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4701 Controller Models 1, 2, 3, and 5 Repair Manual

SC31-3511-4

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Fifth Edition (November 1984)

This edition, SC31-3511-4, is a major revision of SC31-3511-3, which is obsolete. It includes information on the dual expansion units. The Model 3 Controller has been added to this edition.

Information contained in this manual is subject to change from time to time. Any such change will be reported in subsequent revisions or Technical Newsletters. Changes and additions are indicated by a vertical line at the left of the changes.

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Safety Notices

These notices appear on the indicated pages.

DANGER
Do not continue this procedure until the machine power has been switched off. Page 3-17

DANGER
The gound lead must be re-attached if you switch on the controller and the diskette drive is set aside from the controller. Page 3-17

DANGER
The drive motor case becomes hot after continuous use. Page 3-21

DANGER
High voltage may be present at the capacitor terminals **F** ***. Pages 3-21, 3-23***

DANGER
Voltage is still present at the socket when the drive motor power cable is disconnected. Page 3-23

DANGER
Allow approximately two minutes for the power supply capacitors to completely discharge before continuing this procedure. Page 3-29

SAFETY

Safety Procedures

You are responsible for maintaining a safe working environment at all times. This section describes the rules that you should follow when working with electrical and mechanical equipment, describes how to administer first aid if an electrical accident occurs, and describes how to report an accident. You must use discretion and your own judgment as to when and how to apply these procedures.

Rules for Safety

If you know the safety rules for working with electrical and mechanical equipment and if you observe these rules, you can work safely with IBM equipment. These rules are described below.

Environmental Safety

Observe the following rules:

- Do not work alone in hazardous conditions or near equipment that has dangerous voltages. Always inform your manager of conditions or voltages that could cause a problem.
- Always look for possible hazards, such as moist floors, nongrounded extension cables, power surges, and missing safety grounds.
- Do not do anything that could make the equipment unsafe or that could create a hazard.
- Before you start the equipment, ensure that other customer engineers (CEs) and customer personnel are not in a hazardous position.
- Do not wear loose clothing that can be trapped in the moving parts of a machine. Ensure that the sleeves of your clothing are fastened or are rolled above the elbow. If your hair is long, fasten it to make it safe.
- Insert your necktie or scarf into your clothing or fasten it with a clip (preferably nonconductive) at approximately 8 centimeters (3 inches) from its end.
- Lift the equipment or parts by pushing up with your leg muscles; this removes the strain from your back. Do not lift any equipment or parts that are too heavy for you to lift comfortably.

- Put removed machine covers in a safe place while you are servicing the machine. Reinstall the covers before returning the machine to the customer.

- Always keep your tool kit away from walk areas so that other persons cannot trip over it. For example, keep the kit on or under a desk or a table.

- Observe good housekeeping practices in the area of the machines while you are performing maintenance and after completing it.

- Reinstall all safety devices, such as guards, shields, labels, and ground wires. Replace safety devices that are worn or defective with new ones. (*Remember,* the safety devices protect you from a hazard. You defeat their purpose if you do not reinstall them when you have completed the service call.)

Electrical Safety

Observe the following rules when working on electric machinery:

- If possible, always unplug the power-supply cable before you work on a machine. When you switch off power at the wall box, lock the switch in the off position or attach a DO NOT OPERATE tag (Z229-0237) to the switch.

  Note: Non-IBM equipment that is attached to an IBM machine may be powered by another source and may be controlled by a different switch or circuit breaker.

- Switch off all power:

  - Before removing or assembling the main units of the equipment
  - Before working near power supplies
  - Before inspecting power supplies
  - Before installing changes in machine circuits.

- Unless the maintenance documents specifically instruct you, do not service the following parts with power on *if the part is removed from its installed position in the machine:* power supplies, pumps, blowers, motor generators, and other units with voltages that are more than 30 V ac or 42.4 V dc. (This is to ensure that correct electrical grounding is maintained.)

- If you must work on equipment that has exposed live electric circuits, observe the following precautions:

  - Ensure that another person who is familiar with the power-off controls is near you. Another person must be there to switch off the power if necessary.

- Do not wear jewelry, chains, metal-frame eyeglasses, or other personal metal objects. (*Remember,* if the metal touches the machine, the flow of current increases because the metal is a conductor.)

- Use only insulated probe tips or extenders. (*Remember,* worn or cracked insulation is unsafe.)

- Use only one hand while you are working on or near equipment with power switched on. Keep the other hand in your pocket or behind your back. (*Remember,* there must be a complete circuit for an electrical shock to occur. This precaution prevents *your body* from completing the circuit!)

- Do not touch objects that are grounded, such as metal floor strips, machine frames, or other conductors. Use suitable rubber mats obtained locally, if necessary.

- When you use test equipment, set the controls correctly and use only properly insulated probes.

- When you are working with machines having voltages more than 30V ac or 42.4 V dc, observe the special safety instructions given in customer engineering memorandums (CEMs).

- Never *assume* that power has been removed from a circuit; *check* that it has been removed.

- Do not touch live electric circuits with the surface of a plastic dental mirror. (*Remember,* the handle of the dental mirror is conductive and can cause damage and personal injury.)

- If an electrical accident occurs:

  1. *Use caution; do not be a victim yourself.*

  2. *Switch off the power.*

  3. *Instruct another person to get medical aid.*

  4. *If the victim is not breathing, perform mouth-to-mouth rescue breathing. See "Rescue Breathing" later in this section.*

Summary

Prevention is the main aid to electrical safety. Always think about electrical safety and use *good practice,* for example:

- Ensure that the customer's power receptacle matches the IBM equipment specifications.
- Inspect power cables and plugs; check for loose, damaged, or worn parts.
- Review the procedure in the maintenance documents before you remove a part that can hold an electric charge. *Carefully* discharge the necessary parts exactly as instructed by the procedure.
- Do not use a normal light (for example, a table lamp) as a trouble light at a machine.

Never *assume* that a machine or a circuit is safe. No machine is *always* completely safe. Any of the following conditions can cause the machine to be hazardous:

- The power receptacles could be wired incorrectly.
- Safety devices or features could be missing or defective.
- The maintenance and/or change history could be wrong or incomplete.
- The machine could have a design problem.
- The machine could have been damaged when it was shipped.
- The machine could have an unsafe change or attachment installed.
- An engineering change or a sales change could be installed incorrectly.
- A part could be defective.
- A part could be assembled incorrectly.
- The machine could have deteriorated because it is old or because it operates in an extreme environment.

These are some of the ways that the condition of the machine could affect safety. *Before you start a service call or procedure, use good judgment and use caution.*

Mechanical Safety

Do not touch moving mechanical parts when you are:

- Lubricating a part
- Checking for play
- Doing other similar work.

Eye Safety

Wear safety glasses when:

- Using a hammer to drive pins or similar parts
- Using a power drill
- Using a spring hook to attach or remove a spring
- Soldering parts
- Cutting wire or removing steel bands
- Using solvents, chemicals, or cleaners to clean parts
- Working in any other conditions that could injure your eyes.

Tools, Testers, and Expendable Field Supplies

Observe the following rules when working with tools, testers, solvents, adhesives, and lubricants:

- Do not use tools and testers that have not been approved by IBM. Ensure that electrical hand tools, such as wire wrapping tools and power drills, are inspected regularly.

- Exchange worn or broken tools and testers with new ones.

- Do not use solvents, cleaners, adhesives, or oils that have not been approved by IBM.

Electrical Accidents – First Aid

When performing rescue procedures for an electrical accident, do as follows:

- *Use Caution:* If the victim is still in contact with the electrical-current source, remove the power; to do this, you may need to operate the room emergency power-off (EPO) switch or the disconnecting switch. If you cannot find the switch, use a dry wooden rod or other nonconductive object to pull or push the victim away from contact with the electrical-current source.

- *Work Quickly:* If unconscious, the victim may need mouth-to-mouth rescue breathing and possibly external cardiac compression if the victim's heart is not beating.

- *Call for the Rescue Service,* such as the ambulance or the hospital. Instruct another person to call for medical aid.

Rescue Breathing

If the victim needs mouth-to-mouth rescue breathing, perform the following steps:

CAUTION

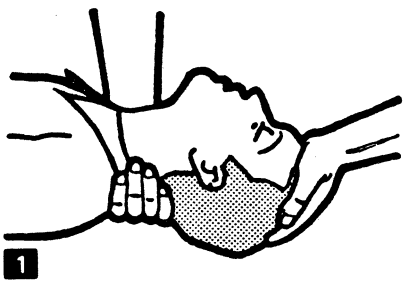
Use extreme care when you perform rescue breathing for a victim who may have breathed in toxic fumes. Do not breathe in air that the victim has breathed out.

1. Prepare for rescue breathing as follows:

   a. Ensure that the victim's airway is open and that it is not obstructed; check the mouth for objects that may be obstructing the airway, such as chewing gum, food, dentures, or the tongue.

   b. Place the victim on his back, put one hand behind the victim's neck, and put the other hand on his forehead.

   c. Lift the victim's neck with one hand, and tilt his head backward by pressing on his forehead with your other hand **1** .



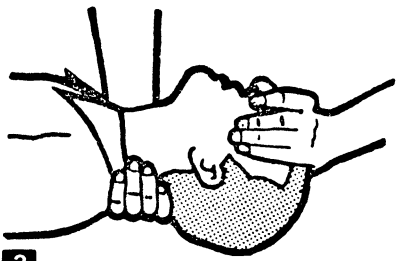
2. *Look, listen, and feel* to determine if the victim is breathing freely:

   a. Put your cheek near the victim's mouth and nose.

   b. Listen and feel for the breathing-out of air. At the same time, look at the victim's chest and upper abdomen to see if they move up and down.

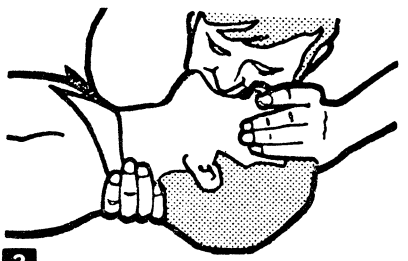
3. If the victim is not breathing correctly:

   a. Keep the victim's head tilted backward and continue to press on the victim's forehead with your hand; at the same time, rotate this same hand so that you can pinch the victim's nostrils together with your thumb and finger **2** .



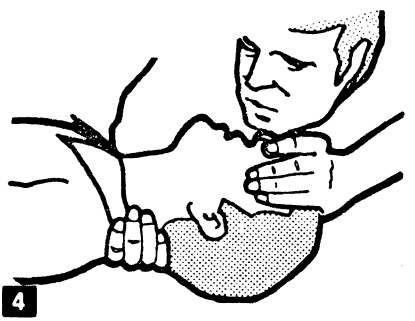
2

   b. Open your mouth wide and take a deep breath. Make a tight seal with your mouth around the victim's mouth **3** and blow into the victim's mouth.



3

   c. Remove your mouth to let the victim breathe out, and check to see if the victim's chest moves down **4** .



4

   d. Repeat steps 3b and 3c once every 5 seconds until the victim breathes for himself or until medical aid arrives.

Reporting Accidents

Report, to your *manager*, all accidents, possible hazards, and accidents that nearly occurred. (*Remember,* an accident that nearly occurs might be caused by a design problem; by reporting the problem, you ensure that the problem will be quickly solved.)

Also report all small electrical shocks. (*Remember,* a condition that causes a small shock need differ only slightly to cause serious injury.)

ESD Warning Notices

You should observe the following procedures when handling Electrostatically Sensitive Parts such as logic cards.

ESD Precaution Procedures

Certain cards and logic boards can be damaged by electrostatic discharge (ESD) when they are handled. If current from such a discharge passes through these parts, damage can range from immediate failure to degraded performance (the parts wear out prematurely). To reduce the exposure to damage from ESD, you should:

- Keep the ESD-sensitive parts in their protective container (ESD bag) until you are ready to install the parts into the machine.
- When handling these parts, minimize your body movement to prevent the buildup of static electricity from clothing, carpeting, and furniture. Be most cautious when handling these parts during the winter heating season because low humidity contributes to static buildup.
- Before touching ESD-sensitive parts, discharge yourself by touching the machine or a ground point.
- When handling these parts, avoid touching the components or pins on the card or board. Handle the parts by their edges or connector shrouds (covers) and use the proper tool to remove the parts from the machine.
- When you remove ESD-sensitive parts from their protective containers, do not place the parts on a machine cover or on a metal table. Machine covers and metal tables are electrical grounds. They increase the risk of damaging the parts by providing a discharge path from your body through the parts to ground. When you remove ESD-sensitive parts from a machine, always put them in a protective container before you set them down.
- Do not leave ESD-sensitive parts where they can be exposed to accidental contact by anyone. Replace machine covers when you are not working on the machine.
- If practical, store all ESD-sensitive parts in a grounded metal cabinet.

Preface

This manual contains maintenance information to enable the service representative to repair the IBM 4701 Controller at the customer's location. This manual does not use MAPs and does not reference scoping points; it has the service representative measure voltages as little as possible. The repair concept is to use symptom fix charts.

This manual contains the following chapters:

- "Chapter 1. Introduction"
- "Chapter 2. Fault Isolation Procedures"
- "Chapter 3. Removal and Replacement Procedures"
- "Chapter 4. 4701 Diagrams"
- "Chapter 5. FRU Locations"
- "Appendix A. Expansion Unit Removal and Replacement Procedures"
- "Appendix B. Expansion Frame General Information"

Related Publications

Consult the following publications if additional information is required:

IBM 4701 Controller Operating Instructions, GC31-2022
IBM 4701 Controller Parts Catalog, SC31-3529
IBM 4701 Controller Parts Catalog, SC31-3529
IBM 4701 Communication Expansion Unit Custom Unit Description, SC31-2562
IBM 4704 Display Station Operating Instructions, GC31-2025
IBM 4704 Display Station Repair Manual, SC31-3512
IBM 4710 Receipt/Validation Printer Operating Instructions, GC31-2028
IBM 4710 Receipt/Validation Printer Repair Manual, SC31-3513
IBM 4720 Printer, Models 1, 2, 3, and 4, Repair Manual, SC31-2053
IBM 4720 Forms/Passbook Printer Operating Instructions, GC31-2064
IBM 4700 Subsystem Maintenance Support Manual, SC31-3514
IBM 4700 Subsystem Operating Procedures, GC31-2032
IBM 4700 Finance Communication System Subsystem Problem Determination Guide, GC31-2033
IBM 4700 Control Program Generation, GC31-2071
IBM 4700 Installation Planning Manual, GC31-2018

Related RPQ Bills of Material

The following RPQs are listed below because they are referenced throughout this document. The B/Ms are additional features other than those listed in the Sales Manual.

Alternate Line Attachments:	RPQ Number
– CCA Asynchronous Adapter with Clock (Start/Stop)	8V0114
– CCA Asynchronous Adapter without Clock	8V0168
– EIA/CCITT Interface	8V0115
– EIA/CCITT Interface (Japan only)	8V0116
– HPCA Adapter without Clock (ALA)	8V0117
– SNA-Fanout Communications Interface	8V0118/8V0132
– X.25 with X.21 Nonswitched	8V0134
– X.25 with EIA/CCITT	8V0134
DCA Ports 8 through 15	8V0124/8V0133
4701 Communication Expansion Unit (Frame 4)	8V0222
4701 Dual Expansion Unit Feature	8V0223

Related Diagnostic Diskettes

To determine the level of diagnostic diskette that you should be using, refer to the following table. There may be a few exceptions if your machine has had a field update and so on, but the table will generally meet your requirements.

Diskette Release Level	4701 Controller Repair Manual Suffix Level	Comments
1.0	–0	
1.01	–1	
2.0	–2	
3.0	–3	
3.1	–3	
4.0	–4	Models 1, 2, and 2SE (note)
A.1	–4	Model 3 only (note)

Note: These diskettes are not compatible and not interchangeable.

Summary of Amendments

This edition replaces SC31-3511-3. Changes are indicated by a vertical line to the left of each change, as shown in the left margin of this page.

The following items have been added or deleted from this version of the repair manual.

Dual Expansion Unit information (RPQ 8V0223) has been added to this version. This RPQ is a combination of two Disk Expansion Units or the combination of a Disk Expansion Unit and a Communication Expansion Unit. Throughout this document, for simplicity, these frames will be referred to as expansion units.

Expansion unit related messages and other expansion unit related information have been added to this version of the repair manual. Logic card part numbers and a plug list have been added to this manual to show the card types and locations for a Model 3 logic board.

Chapter 5 reflects only FRU locations. A 4701 parts catalog (SC31-3629) is now available. It is being shipping with the repair manual. Field updates will require that you order the manual through regular ordering procedures.

Contents

Figures

Chapter 1. Introduction

Purpose

The purpose of this manual is to assist you in finding and repairing failures such as:

- A light does not come on.
- An error message is displayed.
- A motor or fan does not run.

This manual assumes that the customer has used the problem determination procedures to identify the controller as the failing unit. It is not intended to assist you in finding and repairing failures that occur when the following events happen at the same time:

- The customer's job stops running or produces incorrect results.
- The diagnostic tests run without failing.
- No visual failure is evident.

Note: For these types of failures, request assistance from your next level support.

Maintenance Approach

This manual has been prepared to enable you to use messages and symptom fix charts to find and repair failures. These messages are displayed when you run the Power-On tests and the offline tests. The Power-On tests are located in read-only storage (ROS) and run anytime you power up or press the Reset key. The offline tests are located on the diagnostic diskette and run following the Power-On tests if the diagnostic diskette is in the diskette drive and the drive is ready.

This manual includes no procedures for online tests. If you must run online tests, consult your next level support. To perform a controller dump to a diskette, you must use the system monitor. Also, you must use the system monitor to execute any system monitor commands. Refer to the *IBM 4701 Controller Operating Instructions,* the *IBM 4700 Subsystem Operating Procedures,* and the *IBM 4700 Problem Determination Guide* to perform any of the previously mentioned functions.

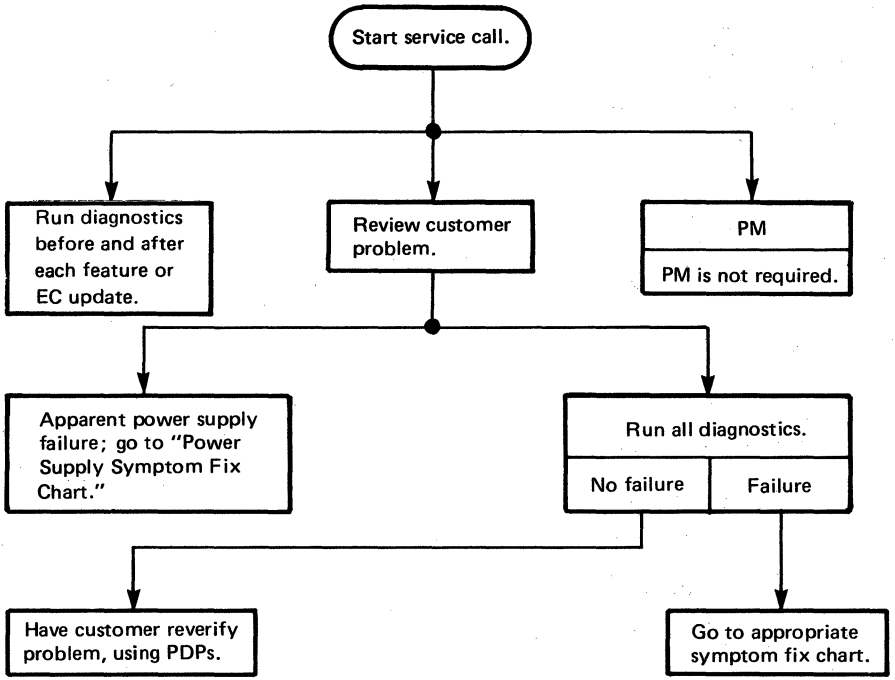


Figure 1-1. Maintenance Approach Flowchart

Field Replaceable Units (FRUs)

Component replacement is limited to certain field-replaceable units (FRUs). When the trouble is isolated to a FRU, you should replace the unit immediately rather than repair it. The FRU replacement philosophy is practical because functionally packaged logic and densely packed components are used throughout the controller.

Customer's Responsibility

It is the customer's responsibility to identify the failing unit and to complete a problem report.

Repair Procedures

Start all repair procedures by following the steps listed under "Start Repair Action" in Chapter 2. Symptom fix charts that point to the most probable cause of a failure are provided to assist you in locating and repairing a failure. Follow the instructions in the Action column sequentially until you have fixed the problem or have requested assistance.

The removal and replacement procedures for the controller are listed in Chapter 2. The removal and replacement procedures for devices mounted in any of the expansion units are listed in Appendix A of this manual.

Part Number Information

Part number information is now in a separate parts catalog.

Field replaceable unit (FRU) location information is located in "Chapter 5. FRU Locations" in this manual.

Chapter 2. Fault Isolation Procedures

Start Repair Action

A problem report should be filled out by the customer each time a failure occurs.

1. Read the information provided on the problem report.

2. Verify that the feature switches are set properly after a new installation, after replacing the operator panel, after an EC change, and after a feature change.

3. Run the Power-On tests and the appropriate adapter tests that are located on the diagnostic diskette to verify that the reported trouble still exists.

4. Match the resulting message with a message in the symptom fix charts.

5. Follow the instructions sequentially in the Action column of the symptom fix charts. If a step in the Action column does not fix the problem or does not apply to your failure, proceed to the next step. If the recommended actions do not fix the problem, call for assistance.

6. Refer to Chapter 3 for the removal and replacement procedures for all the FRUs. FRU locations are given in "Chapter 5. FRU Locations." Refer to the *4701 Parts Catalog* for FRU part numbers.

7. Verify the repair by running the offline tests.

Feature Switches

The feature switches must be set properly before you can run the offline tests or run the customer's application programs; therefore, you must check the feature switch settings to ensure that they accurately reflect the customer's features.

If your controller has either RPQ 8V0222 or RPQ 8V0223, you must also consider the position of the serial number switches, because they also identify features that may be installed on your controller. These switches are used in conjunction with upper feature switch 1 being set to the "on" position.

Figure 5-14 and Figure 5-15 describe the feature switches.

Diagnostic Tests

Introduction

The diagnostic tests for the 4700 Finance Communication System consist of:

- Power-On Tests

  The Power-On tests reside in read-only storage (ROS) and run after you press either the On/Off switch or the Reset key. These tests are used primarily to test the electronics of the controller card, all of storage, and other basic controller components.

- Offline Tests

  - Extended controller tests
  - Disk enclosure file tests
  - Controller adapter tests

  The offline tests (extended controller tests, disk enclosure (disk) file tests, and controller adapter tests) reside on the diagnostic diskette and run automatically after the Power-On tests if the diagnostic diskette is in the diskette drive. There are controller adapter tests for the DCA, disk, host link, ALA, loop, and diskette adapters.

- Device Exercisers

  The device exercisers reside on the diagnostic diskette and are invoked *only* from a keyboard display with address 1, loop 1.

  There are device exercisers for the 3604, the 4704, the 4710, 4720, and the DCA terminals.

Figure 2-1 illustrates how to connect wrap plugs (if applicable), set wrap switches (if applicable), and which part numbered cable or wrap plug to use. Before using Figure 2-1 observe your machine's features.

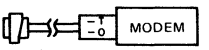
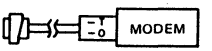
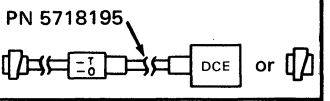
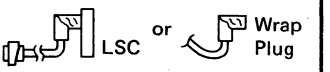
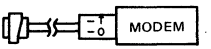
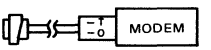
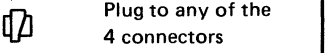
Feature		Internal Cable Number	External Cable Number	Wrap Plug Number	Wrap Test Setup Illustration
Number	Name				
Default	Host EIA/CCITT	6018767	8249921	6125582	
Default	Host EIA/CCITT Japan only	6018767	8249922	6125582	
1422	Host BSC (CCA w/o clock)	6018767	8249921	6125582	
5656	Host X.21 switched and nonswitched	6018767	5718197 5718195	5680976	
4850	Host (8100) Direct or Multi-use Communication Loop (WT only)	6018767	6018886	7389282	
8V0114	ALA synchronous adapter (CCA w/clk)	8259721	None.	6125582	
8V0115	EIA/CCITT (US/WT)	8259721	8249921	6125582	
8V0116	EIA/CCITT (Japan only)	8259721	8249922	6125582	
8V0117	ALA-SDLC Adapter (HPCA w/o clock)	8259721	None.	None.	
8V0118	SNA-Fanout	6018768	None.	8259706	
8V0168	ALA-Synchronous Adapter (CCA w/o clk)	8259721	None.	None.	
2835	DATEL (UK only)	None.	1743584	—	

Figure 2-1. Communication Adapter Cable and Wrap Plug Connections

Diagnostic Test Summary

All of the offline tests can be selected for looping by the diagnostic test switches on the operator panel (see Figure 2-4 in this chapter). The controller adapter tests can also be started by the control console (keyboard/display). The device exercisers can be started only by the control console; these tests are controlled by facilities that were read into storage when the diagnostic diskette was loaded during the initialization phase.

Controller Adapter Tests

The controller adapter tests are on the diagnostic diskette. Only those adapters with feature switches that are set on are tested. The adapter tests run automatically after the extended controller tests and can be selectively run at a keyboard/display installed on loop 1 (see "Running the Offline Tests/Device Exercisers at a Control Console" in this chapter).

The adapter testing sequence is as follows:

1. DCA adapter (T100)

   The DCA adapter is tested by microcode that runs prior to the disk enclosure adapter/drive test (optional feature).

2. Disk enclosure adapter and disk enclosure drive (T500) (optional feature) and (T700) RPQ.

   The redrive card, the disk drive adapter card, the disk drive attachment card, disk drive(s) A and B, and the drive's associated logic cards are tested by microcode that runs prior to loading the initialization microcode from the diagnostic diskette.

   A controller with the Dual Expansion Unit Feature (RPQ) installed will also run an additional test (T700). It tests those same adapters and cards associated with disk drive(s) C and D in the second expansion unit.

3. Host adapter (T200)

   The high performance communications adapter (HPCA) or the common communications adapter (CCA) is tested by the appropriate diagnostic common adapter code (CAC).

   a. For the Electronics Industries Association (EIA) driver/receiver, the host cable must be installed and the Oper/Test switch must be set to Test before this test can be run.

   b. For a multiuse communication loop, the wrap plug must be installed, or the connector must be plugged into the loop station connector (LSC).

   c. For X.21 switched or nonswitched, the wrap plug (PN 5680976) must be plugged into the connector on the rear of the controller.

4. Alternate Line Adapter (ALA) (T300)

   a. For SNA-Fanout, the wrap plug (PN 8259706) must be plugged to one of the connectors (at panel H) on the rear of the controller.

   b. For ALA (other than SNA-Fanout), the external cable must be installed (panel G) and the Oper/Test switch must be set to Test before this test can be run, or the wrap plug (PN 6125582) must be inserted.

5. Loop adapter (T400)

   The loop adapter(s) identified by the controller feature switches is/are tested.

6. Primary diskette drive/adapter (T600)

   The primary diskette drive (IPL drive) and adapter's write capability are tested by writing a test pattern to track 73 on the diagnostic diskette, and read capability is tested by reading the record and comparing its data with that which was written. Both sides of a diskette are tested if a diagnostic diskette 2 is used.

7. Auxiliary diskette drive adapter (T600)

   The auxiliary diskette drive and adapter are tested when the appropriate feature switch is set on and the diagnostic diskette is inserted, or when the diagnostic diskette is inserted in the auxiliary diskette drive and is alternately used as the IPL drive.

Diagnostic Tests		
Power-On Tests	**Offline Tests**	**System Monitor Tests**
Reside in read-only storage.	Reside on the diagnostic diskette.	Are run only when your next level support directs you to run them.
Test the: • Controller card • Basic controller electronics • All of the storage	Consist of: • Extended controller tests • Disk enclosure tests • System monitor • Controller adapter tests • Device exercisers	

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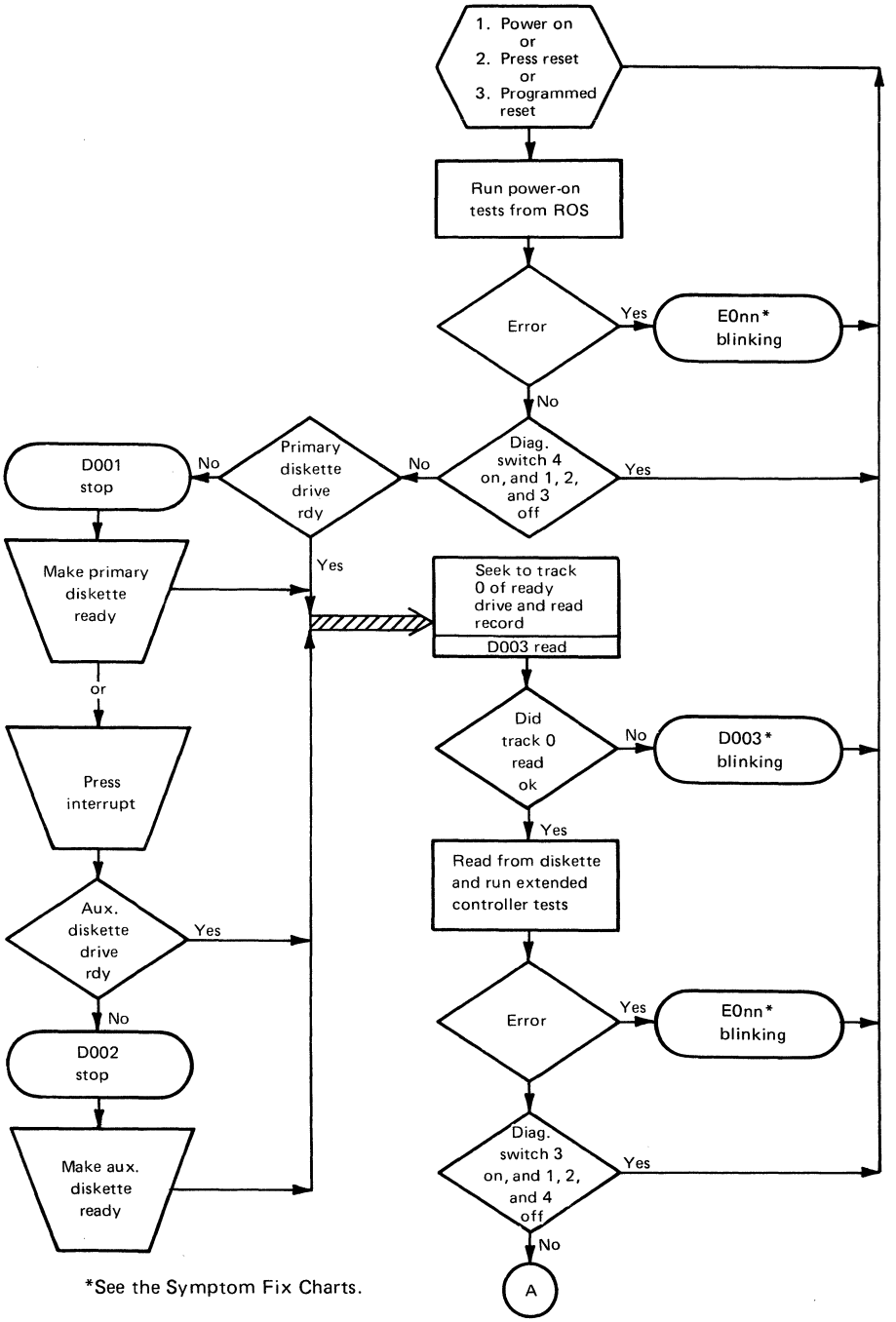


Figure 2-2 (Part 1 of 4). Diagnostic Test Flowchart

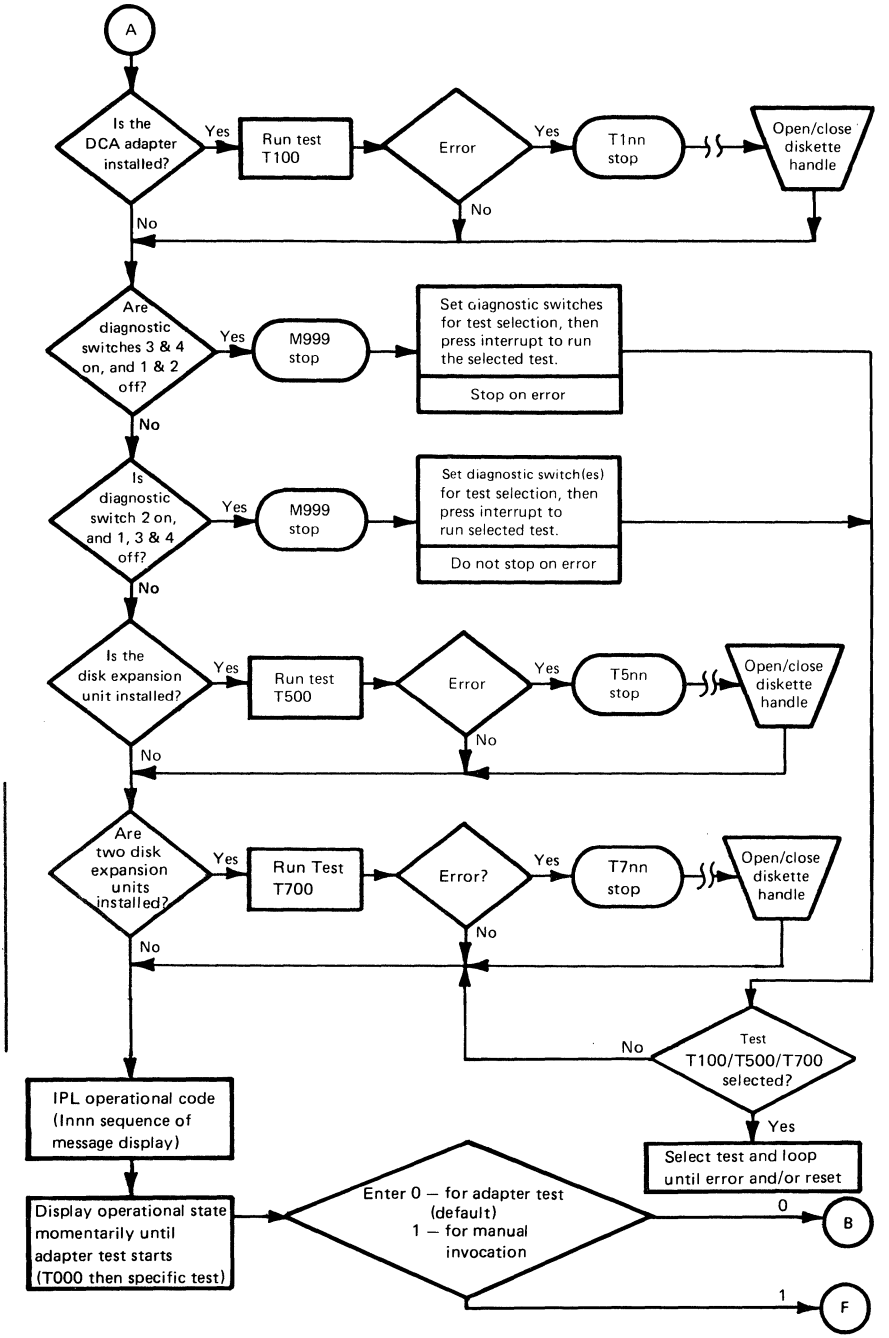


Figure 2-2 (Part 2 of 4). Diagnostic Test Flowchart

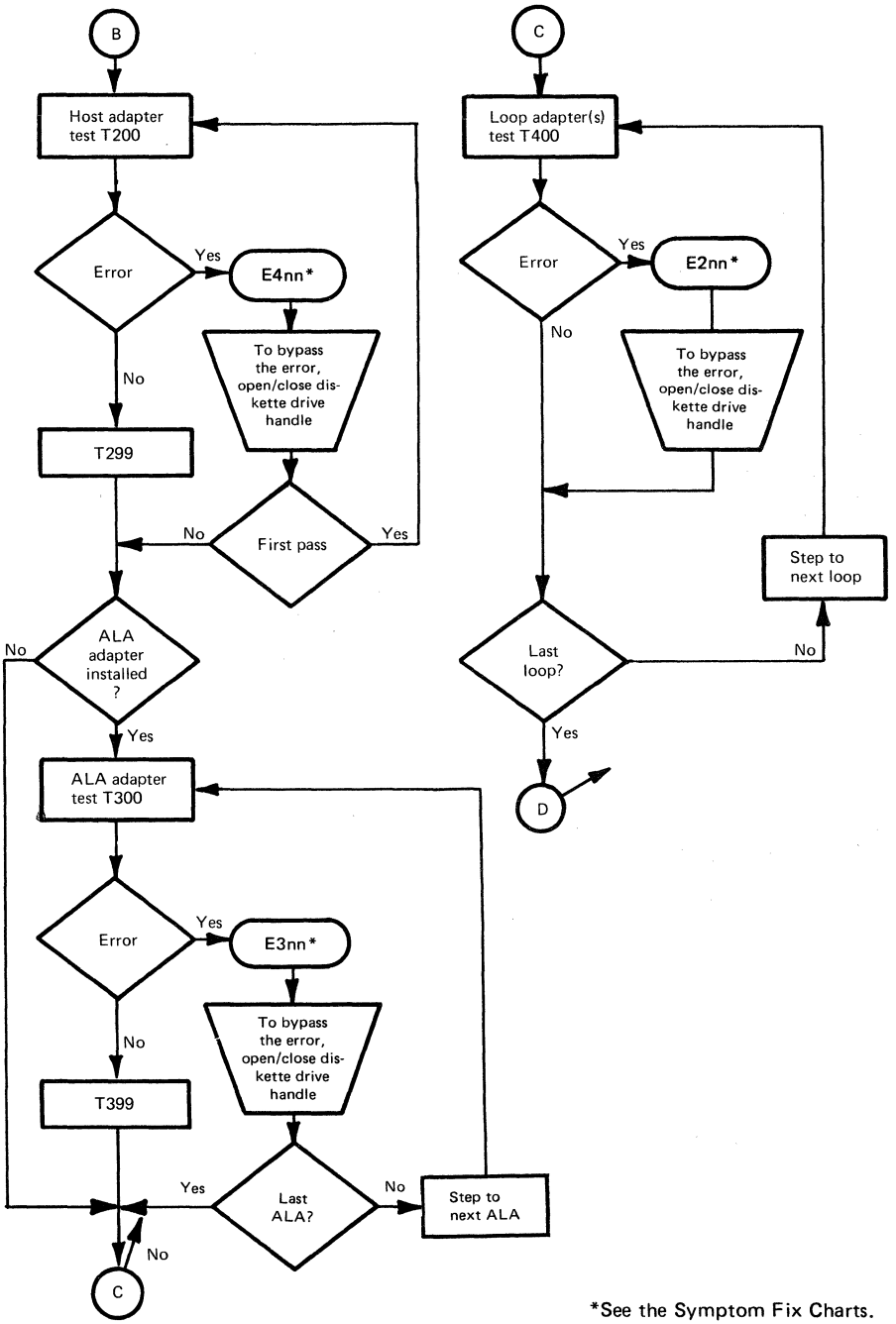
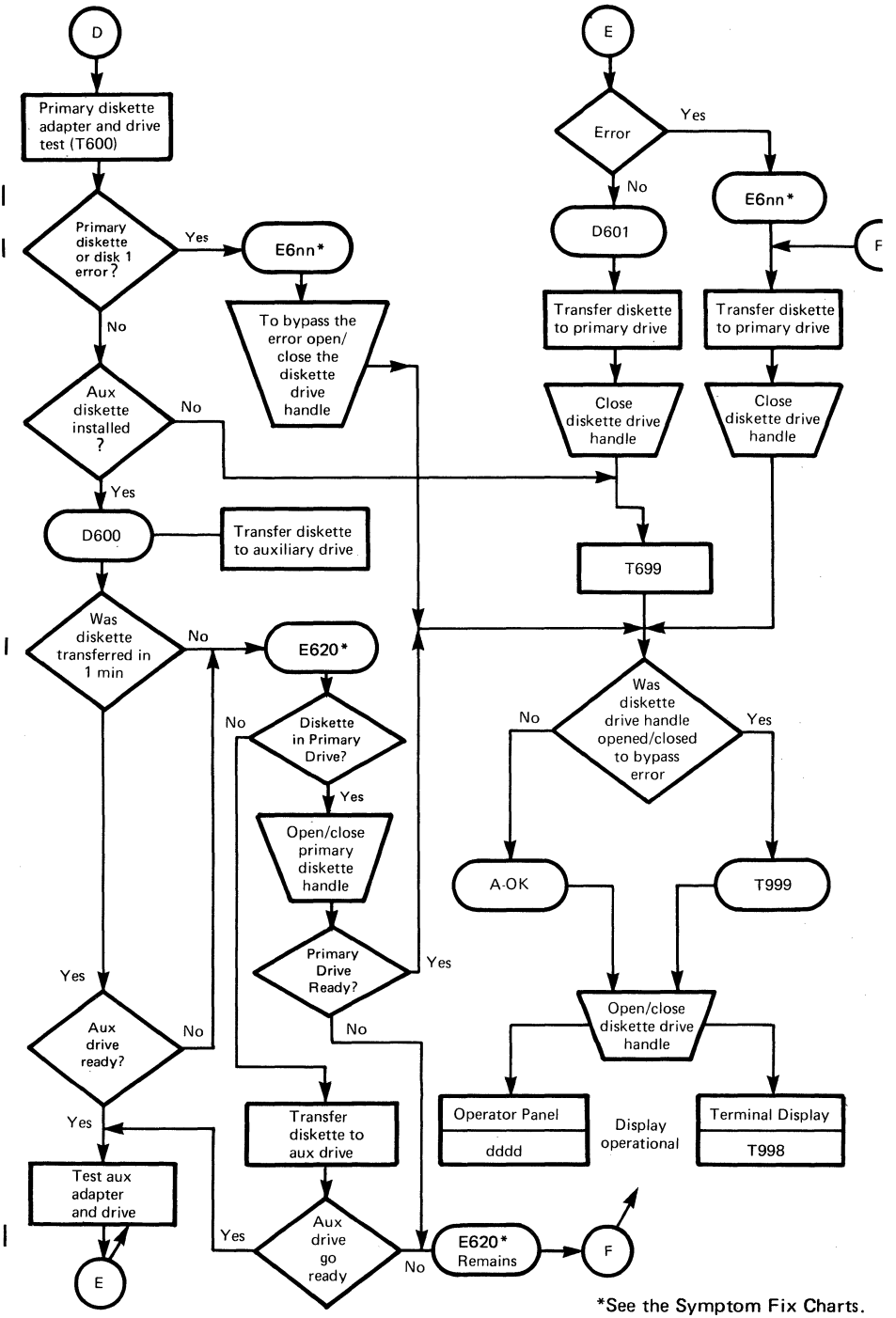


Figure 2-2 (Part 3 of 4). Diagnostic Test Flowchart



*See the Symptom Fix Charts.

