VOLUME A01 MACHINE 4381- -0010900 MODEL R03 SYSTEM 0000LBH MODE SCHED SHIP 84/10/30

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PAGE NUM	SH	TITLE	PART NUM	EC NUM	FEATURE	B/M OR B/MS
AA005			0006169372	A20558	.W.	0002676380
AA010		PREFACE 001	0006169371	A20558	.W.	0002676380
AA015		SAFETY 001	0006169604	A20558	.W.	0002676380
AA020		SAFETY 003	0006169605	A20558	.W.	0002676380
AB005		TAB-INDEX	0000445720	A02214	.W.	0002676380
AB010		INDEX 001	0006169640	A20562	.W.	0002676380
AC005		GLOSSARY	0000445732	A02214	.W.	0002676380
AC010		GLOSSARY 001	0006169637	A20558	.W.	0002676380
AD005		TAB-INTRO	0000445736	A02214	.W.	0002676380
AD010		INTRO 001	0006169367	A20560	.W.	0002676380
AD015		INTRO 005	0006169368	A20558	.W.	0002676380
AD020		INTRO 007	0006169369	A20562	.W.	0002676380
AD025		INTRO 015	0006169370	A20560	.W.	0002676385
AE005		TAB-START	0000445743	A02214	.W.	0002676380
AE010		START 001	0006169428	A20562	.W.	0002676380
AE015		START 005	0006169429	A20562	.W.	0002676380
AE020		START 015	0006169430	A20562	.W.	0002676380
AE025		START 025	0006169431	A20562	.W.	0002676380
AE030		START 035	0006169432	A20562	.W.	0002676380
AF005		TAB-PU REPAIR	0000445751	A02214	.W.	0002676380
AF010		PU 001	0006169628	A20560	.W.	0002676380
AF015		PU 041	0006169629	A20560	.W.	0002676380
AF020		PU 051	0006169630	A20560	.W.	0002676380
AG005		TAB-CHAN REPAI	0000445755	A02214	.W.	0002676380
AG010		CHNL 001	0006169631	A20560	.W.	0002676380
AG015		CHNL 021	0006169632	A20560	.W.	0002676380
AG020		CHNL 031	0006169633	A20560	.W.	0002676380
AG025		CHNL 051	0006169634	A20560	.W.	0002676380
AG030		CHNL 061	0006169635	A20560	.W.	0002676380
AH005		TAB-MSS REPAIR	0000445766	A02214	.W.	0002676380
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AH015		MSS 011	0006169413	A20562	.W.	0002676380
AH020		MSS 013	0006169414	A20562	.W.	0002676380
AH025		MSS 015	0006169415	A20562	.W.	0002676380
AH030		MSS 017	0006169416	A20562	.W.	0002676380
AH035		MSS 031	0006169417	A20562	.W.	0002676380
AH040		MSS 033	0006169418	A20562	.W.	0002676380
AH045		MSS 035	0006169419	A20562	.W.	0002676380
AH050		MSS 037	0006169420	A20562	.W.	0002676380
AH055		MSS 039	0006169421	A20562	.W.	0002676380
AH060		MSS 041	0006169422	A20562	.W.	0002676380
AH065		MSS 051	0006169423	A20562	.W.	0002676380
AH070		MSS 053	0006169424	A20562	.W.	0002676380
AH075		MSS 055	0006169425	A20562	.W.	0002676380
AH080		MSS 057	0006169426	A20562	.W.	0002676380
AH085		MSS 059	0006169427	A20562	.W.	0002676380
AI005		TAB-E-O REPAIR	0000445780	A02214	.W.	0002676380
AI010		END 001	0006169435	A20562	.W.	0002676380

TOTAL PART NUMBERS THIS VOLUME 48

IBM Maintenance Information

4381-3 S/N MI	4381-3 S/N MI	4381-3 S/N MI	4381-3 S/N MI	4381-3 S/N MI	4381-3 S/N MI	4381-3 S/N MI	4381-3 S/N MI
MAINTENANCE INFORMATION	MAINTENANCE INFORMATION	MAINTENANCE INFORMATION	MAINTENANCE INFORMATION	MAINTENANCE INFORMATION	MAINTENANCE INFORMATION	MAINTENANCE INFORMATION	MAINTENANCE INFORMATION
SAFETY INDEX TERMS/ ABBREVIATIONS INTRODUCTION START PU REPAIR CHNL REPAIR MSS REPAIR END OF REPAIR	PWR REPAIR (HWS AND MBC) PR 001 THRU PR 999	PWR REPAIR (PROC) PR 1001 THRU PR 13 XX	PWR REPAIR (PROC) PR 1401 THRU PR 18 XX	PWR REPAIR (PROC) PR 1901 THRU PR 5001	SERVICE AIDS	LOCATIONS TOOLS REMOVAL/ REPLACEMENT PREVENTIVE MAINTENANCE DIAGNOSTICS LOGS SYSTEM TEST INSTALLATION SAFETY INSP	CONSOLE FUNCTIONS MESSAGES
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4381 Processor Maintenance Information

IBM has prepared this maintenance manual for you in the use for installation, maintenance, or repair of the specific machine indicated. IBM makes no representation that it is suitable for any other purpose.

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.

It is possible that this material may contain reference to, or information about IBM products (machines and programs), programming, or services that are not announced in your country. Such references or information must not be construed to mean that IBM intends to announce such IBM products, programming, or services in your country.

Publications are not stocked at the address below; requests for IBM publications should be made to your IBM representative or to the IBM branch office serving your locality.

A form for reader's comments is provided in Volume A01, Introduction. If the form has been removed, comments may be addressed to IBM Corporation, Processor MIM Development, Department X65, P.O. Box 6, Endicott, NY, U.S.A. 13760. IBM may use or distribute whatever information you supply in any way it believes appropriate without incurring any obligation to you.

Processor Library

The Processor Maintenance Library consists of the following manuals:

Order Number	Title
PN Controlled	Processor Maintenance Information (MI) manual
PN Controlled	Card/Module Plug Lists
PN Controlled	Cable Plug List
PN Controlled	Unpack/Pack Instructions
GA18-2339	3205 Color Display Console Operator Reference and Problem Determination Guide
SY18-2121	3205 Color Display Console Maintenance Information
SY27-2546	3278 2A Display Console Maintenance Information
SY33-0069	3279 2C Display Console Maintenance Information
S124-0153	Parts Catalog
ZZ29-2303	4300 Remote Support Facility Reference Guide
Z150-0103	CE Log Card
Z150-0343	Quality Service Technical Activity Reporting

Note: Requests for copies of this material should be made to your IBM representative or to the IBM branch office serving your locality.

Purpose of Manual

The main purpose of the maintenance philosophy contained in this manual, is to help you perform maintenance activities and repair failures quickly. To bring about this objective, emphasis is placed on "how to fix" rather than "how it works." For each failure, the "how to fix" approach uses your resources, the failure isolation methods, and the individual analysis procedures.

Audience and Level of Knowledge

Although the maintenance philosophy is designed for the service representative, it is recognized that there are significant differences in skill levels, experience, and natural ability. Additional maintenance procedures and sections are provided allowing you to continue with the maintenance procedure until you have exhausted your resources, or until existing policies dictate that you request assistance.

Manual Organization

The Maintenance Information (MI) manual has eight volumes. Volumes A01 through A07 are 11 x 17, and Volume A08 is 8.5 x 11 inches in size. They are organized in the following way:

Volume	Subject Material
A01	Preface Safety Index Glossary of Terms and Abbreviations Introduction START Repair Procedure Processing Unit Problem Isolation Procedure Channel Problem Isolation Procedure MSS Repair Procedure END Repair Procedure
A02	Power Repair (HWS and MBC) PR 001 through PR 9xx
A03	Power Repair (Processor) PR 1001 through PR 13xx
A04	Power Repair (Processor) PR 1401 through PR 18xx
A05	Power Repair (Processor) PR 1901 through PR 5001
A06	Service Aids
A07	Locations Tools Removals and Replacements Preventive Maintenance Diagnostics Logs System Test Processor Installation 4381 Processor Safety Inspection Guide
A08	Console Functions Messages

4381 Model Group 3 Processor

The 4381 is an intermediate, general purpose processor. The processor is compatible with System/360, System/370, and 4341 Processors. No changes to customer programs, data, or operations are needed to upgrade from a System/360, System 370, or 4341 Processor. The 4381 Processor supplies the range of commercial and scientific data processing of previous systems with the addition of advanced functions through new circuit technology.

The 4381 Model Group 3 processor is a dual processor, meaning it contains two processors operating under a single control program.

The two processing units of the machine are processor 0 (PU0) and processor 1 (PU1).

Each processor includes:

- Reloadable Control Storage
- High Speed Buffer
- Channels

This allows each processor to work on different tasks at the same time.

Both processors share the same main frame and covers. They also share power and cooling, the maintenance and support processor, and main storage facilities.

Safety Notices

Notices for 4381 Processor

Specific safety notices are published in each volume of the Maintenance Information (MI) manual. DANGER notices warn against conditions or procedures that can result in death or severe personal injury. CAUTION notices warn against personal injury that is neither lethal nor extremely hazardous. Warning notices warn against damage to machines, equipment, or programs.

Danger Notices

The following DANGER notices from the Maintenance Information (MI) manual are especially important:

Page MSS 058 ***DANGER***
Hazardous voltages are present on the connector.

Page PR 1052 ***DANGER***
300 Vdc.

Page PR 1062 ***DANGER***
300 Vdc.

Page PR 1071 ***DANGER***
300 Vdc.

Page PR 1072 ***DANGER***
300 Vdc.

Page PR 1074 ***DANGER***
300 Vdc.

Page PR 1075 ***DANGER***
300 Vdc.

Page PR 1076 ***DANGER***
300 Vdc.

Page PR 1077 ***DANGER***
300 Vdc.

Page PR 1091 ***DANGER***
300 Vdc.

Page PR 1093 ***DANGER***
300 Vdc.

Page PR 1154 ***DANGER***
Disconnect line cord before exchanging CB2.

Page PR 1161 ***DANGER***
300 Vdc.

Page PR 1162 ***DANGER***
300 Vdc.

Page PR 1163 ***DANGER***
300 Vdc.

Page PR 1164 ***DANGER***
300 Vdc.

Page PR 1165 ***DANGER***
300 Vdc.

Page PR 1166 ***DANGER***
300 Vdc.

Page PR 1931 ***DANGER***
300 Vdc.

Page PR 2321 ***DANGER***
300 Vdc.

Page PR 2322 ***DANGER***
300 Vdc.

Page PR 2531 ***DANGER***
300 Vdc.

Page PR 2532 ***DANGER***
300 Vdc.

Page PR 2534 ***DANGER***
300 Vdc.

Page PR 2535 ***DANGER***
300 Vdc.

Page PR 2561 ***DANGER***
300 Vdc.

Page PR 2562 ***DANGER***
300 Vdc.

Page PR 2564 ***DANGER***
300 Vdc.

Page PR 2565 ***DANGER***
300 Vdc.

Page INST 002 ***DANGER***
Do not touch any customer power receptacles at the installation site until instructed in the "Site and Processor Safety Checkout" procedure.

Page INST 012 ***DANGER***
With the customer branch CB in the OFF position, do not touch the exterior shell of the customer receptacle with anything except the test probes until step 2 is complete.

Power must not be applied to the processor if the building ground cannot be located and verified.

Page INST 015 ***DANGER***
This procedure must not be performed until you have completed the following procedures:

"Checking the 4381 Processor Power Plug"

"Checking the Customer Power Receptacle."

Do not touch the internal parts of the customer receptacle with anything except the test probes.

Page iNSP 003 ***DANGER***
Use only test probes to touch the exterior shell of the customer's receptacle until step 7.

Page INSP 003 ***DANGER***
Do not touch connectors to be separated. Wrap connector with electrical tape or wear rubber gloves.

Page INSP 004 ***DANGER***
A shock hazard may exist while plugging or disconnecting inline or Mate-N-Lok* connectors because of the connector pin slipping from its socket. Before working with any connectors, ensure power is off.

* Trademark of AMP, Inc.

Safety Practices

Mandatory Safety Practices

Your Personal Safety Can Never Be Overemphasized

- You have been taught safety procedures since the earliest phase of your IBM training.
- Your safety is a part of every maintenance call. Be aware that:
  - Safety features are designed into every IBM machine.
  - IBM tools and test equipment, either furnished or recommended, are safety approved.
  - Chemicals and solvents are provided to you only after they meet IBM health and safety requirements.
  - Your IBM management insists that your customers provide a safe working environment that meets the National Fire Protection Association (NFPA) requirements (U.S.A.) or your country's local fire protection codes.
- You are the only one who can make a maintenance call safe.

The following safety practice are mandatory:

- Read and observe all the DANGER and CAUTION notices in this manual.
- Notify your management immediately of any unsafe working conditions.
- Ensure that someone can see or hear you while you are working on a maintenance call.
- Make sure that your management or another IBM employee knows where you are at all times.
- Ensure that another person is present in your immediate area when you are working with power on the machine. Instruct this person in emergency power-off procedures.
- Develop good safety habits by consistently following recommended safety practices.
- Report all accidents immediately to your manager.

Power-Off Maintenance

Ensure (by contacting your management) that the original equipment manufacturer (OEM) equipment attached to the machine does not affect your safety; do not assume that it does not affect you. After a 4381 has been powered down, voltages can still be present in the processor because of the attached OEM equipment that is still powered up.

For power-off maintenance:

1. Power down the processor:
   a. Press the Power Off switch on the operator control panel.
   b. Open left side cover of frame.
   c. Locate Primary Control Compartment (PCC) and place CB1 and CB2 in the OFF position.
   d. Have the customer personnel turn off primary power at the customer branch circuit breaker. Switches or circuit breakers opened for this purpose should be tagged or locked open to avoid inadvertent closure while an engineering change is being installed.
   e. Attach DO NOT OPERATE tags (Z229-0237) to the switches.
   f. Using a voltmeter, verify that the power is off.
   g. If voltage is detected at this time, notify the customer that you cannot proceed until the power source is removed.
2. Ensure that someone can see or hear you while you are working on a maintenance call. Also ensure that your management or another IBM employee knows where you are at all times.
3. Be prepared for any emergency. For example, someone in your immediate area should know:
   - The location of a telephone to be used for emergency calls and the emergency telephone number for your area.
   - The location of fire extinguishers and fire exits, and the type of chemical(s) used in the sprinkler system.
   - The location at which aid can be obtained.
   - The emergency procedures to be taken in case of an accident.
4. Practice good housekeeping habits by placing your tool kit, test equipment, and machine covers in a safe location. Never place anything on top of the machine frame.
5. Do not lean on or against machines or frames.
6. Remove all jewelry that can cause personal injury or machine damage (for example, rings, watches, earrings, necklaces, and bracelets).
7. Secure (tie back, tuck in) or remove loose items of clothing.
8. Wear safety glasses wherever a risk of eye injury exists and in designated areas. You are responsible for the proper fit of your glasses.
9. Use only the chemicals and solvents furnished by your branch office supply department. Before using any chemical, READ THE LABEL and observe the special safety rules that apply to the use and storing of that chemical.
10. When lifting an object, choose a comfortable lifting position; lift with leg muscles, and avoid any twisting motion of the body.
11. Ensure that no line-cord ground wire is open on powered test instruments. As a safety precaution, ground all test equipment to the frame ground, using a multimeter test lead, before plugging the line cord into a receptacle.

SAFETY 003

Power-On Maintenance

Ensure (by contacting your management) that the original equipment manufacturer (OEM) equipment attached to the machine does not affect your safety; do not assume that it does not affect you. After a 4381 has been powered down, voltages can still be present in the processor because of the attached OEM equipment that is still powered up.

Power-on maintenance requires that you:

- Remain alert and exercise all possible safety precautions.
- Follow only approved maintenance procedures from authorized publications such as this manual, Customer Engineering Memorandums (CEMs), and plant engineering changes.
- Always work within sight or hearing of someone who can take emergency action immediately.

Besides the standard safety practices, the following safety practices are to be observed:

1. Instruct personnel in your immediate area on the locations of the Unit Emergency switch on the machine and the location of the room emergency power off switch. Ensure that someone who can take emergency action should it become necessary remains in the immediate area.
2. Turn off the power at the appropriate source before removing covers and safety shields. Power sources include: Power Off switches, master circuit breakers, branch circuit breaker, and power cable connectors. Attach a DO NOT OPERATE tag (Z229-0237) to the switch when it is turned off.

   a. Using a FLUKE* digital meter (or equivalent tool), verify that the power is off.

   b. Remove appropriate machine covers and protective shields. Place all removed hardware parts away from your immediate work area. Save all star washers to be reinstalled later for proper grounding.

      Note: Star washers are installed under the connector and next to the frame.

   c. Ensure that no one is in danger when power is applied; only then, turn on the power.

While doing maintenance with power on:

1. Wear safety glasses in designated areas and wherever a risk to eye injury exists.
2. Ground all test equipment with a ground wire (use a multimeter test lead) to machine ground.
3. Use only one hand to contact any part of the machine at any one time. Avoid contact with any other part of your body (such as your knees, elbows, and head).
4. Use only IBM-approved insulated tools issued by your branch office. Replace tools having broken or worn insulation.
5. Be aware of hazards in your immediate environment, such as holes in the floors, open machine gates, test equipment on casters near open gates or removed floor panels, and traffic in aisles.
6. Place manuals or test equipment on carts or tables. Do not place anything on top of machine frames.
7. Regularly check that the person designated to take emergency action remains in your immediate area.

Post Maintenance Procedure

At the completion of maintenance, perform the following procedure with power off:

1. Verify that power is off.
2. Replace all the safety shields and covers. Be sure to use the star washers that provide grounding to the frame (when applicable).

   Note: Star washers are installed under the connector and next to the frame.

3. Restore all safety interlocks.
4. Remove DO NOT OPERATE tag(s) from the power source switch.

Housekeeping

To maintain a neat environment:

1. Secure machine gates and covers.
2. Ensure that all your tools are in your tool kit (leave no tools in the machine or on the floor).
3. Ensure that manual racks and test equipment do not block machine air circulation ports, traffic aisles, or access to wall power switches.
4. Ensure that any nickel-cadmium batteries or any capacitors that were replaced during maintenance are returned to the branch office parts room for proper disposal.

* **Trademark** of John Fluke Mfg. Co. Mount Lake Terrace, Washington

SAFETY 004

Safety Guidelines

If you are aware of the guidelines for working with electrical and mechanical equipment and practice these guidelines, you can work safely with this equipment. ***You need not fear electricity, but you must respect it.***

You should take every safety precaution possible and observe the following safety practices while maintaining IBM equipment:

1. You should not work alone under hazardous conditions or around equipment with dangerous voltage. Always advise your manager if this is a potential problem.

2. Remove all power before removing or assembling major components, working in the immediate area of power supplies, performing mechanical inspection of power supplies, or installing changes in machine circuitry.

3. Power supplies, pumps, blowers, motor-generators, and other units with voltages that exceed 30 Vac or 42.4 Vdc must not be serviced with power on when the unit is removed from its normal installed position within the machine, unless maintenance documentation clearly states otherwise. (This is done to ensure that proper grounding is maintained.)

4. Unplug the power supply cord whenever possible before working on the machine. The wall box switch when turned off should be locked in the OFF position or tagged with a DO NOT OPERATE tag (Order No. Z229-0237). Be aware that a non-IBM attachment to an IBM machine may be powered from another source and be controlled by a different disconnect or circuit breaker.

5. When it is absolutely necessary to work on equipment having exposed live electrical circuitry, observe the following precautions:

   a. Another person familiar with power-off controls must be in immediate vicinity. (Someone must be there to turn off power if it should become necessary.)
   b. Do not wear any jewelry, chains, metallic frame eyeglasses, or metal cuff links. (In the event of contact, there will be more current flowing because of the greater contact area afforded by the metal.)
   c. Use only insulated pliers, screwdrivers, and appropriate probe tips/extenders. (Remember, worn or cracked insulation is unsafe.)
   d. Use only one hand when working on equipment with power on. Keep the other hand in your pocket or behind your back. (Remember there must be a complete circuit for electrical shock. This procedure helps eliminate a path that could complete a circuit through you!)
   e. When using test equipment, be certain that controls are set correctly and that insulated probes of proper capacity are used.
   f. Avoid contacting ground potential (metal floor strips, machine frames, and so forth); use suitable rubber mats purchased locally if necessary.

6. Follow special safety instructions when working with extremely high voltages. These instructions are outlined in Customer Engineer Memorandums (CEMs) and the safety portion of maintenance documentation. Use extreme care when checking high voltage.

7. Avoid use of tools and test equipment that have not been approved by IBM. [Electrical hand tools (wire wrap guns, drills, and so forth) should be inspected periodically.]

8. Replace worn or broken tools and test equipment.

9. After maintenance, restore all safety devices, such as guards, shields, signs, and ground leads. Replace any safety device that is worn or defective. (These safety devices are there to protect you from a hazard. Do not defeat their purpose by not replacing them at the completion of the service call.)

10. Safety glasses must be worn when doing any of the following:

    - Using a hammer to drive pins, and so forth.
    - Using power hand tools.
    - Using spring hooks to attach springs.
    - Soldering, wire cutting, and removing steel bands.
    - Parts cleaning, using solvents, chemicals, and cleaners.
    - Working with electrolytic capacitors that have blowout plugs.
    - All other conditions which might be hazardous to your eyes.

11. Never assume that a circuit is not powered on. (Check it first!)

12. Always be alert to potential hazards in your working environment (for example, damp floors, power surges, missing safety grounds, extension cords that are not grounded, and so forth.

13. Do not touch live electrical circuits with the surface of the plastic dental mirrors. The surface of the dental mirror is conductive and can result in machine damage and personal injury.

14. Four steps that should be taken in the event of an electrical accident:

    a. USE CAUTION-DO NOT BE A VICTIM YOURSELF.
    b. TURN POWER OFF.
    c. HAVE SOMEONE ELSE GET MEDICAL HELP.
    d. ADMINISTER RESCUE BREATHING IF VICTIM IS NOT BREATHING.

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

16. Lift by standing or pushing up with stronger leg muscles. This takes strain off back muscles. Do not lift any equipment or parts which you feel uncomfortable with.

17. It is your responsibility to be certain that no action on your part renders the product unsafe or exposes hazards to customer personnel.

18. Place removed machine covers in a safe out-of-way location while servicing the machine. These covers must be in place on the machine before the machine is returned to the customer.

19. Always place tool kit away from walk areas where no one can trip over it (for example, under desk or table).

20. Avoid wearing loose clothing that may be caught in machinery. Shirt sleeves must be buttoned or rolled up above the elbow. Long hair and scarves must be secured.

21. Ties must be tucked in shirt or have a tie clasp (preferably nonconductive) about three inches from the end when servicing a machine.

22. Before starting equipment, make sure that any personnel in the area are not in a hazardous position.

23. Maintain good housekeeping in the area of the machines while performing and after completing maintenance.

24. Avoid touching moving mechanical parts when lubricating, checking for play, and so forth.

Prevention is the key to electrical safety. You should always be conscious of electrical safety and practice ***good habits*** such as:

- Making certain that the customer's power receptacle meets IBM equipment requirements.
- Inspect line cords and plugs. Check for loose, damaged, or worn parts.
- Before removing a component that can retain a charge from the machine, review the procedure in the maintenance documentation. Wear safety glasses and CAREFULLY discharge the necessary components exactly as directed by the service procedure.
- Do not use an ordinary lamp as an extension trouble light.

Never ***assume*** anything about a machine or circuit. No machine is completely safe ***all*** of the time. The exact condition of a machine may be unknown. Here are some reasons why:

- The power cord could be incorrectly wired.
- Safety devices or features could be missing or defective.
- The maintenance and/or change history may be uncertain or unclear.
- A possible design deficiency could exist.
- The machine may have suffered transportation damage.
- The machine might have an unsafe alteration or attachment.
- An EC or sales change may have been improperly installed.
- The machine may have deteriorated because of age or environmental extremes.
- A component could be defective and create a hazard.
- Some component of the machine may have been incorrectly assembled.

Before you begin a service call or procedure, exercise good judgement and proceed with caution.

Electrical Accidents

Administering First Aid

In implementing rescue procedures in an electrical accident, one must:

- ***Use Caution***—If the victim is still in contact with the electrical current source, it may be necessary to use the room emergency power off or disconnect switch to remove the electrical current. If the switch in the room cannot be located, use a dry stick or another nonconducting object to pull or push the victim away from contact with the electrical equipment.

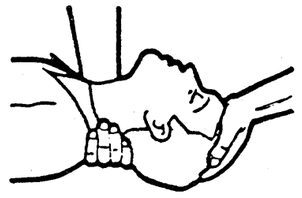
- ***Act Quickly***—If the victim is unconscious, the person may need rescue breathing. If the heart has stopped beating, the victim may also need external cardiac compression. **(External Cardiac Compression should only be performed by a qualified person.**Persons interested in becoming certified in Cardiopulmonary Resuscitation (CPR) should contact the local American Red Cross or the American Heart Association.)

- ***Call Fire Rescue***—Have someone summon medical aid (rescue squad, emergency, ambulance, hospital, and so forth).

If no CPR-trained person is available, determine if the victim needs rescue breathing.

1. Make certain that the victim's airway is open and not obstructed. Check the mouth for objects that may be blocking the airway, such as gum, food, dentures, or even the tongue. Position the victim on his back, and place one hand beneath the victim's neck and the other hand on his forehead. Then lift the neck with one hand, and tilt the head backward with pressure on the forehead from the other hand **A** .

A

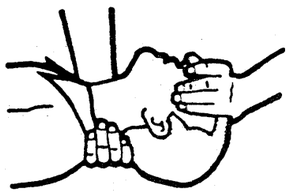


2. Now you must ***look, listen, and feel*** to determine if the victim is breathing freely. Place your cheek close to the victim's mouth and nose to listen and feel for exhaling of air.

   At the same time, look at the chest and upper abdomen to see if they rise and fall. If the victim is not breathing properly, you should:

   a. With the head in a backward tilt **A** , continue to exert pressure on the victim's forehead with your hand while rotating this same hand so that you can pinch the victim's nostrils together with the thumb and index finger **B** .

B



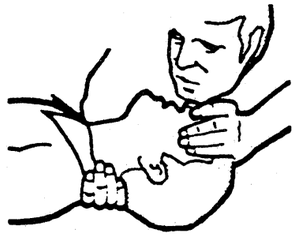
CAUTION
Use extreme care when administering rescue breathing to a victim that may have breathed in toxic fumes. DO NOT INHALE AIR EXHAUSTED BY THE VICTIM.

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

C

   c. Remove your mouth and allow the victim to exhale. Watch for the victim's chest to fall **D** .

D



   d. Repeat this cycle once every five seconds until the victim breathes for himself or medical help arrives.

Reporting Accidents

It is your responsibility to report all electrical accidents, potential electrical hazards, and "near miss" accidents to your ***field manager***. Remember, a near-miss accident might be the result of a design deficiency and prompt reporting assures that the situation will be resolved quickly. .

It is important to report even a minor shock because the conditions which caused it need only be varied slightly to cause serious injury.

SAFETY 006

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INDEX 006

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Numerics

GLOSSARY of TERMS and ABBREVIATIONS

The following terms are defined as they are used in the Maintenance Information (MI) manual. If you do not find the term you are looking for, refer to the index or to the *IBM Vocabulary for Data Processing, Telecommunications, and Office Systems,* Order No. GC20-1699.

A

A/D Alter/Display

A/FE Americas/Far East (WT)

ac Alternating Current

ACB Address Check Boundary, Address Control Block

ACR Automatic Carriage Return

AD Address (channel tag)

Addx Add Index

Adpt Adapter

Adr Address

AFS Air Flow Sensor

AIO Adapter Input/Output

AIS Air Inlet Sensor

ALD Automated Logic Diagrams

ALT Alternate (key)

ALU Arithmetic and Logic Unit

AM Address Match

AMD Air Moving Device

ANYREF Any Reference

AOS Air Outlet Sensor

AREG A Register

ASCII American Standard Code Information Interchange

Asm Assembly

Async Asynchronous

Attn Attention

Aux Auxiliary

B

B/M Bill of Material

BAL Branch and Link

BAR Buffer Address Register

BAS Branch and Save

BC Basic Control (mode)

Bd Board

Bfr Buffer

BG Bias Good

Bi-Di Bidirectional bus.
A bus on which data can be sent in either direction.

Bkwd Backward

BMCB Burst Mode Control Byte

BMpx Block Multiplexer

block multiplexer channel. A multiplexer channel that interleaves blocks of data.

Bndry Boundary

BOC Bus-Out Check

Br Branch

BREG B Register

BSM Basic Storage Module

BUSIN Data Input Bus

BUSOUT Data Output Bus

byte multiplexer channel. A multiplexer channel that interleaves bytes of data.

C

C Capacitor

C-IC Corrected Instruction Counter

C-PAC Decoupling Capacitor

C-STEP Clock Step

CAC Common Adapter Code

CACHE. Buffer that provides high-speed storage.

CAP Code Analysis Processor

CAW Channel Address Word

CB Circuit Breaker

CBC Checking Block Code

CC Chain Command, Condition Code, Control Check, Cyclic Code

CCA Common Communications Adapter (RSF), Channel Control Array

CCAR Channel Control Array Register

CCC Channel Control Check

CCER Cache Control Extension Register

CCW Channel Command Word

Cd Card, Command (channel tag)

CDB Channel Data Buffer

CDC Channel Data Check

CE Customer Engineer (service representative), Channel End

CHAN Channel

CHAREG Channel A Register

CHPID Channel Path Identifier

CH-DAT Channel Data

CH-SEQ Channel Sequence

CHG DPLY Change Display (key)

CHKEY Channel Key

Chnl Channel

CK ST Check Stop

CL Current Limit

CLKS Clocks

CLRB Clear Block (instruction)

CLRIO Clear I/O (instruction)

CMASK Common Mask Setting

Cmd Command

CMDE Channel Microcode Device Exerciser

CNCL Cancel (key)

Cnfg Configuration

Cnsl Console

COMM REQ Communications Request (key)

Cond Condition

Conn Connector

CONV Convergence

CP Circuit Protector

CPS Characters per Second

CRC Cyclical Redundancy Check

CREG Control Register

CRW Channel Report Word

CS Control Storage

CSAR Control Storage Address Register

CSARBU Control Storage Address Register Backup

CSDBAR Channel Storage Data Buffer Address Register

CSW Channel Status Word

CTCA Channel-to-Channel Adapter.
A hardware device that connects two channels for a channel-to-channel data path.

