IBM Maintenance Library

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8809

Magnetic Tape Unit Maintenance Information (4300 Processors)

8809

AV0001 Seq 1 of 2	2699289 Part Number	846318 15 Mar 79	846481 15 Dec 79	847308 1 Aug 81	847314 1 Apr 82			

PREFACE

How to use the MIM

The MIM can be used in three ways:

1. As a problem solving aid:
   a. The CE can enter the MIM in the START section.
   b. The CE can follow the instructions in the START section to progress to other sections.
   c. In the START section and other MIM sections, references are made to other sections for support information.
2. As a recall aid:
   a. The cover of each volume shows the contents of the entire MIM, highlighting the contents of particular volume.
   b. The CE can enter a section on page 1 (the table of contents) if he knows the section contains the needed information.
   c. The CE can refer to the INDEX section to locate desired information.
3. As an education tool:
   a. The student completes reading assignments in the MIM required by the FE education course.
   b. The student uses pages in the MIM as reference material.

How to Update the MIM

This manual is under normal Logic Engineering Change controls. File pages by sequence number and side 1 EC level. EC level and date are given in the EC history strip 2.

Related Publications

For 8100 system attachment:

- Introduction to the IBM 8100 Information System, Order No. GA27-2875.
- IBM 8100 Information System Configurator, Order No. GA27-2876.

For 4331 system attachment:

- IBM 4331 Computing System Summary, Input/Output and Data Communications Configurator, Order No. GA33-1523.
- IBM Input/Output Device Summary, Order No. GA32-0039.
- IBM Input/Output Equipment Installation Manual - Physical Planning, Order No. GC22-7064.

For 8100 and 4331 system attachment:

- Reference Manual for IBM 8809 Tape Unit, Order No. GA26-1659.
- IBM 8809 Tape Unit Operator's Guide, Order No. 232-0005.
- Tape Specifications for IBM One-Half Inch Tape Units at: 5556, 800, 1600, and 6250 BPI, Order No. GA32-0006.

This manual was prepared by the IBM General Products Division, Department 61E, Tucson, Arizona 85744.

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SAFETY

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 which exceed 30V ac or 42.4V dc 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 (form 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 energized equipment. 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, etc.), use suitable rubber mats purchased locally if necessary.

6. Follow special safety instructions when working with extremely high voltages. These instructions are outlined in 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, etc.] 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. Don't defeat their purpose by not replacing them at the completion of the service call.)

10. Safety glasses must be worn when:

    - Using a hammer to drive pins, etc.
    - Power hand drilling
    - Using spring hooks, attaching springs
    - Soldering, wire cutting, removing steel bands
    - Parts cleaning, using solvents, chemicals, and cleaners
    - All other conditions which might be hazardous to your eyes

11. Never assume that a circuit is deenergized. (Check it first.)

12. Always be alert to potential hazards in your working environment (i.e., damp floors, nongrounded extension cords, power surges, missing safety grounds, etc.).

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--DON'T 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. Each customer engineer is responsible to be certain that no action on his/her part renders the product unsafe or exposes hazards to customer personnel.

18. Place removed machine covers in a safe out-of-the-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 CE tool kit away from walk areas where no one can trip over it (i.e., under desk or table).

20. Avoid wearing loose clothing that may be caught in machinery. Shirt sleeves must be left 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 non-conductive) approximately three inches from the end when servicing a machine.

22. Before starting equipment, make sure that fellow CEs and customer personnel 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, etc.

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 which can retain a charge from the machine, review the procedure in the maintenance documentation. 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* the time. The exact condition of a machine may be unknown. Here are some of the reasons why:

- The power receptacle could be incorrectly wired.
- Safety devices or features could be missing or defective.
- The maintenance and/or modification 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 due to age or environmental extremes.
- A component could be defective, creating a hazard.
- Some component of the machine may have been incorrectly assembled.