Figure 2-2 (Part 4 of 4). Diagnostic Test Flowchart

Test/Function Sequence	Status Indicator		Message Display		Approx Run Time
	Normal	Error	Normal	Error Stop	
Power-On (i) Tests	Test	Test Check	E00n	E00n (b)	30 to 40 sec
Extended (i) Controller Tests	Test	Test Check	D003, then E0nn	D00n or (b) E00n (b)	25 to 40 sec
DCA Adapter Test	Test	Test Check	T100 (s) T199 (c)	E1nn (b)	5 sec
Disk Enclosure Tests	Test	Test Check	T500 (s) T599 (c) T700 (s) T799 (c)	E5nn (b) E7nn (b)	Each drive approx 3 minutes and 45 seconds
Initialization Phase (i)	Test	Check	Innn	Cnnn (b) Xnnn (b)	3 minutes and 30 sec
Operational State (i)	Ready Alert (u)	Check	uuuu (u)	Cnnn (b) Xnnn (b)	30 sec
	Ready	—	T000	(a)	—
Host Adapter Test	Test Ready Alert (u)	Test Check	T200 (s) T299 (c)	E2nn (b)	15 sec (t)
SNA-Fanout/ ALA Adapter Test	Test Ready Alert (u)	Test Check	T300 (s) T399 (c)	E3nn (b)	15 sec (t)
Loop Adapter Test	Test Ready Alert (u)	Test Check	T400 (s) T499 (c)	E4nn (b)	25 sec (t)
Diskette Adapter Test	Test Ready Alert (u)	Test Check	T600 (s) T699 (c) D600 (m) D601 (m)	E6nn (b)	15 sec (t)
End of Testing	Test Ready		A-OK or T999 (*)		(t)

Figure 2-3 (Part 1 of 2). Diagnostic Tests

Test/Function Sequence	Status Indicator		Message Display		Approx Run Time
	Normal	Error	Normal	Error Stop	
At this time, you can enter the system operation state by opening and then closing the primary diskette drive handle. T998 is displayed on the control console when the drive becomes ready. Do *not* enter keyboard information until T998 is displayed.					
System Status Operational	Ready Alert (u)	Check	dddd (d) (a)	Cnnn (b) Xnnn (b)	(t)

Figure 2-3 (Part 2 of 2). Diagnostic Tests

The following letter codes provide additional information for Figure 2-3.

Letter Code	Description
a	Indicates that a system error can occur at this time. Look in the Problem Determination Procedures (PDP) for a description of the errors.
b	Indicates that the displayed message will blink.
c	Indicates that the test is complete.
d	Indicates that the display is a nominal display that gives the status of the adapters as seen by the operational code.
i	Indicates that the test/function is also on the installation diskette and on the operating diskette.
m	Indicates that the message requires manual intervention.
n	Indicates that a variable error or a sequence number can be displayed at this time.
s	Indicates that a test has started. This message may be displayed during the entire test, for example, the host adapter test.
t	Indicates that the execution time of the test is variable. Factors affecting this time include the host adapter type, the number of loops, and the time required for manual intervention.
u	Indicates that the indicator or message is undefined. The indicator could be "on" or "off," or a message could be displayed.
*	Indicates that the test is complete but that an error occurred or a message requiring manual intervention was displayed during the test.

Running the Offline Tests by Using the Diagnostic Test Switches

Before running the offline tests, set the diagnostic test switches as shown in Figure 2-4.

Test Description	Switch * Setting 1	2	3	4	Test Procedures
Loop the power-on tests.	0	0	0	1	1. Insert the diagnostic diskette. 2. Set the appropriate diagnostic test switches on. 3. Press the Reset key to start looping the test. 4. To stop the tests, set all diagnostic test switches off and press the Reset key.
Loop the power-on tests and the extended controller tests.	0	0	1	0	
Loop all tests. This selection performs an IPL after the adapter tests have run.	0	1	0	1	

Figure 2-4 (Part 1 of 2). Diagnostic Test Switches

Test Adapters	Switch * Setting 1	2	3	4	Test Procedures
Loop the adapter tests and stop on an error.	0	0	1	1	1. Insert the diagnostic diskette. 2. Set the appropriate diagnostic test switches on. 3. Press the Reset key to load the monitor. 4. Wait for M999 stop.
Loop the adapter tests, but do not stop on an error.	0	1	0	0	
M999 Stop					
DCA Adapter (T100)	0	0	0	1	5. At M999 stop, select the adapter test by setting the appropriate diagnostic test switches on. 6. Press the Interrupt key to begin looping the selected adapter test. 7. To stop the tests, set all diagnostic test switches off and press the Reset key.
Host Adapter (T200)	0	0	1	0	
ALA Adapter (T300)	0	0	1	1	
Loop(s) Adapter (T400)	0	1	0	0	
Disk Enclosure and Adapter (T500)	0	1	0	1	
Diskette Drive and Adapter (T600)	0	1	1	0	
Disk Enclosure and Adapter (T700)	0	1	1	1	

* 0 = switch off 1 = switch on

Figure 2-4 (Part 2 of 2). Diagnostic Test Switches

Note: When the looping of the controller adapter tests has started, changing the switches will have no effect. To stop the tests, set all switches off and press the Reset key.

You can alternately run the offline tests by using the control console. Refer to "Running the Offline Tests/Device Exercisers at a Control Console" in this chapter.

Note: You cannot select the DCA Adapter Tests (T100) or the Disk Enclosure Tests (T500 or T700) from the control console.

Running the Offline Tests/Device Exercisers at a Control Console

Notes:

1. These tests are applicable only when the diagnostic diskette is installed.

2. Turn power off all terminals except for the control console and the device under test, when executing offline tests and the device exercisers.

The operator can invoke the controller adapter tests and/or the device exercisers at the control console. The keyboard/display unit that is attached to loop 1, address 1, is used as the control console.

The tests may be invoked at two points in the test cycle:

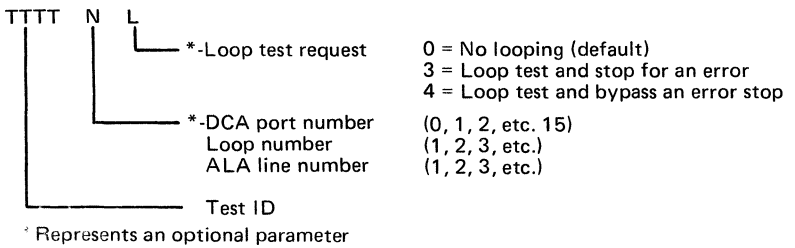
1. When the controller completes the initialization phase, you will receive prompt message:

   T000 enter

   0 – for the adapter tests (default)
   1 – for manual invocation (you must enter it within 20 seconds).

2. When T998 is displayed, you can enter data at the console. Do *not* log onto the system monitor; simply enter the appropriate test ID.

The format for the command is:



Adapter Tests

Note: Enter only the test ID to select and run all the routines of an adapter test. Enter four x's (xxxx) to stop looping.

The *only* valid devices and their corresponding test identification numbers are as follows:

Test ID	Device Tested	Comments
0002	Host Adapter and External Wrap	The Oper/Test switch on the host cable must be in the Test position for EIA. The wrap plug must be installed or the connector must be plugged into the loop station connector (LSC) for a multiuse communication loop. The host cable must be unplugged from the controller, and the wrap plug must be installed for an X.21 switched or X.21 nonswitched host.
0003	ALA Adapters and External Wrap	The ALA cables must be unplugged from the controller, and the wrap plug must be installed for X.21 switched and SNA-Fan-out. A powered on modem must be attached for an X.21 nonswitched.
0004	Loop Adapter(s)	The N parameter has no effect, enter a zero if L parameter is needed. All loop adapters are tested.
0006	Diskette Adapter(s)	

Device Tests

Notes:

1. All of the following devices require that the N parameter be specified.

2. The L parameter is not effective for the device tests.

Enter the test ID for the respective DCA compatible device.

Test ID	Device Tested	Comments
3278	Any DCA display that is 3278 compatible.	Writes a test pattern on any 3278 compatible display.
3287	Any DCA printer that is 3287 compatible.	Writes a test pattern on any 3287 compatible printer.

Enter the test ID for the following loop attached devices.

3604	3604 Display	Set address switch 2 on (address 2).
4704	4704-1 Display	Set address switch 2 on (address 2).
4710	4710 Printer	Set address switches 3 and 7 on
4720	4720 Printer (Note 2)	(address 4, subaddress 4).

Notes:

1. For information concerning using the system monitor to run the system commands, refer to the *IBM 4700 Sybsystem Operating Procedures,* GC31-2032.

2. You must have a diagnostic diskette with a release level of 2.0 or higher.

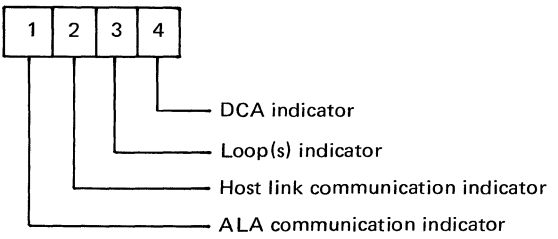
Message Format

When offline testing is complete, the Ready (green) light is turned on and each message display position is set to the initial state (-). Each display position is dynamic; as the microcode determines the state of each adapter, the assigned position is updated.

When a controller adapter (DCA, host, loop, or diskette) problem is indicated by one of the display positions and the offline tests run without detecting a failure, replace the appropriate adapter card. If this does not correct the problem, replace the driver/receiver card (DCA or host).

Note: The "stop loop" command (041 1) will reset the indicator (the command does not define the failing loop).

The following explanation describes the four character positions of the message:



Note: Run the diagnostic diskette tests until you get "A-OK" before trying to diagnose the customer's error message.

Character Position 1: Indicates the status of the ALA communication adapter. The following characters can be displayed in this position:

– The ALA communication adapter was not started, or it was not installed on the controller.

% An error was detected during normal operations causing a line failure. An attempt was made to restart the line. The status of the failure can be found in the ALA line status counters.

* An error was detected during a wrap test of the adapter or modem. Retry of the wrap test is in process. The status of the failure can be found in the system log.

" The Stop Line command for the ALA communication adapter was issued. The adapter was stopped.

< The adapter was started, but contact with a secondary unit has not been established.

> The controller is in contact with at least one of the attached secondary control units. Frame/synchronization characters are being received on the communication line.

\+ All control units attached to the ALA line are on line and ready. Frame/synchronization characters are being received from all of the attached control units.

= No ALA module was loaded because of a mismatch between the ALA machine configuration switches and the ALA line selected in the CPGEN.

& A control unit that has been varied on line and has been placed on the slow poll list. That is, ALA is not receiving frame/sync characters from one or more of the secondary control units which had previously been ready.

@ A read/write error to a control unit has occurred.

Character Position 2: Indicates the status of the host communication link. This includes all supported links, including SNA SDLC, SNA multiuse communication loop, and BSC. The following characters can be displayed in this position:

\- The host communication adapter was not started.

% An error was detected during normal operations, causing a link failure. An attempt was made to re-establish the link.

1. Check the status counters and log messages.
2. Run the diagnostics using the diagnostic diskette.
3. Check that the controller has the correct unit address.

* An error was detected during a wrap test of the adapter or modem. Retry of the wrap test is in process.

1. The status can be found in the system log.
2. Run the diagnostics using the diagnostic diskette.

" The Stop Link command for the secondary communications adapter was issued. The adapter was stopped.

< The adapter was started, but contact with the host was not established.

> The controller is in contact with the host. Frame/sync characters are being received on the communication line. This is not applicable for the BSC link.

\+ The controller is in contact with the host and it has received Activate Physical Unit (ACTPU). For BSC, Poll/Sec was received.

= No host link module was loaded because of a mismatch between the host link machine configuration switches and the 4701 host link selected in the CPGEN.

/ The host link is connected to the IBM multiuse communication loop, and contact with the host was lost. (This is displayed approximately eight seconds after contact has been lost.)

Character Position 3: Indicates the status of the loop(s). A plus sign (+) means that all the defined loops are operational. A number identifies the lowest failing loop. Additional higher numbered loops may also be failing.

Note: A "stop loop" (040 1) system monitor command will reset the indicator (the 040 1 does not define the failing loop).

Character Position 4: Indicates the status of the DCA and its attached terminals. The following characters can be displayed in this position:

– The DCA was not started or was stopped, or it was not installed on the controller.

\+ The DCA was started, and all defined ports with attached powered-on devices were activated.

0–F These characters indicate the number of the last port that went from an active state to an inactive state. If multiple ports have gone from an active state to an inactive state, only the number of the last port is indicated. When the port indicated as inactive returns to the active state, the lowest port number of any remaining ports that went from active to inactive is indicated. If all remaining ports are active, the indicator returns to plus (+), indicating that all the defined ports are active.

X The DCA was stopped due to an operator request.

* The DCA was stopped due to an error.

A-OK and M999 Messages

A-OK and M999 messages are displayed when testing is complete or when manual intervention is required.

The following A-OK and M999 Messages Chart lists the messages, the causes, and recommended actions to follow when you receive these messages:

Message	Cause	Action
A-OK	This message is displayed at the end of the adapter test. It indicates that after opening and closing the diskette drive handle, you can now use the keyboard/display to select a test, or you can log on to the system monitor. When the drive becomes ready, the A-OK message changes to the system state (usually message dddd). Wait for T998 on the control console before making any keyboard entry.	1. Open and close the diskette drive handle (T998 will display on the control console) and then select the adapter/terminal you want to test (refer to "Running the Offline Tests/Device Exercisers at a Control Console" in this chapter.) 2. Press the Reset key (on the 3604 or 4704) three times if you want to log on to the system monitor and display the error logs or run the monitor device exerciser tests (refer to the *IBM 4700 Subsystem Operating Procedures,* GC31-2032, for additional information.)
M999	Diagnostic switches 3 and 4 or diagnostic switch 2 was set on at POR.	Set on the diagnostic test switches for the adapter that you want to test and press the Interrupt key to continue.

Figure 2-5. A-OK and M999 Messages Chart

Power Supply Symptom Fix Chart

The power supply for the controller, the primary diskette drive, and the auxiliary diskette drive is located in the base of the controller (frame 1). An additional power supply is located in the base of the disk expansion unit and the communication expansion unit (frames 3, 3cd, and 4). These power supplies are essentially identical; therefore their removal and replacement procedures as well as the symptom fix charts will be included, with the exceptions noted. The cooling fan is attached to the controller/expansion unit and provides the cooling for the power supply and the logic cards. Power is distributed from the controller power supply (frame 1) to the controller and the diskette drive(s) via the cables plugged into connectors A2J2, A2J3, and A2J4. Refer to Figure 4-4 for additional information about the controller power supply. Power is distributed from frames 3, 3cd, and 4 to the disk enclosure(s) via connectors A2J2, A2J4, and A2J5. A diskette drive may be installed in either frame 3 or frame 4. Refer to Figure 4-5 for additional information about the frames 3, 3cd and 4 power supplies.

A Power-On light located on the operator panel of the controller, a power supply LED located on the power supply, and the cooling fan can help you identify problems with the controller power supply.

A Power-On light located on the Indicator Panel of frames 3, 3cd or 4, a power supply LED located on the power supply, and the cooling fan can help you identify problems with the power supply in frames 3, 3cd, or 4.

If the power-on light on the frames, 3, 3cd, or 4 Indicator Panel did not come on, follow the action for the controller power supply.

The following Power Supply Symptom Fix Chart lists the symptoms, the causes, and the recommended actions to follow to resolve the problem:

Symptom	Cause	Action
The Power-On light on the 4701 does not come on, and the cooling fan does not run when the On/Off switch is set to the On position.	The ac voltage is incorrect or missing, or a fuse is blown. The following FRUs could be defective: • Fuse • Power cord • Power switch • Line filter • Ac cable	1. Ensure that the power cord is plugged in an outlet that has the correct voltage. 2. Ensure that the power cord is plugged into the controller. 3. Check for a defective fuse. If the fuse is defective, go to the symptom "Fuse A1F1 blows." 4. Remove the top cover (refer to "Removal" under "Top Cover" in Chapter 3) and measure the ac input voltage at ac switch connector A1J6 — pins 1 and 2. If the voltage is missing, unplug the power cord and use the CE meter to check the ac input. Replace the cable, line filter, or ac power cord if it is defective. 5. Check the switch by measuring the ac voltage at ac switch connector A1J6 — pins 3 and 4. Refer to Figure 4-4 (Part 1 of 2). Replace the switch if it is defective.
The Power-On light on one of the expansion units does not come on, and the associated fan does not run when the On/Off switch on the 4701 is set to the On position.	The ac voltage is incorrect or missing, a fuse is blown, or the D1 and/or D2 connectors on the rear of the 4701 are not securely plugged. The following FRUs could be defective: • Fuse • Power Cord • Line Filter • Ac distribution cable • Interconnecting +24 V cable • K1 relay	1. Ensure that the power cord is securely plugged at both ends and that ac voltage is present at the ac outlet. 2. Ensure that the D1, D2, D3 and D4 connectors are securely plugged into the correct connectors on the rear of the 4701. **Note:** D1 and D3 are the top connectors for each respective expansion unit. 3. Check for a defective fuse. 4. Remove the Expansion Unit top cover and check for +24 V at pin 1 of connector A1J6. Refer to Figure 4-5 (Part 2 of 2) to determine where to measure the voltage. 5. Replace the indicator panel card. 6. Replace the ac distribution panel assembly.

Figure 2-6 (Part 1 of 5). Power Supply Symptom Fix Chart

Symptom	Cause	Action
Fuse A1F1 on the 4701 blows.	The power supply input circuit is overloaded, is shorted, or is grounded.	1. Replace fuse 01-A1F1. 2. Switch on the power. If the fuse in the controller blows again, remove the top cover and unplug connectors A1P5, A1P2 (optional), A2P1, A3P1, and A3P2. Replug one connector at a time to find the problem source. 4701 Problem source: • A1P5 — Check the primary diskette drive for binds. Replace the drive motor and capacitor or the diskette drive if necessary. Check the cable and connector to see if one of them is shorted or grounded. • A1P2 — Check the auxiliary diskette drive cables as you did for the primary diskette drive. Interchange the diskette drives to determine if one of the drives is bad. Replace the diskette drive if necessary. • A2P1 — Replace the A2 power supply. **Note:** The LED located on the power supply should blink if the power supply is overloaded. The fuse located on the power supply card should blow *only* when the power supply is defective; therefore, the power supply fuse should not be replaced. • A3P1 and A3P2 — Check the cables and connectors to see if one of them is shorted. 3. Check the fan assembly for binds or shorts. Replace the fan assembly if necessary.

Figure 2-6 (Part 2 of 5). Power Supply Symptom Fix Chart

Symptom	Cause	Action
Fuse A1F1 on one of the expansion units blows.	The power supply input circuit is overloaded, is shorted, or is grounded.	1. Replace fuse A1F1. 2. Switch on the power. If the fuse in the expansion unit blows again, remove the expansion unit top cover and unplug connectors A1P2 and A2P1. Replug one connector at a time to find the problem source. Problem Source: • A1P2 – Check the diskette drive (if installed) for binds. Replace the diskette drive motor and capacitor or the diskette drive if necessary. • A2P1 – Replace the A2 power supply. **Note:** The LED located on the power supply should blink if the power supply is overloaded. The fuse located on the power supply card should blow *only* when the power supply is defective; therefore, the power supply fuse should not be replaced. • A3P1 and A3P2 – Check the cables and connectors to see if one of them is shorted. 3. Check the fan assembly for binds or shorts. Replace the fan assembly if necessary.

Figure 2-6 (Part 3 of 5). Power Supply Symptom Fix Chart

Symptom	Cause	Action
The Power-On light on the 4701 does not come on, the fan is running, and the LED on the power supply is blinking. See Figure 5-9 for the location of the LED.	The power supply output circuit is overloaded or shorted.	1. Switch off the power. Remove the top cover (refer to "Removal" under "Top Cover" in Chapter 3). If the controller power supply appears to be the problem, unplug distribution cables 01D-A2P2, A2P3 (optional feature) and A2P4. 2. Switch on the power. If the LED blinks, replace the power supply (refer to "Removal" under "Power Supply Card" in Chapter 3). If the LED does not blink, switch off the power and disconnect one item at a time and switch on the power, on the following: • Primary diskette 01D-A2P2 • Auxiliary diskette 01D-A2P3 • Logic board 01D-A2P4 Repeat until the problem has been isolated. Replace the defective item.
The Power-On light on the 4701 does not come on, but the LED on the power supply stays on. See Figure 5-9 for the location of the LED.	The Power-On light on the operator panel is defective, there is an open circuit to the LED, or one of the system card connectors is loose.	1. Ensure that all connectors are plugged into the system card. 2. Replace the operator panel (refer to "Removal" under "Operator Panel" in Chapter 3).
The Power-On light on the Disk Expansion or the Communication Expansion Unit does not come on, but the LED on the power supply stays on. See Figure 5-9 for the location of the LED.	The Power-On light on the indicator card is defective, there is an open circuit to the LED, or one of the cable connectors is loose.	1. Ensure that the cable connector A4 is tightly plugged into the segment board. 2. Replace the indicator card. 3. Replace the power supply card.

Figure 2-6 (Part 4 of 5). Power Supply Symptom Fix Chart

Symptom	Cause	Action
The Power-On light on one of the expansion units does not go off (power does not go off) when you switched off the power, or the Power On light goes off immediately (no 30-second delay).	There is a defective indicator card on the respective expansion unit.	Replace the indicator card.
The 4701 controller powers off during normal operation. **Note:** 4701 does not power on while hot (fan continues to run until 4701 cools down).	One of the following may cause the failure: • Insufficient air-flow in the 4701 or the frame 3 or 4 expansion unit. • Inadequate Ac power to the 4701 or the frame 3 or 4 expansion unit. • Defective fan or fan power leads in the 4701 or the frame 3 or 4 expansion unit.	1. Remove any obstacle blocking the airflow. 2. Check the ac power leads to the fan. 3. Rotate the fan and check for binds. Replace the fan if it is binding. 4. Replace the power supply board (refer to "Removal" under "Power Supply Board" in Chapter 3).

Figure 2-6 (Part 5 of 5). Power Supply Symptom Fix Chart

Power-On Test Symptom Fix Chart

The following Power-On Test Symptom Fix Chart lists the sequence of events that occur when the controller is powered on or when the Reset key has been pressed.

You should first reseat a card called out for replacement, rerun the test, and then replace it if necessary.

The following Power-On Tests Symptom Fix Chart lists the correct and incorrect operations and the recommended actions to follow to resolve the problem:

Power-On Sequence	Correct Operation	Incorrect Operation	Action
Light and display test	All the lights and the display segments come on for approximately 2 seconds.	Any light is off except for the Power-On light, or any display segment is blank; or, all the lights are on, and all the display segments are blank.	1. Check that cable conectors W, X, Y and Z are firmly plugged into the top card connectors on the system card. 2. Replace the controller card and the ROS module on the card. 3. Replace the system card. 4. Replace the operator panel. 5. Replace loop adapter number 1 card. 6. Check for a shorted capacitor on the pin side of the logic board (01A-V2J12 to 01A-V2P08). 7. Check the voltages to the logic board. Refer to "Controller Power Diagram" in Chapter 4. 8. Check that the power-on reset line is at +5 V (pin 01AV-2J12). Pin is fed from power supply A2J4 pin 7 through pin 01A-Z4B4. 9. Go to the "Minimum System Checkout Procedure."

Figure 2-7. Power-On Tests Symptom Fix Chart

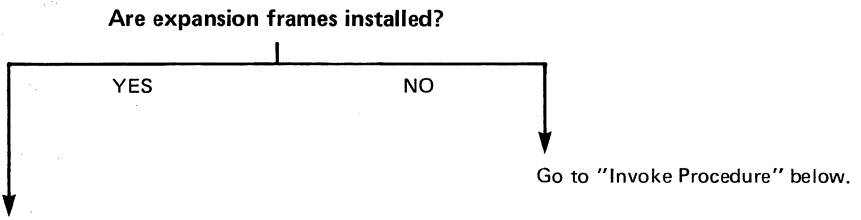
Minimum System Checkout Procedure

Warning: Record the feature switch settings (Figure 5-14) and configurator switch settings (Figure 5-16 and Figure 5-17) before proceeding. Switch settings must be changed as adapters are removed and added.

Always power off the controller before removing or replacing a card.

Minimum System Checkout Procedure Preliminary Setup Instructions

Before starting the Minimum System Checkout Procedure, isolate the controller from any expansion frame(s). After you have disconnected the expansion frame(s), recheck that there is still a failure before continuing the checkout.



Go to "Minimum System Checkout Frame Disconnect Procedure" on page B-1.

References

See Figure:

- Figure 4-2 for physical configuration possibilities
- Figure 5-14 for feature switches
- Figure 5-15 for ALA feature switches (serial number switches)
- Figure 5-17 for Configurator switches.

Invoke Procedure

Models 1 and 2 Only

Unplug all cards except for the following:

- P2, Q2, V2, Y4, and Y5
- If K2 is removed, install a jumper from 01A-Q1B13 to 01A-Q1B11.
- If H2 is removed, set Y5 switch 6 on.
- Set Y4 switch 6 on.

Follow the chart from top to bottom when you test the controller. Do *not* remove or replace any cards not called out by the action column of the following chart.

Models 1 and 2

Message Expected	Action
E001 (2nd 64K of storage)	Install the R2 card and all storage cards.
D001 (Primary diskette adapter)	Install the following card: Model 1 – 01A-F2 Model 2 – 01A-G2
E0A3 (Auxiliary diskette adapter) Note.	Install the following card: 1 Meg drive – 01A-E2 0.5 Meg drive – 01A-D2
E0A4 (DCA adapter) Note.	Install the following card: Model 1 – 01A-H2 Model 2 – 01A-H2 Set switch 6 on the 01A-Y5 configurator cards to the "off" position.

Note: This message is feature sensitive.

Figure 2-8 (Part 1 of 6). Minimum System Checkout Procedure

Message Expected	Action
E0A6 (Loop 4 adapter) Note.	Install the following card: Model 1 – 01A-L2 Model 2 – 01A-L2
E0A7 (Loop 3 adapter) Note.	Install the following card: Model 1 – 01A-M2 Model 2 – 01A-M2
E0A8 (Loop 2 adapter)	Install the following card: Model 1 – 01A-N2 Model 2 – 01A-N2 (See Appendix B)
E0B1 (Host adapter)	Install the 01A-J2 card. Set switch 6 on the 01A-Y4 configurator cards to the "off" position.
E0B4 (ALA adapter) Note.	Install the 01A-K2 card. Remove the jumper from 01A-Q1.
E203 (Host line)	Install the 01A-A2 card. Install the proper communication cable or wrap. See Figure 2-1.
E313 (Comm. Driver) Note.	Install the 01A-R4 card. Install the proper communication cable or wrap. See Figure 2-1.
D600 (Aux. diskette adapter) Note.	
A-OK	All adapters test "good".

Note: This message is feature sensitive.

Figure 2-8 (Part 2 of 6). Minimum System Checkout Procedure

Model 2SE Only

Unplug all cards except for the following:

- Q2, V2, L2, Y4, Y5.
- If J2 is removed, install a jumper from 01A-M1A13 to 01A-M1A11.
- If K2 is removed, install a jumper from 01A-Q1B13 to 01A-Q1B11.
- If H2 is removed, set Y5 switch 6 on.

Model 2SE Only

Message Expected	Action
E001	Install the R2 card.
D001	Install all remaining storage cards.
D001 (Primary diskette adapter)	Install the 01A-G2 card.
E0A3 (Auxiliary diskette adapter) Note.	Install the following card: 01A-E2.
E0A4 (DCA adapter) Note.	Install the following card: 01A-H2. Set switch 6 on the 01A-Y5 configurator card to the "off" position.

Note: This message is feature sensitive.

Figure 2-8 (Part 3 of 6). Minimum System Checkout Procedure

Model 2SE Only

Message Expected	Action
E0A6 (Loop 4 adapter) Note.	Install the following card: 01A-B2.
E0A7 (Loop 3 adapter) Note.	Install the following card: 01A-D2.
E0A8 (Loop 2 adapter)	Install the following card: 01A-F2.
E0B1 (Host adapter)	Install the 01A-J2 card. Remove the jumper from 01A-M1.
E0B4 (ALA adapter) Note.	Install the 01A-K2 card. Remove the jumper from 01A-Q1.
E203 (Host line)	Install the 01A-A2 card. Install the proper communication cable or wrap. See Figure 2-1.
E313 (Comm. Driver) Note.	Install the 01A-R4 card. Install the proper communication cable or wrap. See Figure 2-1.
D600 (Aux. Diskette adapter) Note.	
A-OK	All adapters test "good".

Note: This message is feature sensitive.

Figure 2-8 (Part 4 of 6). Minimum System Checkout Procedure

Model 3 Only

Unplug all cards except for the following:

- Q2, V2, L2, Y4, Y5.
- If J2 is removed install a jumper from 01A-M1A13 to 01A-M1A11.
- If K2 is removed install jumper from 01A-Q1B13 to 01A-Q1B11.
- If H2 is removed set Y5 switch 6 on.

Model 3 Only

Message Expected	Action
E000	Install the S2 card. This must always be a 256K card for a Model 3. See "Model 3 Diagnostic Aids," page 2-37.
D003 (Primary Diskette Adapter)	Install the 01A-G2 card.
EM03	Install the 01A-T2 card. Install the remaining storage cards. Ensure that any 128K card is installed in the highest increment of storage. **Note:** The storage cards must be installed in the following sequence: S2, T2, U2, M2, N2, and then P2. See "Model 3 Diagnostic Aids," page 2-37.
E0A3 (Auxiliary diskette adapter) Note.	Install the following card: 01A-E2.
E0A4 (DCA adapter) Note.	Install the following card: 01A-H2. Set switch 6 on the 01A-Y5 configurator cards to the "off" position.

Note: This message is feature sensitive.

Figure 2-8 (Part 5 of 6). Minimum System Checkout Procedure

Model 3 Only

Message Expected	Action
E0A6 (Loop 4 adapter) Note 1.	Install the following card: 01A-B2.
E0A7 (Loop 3 adapter) Note 1.	Install the following card: 01A-D2.
E0A8 (Loop 2 adapter)	Install the following card: 01A-F2.
E0B1 (Host adapter)	Install the 01A-J2 card. Remove the jumper from 01A-M1.
E0B4 (ALA adapter) Note 1.	Install the 01A-K2 card. Remove the jumper from 01A-Q1.
E203 (Host line)	Install the 01A-A2 card. Install the proper communication cable or wrap. See Figure 2-1.
E313 (Comm. Driver)	Install the 01A-R4 card. Install the proper communication cable or wrap. See Figure 2-1.
D600 (Note 1)	
A-OK	All adapters test "good".

Notes:
1. This message is feature sensitive.
2. Model 2SE represents controllers that have the storage enhancement feature installed.

Figure 2-8 (Part 6 of 6). Minimum System Checkout Procedure

Model 3 Diagnostic Aids

The controller card and storage cards for a Model 3 successfully bypass some types of temporary or permanent storage errors. Normally, these errors are bypassed automatically and are not recorded as a failure or noticed by the customer.

If errors occur that are nonrecoverable, the failure may sometimes be bypassed by relocating storage cards. Before replacing a storage card or if a replacement card is not immediately available, try relocating the failing card to another storage location. If storage size permits, move the failing card from one order of storage to the other (high to low or low to high). For example, install either S2, T2, or U2 into M2, or install either M2, N2, or P2 into S2.

Note: Ensure that the cards are installed in the following order: S2, T2, U2, M2, N2, and P2, and that 256K byte cards are installed first. Model 3 controllers are shipped with 256K cards; 128K cards are available only as a result of ordering a model conversion. See error code EMnn for an explanation of storage increment locations.

To bypass one type of failure, you can rearrange the storage cards. But even if you leave the cards in their present location, the customer will probably experience no problem unless a storage failure occurs at the same time that this logic is also defective. Otherwise, only a type 031 log message will be recorded.

The chart below lists the logic card and the storage cards. You should replace the specified logic card and the corresponding storage increment card when you get one of the messages below.

The error codes for reconfigure and storage failure are:

Message	Logic Card	and	Storage Card Affected
EK01	System Card	and	first 128K increment
EK02	System card	and	second 128K increment
EK03	System card	and	third 128K increment
EK04	System card	and	fourth 128K increment
EK05	System card	and	fifth 128K increment
EK06	System card	and	sixth 128K increment
EP07	Controller card	and	seventh 128K increment
EP08	Controller card	and	eighth 128K increment
EP09	Controller card	and	ninth 128K increment
EP10	Controller card	and	tenth 128K increment
EP11	Controller card	and	eleventh 128K increment
EP12	Controller card	and	twelfth 128K increment

Chart A

<table>
<tr>
<td>EMnn</td>
<td>The indicated storage increment failed.
Note: Each increment is equal to 128K bytes of storage. The storage cards may be 128K or 256K bytes. Card position S2 must contain a 256K-byte card. All 256K cards must be installed into lower increment positions than the 128K-byte cards. A maximum of two 128K storage cards may be used.

The storage cards are identified as follows:

1. The part number
128K-byte is 6931961
256K-byte is 4752116.
2. 256K-byte cards have components covering the entire card, while the 128K-byte cards have components on only half of the card.
3. The storage cards can be installed in increments and can be plugged in the following incremental order:

The order of installation is:
<table>
<tr><th>512K</th><th>768K</th><th>1024K</th><th>1280K</th><th>1536K</th><th></th></tr>
<tr><td>S2
T2*</td><td>S2
T2
U2*</td><td>S2
T2
U2
M2*</td><td>S2
T2
U2
M2
N2*</td><td>S2
T2
U2
M2
N2
P2</td><td>256K
256K
256K
256K
256K
256K</td></tr>
<tr><td>T2
U2</td><td>U2
M2</td><td>M2
N2</td><td>N2
P2</td><td></td><td>128K
128K</td></tr>
</table>
</td>
<td>1. Replace indicated storage card.
2. Replace the controller card.
3. Replace the system card.
4. Go to the "Minimum System Checkout Procedure."</td>
</tr>
</table>

*This 256 K card can be replaced with the two 128K cards listed below.

Chart B

Offline Tests Symptom Fix Charts

Prior to using the following symptom fix charts in this chapter, remove the top cover and check to see if:

1. The fan is turning. If the fan fails to run, verify that you have the proper voltage at A3P1 and A3P2. Refer to Figure 4-3 and Figure 4-4 for the location of these connectors. Replace the fan if necessary.

2. The diskette drive motor/belt/collet is turning. If the diskette drive motor is not turning, verify that you have the proper voltage at A1J5. Refer to Figure 4-3 for the location of this connector. Replace the diskette drive motor if necessary.

3. The cards are seated and latched. Verify that the card retention rails are installed. These should be replaced after every service call. Never replace the top cover until the rails have been replaced.

4. The power connectors and other cable connectors are seated correctly. Refer to Figure 4-3 and Figure 4-4 for the location of all the power connectors.

5. Top card connectors W, X, Y, and Z are plugged into the correct positions on the system card. If you are not careful, the connectors can be plugged wrong by one pin-row. Refer to Figure 5-6 for the location of these connectors in the controller (frame 01).

   Note: Insert the diagnostic diskette.

You should first reseat a card called out for replacement, rerun the test, and then replace it if necessary.

Offline Tests Symptom Index Chart

The following Offline Tests Symptom Index Chart lists the sequence of tests that run when the diagnostic diskette is installed in the diskette drive and the diskette drive handle is closed and no diagnostic test switches have been set on or when diagnostic switches 2 and 4 have been set on.

You should first reseat a card called out for replacement, rerun the test, and then replace it if necessary.

Power-On Sequence	Correct Operation	Incorrect Operation	Action
Extended controller tests	All lights are off except the Test/IPL and the Power-On light, and the E0nn message is displayed.	The E0nn message is blinking.	Refer to "E Message Symptom Fix Chart" in this chapter.
		The D00n message is displayed.	Refer to "D Message Symptom Fix Chart" in this chapter.
DCA adapter tests	The Test/IPL light stays on, and the T100 message followed by the T199 message is displayed	The E101 error message is blinking.	Refer to "E Message Symptom Fix Chart" in this chapter.
Disk drive tests for drives A and B	T500 should be followed by the T5nn and T599 messages.	The E5nn error message is blinking.	Refer to "Expansion Unit Error Symptom Fix Chart" in Appendix A.
Disk drive tests for drives C and D	T700 should be followed by the T7nn and T799 messages.	The E7nn error message is blinking.	Refer to "Expansion Unit Error Symptom Fix Chart" in Appendix A.

Figure 2-9 (Part 1 of 2). Offline Tests Symptom Fix Chart

Power-On Sequence	Correct Operation	Incorrect Operation	Action
Initialization	The Test/IPL light stays on, and a series of Innn messages is displayed. When I699 is displayed, a programmed pause occurs, and a start message is sent to a display unit on loop 1, address 1. Initialization automatically resumes after 20 seconds if the terminal sends no response to the start message. The Ready (green) light comes on at the end of initialization.	The Test/IPL light goes off, and the Check light comes on. The Cnnn or Xnnn message is displayed. Testing stops when the Cnnn or Xnnn message is displayed.	Refer to "X Message Symptom Fix Chart" or "C Message Symptom Fix Chart" in this chapter.
Controller adapter tests	The Ready (green) and Test/IPL lights stay on. The Tnnn message keeps changing.	The Check (red) light may stay on. The display does not change, or an E error message is displayed.	Refer to "E Message Symptom Fix Chart" in this chapter.

The controller adapter tests have run successfully when A-OK is displayed and when the Ready and Test/IPL lights stay on.

T999 is displayed at the end of the test if manual intervention (opening and closing the primary diskette drive handle) was required at any time during the test.

When A-OK or T999 is displayed, you can enter the system state by opening and then closing the diskette drive handle.

A keyboard/display that is powered on and attached to loop 1, address 1, displays T998 when the drive becomes ready.

Figure 2-9 (Part 2 of 2). Offline Tests Symptom Fix Chart

C Message Symptom Fix Chart

C messages are displayed when a hardware error has been detected on the controller. A system dump is usually necessary to save the error information for the customer engineer when the diagnostic tests do not detect the error, when the error is intermittent, or when the error occurs only during certain operations.

You should first reseat a card called out for replacement, rerun the test, and then replace it if necessary.

The following C Message Symptom Fix Chart lists the messages, the causes, and the recommended actions to follow to resolve the problem:

Message	Cause	Action
C00n	The Interrupt key was pressed during normal operations. n is the interrupt level.	1. If a dump is required: a. Remove the diskette from the IPL drive. b. Press the Interrupt key to display the D1nn message. c. Refer to the D1nn message to complete the dump. 2. Press the Reset key to start the controller.
C1nn	A controller error occurred. nn is the trap code and is used by the design support center to analyze the dump. Record the message number for the support center if you plan to call for assistance.	1. Complete a dump. 2. Press the Interrupt key and continue as instructed in the D100 message.
C2nn	A storage parity error occurred. nn is the storage area: See: C280 = 1st 64K storage (E000) C240 = 2nd 64K storage (E001) C220 = 3rd 64K storage (E002) C210 = 4th 64K storage (E003) C208 = 5th 64K storage (E004) C204 = 6th 64K storage (E005) C202 = 7th 64K storage (E006) C201 = 8th 64K storage (E007) C200 = Unknown 64K storage	1. Record the message. 2. Press the Reset key to run the Power-On tests. 3. Check the resulting Ennn message and replace the defective storage card. 4. If the Power-On tests do not fail, use the C2nn message to identify the failing storage card. 5. If message C200 is displayed, replace the controller card.

Figure 2-10 (Part 1 of 4). C Message Symptom Fix Chart

Message	Cause	Action
C3nn	A storage parity error occurred. nn is the 64K section of storage that failed.	Inset the diagnostic diskette and perform the steps listed in the Action column under the C2nn message.

nn	64K Storage Increment			Associated E Message		
	Models 1 and 2	Model 2SE	Model 3	Models 1 and 2	Model 2SE	Model 3
00	1st	1st	1st	E000	E000	See the EMnn chart in Figure 2-12.
01	2nd	2nd	2nd	E001	E001	
02	3rd	3rd	3rd	E002	E002	
03	4th	4th	4th	E003	E003	
04	5th	5th	5th	E004	E004	
05	6th	6th	6th	E005	E005	
06	7th	7th	7th	E006	E006	
07	8th	8th	8th	E007	E007	
08			9th			
09			10th			
0A		9th	11th		E012	
0B		10th	12th		E013	
0C		11th	13th		E014	
0D		12th	14th		E015	
0E		13th	15th		E016	
0F		14th	16th		E017	
10			17th			
11			18th			
12			19th			
13			20th			
14			21st			
15			22nd			
16			23rd			
17			24th			
FF		System Card		E018		

Note: C308 and C309 should not occur.

Figure 2-10 (Part 2 of 4). C Message Symptom Fix Chart

<table>
<tr><th>Message</th><th>Cause</th><th>Action</th></tr>
<tr><td>C4nn</td><td>An invalid sequence was detected between the controller and the adapter. nn is the adapter address.
<table>
<tr><th>nn</th><th>Adapter Address</th></tr>
<tr><td>06</td><td>DCA</td></tr>
<tr><td>0B</td><td>Auxiliary diskette</td></tr>
<tr><td>0C</td><td>Disk adapter</td></tr>
<tr><td>0D</td><td>Second disk adapter or the Communications Expansion Unit</td></tr>
<tr><td>0F</td><td>System card</td></tr>
<tr><td>15</td><td>Host link</td></tr>
<tr><td>17</td><td>Primary diskette</td></tr>
<tr><td>20</td><td>Loop 1 Read</td></tr>
<tr><td>21</td><td>Loop 1 Write</td></tr>
<tr><td>22</td><td>Loop 2 Read</td></tr>
<tr><td>23</td><td>Loop 2 Write</td></tr>
<tr><td>24</td><td>Loop 3 Read</td></tr>
<tr><td>25</td><td>Loop 3 Write</td></tr>
<tr><td>40</td><td>Loop 4 Read</td></tr>
<tr><td>41</td><td>Loop 4 Write</td></tr>
<tr><td>42</td><td>Loop 5 Read</td></tr>
<tr><td>43</td><td>Loop 5 Write</td></tr>
<tr><td>44</td><td>Loop 6 Read</td></tr>
<tr><td>45</td><td>Loop 6 Write</td></tr>
<tr><td>60</td><td>Invalid adapter</td></tr>
<tr><td>80</td><td>ALA port 1</td></tr>
<tr><td>81</td><td>ALA port 2</td></tr>
<tr><td>82</td><td>ALA port 3</td></tr>
<tr><td>83</td><td>ALA port 4</td></tr>
<tr><td>84</td><td>ALA port 5</td></tr>
</table></td><td>1. Record the message.
2. Insert the diagnostic diskette and run the adapter tests.
3. Check the resulting Ennn messages for the same adapter. Refer to "E Messages Symptom Fix Chart" in this chapter.
4. If the adapter tests do not fail, use the C4nn message to identify the failing adapter; replace the defective card.
5. Verify proper switch settings on the configurator cards. (A1Y4/A1Y5)</td></tr>
</table>

Figure 2-10 (Part 3 of 4). C Message Symptom Fix Chart

Message	Cause	Action
C500	A controller processor failure occurred.	Record this message in case it is needed for your support center.
C7nn	A controller error occurred. nn is the trap code. It can be used by your support center to analyze the dump.	1. Record the C7nn message. 2. Perform a storage dump. a. Remove the diskette from the IPL drive. b. Press the Interrupt key to display the D1nn message. c. Refer to the D1nn message to complete the dump.
C8nn	An input parity error occurred. nn is the adapter address.	Follow the instructions in the Action column under the C4nn message.

