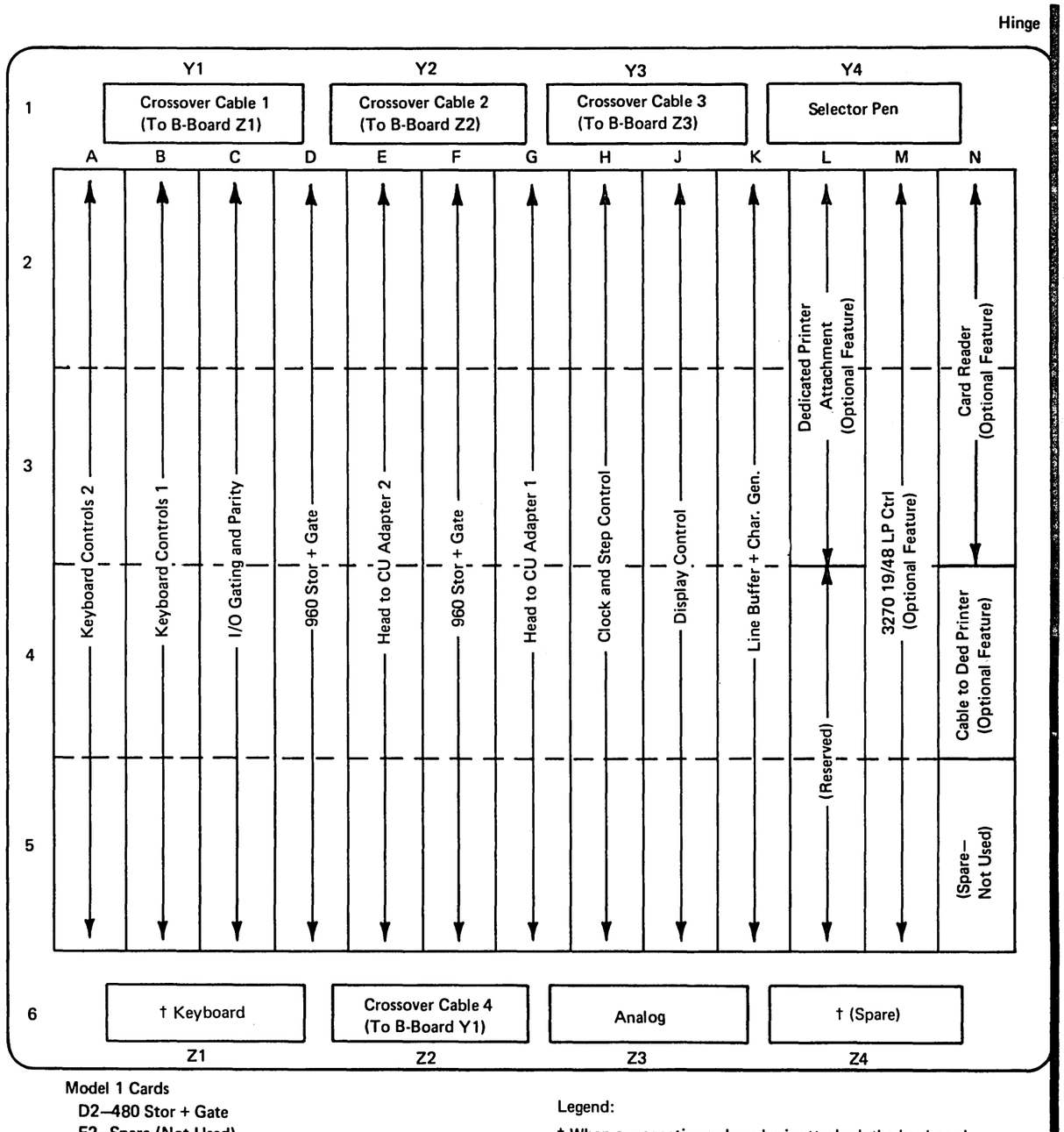


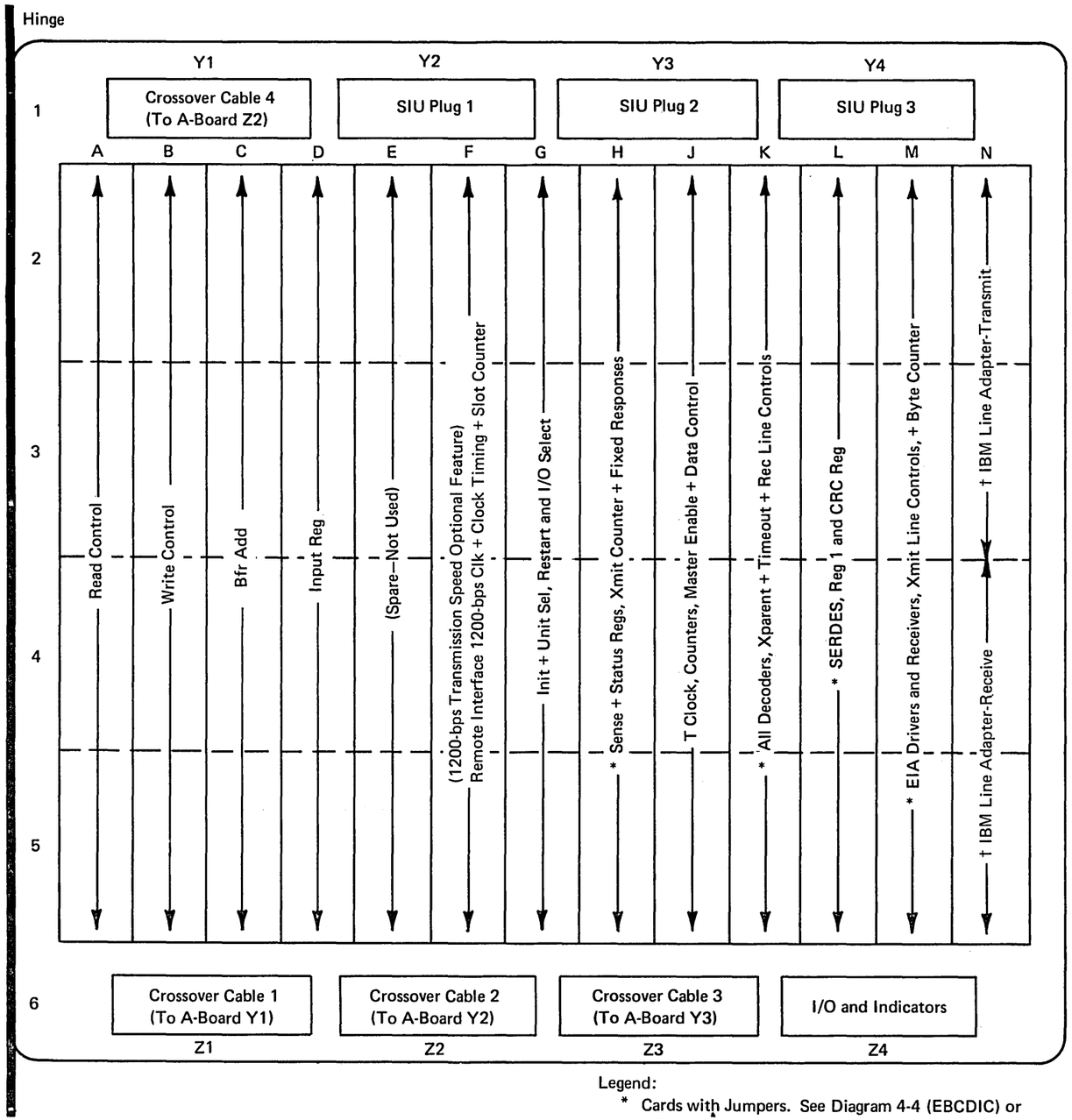
Diagram 4-1. Locations (Sheet 3 of 3)



Model 1 Cards
D2—480 Stor + Gate
F2—Spare (Not Used)
K2—Line Buffer and Char Gen

Legend:
† When a magnetic card reader is attached, the keyboard cable plugs into socket Z4.

Diagram 4-2. A-Gate Card Layout by Function (Card Side)



Legend:

* Cards with Jumpers. See Diagram 4-4 (EBCDIC) or 4-5 (ASCII).

† Locations N2 and N4 are empty when Line Adapter feature is not installed.

Diagram 4-3. B-Gate Card Layout by Function (Card Side)

ASCII Feature Cards

H2—ASCII Fixed Inputs Status Reg Xmit Ctr
J2—ASCII T Clock and Timeout
K2—ASCII Decoder and LRC Reg and LRC SERDES
L2—SERDES and ASCII/EBCDIC Code Converters

4800-bps Transmission Speed Card

F2—High-Baud Feature (Double card)

Line Adapter Feature Cards

N2—IBM Line Adapter - Transmit
N4—IBM Line Adapter - Receive

Transmit Level Adjustment

Direct attachment to a leased line normally requires a 0-dbm transmit level. If attachment is by a 1000-B coupler (leased line), a CDT Data Access Arrangement (manual-switched network), or equivalent, adjust the transmit level to the value marked on the common-carrier equipment. To set the appropriate transmit level:

1. Turn the 3275 power off.
2. For direct leased line, 1000-B or CDT applications, disconnect the communications line plug (283-B) and insert it in the TRANS/REC jack in the dB meter cover.

   Note: Terminate the line with the 600-ohm terminating plug.

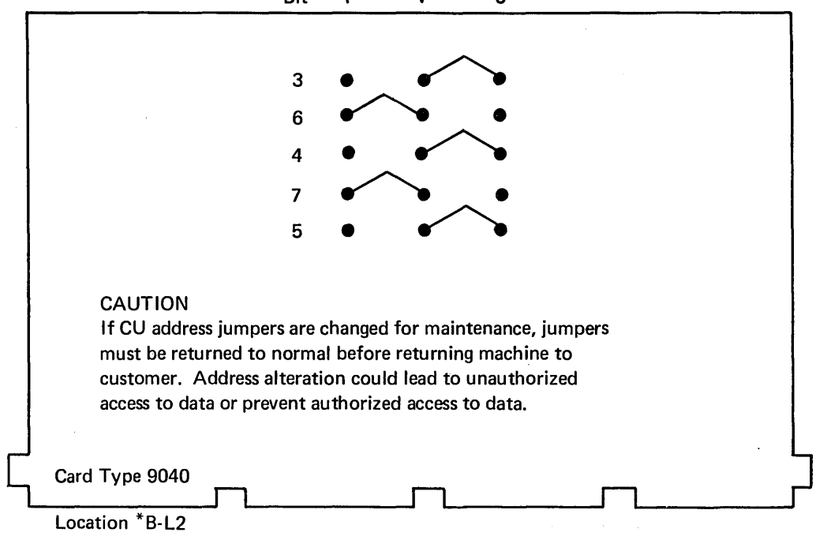
3. Place the 2W-4W TRANS/REC switch in the TRANS position.
4. If the connection is made by plugging the 283-B plug to the dB meter cover, jump the LINE terminals on the cover to the LINE terminals on the meter.
5. Place the BRIDGING, 600, 324 switch in the 600 position.
6. Turn the meter POWER switch on, and turn 3275 power on..
7. Unclamp the transmitter by grounding 01BA1N2 B10 (wrap unclamp) and 01BA1N2 J07 (request to send), which causes the modem to transmit a steady mark frequency (carrier on).
8. While reading the dBm scale on the meter, adjust R3 on 01BA1N2 (top resistor) to the correct transmit level.
9. Return all connections to normal and reconnect to the line.

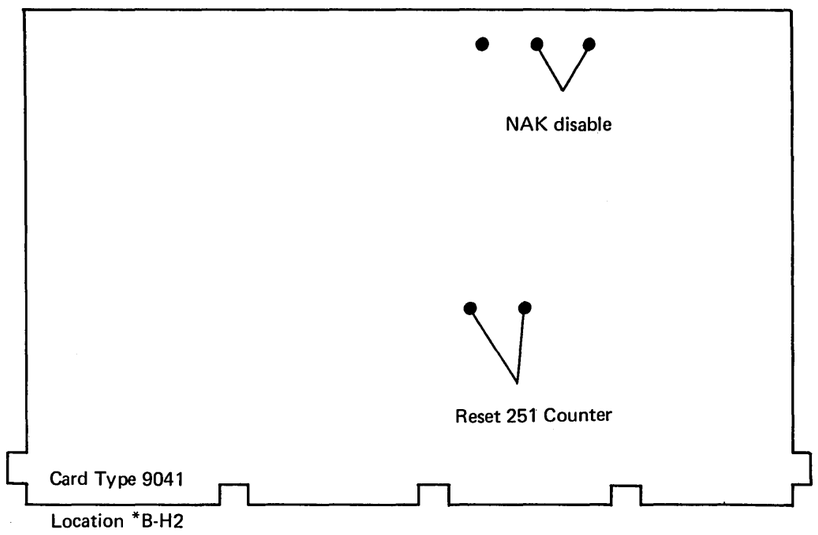
Jumper correct CU address per chart. CU address 3 is shown.

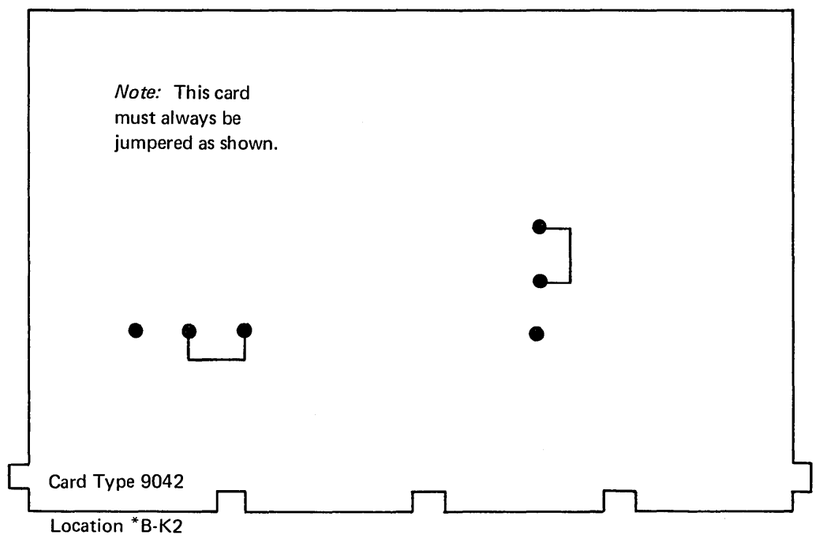
CU Address	Binary Bits 3	4	5	6	7
0	0	0	0	0	0
1	0	0	0	0	1
2	0	0	0	1	0
3	0	0	0	1	1
4	0	0	1	0	0
5	0	0	1	0	1
6	0	0	1	1	0
7	0	0	1	1	1
8	0	1	0	0	0
9	0	1	0	0	1
10	0	1	0	1	0
11	0	1	0	1	1
12	0	1	1	0	0
13	0	1	1	0	1
14	0	1	1	1	0
15	0	1	1	1	1
16	1	0	0	0	0
17	1	0	0	0	1
18	1	0	0	1	0
19	1	0	0	1	1
20	1	0	1	0	0
21	1	0	1	0	1
22	1	0	1	1	0
23	1	0	1	1	1
24	1	1	0	0	0
25	1	1	0	0	1
26	1	1	0	1	0
27	1	1	0	1	1
28	1	1	1	0	0
29	1	1	1	0	1
30	1	1	1	1	0
31	1	1	1	1	1

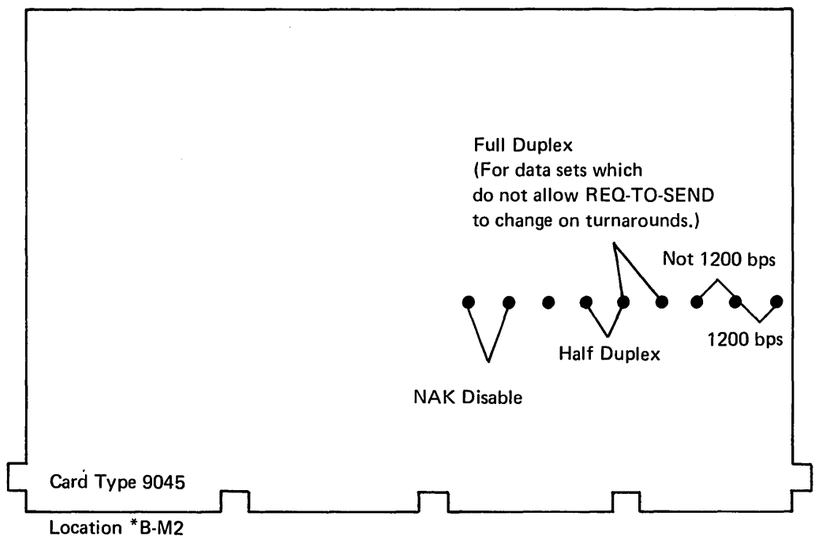
Binary CU Addresses

Notes:
1. Bit 0 reset for CU address.
2. Bits 1 and 2 set for CU selection address.
3. Bit 1 set for CU polling address.



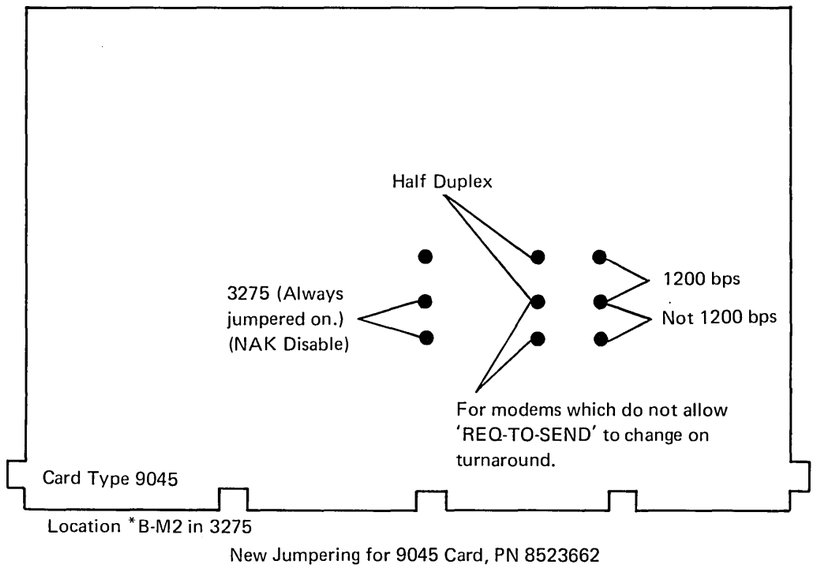






CAUTION
Jumper pins can bend or break, or jumpers can be pulled off pins. Exercise care when inserting or removing jumpered cards or cards next to jumpered cards.

Diagram 4-4. Logic Card Jumpering — EBCDIC (Sheet 1 of 2)



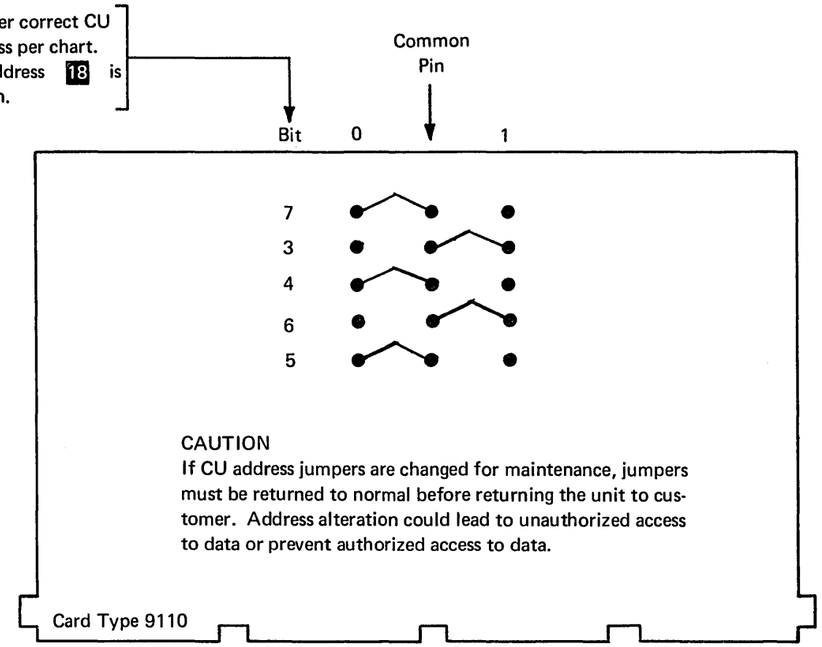
New Jumpering for 9045 Card, PN 8523662

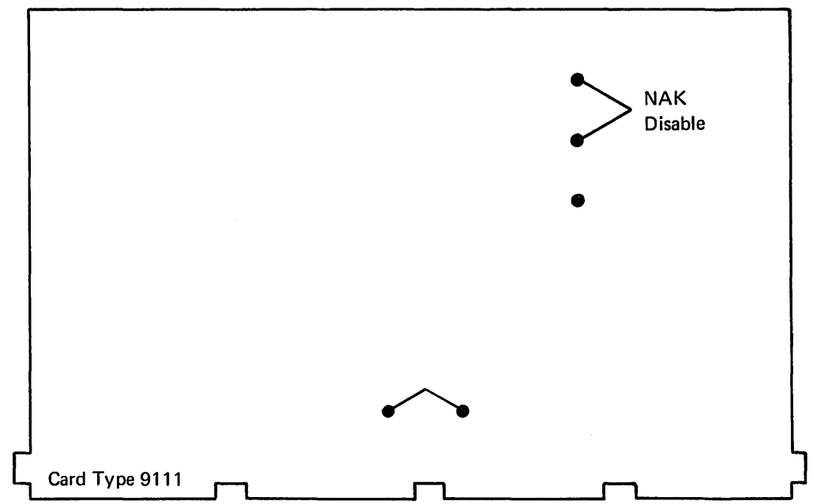
Diagram 4-4. Logic Card Jumpering — EBCDIC (Sheet 2 of 2)

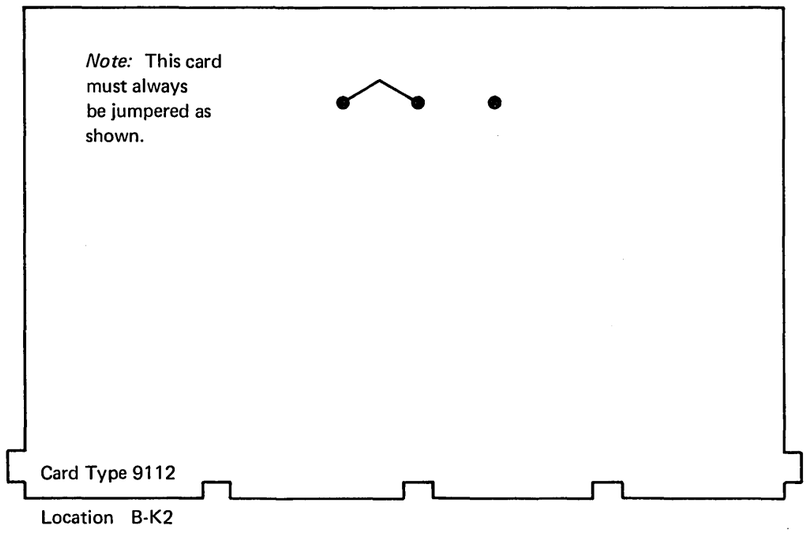
Jumper correct CU address per chart. CU address 18 is shown.

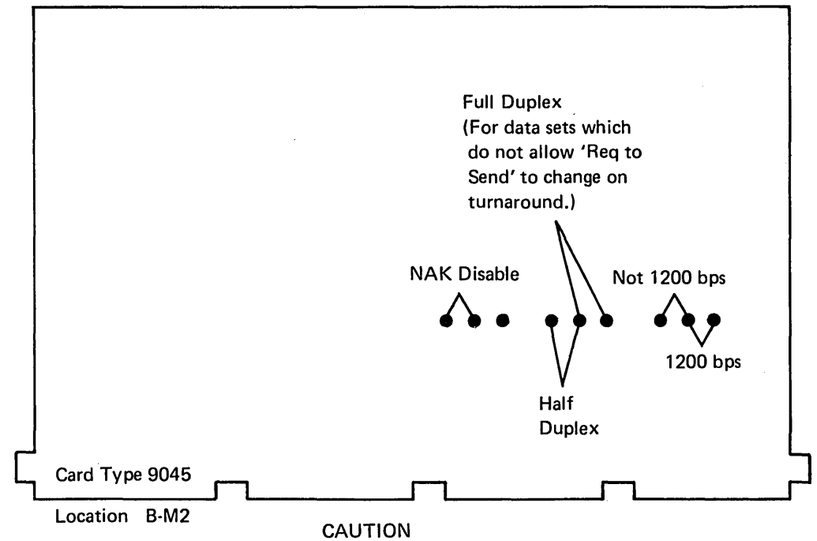
CU Adr	Binary Bits 3	4	5	6	7
0	0	0	0	0	0
1	0	0	0	0	1
2	0	0	0	1	0
3	0	0	0	1	1
4	0	0	1	0	0
5	0	0	1	0	1
6	0	0	1	1	0
7	0	0	1	1	1
8	0	1	0	0	0
9	0	1	0	0	1
10	0	1	0	1	0
11	0	1	0	1	1
12	0	1	1	0	0
13	0	1	1	0	1
14	0	1	1	1	0
15	0	1	1	1	1
16	1	0	0	0	0
17	1	0	0	0	1
18	**1**	**0**	**0**	**1**	**0**
19	1	0	0	1	1
20	1	0	1	0	0
21	1	0	1	0	1
22	1	0	1	1	0
23	1	0	1	1	1
24	1	1	0	0	0
25	1	1	0	0	1
26	1	1	0	1	0
27	1	1	0	1	1
28	1	1	1	0	0
29	1	1	1	0	1
30	1	1	1	1	0
31	1	1	1	1	1

Binary CU Addresses



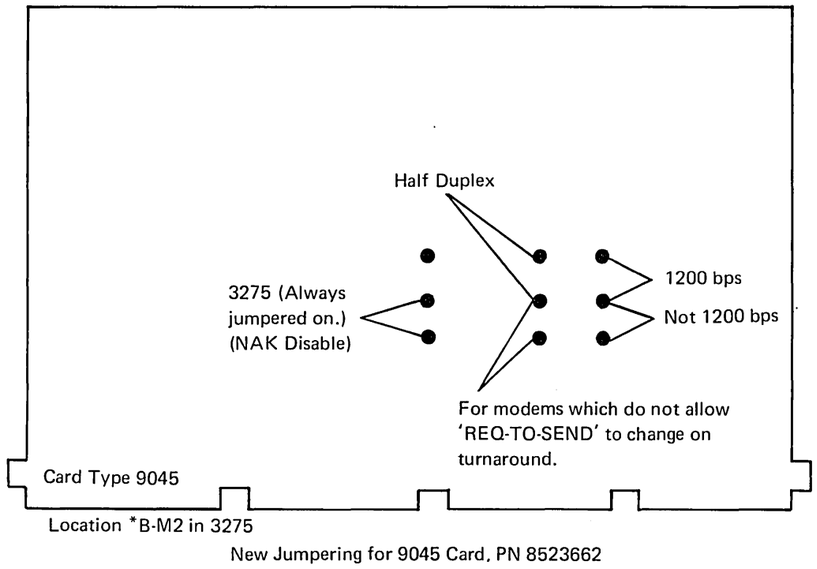






CAUTION
Jumper pins can bend or break, or jumpers can be pulled off pins. Exercise care when inserting or removing jumpered cards or cards next to jumpered cards.

Diagram 4-5. Logic Card Jumpering — ASCII (Sheet 1 of 2)



New Jumpering for 9045 Card, PN 8523662

Diagram 4-5. Logic Card Jumpering — ASCII (Sheet 2 of 2)

3275 DISPLAY STATION (DIAL FEATURE) INSTALLATION PROCEDURES

This section contains the information necessary to install and check out the 3275 Display Station with Dial feature.

Prerequisites

The following items are prerequisites for installing the IBM 3275 Display Station with Dial feature. None of these items is to be done by the installing CE, but he must check that they have been accomplished and he may have to provide information to the personnel involved.

1. The transmission control unit (2701, etc) attaching the 3275 to the host system must be properly jumpered for the 3275 and for the features installed. The CE at the TCU should refer to the TCU Installation Manual for jumpering information. (The CE at the Remote site must furnish feature data to the host CPU CE.)
2. A data set must be properly installed near the proposed location of the 3275 (40 ft max cable length should be ordered). If the IBM Line Adapter feature is installed in the 3275, the following manual is required for installation – *1200 BPS Line Adapter Reference Manual*.
3. Data sets on both ends of the transmission line must be properly strapped (jumpered) for the 3275 and the features installed. Contact DP Division for data set information. On all MODEMS (except the IBM 3872 and 3875), the jumper that ties signal ground to frame ground should be used. Use the External MODEM cable (PN 2564941).
4. A proper three-wire connector (two voltage wires plus a ground) must exist within 8 feet of the proposed location of the 3275.
5. A telephone must be available as part of the Dial feature installation. A Data Access Arrangement and a telephone must also be made available if the IBM 600/1200 Line Adapter feature is installed on the 3275. (DAA cable for Line Adapter feature without Auto Answer is PN 2564877. DAA cable for Line Adapter feature with Auto Answer is PN 2564878.)
6. Insure that the 3270 On Line Tests (OLTs) have been inserted into the OLT library at the host CPU site and configured for this 3275 Display Station with Dial feature. (Check features list after receiving 3275 and relay information from host CPU site CE.)
7. Insure that the following CE tools are on site for this installation: IBM 1200 TDAT PN 453679 (IBM Domestic and Canada), or IBMCRAU (World Trade only), or an equivalent tape tester; Switch Indicator Unit (SIU) PN 2570250; and a Logic Probe PN 453652. These tools *must* be available for installation checkout.

Installation Instructions

When authorization to install the 3275 is received from the Branch Office, the following instructions must be performed in the sequence listed.

Unpacking

1. Unpack according to instructions shipped with the unit. Inspect shipment for possible damage incurred in transit. Report any damage at once.

> DANGER
> The 3275 Display Station weighs about 95 pounds without keyboard. Two people should be available to move this unit. If the display station must be moved by one person, separate the upper chassis from the lower chassis and move them individually. See steps 1–7 of paragraph 5.3.2.6 (Diagram 5-32)* to separate the two chassis.

2. Check off all received items against those listed on the shipping Bill of Materials. Report all shortages at once.

Card Jumpering

1. Remove the left side cover (Diagram 4-6), using instructions for removal located on Diagram 5-31.*
2. Plug the Device Identification (DVC ID) card (B-J2) only if the customer requests that the DVC ID be other than the IBM assigned code. Use Table 2 (Diagram 4-9) for selection of the non-IBM assigned DVC ID codes and use Diagram 4-10 (EBCDIC) or Diagram 4-11 (ASCII) for physical jumpering.
3. Check for correct jumpering of the following cards on Diagram 4-10 (EBCDIC) or Diagram 4-11 (ASCII):
   - B-E2
   - B-F2
   - B-N2 Only if the IBM Line Adapter feature is installed.
   - B-M5 World Trade only (Diagram 6-25).*

   On completion of jumpering checks:
   a. Check for loose cards and cables.
   b. Insert security key in security keylock if this feature is installed (Diagram 4-6).

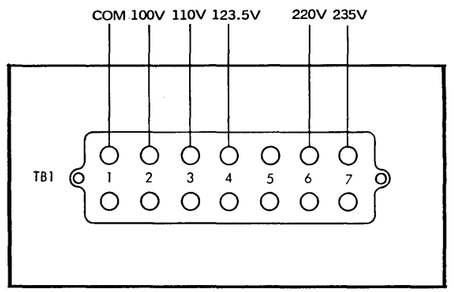
*IBM 3275 Display Station Troubleshooting Guide (Dial Feature), SY27-2329

Cable Insertion

1. Remove front cover (Diagram 4-6) using instructions on Diagram 5-31.* Check that the OFF-PUSH button is pushed in.
2. Connect the following cables if applicable. Note that cable sockets are identified by function. Socket names are embossed on the chassis, beneath each socket.
   a. Keyboard cable
   b. Card Reader cable
   c. Printer cable
3. Reposition I/O cable retainer to insure a tight connector fit for the above cables. Connect shield ground leads from above cables under the wing screw beneath the cable sockets.
4. Remove keyboard top cover and ensure that cable is seated in K-B1 connector.

Power Requirements Check

1. Check that the source voltage provided by the customer agrees with display station wiring using the following information:
   a. Domestic USA models use 115V ac (±10%), 60-Hz, single-phase, line voltage. No internal adjustments are required for Domestic (USA) display stations.
   b. World Trade models use 100, 110, 123.5, 220, or 235V ac (±10%), 50-Hz single-phase; or 100V ac (±10%), 60-Hz single-phase line voltage. For 50-Hz models only, check that the ferro connectors on terminal block TB-1 agree with the line voltage provided. If it is necessary to change taps on the ferro, update the voltage decal.



Ferro

2. Remove seal from power cord plug. Plug female end of cable into 3275 prime power box receptacle. Plug male end of cable to the cusomter's power source.

Power-On Basic Checkout

1. Turn power on. Connect and check out Switch Indicator Unit (SIU) as described in Diagram 8-14.* Perform Display Logic Checkout Procedure 1 (Diagram 1-2).*
   Turn power off and remove SIU.
2. Plug Data Set cable or Data Access Arrangement cable into the socket labeled I/O. Reposition I/O Cable Retainer to insure a tight connector fit. Connect shield ground to common ground, which is the wing screw beneath the cable sockets. Replace front cover.

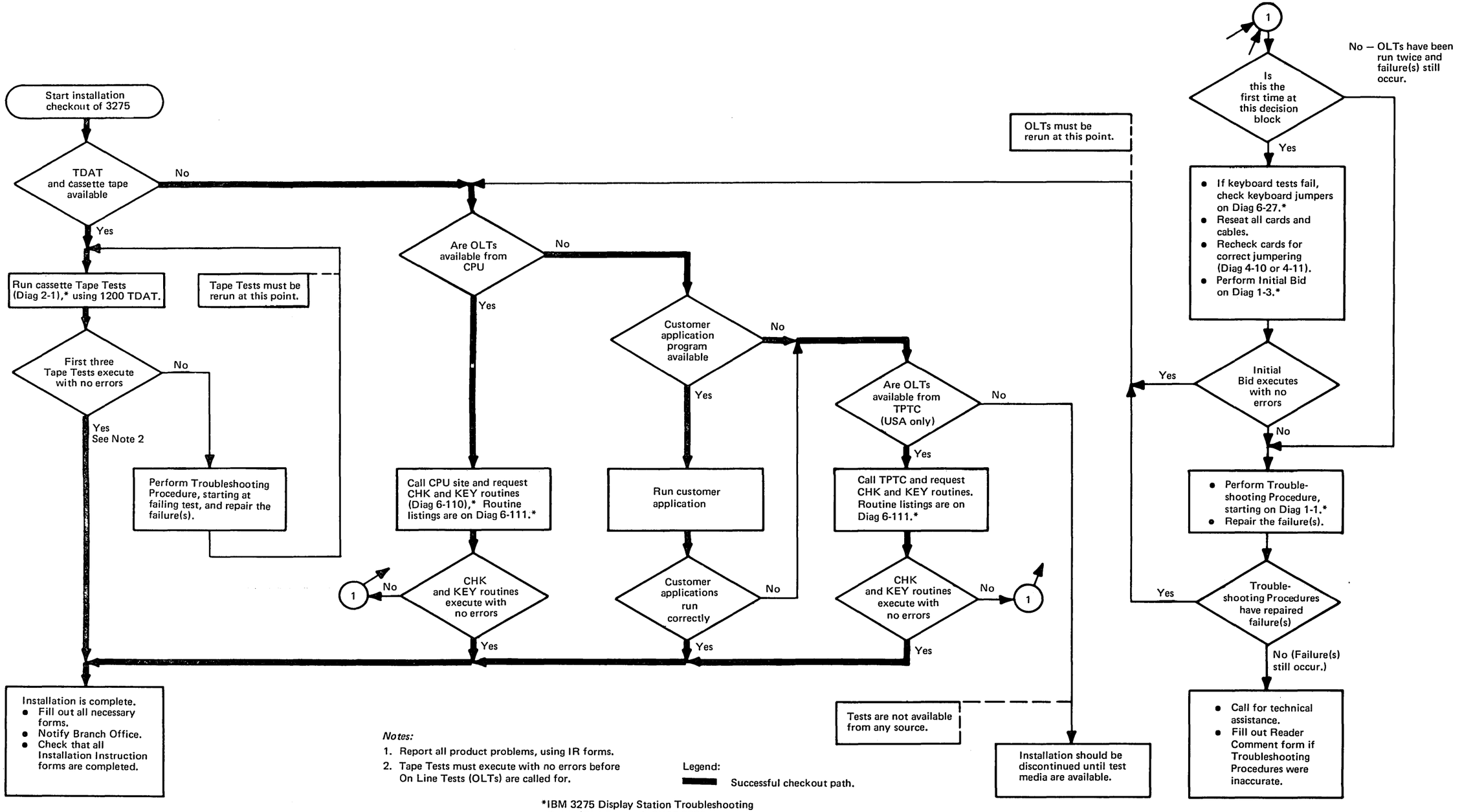
Check with Tape and 1200 Teleprocessing Diagnostic Analyzer Tester (TDAT) Unit

1. Perform the tape tests (Diagram 2-1)* using the IBM 1200 TDAT (IBM Domestic), IBM CRAU (World Trade Corporation) or equivalent, and the cassette tape supplied. All tape tests must run with no errors before installation can be continued.
   Information for setup of the IBM 1200 TDAT is contained in the *IBM Maintenance Library 1200 Teleprocessing Diagnostic Analyzer Tester* S226-3029.

Check with CPU or TPTC (IBM Domestic and Canada only)

1. Request only the Check (CHK) and KEYBOARD (KEY) portions of the OLTs from either the host CPU or TPTC (IBM Domestic and Canada only) (Diagram 6-110* and Diagram 6-111).* When these two sections run error-free, installation is complete.

*IBM 3275 Display Station Troubleshooting Guide (Dial Feature), SY27-2329



Notes:

1. Report all product problems, using IR forms.
2. Tape Tests must execute with no errors before On Line Tests (OLTs) are called for.

Legend:

Successful checkout path.

*IBM 3275 Display Station Troubleshooting Guide (Dial Feature), SY27-2329

Component Locations

Photographs and drawings are provided in this section to aid in locating field-replaceable units, adjustable components, and voltage measurement points.

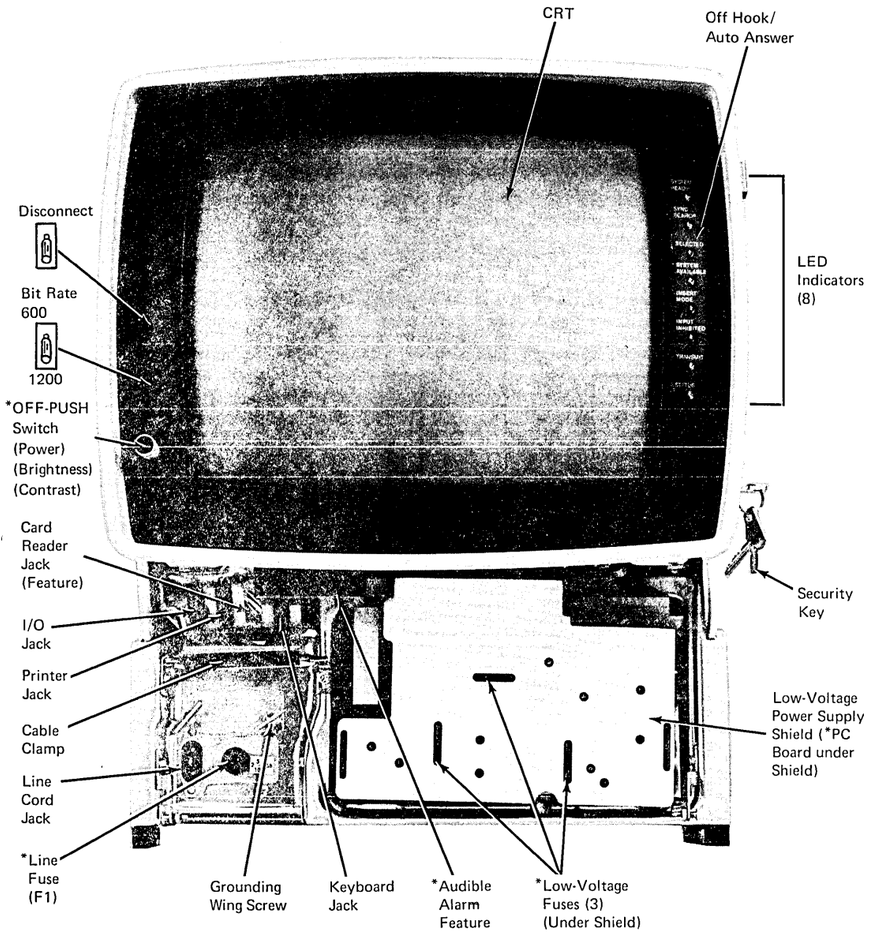


Diagram 4-6. Locations

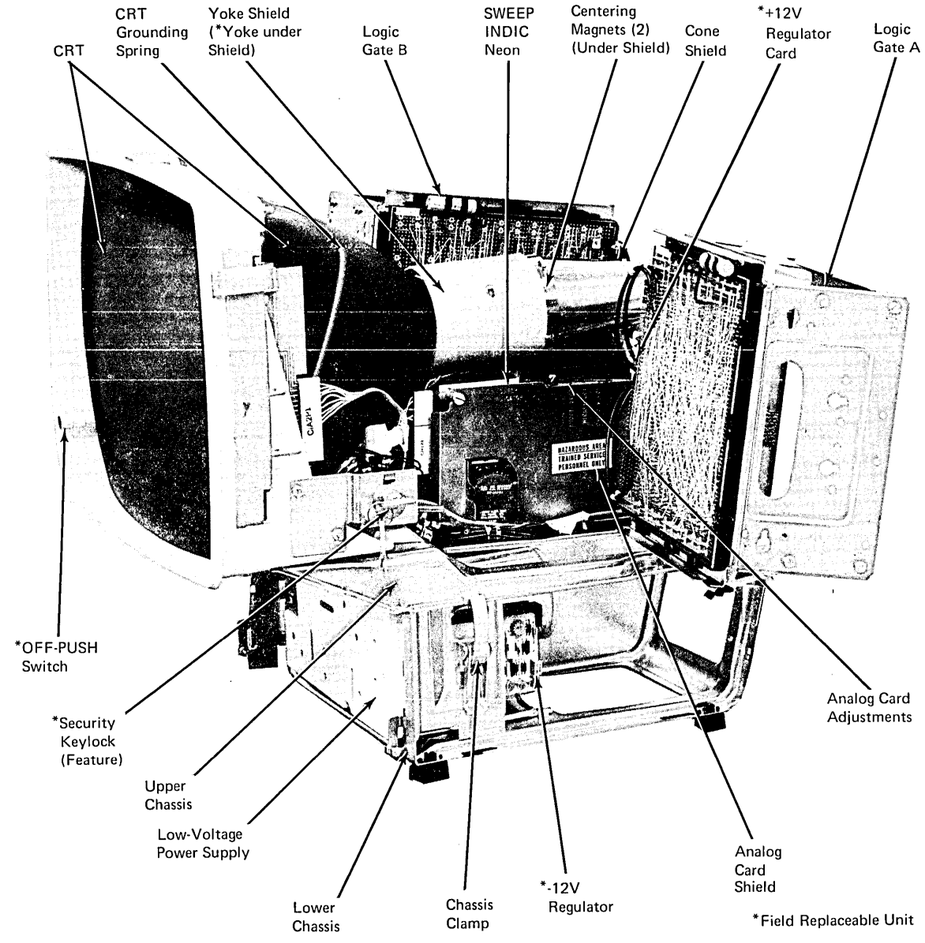


Diagram 4-7. Locations

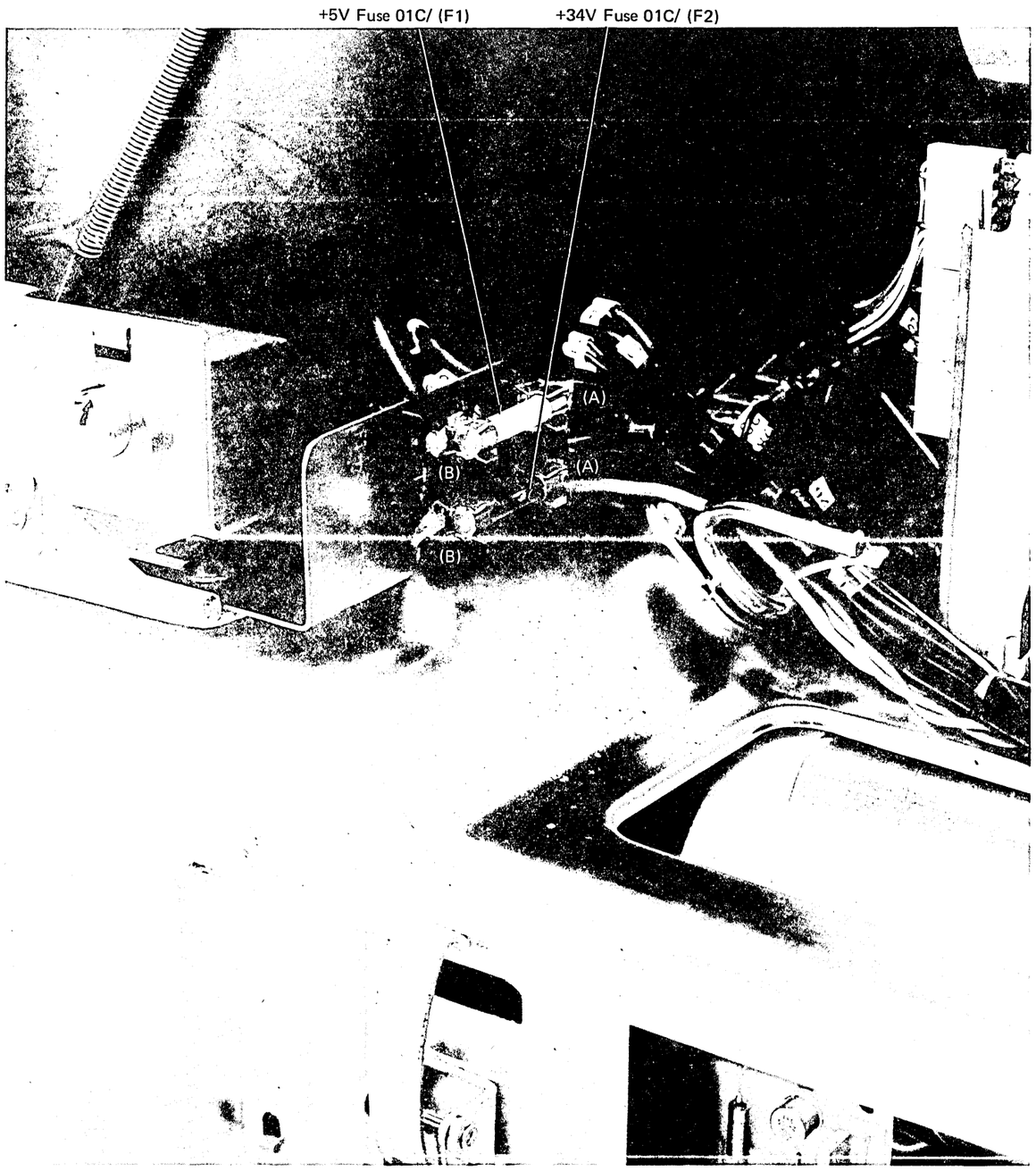


Diagram 4-7.1. Location of +5V and +34V Fuses

NOTE: This view shows the area to the right and behind the keylock, shown in Diagram 4-7.