CTL UNIT Control Unit

Ctr Counter

Ctrl Control

CTS Clear To Send

CU Control Unit

CWT Cable Wrap Test (channel)

Cyc Cycle

Cyl Cylinder

D

D-STOR Data Store

DA Data (channel tag)

DAC Digital-to-Analog Converter

DASD Direct Access Storage Device

DASF Dual Address Space Facility

DAT Dynamic Address Translation

DATA-PHONE. Both a service mark and a trademark of AT&T and the Bell System. As a service mark, it indicates the transmission of data over the telephone network. As a trademark, it identifies the telecommunication equipment furnished by the Bell System for transmission services.

data-streaming mode. A mode of data transfer that permits a data transfer rate up to 3.0 megabytes per second on a single-byte bus. Used only for the Read and Write commands (not for the Sense or Control commands).

DBE Double-Bit Error

DBI Data Bus-In

DBO Data Bus-Out

dc Direct Current

DC Disconnect (channel tag)

DCA Device Cluster Adapter

DCC Disconnect Command Chaining

DCD Data Carrier Detect

DCE Data Communication Equipment

DCI Direct Control Interlock

DCk Data Check

DDA Diskette Drive Adapter

DE Device End

Decr Decrement

Dev Device

DI Disconnect-In

DIAG1 Diagnostic Diskette 1

Dir Directory

Disc Disconnect

diskette. A thin, flexible magnetic disk that is permanently enclosed in a semi-rigid protective jacket. Synonymous with flexible disk.

DLAT Directory Lookaside Table

DOS Disk Operating System

DOS/VS Disk Operating System/Virtual Storage

DOS/VSE Disk Operating System/Virtual Storage Extended

DP Data Processing

DREG Destination Register

DRIVE1 Diskette Drive 1

DRIVE2 Diskette Drive 2

DRS Data Rate Select

Drvr/Rec Driver/Receiver

DSR Data Set Ready

DST Data Streaming

DTR Data Terminal Ready

Dual Processor. Two integrated central processors operating under a single control program. Each processor has its own set of channels, but they share central storage.

E

E/ME/A Europe/Middle East/Africa (WT)

EAU Erase All Unprotected

EBCDIC. Extended Binary-Coded Decimal Interchange Code.
A set of 256 characters, each represented by eight bits.

EC Engineering Change, Extended Control (mode)

ECC Error Checking and Correction

ECPS Extended Control Program Support

ECSW Extended Channel Status Word

EIA External Interface Adapter, Electronic Industries Association

ELA Error Log Analysis

EMC Electromagnetic Compatibility

EMI Electromagnetic Interference

Enb/Dis Enable/Disable

EOB End of Block

EOF End of File

EOP End of Operation.
A microcode controlled signal that indicates a microcode sequence has terminated, the end of instruction execution.

ERDS Environment Recording Data Set

EREG E Register

EREP Environmental Recording, Editing, and Printing. Program that makes the data on the system recorder file available for analysis.

ERP Error Recovery Procedure

ESD Electrostatic Discharge

EST Eastern Standard Time

Exec Execution

Ext External

Ext Int External Interrupt

Extn Extension

F

F Fuse

FBM Field Bill of Material

FDS Flexible Distribution System

FE Field Engineering

FP Floating Point

frame. The hardware support structure, the covers, and all electrical parts mounted therein that are packaged as one entity for shipping.

FRIEND Fast Running Interpreter Enabling Natural Diagnosis

GLOSSARY 002

FRU Field Replaceable Unit.
A mechanical or electronic assembly or part that can be replaced in the field.

FSC Field Support Center

FUNC1 Functional Diskette 1

FUNC2 Functional Diskette 2

G

G/Y Green/Yellow

Gen Generator

Gnd Ground

GPR General Purpose Register

H

HD Hold (channel tag)

HDV Halt Device (instruction)

Hdwr Hardware

hex Hexadecimal

HIO Halt Input/Output (instruction)

Hot I/O. The device did not drop off properly after a selective reset was issued.

HREG H Register

HSB High-Speed Buffer

HW Halfword

HWS Hardwired sequence

Hz Hertz

I

I-Cntr Instruction Counter

I-Step Instruction Step

I/O Input/Output.
Pertaining to a device or to a channel that may be involved in an input process, and, at a different time, an output process.

IB Interrupt Buffer

IC Instruction Counter

ICER IPU Control Extension Register

ICtr Instruction Counter

ID Identifier

IDA Indirect Data Addressing

IDAW Indirect Data Addressing Word

IFCC Interface Control Check

IFA Interface Adapter

IL Incorrect Length

IML Initial Microcode Load

Ind Indicator

INST Instruction at Time of Failure

Intf Interface

Intlk Interlock

Intr Interrupt

IO-Ref I/O Reference

IOAdpt I/O Adapter

IOCDS Input/Output Configuration Data Set

IOCmd I/O Command

IOCP Input/Output Configuration Program

IOIRR, IORR I/O Interrupt Request Register

IPC Interprocessor Control

IPL Initial Program Load

IPM Insert Program Mask

IPO Immediate Power Off (cable)

IR Intervention Required

IVSK Insert Virtual Storage Key

J

JCL Job Control Language

K

K Relay

Kb Kilobyte.
Each kilobyte equals 1,024 bytes and refers to storage capacity.

L

L Inductor

LCA Local Channel Adapter

LCL Limited Channel Logout

LED Light Emitting Diode

LMR Last Module ID Base Program Read

LOMC SP Check Register after Logging

LPUM Last Path Used Mask

LRU Least Recently Used

LS Local Storage

LS-Ext Local Storage External

LS-Des Local Storage Destination

LS-SRC Local Storage Source

LSI Large Scale Integration

LSXAD Local Storage Extended Addressing Register

M

M-Step Microword Step

Mb Megabyte (1,048,576 bytes)

MBC Maintenance Bias Controller

MBTR Trace Microbranch

MC SP Check Register

MCk Machine Check

MCM Multi Chip Module

MDM Multiple Decision Maker

MDT Modified Data Tags

MFI Machine Features Index

MI Maintenance Information

Microdiagnostic. A microcode diagnostic routine.

Micwrd Microword

MIRR Microcode Interrupt Request Register

mm millimeter

MODE SEL Mode Select (key)

Mpx Multiplex, Multiplexer

MS Main Storage

ms millisecond

MSMD Machine Speed Microdiagnostic

MSS Maintenance Support Subsystem

GLOSSARY 003

MSSF Monitoring and System Support Facility. Supports the normal operation of and provides maintenance to the processor.

MST Monolithic System Technology

MSW Microcode Status Word

multiplexer channel. A channel designed to operate with a number of I/O devices simultaneously. Several I/O devices can transfer records at the same time by interleaving items of data.

MTR Metering (channel tag)

MWTR Microword Trace

N

N Neutral

NA Not Applicable

N/C Normally Closed

N/O Normally Open

NE Not Equal

NIB Next Instruction Buffer

NL New Line

NFPA National Fire Protection Association

NOP No Operation

Nor Normalized

ns nanosecond

NTF No Trouble Found

NZ Nonzero

O

OBR Outboard Recorder

OC Overcurrent

OCP Operator Control Panel.
A panel containing switches and indicators that control system power, IML and monitoring of the system operating status.

OCR Optical Character Recognition

OLT Online Test

OLTEP Online Test Executive Program

OLTSEP Online Test Stand-alone Executive Program

OP Operational (channel tag)

ORB Operation Request Block

OS Operating System

OS/VS1 Operating System/Virtual System 1

OS/VS2 Operating System/Virtual System 2

operator console. A display console used for communications between the operator and the system. This console is used primarily to specify information about application programs and I/O operations.

OSC Oscillator

OV Overvoltage

Overrun. A loss of data condition because a receiving device is not able to accept data at the rate that it is transmitted.

P

P-Step Pulse Step

PN Part Number

PA Problem Analysis.
A customer run routine used to identify system and procedure problems.

PAxx Problem Analysis Log Number

PC Parity Check, Power Controller

PCA Power Control Adapter

PCC Primary Control Compartment

PCI Power Control Interface, Program Controlled Interrupt

PCk Program Check

PDP Problem Determination Procedure

PER Program Event Recording

PFK Program Function Key

PF1-12 Program Function Keys 1-12

Ph Phase

PIM Path Installed Mask

PIRR Program Interrupt Request Register

PLDA Program Link Data Area

PLT Power Line Transient

Plug List. Contained in Volume C01. Use to determine board or card part numbers for a specific location.

PM Preventive Maintenance

PMA Product Maintenance Adapter

Pnl Panel

PP Primary Page

PR Power Repair

Prgm Program

Propagate. The act of a channel control unit to receive and pass on a signal.

Prt Printer

Prt/Kybd Printer/Keyboard (mode)

PS Power Supply

PSC Priority Switching Controller

PST CE. Product Support Trained Customer Engineer (service representative)

PSW Program Status Word

PT Program Transfer

PTCE. Product Trained Customer Engineer (a service representative)

PU Processing Unit

PUA Processing Unit Analysis

PUAD Processing Unit Analysis Diskette

PUMA Processing Unit Maintenance Algorithm

PUSAR Processing Unit Storage Address Register

Pwr Power

Q

Q Queue

R

R Resistor

R-Adr Real Address

R-Data Real Data

R/W Read/Write

Reconfiguration. If primary hardware fails microcode allocates backup hardware during processor operation. The backup hardware is used for functional operation. Repairs to the failing section of the processor are made only if a loss in performance has occurred.

RA Repair Action

Repair Procedure. A maintenance document that gives the service representative a step-by-step procedure for tracing a symptom to the cause of the failure.

RAS Reliability, Availability, and Serviceability

RC Reference Code

RC Extn Reference Code Extension

RCDB Reference Code Data Bank

RCNT Retry Count Register

RCS Reloadable Control Storage, Remote Communication Support

Rd In Read In

RDB Remote Data Bank

RDS Regional Designated Specialist

RE Request (channel tag)

Ref Reference

REQ Request (key)

Res Restart

RI Ring Indicator

RMS Recovery Management Support, Root Mean Square

RMSR Recovery Management Support Recorder

ROCF Remote Operator Console Facility

ROS Read-Only Storage

RSC Real Storage Control, Remote Support Center

RSF Remote Support Facility.
Supplies a means of controlling the processor from a remote location for maintenance or operation.

RSP Recommended Spare Parts, a listing

RTS Request to Send

S

S/370 System/370

S/370XA System/370Extended Architecture

SAL Set Address Limit

SAR Storage Address Register

SBA Support Bus Adapter

SCP System Control Program

SCR Silicon Controlled Rectifier

SDI Scanned Data In

SDLC Synchronous Data Link Control

SDO Scanned Data Out

SDR Storage Data Register

SE Systems Engineer, Storage Error Uncorrected, Select (channel tag)

Sel Select (MODE SEL key)

selector channel. An I/O channel designed to operate with only one I/O device at a time. Once the I/O device is selected, a complete record is transferred one byte at a time.

Sel In Select In

Sel Out Select Out

Seq Sequence

SERDES Serializer/Deserializer

SEREP Systems Environmental Recording, Editing, and Printing

Serv Service

SF Start Field

SIC SP Last Instruction Address

SID Subsystem Identification Word

SIE Start Interpretive Execution

SILI Suppress Incorrect Length Indicator

SIO Start I/O (instruction)

SIOF Start I/O Fast Release (instruction)

SIR Shift Indirect Register

SNA Systems Network Architecture

SP Support Processor, Secondary Page

SPCk SP Check Register

SR Scan Ring, Shift Register, System Recovery, Service (channel tag)

SRL Shift Register Latch, Scan Ring Latch

Srv In Service In

Srv Out Service Out

SSB Select Stand By

SSI Send Service Information

SSM Set System Mask

SSR Solid State Relay

St Status (channel tag)

Stat Status

Stat In Status In

Stg Storage

ST/4381 System Test 4381

ST/4381XA System Test Extended Architecture

subchannel. The channel facility required for sustaining a single I/O operation.

Supr Out Suppress Out

SvC Supervisor Call

Sw Switch

Sync Synchronous

Sys System.
Consists of the processor complex and its associated I/O and communications devices.

system console. A free standing console used by the operator to perform IPLs, to display data, to configure the system, and to perform other procedures.

SysLog System Log (printer-keyboard)

SysLst System List (printer)

SysRec System Record File

SysRes System Resident

Sys1/LogRec System 1/Log Recorder

Sys1LogRec System Log Recorder

T

TB Terminal Block, Terminal Board, Test Block

TCCC Top Card Crossover Connector

TCh Test Channel

TCM Test Case Monitor

TD Time Delay, Timer Damage

Temp Temperature

Term Terminal, Terminator

Th Thermal

TIC Transfer in Channel

TIO Test Input/Output

TLB Table Lookaside Buffer

TLU Table Lookup

TNL Technical Newsletter

TOD Time of Day

Tp Teleprocessing

TPI Test Pending Interruption

TProt Test Protection

Tr Transformer

TrSt Trace Stop

TrWr Trace Wrap

Tripped. In reference to a circuit protector **tripped** means a circuit protector in the off position.

Tx Transmit

U

U/D Up/Down

UC Unit Check, Undercurrent

UCB Unit Control Block

UCS Universal Character Set

UCW Unit Control Word

UE Unit Exception

URSF Universal Remote Support Facility

us microsecond

US Unit Specify

U.S.A. United States of America

UV Undervoltage

V

V Volt

VA Volt-Ampere

V-Adr Virtual Address

V-Data Virtual Data

V/R Virtual/Real

Vac Volts Alternating Current

Vdc Volts Direct Current

VM Virtual Machine

VM/370 Virtual Machine 370

VMA Virtual Machine Assist

Vol ID Volume Identifier

VS Virtual Storage

VTL Vendor Transistor Logic

W

WCC Write Control Character

WEOF Write End-of-File

Wr Write

WS Work Storage

WT World Trade Corporation

X

XA Extended Architecture

XLATSAR Translate Storage Address Register

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Contents

Frequently Performed Tasks

This page provides you with a quick page reference to find a given task or to seek general subject information:

To analyze a message:
Go to Volume A08, Console Functions and Messages.

To configure the system:
Go to Volume A06, page AID 001.

To find a certain subject matter:
Go to Volume A01, page INDEX 001.

To install a machine:
Go to Volume A07, page INST 001.

To perform a module transfer:
Go to Volume A06, page AID 001.

To perform a safety inspection:
Go to Volume A07, page INSP 001.

To perform a UCW assignment:
Go to Volume A06, page AID 001.

To perform system test:
Go to Volume A07, page SYS TEST 001.

To remove or replace a mechanical part:
Go to Volume A07, page REM 001.

To review a term or acronym:
Go to Volume A01, page GLOSSARY 001.

To review information about a screen:
Go to Volume A08, Console Functions and Messages, for console function screens.

Go to Volume A07, page DIAG 001 for diagnostic screens.

Go to Volume A07, page LOG 001 for log screens.

To review information about Problem Analysis:
Go to Volume A08, Console Functions and Messages.

To review logs:
Go to Volume A07, page LOG 001.

To review preventive maintenance:
Go to Volume A07, page PM 001.

To review the maintenance philosophy:
Go to Volume A01, page INTRO 011.

To review the safety guidelines:
Go to Volume A01, page SAFETY 001.

To review tool requirements:
Go to Volume A07, page TOOL 005.

To run diagnostics:
Go to Volume A07, page DIAG 001.

To troubleshoot or repair the machine:
Go to Volume A01, page START 001.

To understand how the machine operates:
Go to Volume A01, page INTRO 007.

To run FRIEND:
Go to Volume A07, page SYS TEST 001.

To understand how a repair procedure works:
Go to Volume A01, page INTRO 014.

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Seq AD010	2 of 4	01 Oct 84	18 Feb 85			

Documentation Organization

The Maintenance Information (MI) manual has eight volumes. Each volume contains sections, some with their own table of contents. Divider tabs identify each section contained within the volume. Spine tabs identify the volume and what sections are contained within that volume.

Volume A01

Contains the following sections:

MASTER INDEX	Alphabetical subject listing, and the page number where it is found.
TERMS AND ABBREVIATIONS	Glossary of technical terms, acronyms, and abbreviations.
INTRODUCTION	A quick reference guide to find specific procedures pertaining to the processor. Describes the functional operation and specifications of the processor, documentation description, maintenance philosophy, and how to use the manual.
START	Repair Procedure starting point. Contains the entry point for troubleshooting and the exits to repair procedures contained within the manual.
PU REPAIR	Repair Procedures pertaining to the processor.
CHNL REPAIR	Repair Procedures pertaining to the channels.
MSS REPAIR	Repair Procedures pertaining to the maintenance support subsystem (MSS).
END REPAIR	Exit Repair Procedure on completion of other repair procedures.

Volume A02

Contains Repair Procedures for the hardwired sequence (HWS) and maintenance bias controller (MBC).

Volume A03

Contains Repair Procedures for the power section of the processor.

Volume A04

Contains Repair Procedures for the power section of the processor.

Volume A05

Contains Repair Procedures for the power section of the processor.

Volume A06

Contains Service Aid material used with the Repair Procedures or Installation Instructions. Also provides procedures to configure the state of the system or to enable remote site communication.

Volume A07

Contains the following sections:

LOCATIONS	Locations of components within the frame.
TOOLS	Tools required to maintain and service the processor.
REMOVAL AND REPLACEMENT	Removal and replacement procedures for servicing the processor.
PREVENTIVE MAINTENANCE	Preventive Maintenance procedures for the processor.
DIAGNOSTICS	Information for running any diagnostics available for the processor.
LOGS	Information about the types of logs available with the processor, and how to display and print the logs.
SYSTEM TEST	Description of all system tests available with the processor.
INSTALLATION	Instructions for installing the processor.
SAFETY INSPECTION	Procedures to ensure the electrical integrity of the processor.

Volume A08

Contains the console functions available with the processor. Also contains alphabetical listing of console messages, definitions, and recovery procedures (if applicable).

EC Level Control

This page provides a convenient place to record the EC level of the maintenance package and machine components.

Maintenance Package

Maintenance Information (MI)

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Console Functions (Vol A08 of MI)

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Maintenance Diagrams (MD)

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Power Reference

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Parts Catalog

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Machine

Diskettes

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Power

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Logic

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Mechanical

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EC DOCUMENT
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Processor Overview

The IBM 4381 Processor contains processor storage, control storage, the system control functions, and other facilities to perform arithmetic and logical processing of data. The processor also contains the input/output channels for transferring data to and from I/O devices.

Some of the characteristics of the processor are shown under "Highlights."

Processor operation is controlled by reloadable microcode that is kept in control storage. The processor uses hardware registers to link user programs, processor microcode, and processor hardware. These registers assist the microcode in transferring data and control information to and from the various functional units of the processor.

Each of these registers can be addressed, read from, and written to, by the microcode. Some registers are set and reset by the hardware and then tested by microcode. Others are set and reset only by microcode.

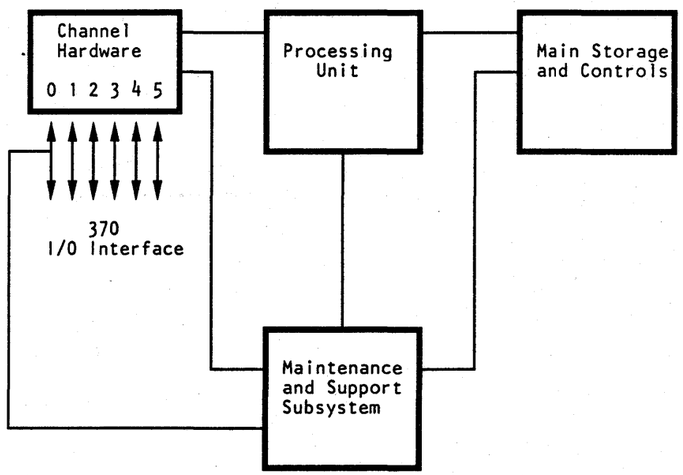
The processor is compatible with, and can run under existing IBM program operating systems.

The processor includes:

- Channel Hardware
- Instruction Processor which includes:

  Reloadable Control Storage
  Cache
  Arithmetic and Logic.
- Main Storage and Controls
- Maintenance and Support Subsystem.

Processor Block Diagram



IBM 4381 Processor Model Group 3

The 4381 Processor Model Group 3 is a dual processor; it contains two processors operating under a single control program.

The two processing units of the 4381 Model Group 3 machine are processor 0 (PU0) and processor 1 (PU1).

Each processor includes:

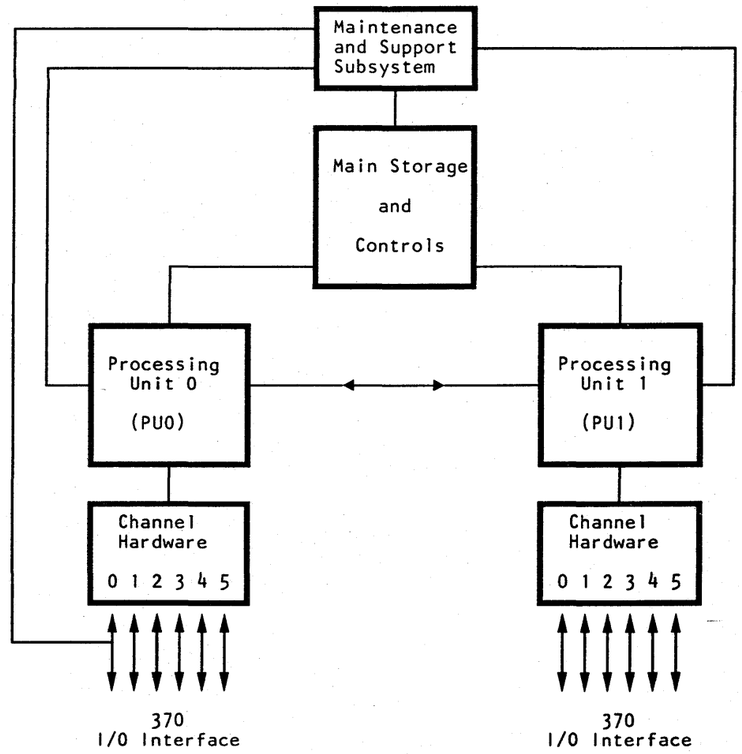
- Reloadable Control Storage
- Cache
- Channels.

This allows each processor to work on different tasks at the same time.

Both processors share the same main storage. They also share the same frame and covers, power and cooling, and maintenance and support processor.

A dual processor cannot be configured into two distinct processing systems. With some failures, the system can continue to run (with degraded performance); thereby, providing enhanced availability when compared to a conventional processor. To ensure maximum system availability, the customer should provide paths from both processors to I/O devices by installing appropriate channel-switching facilities.

Dual Processor Block Diagram



Highlights

The processor provides virtual storage system control program (SCP) support and System/370 compatibility enabled by using a new high density, module-on-board packaging technique.

A 3205 or 3278-2A (or optional 3279-2C) Display Console with an Operator Control Console and two diskette drives are included to enable processor operation.

Model Group 3 Characteristics

Model	Processor Storage
M3	8,388,608 Bytes
P3	16,777,216 Bytes (Optional)
Q3	25,165,824 Bytes (Optional)
R3	33,554,432 Bytes (Optional)

Two Processors (PU0 and PU1):

PU0 Characteristics are:

- A sixteen-byte wide data path between the main storage and the cache.
- A 128K control storage.
- A 32K cache.
- An optional channel to channel adapter (CTCA).
- Six channels are standard.

The customer can select either five block multiplexer channels and one byte multiplexer channel, or four block multiplexer channels and two byte multiplexer channels. Six additional block multiplexer channels, three for each processing unit, are available as an option.

PU1 Characteristics are:

- A sixteen-byte wide data path between the main storage and the cache.
- A 128K control storage.
- A 32K cache.
- An optional channel to channel adapter (CTCA).
- Six channels are standard.

The customer can select either five block multiplexer channels and one byte multiplexer channel, or four block multiplexer channels and two byte multiplexer channels. Six additional block multiplexer channels, three for each processing unit, are available as an option.

Standard Features

68 to 136 nanosecond cycle time
Branch and Save
Channel Command Retry
Clear I/O
Conditional Swapping
Clock Comparator and CPU Timer
Control Registers
Data Streaming Mode
Decimal Instructions
Dual Address Space (DAS) Facility
Dynamic Address Translation (in System/370 Mode)
Eight-Byte Parallel Data Flow (16 bytes between processor storage and cache)
Engineering Scientific Assist
Error Checking and Correction (ECC) in Processor Storage
Error Retry
Extended Control (EC) Mode
Extended Precision Floating Point
External Signal
Fast Release
Floating-Point Instructions
High-Speed Transfer
Interval Timer
I/O Error Alert
Limited Channel Logout
Machine Check Handling
Maintenance Support Subsystem (MSS)
Move Inverse Function
Modes:
  S/370
  370/XA (Extended Architecture)
Multiprocessing Extension
Program Event Recording
PSW Key Handling
Reloadable Control Storage
Segment Protection
Service Signal
Storage Protection (store and fetch)
Store Status (System/370 Mode)
Subchannels (up to 2048)
Support Processor
System/370 Mode
  ECPS:VM/370 Assist
  ECPS:MVS/Dual Address Space Facility
System/370 Universal Instruction Set
Test Block
Time-of-Day Clock
Two Diskette Drives
Virtual Storage

Optional Features

Channel-to-Channel Adapter
Elementary Math Library Facility
Remote Support Facility
Remote Operator Console Facility
Six Additional Channels
3205 Display Consoles
3268-2 Printers
3278-2A Display Consoles
3279-2C Color Display Consoles
3287 Printers

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Common Characteristics:

- Easy installation, with minimum change of existing input/output configuration.
- Program support available includes DOS/VSE, OS/VS1, and VM/370.
- High reliability, availability, and serviceability (RAS) is given. This includes: instruction and interrupt retry, dynamic reconfiguration of some processor hardware, single- and double-bit error checking and correction (ECC), error recording, remote maintenance, and problem analysis routine.
- The 3205 Color Display Console, 3278-2A Display Console, or 3279-2C Color Display Console can be used as the system console. The system console turns power on and off for initial microcode load and starts and stops processor operations.

  The console can operate in either printer/keyboard mode or display mode. In display mode, the display console is available to the operating system using 3272 control unit interface or equivalent support. The display output can be up to 20 lines of up to 80 characters each.

  In printer/keyboard mode, the display console is available to the operating system using 1052, 3210, or 3215 Console Printer/Keyboard interface support. The display output can be up to 18 lines of up to 80 characters. The display console and an optional 3287 Printer (Model 1, 2, or 2C) are output devices. The display console and optional printer appear to the system as a printer/keyboard console. An optional alternate console (with one display/keyboard and one printer) can also be configured. For more information, see Volume A08, Console Functions and Messages, "Display Console Modes of Operation."

  The console also supplies for normal versus instruction step processing for address compare stopping, for changing some registers and storage areas, and for displaying hardware status.

  For maintenance and service support, the console can display and store the status of the system and servicing information. The console also supplies a tool for using the problem analysis routine and diagnostics.

  Note: The 3205 Color Display Console cannot be intermixed with the 3278-2A and 3279-2C Display Consoles.

  A combination of up to three 3205, 3278-2A, 3279-2C Display Consoles, or 3287 Printers Model 1, 2, or 2C can be configured. The optional printer has a separate address and requires Multiple Console Support (MCS).

  Note: The procedure for configuring 3287 Printers depends on the operating system being used. For OS/VS1, for example, the 3287 is supported by specifying either a 3286 or 3210 Printer.

- The support processor performs automatic analysis of failure symptoms. This **self-diagnosis** generates a ***reference code*** that is used in the repair procedures to find the failing FRU. The reference code is logged on the system diskette and displayed to alert the operator to notify the service representative.
- The diskette drives are used to IML the processor and also to log error messages for diagnostic purposes. The diskettes, named FUNC1 and FUNC2, contain all the microcode needed to initialize the processor according to its configuration. Diagnostics that the service representative needs also reside on these diskettes.
- The Remote Support Facility (RSF), under control of the on-site service representative (and with customer authorization), enables a remotely based specialist to assist in problem resolution. The specialist can observe and start functional operations of the system by telecommunication line transmission of data. The RSF enables remote operation of all system controls except power on, power off, and IML. Logout data stored on the functional diskettes can be sent to the remote support site for analysis later.
- The Remote Operator Console Facility (ROCF) is an extension of the RSF. The ROCF enables personnel at a host site to dial up and control the processor (remote processor). When ROCF is in use, the RSF cannot be used. ROCF includes password verification to protect against unauthorized use of the remote processor.

Modes of Operation

The processor performs in 370 or 370-XA mode. These modes are user-selected.

For details of processing and input output functions for a specific mode of operation, see *IBM System/370 Principles of Operation,* order number GA22-7000 and *IBM System/370 Extended Architecture Principals of Operation,* order number SA22-7085.

Programming Support

In System/370 mode, programming support is supplied by DOS/VSE, OS/VS1, MVSSP, VM/370, VMSP, and ACP/TPF. In 370-XA mode, program support for the processor is supplied by MVS/XA and VM/XA.

Brief descriptions of these program support packages (and references to the publications that describe them in detail) are available from your IBM representative.

System Maintenance

System Failures

System failures are diagnosed using the procedures shown in the flowchart on this page.

The customer uses a problem analysis (PA) routine to determine the cause of a system failure. If the failure is in the processor, PA lists the possible failing FRUs, records failure information, and recommends corrective action (such as a call for service).

The service representative uses the repair procedure documentation (START Repair, Power Repair, PU Repair, Channel Repair, MSS Repair, and END Repair) to analyze and repair the processor.

The service representative's support structure can be invoked at any point during a processor repair action.

Problem Analysis (PA)

Problem analysis is performed by system operators assisted by a user-selected PA routine.

The PA routine assists the user in identifying system and procedure problems. If PA detects a failure, it collects operational and error information and saves it for later analysis. Also, if PA detects a processor failure, it guides the user through options that isolate probable failing FRUs.

The user reports the resulting PA Error Code (which may include FRU part numbers). The service representative uses this information with the Repair Procedures (shown in the flowchart at the right) to repair the machine problem.

Problem Analysis Error Code

The PAnn xxxx-xxxx-etc. number is an error code that is displayed by the PA routine and reported by the customer when requesting service.

The nn of PAnn is the PA log number. The service representative makes reference to this PA log for failure information.

The xxxx-xxxx-etc. are possible failing parts that display only if PA isolated the failure. (Two groups of four digits make one part number.)

START Repair Procedure

Start all processor repair actions at the START Repair procedure. Also, start again at the START Repair when new failure symptoms are found while using these Repair Procedures and no other instructions are given.