Figure 2-10 (Part 4 of 4). C Message Symptom Fix Chart

D Message Symptom Fix Chart

D messages are displayed during the Power-On test when the diskette drive is not ready, when a read error occurs, or when manual intervention is required. These messages are also displayed during a dump when there are diskette problems.

If you replace the diskette drive, make sure you replace it with the correct diskette drive. There are two versions of the diskette drive. The difference between the two versions is not easy to determine, so you should check the part numbers.

You should first reseat a card called out for replacement, rerun the test, and then replace it if necessary.

The following D Message Symptom Fix Charts list the messages, the causes, and the recommended actions to follow to resolve the problem:

Message	Cause	Action
D001 (blinking) D002 (blinking)	The primary diskette drive is not ready. **Note 1:** If you want to use the auxiliary diskette drive, insert the diagnostic diskette into the auxiliary diskette drive and press the Interrupt key when the D001 message appears. The diagnostic tests will then be loaded from the auxiliary diskette drive. **Note 2:** For detailed diskette drive service procedures, refer to the *IBM 4700 Subsystem Maintenance Support Manual,* SC31-3514. **Note 3:** D002 message identifies the auxiliary drive.	1. Check the diskette as follows: a. Make sure the diskette is correctly inserted and that the diskette drive handle is closed. b. Try another diskette. 2. Check the diskette drive as follows: a. Remove the controller top cover. Refer to "Removal" under "Top Cover" in Chapter 3. b. Check the diskette drive for damage. c. Check that the diskette drive motor is turning. 3. Replace the primary diskette adapter card. 4. Replace the primary diskette drive. 5. Replace the controller card. If that does not correct the problem, one of the PIO bus adapter cards may be the cause. 6. If there are any expansion units attached, ensure that all connectors are securely fastened and that they are in the correct position. See Figure 4-2. 7. Go to the "Minimum System Checkout Procedure."

Figure 2-11 (Part 1 of 4). D Message Symptom Fix Chart

Message	Cause	Action
D003	A diskette read error occurred. **Note:** A D003 message is displayed for a short time during initial storage loading.	1. Try another diskette. 2. Remove the top cover. Refer to "Removal" under "Top Cover" in Chapter 3. 3. Check the diskette drive for damage. 4. Check that the configurator cards plugged into A1Y4 and A1Y5 have the proper setting. Replace the card if necessary. See Figure 5-16 and Figure 5-17. 5. Replace the diskette adapter card for the diskette drive being tested. 6. Replace the diskette drive. 7. Replace the controller card. 8. If there are any expansion units attached, ensure that all connectors are securely fastened and that they are in the correct position. See Figure 4-2. 9. Go to the "Minimum System Checkout Procedure," page 2-31.

Figure 2-11 (Part 2 of 4). D Message Symptom Fix Chart

Message	Cause	Action
D004	The diskette in the diskette drive is not an IPL diskette.	1. Replace the diskette with an IPL diskette. 2. Press the Reset key to see if the error recurs. 3. Refer to the Action column under the D003 message for a possible hardware failure.
D005	The diagnostic test was being loaded and the startup micro-code was being checked. A hash error occurred.	1. Press the Reset key to retry. If the error recurs, try another diskette. 2. Refer to the Action column under the D003 message for a possible hardware failure. The D003 testing may not have detected the problem.
D006	The microcode was being authenticated. If D006 was blinking (after a steady display of approximately 35 seconds), the authentication process has indicated a failure. **Note:** On IBM supplied diskettes, other than a diagnostic diskette, D006 will display for approximately 20 seconds. If authentication fails, D006 will blink.	1. Press the Reset key to retry. If the error recurs, confirm that a properly written 4701 diskette is being used. Try another diskette. 2. Refer to the Action column under the D003 and E00A messages for a possible hardware failure. The D003 and E00A testing may not have detected the problem.

Figure 2-11 (Part 3 of 4). D Message Symptom Fix Chart

Message	Cause	Action
D1nn	The controller is ready to dump. nn identifies the storage section to be dumped. For a more complete description of the dump process, refer to the *IBM 4700 Subsystem Operating Procedures,* GC31-2032.	Insert a dump diskette into the diskette drive and close the diskette drive handle. If you do not want a dump, press the Reset key.
D200	The dump was completed.	Remove the dump diskette.
D201	The dumping of the currently loaded diskette was completed; however, the controller dump was not completed.	Remove the diskette and continue the dump process as instructed by the D100 message.
D202	An output error occurred during the diskette dump.	Remove the diskette and continue the dump process as instructed by the D100 message. Use a different diskette.
D203	The diskette is not formatted for 256-byte records.	Remove the diskette and continue the dump process as instructed by the D100 message. Use a formatted diskette.
D600	The controller is ready to test the non-IPLed diskette drive and adapter. **Note:** You must transfer the diskette within one minute or you will receive the E620 error message.	Move the diagnostic diskette to the other diskette drive and close the diskette drive handle.
D601	The controller has completed testing of the non-IPLed diskette adapter.	Reinsert the diagnostic diskette into the other diskette drive and close the diskette drive handle.

Figure 2-11 (Part 4 of 4). D Message Symptom Fix Chart

E Message Symptom Fix Chart

E messages are displayed during diagnostic tests. If an error is detected, the test stops and a blinking E message is displayed. If an error is detected, the adapter test stops, the Check light turns on, and an E message is displayed.

You should first reseat a card called out for replacement, rerun the test, and then replace it if necessary.

The following E Message Symptom Fix Chart lists the messages, the causes, and the recommended actions to follow to resolve the problem.

Message	Cause: Storage Card Plug Location: Mod 1,2	Mod 2SE *	Mod 3	Mod 5	Action
E000	Q2	Q2	S2	H2	1. Replace the controller card. 2. Replace the ROS module. 3. If there are any expansion units attached, ensure that all connectors are securely fastened and that they are in the correct position. See Figure 4-2. 4. Go to the "Minimum System Checkout Procedure."
E001	R2	R2	N/A	J2	1. Replace the indicated storage card. 2. Replace the controller card. 3. Go to the "Minimum System Checkout Procedure."
E002	S2	S2	N/A	J4	
E003	T2	S2	N/A	N/A	
E004	U2	T2	N/A	N/A	
E005	U4	T2	N/A	N/A	
E006	T4	T2**	N/A	N/A	
E007	S4	T2**	N/A	N/A	

Note: If you receive an E000 through E007 message that identifies a storage card that is not in your controller or if you replace the identified card and this does not correct the problem, go to the "Minimum System Checkout Procedure."

*Mod 2SE = Model 2 with storage enhancement feature

**T2 could be either 128K or 256 K; refer to Figure 5-25 to determine the appropriate card to be installed.

Figure 2-12 (Part 1 of 18). E Message Symptom Fix Chart

Message	Cause: Storage Card Plug Location			Action
	Mod 1,2	Mod 2SE*	Mod 5	
E012	N/A	P2	N/A	1. Check that upper feature switch 5 is set correctly. 2. Replace the indicated storage card. 3. Replace the controller card. 4. Replace the system card. 5. Go to the "Minimum System Checkout Procedure."
E013	N/A	P2	N/A	
E014	N/A	P2	N/A	
E015	N/A	P2	N/A	
E016	N/A	N2	N/A	
E017	N/A	N2	N/A	
E018	N/A	V2	N/A	1. Replace the system card. 2. Replace the controller card. 3. Replace the top-card connector cable.

* Mod 2SE = Model 2 with storage enhancement feature

Figure 2-12 (Part 2 of 18). E Message Symptom Fix Chart

Message	Cause	Action
E008	The module on the controller card is defective, or a ROS check sum error or a parity error occurred.	1. Replace the ROS module on the controller card. 2. Replace the controller card.
E009	A multiple adapter failure occurred.	1. Replace the system card. 2. Replace the controller card. 3. Replace the loop 1 adapter card. 4. Reseat all the adapter cards. Go to the "Minimum System Check-out Procedure."
E00A	A nonvolatile storage failure occurred.	1. The encryption switch is in the clock-wise position. 2. Replace the system card. 3. Replace the encryption switch.
E020	There is a system control problem.	1. Replace the system card. 2. Replace the operator panel. 3. Replace the controller card. 4. If there are any expansion units attached, ensure that all connectors are securely fastened and that they are in the correct position. See Figure 4-2.
E022	Switch 2 of the upper feature switches is set on. It must be set off.	1. Verify that the feature switches match the features installed with feature switch settings. If incorrect, set them correctly, and press the Reset key to rerun the test. 2. Replace the system card. 3. Replace the operator panel.
E023	Switch 3 of the upper feature switches is set off, but the auxiliary diskette adapter responded.	
E024	Switch 4 of the upper feature switches is set off, but the DCA adapter responded.	
E025	Switch 5 of the upper feature switches is set on. It must be set off if you have 512K or less installed.	
E026	Loop 4 has not been defined, but a response was received from the loop 4 adapter.	
E027	Loop 3 has not been defined, but a response was received from the loop 3 adapter.	
E028	Loop 2 has not been defined, but a response was received from the loop 2 adapter.	

Figure 2-12 (Part 3 of 18). E Message Symptom Fix Chart

Message	Cause	Action
E029	Switches 6, 7, and 8 of the upper feature switches are set off. One of these switches must be set on.	1. Verify that the feature switches match the features installed with feature switch settings. If incorrect, set them correctly, and press the Reset key to rerun the test. 2. Replace the system card. 3. Replace the operator panel.
E02A	Loop 5 has not been defined, but a response was received from the loop 5 adapter.	
E02B	Loop 6 has not been defined, but a response was received from the loop 6 adapter.	
E02C	Upper feature switches 6, 7, and 8 are on. This is an invalid switch setting.	
E031	Lower feature switches 1 through 4 indicate that no communication adapter is installed. **Note:** Host communication adapter is required.	1. Set the appropriate lower feature switch on. See Figure 5-14. Press the Reset key to rerun the test. 2. Replace the system card. 3. Replace the operator panel. 4. The diagnostic diskette is back-level; use a diskette with at least a release level of 2.0.
E032	Lower feature switch 5 was set off. The disk adapter responded.	
E033	Upper feature switch 1 tested on, and second unit was not defined (lower switch 7 off) but the adapter answered.	
E034	Lower feature switches 7 and 8 are set off, but the ALA 1 communication adapter responded.	1. Set the appropriate lower feature switch(es) on. See Figure 5-12. Press the Reset key to rerun the test. 2. Remove the inappropriate or defective adapter card. 3. Replace the system card. 4. Replace the operator panel.

Figure 2-12 (Part 4 of 18). E Message Symptom Fix Chart

Message	Cause	Action
E036	Lower feature switches 7 and 8 tested on.	1. Set the appropriate feature switch(es) on. Press the Reset key to rerun the test. 2. Replace the system card. 3. Replace the operator panel.
E040	Upper feature switch 1 tested on and serial number switch 1 has ALA 1 defined, but there was no response from ALA 1 adapter.	1. Verify that the feature switches match the features installed with the feature switch settings. If they do not match, correct them and then press the Reset key to rerun the test. 2. Replace the adapter card. 3. Replace the system card. 4. Replace the operator panel.
E041	Invalid selection of ALA 1 set in serial number switch 1.	
E042	Serial number switch 2 has ALA 2 defined, but there was no response from ALA 2 adapter.	
E043	Invalid selection of ALA 2 set in serial number switch 2.	

Figure 2-12 (Part 5 of 18). E Message Symptom Fix Chart

Message	Cause	Action
E044	Serial number switch 3 has ALA 3 defined but there was no response from the ALA 3 adapter.	1. Verify that the feature switches match the features installed with the feature switch settings. If they do not match, correct them and then press the Reset key to rerun the test. 2. Replace the adapter card. 3. Replace the system card. 4. Replace the operator panel.
E045	Invalid selection of ALA 3 set in serial number switch 3.	
E046	Serial number switch 4 has ALA 4 defined but there was no response from the ALA 4 adapter.	
E047	Invalid selection of ALA 4 set in serial number switch 4.	
E048	Serial number switch 5 has ALA 5 defined but there was no response from the ALA 5 adapter.	
E049	Invalid selection of ALA 5 set in serial number switch 5.	

Figure 2-12 (Part 6 of 18). E Message Symptom Fix Chart

Message	Cause	Action
E0A3	Upper feature switch 3 is set on. The auxiliary diskette adapter failed to respond.	1. Verify that the feature switches match the features installed with feature switch settings. If not, correct and rerun test. Press the Reset key to rerun the test. 2. Replace the appropriate adapter card. 3. Replace the system card. **Note:** If the adapter fails to fix the problem and you have the redrive card installed, replace it if you receive the E0A8 error message. 4. Replace the operator panel. 5. If there are any expansion units attached, ensure that all connectors are securely fastened and that they are in the correct position. See Figure 4-2.
E0A4	Upper feature switch 4 is set on. The DCA adapter failed to respond.	
E0A6	Upper feature switch 6 is set on. The loop 4 adapter failed to respond.	
E0A7	Upper feature switches 7 and 8 are set on. The loop 3 adapter failed to respond.	
E0A8	Upper feature switch 7 is set on. The loop 2 adapter failed to respond.	
E0AA	Loop 5 has been configured but the loop 5 adapter failed to respond. Upper feature switches 6, 7, and 8 have not been set properly.	
E0AB	Loop 6 has been configured, but the loop 6 adapter failed to respond. Upper feature switches 6, 7, and 8 have not been set properly.	
E0AD	Loop 1 has been configured, but the loop 1 adapter failed to respond.	
E0B1	There was no response from the host adapter. (One should always be installed.)	

Figure 2-12 (Part 7 of 18). E Message Symptom Fix Chart

Message	Cause	Action
E0B2	Lower feature switch 5 and/or 6 was tested and found to be set on or shorted, but the disk adapter in the first expansion unit with a disk drive did not respond.	1. Verify that there is power in frame 3. **Note:** If frame 3cd is attached, a jumper must be attached on the pin side of its segment board from 03E-A1C2D04 to 03E-A1C2D08. This designates it as logical frame 4. • The power cord should be tightly plugged into each expansion unit and the ac power source. • The power-on light should be on. **Note:** If the light is not on, go to "Power Supply Symptom Fix Chart" in this chapter. 2. Check that the D1 and D2 plugs are tightly plugged into the D1 and D2 jack locations on the rear of the controller. Also, assure that the plug holding screws are securely fastened. 3. Check that all cards and cable connectors on the controller logic board are securely plugged, and that the D1 and D2 cable plugs are securely fastened to the segment board in frame 3. See the first note in step 1 above. 4. Replace the disk adapter card. 5. Replace the redrive card. 6. See Figure 4-2 for all possible expansion unit combinations.
E0B3	Upper feature switch 1 tested on and the second expansion unit with a disk drive was defined (lower switch 7 was on), but the disk adapter did not respond. **Note:** The first disk expansion unit will always be a frame with "3" on it; second disk expansion unit will be a frame with "3cd". The communication expansion unit will always have a "4" on it. It could be the second expansion unit or a stand-alone expansion unit.	
E0B4	Upper feature switch 1 tested off and lower switches 7 or 8 tested on indicating ALA 1 as defined, but there was no response from the ALA 1 adapter.	1. Check feature switch settings, and if they are incorrect, set them correctly; then press Reset to rerun the test. 2. Replace the appropriate ALA adapter card. 3. Replace the system card. 4. Replace the operator panel.
E0BE	The disk adapter card and loop 2 adapter card failed to respond correctly.	1. Replace the redrive card in the controller. 2. Replace the disk adapter card in the first expansion unit with a disk drive. 3. Replace the loop 2 adapter card in the controller.

Figure 2-12 (Part 8 of 18). E Message Symptom Fix Chart

Message	Cause	Action
E0C0 E0C2 E0C4 E0C6 E0C8	Upper feature switch 1 was set to the on position and the following serial number switches were set to indicate that there was no ALA, but the adapters responded as follows: Switch 1=ALA 1 E0C0 2=ALA 2 E0C2 3=ALA 3 E0C4 4=ALA 4 E0C6 5=ALA 5 E0C8	1. Set the appropriate lower feature switch(es) on. Press the Reset key to rerun the test. 2. Replace the system card. 3. Replace the operator panel.
E101	The DCA adapter failed.	1. Replace the DCA adapter card. 2. Replace the DCA driver/receiver card. 3. Replace the DCA connector panel (PN 5267709). 4. Check the cable between the DCA connector panel and the logic board. 5. Check the switch setting on the configurator cards (A1Y4/A1Y5). 6. Replace the configurator cards in locations A1Y4 and A1Y5. 7. Check the DCA feature switch setting. If the setting is correct, replace the operator panel and then the system card. 8. Check for +5 volts at 01A-A2E1 (driver/receiver card.) See Figure 5-28 for pin location.
E155	One or more of the diagnostic test switches were set incorrectly in response to the M999 message.	1. Set the diagnostic test switch(es) correctly. Refer to Figure 2-4. 2. Replace the system card. 3. Replace the operator panel.
E201	The host prewrap test failed.	1. Replace the host HPCA or CCA adapter card. 2. Reseat the A1Y4 configurator card. If the failure recurs, replace the configurator card in location A1Y4.
E202	The host adapter wrap test failed.	1. Replace the host HPCA or CCA adapter card. 2. Replace the host/driver receiver card.

Figure 2-12 (Part 9 of 18). E Message Symptom Fix Chart

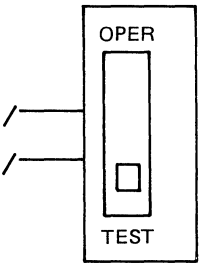
Message	Cause	Action
E203	The host cable wrap test failed.	1. Ensure that the wrap switch is in the Test position, that the wrap plug is installed, or that the connector is plugged into the LSC for a multiuse communication loop or wrappable DCE for X.21. 2. Replace the driver/receiver card. 3. Replace the HPCA or CCA adapter card. 4. Check the external cable connectors for damage and that they are tightly plugged into the controller (also the modem, LSC and DCE). 5. If the error recurs, replace the wrap cable.
E204	A wrap-test line adapter setup error occurred. 	
E209	A parameter is incorrect. An optional module was not loaded for this adapter. The diskette is probably bad.	Press the Reset key and if the error recurs, try another diskette.
E3n1	ALA n adapter prewrap test failed. **Note:** n = 1 for ALA 1 2 for ALA 2 (RPQ) 3 for ALA 3 (RPQ) 4 for ALA 4 (RPQ) 5 for ALA 5 (RPQ)	1. Replace the appropriate ALA adapter card: ALA 1 location 01A-A1K2 ALA 2 location 04A-A1J2 ALA 3 location 04A-A1H2 ALA 4 location 04A-A1G2 ALA 5 location 04A-A1F2 2. Reseat the A1Y4 and A1Y5 configurator cards. If the failure recurs, replace the configurator card(s) one at a time.

Figure 2-12 (Part 10 of 18). E Message Symptom Fix Chart

Message	Cause	Action
E3n2	ALA n adapter wrap test failed. **Note:** n = 1 for ALA 1 2 for ALA 2 (RPQ) 3 for ALA 3 (RPQ) 4 for ALA 4 (RPQ) 5 for ALA 5 (RPQ)	1. Replace the appropriate ALA adapter card: ALA 1 location 01A-A1K2 ALA 2 location 04A-A1J2 ALA 3 location 04A-A1H2 ALA 4 location 04A-A1G2 ALA 5 location 04A-A1F2 2. Replace the appropriate ALA driver/receiver card: ALA 1 location 01A-A1R4 ALA 2 location 04A-A1K2 ALA 3 location 04A-A1K4 ALA 4 location 04A-A1E2 ALA 5 location 04A-A1E4
E3n3 E3n4	The external ALA wrap test failed. **Note:** n = 1 for ALA 1 2 for ALA 2 (RPQ) 3 for ALA 3 (RPQ) 4 for ALA 4 (RPQ) 5 for ALA 5 (RPQ)	1. Ensure that the wrap switch on the data communication equipment cable is in the test position or that the wrap plug is installed. Refer to "Controller Adapter Tests" in this chapter for the ALA test (T300) setup requirements. 2. Replace the appropriate ALA driver/receiver card. Refer to the E3n2 message for the driver/receiver card location. 3. Replace the appropriate ALA adapter card. Refer to the E3n2 message for the adapter card location. 4. Check the external cable connectors for damage and that they are tightly plugged into the controller (also the modem, LSC and DCE). Replace the cable if the error continues to recur.

Figure 2-12 (Part 11 of 18). E Message Symptom Fix Chart

Message	Cause	Action
E3n9	An ALA parameter is incorrect. An optional module was not loaded for this adapter or the diskette is probably bad. **Note:** n = 1 for ALA 1 2 for ALA 2 (RPQ) 3 for ALA 3 (RPQ) 4 for ALA 4 (RPQ) 5 for ALA 5 (RPQ)	Press the Reset key and if the error recurs: 1. Allow the default to load all optional modules. 2. Select the correct optional modules. 3. Try another diskette.
E4n1	Loop adapter n failed. **Note:** n = 1 for loop 1 2 for loop 2 3 for loop 3 4 for loop 4 5 for loop 5 (RPQ) 6 for loop 6 (RPQ)	1. The loop speed switch is set off or it is defective. 2. Replace the appropriate loop adapter card: Loop 1 – 01A-A1P2 2 – 01A-A1N2 (std) 2 – 01A-A1B2 3 – 01A-A1M2 4 – 01A-A1L2 5 – 04A-A1M2 (RPQ) 6 – 04A-A1L2 (RPQ)
E4n2	The loop n circuit failed. **Note:** n = 1 for loop 1 2 for loop 2 3 for loop 3 4 for loop 4 5 for loop 5 (RPQ) 6 for loop 6 (RPQ)	1. Disconnect the external loop and rerun the test. If the error recurs: a. Replace the appropriate loop adapter card. b. Check that the n/c loop bypass contacts on the ring tip loop jack are making contact when the external loop plugs are removed. Clean the contacts or replace the connector. c. Check for broken wires or loose plugs. d. Replace the system card. 2. Refer to Figure 4-8 or the System PDPs for loop problem analysis.

Figure 2-12 (Part 12 of 18). E Message Symptom Fix Chart

Message	Cause	Action
E4n3	There are too many devices on loop n. (Propagation delay is excessive.) **Note:** n = 1 for loop 1 2 for loop 2 3 for loop 3 4 for loop 4 5 for loop 5 (RPQ) 6 for loop 6 (RPQ)	1. Disconnect the excess devices from the appropriate loop. 2. Check the loop length to see if it is within planning guidelines.
E5xx E7xx	**Note:** The following messages are the E5xx and E7xx messages.	
En01 ↓ En03	The disk logic failed. **Note:** See Figure 4-2 for all controller and expansion unit combinations. n = 5 = frame 3 7 = frame 3cd or 4	1. Replace the redrive card. (This card is located in frame 1.) 2. Replace the disk adapter card n. 3. Replace the loop 2 adapter card.
En04 ↓ En11	The disk logic failed. Refer to the note under the En01 message. n = 5 = frame 3 7 = frame 3cd or 4	1. Replace the disk adapter card n. 2. Replace the redrive card in frame 1. 3. Replace the loop 2 adapter card.
En20 ↓ En22	The disk logic failed. Refer to the note under the En01 message. n = 5 = frame 3 7 = frame 3cd or 4	1. Replace the disk attachment card n. 2. Check for a jumper from 01A-A1A2S12 to 01A-A1M6B04. 3. Replace the disk adapter card in frame n. 4. Check for a jumper on disk attachment card n.

Figure 2-12 (Part 13 of 18). E Message Symptom Fix Chart

Message	Cause	Action
En23 ↓ En43	The disk logic failed. Refer to the note under the En01 message. n = 5 = disk a = frame 3 7 = disk c = frame 3cd or 4	1. Replace the disk attachment card in frame n. 2. Replace the digital card on disk n. 3. Replace the analog card on disk n. 4. Perform the following service check for disk n. **Note:** Switch off the 4701 and wait until the power-on light on the expansion unit goes off.
	HEAD LOCK SOLENOID SERVICE CHECK a. Label and disconnect the P3-B connector from the motor drive card. b. Use the RX1 scale of your CE meter and measure the resistance from P3-B pin 7 to P3-B pin 8. You should read approximately 24 ohms. ACTUATOR VOICE COIL SERVICE CHECK a. Label and disconnect the P3-A connector from the motor drive card. b. Use the RX1 scale of your CE meter and measure the resistance from P3-A pin 1 to P3-A pin 3. You should read approximately 20 ohms. DRIVE MOTOR WINDING SERVICE CHECK a. Label and disconnect the P4 connector from the motor drive card. b. Use the RX1 scale of your CE meter and measure the resistance from P4 pin 1 to P4 pin 6. You should read approximately 1.5 ohms for the phase 2 motor winding resistance. c. Measure the resistance from P4 pin 1 to P4 pin 5. You should read approximately 1.5 ohms for the phase 4 motor winding resistance. d. Measure the resistance from P4 pin 1 to P4 pin 4. You should read approximately 1.5 ohms for the phase 1 motor winding resistance. e. Measure the resistance from P4 pin 1 to P4 pin 3. You should read approximately 1.5 ohms for the phase 3 motor winding resistance.	
		5. Replace the motor drive card if none of the service checks failed. 6. Replace the disk drive if any of the service checks fail.
	Note: Before you replace the disk drive, refer to Figure 5-3 and make sure that all possible failing units have been considered. Request assistance from your next level support before replacing the disk drive.	
EnA0	Upper feature switch 1 tested on and lower feature switch n tested off and disk n responded. n = 5 = switch 6 = disk B 7 = switch 8 = disk D	1. Set lower feature switch n on. 2. Remove the disk adapter card. 3. Replace the disk adapter card. 4. Replace the system card. 5. Replace the operator panel.

Figure 2-12 (Part 14 of 18). E Message Symptom Fix Chart

Message	Cause	Action
EnA3 ↓ EnC3	The disk logic failed. Refer to the note under the En01 message. n = 5 = frame 3 = disk B 7 = frame 3cd = disk D	1. Replace the disk attachment card in frame n: location 03E-A1D3. 2. Replace the digital card on disk n. 3. Replace the analog card on disk n. 4. Perform the service checks for disk n. Refer to the service checks listed under the En23 message. **Note:** Switch off the 4701 and wait until the power-on light on the expansion frame goes off. 5. Replace the motor drive card if none of the service checks failed. 6. Replace the disk drive if any of the service checks fail. **Note:** Before you replace the disk drive, refer to Figure 5-3 and make sure that all possible failing units have been considered. Request assistance from your next level support before replacing the disk drive.
E601	A write error to the primary diskette, side 0, track 73, occurred.	1. Replace the primary diskette drive adapter card. 2. Replace the primary diskette drive control card. 3. Check the primary diskette drive assembly or interchange it with the auxiliary diskette drive if the optional feature is installed. 4. Try another diagnostic diskette.
E602	A read error on the primary diskette, side 0, occurred.	
E603	The write/read data did not compare.	
E604	A read error occurred, or the diskette in the IPL drive is not a diagnostic diskette.	Insert a diagnostic diskette and close the diskette drive handle.

Figure 2-12 (Part 15 of 18). E Message Symptom Fix Chart

Message	Cause	Action
E611	A write error to the primary ette, side 1, track 73, occurred.	Follow the instructions in the Action column under the E601 message for the adapter and drive being used.
E612	A read error on the primary diskette, side 1, occurred.	
E613	The write/read data on the primary diskette did not compare.	
E620	The auxiliary diskette drive was not ready, the diskette drive did not become ready within one minute, or the diskette is not a diagnostic diskette.	1. Insert a diagnostic diskette into the auxiliary diskette drive and close the drive handle. 2. Follow the steps under the Action column of the D002 message.
E621	A write error to the auxiliary diskette, side 0, track 73, occurred.	1. Replace the auxiliary diskette drive adapter card. 2. Replace the auxiliary diskette drive control card. 3. Check the auxiliary diskette drive control cable for continuity. 4. Exchange the auxiliary diskette drive with the primary diskette drive. Replace the auxiliary diskette drive if it is defective.
E622	A read error on the auxiliary diskette, side 0, occurred.	
E623	The write/read data did not compare.	
E624	A read error occurred, or the diskette in the auxiliary diskette drive is not a 4701 diagnostic diskette.	1. Insert a diagnostic diskette into the primary diskette drive and close the diskette drive handle. 2. Follow the steps under the Action column of the D002 message.
E631	A write error on the auxiliary diskette, side 1, track 73, occurred.	Follow the instructions in the Action column under the E621 message.
E632	A read error on the auxiliary diskette, side 1 occurred.	
E633	The write/read data did not compare.	
Note: The E7xx messages are listed following the E4xx messages listed on Page 2-64.		

Figure 2-12 (Part 16 of 18). E Message Symptom Fix Chart

Message	Cause	Action
E901	An invalid request to the control terminal occurred.	Reenter the command with the correct input.
E902	A read error occurred on the diagnostic diskette while an overlay was being loaded.	Reenter the command for the test selected. If this error recurs, log on to the System Monitor and execute the 042 0 command (Start Diskette). Refer to the *IBM 4700 Subsystem Operating Procedures* for the logon procedure.
E903	An incorrect read from the control terminal occurred.	Reenter the command with the correct input.
E905	A write error to the control console occurred.	1. Reenter the correct input if the error recurs. 2. Disconnect the external loop cable. Press the Reset key to rerun the test to determine if the test runs correctly; do not use the control console. If the test runs correctly, there is a control console problem or a loop problem.
E916	An invalid test routine or device model was specified.	Reenter the command with the correct input.
E932	A read/write error occurred during the programmable input mode.	Retry the command and if the error recurs, perform a dump for your next level support.
E933	An attempt to log on to the system monitor failed because another terminal was already logged on.	Enter the logoff command (000) at the other terminal if you still wish to log on.
E960	A timer interrupt occurred. This should not occur.	Retry the test. If the error recurs, perform a dump and save it for your next level support.
E961	A program check occurred. This should not occur. **Note:** If optional modules were selected during startup, all modules required for running the drive/adapter tests may not have loaded.	Retry the test. Press the Reset key and allow all modules to load from the diagnostic diskette (default is "FF" for all modules). If the error recurs, perform a dump and save it for your next level support.

Figure 2-12 (Part 17 of 18). E Message Symptom Fix Chart

Message	Cause	Action
EKnn	The system card and increment nn of storage failed.	1. Go to the "Model 3 Diagnostic Aids." See page 2-37. 2. Replace the system card. 3. Replace the indicated storage card defined below.
EMnn	The indicated storage increment failed. **Notes:** 1. Each storage increment is 128K. Each 256K card contains two increments. 2. All 256K cards must precede any 128K cards that may be installed. 3. Replace the storage cards as defined below.	1. Replace the indicated storage card. 2. Replace the controller card. 3. Replace the system card. 4. Go to the "Minimum System Checkout Procedure." See page 2-30. **Note:** For additional information about Model 3 storage increments, go to "Model 3 Diagnostic Aids." See page 2-37.
EPnn	The controller card and increment nn of storage failed.	1. Go to the "Model 3 Diagnostic Aids." 2. Replace the controller card. 3. Replace the indicated storage card defined below.
EKnn EMnn EPnn	nn = increment = card location = 01 = 01A-A1S2 = 02 = 01A-A1S2 = 03 = 01A-A1T2 = 04 = 01A-A1T2 or U2 if T2 is a 128K card. = 05 = 01A-A1U2 = 06 = 01A-A1U2 or M2 if U2 is a 128K card. = 07 = 01A-A1M2 = 08 = 01A-A1M2 or N2 if M2 is a 128K card. = 09 = 01A-A1N2 = 10 = 01A-A1N2 or P2 if N2 is a 128K card. = 11 = 01A-A1P2 = 12 = 01A-A1P2	

Figure 2-12 (Part 18 of 18). E Message Symptom Fix Chart

F Message Symptom Fix Chart

F messages are displayed during diskette diagnostic tests. If an error is detected, the test stops, and a blinking F message is displayed.

If an error is detected, the adapter test stops, the Check light comes on, and an F message is displayed.

You should first reseat a card called out for replacement, rerun the test, and then replace it if necessary.

The following F Message Symptom Fix Chart lists the messages, the causes, and the recommended actions to follow to resolve the problem:

Message	Cause	Action
F1n1	The specified diskette drive has an unrecoverable error. **Note:** n = 1 = primary 2 = auxiliary	Look at the system log and the statistical counters to determine the cause of the problem.
F112	The drive from which you IPLed has gone from a physically ready status to a non-ready status.	Ensure that the diskette has been properly inserted and that the diskette drive handle has been closed.
F114	The primary diskette drive is in the stopped state.	If the primary drive should be in the stopped state: (a) Insert the operating (IPL) diskette, (b) Log on to the system monitor, and (c) Execute the 042 0 command to make the diskette drive ready and logically connected to the system.
F122	The secondary diskette drive physically is not ready.	Ensure that a diskette has been properly inserted and that the diskette drive handle has been closed.
F2n1	The specified disk drive has an unrecoverable error. **Note:** n = drive A, B, C, or D	Look at the system log and the statistical counters to determine the cause of the problem.

Figure 2-13. F Message Symptom Fix Chart

I Message Symptom Fix Chart

I messages are displayed when the controller is in the initialization phase. These messages occur after the DCA adapter test when you use the diagnostic diskette and after the extended controller test for the other diskette.

The Test (yellow) light remains on when the initialization phase is entered. The initialization progress is indicated by a sequence of I messages. The Ready (green) light comes on at the end of the initialization phase.

The following I Message Symptom Fix Chart lists the I messages, the causes, and the recommended actions to follow to resolve the problem.

Refer to the *IBM 4700 Subsystem Operating Procedures,* GC31-2032, for a detailed listing and description of the I messages.

Message	Cause	Action
I00V	Initialization has started. V = The storage size indicator.	None.
I100	The base microcode is being loaded.	None.
I200	The CPGEN is being loaded.	None.
I3nn	CPGEN data is being modified or processed.	None.
I4nn	The system application program is being loaded.	None.
I5nn	The user application program is being loaded.	None.
I6nn	The system is initializing and allocating segment headers.	None.
I699	Control is being given to the system monitor.	None. **Note:** If an automatic startup has not been specified, a startup response is required. If a response does not occur within 20 seconds, a default startup is begun.
I7nn	Optional modules are being loaded.	None.
I8nn	The initialization overlay modules are being loaded and are running.	None.
I9nn	The communication code is being loaded.	None.

Figure 2-14. I Message Symptom Fix Chart

T Message Symptom Fix Chart

T messages are displayed when the controller adapter tests on the diagnostic diskette are running. A TX00 message is displayed at the start of each test, and a TX99 message is displayed at the successful completion of each test. If an error is detected, the adapter test stops, the Check light comes on, and an E message is displayed.

Note: The diskette adapter/drive test writes on track 73. Insert the diagnostic diskette into the drive that you are testing.

The following T Message Symptom Fix Chart lists the messages, the causes, and the recommended actions to follow to resolve the problem:

Message	Cause	Action
T000	The Diagnostic Monitor test sequence has started.	None.
T100	The DCA test started.	None.
T199	The DCA test is complete.	None.
T200	The host adapter test started.	None.
T299	The host adapter test is complete. No errors were detected.	None.
T300	The ALA test has started.	None.
T310	ALA 1 is being tested.	None.
T320	ALA 2 is being tested. (RPQ)	None.
T330	ALA 3 is being tested. (RPQ)	None.
T340	ALA 4 is being tested. (RPQ)	None.
T350	ALA 5 is being tested. (RPQ)	None.
T399	The ALA test is complete. No errors were detected.	None.

Figure 2-15 (Part 1 of 4). T Message Symptom Fix Chart

Message	Cause	Action
T400	The loop adapter test has started.	None.
T410	Loop adapter 1 is being tested.	None.
T420	Loop adapter 2 is being tested.	None.
T430	Loop adapter 3 is being tested.	None.
T440	Loop adapter 4 is being tested.	None.
T450	Loop adapter 5 is being tested. (RPQ)	None.
T460	Loop adapter 6 is being tested. (RPQ)	None.
T499	The test is complete. No errors were detected.	None.
T5nn	These messages are displayed at the beginning of each disk test routine for disks A and B and remain on until that routine is completed. **Note:** These messages are displayed only for a few seconds and none of them should last longer than two and one-half minutes.	None.

Figure 2-15 (Part 2 of 4). T Message Symptom Fix Chart

Message	Cause	Action
T599	The disk test routines for disks A and B are complete.	None.
T600	The diskette drive test started.	None.
T699	The diskette drive test is complete.	None.
T7nn	These messages are displayed at the beginning of each disk test routine for disks C and D and remain on until that routine is complete. **Note:** These messages are displayed only for a few seconds and none of them should last longer than two and one-half minutes.	None.
T799	The disk test routines for disks C and D are complete.	None.
T998	The loop 1, address 1, terminal is ready for off-line test requests or for logging on to the system monitor. **Note:** You have opened and closed the diskette drive handle or you have entered "1" for manual invocation.	1. The controller adapter tests and/or device exercisers can now run from the keyboard/display console. Select the adapter/device that you want to test. Refer to "Running the Offline Tests/Device Exercisers at a Control Console" in this chapter. 2. Press the Reset key (on the 3604 or 4704) three times if you want to log on to the system monitor and display the error logs or run the monitor device exerciser tests (refer to the *IBM 4700 Subsystem Operating Procedures,* GC31-2032, for additional information).

Figure 2-15 (Part 3 of 4). T Message Symptom Fix Chart

Message	Cause	Action
T999	This message is displayed at the end of the adapter test if you opened and closed the diskette drive handle.	1. Open and close the diskette drive handle; after a short delay, T998 will display at the control console, address 1, loop 1. Refer to "Running the Offline Tests/Device Exercisers at the Control Console" in this chapter. 2. Press the Reset key on the 3604 or 4704 three times if you want to log on to the system monitor and display the error logs or run the system monitor device exerciser tests (refer to the *IBM 4700 Subsystem Operating Procedures,* GC31-2032, for detailed information).

Figure 2-15 (Part 4 of 4). T Message Symptom Fix Chart

X Message Symptom Fix Chart

X messages are displayed when the initialization phase stops as a result of an error. The Alert and Check lights come on. Refer to the *IBM 4700 Subsystem Operating Procedures,* GC31-2032, for additional information.

The following X Message Symptom Fix Chart lists the messages, the causes, and the recommended actions to follow to resolve the problem:

Message	Cause	Action
XCnn	A machine check or a program check occurred before the machine check handler program was loaded. nn is the MCPC value encountered. **Note:** It is not possible to perform a dump at this time.	1. Press the Reset key. If the message recurs, the Power-On tests did not detect the error. 2. Load the diagnostic diskette and run the adapter tests. If the adapter tests do not fail, call for assistance.
X011 through X01D	The extent data is invalid, the diskette adapter control code is missing, or the diskette adapter failed.	1. Verify that the correct operating diskette is in the IPL drive. 2. If the failure recurs, try another operational diskette. **Note:** It is not possible to perform a dump at this time. 3. Follow the instructions in the Action column under the D003 message for a possible hardware failure.
X020	The control operator did not respond to the 00001 message within the timeout period.	Open the operator panel and press the Interrupt key. Follow the instructions in the Action column under the D1nn message.
X021	A diskette label read error occurred.	Follow the instructions in the Action column under the X011 message.
X022	A diskette label write error occurred.	Follow the instructions in the Action column under the X011 message.
X030 through X03F	Not enough storage is available for the various functions.	Insert the diagnostic diskette. If the tests do not fail, ask the customer to verify that the system configuration is correct.

Figure 2-16 (Part 1 of 2). X Message Symptom Fix Chart

Message	Cause	Action
X041 through X059	A check sum error or a diskette read error occurred.	1. Verify that the correct operational diskette is in the IPL drive. 2. If the failure recurs, try another operating diskette. 3. If the failure still occurs, install the diagnostic diskette into the IPL drive and run the adapter tests. 4. Replace the diskette drive.
X060 through X069	An LCF data set cannot be found; a diskette read error occurred while loading startup microcode used by LCF, or LCF startup data does not compare with that expected.	Reinitialize or re-create the diskette using the *IBM 4700 Control Program Generation,* GC31-2071, as a reference.
X070 through X082	The application program is too large, an optional module contains invalid information, not enough storage is available, or a system definition error occurred.	1. Ensure that the system parameters are correctly defined and the application programs are not too large. 2. Ask the customer to reassemble the application programs and to create a new operating diskette.
X083 through X087	A configuration or microcode error occurred.	Record the message and call your next level support.
X089 through X0A8	A definition for the controller was defined incorrectly.	1. Verify that the correct operating diskette is in the IPL drive. 2. If the error recurs, try another operating diskette. 3. If the failure still occurs, ask the customer to respecify the definition and to create a new operating diskette.

Figure 2-16 (Part 2 of 2). X Message Symptom Fix Chart

9nnnn Message Chart

9nnnn messages may occur on the display attached to loop 1, address 1, during the execution of diagnostic tests. A procedural error or a hardware error will normally have occurred.

The following 9nnnn Message Chart lists the messages, the causes, and the recommended actions to follow to resolve the problem:

Message	Cause	Action
9nnnn	There has been either: • Control operator error, or • A hardware error.	If you encounter one of these messages, refer to Appendix A of the *IBM 4700 Subsystem Operating Procedures,* GC31-2032. **Note:** Some 9nnnn messages are accompanied by status bytes displayed as hexadecimal characters.
92076	The controller has insufficient storage to load optional modules.	1. Press the Enter key on the 4704/3604 Display Station keyboard to continue. 2. Refer to the Action for the 9nnnn Messages.

Figure 2-17. 9nnnn Message Chart

Chapter 3. Removal and Replacement Procedures

Top Cover

Note: Refer to Figure 3-1 when performing this procedure.

Removal

1. Switch off the power.
2. Remove the ac power cord from the ac source.
3. Unplug all cables from the rear of the controller/expansion unit.
4. Place the controller/expansion unit on its side.
5. Loosen the two allen screws **A** on the bottom of the controller/expansion unit.