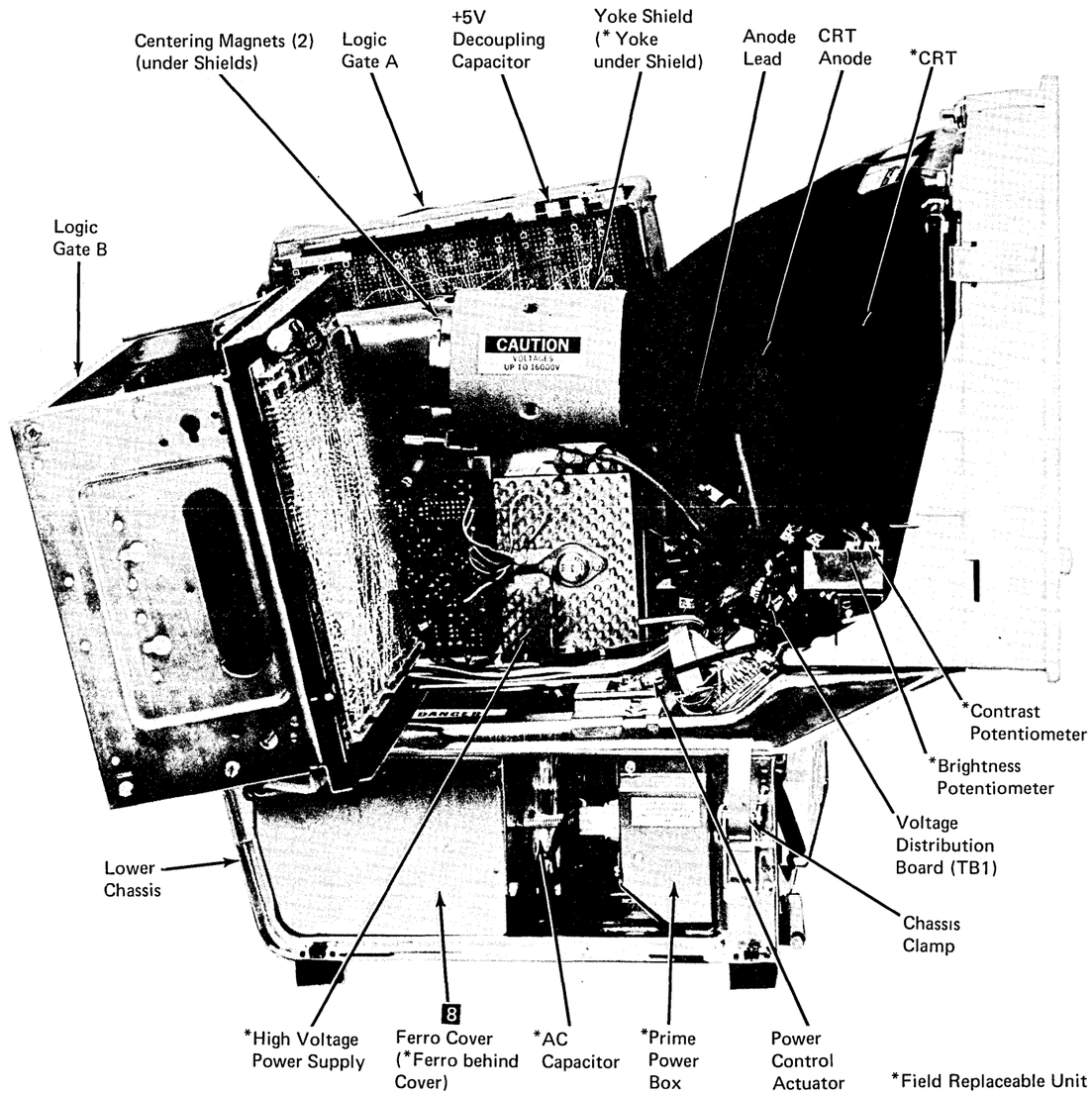


Diagram 4-8. Locations

IBM Assigned ID Code

The IBM ID code consists of four bytes of information. Byte 1 (CODE ID) is fixed. Bytes 2, 3, and 4 (DVC ID) are assigned and wired by IBM during manufacture.

Byte 1 — Fixed (CODE ID)
Byte 2 — Assigned
Byte 3 — Assigned (DVC ID)
Byte 4 — Assigned

The computation to determine the DVC ID bytes of the ID code is as follows:

Step 1 — The serial number of the 3275 = XXXXX.

Step 2 — Divide: $\frac{XXXXX}{50}$ = YYYY. [Use the remainder **C**.]

Step 3 — Divide: $\frac{YYYY}{50}$ = ZZ. [Use the remainder **B** .]

Step 4 — Use the quotient from Step 3 (ZZ) for **A**.

Determine the EBCDIC code bits from Table 1 using the values:

A = Byte 2
B = Byte 3
C = Byte 4

Plug card B-J2 according to Diagram 4-10 (EBCDIC) or Diagram 4-11 (ASCII).

Diagram 4-9. ID Code Generation

Example:

Step 1 — The serial number of the 3275 = 83581.

Step 2 — Divide: $\frac{83581}{50}$ = 1671 [Remainder = 31 = **C**]

Step 3 — Divide: $\frac{1671}{50}$ = 33 [Remainder = 21 = **B**]

Step 4 — Quotient from Step 3 = 33 = **A**

Card B-J2 is jumpered using the values derived from the computation and Table 1 as follows: (See Diagram 4-10 or 4-11 for actual jumpering.)

Symbol	Byte	Computation	Graphic	Bits
A	2	33	$	0101 1011
B	3	21	v	1010 0101
C	4	31	&	0101 0000

Non-IBM Assigned ID Code

The DVC ID portion of the ID code may be changed at the customer's request.

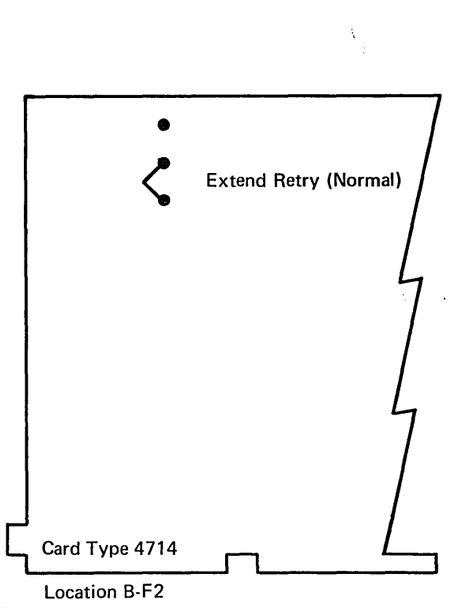
Table 2 has been provided for selection of a non-IBM assigned code. It is recommended that the customer select a three-digit code from this table to be wired on the B-J2 card (Diag 4-10 or 4-11) by the customer engineer.

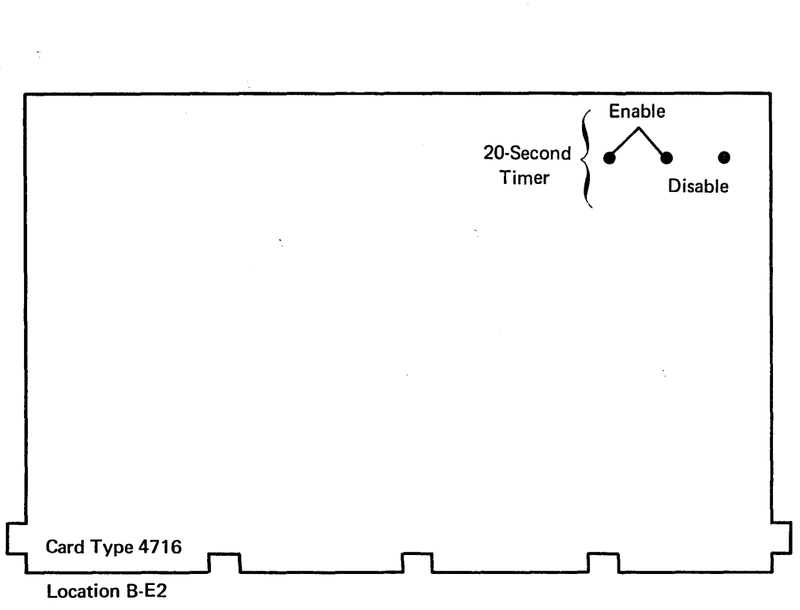
Table 1. IBM Assigned DVC ID Code

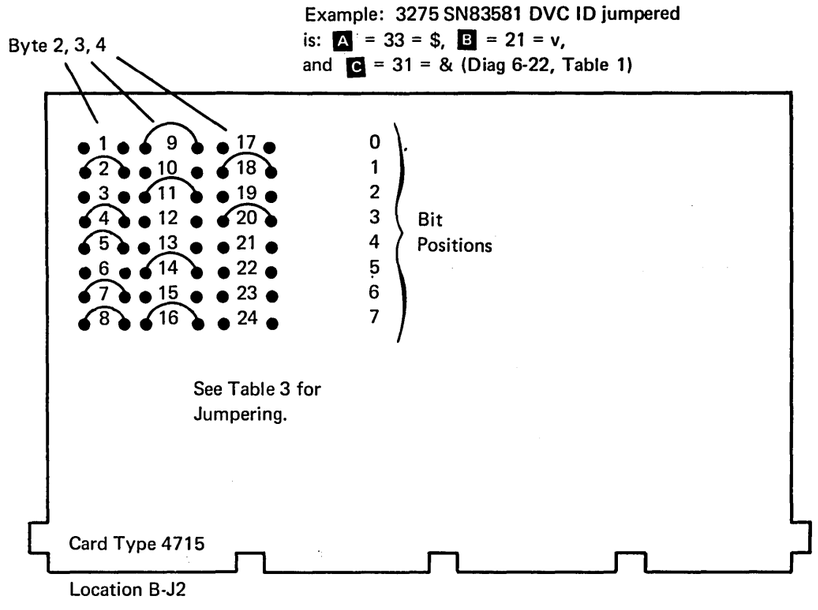
Values of **A** **B** or **C**	EBCDIC Code 0123 4567	EBCDIC Graphic
0	1000 0001	a
1	1000 0010	b
2	1000 0011	c
3	1000 0100	d
4	1000 0101	e
5	1000 0110	f
6	1000 0111	g
7	1000 1000	h
8	1000 1001	i
9	1001 0001	j
10	1001 0010	k
11	1001 0011	l
12	1001 0100	m
13	1001 0101	n
14	1001 0110	o
15	1001 0111	p
16	1001 1000	q
17	1001 1001	r
18	1010 0010	s
19	1010 0011	t
20	1010 0100	u
21	1010 0101	v
22	1010 0110	w
23	1010 0111	x
24	1010 1000	y
25	1010 1001	z
26	0100 1011	.
27	0100 1100	<
28	0100 1101	(
29	0100 1110	+
30	0100 1111	|
31	0101 0000	&
32	0101 1010	!
33	0101 1011	$
34	0101 1100	*
35	0101 1101	)
36	0101 1110	;
37	0101 1111	¬
38	0110 0000	-
39	0110 0001	/
40	0110 1011	,
41	0110 1100	%
42	0110 1101	_
43	0110 1110	>
44	0110 1111	?
45	0111 1011	#
46	0111 1100	@
47	0111 1101	'
48	0111 1110	=
49	0111 1111	"

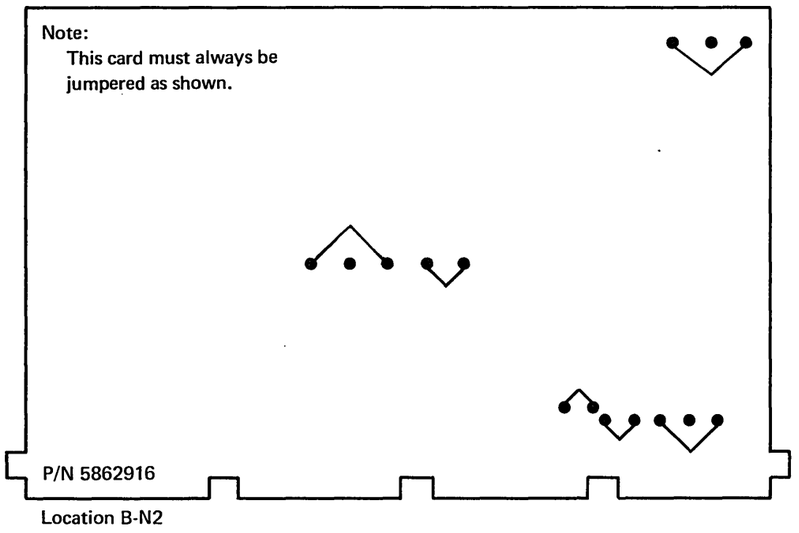
Table 2. Non-IBM Assigned DVC ID Code

EBCDIC Graphic	EBCDIC Code 01234567
A	11000001
B	11000010
C	11000011
D	11000100
E	11000101
F	11000110
G	11000111
H	11001000
I	11001001
J	11010001
K	11010010
L	11010011
M	11010100
N	11010101
O	11010110
P	11010111
Q	11011000
R	11011001
S	11100010
T	11100011
U	11100100
V	11100101
W	11100110
X	11100111
Y	11101000
Z	11101001
0	11110000
1	11110001
2	11110010
3	11110011
4	11110100
5	11110101
6	11110110
7	11110111
8	11111000
9	11111001









CAUTION
Jumper pins can bend or break, or jumpers can be pulled off pins. Exercise care when inserting or removing jumpered cards or cards next to jumpered cards.

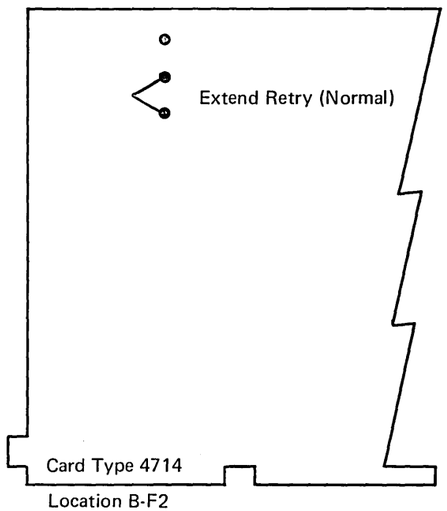
Diagram 4-10. Logic Card Jumpering — EBCDIC

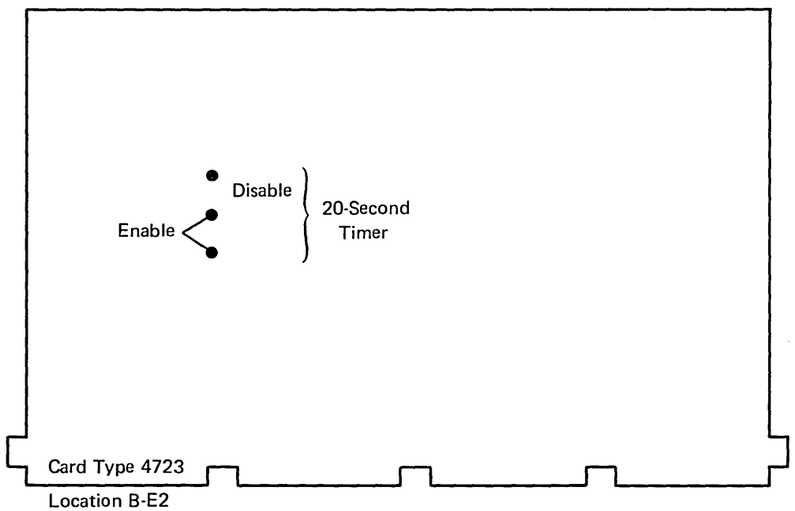
Table 3. DVC ID Jumpering

Card B-J2 DVC ID Bits *

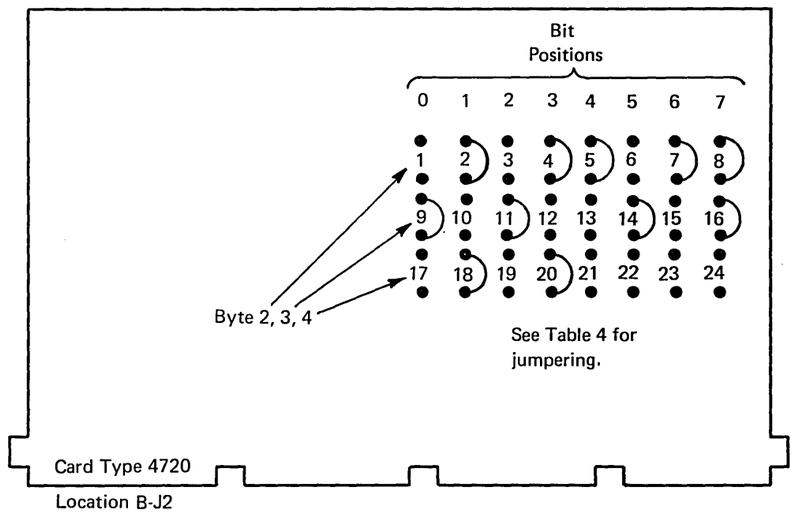
Bit→	0	1	2	3	4	5	6	7
Byte 2	1	2	3	4	5	6	7	8
Byte 3	9	10	11	12	13	14	15	16
Byte 4	17	18	19	20	21	22	23	24

*Jumper to turn on.

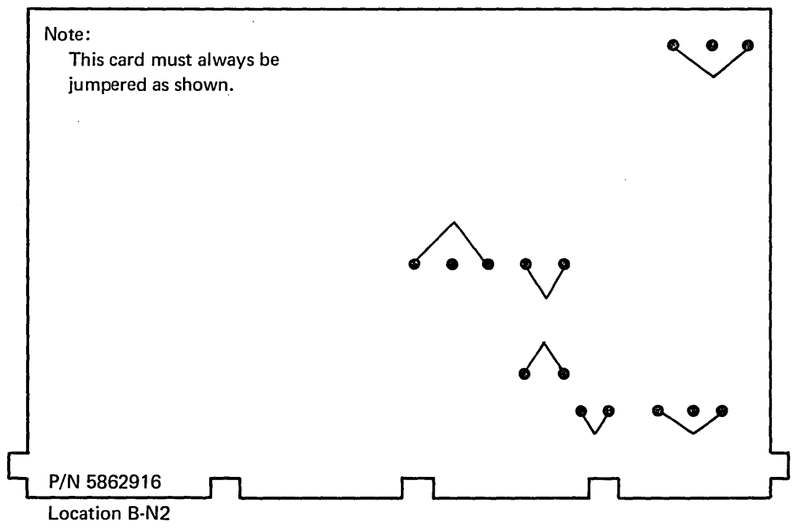




Example: 3275 SN 83581
DVC ID jumpered
is: A = 33 = $, B = 21 = v,
and C = 31 = & (Diag 6-22, Table 1)



Note: ID is jumpered in EBCDIC.



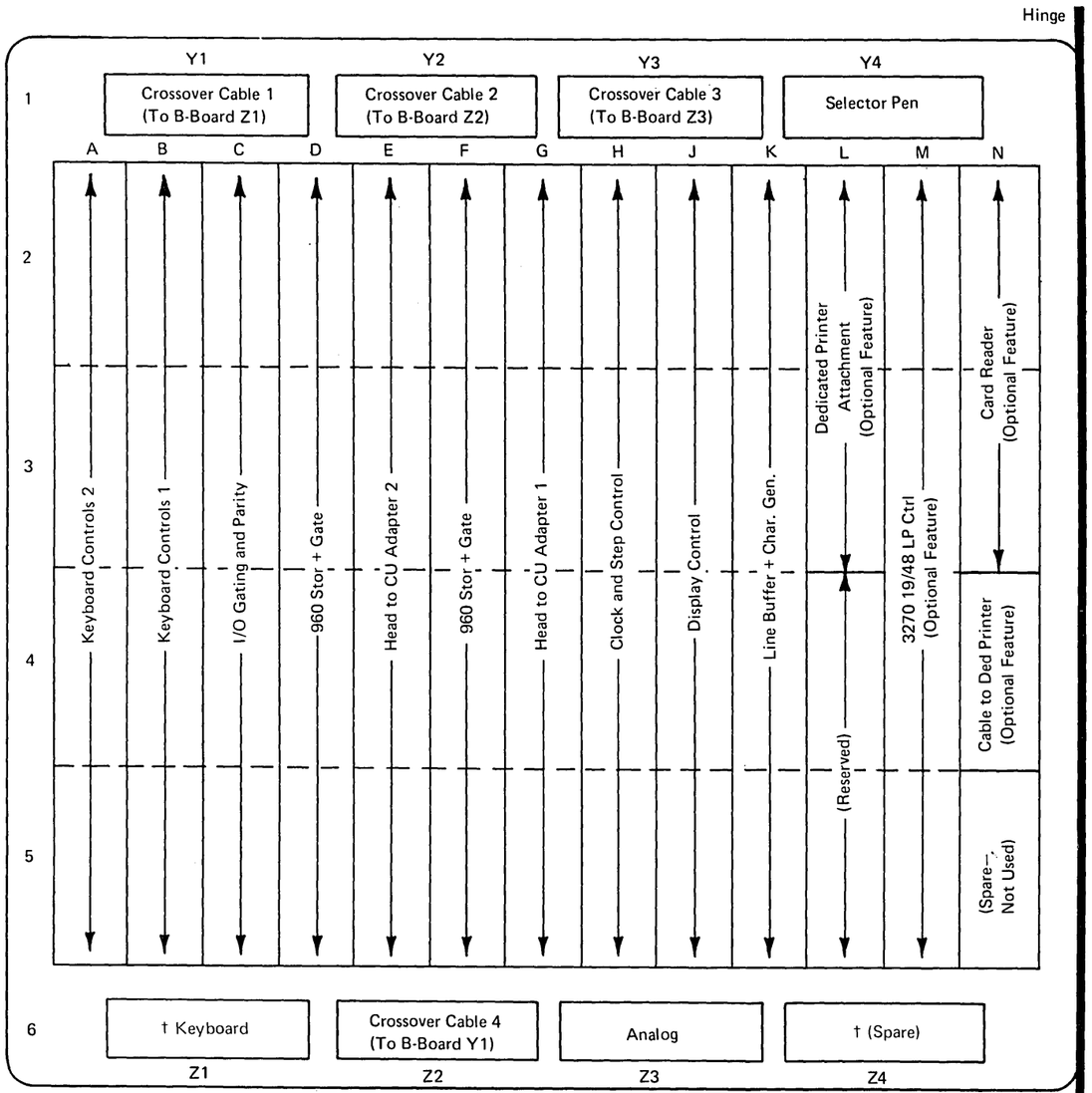
CAUTION:
Jumper pins can bend or break, or jumpers can be pulled off pins. Exercise care when inserting or removing jumpered cards or cards next to jumpered cards.

Table 4. DVC ID Jumpering

Card B-J2	DVC ID Bits*							
Bit →	0	1	2	3	4	5	6	7
Byte 2	1	2	3	4	5	6	7	8
Byte 3	9	10	11	12	13	14	15	16
Byte 4	17	18	19	20	21	22	23	24

*Jumper to turn on.

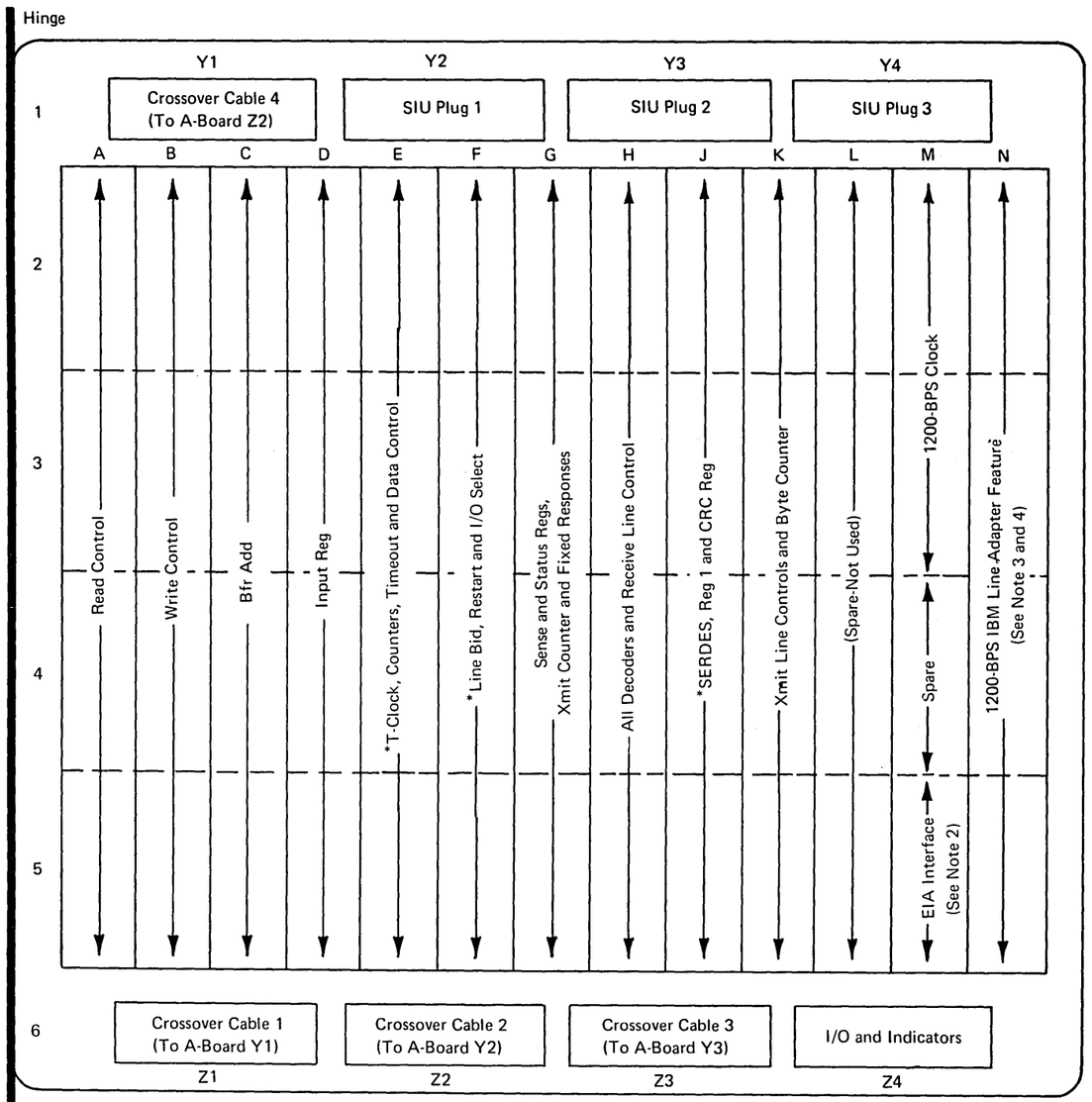
Diagram 4-11. Logic Card Jumpering — ASCII



Model 1 Cards
D2–480 Stor + Gate
F2–Spare (Not Used)
K2–Line Buffer and Char Gen

Legend:
† When a magnetic card reader is attached, the keyboard cable plugs into socket Z4.

Diagram 4-12. A-Gate Card Layout by Function (Card Side)



Notes:
1. ASCII Feature Cards
   *E2 – ASCII T-Clock and Timeout.
   G2 – ASCII Fixed Inputs, Status Reg and Xmit Ct.
   H2 – ASCII Decoder, LRC Reg and LRC SERDES.
   J2 – SERDES and ASCII/EBCDIC Code Converters.
   D2 – ASCII Input Reg.
2. EIA Interface Card only: B-M5 (One card wide)
3. 1200 bps Line Adapter feature without Auto Answer: B-N2 and B-N4 (Two 2 wide cards)
4. 1200 bps Line Adapter feature with Auto Answer: B-N2 (One 4 wide card)

Legend
* = Cards with jumpers

Diagram 4-13. B-Gate Card Layout by Function (Card Side)

LINE ADAPTER REPAIR PROCEDURE

Introduction

Maintenance of the IBM 3275 Display Station that is equipped with the Dial Feature includes repair and adjustment of the line adapter (undercover modem).

The objective of the line adapter maintenance is to return the failing unit to customer service as quickly as possible. This appendix guides the Customer Engineer through procedures that enable him to adjust or replace a malfunctioning component.

Dial Feature

This special feature attaches a 3275 Display Station to a computer system via a common carrier switched telephone network and the IBM 600/1200 bps line adapter or equivalent data set. Permanently attached leased network lines are not required for Dial Feature attachment. Clocking is obtained from the 3275 which must be equipped with the 600/1200 bps transmission speed capability (provided as part of the Dial Feature). EBCDIC or ASCII transmission codes may be used. The BSC point-to-point contention line discipline is employed. The Dial Feature provides a DISCONNECT toggle switch to terminate a call. The 3275 equipped with the Dial Feature may be attached to the telephone network through an external data set or via a data set (called the IBM 600/1200 bps line adapter) mounted within the 3275.

IBM 600/1200 BPS Line Adapter Feature

The IBM 600/1200 bps Line Adapter Feature operates at 600 or 1200 bps.

With dial capability present, the line adapters are attached to the telephone lines by data access arrangements which require coupling devices available from the telephone company.

The IBM 600/1200 bps Line Adapter may be obtained with automatic answering capability.

IBM 600/1200 BPS Line Adapter with Auto Answer Feature

The IBM 600/1200 bps Line Adapter with Auto-Answer feature is applicable to the 3275 using the Dial Feature. The Auto-Answer portion of the line adapter enables the 3275 to automatically answer incoming calls from the central processor without operator assistance. If a call has been answered, and data or control information is not received or transmitted by the 3275 within 20 seconds, the 3275 will automatically disconnect (hang up). This timeout prevents the 3275 from tieing up the line upon receiving an erroneous phone call.

Note: It is advisable that the CE have a DB meter to make the Transmit Level Adjustment.

Installation and Testing

Transmit Level Adjustment

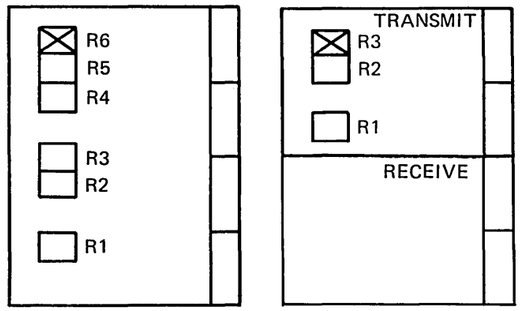
If attachment is by a CDT Data Access Arrangement (switched network) or a CBS Automatic Data Coupler (or equivalents), adjust the transmit level to the value marked on the common-carrier equipment. To set the appropriate transmit level:

1. Turn the 3275 power off.
2. For CDT applications, disconnect the communications line plug (283-B) and insert it in the TRANS/REC jack in the dB meter cover.

   Note: Terminate the line with the 600-ohm terminating plug.

   For CBS coupler applications, disconnect the coupler cable from the 3275 and connect the transmit pair (B02 and D05 on the B-N2 card) to the LINE terminals on the dB meter.
3. Place the 2W-4W TRANS/REC switch in the TRANS position.
4. If the connection is made by plugging the 283-B plug to the dB meter cover, jump the LINE terminals on the cover to the LINE terminals on the meter.
5. Place the BRIDGING, 600, 324 switch in the 600 position if the terminating resistor is connected. If it is not, use the 324 position.
6. Turn the meter POWER switch on, and turn 3275 power on.
7. Unclamp the transmitter by grounding 01BA1N2 B10 (wrap unclamp) and 01BA1N2 J07 (request to send), which causes the modem to transmit a steady mark frequency (carrier on).
8. While reading the dBm scale on the meter, adjust R3 (line adapter without auto answer) or R6 (line adapter with auto answer) to the correct transmit level.

   Note: See diagram below for location of R6 or R3 on N2 card.
9. Return all connections to normal and reconnect to the line.



With Auto Answer Without Auto Answer

TDAT to 3275 Tape Test Substitution Method

Insert 01BA1M5 card, and remove 01BA1N2 card. Connect EIA interface cable from 3275 to TDAT; run tape (SY27-2325 EBCDIC or SY27-2326 ASCII) for normal testing.

*Acoustic Coupler Test (Diagram C-2)**

Remove 01BA1M5 card and insert 01BA1N2 in its place; ensure that the DAA cable is connected between DAA and the 3275 (see Table 1 for cable connection). After the cable is connected, set up TDAT as follows:

a. Tape I/O to transmit.
b. Other switches not applicable.

Using any telephone available, other than the DAA telephone, dial DAA. Place headset on coupler, and place coupler switch in ON position and start tape.

Connection of IBM Cables to Communication Equipment

The customer is responsible for making the connection of IBM external cables, at the signal interchange point, to his or a vendor's communication equipment.

IBM will make such connections if all of the following criteria are met:

1. The customer has requested IBM to make the connections.
2. No safety hazard exists.
3. The design of the connector is of a quick disconnect type only, which implies interchangeability (EIA connector or 404B only).
4. No special training or tools are required.
5. Full and free access is provided by the customer.

The task of connection should be an insignificant workload, secondary to the maintenance and/or installation effort, and should increase availability of the IBM equipment.

+12V DC Check (Line Adapter)

This voltage is derived from the +34V dc supply. If +34V dc is missing, the +12V dc will also be missing. Proceed as follows:

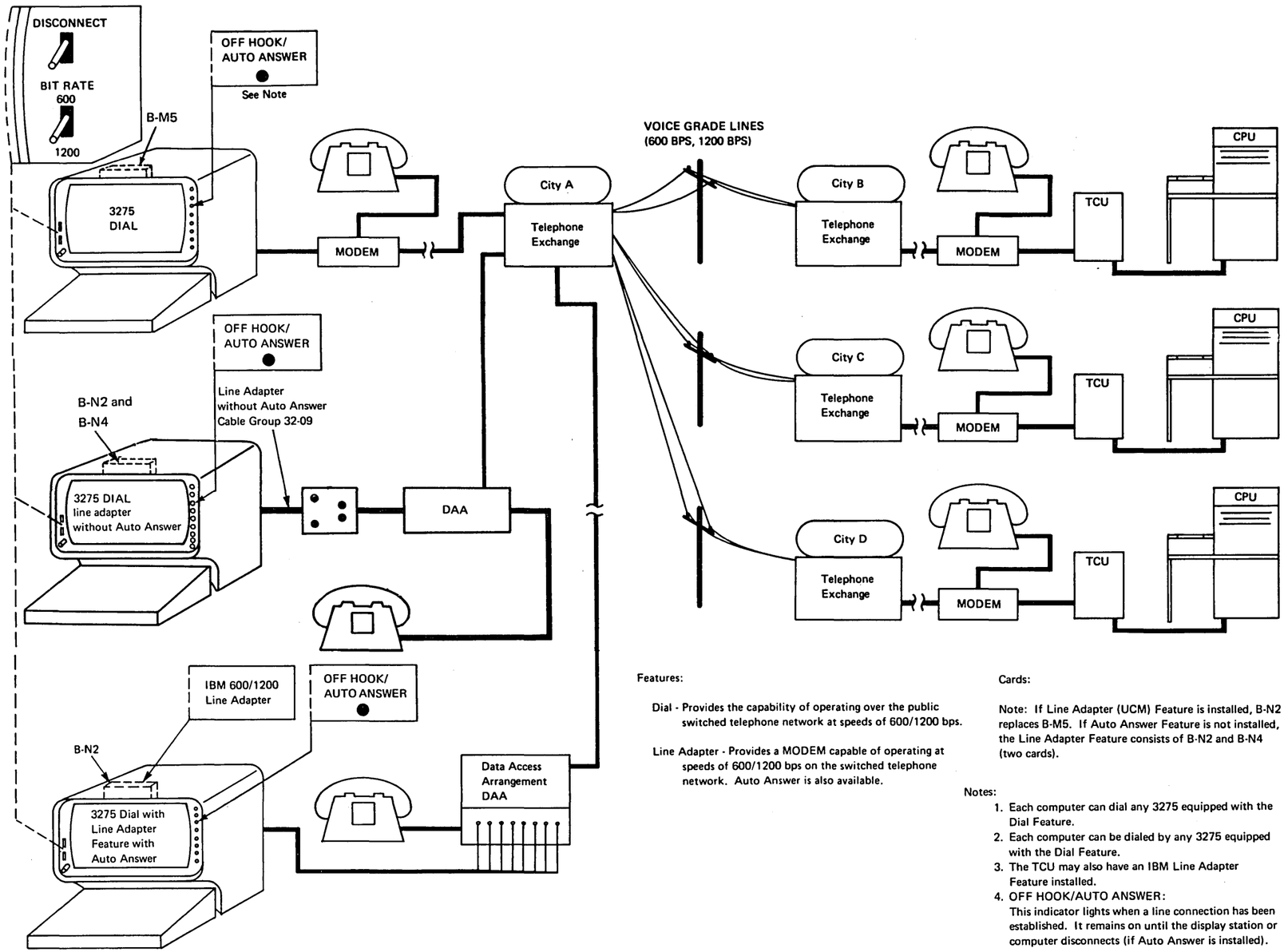
1. Check for +34V dc at the PC board. Use Troubleshooting Procedure 4-390 if +34V dc is not present.
2. Check for +12V dc ±10% on logic pin B-N2 B04. Reference the negative (-) lead to any D08 pin. Observe correct polarity of list leads.
3. Replace +12V regulator card (located at rear of high-voltage power supply) if +12V dc is incorrect and +34V dc is correct. No adjustment is required.

Table 1. Cable Connections

Information on where to attach the 8 terminals is as follows (cable group 32-10):

Wire Number	Color	TB Position	01BA1N2	J4 EIA Conn
1	Red	SH	S12	04
2	Grey	SG		
3	Yellow	DA	S13	06
4	Brown	CCT	M12	20
5	Violet	OH	D02	05
6	Blue	RI	M10	22
7	Black	DT	D05	03
8	White	DR	B02	02

*IBM 3275 Display Station Troubleshooting Guide (Dial Feature), SY27-2329



Features:

Dial - Provides the capability of operating over the public switched telephone network at speeds of 600/1200 bps.

Line Adapter - Provides a MODEM capable of operating at speeds of 600/1200 bps on the switched telephone network. Auto Answer is also available.

Cards:

Note: If Line Adapter (UCM) Feature is installed, B-N2 replaces B-M5. If Auto Answer Feature is not installed, the Line Adapter Feature consists of B-N2 and B-N4 (two cards).

Notes:

1. Each computer can dial any 3275 equipped with the Dial Feature.
2. Each computer can be dialed by any 3275 equipped with the Dial Feature.
3. The TCU may also have an IBM Line Adapter Feature installed.
4. OFF HOOK/AUTO ANSWER:
   This indicator lights when a line connection has been established. It remains on until the display station or computer disconnects (if Auto Answer is installed).

Diagram 4-14. 3275 Dial Feature CPU Attachments

INSTALLATION PROCEDURE – SDLC

This section contains the information necessary to install and check out the 3275 Display Station. As each item is completed, place a check mark in the corresponding box. Installation time of the 3275 is 6.7 hours. Due to the Maintenance approach used for SDLC, this sheet only provides an introduction to installation. Refer to the 3275 Display Station, Models 11 and 12, Leased Line, Trouble-shooting Guide (SY27-2410) for complete installation procedures.

PREREQUISITES

The following items are prerequisites for installing the IBM 3275 Display Station. None of these items is to be done by the installing CE, but he must check that they have been accomplished and he may have to provide information to the personnel involved.

1. The transmission control unit (3705, etc.) attaching the 3275 to the host system must be properly jumpered for the 3275 and for the features installed. The CE at the TCU should refer to the TCU Installation Manual for jumpering information. (The CE at the Remote site must furnish feature data to the host CPU CE.)
2. A data set must be properly installed near the proposed location of the 3275 (40 ft max cable length should be ordered). If the IBM Integrated Modem feature is installed in the 3275, the data set is a part of the 3275.
3. Data sets on both ends of the transmission line must be properly strapped (jumpered) for the 3275 and the features installed. Contact Branch Office Specialist for data set information. On all Modems (except the IBM 3872 and 3875), the jumper that ties signal ground to frame ground should be used. Use the External Modem cable (PN 2564941).
4. A proper three-wire connector (two voltage wires plus a ground) must exist within 8 feet of the proposed location of the 3275.
5. A telephone, connected to an outside line, should be available within easy reach of the proposed location of the 3275.
6. Insure that the 3270 On Line Tests (OLTs) have been inserted into the OLT library at the host CPU site and configured for this 3275 Display Station. (Check features list after receiving 3275 and relay information to host CPU site CE.)
7. Insure that the following CE tools are on site for this installation: IBM 1200 TDAT PN 453679 (IBM Domestic and Canada) or IBM CRAU (PN 1744195), Switch Indicator Unit (SIU) Model 2 PN 1830679 and a Logic Probe PN 453652. These tools *must* be available for installation checkout.

INSTALLATION INSTRUCTIONS

When authorization to install the 3275 is received from the Branch Office, the following instructions must be performed in the sequence listed.

Unpacking

1. Unpack according to instructions shipped with the unit. Inspect shipment for possible damage incurred in transit. Report any damage at once. Keyboard is packaged in top of shipping carton.

DANGER
The 3275 Display Station weighs about 95 pounds without keyboard. Two men *are required* to remove the unit from the shipping carton. Two people should be available to move this unit. If the display station must be moved by one person, separate the upper chassis from the lower chassis and move them individually. The 3275 cannot be separated until it is out of the carton. See steps 1–7 of *paragraph 5.3.2.7 to separate the two chassis.

2. Check off all received items against those listed on the shipping Bill of Materials. Report all shortages at once. The Feature Identification Table (below) is provided as an additional check.

Feature Identification Table

Feature	Identifier
Light Pen	Light pen or card A-M2
Card Reader	Reader or card A-N2
Audible Alarm	See *Diagram 7-1.
Printer	3284 or card A-L2
ASCII Code	Jumper on card B-G2 ROS Modules card B-M2
NRZI Transmission	B-K2 card jumper installed
IBM Integrated Modem	Outrigger B-gate

*Refer to *3275 Display Station, Models 11 and 12, Leased Line, Troubleshooting Guide;* SY27-2410.

Card Jumpering

1. Remove the left side cover (*Diagram 7-1), using instructions in *paragraph 5.3.1.

   Note: Do not perform items 2 and 3 until after running tape tests.

2. Set address switches for correct CU address on card B-K2. Use *Diagram 6-20 for sample CU address setting.
3. Check for correct jumpering of the following cards on *Diagram 6-20:
   B-G2 for ASCII feature
   B-K2 for CU address and NRZI transmission
4. If the IBM Integrated Modem feature is installed, B-A2 (outrigger; refer to *Diagram 7-1, Sh 1, for location) must be checked for correct jumpers and alignment.
   a. Wiring Options (Remove outrigger to check or modify.)

   CAUTION:
   Be very careful when the outrigger is unattached because the yellow cable will not allow complete removal from gate. It will be necessary to remove the outrigger, to wire wrap the following options. Refer to Diagram 4-15 and remove the four nuts, PN 257189 (A) . Wire as required below and then install outrigger.

   Jumpering options:
   For 2-wire operation:
   (1) Jumper B-N2D05 to B-N4G09.
   (2) Jumper B-N2B02 to B-N4J11.

   For 4-wire operation:
   (1) Remove jumpers B-N2D05 to B-N4G09 and B-N2B02 to B-N4J11 (if installed)
   (2) Jumper B-N2B03 to B-N2D05.

   b. Alignment.
   Perform transmit level adjustments (*par. 5.2.4).
5. On completion of jumpering checks:
   a. Check for loose cards and cables.
   b. Insert security key in security keylock if this feature is installed. (See 1 on *Diagram 7-1, Sh 1)

Cable Insertion

1. Remove front cover (*Diagram 7-1), using instructions in paragraph 5.3.1. Check that the OFF-PUSH button is pushed in 2 on *Diagram 7-1, Sheet 1.
2. Connect the following cables, if applicable. Note that cable sockets are identified by function. Socket names are embossed on the chassis, beneath each socket.
   a. Keyboard cable 3 on *Diagram 7-1, Sheet 1.
   b. Card Reader cable 4 on *Diagram 7-1, Sheet 1.
   c. Printer cable 5 on *Diagram 7-1, Sheet 1.
3. Adjust I/O cable retainer to ensure a tight connector fit for the above cables. Connect shield ground leads from above cables under the wing screw beneath the cable sockets (6 on *Diagram 7-1, Sheet 1).

Power Requirements Check

1. Check that the source voltage provided by the customer agrees with display station wiring, using the following information (8 on *Diagram 7-1, Sheet 2):
   a. Domestic USA models use 115V ac (±10%), 60-Hz, single-phase, line voltage. No internal adjustments are required for Domestic (USA) display stations.
   b. World Trade models use 100, 110, 123.5, 220, or 235V ac (±10%), 50-Hz single-phase; or 100V ac (±10%), 60-Hz single-phase line voltage. For 50-Hz models only, check that the ferro connectors on terminal block TB-1 agree with the line voltage provided. If it is necessary to change taps on the ferro, update the voltage decal.
2. Remove seal from power cord plug. Plug female end of cable into 3275 prime power box receptacle (7 on *Diagram 7-1, Sheet 1). Plug male end of cable to the customer's power source.

Checkout Procedure (Flowchart, Diagram 4-16)

1. Plug data set cable or Line Adapter Feature cable into the socket labeled I/O. (See 9 on *Diagram 7-1). Always adjust I/O cable retainer to ensure a tight connector fit. Connect shield ground to common ground, which is the wing screw beneath the cable sockets.
2. If possible, try to utilize the customer data set cable for tape tests. Refer to Diagram 4-16 for checkout.
3. If the checkout procedure ran successfully, turn power off and remove SIU. (If CRAU or TDAT was used, remove it and install the data set cable.) Replace the front cover. Installation is complete.

*Refer to *3275 Display Station, Models 11 and 12, Leased Line, Troubleshooting Guide;* SY27-2410.