Relating to safety, these are some of the ways the condition of the machine can be affected. *Before you begin a service call or procedure, exercise good judgment and proceed with caution.*

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Safety Guidelines (Continued)

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 EPO (Emergency Power Off) or disconnect switch to remove the electrical current. If the EPO or disconnect switch 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, he/she may need rescue breathing and possibly external cardiac compression if the heart is not beating.
- *Call Fire Rescue* (Rescue Squad, Emergency, Ambulance, Hospital, etc.). Have someone summon medical aid.

Determine if the victim needs rescue breathing.

1. Make certain that the victim's airway is open and that it is 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 as shown in Figure 1.
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 the exhaling of air.

Figure 1.

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 as shown in Figure 1, 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 (See Figure 2).

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.

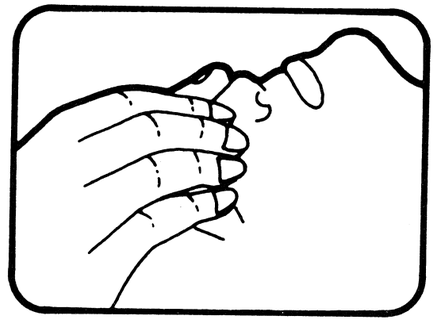

Figure 2.

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 (See Figure 3).

Figure 3.

c. Remove your mouth and allow the victim to exhale while watching for the victim's chest to fall (See Figure 4).

Figure 4.

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

Reporting Accidents

It is a CE's 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 will ensure that the situation will be resolved quickly.

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

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NOTES:

Notes **SCGEN 5**

SYMPTOM CODE GENERATION INSTRUCTIONS

The host system program generates the symptom code (SC) and places it in sense bytes 30 and 31. Under certain conditions, the SC may not be in these sense bytes. This procedure is used to generate the SC if it is missing.

The SC is used as an entry to maintenance analysis procedures (MAPs). The SCs are listed in the Fault Code Dictionary (FCD) section. Each SC entry gives additional references to a field replaceable unit (FRU) list, MAP entry, maintenance information manual (MIM) support page, and SC error descriptions.

The symptom code for a failure is determined by:

1. Examining the host system and adapter error conditions.
2. Referring to the sense byte data logged at the time of failure.
3. Following the procedure, starting on this page under symptom code generation, to determine the symptom code.

System codes are grouped into six error categories, as shown in Figure 1.

Symptom Code	Error Condition
AXXX	System adapter detected errors
BXXX	8809 detected control line and basic control logic errors
CXXX	8809 detected motion errors
DXXX	8809 detected read/write errors
EXXX	8809 detected data checks
FFFX	SCs that may be generated from incorrect error data

Figure 1.