   Note: A 3mm metric allen wrench is required.
6. Place the controller/expansion unit on its base.
7. Slide the top cover up and off.

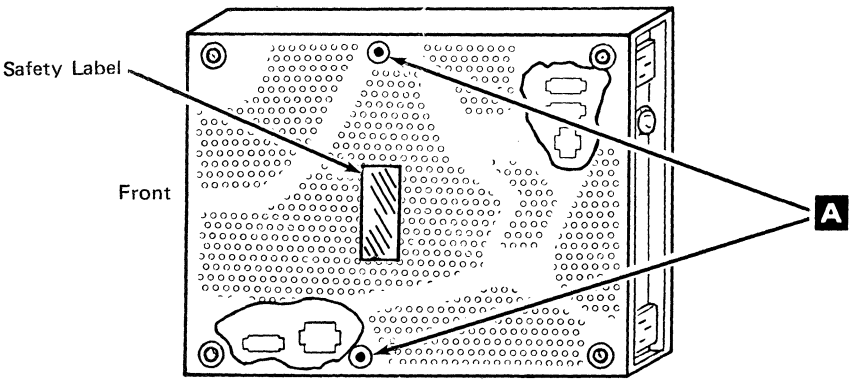
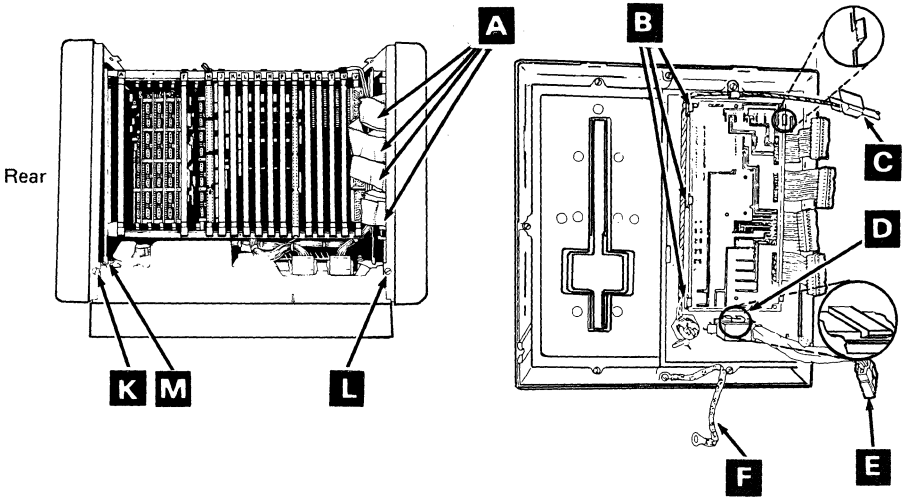


Figure 3-1. Top Cover Removal and Replacement

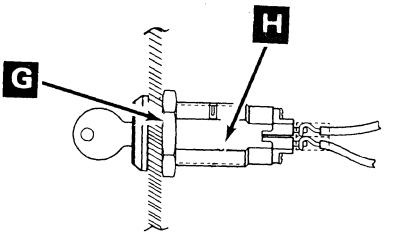
Replacement

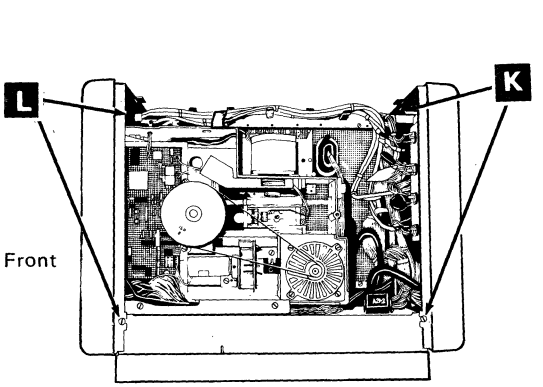
Reverse the steps in the removal procedure.

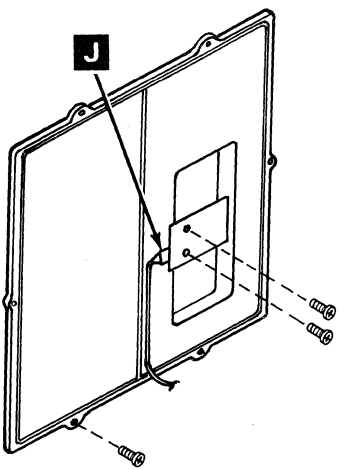
Note: The current controllers have a top cover that includes a fire-retardant plastic pocket in which to store the repair manual and parts catalog.



Inside View - Frame 1







Inside View - Frames 3 and 4

Figure 3-2. Front and Rear Cover Panel Removal and Replacement

Front Cover and Rear Cover Panel

Note: Refer to Figure 3-2 when performing this procedure.

Removal

1. Remove the top cover. Refer to "Removal" under "Top Cover" in this chapter. (See page 3-1.)

2. Turn the diskette drive handle (if applicable) so that it is horizontal.

3. **Front Only**: Unplug the four connectors (if applicable) that are attached to the end of the system card **A** .

   Warning: This erases all information stored in nonvolatile memory (NVM).

4. **Front Only**: Unplug the appropriate switch.
   a. Controller: encryption switch connector (B1J1) **C** .
   b. Expansion frame 3 or 4: indicator panel switch connector (A1P1) **J** .

5. **Front Only**: Unplug the On/Off switch connector (A1P6) **E** .

6. **Front Only**: Loosen the three screws **L** .

   Warning: Be careful not to damage the loop cable when you are loosening the top screw.

7. **Front Only**: Slide the bottom of the front cover far enough away from the bottom of the controller to enable the cover to clear the diskette drive handle.

8. **Rear Only**: Unplug all the connectors from the rear of the controller/ expansion unit.

9. **Rear Only**: Loosen the three screws **K** .

10. **Rear Only**: Slide the bottom of the back cover far enough away from the base of the controller/expansion unit to clear the screws.

11. Lift the cover up and off.

12. **Front Only**: Remove the ground lead **F** .

13. **Rear Only**: Remove the ground strap screw **M** .

Replacement

Reverse the steps in the removal procedure.

Operator Panel

Note: Refer to Figure 3-2 when performing this procedure.

Removal

1. Push the locking tabs **B** and remove the operator panel.

2. Remove the front cover from the applicable frame assembly. Refer to "Removal" under "Front and Rear Cover Panel" in this chapter.

Replacement

Reverse the steps in the removal procedure.

Notes:

1. Set the serial number switches to equal the serial number inscribed on the base plate tag, unless upper feature switch 1 is set on; then set the serial number switches according to the ALA features installed. See Figure 5-15.

2. Set the feature switches on the new operator panel to match the features installed on the controller. Use the appropriate plug chart (shown in Chapter 5), dependent upon the model number, to determine the features installed on the controller.

On/Off Switch

Note: Refer to Figure 3-2 when performing this procedure.

Removal

1. Remove the front cover. Refer to "Removal" under "Front and Rear Cover Panel" in this chapter.

2. Push the retaining plastic clip **D** away from the On/Off switch and remove the switch.

Replacement

Reverse the steps in the removal procedure.

Encryption Switch

Note: Refer to Figure 3-2 when performing this procedure.

Removal

1. Remove the front cover. Refer to "Removal" under "Front and Rear Cover Panel" in this chapter.

2. Remove the locknut **G** .

3. Remove the switch **H** from the front side.

Replacement

Reverse the steps in the removal procedure.

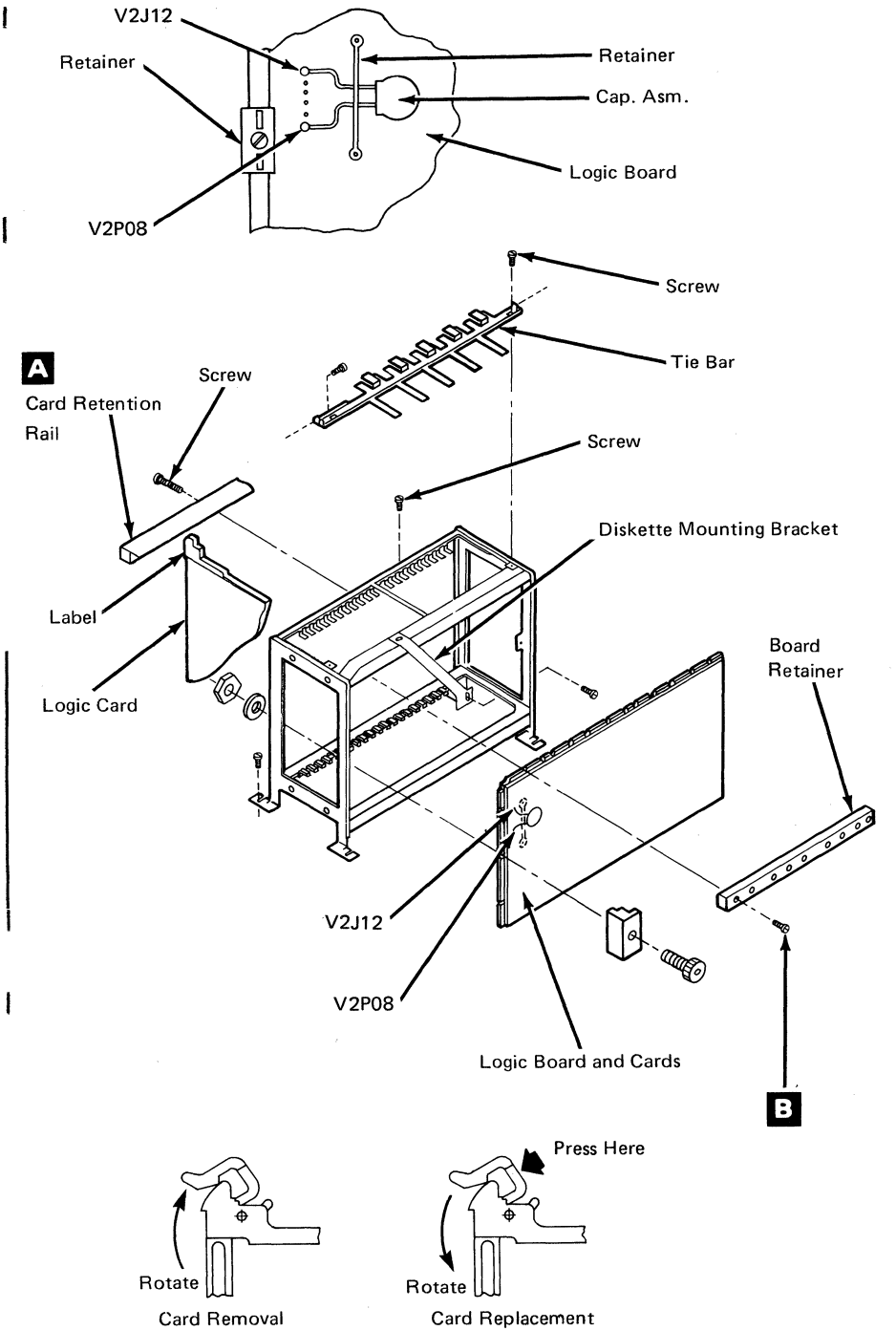


Figure 3-3 (Part 1 of 2). Frame, Logic Board Removal

Frame 1 Logic Board

Note: Refer to Figure 3-3 when performing this procedure.

Removal

1. Remove the top cover. Refer to "Removal" under "Top Cover" in this chapter.

2. Remove the front cover. Refer to "Removal" under "Front and Rear Cover Panel" in this chapter.

3. Remove the diskette drive. Refer to "Removal" under "Diskette Drive" in this chapter.

4. Remove the card retention rails **A** .

   Note: Be sure to replace the card retention rails during the replacement procedures.

5. Remove the top card connectors from the system card (V2 or K2).

6. Remove the top card connector from the controller card located in position Q2, if your controller has the storage enhancement feature.

7. Remove all of the logic cards on the logic board.

8. Remove the cables that are plugged into the Y and Z cable connectors and allow them to hang freely.

9. Remove the configurator cards that are plugged into the Y cable connectors.

10. Remove the capacitor installed in location A1V2J12 to A1V2P08.

    Note: This capacitor may be fastened to the side bracket with electrical tape on some of the machines; therefore, just slip the connectors off the pins and leave the capacitor in place. On other machines, the capacitor may be held in place by a retainer across the capacitor in the A1U2 location.

11. Remove the eight board mounting screws **B** from the top and bottom board retainers.

    Note: You might have to cut some of the loop cable ties to gain access to the board retainer screws.

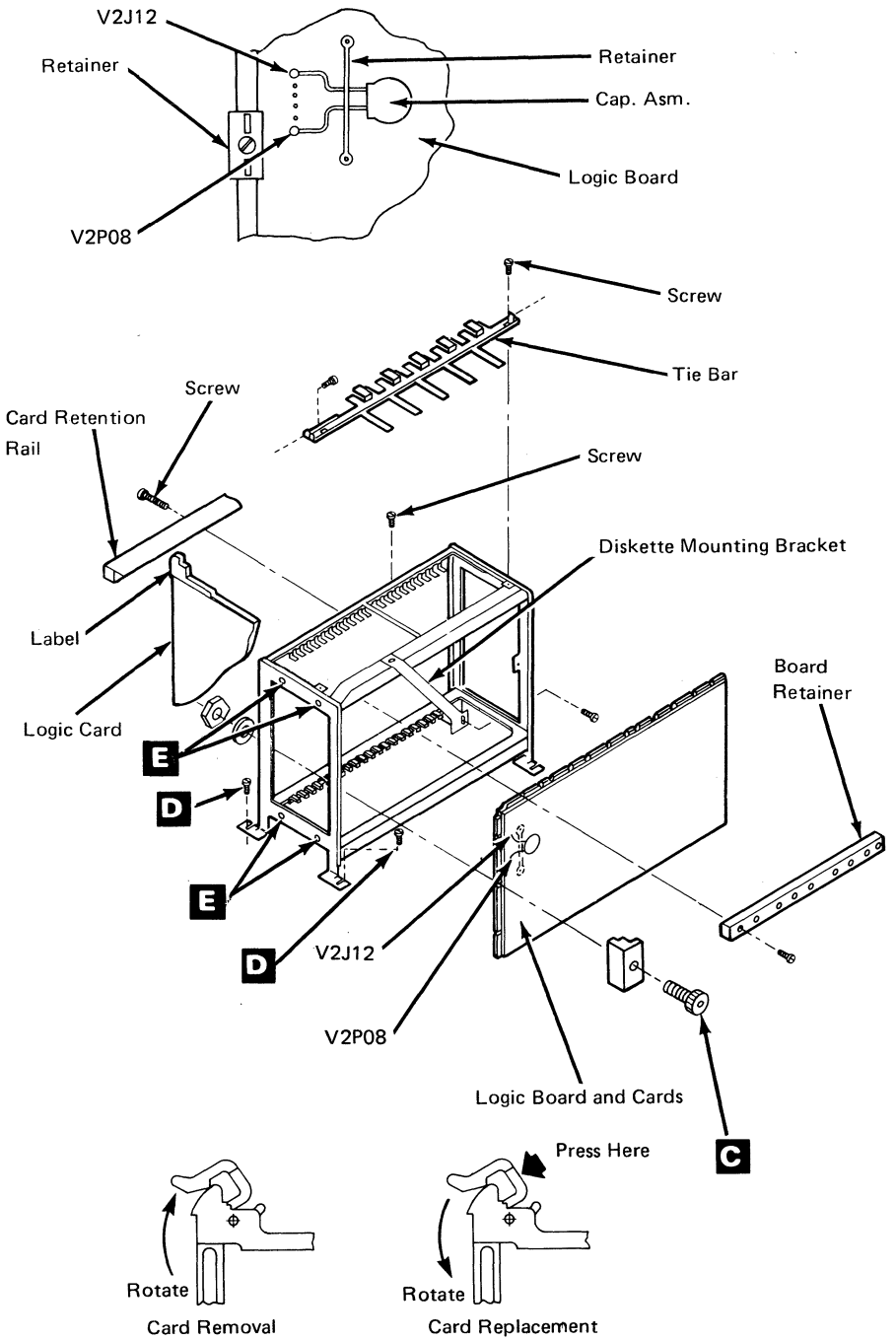


Figure 3-3 (Part 2 of 2). Frame, Logic Board Removal

12. Remove the two board mounting screws **C** from the side board retainers.

13. Lift the logic board carefully from the gate to avoid damage to the back panel pins. If the board is not removed with ease, you will have to perform the following steps:

    a. Remove the four screws **E** that hold the side bracket of the gate assembly.

    b. Remove the two screws **D** that hold the side bracket of the gate assembly to the base.

    c. Remove the side bracket of the gate assembly.

    d. Remove the top and bottom board retainers by slightly lifting the upper gate assembly and pressing down on the lower gate assembly and sliding the board retainers toward the front of the machine.

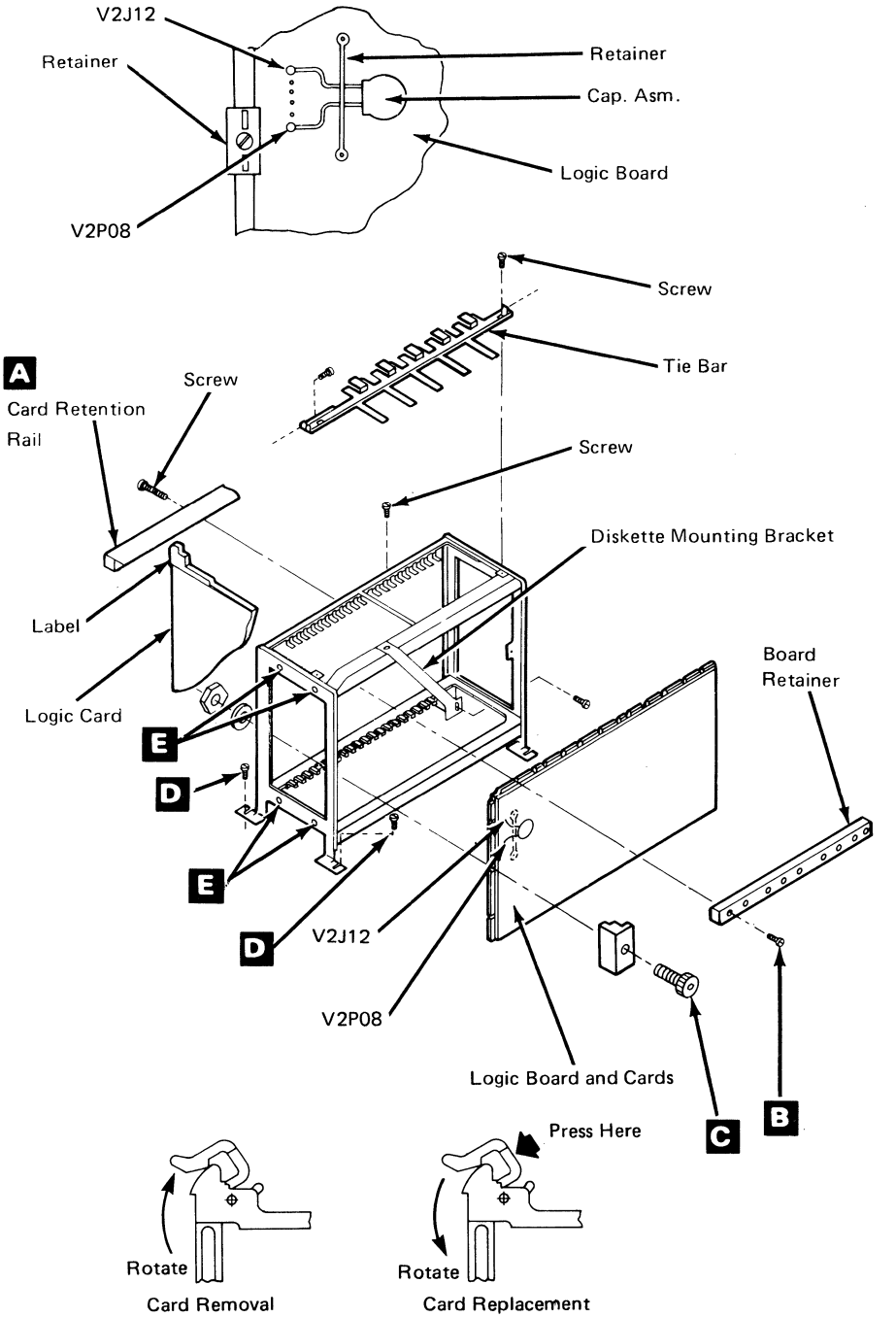


Figure 3-4. Frame 1 Logic Board Replacement

Frame 1 Logic Board

Note: Refer to Figure 3-4 when performing this procedure.

Replacement

1. Refer to Figure 3-5 to replace or delete feature wiring depending upon the features that are installed on your machine.

2. Install the new board. If you had to remove the side bracket in the removal procedure, perform the following steps, otherwise go to step 3.

   a. Place the new board into place and slide the top retainer in from the front edge and insert one screw **B** to hold the retainer and board in place. (Do not tighten the screw more than two turns.)

   b. Slide the lower retainer in place and add a screw as in the previous step.

   c. Reassemble the side bracket to the gate assembly, aligning the screw holes **E** and so on as you reassemble. Do not tighten any of the screws at this time.

   d. Align each side board retainer and start the screw **C** .

   e. Insert the remaining top and bottom board retainer screws, the side bracket screws **E** , and the base screws **D** , and tighten all of them.

   f. Go to step 4.

3. Install the logic board by placing the lower retainer along the bottom edge of the board and placing both on the gate assembly.

   a. Insert one screw **B** through the retainer and board and start the threads with two turns.

   b. Place the top retainer in place and insert one screw **B** through the retainer and start the screw with two turns.

   c. Place each side retainer in place and start the screw **C** through the retainer and board assembly.

   d. Insert the remainder of the screws in the top and bottom retainers and tighten all of the board mounting screws.

4. Replace the configurator cards, if applicable.

5. Replace the Y and Z cable connectors.

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6. Replace the logic cards.

7. Replace the card retention rails **A** .

8. Replace the diskette drive or disk enclosure that you removed in the removal procedure.

9. Replace the front cover.

10. Replace the top cover.

11. Test the controller for correct operation.

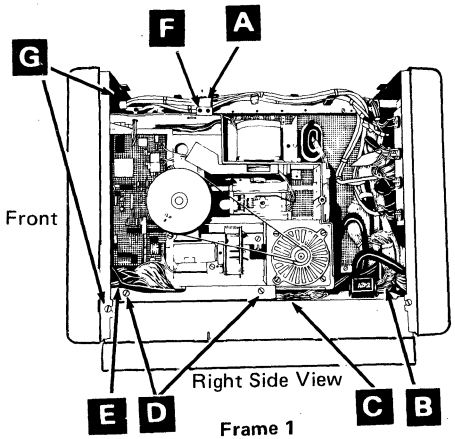
Feature	Model Number	Add or Remove	Jumper	
			From	To
Standard	2	Remove	01A-A1G2G13	01A-A1G2D08
		Remove	01A-A1E2D08	01A-A1E2G13
1 meg Auxiliary Diskette	1	Remove	01A-A1E2G13	01A-A1E2D08
Expansion Frame 3 or 4	2	Add	01A-A1A2S12	01A-A1M6B04
Com. Expansion Unit (frame 4)	2, 2SE & 3	Remove	01A-A1A2S04	01A-A1A2S08
With IBM Multiuse Loop	1 & 2	Remove	01A-A1J2M10	01A-A1A2D09
		Add	01A-A1J2M04	01A-A1A2J12
Capacitor PN 8259718 PN 6096895*	1, 2 2SE & 3	Add	01A-V2J12	01A-V2J08
Retainer clip PN 815080	1, 2, 2SE & 3	Add	01A-U2	01A-U2
X.21 ALA (with board PN 8588560 installed)	1 & 2	Remove	01A-A1K2M10	01A-A1K2M12
		Remove	01A-A2K2M12	01A-A1R4G02
		Remove	01A-A1R4G02	01A-A1R4D09
		Add	01A-A2K2M10	01A-A1K2M12
		Add	01A-A1K2M12	01A-A1R4D09
		Add	01A-A1R4G02	01A-A1Z6D06
		Add	01A-A1R4G08	01A-A1Z6D04
		Add	01A-A1R4G09	01A-A1Z6B03
		Add	01A-A1R4J05	01A-A1Z6B05
		Add	01A-A1R4J13	01A-A1Z6B07
X.21 ALA (with board PN 8259369 installed)	1 & 2	Remove	01A-A1R4G02	01A-A1R4D09
		Remove	01A-A1R4G02	01A-A1K2M12
		Add	01A-A1R4D09	01A-A1K2M12
		Add	01A-A1R4G08	01A-A1Z6D04
		Add	01A-A1R4G02	01A-A1Z6D06
		Add	01A-A1R4G09	01A-A1Z6B03
		Add	01A-A1R4J05	01A-A1Z6B05
		Add	01A-A1R4J13	01A-A1Z6B07

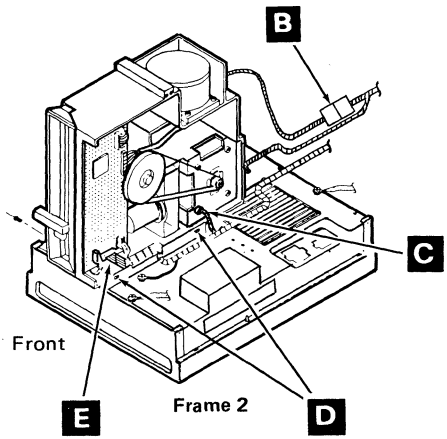
Figure 3-5 (Part 1 of 2). Frame 1 Logic Board Feature Wiring.

Feature	Model Number	Add or Remove	Jumper	
			From	To
X.21 ALA		Remove	01A-A1R4D09	01A-A1R4G02
(with board PN 6096662 installed)	2SE	Remove	01A-A2R4D09	01A-A1K2M10
		Add	01A-A1R4D09	01A-A1K2M12
	or	Add	01A-A1R4G08	01A-A1Z6D04
(with board PN 6125510 installed)	3	Add	01A-A1R4G02	01A-A1Z6D06
		Add	01A-A1R4G09	01A-A1Z6B03
		Add	01A-A1R4J05	01A-A1Z6B05
		Add	01A-A1R4J13	01A-A1Z6B07
SNA Fanout ALA	1 & 2	Remove	01A-A1K2M10	01A-A1K2M12
(with board PN 8588560 installed)		Remove	01A-A1R4G02	01A-A1R4D09
		Remove	01A-A1R4G02	01A-A1K2M12
		Add	01A-A1K2M10	01A-A1K2M12
		Add	01A-A1R4G02	01A-A1K2P06
		Add	01A-A1R4D13	01A-A1R4B12
SNA Fanout ALA	1 & 2	Remove	01A-A1R4G02	01A-A1R4D09
(with board PN 8259369 installed)		Remove	01A-A1R4G02	01A-A1K2M12
		Add	01A-A1R4G02	01A-A1K2P06
		Add	01A-A1R4D13	01A-A1R4B12
SNA Fanout ALA		Remove	01A-A1R4D09	01A-A1R4G02
		Remove	01A-A1R4D09	01A-A1K2M10
(with board PN 6096662 installed)	2SE	Add	01A-A1R4G02	01A-A1K2P06
	or	Add	01A-A1R4D13	01A-A1R4B12
(with board PN 6125510 installed	3			

Note: The feature wiring for the frame 4 expansion unit is located in Appendix A of this manual.

Figure 3-5 (Part 2 of 2). Frame 1 Logic Board Feature Wiring





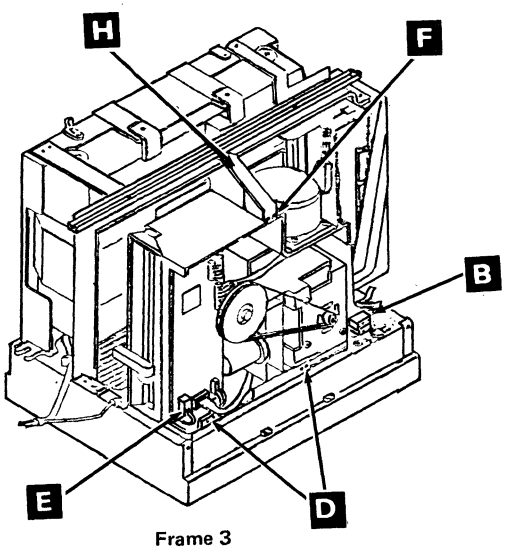


Figure 3-6. Diskette Removal and Replacement

Diskette Drive

Note: Refer to Figure 3-6 when performing this procedure.

Removal

1. Remove the top cover. Refer to "Removal" under "Top Cover" in this chapter. (See page 3-1.)

   DANGER
   Do not continue this procedure until the machine power has been switched off.

2. Unplug the diskette ac connector **B** .

3. Remove the screws **F** that hold the diskette drive support bracket.

4. Remove the diskette drive support bracket (PN 6018785) **A** if you are removing the primary diskette drive; remove the bracket (PN 6018785) **H** if you are removing the auxiliary diskette drive in frame 3 or 4.

   Note: The auxiliary diskette drive in frame 2 does not have a support bracket.

5. Unplug the diskette I/O signal connector (PN 6019012) **E** and the ground lead [C] .

   DANGER
   The ground lead must be re-attached if you switch on the controller and the diskette drive is set aside from the controller.

6. Remove the two screws **D** .

   Note: The two shouldered screws (PN 6018808) on the back side (inside rail) of the diskette drive do not require removal.

7. Turn the diskette drive handle so that it is horizontal.

   Warning: Make sure the diskette drive does not hit and damage the board pins when you remove or replace the diskette drive.

8. Loosen the three screws **G** to allow movement of the front panel, so the diskette handle will clear the cover.

9. Slide the diskette drive toward the rear of the controller/expansion unit, and lift it out.

10. Remove the ground lead **C** .

    Note: The ground lead may be installed on the inside or outside of the motor. Reinstall the ground lead at the same end that it was removed.

Replacement

Reverse the steps in the removal procedure.

Make sure that the I/O cable is routed under the diskette drive and is inside the bracket rail.

Notes:

1. If a different diskette drive is being installed, remove the two mounting screws on the rear side of the old diskette drive and install them on the replacement diskette drive.

2. Ensure that screws **D** are tight.

Diskette Drive Control Card

Note: Refer to Figure 3-7 when performing this procedure.

Removal

1. Switch off the power.
2. Remove the top cover. Refer to "Removal" under "Top Cover" in this chapter. (See page 3-1.)
3. Remove the diskette drive. Refer to "Removal" under "Diskette Drive" in this chapter.
4. Remove the six connectors **A** from the control card.
5. Loosen the two retainer screws **D** and turn the two retainers **C** outward until they are no longer in the path of the control card **B** .
6. Remove the control card.

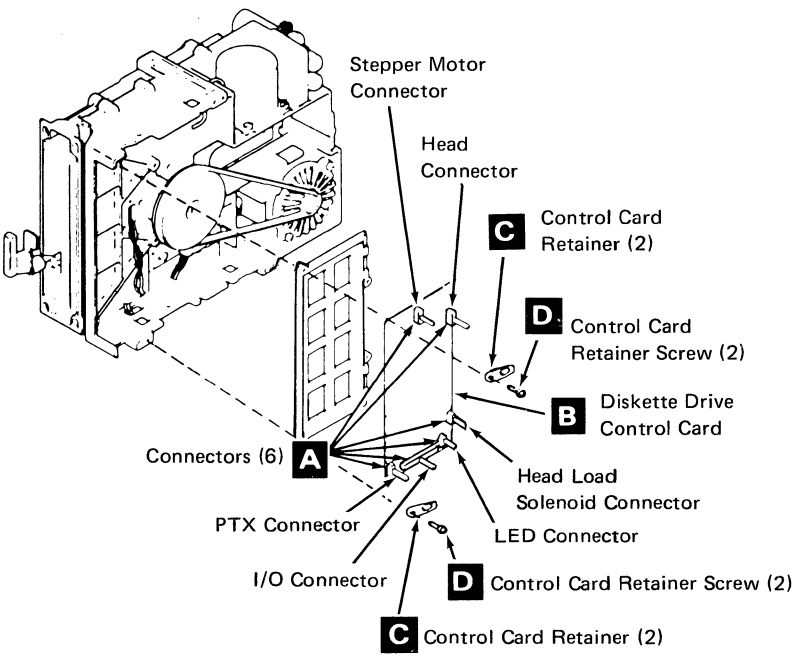


Figure 3-7. Control Card Removal and Replacement

Replacement

Reverse the steps in the removal procedure.

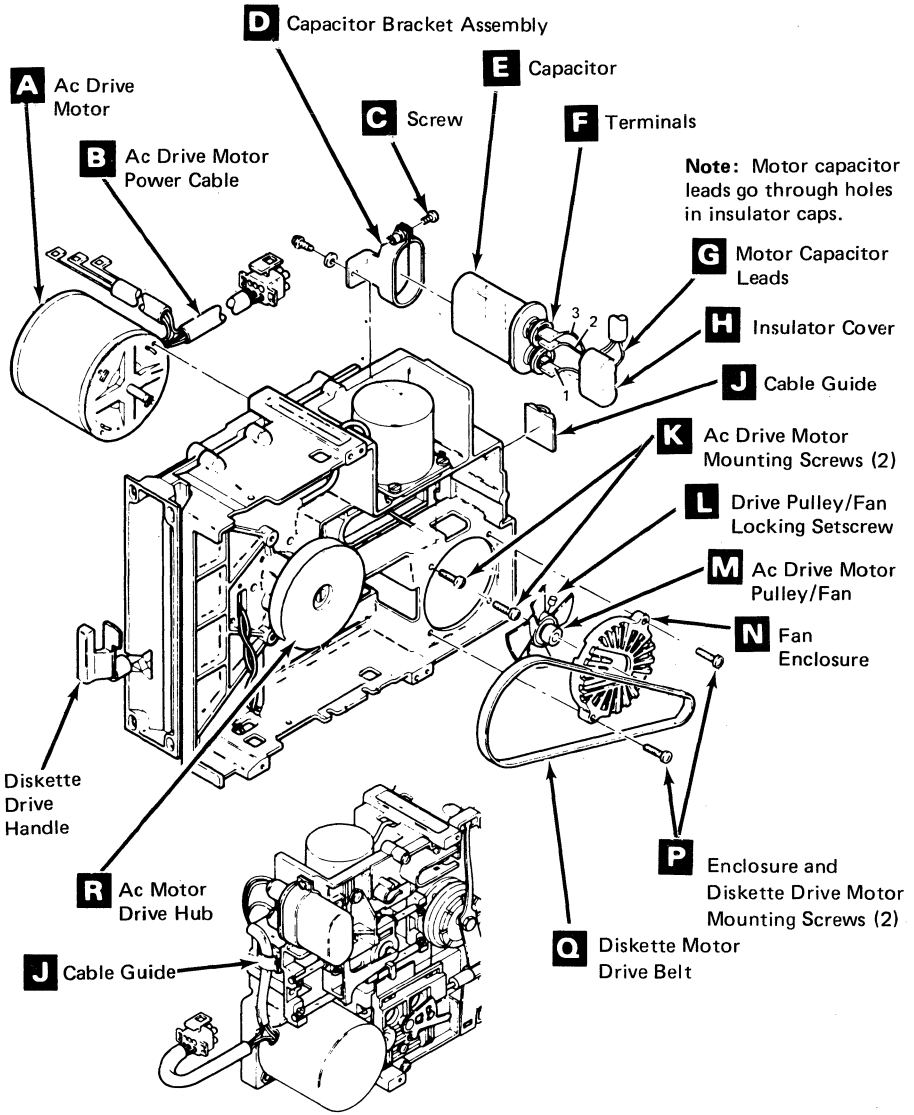


Figure 3-8. Diskette Drive Components Removal and Replacement

Diskette Drive Motor

Note: Refer to Figure 3-8 when performing this procedure.

Removal

1. Switch off the power.
2. Remove the top cover. Refer to "Removal" under "Top Cover" in this chapter. (See page 3-1.)

   DANGER
   The drive motor case becomes hot after continuous use.

3. Disconnect the drive motor power cable **B** .
4. Remove the diskette drive. Refer to "Removal" under "Diskette Drive" in this chapter.
5. Remove the drive motor belt **Q** .
6. Remove the two fan enclosure mounting screws **P** and remove the fan enclosure **N** .
7. Loosen the locking setscrew **L** on the drive motor pulley; then remove the drive motor pulley/fan assembly **M** .

   DANGER
   High voltage may be present at the capacitor terminals **F** .

8. Remove the capacitor insulator cover **H** from the capacitor terminals **F** .
9. Discharge the capacitor **E** by jumpering its terminals **F** , using a large blade screwdriver.
10. Remove the drive motor capacitor leads **G** from the capacitor terminals.
11. Remove the drive motor capacitor leads **G** from the cable guide **J** on the casting.
12. Remove the capacitor insulator cover **H** from the drive motor capacitor leads **G** .
13. Remove the remaining two drive motor mounting screws **K** and remove the drive motor **A** .

Replacement

1. Install the drive motor **A** , using the two drive motor mounting screws **K** . Note in Figure 3-6 that the drive motor power cable **B** and the drive motor capacitor leads **G** should extend toward the rear of the machine.

2. Install the drive motor pulley/fan assembly **M** on the new drive motor. Ensure that the drive motor pulley/fan locking setscrew **L** is centered in the flat surface of the motor shaft. Do not tighten the setscrew.

3. Place the fan and the pulley on the motor shaft; leave a gap of 0.5 mm ± 0.1 mm (0.020 ± 0.004 in) between the motor face and the fan hub. Tighten the setscrew.

4. Reinstall the fan enclosure **N** so that the belt clearance slots are toward the drive motor hub **R** .

5. Reinstall the diskette drive belt **Q** .

6. Reinstall the capacitor insulator cover **H** on the drive motor capacitor leads **G** ; place one on leads 2 and 3 and one on lead 1.

7. Reconnect the drive motor capacitor leads **G** in the cable guide **J** on the casting.

8. Reinstall the drive motor capacitor leads **G** on the capacitor terminals **F** ; place leads 2 and 3 on the top terminal and lead 1 on the bottom terminal.

9. Reinstall the capacitor insulator cover **H** on the capacitor terminals **F** .

10. Reinstall the diskette drive.

11. Reconnect the drive motor power cable **B** .

12. Replace the top cover. Refer to "Replacement" under "Top Cover" in this chapter. (See page 3-1.)

13. Switch on the power.

Capacitor

Note: Refer to Figure 3-8 when performing this procedure.

Removal

1. Switch off the power.

2. Remove the top cover. Refer to "Removal" under "Top Cover" in this chapter. (See page 3-1.)

   DANGER
   Voltage is still present at the socket when the drive motor power cable is disconnected.

3. Disconnect the drive motor power cable **B** .

   DANGER
   High voltage may be present at the capacitor terminals **F** .

4. Remove the capacitor insulator cover **H** from the capacitor terminals **F** .

5. Discharge the capacitor **E** by jumpering its terminals **F** , using a large blade screwdriver.

6. Remove the drive motor capacitor leads **G** from the capacitor terminals.

7. Loosen screw **C** and slide the capacitor from bracket assembly **D** .

Replacement

1. Reinstall the capacitor bracket **D** using the screw **C** . Tighten the screw.

2. Reinstall the drive motor capacitor leads **G** on the capacitor terminals **F** ; place leads 2 and 3 on the top terminal and lead 1 on the bottom terminal.

3. Reinstall the capacitor insulator cover **H** on the capacitor terminals **F** .

4. Reconnect the drive motor power cable **B** .

5. Replace the top cover. Refer to "Replacement" under "Top Cover" in this chapter. (See page 3-1.)

6. Switch on the power.

Diskette Drive Belt

Notes:

1. The diskette drive belt is marked with a white stripe on the outer surface.

2. Refer to Figure 3-8 when performing this procedure.

Removal

1. Remove the top cover. Refer to "Removal" under "Top Cover" in this chapter. (See page 3-1.)

2. Remove the diskette drive belt Q .

Replacement

Reverse the steps in the removal procedure.

Diskette Drive Handle

Note: Refer to Figure 3-7 when performing this procedure.

Removal

1. Remove the top cover. Refer to "Removal" under "Top Cover" in this chapter. (See page 3-1.)

2. Remove the diskette drive. Refer to "Removal" under "Diskette Drive" in this chapter.

3. Remove the screw (PN 1621182) and the washer and nut (PN 1622402) shown in detail **A** .

   Note: It may be necessary to turn the diskette drive handle to a vertical position.

4. Turn the diskette drive handle so that it is horizontal.

5. Pull the handle from the diskette drive.

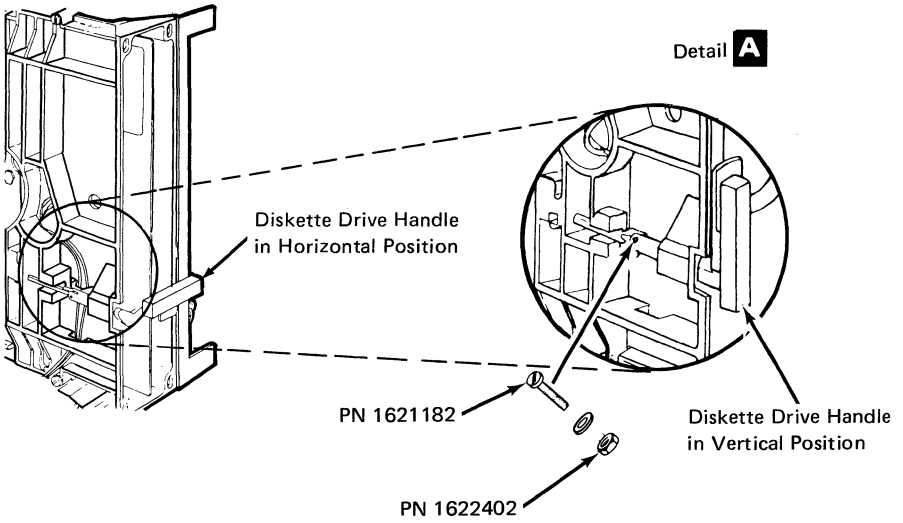


Figure 3-9. Diskette Drive Handle Removal and Replacement

Replacement

Reverse the steps in the removal procedure.

Fan Assembly

Notes:

1. Refer to Figure 3-10 when performing this procedure.
2. Wait until the power-on light goes off before performing this procedure.
3. This procedure applies to the controller and any expansion unit.