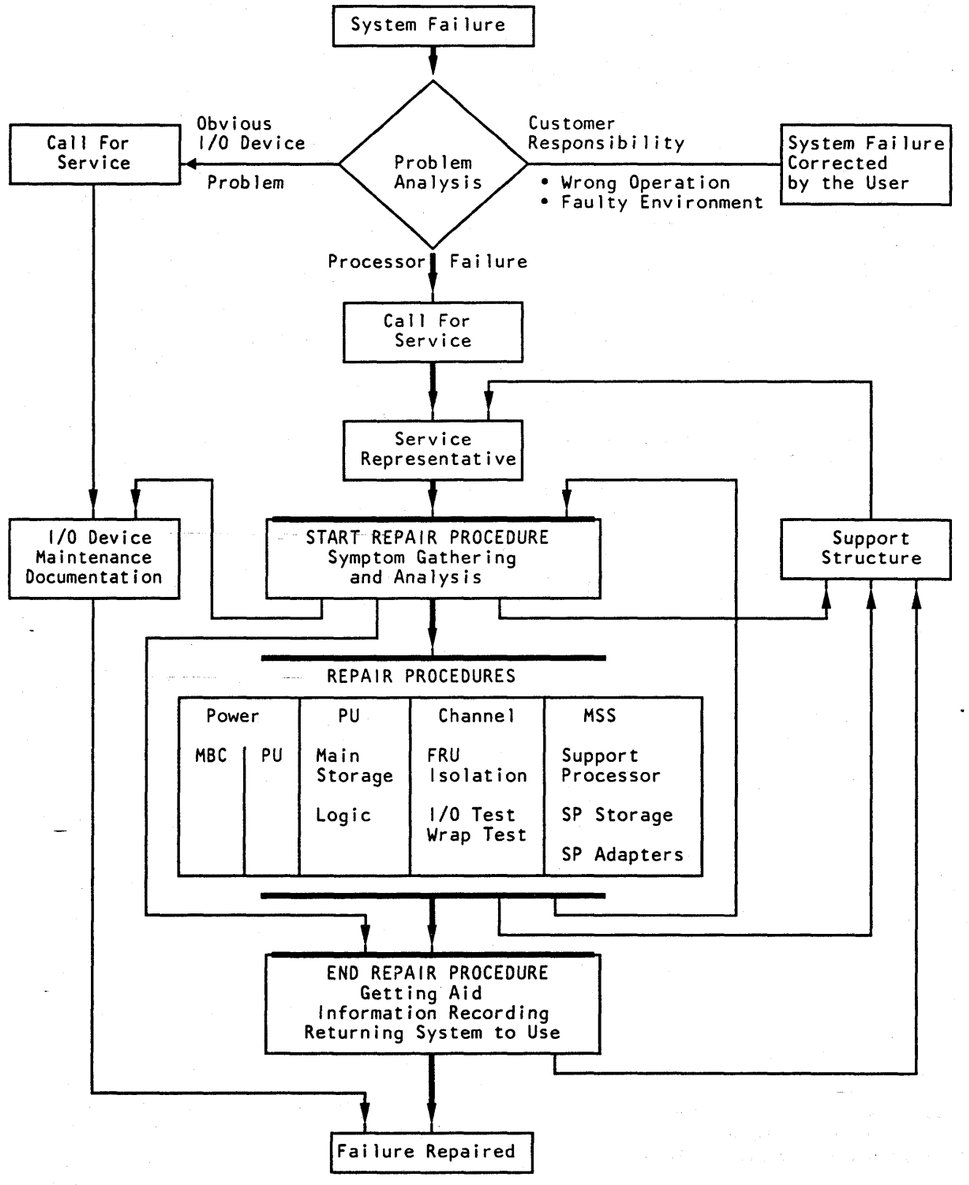
- START Repair guides you to an individual unit repair procedure to repair processor failures.
- If an I/O problem is indicated, you are sent to the I/O maintenance documentation.
- If the problem is repaired in the START Repair, you are guided to the END Repair procedure.

Unit Repair Procedures

The individual unit repair procedures (Power, PU, Channel, and MSS) aid in isolating the failure to a field replaceable unit (FRU) and aid in repairing the problem.

END Repair Procedure

All repair actions terminate utilizing the END Repair procedure. Instructions for completing the repair action and for getting aid are supplied in this procedure.



Processor Maintenance

Power

The maintenance and support subsystem (MSS) and the processing unit (PU) are powered separately. Power for the maintenance and support subsystem is supplied by the maintenance bias controller (MBC) which must complete its tasks before power can be supplied to the processing unit by the power controller adapter.

MBC failures are indicated in LEDs on the service panel. These Power Codes are analyzed under the direction of the Power Repair procedures.

Power controller adapter diagnostic tests run automatically during support processor power-on sequences. Failures are indicated by reference codes.

Processing unit power is controlled and monitored by microcode by the power controller adapter. Failures result in power error logs and a reference code (see "Reference Codes" on this page).

Power Codes

A power code is an error message from the maintenance bias controller. The Power Code is a two-character (hex) number that is displayed on the service panel.

When a power code is available, the repair action is directed from the START Repair procedure to an individual unit repair procedure.

For more information, see Volume A07, Diagnostics, "MSS and Power Codes."

Maintenance and Support Subsystem (MSS)

Although MSS error logs are available, diagnostic tests are used as the primary method for sensing and isolating failures in the MSS.

- The Basic MSS diagnostic tests contained in the support processor read-only storage (SP ROS) and on the functional diskettes run automatically when the MSS is powered on. Failures sensed by these tests result in MSS Codes that are displayed on the service panel.
- Extended and optional MSS diagnostic tests give more complete testing and are run when requested by the repair procedures. Failures sensed by these tests result in reference codes.

For more information, see Volume A07, Diagnostics, "Maintenance and Support Subsystem (MSS) Diagnostics" and Logs, "Processing Unit Logs."

MSS Codes

An MSS code is an error message from the support processor error analysis routines. The MSS Code is a five-character (hex) number that is displayed on the service panel.

When an MSS code is available, the repair action is guided from the START Repair procedure to an individual unit repair procedure.

For more information, see Volume A07, Diagnostics, "MSS and Power Codes."

Processing Unit (PU)

Automatic error logging and error log analysis routines are used as the primary method for isolating failures in the processing unit. These routines run in the support processor and give a reference code that is used as input to the repair procedures. For more information, see Volume A07, Logs, "Processing Unit Logs."

Processing unit diagnostic tests are also available. The tests, consisting of processing unit basics and machine speed microdiagnostics, are run under direction of the repair procedures when error log analysis did not isolate the failing FRU and for processing unit verification.

For more information, see Volume A07, Diagnostics, "Processing Unit Diagnostics."

Reference Codes (RC)

A reference code is an error message from functional microcode, diagnostics, and error log analysis routines. The RC, an eight-character (hex) number, contains information that pertains to a processor failure, and displays on the display/console when a failure occurs.

When a reference code is available, the repair action is directed from the START Repair procedure to an individual unit repair procedure.

For more information, see Volume A07, Diagnostics, "Reference Codes."

Error Checking, Retry, and Reconfiguration

The processor detects errors on data and control lines. Data paths in the processor are monitored to detect any errors that occur. In addition, control lines in the PU are monitored for correct and valid operation.

Processor Retry

When an error is detected, the processor attempts to retry the failing operation by returning to the start of the instruction to refresh the data (instruction retry). Most operations are retried by this method. Because of time considerations, some operations are retried by returning to a checkpoint in the microcode to redo the operation (interrupt retry).

Channel operations cannot be retried by the processor. Channel failures are reported to the control program by a machine check and a logout of information is made for analysis purposes.

After retry, a routine determines the correct action to be taken. Some actions are: console messages, reference codes, or hardware reconfiguration of specific hardware.

Reconfiguration

Seven hardware units can be reconfigured while the processor is operating (dynamic reconfiguration). In most cases, the time taken for the retry and reconfiguration of these units does not interfere with system operation. However, I/O overruns can occur.

The units that can be reconfigured are:

- Multiply Function
- Main Storage
- Key Storage
- Cache
- Channel Data Buffer
- Swap Buffer
- Reloadable Control Storage.

For each FRU that can be reconfigured by using backup hardware, the backup hardware is substituted until no backup capacity remains. When no capacity remains, replacement of the failing hardware is indicated by a displayed reference code. Performance degradation, resulting from reconfiguration of the multiply function, main and key storage, and the high-speed buffer, is indicated by a console message.

All reconfiguration information is saved on the functional diskette. Diagnostic routines (run by the service representative) use this saved information both to set the configuration back to the original hardware and to test the replacement FRU. The backup hardware and the original hardware are in the same FRU. Therefore, when the FRU is exchanged, both the original and the backup hardware are exchanged.

Storage Correction (Single-Bit/Double-Bit)

Processor storage data is checked and in most cases corrected by an error-correction and bit-generation unit (ECBG) and a maintenance routine. All data that is read from the basic storage module (BSM) is checked by an ECC and bit-generation unit. Data is checked on a doubleword basis (matching the internal data transfer width of the processor). If a single bit of the doubleword picks or drops, it is corrected by inverting its data line. This method corrects the failing bit with no time lost.

The processor also corrects two kinds of double-bit errors:

- **One solid single-bit** failure and **one intermittent single-bit** failure within a doubleword.
- **Two solid single-bit** failures within a doubleword.

  This type of failure is corrected in the high-speed buffer, and is reported to the system control program. System degradation is indicated and the current operation continues.

The processor does not correct **two intermittent single-bit failures** in the same doubleword.

When a double-bit error occurs, a routine saves the error data along with its storage address. The routine then searches for a solid single-bit failure at that storage address. When a solid single-bit failure is found, the bit in that location in the original data is corrected. The routine then generates the syndrome bits for the remaining single-bit error, and using these results, identifies and inverts the remaining single-bit error. All uncorrected bit failures are reported to the system control program.

Diskette Drives

The diskette drives are small disk drive units into which flexible disks (diskettes) of prerecorded data are inserted. The drives are used during IML to copy the functional microcode from the functional diskettes (FUNC1 and FUNC2) into reloadable control storage. The drives are also used to record logout information and to supply microdiagnostics for system and processor testing.

Normally, FUNC1 is installed in diskette drive 1, and FUNC2 is installed in diskette drive 2 (all system modes and processor utilities are available).

If a diskette drive is inoperable, console messages inform the operator to install FUNC1 in the other drive. Now the processor can only operate in System/370 mode. Because FUNC2 is not available, none of the FUNC2 actions can be performed. (The FUNC2 diskette contains additional processor diagnostics, error log information (that supports PA), additional support processor utilities, and 370-XA microcode.)

System and I/O Tests

FRIEND, System Test/4381, and OLTS are available for testing the processor and attached I/O devices as a system. For more information, see Volume A07, "System Test."

Channels

System/370 Unit Control Words (UCW)

A UCW contains the control information needed to perform I/O operations to a specific I/O device. Each device needs its own descriptive UCW. However, some control units operate continuously with only one device at a time, and need only one UCW for all of the devices that are attached to it.

Each group of 64 UCWs that is assigned decreases the available processor storage by 4096 bytes. A maximum of 2048 UCWs are allowed.

For more information, see Volume A06, Service Aids, "I/O Configuration S/370."

System/370-XA Subchannels

Because of the many subchannels and paths that System/370-XA uses, a much larger descriptive data set is required. It is called the *Input/Output Configuration Data Set (IOCDS).*

At processor installation time, an IOCDS is generated and stored on the functional diskette by a routine called *I/O Configuration Program (IOCP).* For more information, see Volume A06, Service Aids, "I/O Configuration S/370XA."

Channel Tests

Two special channel tests are available to aid in isolating I/O device and channel interface problems:

- Channel Microcoded Device Exerciser (CMDE). This test sends a TIO and SIO (sense and NOP) to all available devices and displays detailed error information when a failure is sensed.
- Channel Cable Wrap Test (CWT). This test, using special channel cable wrap terminators, aids in isolating failures in the channel interface adapter drivers and receivers and in the cables and connectors on the interface.

For more information, see Volume A07, Diagnostics, "Special Channel Tests."

Introduction to Repair Procedures

Repair Procedures

Repair Procedures supply aid in making decisions (based on sense data, microdiagnostic results, customer data, or visual indications) to isolate the failure to the smallest possible area. The normal isolation method is to exchange a specified card or module in a specific repair procedure until the failing part is located.

Organization

The repair procedures are contained in Volumes A01 through A05:

- Volume A01 contains the START, PU (processing unit), CHNL (channel), MSS (maintenance support subsystem), and END repair procedures.
- Volume A02 contains the PR (power repair) procedures for the hardwired sequence and the maintenance bias controller.
- Volumes A03, A04, and A05 contain the PR (power repair) procedures for processor power.

START Repair

Start all maintenance action with this repair procedure. The repair procedure guides you to:

- The needed repair procedure to repair the failure.
- The needed I/O repair procedure if an I/O problem has been determined.
- The END Repair procedure if the problem is repaired in the START Repair procedure or if aid is needed.

Power Repair (HWS and MBC)

Aids you in isolating a problem to a FRU in the HWS or MBC and repairing the problem.

MSS Repair

Aids you in isolating a problem to a FRU in the MSS and repairing the problem.

Power Repair (Processor)

Aids you in isolating a problem to a FRU in the processor power and repairing the problem.

Processing Unit Repair

Aids you in isolating a problem to a FRU in the processor and repairing the problem.

Channel Repair

Aids you in isolating an internal channel failure to a FRU in the processor and repairing the failure. The channel repair procedure also aids in identifying a possible failing unit or device that is external to the processor.

End Repair

After you complete a repair procedure, return to the END Repair procedure. This procedure aids you to:

- Collect any needed information
- Record this information
- Return the processor, in running order, to the customer.

Using the Repair Procedures

Each repair procedure is formatted the same way. Any needed setup information is ahead of the table. The table is used to isolate the problem and to send you to the correct FRU or repair procedure.

To use the repair procedure:

1. Read down the **Condition** column in the table until you find a condition that matches your machine symptom.
2. Do the instructions found in the **Instructions** column of that step.

Example:

0A,A0

Power code indicates tripped CP in PS102.

Possible causes:

- PS102
- Short in PS102 dc distribution
- 01A-A1V2.

Step	Condition	Instructions
1	Go to **Instructions** column.	1. Set PCC CB1 and CB2 off. 2. Record and reset any tripped CP. 3. Set PCC CB1 and CB2 on.
2	Is any CP tripped?	1. Set PCC CB1 and CB2 off. 2. Exchange PS102. 3. Set PCC CB1 and CB2 on. 4. Go to page PR 901.
3	Do you have a power code of 0A or A0?	Go to page PR 231.
4	No power code?	1. Press Check Reset. 2. Press Power On.

Note: If your machine condition changes or you do not get the described result, start at page START 001 with the new symptom. You have a new failure.

Channel to Channel Feature

Overview

The channel-to-channel adapter (CTCA) is used to move data from one processor to another through their I/O channels. The CTCA can be attached on one side to a block multiplexer channel from one processor and on the other side to a block multiplexer channel from another processor. Included in the CTCA is the hardware for both a host processor and a remote processor. The CTCA hardware resides in the host processor and receives its power from the host processor.

The CTCA hardware includes:

- Channel To Channel switch and a Chan-Chan indicator which are located on the operator control panel.
- Two CTCA cards with the same part number.

  The X-side card at 01A-A1B2.

  The Y-side card at 01A-A1C2.
- The X and Y connectors on gate 01H.

The CTCA has an X-side and a Y-side that connect as control units between two channels. Each side communicates with its attached channel by using Bus and Tag lines in the same way as any other I/O control unit. Status information is available to both processors. When one processor starts an action through its side of the CTCA, the processor on the other side acts as an attached device (the processors use program commands to simulate the attached device). The two channels communicate through the CTCA by using sets of complementary commands. For example, a Read command from channel X is answered by a Write command from channel Y.

The CTCA is operated in selector channel mode (operational-in line of the adapter is held up from selection until ending status). Because of the complementary command operation, the overall data rate is the speed of the slower channel.

Data Flow and Operation

The data path through the adapter is one byte wide (eight bits plus a parity bit). Entry is from the channel bus-out lines, and exit is by the channel bus-in lines. The Y-side of the adapter is the same as the X-side. For this reason, most of the following descriptions are in terms of X.

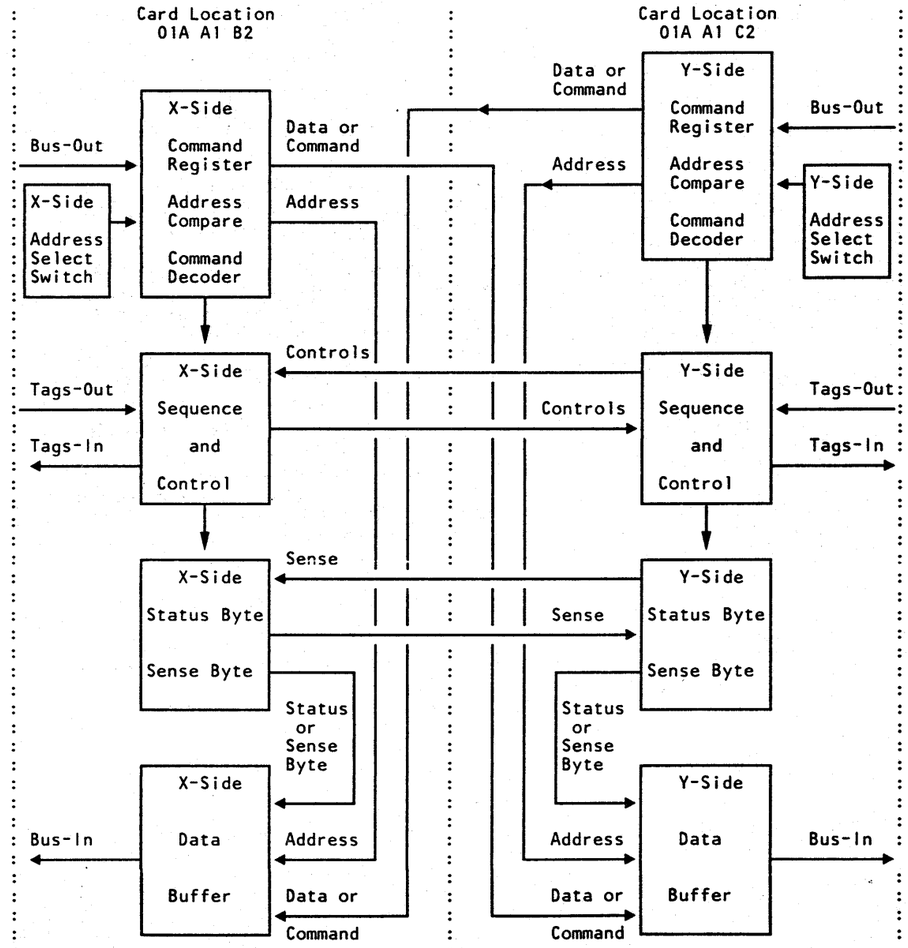
During initial selection, a command register for each side of the adapter is loaded from its associated bus-out at command-out time. The contents of the command register are supplied to the other processor in response to a sense command byte. Therefore, the program can analyze what command was sent by the other processor and also use the modifier bits.

If an SIO (not a Sense, Write End-of-File, or a No-Op) is sent on the Y-side of the CTCA and the X-side is not operating on a command, an attention interrupt is generated to the X-side of the CTCA. The attention interrupt signals the X-side program that the Y-side program has an active I/O operation waiting for a response. The X-side then sends a sense command to determine what kind of operation is pending, and responds with a complementary operation. That is, Y sends a Write; X responds with Read.

An interface disconnect, selective reset, or equipment check from the X-side of the CTCA causes a not-ready condition. Commands sent by the Y-side processor (except Sense Adapter State) are rejected when the X-side is not ready. A unit check in the status to the Y-side command indicates that the X-side is not available.

The X-side adapter can be made ready by sending to the CTCA any command (except Test I/O or Sense Adapter State).

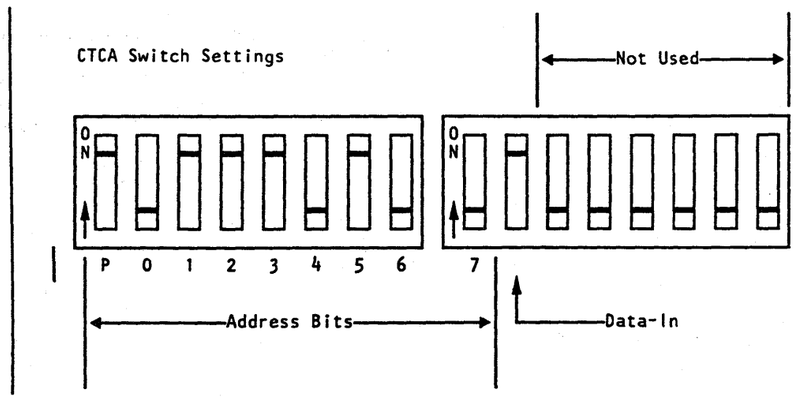
A not-ready-to-ready sequence causes a device-end interrupt to be sent to the Y-side processor that indicates that the X-side is now available for operation.



Channel To Channel Maintenance

Addressing

The CTCA has an eight-bit address for the X-side and another eight-bit address for the Y-side. When the customer needs an address, the service representative sets the bit switches in the related CTCA card. One address for each side of the adapter is set when the machine is installed (see figure below).



Address Bit Switches:

The address bit switch settings shown are for a sample address of X'74' with the P-bit on to maintain odd parity across the address bits.

Set the X-side address and Data-In information in the card at 01A-A1B2.

Set the Y-side address and Data-In information in the card at 01A-A1C2.

Data-In Switch:

1. Set on when both sides of the CTCA are connected to S/370 channels.
2. Set off if either side is connected to a S/360 channel.
3. This switch must be set the same in both the X and Y address cards.

Online/Offline Operation

The CTCA has a Channel To Channel switch and a Chan-Chan Disabled indicator on the console of the host system. The Channel To Channel switch places the CTCA offline (logically removed from both using systems channels). When offline, the CTCA propagates select-out. Therefore, if selection is attempted, the CTCA does not answer to its address.

The Chan-Chan Disabled indicator turns on to indicate that the CTCA is offline. The following conditions must be met to turn the Chan-Chan Disabled indicator on.

1. The CTCA is not operating with a channel (both op-in tags are down).
2. Neither of the connected channels is chaining commands.
3. Neither of the connected channels has waiting or stacked status.
4. Neither CTCA side has a control command waiting.

When the Chan-Chan Disabled indicator is on, the CTCA is not available to either connected channel. The CTCA remains offline until the Channel To Channel switch is operated again. Then the Chan-Chan Disabled indicator turns off, and the CTCA is online.

Interface Isolation

The host processor and the CTCA can be serviced while the CTCA is connected to the channels. When the CTCA is offline, circuits are activated that isolate the CTCA from both of the connected channels. Because of this isolation, the host system power can be on or off without affecting operations on the attached channels.

The CTCA interface connectors are near the normal channel interface connectors on gate 01H. The CTCA can be installed in any place on a 370 I/O Interface.

Power-On/Power-Off Sequence

To ensure isolation, the host system has the following hardware and controls when powering up or down:

1. A Channel To Channel switch and a Chan-Chan Disabled indicator.
2. Controls for the power sequencing of a +6V supply that isolates the CTCA from both of the 370 I/O Interfaces.
3. Controls for the select-out bypass relays.

These functions are performed in the following manner.

Enabling the CTCA when turning power on:

1. Press Power On/IML.
2. When the Chan-Chan Disabled indicator turns on, press the Channel To Channel switch.
3. Wait for the Chan-Chan Disabled indicator to turn off.

When turning off host processor power:

1. Press the Channel To Channel switch.
2. Wait for the Chan-Chan Disabled indicator to turn on.
3. Press Power Off.

Channel-To-Channel Adapter Test

The CTCA test operates between two channels on the host processor. The test resides on the diagnostic diskette. The CTCA test is used for installation verification of the CTCA and as an exerciser for later failure analysis. For more information, see Volume A06, Service Aids,

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START REPAIR PROCEDURE

Read the **Condition** column until you find a question that you can answer "yes" or a description that matches the condition you have. Then follow the instructions listed in the **Instructions** column.

Step	Condition	Instructions	Comments
1	Did a Problem Analysis (PA) message display while the customer was running?	Go to step 20.	Problem Analysis was run automatically.
2	Did the customer try to run PA option 1 for this problem?	• If PA option 1 did not run, go to step 4. • If PA option 1 ran correctly, go to step 20.	
3	Is your problem any of the following? • Convenience outlet • Switches • Service panel display • The message: SERIAL NOS DO NOT MATCH • Remote Support Facility • The General Selection (Q) screen displays during normal operation when it is not expected.	Go to "Nondetectable Problems" on page START 030.	
4	Go to the **Instructions** column.	1. Press RESET. 2. Press MODE SEL. 3. Go to step 5.	RESET and MODE SEL are on the system console keyboard.
5	Did the General Selection screen display?	1. Set the CE Mode switch to CE Mode. 2. Key in P, and press ENTER. 3. Go to step 18.	
6	Do you have the Basic Check indicator on **and** a two-digit power code?	Go to Volume A02, "Basic Power (Hardwire Sequence) Repair Procedure" on page PR 001.	The service panel indicates a power code if *only* the two rightmost digits are on.
7	Are *any* of the following indicators *off*? 24 Volt 5 Volt MBC On	Go to Volume A02, "Basic Power (Hardwire Sequence) Repair Procedure" on page PR 001.	The General Selection screen failed to display.
8	Do you have a five-digit MSS Code of 00000?	1. Ensure the CE Mode switch is in CE Mode. 2. Press the Power On switch on the service panel. 3. Allow 30 seconds for the MSS to power up. 4. Go to step 9.	Zeros are displayed in all five of the display positions on the service panel.
9	Do you have a two-digit Power Code?	Go to Volume A02, "Basic Power (Hardwire Sequence) Repair Procedure" on page PR 001.	The service panel indicates a power code if *only* the two rightmost digits are on.
10	Is the Partial Power screen displayed?	1. Key in UP, and press ENTER. 2. Allow time for the processor to power up. 3. Press MODE SEL. 4. Go to step 5.	
11	Is the Basic Check indicator *on*?	Set the CE Mode switch to Normal. If the Basic Check indicator stays on, go to "MSS Repair Procedure" on page MSS 001. If the Basic Check indicator goes off, go to step 12.	
12	Do you have a reference code with a UU field of 1x?	Go to "Processing Unit Power Repair Procedure" on page PR 1001.	Reference codes have a format of UU RRRR IS.
13	Do you have a reference code with a UU field of Fx?	Go to "MSS Repair Procedure" on page MSS 001.	Reference codes have a format of UU RRRR IS.
14	Is the Power In Process indicator on?	Go to "MSS Repair Procedure" on page MSS 001.	
15	Do you have an obvious problem with the keyboard or the screen image on your system console?	Go to the maintenance documentation for the system console.	
16	Do you have a five-digit MSS Code? (See **Comments**.)	Ensure the CE Mode switch is set to Normal. • If the MSS Code is 00000, go to Volume A02, "Basic Power (Hardwire Sequence) Repair Procedure" on page PR 001. • If the MSS Code is other than 00000, go to "MSS Repair Procedure" on page MSS 001.	Digits are displayed or are changing in all five of the display positions on the service panel.
17	Go to the **Instructions** column.	Go to Volume A02, "Basic Power (Hardwire Sequence) Repair Procedure" on page PR 001.	
18	Did the Problem Analysis screen display?	Go to "PA Options" on page START 005.	
19	Go to the **Instructions** column.	Go to "MSS Repair Procedure" on page MSS 001.	The Problem Analysis screen failed to display.
20	Go to the **Instructions** column.	1. Set the CE Mode switch to CE Mode. 2. Press MODE SEL. The General Selection screen displays. 3. Key in P2 and press ENTER. The PA Message History screen displays. 4. Find the run number for the time PA was run. 5. Key in the run number and an S. The correct format is: QP2xS where x is the run number and S selects the service option. 6. Press ENTER. The PA2 service option runs. 7. Follow the instructions on the screen.	The PA Option 2 screen displays the numbers of the message screens displayed during PA (if any). The PA2 service option analyzes the failure for you.

4381-3 B/M 2676380	MI Seq AE010	PN 6169428 1 of 1	EC A20558 01 Oct 84	EC A20559 03 Dec 84	EC A20562 30 Aug 85		

0 0 0

PA Options

You have been directed here because Problem Analysis (PA) was not run.

Step	Condition	Instructions	Comments
1	Are PA options 7, 8, and 9 displayed on the PA menu screen?	Go to step 4.	Selections 7 through 9 are displayed only in CE mode.
2	Do you have a reference code with a UU field of Fx?	Go to "MSS Repair Procedure" on page MSS 001.	Reference codes have a format of UU RRRR IS.
3	Go to the **Instructions** column.	Go to Volume A02, "Basic Power (Hardwire Sequence) Repair Procedure" on page PR 001.	The processor is not in CE mode.
4	Did the failure occur **less than** 24 hours ago?	1. Key in QP1 and press ENTER. PA option 1 runs. 2. Key in QP20S where 0 is the run number and S is for the service option. 3. Press ENTER. 4. Follow the instructions on the screen.	The PA2 service option analyzes the failure for you.
5	Go to the **Instructions** column. (The failure occurred **more than** 24 hours ago and the customer did not run PA option 1.)	1. Key in QP2TS and press ENTER. 2. Follow the instructions on the screen.	Problem Analysis checks the error log for the cause of the failure.

Running PA Option 8

Step	Condition	Instructions	Comments
1	Go to the **Instructions** column.	1. Ensure the FUNC1 diskette is in diskette drive 1. 2. Set the CE Mode switch to CE Mode. 3. Press MODE SEL. The General Selection screen displays. 4. Key in P, and press ENTER. The Problem Analysis Option screen displays. 5. Key in 8, and press ENTER. The first of two Problem Analysis FRU-Logs screens displays. 6. Compare the entries in the LOG TIME STAMP fields with the date and time that PA was run for this problem. (Use ENTER to go from one screen to the other.) 7. Go to step 2.	
2	Is the date and time that PA was run (for this problem) displayed in any of the LOG TIME STAMP entries?	1. Copy the PA log number (PAxx) for this problem. 2. Go to "PA Log Number" on page START 015.	
3	Go to the **Instructions** column. (You have no PA log number and there is no PA log at the time PA was run.)	Go to "Processing Unit Failure Isolation Procedure" on page PU 001, Entry Point A. Your condition is **no reference code**.	