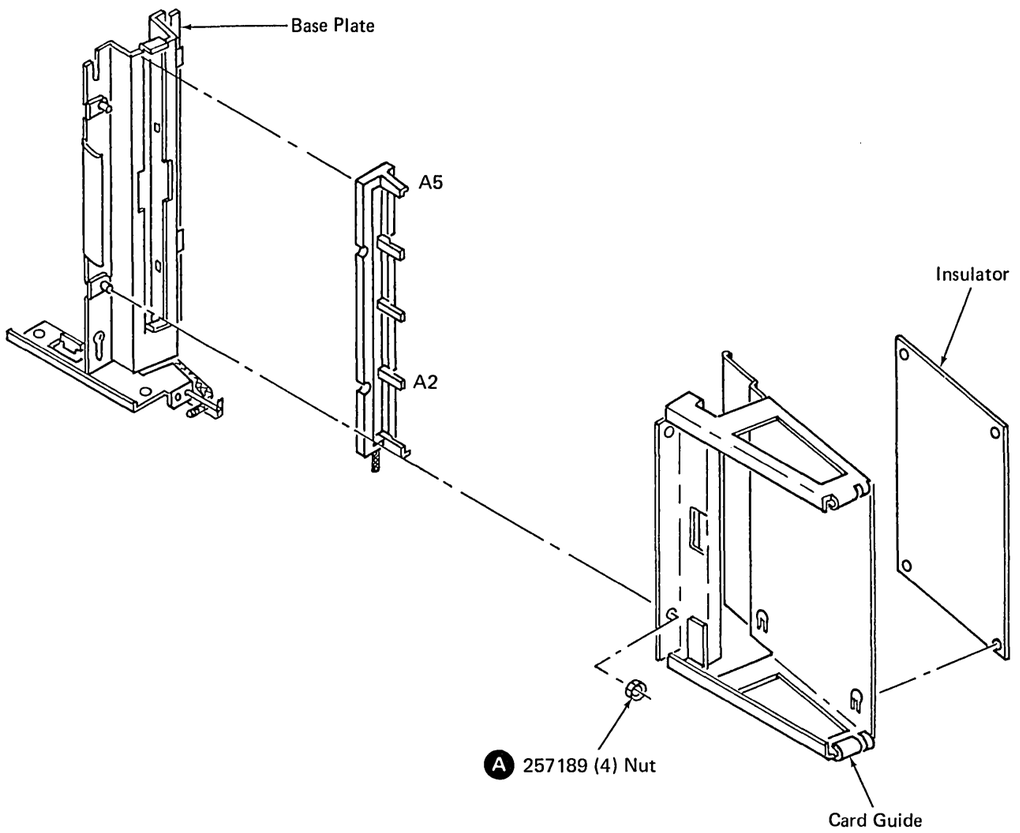
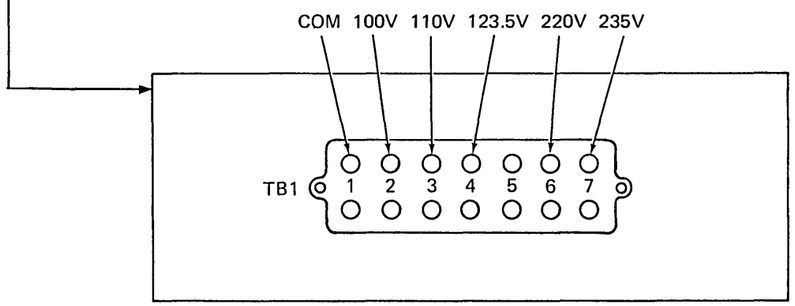


Diagram 4-15. Outrigger Assembly



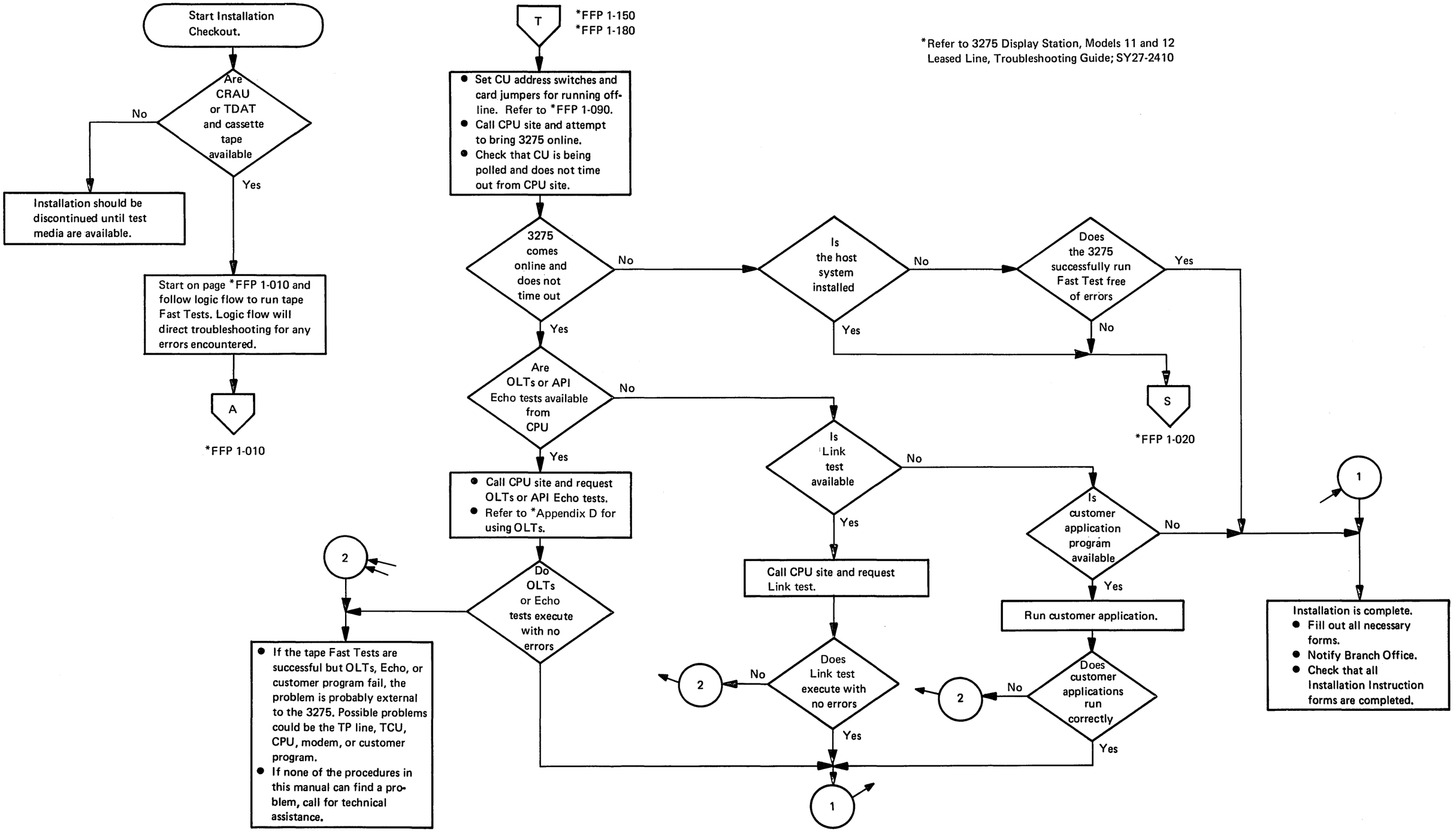
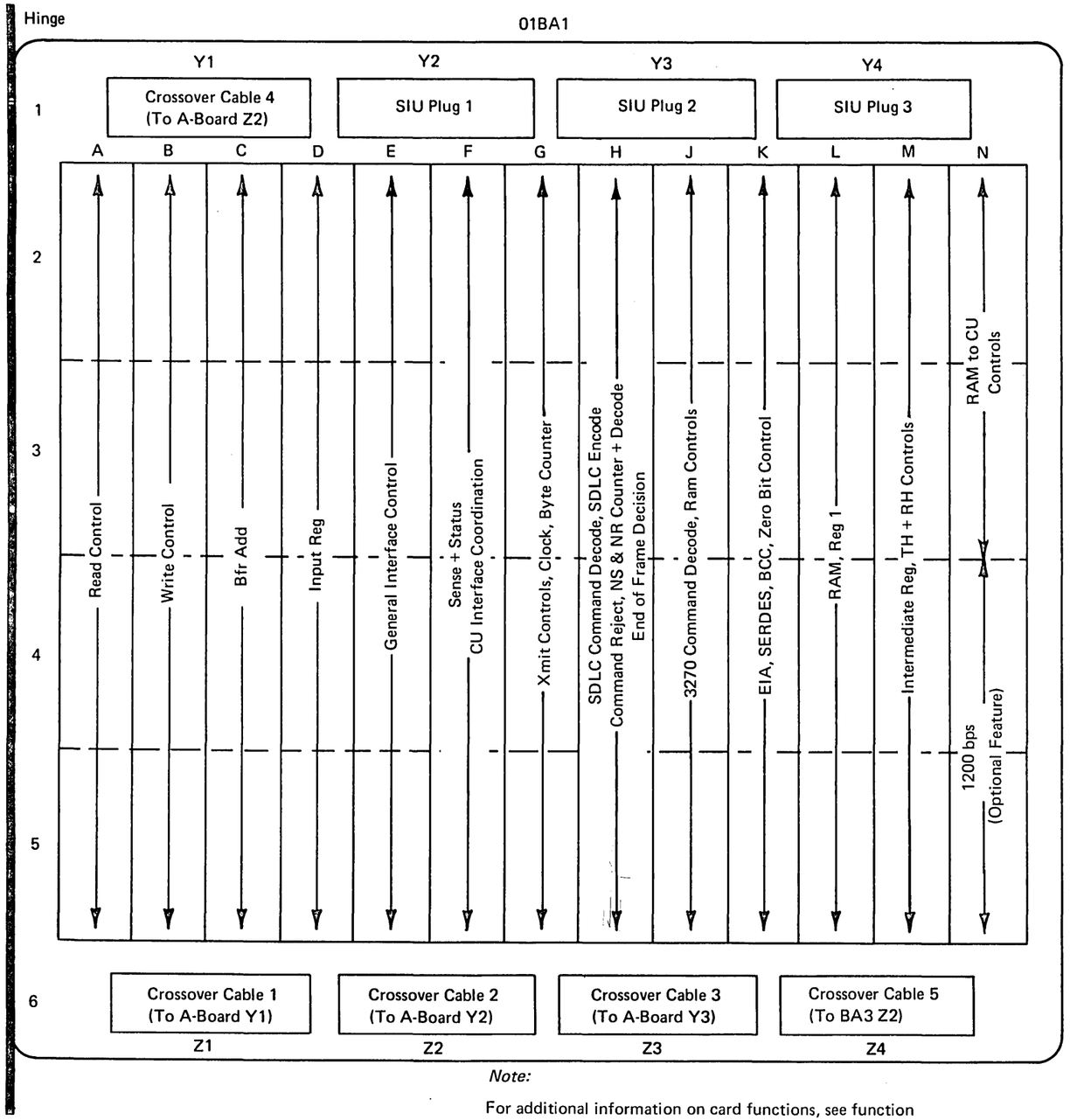
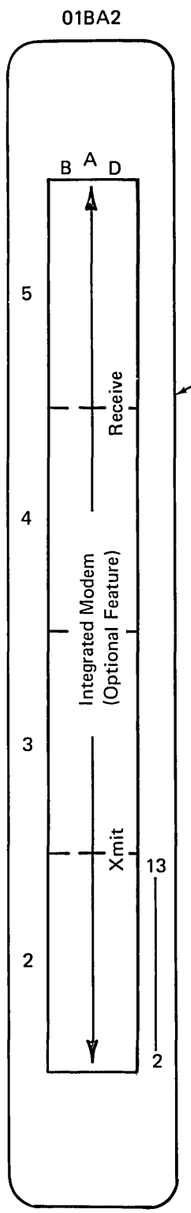


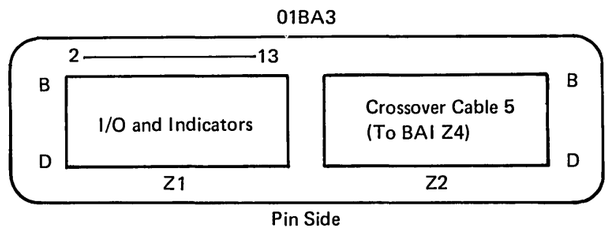
Diagram 4-16. Installation Checkout Flowchart





Connection blocks shown from pin side.

Note: When Integrated Modem feature is not installed, crossover cable 5 is removed and BA1Z4 is used for I/O and indicators.

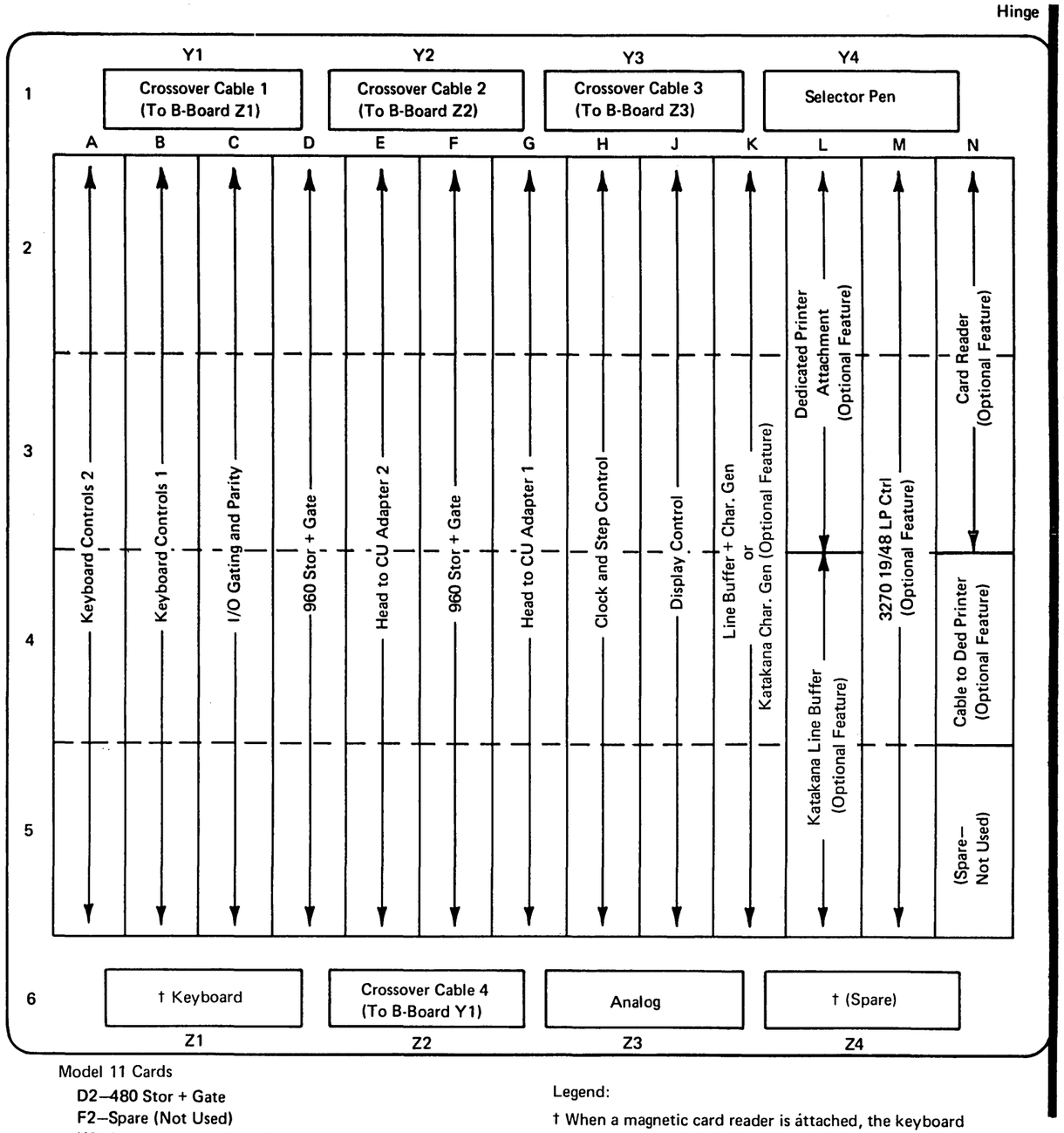


Outrigger B-Gate

Note:

For additional information on card functions, see function Diagram 6-25 in the *3275 Display Station Models 11 and 12, Leased Line, Troubleshooting Guide,* SY27-2410.

Diagram 4-17. B-Gate Card Layout by Function (Card Side)



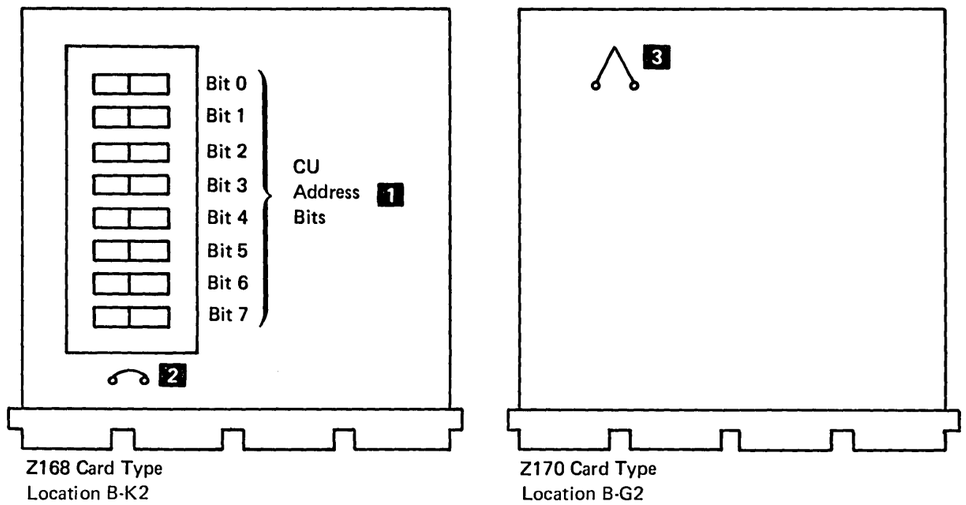
Model 11 Cards

D2—480 Stor + Gate
F2—Spare (Not Used)
K2—Line Buffer and Char Gen

Legend:

† When a magnetic card reader is attached, the keyboard cable plugs into socket Z4.

Diagram 4-18. A-Gate Card Layout by Function (Card Side)



Notes:

1. Two addresses are illegal Hex "00" and "FF"; any other addresses are legal.
2. No jumper required unless NRZI.
3. No jumper required unless ASCII.

Example

- Shows how to set any of the valid CU addresses (254 total).
- Non-valid addresses are:

All zeros	0000 0000
All ones	1111 1111

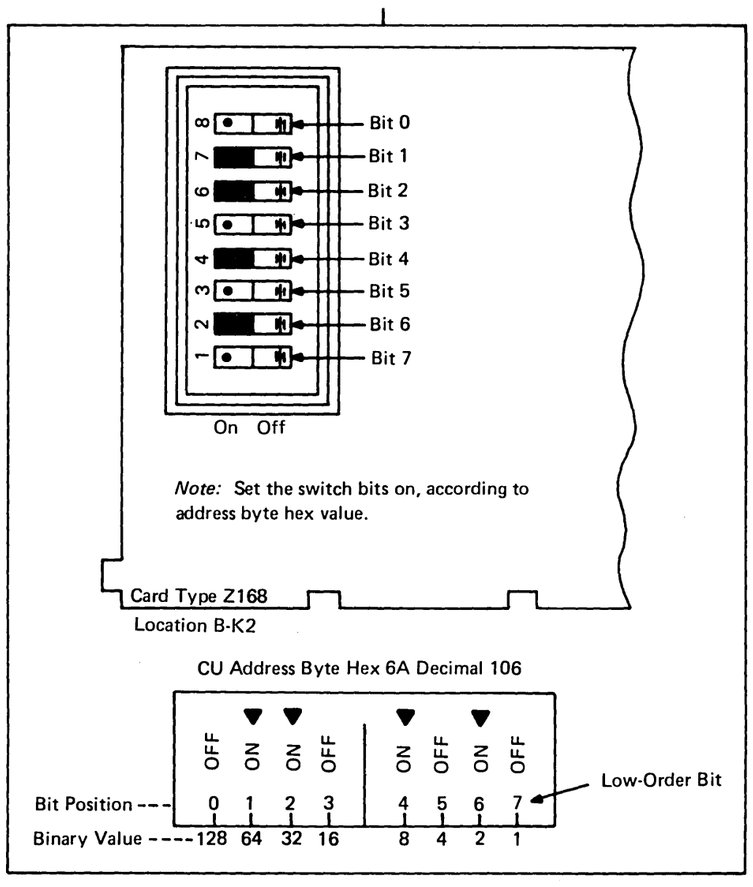
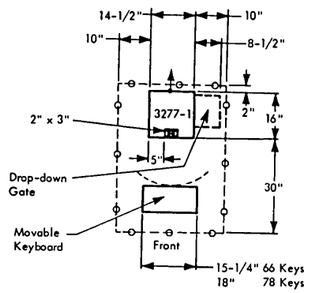


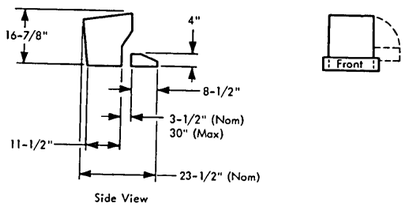
Diagram 4-19. CU Address Switches and Logic Card Jumpering

Section 5. 3277 Display Station, Models 1 and 2, Physical Planning and Installation

3277 DISPLAY STATION MODEL 1

Plan View (Template GX22-7018)





Inches	Centimeters
1	3
2	5
3	8
3-1/2	9
4	10
5	13
6	15
8-1/2	22
10	25
11-1/2	29
14-1/2	37
15-1/4	39
16	41
16-7/8	43
18	46
18-3/4	48
23-1/2	60
30	76

Display Unit Operating Clearances

	Inches	(cm)	
Fronf	0	(0)	Dimensions are minimum requirements for functional operation of the machine. These dimensions allow sufficient airflow to provide convection cooling.
Rear	1	(3)	
Right	3	(8)	
Left	3	(8)	
Top	6	(15)	

Bottom: Unit should be installed in a manner which would guarantee adequate airflow into the underside of the unit to provide convection cooling.

Note: If unit is installed with minimum clearance, service access must be provided.

Specifications

Dimensions:

	F	S	H
Inches	14-1/2	16*	16-7/8
(cm)	(37)	(41*)	(43)

Service Clearances:

	F	R	Rt	L
Inches	30**	2	10	10
(cm)	(76**)	(5)	(25)	(25)

Weight: 60 lb*** (28 kg***)

Heat Output: 525 BTU/hr (140 kcal/hr)

Airflow: Convection only

Power Requirements:

kVA 0.17
Phases 1
Locking:
Plug H or P&S, 4723
Connector H or P&S, 4730
Receptacle H or P&S, 4700 or 4710
Nonlocking:
Plug H or P&S, 5266
Connector H or P&S, 5269
Receptacle H or P&S, 5261 or 5262
Power Cord Length 7-1/2 feet (229 cm)

Branch Circuit Ampacity	*Branch Circuit Voltage*	*Max Cont Load (A)*
15	115	1.5

Environment Operating:

Temperature 50°-110°F (10°-43°C)
Rel Humidity 8%–80%
Max Wet Bulb 85°F (29°C)

Environment Nonoperating:

Temperature 50°-125°F (10°-52°C)
Rel Humidity 8%–80%
Max Wet Bulb 85°F (29°C)

Notes:

The 3277 is installed on a customer-supplied desk or table. Recommended keyboard height (measured at home-row keys) is 28-1/2" (72 cm) from the floor. Lighting level should not exceed 75 footcandles (810 lumens/m²).

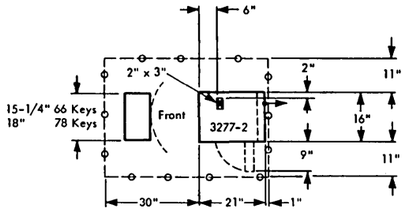
*See also plan view.

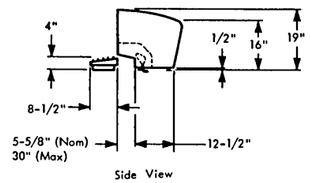
**Keyboard feature adds 8-1/2" (22 cm) to front of display and can be moved up to 30" (76 cm) away from lower front of display.

***Keyboard feature adds about 10 lb (5 kg).

3277 DISPLAY STATION MODEL 2

Plan View (Template GX22-7018)





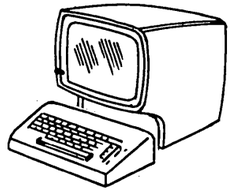
Inches	Centimeters
1/2	1
1	3
2	5
3	8
4	10
5-5/8	14
6	15
8-1/2	22
9	23
11	28
12-1/2	32
15-1/4	39
16	41
18	46
18-3/4	48
19	48
21	53
30	76

Display Unit Operating Clearances

	Inches	(cm)	
Front	0	(0)	Dimensions are minimum requirements for functional operation of the machine. These dimensions allow sufficient airflow to provide convection cooling.
Rear	1	(3)	
Right	3	(8)	
Left	3	(8)	
Top	6	(15)	

Bottom: Unit should be installed in a manner which would guarantee adequate airflow into the underside of the unit to provide convection cooling.

Note: If unit is installed with minimum clearance, service access must be provided.



Specifications

Dimensions:

	F	S	H
Inches	16	21*	19
(cm)	(41)	(53*)	(48)

Service Clearances:

	F	R	Rt	L
Inches	30**	1	11	11
(cm)	(76**)	(3)	(28)	(28)

Weight: 85 lb*** (39 kg***)

Heat Output: 525 BTU/hr (140 kcal/hr)

Airflow: Convection only

Power Requirements:

kVA 0.17
Phases 1
Locking:
Plug H or P&S, 4723
Connector H or P&S, 4730
Receptacle H or P&S, 4700 or 4710
Nonlocking:
Plug H or P&S, 5266
Connector H or P&S, 5269
Receptacle H or P&S, 5261 or 5262
Power Cord Length 7-1/2 feet (229 cm)

Branch Circuit Ampacity	*Branch Circuit Voltage*	*Max Cont Load (A)*
15	115	1.5

Environment Operating:

Temperature 50°-110°F (10°-43°C)
Rel Humidity 8%–80%
Max Wet Bulb 85°F (29°C)

Environment Nonoperating:

Temperature 50°-125°F (10°-52°C)
Rel Humidity 8%–80%
Max Wet Bulb 85°F (29°C)

Notes:

The 3277 is installed on a customer-supplied desk or table. Recommended keyboard height (measured at home-row keys) is 28-1/2" (72 cm) from the floor. Lighting level should not exceed 75 footcandles (810 lumens/m²).

*See also plan view.

**Keyboard feature adds 8-1/2" (22 cm) to the front of display and can be moved up to 30" (76 cm) away from lower front of display.

***Keyboard feature adds approximately 10 lb (5 kg).

3277 DISPLAY STATION INSTALLATION PROCEDURES

General

Carefully inspect the display station for any obvious damage as soon as it arrives on site. Check that all items listed in the bills of material are received. It is extremely important that power-source line voltage is correct and that primary power connections in the display station are correct before power is applied to the unit. A grounded power circuit is required. Do not turn power on until the following checks are performed. The keyboard is packaged in top of shipping carton.

Installation

Check with the customer, and place display station in the location designated by him. If it is necessary to move a display station, observe good safety procedures.

DANGER
The 3277 Model 2 Display Station weighs about 90 pounds. Two men *are required* to remove the unit from the shipping carton. Two men should be used to move this unit. If the display station must be moved by one person, separate the upper chassis from the lower chassis and move them individually. The 3277 Model 2 cannot be separated until it is out of the carton. Using Diagrams 5-4, 5-5, and 5-6, remove the upper chassis by following the procedure listed below.

1. Disconnect LV cable connector (J2) between the two chassis (See 7 on Diagram 5-4).
2. If a card reader is attached, unplug cable from rear of prime power box (See 8 on Diagram 5-6).
3. If a selector-pen is attached, remove cable from clip at lower right rear of frame (See 9 on Diagram 5-5).
4. Release the two clamps at sides of chassis that hold upper chassis to base chassis (See 10 on Diagram 5-5 and 11 on Diagram 5-6).
5. Release spring catches on rear guides, and slide upper chassis slightly to front to disengage the two rear guides (See 12 on Diagram 5-6).
6. Lift upper chassis off base chassis, and place upper chassis on a flat surface.

Line Voltage Check

Domestic (USA) models use 115V ac (±10%), 60-Hz, single-phase line voltage. No internal adjustments are required for domestic display stations.

World Trade models use 100, 110, 123.5, 220, 235V ac, 50-Hz, single-phase, or 100V ac, 60-Hz single-phase line voltage. Check that the connections on the ferro terminal block, TB1, agree with the line voltage provided.

Feature Installation

Connect all features supplied with the display station. Proceed to paragraph if no features are to be attached.

Note: Ensure that power is off for all feature installations.

Keyboard Installation

1. Remove front cover.
2. Plug keyboard cable connector into keyboard jack.
3. Secure cable by attaching Model 1 nylon cable clamp or by hooking Model 2 I/O cable retainer. (Model 2 cable retainer may have to be repositioned to maintain a snug connector fit.)
4. Connect cable ground strap to the chassis.

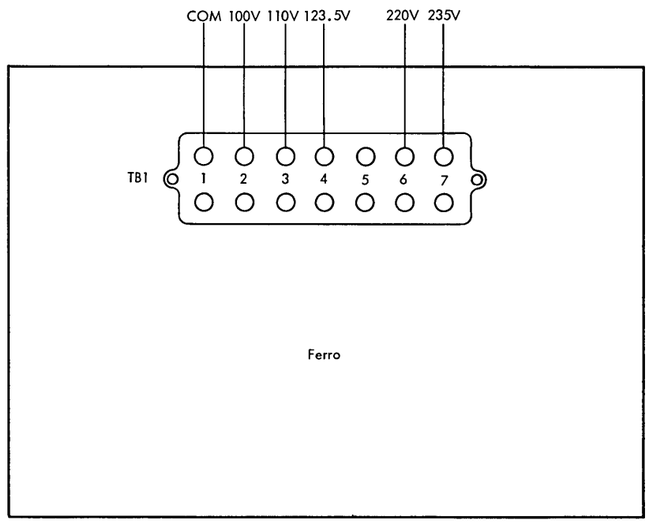
Selector Light-Pen Installation

1. Place pen holder next to display station.
2. Insert pen in pen holder.

Note: Packaged Light Pen may have its tip switch on. This will stop other normal machine operations. Check that the tip switch is off.

Operator Identification Card Reader Installation

1. Remove front cover.
2. Plug reader cable connector into reader jack.
3. Secure cable by attaching nylon cable clamp (Model 1) or by hooking the cable retainer (Model 2).
4. Connect cable ground strap to chassis.



50-Hz Ferro TB-1

Installation Locations

For Model 1 see 1 on Diagram 5-1.
For Model 2 see 2 on Diagram 5-4.

For Model 1 see 3 on Diagram 5-1.
For Model 2 see 4 on Diagram 5-4.

For Model 1 see 5 on Diagram 5-1.
For Model 2 see 6 on Diagram 5-4.

Prepower-On Checks

1. Remove front cover if it was not previously removed to install feature(s).
2. Plug line cord into display station chassis jack. Secure cord by attaching cord clamp (Model 2 only).
3. Open side covers.
4. Reseat all logic cards and cable connections to board.

Power-On Checks

1. Plug line cord into power source.
2. Perform the display station operational test described below. Perform the steps in sequence for most effective results.
   a. Turn power on by pulling out the OFF/PUSH switch. Within 15 seconds, cursor should appear on screen at character location 0. No indicators should be lighted.
   b. Press → (Right) key, and hold it down. Cursor should move through each character location in the row. After reaching last character location, cursor should appear in first character location in second row.
   c. Exercise ↑ (UP), ↓ (Down), ← (New Line), and ← (Left) cursor move keys. Observe that each key performs its operation correctly.
   d. Press several alphameric keys in succession. The corresponding characters should display, and cursor should move one space as each new character appears.
   e. Key in a complete row of characters. When last character of row enters, cursor should appear in first character position of next row.
   f. Press an alphameric key. Character should appear in cursor location, and cursor should advance one space.
   g. Exercise both upper and lower shift of all keys. If the Data Analysis – APL Feature is installed, exercise upper and lower with APL turned off; then upper, lower, and alternate shift, with APL turned on. Observe display screen as each key is pressed, checking for proper operation.
   h. Exercise Typamatic function of each Typamatic key.
   i. Move cursor into last row, and key in several alphameric characters.
   j. Backspace cursor near middle of group of characters just entered.
   k. Press INS MODE key. INSERT MODE indicator should light.
   l. Press Space bar enough times to cause characters at right of cursor to move to end of row and wrap around to first row.

m. Press RESET key. INSERT MODE indicator should go out.
n. Delete several characters using DEL key. Character in cursor position should disappear, and characters in same row at right of cursor should move left one character position each time DEL is pressed.
o. Move cursor to middle of a row of characters.
p. Press ERASE EOF key. Characters from cursor position through last position on screen should erase, and cursor should not move.
q. Press ERASE INPUT key. All characters should erase, and cursor should move to location 0.
r. Enter several alphameric characters as in step f.
s. If display station has the security keylock feature, turn key off. Characters should disappear from screen, INPUT INHIBITED should light, and cursor should remain displayed.
t. Turn security key on. Original data should reappear on screen, and INPUT INHIBITED should go out.
u. Press CLEAR key. All characters should disappear from screen, and cursor should reappear in character location 0, INPUT INHIBITED should light, press RESET key to turn INPUT INHIBITED off.
v. Press Backspace key three times.
w. Press any character key. Audible alarm should sound when key is pressed if installed.
x. If an operator identification card reader is attached, proceed to step aa. Turn power off, and reconnect control unit signal cable if a card reader is not attached.
y. Press CLEAR key, RESET key, then enter several alphameric characters as in step f.
z. Return cursor to location 0 using ← (Left) key.
aa. Read in card reader test card (PN 2143816).
bb. Observe that INPUT INHIBITED indicator comes on, cursor moves 40 spaces, and keyed-in data disappears from screen as card passes through reader.
cc. If cursor does not move 40 spaces, read-in operation was unsuccessful.
dd. Offline tests are completed. Turn power off.

3. Refer to IBM 3277 Display Station Models 1 and 2 Troubleshooting Guide, SY27-2314, Section 3 (Symptom Index) if a malfunction occurs during power-on check procedure.
4. Refer to paragraph 5.2 of Section 5 in the IBM 3277 Display Station Models 1 and 2 Troubleshooting Guide, SY27-2314, if any adjustments are required during power-on check.
5. Connect control unit signal cable.
6. Replace all covers previously removed except front cover.

Hexadecimal Address Label

1. On front cover, locate a point 3 inches up from bottom edge and 1/2 inch in from left edge.
2. Attach label to cover, parallel to bottom edge, with lower-left corner of label on the point located in step 1.
3. Replace front cover.

Photographs and drawings are provided in this section to aid in locating field-replaceable units, adjustable components, and voltage measurement points.

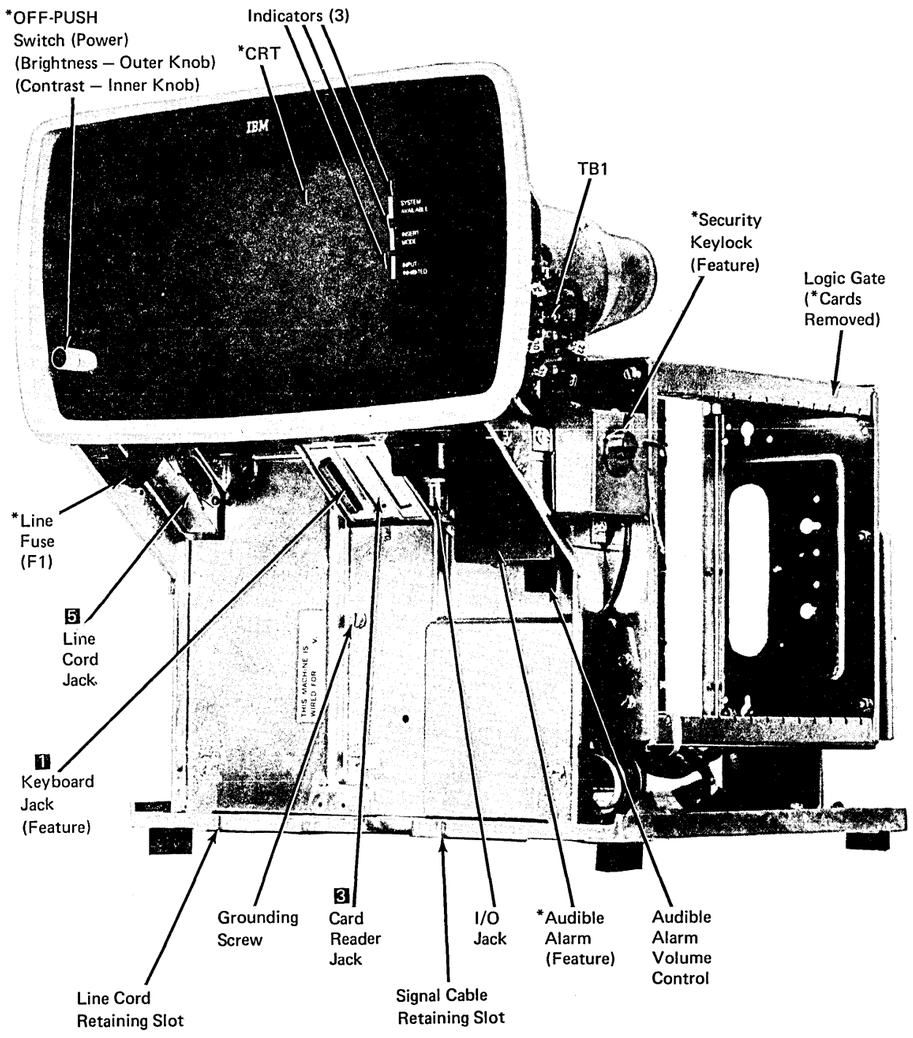


Diagram 5-1. Model 1 Locations, Front View

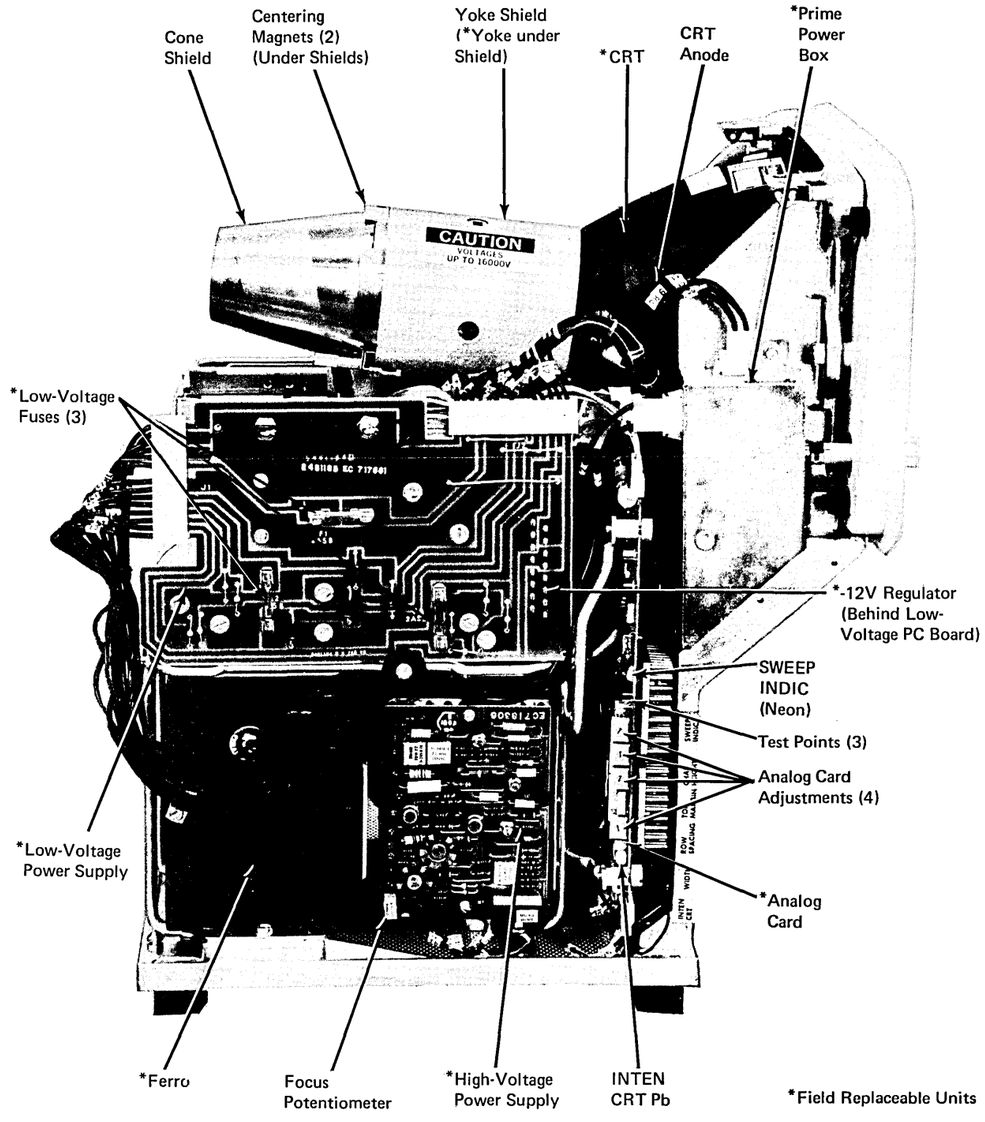


Diagram 5-2. Model 1 Locations, Left-Side View

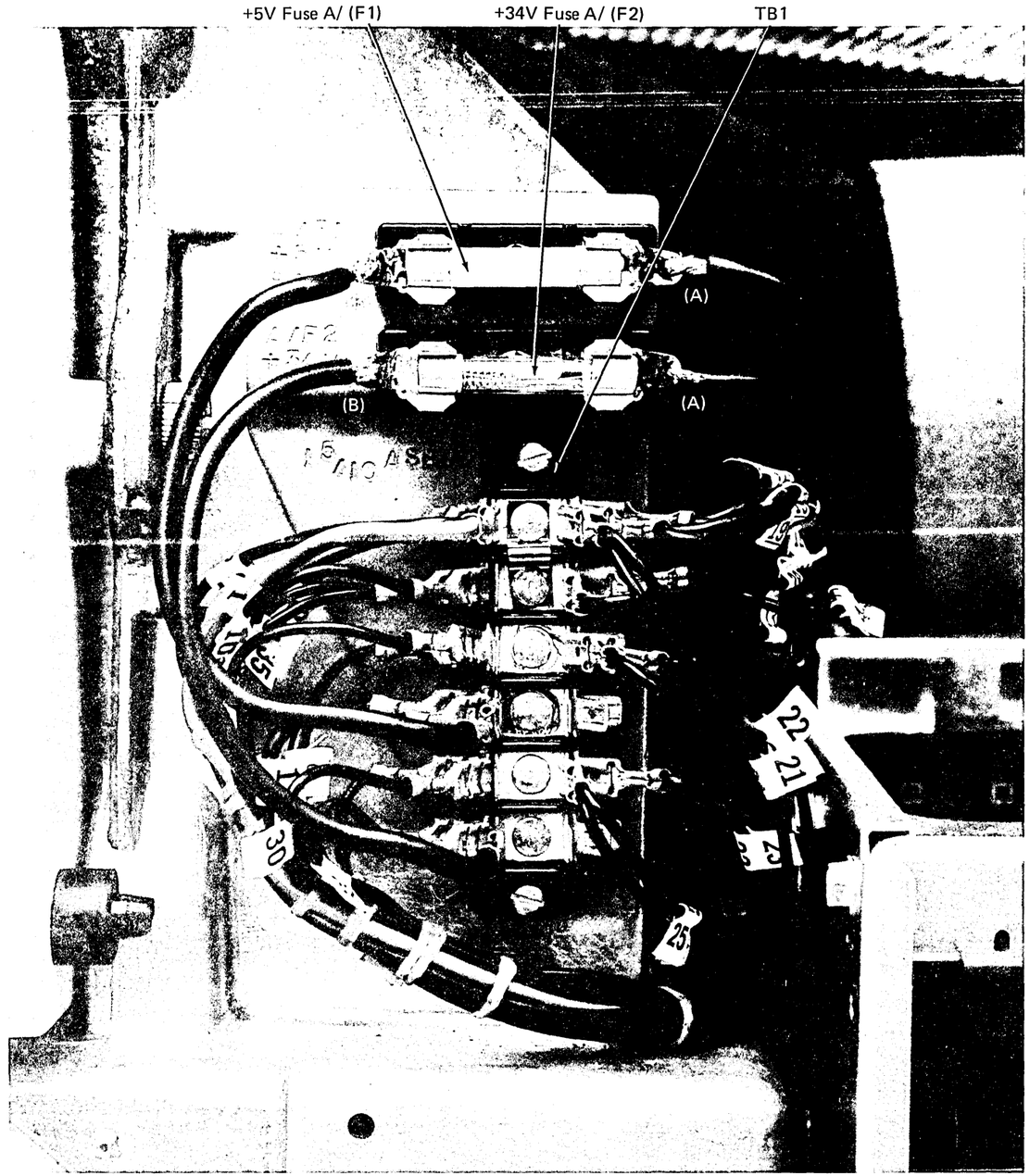
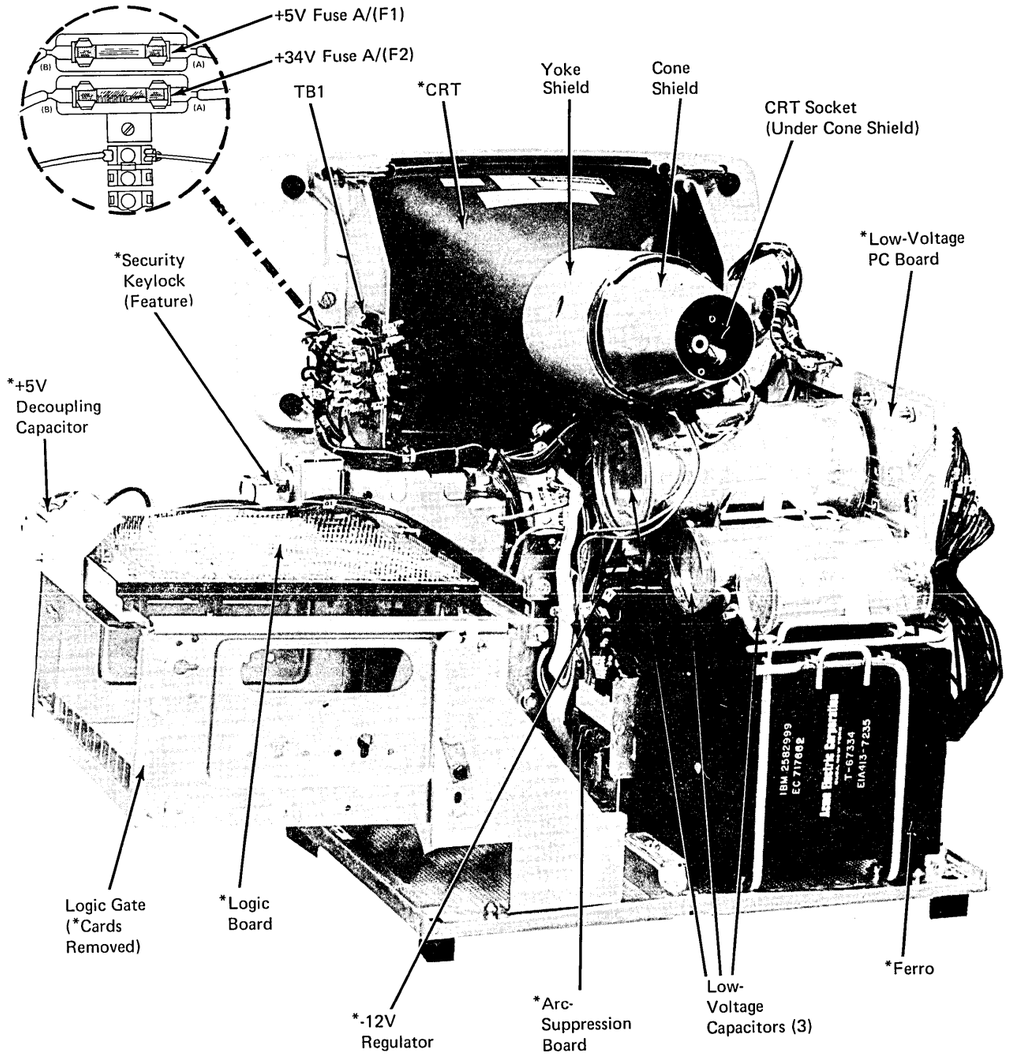