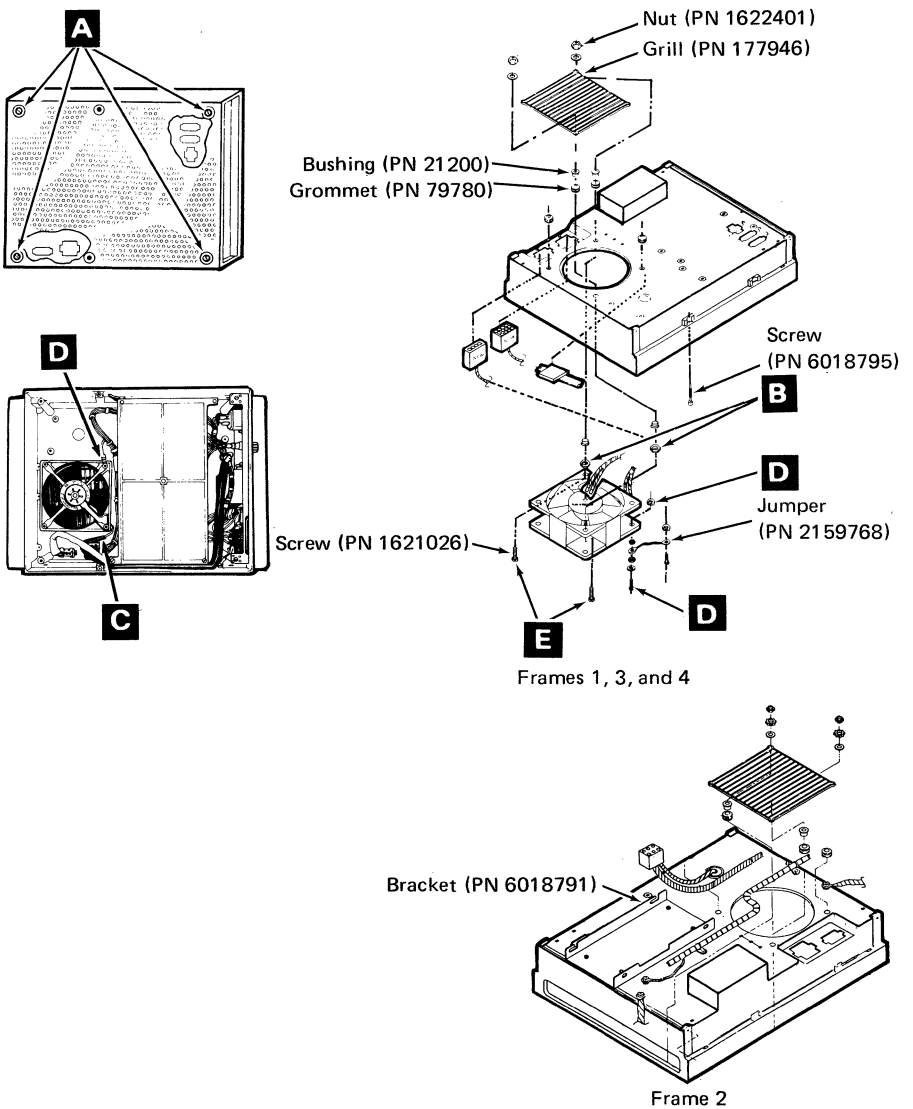


Figure 3-10. Fan Removal and Replacement

Removal

1. Remove the top cover. Refer to "Removal" under "Top Cover" in this chapter. (See page 3-1.)

2. To gain access to the nuts that hold the fan:

   - Remove the diskette drive if it restricts access to the nuts that hold the grill and fan to the controller base (frame 1) or if a diskette drive is installed in frame 3 or frame 4. Refer to "Removal" under "Diskette Drive" in this chapter.

   - Place a disk file A into the service position on frame 3. Refer to "Place Disk A into the Service Position" (see "Disk Enclosure" on page A-15).

   - Remove the disk file if it restricts access to the nuts that hold the grill and fan to the frame 4 base. Refer to "Removal" under "Disk Enclosure" on page A-15.

3. Remove the nuts and washers from the grill; then remove the grill.

4. Place the controller/expansion unit on its side.

5. Remove the four screws **A** that hold the bottom cover; then remove the bottom cover.

   Note: Observe the cable routings so that they can be rerouted the same way.

6. Remove the grounding screw, the washers, and the nut **D** from the fan.

7. Slip the power leads **C** off the fan.

8. Remove the fan from the bottom by pulling it toward you.

9. Remove the nuts **B** and the screws **E** from the fan.

Replacement

Reverse the steps in the removal procedure.

CAUTION

The cable routing is critical. Make sure that you replace the cables in the same location from which you removed them.

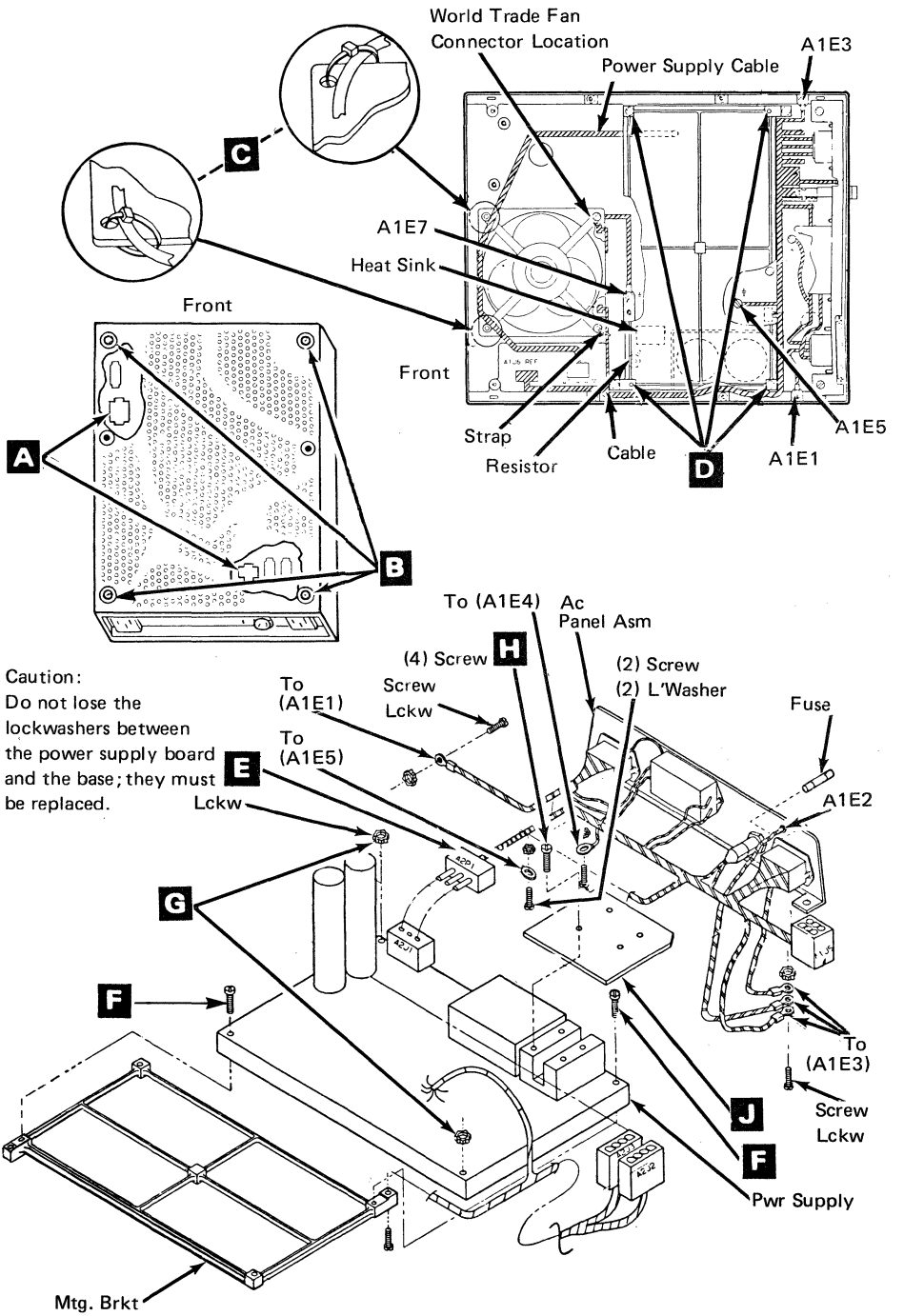


Figure 3-11. Power Supply Board Removal and Replacement

Power Supply Board

Note: Refer to Figure 3-11 when performing this procedure.

Removal

1. Switch the power off.

   DANGER
   Allow approximately two minutes for the power supply capacitors to completely discharge before continuing this procedure.

2. Unplug all the connectors from the rear of the controller/expansion unit.

3. **Frame 3 and 3cd only**: Remove disk B/D, if installed. See "Disk Enclosure" on page A-15.

4. **Frame 4 only**: Remove disk C, if installed. See "Disk Enclosure" on page A-15.

5. Place the controller/expansion unit on its side.

6. Remove the four screws **B** that hold the bottom cover.

   Note: Observe that part of the cover fits inside a slot behind the ac connector on the ac power panel.

7. Remove the four support board mounting screws **D**.

8. Unplug the connector A2P1 **E** from the power supply board.

9. Remove the connectors **A** from the base of the frame from which you are removing the power supply board.

10. Remove the cable ties **C** from the fan assembly.

    CAUTION
    Do not lose the two lock washers G between the power supply board and the base; they must be replaced.

11. Remove the two screws **F** that hold the power supply board to the support board.

12. Remove the power supply board.

13. **Model 3 controller only**: Remove the four screws **H** that hold the heat sink **J** to the power supply board. Retain the two screws and the heat sink for reinstallation on the new board.

Replacement

Reverse the steps in the removal procedure.

Note: Ensure that the cable ties **C** are replaced.

Warning: Do not power on the controller with the bottom cover removed and the controller placed so that it sets on its base because there is danger of the controller overheating.

AC Panel Assembly

Note: Refer to Figure 3-11 when performing this procedure.

Removal

1. Switch the power off.
2. Remove the top cover. Refer to "Removal" under "Top Cover" in this chapter. (See page 3-1.)
3. Place the controller/expansion unit on its side.
4. Remove the four screws **B** that hold the bottom cover.

   Note: Observe that part of the cover fits inside a slot behind the ac connector on the ac power panel.
5. Remove the four support board mounting screws **D**.
6. Unplug the connector A2P1 **E** from the power supply board assembly.
7. Unplug the connectors from the base of the frame from which you are removing the ac panel assembly.
8. Remove the ground screws from the base of the frame that you are removing the ac panel assembly.
9. Remove the two screws **F** that hold the power supply board to the support board.
10. Remove the ac panel.

Replacement

Reverse the steps in the removal procedure.

DCA Connector Panel Assembly

Note: Refer to Figure 3-12 when performing this procedure.

Removal

1. Remove the top cover. Refer to "Removal" under "Top Cover" in this chapter. (See page 3-1.)
2. Remove card retention rails **A** . Refer to Figure 3-2.
3. Remove logic cards A through F to gain access to the DCA connector panel.
4. Press the two locking tabs **B** on the bottom edge of the DCA connector panel and gently push on the connector panel.
5. Remove the connector **D** from the DCA panel and remove the E1 and black ground leads **C** .

   Note: The E1 lead goes to the top terminal.

Replacement

Reverse the steps in the removal procedure.

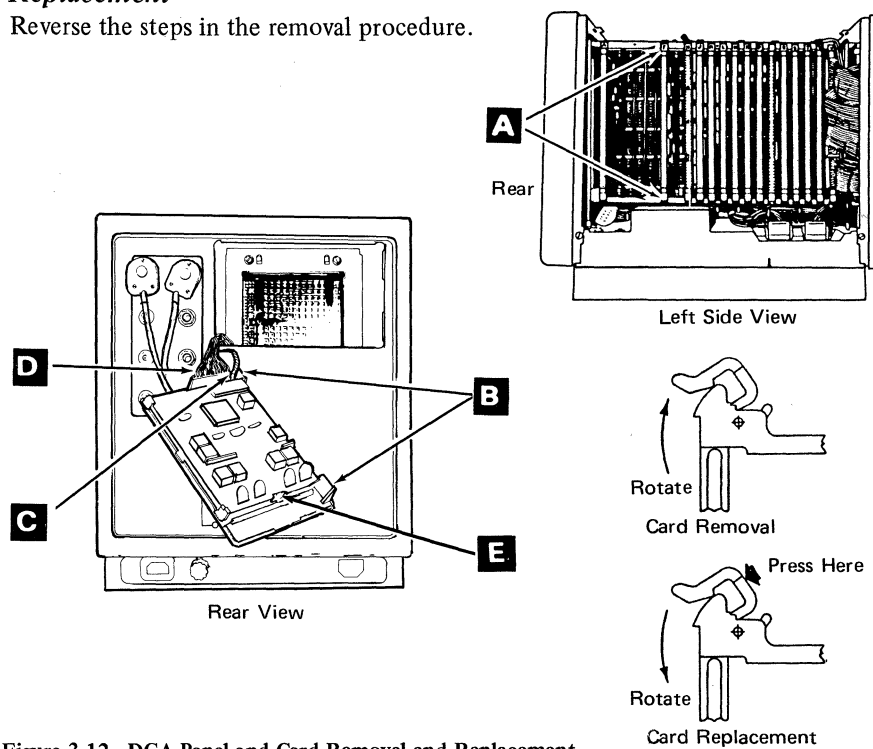


Figure 3-12. DCA Panel and Card Removal and Replacement

DCA Driver/Receiver Card

Note: Refer to Figure 3-12 when performing this procedure.

Removal

1. Perform steps 1 through 4 of the DCA connector panel removal procedure.

2. Press the locking tab **E** away from the DCA driver/receiver card and lift the end of the card far enough to clear the tab and remove the DCA driver/receiver card from the DCA coaxial panel.

Replacement

Reverse the steps in the removal procedure.

Warning: The DCA connector panel is mounted upside down compared to conventional DCA panels. Therefore, use care and do not interchange the +5 volt and ground jumper wires (A2E1 and A2E2 for 0-7) and (A3E1 and A3E2 for 7-15).

Internal Cables

Removal

1. Power off and wait until the Power-on light goes off.

2. Remove the top cover. Refer to "Removal" under "Top Cover" in this chapter. (See page 3-1.)

3. Remove the necessary cable ties, logic cards, diskette drive, disk drive, or other obstruction to gain access to the respective cable.

4. Refer to the following chart for the particular cable. The chart lists the 'to' and 'from' locations.

From Location	Cable Description	To Location
01A-A1Z3	DCA Cable (ports 0-7)	01E-A2A2
01A-A1Z5	DCA Cable (ports 8-15) (RPQ)	01E-A2A3
01A-Yx	Loop Cable where x = 3 for model 5 where x = 6 for models 1 and 2	01E-A1
01A-A1Y2	EIA to Logic Board Cable (frame 1)	01E-J14
01A-A1Z6	ALA Cable **Note:** ALA/EIA – panel location G SNA-Fanout – panel location H	01E-J15 or J15-J18
01A-A1Z2	Auxiliary Diskette Drive Cable	01E-J13 01D-A2P3
01A-A1Z1	Primary Diskette Drive Cable	01C-C1P1 01D-A2P2
01A-B1J1	Encryption Switch Cable	01D-A1P6

Figure 3-13 (Part 1 of 2). Internal Cables Chart

From Location	Cable Description	To Location
01D-A2P4 01D-A2P2 01D-Q2Y (Model 2SE only)	dc Cable to Logic Board	01A-A1Y3 01A-A1Z4 01A-A1Z3
01A-A1A4	Disk A Cable	01E-J11
01A-A1A5	Disk B Cable	01E-J12
01A-C2Y	Disk C Cable	01E-J19
01A-C2Z	Disk D Cable	01E-J20
03E-A1A2	Disk A Signal Cable 1	03A-A1A5 03A-P1 03A-P2 03A-P5
03E-A1B2	Disk A Signal Cable 2	03A-A1A2
03E-A1A3	Disk B Signal Cable 1	03C-A1A5 03C-P1 03C-P2 03D-P5
03E-A1B5	Disk B Signal Cable 2	03C-A1A2
0xE-A1A4	Indicator Panel Cable (frame 3 or 4) where x = 3 for frame 3 x = 4 for frame 4 (RPQ)	0xB-P1 0xD-A2P4 pin 12
03D-J4	Power Cable 1	03E-A1A5
03D-J6	Power Cable 2	03E-A1A4
03D-J5	Power Cable 3	03 Disk A or C
0xD-J2	Power Cable 4 where x = 3 for frame 3 x = 3 for frame 4 (RPQ)	0xC Diskette

Figure 3-13 (Part 2 of 2). Internal Cables Chart

Replacement

Reverse the steps in the removal procedures.

Note: Replace any cable ties that may be necessary.

Chapter 4. 4701 Diagrams

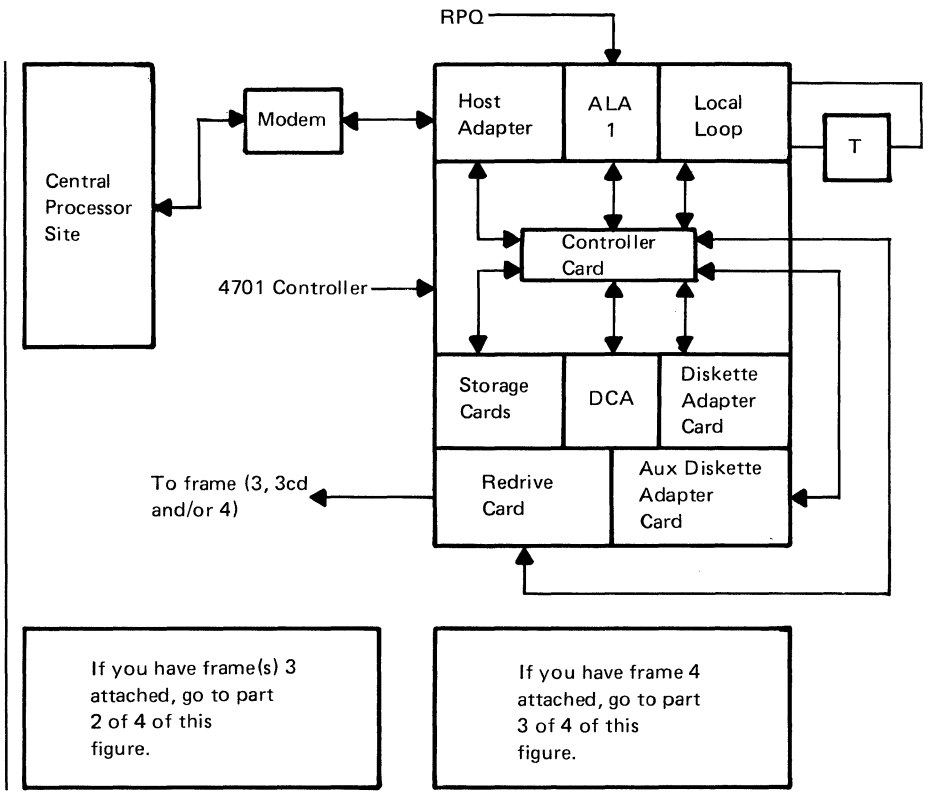


Figure 4-1 (Part 1 of 4). 4701 Simplified Data Flow Diagram

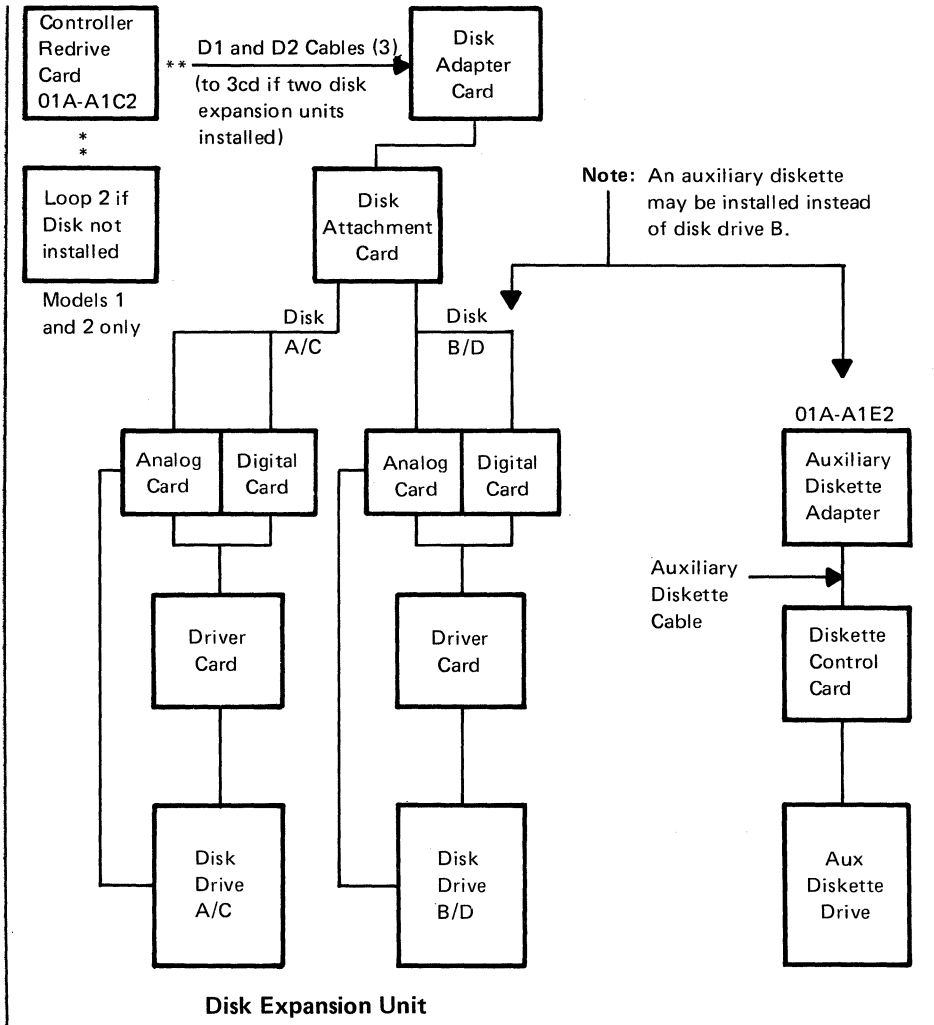


Figure 4-1 (Part 2 of 4). 4701 Simplified Data Flow Diagram

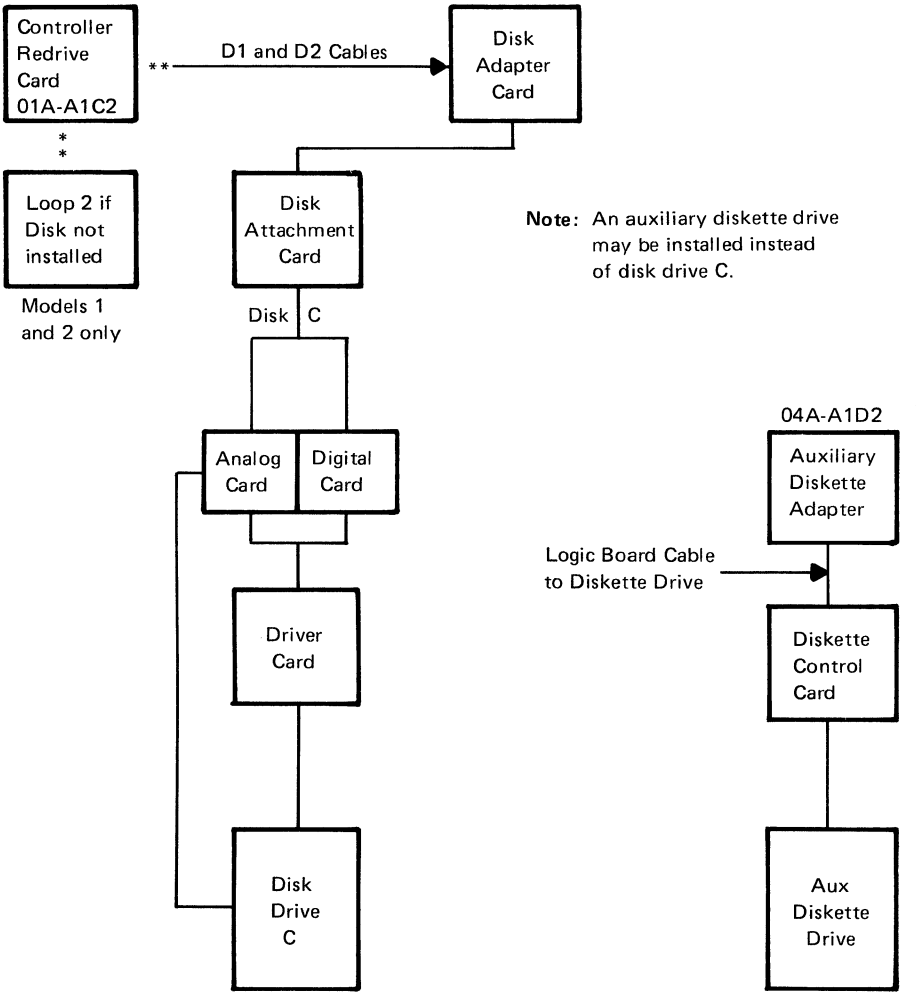


Figure 4-1 (Part 3 of 4). 4701 Simplified Data Flow Diagram

Notes:

1. [T] can be up to 16 addresses per loop.
2. A 4701-1 has two or four loops (frame 1).
3. A 4701-2 has two or four loops (frame 1).
4. A 4701-5 has one loop (frame 1).
5. Frame 4 may have two loops (5 and 6).
6. Frame 2 may have a 0.5- or 1-megabyte diskette drive.
7. Frame 3 or frame 4 may have a 1-megabyte diskette drive.
8. Frame 3cd cannot have an auxiliary diskette drive.
9. Frame 4 with an auxiliary diskette drive has an adapter card in frame 4.
10. Cables D1 and D2 go to frame 4, if frame 4 is installed.
11. The DCA panel has ports 0-7 (0-15 with RPQ 8V0124 or 8V0133).
12. Disk B or C may be replaced by a diskette drive, unless frame 3cd is present.
13. Frames 2, 3, or 4 can have an auxiliary diskette cable depending upon the physical configuration.
14. Frame 3cd will be designated as address "0D" if a jumper assembly (PN 8259532) is installed in position 03E-A1C2.
15. Capacitor PN 6096880 is installed in position 03E-A1C3.

Figure 4-1 (Part 4 of 4). 4701 Simplified Data Flow Diagram

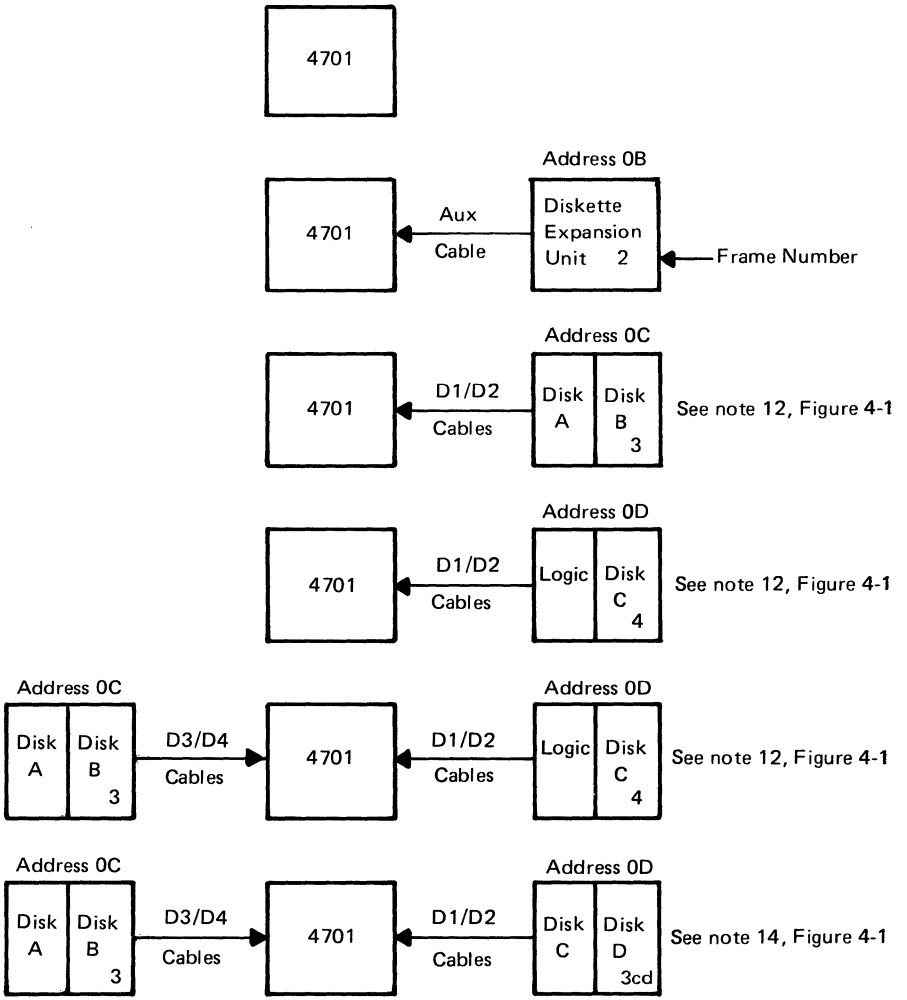


Figure 4-2. 4701 Physical Configurations

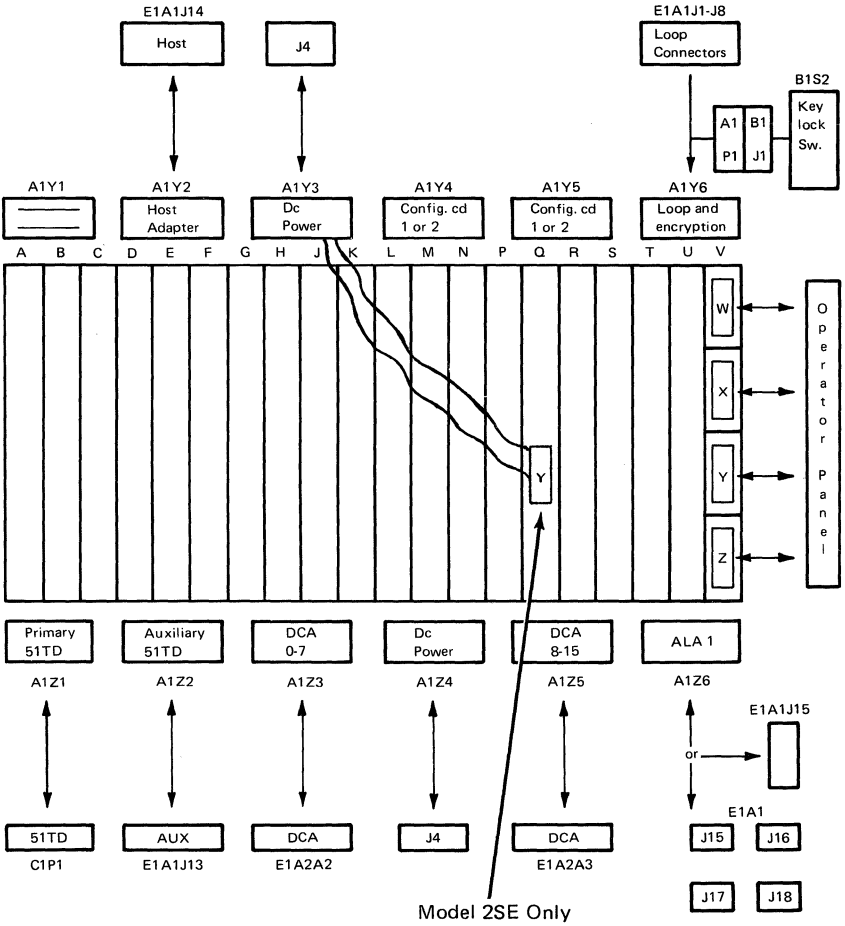
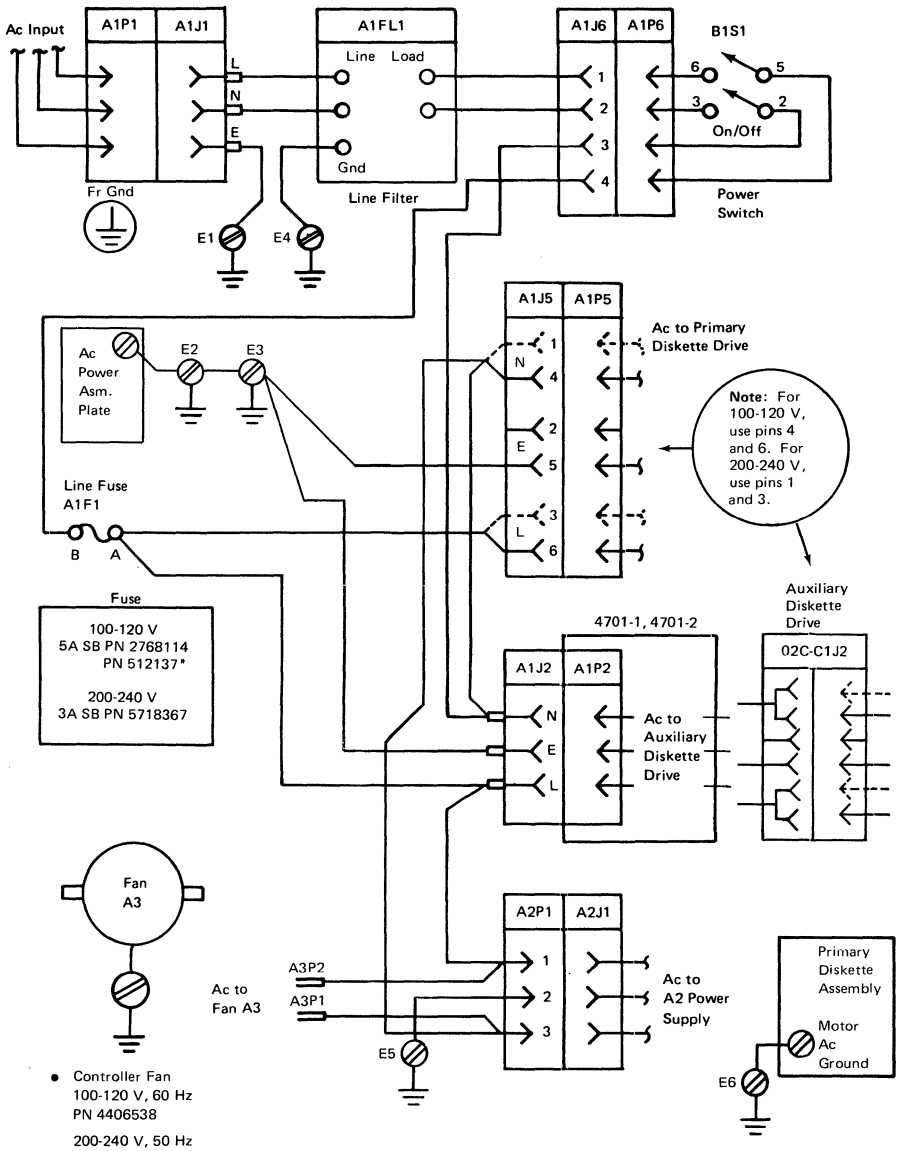


Figure 4-3. 4701 A1 Logic Board Data Flow Path



*Most current part number.

Figure 4-4 (Part 1 of 2). 4701 Controller Power Diagram

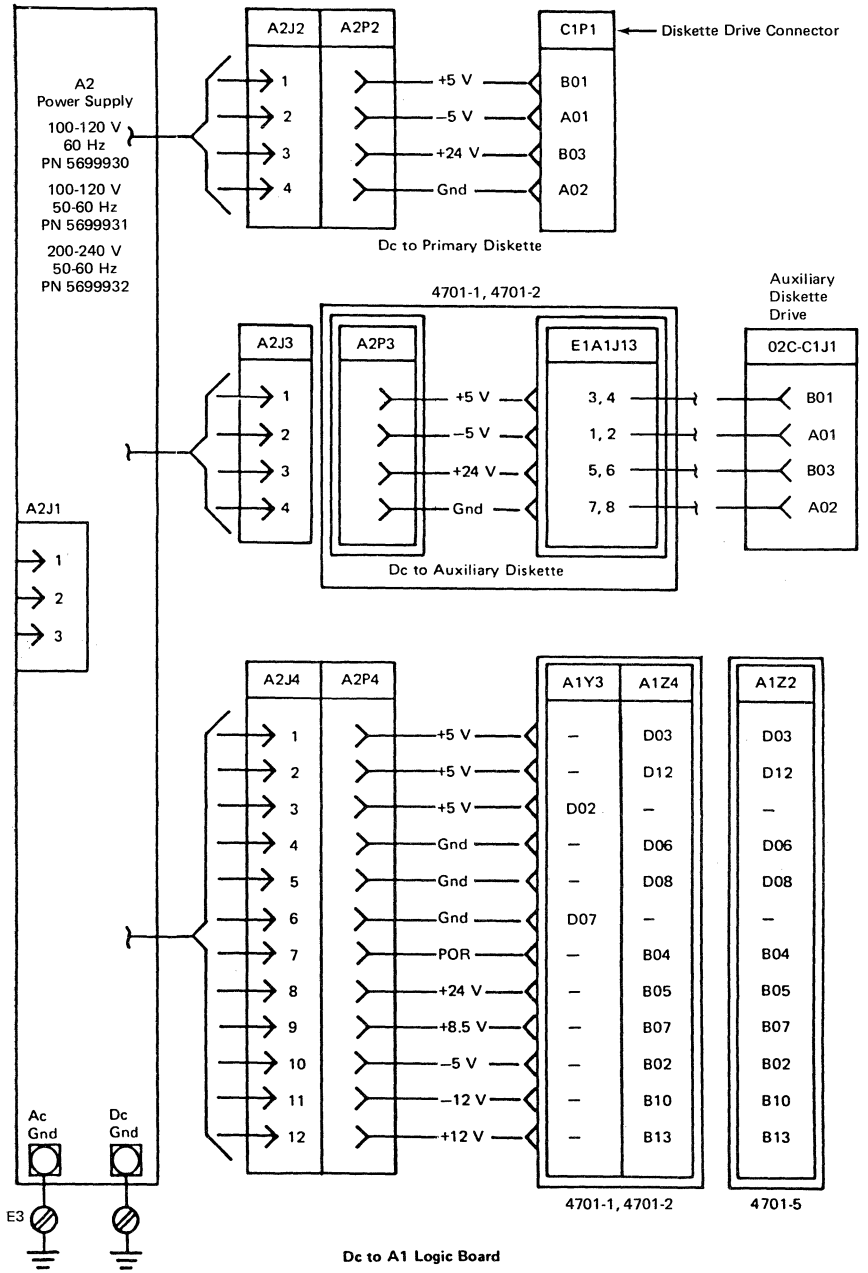
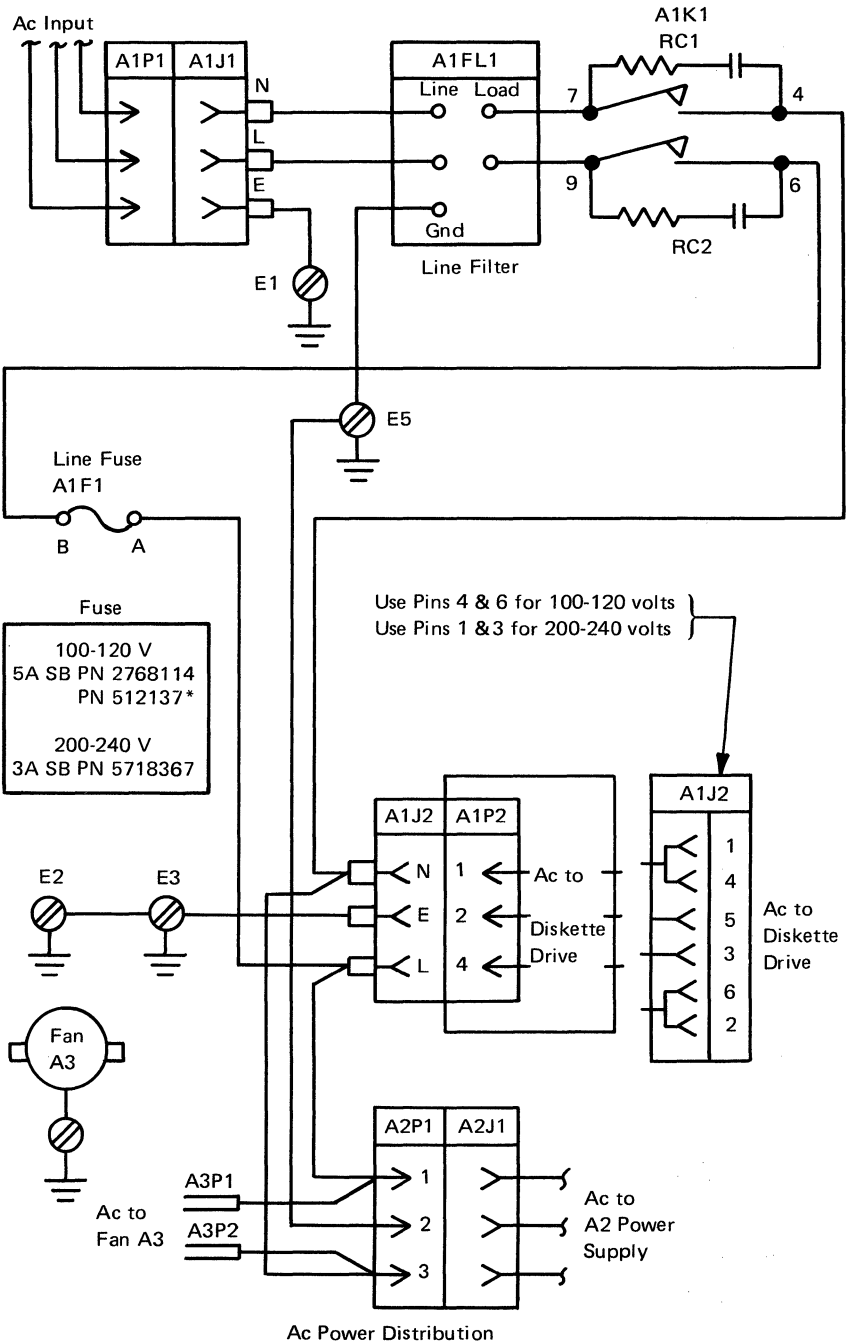
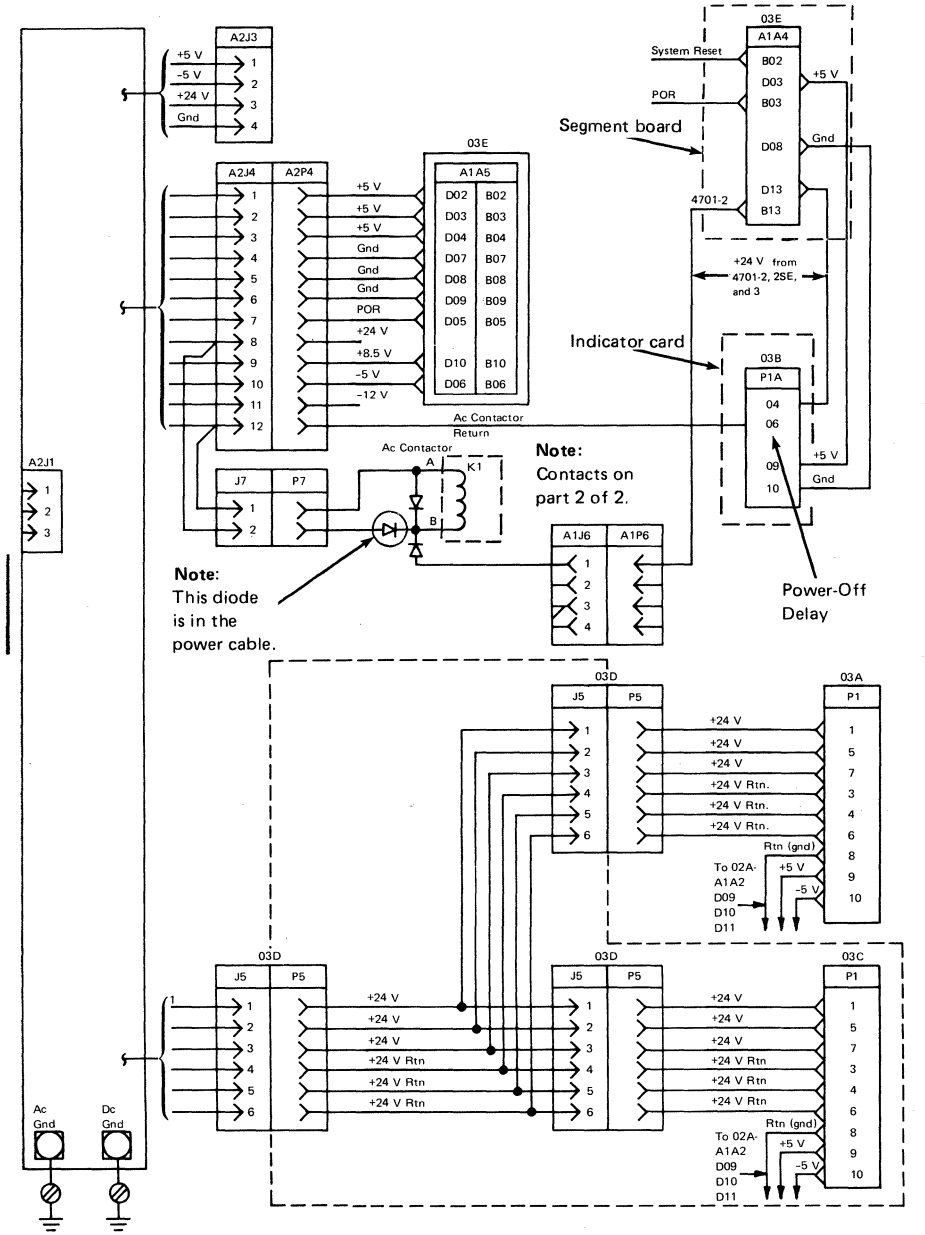


Figure 4-4 (Part 2 of 2). 4701 Controller Power Diagram



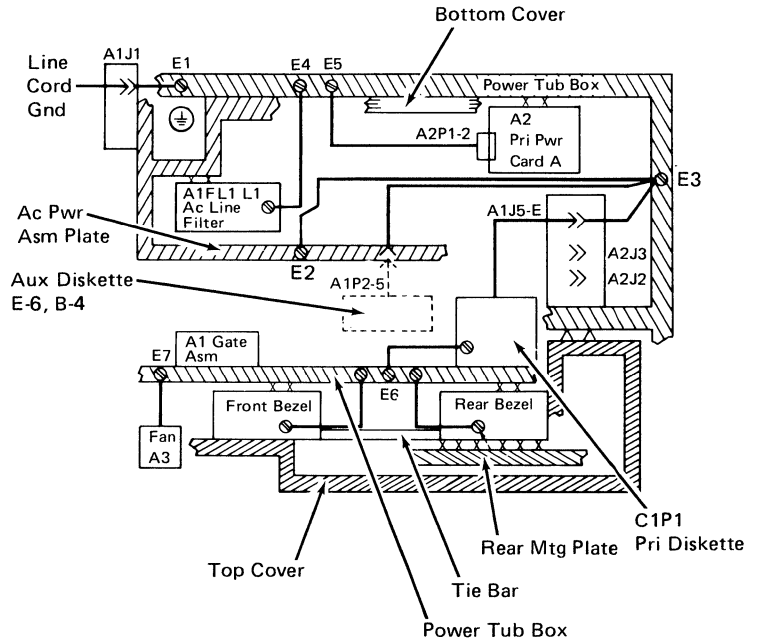
*Most current part number.