Example of Problem Analysis FRU-Logs (QP8) Screen

```
                        *PROBLEM ANALYSIS FRU-LOGS*          page n of 2

LOG RECORD NUMBER          :      PA04          PA03          PA02
LOG TIME STAMP             :yy/mm/dd hh:mm:ss  yy/mm/dd hh:mm:ss  yy/mm/dd hh:mm:ss

PRIME FAILURE SEVERITY     : SYSTEM DAMAGE     CATASTROPHIC ERR  CATASTROPHIC ERR
PRIME REFERENCE CODE/EXT   :xxxxxxxx xxxxxxxx  xxxxxxxx xxxxxxxx  xxxxxxxx xxxxxxxx
REFERENCE CODES 2-3        :xxxxxxxx xxxxxxxx  xxxxxxxx xxxxxxxx  xxxxxxxx xxxxxxxx
REFERENCE CODES 4-5        :xxxxxxxx xxxxxxxx  xxxxxxxx xxxxxxxx  xxxxxxxx xxxxxxxx
PUA REFERENCE CODE/EXT     :xxxxxxxx-xxxxxxxx  xxxxxxxx-xxxxxxxx  xxxxxxxx-xxxxxxxx

FRU COUNT DISPLAY/TOTAL    :     02 04           00 08           00 00
FAILURE RESULT             .ISOLATED           INTERMITTENT    NO ISOLATION
FAILING TEST/CORELOAD-ID:    xxxx xx             xxxx xx         xxxx xx

FRU LOCATIONS (0-8 MAX)    :_______ _______  _______ _______  _______ _______
                            _______ _______  _______ _______  _______ _______
Q GEN SELECTION             _______ _______  _______ _______  _______ _______
Z RTN TO PROG SYS           _______ _______  _______ _______  _______ _______
 COMMAND: QP8

                                                        MORE, PRESS ENTER
```

Log Not Available Message

The PA2 service option directed you to this page because the PA log number (PAxx) you entered was not on PA8. Use the PA8 screen to find a valid PA log number.

Step	Condition	Instructions	Comments
1	Go to the **Instructions** column.	1. Key in QP8 and press ENTER. The first of two Problem Analysis FRU-Logs screens displays. 2. Find a valid PA log number on these screens. (Use ENTER to move from one screen to the other.) 3. Go to "PA Log Number" on page START 015.	Your original PA log number is not on the Problem Analysis FRU-Logs screens. This occurs if PA was run six times after the PA log number was reported, if the PA logs were cleared, or if the wrong PA number was reported. If PA was run again for the same problem, the same FRUs can be recorded in another PA number.

Example of Problem Analysis FRU-Logs (QP8) Screen

```
                      *PROBLEM ANALYSIS FRU-LOGS*               page n of 2

LOG RECORD NUMBER        :      PA04                PA03                PA02
LOG TIME STAMP           :yy/mm/dd hh:mm:ss   yy/mm/dd hh:mm:ss   yy/mm/dd hh:mm:ss

PRIME FAILURE SEVERITY   : SYSTEM DAMAGE      CATASTROPHIC ERR    CATASTROPHIC ERR
PRIME REFERENCE CODE/EXT:xxxxxxxx xxxxxxxx    xxxxxxxx xxxxxxxx   xxxxxxxx xxxxxxxx
REFERENCE CODES 2-3      :xxxxxxxx xxxxxxxx   xxxxxxxx xxxxxxxx   xxxxxxxx xxxxxxxx
REFERENCE CODES 4-5      :xxxxxxxx xxxxxxxx   xxxxxxxx xxxxxxxx   xxxxxxxx xxxxxxxx
PUA REFERENCE CODE/EXT   :xxxxxxxx-xxxxxxxx   xxxxxxxx-xxxxxxxx   xxxxxxxx-xxxxxxxx

FRU COUNT DISPLAY/TOTAL :      02 04               00 08               00 00
FAILURE RESULT           .ISOLATED            INTERMITTENT        NO ISOLATION
FAILING TEST/CORELOAD-ID:    xxxx xx             xxxx xx             xxxx xx

FRU LOCATIONS (0-8 MAX) :_______ _______     _______ _______     _______ _______
                         _______ _______     _______ _______     _______ _______
Q GEN SELECTION          _______ _______     _______ _______     _______ _______
Z RTN TO PROG SYS        _______ _______     _______ _______     _______ _______
 COMMAND: QP8

                                                          MORE, PRESS ENTER
```

PA Log Number

You have been directed here because you have a PA log number.

Step	Condition	Instructions	Comments
1	Go to the **Instructions** column.	1. Ensure the CE Mode switch is set to CE Mode. 2. Press MODE SEL. 3. Key in QP7PAxx, and press ENTER. The PA Log Part Numbers screen displays. (See **Comments.**) 4. Go to step 2.	PAxx is your PA log number. If you do not know the PA log number for this problem, use PA option 2 to display the PA messages.
2	Did the message INVALID INPUT display?	The PA log number you entered was not valid. The correct format is: **PAxx**, where xx has a value of 00 through FF. Go back to step 1 on this page and enter the PA log number again. (See **Comments.**)	If this message occurs again, call your support structure.
3	Did the message NO PA LOGS display?	• Ensure that the original FUNC1 diskette is installed. • If the original FUNC1 diskette is **not** installed, install the original FUNC1 and go back to step 1. • If the original FUNC1 diskette is installed, call your support structure for assistance on this problem.	There are no logs on the FUNC1 diskette. This occurs if the FUNC1 diskette was swapped with the backup diskette or if the PA logs were cleared.
4	Go to the **Instructions** column.	1. Follow the instructions on the screen. 2. Go to the Repair Procedure page displayed on the screen.	Abbreviations are used for the locations of some of the FRUs. See the list on this page for an explanation of the abbreviations.

Example of a PA Log Part Number (PA7) Screen

```
                              *PA LOG PART NUMBERS*
ACTION: *RECORD THIS REFERENCE CODE: UURRRRIS
*RECORD THE FRU LOCATION AND REPLACEMENT SEQUENCE,
          UNDERLINE ANY INTENSIFIED FRUS.
        *GO TO REPAIR PROCEDURE PR1001
                                 LOG ID NUMBER: PAxx
                       REPLACEMENT
                        SEQUENCE     LOCATION    P/N
                           01        XXXXXXX   NNNNNNN
                           02        XXXXXXX   NNNNNNN
                           03        XXXXXXX   NNNNNNN
                           04        XXXXXXX   NNNNNNN
                           05        XXXXXXX   NNNNNNN
                           06        XXXXXXX   NNNNNNN
                           07        XXXXXXX   NNNNNNN
                           08        XXXXXXX   NNNNNNN


COMMAND: QP7PAxx                 >
```

The meanings of the abbreviations used on the PA Log Part Numbers screen are:

01AA1BD	01A-A1 board
01AA2BD	01A-A2 board
01AA3BD	01A-A3 board
01AA4BD	01A-A4 board
01AB1BD	01A-B1 board
01AB2BD	01A-B2 board
01BA1BD	01B-A1 board
AFS-1xx	Airflow sensor 1xx (xx equals 01 through 07)
AIS-101	Air inlet sensor 101
AMD-1xx	Air moving device 1xx (xx equals 01 through 07)
DISKD0x	Diskette drive 0x (x equals 1 or 2).
INTLK0x	Interlock switch 0x (x equals 1 through 3)
PCCCP01	Primary control compartment circuit protector 01
PCCCB0x	Primary control compartment circuit breaker (x equals 1 or 2)
PCC-K0x	Primary control compartment contactor (x equals 1 through 4)
PS—1xx	Power supply 1xx (xx equals 01 through 12)
PS104Fx	Power supply 104 fuse x (x equals 1 through 9)

0 0 0

System Control Program or Program Product Message

If a message from the system control program or a program product is displayed in the program area of the screen (lines 1 through 20) or printed on the system printer, look up the message in the manual for your system.

If no message was displayed and Problem Analysis reported a program hard wait (MSG25), a message code was stored by the operating system. Use the message manual for your system to find the hard wait message.

SCP Message Manuals

DOS/VSE GC33-5379
VM370 GC20-1808
OS/VS GC38-1008
OS/VS1 GC38-1001
OS/VS2 GC38-1002

Step	Condition	Instructions	Comments
1	Does the message indicate an operational problem?	Report the problem to the customer. After the problem is resolved, go to "END Repair Procedure" on page END 001.	
2	Does the message indicate an I/O device or channel problem?	Go to "Channel Problem Isolation Procedure" on page CHAN 001, Entry Point A.	
3	You have not resolved the problem using the information provided by the program message manuals.	The message can result from a program check or a program problem. Call your support structure for assistance on this problem.	

FRU Replacement

You are here because you have FRUs to replace or a reference code.

Step	Condition	Instructions	Comments
1	Do you have a reference code with a UU field of 1x?	Go to Volume A03, "Processing Unit Power Repair Procedure" on page PR 1001.	Reference code format is: UU RRRR IS.
2	Do you have reference code with a UU field of EC?	Go to "Processing Unit Failure Isolation Procedure" on page PU 001.	Reference code format is: UU RRRR IS.
3	Do you have reference code with a UU field of Fx or ED?	Go to "MSS Repair Procedure" on page MSS 001.	Reference code format is: UU RRRR IS.
4	For any other problem.	Go to "Processing Unit Failure Isolation Procedure" on page PU 001, Entry Point A. Your symptom is FRU list.	

Step	Condition	Instructions	Comments
1	Do you have the wrong or missing output on the system console or is the console keyboard inhibited or not operational?	Go to step 16.	You have: Blank display Keyboard failure Messages that do not display Jitter Invalid or wrong characters.
2	Do you have the wrong or missing output on any of the other devices attached to the MSS?	Go to the maintenance document for the device.	Wrong output means the data is missing or not correct.
3	Does Power On/IML on the OCP or Power On on the service panel fail to power up the processor?	Go to "Basic Power (Hardwire Sequence) Repair Procedure" on page PR 001.	
4	Does Power On/IML fail to start an SP re-IML?	Go to "Basic Power (Hardwire Sequence) Repair Procedure" on page PR 001.	
5	Does the processor fail to sequence power **off** when Power Off is pressed?	Go to "Basic Power (Hardwire Sequence) Repair Procedure" on page PR 001.	
6	Do you have a channel-to-channel problem?	Go to "Channel Problem Isolation Procedure" on page CHNL 001, Entry Point A.	For information, see "Introduction."
7	Do you suspect a remote support adapter problem when using RSF?	Go to "MSS Repair" on page MSS 001.	
8	Are the I/O meters running all the time or not at all on any channel?	Go to "Channel Problem Isolation Procedure" on page CHNL 061, Entry Point A.	
9	Do you have a convenience outlet problem?	Go to "Basic Power (Hardwire Sequence) Repair Procedure" on page PR 001.	
10	Do you have service panel or OCP indicators that are on when they should be off or that do not come on?	Go to "Basic Power (Hardwire Sequence) Repair Procedure" on page PR 001.	You have an OCP or service panel indicator failure.
11	Do you have the message SERIAL NO. DO NOT MATCH?	Go to "MSS Repair" on page MSS 001.	
12	Do you have the wrong output on the service panel five-digit display?	Go to "Basic Power (Hardwire Sequence) Repair Procedure" on page PR 001.	
13	Is the console keyboard failing?	Go to the maintenance document for the system console.	
14	Did the customer report that the General Selection (G) screen displayed during normal operation? (MODE SEL was not pressed.)	Go to "MSS Repair" on page MSS 001.	The system continued to run but the customer had to press CHG DPLY to return to the normal operations screen.
15	Go to the **Instructions** column.	Go to "Intermittent MSS Problems" on page START 040.	
16	Was your original symptom a basic check?	Go to "MSS Repair Procedure" on page MSS 001.	Use the MSS Code recorded by the customer.
17	Was your *original* symptom the Power In Process indicator on?	Go to "MSS Repair" on page MSS 001.	
18	Was your *original* symptom one of the following? • System console unchanged after IPL; keyboard works correctly. • System appeared to be running; no messages appeared at the system console. • An alternate console was assigned by the system.	Go to "Channel Problem Isolation Procedure" on page CHNL 001, and test channel 0.	
19	Do you have the wrong or missing output or does the keyboard fail on the system console?	Go to the maintenance document for the system console. If you cannot find a problem with the console, assume you have a reference code with a UU field of F8 and go to page MSS 001.	

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Step	Condition	Instructions	Comments
1	Go to the **Instructions** column.	1. Ensure the CE Mode switch is set to CE Mode. 2. Press MODE SEL. 3. Key in QESE, and press ENTER. The first SP Event Counter screen displays. 4. Use the ALT and PAGE UP or PAGE DOWN keys to display the second screen. 5. Scan the DELTA fields for errors. 6. Go to step 2.	For more information, see Volume A07, Logs, "SP Event Counter Sceen."
2	Do you have more than three LCA retries?	1. Assume that a reference code of F2xxxxxx occurred. 2. Clear the DELTA fields. (See **Comments**.) 3. Go to "MSS Repair Procedure" on page MSS 001.	For instructions on clearing the DELTA fields, see step 9.
3	Do you have more than three SP parity errors?	1. Assume that a reference code of F1xxxxxx occurred. 2. Clear the DELTA fields. (See **Comments**.) 3. Go to "MSS Repair Procedure" on page MSS 001.	For instructions on clearing the DELTA fields, see step 9.
4	Do you have more than three DCA retries?	1. Assume that a reference code of F8xxxxxx occurred. 2. Clear the DELTA fields. (See **Comments**.) 3. Go to "MSS Repair Procedure" on page MSS 001.	For instructions on clearing the DELTA fields, see step 9.
5	Do you have more than three SP resets?	1. Assume that a reference code of F0xxxxxx occurred. 2. Clear the DELTA fields. (See **Comments**.) 3. Go to "MSS Repair Procedure" on page MSS 001.	For instructions on clearing the DELTA fields, see step 9.
6	Do you have more than three DDA retries?	1. Assume that a reference code of F5xxxxxx occurred. 2. Clear the DELTA fields. (See **Comments**.) 3. Go to "MSS Repair Procedure" on page MSS 001.	For instructions on clearing the DELTA fields, see step 9.
7	Do you have more than three SBA retries?	1. Assume that a reference code of FDxxxxxx occurred. 2. Clear the DELTA fields. (See **Comments**.) 3. Go to "MSS Repair Procedure" on page MSS 001.	For instructions on clearing the DELTA fields, see step 9.
8	Do you have more than three PCA retries?	1. Assume that a reference code of F6xxxxxx occurred. 2. Clear the DELTA fields. (See **Comments**.) 3. Go to "MSS Repair Procedure" on page MSS 001.	For instructions on clearing the DELTA fields, see step 9.
9	Go to the **Instructions** column.	1. Ensure the CE Mode switch is set to CE Mode. 2. Key in QESER, and press ENTER. 3. When prompted, key in QESER and press ENTER again. The DELTA fields are reset to zero (0). 4. Call your support structure for assistance.	

Example of the SP Event Counters Screens

```
*ERROR LOG DISPLAY*          *SP EVENT COUNTERS*
     0  TOTAL POWER ON HOURS              CURRENT TODC EQUIV: yy/mm/dd hh mm ss
     0  DELTA POWER ON HOURS            LAST RESET TODC EQUIV:
 TOTAL  DELTA                             TOTAL  DELTA
     0      0 TIMES POWERED ON               0      0 TIMES POWERED OFF
     0      0 POWER FAULTS                   0      0 HOURS IN CE MODE
     0      0 HOURS IN DIAGNOSTIC MODE
     0      0 SP PARITY ERR HARD RECOV       0      0 SP PARITY ERR HARD UNREC
     0      0 SP PARITY ERR SOFT RECOV       0      0 SP PARITY ERR SOFT UNREC

     0      0 SP REIML                       0      0 AUTO SP-REIML
     0      0 SP RESETS                      0      0 AUTO SP-RESET

     0      0 SUCCESSFUL LCA RETRY           0      0 UNSUCCESSFUL LCA RETRY
     0      0 LCA CYCLE STEAL ERROR

     0      0 SUCCESSFUL DCA RETRY           0      0 UNSUCCESSFUL DCA RETRY
     0      0 DCA CYCLE STEAL ERROR

  COMMAND: QESE                                    ==>
```

```
*ERROR LOG DISPLAY*          *SP EVENT COUNTERS*
     0  TOTAL POWER ON HOURS              CURRENT TODC EQUIV: yy/mm/dd hh mm
     0  DELTA POWER ON HOURS            LAST RESET TODC EQUIV: yy/mm/dd hh mm
 TOTAL  DELTA                             TOTAL  DELTA
     0      0 SUCCESSFUL CCA RETRY           0      0 UNSUCCESSFUL CCA RETRY

     0      0 SUCCESSFUL DDA RETRY           0      0 UNSUCCESSFUL DDA RETRY
     0      0 DDA CYCLE STEAL ERROR

     0      0 SUCCESSFUL PCA RETRY           0      0 UNSUCCESSFUL PCA RETRY

     0      0 SUCCESSFUL SBA RETRY           0      0 UNSUCCESSFUL SBA RETRY

     0      0 PU-IML XA-MODE                 0      0 PU-IML S370
     0      0 PU-IPL
     0      0 PU  SUCCESSFUL RETRY           0      0 PU  UNSUCCESSFUL RETRY
     0      0 PU1 SUCCESSFUL RETRY           0      0 PU1 UNSUCCESSFUL RETRY

  COMMAND: QESE                                    ==>
```

PROCESSING UNIT PROBLEM ISOLATION PROCEDURE

ENTRY POINTS

From Repair Procedure	Entry Point	Page Number	Procedure Title
START	A	PU 001	Processing Unit Failure Isolation
PA OPT 7	A	PU 001	Processing Unit Failure Isolation

**** ENTRY POINT A ****

The purpose of this Repair Procedure is to guide in processing unit problem isolation.

Processing Unit Failure Isolation

Note: If the following **Required Actions** do not produce the **Expected Results**, go to "START Repair Procedure" on page START 001 with the new symptom.

Step	Condition	Instructions
1	If you came to the account **with** parts on a deferred call (MSG1C) and the customer has been able to run since the failure:	Go to "Intermittent Failure Analysis" on PU 043 entry point B.
2	If **not:**	Continue with this Repair Procedure.

Required Actions	Expected Results
1. Ensure that the FUNC1 diskette is installed in diskette drive 1.	
2. Ensure that the CE Mode switch is set to CE Mode.	
3. Press the MODE SEL key.	The General Selection screen is displayed.
4. Key in G, and press the ENTER key.	The Diagnostic Mode PU Diagnostic Selection screen is displayed.
5. Key in I, and press the ENTER key.	This selects the Isolate Failure option.
6. Follow the directions displayed on the screen.	Diagnostic tests run.
7. Wait for the results from the diagnostics being run.	

Step	Condition	Instructions
3	Is a repair procedure indicated on the screen?	Record the reference code, extension, and FRU list on a paper pad. Go to the indicated Repair Procedure.
4	If **not:**	It is recommended that you invoke your support structure. Go to "END Repair Procedure" on page END 001.

Processing Unit FRU Exchange Procedure

ENTRY POINTS

From Repair Procedure	Entry Point	Page Number	Procedure Title
PU DIAGS	A	PU 041	FRU Exchange
PA OPT 7	A	PU 041	FRU Exchange
PU DIAGS	B	PU 043	Intermittent Failure Analysis
PU 001	B	PU 043	Intermittent Failure Analysis
PA OPT 7	B	PU 043	Intermittent Failure Analysis
PU DIAGS	D	PU 044	FRU Removal
PU 051	F	PU 042	Processing Unit Fix Verification
CHNL 021	F	PU 042	Processing Unit Fix Verification

The purpose of this Repair Procedure is to guide in processing unit FRU exchange.

***** ENTRY POINT A *****

FRU Exchange

Always exchange FRU(s) in the order they are listed in your FRU list.

Circle the FRU(s) in the FRU list that you are going to exchange.

Note: Unless you have been instructed to exchange more than one FRU by another repair procedure or your support structure, exchange only one FRU at a time.

Step	Condition	Instructions
1	Is the FRU (or the last one exchanged) located on the 01A-A1 or 01A-A2 board?	Go to "Complete System Power Down FRU Exchange" on page PU 042.
2	If **not:**	Go to "Partial Power Down FRU Exchange" on this page.

Partial Power Down FRU Exchange

Warning: Damage will result if cards or modules are removed or installed with power ON. For more information on FRU removal and exchange, refer to Volume A07, Removals and Replacements.

Note: If the following **Required Actions** do not produce the **Expected Results**, go to "START Repair Procedure" on page START 001 with the new symptom.

	Required Actions	Expected Results
1.	Ensure that the I/O Power Hold switch is set to I/O Power Hold.	
2.	Press the MODE SEL key.	The General Selection screen is displayed.
3.	Key in QWW, and press the ENTER key.	The Power Up/Down screen is displayed.
4.	Key in DP, and press the ENTER key.	PROCESSOR STATUS: POWER IS OFF is displayed.
5.	Remove the last FRU exchanged (if any) and reinstall the **original** FRU before exchanging the next FRU.	
6.	Inspect the card or module to be installed for bent, broken, or dirty pins. Exchange or repair the card or module if any damage is found.	
7.	Exchange the circled FRU(s) in the FRU list.	
8.	Key in UC, and press the ENTER key.	PROCESSOR STATUS: POWER IS ON is displayed. I/O STATUS: POWER IS ON is displayed.
9.	Go to "Processing Unit Fix Verification" on page PU 042, Entry Point F.	

Complete System Power Down FRU Exchange

Warning: Damage will result if cards or modules are removed or installed with power ON. For more information on FRU removal and exchange, refer to Volume A07, Removals and Replacements.

Note: If the following **Required Actions** do not produce the **Expected Results**, go to "START Repair Procedure" on page START 001 with the new symptom.

	Required Actions	Expected Results
1.	Ensure that the CE Mode switch is set to CE Mode.	
2.	Ensure that the I/O Power Hold switch is set to I/O Power Hold.	
3.	Press the Power Off key.	The Power In Process indicator turns OFF.
4.	Remove the last FRU exchanged (if any) and reinstall the **original** FRU before exchanging the next FRU.	
5.	Inspect the card or module to be installed for bent, broken, or dirty pins. Exchange or repair the card or module if any damage is found.	
6.	Exchange the circled FRU(s) in the FRU list.	
7.	Press the Power On pushbutton on the service panel.	The Local Time/Date screen is displayed.
8.	Key in the correct time and date, and press the ENTER key.	The Power Up/Down screen is displayed.
9.	Key in UC, and press the ENTER key.	PROCESSOR STATUS: POWER IS ON is displayed. I/O STATUS: POWER IS ON is displayed.
10.	Go to "Processing Unit Fix Verification," Entry Point F on this page.	

*** ENTRY POINT F ***

Processing Unit Fix Verification

Note: If the following **Required Actions** do not produce the **Expected Results**, go to "START Repair Procedure" on page START 001 with the new symptom.

	Required Actions	Expected Results
1.	Ensure that the FUNC1 diskette is installed in diskette drive 1.	
2.	Ensure that the CE Mode switch is set to CE Mode.	
3.	Press the MODE SEL key.	The General Selection screen is displayed.
4.	Key in G, and press the ENTER key.	The Diagnostic Mode PU Diagnostic Selection screen is displayed.
5.	Key in V, and press the ENTER key.	This selects the Fix Verify option.
6.	Follow the directions displayed on the screen.	

** ENTRY POINT B **

Intermittent Failure Analysis

The problem cannot be recreated by the diagnostics or is a deferred call.

FRU(s) that are **intensified**, or FRU(s) obtained from the **QP7** Problem Analysis screen, have a probability of 90% or more of fixing the failure.

Before exchanging FRUs, check the Account Management Log and any other source of problem history for this processor. Look for previous incidents with similar symptoms.

Step	Condition	Instructions
3	Are there previous incidents with similar symptoms and/or FRUs listed?	1. It is recommended that you inform your support structure of this repeated intermittent failure. 2. If you are instructed to continue exchanging FRUs, go to "FRU Exchange" on page PU 041, Entry Point A.
4	If **not:**	1. This is the first reported occurrence of this intermittent failure on this processor. 2. Depending on parts availability, you should exchange all of the **intensified** FRU(s) in the FRU list, or FRU(s) from the **QP7** Problem Analysis screen, **at the same time.** **Note:** If **no** FRUs are intensified, it is recommended that you invoke your support structure for assistance in isolating this failure. If this is not possible, exchange **only** the first FRU. 3. Go to "FRU Exchange" on page PU 041, Entry Point A.

*** ENTRY POINT D ***

FRU Removal

The purpose of this procedure is to restore the processing unit to its original condition before invoking your support structure.

Warning: Damage will result if cards or modules are removed or installed with power ON. For more information on FRU removal and exchange, refer to Volume A07, Removals and Replacements.

Note: If the following **Required Actions** do not produce the **Expected Results**, go to "START Repair Procedure" on page START 001 with the new symptom.

	Required Actions	Expected Results
1.	Record all of the information displayed on the screen.	
2.	Ensure that the I/O Power Hold switch is set to I/O Power Hold.	
3.	Press the Power Off key.	The Power In Process indicator turns OFF.
4.	Inspect the card or module to be reinstalled for bent, broken, or dirty pins. Exchange or repair the card or module if any damage is found.	
5.	Remove the last FRU exchanged and reinstall the **original** FRU.	
6.	Press the Power On pushbutton on the service panel.	The Local Time/Date screen is displayed.
7.	Key in the correct time and date, and press the ENTER key.	The Power Up/Down screen is displayed.
8.	Key in UC, and press the ENTER key.	PROCESSOR STATUS: POWER IS ON is displayed. I/O STATUS: POWER IS ON is displayed.
9.	**Invoke your support structure** for assistance with this failure.	
10.	Go to "END Repair Procedure" on page END 001.	

Scan Ring Problem Isolation Procedure

ENTRY POINTS

From Repair Procedure	Entry Point	Page Number	Procedure Title
PU DIAGS	A	PU 051	FRU Exchange and Power-On Sequencing
PA OPT 7	A	PU 051	FRU Exchange and Power-On Sequencing
PU DIAGS	B	PU 052	Intermittent Failure Analysis
PA OPT 7	B	PU 052	Intermittent Failure Analysis

The purpose of this Repair Procedure is to isolate processing unit scan ring problems by using the Power-On sequencing.

**** ENTRY POINT A ****

FRU Exchange and Power-On Sequencing

Always exchange FRU(s) in the order they are listed in your FRU list.

Circle the FRU(s) in the FRU list that you are going to exchange. Unless otherwise specified, exchange only one FRU at a time.

Warning: Damage will result if cards or modules are removed or installed with power ON. For more information on FRU removal and exchange, refer to Volume A07, Removals and Replacements.

Note: If the following **Required Actions** do not produce the **Expected Results**, go to "START Repair Procedure" on page START 001 with the new symptom.

	Required Actions	Expected Results
1.	Ensure that the CE Mode switch is set to CE Mode.	
2.	Ensure that the I/O Power Hold switch is set to I/O Power Hold.	
3.	Press the Power Off key.	Power In Process indicator turns OFF.
4.	Remove the last FRU exchanged (if any) and reinstall the **original** FRU before exchanging the next FRU.	
5.	Inspect the card or module to be installed for bent, broken, or dirty pins. Exchange or repair the card or module if any damage is found.	
6.	Exchange the circled FRU(s) in the FRU list.	
7.	Press the Power On pushbutton on the service panel.	The Local Time/Date screen is displayed.
8.	Key in the correct time and date, and press the ENTER key.	The Power Up/Down screen is displayed.
9.	Key in UC, and press the ENTER key.	PROCESSOR STATUS: POWER IS ON is displayed. I/O STATUS: POWER IS ON is displayed. The expected failure is a reference code (uurrrris) with an **IS** field equal to 2E or 2F.

Step	Condition	Instructions
1	Is a Reference Code displayed on the screen?	Go to step 3.
2	If **not:**	You have had a correct power-up sequence after problem FRU exchange. Go to *Processing Unit Fix Verification* on page PU 042, Entry Point F.
3	Have all of the FRUs been exchanged?	You have reached a point where you have one of the following conditions. 1. You have a board or cable problem. 2. A possible bad card or module from supplies is causing the same or similar failure. If possible, try exchanging the same FRUs. It is recommended that you invoke your support structure. Go to "END Repair Procedure" on page END 001.
4	If **not:**	The FRU you exchanged did not fix the problem. You will have to continue with the FRU exchange procedures using the next FRU in the FRU list. Go to "FRU Exchange and Power-On Sequencing," Entry Point A on this page.

*** ENTRY POINT B ***

Intermittent Failure Analysis

The problem cannot be recreated by the diagnostics.

The FRU(s) that are **intensified** have a probability of 90% or more of fixing the failure.

Before exchanging FRUs, check the Account Management Log and any other source of problem history for this processor. Look for previous incidents with similar symptoms.

Step	Condition	Instructions
5	Are there previous incidents with similar symptoms and/or FRUs listed?	1. It is recommended that you inform your support structure of this repeated intermittent failure. 2. If you are instructed to continue exchanging FRUs, go to FRU Exchange and Power-On Sequencing on page PU 051, Entry Point A.
6	If **not:**	1. This is the first reported occurrence of this intermittent failure on this processor. 2. Depending on parts availability, you should exchange all of the **intensified** FRU(s) in the FRU list **at the same time.** 3. When **no** FRUs are intensified, exchange **only** the first FRU. 4. Go to "FRU Exchange and Power-On Sequencing" on page PU 051, Entry Point A.

CHANNEL PROBLEM ISOLATION PROCEDURE

ENTRY POINTS

From Repair Procedure	Entry Point	Page Number	Procedure Title
START	A	CHNL 001	Test Processing Unit Hardware

The purpose of this Repair Procedure is to analyze Channel errors.

**** ENTRY POINT A ****

Test Processing Unit Hardware

Note: If the following **Required Actions** do not produce the **Expected Results**, go to "START Repair Procedure" on page START 001 with the new symptom.

	Required Actions	Expected Results
1.	Ensure that the FUNC1 diskette is installed in diskette drive 1.	
2.	Ensure that the CE Mode switch is set to CE Mode.	
3.	Press the MODE SEL key.	The General Selection screen is displayed.
4.	Key in G, and press the ENTER key.	The Diagnostic Mode PU Diagnostic Selection screen is displayed.
5.	Key in I, and press the ENTER key.	This selects the Isolate Failure option.
6.	Follow the directions displayed on the screen.	Diagnostic tests run.
7.	Wait for the results from the diagnostics being run.	

Step	Condition	Instructions
1	Is a reference code displayed on the screen?	Record the reference code and FRUs for use later. Then go to the indicated repair procedure.
2	If **not:**	Go to "Cable Wrap Test Setup" on this page.