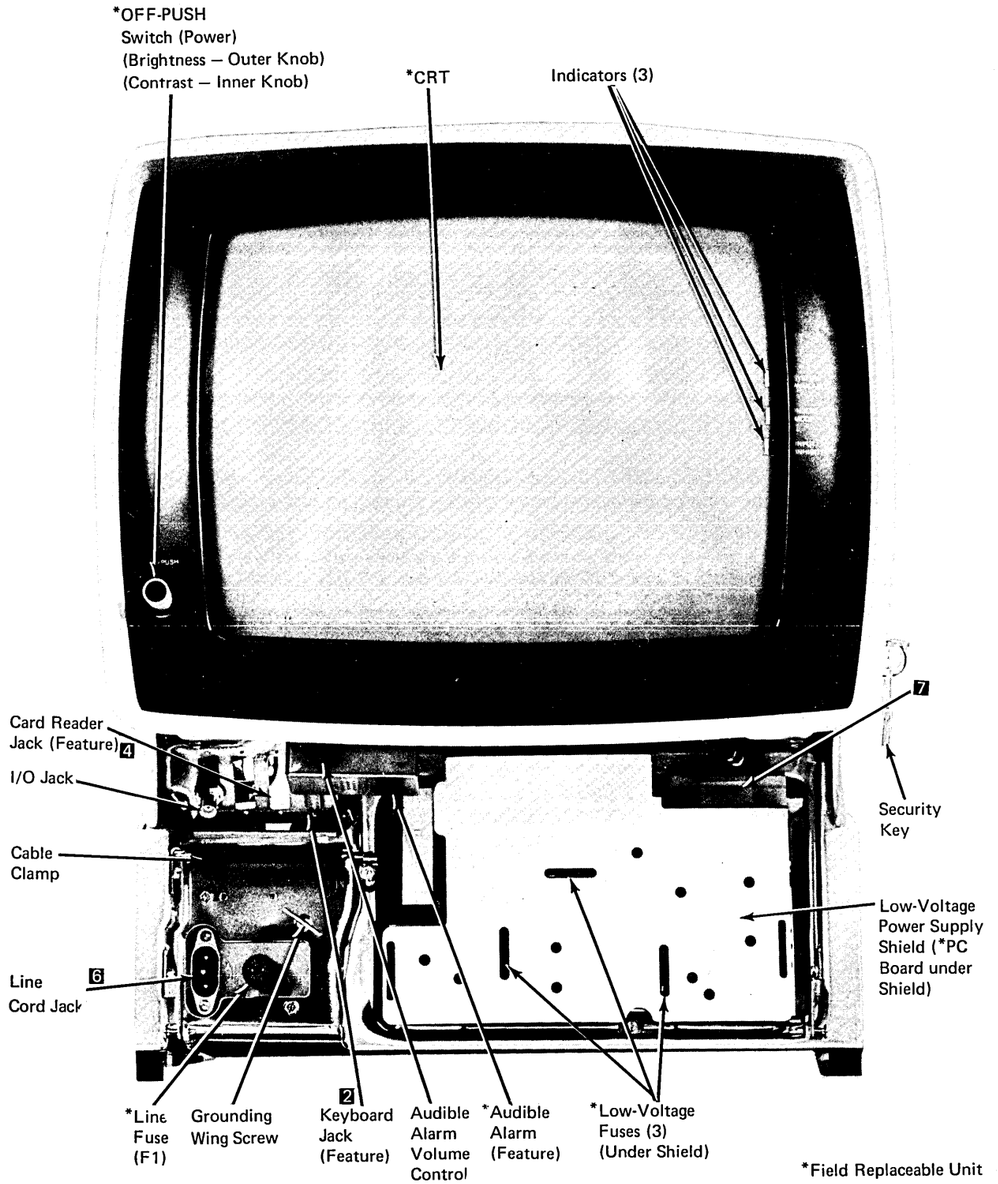
Diagram 5-2.1. Location of +5V and +34V Fuses (Model 1)

3277 Display Station Installation (Sheet 5 of 7)



*Field Replaceable Units

Diagram 5-3. Model 1 Locations, Rear View



*Field Replaceable Unit

Diagram 5-4. Model 2 Locations, Front View

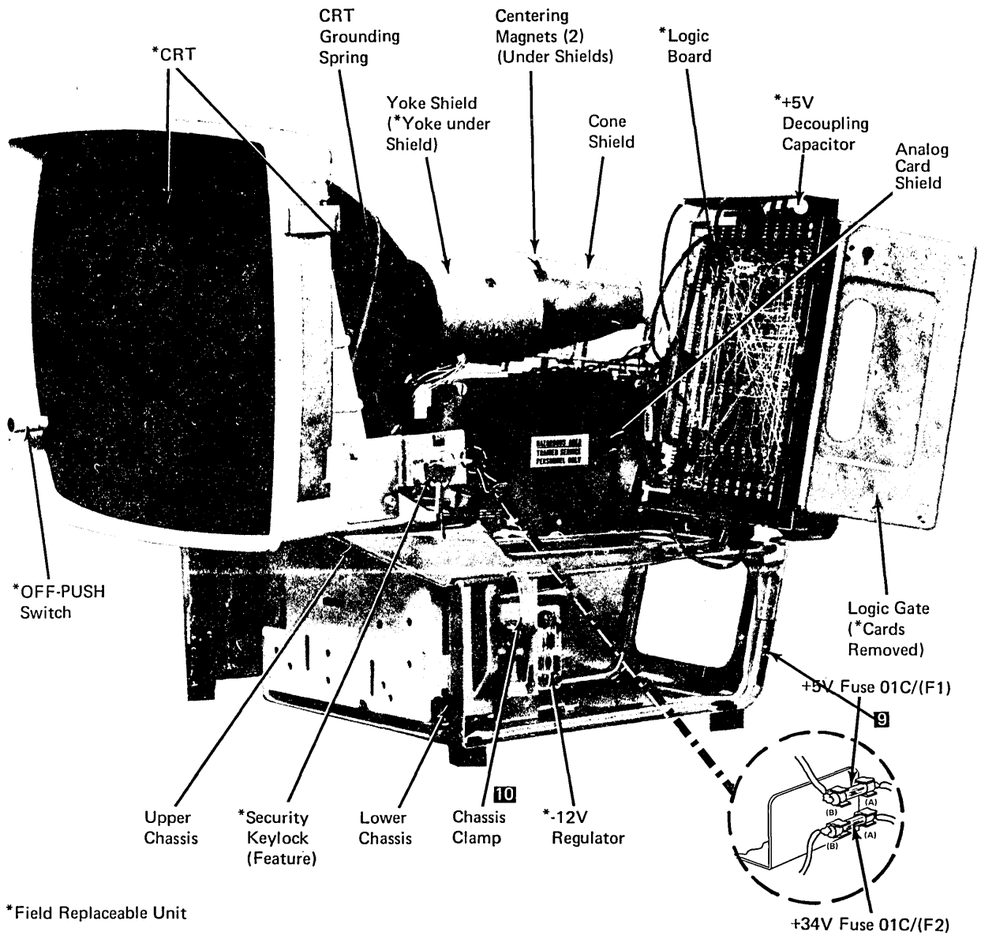


Diagram 5-5. Model 2 Locations, Right-Side View

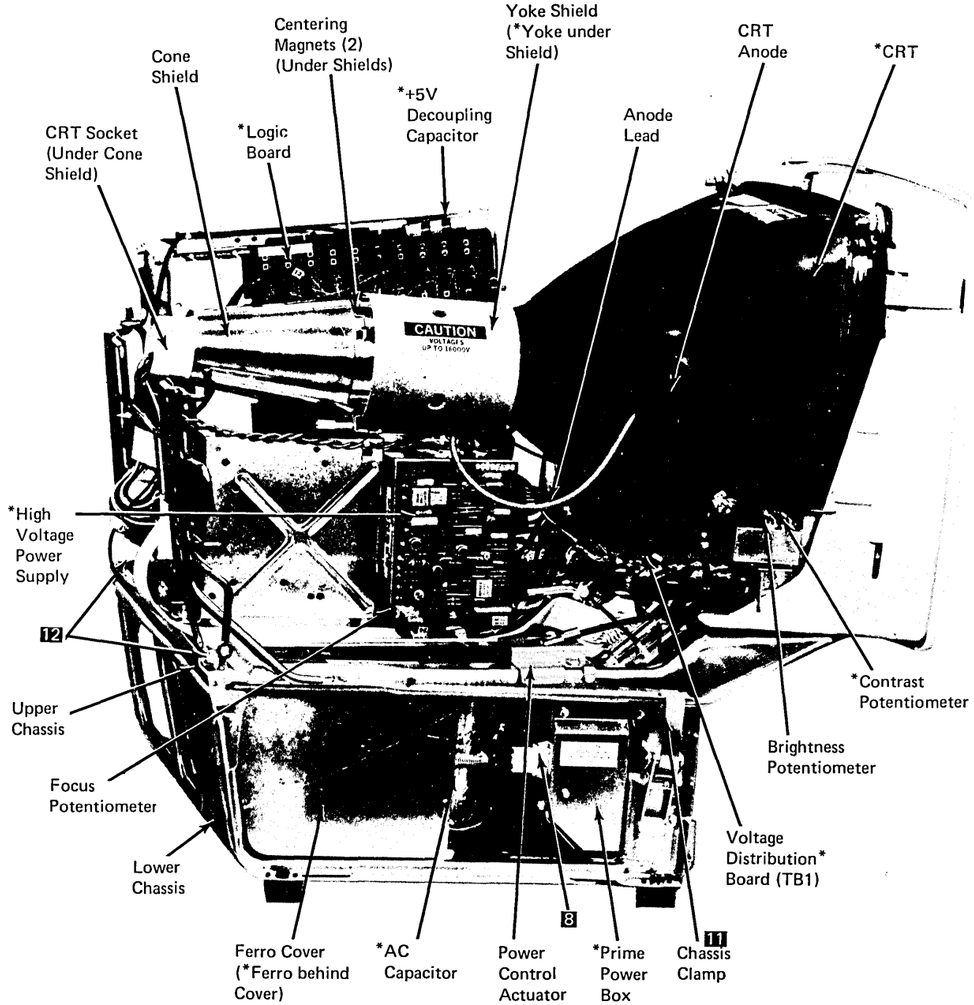


Diagram 5-6. Model 2 Locations, Left-Side View

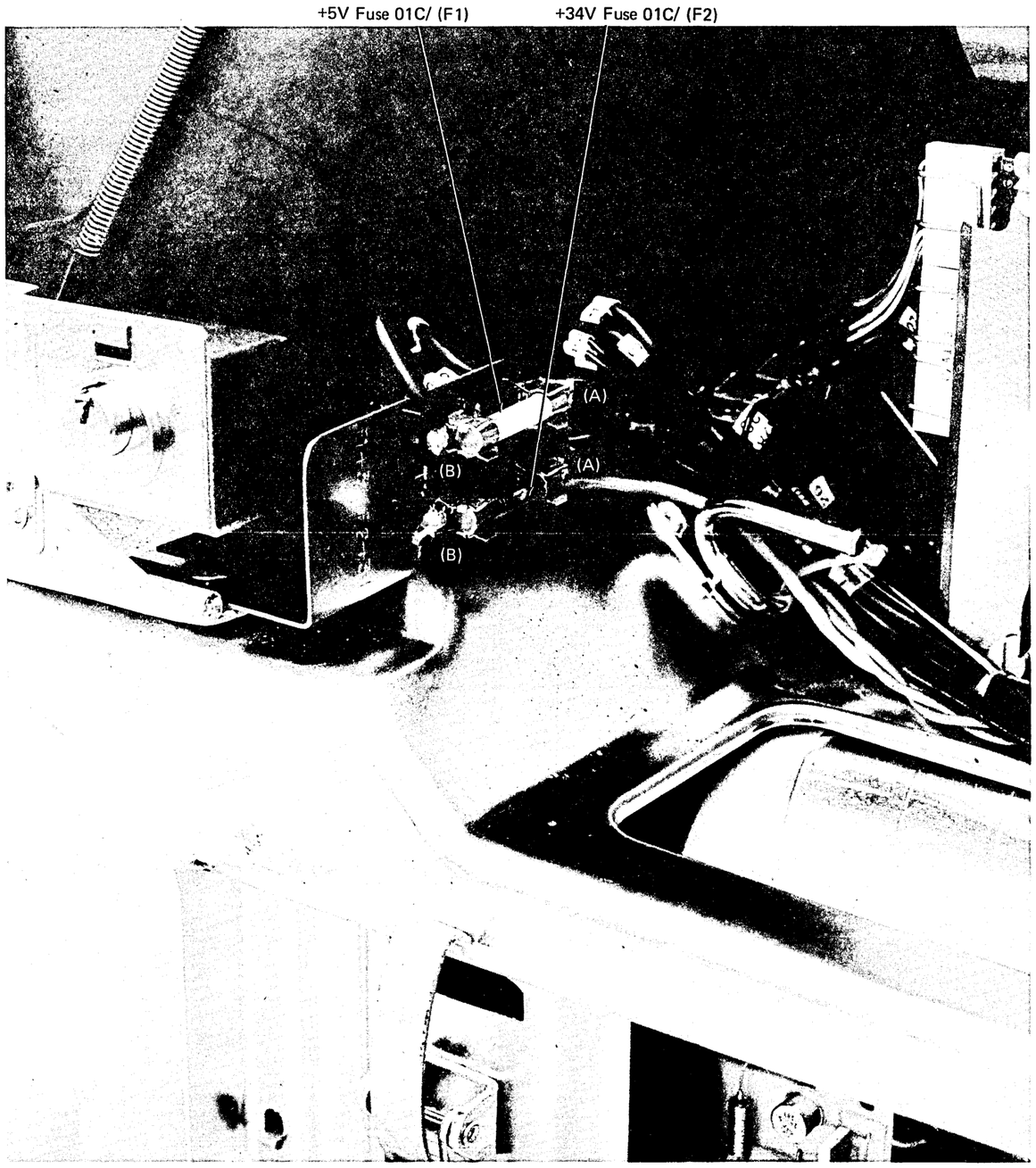


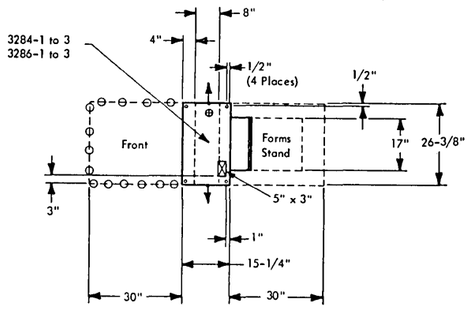
Diagram 5-7. Location of +5V and +34V Fuses (Model 2)

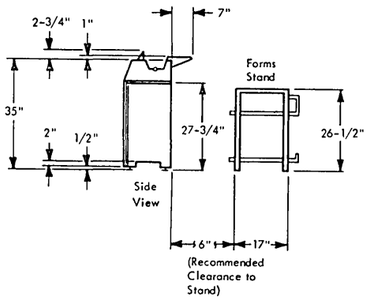
NOTE: This view shows the area to the right and behind the keylock, shown in Diagram 5-5.

Section 6. 3284/3286 Printer, Models 1, 2, and 3, Physical Planning and Installation

3284 PRINTER MODELS 1, 2, AND 3
3286 PRINTER MODELS 1, 2, AND 3

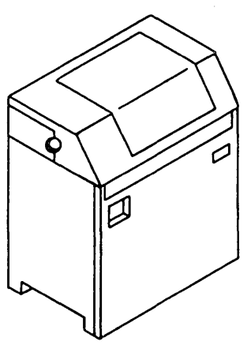
Plan View (Template GX22-7018)





Inches	Centimeters
1/2	1
1	3
2	5
2-3/4	7
3	8
4	10
5	13
6	15
7	18

Inches	Centimeters
8	20
15-1/4	39
17	43
26-3/8	67
26-1/2	67
27-3/4	70
30	76
35	89



Specifications

Dimensions:

	F	S	H
Inches	26-3/8	15-1/4	37-3/4
(cm)	(67)	(39)	(96)

Service Clearances:

	F	R	Rt	L
Inches	30	30*	0	0
(cm)	(76)	(76*)	(0)	(0)

Weight: 135 lb (62 kg)

Heat Output: 770 BTU/hr (200 kcal/hr)

Airflow: Convection only

Power Requirements:

kVA	0.26
Phases	1
Locking:	
Plug	H or P&S, 4723
Connector	H or P&S, 4730
Receptacle	H or P&S, 4700 or 4710
Nonlocking:	
Plug	H or P&S, 5266
Connector	H or P&S, 5269
Receptacle	H or P&S, 5261 or 5262
Power Cord Length	9 feet (274 cm)

Branch Circuit Ampacity	*Branch Circuit Voltage*	*Max Cont Load (A)*
15	115	2.2

Environment Operating:

Temperature	50°-110°F (10°-43°C)
Rel Humidity	8%–80%
Max Wet Bulb	85°F (29°C)

Environment Nonoperating:

Temperature	50°-125°F (10°-52°C)
Rel Humidity	8%–80%
Max Wet Bulb	85°F (29°C)

Notes:

*A 6-inch (15-cm) clearance is recommended to forms stand (SF #4450), if used.

3284/3286 PRINTERS MODELS 1 AND 2 INSTALLATION PROCEDURES

Preliminary Procedures

1. Ensure that all shipping material, including the four (4) shipping bolts, is removed as per shipping instructions.
2. Reseat all logic cards and cable connectors to the logic board, and check for proper placement of jumper on G2 and H2 cards (see Sheets 2 and 3).
3. Install the ribbon cassette as per threading diagram mounted on the inside right corner of internal safety cover.
4. Check that the four printer-to-base cables are tightly connected.
5. Remove the top printer cover.
6. *Manually move the print-head back and forth while listening for the sound of the transducers rubbing on the emitter wheel. If a rubbing noise is heard, refer to the transducer adjustment procedure (Section 6, par. 6.5.2).**
7. Check that the CE motor switch, located in right rear of printer, is turned on.
8. Thread paper forms through paper guide sufficiently to actuate the forms interlock switch.
9. Check that the source voltage provided by the customer agrees with printer wiring.
   a. Domestic (USA) models: 115V ac (±10%), 60-Hz, single-phase line voltage is used. No internal adjustments are required for domestic (USA) printers.
   b. World Trade models: 100, 110, 123.5, 200, 220, 235V ac (±10%), 50-Hz, single-phase; or 100V ac (±10%), 60-Hz, single-phase line voltage is used. For 50-Hz models only, check that the connections on ferro terminal block TB1 agree with the line voltage provided. If it is necessary to change taps on the ferro, update the voltage decal.
10. Plug in the ac power cord to convenience outlet.
11. Turn on the main power switch, located at left-front of printer, and check that the printer performs a power-on-reset (POR) operation. Refer to Section 4 (4.2.1).*

Print Right Transducer Check

1. Following the POR operation, check that the point of the transducer labeled "print right" is positioned exactly opposite the center scribe line on the transducer emitter wheel. If it is correctly positioned, perform the steps in next paragraph. If it is *not* positioned correctly, refer to Section 6 (6.5.3)* for the proper adjustment procedure.
2. Jumper slowdown switch to ground (point A1G2-B06 to A1G2D08).

Forward Transducer Check

The forward transducer is checked by scoping point A1B2-J12.

1. Turn the main power switch on and off to effect a POR operation. Repeat this step in order to observe pulse width.
2. The correct pulse width for the 3284 Printer is 2.0 ms ± 80 usec.
3. The correct pulse width for the 3286 Printer is 1.2 ms ± 50 usec.

Note: The proper pulse width diagram relating to steps 2 and 3 above is on Diagram 6-1.

Reverse Transducer Check

The reverse transducer is checked by scoping point A1B2-D12.

1. Turn the main power switch on and off to effect a POR operation. Repeat this step in order to observe pulse width.
2. The correct pulse width for the 3284 Printer is 2.0 ms ± 80 usec.
3. The correct pulse width for the 3286 Printer is 1.2 ms ± 50 usec.

Notes:

(1) The proper pulse width diagram relating to steps 2 and 3 above is on Diagram 6-1.

(2) If either pulse widths obtained is wrong, the printer will operate at the wrong speed as determined by the incorrect pulse.

(3) After the transducer check procedure is completed, be sure to remove the slowdown switch jumper. If the jumper is not removed, the printer will never perform a highspeed carriage return.

Offline Check Procedure

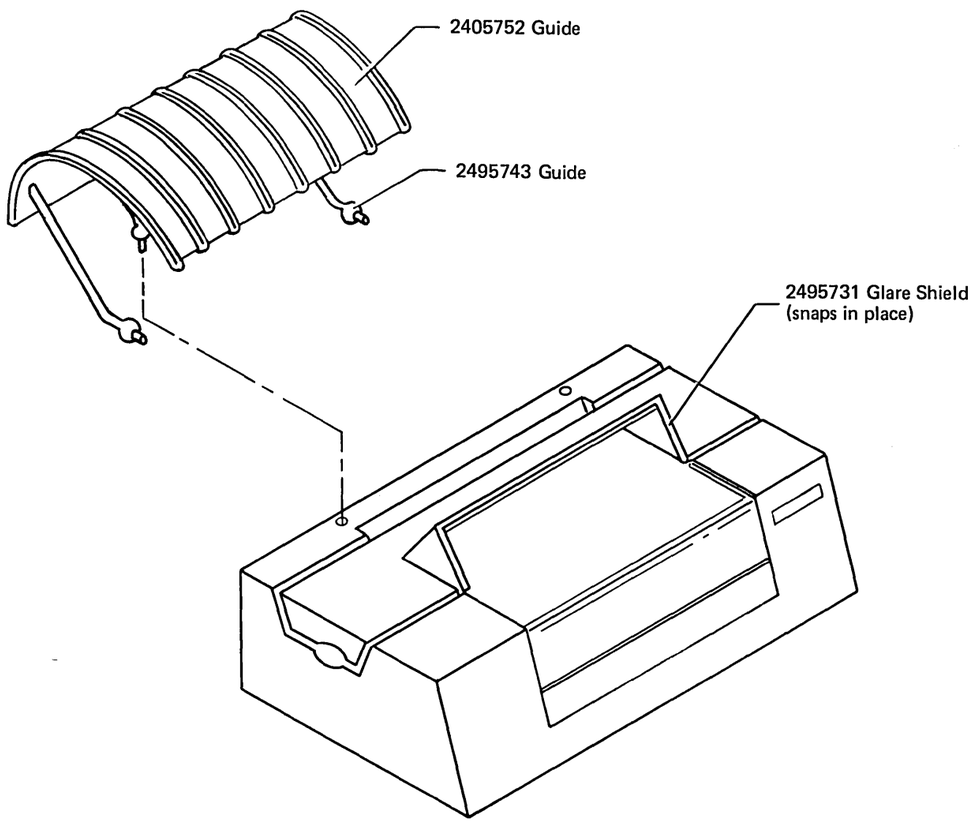
After it has been determined that the POR sequence is operating correctly (Section 4, par. 4.2.1),* an offline check procedure must be performed.

1. Set the CE switch to the PRINT PATTERN position.
2. Set MODE switch to the MODE 1 position.
3. Activate the START PRINT switch.
4. Observe that alphameric test printout is similar to that in Diags. 6-7 and 6-8. Printout will consist of 480 or 1920 characters depending upon printer model.
5. Set MODE switch to the MODE 2 position.
6. Activate the START PRINT switch.
7. Observe that All H test printout is similar to that shown in Diag. 6-10. Printout will consist of 480 or 1920 characters depending upon the printer model.
8. If the test printouts observed are correct, proceed to the Online Check procedure below.

Offline Check Procedure (Data Analysis — APL — Feature)

After it has been determined that the POR sequence is operating correctly (Section 4, par. 4.2.1), an offline check procedure must be performed.

1. Set the CE switch to the PRINT PATTERN position.
2. Set MODE switch to the MODE 1 position.
3. Set the External Print Test Switch to the ON position.
4. Activate the START PRINT switch.
5. Observe that alphameric test printout is similar to that shown in Diagram 6-10.2.
6. Set External Print Test Switch to the OFF position; then repeat steps 4 and 5. (See Diag. 6-10.1.)
7. Set MODE switch to the MODE 2 position.
8. Activate the START PRINT switch.
9. Observe that All H test printout is similar to that shown in Diagram 6-10.
10. If the test printouts observed are correct, proceed to the Online Check procedure below.

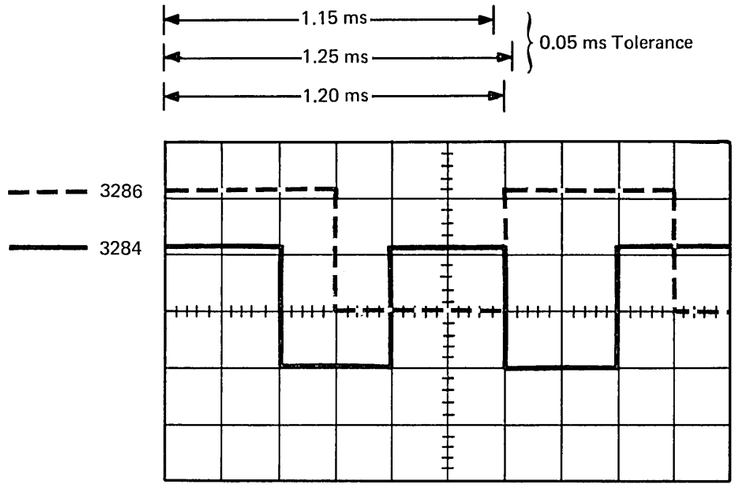


Online Check Procedure

1. Reinstall the printer top cover.
2. Install Glare Shield as indicated in diagram.
3. Install Paper Forms Guide as indicated in diagram.
4. Connect a coax cable from the interface panel (refer to Diag. 6-5 for location) on the printer to the proper address connector on the interface panel of the 3271 or 3272 Control Unit.
5. To find out what online programs (diagnostics) to run and how to use them, refer to the 3271 or 3272 *Troubleshooting Guide.*
6. Do not interchange top covers between printers.
7. *Ensure that cover interlock switch is operating correctly. Refer to pages 6-51* and 5-31* for adjustment procedures.*

*These references may be found in the IBM 3284/3286 Printer Models 1 and 2 Troubleshooting Guide, SY27-2315

3286 Time/Division: 0.2 Millisecond
Volts/Division: 2 Volts
Mode Channel: 1
Sync: Internal Coupling DC, Slope Plus
Source: Internal Channel 1 Only



3284 2 ms
2.08 ms
1.93 ms
0.08 ms Tolerance

Time/Division: 0.5 Millisecond
Volts/Division: 2 Volts
Mode Channel: 1
Sync: Internal Coupling DC, Slope Plus
Source: Internal Channel 1 Only

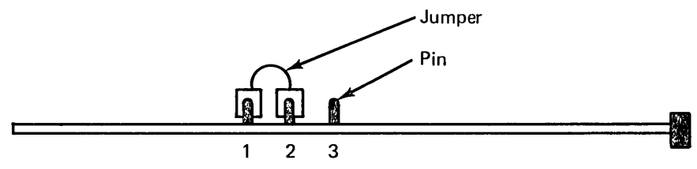
Diagram 6-1. POR Pulse Waveshapes

Correct Orientation of Program Pin Jumper on Counter and Compare Card (H2)

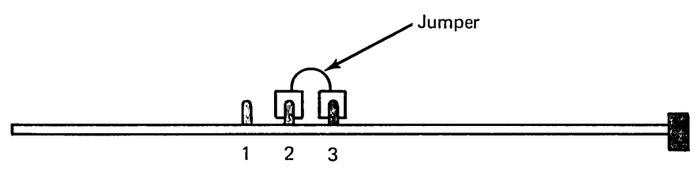
The counter and compare card mounted in logic gate location H2 requires a programmable pin-jumper. The manner in which the pin-jumper is mounted on the card, (shown in the diagrams below) is dependent upon the printer model in use.

Note: Whenever card H2 is replaced, the pin-jumper connection must be checked to ensure that it is properly mounted for the printer model in use.

For IBM 3284/86 Printers, Models 2

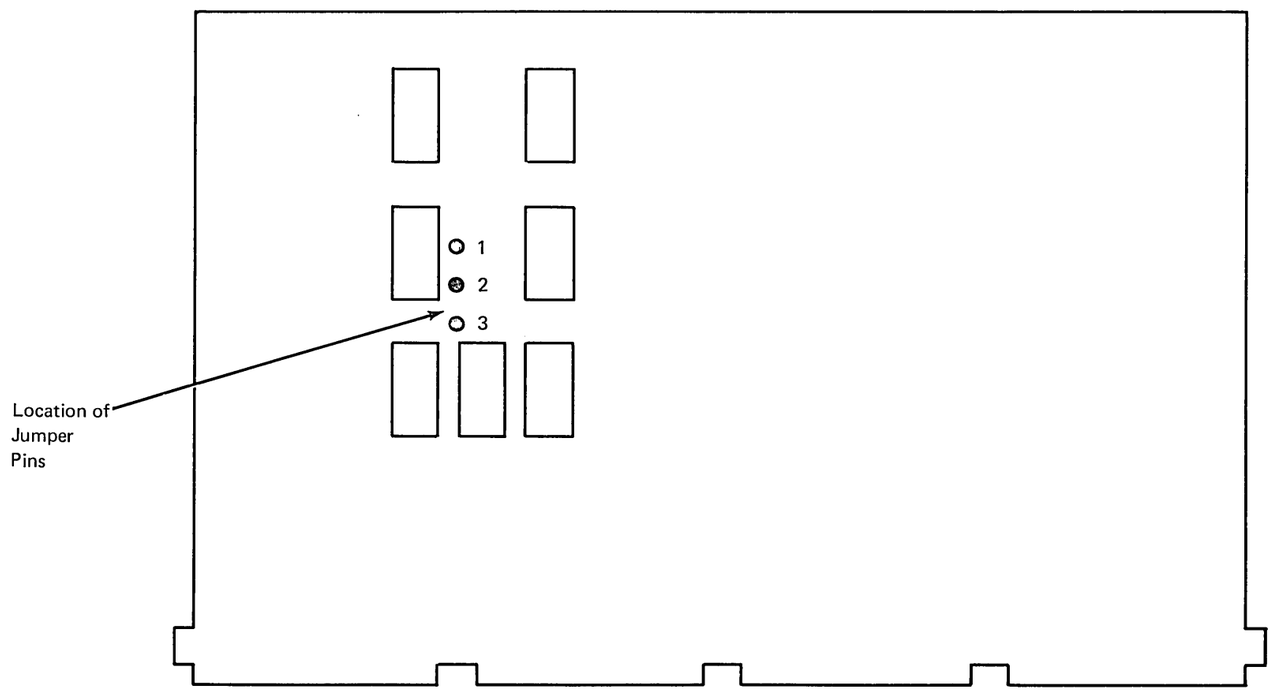


For IBM 3284/86 Printers, Models 1



CAUTION
Jumper pins can bend or break, or jumpers can be pulled off pins. Exercise care when inserting or removing jumpered cards or cards next to jumpered cards.

COUNTER AND COMPARE CARD (H2)
(Module Side)

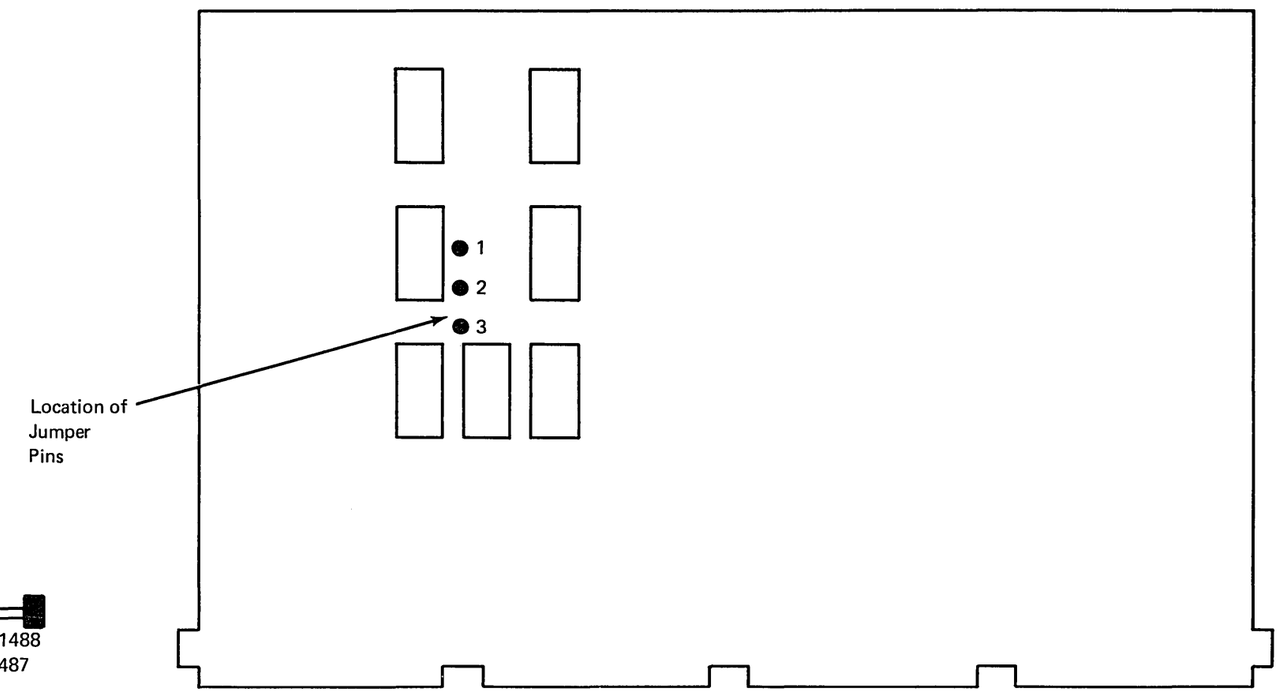


Correct Orientation of Program Pin Jumper on Motor Control Card (G2)

The motor control card (G2) contains most of the logic for the control of the dc stepper motor which drives the screw to run the print-head carrier in forward and reverse directions. Since the motor control card is used in both the 3284 and 3286 printers, there is a programmable pin jumper on the card which determines whether the card will function as a 3284 stepper motor control or a 3286 stepper motor control. The proper programming is shown below.

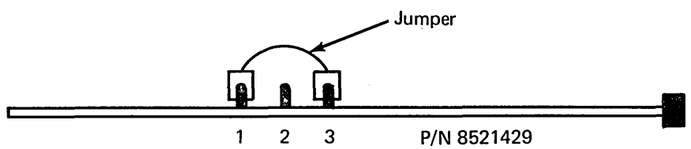
CAUTION
Jumper pins can bend or break, or jumpers can be pulled off pins. Exercise care when inserting or removing jumpered cards or cards next to jumpered cards.

MOTOR CONTROL CARD (G2)
(Module Side)

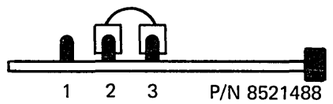


For IBM 3284 Printer, Models 1 and 2

The outer pins must be jumpered together:



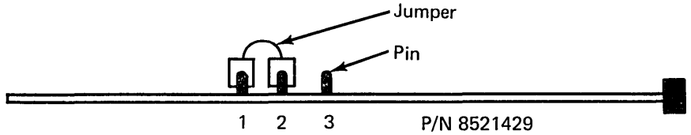
P/N 8521429
EC 716936



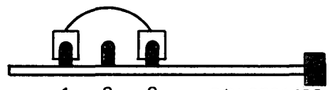
P/N 8521488
EC 717487

For IBM 3286 Printer, Models 1 and 2

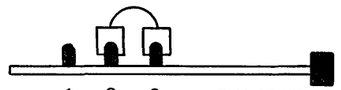
The center pin must be jumpered to the pin (1) farthest from the plug side of the card:



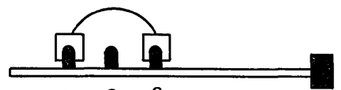
P/N 8521429
EC 716936



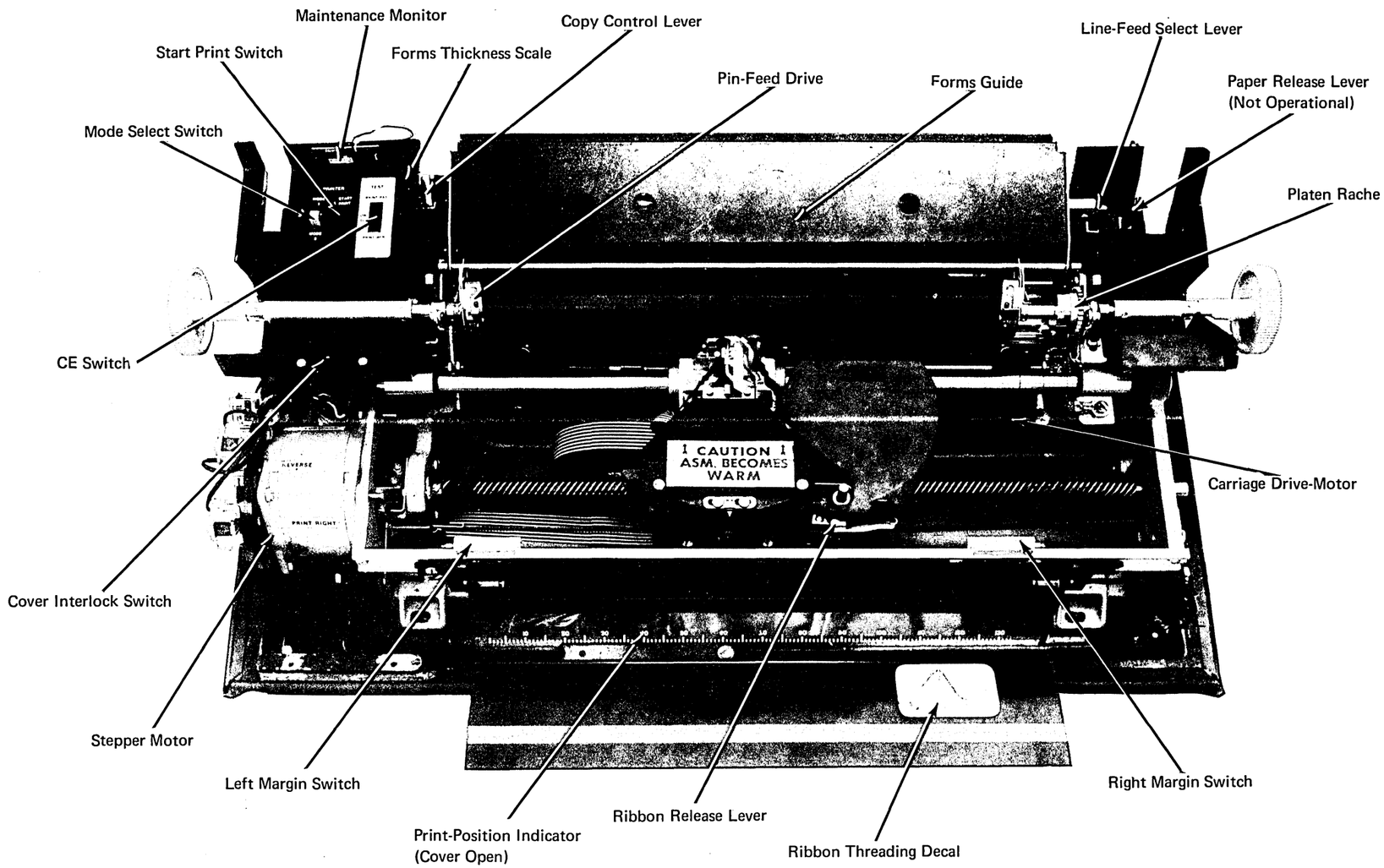
P/N 8521488
EC 717487



P/N 8523248
EC 718946



P/N 8523248
EC 718946



Printer, Top Front View

Diagram 6-2. Printer, Top Front View

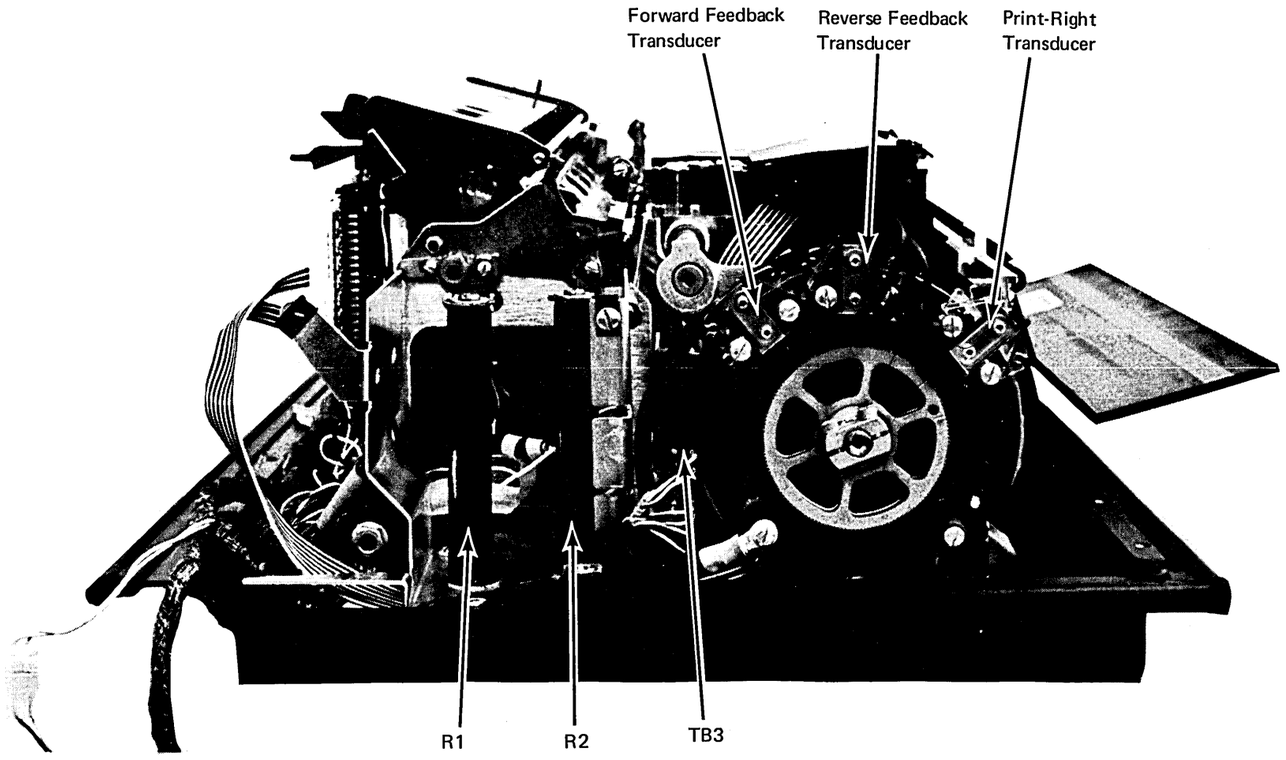


Diagram 6-3. Printer, Left Side View

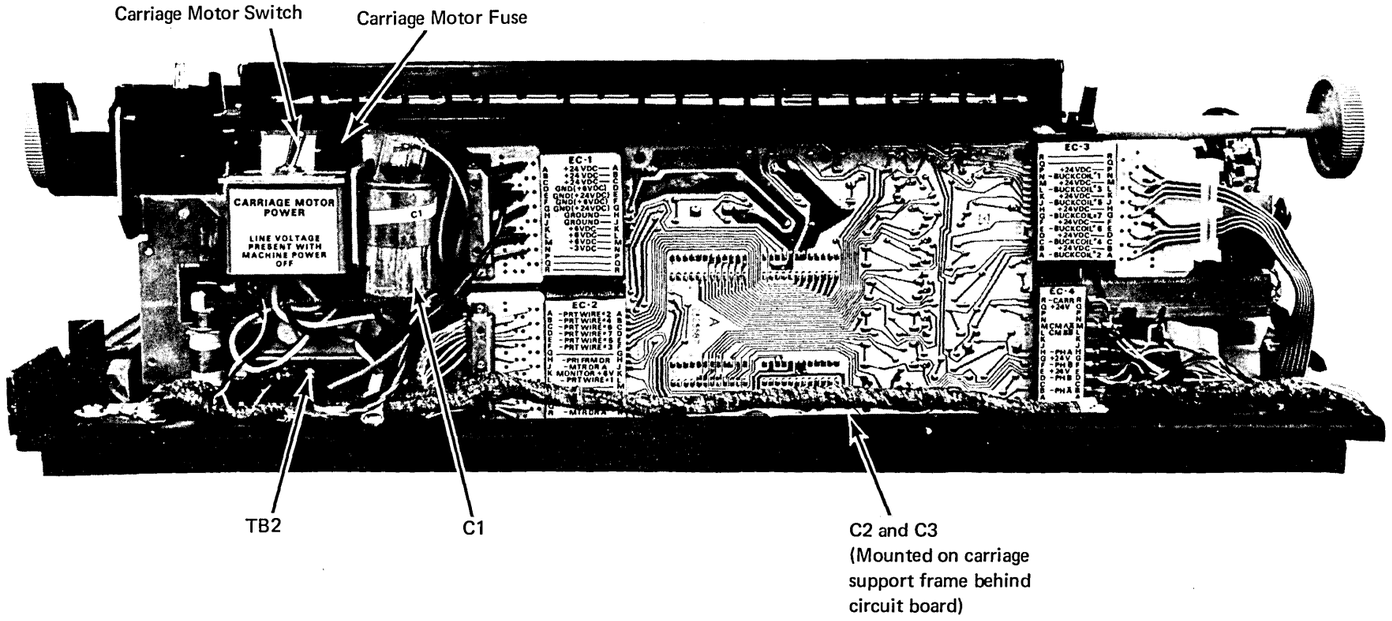


Diagram 6-4. Printer, Rear View

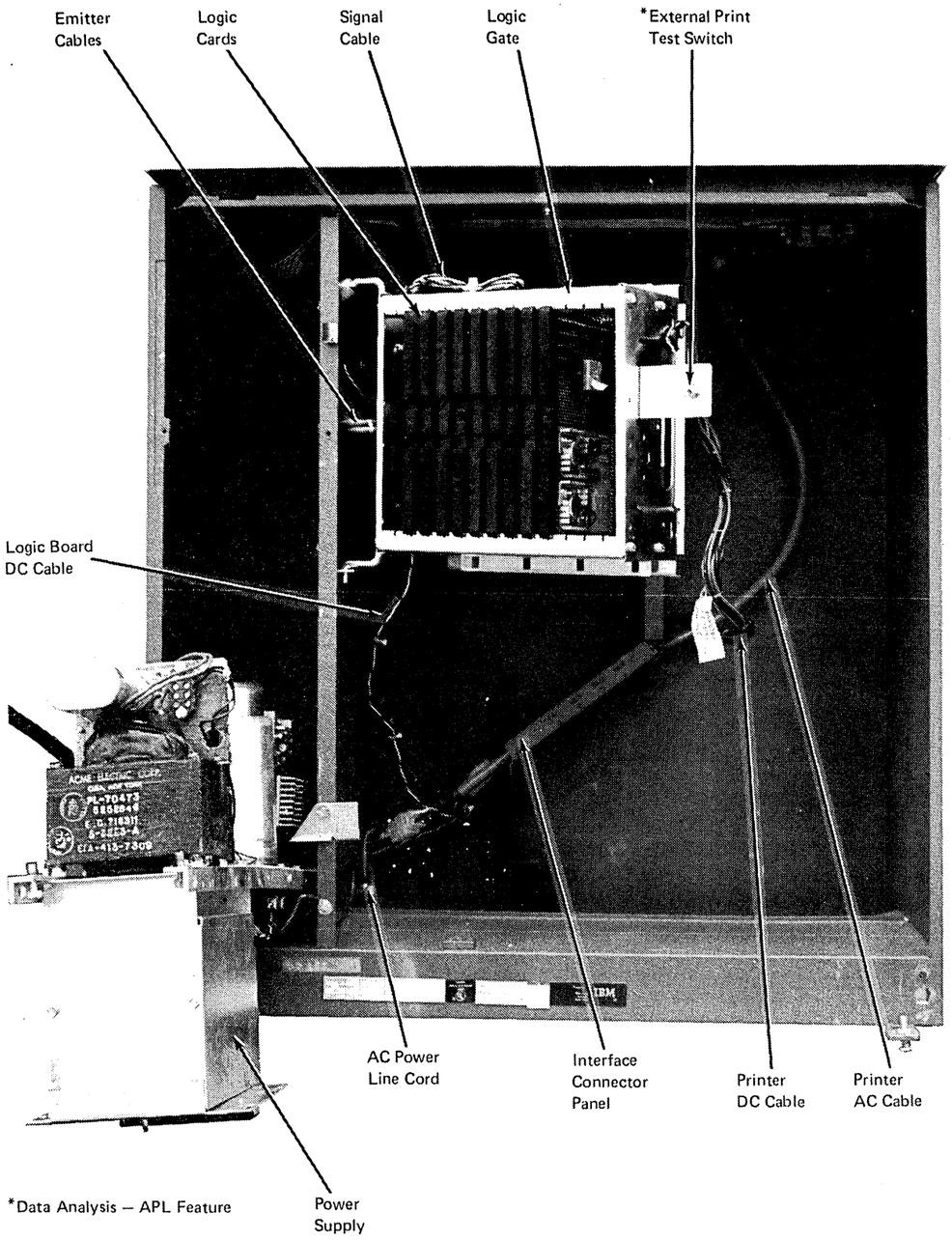


Diagram 6-5. Power and Signal Cable Distribution

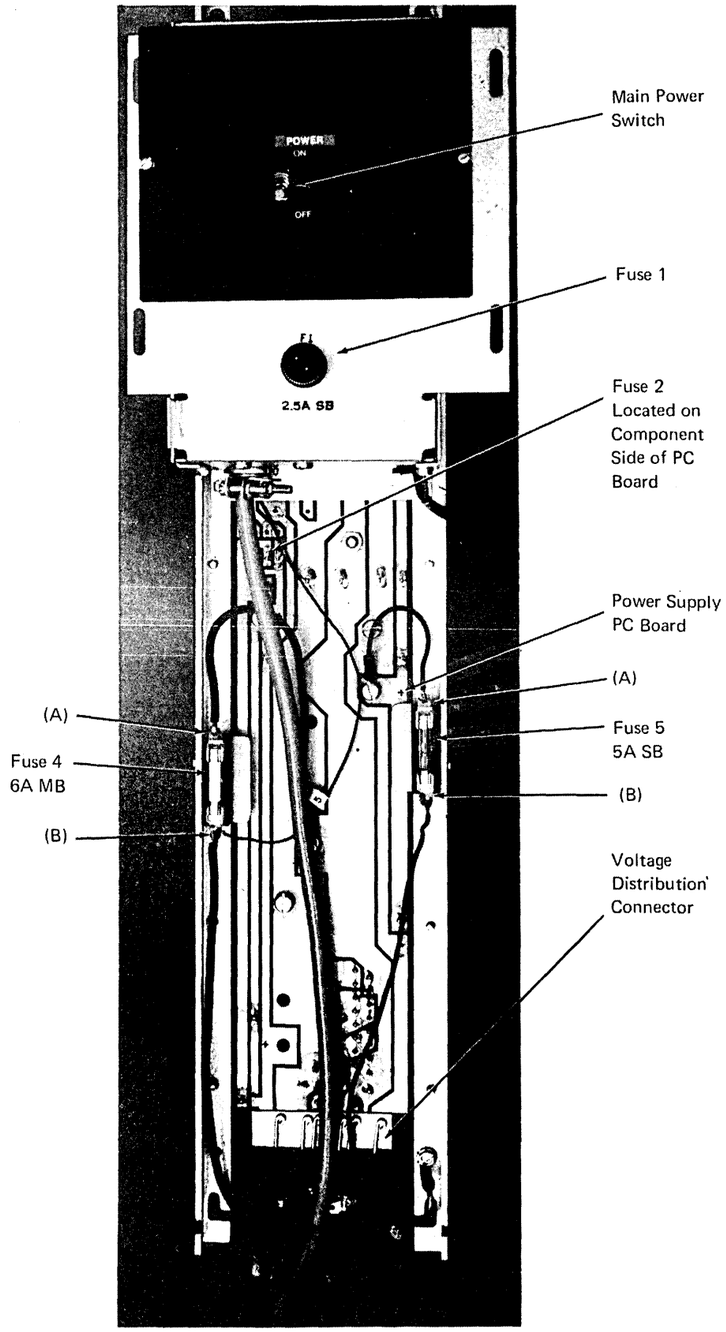


Diagram 6-6. Power Supply

```
  B D F H ¢ <     K M O Q ! *     S U W Y   %     2 4 6 8 : @     B D F   B D F
XXCXEFXXI¢X<XX‖XJKXMXXPQXX$X);XX/SXUXXXYXX,X_)X0XX3X56XX9:X@XX" XXCXEFX XXCXEFX
ABCDEFGHI¢.<(+‖&JKLMNOPQR!$*);¬-/STUVWXYZ ,%_)?0123456789:#@'=" ABCDEFG ABCDEFG
ABCDEFGHI¢.<(+‖&JKLMNOPQR!$*);¬-/STUVWXYZ ,%_)?0123456789:#@'=" ABCDEFG ABCDEFG
  B D F H ¢ <     K M O Q ! *     S U W Y   %     2 4 6 8 : @     B D F   B D F
XXCXEFXXI¢X<XX‖XJKXMXXPQXX$X);XX/SXUXXXYXX,X_)X0XX3X56XX9:X@XX" XXCXEFX XXCXEFX
X
                               S U W Y   %     2 4 6 8 : @
                               S U W Y   %     2 4 6 8 : @
```

1st Part of Printout

2nd Part of Printout

Diagram 6-7. IBM 3284/86 Printers, Model 1, Aiphameric Pattern Printout

```
  B D F H ¢ <     K M O Q ! *     S U W Y   %     2 4 6 8 : @     B D F   B D F
XXCXEFXXI¢X<XX‖XJKXMXXPQXX$X);XX/SXUXXXYXX,X_)X0XX3X56XX9:X@XX" XXCXEFX XXCXEFX
ABCDEFGHI¢.<(+‖&JKLMNOPQR!$*);¬-/STUVWXYZ ,%_)?0123456789:#@'=" ABCDEFG ABCDEFG
ABCDEFGHI¢.<(+‖&JKLMNOPQR!$*);¬-/STUVWXYZ ,%_)?0123456789:#@'=" ABCDEFG ABCDEFG
  B D F H ¢ <     K M O Q ! *     S U W Y   %     2 4 6 8 : @     B D F   B D F
XXCXEFXXI¢X<XX‖XJKXMXXPQXX$X);XX/SXUXXXYXX,X_)X0XX3X56XX9:X@XX" XXCXEFX XXCXEFX
ABCDEFGHI¢.<(+‖&JKLMNOPQR!$*);¬-/STUVWXYZ ,%_)?0123456789:#@'=" ABCDEFG ABCDEFG
ABCDEFGHI¢.<(+‖&JKLMNOPQR!$*);¬-/STUVWXYZ ,%_)?0123456789:#@'=" ABCDEFG ABCDEFG
  B D F H ¢ <     K M O Q ! *     S U W Y   %     2 4 6 8 : @     B D F   B D F
XXCXEFXXI¢X<XX‖XJKXMXXPQXX$X);XX/SXUXXXYXX,X_)X0XX3X56XX9:X@XX" XXCXEFX XXCXEFX
ABCDEFGHI¢.<(+‖&JKLMNOPQR!$*);¬-/STUVWXYZ ,%_)?0123456789:#@'=" ABCDEFG ABCDEFG
ABCDEFGHI¢.<(+‖&JKLMNOPQR!$*);¬-/STUVWXYZ ,%_)?0123456789:#@'=" ABCDEFG ABCDEFG
  B D F H ¢ <     K M O Q ! *     S U W Y   %     2 4 6 8 : @     B D F   B D F
XXCXEFXXI¢X<XX‖XJKXMXXPQXX$X);XX/SXUXXXYXX,X_)X0XX3X56XX9:X@XX" XXCXEFX XXCXEFX
ABCDEFGHI¢.<(+‖&JKLMNOPQR!$*);¬-/STUVWXYZ ,%_)?0123456789:#@'=" ABCDEFG ABCDEFG
ABCDEFGHI¢.<(+‖&JKLMNOPQR!$*);¬-/STUVWXYZ ,%_)?0123456789:#@'=" ABCDEFG ABCDEFG
X
                               S U W Y   %     2 4 6 8 : @
                               S U W Y   %     2 4 6 8 : @
                               S U W Y   %     2 4 6 8 : @
                               S U W Y   %     2 4 6 8 : @
                               S U W Y   %     2 4 6 8 : @
                               S U W Y   %     2 4 6 8 : @
```

1st Part of Printout

2nd Part of Printout

Diagram 6-8. IBM 3284/86 Printers, Model 2, Alphameric Pattern Printout

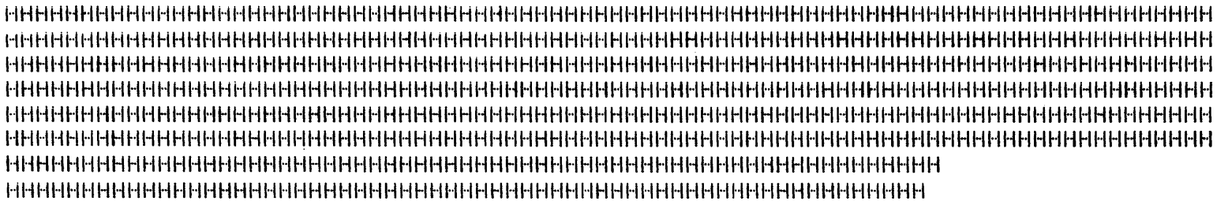
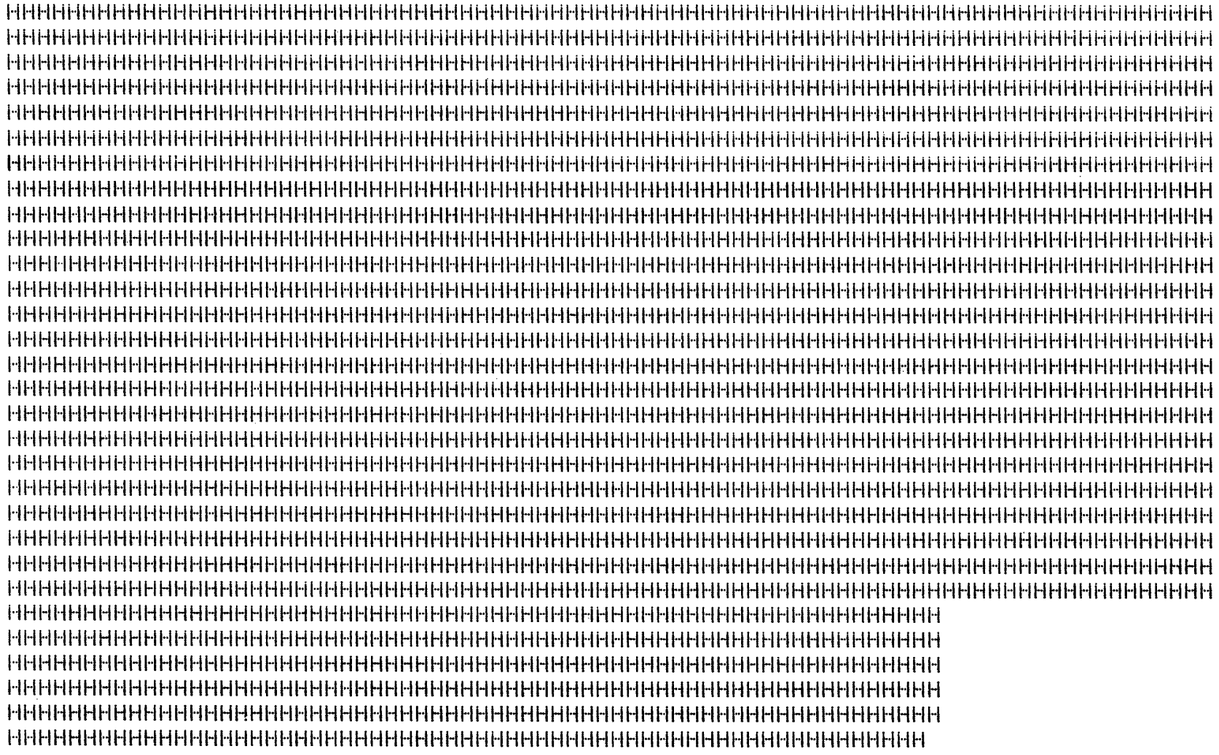


Diagram 6-9. IBM 3284/86 Printers, Model 1, "All H" Pattern Printout



Note: The External Print Test Switch (Data Analysis – APL Feature) must be off, or no characters will be printed.

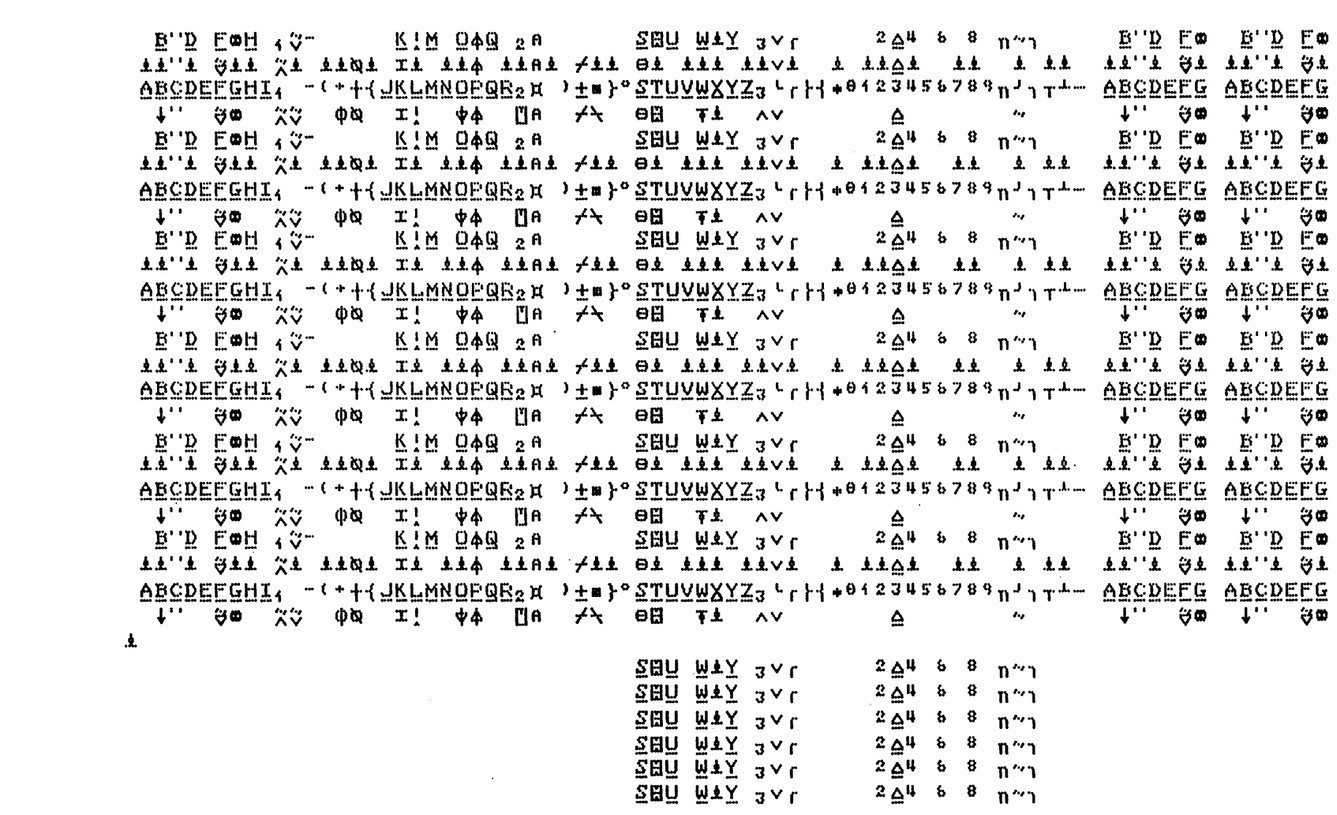
Diagram 6-10. IBM 3284/86 Printers, Model 2, "All H" Pattern Printout

```
 b''d f⌾h ↑▽≤      k¦m o∮q ⊃∧*      s⊞u w⍋y ∩∨⊥      ⍳≜ω x ÷ ▽~⊤     b''d f⌾  b''d f⌾
XXCXEFXXI¢X≤XX▮XJKXMXXPQXX$X);XX/SXUXXXYXX,X_>X0XX3X56XX9:X@XX" XXCXEFX XXCXEFX
abcdefghi↑ ≤⌈L→⌷jklmnopqr⊃c*o;←¯ stuvwxyz∩υ⊥[≥∘α∈⍳ρω5x\÷9▽▵⊤]≠| abcdefg abcdefg
ABCDEFGHI¢.≤((+▮&JKLMNOPQR!$*);¯-/STUVWXYZ ,%_>?0123456789:#@'=" ABCDEFG ABCDEFG
 b''d f⌾h ↑▽≤      k¦m o∮q ⊃∧*      s⊞u w⍋y ∩∨⊥      ⍳≜ω x ÷ ▽~⊤     b''d f⌾  b''d f⌾
XXCXEFXXI¢X≤XX▮XJKXMXXPQXX$X);XX/SXUXXXYXX,X_>X0XX3X56XX9:X@XX" XXCXEFX XXCXEFX
abcdefghi↑ ≤⌈L→⌷jklmnopqr⊃c*o;←¯ stuvwxyz∩υ⊥[≥∘α∈⍳ρω5x\÷9▽▵⊤]≠| abcdefg abcdefg
ABCDEFGHI¢.≤((+▮&JKLMNOPQR!$*);¯-/STUVWXYZ ,%_>?0123456789:#@'=" ABCDEFG ABCDEFG
 b''d f⌾h ↑▽≤      k¦m o∮q ⊃∧*      s⊞u w⍋y ∩∨⊥      ⍳≜ω x ÷ ▽~⊤     b''d f⌾  b''d f⌾
XXCXEFXXI¢X≤XX▮XJKXMXXPQXX$X);XX/SXUXXXYXX,X_>X0XX3X56XX9:X@XX" XXCXEFX XXCXEFX
abcdefghi↑ ≤⌈L→⌷jklmnopqr⊃c*o;←¯ stuvwxyz∩υ⊥[≥∘α∈⍳ρω5x\÷9▽▵⊤]≠| abcdefg abcdefg
ABCDEFGHI¢.≤((+▮&JKLMNOPQR!$*);¯-/STUVWXYZ ,%_>?0123456789:#@'=" ABCDEFG ABCDEFG
 b''d f⌾h ↑▽≤      k¦m o∮q ⊃∧*      s⊞u w⍋y ∩∨⊥      ⍳≜ω x ÷ ▽~⊤     b''d f⌾  b''d f⌾
XXCXEFXXI¢X≤XX▮XJKXMXXPQXX$X);XX/SXUXXXYXX,X_>X0XX3X56XX9:X@XX" XXCXEFX XXCXEFX
abcdefghi↑ ≤⌈L→⌷jklmnopqr⊃c*o;←¯ stuvwxyz∩υ⊥[≥∘α∈⍳ρω5x\÷9▽▵⊤]≠| abcdefg abcdefg
ABCDEFGHI¢.≤((+▮&JKLMNOPQR!$*);¯-/STUVWXYZ ,%_>?0123456789:#@'=" ABCDEFG ABCDEFG
 b''d f⌾h ↑▽≤      k¦m o∮q ⊃∧*      s⊞u w⍋y ∩∨⊥      ⍳≜ω x ÷ ▽~⊤     b''d f⌾  b''d f⌾
XXCXEFXXI¢X≤XX▮XJKXMXXPQXX$X);XX/SXUXXXYXX,X_>X0XX3X56XX9:X@XX" XXCXEFX XXCXEFX
abcdefghi↑ ≤⌈L→⌷jklmnopqr⊃c*o;←¯ stuvwxyz∩υ⊥[≥∘α∈⍳ρω5x\÷9▽▵⊤]≠| abcdefg abcdefg
ABCDEFGHI¢.≤((+▮&JKLMNOPQR!$*);¯-/STUVWXYZ ,%_>?0123456789:#@'=" ABCDEFG ABCDEFG
X
                                  s⊞u w⍋y ∩∨⊥      ⍳≜ω x ÷ ▽~⊤
                                  s⊞u w⍋y ∩∨⊥      ⍳≜ω x ÷ ▽~⊤
                                  s⊞u w⍋y ∩∨⊥      ⍳≜ω x ÷ ▽~⊤
                                  s⊞u w⍋y ∩∨⊥      ⍳≜ω x ÷ ▽~⊤
```

1st Part of Printout

2nd Part of Printout

Diagram 6-10.1. IBM 3284/3286 Printers, Model 2, Data Analysis — APL Feature Printout with External Print Test Switch OFF



1st Part of Printout

2nd Part of Printout

Diagram 6-10.2. IBM 3284/3286 Printers, Model 2, Data Analysis — APL Feature Printout with External Print Test Switch ON

3284 PRINTER MODEL 3 INSTALLATION PROCEDURES

Preliminary Procedures

1. Ensure that all shipping material, including the four (4) shipping bolts, is removed as per shipping instructions.
2. Reseat all logic cards and cable connectors to the logic board.
3. Install the ribbon cassette as per threading diagram mounted on the inside right corner of internal safety cover.
4. Check that the four printer-to-base cables are tightly connected.
5. Remove the top printer cover.
6. *Manually move the print-head back and forth while listening for the sound of the transducers rubbing on the emitter wheel. If a rubbing noise is heard, refer to the transducer adjustment procedure (Section 6, par. 6.5.2).**
7. Check that the CE motor switch, located in right rear of printer, is turned on.
8. Thread paper forms through paper guide sufficiently to actuate the forms interlock switch.
9. Check that the source voltage provided by the customer agrees with printer wiring.
   a. Domestic (USA) models: 115V ac (±10%), 60-Hz, single-phase line voltage is used. No internal adjustments are required for domestic (USA) printers.
   b. World Trade models: 100, 110, 123.5, 200, 220, 235V ac (±10%), 50-Hz, single-phase; or 100V ac (±10%), 60-Hz, single-phase line voltage is used. For 50-Hz models only, check that the connections on ferro terminal block, TB1, agree with the line voltage provided. If it is necessary to change taps on the ferro, update the voltage decal.
10. Plug the interface cable (curled up in the base of the printer) into the space provided in the lower left corner of the 3275 unit. This cable must be plugged in and power must be turned on in the 3275 unit before the 3284-3 Printer can be activated.
11. Plug in the ac power cord to convenience outlet.
12. Turn on the main power switch, located at left-front of printer, and check that the printer performs a power-on-reset (POR) operation. Refer to Section 4 (4.2.1).*

Print Right Transducer Check

1. Following the POR operation, check that the point of the transducer labeled "print right" is positioned exactly opposite the center scribe line on the transducer emitter wheel. If it is correctly positioned, perform the steps in next paragraph. If it is *not* positioned correctly, refer to Section 6 (6.5.3)* for the proper adjustment procedure.
2. Jumper slowdown switch to ground (point A1E2-B06 to A1E2D08).

Forward Transducer Check

The forward transducer is checked by scoping point A1B2-J12.

1. Turn the main power switch on and off to effect a POR operation. Repeat this step in order to observe pulse width.
2. The correct pulse width for the 3284 Printer is 2.0 ms ± 80 usec.

Note: The proper pulse width diagram relating to step 2 above is on Diag. 6-11.

Reverse Transducer Check

The reverse transducer is checked by scoping point A1B2-D12.

1. Turn the main power switch on and off to effect a POR operation. Repeat this step in order to observe pulse width.
2. The correct pulse width for the 3284 Printer is 2.0 ms ± 80 usec.

Notes:

(1) The proper pulse width diagram relating to step 2 above is on Diag. 6-11.
(2) If the pulse width obtained is wrong, the printer will operate at the wrong speed as determined by the incorrect pulse.
(3) After the transducer check procedure is completed, be sure to remove the slowdown switch jumper. If the jumper is not removed, the printer will never perform a high-speed carriage return.

Offline Check Procedure

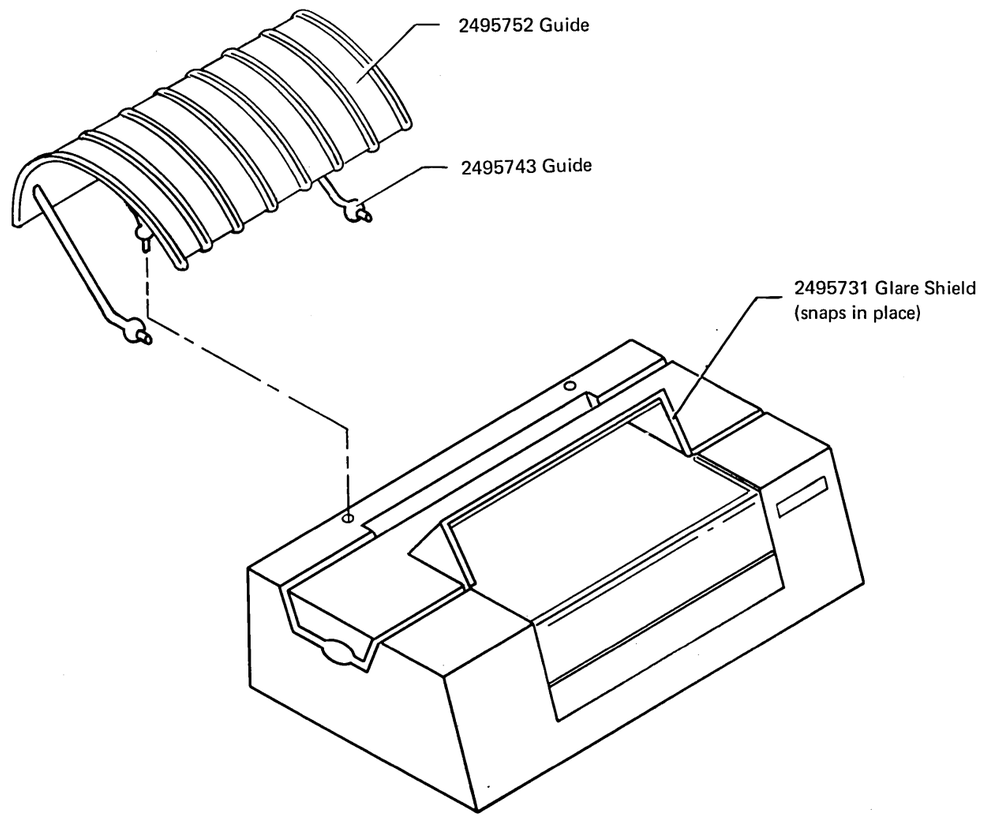
After it has been determined that the POR sequence is operating correctly (Section 4, par. 4.2.1),* an offline check procedure must be performed.

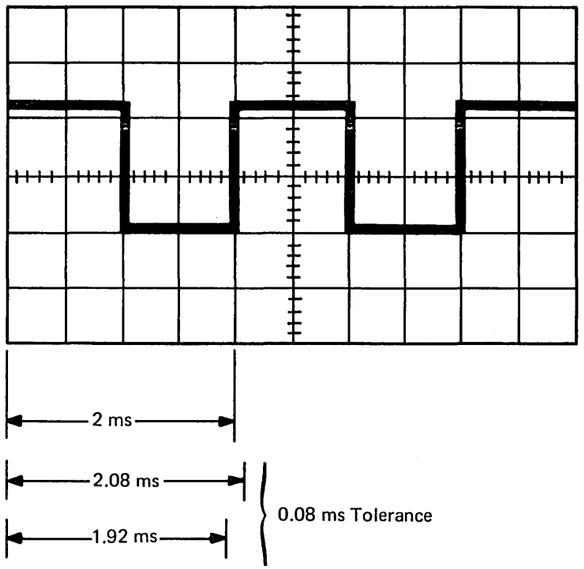
1. Set the CE switch to the PRINT PATTERN position.
2. Set MODE switch to the MODE 1 position.
3. Activate the START PRINT switch.
4. Observe that alphameric test printout is similar to that shown in Diag. 6-17. Printout will consist of 480 or 1920 characters depending upon printer model.
5. Set MODE switch to the MODE 2 position.
6. Activate the START PRINT switch.
7. Observe that All H test printout is similar to that shown in Diag. 6-18. Printout will consist of 480 or 1920 characters depending upon the printer model.
8. If the test printouts observed are correct, proceed to the Online Check procedure below.

Online Check Procedure

1. Reinstall the printer top cover.
2. Install Glare Shield as indicated in diagram.
3. Install Paper Forms Guide as indicated in diagram.
4. To find out what online programs (diagnostics) to run and how to use them, refer to the 3275 *Troubleshooting Guide*.
5. Do not interchange top covers between printers.
6. *Ensure that cover interlock switch is operating correctly. (Refer to pages 5-29 and 6-51 for adjustment.)**

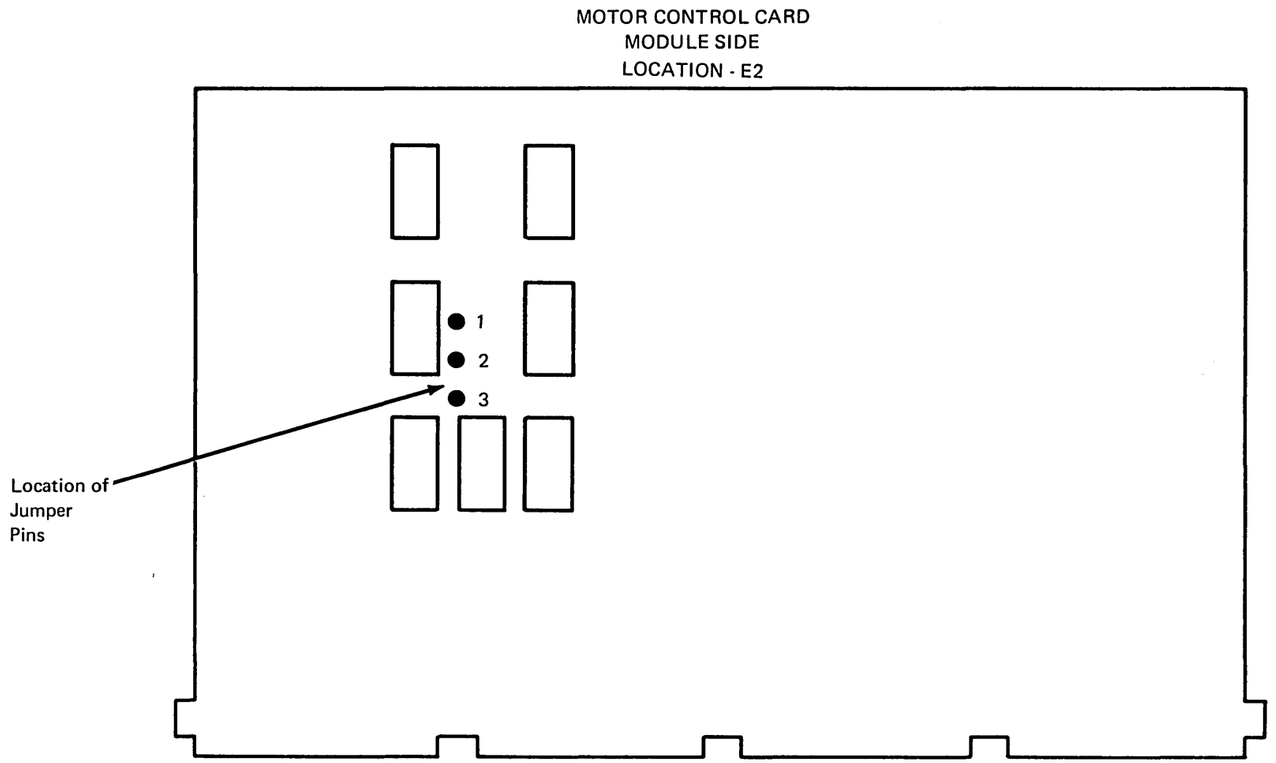
*3284 Printer Model 3 Troubleshooting Guide, Form No. SY27-2316





Time/Division : 0.5 Millisecond
Volts/Division : 2 Volts
Mode Channel : 1
Sync : Internal Coupling DC, Slope Plus
Source : Internal Channel 1 Only

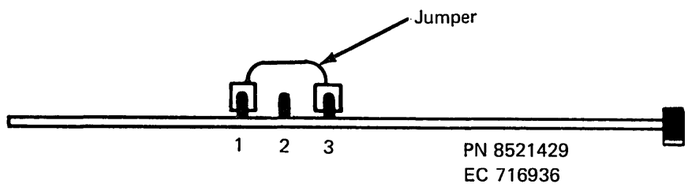
Diagram 6-11. POR Pulse Waveshape

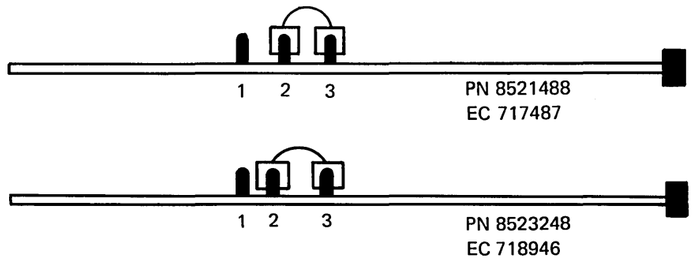


The motor control card (E2) contains most of the logic for the control of the dc stepper motor which drives the screw to run the print-head carrier in forward and reverse directions. Since the motor control card is used in both the 3284 and the 3286 printers, there is a programmable pin jumper on the card which determines whether the card will function as a 3284 stepper-motor control or a 3286 stepper-motor control. The proper programming is shown below.

For a 3284-3 Printer

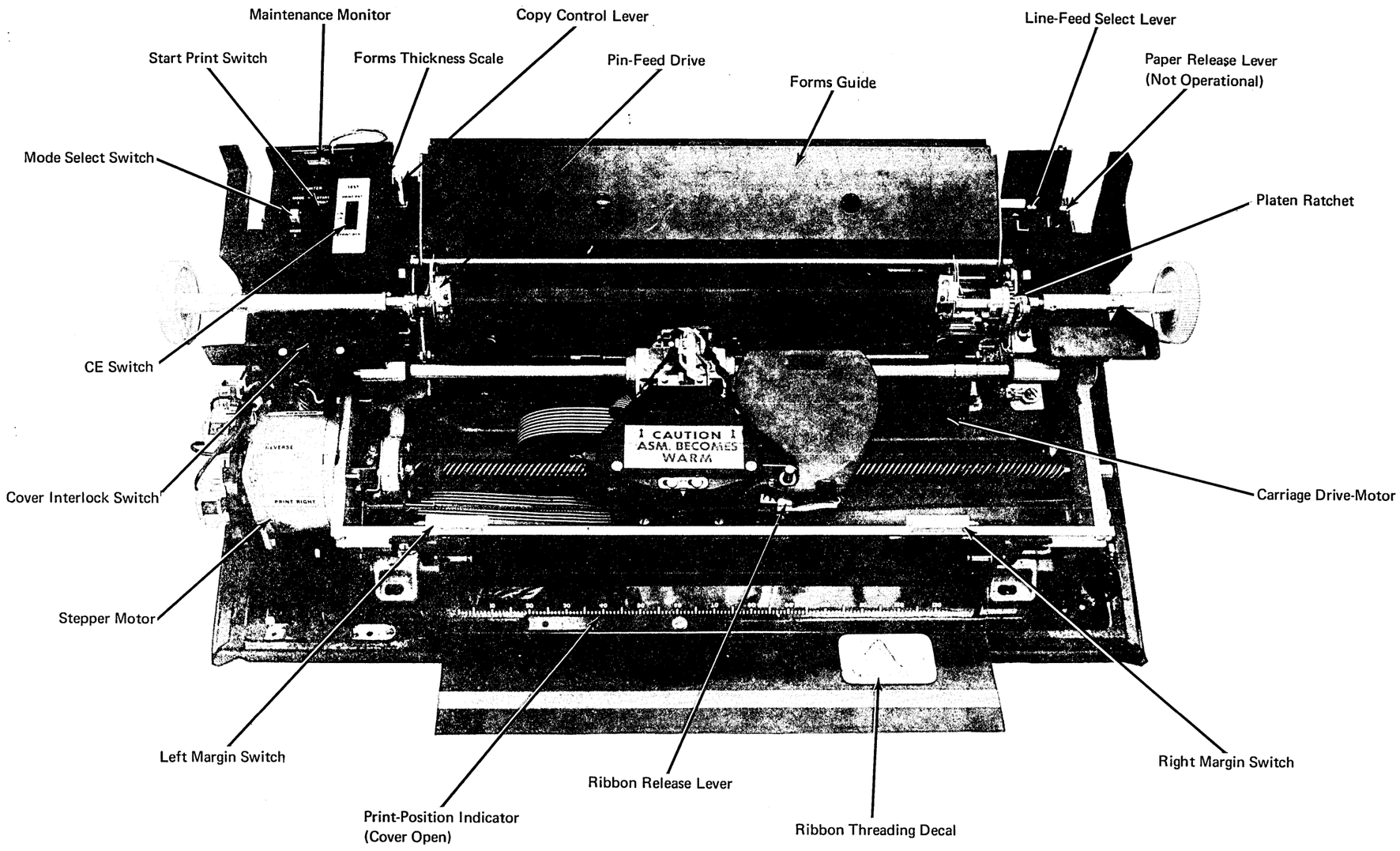
The pins must be jumpered as shown below:





CAUTION
Jumper pins can bend or break, or jumpers can be pulled off pins. Exercise care when inserting or removing jumpered cards or cards next to jumpered cards.