Figure 4-5 (Part 1 of 2). Frames 3, 3cd and 4 Power Diagram

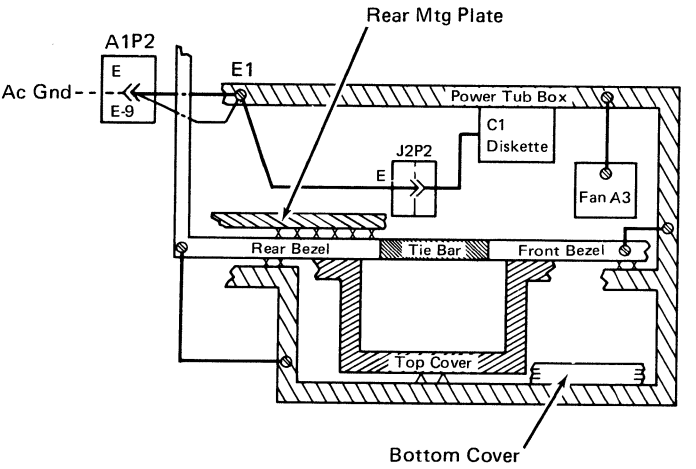


Note:
Connector 03A-J5/P5 does not exist on Frame 03 when one disk drive is present. With one DASD drive, wiring goes directly from 03D-P5 to 03A-P1.

Figure 4-5 (Part 2 of 2). Frames 3, 3cd and 4 Power Diagram



Frame 1

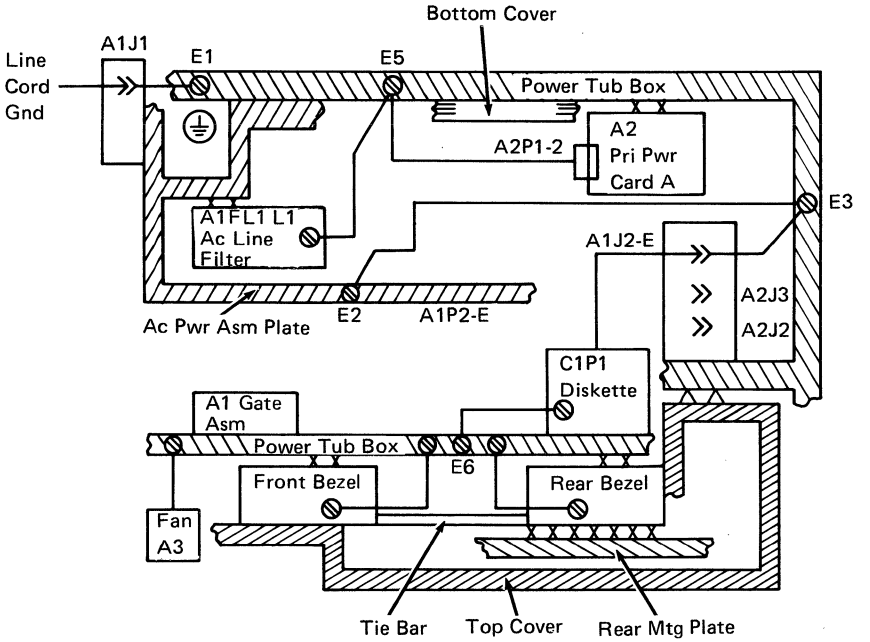


Frame 2

Notes:

1. X = Screws with an external lockwasher.
2. △ = Screws without an external lockwasher.
3. ⊘ = Each E position has an external lockwasher.

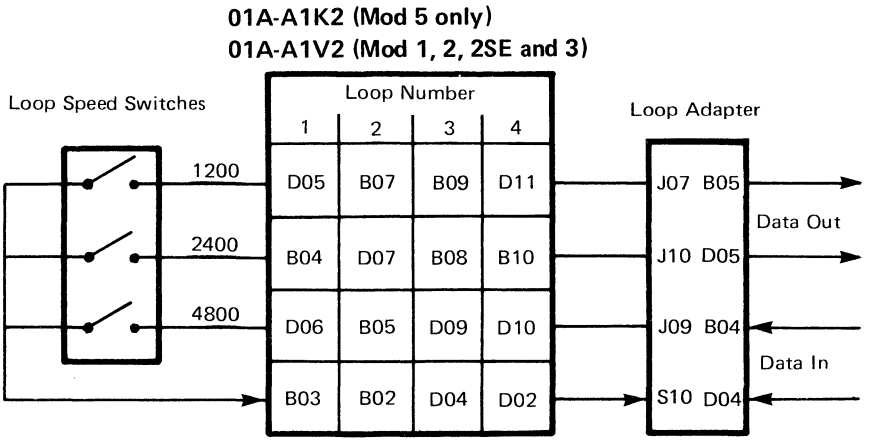
Figure 4-6. 4701 Frames 1 and 2 Ac Grounding Diagram



Notes:

1. X = Screws with an external lockwasher.
2. △ = Screws without an external lockwasher.
3. ⌀ = Each E position has an external lockwasher.

Figure 4-7. Frames 3, 3cd and 4 Ac Grounding Diagrams



Card Function	Socket Position			
	4701-1	4701-2	4701-2SE,3	4701-5
Loop Adapter 4	L2	L2	B2	
Loop Adapter 3	M2	M2	D2	
Loop Adapter 2	N2	N2 B2	F2	
Loop Adapter 1	P2	P2	L2	F2

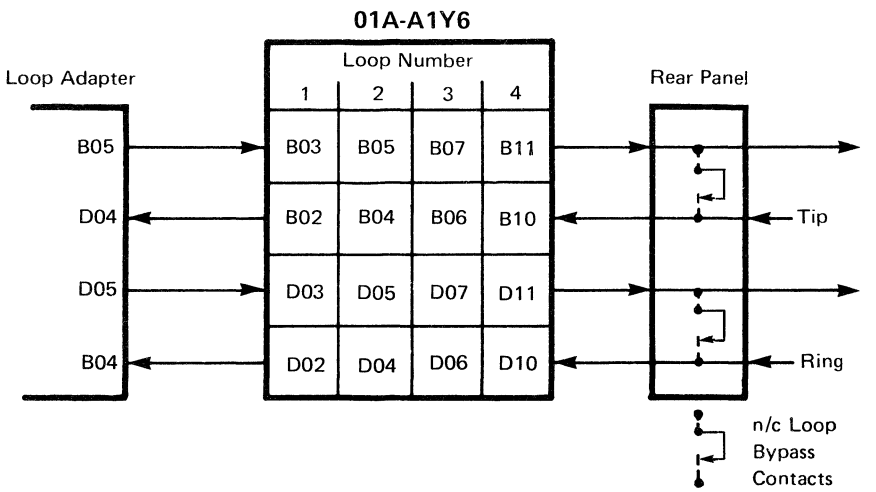


Figure 4-8. Loop Diagnostic Diagram

Chapter 5. FRU Locations

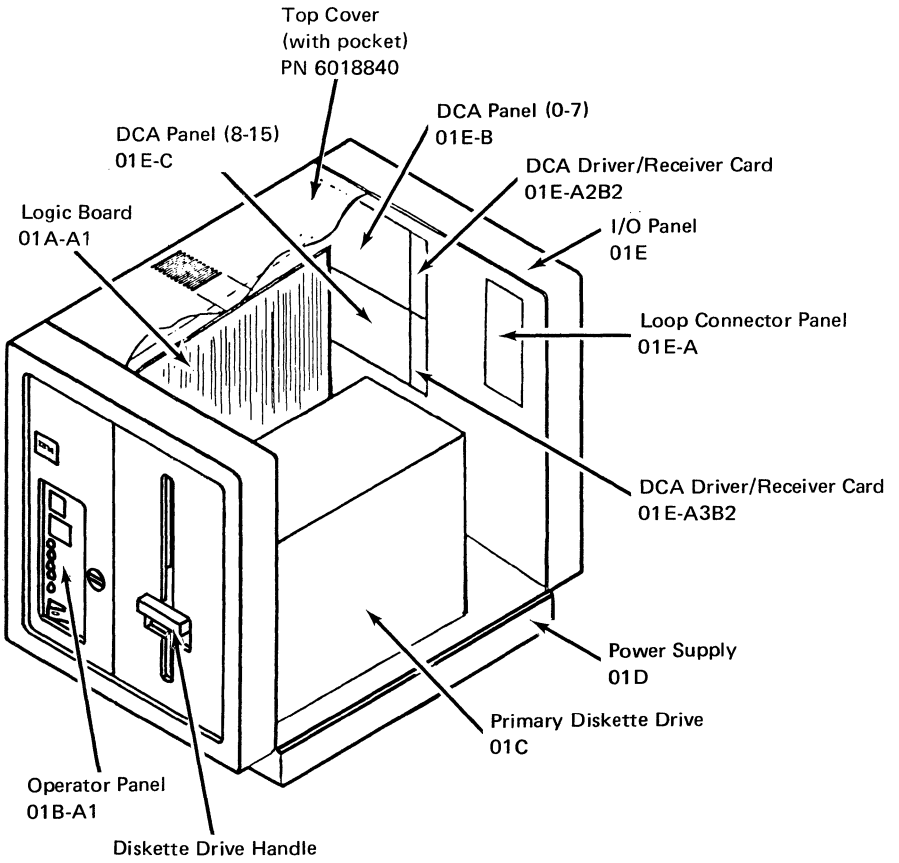


Figure 5-1. 4701 Controller (Frame 1)

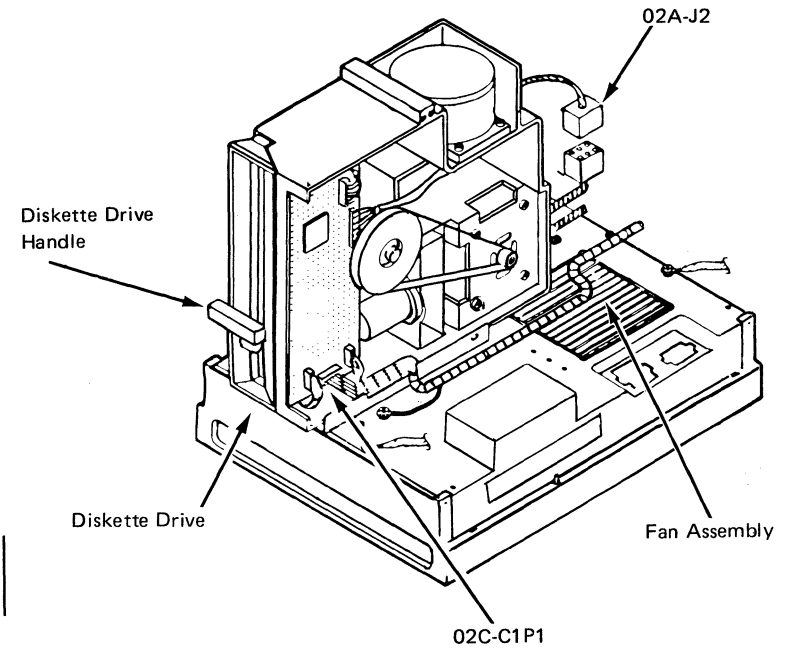
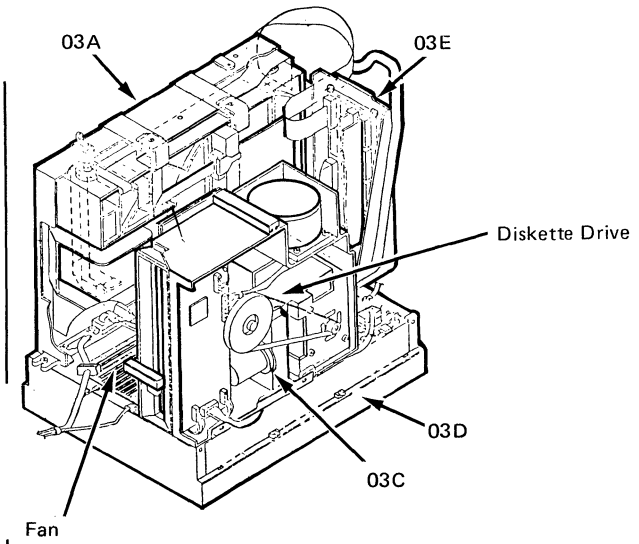


Figure 5-2. Diskette Expansion Unit (Frame 2)



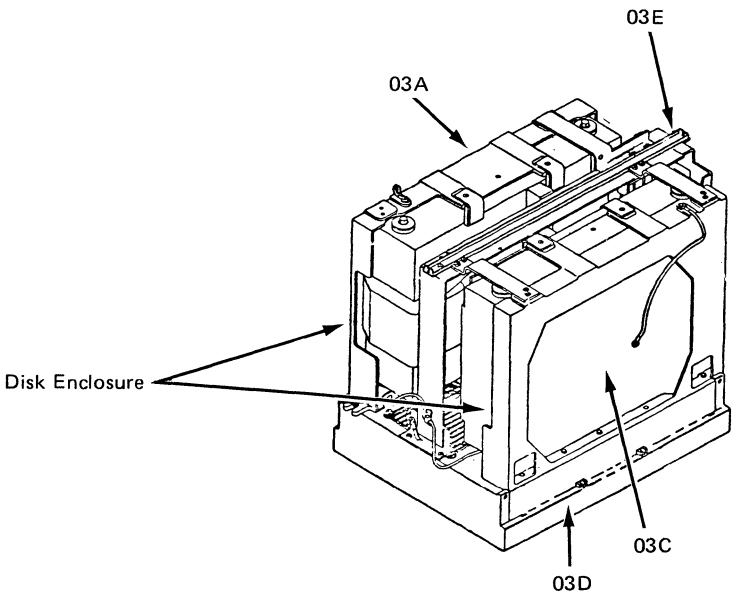


Figure 5-3 (Part 2 of 2). Disk Expansion Unit (Frames 3 and 3 cd)

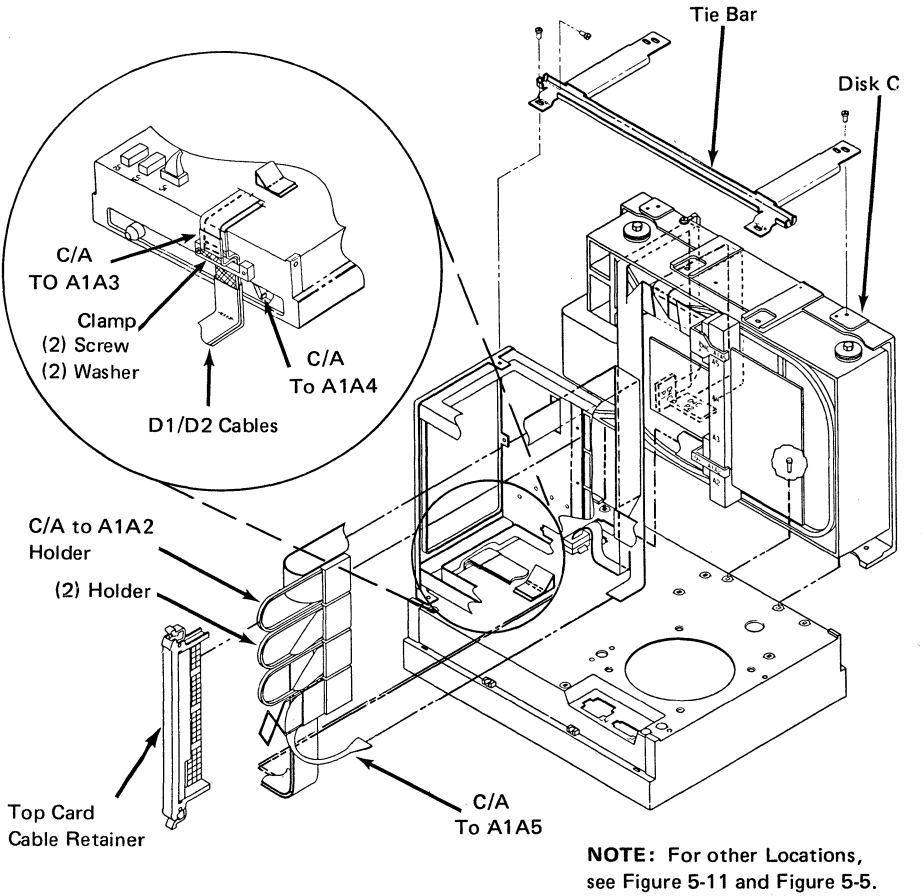


Figure 5-4. Communication Expansion Unit (RPQ)

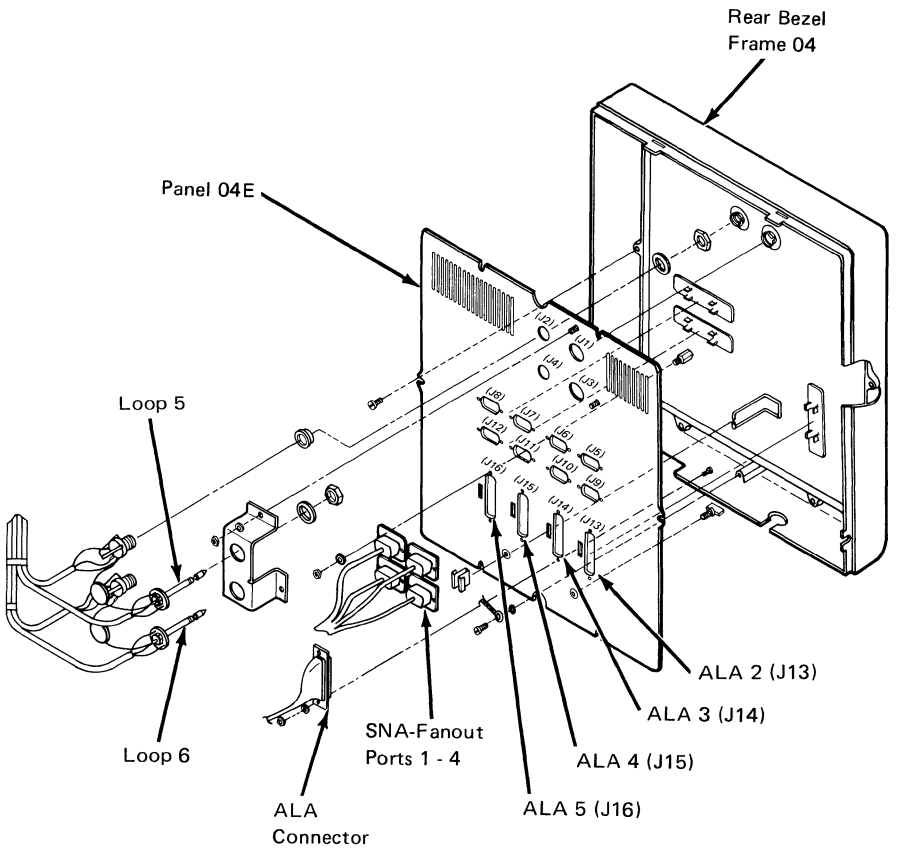


Figure 5-5. Communication Expansion Unit Rear Panel (Frame 4)

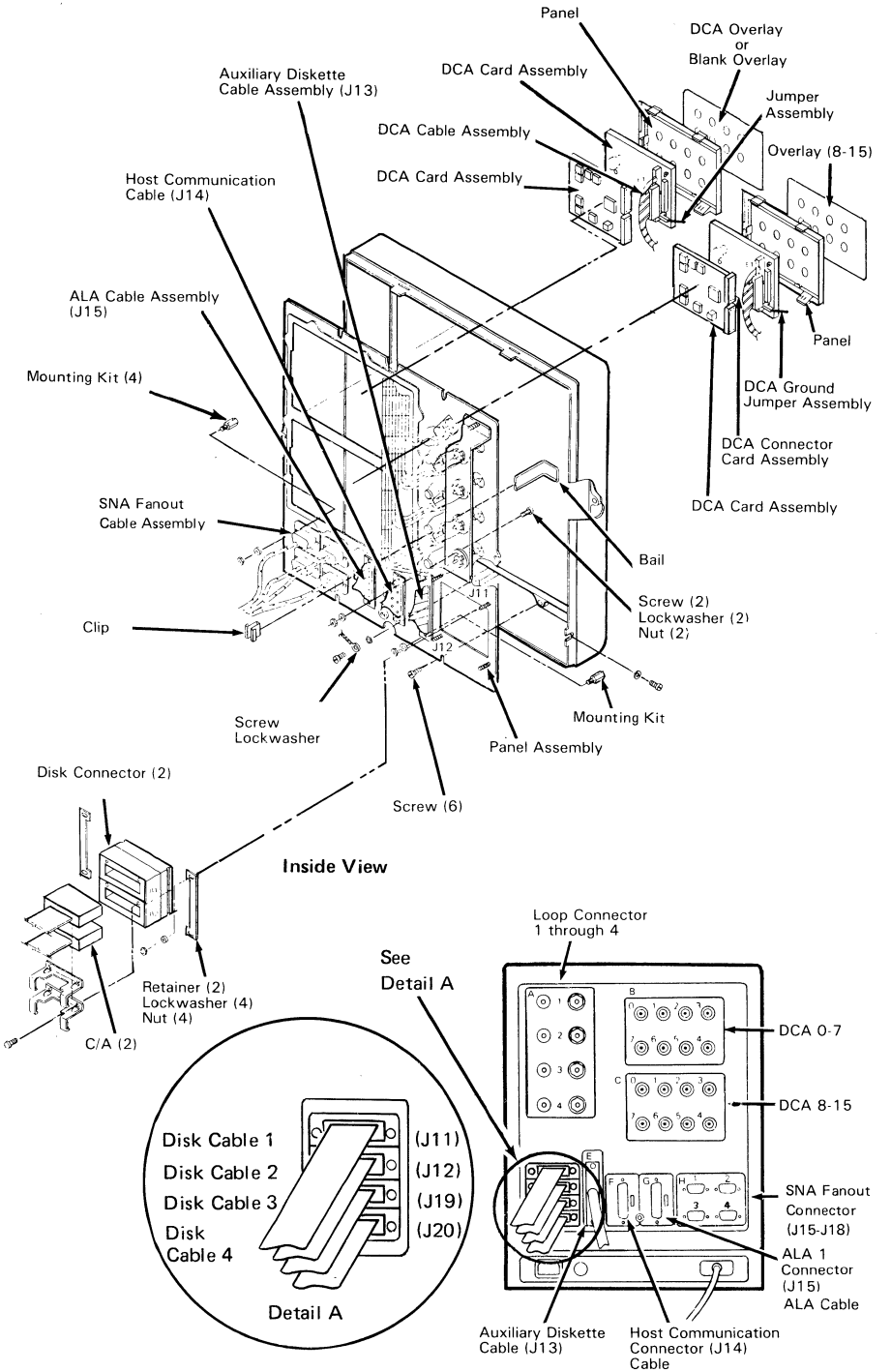


Figure 5-6. 4701 Rear Panel

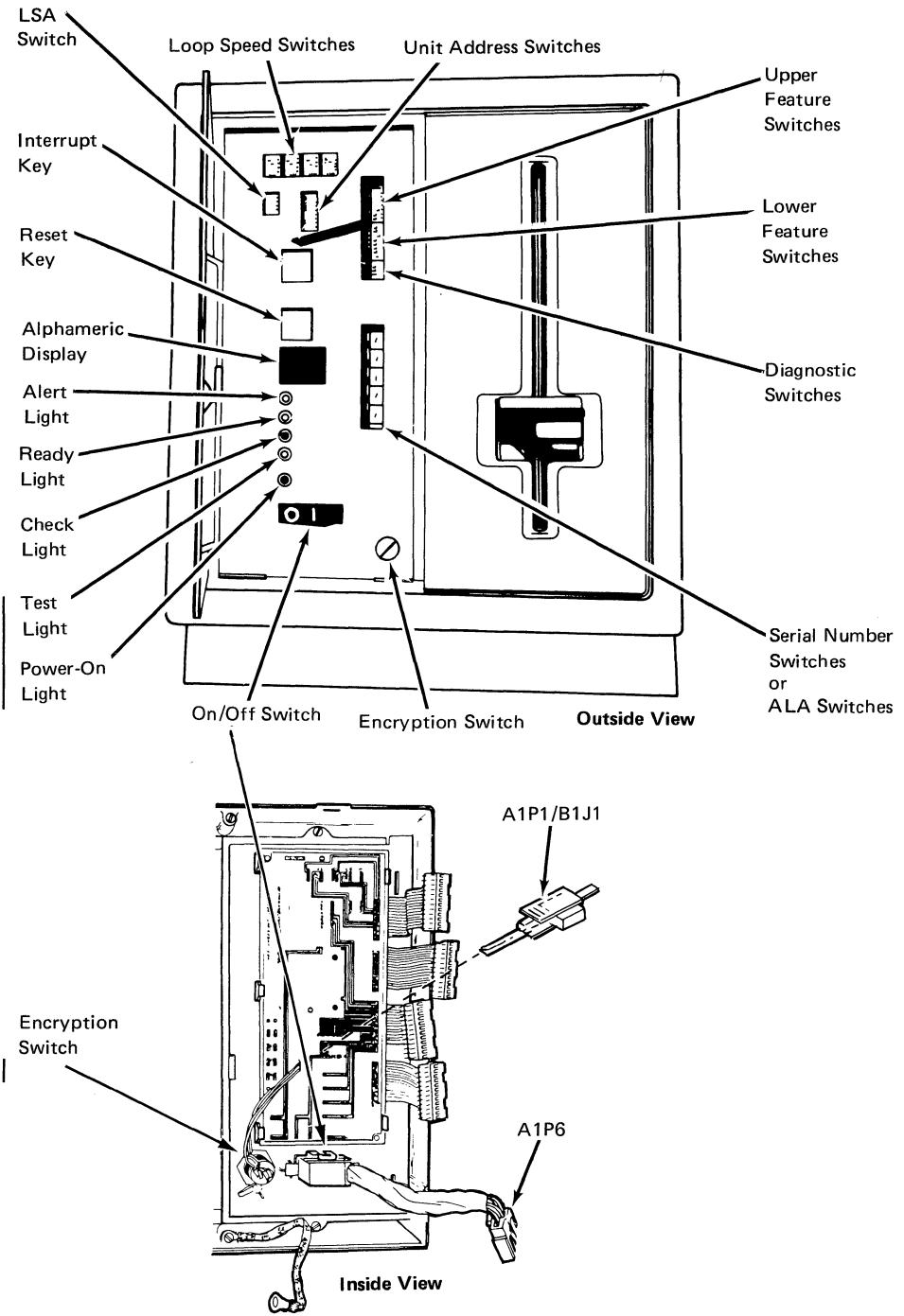


Figure 5-7. 4701 Operator Panel and Cable Assembly

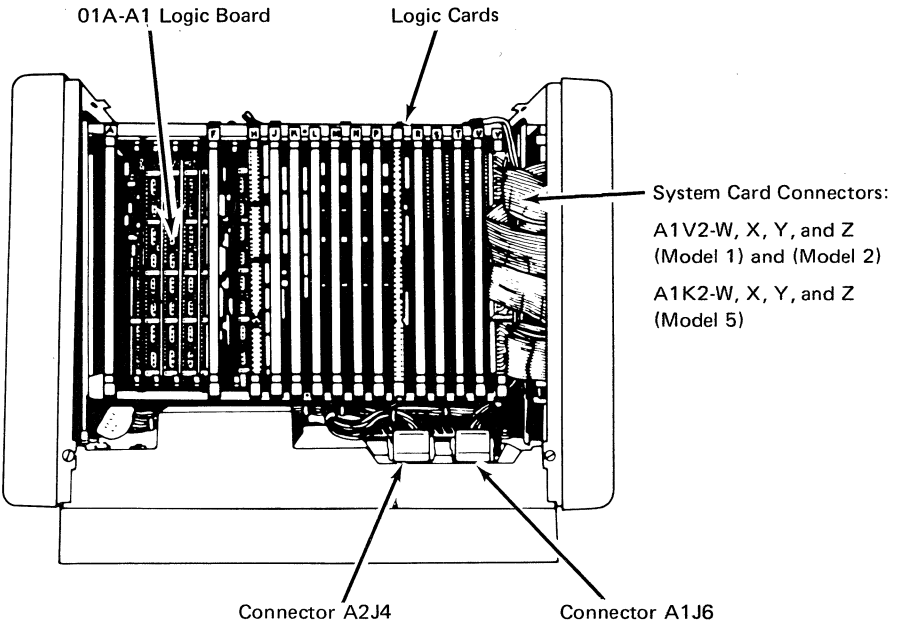


Figure 5-8. 4701 Controller (Side Views)

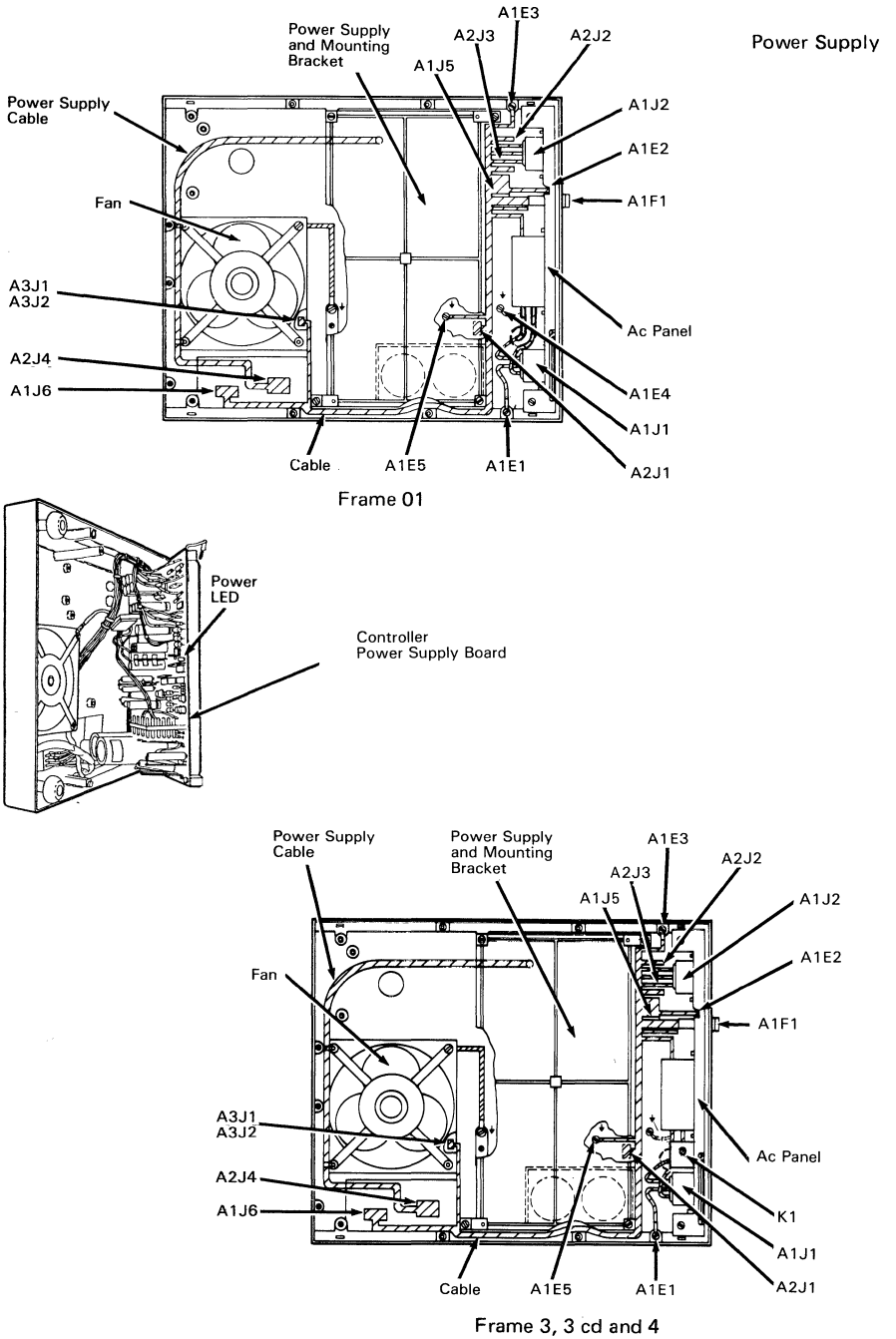


Figure 5-9. Controller and Expansion Unit Power Supply (Bottom View)

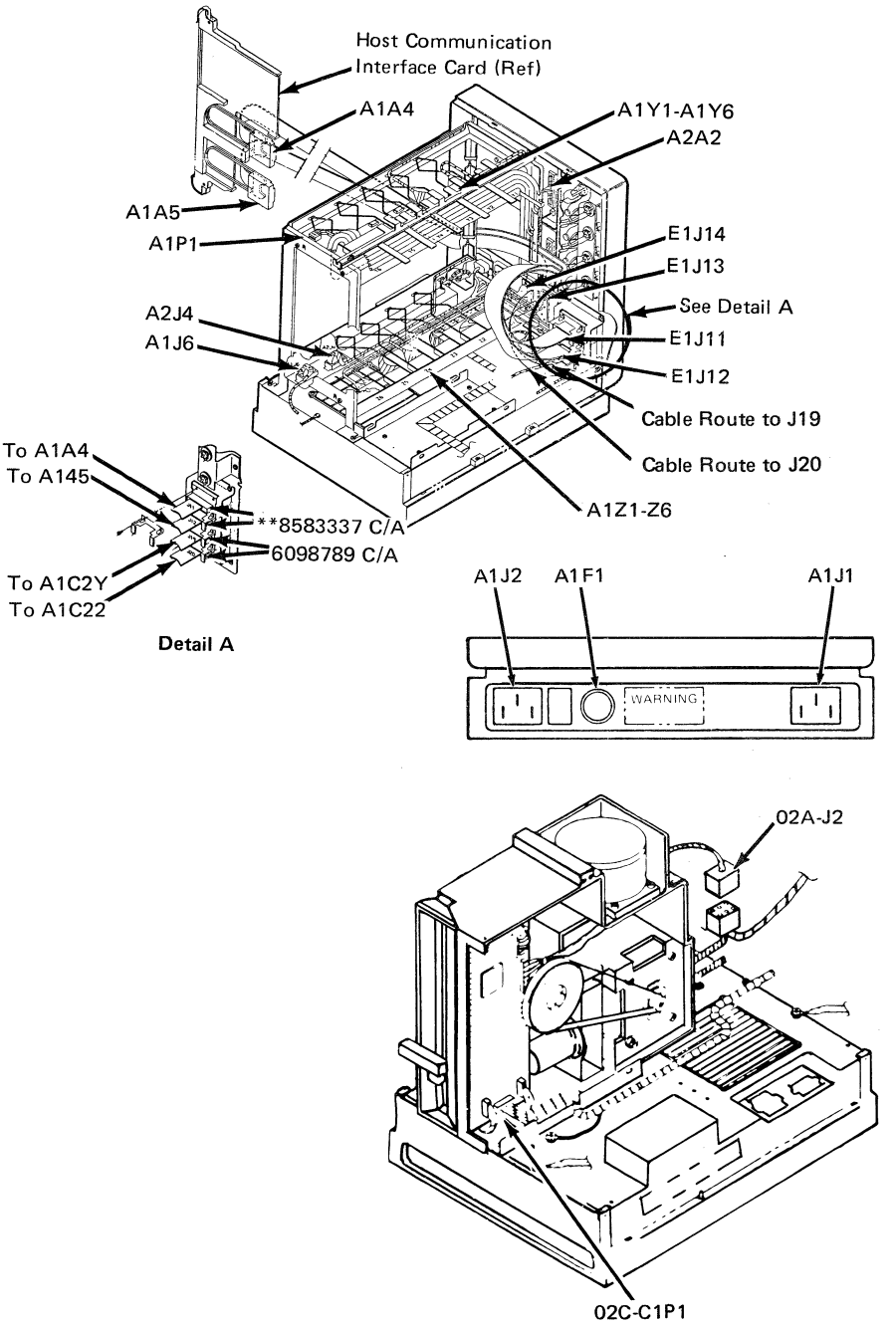
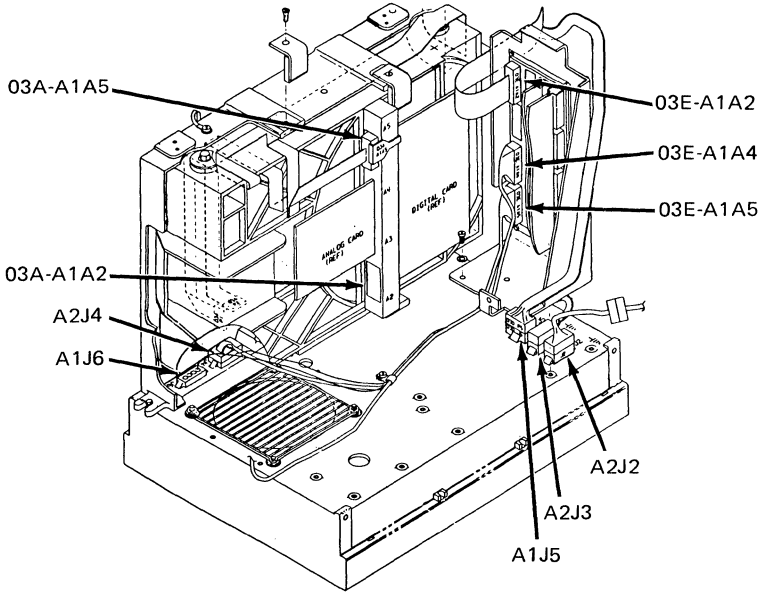
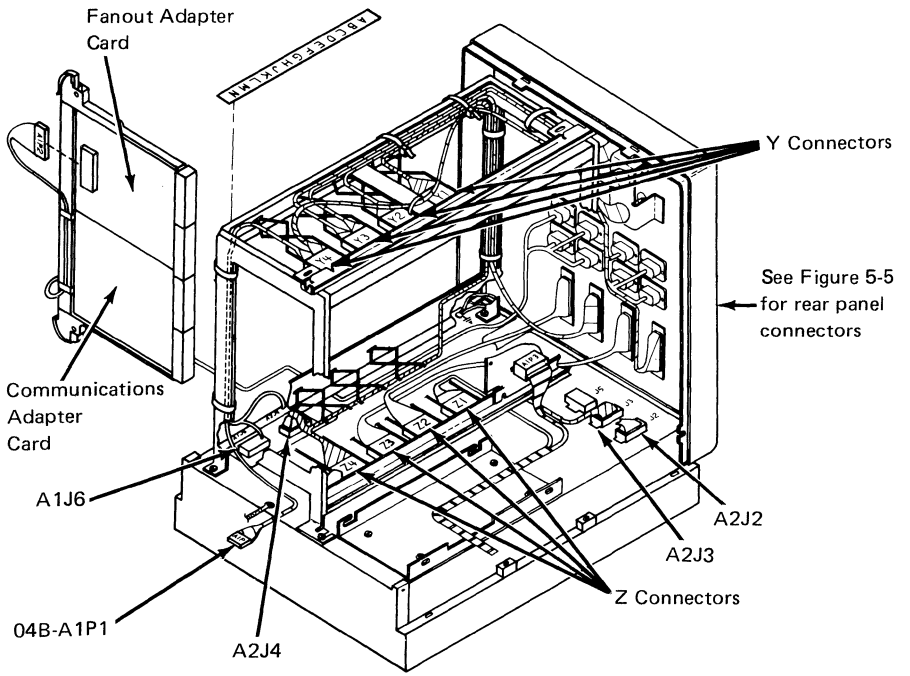