Cable Wrap Test Setup

Step	Condition	Instructions	Comments
3	Is a Channel Switching Unit attached to the channel being tested?	Install the Cable Wrap Terminators, BUS (part 8483772) and TAG (part 8483773), in the channel side BUS/TAG OUT I/O connector positions of the switching unit. Go to "Running the Cable Wrap Test" on page CHNL 002.	For more information, use the attached switching unit's maintenance documentation.
4	If **not:**	Find the standard channel terminators on the suspected channel and exchange them with the Cable Wrap Terminators, BUS (part 8483772) and TAG (part 8483773). Go to "Running the Cable Wrap Test" on page CHNL 002.	

Running the Cable Wrap Test

Note: While running the Cable Wrap Test, false errors may be sensed if operator action causes interrupts on the channel.

Note: If the following **Required Actions** do not produce the **Expected Results**, go to "START Repair Procedure" on page START 001 with the new symptom.

	Required Actions	Expected Results
1.	Ensure that the FUNC1 diskette is installed in diskette drive 1.	
2.	Ensure that the DIAG1 diskette is installed in diskette drive 2.	
3.	Ensure that the CE Mode switch is set to CE Mode.	
4.	Press the MODE SEL key.	The General Selection screen is displayed.
5.	Key in G, and press the ENTER key.	The Diagnostic Mode PU Diagnostic Selection screen is displayed.
6.	Key in C, and press the ENTER key.	
7.	Key in a 0 or 1 for the failing processor, and press the ENTER key.	Channel tests are loaded; then the Special Channel Tests Selection screen is displayed.
8.	Key in 02, and press the ENTER key.	Instructions are displayed on the screen.
9.	Follow the displayed instructions.	

Step	Condition	Instructions
5	Did the Channel Cable Wrap Test sense a failure?	Go to "Cable Wrap Test Failure Isolation" on page CHNL 031, Entry Point B.
6	If **not:**	Go to "Running the Channel Microcoded Device Exerciser" on this page.

Running the Channel Microcoded Device Exerciser

Use the following procedure to run the Channel Microcoded Device Exerciser (CMDE) on the suspected channel.

For additional information, see Volume A07, Diagnostics, "Channel Microcoded Device Exerciser (CMDE)."

Note: If the following **Required Actions** do not produce the **Expected Results**, go to "START Repair Procedure" on page START 001 with the new symptom.

	Required Actions	Expected Results
1.	Return all standard channel terminators to their original locations on the channels.	
2.	Ensure that the DIAG1 diskette is installed in diskette drive 2.	
3.	Ensure that the CE Mode switch is set to CE Mode.	
4.	Press the MODE SEL key.	The General Selection screen is displayed.
5.	Key in G, and press the ENTER key.	The Diagnostic Mode PU Diagnostic Selection screen is displayed.
6.	Key in C, and press the ENTER key.	
7.	Key in a 0 or 1 for the failing processor, and press the ENTER key.	Channel tests are loaded; then the Special Channel Tests Selection screen is displayed.
8.	Key in 01, and press the ENTER key.	Instructions are displayed on the screen.
9.	Follow the displayed instructions.	

Step	Condition	Instructions
7	Did the CMDE sense a failure?	Using the device maintenance package and CMDE, attempt to solve the problem. If you require assistance, go to "END Repair Procedure" on page END 001.
8	If **not:**	This is either an **intermittent** failure, or a failure inside the I/O device. Using the device maintenance package and/or information from the IFCC logs (Selection QEI from the General Selection screen), attempt to correct the problem. Go to "END Repair Procedure" on page END 001.

Channel Hot Tag Failure Isolation Procedure

ENTRY POINTS

From Repair Procedure	Entry Point	Page Number	Procedure Title
PU DIAGS	A	CHNL 021	Channel Error Analysis

The purpose of this Repair Procedure is to analyze channel errors that are associated with diagnostic reference codes.

**** ENTRY POINT A ****

Channel Error Analysis

Step	Condition	Instructions
1	Do you have a diagnostic reference code (60xxxx9x)?	Go to the chart below to determine the failing channel.
2	If **not:**	Do the following: 1. Press the MODE SEL key. 2. Type in QP8, then press ENTER. 3. Record the PUA Reference Code and extension field in the log under the PAxx number you are working with. 4. Go to the chart below to determine the failing channel.

Using the chart below, find the channel that is failing. Write the channel number on the paper pad.

Reference Code	Extension Field	Channel
60xxxx9x	xxxxxx10	0
60xxxx9x	xxxxxx20	1
60xxxx9x	xxxxxx30	2
60xxxx9x	xxxxxx40	3
60xxxx9x	xxxxxx50	4
60xxxx9x	xxxxxx60	5
60xxxx9x	xxxxxx70	6
60xxxx9x	xxxxxx80	7
60xxxx9x	xxxxxx90	8

Note: The error may be in a cable, control unit or LCA.

Note: If the following **Required Actions** do not produce the **Expected Results**, go to "START Repair Procedure" on page START 001 with the new symptom.

	Required Actions	Expected Results
1.	Remove the BUS and TAG I/O cables from the failing channel at the channel tailgate. (Refer to the decal by the 01E gate for the proper location.)	
2.	Move the standard terminators from the last control unit on the failing channel to the channel tailgate.	
3.	Ensure that the FUNC2 diskette is installed in diskette drive 2.	
4.	Ensure that CE Mode switch is set to CE Mode.	
5.	Press the MODE SEL key.	The General Selection screen is displayed.
6.	Key in G, and press the ENTER key.	The Diagnostic Mode PU Diagnostic Selection screen is displayed.
7.	Key in F, and press the ENTER key.	The Field Support Center screen is displayed.
8.	Press the ENTER key **twice**.	The system requests START TEST ID.
9.	Key in Z4, and press the ENTER key.	Run time is about 2 minutes. Normal end is indicated by an END of MSMDs message. A reference code (uurrrris) with a **UU** field equal to 6X is the expected failure indication. **Ignore any repair procedure direction on the screen and continue at step 3 below.**

Step	Condition	Instructions
3	Is a reference code displayed on the screen?	The error is inside the processor. It is possible that you have a bad channel terminator. Use the current diagnostic FRU list, and add the channel terminators to the FRU list. Go to "FRU Exchange" on page PU 041, Entry Point A.
4	If **not:**	Go to "Running the Cable Wrap Test" on page CHNL 022.

Running the Cable Wrap Test

The error was not found with the cables disconnected.

The problem may be with a control unit or cable associated with the failing channel, or it may be **intermittent**.

A special test, Cable Wrap Test, will now be run to check the cables.

Note: While running the Cable Wrap Test, false errors may be sensed if operator action causes interrupts on the channel.

Note: If the following **Required Actions** do not produce the **Expected Results**, go to "START Repair Procedure" on page START 001 with the new symptom.

	Required Actions	Expected Results
1.	Remove the standard terminators at the channel tailgate of the failing channel. Reinstall the BUS and TAG I/O cables of the failing channel in their original location.	
2.	Install the special wrap terminators, BUS (part 8483772) and TAG (part 8483773), in place of the standard terminators in the last control unit on the failing channel.	
3.	Ensure that the DIAG1 diskette is installed in diskette drive 2.	
4.	Ensure that the CE Mode switch is set to CE Mode.	
5.	Press the MODE SEL key.	The General Selection screen is displayed.
6.	Key in G, and press the ENTER key.	The Diagnostic Mode PU Diagnostic Selection screen is displayed.
7.	Key in C, and press the ENTER key.	
8.	Key in a 0 or 1 for the failing processor, and press the ENTER key.	Channel tests are loaded; then the Special Channel Tests Selection screen is displayed.
9.	Key in 02, and press the ENTER key.	Instructions for CWT are displayed.
10.	Follow the displayed instructions.	

Step	Condition	Instructions
5	Does the Cable Wrap Test indicate a failure?	Go to "Cable Wrap Test Failure Isolation" on page CHNL 031, Entry Point B.
6	If **not:**	Go to "Intermittent Cable Errors" on this page.

Intermittent Cable Errors

The failure was not sensed by the Cable Wrap Test.

This indicates that no TAG or BUS lines have been found to be bad.

The problem may be inside one of the control units on the channel, or it may be **intermittent**.

Using the Cable Wrap Test as an exerciser, see if the failure is caused by loose cables or connectors along the interface.

Step	Condition	Instructions
7	Can you locate the problem?	Repair the cables or connectors; then ensure that the cable(s) and terminator(s) are returned to their original positions. Go to "END Repair Procedure" on page END 001.
8	If **not:**	Reinstall the standard terminators on the last control unit. It is recommended that you invoke your support structure. Go to "END Repair Procedure" on page END 001.

Channel Cable Wrap Failure Isolation Procedure

ENTRY POINTS

From Repair Procedure	Entry Point	Page Number	Procedure Title
CHNL 022	B	CHNL 031	Cable Wrap Test Failure Isolation

The purpose of this Repair Procedure is to analyze Channel errors that are associated with failures detected while running the Cable Wrap Test.

**** ENTRY POINT B ****

Cable Wrap Test Failure Isolation

The Cable Wrap Test has sensed an error in the cable path. (This is often caused by a bad connection.)

Disconnect the failing channel interface cable(s) at the channel tailgate, and install the special TAG and BUS Wrap terminator(s).

Note: Each time the special TAG and BUS Wrap terminator(s) are installed, inspect the cable(s), wrap terminator(s) and tailgate for any bent, broken or missing pins.

Follow the directions on the screen to display the Cable Wrap Test screen, and **rerun the Cable Wrap Test.**

Step	Condition	Instructions
1	Does the Cable Wrap Test indicate a failure?	Follow instructions on the screen to exit the Cable Wrap Test. Go to "Tailgate Failure Isolation" on page CHNL 033.
2	If **not:**	To isolate the failing cable, connector, or control unit, remove the special TAG and BUS Wrap terminators from the failing channel at the tailgate and reinstall the interface cables. Go to "Moving the Wrap Terminators" on this page.

Moving the Wrap Terminators

Locate the next control unit on the channel in the direction outward from the processor.

If this is the last control unit on the channel, remove the standard terminators. Otherwise, disconnect the outbound TAG and BUS cables.

Install the special TAG and BUS terminators in their place.

Note: If this channel has a Channel to Channel Adapter (CTCA) on it, start by removing the BUS OUT and TAG OUT cables from the 01H gate, positions A3 and A4. Install the special TAG and BUS terminators in their place.

Follow the directions on the screen to display the Cable Wrap Test screen and **rerun the Cable Wrap Test.**

Step	Condition	Instructions
3	Does the Cable Wrap Test indicate a failure?	Either the channel interface cables between the terminated control unit and last control unit that ran error free, or the terminated control unit, is causing the failure. Go to "Cable Checkout" on page CHNL 032.
4	Are the special TAG and BUS Wrap terminators installed in the last control unit on the failing channel?	There is no longer a failure on this channel. Remove the special TAG and BUS Wrap terminators and install the standard terminators. Exchange the standard terminators if the problem continues. Go to "END Repair Procedure" on page END 001.
5	If **not:**	Remove the special terminators and reinstall the cables. Go to "Moving the Wrap Terminators" on page CHNL 031.

Cable Checkout

Remove the interface cables from the failing control unit, and connect the special TAG and BUS terminators directly to the inbound cables.

Note: If the failing unit is a Channel to Channel Adapter (CTCA), the inbound cables are on the 01H gate, positions A1 and A2.

Follow the directions on the screen to display the Cable Wrap Test screen, and **rerun the Cable Wrap Test.**

Step	Condition	Instructions
6	Does the Cable Wrap Test indicate a failure?	The channel interface cables that have the cable wrap terminators connected directly to them are causing the failure. Repair the failing cables. Go to "Verify Cable Repair" on this page.
7	If **not:**	The last control unit to be terminated is the probable cause of the channel failure. 1. Reinstall the channel interface cable(s) and terminators in their original location. 2. Ensure that the standard terminators are in the last control unit of the failing channel. 3. The repair action for the failing control unit should be performed following the maintenance package of that control unit. If the failing unit is a Channel to Channel Adapter, see the "Channel to Channel Adapter (CTCA)" section of Volume A06, Service Aids to isolate the failure. 4. Go to "END Repair Procedure" on page END 001.

Verify Cable Repair

Return the cables to their original positions.

Place the special terminators at the last control unit.

Follow the directions on the screen to display the Cable Wrap Test screen, and **rerun the Cable Wrap Test.**

Step	Condition	Instructions
8	Does the Cable Wrap Test indicate a failure?	A failure occurred during the verifying test. Go to "Cable Wrap Test Failure Isolation" ON PAGE CHNL 031, ENTRY POINT B.
9	If **not:**	The repair has been verified. Exchange the special terminators with the standard terminators. Go to "END Repair Procedure" on page END 001.

Tailgate Failure Isolation

The error is inside the processing unit.

The following chart has the Interface Adapter cards listed by channel assignment.

Chan Number	PU0 IFA Cards	PU1 IFA Cards
0	01A-A3K2	01B-A1K2
1	01A-A3E2	01B-A1E2
2	01A-A3F2	01B-A1F2
3	01A-A3G2	01B-A1G2
4	01A-A3H2	01B-A1H2
5	01A-A3J2	01B-A1J2
6	01A-A3P2	01B-A1P2
7	01A-A3Q2	01B-A1Q2
8	01A-A3R2	01B-A1R2

Using the above chart, **do one of the following:**

1. If you have a new Channel Interface Adapter card with you, use the following procedure to exchange the card for the failing channel.
2. Otherwise, use the following procedure to swap the Channel Interface Adapter card for the failing channel with a card for another channel.

   Note: **Do not** use the CHAN 0 Interface Adapter card for swapping, unless CHAN 0 is the failing channel.

Go to "Exchange of the Failing Interface Adapter Card" on this page.

Exchange of the Failing Interface Adapter Card

Warning: Damage will result if cards or modules are removed or installed with power ON. For more information on FRU removal and exchange, refer to Volume A07, Removals and Replacements.

Note: If the following **Required Actions** do not produce the **Expected Results**, go to START Repair on page START 001 with the new symptom.

	Required Actions	Expected Results
1.	Ensure that the I/O Power Hold switch is set to I/O Power Hold.	
2.	Press the MODE SEL key.	The General Selection screen is displayed.
3.	Key in QWW, and press the ENTER key.	Power Up/Down screen is displayed.
4.	Key in DP, and press the ENTER key.	PROCESSOR STATUS: POWER IS OFF is displayed.
5.	Ensure that there are no bent, broken, or dirty pins on the card to be exchanged.	
6.	Exchange or swap the failing channel Interface Adapter card.	
7.	Key in UC, and press the ENTER key.	PROCESSOR STATUS: POWER IS ON is displayed. I/O STATUS: POWER IS ON is displayed.
8.	Go to "Verify Fix of Interface Adapter" on page CHNL 034.	

Verify Fix of Interface Adapter

Note: If the following **Required Actions** do not produce the **Expected Results**, go to "START Repair Procedure" on page START 001 with the new symptom.

	Required Actions	Expected Results
1.	Ensure that the DIAG1 diskette is installed in diskette drive 2.	
2.	Ensure that the CE Mode switch is set to CE Mode.	
3.	Press the MODE SEL key.	The General Selection screen is displayed.
4.	Key in G, and press the ENTER key.	The Diagnostic Mode PU Diagnostic Selection screen is displayed.
5.	Key in C, and press the ENTER key.	
6.	Key in a 0 or 1 for the failing processor, and press the ENTER key.	Channel tests are loaded; then the Special Channel Tests Selection screen is displayed.
7.	Key in 02, and press the ENTER key.	Instructions for CWT are displayed.
8.	Follow the directions to rerun the Cable Wrap Test.	

Step	Condition	Instructions
10	Does the Cable Wrap Test indicate a failure?	You may have a bad terminator, a bad cable, a bad 01A-A3 board (PU0), or a bad 01B-A1 board (PU1). Use the "Channel Failure Isolation" procedure in Volume A06, Service Aids to isolate the failure. If you require assistance with this problem, invoke your support structure. Go to "END Repair Procedure" on page END 001.
11	If **not:**	You have had a good diagnostic run after a problem FRU exchange or swap. Go to step 12.
12	Did you exchange the failing Interface Adapter Card with a **new** FRU?	You have repaired the failure. **Return all standard channel terminators and cables to their original locations.** Follow the instructions on the screen to exit from the Cable Wrap Test. Go to END Repair on page END 001.
13	If **not:**	Key in E, and press the ENTER key. (**Do not** remove the wrap terminators). Exit the Special Channel Tests following the screens instructions. Obtain a new FRU for the failing Interface Adapter Card. Return the swapped cards to their original locations, and exchange the failing card by going to "Exchange of the Failing Interface Adapter Card" on page CHNL 033.

End Channel Problem Isolation Procedure

ENTRY POINTS

From Repair Procedure	Entry Point	Page Number	Procedure Title
PU DIAGS	A	CHNL 051	End Channel Isolation

The purpose of this Repair Procedure is to restore the processor to its original condition before seeking assistance.

ENTRY POINT A

End Channel Isolation

The purpose of this procedure is to restore the Processing Unit to its original condition before invoking your support structure.

Warning: Damage will result if cards or modules are removed or installed with power ON.

Note: If the following **Required Actions** do not produce the **Expected Results**, go to "START Repair Procedure" on page START 001 with the new symptom.

	Required Actions	Expected Results
1.	Record all of the information displayed on the screen.	
2.	Ensure that the I/O Power Hold switch is set to I/O Power Hold.	
3.	Press the Power Off key.	Power In Process indicator turns OFF.
4.	Inspect the card or module to be reinstalled for bent, broken, or dirty pins. Exchange or repair the card or module if any damage is found.	
5.	Remove the last FRU exchanged and reinstall the **original** FRU.	
6.	Press the Power On pushbutton on the service panel.	The Local Time/Date screen is displayed.
7.	Key in the correct time and date, and press the ENTER key.	The Power Up/Down screen is displayed.
8.	Key in UC, and press the ENTER key.	PROCESSOR STATUS: POWER IS ON is displayed. I/O STATUS: POWER IS ON is displayed.
9.	Go to "Cable and Pin Checkout" on this page.	

Cable and Pin Checkout

The FRUs you have exchanged have not corrected the failure.

Use the pin location diagram in the Channel Service Aids in the AID section of Volume A06 to check for loose connectors or cables and bent or dirty pins on the channel with the failure. Run the failing procedure again to verify any repair action made.

Step	Condition	Instructions
1	Has the failure been corrected?	Go to "END Repair Procedure" on page END 001.
2	**If not:**	You are at a point where you need aid. **Invoke your support structure for assistance with this failure.** Go to "END Repair Procedure" on page END 001.

0 0 0

Metering Test Repair Procedure

ENTRY POINTS

From Repair Procedure	Entry Point	Page Number	Procedure Title
START	A	CHNL 061	Metering Test Repair Procedure

**** ENTRY POINT A ****

The purpose of this Repair Procedure is to find and repair any problem with the metering circuit in the processor or the interface cables attached to the processor tailgate.

This procedure can be used to solve the following meter problems:

1. Meter is running all the time.
2. The meter is not running.

Note: Use the following table to find the location of an IFA card, when required by this repair procedure.

Chan Number	PU0 IFA Cards	PU1 IFA Cards
0	01A-A3K2	01B-A1K2
1	01A-A3E2	01B-A1E2
2	01A-A3F2	01B-A1F2
3	01A-A3G2	01B-A1G2
4	01A-A3H2	01B-A1H2
5	01A-A3J2	01B-A1J2
6	01A-A3P2	01B-A1P2
7	01A-A3Q2	01B-A1Q2
8	01A-A3R2	01B-A1R2

Step	Condition	Instructions
1	Is the problem that meters **are running** when they should not be?	Go to step 12 on page CHNL 062.
2	The problem is that meters are **not running** when they should be. Is this metering problem on **more than one** channel?	Go to step 7.
3	Go to the instructions column.	Enable metering by doing the following: 1. Press the MODE SEL key. 2. Key in QLM, and press ENTER to IML the processor. 3. Key in QDM0, and press ENTER. 4. At location 0000, key in 47F0 0000, and press the ENTER key. 5. Press the START key. Go to step 4.
4	Using a voltage meter, measure the voltage on the D12 pin on the IFA card of the failing channel (normal values, ground or +4 volts). Is the signal equal to +4 volts?	The problem is on the channel interface. Check all cable connections for bent pins. If you cannot find the problem, you are at a point where you need aid. **Invoke your support structure for assistance with this failure.** Go to "END Repair Procedure" on page END 001.
5	If **not:**	Using the "FRU Exchange" procedure on page CHNL 063, exchange the IFA card of the failing channel for a new one.
6	Has the metering problem been corrected?	You have exchanged the failing FRU. Go to "END Repair Procedure" on page END 001.
7	Go to the instructions column.	Using the "FRU Exchange" procedure on page CHNL 063, exchange the 01A-A2U2 and the SBA card of the failing processor (01A-A2T2 for PU 0, 01A-A2S2 for PU 1) for new ones.
8	Has the metering problem been corrected?	You have exchanged the failing FRU. Go to "END Repair Procedure" on page END 001.
9	If **not:**	Using the "FRU Exchange" procedure on page CHNL 063, exchange the 01A-B1MJ and 01A-B2MJ modules for new ones.
10	Has the metering problem been corrected?	You have exchanged the failing FRU. Go to "END Repair Procedure" on page END 001.
11	If **not:**	You are at a point where you need aid. **Invoke your support structure for assistance with this failure.** Go to "END Repair Procedure" on page END 001.

Step	Condition	Instructions
12	The problem is that meters **are running** when they should not be. Ensure that there is no activity on the system by pressing the STOP key. Use a voltage meter to measure the voltage on pin 01A-A3A4B02 (normal values, ground or -1.2 volts). Is the signal equal to -1.2 volts?	Go to Step 24.
13	Use a voltage meter to measure the voltage on pin 01B-A1A4B02 (normal values, ground or -1.2 volts). Is the signal equal to -1.2 volts?	Go to Step 24.
14	Is this metering problem on **more than one** channel?	Go to Step 17, Instructions column.
15	If **not:**	Using the "FRU Exchange" procedure on page CHNL 063, exchange the IFA card of the failing channel for a new one.
16	Has the metering problem been corrected?	You have exchanged the failing FRU. Go to "END Repair Procedure" on page END 001.
17	If **not:**	Using the "FRU Exchange" procedure on page CHNL 063, exchange the 01A-A2U2 and the SBA card of the failing processor (01A-A2T2 for PU 0, 01A-A2S2 for PU 1) for new ones.
18	Has the metering problem been corrected?	You have exchanged the failing FRU. Go to "END Repair Procedure" on page END 001.
19	If **not:**	Using the "FRU Exchange" procedure on page CHNL 063, exchange the 01A-B1MJ and 01A-B2MJ modules for new ones.
20	Has the metering problem been corrected?	You have exchanged the failing FRU. Go to "END Repair Procedure" on page END 001.
21	If **not:**	Using the "FRU Exchange" procedure on page CHNL 063, exchange the 01A-B2RN and 01A-B1RN modules for new ones.
22	Has the metering problem been corrected?	You have exchanged the failing FRU. Go to "END Repair Procedure" on page END 001.
23	If **not:**	You are at a point where you need aid. **Invoke your support structure for assistance with this failure.** Go to "END Repair Procedure" on page END 001.

Step	Condition	Instructions
24	The METER IN line is active on one of the channels. To isolate which channel is failing, go to the instructions column.	Use the following procedure to remove the IFA cards **one at a time** on the **board with -1.2 volts on the A4B02 pin.** 1. Ensure that the CE Mode switch is set to CE Mode. 2. Press the MODE SEL key. 3. Key in QWW, and press ENTER. 4. Key in D and P, and press ENTER. 5. Remove the next IFA card. 6. Key in U and P, and press ENTER. 7. Go to the Step 25.
25	Is the voltage on the A4B02 pin now equal to ground?	Go to Step 28.
26	Have **all** the IFA cards been removed?	You are at a point where you need aid. **Invoke your support structure for assistance with this failure.** Go to "END Repair Procedure" on page END 001.
27	If **not:**	Continue with IFA card removal by going to Step 24.
28	The card you have just removed indicates the failing channel. Using the "FRU Exchange" procedure on page CHNL 063, exchange that card for a new one and return all other IFA card to their original locations. Is the voltage on the A4B02 pin still equal to ground?	You have exchanged the failing FRU. Go to "END Repair Procedure" on page END 001.
29	If **not:**	The problem is a hot tag on the interface of the failing channel. Try to locate the failing control unit by taking each one off-line, or by detaching the interface cables. If you require assistance, invoke your support structure. Go to "END Repair Procedure" on page END 001.

FRU Exchange

Warning: Damage will result if cards or modules are removed or installed with power ON. For more information on FRU removal and exchange, refer to Volume A07, Removals and Replacements.

Note: If the following **Required Actions** do not produce the **Expected Results**, go to "START Repair Procedure" on page START 001 with the new symptom.

	Required Actions	Expected Results
1.	Ensure that the CE Mode switch is set to CE Mode.	
2.	Ensure that the I/O Power Hold switch is set to I/O Power Hold.	
3.	Press the Power Off key.	Power In Process indicator turns OFF.
4.	Remove the required FRU(s).	
5.	Inspect the card or module to be installed for bent, broken, or dirty pins. Exchange or repair the card or module if any damage is found.	
6.	Install the required FRU(s).	
7.	Press the Power On pushbutton on the service panel.	The Local Time/Date screen is displayed.
8.	Key in the correct time and date, and press the ENTER key.	The Power Up/Down screen is displayed.
9.	Key in UC, and press the ENTER key.	PROCESSOR STATUS: POWER IS ON is displayed. I/O STATUS: POWER IS ON is displayed.
10.	Ensure that the CE Mode switch is set as required.	
11.	Ensure that the required diskettes are installed.	
12.	If required, restore the processor to the state in which the failure can be detected, before returning to the procedure step from which you came.	

*** End of FRU Exchange Procedure ***

0 0 0

MSS Repair Procedure

Start all **MSS Repair** actions here. You have one of the following:

- Reference code
- MSS code stop
- SP message
- MSS FRUs to be installed
- RSF failure.

Read the **Condition** column until you find a description that matches the condition you have. Then follow the instructions in the **Instructions** column.

Step	Condition	Instructions	Comments
1	Go to the **Instructions** column.	1. Write down your *original* symptom. 2. Go to step 2.	
2	Did you come here from an MSS diagnostic screen after exchanging all FRUs without fixing the problem?	If your diagnostic reference code is FE E0xx F8, go to "RSF Cable Analysis" on page MSS 035 and repair the RSF cable. For all other reference codes, go to "Adapter Isolation" on page MSS 015.	You have an MSS diagnostic reference code of FxxxxxF8.
3	Do you have a reference code with a UU field of **EC**?	Go to "UU = EC" on page MSS 040.	Reference codes have a format of UU RRRR IS.
4	Do you have a reference code with a UU field of **ED**?	Go to "UU = ED" on page MSS 041.	Reference codes have a format of UU RRRR IS.
5	Do you have a reference code with a UU field of **FD**?	Go to "UU = FD" on page MSS 039.	Reference codes have a format of UU RRRR IS.
6	Go to the **Instructions** column.	1. Set the Power Off switch on the service panel to Power Off. 2. Wait for power off to complete. The service panel display is 00000. 3. Install DIAG1 in diskette drive 1 and remove FUNC2 from diskette drive 2. 4. Set the Power Off switch to Normal and press Power On. MSS Basic and Extended diagnostics run. 5. Go to step 7.	
7	Do you have the message MSS EXTENDED DIAGNOSTICS COMPLETED?	Go to step 10.	
8	Do you have a diagnostic error stop with a reference code displayed?	If you have a reference code of F5xxxxxx displayed, go to "Console Diskette Errors" on page MSS 051. If you have a reference code of F23144F8 or F23155F8 displayed, go to "UU = F2" on page MSS 033. For any other reference code, follow the instructions on the system console.	The MSS diagnostic screens guide you in the repair.
9	You have an MSS Code stop.	Go to "MSS Code Stop" on page MSS 011.	Wait 30 seconds for the MSS Code to display.
10	Go to the **Instructions** column.	1. Wait 30 seconds after the message MSS EXTENDED DIAGNOSTICS COMPLETED displays. 2. If the screen clears and the diagnostics start to run again, go to "Reset Failure" on page MSS 041. 3. If the message MSS EXTENDED DIAGNOSTICS COMPLETED remains on the screen for over 30 seconds, go to step 11.	
11	Go to the **Instructions** column.	Test diskette drive 1 as follows: 1. Key in A0 and press ENTER. 2. Key in 1 to select diskette drive 1. 3. Press ENTER. The diskette drive diagnostics are run on diskette drive 1. 4. Go to step 12.	
12	Did diagnostic option A0 run on diskette drive 1 without errors?	Go to step 15.	
13	Do you have a diagnostic error stop with a reference code displayed?	If you have a reference code of F5xxxxxx displayed, go to "Console Diskette Errors" on page MSS 051. For any other reference code, follow the instructions on the system console.	
14	You have an MSS Code stop.	Go to "MSS Code Stop" on page MSS 011.	
15	Go to the **Instructions** column.	Test diskette drive 2 as follows: 1. Key in A0 and press ENTER. 2. Insert DIAG1 in diskette drive 2. 3. Key in 2 to select diskette drive 2. 4. Press ENTER. The diskette drive diagnostics are run on diskette drive 2. 5. Go to step 16.	
16	Did diagnostic option A0 run on diskette drive 2 without errors?	1. Insert DIAG1 in diskette drive 1. 2. Key in G and press ENTER. 3. Go to step 19.	
17	Do you have a diagnostic error stop with a reference code displayed?	If you have a reference code of F5xxxxxx displayed, go to "Console Diskette Errors" on page MSS 051. For any other reference code, follow the instructions on the system console.	
18	You have an MSS Code stop.	Go to "MSS Code Stop" on page MSS 011.	