Diagram 6-12. Program Pin Jumper Connections — Motor Control Card (E2)



Printer, Top Front View

Diagram 6-13. Printer, Top Front View

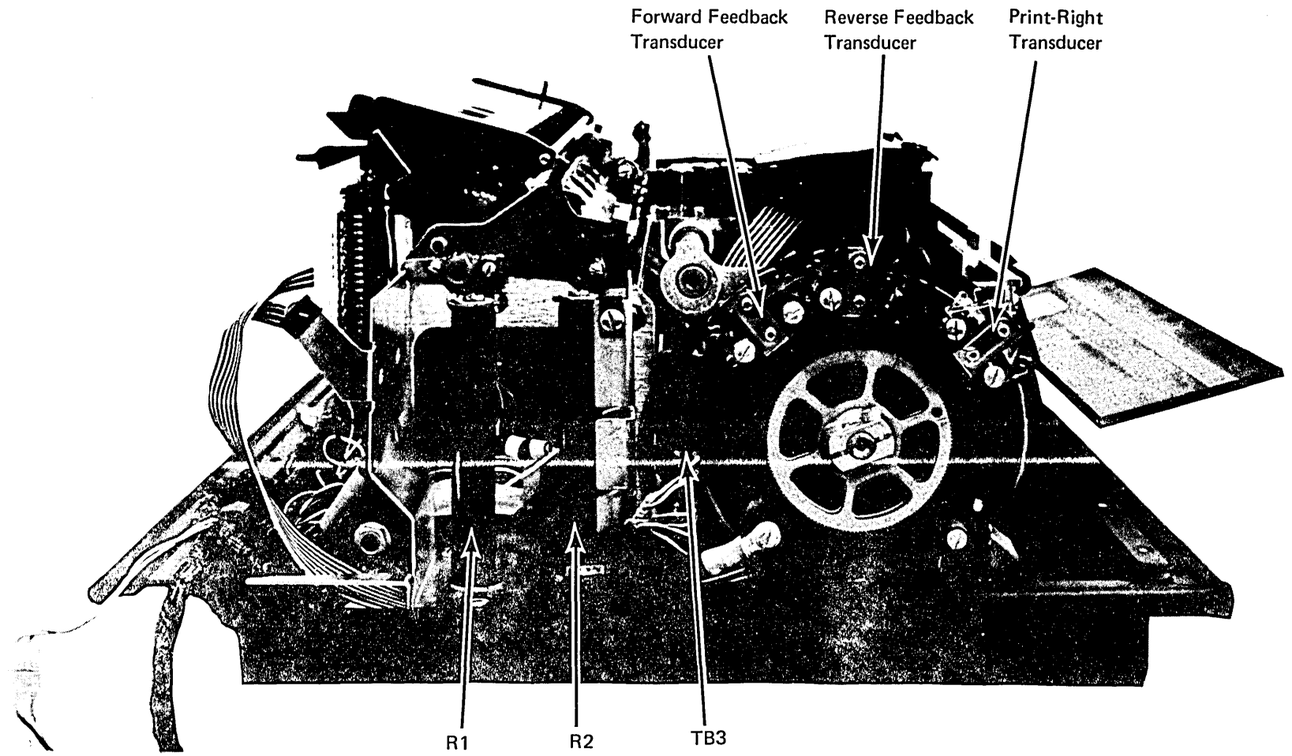


Diagram 6-14. Printer, Left Side View

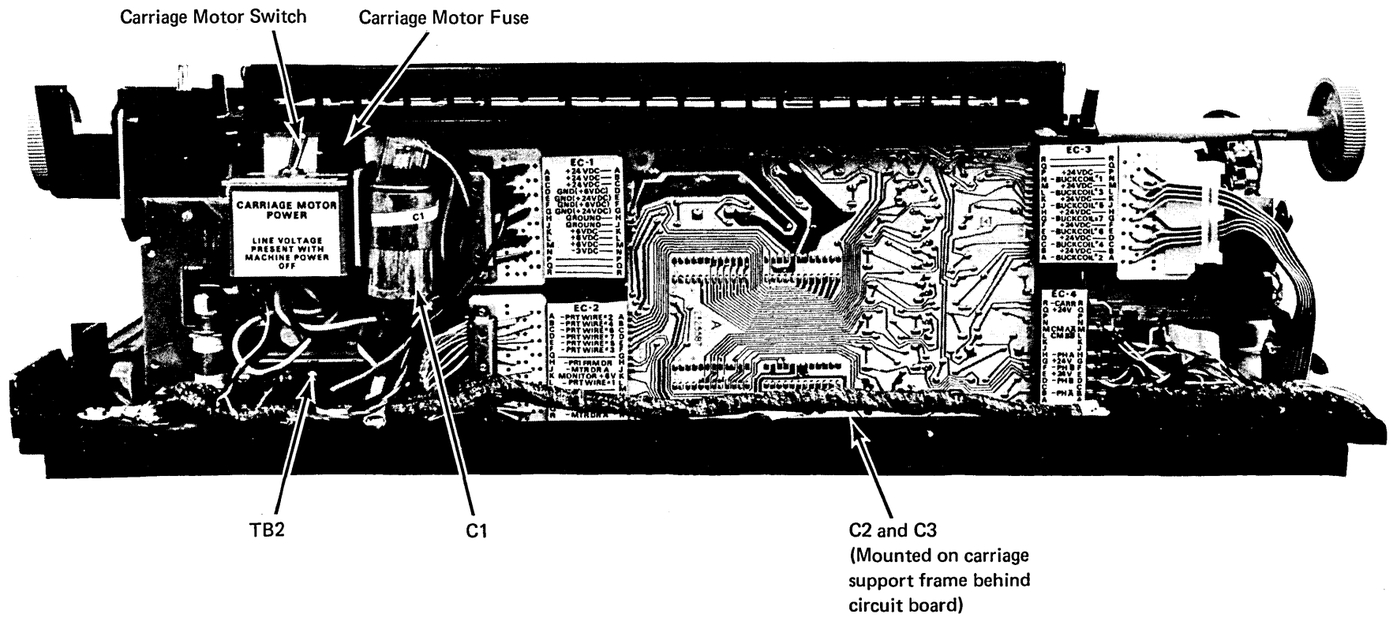


Diagram 6-15. Printer, Rear View

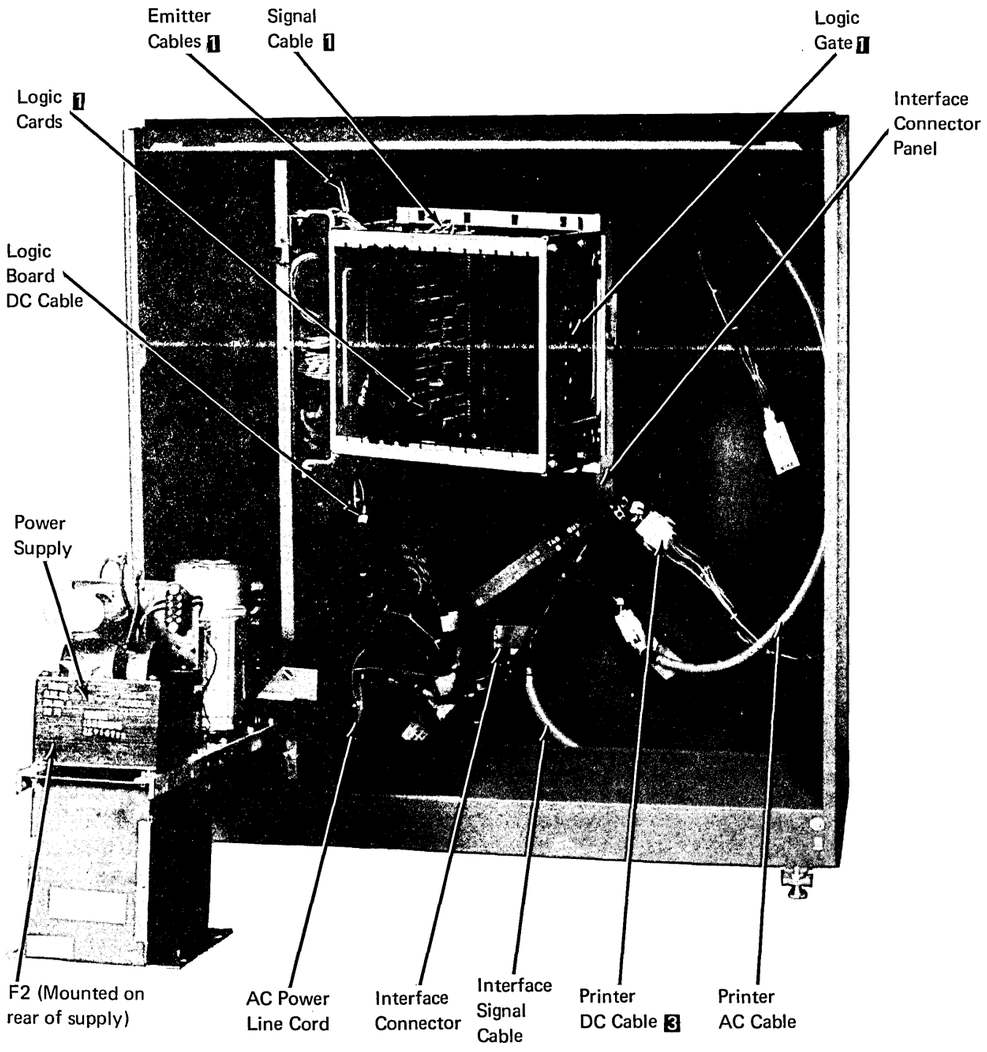
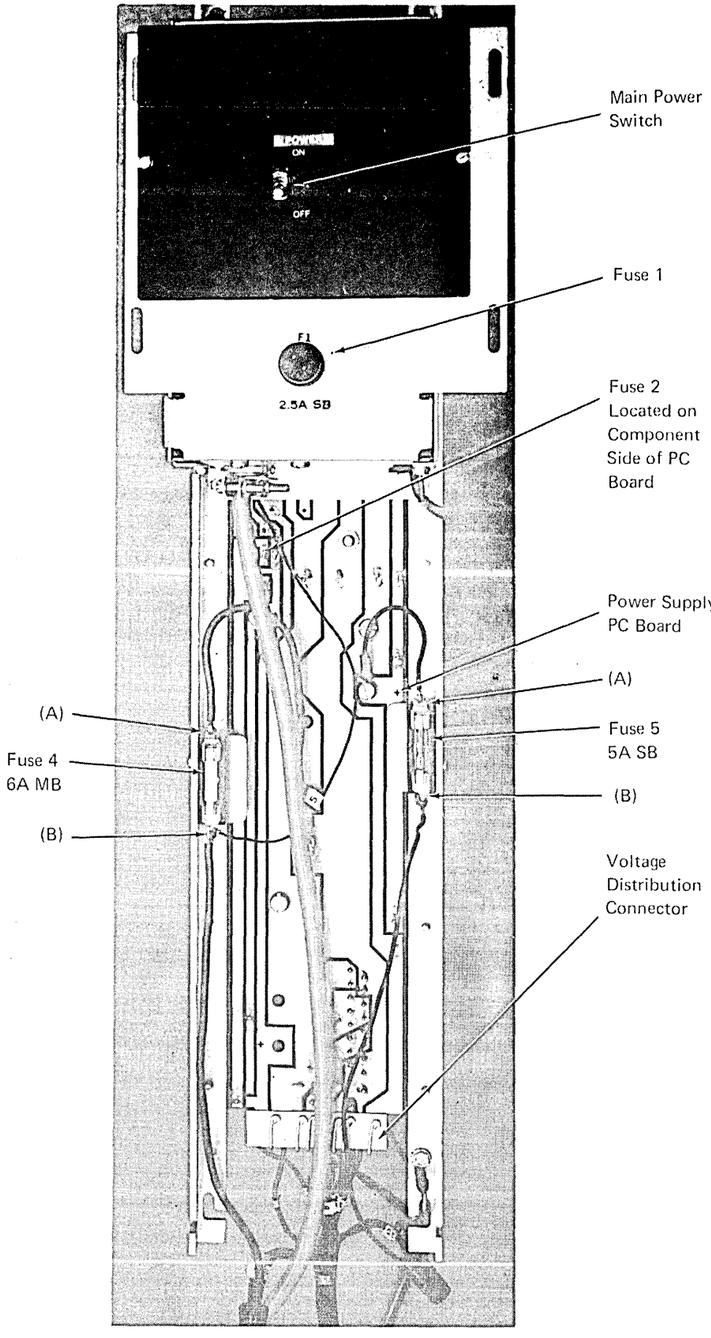


Diagram 6-16. Power and Signal Cable Distribution



(Power Supply)

CE Test Switch Printouts

Note. First character position may vary depending upon last character printed in previous printout.

```
HXXCXEFXXI¢X(XX▮XJKXMXXPQXX$X);XX/SXUXXXYXX,X_)X0XX3X56XX9:X@XX" XXCXEFXXI¢X(XX▮
XABXDXXGHXX.X(+X&XXLXNOXXR!X*XX¬-XXTXVWXXZ X%XX?X12X4XX78XX*X'=XXABXDXXGHXX.X(+X
 ABCDEFGHI¢.<(+▮&JKLMNOPQR!$*);¬-/STUVWXYZ ,%_)?0123456789:#@'=" ABCDEFGHI¢.<(+▮
 ABCDEFGHI¢.<(+▮&JKLMNOPQR!$*);¬-/STUVWXYZ ,%_)?0123456789:#@'=" ABCDEFGHI¢.<(+▮
 XXCXEFXXI¢X(XX▮XJKXMXXPQXX$X);XX/SXUXXXYXX,X_)X0XX3X56XX9:X@XX" XXCXEFXXI¢X(XX▮
XABXDXXGHXX.X(+X&XXLXNOXXR!X*XX¬-XXTXVWXXZ X%XX?X12X4XX78XX*X'=XXABXDXXGHXX.X(+X
 ABCDEFGHI¢.<(+▮&JKLMNOPQR!$*);¬-/STUVWXYZ ,%_)?0123456789:#@'=" ABCDEFGHI¢.<(+▮
 ABCDEFGHI¢.<(+▮&JKLMNOPQR!$*);¬-/STUVWXYZ ,%_)?0123456789:#@'=" ABCDEFGHI¢.<(+▮
X
```

Diagram 6-17. 3284 Model 3, Alphameric Pattern Test Printout

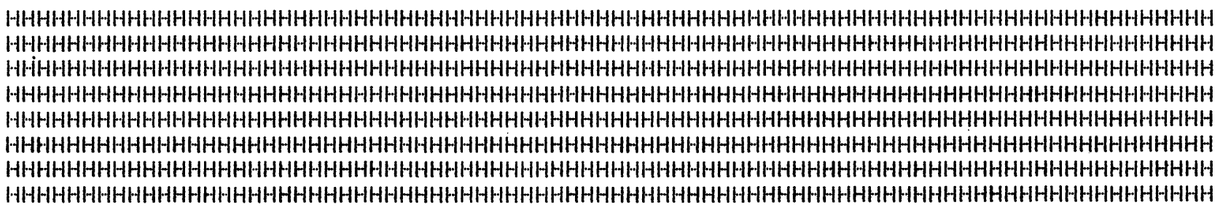
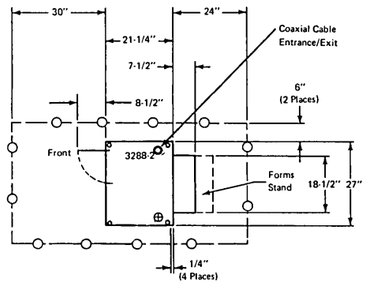
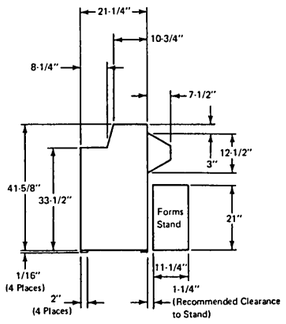


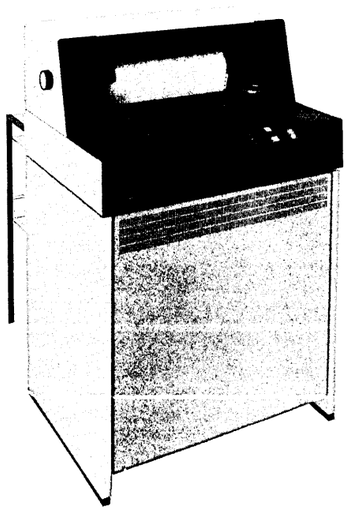
Diagram 6-18. 3284 Model 3, All H Pattern Test Printout

3288 LINE PRINTER MODEL 2 PLAN VIEW





Side View



SPECIFICATIONS

Dimensions:

	F	S	H
Inches	27	21-1/4	41-5/8
(cm)	69	55	106

Service Clearances:

	F	R	Rt	L
Inches	30	24	6	6
(cm)	76	61	15	15

Weight: 280 lb (127 kg)

Heat Output: 1926 BTU/hr (485 kcal/hr)

Airflow: 39 cfm ($2m^3$/min)

Inches	Centimeters
1/16	0,1588
1/4	0,6350
1-1/4	3
2	5
3	8
6	15
7-1/2	19
8-1/4	21
8-1/2	22
10-3/4	27
12-1/2	32
18-1/2	47
21	53
21-1/4	54
24	61
27	69
30	76
33-1/2	85
41-5/8	10

Power Requirements:

kVA	0.60
Phase	1
Nonlocking:	
Plug	H or P&S, 5266
Connector	H or P&S, 5269
Receptacle	H or P&S, 5261 or 5262
Locking:	
Plug	H or P&S, 4723
Connector	H or P&S, 4730
Receptacle	H or P&S, 4700 or 4710
Power Cord Style	A9
Power Cord Length	9 feet (274 cm)

Environment Operating:

Temperature	50° to 105°F (10.0° to 40.6°C)
Rel Humidity	8% to 80%
Max Wet Bulb	80°F (26.7°C)

Environment Nonoperating:

Temperature	50° to 125°F (10.0° to 51.7°C)
Rel Humidity	8% to 80%
Max Wet Bulb	80°F (26.7°C)

3288 LINE PRINTER MODEL 2. INSTALLATION PROCEDURE

Preliminary Procedures

1. Ensure that all shipping material is removed as per shipping instructions.
2. Remove upper cover assemblies as follows: (Diagram 7-1)
   a. Pull out two knobs **1** and open cover **2** .
   b. Remove latch holding screws **3** . Pull latches **4** and lift top section from unit.
   c. Lift out back section **5** .
   d. Remove four screws **6** .
   e. Lift front section **7** .
3. Lower the stop nuts on the print stop screw (Diagram 7-2). (These nuts hold the print unit steady during shipping.)
4. Pull forward on the print unit release lever and open the print unit (Diagram 7-1). The print unit will drop down.
5. Adjust the upper stop nut upward until it touches the bottom of the print unit, then continue to turn the stop nut 3/4 ± 1/4 turn (Diagram 7-2). Tighten the lower stop nut against the upper stop nut.
6. Open front cover by pulling out at the bottom edge of the cover and lifting upward. Check for damage and loose parts. Check seating of all cards and cable connectors.

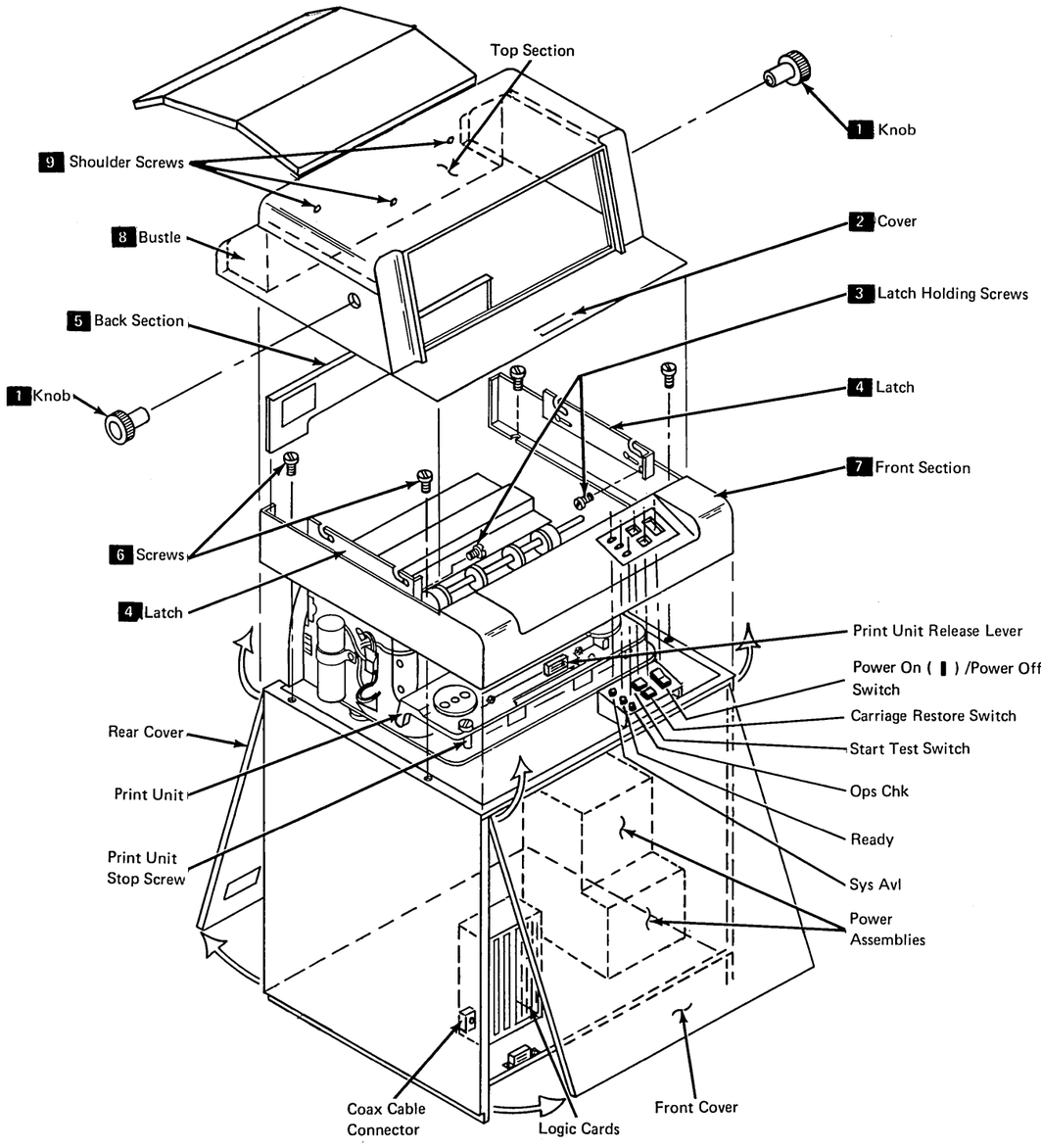


Diagram 7-1. Removal of Top Cover Assemblies

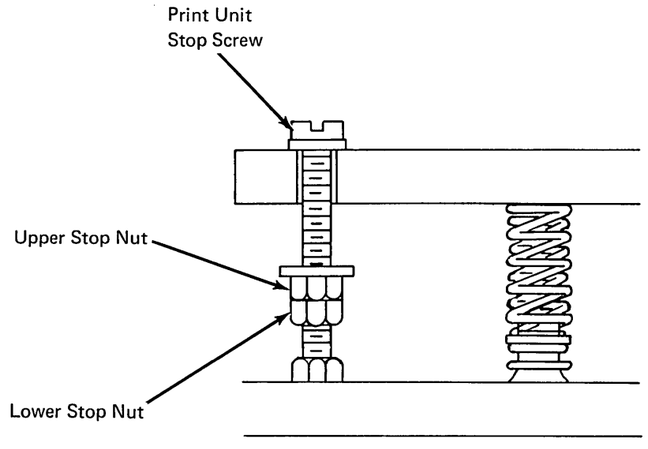


Diagram 7-2. 3288 Print Unit Stop Screw and Stop Nuts

7. Install the type belt as follows (Diagram 7-3):
   a. Pull the type belt release lever 1 toward the front of the unit.
   b. Install the type belt 2 evenly around the top of the pulleys 3 . Make sure that the type belt is positioned between the ribbon shield and the platen 6 .
   c. Using the hole 4 in the pulley 3 , turn the pulley counterclockwise until the belt moves down to positioning rollers 7 located under the platen.
   d. Verify that the print belt does not come in contact with the transducer 5 , as the belt is turned. The transducer will be damaged if the timing marks on the print belt are drawn over the head of the transducer. If transducer adjustment is necessary, refer to the 3288 Troubleshooting Guide.
8. Install the ribbon as follows (Diagram 7-4):
   a. Open the ribbon-drive-release lever 9 . Raise both ribbon guides 1 , 4 .
   b. Lay the cassette 7 down on the printer so that the left end is about 1 inch (25.4 mm) from the ribbon drive rollers 8 . The right end of the cassette will cover the ribbon cassette release button 6 . Pull about 6 inches (15.24 cm) of ribbon out of the left end of the cassette, place the ribbon between the ribbon drive rollers, press down on the cassette, and slide the cassette to the left until it latches.
   c. From the left end of the cassette, feed ribbon through the drive rollers and around the left ribbon guide 1 .
   d. Pull about 12 inches (30.5 cm) of ribbon out of the right end of the cassette. Start feeding ribbon from the left ribbon guide 1 around the right ribbon guide 4 .
   e. Take up any ribbon slack by turning the print belt pulley 3 . When the ribbon is taut, there should be a one-half-turn twist 5 between the cassette and the right ribbon guide.
   f. Lower the ribbon guides.
   g. Turn the pulley again to feed ribbon down between the type belt and the ribbon shield 2 . Continue turning the pulley and check that the ribbon feeds correctly.
   h. Close the print unit by raising the front edge of the print unit, or by pushing the print unit release lever toward the rear of the unit.

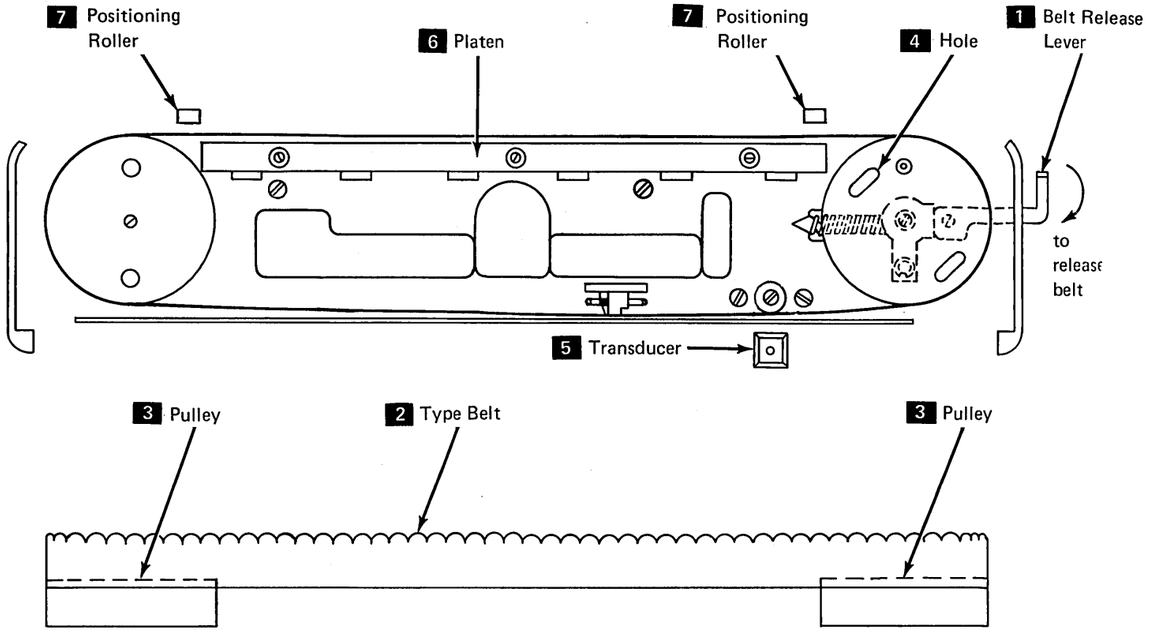


Diagram 7-3. 3288 Type Belt Installation

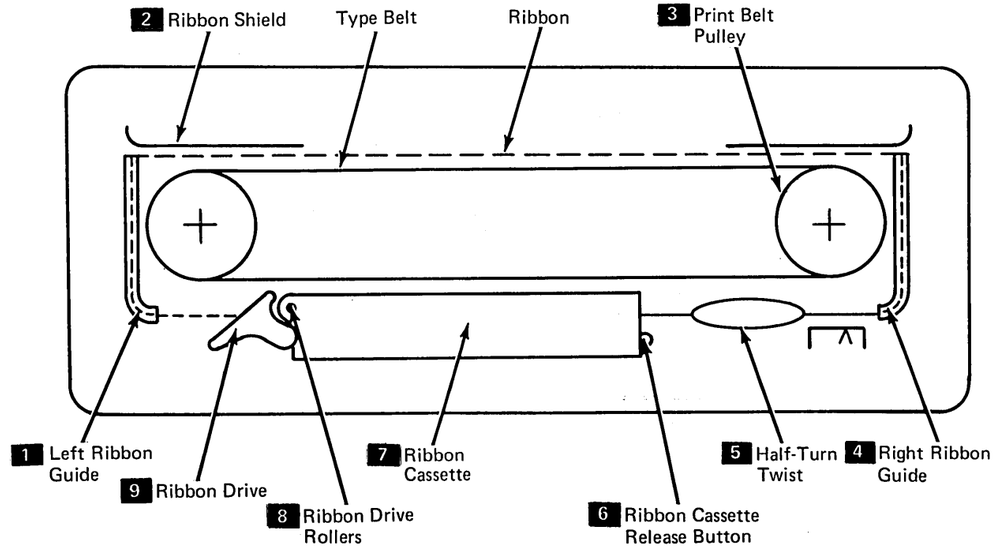


Diagram 7-4. 3288 Ribbon Installation

9. Thread paper forms through unit as follows:
   a. Pull the print unit release lever forward to unlatch the print unit and open the forms path (Diagram 7-5).
   b. Open the forms tractor covers **2** on both sides of the paper path.
   c. From the rear of the printer, slide the rear forms guides **10** apart and feed about 2 feet of forms into the forms chute (Diagram 7-6). Be sure the forms pass under the end-of-forms switch **11** located on the right side of the forms chute or the printer will not print.
   d. Pull the forms up through the printer to the top of the tractor pins. If necessary, adjust the forms tractors to accommodate the width of the forms by squeezing the tractor release levers (**3** , Diagram 7-5) and sliding the tractors left or right.
   e. Align holes in sides of paper to fit the pins on the forms tractors.
   f. Engage paper on tractor pins and close tractor covers **2** .
   g. The forms may now be positioned left or right (if needed) by squeezing both tractor release levers **3** at the same time and moving them left or right to the desired position as indicated on the forms alignment scale **4** . Release the levers to lock the tractors and forms in place.
   h. Close the print unit by pushing the print unit release lever **1** toward the rear of the printer.
   i. Turn the forms advance knobs **5** or **6** to make sure the forms feed properly. Open the upper paper clamp **7** and feed forms through the leading edge of the upper paper clamp.
   j. Set the forms thickness control **8** to match the thickness of the forms installed (or the number of forms used).
   k. From the rear of the printer (Diagram 7-6), slide the rear forms guides **10** in to just touch the edges of the forms.
10. Replace the upper cover assemblies by reversing the procedure in step 2 (Diagram 7-1). Install the bustle **2** by resting it on the supporting shoulder screws **3** .
11. Check that 115V ac is available at the customer's outlet.
12. Check that the power ON/OFF switch is OFF.
13. Insert the 3288 power plug in the customer's outlet.

Offline Check Procedure

1. Turn power on and raise the top cover.
2. Set the CE switch (**13** , Diagram 7-5) to the PRINT PAT position. Verify that the print belt is running, the Ready indicator is lit (Diagram 7-1), and the Ops Chk indicator is flashing. If the Ready indicator is off, check that:
   a. The cover (**2** , Diagram 7-1) is closed.
   b. Paper is installed correctly and is not jammed.
   c. Print unit is closed.

   If Ready remains off, refer to the 3288 Trouble-shooting Guide.
3. Set the MODE switch to the MODE 1 position.
4. Set the VFC switches (**12** , Diagram 7-5) to the desired number of line advances.
5. Press the Carriage Restore switch and check that the paper has advanced correctly.
6. Activate the Start Test switch.
7. Verify that the alphameric test printout is identical to that shown in Diagram 7-7.
8. Set the MODE switch to the MODE 2 position, and press Start Test.
9. Verify that the "All H" test printout is identical to that shown in Diagram 7-8.
10. If the test printouts observed are correct, proceed to the "Online Check Procedure" below. If they are incorrect, refer to the 3288 Troubleshooting Guide.

Online Check Procedure

1. Open the rear base cover by pulling out at the bottom edge of the cover and lifting upward.
2. Feed the coax signal cable from the floor hole through the cutout in the base of the unit and plug the cable into the connector located on the interface panel behind the logic gate.
3. Connect the other end of the coax cable to the proper address connector on the interface panel of the 3271 or 3272 control unit.
4. Place the CE switch in the ON LN position. The Ready indicator should light and Ops Chk should be off. If Ops Chk is blinking, check items a, b, and c in step 2 of the "Offline Check Procedure". If Ops Chk remains on, refer to the 3288 Troubleshooting Guide.
5. To find out what online programs (diagnostics) to run and how to use them, refer to the 3271 or 3272 Troubleshooting Guide.

Note: When programs have been completed, the Sys Avl indicator should remain on.

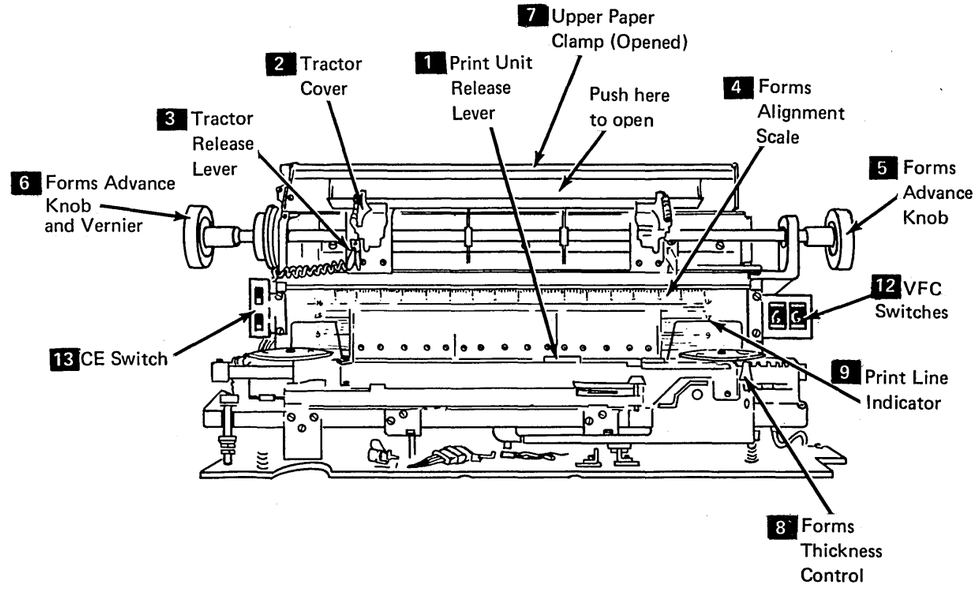


Diagram 7-5. 3288 Print Controls

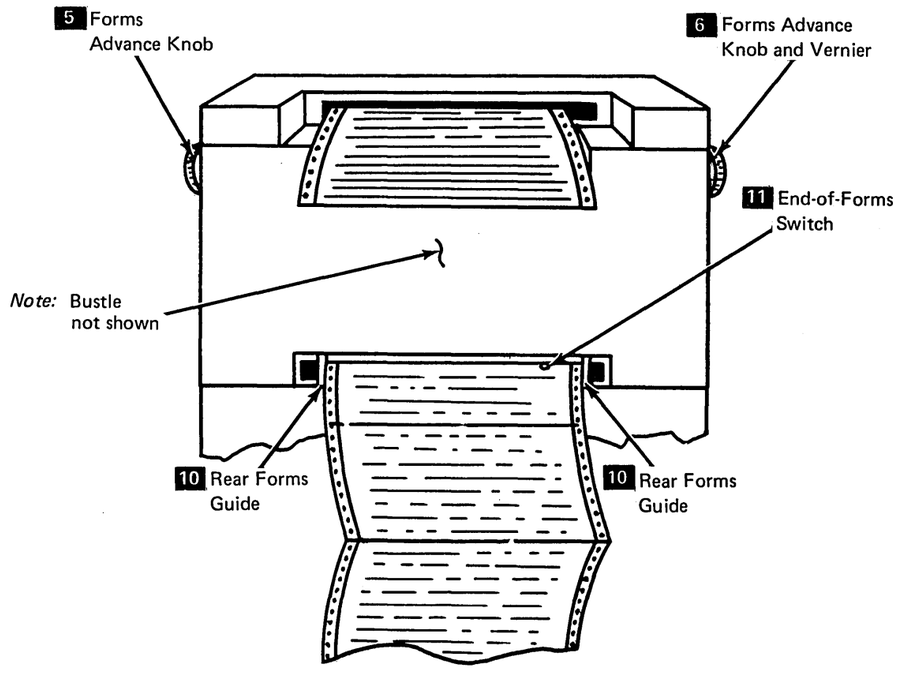


Diagram 7-6. 3288, Rear View

```
 B D F H @ <     K M O Q ! *     S U W Y ¦ %     2 4 6 8 : @     B D F   B D F
XXCXEFXXI@X<XX|XJKXMXXPQXX$X);XX/SXUXXXYXX,X_>XOXX3X56XX9:X@XX" XXCXEFX XXCXEFX
ABCDEFGHI@.<(+|&JKLMNOPQR!$*);¬-/STUVWXYZ¦,%_>?0123456789:#@'=" ABCDEFG ABCDEFG
ABCDEFGHI@.<(+|&JKLMNOPQR!$*);¬-/STUVWXYZ¦,%_>?0123456789:#@'=" ABCDEFG ABCDEFG
 B D F H @ <     K M O Q ! *     S U W Y ¦ %     2 4 6 8 : @     B D F   B D F
XXCXEFXXI@X<XX|XJKXMXXPQXX$X);XX/SXUXXXYXX,X_>XOXX3X56XX9:X@XX" XXCXEFX XXCXEFX
ABCDEFGHI@.<(+|&JKLMNOPQR!$*);¬-/STUVWXYZ¦,%_>?0123456789:#@'=" ABCDEFG ABCDEFG
ABCDEFGHI@.<(+|&JKLMNOPQR!$*);¬-/STUVWXYZ¦,%_>?0123456789:#@'=" ABCDEFG ABCDEFG
 B D F H @ <     K M O Q ! *     S U W Y ¦ %     2 4 6 8 : @     B D F   B D F
XXCXEFXXI@X<XX|XJKXMXXPQXX$X);XX/SXUXXXYXX,X_>XOXX3X56XX9:X@XX" XXCXEFX XXCXEFX
ABCDEFGHI@.<(+|&JKLMNOPQR!$*);¬-/STUVWXYZ¦,%_>?0123456789:#@'=" ABCDEFG ABCDEFG
ABCDEFGHI@.<(+|&JKLMNOPQR!$*);¬-/STUVWXYZ¦,%_>?0123456789:#@'=" ABCDEFG ABCDEFG
 B D F H @ <     K M O Q ! *     S U W Y ¦ %     2 4 6 8 : @     B D F   B D F
XXCXEFXXI@X<XX|XJKXMXXPQXX$X);XX/SXUXXXYXX,X_>XOXX3X56XX9:X@XX" XXCXEFX XXCXEFX
ABCDEFGHI@.<(+|&JKLMNOPQR!$*);¬-/STUVWXYZ¦,%_>?0123456789:#@'=" ABCDEFG ABCDEFG
ABCDEFGHI@.<(+|&JKLMNOPQR!$*);¬-/STUVWXYZ¦,%_>?0123456789:#@'=" ABCDEFG ABCDEFG
 B D F H @ <     K M O Q ! *     S U W Y ¦ %     2 4 6 8 : @     B D F   B D F
XXCXEFXXI@X<XX|XJKXMXXPQXX$X);XX/SXUXXXYXX,X_>XOXX3X56XX9:X@XX" XXCXEFX XXCXEFX
ABCDEFGHI@.<(+|&JKLMNOPQR!$*);¬-/STUVWXYZ¦,%_>?0123456789:#@'=" ABCDEFG ABCDEFG
ABCDEFGHI@.<(+|&JKLMNOPQR!$*);¬-/STUVWXYZ¦,%_>?0123456789:#@'=" ABCDEFG ABCDEFG
 B D F H @ <     K M O Q ! *     S U W Y ¦ %     2 4 6 8 : @     B D F   B D F
XXCXEFXXI@X<XX|XJKXMXXPQXX$X);XX/SXUXXXYXX,X_>XOXX3X56XX9:X@XX" XXCXEFX XXCXEFX
ABCDEFGHI@.<(+|&JKLMNOPQR!$*);¬-/STUVWXYZ¦,%_>?0123456789:#@'=" ABCDEFG ABCDEFG
ABCDEFGHI@.<(+|&JKLMNOPQR!$*);¬-/STUVWXYZ¦,%_>?0123456789:#@'=" ABCDEFG ABCDEFG
X
(Note)                          S U W Y ¦ %     2 4 6 8 : @
                                S U W Y ¦ %     2 4 6 8 : @
                                S U W Y ¦ %     2 4 6 8 : @
                                S U W Y ¦ %     2 4 6 8 : @
                                S U W Y ¦ %     2 4 6 8 : @
                                S U W Y ¦ %     2 4 6 8 : @
```

Note: The additional line with an "X" indicates that the X Error Print feature is installed on the 3288. When the X Error Print feature is not installed, the X does not appear, and the remaining lines in the printout are moved up one line position.

Diagram 7-7. 3288 Printer Model 2 Alphameric Pattern Printout

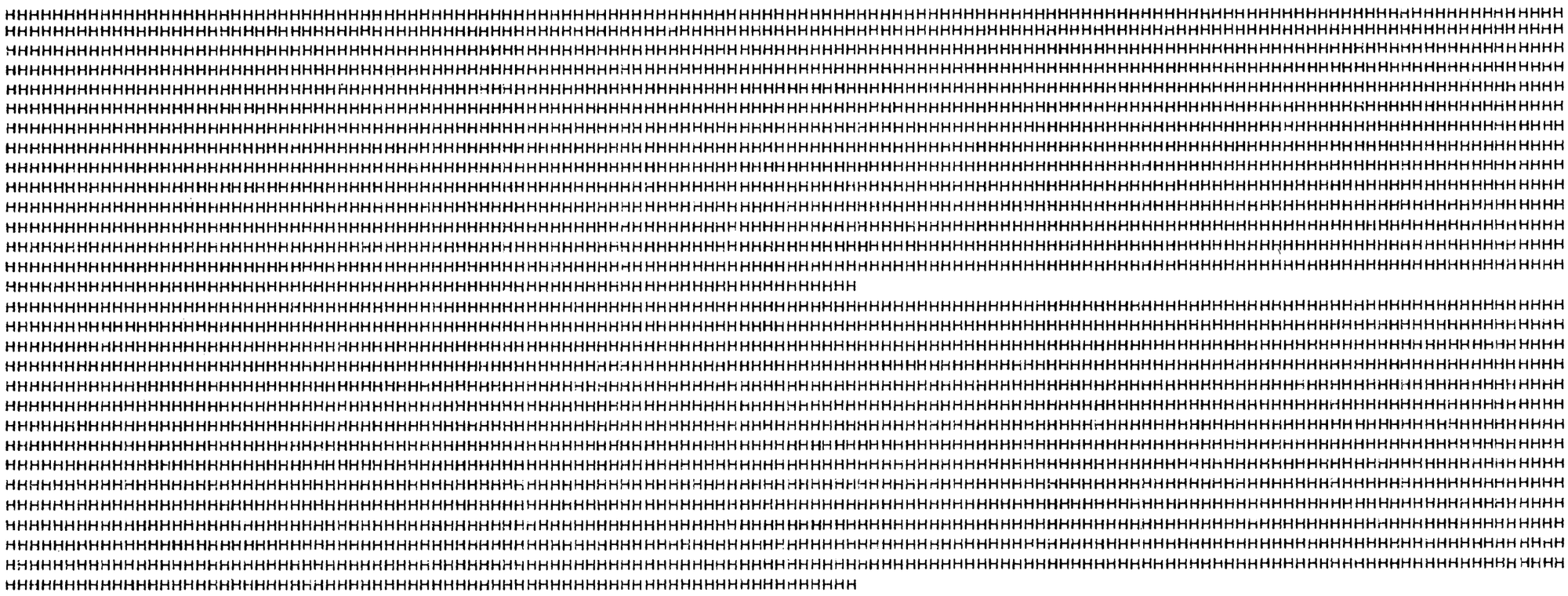
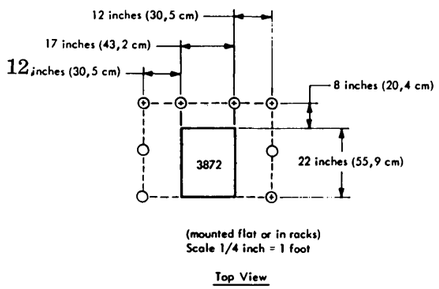


Diagram 7-8. 3288 Printer Model 2 "All H" Pattern Printout

Section 8. IBM Modems Physical Planning and Installation

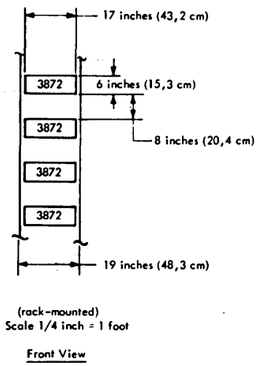
3872 MODEM INSTALLATION PROCEDURES

IBM 3872 Modem Specifications



(mounted flat or in racks)
Scale 1/4 inch = 1 foot

Top View



(rack-mounted)
Scale 1/4 inch = 1 foot

Front View

Dimensions:

	Front	Side	Height
Inches	17	22	6
Centimeters	43,2	55,9	15,3

Service Clearances (mounted flat or in racks):

	Right	Left	Rear	Above (mounted in standard racks)
Inches	12	12	8	8
Centimeters	30,5	30,5	20,4	20,4

Weight: 50 lbs; (22,68 kg)

Heat Output: 185 Btu/hr (46.6 kcal/hr)

Air Flow: Natural convection only. A clearance of at least 2 inches (5,08 cm) is required at the sides and at the rear, for cooling.

Environment:

	Temperature (dry bulb)	Temperature (wet bulb)	Humidity
Power On	50°–110°F (10°–43.3°C)	85°F (29.4°C) max.	8%–80%
Power Off	50°–125°F (10°–51.6°C)	85°F (29.4°C) max.	8%–80%
Shipment	–40°140°F (–40°–60°C)		5%–100% *

*Condensation, not precipitation or immersion

Power Requirements:

	60 Hz	50 Hz
Volts	100, 115, 200, 208, or 230	100, 110, 123.5, 200, 220, or 235
kVA	0.06	0.06
Phase	1	1
Branch Circuit (amperes)	15	15

Nominal current (amperes): 0.67 at 115V

Power cord length: 8 ft. (2,432m) (Power cord only in World Trade countries, "skinned and tinned")

Power Cord (World Trade):

3 AWG No. 18 conductors, 0.04 inches (0.1 cm) in diameter
0.374 inches (1.0 cm) outside diameter of the cable

Power Cord Plug (USA only):

	Nonlocking		Locking	
Volts	115	208/230	115	208/230
Plug	5266	5666	4720	4771
Connector				
(in-line)	5269	5669	4730	4780
(single)	5661	5661	4710	4760
Receptacle				
(duplex)	5262	5662	4700	4750

Note: All connectors are Hubbell or Pass & Seymour (or equivalent) except 5666, which is Hubbell (or equivalent).

Cables and Plugs:

Cables from DTE are provided by the DTE supplier. Each modem or ACO has a standard 25-pin receptacle, described by EIA RS-232-C, to accept these cables.
Cables to line access are provided with the 3872 Modem.
Dedicated line or CDT Data Access Arrangement (or equivalent manual access arrangement) in USA—terminates in male plug, type 283B or equivalent (user must arrange for receptacle 549A or 404B surface-mounted or 493A flush-mounted with the channel supplier).
Dedicated channel is World Trade countries—terminates in spade lugs.
CBS Data Coupler (or equivalent automatic access arrangement) in USA (with ACO or AA)—terminates in spade lugs at DAA. Connects to 3872 by the standard 25-pin connector and receptacle described in EIA RS-232-C.

Exclusions:
1. The 3872 does not have a convenience outlet.
2. Marginal checking is not provided and should not be attempted.
3. Rack mounting is the customer's responsibility. Mounting hardware is not provided with the 3872.

Communications Channel Specifications

With dedicated voice-grade channel service, the 3872 Modem requires a communications channel of FCC Tariff 260-type 3002 channel with C1 conditioning. In addition, the characteristics of the required channel include those specified in the Bell System administrative guidelines, as described in Bell System Data Communications Technical Reference PUB41004, *Transmission Specifications for Voice Grade Private Line Data Channels* (March 1969). Duplex or half-duplex operation and two-wire or four-wire connection must be stipulated; a DAA (data access arrangement) must be obtained from the channel supplier.

The 3872 is also designed to operate on public switched network channels in the USA and Canada. The characteristics of a switched network channel in the USA are described in Bell System Data Communications Technical Reference PUB41005, *Data Communications Using The Switched Telecommunications Network* (May 1971). Refer to the notice "To The Reader", at the front of this manual, for the address from which these publications may be obtained.

Duplex switched network data channels are available in some parts of the USA and Canada. Consult the communications channel supplier about the availability of this type of channel.

With switched network facilities, the DAA (data access arrangement) procured from the common carrier should be specified for a "type II loop". The DAA will include a telephone set and will be marked with the proper transmit level. The type II loop is described in the Bell publication PUB41005, referred to above.

MODEM CHARACTERISTICS SIGNIFICANT TO THE COMMUNICATIONS CHANNEL SUPPLIER

Input or output impedance—600 ohms
Modulation technique—four-phase differential phase shift keying (DPSK).
Receiver sensitivity threshold—On at -4dBm (+1dBm)
Off at -43dBm
Transmit Level—for data, 0dBm, variable by strapping in 1dB steps to -15dBm; for answer tone, 0dBm, variable by strapping in 1dB steps to -10dBm.

Note: Transmit level in the USA and Canada for common-carrier dedicated lines is 0dBm. In other cases, transmit level is specified by the communications facilities supplier. In the USA, switched network transmit level is individually marked on the DAA.

Dialing signals (ACO)—pulse mode; consult the common carrier about applicability.

STRAPPING OPTIONS

Refer to "Modem Characteristics Significant to the Communications Facilities Supplier" and to "Using Machine

Options" under "Interface", preceding, for strapping options not described here.

Automatic Call Delay - strapping provides options of 20, 40 or 60 seconds for an automatically originated call to be answered.

Blind Dial - this strap replaces recognition of dial tone with a delay. Dialing proceeds when the delay times out.

EON/SEP - this strap adds these two dial characters. The use of EON and SEP is recommended for reliable operation.

Two-wire/Four-wire - adapts the modem to the selected communications channel service. Switched network is usually two-wire, half-duplex; multipoint is always four-wire duplex. Point-to-point dedicated configurations have three options; two-wire half-duplex, four-wire half-duplex, and four-wire duplex. Each succeeding facilities option has a shorter turnaround and a higher throughput.

3875 MODEM INSTALLATION PROCEDURES

Physical Installation

The 3875 may be free standing on four rubber feet fitted to its base. The location must give the operator complete access to the control panel. On no account must the cooling be affected by restriction of the air flow into or out of the 3875.

For servicing purposes, access must be provided for cover removal, and to permit the 3875 to be turned on its side. Service clearances are given below.

CAUTION
Under no circumstances must the 3875's be stacked (one on top of the other). However, when 3875's are placed on shelves the customer must provide space for air circulation and the possibility of moving the unit to meet service clearances. Cables must remain connected.