Figure 5-10. 4701 Frame 1 and 2 Cable and Connector Locations



Frame 3



Frame 4

Figure 5-11. 4701 Frame 3, 3 cd, and 4 (RPQ) Cable and Connector Locations

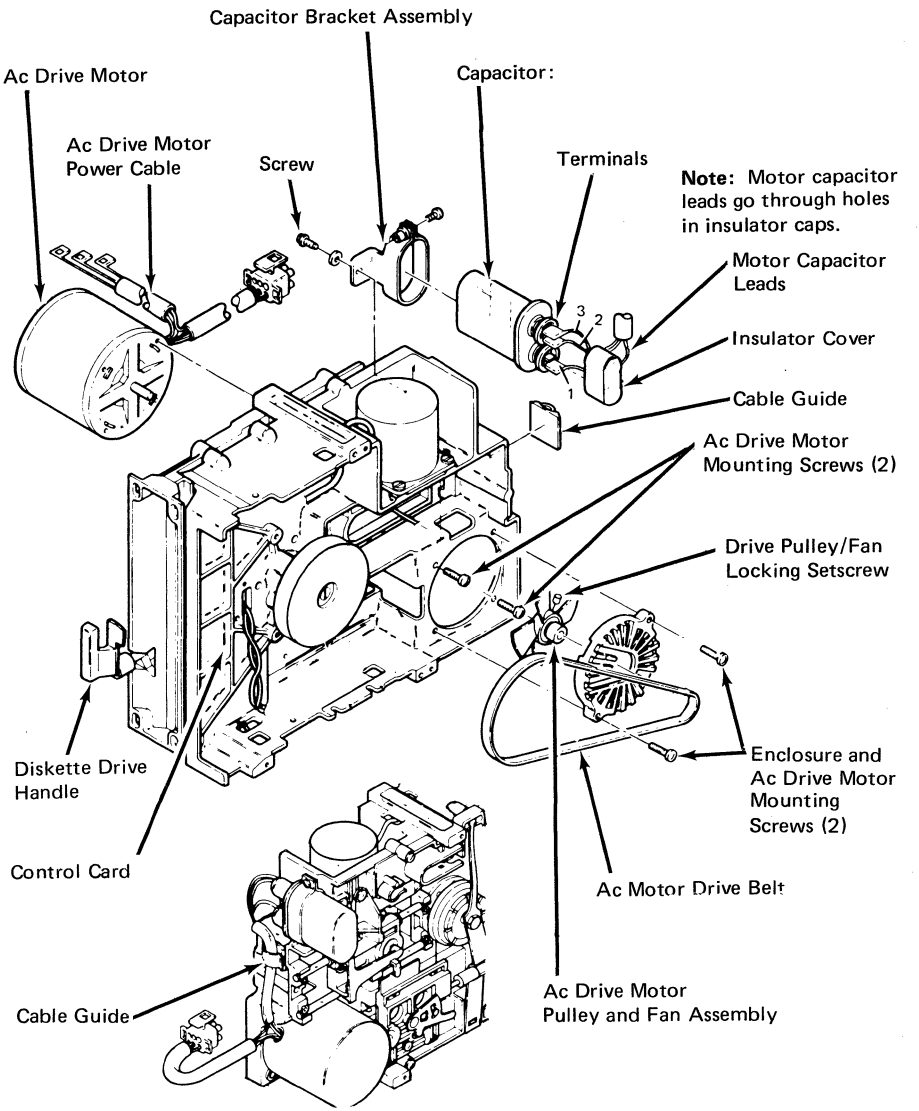


Figure 5-12. Diskette Drive Assembly

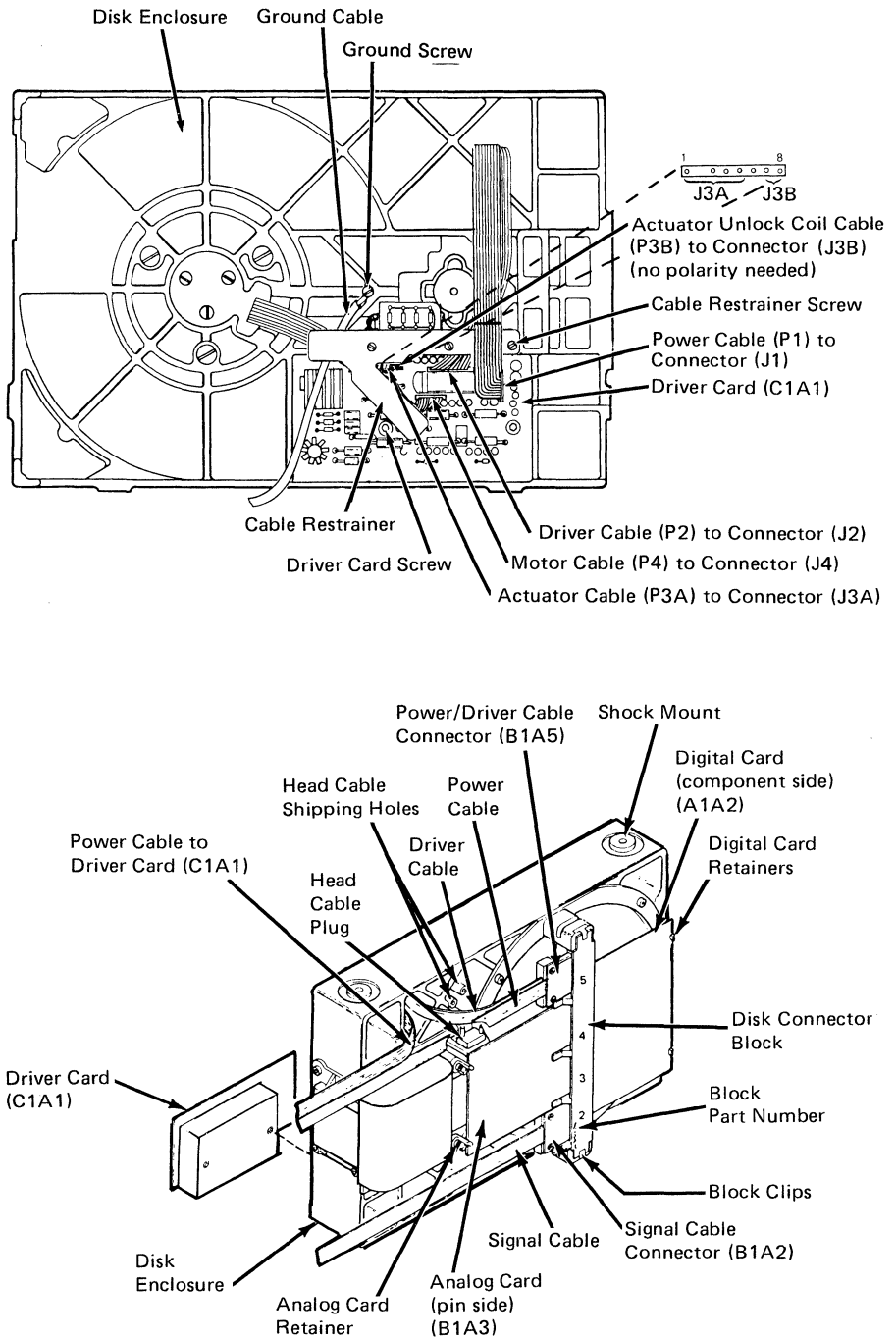


Figure 5-13. Disk Drive Enclosure

Upper Feature Switches

Switch Positions 1 = On 0 = Off								
1	2	3	4	5	6	7	8	Meaning
0								Without the communication expansion unit, or dual expansion frames attached.
1								With the communication expansion unit or dual expansion frames attached.
	0							Reserved.
		0						1 diskette adapter installed.
		1						2 diskette adapters installed.
			0					No DCA adapter installed.
			1					DCA adapter installed.
				1				4701-2 with storage enhancement feature. (over 512K)
					0	0	0	No loop adapters installed.
					0	0	1	1 loop adapter installed.
					0	1	0	2 loop adapters installed.
					0	1	1	3 loop adapters installed.
					1	0	0	4 loop adapters installed.
					1	0	1	5 loop adapters installed.
					1	1	0	6 loop adapters installed.

Figure 5-14 (1 of 2). Upper and Lower Feature Switches

Lower Feature Switches

Switch Positions 1 = On 0 = Off								
1	2	3	4	5	6	7	8	Meaning
0	0	0	1					(Host) HPCA w/o clock – X.21 switched
0	0	1	0					(Host) HPCA w/o clock – EIA/CCITT
0	0	1	1					(Host) HPCA w/o clock – IBM Multiuse Communication Loop
0	1	0	0					(Host) CCA w/clock with EIA/CCITT (Start/Stop)
0	1	0	1					(Host) CCA w/o clock with EIA/CCITT (BSC)
0	1	1	0					(Host) HPCA w/o clock – X.25 EIA interface
0	1	1	1					(Host) HPCA w/o clock – X.21 nonswitched
1	0	0	0					(Host) X.25 – X.21 nonswitched interface
						1	0	ALA 1 CCA w/clock with EIA/CCITT (Start/Stop)
						0	1	ALA 1 HPCA w/o clock – SNA Fanout or EIA
						1	1	ALA 1 CCA w/clock (BSC)
If upper feature switch 1 is set on, lower feature switches 5, 6, 7, and 8 identify that the following features are installed. See note 5 below.								
				1				Disk Drive A installed in frame 3.
					1			Disk Drive B installed in frame 3.
						1		Disk Drive C installed in frame 3cd or 4.
							1	Disk Drive D installed in frame 3cd.

Notes:

1. When multiple expansion units have been installed on a 4701 Model 2, 2SE or 3, the Serial Number Switches are used to identify Alternate Line Adapter (ALA) features. The serial number is stored in nonvolatile storage.

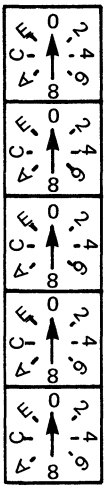
2. See notes of Figure 5-15 for additional information on serial number switch usage.

3. The serial number switches operate only as serial number switches on a 4701 Model 1 controller.

4. See Figure 4-2 for the possible physical configurations when multiple expansion units are installed.

5. If only frame 3 is installed, upper feature switch 1 is not set on.

Figure 5-14 (Part 2 of 2). Upper and Lower Feature Switches



Serial Number SW 1 or ALA-1

Serial Number SW 2 or ALA-2

Serial Number SW 3 or ALA-3

Serial Number SW 4 or ALA-4

Serial Number SW 5 or ALA-5

Typical Serial Number Switch

Serial Number Switch 1 or ALA1

Switch Positions 1 = position setting									
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9-F**	**Meaning**
0	0	0	0	0	0	0	0	n/a	No alternate adapter installed.
1								n/a	(ALA) HPCA w/o clock – X.21 switched.
	1							n/a	(ALA) HPCA w/o clock – EIA/CCITT.
		1						n/a	(ALA) Reserved.
			1					n/a	(ALA) CCA w/clock – EIA/CCITT (Start/Stop).
				1				n/a	(ALA) CCA – EIA/CCITT (BSC)
					1			n/a	(ALA) X.25 EIA/CCITT interface.
						1		n/a	(ALA) HPCA w/o clock – X.21 nonswitched.
							1	n/a	(ALA) X.25 – X.21 nonswitched interface.

ALA 1

Figure 5-15 (Part 1 of 2). ALA Features Identified by Serial Number Switches

Serial Number Switches 2-5 or ALA 2-5

Switch Positions 1 = position setting									
1	2	3	4	5	6	7	8	9-F	Meaning
0	0	0	0	0	0	0	0	n/a	No alternate adapter installed.
1								n/a	(ALA) Reserved.
	1							n/a	(ALA) HPCA w/o clock – EIA/CCITT.
		1						n/a	(ALA) Reserved.
			1					n/a	(ALA) CCA w/clock – EIA/CCITT (Start/Stop).
				1				n/a	(ALA) EIA CCITT (BSC)
					1			n/a	(ALA) Reserved.
						0		n/a	Reserved.
							1	n/a	(ALA) Reserved.

Notes:

1. See the notes listed on Figure 5-14 for additional information.

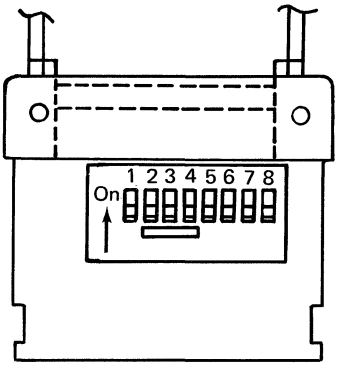
2. If your controller has either RPQ 8V0222 or RPQ 8V0223, you must also consider the position of the serial number switches, because they identify features that may be installed on your controller. These switches are used in conjunction with upper feature switch 1 being set to the on position.

3. The above switch positions indicate the features for serial number switches 2 through 5 when alternate adapters are installed (Upper feature switch 1 is on). See Figure 5-14. Switch positions two through five indicate the same features. Each switch position is assigned to the ALA line number corresponding to the switch number, counting top to bottom (Switch 1 = ALA 1, switch 2 = ALA 2, and so on).

4. The feature definition combination for the communication and line interface adapters for the host, ALA and/or twin-host interface does not indicate that IBM supports all combinations. The assignments are made only to assure commonality of switch settings.

Figure 5-15 (Part 2 of 2). ALA Features Identified by Serial Number Switches

Configurator Cards



A1Y4 or A1Y5

Configurator Card Position 01A-A1Y4

- If the host HPCA feature is installed (P/N 6340976 plugged in 01A-A1J2), configurator card P/N 6018830 is installed in 01A-A1Y4.
- If the host CCA feature is installed (P/N 8523016 plugged in 01A-A1J2), configurator card P/N 6018832 is installed in 01A-A1Y4.
- If the Model 1 controller has neither the DCA feature nor the ALA feature, it has only an A1Y4 card.
- Set configurator switches as follows:

A1Y4 Configurator Card Switches

Switch Positions 1=position setting								
1	2	3	4	5	6	7	8	Meaning
0	0	0	0	0	0	0	0	Initial setting of all models.
						1		Model 1 without 0.5-megabyte auxiliary diskette.
						1	1	Model 2.

Figure 5-16. Configurator Card 01A-A1Y4 Installation Instruction

Configurator Card Position 01A-A1Y5

- If the ALA feature, with HPCA adapter (PN 6340976 plugged in 01A-A1K2), is installed, configurator card PN 6018830 is installed in 01A-A1Y5. Otherwise, configurator card PN 6018832 is installed in 01A-A1Y5.

- If the Model 1 controller has neither the DCA feature nor the ALA feature, it has only an A1Y4 card.

- Set configurator switches as follows:

A1Y5 Configurator Card Switches

Switch Positions 1=position setting								
1	2	3	4	5	6	7	8	Meaning
0	0	0	0	0	0	0	0	Initial setting of all models.
	1							Any model with ALA (CCA adapter card PN 8523016 or PN 8526485 installed in 01A-A1K2).
					1			Any model without DCA (no adapter installed in 01A-A1H2).
						1		Model 2, 2SE or 3 with frame 4 installed.
						1		Any time an adapter is not installed in position 01A-A1E2.
							1	Model 1 with 1-megabyte auxiliary diskette. (Adapter in 01A-A1E2).

Note: The above chart represents single features; where there are multiple features, more than one switch may be on.

Figure 5-17. Configurator Card 01A-A1Y5 Installation Instruction

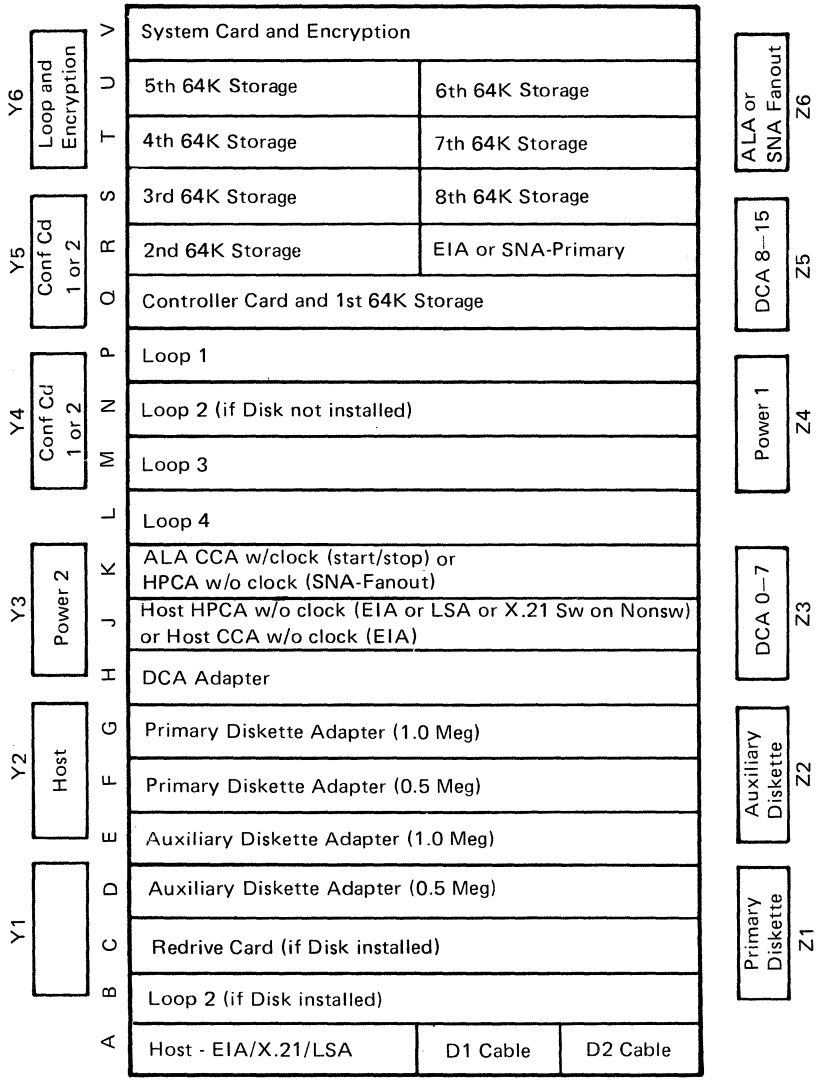


Figure 5-18. 4701-1, 2 Standard Logic Board 01A-A1

Warning: Always replace the card retention rails after removing or replacing a card.

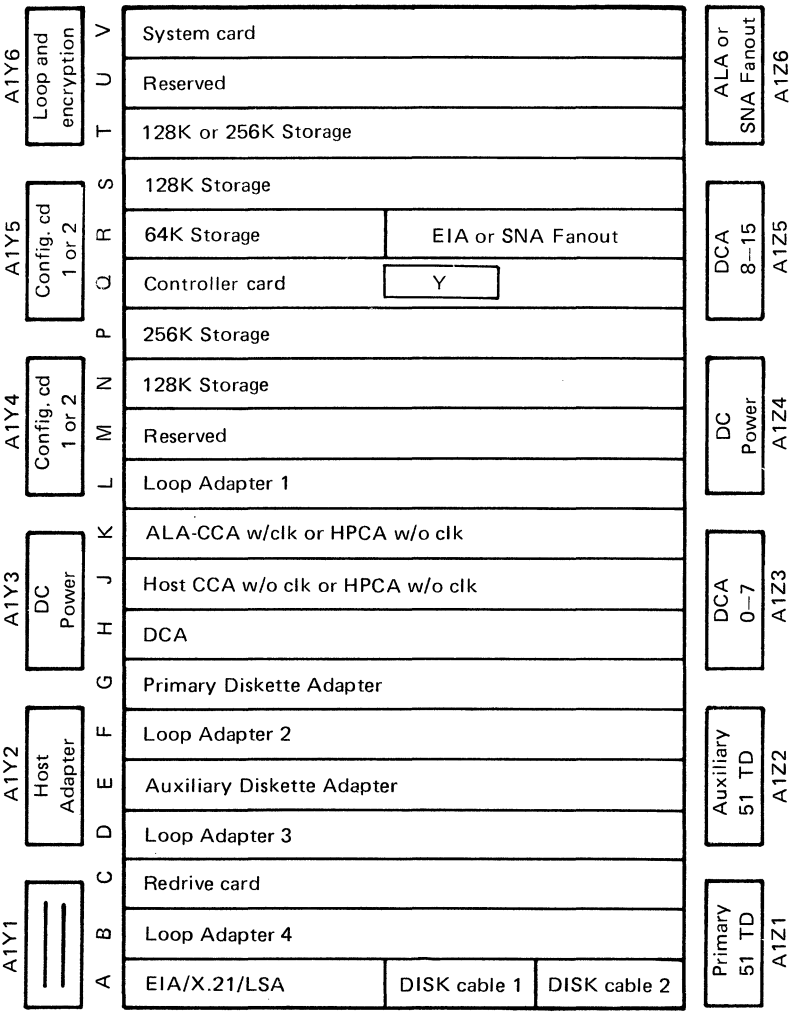
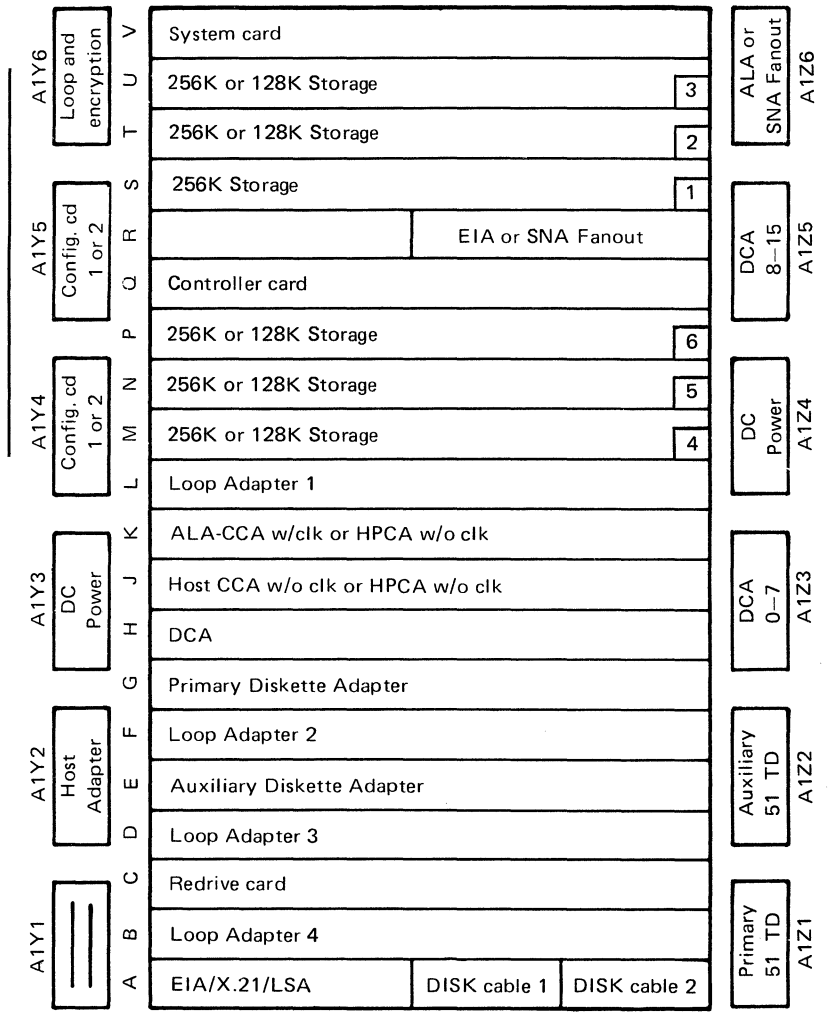


Figure 5-19. 4701-2 Storage Enhanced Logic Board 01A-A1

Warning: Always replace the card rentention rails after removing or replacing a card.



Note: The keys located in the lower right corners of M, N, P, S, T, and U identify the sequence in which the storage cards should be plugged.

Figure 5-20. 4701-3 Logic Board 01A-A1

Warning: Always replace the card retention rails after removing or replacing a card.

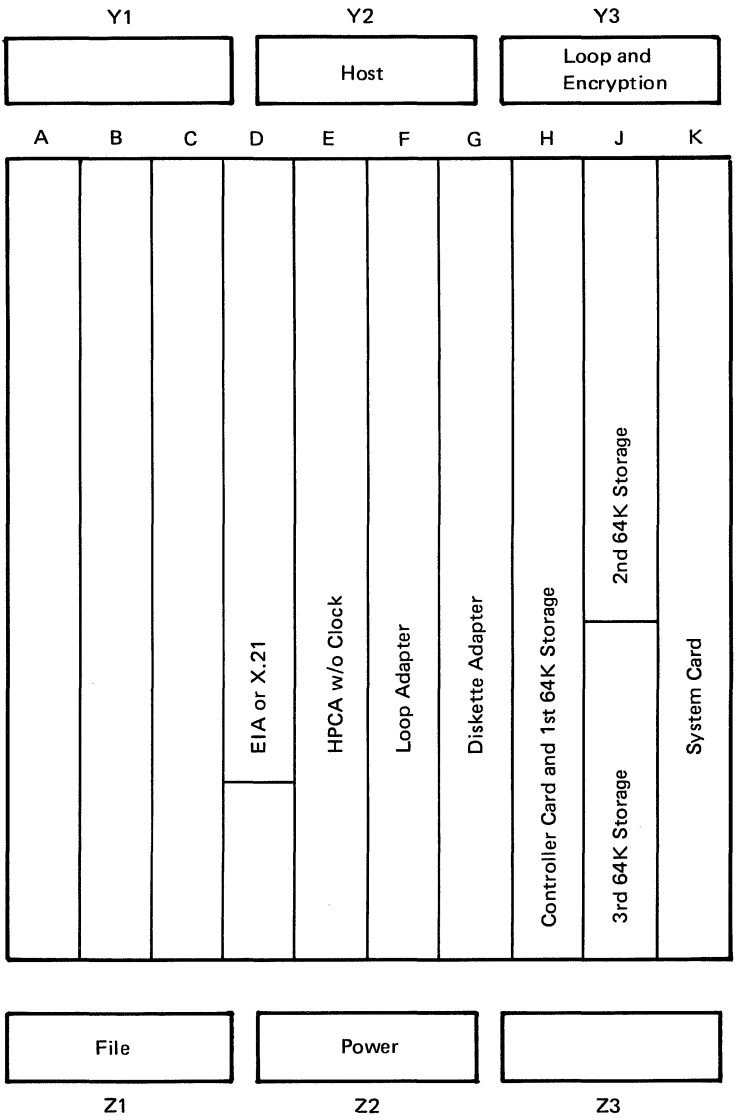


Figure 5-21. 4701-5 Logic Board 01A-A1

Warning: Always replace the card retention rails after removing or replacing a card.

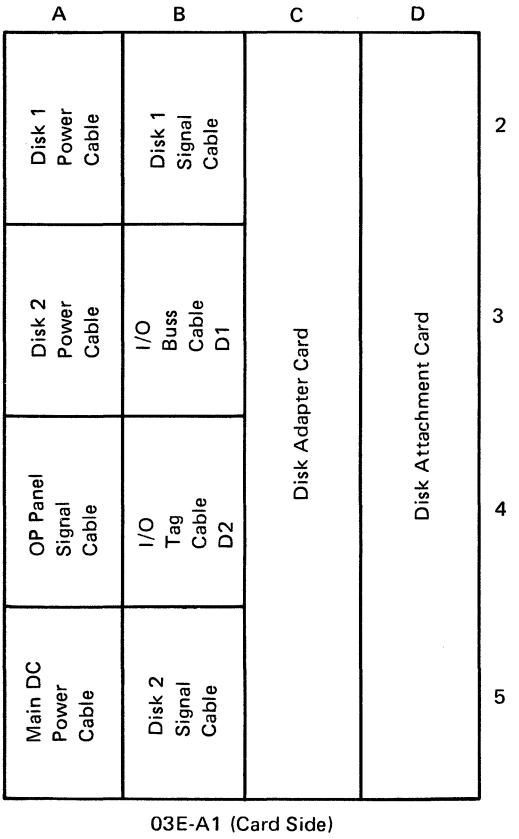


Figure 5-22. 4701 Disk Expansion Unit Segment Board (Frame 3)

Warning: Always replace the card retention rails after removing or replacing a card.

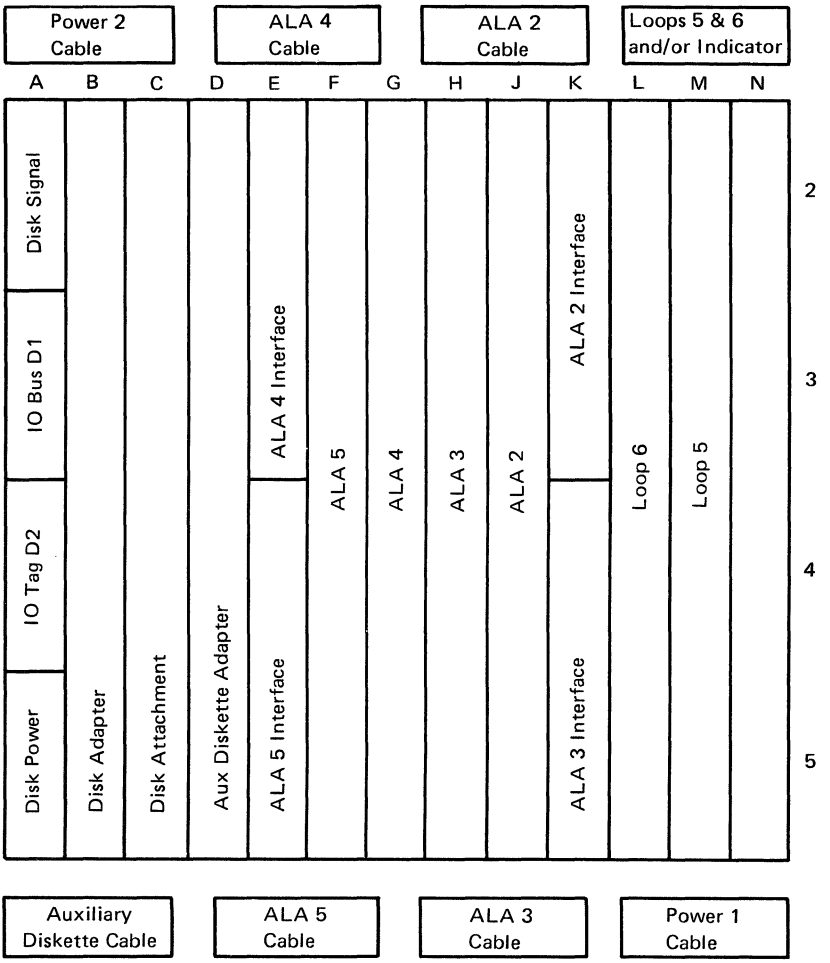


Figure 5-23. 4701 Communication Expansion Unit Logic Board (Frame 4) RPQ

Warning: Always replace the card retention rails after removing or replacing a card.

Card Function		Socket Position					Card Part Number
		4701-1	4701-2	4701-2SE	4701-3	4701-5	
Host Driver Receiver	EIA/CCITT	A2	A2	A2	A2	D2	5864668
	X.21 Switched	A2	A2	A2	A2	D2	5864683
	X.21 Nonswitched	A2	A2	A2	A2	D2	5864683
	LSA (Multiuse Comm Loop)	A2	A2	A2	A2		2399082 8548788*
Redrive card See note.			C2	C2	C2		5680974 8259371*
Auxiliary Diskette Adapter		D2 (0.5M)					5675144 6062717*
		E2 (1.0M)	E2 (1.0M)	E2 (1.0M)	E2 (1.0M)		6028784 6235737*
Primary Diskette Adapter		F2 (0.5M)				G2 (0.25M)	5675144 6062717*
			G2 (1.0M)	G2 (1.0M)	G2 (1.0M)		6028784 6235737*
DCA		H2	H2	H2	H2		6016034
HPCA (w/o Clock) (Host)		J2	J2	J2	J2	E2	5167241 6340976*
CCA (w/o Clock) (Host)		J2	J2	J2	J2		8523016
CCA (w/Clock) (Start/stop)		K2	K2	K2	K2		8526485
HPCA (w/o Clock) (ALA)		K2	K2	K2	K2		5167241 6340976*
Loop Adapter 4		L2	L2	B2	B2		8708467
Loop Adapter 3		M2	M2	D2	D2		8708467
Loop Adapter 2 See note.		N2	N2 B2	F2	F2		8708467
Loop Adapter 1		P2	P2	L2	L2	F2	8708467
Controller card and first 64K of storage**		Q2	Q2			H2	6062383 8665906*
				Q2			8665906
Controller card**					Q2		6217298
EIA/CCITT (ALA)		R4	R4	R4	R4		5864668

*Most recent part number.

**When replacing the controller card, plug the ROS module into the new card.

Figure 5-24 (Part 1 of 2). Logic Card Plug List

Card Function	Socket Position					Card Part Number
	4701-1	4701-2	4701-2SE	4701-3	4701-5	
SNA Fanout Adapter	R4	R4	R4	R4		6815278
System Card	V2	V2			K2	5681122
			V2	V2		6096660
DCA driver/receiver	01E-A2 and A3	01E-A2 and A3	01E-A2 and A3	01E-A2 and A3		5699968
Configurator 1	Y4 or Y5	Y4 or Y5	Y4 or Y5	Y4 or Y5		6018830
Configurator 2	Y4 or Y5	Y4 or Y5	Y4 or Y5	Y4 or Y5		6018832
ROS module (plugs onto the controller card)	Q2	Q2	Q2		H2	8259709 ***
				Q2		6096668
Top card connector X and Y	E2	E2/G2	E2/G2	E2/G2		2399086
Operator Panel	U.S. and AFE					6018765 6041216*
	EMEA only					6096737 6125601*
Logic board, controller	01A-A1					8259369
		01A-A1				5858560
			01A-A1			6096662
				01A-A1		6125510
					01A-A1	8259720
Logic board, frame 4			04A-A1	04A-A1		8588703
Segment board, frame 3, 3cd			03E-A1	03E-A1		8259408

*Most recent part number.

**When replacing the controller card, plug the ROS module into the new card.

Note: The loop 2 adapter card is installed in position 01A-A2B2, and the redrive card is installed in position 01A-A1C2 any time that a disk expansion unit and/or a communication expansion unit is attached to the 4701-2 and you do not have the storage enhancement feature installed.

Figure 5-24 (Part 2 of 2). Logic Card Plug List

Warning: Always replace the card retention rails after removing or replacing a card.

Controller Model	Controller Storage Size Description										Card Part Number	Card Storage Size
	192K	256K	320K	384K	448K	512K	640K	768K	768K	896K		
4701-1, 2	Q2	Q2	Q2	Q2	Q2	Q2					6062383	64K
											8665906*	64K
	R2	R2	R2	R2	R2	R2					6028789	64K
	S2	S2	S2	S2	S2	S2					6028789	64K
		T2	T2	T2	T2	T2					6028789	64K
			U2	U2	U2	U2					6028789	64K
				U4	U4	U4					6028789	64K
					T4	T4					6028789	64K
						S4					6028789	64K
4701-2SE		Q2		Q2		Q2	Q2	Q2	Q2	Q2	8665906	64K
		R2		R2		R2	R2	R2	R2	R2	6028789	64K
		S2		S2		S2	S2	S2	S2	S2	6931961	128K
				T2			T2		T2		6931961	128K
						T2		T2		T2	4752116	256K
							P2	P2	P2	P2	4752116	256K
									N2	N2	6931961	128K
4701-5	H2										6062383	64K
											8665906*	64K
	J2										6028789	64K
	J4										6028789	64K

Figure 5-25 (Part 1 of 2). Storage Size Card Plug List

Controller Model	Controller Storage Size Description						Card Part Number	Card Storage Size
	512K	768K	1024K	1280K	1536K			
4701-3	S2 T2# T2 U2	S2 T2 U2# U2 M2	S2 T2 U2 M2# M2 N2	S2 T2 U2 M2 N2# N2 P2	S2 T2 U2 M2 N2 P2 		4752116 4752116 4752116 4752116 4752116 4752116 6931961 6931961	256K 256K 256K 256K 256K 256K 128K 128K

*Most current part number.

#This 256K card can be replaced with two 128K cards listed below.

Figure 5-25 (Part 2 of 2). Storage Size Card Plug List

Card Type	Part Number	Location
Disk Adapter	6871587	03E-A1C2
Disk Attachment	2437570	03E-A1D2
Disk Adapter	6871587	04E-A1B2
Disk Attachment	2437570	04E-A1C2
Auxiliary Diskette Adapter	6235737	04E-A1D2
ALA 4 – EIA	5864668	04E-A1E2
ALA 4 – X.21	5864683	04E-A1E2
ALA 5 – EIA	5864668	04E-A1E4
ALA 5 – X.21	5864683	04E-A1E4
ALA 5 CCA with Clock	8526485	04E-A1F2
ALA 5 HPCA w/o Clock	6340976	04E-A1F2
ALA 4 CCA with Clock	8526485	04E-A1G2
ALA 4 HPCA w/o Clock	6340976	04E-A1G2
ALA 3 CCA with Clock	8526485	04E-A1H2
ALA 3 HPCA w/o Clock	6340976	04E-A1H2
ALA 2 CCA with Clock	8526485	04E-A1J2
ALA 2 HPCA w/o Clock	6340976	04E-A1J2
ALA 2 – EIA	5864668	04E-A1K2
ALA 2 – X.21	5864683	04E-A1K2
ALA 2 – Fan-out	6815278	04E-A1K2
ALA 3 – EIA	5864668	04E-A1K4
ALA 3 – X.21	5864683	04E-A1K4
Loop Adapter 6	8708467	04E-A1L2
Loop Adapter 5	8708467	04E-A1M2
Reserved		04E-A1N2
Driver Card	1616814	See Figure 5-13
Digital Card	5811698	See Figure 5-13
Analog Card	1616800	See Figure 5-13
Disk Drive w/cards	1616513 (15M)	
	1616514 (30M)	
Disk Drive w/o cards	1616698 (15M)	
	1616699 (30M)	
Indicator Card	8259548	03B-A1 and 04B-A1

Figure 5-26. Disk and Communication Expansion Units Card Plug List

Host/ALA Adapter	Card Location		Line Adapter	Card Location	
	4701-1, 2	4701-5		4701-1, 2	4701-5
CCA (w/o clock)	01A-A1J2	N/A	EIA/CCITT Refer to (A).	01A-A1A2	N/A
HPCA (w/o clock)	01A-A1J2	01A-A1E2	EIA/CCITT Refer to (A).	01A-A1A2	01A-A1D2
			X.21 Switched Refer to (C).	01A-A1A2	01A-A1D2
			LSA (WT) Refer to (B).	01A-A1A2	N/A
HPCA (w/o clock)	01A-A1K2	N/A	SNA-Fanout Refer to (D).	01A-A1R4	N/A
CCA (with clock)	01A-A1K2	N/A	EIA/CCITT Refer to (A).	01A-A1R4	N/A

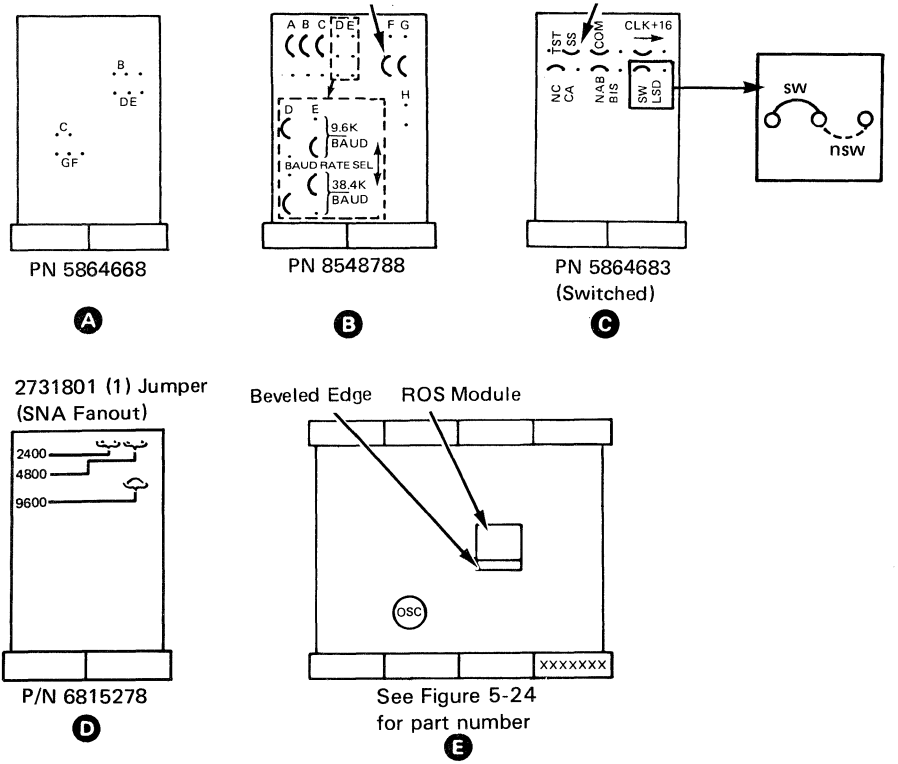
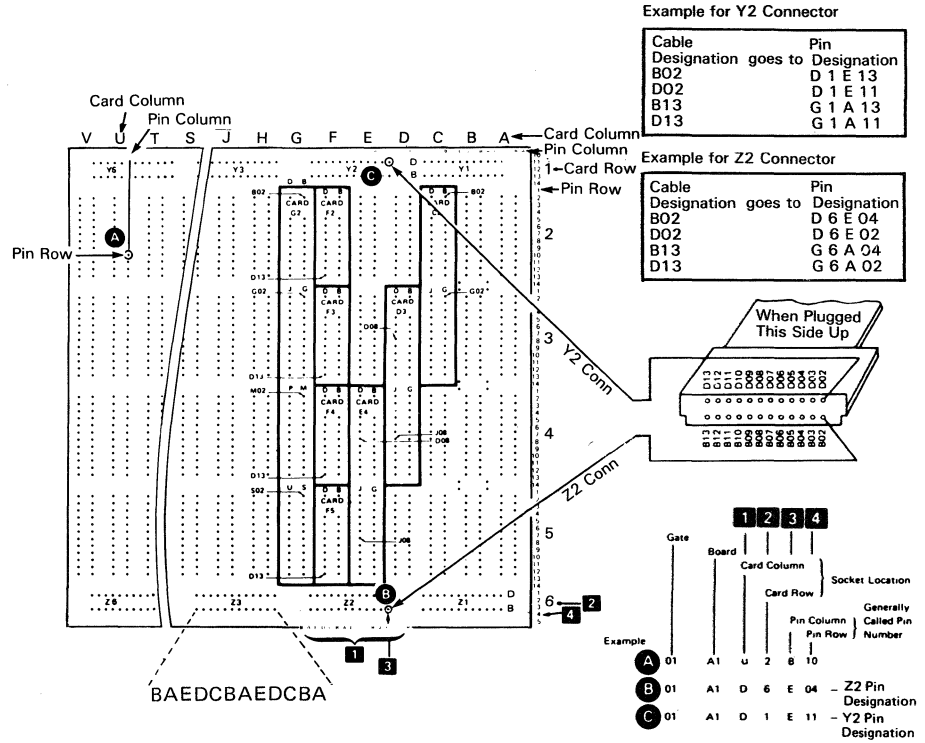


Figure 5-27. 4701 Host Link and Line Adapter Configuration



Legend:

- Probe Pin

Notes:

1. For multiple-socket cards (such as cards G2, E4, D3, and C2 in illustration), card location designation is specified by the uppermost row. For example, the location of card G2, which actually occupies four sockets, is specified by the uppermost row G2. If this card is located on board A1, its location is identified as A1G2.
2. Pin-column letter designations are signified by card size (rather than vertical position of card on board), beginning with DB in the first pin row used. Subsequent designations are JG, PM, and US, which, when required, specify pin columns in the second, third, and fourth card row, respectively. See examples in the illustration.
3. Ground = Any D08, J08, or U08 pin; identified by a square surrounding each ground pin. (The square is not shown.) +5 = Any D03, J03, P03, or U03 pin.