Step	Condition	Instructions	Comments
19	Go to the **Instructions** column.	Test the device cluster adapter (DCA) as follows: 1. Insert DIAG1 in diskette drive 1. 2. Key in CE and press ENTER. The DCA diagnostics are run. 3. Go to step 20.	**Note:** Diagnostic reference code F8Cx03F8 is a normal stop if there is no terminal on port x or if the terminal on port x is not powered on and ready. To continue testing the rest of the DCA, key in G and press ENTER.
20	Did diagnostic option CE run without errors?	Go to step 23.	
21	Do you have a diagnostic error stop with a reference code displayed?	If you have a reference code of F8xxxxxx displayed, go to "UU = F8 or F9" on page MSS 038. For any other reference code, follow the instructions on the system console.	
22	You have an MSS Code stop.	Go to "MSS Code Stop" on page MSS 011.	Wait 30 seconds for the MSS Code to display.
23	Go to the **Instructions** column.	Test the remote support facility (RSF) adapter as follows: 1. Key in DO and press ENTER. The RSF diagnostics are run. 2. Go to step 24.	
24	Did diagnostic option DO run without errors?	Go to step 27.	
25	Do you have a diagnostic error stop with a reference code displayed?	Follow the directions on the system console.	
26	You have an MSS Code stop.	Go to "MSS Code Stop" on page MSS 011.	Wait 30 seconds for the MSS Code to display.
27	Do you have a machine **without** the EIA interface feature?	You do not have a diagnostic failure. **Use your original symptom to find the problem.** Go to step 32.	
28	Go to the **Instructions** column.	Test the EIA interface as follows: 1. Install the wrap plug on the end of your EIA interface cable. 2. Select diagnostic option E0 and press ENTER. The EIA diagnostics are run. 3. Go to step 29.	
29	Did diagnostic option E0 run without errors?	You do not have a diagnostic failure. **Use your original symptom to find the problem.** Go to step 32.	
30	Do you have a diagnostic error stop with a reference code displayed?	If you have a reference code of FE E0xx F8 displayed, go to "UU = FE" on page MSS 034. For any other reference code, follow the directions on the system console.	
31	You have an MSS Code stop.	Go to "MSS Code Stop" on page MSS 011.	Wait 30 seconds for the MSS Code to display.
32	Was your **original** symptom either a five-digit MSS Code displayed on the service panel or a basic check?	Go to "Functional Code Stop" on page MSS 014.	Digits are displayed or are changing in all five of the display positions on the service panel.
33	Did you have an RSF problem? (Example: fails to transmit, does not initialize.)	Go to "UU = FE" on page MSS 034.	
34	Did you have the message SERIAL NO. DOES NOT MATCH or a reference code of F61801FA?	Go to "Serial Number Match" on page MSS 042.	
35	Did you have a console message indicating an **MSS** problem? (Example: DISKETTE DRIVE 1 NOT READY.)	Go to "MSS Reference Code Index" on page MSS 031.	
36	Did you have a reference code (Fxxxxxx) indicating an **MSS** problem?	Go to "MSS Reference Code Index" on page MSS 031.	
37	Did the customer report that the General Selection (Q) screen displayed during normal operation? (MODE SEL was not pressed.)	Go to "Reset Failure" on page MSS 041.	
38	Was your **original** symptom the Power In Process indicator on?	Go to "Reset Failure" on page MSS 041.	
39	Did the PA option screen fail to display on page START 001?	Go to the maintenance document for your system console.	
40	Go to the **Instructions** column.	You do not have a diagnostic failure or a symptom related to the MSS. 1. Insert FUNC1 in diskette drive 1 and FUNC2 in diskette drive 2. 2. Press Power On/IML. 3. Go back to page START 001.	

4381-3
B/M 2676380

MI	PN 6169412	EC A20558	EC A20559	EC A20560	EC A20562	
Seq AH010	2 of 2	01 Oct 84	03 Dec 84	18 Feb 85	30 Aug 85	

MSS Code Stop

You had a five-digit **MSS Code** displayed on the service panel while MSS diagnostics were running.

Notes:

1. All the digits of the display are not stable if the MSS microcode is in a loop.
2. If 'x' is specified as part of an MSS Code, that position can be any hex digit (0-9, A-F) or can be constantly changing.

Read the **Condition** column until you find a question you can answer "yes" or a description that matches the condition you have. Then follow the instructions in the **Instruction** column.

Warning: Damage will result if cards are removed with power on. Do not remove any FRUs until you power down and the service panel to displays 00000.

Step	Condition	Instructions	Comments
1	Do you have an MSS Code of 0Exxx or 0Fxxx?	1. Set the Power Off switch on the service panel to Power Off. 2. Exchange 01A-A2 H2. 3. Ensure DIAG1 is installed in diskette drive 1. 4. Set the Power Off switch to Normal, and press Power On. The MSS Basic and Extended diagnostics run. 5. Go to step 9. **Note:** If this problem occurs again when you IML, you may have a problem with your FUNC1 diskette. Go to "Console Diskette Errors" on page MSS 051.	These MSS Codes indicate a controller problem. **Note:** MSS Code 0E06x can be caused by a DIAG1 diskette problem or a diskette hardware error.
2	Do you have an MSS Code of 80011, 80012, 80013, 80014, 80015, 80016, 81513, or 81523?	Go to "Adapter Isolation" on page MSS 015.	These MSS Codes indicate a bit on the controller bus is always on or off. Because the bus is common to the controller and all adapters, this can be either a controller or an adapter problem.
3	Do you have an MSS Code of 83502 or 83503?	1. Set the Power Off switch on the service panel to Power Off. 2. Exchange 01A-A2 H2. 3. Ensure DIAG1 is installed in diskette drive 1. 4. Set the Power Off switch to Normal, and press Power On. MSS Basic and Extended diagnostics run. 5. Go to step 9.	This MSS Code indicates a problem in the first 32K bytes of SP storage.
4	Do you have an MSS Code of 815xx, 818xx, 81Fxx, or 835xx?	Go to "Console Diskette Errors" on page MSS 051.	These MSS Codes indicate a problem with the Diskette Drive Adapter (DDA).
5	Do you have an MSS Code of 88xxx or 89xxx?	Check for the following: 1. The system console is powered on. 2. The system console Normal/Test switch is set to Normal. 3. Go to step 16.	These MSS codes indicate a problem with the Device Cluster Adapter (DCA).
6	Do you have an MSS Code that does not change but has a combination of hex characters that are mainly the characters F or 0? (For example: BFFFF, F0FF0, FFFEF, 00006.)	1. Set the Power Off switch on the service panel to Power Off. 2. Exchange 01A-A2 H2. 3. Ensure DIAG1 is installed in diskette drive 1. 4. Set the Power Off switch to Normal, and press Power On. MSS Basic and Extended diagnostics run. 5. Go to step 8.	MSS Code FFFFF or combinations that are mainly F or 0 indicate that the support processor is held reset.
7	You have some other MSS Code.	1. Check the service panel for valid displays as follows: a. Set the Power Off switch on the service panel to Power Off. The display should return to 00000. b. Set the Power Off switch to Normal, and press Power On. c. Wait 2 seconds, and set the Power Off switch to Power Off again. d. The display should be FFFFF for about 1.5 seconds and then return to 00000 a few seconds after power off. 2. If the display is **not** correct, go to Volume A02, "Hex Display" on page PR 381. 3. If the display is correct: a. Exchange 01A-A2 H2 and G4. b. Ensure DIAG1 is installed in diskette drive 1. c. Set the Power Off switch to Normal and press Power On. d. Go to step 9.	Your controller is in a microcode loop, an uncontrolled runaway, or cannot communicate with the DCA. Ensure the Security Keylock (if you have one) in your system console is on and the Brightness Control is not set too low.
8	Is an MSS Code mainly of the characters F or 0 still displayed?	Reinstall any FRUs you exchanged. Go to Volume A02, "MBC Reset" on page PR 431.	The FRU you replaced did not fix the problem.
9	Do you have the message MSS EXTENDED DIAGNOSTICS COMPLETED?	Run the following MSS optional diagnostics: 1. A0 on diskette drive 1. 2. A0 on diskette drive 2. 3. CE to test the DCA. 4. D0 to test the RSF. If an error occurs during the tests, go to step 14. If you complete the tests, go to step 13.	For information on running MSS optional diagnostics, see Volume A07, Diagnostics, "Optional MSS Diagnostics."
10	Do you have a diagnostic error stop with a reference code displayed?	Follow the instructions on the display console. If you have already exchanged all FRUs displayed, go to "Adapter Isolation" on page MSS 015.	The MSS diagnostic screens now guide you in the repair.
11	Do you still have the **same** MSS code after replacing FRU(s) in a previous step?	Reinstall any FRUs you exchanged. Go to "Adapter Isolation" on page MSS 015.	

Step	Condition	Instructions	Comments
12	A **different** MSS Code is displayed when the MSS Basic diagnostics run.	Copy down your *new* MSS Code. Go to step 1 on page MSS 011.	Start this Repair Procedure again using your *new* MSS Code as the symptom.
13	Did the optional MSS diagnostics run without error?	If more than one FRU was exchanged, reinstall the FRUs one at a time and rerun the MSS diagnostics to isolate the failing FRU. If the failure is intermittent and you cannot isolate the failing FRU, leave all FRUs exchanged. Go to "END Repair Procedure" on page END 001.	Power down before exchanging FRUs.
14	Do you have a diagnostic error stop with a reference code displayed?	If a reference code of F5xxxxxx is displayed, go to "Console Diskette Errors" on page MSS 051. For all other reference codes, follow the instructions on the display console. If you have already exchanged all FRUs displayed, go to "Adapter Isolation" on page MSS 015.	The MSS diagnostic screens now guide you in the repair.
15	You have an MSS code stop	Go to "MSS Code Stop" on page MSS 011.	Wait 30 seconds for the MSS Code to display.
16	Was the system console powered on and the Normal/Test switch set to Normal?	Check for the following: • The coaxial cable for the system console is connected at Port 0 (location 01F - Port 0) and at the system console. • The signal cable from Port 0 (01F - Port 0) to board location 01A-A2 YN is properly installed. Go to step 18.	MSS code 89102 indicates no response from the system console. For the Location of 01F - Port 0, see Volume 07, "Locations."
17	The system console was **not** powered on or the Normal/Test switch was set to Test.	1. Ensure the Normal/Test switch on the system console is set to Normal. 2. Power on the system console. 3. Wait for the three console LEDs to light. 4. Set the Power Off switch on the service panel to Power Off. 5. Set the Power Off switch to Normal, and press Power On. MSS Basic and Extended diagnostics run. 6. Go to step 9.	MSS code 89102 indicates no response from the system console.
18	Is the coaxial cable to the system console installed correctly?	1. Set the Power Off switch on the service panel to Power Off. 2. Exchange 01A-A2 H2, Q2, and R2. 3. Ensure DIAG1 is installed in diskette drive 1. 4. Set the Power Off switch to Normal, and press Power On. MSS Basic and Extended diagnostics run. 5. Go to step 20.	This MSS code indicates no Power On response from the system console.
19	The coaxial cable or signal cable to the system console was **not** installed correctly.	1. Set the Power Off switch on the service panel to Power Off. 2. Correct the problem with the coaxial cable or signal cable. 3. Set the Power Off switch to Normal, and press Power On. 4. Go to step 9.	
20	Do you *still* have an MSS Code of 88xxx or 89xxx?	Reinstall any FRUs you exchanged. Go to the maintenance document for the system console.	The failure is in the coaxial cable or the system console.
21	Do you have the message MSS EXTENDED DIAGNOSTICS COMPLETED?	Go to "END Repair Procedure" on page END 001.	
22	Do you have a diagnostic error stop with a reference code?	If a reference code of F5xxxxxx is displayed, go to "Console Diskette Errors" on page MSS 051. For all other reference codes, follow the instructions on the display console. If you have already exchanged all FRUs displayed, go to "Adapter Isolation" on page MSS 015.	The MSS diagnostic screens will now guide you in the repair.
23	You have an MSS Code stop.	Go to "MSS Code Stop" on page MSS 001.	Wait 30 seconds for the MSS Code to display.

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Functional Code Stop

Because customer microcode detected a failure and MSS diagnostics ran without error, you may have an intermittent problem. The following procedure will have you exchange the FRU(s) that are the most probable cause of the original failure.

Warning: Damage will result if cards are removed with power on. Do not remove any FRUs until you power down and the service panel displays 00000.

Step	Condition	Instructions	Comments
1	Go to the **Instructions** column.	1. Set the Power Off switch to Power Off. 2. Locate your **original** MSS Code in the **Condition** column of the following steps, and follow the instructions in the **Instructions** column. 3. Go to step 2.	
2	Was your MSS Code 81601, 81606, or 8160A?	1. Exchange 01A-A2 H2 and J2. 2. Go to step 14	
3	Was your MSS Code 81602, 81608, 81701, or 82806?	1. Exchange 01A-A2 Q2, R2 and H2 2. Go to step 14	
4	Was your MSS Code any of the following? 81603 81702 8170A 82802 82803 82804 82805 82807 82808 8280C	Go to "Console Diskette Errors" on page MSS 051.	You may have a problem with your FUNC1 diskette.
5	Was your MSS Code 81607?	1. Exchange 01A-A2 V2, W2, and X2. 2. Go to step 14.	
6	Was your MSS Code 820C0?	1. Exchange 01A-A2 H2, J2, K2, L2, R2, P2, and V2. 2. Go to step 14.	
7	Was your MSS Code 820A6?	1. Exchange 01A-A2 J2. 2. Go to step 14.	
8	Was your MSS Code 8280D?	1. Exchange 01A-A2 F2. 2. Go to step 14.	
9	Was your MSS Code 820xx or 828xx?	1. Exchange 01A-A2 H2, and J2. 2. Go to step 14.	
10	Was your MSS Code 81703?	Go to "MSS Code Stop 81703" on page MSS 018.	
11	Was your MSS Code 06xxx or 81704?	These MSS codes indicate that the DCA was not able to communicate with the system console. This can be caused by one of the following: • A system console error • A defective coaxial cable to the system console • A DCA problem. 1. Exchange 01A-A2 R2 and Q2 2. Go to step 14.	If this problem returns check the system console and coaxial cable to the system console.
12	Was your MSS Code 0E06x?	Go to "Console Diskette Errors" on page MSS 051.	
13	Go to the **Instructions** column.	1. Invoke your support structure. 2. Exchange any FRUs called out by your support structure. 3. Go to step 14.	
14	Go to the **Instructions** column.	1. Set the Power Off switch to Normal. 2. Ensure DIAG1 is installed in diskette drive 1. 3. Press Power On. MSS Basic and Extended diagnostics run. 4. Go to step 15.	
15	Do you have the message MSS EXTENDED DIAGNOSTICS COMPLETED?	Run the following MSS optional diagnostics: 1. A0 on diskette drive 1. 2. A0 on diskette drive 2. 3. CE on the DCA. 4. D0 on the RSF. If an error is detected during the optional diagnostics, go to step 16. If the tests run without errors, exchange any FRUs called out by your support structure and then go to "END Repair Procedure" on page END 001.	For information on running the MSS optional diagnostics, see Volume A07, Diagnostics, "Optional MSS Diagnostics."
16	Do you have a diagnostic error stop with a reference code displayed?	If a reference code of F5xxxxxx is displayed, go to "Console Diskette Errors" on page MSS 051. For all other reference codes, follow the instructions on the display console.	Diagnostic reference code F8Cx03F8 is a normal stop if the console on port x is not ready. Continue testing the DCA by keying in G and pressing ENTER.
17	You have an MSS Code stop.	Go to "MSS Code Stop" on page MSS 011.	Wait 30 seconds for the MSS Code to display.

Adapter Isolation

This procedure uses the MSS diagnostics to identify the failing adapter for a solid failure on the bus that attaches to all MSS adapters.

The procedure starts with a minimum number of MSS adapters and has you run MSS diagnostics looking for known diagnostic error stops. After each known stop is reached, you are asked to reinstall the FRUs for another adapter and run the diagnostics again.

Notes:

1. Each of the following steps **MUST** produce the five-digit (hex) MSS code or MSS diagnostic reference code indicated or the last FRU(s) to be reinstalled is defective or not properly seated.
2. The MSS Diagnostic reference codes for the following steps are displayed on the system console. **Ignore** the repair instructions displayed.

Warning: Damage will result if cards are removed with power on. Do not remove any FRUs until you power down and the service panel displays 00000.

Step	Condition	Instructions	Comments
1	Go to the **Instructions** column.	Check the dc voltages to the MSS as follows: 1. See "MSS Power Supply Voltages" on this page and measure the voltage from 01A-A1 V2D08 to each of the points listed. 2. Note whether any of the voltages you measure are outside of the tolerance range. 3. Go to step 2.	You may have to remove the board retention cover from the pin side of the 01A-A1 board before measuring the voltages. For instructions, see Volume A07, Removals and Replacements, "Board/Retention Cover."
2	Are any of the MSS voltages **outside** of the tolerance range?	For voltages outside the tolerance range, go to the Power Repair page listed in "MSS Power Supply Voltages."	If more than one of the voltages is outside of the tolerance range, go to the Power Repair page listed for the first voltage that is out of tolerance.
3	Go to the **Instructions** column.	1. Set the Power Off switch on the service panel to Power Off. Remove all the cards from board 01A-A2 **except** G4, H2, Q2, and R2. 2. Ensure DIAG1 is installed in diskette drive. 3. Set the Power Off switch to Normal and press Power On. 4. Go to step 4.	Ensure Q4 is removed and each card is labeled with its location. Ensure that the top card connector at GY/HY is **not** removed and is plugged in the correct location.
4	Do you have an MSS Code of 81513?	1. Set the Power Off switch on the service panel to Power Off. 2. Reinstall 01A-A2 K2 and top card connectors KX and KY. 3. Set the Power Off switch to Normal, and press Power On. 4. Go to step 6.	Test DDA1. For the locations of the top card connectors, see Volume A07, Locations, "Board 01A-A2."

MSS Power Supply Voltages

Point	Power Supply	Tolerance Range	Go to page
01A-A1 V2B11	PS101	+21.60 to + 26.40 Vdc	PR 021
01A-A1 V2D03	PS101	+4.50 to +5.50 Vdc	PR 031
01A-A1 V2D04	PS102	-4.55 to -5.55 Vdc	PR 261
01A-A1 V2D05	PS102	+4.55 to +5.55 Vdc	PR 281
01A-A1 V2D06	PS102	+7.74 to +9.45 Vdc	PR 291
01A-A1 V2D02	PS102	-10.92 to -13.32 Vdc	PR 271
01A-A1 V2B13	PS102	+10.92 to +13.32 Vdc	PR 301
01A-A1 V2D13		+21.60 to +26.40 Vdc	PR 311

Step	Condition	Instructions	Comments
5	Go to the **Instructions** column. (You do **not** have an MSS code of 81513.)	Your failing FRU is either 01A-A2 G4, H2, Q2, R2, or 01A-A1 U2. Write down number 5 and the failing FRU list. Go to "Failing FRU Procedure" on MSS 017.	Ensure that all top card connectors are correctly installed.
6	Do you have a reference code of F11101F8 displayed on the system console? **Ignore the instructions on the screen.**	1. Set the Power Off switch on the service panel to Power Off. 2. Reinstall 01A-A2 J2. 3. Clear the display by setting the Normal/Test switch on the system console to Test and then back to Normal. 4. Set the Power Off switch to Normal, and press Power On. 5. Go to step 8.	Test the remainder of SP storage.
7	Go to the **Instructions** column. (You do **not** have a reference code of F11101F8 displayed.)	Your failing FRU is 01A-A2 K2. Write down number 7 and the failing FRU list. Go to "Failing FRU Procedure" on MSS 017.	Ensure that all top card connectors are correctly installed.
8	Do you have a reference code of FD2121F8 displayed on the system console? **Ignore the instructions on the screen**	1. Set the Power Off switch on the service panel to Power Off. 2. Reinstall 01A-A2 S2, T2, U2, and top card connectors SX and TX. 3. Clear the display by setting the Normal/Test switch on the system console to Test and then back to Normal. 4. Set the Power Off switch to Normal, and press Power On. 5. Go to step 10.	Test SBAs. For the locations of the top card connectors, see Volume A07, Locations, "Board 01A-A2."

Step	Condition	Instructions	Comments
9	Go to the **Instructions** column. (You do **not** have a reference code of FD2121F8 displayed.)	Your failing FRU is 01A-A2 J2. Write down number 9 and the failing FRU list. Go to "Failing FRU Procedure" on MSS 017.	
10	Do you have a reference code of F23106F8 displayed on the system console? **Ignore the instructions on the screen**	1. Set the Power Off switch on the service panel to Power Off. 2. Reinstall 01A-A2 L2, V2, W2, X2, and top card connectors LX, LY, VX/WX, VY/WY, and VZ/WZ. 3. Clear the display by setting the Normal/Test switch on the system console to Test and then back to Normal. 4. Set the Power Off switch to Normal and press Power On. 5. Go to step 12.	Test LCA and DDA2. For the locations of the top card connectors, see Volume A07, Locations, "Board 01A-A2."
11	Go to the **Instructions** column. (You do **not** have a reference code of F23106F8 displayed.)	Your failing FRU is either 01A-A2 S2, T2, or U2. Write down number 11 and the failing FRU list. Go to "Failing FRU Procedure" on MSS 017.	Ensure that all top card connectors are correctly installed.
12	Do you have a reference code of F68121F8 displayed on the system console? **Ignore the instructions on the screen**	1. Set the Power Off switch on the service panel to Power Off. 2. Reinstall 01A-A2 C2, C4, D2, E2, F2, F4, and top card connectors DW/EW/FW and DX/EX/FX. 3. Clear the display by setting the Normal/Test switch on the system console to Test and then back to Normal. 4. Set the Power Off switch to Normal, and press Power On. 5. Go to step 14.	Test PCA. For the locations of the top card connectors, see Volume A07, Locations, "Board 01A-A2."
13	Go to the **Instructions** column. (You do **not** have a reference code of F68121F8 displayed.)	Your failing FRU is either 01A-A2 E2, G4, L2, V2, W2 or X2. Write down number 13 and the failing FRU list. Go to "Failing FRU Procedure" on MSS 017.	Ensure that all top card connectors are correctly installed.
14	Do you have the message MSS EXTENDED DIAGNOSTICS COMPLETED?	1. Set the Power Off switch on the service panel to Power Off. 2. Reinstall 01A-A2 P2 and Q4. 3. Clear the display by setting the Normal/Test switch on the system console to Test and then back to Normal. 4. Set the Power Off switch to Normal, and press Power On. 5. Go to step 16.	Test CCA.
15	Go to the **Instructions** column. (You do **not** have the message MSS EXTENDED DIAGNOSTICS COMPLETED.)	Your failing FRU is either 01A-A2 C2, C4, D2, E2, F2, F4 or the top card connectors. Write down number 15 and the failing FRU list. Go to "Failing FRU Procedure" on MSS 017.	Ensure that all top card connectors are correctly installed.
16	Do you have the message MSS EXTENDED DIAGNOSTICS COMPLETED?	Run the following MSS optional diagnostics: 1. A0 on diskette drive 1. 2. A0 on diskette drive 2. 3. CE on the DCA. 4. D0 on the RSF. If all optional diagnostics run without errors, go to "END Repair Procedure" on page END 001. If an error occurs during one of the tests, go to step 18.	For information about running MSS optional diagnostics, see Volume A07, Diagnostics, "Optional MSS Diagnostics." **Note:** Diagnostic reference code F8Cx03F8 is a normal stop if the console on port x is not ready. Continue testing the DCA by keying in G and pressing ENTER.
17	Go to the **Instructions** column. (You do **not** have the message MSS EXTENDED DIAGNOSTICS COMPLETE.)	Your failing FRU is either 01A-A2 P2 or Q4. Write down number 17 and the failing FRU list. Go to "Failing FRU Procedure" on MSS 017.	
18	Do you have a diagnostic error stop with a reference code displayed?	If a reference code of F5xxxxxx is displayed, go to "Console Diskette Errors" on page MSS 051. For all other reference codes, follow the instructions on the display console.	
19	Go to the **Instructions** column. (You have an MSS code stop.)	Go to "MSS Code Stop" on page MSS 011.	Wait 30 seconds for the MSS Code to display.

Failing FRU Procedure

You were directed here from the Adapter Isolation procedure.

This procedure identifies the FRU(s) that is causing the error detected by the MSS Basic or Extended diagnostics.

Step	Condition	Instructions	Comments
1	Go to the **Instructions** column.	1. Set the service panel Power Off switch to Power Off. 2. Set CB1 and CB2 off. 3. Exchange the failing FRU identified in the Adapter Isolation procedure. **Note:** If more than one FRU is to be exchanged, reinstall the FRUs one at a time to isolate the failing FRU. 4. Set CB1 and CB2 on. 5. Set the Power Off switch to Normal, and press Power On. The MSS Basic and Extended diagnostics run. 6. Go to step 2.	For the locations of CB1 and CB2, see Volume A07, Locations, "Primary Control Compartment (PCC)." If you cannot isolate the failing FRU because your problem is intermittent, leave all FRUs exchanged.
2	Go to the **Instructions** column.	Find the step number that you recorded in "Adapter Isolation" in the list below and verify that you **now** have the expected error code or diagnostic message. step 5 MSS Code is 81513 step 7 reference code is F11101F8 step 9 reference code is FD2121F8 step 11 reference code is F23106F8 step 13 reference code is F68126F8 step 15 message is MSS EXTENDED DIAGNOSTICS COMPLETED step 17 message is MSS EXTENDED DIAGNOSTICS COMPLETED Go to step 3.	Failing FRU list 01A-A2 G4, H2, Q2, R2, and 01A-A1 U2 01A-A2 K2 01A-A2 J2 01A-A2 S2, T2, U2 01A-A2 E2, G4, L2, V2, W2, and X2 01A-A2 C2, C4, D2, E2, F2, F4 01A-A2 P2, Q4
3	Did you have the **expected** error code or message in step 2?	1. Set the Power Off switch to Power Off. 2. Install all remaining board 01A-A2 FRUs. 3. Set the Power Off switch to Normal, and press Power On. 4. Go to step 5.	
4	You do not have the expected error code or message.	Check that all cards, cables, and top card connectors in board 01A-A2 are in the correct positions. Go back to "Adapter Isolation" on page MSS 015. If you cannot resolve this problem, call for assistance.	
5	Do you have the message MSS EXTENDED DIAGNOSTICS COMPLETED?	Run the MSS optional diagnostics as follows: 1. A0 on diskette drive 1. 2. A0 on diskette drive 2. 3. CE on the DCA. 4. D0 on the RSF. If all optional diagnostics run without errors, go to "END Repair Procedure" on page END 001. If you get an error during the optional diagnostics, go to step 6.	**Note:** Diagnostic reference code F8Cx03F8 is a normal stop if there is no terminal on port x, or the terminal on port x is not powered on and ready. To continue testing the DCA, key in G and press ENTER.
6	Do you have a diagnostic error message and a reference code displayed?	If a reference code of F5xxxxxx is displayed, go to "Console Diskette Errors" on page MSS 051. For any other reference code, follow the instructions on the display console.	
7	You have an MSS Code stop.	Go to "MSS Code Stop" on page MSS 011.	Wait 30 seconds for the MSS Code to display.

MSS Code Stop 81703

MSS Code 81703 indicates that multiple errors occurred during automatic SP re-IML.

No errors occurred when you looped MSS Basic and Extended Diagnostics.

Warning: Damage will result if cards are removed with power on. Do not remove any FRUs until you power down and the service panel displays 00000.

Step	Condition	Instructions	Comments
1	Go to the **Instructions** column.	1. Set the Power Off switch at the service panel to Power Off. 2. Set the Power Off switch to Normal, and press Power On. 3. After MSS extended diagnostics complete, select MSS Diagnostic option AF. 4. Run option AF for two minutes. 5. Press Power On/IML to terminate the loop. 6. Go to step 2.	This option loops the diskette drive adapter diagnostics.
2	Did an MSS Code stop occur?	Go to page MSS 011, step 1.	Start this repair procedure with your *new* symptom.
3	Do you have the message DIAGNOSTIC OPTION AF DETECTED AN ERROR?	Follow the directions on the console.	
4	Go to the **Instructions** column.	1. Select MSS Diagnostic option C0. 2. Run option C0 for two minutes. 3. Press Power On/IML to terminate the loop.	This option loops the system console adapter diagnostics.
5	Do you have the message DIAGNOSTIC OPTION C0 DETECTED AN ERROR?	Follow the directions on the console.	
6	Did diagnostic option C0 run without errors?	1. Set the Power Off switch at the service panel to Power Off. 2. Insert FUNC1 diskette in diskette drive 1. 3. Set the CE Mode switch to CE Mode. 4. Set the Power Off switch to Normal, and press Power On. 5. Go to "START Repair Procedure," "Intermittent MSS Errors" on page START 040.	Find the cause of the automatic re-IML using the SP logs.
7	You have an MSS Code stop.	Go to "MSS Code Stop" on page MSS 011.	Wait 30 seconds for the MSS Code to display.

MSS Reference Code Index

MSS diagnostics do not fail. Your original symptom was one of the following:

- MSS reference code with a UU field of Fx, EC, or ED
- MSS error message
- Instructions to go to ***Fx Exit*** on this page.

Read the **Condition** column until you find a question you can answer "yes" or a description that matches the condition you have. Then do the instructions in the **Instructions** column.

Warning: Damage will result if cards are removed with power on. Do not remove any FRUs until you power down and the service panel displays 00000.

Step	Condition	Instructions	Comments
1	Were you instructed to go to ***Fx Exit*** on this page?	Go to step 16.	You exchanged FRUs to correct a failure detected by MSS diagnostics.
2	Go to the **Instructions** column.	1. Set the CE Mode switch to Normal. 2. Go to step 3.	
3	Do you have a reference code with a UU field of **EC**?	Go to "UU = EC" on page MSS 040.	Reference code format is UU RRRR IS.
4	Do you have a reference code with a UU field of **ED**?	Go to "UU = ED" on page MSS 041.	Reference code format is UU RRRR IS.
5	Do you have a reference code with a UU field of **F0** or **F1**?	Go to "UU = F0 or F1" on page MSS 032.	Reference code format is UU RRRR IS.
6	Do you have a reference code with a UU field of **F2**?	Go to "UU = F2" on page MSS 033.	Reference code format is UU RRRR IS.
7	Do you have a reference code with a UU field of **F4** or **F5**?	Go to "Console Diskette Errors" on page MSS 051.	Reference code format is UU RRRR IS.
8	Do you have a message SERIAL NO. DOES NOT MATCH or a reference code of F61801FA?	Go to "SERIAL NUMBER MATCH" on page MSS 042.	
9	Do you have a reference code with a UU field of **F6**?	Go to "UU = F6" on page MSS 036.	Reference code format is UU RRRR IS.
10	Do you have a reference code with a UU field of **F8** or **F9**?	Go to "UU = F8 or F9" on page MSS 038.	Reference code format is UU RRRR IS.
11	Do you have a reference code with a UU field of **FD**?	Go to "UU = FD" on page MSS 039.	Reference code format is UU RRRR IS.
12	Do you have a reference code with a UU field of **FE**?	Go to "UU = FE" on page MSS 034.	Reference code format is UU RRRR IS.
13	Do you have one of the following messages? DISKETTE DRIVE x NOT READY CONSOLE DISK FAILURE CONSOLE DISK I/O ERROR CRC ERROR ON DRIVE x DISKETTE xxx CHECK DISKETTE xxx NOT READY ERR - DISK ERROR FUNCTION NOT AVAILABLE	Go to "Console Diskette Errors" on page MSS 051.	
14	Do you have one of the following messages? DISPLAY CONSOLE FAILURE PRT-INTV REQD	Go to "UU = F8 or F9" on page MSS 038.	
15	Do you have the message SUPPORT BUS FAILURE?	Go to "UU=F0 or F1" on page MSS 032.	
16	You were instructed to go to ***Fx Exit*** on this page.	If you exchanged more than one FRU, reinstall the FRUs one at a time and rerun the diagnostics to isolate the failing FRU. If you cannot isolate to a single FRU because of an intermittent problem, leave all FRUs exchanged. Go to "END Repair Procedure" on page END 001.	