Dimensions

	Width	Depth	Height
Inches	17	22	6
Centimeters	43	55	15

Service Clearances

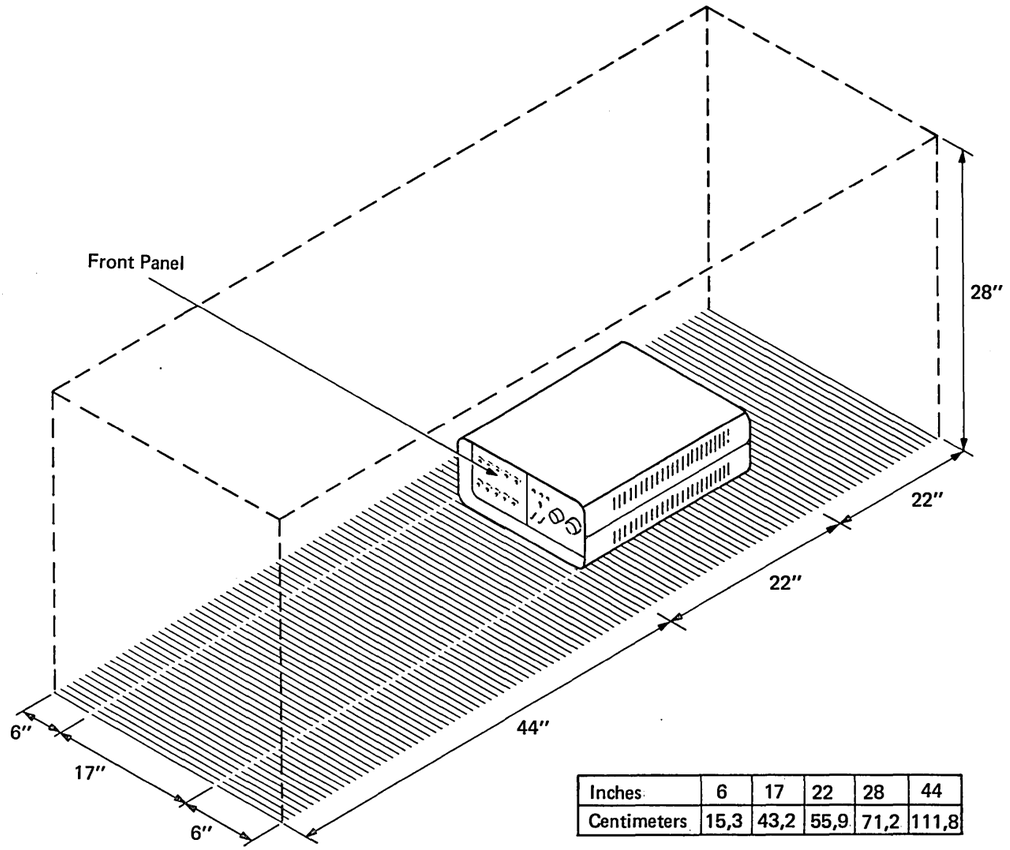
Given in Figure 18.

Weight (Maximum with All Features)

lb	62
kg	28

Heat Dissipation

BTU/hour	1000
K cal/hour	252



Inches	6	17	22	28	44
Centimeters	15,3	43,2	55,9	71,2	111,8

External Power Supplies

Voltage
60 Hz 100V, 115V, 200V, 208V, 230V
50 Hz 100V, 110V, 123.5V, 200V, 220V, and 235V

Voltage tolerance	± 10%
Phase	Single
Frequency tolerance	±0.5 Hz
Power consumption	250 VA at the rated voltages

Environmental Requirements

Temperature	50° to 100°F (10° to 44°C)
Relative humidity	8 to 80%
Barometric pressure	29.9 to 23.1 in. (759,5 to 586,7 mm) of mercury; this is equivalent of from sea level to 7000 ft (2134m).

Cooling

Provided by a blower.

Connector and Cable Locations

The positions of the sockets and cables used to connect the 3875 to the DTE and telephone lines are shown in Diag. 8-1.

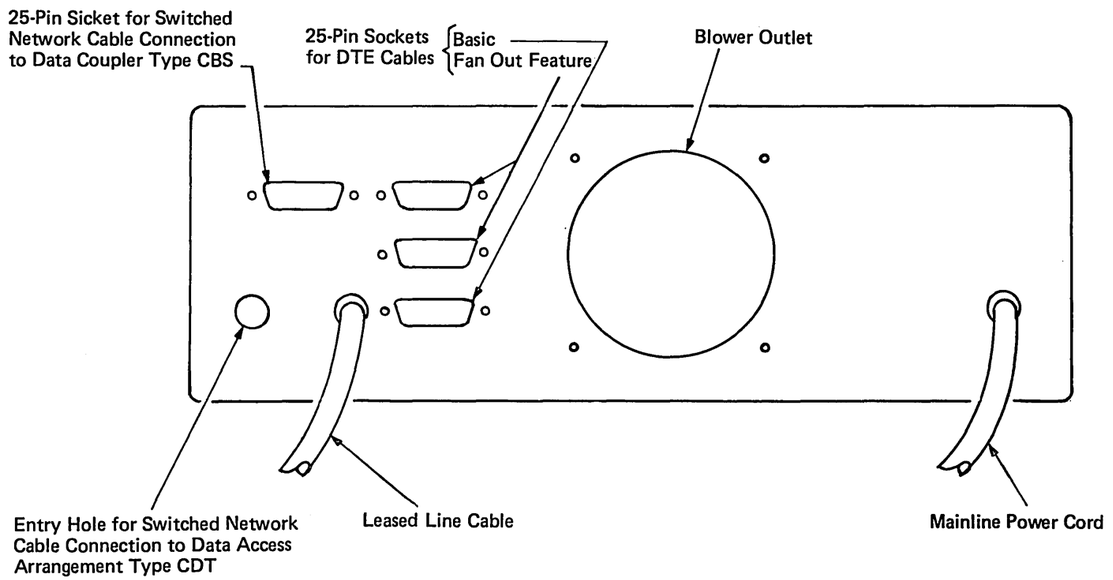


Diagram 8-1. Back Panel of 3875 [09086]

Data Terminal Equipment Connector

On the basic 3875 a 25-pin female connector (Part 5302663; Diag. 8-2) provides for the connection to the DTE; the data terminal interface cable and its male connector must be provided by the DTE. This cable and its associated driving and terminating circuits must meet CCITT Recommendation V24 and EIA Standard RS 232 C. When the fan out feature is installed, two additional connectors are provided (see Diag. 8-1).

Mainline Power Cord and Telephone Line Cables

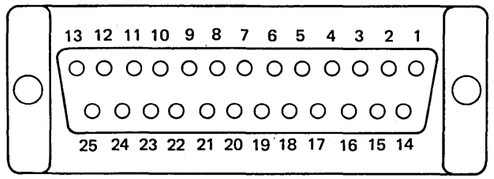
Details of the mainline power cord and the telephone line cables provided with the modem are given in Diag. 8-4.

Leased Line: An FCC* tariff 260 Type 3002 channel with C-2 conditioning or a line with specifications meeting the CCITT Recommendation M102 must be provided for leased line operation. These characteristics are to be obtained between any transmitter and its corresponding receiver of a point-to-point or a centralized multipoint network.

Particular conditions (for example, phase jitter or non-linear distortion) that are not specified by the above references are not usually found at high enough levels on

*Federal Communications Commission

Pin Locations



Pin Assignments

Pin No.	Signal Name
	Basic Modem
1	Protective Ground
2	Transmitted Data
3	Received Data
4	Request to Send
5	Ready for Sending (Clear to Send)
6	Data Set Ready
7	Signal Ground
8	Received Line Signal Detector
15	Transmitter Signal Element Timing
17	Receiver Signal Element Timing
18	Test
23	Data Signaling Rate Selector
	With Switched Network Feature
11	Select Standby
20	Data Terminal Ready
22	Calling Indicator (Ring Indicator)

Diagram 8-2. Data Terminal Equipment Interface [09087]

such lines to affect the operation of modems at medium speed.

Switched Network: For switched network operation, the customer must obtain from the Common Carrier a Data Coupler Type CBS or a Data Access Arrangement Type CDT. The customer should tell the Common Carrier that this line will be used for transmission at 3600 bps. At this speed, the US Common Carriers will provide special conditioning type 2 on the circuit from the customer's facility to the telephone office (local loop).

Telephone Handset

The telephone handset is not provided with the 3875. Any PTT- or Common Carrier-approved unit is suitable, provided it is of a type in current use with the following characteristics:

- Carbon microphone
- Conventional receiver (permanent magnet)
- Three-wire connection (microphone, receiver and common).

Additional telephone jack plugs may be obtained from IBM.

STRAPPING OPTIONS

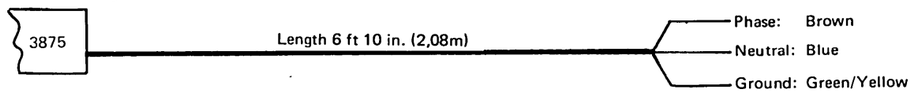
To assist in selecting the correct type of modem operation, the various strapping options are given.

Function	Adjustment Range	Purpose	Remarks
Transmission Level	0 dBm to –30 dBm in 1 dB steps	Obtains correct transmission level	Maximum permissable output is specified by PTT. Adjustment is made at installation
Resynchronization controlled by modem (RE-SYNC position) or by DTE (NO RE-SYNC position)		To select appropriate resynchronization circuits	RE-SYNC must be used when DTE is incapable of initiating resynchronization by 'request to send' NO RE-SYNC can be used when DTE is capable of initiating resynchronization by 'request to send'
Resynchronization Timeout	360 ms or 1.5s	Provides a timeout in a point-to-point configuration, in which the 'synchro pattern' must be received from the modem at the other end	Timeout is only applicable with RE-SYNC strap 1.5s timeout is usually used for transmission via satellite
Drop of 'ready for sending'		Informs DTE that resynchronization is taking place in the modems	Only applicable with RE-SYNC strap 'Ready for sending' is off until resynchronization is re-established
'Request to send' on permanently		Avoids turnaround times in point-to-point configurations with terminals that activate 'request to send' only when transmitting	Can be used with the fan out feature
Multipoint Control (strap set to CONTROL)		Bypasses the receive equalizer, if installed, and activates appropriate resynchronization circuits if RE-SYNC strap is used	
Multipoint Tributary (strap set to TRIBUTARY)		Activates the transmit equalizer and the appropriate resynchronization circuits if RE-SYNC strap is used	
Answer Back Inhibit on Multipoint		Inhibits return buzz when call switch is operated on calling modem	Must be used on all tributary modems except one to prevent mixing of several responses May be used at control station to prevent outbound lines from being disturbed
Signal Ground to Frame Ground		Grounding assurance	

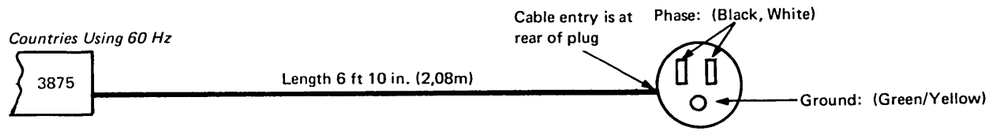
Diagram 8-3. Strapping Options [09084]

Mainline Power Cord

Countries Using 50 Hz

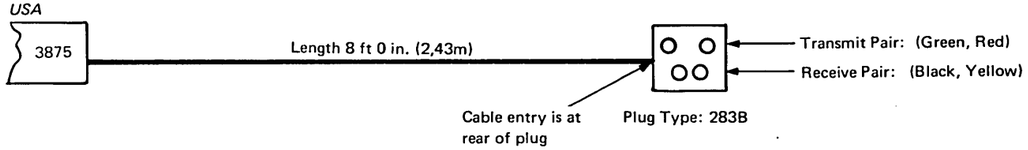


Countries Using 60 Hz

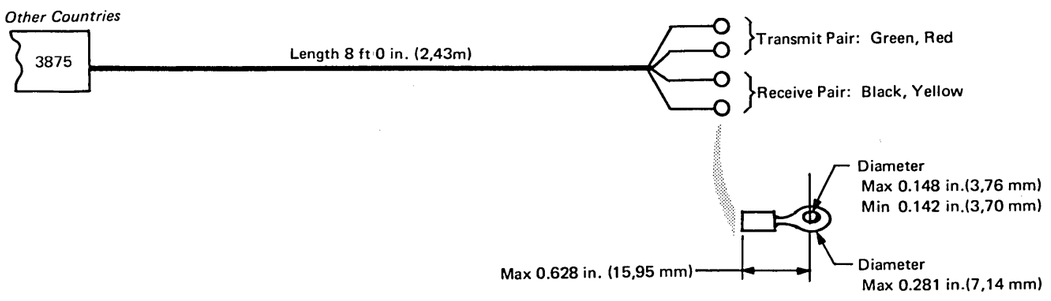


Leased Line Cable

USA

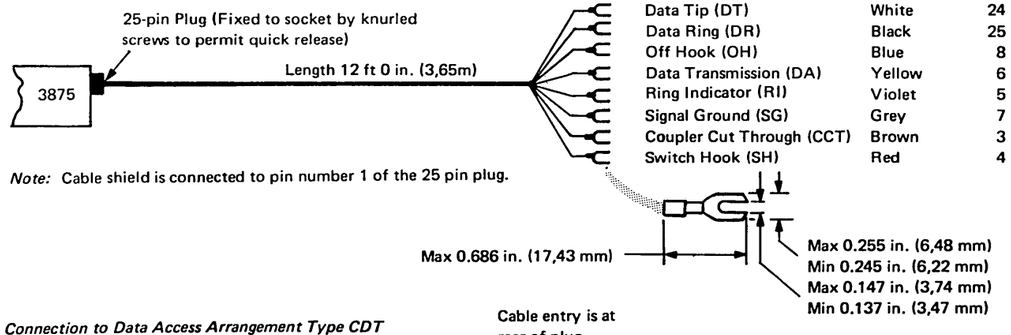


Other Countries



Switched Network Cable (USA only)

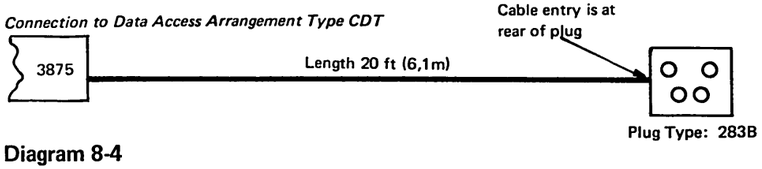
Connection to Data Coupler Type CBS



	Colors	*Pin Number of 25 pin Plug*
Data Tip (DT)	White	24
Data Ring (DR)	Black	25
Off Hook (OH)	Blue	8
Data Transmission (DA)	Yellow	6
Ring Indicator (RI)	Violet	5
Signal Ground (SG)	Grey	7
Coupler Cut Through (CCT)	Brown	3
Switch Hook (SH)	Red	4

Note: Cable shield is connected to pin number 1 of the 25 pin plug.

Connection to Data Access Arrangement Type CDT



Important Notice:

The customer is responsible for making the connection of IBM external cables, at the signal interchange point, to a customer's or a vendor's communication equipment.

Diagram 8-4

3875 Physical Planning, Installation, and Alignment (Sheet 3 of 3)

4872 MODEM, MODEL 1, INSTALLATION PROCEDURES

Selecting Modem Location

Selecting a modem location usually hinges on the customer's preferences. A location near the digital equipment is advantageous because it simplifies the digital interface and allows the digital equipment operator to monitor the modem operations. A location as far as 50 feet (maximum digital equipment cable length by EIA standards) from the digital equipment could be selected with the idea of combining or grouping similar functions, such as message control, communications, and teleprocessing. Connect the modem to a 115 vac outlet capable of delivering 70 watts in addition to all other loads connected. Avoid hot spots in the room, such as those near heating vents or in full sun. Avoid areas near heavy-duty electrical equipment producing power transients and static transients, as in arc welding equipment.

Rack Installation

The 4872 Modem may be rack-mounted by use of an optional rack mount adapter. The adapter is a standard 19-inch panel with a frame to hold the modem. Customer-provided slides are bolted to the rack mount adapter to provide easy pull-out access to the modem.

Installation, Checkout, and Maintenance Procedures

The installation procedure is to be performed at the initial modem installation, which is followed by the modem (Analog Loop) self-test procedure and the system equalization and alignment check.

A new modem location that provides a different 115 vac power source or digital equipment interface connection requires performance of Steps 4 and 7 of the installation procedure.

A different telephone line connection requires performance of the system equalization and alignment check.

Corrective maintenance can be guided by the malfunction analysis flowchart (Figure 2-5).* This flowchart indicates test points to be observed with an oscilloscope. Waveform photographs are illustrated in Chapter 6* and are to be compared with the observed waveform. Where waveform anomalies are observed, corrective action is suggested in the flowchart.

Corrective action includes card replacement and modem alignment (Chapter 3).*

The modem (Analog Loop) self-test and the system equalization and alignment check procedures are used in corrective action followup.

Additional troubleshooting aids (provided in Chapter 8)* are the transmitter detailed block diagram (Figure 2-10)* and receiver detailed block diagram (Figure 2-11).* ALD page numbers are referenced in Figures 2-10* and 2-11* and in the malfunction analysis flowchart, Figure 2-5.*

Installation Procedure

Note: After unpacking, remove the bottom cover (refer to Chapter 5)* and ensure that each SLT card and cable paddle card is securely seated.

1. Make certain that the POWER switch is in the OFF position and that the power outlet to which the modem is to be connected is a 115 vac, 60 Hz source. The modem typically consumes 70 watts.
2. Connect the interface cable from the terminal equipment to a flush-mounted receptacle on the rear of the modem.
3. Connect the 14-foot cable with the four-pronged connector on the rear of the modem to the telephone line receptacle.
4. Make certain that the digital equipment and modem have a common power ground. A third wire in the 115 vac line is a common power ground.
5. Connect the 6-foot power cable on the rear of the modem to the power outlet.
6. Remove the top cover to expose the control/meter panel and set the MODE switch to OPR, the TRANSMIT switch to DATA, and the METER switch to SGL QUAL.
7. One ground strap on the power supply connects signal ground to chassis ground. Some modem installations may perform best (less data errors) with the ground strap disconnected. This "optional" strap is illustrated in Chapter 4 (Figures 2-9 and 2-10).*

One way to observe an input quality difference, if it exists, is to have a pattern sent from the digital equipment to the modem. With the modem POWER switch to ON and the top cover removed (refer to Chapter 5* for removal procedures), observe the input signal at pin location N1B03. The input signal should have its positive and negative excursions equal distance from zero reference. If the distance is not equal (asymmetrical), disconnect the ground strap and observe the input signal. Position the ground strap according to the best signal reference.

Modem (Analog Loop) Self-Test Procedure

The modem self-test procedure provides a positive indication of modem failure. It does not, however, prove conclusively that the modem is operating properly, because it does not check the digital and analog interfaces, the susceptibility to noise, or the line equalizers. It also does not fully exercise the design limits of the timing recovery circuits, because the basic transmitter and receiver timing is derived from a common oscillator. This procedure does, however, indicate most failures and is useful as a quick check that repair has been accomplished satisfactorily.

*See 4872 Modem - Model 1 Theory - Maintenance Manual.

Refer to Figure 2-1* for the control panel illustration and to Diag. 8-6 for the self-test configuration. Proceed as follows:

Note: The top cover must be removed to gain access to the control panel. (Removal instructions are in Chapter 5.)*

1. Set the POWER switch to ON.
2. Set the MODE switch to ANLG LOOP.
3. Set the METER switch to SGL QUAL.
4. Set the TRANSMIT switch to TONE.
5. Observe that the DATA CHECK light flashes.
6. Set the TRANSMIT switch to PATT. Observe that the DATA CHECK light does not flash and that the meter indicates zero. If these conditions are not met, proceed with the diagnostic procedures, Section 2.4.*
7. Position the METER switch to LEVEL and observe a midscale (100±5) reading.
8. Position the METER switch to SGL QUAL and observe that the DATA CHECK light is extinguished and that the meter indicates less than 5. If the meter does not work, replace the meter amplifier cord G3.
9. If the preceding requirements (Steps 5, 7, and 8) are not met, align the modem as described in Chapter 3.* If alignment fails to correct the malfunction, proceed with the malfunction analysis in Section 2.4.*

System Equalization and Alignment Check

Note 1: Performance of the procedure in Section 2.2* is prerequisite to the equalization procedure.

Note 2: Local and distant modems may be equalized sequentially or simultaneously.

Equalization Procedure (Refer to Diag. 8-7.)

1. Position the MODE switch to OPR.
2. Request the distant modem operator to transmit a test pattern by selecting the PATT position of the TRANSMIT switch. The distant modem MODE switch must be positioned to OPR or ANLG LOOP. All other distant modem controls have no effect on local modem equalization and alignment.
3. Place the METER switch to LEVEL and adjust the LEVEL control until the meter indicates 100.

Carrier Phase Equalizations

4. Place the METER switch to EQL, and set the LOW FREQ and HIGH FREQ switches to the OFF position.
5. Adjust the CARRIER PHASE control very slowly (the meter is highly damped) to obtain the lowest value on the meter and note the reading.
6. Adjust the LEVEL control to reduce the meter reading to its lowest value.
7. Place the HIGH FREQ switch to each of the other positions, and repeat Steps 5 and 6 for each position.
8. Place the HIGH FREQ switch to the position in which the lowest value was obtained and readjust the CARRIER PHASE control for the lowest meter reading.
9. Set the LOW FREQ switch to each of the other positions, and repeat Steps 5 and 6 for each position.
10. Place the LOW FREQ switch to the position in which the lowest value was obtained and readjust the CARRIER PHASE control for lowest value meter reading.
11. Adjust the LEVEL control for a minimum value meter reading. A meter indication of less than 50 is typical, but each installed modem has an individual norm and failure level. The failure level should be established during installation and referred to during maintenance for a measure of operational degradation.

    To establish and check the failure level, observe the DATA CHECK indicator and increase the meter indication with the RCVR LEVEL control until the indicator blinks more frequently than once a minute. Record the meter indication. Reposition the LEVEL control for a minimum meter indication. Repeat the failure level check with the RCVR CARRIER control.

Pilot Phase Adjustments

12. Place the METER switch to the SGL QUAL position.
13. Rotate the PILOT PHASE control back and forth slowly to locate the lowest value on the meter. The lowest value may be noted in the midrange and at the end of the control rotation. Select the midrange lowest value.
14. Set the PILOT PHASE control halfway between the positions where the meter indicator just rises from the lowest value.
15. Adjust the LEVEL control once again to obtain the lowest value.

Telephone Line Alignment Checks

16. Position the MODE switch to OPR and the TRANSMIT switch to PATT for both modems. Both local and distant operators observe the DATA CHECK lamp for about 6 minutes. If it illuminates more than once per minute, trouble with the telephone lines or modem maladjustment is indicated. Correct before proceeding. The modem alignment procedure is in Chapter 3,* and the diagnostic flowchart is in Section 2.4* if needed for modem adjustment.

* See 4872 Modem - Model 1 Theory - Maintenance Manual

System Operation Check

17. Prerequisites to the system operational check for both local and distant modems are the following:
    a. System equalization and alignment procedure complete.
    b. Applicable switches positioned to OPR, DATA, and SGL QUAL.
    c. Operate lamp is illuminated.

    Request the local and distant digital equipment operators to run a system evaluation test (refer to Diag. 8-5).

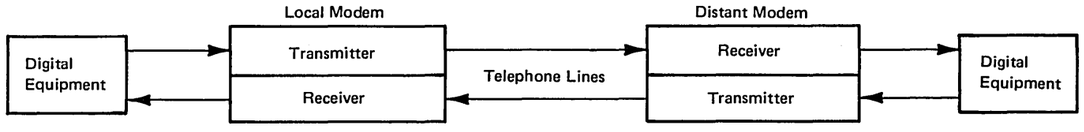


Diagram 8-5. Operational Configuration

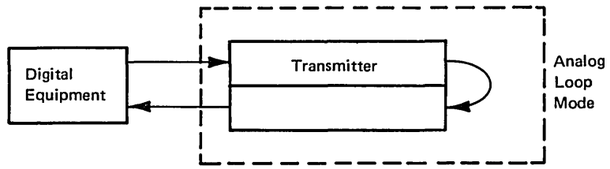


Diagram 8-6. Modem Self-Test Configuration

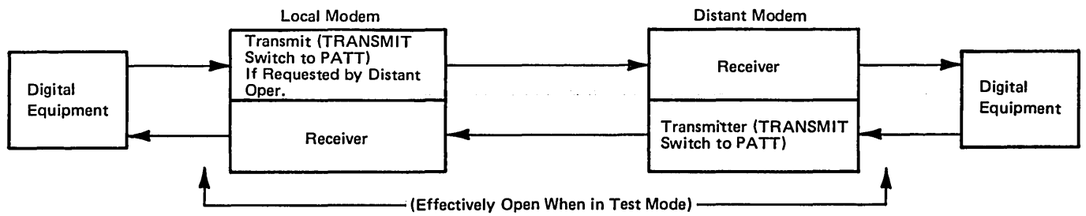


Diagram 8-7. Equalization Configuration

4872 MODEM, MODELS 2 AND 3, INSTALLATION PROCEDURES

This section defines the parameters for use in planning the installation of the IBM 4872 Modem.

Location

The modem is available in either a desk-top or a rack-mounted model. The rack-mounted model fits standard 19-inch RETMA racks and permits use of any one of several manufacturer's slides (including tilt-type slides).

Environment

Temperature Range:	50°F to 110°F (10°C to 43.5°C)
Humidity Range:	8% to 80% normal
Altitude:	Sea level to 7000 feet (0 to 2134 meters)

Cabling/Connectors

Both power and signal cable connections are made on the rear of the modem. A standard 6-foot, three-wire molded power cord is provided. Interface cables (customer provided) must be in accordance with EIA-RS-232-B and must have a connector to attach to a flush-mount receptacle (Cannon Electric Co. DB 19604-433-0, IBM P/N 385951). Attachment to the telephone channel is through a 14-foot cable with an attached four-prong connector (IBM P/N 341200). This will connect with a Western Electric 404B surface-mount or a Western Electric 483A flush-mount receptacle. For modems with the Fanout feature, see Chapter 5, "Cable Adapter."

Should it be necessary to remove the IBM connector (P/N 341200) in order to make connection on a terminal board, the wires should be mated as follows (note that there are two alternate color code configurations in the IBM cable):

	IBM	Telephone Co.
Transmit Pair (wide pins on connector)	White-Black or White-Green	Red-Green
Receive Pair (narrow pins on connector)	Red-Blue or Red-Black	Black-Yellow

Electrical Power Requirements

Voltage:	115 vac
Tolerance:	10%
Frequencies:	60 ± 0.5 Hz
Power Consumption:	70 watts

Overload protection is provided inside the modem enclosure.

The modem and the computer it is serving must have a common ground.

Telephone Line Requirements

Common Carrier Leased Private Telephone Line—Type 3002, C2 conditioned.

Privately Owned Communications Facilities—The facility must be equivalent to a Type 3002, C2 conditioned line.

Attenuation:	16 db ± 1 db at 1000 Hz
Frequency Response:	300 to 3000 Hz, -2 to +6 db; 500 to 2800 Hz, -1 to +3 db (attenuation relative to 1000 Hz response)
Frequency Translation:	± 5 Hz
Envelope Delay Distortion:	1000 to 2600 Hz, less than 500 microseconds; 600 to 2600 Hz, less than 1500 microseconds; 2800 Hz, less than 2000 microseconds
Noise	Impulse noise 15 counts in 15 minutes, -72 dBrn 0 vb; message noise, "C" weighting less than 52 dBrnCo

MODEM TEST

There are two test configurations that are useful for fast checks of the modems and the telephone lines; the Analog Loop test and the Digital Loop test.

Analog Loop Test

The Analog Loop test provides a positive indication of modem failure and may be used to verify operation of an individual unit. The test does not, however, prove conclusively that the modem is operating properly, because it does not check digital or analog interfaces, equalizers, or susceptibility to telephone line noise. The same procedure may be used for Model 2 and Model 3.

1. Set the POWER switch to ON.
2. Set the MODE switch to ANLG LOOP.
3. Set the METER switch to SGL QUAL.
4. Set the TRANSMIT switch to TONE.
5. Observe that the DATA CHECK indicator flashes.
6. Set the TRANSMIT switch to PATT.
7. Observe that the DATA CHECK indicator does not flash and that the meter indicates approximately 10 or less.
8. Set the METER switch to LEVEL.
9. Observe a midscale, approximately 100, reading on the meter.

If any or all of the conditions in Steps 5, 7, and 9 are not met, maintenance is required.

Note: Do not switch any remote modem to ANLG LOOP without first disconnecting the modem from the telephone line to avoid interrupting the remaining multipoint system.

Digital Loop Test

Digital Loop test should be performed following Analog Loop test. Digital Loop test is used primarily to verify the ability to communicate via telephone lines. This test also exercises additional circuits within the modem, which cannot be checked in Analog Loop. The test should be performed using the master and each remote modem, in turn, following this procedure:

1. Position the switches on the master modem as follows:
   a. Set the POWER switch to ON.
   b. Set the MODE switch to DGTL LOOP.
   c. Set the TRANSMIT switch to DATA.
   d. Set the METER switch to SGL QUAL.
2. Position the switches on the selected remote modem as follows:
   a. Set the POWER switch to ON.
   b. Set the MODE switch to OPR.
   c. Set the TRANSMIT switch to PULSE.
   d. Set the METER switch to EQL.
3. Observe that the DATA CHECK indicators on both units flash.
4. Set the TRANSMIT switch on the remote modem to PATT.
5. Observe that the DATA CHECK indicators are extinguished on both units.

   Note: If the conditions in Steps 3 and 5 are not met, perform the alignment procedure in Chapter 7 and repeat Digital Loop test. If the alignment procedure does not correct the defective condition, maintenance is required.

6. If the conditions in Steps 3 and 5 are met, the Digital Loop test should be run in reverse with the same two modems.
7. Position the switches on the master modem as follows:
   a. Set the MODE switch to OPR.
   b. Set the TRANSMIT switch to PULSE.
   c. Set the METER switch to SGL QUAL.
8. Position the switches on the remote modem as follows:
   a. Set the MODE switch to DGTL LOOP.
   b. Set the TRANSMIT switch to DATA.
   c. Set the METER switch to SGL QUAL.
9. Observe that the DATA CHECK indicators on both units flash.
10. Set the master modem TRANSMIT switch to PATT.
11. Observe that the DATA CHECK indicators are extinguished on both units.
12. If Steps 9 and 11 indicate a problem, maintenance is required.
13. Following successful tests in both directions between the master and a remote modem, repeat the entire procedure with the master and each remote modem in the network in turn, until all have been checked.

For a summary of all positions of the MODE and TRANSMIT switches, see Table 1.

Model 2 Reset Button

This control is used in conjunction with self-test and remote-to-master transmission tests. During the reception of a test pattern, if the DATA CHECK indicator is on, the RESET button should be depressed. If the modem is in test and is receiving the test pattern properly, the DATA CHECK light should be extinguished, except during the occurrence of errors.

Model 3 Equalization and Alignment Controls

The upper section of the Control/Meter panel contains the controls for adjusting the transmitter to permit operation from the remote transmitter to the master receiver. These controls include the COMPROMISE EQL switches, the CARRIER PHASE control, and the CARRIER LEVEL control.

The lower section of the panel contains the controls for adjusting the receiver to permit operation from the master transmitter to the remote receiver. Controls for modem self-testing and system testing are also included on the lower panel.

Transmitter Controls

LEVEL Control—This control adjusts the amplitude of the transmitted carrier.

CARRIER PHASE Control—This control adjusts the phase of the transmitted carrier.

COMPROMISE EQL Switches—There are two six-position rotary switches provided for fixed-compromise equalization. These switches incrementally correct telephone channel delay distortion. One switch provides high-frequency equalization and the other provides low-frequency equalization. The range of the switches is from zero (OFF) to FULL delay distortion correction for telephone channel C2 lines (ranging from worst-case C2 to ideal).

Receiver Controls

LEVEL Control—This control adjusts the amplitude of the received signal prior to its detection.

CARRIER PHASE Control—This control adjusts the phase of the received carrier.

COMPROMISE EQL Switches—Same as transmitter controls.

PILOT PHASE Control—This control adjusts the phase of the recovered pilot for proper timing recovery. When all other controls have been properly adjusted and an error-free test pattern is being received, the proper adjustment of this control is the position midway between the two points that cause an upward meter deflection. With the modem in TEST and receiving the test pattern, if the received data is not error free at the conclusion of this final adjustment, the DATA CHECK indicator will illuminate.

Equalization and Alignment Procedure

The multipoint Model 2 and 3 modems can be adjusted and operated using the procedures outlined in this chapter.

Table 1. DATA CHECK Indicator Operation

MODE Switch	TRANSMIT Switch	DATA CHECK Lamp Status		
		No Errors Received	Errors Received	Loss of Carrier*
OPR	DATA	Extinguished	Extinguished	Continuous Illumination (probable open telephone line)
ANLG LOOP	DATA	X	X	Continuous Illumination (loss of carrier within modem)
	TONE	X	X	
	PULSE	X	X	
	PATT	Extinguished	Blinks	
DGTL LOOP	DATA**	X	X	Continuous Illumination (probable open telephone line)
	TONE**	X	X	
	PULSE**	X	X	
	PATT**	Extinguished	Blinks	

NOTE: DATA CHECK lamp operation depends on the settings of the MODE and TRANSMIT switches. An "X" indicates that the DATA CHECK lamp blinks, but is not indicative of errors. Data checking does not occur in DATA, TONE, or PULSE switch positions.

*For Model 2 only, DATA CHECK indicator will illuminate during periods when no remote modems are transmitting. This is normal and is not an error indication.

**Distant TRANSMIT switch position; local TRANSMIT switch is ineffective during digital loop test.

Reequalization and alignment, in case of telephone line changes, can be performed by the customer's operator. This procedure can be accomplished quickly and does not require any special skills or prior knowledge.

The modem is first connected to the telephone line and 115v, 60 Hz power, as described in Chapter 9.* Voice contact with the remote modem is required and can be made using the alternate voice capability.

The following itemized procedure is then employed to adjust the modem for proper operation over the telephone line. The purpose of these adjustments is to equalize or "match" the modem to the line so that digital data may be passed with as few errors as possible. The key to this procedure is the built-in meter on the Control/Meter panel. All controls noted are shown in Figures 5 and 6,* and cross-reference to these figures will help clarify the procedure.

The initial procedure is to check all of the modems in the system (master and remote units). This is accomplished by performing the following steps:

1. Check for proper operation of master and remote modems:
   a. Set MODE switch to ANLG LOOP (Analog Loop).
   b. Set TRANSMIT switch to PATT (Pattern).
   c. Set METER switch to SGL QUAL (Signal Quality).
   d. The DATA CHECK light should be extinguished, and the meter should read less than 20 for proper operation. (Depress the RESET button on the master if this result is not obtained.) If these conditions are not met, maintenance is required.

The next step permits equalization and alignment of all the remote (Model 3) receivers on the multipoint line. The operator at each remote location is contacted by the operator at the master location, who controls the adjustment procedure. The remote operators are told to perform the following procedure:

2. Equalize and align the remote modem receivers on the telephone line:
   a. The operator at the master modem sets the TRANSMIT switch to PATT and the MODE switch to OPR.

   Note: In the following procedures, the LEVEL and CARRIER PHASE knobs should be rotated slowly for best alignment.

   b. On the remote modem, place the MODE switch to OPR, the METER switch to LEVEL, and the TRANSMIT switch to PATT. Adjust the receiver LEVEL control until a reading of 100 is obtained on the meter.

Legend:

* 4872 Modem, Models 2 and 3 – SRL

   c. Place the METER switch to EQL (Equalize) and the receiver COMPROMISE EQL switches (both LOW FREQ and HIGH FREQ) to OFF. Adjust the receiver CARRIER PHASE and LEVEL knobs until the lowest meter reading is obtained.
   d. The best receiver equalizer settings are determined as follows: Set the HIGH FREQ switch to .2 and again adjust the receiver CARRIER PHASE and LEVEL controls for the lowest meter reading. Repeat this procedure for all of the HIGH FREQ positions (OFF, .2, .4, .6, .8, FULL) and find the position that gives the lowest meter reading. Set the HIGH FREQ switch to that position and again adjust the receiver CARRIER PHASE and LEVEL controls for the lowest meter reading.

      Repeat this procedure with the receiver LOW FREQ switch and select the position that gives the lowest meter reading. After selecting the best LOW FREQ setting, return to the HIGH FREQ switch and repeat the process to select the final best HIGH FREQ position.
   e. With the HIGH FREQ and LOW FREQ switches in their selected positions, readjust the receiver CARRIER PHASE and LEVEL knobs for the lowest meter reading.
   f. Set the METER switch to SGL QUAL (Signal Quality). Adjust the PILOT PHASE control for the lowest meter reading. The PILOT PHASE control is a coarse adjustment.

      The meter will read its lowest setting over several degrees of PILOT PHASE adjustment. Set the knob to the approximate middle of this adjustment range.
   g. With the METER switch still in the SGL QUAL position, readjust the receiver LEVEL control to obtain the lowest meter reading.
   h. After these adjustments are complete, a quick check for satisfactory remote modem operation can be made by observing that:
      (1) A meter indication of less than 50 is typical, but each installed modem has an individual norm and failure level. The failure level should be established during installation and referred to during maintenance for a measure of operational degradation.

         To establish and check the failure level, observe the DATA CHECK indicator and increase the meter indication with the receiver LEVEL control until the indicator blinks more frequently than once a minute. Record the meter indication. Reposition the LEVEL control for a minimum meter indication. Repeat the failure level check with the receiver CARRIER control.
      (2) The DATA CHECK indicator does not light more than approximately once a minute.

Upon completion of remote receiver alignment, the remote operators advise the master operator that they are ready for the next step.

The next step permits equalization and alignment of the remote (Model 3) transmitters on the multipoint line. During this alignment, continuous voice contact must be maintained between the master operator and the remote operator. The operator at the master station may talk unilaterally to the remote stations without affecting digital data transmission from the remote modems to the master modem. During this procedure, the operators at the remote stations may not talk to the master operator, because this will disrupt the transmission of data from the remote modem to the master modem and prevent proper alignment.

3. All adjustments are made at the remote modem, but the meter is monitored on the master modem. Thus, the operator at the master station must continually advise the operator at the remote station concerning what controls to adjust, which way to adjust them, and when to stop the adjustments. The following procedure simplifies this operation:
   a. The operator at the master station calls all of the remote stations and tells them to set the TRANSMIT switch to DATA and the MODE switch to OPR. He advises them that he will call each one sequentially to align the multipoint link in the direction from the remote modem transmitters to the master modem receiver.
   b. The master station operator calls the first remote station operator and advises him to set the TRANSMIT switch to PATT.
   c. The master operator places his own METER switch to LEVEL.
   d. The master operator advises the remote operator to rotate his transmitter LEVEL control slowly until a reading of 100 is obtained on the meter at the master modem.
   e. The master operator then switches his METER switch to EQL. He advises the remote operator to switch the transmitter COMPROMISE EQL switches (both LOW FREQ and HIGH FREQ) to OFF. He then advises the remote operator to adjust the transmitter CARRIER PHASE knob slowly until the lowest reading obtainable is observed on the meter on the master modem.
   f. The best remote modem transmitter equalizer settings are selected as follows: Using the meter at the master modem, have the remote operator set the HIGH FREQ switch to .2 and again adjust the transmitter CARRIER PHASE for the lowest meter reading on the master modem.

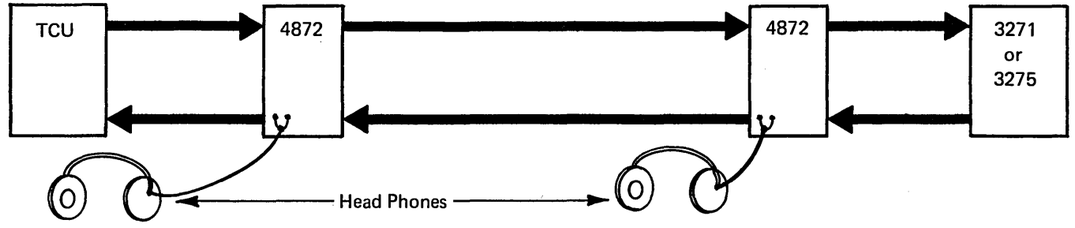
      Repeat this procedure for all of the HIGH FREQ positions (OFF, .2, .4, .6, .8, FULL) and find the position that gives the lowest meter reading. Advise the remote operator to set the HIGH FREQ switch to that position, and again adjust the transmitter CARRIER PHASE for the lowest meter reading.

      The master operator advises the remote operator to repeat this procedure with the transmitter LOW FREQ switch.

      After selecting the best LOW FREQ setting, the master operator advises the remote operator to repeat the process again on the HIGH FREQ switch, because additional improvement can usually be obtained by a final readjustment.
   g. The master operator advises the remote operator to set the transmitter HIGH FREQ and LOW FREQ switches to the selected positions. The remote operator should then readjust the transmitter CARRIER PHASE knob to obtain the lowest meter reading on the master modem.
   h. At the master modem, the operator sets the METER switch to SGL QUAL (Signal Quality). He advises the remote operator to adjust his transmitter LEVEL control slowly to obtain the lowest meter reading on the master modem.
   i. After all these adjustments are complete, a quick check for satisfactory operation with the first remote station can be made by observing the following:
      (1) A meter indication of less than 50 is typical, but each installed modem has an individual norm and failure level. The failure level should be established during installation and referred to during maintenance for a measure of operational degradation.

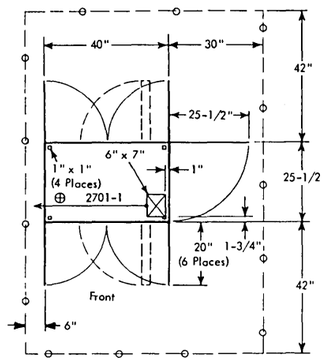
          To establish and check the failure level, observe the DATA CHECK indicator and increase the meter indication with the transmitter LEVEL control until the indicator blinks more frequently than once a minute. Record the meter indication. Reposition the LEVEL control for a minimum meter indication. Repeat the failure level check with the transmitter CARRIER control.
      (2) The DATA CHECK indicator does not light more than approximately once a minute. If the indicator flashes more frequently, trouble with the alignment or the telephone line is indicated.
   j. The first remote station is now properly adjusted. The master station operator advises this remote operator to switch his TRANSMIT switch to DATA.
   k. Each remaining remote station is contacted and aligned, one at a time, using the procedure described for the first station.
   l. After all stations are properly aligned, a check is made that all modem TRANSMIT switches are on DATA, all MODE switches are on OPR, and all METER switches are on SGL QUAL.

The system is now ready for operation.