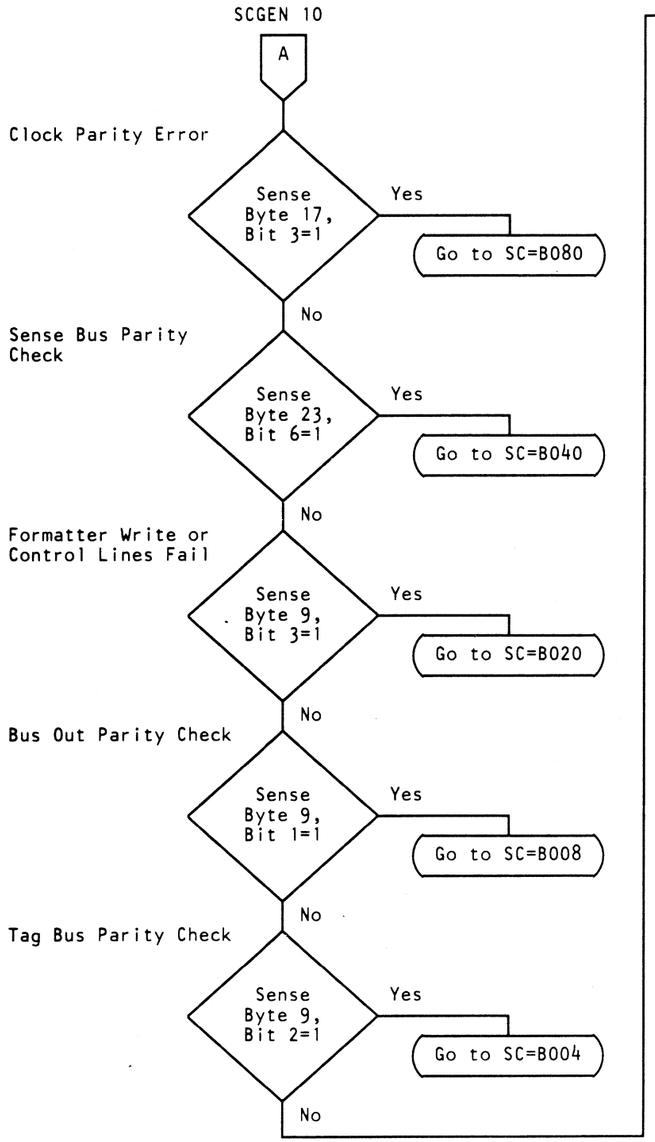
SYMPTOM CODE GENERATION PROCEDURE

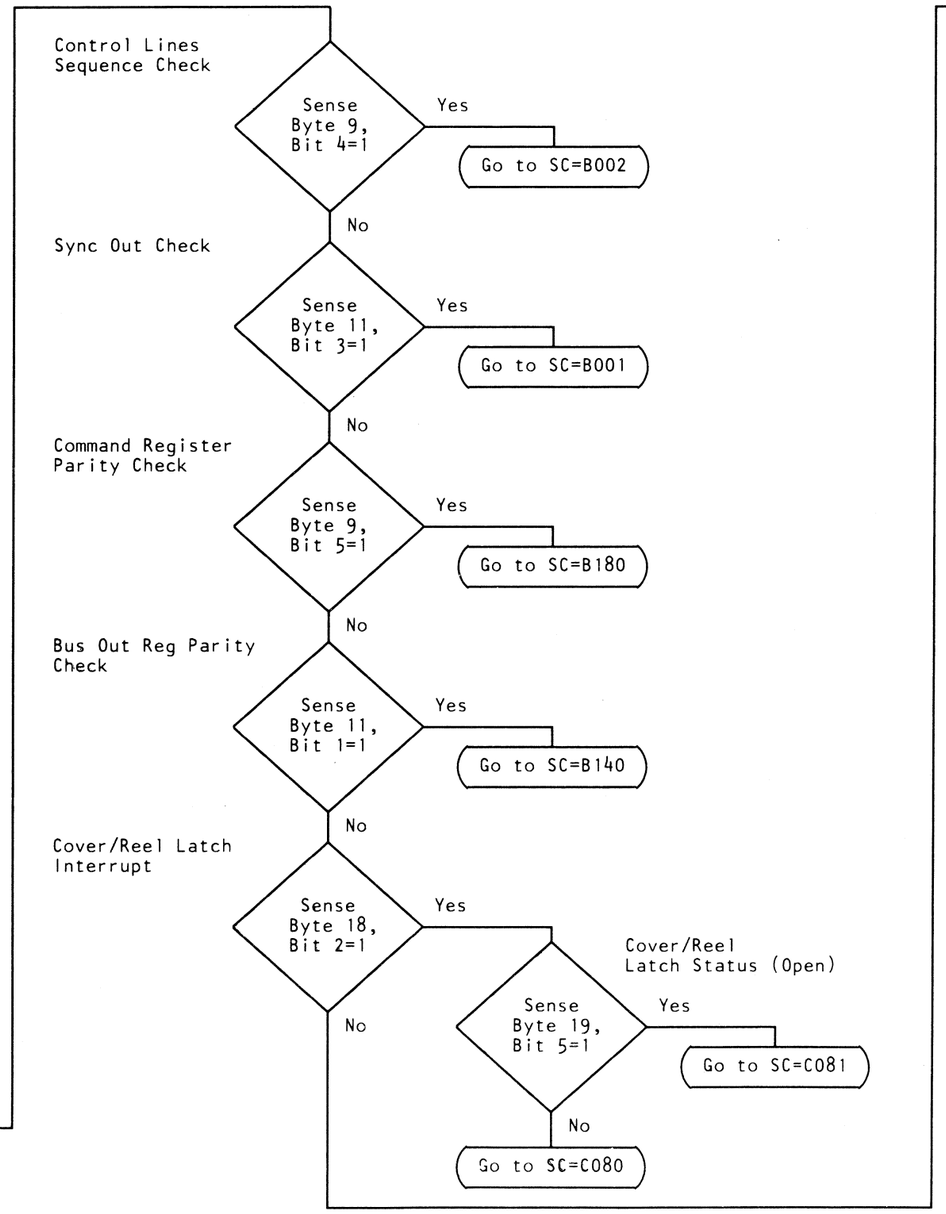
The first set of error conditions to be examined are those detected by the host system. If you have one of the error conditions listed in Figure 2, go to the Fault Code Dictionary section and follow the instructions in the Action column for the symptom code listed for that error.