UU = F0 or F1

Your original failure was one of the following:

- A reference code with a UU field of F0
- A reference code with a UU field of F1
- The message SUPPORT BUS FAILURE.

These indicate a failure in the Support Processor (SP) or SP storage. Suspect the following FRUs:

01A-A2 H2 SP
01A-A2 J2 SP storage

Warning: Damage will result if cards are removed with power on. Do not remove any FRUs until you power down and the service panel displays 00000.

Step	Condition	Instruction	Comments
1	Go to the **Instructions** column.	1. Set the Power Off switch on the service panel to Power Off. 2. Ensure DIAG1 is in diskette drive 1. 3. When you are asked to exchange FRUs, check all top card connectors (TCCs) for damaged pins. 4. Go to step 2.	
2	Did you have a reference code with a UU field of F0 or the message SUPPORT BUS FAILURE?	1. Exchange 01A-A2 H2. 2. Set the Power Off switch to Normal, and press Power On. MSS Basic and Extended diagnostics are run. 3. Go to step 4.	This indicates a logic failure in the controller.
3	Did you have a reference code with a UU field of F1?	1. Exchange 01A-A2 H2 and J2. 2. Set the Power Off switch to Normal, and press Power On. MSS Basic and Extended diagnostics are run. 3. Go to step 4.	This indicates a parity error in MSS storage.
4	Do you have the message MSS EXTENDED DIAGNOSTICS COMPLETED?	1. Select diagnostic option FF. 2. Let the tests loop for two minutes. 3. Press Power On/IML to terminate the loop. 4. Go to step 7.	
5	Do you have an error stop and a reference code displayed?	Follow the directions on the screen.	
6	You have an MSS Code displayed.	Go to "MSS Code Stop" on page MSS 011 with your *new* symptom.	
7	Did the tests run without errors?	If you were asked to exchange more than one FRU, reinstall the FRUs one at a time and rerun the diagnostics to isolate the failing FRU. If the failure is intermittent or you cannot isolate to the failing FRU, leave all FRUs exchanged. Go to "END Repair Procedure" on page END 001.	Power down before reinstalling FRUs.
8	Do you have an error stop and a reference code displayed?	Follow the directions on the screen.	
9	You have an MSS Code displayed.	Go to "MSS Code Stop" on page MSS 011 with your *new* symptom.	

UU = F2

You have a failure in the Local Channel Adapter (LCA). Suspect the following FRUs:

01A-A2 V2 LCA
01A-A2 W2 LCA
01A-A2 X2 LCA.
01A-A2 E2 voltage sense
01A-A2 G4 latch display

Warning: Damage will result if cards are removed with power on. Do not remove any FRUs until you power down and the service panel displays 00000.

Step	Condition	Instruction	Comments
1	Do you have a reference code of F23144F8 or F23155F8?	1. Set the Power Off switch on the service panel to Power Off. 2. Ensure DIAG1 is in diskette drive 1. 3. Exchange 01A-A2 E2, G4, W2 and X2. 4. Set the Power Off switch to Normal, and press Power On. MSS Basic and Extended diagnostics are run. 5. Go to step 3.	
2	Go to the **Instructions** column.	1. Set the Power Off switch on the service panel to Power Off. 2. Ensure DIAG1 is in diskette drive 1. 3. When you are asked to exchange FRUs, check all top card connectors (TCCs) for damaged pins. 4. Exchange 01A-A2 V2, W2, and X2. 5. Set the Power Off switch to Normal, and press Power On. MSS Basic and Extended diagnostics are run. 6. Go to step 3.	You have a failure in the Local Channel Adapter (LCA).
3	Do you have the message MSS EXTENDED DIAGNOSTICS COMPLETED?	1. Select diagnostic option FF. 2. Let the tests loop for two minutes. 3. Press Power On/IML to terminate the loop. 4. Go to step 6.	These diagnostics test only the logic between the SP and the LCA. The processing unit diagnostics test the logic between the LCA and channel.
4	Do you have an error stop and reference code displayed?	Follow the directions on the screen.	
5	You have an MSS Code displayed.	Go to "MSS Code Stop" on page MSS 011 with your *new* symptom.	
6	Did the tests run without errors?	Go to "END Repair Procedure" on page END 001.	
7	Do you have an error stop and reference code displayed?	Follow the directions on the screen.	
8	You have an MSS Code displayed.	Go to "MSS Code Stop" on page MSS 011 with your *new* symptom.	

UU = FE

Your symptom is a Remote Support Facility (RSF) failure or a reference code of FExxxxxx.

Suspect the following FRUs:

01A-A2 P2 CCA
01A-A2 Q4 38LS modem or EIA interface
01G-CCA1 Integrated Protective Coupler.

Notes:

1. See Volume A06, Service Aids, "RSF Cards and Wiring Configurations" for diagrams of the possible RSF configurations.

2. Location 01A-A2 Q4 has either the 38LS modem or the EIA interface card. The 38LS has two rows of switches. For switch settings and jumper locations, see Volume A07, Installation, "Installing Remote Support Facility (RSF)."

3. The 38LS modem can be isolated from the integrated protective coupler by setting switch K to the ON position and selecting the D0 option. This will test only the 38LS and not test the integrated protective coupler or connecting cable.

Warning: Damage will result if cards are removed with power on. Do not remove any FRUs until you power down and the service panel displays 00000.

Step	Condition	Instruction	Comments
1	Do you have RSF Feature Code 9514 installed?	Go to step 14.	See **Notes** to determine which RSF feature you have.
2	You do **not** have RSF feature code 9514 installed.	1. Set the Power Off switch on the service panel to Power Off. 2. Exchange 01A-A2 P2 and Q4. 3. Ensure the DIAG1 diskette is in diskette drive 1. 4. Set the Power Off switch to Normal and press Power On. The MSS Basic and Extended diagnostics run. 5. Go to step 3	Verify that the switch settings or jumpers are correct on the new FRUs. (See **Notes**.)
3	Do you have an error stop with a reference code displayed?	Follow the instructions on the screen.	
4	Do you have the message EXTENDED DIAGNOSTICS COMPLETED?	Go to step 6.	
5	You have an MSS Code stop.	Go to "MSS Code Stop" on page MSS 011 with your new symptom.	Wait 30 seconds for the MSS Code to display.
6	Go to the **Instructions** column.	1. Select diagnostic option D0 and press ENTER. 2. Let the tests loop for two minutes. 3. Press Power On/IML to stop the loop. 4. Go to step 7.	
7	Do you have an error stop with a reference code displayed?	Follow the instructions on the display.	
8	Did the diagnostics run without error?	Go to step 10.	
9	You have an MSS Code stop.	Go to "MSS Code Stop" on page MSS 011 with your new symptom.	Wait 30 seconds for the MSS Code to display.
10	Do you have an RSF with an EIA interface?	1. Install the wrap plug on the end of the EIA interface cable. 2. Select diagnostic option EF and press ENTER. 3. Let the tests loop for two minutes. 4. Press Power On/IML to stop the loop. 5. Go to step 12.	
11	You do **not** have an EIA interface.	Go to "END Repair Procedure" on page END 001. **Note:** If the RSF still fails, suspect the telecommunication line.	
12	Do you have an error stop with a reference code displayed?	If the reference code is FE E0xx F8, refer to "RSF Cable Analysis" on page MSS 035 and either repair or exchange the RSF cable. If you have a different reference code, follow the instructions on the screen. Reinstall the FRUs you exchanged in step 2 and go to "END Repair Procedure" on page END 001 after you complete the repair.	
13	The diagnostics ran without error.	Go to "END Repair Procedure" on page END 001. **Note:** If the RSF still fails, suspect the telecommunication line.	
14	Go to the **Instructions** column.	Go to Volume A06, Service Aids, "RSF Option Verification Procedure for Feature Code 9514" and follow the procedure for checking the telephone configuration you have (Common Carrier or IBM supplied). Go to step 15 when you complete the checks.	
15	Did you find a problem with your telephone?	Follow the instructions in the Service Aids to correct the problem and go to "END Repair Procedure" on page END 001.	
16	You did not find a problem with your telephone.	1. Set the Power Off switch on the service panel to Power Off. 2. Exchange 01A-A2 P2, Q4, and the integrated protective coupler (if installed). 3. Ensure the DIAG1 diskette is in diskette drive 1. 4. Set the Power Off switch to Normal, and press Power On. The MSS Basic and Extended diagnostics run. 5. Go to step 17.	Verify that the switch settings or jumpers are correct on the new FRUs. (See **Notes**.)

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B/M 2676380

MI	PN 6169418
Seq AH040	2 of 2

EC A20558	EC A20559	EC A20562		
01 Oct 84	03 Dec 84	30 Aug 85		

Step	Condition	Instruction	Comments
17	Do you have an error stop with a reference code displayed?	Follow the instructions on the display.	
18	Do you have the message EXTENDED DIAGNOSTICS COMPLETED?	Go to "END Repair Procedure" on page END 001. **Note:** If the RSF still fails, suspect the telecommunication line.	

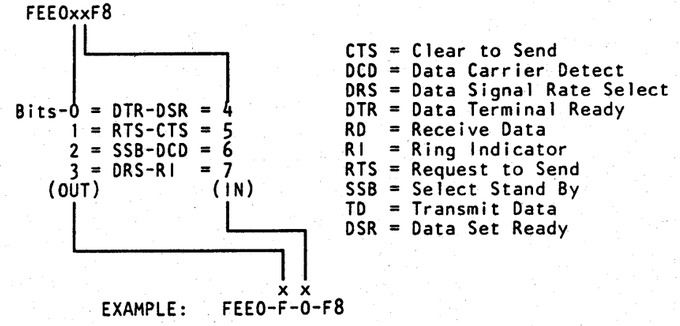
RSF Cable Analysis

The MSS diagnostic option Ex wraps the EIA interface cable through a wrap plug. The following reference codes indicate a failure in the EIA wrap test:

```
FEE0EEF8  =  TD - RD connection disturbed

FEE0FFF8  =  CCA FRU defective

FEE0xxF8
```



Reference code FEE0 F0 F8 indicates that all four EIA interface OUT lines (F) had a signal on them and none of the IN lines returned the signal (0). This occurs if the wrap plug was not plugged on the end of the cable.

Reference code FEE0-8-C-F8 indicates that a signal was present on the DTR OUT line (8) and both the DSR and CTS IN lines returned a signal. This indicates a short between DSR and CTS.

UU = F6

Your original symptom was a reference code of F6xxxxxx. This indicates a failure in the Power Controller Adapter (PCA) voltage sense, the isolator, the PCA interface, or the sense cables. Suspect the following FRUs.

01A-A2 C2 isolator
01A-A2 C4 isolator
01A-A2 D2 voltage sense
01A-A2 E2 voltage sense
01A-A2 F2 PCA interface.

Notes:

1. The FRUs in location C2 and C4 have the same part number and the FRUs in D2 and E2 have the same part number.

2. Jumpers are required on the voltage sense cards. For the location of the jumpers, see "Sense Card Jumpers" on page MSS 037.

3. Some voltage sense failures cause an F6 reference code when there is **no** problem with the PCA. This procedure will have you exchange the PCA FRUs to verify that the PCA is not causing the problem.

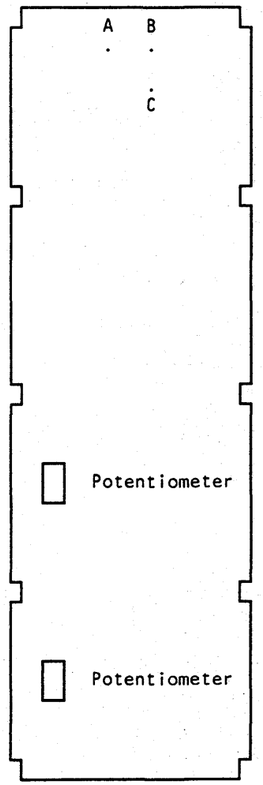
Warning: Damage will result if cards are removed with power on. Do not remove any FRUs until you power down and the service panel displays 00000.

Step	Condition	Instruction	Comments
1	Go to the **Instructions** column.	1. Set the Power Off switch on the service panel to Power Off. 2. Set the CE Mode switch to CE Mode. 3. Ensure the FUNC1 diskette is in diskette drive 1 and the FUNC2 diskette is in diskette drive 2. 4. Set the Power Off switch to Normal, and press Power On. 5. When prompted, key in the date and time, and then press ENTER. The Power Up/Down screen is displayed. 6. Key in QWP and press ENTER. The PCA diagnostics run. 7. Go to step 2.	
2	Did the PCA diagnostics run without an error?	Exchange the FRUs at 01A-A2 D2, E2, and F2. (See **Comments**.) Then go to "END Repair Procedure" on page END 001. If these FRUs have already been exchanged for this intermittent problem, exchange C2 and C4. Go to "END Repair Procedure" on page END 001.	Jumpers are required on the voltage sense cards. For the location of the jumpers, see "Sense Card Jumpers" on page MSS 037.
3	Did the PCA diagnostics fail **and** a reference code of F6xxxxxx display?	1. Set the Power Off switch on the service panel to Power Off. 2. Exchange 01A-A2 D2, E2, and F2. (See **Comments**.) 3. Set the Power Off switch to Normal, and press Power On. 4. When prompted, key in the date and time, and then press ENTER. The Partial Power Up/Down screen is displayed. 5. Key in QWP and press ENTER. The PCA diagnostics run. 6. Go to step 5.	Jumpers are required on the voltage sense cards. For the location of the jumpers, see "Sense Card Jumpers" on page MSS 037.
4	The PCA diagnostics failed **and** you have another reference code displayed.	Reinstall all the FRUs you exchanged. Go back to page MSS 001.	
5	Did the PCA diagnostics run without an error?	Reinstall the old FRUs one at a time and, rerun the diagnostic until the failing FRU is isolated. Go to "END Repair Procedure" on page END 001.	Power down before reinstalling FRUs.
6	The PCA diagnostics failed again.	1. Set the Power Off switch on the service panel to Power Off. 2. Reinstall the FRUs you exchanged in step 3. 3. Exchange 01A-A2 C2 and C4. 4. Set the Power Off switch to Normal and press Power On. 5. When prompted, key in the date and time, then press ENTER. The Power Up/Down screen is displayed. 6. Key in QWP and press ENTER. The PCA diagnostics run. 7. Go to step 7.	
7	Did the PCA diagnostics run without an error?	Reinstall the old FRUs one at a time and rerun the diagnostic until the failing FRU is isolated. Go to "END Repair Procedure" on page END 001.	Power down before reinstalling FRUs.
8	The PCA diagnostics failed again.	1. Press Power Off. 2. Reinstall the FRUs exchanged in step 6. 3. Call for assistance on this problem.	See Note 2.

MSS 036

Sense Card Jumpers

Ensure that the voltage sense cards (01A-A2 D2 and E2) have jumpers between B and C.



UU = F8 or F9

You have a diagnostic failure with a reference code of F8xxxxxx or your original symptom was a reference code of F8xxxxxx, F9xxxxxx, or a failure of one of the devices attached to the Device Cluster Adapter (DCA). This indicates one of the following:

- Device Cluster Adapter (DCA) failure
- Coaxial cable problem
- Console device failure.

Suspect the following FRUs:

01A-A2 Q2 DCA receiver/driver
01A-A2 R2 DCA

Warning: Damage will result if cards are removed with power on. Do not remove any FRUs until you power down and the service panel displays 00000.

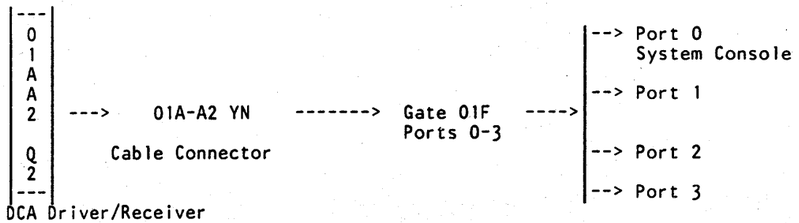
Step	Condition	Instruction	Comments
1	Do you have a reference code of F8 4001 C0?	You have a command failure on a console printer. Go to the maintenance procedures for the attached printer and run the device tests. If you cannot find a problem with the device: 1. Set the Power Off switch on the service panel to Power Off. 2. Verify that all console devices are ready. 3. Ensure DIAG1 is in diskette drive 1. 4. Set the Power Off switch to Normal, and press Power On. 5. After the MSS Basic and Extended diagnostics run, select diagnostic option CF and let the tests loop for two minutes. 6. Press Power On/IML to stop the loop. If errors occur, go to step 5. If the test runs without errors, go to step 4.	Reference code F8 Cx03 F8 is a normal stop if the device on port x is not connected or not ready.
2	Do you have a reference code of F9 0x0B 20?	You have a problem with the device attached to port x (where x equals 0-3). Go to the device maintenance procedures to test the device and the coaxial cable between the device and gate 01F. If you cannot resolve the problem using the device maintenance procedures, continue with step 4.	For information on the coaxial cables, see "DCA Port to Device Attachment" on page MSS 039.
3	Did you have a diagnostic failure with a reference code of F8 Cx03 F8? (This indicates no response from the device attached to port x.)	Do the following: • Check that the device attached to port x is powered up and ready. • Check that the coaxial cable for the device attached to port x is correctly attached at both ends. • Use the maintenance information for the device attached to port x to check the console device off-line and test the coaxial cable. If a problem is found with the console device or the coaxial cable, fix the problem and go to "END Repair Procedure" on page END 001. If no problem is found, go to step 4.	
4	Go to the **Instructions** column.	1. Set the Power Off switch on the service panel to Power Off. 2. Exchange 01A-A2 Q2 and R2. 3. Verify that all console devices are attached and ready. 4. Ensure the DIAG1 diskette is in diskette drive 1. 5. Set the Power Off switch to Normal, and press Power On. 6. After the MSS Basic and Extended diagnostics run, select diagnostic option CF and let the tests loop for two minutes. 7. Press Power On/IML to stop the loop. 8. Go to step 5.	Reference code F8 Cx03 F8 is a normal stop if the device on port x is not connected or not ready.
5	Do you have a diagnostic error stop with a reference code displayed?	Follow the instructions on the console display.	
6	Did diagnostic option CF run without errors?	Go to "END Repair Procedure" on page END 001. If errors occur during customer operation, the failure is in one of the devices attached to the DCA. Go to the device maintenance procedures.	
7	You have an MSS Code stop.	Go to "MSS Code Stop" on page MSS 011 with your new symptom.	Wait 30 seconds for the MSS Code to display.

4381-3
B/M 2676380

MI	PN 6169420	EC A20558	EC A20559	EC A20562		
Seq AH050	2 of 2	01 Oct 84	03 Dec 84	30 Aug 85		

DCA Port to Device Attachment

The coaxial cables for the system console and console devices are connected at gate 01F (the system console is attached at gate 01F, port 0). The signal cable from the MSS board goes from 01A-A2 YN to gate 01F.



UU = FD

Your original symptom was a reference code of FDxxxxxx. This indicates a failure in one of the following:

- Support Bus Adapter (SBA)
- Converter.

Suspect the following FRUs:

01A-A2 S2 SBA 2
01A-A2 T2 SBA 1
01A-A2 U2 Converter

Warning: Damage will result if cards are removed with power on. Do not remove any FRUs until you power down and the service panel displays 00000.

Step	Condition	Instruction	Comments
1	Go to the **Instructions** column.	1. Set the Power Off switch on the service panel to Power Off. 2. Install DIAG1 in diskette drive 1 and remove FUNC2 from diskette drive 2. 3. Exchange the FRUs at 01A-A2 S2, T2, and U2. 4. Set the Power Off switch to Normal, and press Power On. The MSS Basic and Extended diagnostics run. 5. Go to step 2.	The MSS Basic and Extended diagnostics test the path from the SP to the SBAs and some lines to the converter. The path through the converter to the processing unit is tested during processing unit IML.
2	Do you have the message MSS EXTENDED DIAGNOSTICS COMPLETED?	1. Key in FF and press ENTER. MSS diagnostics loop. 2. After two minutes, press Power On/IML to stop the loop. 3. Go to step 5.	
3	Do you have a diagnostic error stop with a reference code displayed?	Follow the directions on the system console.	MSS diagnostic screens guide you in the repair.
4	You have an MSS Code stop.	Go to "MSS Code Stop" on page MSS 011 with your *new* symptom.	Wait 30 seconds for the MSS Code to display.
5	Did diagnostic option FF run without errors.	Go to "END-Repair Procedure" on page END 001. If this problem occurs again, go to "Processing Unit Failure Isolation Procedure" on page PU 001.	
6	Do you have a diagnostic error stop with a reference code displayed?	Follow the directions on the console.	
7	You have an MSS Code stop.	Go to "MSS Code Stop" on page MSS 011 with your *new* symptom.	Wait 30 seconds for the MSS Code to display.

UU = EC

Your original symptom was a reference code of ECxxxxxx. This indicates a MSS microcode failure that may be caused by a failure in the MSS hardware. Channel and processing unit diagnostics have not detected an error.

Warning: Damage will result if cards are removed with power on. Do not remove any FRUs until you power down and the service panel displays 00000.

Step	Condition	Instruction	Comments
1	Go to the **Instructions** column.	1. Set the Power Off switch on the service panel to Power Off. 2. Ensure DIAG1 is in diskette drive 1. 3. Set the Power Off switch to Normal, and press Power On. The MSS Basic and Extended diagnostics are run. 4. Go to step 2.	
2	Do you have the message MSS EXTENDED DIAGNOSTICS COMPLETED?	1. Select diagnostic option FF and press ENTER. 2. Let the diagnostics loop for two minutes. 3. Press Power On/IML to stop the loop. 4. Go to step 5.	
3	Do you have an error stop with a reference code displayed?	Follow the directions on the display.	
4	You have an MSS Code stop.	Go to "MSS Code Stop" on page MSS 011 with your *new* symptom.	Wait 30 seconds for the MSS Code to display.
5	Did diagnostic option FF loop without detecting an error?	Run the following MSS optional diagnostics: 1. A0 on diskette drive 1. 2. A0 on diskette drive 2. 3. CE to test DCA. 4. D0 to test RSF. If all optional diagnostics run without errors, call for assistance on this problem. If errors occur, go to step 6.	For more information on the MSS optional diagnostics, see Volume A07, Diagnostics, "MSS Optional Diagnostics."
6	Do you have an error stop with a reference code displayed?	Follow the directions on the display.	
7	You have an MSS Code stop.	Go to "MSS Code Stop" on page MSS 011 with your *new* symptom.	Wait 30 seconds for the MSS Code to display.

UU = ED

Your original symptom was a reference code of EDxxxxxx. Processing Unit diagnostics did not find a failure. this indicates one of the following:

- Channel 0 logic failure
- IFCC on channel 0
- Local Channel Adapter (LCA) failure.

Suspect the following FRUs:

01A-A2 V2 LCA
01A-A2 W2 LCA
01A-A2 X2 LCA

Warning: Damage will result if cards are removed with power on. Do not remove any FRUs until you power down and the service panel displays 00000.

Step	Condition	Instruction	Comments
1	Go to the **Instructions** column.	1. Set the Power Off switch on the service panel to Power Off. 2. Ensure DIAG1 is in diskette drive 1. 3. Set the Power Off switch to Normal, and press Power On. MSS Basic and Extended diagnostics are run. 4. Go to step 2.	
2	Do you have the message MSS EXTENDED DIAGNOSTICS COMPLETED?	1. Select diagnostic option FF and press ENTER. 2. Let the diagnostics loop for two minutes. 3. Press Power On/IML to stop the loop. 4. Go to step 5.	
3	Do you have an error stop with a reference code displayed?	Follow the directions on the screen.	
4	You have an MSS Code stop.	Go to "MSS Code Stop" on page MSS 011 with your *new* symptom.	Wait 30 seconds for the MSS Code to display.
5	Did diagnostic option FF loop without detecting an error?	You have either an intermittent failure or a failure caused by a device on channel 0. Exchange 01A-A2 V2, W2, and X2 and go to "END Repair Procedure" on page END 001. (See **Comments**.)	If the problem returns when the customer tries to use the system, go to "Channel Problem Isolation Procedure" on page CHNL 001 and test channel 0.
6	Do you have an error stop with a reference code displayed?	Follow the directions on the screen.	
7	You have an MSS Code stop.	Go to "MSS Code Stop" on page MSS 011 with your *new* symptom.	Wait 30 seconds for the MSS Code to display.

Reset Failure

You have one of the following:

- The MSS diagnostics start to run again every 30 seconds
- The customer reported that the General Selection (Q) screen displayed during normal operation
- The Power In Process indicator was on.

Suspect the following FRUs:

01A-A1 U2
01A-A1 V2.

Step	Condition	Instruction	Comments
1	Do the MSS diagnostics start to run every 30 seconds?	1. Set the Power Off switch on the service panel to Power Off. 2. Set CB1 and CB2 off. 3. Exchange 01A-A1 U2. 4. Set CB1 and CB2 on. 5. Set the Power Off switch to Normal, and press Power On. 6. Go to step 3.	For the locations of CB1 and CB2, see Volume A07, Locations, "Primary Control Compartment (PCC)."
2	Did the customer report that the General Selection (Q) screen displayed during normal operation or that the Power In Process indicator was on?	1. Set the Power Off switch on the service panel to Power Off. 2. Set CB1 and CB2 off. 3. Exchange 01A-A1 U2, and 01A-A2 V2. 4. Set CB1 and CB2 on. 5. Set the Power Off switch to Normal, and press Power On. 6. Go to step 3.	For the locations of CB1 and CB2, see Volume A07, Locations, "Primary Control Compartment (PCC)."
3	Go to the **Instructions** column.	This problem can also be caused by the following: Power On/IML switch on the OCP Logic Reset switch MODE SEL on the system console An MSS error that causes an automatic SP IML. If this problem occurs again, call your support structure for assistance. Go to "END Repair Procedure" on page END 001.	

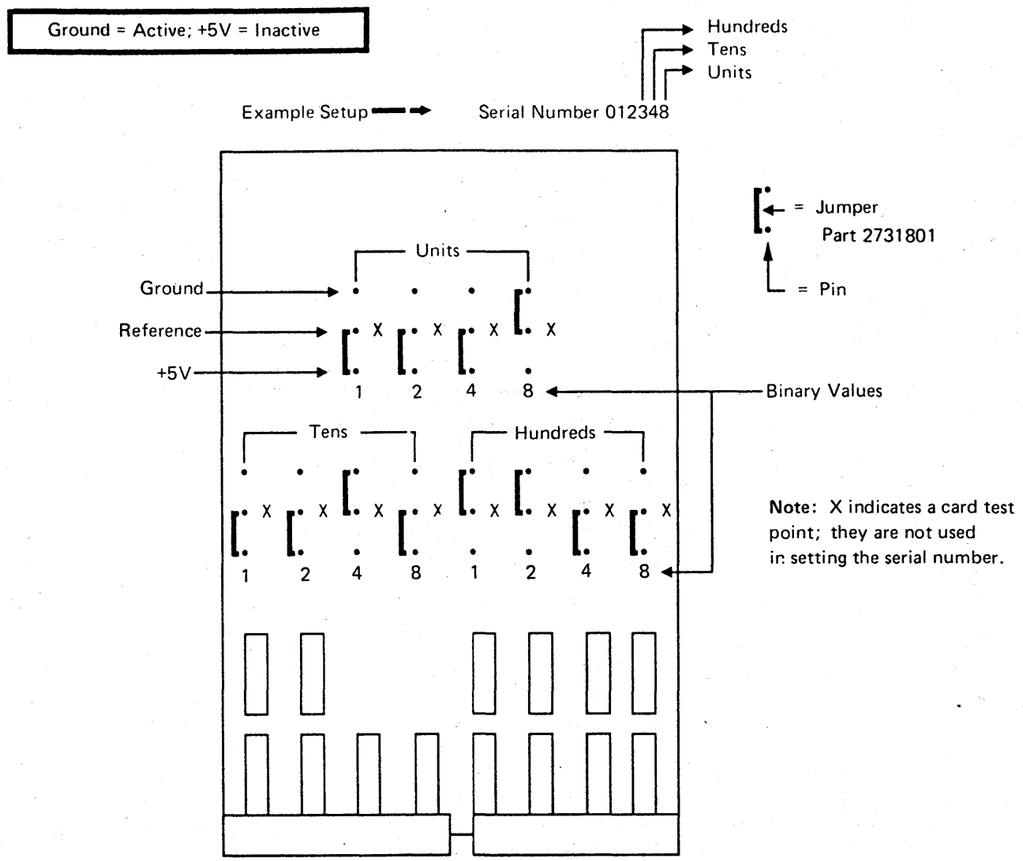
Serial Number Match

You have a reference code of F61801FA or the message SERIAL NO. DOES NOT MATCH. This indicates one of the following:

The wrong machine serial number stored on the FUNC1 diskette
The wrong machine serial number wired on the 01A-A2 F4 card
A defective serial number card at 01A-A2 F4.

Warning: Damage will result if cards are removed with power on. Do not remove any FRUs until you power down and the service panel displays 00000.

Step	Condition	Instruction	Comments
1	Go to the **Instructions** column.	1. Set the Power Off switch on the service panel to Power Off. 2. Set the CE Mode switch to CE Mode. 3. Ensure the FUNC1 diskette is in diskette drive 1 and the FUNC2 diskette is in diskette drive 2. 4. Set the Power Off switch to Normal and press Power On. 5. When prompted, key in the date and time then press ENTER. The Partial Power Up/Down screen displays. 6. Key in QWP and press ENTER. The PCA diagnostics run. 7. Go to step 2.	
2	Did the PCA tests run without errors?	You have an intermittent problem. Exchange 01A-A2 F4 and go to "END Repair Procedure" on page END 001.	Ensure the new FRU has the correct jumpers.
3	Did the PCA tests fail with a reference code of F6 1801 FA?	The serial numbers stored on the FUNC1 diskette and jumpered on 01A-A2 F4 are displayed. Check the serial numbers displayed and go to step 5.	
4	Did the PCA tests fail with an MSS Code or a reference code **other than** F6 1801 FA?	You have a new failure. Go back to MSS 001 with your new symptom.	
5	Is the serial number displayed for the machine different from the actual serial number on the machine?	1. Set the Power Off switch on the service panel to Power Off. 2. Check the jumpers on 01A-A2 F4 using the example on this page as a guide. If the jumpers are not correct, correct the jumpers. Rerun the PCA test and go to "END Repair Procedure" on page END 001. If the jumpers are correct, exchange 01A-A2 F4. (Ensure the new FRU has the correct jumpers.) Go to "END Repair Procedure" on page END 001.	
6	The serial number displayed for the FUNC1 diskette is wrong.	Ensure the correct FUNC1 diskette is installed. Use the backup FUNC1 diskette if possible and order a replacement diskette. Go to "END Repair Procedure" on page END 001.	