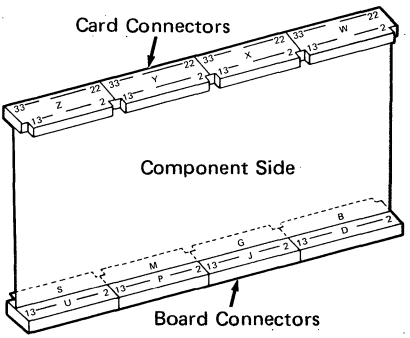


Figure 5-28. Logic Board - Card, Connector, and Pin Locations (Pin Side)

Appendix A. Expansion Unit Removal and Replacement Procedure

Expansion Unit Removal and Replacement Explanation

This appendix contains removal and replacement procedures for FRUs that are located in frames 2, 3, and 4. However, the FRUs that are identical to those in frame 1 are not repeated here. See Chapter 3. For example, the diskette drive is basically the same in each frame and therefore is in Chapter 3. The power supply boards are essentially the same, and so are in Chapter 3.

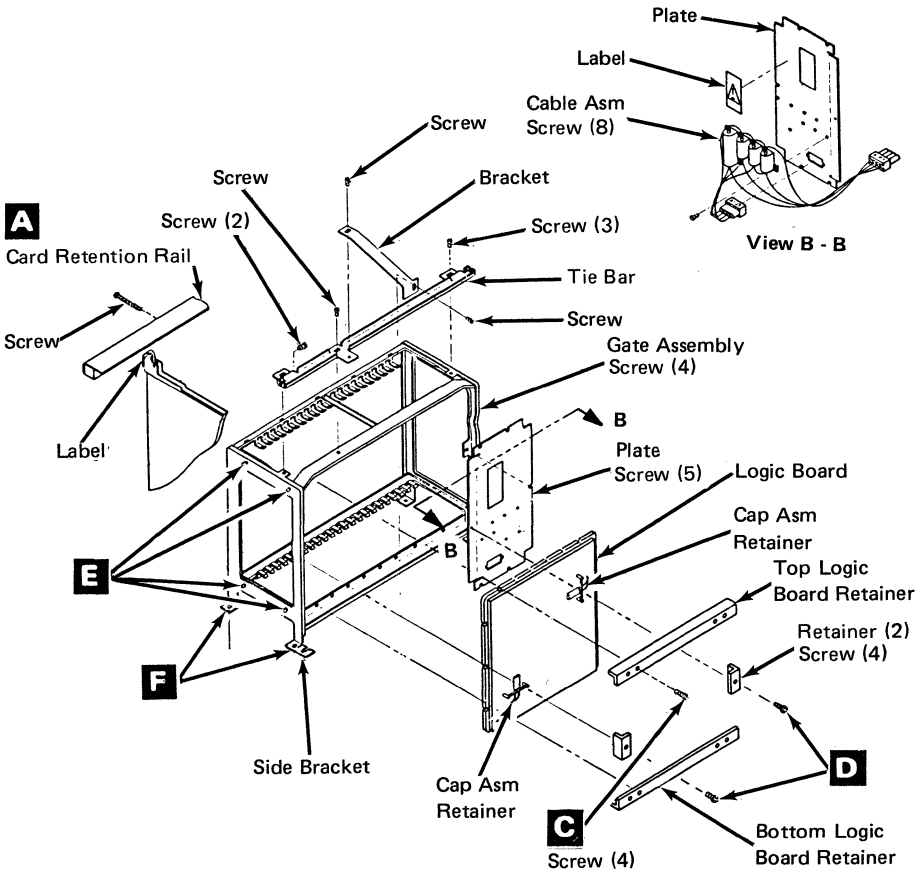


Figure A-1. Frame 4 Logic Board Removal

Frame 4 Logic Board

Note: Refer to Figure A-1 when performing this procedure.

Removal

1. Remove the top cover. Refer to "Removal" under "Top Cover" in Chapter 3.

2. Remove the front cover. Refer to "Removal" under "Front and Rear Cover Panel" in Chapter 3.

3. Remove the diskette drive or drive enclosure dependent upon the device installed in your machine. Refer to "Removal" under "Diskette Drive" or "Disk Enclosure" in this appendix.

4. Remove the card retention rails **A** .

   Note: Be sure to replace the card retention rails during the replacement procedure.

5. Remove the top card connectors from the cards in positions A2 through A5.

6. Remove all of the logic cards on the logic board.

7. Remove the cables that are plugged into the Y and Z cable connectors and allow them to hang freely.

8. Remove the capacitors installed in location A1M2S09 to A1K2U08 and A1C2P12 to A1C2J08.

9. Remove the four board mounting screws **C** from the top and bottom board retainers.

   Note: You might have to cut some of the loop cable ties to gain access to the board retainer screws.

10. Remove the two board mounting screws **D** from the side board retainers.

11. Lift the logic board carefully from the gate to avoid damage to the back panel pins. If the board does not remove with ease, you must perform the following steps:

    a. Remove the four screws **E** that hold the side bracket of the gate assembly.

    b. Remove the two screws **F** that hold the side bracket of the gate assembly to the base.

    c. Remove the side bracket of the gate assembly.

    d. Remove the top and bottom board retainers by slightly lifting the upper gate assembly and pressing down on the lower gate assembly and sliding the board retainers toward the front of the machine.

Frame 4 Logic Board

Note: Refer to Figure A-2 when performing this procedure.

Replacement

1. Refer to Figure A-3 to replace or delete feature wiring depending upon the features that are installed on your machine.

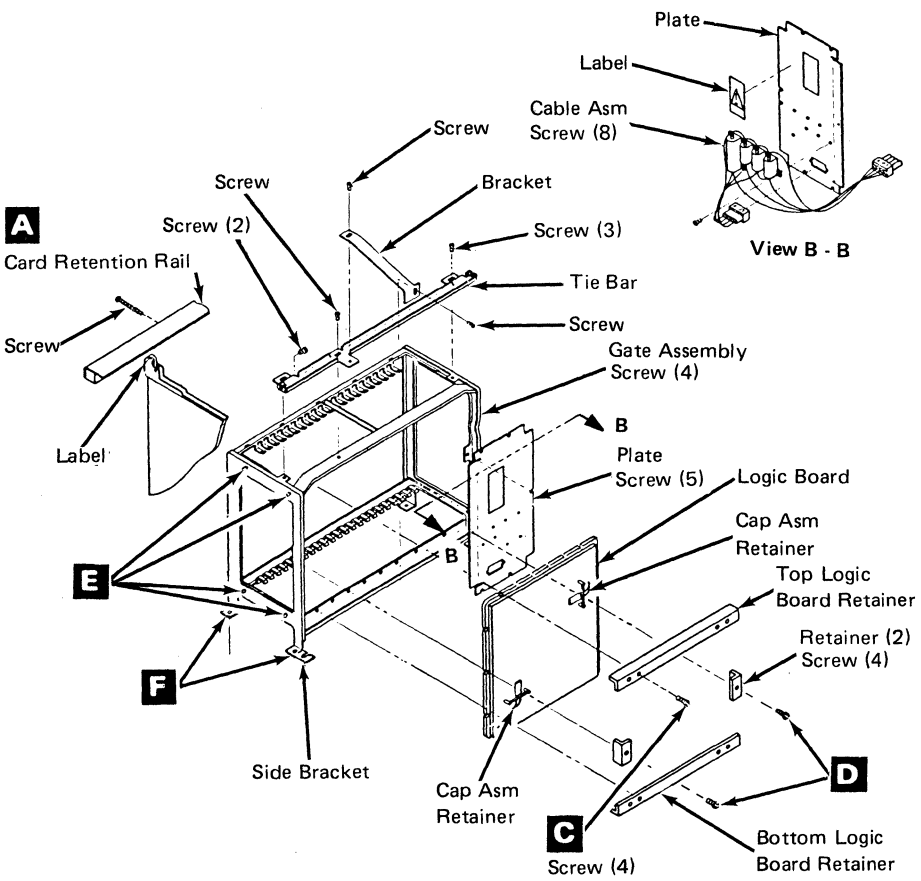


Figure A-2. Logic Board Replacement

2. Install the new board. If you had to remove the side bracket in the removal procedure, perform the following steps; otherwise go to step 3.

   a. Set the new board in place. Slide the top retainer in from the front edge and insert one screw to hold the retainer and board in place (do not tighten the screw more than two turns).

   b. Slide the lower retainer in place and add a screw as in the previous step.

   c. Reassemble the side bracket to the gate assembly, aligning the screw holes as you reassemble. Do not tighten any of the screws at this time.

   d. Align each side board retainer and start the screw.

   e. Insert the remaining top and bottom board retainer screws and tighten all of them.

3. Install the logic board by placing the lower retainer along the bottom edge of the board and placing both on the gate assembly.

   a. Insert one screw through the retainer and board and start the threads with two turns.

   b. Set the top retainer in place. Insert one screw through the retainer and start the screw with two turns.

   c. Place each side retainer in place and start the screw through the retainer and board assembly.

   d. Insert the remainder of the screws in the top and bottom retainers and tighten all of the board mounting screws.

4. Replace the Y and Z cable connectors.

5. Replace the logic cards.

6. Replace the card retention rails.

7. Replace the diskette drive or disk enclosure removed in the removal procedure.

8. Replace the front cover.

9. Replace the top cover.

10. Test the controller for correct operation.

Feature	Model Number	Add or Remove	Jumper	
			From	To
15 or 30 Meg Disk Drive	2, 2SE & 3	Add	04A-A1B2D04	04A-A1B2J08
		Add	04A-A1D2U10	04A-A1D2S10
15 Meg Disk Drive only	2, 2SE & 3	Add	04A-A1C2J04	04A-A1C2J08
Auxiliary Diskette Drive	2, 2SE & 3	Add	04A-A1B2P04	04A-A1B2P05
Capacitor on 04A-A1 logic board	2, 2SE & 3	Add	04A-A1M2S09	04A-A1K2U08
			04A-A1C2P12	04A-A1C2J08
ALA 5 Adapter—HPCA without clock **Note:** HPCAs are always installed in ascending order; for example, 2 through 5.	2, 2SE and 3	Remove	04A-A1D2G09	04A-A1F2B07
		Remove	04A-A1B2G07	04A-A1G2B07
		Remove	04A-A1B2G07	04A-A1D2G09
		Remove	04A-A1D2J07	04A-A1F2J07
		Remove	04A-A1F2G05	04A-A1F2G07
		Remove	04A-A1F2M05	04A-A1F2D08
		Remove	04A-A1F2M13	04A-A1F2P08
		Remove	04A-A1F2B07	04A-A1G2G07
		Remove	04A-A1A2M04	04A-A1G2P04
		Remove	04A-A1B2J07	04A-A1D2J07
		Add	04A-A1B2G07	04A-A1D2G09
		Add	04A-A1D2G09	04A-A1F2G07
		Add	04A-A1F2G07	04A-A1G2G07
		Add	04A-A2B2J07	04A-A1D2J07
		Add	04A-A1D2J07	04A-A1F2B07
		Add	04A-A1F2B07	04A-A1G2B07
		Add	04A-A1F2G05	04A-A1F2J07
		Add	04A-A1A2M04	04A-A1F2P04
		Add	04A-A1F2P05	04A-A2G2P04
		Add	04A-A1F2P11	04A-A1J2P11
		Add	04A-A1F2M13	04A-A1J2M13

Figure A-3 (Part 1 of 4). Frame 4 Logic Board Feature Wiring

Feature	Model Number	Add or Remove	Jumper	
			From	To
ALA 4 Adapter—CCA with clock **Note:** CCAs are always installed in descending order; for example, 5 through 2.	2, 2SE & 3	Remove	04A-A1D2G05	04A-A1G2J07
		Remove	04A-A1G2B07	04A-A1G2G07
		Remove	04A-A1F2J07	04A-A1G2B07
		Remove	04A-A1H2G07	04A-A1J2G07
		Remove	04A-A1G2G07	04A-A1H2G07
		Remove	04A-A1H2B07	04A-A1J2B07
		Remove	04A-A1G2B07	04A-A1H2B07
		Remove	04A-A1A2M04	04A-A1G2P04
		Remove	04A-A1G2P05	04A-A1H2P04
		Remove	04A-A1G2P11	04A-A1H2P11
		Remove	04A-A1D2U13	04A-A1G2P11
		Remove	04A-A1G2M13	04A-A1H2M13
		Remove	04A-A1A2M03	04A-A1G2M13
		Add	04A-A1F2B07	04A-A1G2B07
		Add	04A-A1G2B07	04A-A1H2G07
		Add	04A-A1H2G07	04A-A1J2G07
		Add	04A-A1F2J07	04A-A1G2J07
		Add	04A-A1G2J07	04A-A1H2B07
		Add	04A-A1G2M05	04A-A1G2J08
		Add	04A-A1H2B07	04A-A1J2B07
		Add	04A-A1G2G05	04A-A1G2G07
		Add	04A-A1A2M04	04A-A1H2P04
		Add	04A-A1D2U13	04A-A1H2P11
		Add	04A-A1A2M03	04A-A1H2M13
		Add	04A-A1G2M13	04A-A1G2P08

Figure A-3 (Part 2 of 4). Frame 4 Logic Board Feature Wiring

Feature	Model Number	Add or Remove	Jumper	
			From	To
ALA 3 Adapter— CCA with clock **Note:** CCAs are always installed in descending order; for example, 5 through 2.	2, 2SE & 3	Remove	04A-A1H2G05	04A-A1H2J07
		Remove	04A-A1H2B07	04A-A1J2B07
		Remove	04A-A1G2J07	04A-A1H2B07
		Remove	04A-A1H2G07	04A-A1J2G07
		Remove	04A-A1G2B07	04A-A1H2G07
		Remove	04A-A1A2M04	04A-A1H2P04
		Remove	04A-A1A2M03	04A-A1H2M13
		Remove	04A-A1H2M13	04A-A1J2M13
		Remove	04A-A1D2U13	04A-A1H2P11
		Remove	04A-A1H2P05	04A-A1J2P04
		Remove	04A-A1H2P11	04A-A1J2P11
		Add	04A-A1G2B07	04A-A1H2B07
		Add	04A-A1H2B07	04A-A1J2G07
		Add	04A-A1G2J07	04A-A1H2J07
		Add	04A-A1H2J07	04A-A1J2B07
		Add	04A-A1H2M05	04A-A1H2J08
		Add	04A-A1H2G05	04A-A1H2G07
		Add	04A-A1A2M04	04A-A1J2P04
		Add	04A-A1D2U13	04A-A1J2P11
		Add	04A-A1A2M03	04A-A1J2M13
		Add	04A-A1H2M13	04A-A1H2P08

Figure A-3 (Part 3 of 4). Frame 4 Logic Board Feature Wiring

Feature	Model Number	Add or Remove	Jumper	
			From	To
ALA 2 Adapter— CCA with clock **Note:** CCAs are always installed in descending order; for example 5 through 2.	2, 2SE & 3	Remove	04A-A2J2J07	04A-A1J2G05
		Remove	04A-A1L2G05	04A-A1M2G05
		Remove	04A-A1L2J06	04A-A1M2J06
		Remove	04A-A1H2B07	04A-A1J2G07
		Remove	04A-A1J2G07	04A-A1L2J06
		Remove	04A-A1H2J07	04A-A1J2B07
		Remove	04A-A1J2B07	04A-A1L2G05
		Remove	04A-A1A2M03	04A-A1J2M13
		Remove	04A-A1A2M04	04A-A1J2P04
		Remove	04A-A1D2U13	04A-A1J2P11
		Remove	04A-A1A2M08	04A-A1J2P05
		Add	04A-A1L2G05	04A-A1M2G05
		Add	04A-A1L2J06	04A-A1M2J06
		Add	04A-A1H2B07	04A-A1J2B07
		Add	04A-A1J2B07	04A-A1L2J06
		Add	04A-A1J2M05	04A-A1J2J08
		Add	04A-A1H2J07	04A-A1J2J07
		Add	04A-A1J2J07	04A-A1L2G05
		Add	04A-A1J2G05	04A-A1J2G07
		Add	04A-A1A2M08	04A-A1A2M04
		Add	04A-A1J2M13	04A-A1J2P08
ALA 2 Adapter— SNA Fanout	2, 2SE & 3	Add	04A-A1K2B02	04A-A1K2D08
		Add	04A-A1J2P06	04A-A1K2G02
		Add	04A-A1K2B12	04A-A1K2D13

Figure A-3 (Part 4 of 4). Frame 4 Logic Board Feature Wiring

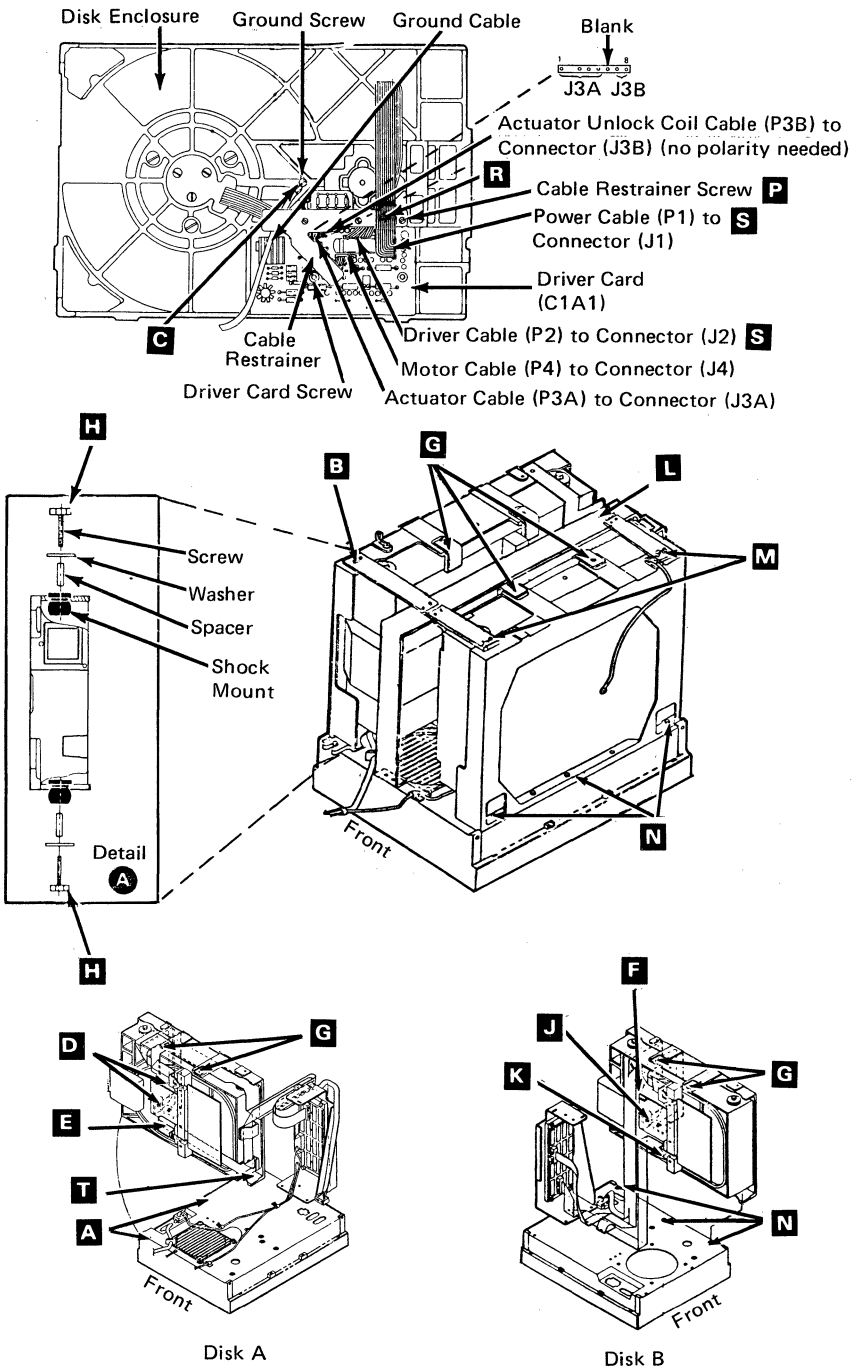


Figure A-4. Disk Enclosure Removal and Replacement

Disk Enclosure

Notes:

1. Power off and wait until the Power-On light goes off before you proceed with the removal.

2. Refer to Figure A-4 when performing this procedure.

3. Inform the customer that the disk format program (On the Installation Diskette) must be used to format a new disk enclosure.

4. To remove a disk enclosure in expansion frame 3 or 3cd, follow those steps for removing disks A and B in the following procedure.

5. To remove the disk enclosure in frame 4, follow those steps for removing disk B in the following procedure.

6. Before removing the disk enclosure for replacement, ensure that the customer data, if possible, is copied or destroyed by the customer.

Place Disk A into the Service Position

1. Remove the top cover. Refer to "Removal" under "Top Cover" in Chapter 3.

2. Loosen the screws that hold the front cover and pull cover away from the base to gain access to the gate casting screws. Refer to Figure 3-2 in Chapter 3.

3. Remove the two gate casting screws **A** .

4. Loosen the third gate casting screw **T** .

5. Remove the bracket mounting screws **B** on top of the gate casting assembly.

6. Pivot disk A into the service position.

Removal

1. Place disk A into the service position.

2. **Disk B only**: Remove the bracket mounting screws **M** .

   Warning: If you remove disk B, or disk B has not been installed and disk A has been placed in the service position, the disk expansion unit may be unstable.

3. **Disk A only**: Remove the screw **T** .

   Warning: The disk enclosure becomes unstable when you remove the following screws.

4. **Disk A only**: Remove the two screws **L** that hold the pivot bracket.

   Disk B. only: Remove the three screws **N** and remove the gate casting and drive assembly from the base.

5. Set the gate casting on a flat surface in an upright position.

   Note: It may be necessary to cut some cable ties to permit the disk enclosure to sit upright.

6. Remove the following cables before you remove the disk drive from the disk enclosure.

   a. **Disk A**: Remove the cable connectors **D** .

      Disk B only: Remove the cable connectors **J** and **K** .

   b. Disconnect the grounding strap **D** .

   c. Remove the driver card cable C1A1 **F** from the disk drive that you are removing.

   d. Remove screw **P** and cut cable tie **R** .

   e. Remove the connectors **S** (04C-P1 and 04C-P2).

7. Lay the gate casting on a flat surface.

8. Remove the screws **G** that hold the upper and lower rubber bumpers.

9. Remove the upper and lower shock mounting screws **H** .

   Note: The spacers usually remain in the shock mounts; however, if they should come out, retain them for reassembly.

10. Lift the disk from the gate casting assembly.

Replacement

Reverse the steps in the removal procedure.

Notes:

1. Run tests T500 and/or T700 to verify correct operation.

2. A new disk must be formatted. Instruct the customer to run disk format function code 20. Refer to "IBM 4700 Subsystem Operating Procedures," GC31-2032, for formatting details.

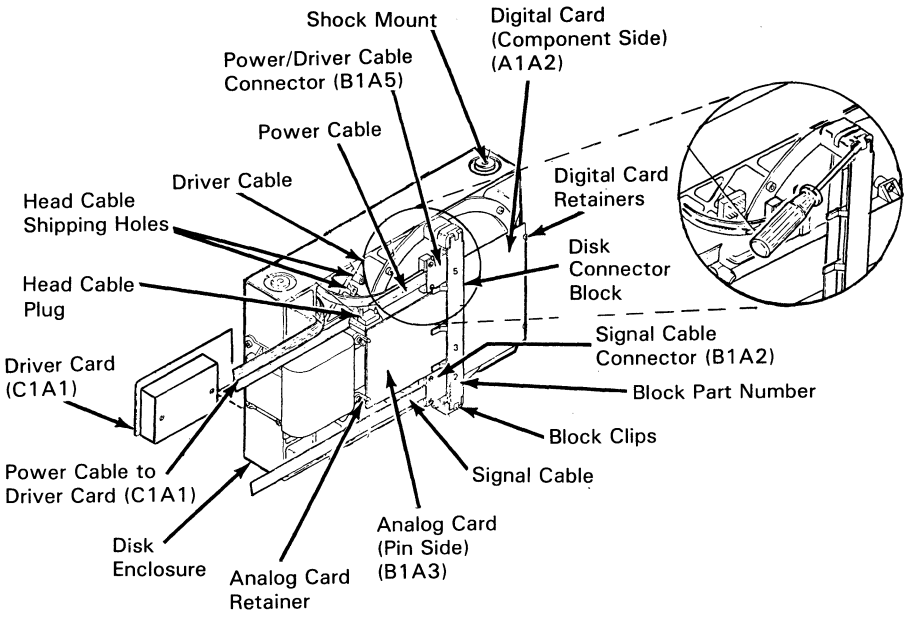


Figure A-5. Disk Connector Block Removal and Replacement

Disk Connector Block

Note:

1. Power off and wait until the Power-On light goes off before you proceed with the removal.

2. Refer to Figure A-5 when performing this procedure.

Removal

1. Remove the top cover. Refer to "Removal" under "Top Cover" in Chapter 3. (See page 3-1.)

2. Place disk A into the service position. See "Place Disk A into the Service Position" in this appendix.

3. Remove the digital card, analog card, signal cable, and the power/driver cable from the disk connector block.

4. Use a medium size screwdriver and carefully pry the disk connector block loose from the frame casting.

   Note: This block is held by friction only.

Replacement

Reverse the steps in the removal procedure.

Segment Board (Frames 3 and 3cd)

Notes:

1. Power off and wait until the Power-On light goes off before you proceed with the removal.

2. Refer to Figure A-6 when performing this procedure.

Removal

1. Remove the top cover. Refer to "Removal" under "Top Cover" in Chapter 3. (See page 3-1).

2. Remove the rear cover. Refer to "Removal" under "Front Cover and Rear Cover Removal" in this chapter.

3. Place disk A into the service position. See "Place Disk A into the Service Position" in this appendix.

4. Remove the two screws **A** that hold the card retainer.

5. Remove the two screws **B** that hold the cable retainer.

   Warning: The components on the attachment card (03E-D2) may be very hot; therefore, care should be taken to avoid getting a burn.

6. Remove the cards and cable connectors from the segment board. (Verify the locations and label them if necessary.)

7. Remove the four screw **C** from the rear of the segment board.

Replacement

Reverse the steps in the removal procedure.

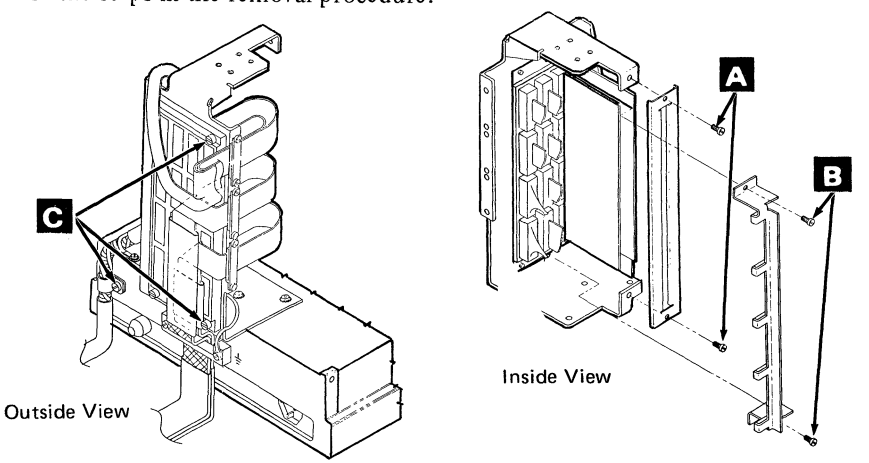


Figure A-6. Segment Board Removal and Replacement

Indicator Card (Frames 3, 3cd, and 4)

Notes:

1. Power off and wait until the Power-On light goes off before you proceed with the removal.

2. Refer to Figure A-7 when performing this procedure.

Removal

1. Remove the top cover. Refer to "Removal" under "Top Cover" in Chapter 3. (See page 3-1.)

2. Remove the front cover. Refer to "Removal" under "Front and Rear Covers" in Chapter 3.

3. Remove the connector **A** to the indicator card.

4. Remove the two screws **B** that hold the indicator card to the indicator panel.

Replacement

Reverse the steps in the removal procedure.

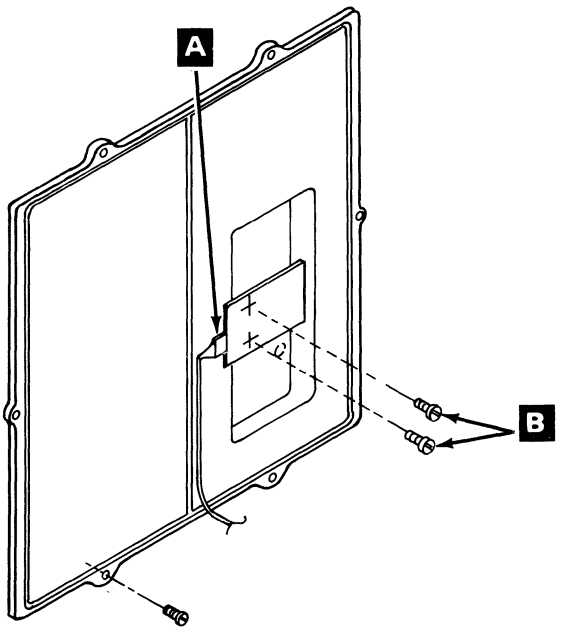


Figure A-7. Indicator Card Removal and Replacement

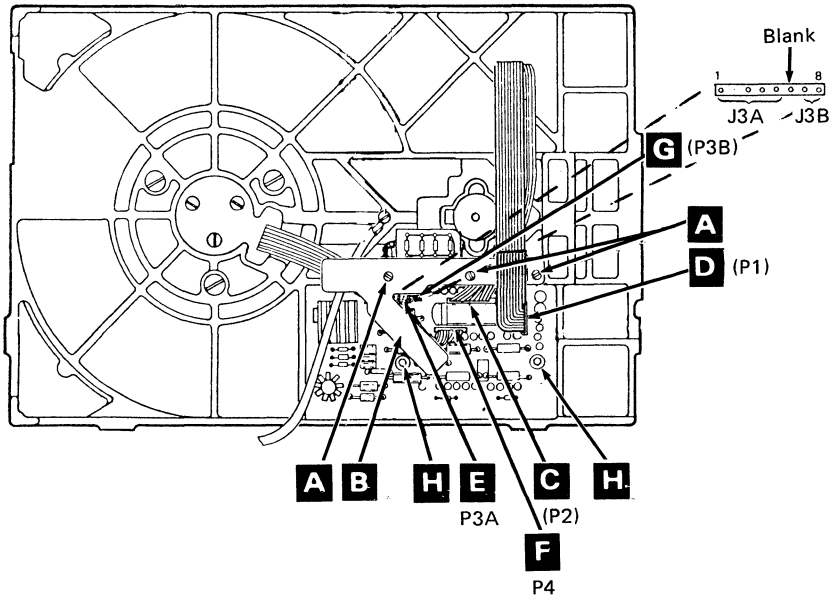


Figure A-8. Driver Card Removal and Replacement

Driver Card

Note: Refer to Figure A-8 when performing this procedure.

Removal

1. Power off and wait until the Power-On light goes off.
2. Remove the top cover. Refer to "Removal" under "Top Cover" in Chapter 3. (See page 3-1.)
3. Remove the screws at **A** and the cable restraint **B** .

   Note: You may have to remove the cable tie.
4. Unplug the power cable (P1) **D** .
5. Unplug the driver cable (P2) **C** .
6. Unplug the motor cable (P4) at **F** .
7. Unplug the actuator cable (P3A) from the drive card **E** .
8. Unplug the actuator unlocking coil cable (P3B) from the driver card **G** .
9. Loosen the screws on the driver card **H** .
10. Remove the driver card.

Replacement

Reverse the steps in the removal procedure.

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Digital Card

Note: Refer to Figure A-9 when performing this procedure.

Removal

1. Power off and wait until the Power-On light goes off.
2. Remove the top cover. Refer to "Removal" under "Top Cover" in Chapter 3. (See page 3-1.)
3. Place Disk A into the service position. See "Place Disk A into the Service Position" in this appendix.
4. Loosen the two card retaining screws **A** .
5. Rotate the two retainers **B** and remove the Digital Card.

Replacement

Reverse the steps in the Removal procedure.

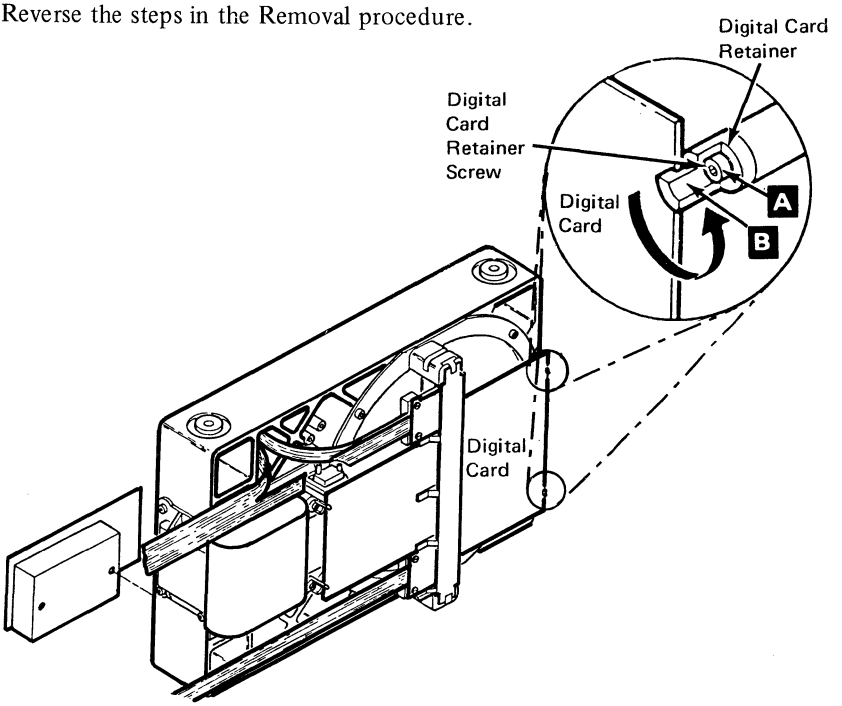

Figure A-9. Digital Card Removal and Replacement

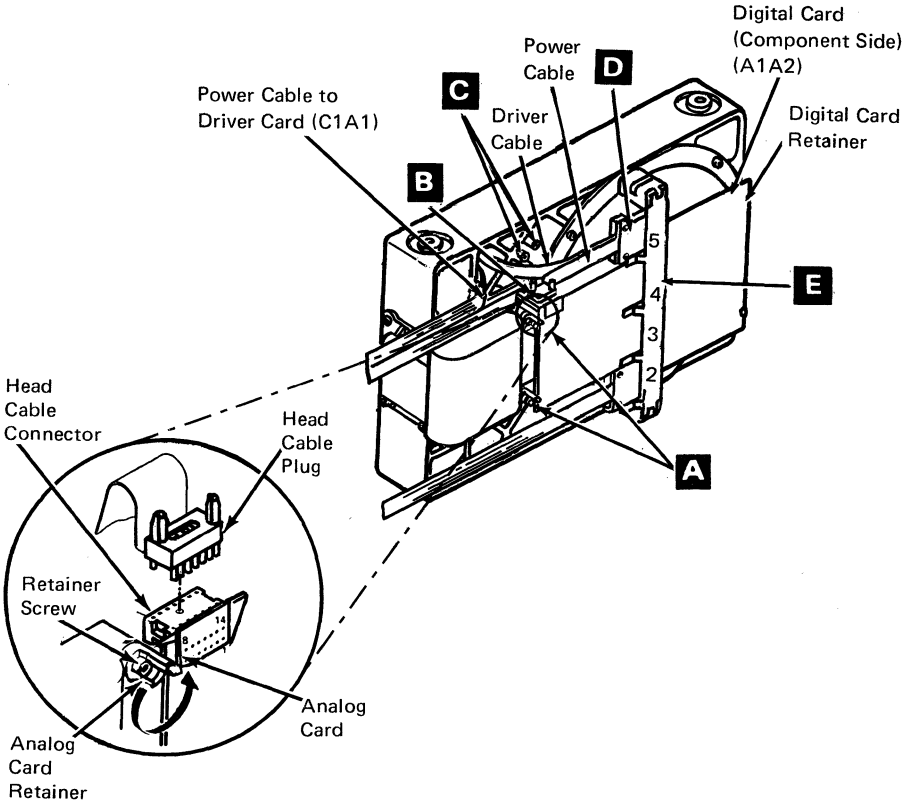

Figure A-10. Analog Card Removal and Replacement

Analog Card

Note: Refer to Figure A-10 when performing this procedure.

Removal

1. Power off and wait until the Power-On light goes off.

2. Remove the top cover. Refer to "Removal" under "Top Cover" in Chapter 3. (See page 3-1.)

3. Place Disk A into the service position. See "Place Disk A into the Service Position" in this appendix.

4. Remove the power driver cable connector 02C-A1A5 **D** from the file connector block **E** .

   CAUTION
   Handle the head cable B with card. If it is broken it cannot be replaced in the field.

5. Disconnect the head cable plug **B** from the Analog Card.

6. Plug the head cable into the shipping socket **C** .

7. Loosen the two retaining screws **A** .

8. Rotate the two retainers and remove the Analog Card.

9. Remove the label from the Analog Card, if present.

Replacement

Note: Remember, place the label on the new Analog Card.

Reversethe steps in the removal procedure.

Appendix B. Expansion Frame General Information

Minimum System Checkout Frame Disconnect Procedure

Warning: If you have not already done so, record the feature switch settings (Figure 5-14) and configurator switch settings (Figure 5-16 and Figure 5-17) before proceeding. Switch settings must be changed as adapters are removed and added.

Always power off the controller before you remove or replace a card.

Frame Disconnect Procedure

Before you start the Minimum System Checkout Procedure, isolate the controller from any expansion frames. After you have disconnected the expansion frames, recheck that there is still a failure before you continue the checkout.

Model 2 (not Model 2SE) controllers that have a disk drive (frame 3) have the loop 2 adapter card installed in position 01A-B2. Message E0BE is displayed instead of E0A8 when the adapter is installed in 01A-B2. You must have a loop adapter installed in 01A-B2 and a redrive card installed in 01A-C2 before you continue testing.

1. Frame 2
   a. Remove the diskette adapter cable from the rear of the controller.

   b. Return to the "Invoke Procedure" under "Minimum System Checkout Procedure" on page 2-31.

2. Frame 3 or 3cd
   a. Remove the disk cables from the rear of the controller.

   b. Set lower feature switch(es) 5, 6, 7, and 8 to the "off" position as required.

   c. Set upper feature switch 1 to the off position.

   d. If an auxiliary diskette is present, remove the diskette adapter cable.

   e. If there are no additional expansion units attached, go to the "Invoke Procedure" under "Minimum System Checkout Procedure" on page 2-31.

3. Frame 4

   a. Remove the disk cables from the rear of the controller.

   b. Set lower feature switch 7 to the "off" position if a disk drive is installed.

   c. Set upper feature switch 1 to the "off" position.

   d. Set configurator card Y5 switch 7 to the "off " position. (See Figure 5-17 on page 5-19.)

   e. Install a jumper from 01A-A1A2S04 to 01A-A1A2S08.

   f. Return to the "Invoke Procedure" under "Minimum System Checkout Procedure" on page 2-31.

Glossary

ALA. Alternate line adapter.

B-loop. Banking loop.

BSCA. Binary synchronous communications adapter.

CAC. Common adapter code.

CCA. Common communication adapter.

DCE. Data communication equipment.

disk. A permanently mounted magnetic storage device.

disk drive. A mechanism for moving a magnetic disk and controlling its movements.

disk enclosure. A disk drive mounted in a frame as removed from an expansion unit.

diskette. A thin, flexible magnetic disk in a semirigid protective jacket.

diskette drive. A mechanism for moving a magnetic diskette and controlling its movements.

ECC. Error checking and correction.

EIA. Electronic Industries Association.

HPCA. High performance communication adapter.

LSC. Loop station connector.

Offline. Pertaining to the operation of a functional unit without the control of a computer.

Offline test. A test internal to the terminal that is run when the terminal is offline.

Online. Pertaining to the operation of a functional unit that is under control of a computer.

Online test. A test that is run when the terminal is online.

ROS. Read-only-storage.

segment board. A logic board with card or cable connectors on each side, but without modules or discrete components mounted to it.

storage. A device, or part of a device, that can hold data.

SDLC. Synchronous data link control.

TLA. Terminal loop adapter.

Index

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