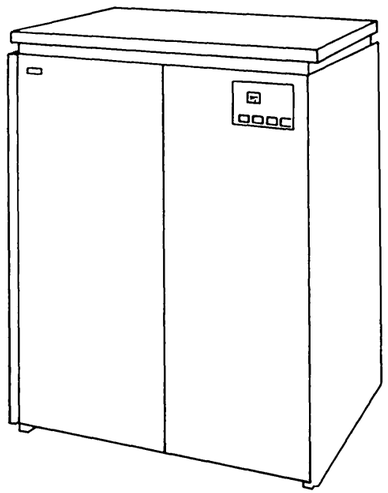


2701 DATA ADAPTER UNIT MODEL 1

Plan View (Template GX22-6857)



Inches	Centimeters
1	3
1-3/4	4
6	15
7	18
20	51
25-1/2	65
30	76
40	102
42	107



2701 Physical Planning and Cabling Schematic

Specifications

Dimensions:

	F	S	H
Inches	40	25-1/2	40
(cm)	(102)	(65)	(102)

Service Clearances:

	F	R	Rt	L
Inches	42	42	30	6
(cm)	(107)	(107)	(76)	(15)

Weight: 600 lb (280 kg)

Heat Output: 3,000 BTU/hr (760 kcal/hr)

Airflow: 120 cfm (4 m^3/min)

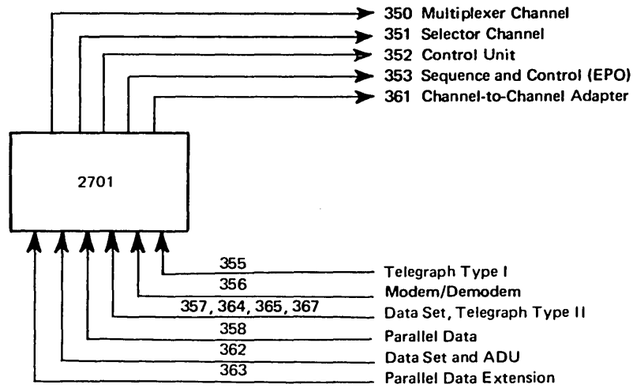
Power Requirements:

kVA	1.0
Phases	1
Plug	R&S, FS3720
Connector	R&S, FS3913
Receptacle	R&S, FS3743

Environment Operating:

Temperature	50°-90°F (10°-32°C)
Rel Humidity	8%-80%
Max Wet Bulb	78°F (26°C)

2701 DATA ADAPTER UNIT CABLING SCHEMATIC



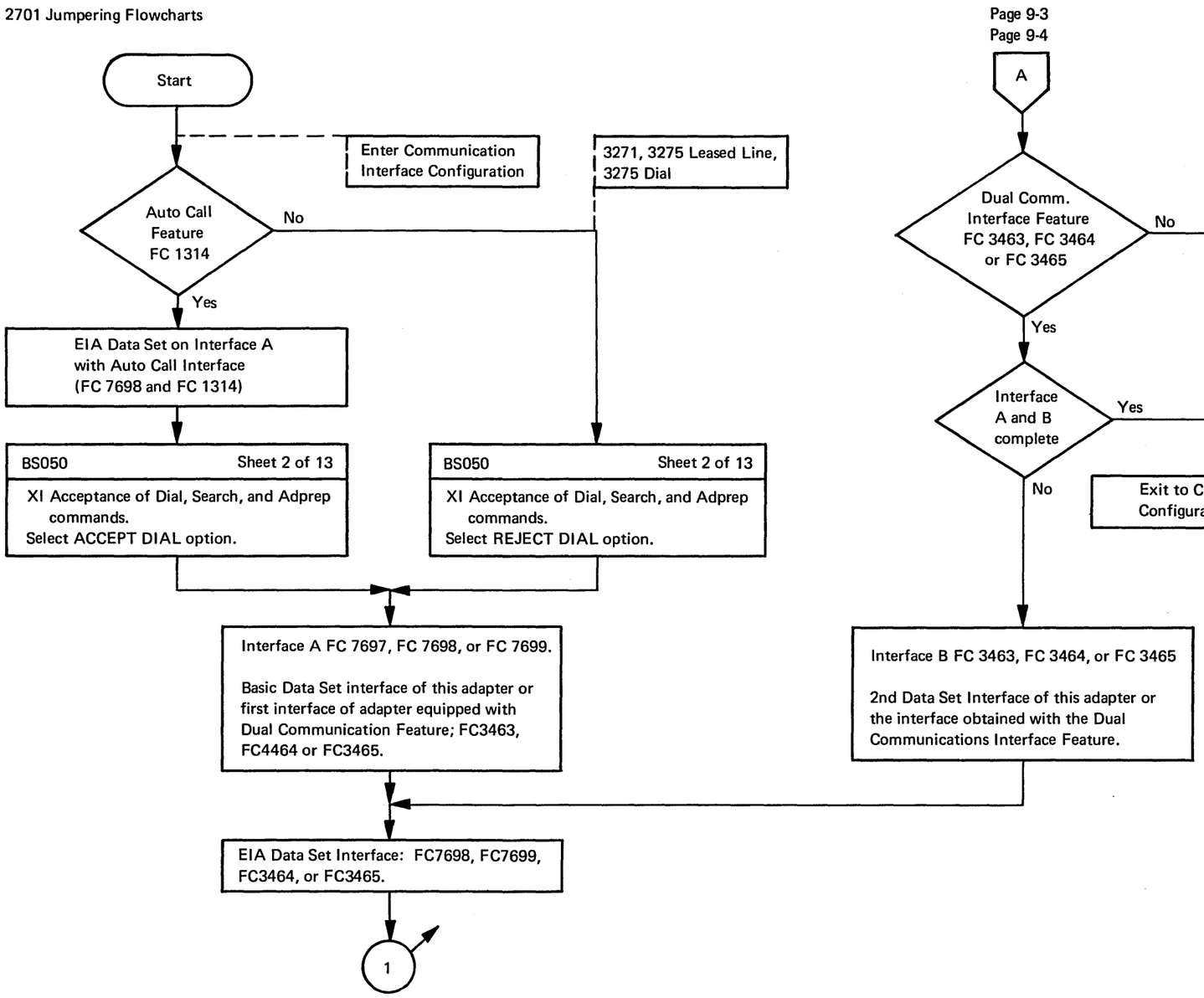
Group No.	No. of Cables	From	To	Max Length (ft)	Notes
350	2	2701	Multiplexer Channel	–	1
351	2	2701	Selector Channel	–	1
352	2	2701	Control Unit	–	1
353	1	2701	Channel	100	2
355	1	Terminal Board	2701	40	5,12
356	1	Customer-owned Communications Line	2701	40	4,12
357	1	Data Set	2701	40	6,12
358	3	Parallel Data (SF #5500)	2701	40	3,12,13
361	2	2701	Channel-to-Channel Adapter	–	1,7
362	2	Data Set and ADU	2701	40	8,12
363	2	Parallel Data Extension (SF #5505)	2701	40	9,12,15
364	1	ADU (SDA)	2701	40	10,12
365	1	SDA Type I and SDA Type II	2701	40	11,12
367	1	SDA Type I and SDA Type II	2701	40	12,14

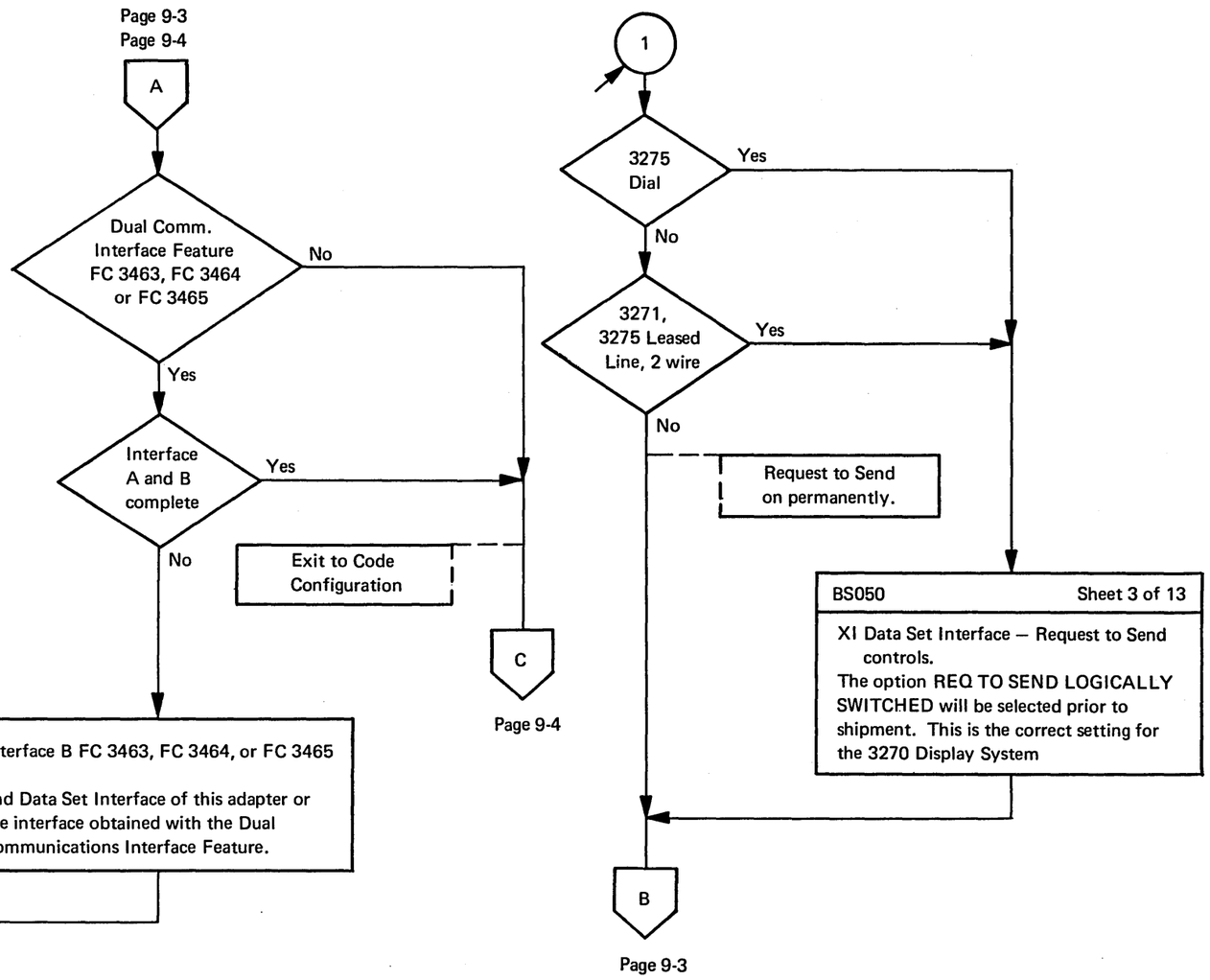
Notes:

1. Total cable length of 200 feet (unless modified by general control-to-channel cabling schematic) available to attach up to eight control units to a channel.
2. Sequence and control (EPO).
3. Order group 358 for SF #5500 (maximum of four).
4. Customer-owned communications lines (SF #4636 and #4637).
5. Use for Telegraph Type I (SF #4633, #7860, #7861, and #7862).
6. Use for SF #4656 and #4657. Use for SF #4640, #4645, #4646, #4648, and #7885 if neither SF #1302, #4636, nor #4637 is used.
7. To channel-to-channel adapter (SF #1850).
8. Use when both data set and ADU are required (SF #4640, #4645, or #7885 with SF #1302), one for each line.
9. Required for first and third extensions only of SF #5505 (maximum of four).
10. For Synchronous Data Adapter (SF #1303 and #1314).
11. For Synchronous Data Adapter (SF #3461, #3463, #7695, and #7697).
12. See Appendix E for cable specifications.
13. Group 358 is two assemblies with a total of three cables to common-carrier facility.
14. For connection to one RS-232, RS-232A, or RS-232B interface data set with SF #3462, #3464, #7696 (including attachment from the IBM 4872 Modem), #7698, or #7699.
15. Group 363 is one assembly with two cables to common-carrier facility.

2701 Jumpering Flowcharts (Sheet 1 of 5)

2701 Jumpering Flowcharts





Page 9-2

B

3275 Dial

Yes

No

3271, 3275 Leased Line

Synchronous clock speed greater than 1200 baud

Yes

No 1200 Baud

Associated with selected Interface A or B

No

Sync Clock present but not used on this interface.

Yes

BS050 Sheet 9 of 13

XII Internal Clock Feature speed selection
Select 1200 BPS CLOCK - FC 7692. If both interfaces of a dual comm. interface adapter use internal clock feature, they must both run at this common selected speed.

BS050 Sheet 3 of 13

XII External Data Set Clock or Internal Clock feature selection
Select INTERNAL CLOCK feature option for appropriate interface (A or B).

- o Interface A - Clock Supplementary Code 1
- ● Interface B - Clock Supplementary Code 2
- ● Interface A and B - Clock Supp. Code 3

2

BS050 Sheet 9 of 13

XII Internal Clock Feature speed selection
Select NO INTERNAL CLOCK option.

2

BS050 Sheet 3 of 13

XII External Data Set Clock or Internal Clock feature selection
Select EXTERNAL DATA SET CLOCK option for appropriate interface (A or B).

Is the attached data Set a WE201 or equivalent

Yes

No

Is this adapter the master terminal in a 4 wire Full Duplex centralized multipoint network attached to the selected interface (A or B) and the remote terminal is not an 1130

Yes

No

BS050 Sheet 4 of 13

XIII New Sync option
Select NOT NEW SYNC for appropriate interface (A or B).

Is Data Set a WE201B FC7699 or FC3465

Yes

No

BS050 Sheet 4 of 13

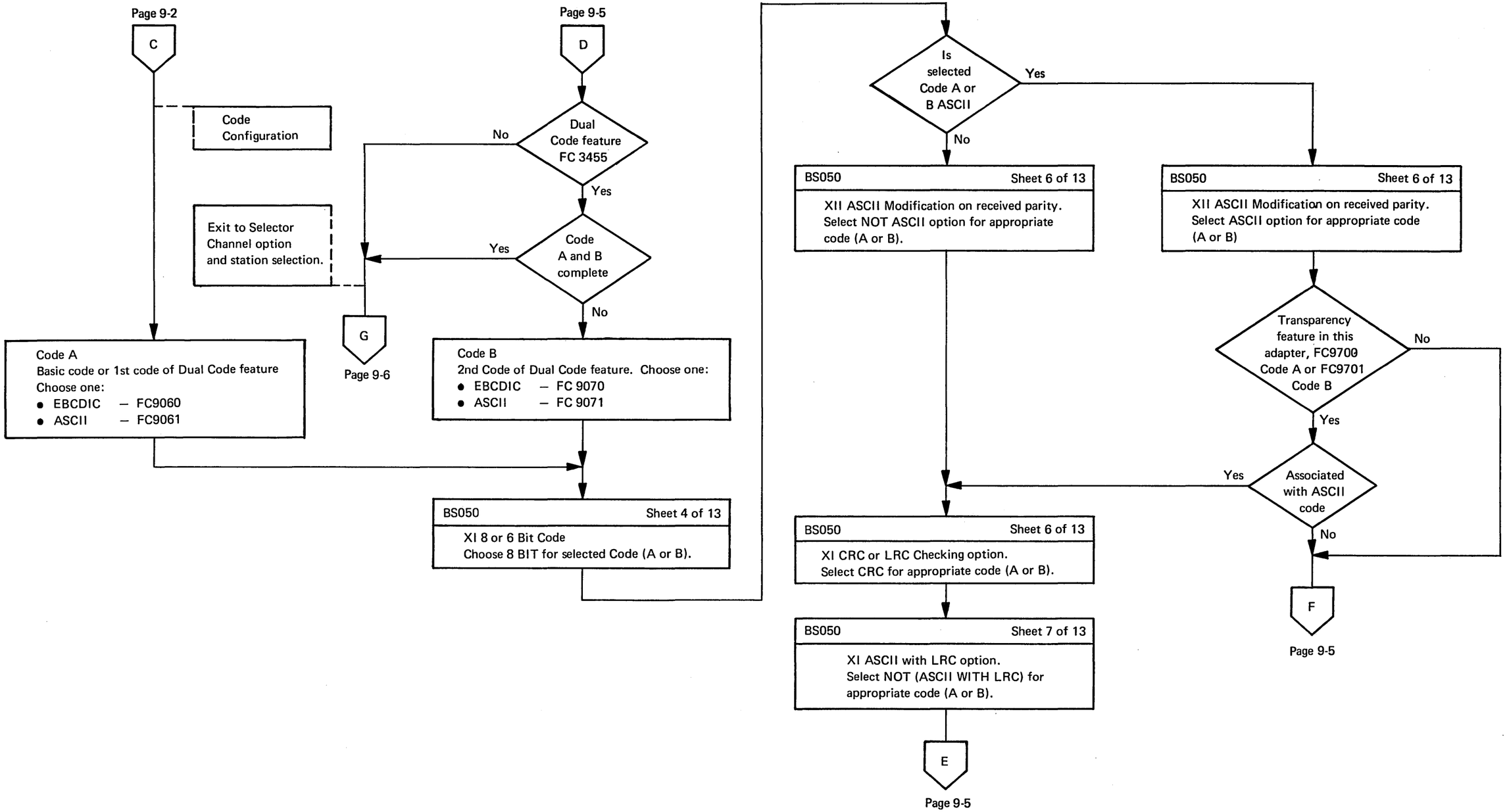
XII 201B option
Select NOT 201B DATA SET option for appropriate interface (A or B).

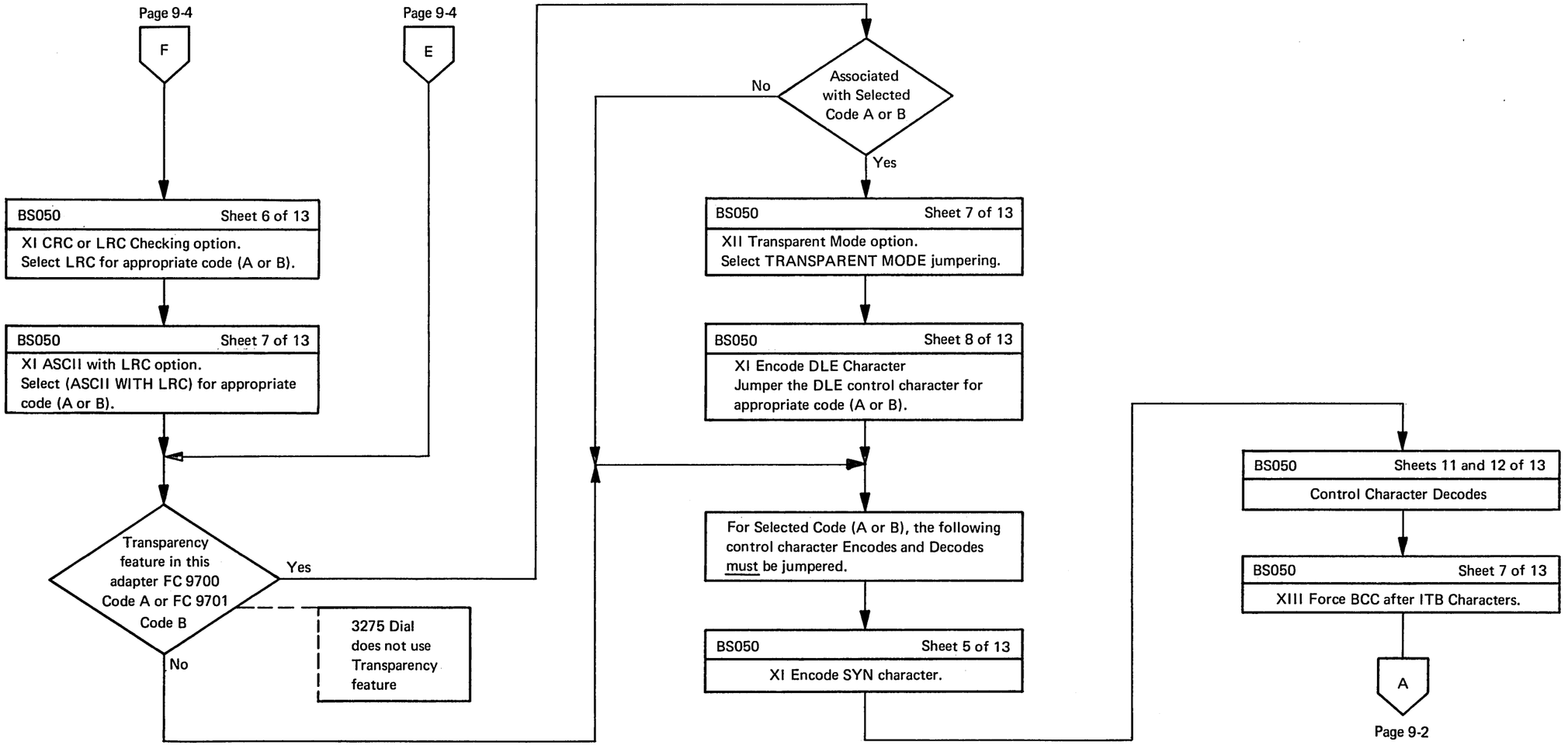
BS050 Sheet 4 of 13

XII 201B option
Select 201B DATA SET option for appropriate interface (A or B)

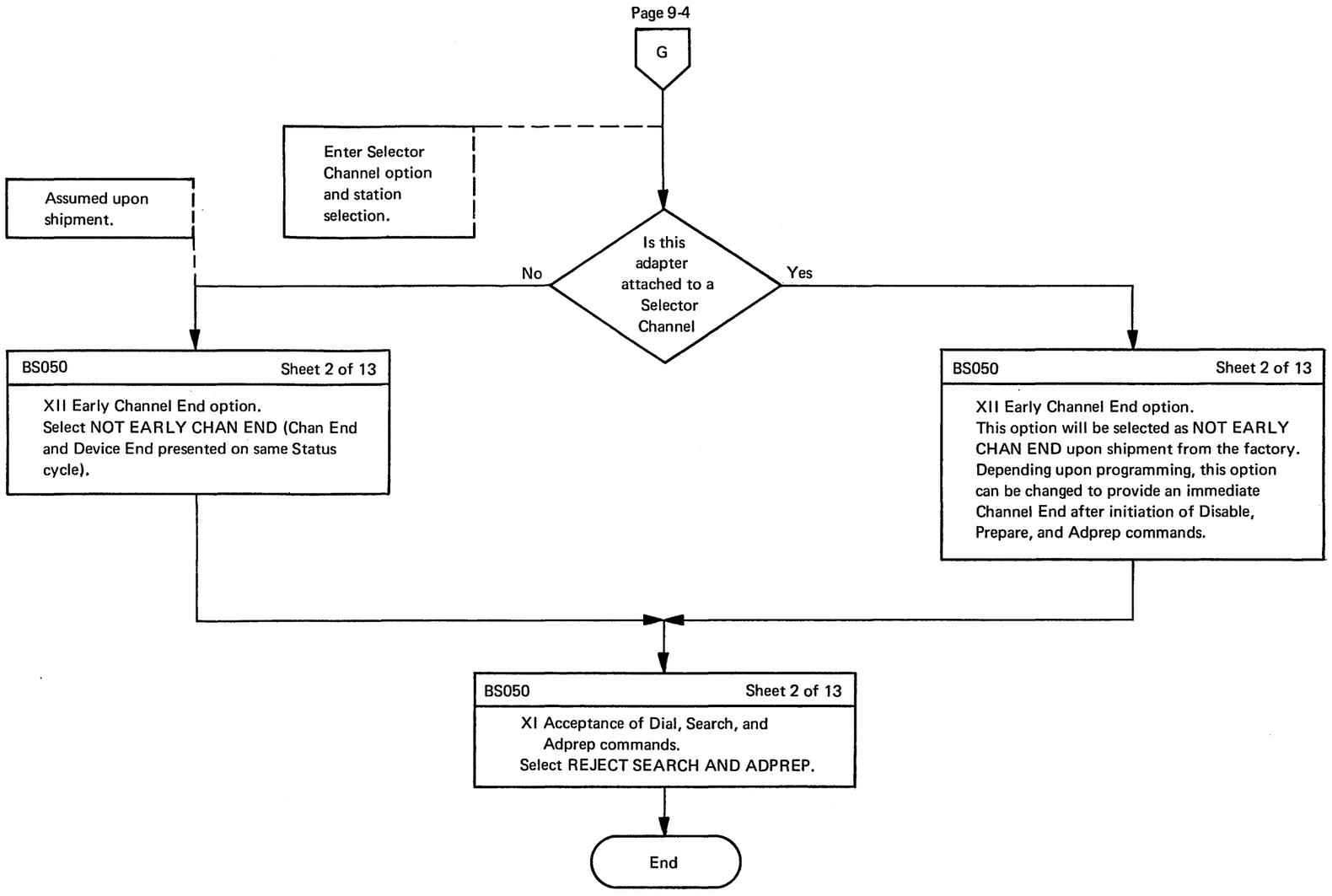
A

Page 9-2


Page 9-2
C
Code Configuration
Exit to Selector Channel option and station selection.
G
Page 9-6
Page 9-5
D
Dual Code feature FC 3455
No
Yes
Code A and B complete
Yes
No
Code A
Basic code or 1st code of Dual Code feature
Choose one:
• EBCDIC — FC9060
• ASCII — FC9061
Code B
2nd Code of Dual Code feature. Choose one:
• EBCDIC — FC 9070
• ASCII — FC 9071
BS050 Sheet 4 of 13
XI 8 or 6 Bit Code
Choose 8 BIT for selected Code (A or B).
Is selected Code A or B ASCII
Yes
No
BS050 Sheet 6 of 13
XII ASCII Modification on received parity.
Select NOT ASCII option for appropriate code (A or B).
BS050 Sheet 6 of 13
XII ASCII Modification on received parity.
Select ASCII option for appropriate code (A or B)
Transparency feature in this adapter, FC9700 Code A or FC9701 Code B
No
Yes
Associated with ASCII code
Yes
No
F
Page 9-5
BS050 Sheet 6 of 13
XI CRC or LRC Checking option.
Select CRC for appropriate code (A or B).
BS050 Sheet 7 of 13
XI ASCII with LRC option.
Select NOT (ASCII WITH LRC) for appropriate code (A or B).
E
Page 9-5

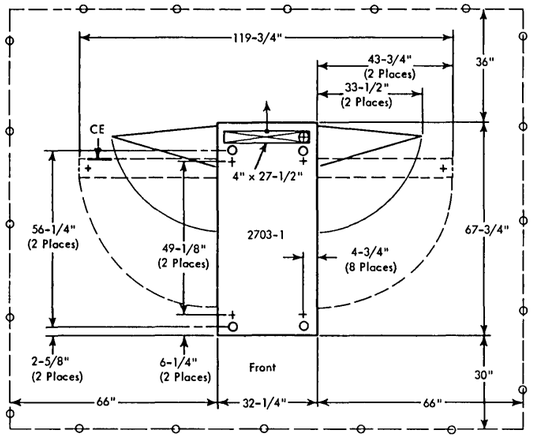


2701 Jumpering Flowcharts (Sheet 4 of 5)


Page 9-4
G
Enter Selector Channel option and station selection.
Assumed upon shipment.
Is this adapter attached to a Selector Channel
No
Yes
BS050 Sheet 2 of 13
XII Early Channel End option.
Select NOT EARLY CHAN END (Chan End and Device End presented on same Status cycle).
BS050 Sheet 2 of 13
XII Early Channel End option.
This option will be selected as NOT EARLY CHAN END upon shipment from the factory. Depending upon programming, this option can be changed to provide an immediate Channel End after initiation of Disable, Prepare, and Adprep commands.
BS050 Sheet 2 of 13
XI Acceptance of Dial, Search, and Adprep commands.
Select REJECT SEARCH AND ADPREP.
End

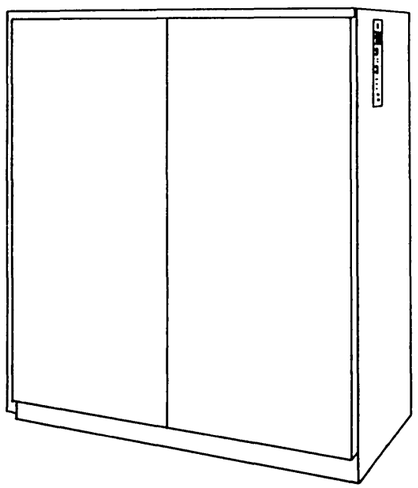
2703 TRANSMISSION CONTROL MODEL 1

Plan View (Template GX22-6857)



Inches	Centimeters
2-5/8	7
4	10
4-3/4	12
6-1/4	16
27-1/2	70
30	76
32-1/4	82
33-1/2	85

Inches	Centimeters
36	91
43-3/4	111
49-1/8	125
56-1/4	143
66	168
67-3/4	172
119-3/4	304



Specifications

Dimensions: *

	F	S	H
Inches	32-1/4	67-3/4	70-3/4
(cm)	(82)	(172)	(180)

Service Clearances:

	F	R	Rt	L
Inches	30	36	66	66
(cm)	(76)	(91)	(168)	(168)

Weight: 2,200 lb (1,000 kg)

Heat Output: 11,750 BTU/hr (3.000 kcal/hr)

Airflow: 2,000 cfm (57 m^3/min)

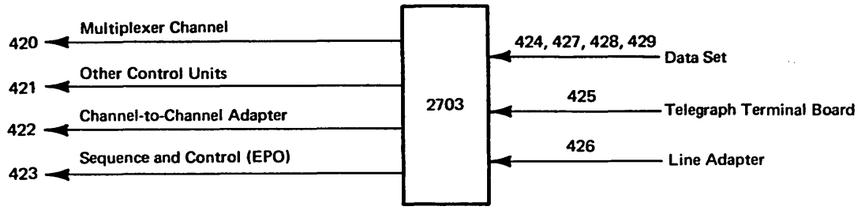
Power Requirements:

kVA	4.3
Phases	3
Plug	R&S, FS3760
Connector	R&S, FS3934
Receptacle	R&S, FS3754

Notes:

*Dimensions can be reduced to 29-1/2" x 60" x 70" (75 cm x 152 cm x 178 cm) for shipping. See sales representative for specifying dimensions on the order.

2703 TRANSMISSION CONTROL CABLING SCHEMATIC



Group No.	No. of Cables	From	To	Max Length (ft)	Notes
420	2	2703	Multiplexer Channel	–	1
421	2	2703	Control Unit	–	1
422	2	2703	Channel-to-Channel Adapter	–	1,10
423	1	2703	Channel	100	2
424	4	Data Set	2703	40	3,4
425	2	Telegraph Terminal Board	2703	40	4,8
426	8	Customer-owned Communications Line	2703	40	4,9
427	4	Data Set (Auto Call)	2703	40	4,6
428	1	Data Set (To 2712)	2703	40	4,5
429	2	Data Set (Synchronous)	2703	40	4,7

Notes:

1. Total cable length of 200 feet (unless modified by general control-to-channel cabling schematic) available to attach up to eight control units.
2. Sequence and control (EPO).
3. Use with data line set (SF #3205 and #3206). Use one for each group of four data sets.
4. See Appendix E for cable specifications.
5. For SF #8047 and #8057 (one group provides for one each of SF #8047 and #8048, *or* one each of SF #8057 and #8058).
6. For SF #1340 and #1341. Use one for each group of data sets.
7. For SF #7710, including attachment from the IBM 4872 Modem. Use one for each group of data sets.
8. For SF #7897 (one group provides for one each of SF #7897 and #7898). Each group contains 16 lines.
9. For #4686, #4687, and #4688. Each group contains 8 lines.
10. To channel-to-channel adapter (SF #1850).

Appendix A. Plug Types

The letter code designation (A, B, F, or G) for plug types for 3270 machines is included on individual machine specification pages in GA27-2787. Matching receptacles are identified in the following chart:

*Plug Type**		*A*	*B*	*F*	*G*
NEMA Receptacle Reference No.		5-15R	L5-15R	6-15R	L6-15R
Receptacle Mfg. No.**	Single	(H, P&S) 5261	(H, P&S) 4710	(H, P&S) 5661	(H) 4560
	Duplex	(H, P&S) 5262	(H, P&S) 4700	(H, P&S) 5662	(H) 4550
	In-line	(H, P&S) 5269	(H, P&S) 4730	(H, P&S) 5669	(H) 4580
Schematic – Face of Receptacle (G = Ground)					
Rating: Amperes/Volts		15/125	15/125	15/250	15/250

*In the U.S. and Canada, these plug types (or equivalent) are supplied with the machines; the customer provides matching receptacle. In World Trade countries other than Canada, only the power cord is supplied; the customer provides plugs to match local receptacles.

Abbreviations of manufacturers' names are indicated in parentheses: Hubbell (H), Pass and Seymour (P&S). Receptacles B and G are locking type.

**Or equivalent.

Branch Circuits and Grounding

The power cords have a green or green and yellow equipment ground wire. For safety, each branch circuit should have an insulated wire conductor (green or green and yellow) for grounding the equipment. All branch-circuit ground wires should be tied to a common ground at the distribution panel, and a single ground wire should be run from the distribution panel to service ground or suitable building ground. The conduit must not be used as the only means of grounding. The system neutral must be electrically isolated from the ground conductor except at the building ground station. The IBM Installation Planning Representative should be consulted for further details.

CABLE SPECIFICATIONS

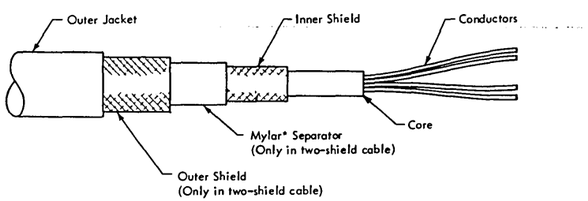
Power Cord Style	Cable Nominal OD inches (mm)	Number of Shields	Conductors		
			Quantity	Nominal OD* inches (mm)	AWG No.
A4	0.350 (9.0)	1	3	0.040 (1.0)	18
A9	0.350 (9.0)	0	3	0.040 (1.0)	18

*This diameter refers to solid, bare wire.

HOW TO INSTALL A POWER PLUG ON SHIELDED CABLE

To make power cable shielding effective, the shield or shields must be properly terminated at the plug end of the cable. Because different plugs are used in different countries, slight changes to the following instructions may be needed.

Names of Bulk Cable Components

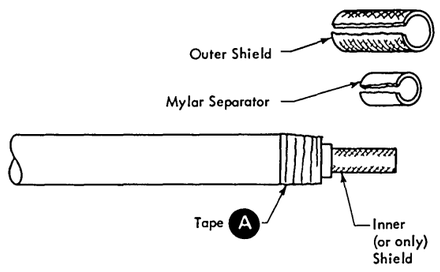


Preparing Bulk Cable End for the Plug

Dimensions given are for reference only. The installer is to use his own discretion to assure proper assembly of the cable and plug.

Step 1: Remove outer jacket for 1-1/2 inches (38 mm) from end for 15A-30A cables or 2-3/4 inches (70 mm) from end for 45A-60A cables. If this is a one-shield cable, go to step 4.

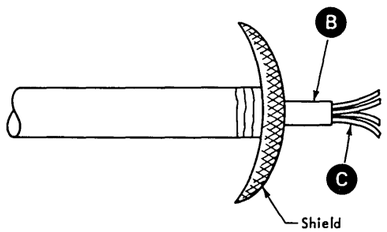
Step 2: (For two-shield cables only.) Remove the outer shield as far back as the outer jacket. The Mylar* separator is exposed. Wrap one full turn of electrical tape over the separator and another full turn of tape over the cut end of the outer shield; overlap onto the outer jacket. This tape is used to assure complete electrical isolation between the inner and the outer shields. (See A .)



Step 3: (For two-shield cables only.) Remove Mylar separator for 1 inch (25 mm) from end for 15A-30A cables or 2-1/4 inches (57 mm) from end for 45A-60A cables. Do not cut the inner shield.

Step 4: Do not cut the inner (or only) shield. Unbraid and carefully comb out the shield for 1 inch (25 mm) from end for 15A-30A cables or 2-1/4 inches (57 mm) from end for 45A-60A cables. The core is exposed. (See B .)

Step 5: Remove cable core for a minimum of 3/4 inch (19 mm) from the end; the conductors are exposed. (See C .)

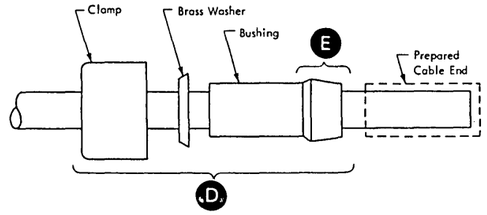


Step 6: Carefully lay the shield back over the cable outer jacket; wrap tape around the shield for temporary protection. Note that on two-shield cables, the outer shield must be insulated from the plug cap, equipment ground (earth) wire, conduit, and so on; the outer shield is grounded at the machine end only. The inner (or only) shield should be grounded through the shell of the plug to the branch circuit conduit. Three-hundred-sixty-degree grounding of the shield to the plug shell is desirable; that is, making contact between the shield and the shell at all points around the edge, not just at one point.

Installing the Plug

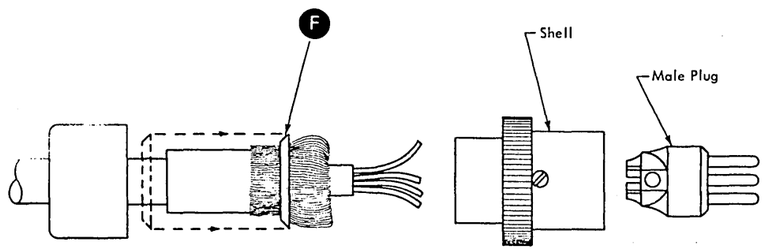
These steps show the attachment of one type of plug; modifications will be needed to allow for the different physical designs of plugs used in various countries.

Install the clamp, brass washer, and bushing over the prepared cable end as shown at D . Take the protective tape off the shield and slide the bushing over against the shield. Carefully lay the shield back over E of the bushing; be sure to spread the strands of the shield evenly over the bushing surface.



Slide the brass washer over the shield and up against the mating surface of the bushing at F . Wrap tape around the shield for one full turn and trim off the remaining shield strands. Install the clamp and be sure that the mating surface is tightly against the brass washer.

Install the proper terminals and put the rest of the plug assembly together.



Branch Circuits and Grounding

The power cords have a green or green and yellow equipment ground wire. For safety, each branch circuit should have an insulated wire conductor (green or green and yellow) for grounding the equipment. All branch-circuit ground wires should be tied to a common ground at the distribution panel, and a single ground wire should be run from the distribution panel to service ground or suitable building ground. The conduit must not be used as the only means of grounding. The system neutral must be electrically isolated from the ground conductor except at the building ground station. The IBM Installation Planning Representative should be consulted for further details.

*Trademark of E. I. duPont de Nemours & Co., Inc.

Glossary

ACK 0, ACK 1 (affirmative acknowledgment): These replies (DLE sequences), indicate that the previous transmission block was accepted by the receiver and that it is ready to accept the next block of the transmission. Use of ACK 0 and ACK 1 alternately provides sequential checking control for a series of replies. ACK 0 is also an affirmative (ready to receive) reply to a station selection (multipoint), or to an initialization sequence (line bid) in point-to-point operation.

Attenuate: To lessen the amount, force, or value of.

Batch Processing: A system of accumulating and grouping a random number of input items to be processed at one time.

BSC (binary synchronous communications): A uniform procedure, using a standardized set of control characters and control character sequences, for synchronous transmission of binary-coded data between stations in a data communications system.

BSC intermix: Capability of different types of BSC stations on the same multipoint line, or using the same switched line termination (phone number) at the central computer, to communicate with a control or central station using BSC procedures.

Carrier: An oscillation or wave suitable for modulation by the intelligence to be transmitted over the communications system.

Centralized Multipoint: A system in leased line operation in which several *tributary* modems are connected via a common line to a *control* modem.

Central station: Term applied to a central computer in a data communications system, because of the function it performs as the main processor of information communicated over the system.

Communications Channel: A single or dual transmission path, characterized by a particular frequency bandwidth (*voice bandwidth* in this manual).

Control: Refers to the controlling unit in a *centralized multipoint* configuration; the term may be applied to modem or to *station*. (Sometimes other publications use "master" or "central".)

Control station: The station (usually a CPU) in a multipoint data communications system that controls network traffic by means of polling and selection. On a centralized multipoint network, tributary stations can communicate only with the control station when polled or selected by the control station.

Conversation Mode: Communication between a terminal and a computer, in which each entry from the terminal elicits a response from the computer, and vice versa.

Data Communications: The transmission and reception of information by data processing equipment, or communications terminal equipment.

Data System: An organized collection of methods and interconnected machines that accepts input data, processes the data, and provides output data.

Dedicated Line: A communications channel which is permanently connected between two or more data stations. (Also called "leased" or "private".)

Delay (group): The time of propagation between two locations of a certain point of the envelope of a wave (varies with the frequency).

Demodulation: The process of retrieving intelligence from a modulated carrier wave.

Deserialize: To change from serial-by-bit to parallel-by-bit.

Digital Echo Modulation: A process (using digital circuits) by which the frequency spectrum of a chain of pulses (representing binary data) is shifted and compressed to be within the bandwidth of the telephone line.

Distortion: The unwanted change in waveform that may occur between two points in a transmission system.

DLE (data link escape): A control character used exclusively to provide supplementary line-control signals (control character sequences or DLE sequences). These are two-character sequences where the first character is DLE. The second character varies according to the function desired and the code used.

Duplex channel: A communications facility capable of transmitting in both directions simultaneously.

Duplex: Applied to the system in which signals may be transmitted and received simultaneously over a telephone line. (In other publications, sometimes referred to as "full-duplex".)

Duplex Facilities: A dual voiceband channel with complete separation of transmit and receive at any station in a system. Any system which uses the same portion or portions of the voiceband spectrum for simultaneous transmission of signals in both directions requires duplex facilities. To reduce turnaround time, carrier can be transmitted continuously from both stations of a point-to-point system or from the control station for a centralized multipoint system. Four-wire duplex facilities avoid false startups caused by interference between multipoint tributary stations.

Duplex Operation: A simultaneous two-way transmission.

Echo: A wave that is returned to the point of origin, because of reflection or some other cause.

Echo Suppressor: A line device used to prevent energy being reflected back to the transmitter.

ENQ (enquiry): Used as a request for a response to obtain identification and/or an indication of station status. Transmitted as part of an initialization sequence (line bid) in point-to-point operation, and as the final character of a selection or polling sequence in multipoint operation.

EOT (end of transmission): Indicates the end of a transmission, which may include one or more messages, and resets all stations on the line to control mode (unless it erroneously occurs within a transmission block). EOT is also transmitted as a negative response to a polling sequence.

Equalizer: Any combination of active and/or passive elements inserted in a transmission line or amplifier circuit to improve its frequency response or phase characteristics.

ETB (end of transmission block): Terminates a group of characters (transmission block) started with SOH or STX, and indicates that the message continues with a following block. A message may contain one or more transmission blocks ending with ETB. The block check character is sent immediately following ETB. ETB requires a reply indicating the receiving station's status.

ETX (end of text): Indicates the end of a message. If multiple transmission blocks are contained in a message, ETX terminates the last block of the message. (ETB is used to terminate preceding blocks.) The block check character is sent immediately following ETX. ETX requires a reply indicating the receiving station's status.

Half-Duplex: Applied to the system in which only one signal may be transmitted or received at a time over a telephone line.

Half-duplex channel: A communications facility capable of transmitting in both directions, but not at the same time.

Half-Duplex Facilities: A single voiceband channel for bidirectional, non-simultaneous transmission between any two stations in a system. Systems that do not require use of the same portion or portions of the voiceband spectrum for simultaneous transmission of signals in both directions can operate with half-duplex facilities; carrier can be transmitted in only one direction at a time.

Note: When the common carrier supplies four-wire duplex facilities for half-duplex mode of operation in a point-to-point system, carrier may be maintained from both stations.

Half-Duplex Operation: A two-way transmission of signals, but in only one direction at a time.

Interface: A point of demarkation that divides the responsibilities of any two connected pieces of equipment.

ITB (intermediate text block): This character (actually IUS or US depending on code) is used to terminate an intermediate block of characters. The block check character is sent immediately following ITB, but no line turnaround occurs. The response following ETB or ETX also applies to all of the ITB checks immediately preceding the block terminated by ETB or ETX.

Leased, or Private, Line: See "dedicated line".

Local: Arbitrarily refers to the modem in a *point-to-point* configuration from which the system is viewed at a particular instant in time.

Mark: The quiescent or binary 1 data bit condition.

Modem: A contraction of "modulator-demodulator". This term may be used when the modulator and demodulator are associated in the same signal conversion equipment.

Modulation: A process by which certain characteristics of a wave are modified in accordance with a characteristic of another wave or signal.

NAK (negative acknowledgment): Indicates that the previous transmission block was in error and the receiver is ready to accept a retransmission of the erroneous block. NAK is also the "not-ready" reply to a station selection (multipoint) or to an initialization sequence (line bid) in point-to-point operation.

Noise: Any unwanted disturbance within a useful frequency band, such as undesired electric waves in a transmission channel or device.

Off-Hook: On-Hook: Activated/deactivated, in reference to a telephone set; it may also be used in reference to a device attached to a switched network line.

Parallel Data: Multiple signal elements, usually a character or byte, transferred simultaneously.

Point-to-Point: A system in leased line operation in which two modems are permanently interconnected; at any point in time, one modem is referred to as *local* and the other is referred to as *remote.*

Propagation Time (delay): The time necessary for a signal to travel from one point of a circuit to another.

Remote: Arbitrarily refers to the modem in a *point-to-point* configuration that is connected via the telephone line to the modem termed local.

Remote station: (Multipoint) synonymous with tributary station. (Point-to-point switched network) a station that can be called by the central station, or can call the central station if it has a message to send.

RVI (reverse interrupt): A control character sequence (DLE sequence) sent by a receiving station instead of ACK 1 or ACK 0 to request premature termination of the transmission in progress.

Serial Transmission: Transmission, at successive intervals, of signal elements (not transmitted simultaneously).

Serialize: To change from parallel-by-bit to serial-by-bit.

Service: The common-carrier function of providing and maintaining a system of facilities to meet customer communications requirements.

Space: The binary 0 data bit condition.

SOH (start of heading): Precedes a block of heading characters.

Station: An input or output point in a communications system.

Strap, Strapping: Selectable wiring to provide optional variations in the performance of equipment.

STX (start of text): Precedes a block of text characters.

Switched Line (switched network): A communications channel made up of a number of shorter communications circuits connected through switching facilities provided by a common carrier.

SYN (synchronous idle): Character used as a time fill in the absence of any data or control character to maintain synchronization. The sequence of two contiguous SYN's is used to establish synchronization (character phase) following each line turnaround.

Synchronization: Bringing the receiver timing pulses into phase with the received modulate signal in order to correctly demodulate the received data.

Teleprocessing: A form of information handling in which a data processing system uses communications facilities.

Transmit Level: A power level of energy introduced onto the communications channel by the transmitter.

Tributary Station: On a centralized multipoint communications channel, one of two or more stations that transmits to, and receives from, the control station.

TTD (temporary text delay): A control character sequence (STX. . .ENQ) sent by a transmitting station to either indicate a delay in transmission or to initiate an abort of the transmission in progress.

Turnaround: The time required to reverse the direction of transmission from send to receive, or vice versa. Time is required for line propagations and line effects, reversal of echo suppressors (where used), modem timing, and DTE reaction.

Two-wire or Four-wire: These terms refer to the physical connection to the communications channel. They do not determine half-duplex and duplex communications facilities.

WACK (wait before transmit positive acknowledgment): This DLE sequence is sent by a receiving station to indicate that it is temporarily not ready to receive.

3270 Information Display System Physical Planning
and Installation Manual

Order No. SY27-2349-4

READER'S COMMENT FORM

Your views about this publication may help improve its usefulness; this form will be sent to the author's department for appropriate action. Using this form to request system assistance or additional publications will delay response, however. *For more direct handling of such request, please contact your IBM representative or the IBM Branch Office serving your locality.*

Possible topics for comment are:

Clarity Accuracy Completeness Organization Index Figures Examples Legibility

What is your occupation? _____

Number of latest Technical Newsletter (if any) concerning this publication: _____

Please indicate if you wish a reply. ☐ Yes ☐ No

If yes: Name _____

_____

Address _____

Thank you for your cooperation. No postage stamp necessary if mailed in the U.S.A. (Elsewhere, an IBM office or representative will be happy to forward your comments.)

Cut or Fold Along Line

3270 Information Display System Physical Planning
and Installation Manual

Order No. SY27-2349-4

READER'S COMMENT FORM

Your views about this publication may help improve its usefulness; this form will be sent to the author's department for appropriate action. Using this form to request system assistance or additional publications will delay response, however. *For more direct handling of such request, please contact your IBM representative or the IBM Branch Office serving your locality.*

Possible topics for comment are:

Clarity Accuracy Completeness Organization Index Figures Examples Legibility

What is your occupation? _____

Number of latest Technical Newsletter (if any) concerning this publication: _____

Please indicate if you wish a reply. ☐ Yes ☐ No

If yes: Name _____

_____

Address _____

Thank you for your cooperation. No postage stamp necessary if mailed in the U.S.A. (Elsewhere, an IBM office or representative will be happy to forward your comments.)

Cut or Fold Along Line

Your comments, please . . .

Your comments, together with your answer to the questions on the back of this form, will help us produce better publications for your use. Your comments will be carefully reviewed by the persons responsible for writing and publishing this material. All comments and suggestions become the property of IBM.

Fold Fold

First Class
Permit 40
Armonk
New York

Business Reply Mail
No postage stamp necessary if mailed in the U.S.A.

Postage will be paid by:

International Business Machines Corporation
Department 52L
Neighborhood Road
Kingston, New York 12401

Fold Fold

IBM

International Business Machines Corporation
Data Processing Division
1133 Westchester Avenue, White Plains, New York 10604
(U.S.A. only)

IBM World Trade Corporation
821 United Nations Plaza, New York, New York 10017
(International)

Cut or Fold Along Line

3270 Information Display System Physical Planning and Installation Manual Printed in USA SY27-2349-4

SY27-2349-4

Your comments, please . . .

Your comments, together with your answer to the questions on the back of this form, will help us produce better publications for your use. Your comments will be carefully reviewed by the persons responsible for writing and publishing this material. All comments and suggestions become the property of IBM.

Fold Fold

First Class
Permit 40
Armonk
New York

Business Reply Mail
No postage stamp necessary if mailed in the U.S.A.

Postage will be paid by:

International Business Machines Corporation
Department 52L
Neighborhood Road
Kingston, New York 12401

Fold Fold

IBM

International Business Machines Corporation
Data Processing Division
1133 Westchester Avenue, White Plains, New York 10604
(U.S.A. only)

IBM World Trade Corporation
821 United Nations Plaza, New York, New York 10017
(International)

Cut or Fold Along Line

3270 Information Display System Physical Planning and Installation Manual Printed in USA SY27-2349-4

Technical Newsletter

This Newsletter No.	SN31-2806
Date	June 15, 1978
Base Publication No.	SY27-2349-4
File No.	None
Previous Newsletters	None

3270 Information Display System
Physical Planning Information and
Installation Manual

©IBM Corp. 1973, 1974, 1975, 1976

This Technical Newsletter provides revised covers which limit the scope of the base publication to the early units of the 3270 Information Display System (3271, 3272, 3275, 3277, 3284, 3286, and 3288). The pages to be inserted and/or removed are:

Cover, ii
Reader's Comment Form (front and back) (removed and not replaced)
Blank, Back Cover

Note: *Please file this cover letter at the back of the manual to provide a record of the changes that have been made.*

IBM Corporation, Department 63T, Kingston, New York 12401

Printed in U.S.A.

System
Maintenance
Library

System

cut here

3270 Information Display System Physical Planning and Installation Manual: 3271/3272/3275/3277/3284/3286/3288 Printed in USA SY27-2349-4

IBM®

International Business Machines Corporation
Data Processing Division
1133 Westchester Avenue, White Plains, N.Y. 10604

IBM World Trade Americas/Far East Corporation
Town of Mount Pleasant, Route 9, North Tarrytown, N.Y., U.S.A. 10591

IBM World Trade Europe/Middle East/Africa Corporation
360 Hamilton Avenue, White Plains, N.Y., U.S.A. 10601