Console Diskette Errors

You have a console message, an MSS Code, or a reference code that indicates a failure in one of the diskette drives, one of the Diskette Drive Adapters (DDAs), or a damaged diskette. Suspect the following FRUs:

- 01A-A2 K2 (DDA1) or 01A-A2 L2 (DDA2)
- Control cards on the diskette drives
- Diskette drive assembly 1 or 2
- 01A-A2 H2 (SP)
- Cable from 01A-A2 ZD to diskette drive 1
- Cable from 01A-A2 ZF to diskette drive 2
- Diskette.

Note: The failing drive is indicated by the third digit of the functional reference code. Example: F5 **2**10A 2C indicates an error in diskette drive 2.

Step	Condition	Instructions	Comments
1	Go to the **Instructions** column.	Check for the following on **both** diskette drives: • The drive motor is running • The belt is not broken or off the pulleys. Go to step 2.	To check the belts and motors, open the cover over the service panel and slide the drives out.
2	Is either drive motor **stopped?**	1. Set the Power Off switch on the service panel to Power Off. 2. Go to "AC Power Plug Check" on page MSS 058.	
3	Are either of the drive belts broken or off the pulleys?	1. Set the Power Off switch on the service panel to Power Off. 2. Exchange the drive belt. 3. Set the Power Off switch to Normal and press Power On. 4. Go to "END Repair Procedure" on page END 001.	Ensure the belt works correctly after pressing Power On.
4	Were you sent here from page MSS 031 with your original symptom of either a reference code or an MSS message?	Go to "Diskette Analysis" on page MSS 052.	Diskette drive diagnostics did not fail.
5	Go to the **Instructions** column.	Go to "Adapter Exchange" on page MSS 054.	Diskette drive diagnostics failed or you got an MSS code when you tried to load MSS diagnostics.

A

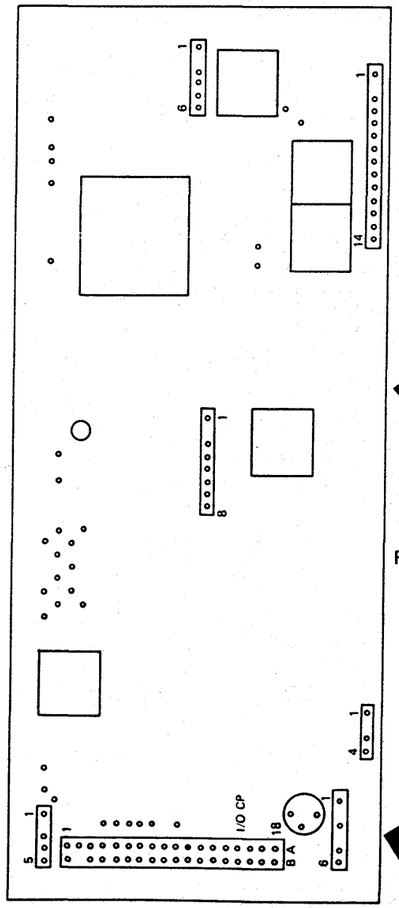
Two identical 51TD diskette drives are used. This allows FRUs to be swapped for diagnostic purposes.

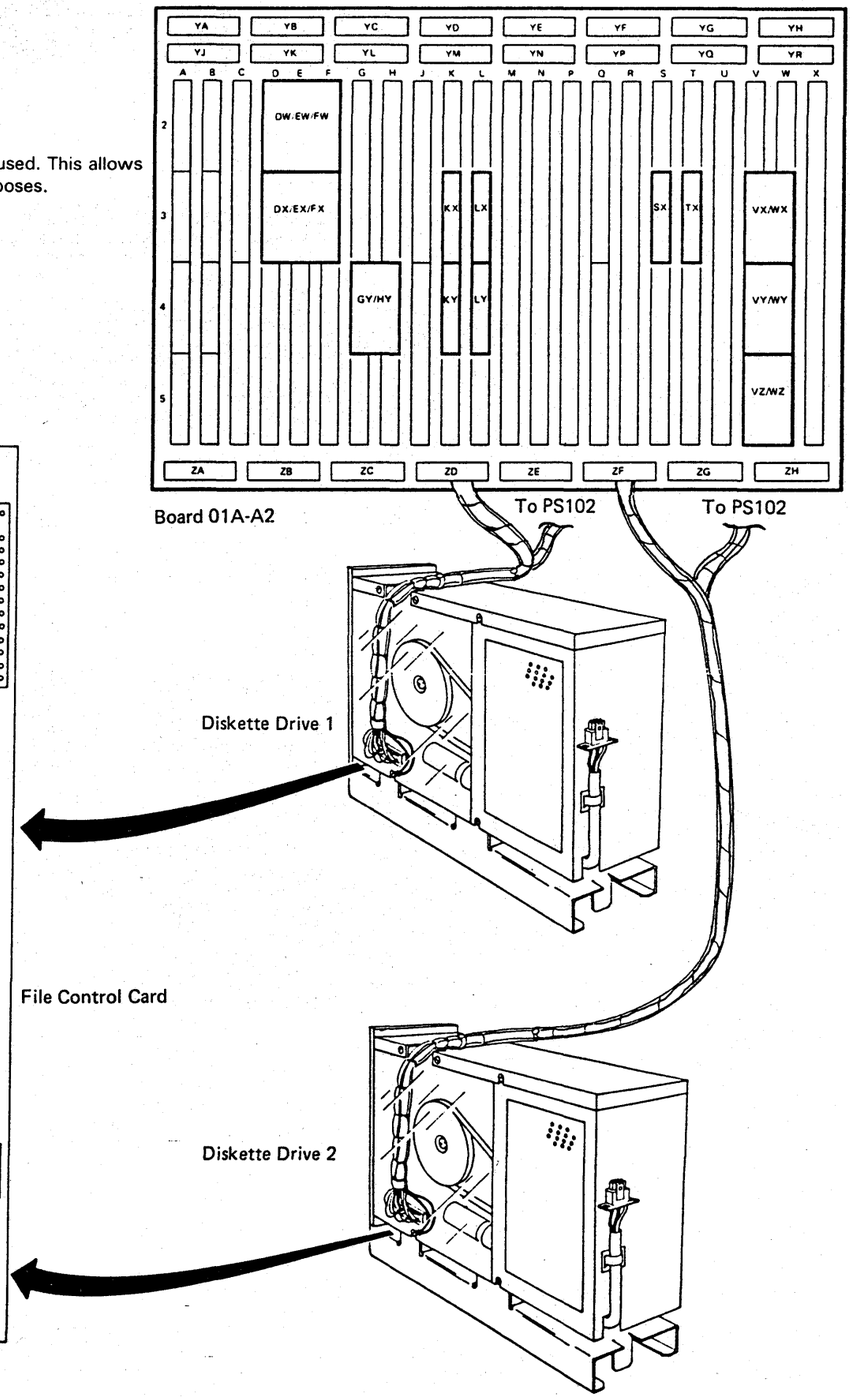
The adapters are located at:

01A-A2K2 diskette drive 1
01A-A2L2 diskette drive 2

The cable locations are:

01A-A2ZD diskette drive 1
01A-A2ZF diskette drive 2





Diskette Analysis

You have run diagnostics on both diskette drives without errors. Use the following procedure to test your functional diskettes for valid data.

Notes:

1. The FUNC1 diskette stores hardware reconfiguration data. If you are instructed to install the backup FUNC1 diskette, use the QFSA screen to see if reconfiguration data is stored. (Reconfiguration data is stored if N is displayed in the *NORMAL* field.) If reconfiguration data is stored, use the QFM screen to transfer the reconfiguration data to the backup FUNC1 diskette. For additional information, refer to Volume A08, Console Functions and Messages.

2. If a reference code or MSS Code is displayed during the diskette analysis test, you have an intermittent problem. Go to "Adapter Exchange" on page MSS 054.

3. If you had an error while testing a device other than the diskette adapters, you may have a damaged DIAG diskette. Use the following procedure but test the DIAG diskette instead of the FUNC diskettes.

Step	Condition	Instructions	Comments
1	Go to the **Instructions** column.	1. Set the Power Off switch on the service panel to Power Off. 2. Install the FUNC1 diskette in diskette drive 1 and the FUNC2 diskette in diskette drive 2. 3. Ensure the CE Mode switch is set to CE Mode. 4. Set the Power Off switch to Normal and press Power On. 5. Key in the date and time when prompted. 6. When the Partial Power Up/Down screen displays, press MODE SEL. The General Selection screen displays. 7. Key in QED and press ENTER. The Diskette Analysis screen displays. 8. Move the cursor to the TARGET DRIVE FOR ANALYSIS line, key in 1 to select drive 1, and press ENTER. 9. Go to step 2.	This tests FUNC1 for valid data. If a reference code or MSS Code displays, go to "Adapter Exchange" on page MSS 054. For more information on the Diskette Analysis test, see Volume A07, Diagnostics, "Diskette Analysis."
2	Did the Diskette Analysis test detect any diskette errors on FUNC1?	Check your system log to see if a backup diskette was exchanged for a similar diskette drive problem. If a backup diskette was **not** used before, install the backup FUNC1 and FUNC2 diskettes. (See **Notes**.) If a backup diskette was already exchanged for a similar problem, exchange the diskette adapter (01A-A2 K2) and diskette drive 1. Then install the FUNC1 and FUNC2 backup diskettes. (See **Notes**.) If your system log indicates that the diskette drive and adapter card have already been exchanged for this problem, exchange the cable to diskette drive 1. (See **A** on page MSS 051.) Then install the FUNC1 and FUNC2 backup diskettes. (See **Notes**.) Go to step 6.	
3	No data errors were detected on FUNC1.	Test FUNC2 as follows: 1. Press MODE SEL. The General Selection screen displays. 2. Key in QED and press ENTER. 3. Key in 00 for the starting cylinder number, 01 for the starting record number, 2 for the drive number, and press ENTER. 4. Go to step 4.	If a reference code or MSS Code displays, go to "Adapter Exchange" on page MSS 054.
4	Did the Diskette Analysis test detect any diskette errors on FUNC2?	Check your system log to see if a backup diskette was exchanged for a similar diskette drive problem. If a backup diskette was **not** used before, install the backup FUNC1 and FUNC2 diskettes. (See **Notes**.) If a backup diskette was already exchanged for a similar problem, exchange the diskette adapter (01A-A2 L2) and diskette drive 2. Then install the backup FUNC1 and FUNC2 diskettes. (See **Notes**.) If your system log indicates that the diskette drive and adapter card have already been exchanged for this problem, exchange the cable to diskette drive 2. (See **A** on page MSS 051.) Then install the backup FUNC1 and FUNC2 diskettes. (See **Notes**.) Go to step 6.	
5	No data errors were found on FUNC2.	1. Set the Power Off switch on the service panel to Power Off. 2. Use the message or reference code recorded at the time of the original failure to determine which diskette drive failed. (See **Notes** on page MSS 051.) 3. Exchange the DDA FRU for the failing diskette drive (01A-A2 K2 or L2.) 4. Go to "END Repair Procedure" on page END 001.	You had an intermittent failure. If the problem occurs again, exchange the failing diskette drive.
6	Go to the **Instructions** column.	Test the backup diskette you installed as follows: 1. Press Power On/IML. 2. When the Partial Power Up/Down screen displays, press MODE SEL. The General Selection screen displays. 3. Key in QED and press ENTER. 4. Key in 00 for the starting cylinder number, and 01 for the starting record number. 5. Key in the drive number that you installed the backup diskette in. 6. Go to step 7.	If a reference code or MSS Code displays, go to "Adapter Exchange" on page MSS 054.

Step	Condition	Instructions	Comments
7	Did the Diskette Analysis test run without errors?	Go to "Diskette Drive 1 Verification" on page MSS 059.	
8	The Diskette Analysis test failed on the backup diskette.	Go to "Adapter Exchange" on page MSS 054.	You may have an intermittent failure.

Adapter Exchange

You have a failure in one of the diskette drives during the MSS diagnostics.

This procedure will have you exchange the diskette adapter FRU for the failing drive (01A-A2 K2 for DDA1 or 01A-A2 L2 for DDA2) and test both drives.

Notes:

1. For a customer failure the failing drive is indicated by the third digit of the reference code. Example: F5 **2**10A 2C indicates an error on diskette drive 2.
2. If you got an MSS Code when you ran the MSS diagnostics, diskette drive **1** is the failing drive.
3. To run the diagnostics with DDA2 FRU removed, place a jumper between the U10 and S10 pins at board location 01A-A2 L2.
4. For intermittent problems, you can operate the machine with the diskette drive cables swapped at the diskette drive ends.

Warning: Damage will result if cards are removed with power on. Do not remove any FRUs until you power down and the service panel displays 00000.

Step	Condition	Instructions	Comments
1	Go to the **Instructions** column.	1. Ensure DIAG1 is in diskette drive 1. 2. Set the Power Off switch on the service panel to Power Off. 3. Exchange the DDA FRU for the failing drive. (01A-A2 K2 for DDA1 or 01A-A2 L2 for DDA2.) 4. Set the Power Off switch to Normal, and press Power On. MSS Basic and Extended diagnostics run. 5. Go to step 2.	
2	Do you have the message MSS EXTENDED DIAGNOSTICS COMPLETED?	Test diskette drive 1 as follows: 1. Key in A0 and press ENTER. The optional diskette drive tests are selected. 2. Key in 1 to select drive 1 and press ENTER. Diskette drive 1 is selected. 3. Go to step 4.	
3	You had a failure on MSS Basic and Extended diagnostics.	Go to step 8.	
4	Did diagnostic option A0 run on diskette drive 1 without errors?	Test diskette drive 2 as follows: 1. Key in A0 and press ENTER. The optional diskette drive tests are selected. 2. Insert DIAG1 in diskette drive 2. 3. Key in 2 to select diskette drive 2 and press ENTER. Diskette drive 2 is tested. 4. Go to step 6.	
5	Diagnostic option A0 failed on diskette drive 1.	Go to step 8.	
6	Did diagnostic option A0 run on diskette drive 2 without errors?	Go to "END Repair Procedure" on page END 001.	The operation of both diskette drives has been verified.
7	Diagnostic option A0 failed on diskette drive 2.	Go to step 8.	
8	Go to the **Instructions** column.	1. Set the Power Off switch on the service panel to Power Off. 2. Reinstall any FRUs you already exchanged. 3. Exchange 01A-A2 H2. 4. Insert DIAG1 in diskette drive 1. 5. Set the Power Off switch to Normal and press Power On. The MSS Basic and Extended diagnostics run. 6. Go to step 9.	
9	Do you have the message MSS EXTENDED DIAGNOSTICS COMPLETED?	Test diskette drive 1 as follows: 1. Key in A0 and press ENTER. The optional diskette drive tests are selected. 2. Key in 1 to select diskette drive 1 and press ENTER. Diskette drive 1 is selected. 3. Go to step 11.	
10	You had a failure on MSS Basic and Extended diagnostics.	1. Set the Power Off switch on the service panel to Power Off. 2. Reinstall 01A-A2 H2. 3. Set the Power Off switch to Normal, and press Power On. 4. Go to "Diskette Drive Voltage Check" on page MSS 056.	
11	Did diagnostic option A0 run on diskette drive 1 without errors?	Test drive 2 as follows: 1. Key in A0 and press ENTER. The optional diskette drive tests are selected. 2. Insert DIAG1 in diskette drive 2. 3. Key in 2 to select diskette drive 2 and press ENTER. Diskette drive 2 is tested. 4. Go to step 13.	
12	Diagnostic option A0 failed on diskette drive 1.	1. Set the Power Off switch on the service panel to Power Off. 2. Reinstall 01A-A2 H2. 3. Set the Power Off switch to Normal, and press Power On. 4. Go to "Diskette Drive Voltage Check" on page MSS 056.	
13 —	Did diagnostic option A0 run on diskette drive 2 without errors?	Go to "END Repair Procedure" on page END 001.	The operation of both diskette drives has been verified.

Step	Condition	Instruction	Comments
14	Diagnostic option A0 failed on diskette drive 2.	1. Set the Power Off switch on the service panel to Power Off. 2. Reinstall 01A-A2 H2. 3. Set the Power Off switch to Normal, and press Power On. 4. Go to "Diskette Drive Voltage Check" on page MSS 056.	

Diskette Drive Voltage Check

The voltages supplied to the diskette drive must be checked at the control card test points shown on this page.

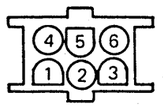
Voltages are supplied to the diskette drives from board 01A-A2 by the signal cables (01A-A2 ZD for diskette drive 1 and 01A-A2 ZF for diskette drive 2). The signal cables for the two diskette drives have the same part number.

Step	Condition	Instructions	Comments
1	Go to the **Instructions** column.	1. Open the front cover of the service panel. 2. Slide the failing drive forward. 3. Set the Power Off switch to Normal, and press Power On. 4. Check the control card for the dc voltages listed in "DC Voltages for the Diskette Control Card" **Warning:** You are working in an area of limited space. Do not short the control card pins to ground. Go to step 2.	
2	Are all voltages correct (+ or - 9%)?	Go to "Diskette Drive Exchange" on page MSS 057.	
3	A voltage is missing or out of tolerance.	Use the connector locations in the table and check for the failing voltage at PS102. Go to step 4.	For the locations on PS102, see Volume A07, Locations, "Power Supplies."
4	Are the voltages correct at PS102?	Exchange the signal cable to the failing diskette drive. Go to "END Repair Procedure" on page END 001.	
5	The voltages are not correct at PS102.	Exchange or repair PS102. Go to "END Repair Procedure" on page END 001.	The diagrams for PS102 are shown in Volume C01.

DC Voltages for the Diskette Control Card

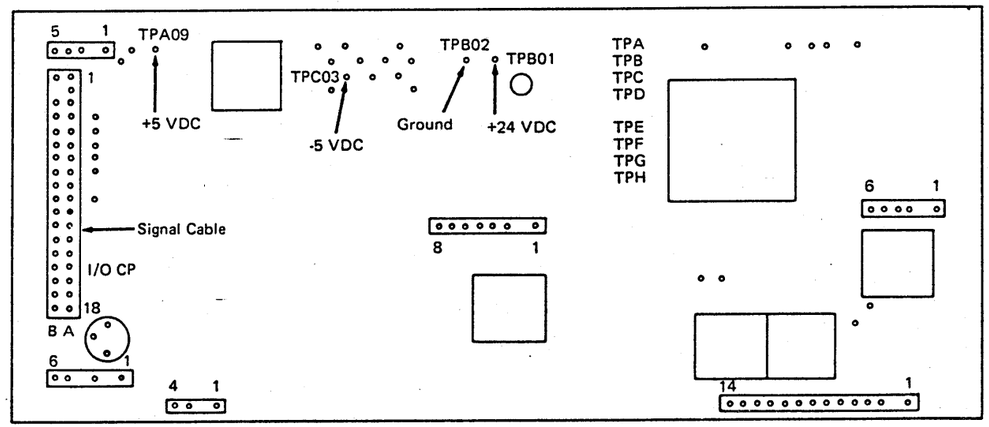
PS102 Output V	Connector Drive 1 or Drive 2	Cable	Control Card I/O CP	Test Point	Voltage
+ 5 Vdc	J10/P10-2 J11/P11-2	--->>	I/O B01	TPA09	+ 5 Vdc
+24 Vdc	J10/P10-5 J11/P11-5	--->>	I/O B03	TPB01	+24 Vdc
- 5 Vdc	J10/P10-6 J11/P11-6	--->>	I/O A01	TPC03	- 5 Vdc
Gnd	J10/P10-4 J11/P11-4	--->>	I/O A18	TPB02	Ground

Pin Locations for J10 and J11



Jack
(Pin Side)

Control Card Test Points



Diskette Drive Exchange

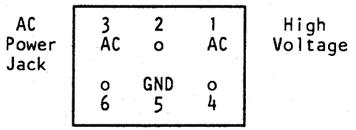
You have exchanged the DDA on the failing drive and checked the voltages on the control card without finding the problem. This procedure will have you exchange the failing diskette drive and the cable to the drive.

Step	Condition	Instructions	Comments
1	Go to the **Instructions** column.	1. Set the Power Off switch on the service panel to Power Off. 2. Exchange the failing diskette drive. 3. Insert DIAG1 in diskette drive 1. 4. Set the Power Off switch to Normal, and press Power On. MSS Basic and Extended diagnostics are run. 5. Go to step 2.	
2	Do you have the message MSS EXTENDED DIAGNOSTICS COMPLETED?	Test diskette drive 1 as follows: 1. Key in A0 and press ENTER. The optional diskette drive tests are selected. 2. Key in 1 to select diskette drive 1 and press ENTER. Diskette drive 1 is tested. 3. Go to step 4.	
3	MSS Basic and Extended diagnostics failed.	Go to step 8.	
4	Did diagnostic option A0 run without errors on diskette drive 1?	Test diskette drive 2 as follows: 1. Key in A0 and press ENTER. The optional diskette drive tests are selected. 2. Install DIAG1 in diskette drive 2. 3. Key in 2 to select diskette drive 2 and press ENTER. Diskette drive 2 is tested. 4. Go to step 6.	
.5	Diagnostic option A0 failed on diskette drive 1.	Go to step 8.	
6	Did diagnostic option A0 run without errors on diskette drive 2?	Go to "END Repair Procedure" on page END 001.	The operation of both diskette drives has been verified.
7	Diagnostic option A0 failed on diskette drive 2.	Go to step 8.	
8	Go to the **Instructions** column.	1. Set the Power Off switch on the service panel to Power Off. 2. Exchange the cable to the failing drive. 3. Insert DIAG1 in diskette drive 1. 4. Set the Power Off switch to Normal, and press Power On. MSS Basic and Extended diagnostics are run. 5. Go to step 9.	
9	Do you have the message MSS EXTENDED DIAGNOSTICS COMPLETED?	Test diskette drive 1 as follows: 1. Key in A0 and press ENTER. The optional diskette drive tests are selected. 2. Key in 1 to select diskette drive 1 and press ENTER. Diskette drive 1 is tested. 3. Go to step 11.	
10	MSS Basic and Extended diagnostics failed.	Go to step 15.	
11	Did diagnostic option A0 run without errors on diskette drive 1?	Test diskette drive 2 as follows: 1. Key in A0 and press ENTER. The optional diskette drive tests are selected. 2. Install DIAG1 in diskette drive 2. 3. Key in 2 to select diskette drive 2 and press ENTER. Diskette drive 2 is tested. 4. Go to step 13.	
12	Diagnostic option A0 failed on diskette drive 1.	Go to step 15.	
13	Did diagnostic option A0 run without errors on diskette drive 2?	Go to "END Repair Procedure" on page END 001.	The operation of both diskette drives has been verified.
14	Diagnostic option A0 failed on diskette drive 2.	Go to step 15.	
15	Go to the **Instructions** column.	1. Reinstall any FRUs you exchanged. 2. Call for assistance on this problem.	You have exchanged the DDA, SP, diskette drive, and drive cable without finding the problem.

AC Power Plug Check

You determined that the drive motor of the failing diskette drive is not turning. Use the diagram of the power plug and the following procedure to check the ac voltage at the drive motor.

DANGER
Hazardous voltages are present on the connector



For power logics, see Volume C01.

Step	Condition	Instructions	Comments
1	Go to the **Instructions** column.	1. Set the Power Off switch on the service panel to Power Off. 2. Unplug the ac power cable on the rear of the failing diskette drive. 3. Check the plug and jack connector for loose or broken pins. 4. Set the Power Off switch to Normal, and press Power On. ***DANGER*** ***Hazardous voltages are present on the connector*** 5. Check for 200 to 240 Vac between connector pins 1 and 3. 6. Set the service panel Power Off switch to Power Off. 7. Reconnect the ac power cable. 8. Go to step 2.	The voltage you measure should be the same as the system phase-to-phase ac input voltage. For pin locations on the plug, see the diagram on this page.
2	Is the voltage missing or low at the power connector?	Use the wiring diagram in Volume C01 to correct the problem. When complete, go to "END Repair Procedure" on page END 001.	
3	The ac voltage is correct at the power connector.	1. Exchange the failing diskette drive. 2. Insert DIAG1 into diskette drive 1. 3. Set the Power Off switch to Normal and press Power On. MSS Basic and Extended diagnostics are run. 4. Go to step 4.	
4	Do you have the message MSS EXTENDED DIAGNOSTICS COMPLETED?	Go to "Diskette Drive 1 Verification" on page MSS 059.	
5	You got an MSS Code or a reference code during the MSS Basic or Extended diagnostics.	Check that all cables and connectors to the diskette drive are correctly installed. If you have a reference code displayed, follow the instructions on the screen. If you have an MSS Code, go to "MSS Repair Procedure" on page MSS 001 with your new symptom.	You have a new problem on the system which may be caused by the new diskette drive.

Diskette Drive 1 Verification

You have isolated and exchanged the failing FRU. Now verify the operation of diskette drives 1 and 2 before going to the "END Repair Procedure"

Step	Condition	Instructions	Comments
1	Go to the **Instructions** column.	1. Set the Power Off switch on the service panel to Power Off. 2. Ensure DIAG1 is in diskette drive 1. 3. Set Power Off to Normal and press Power On. MSS Basic and Extended diagnostics are run. 4. When the message MSS EXTENDED DIAGNOSTICS COMPLETED is displayed, key in A0, and press ENTER. The diskette drive optional diagnostics are selected. 5. Key in 1, and press ENTER. Diskette drive 1 is tested. 6. Go to step 2.	If the Basic and Extended diagnostics detect an error, go to "START Repair Procedure" on page START 001 with your new symptom.
2	Did diagnostic option A0 run without errors?	You have verified the operation of diskette drive 1. Go to "Diskette Drive 2 Verification."	
3	Do you have an error stop and a reference code with a UU field of F5 displayed?	Check that the cards and cables in the area where you were working are properly seated. You may have an intermittent problem. If you cannot resolve the problem, call for assistance.	Reference code format is: UU RRRR IS.
4	Do you have an error stop and a a reference code with a UU field that is not F5?	Follow the instructions on the system console.	You have a new problem on the system.

Diskette Drive 2 Verification

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The failing diskette drive has been repaired and the operation of diskette drive 1 verified. Verify the operation of diskette drive 2 and go to "END Repair Procedure"

Step	Condition	Instructions	Comments
1	Go to the **Instructions** column.	1. Select diagnostic option A0, and press ENTER. The optional DDA/diskette tests are selected. 2. Insert DIAG1 in diskette drive 2. 3. Key in 2, and press ENTER. Diskette drive 2 is tested. 4. Go to step 2.	
2	Did diagnostic option A0 run without errors?	Go to "END Repair Procedure" on page END 001.	You have fixed the problem and verified the operation of both diskette drives.
3	Do you have an error stop and a reference code with a UU field of F5 displayed?	Check that the cards and cables in the area where you were working are properly seated. You may have an intermittent problem. If you cannot resolve the problem, call for assistance.	Reference code format is: UU RRRR IS.
4	Do you have an error stop and a reference code with a UU field that is not F5?	Follow the instructions on the system console.	You have a new problem on the system.

MSS 059

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END REPAIR PROCEDURE

Read down the **Condition** column until you find a question you can answer "yes" or a statement that matches the conditions you have. Then do the instructions in the **Instructions** column.

Step	Condition	Instructions	Comments
1	Is the machine still failing?	Invoke your support structure. Return here when the problem is resolved.	The problem has not been resolved, and the machine is still failing.
2	The machine is not failing.	1. Ensure the FUNC1 diskette is in diskette drive 1 and the FUNC2 diskette is in diskette drive 2. 2. Set the CE Mode switch to Normal. 3. Press Power On/IML on the operator control panel. 4. If the Local Time Clock screen displays, enter the date and time on the fields on the screen and press ENTER. 5. Go to step 3.	The Local Time Clock screen displays only if the MSS was powered down.
3	Did you change the system configuration or UCWs?	Transfer the UCW and configuration data to the other system diskette. Go to step 4.	For additional information, refer to Volume A08, Console Functions, "(QFM) Module Transfer."
4	Did you leave a substitute part number in the machine?	1. Ensure the CE Mode switch is set to CE Mode. 2. Press MODE SEL. The General Selection screen is displayed. 3. Key in P7, and press ENTER. The first of three Component Locations and Part Numbers screens is displayed. (See **Comments**.) 4. Key in the FRU location you exchanged followed by an equal sign (**example**: 01AA1N2=), and press ENTER. The old part number is displayed on the selection line (**example**: 01AA1N2=9999999). 5. Key in the new part number in place of the old part number, and press ENTER. The new part number is stored on the diskette. 6. Repeat the two previous steps for any other FRUs with a substitute part number you left in the machine. 7. Go to step 5.	All of the machine FRUs are not listed on the PA7 screens. If the FRU you replaced is not on one of the screens, go to step 5. For power, cooling, and board FRUs use the chart on page START 015 to determine the code used for the FRU location.
5	Did you update any part numbers on the PA Option 7 screen?	1. Press MODE SEL. The General Selection screen is displayed. 2. Key in QFM and press ENTER. The module transfer screen is displayed. 3. Key in X next to PROBLEM ANALYSIS. 4. Insert the backup FUNC1 diskette in diskette drive 2 and press ENTER. The new part number is transferred to the backup diskette. 5. Return the FUNC2 diskette to diskette drive 2. 6. Go to step 6.	Update the backup system diskette with the new part number(s).
6	Go to the **Instructions** column.	1. Set the CE Mode switch to CE Mode. 2. Key in QPE, and press ENTER. SERVICE ACTION COMPLETED is displayed on line 20 of the console display. 3. Set the CE Mode switch to Normal. 4. Ensure all other switches (including control unit Local/Remote switches and I/O Power Hold) are set to Normal. 5. Key in QL, and press ENTER. When the Program Load screen displays, ensure the correct mode is set. (See **Comments**) 6. If NO IML is displayed, key in M and press ENTER to IML the processing unit. 7. Complete your call report.	If necessary, use the QLI screen to change the mode for IML. Refer to Volume A08, Console Functions, "(QLI) Alter IML Parameters."