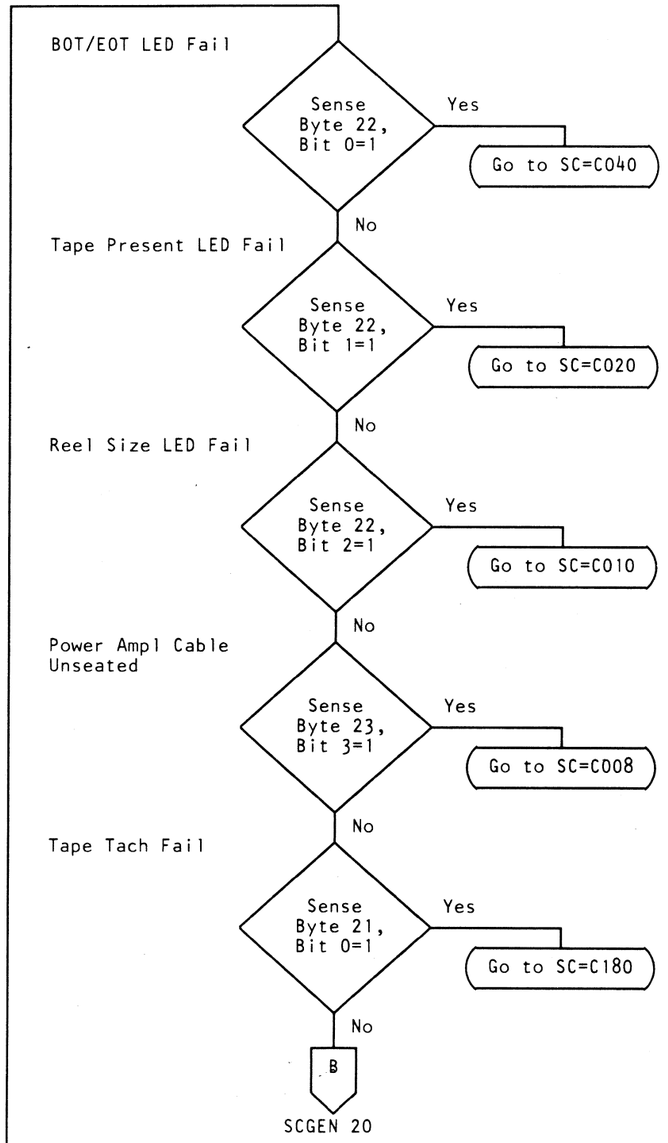
Error Condition	Symptom Code
A Bus In parity error occurred.	A100
An active control line (any bit equal to 1) has been detected at Selection time.	A110
A timeout waiting for Tag Valid during selection (Tag =X '83').	A220
A timeout waiting for Tag Valid on any operation except selection (Tag =X '01').	A221
Control line timeout waiting for Normal/Check End, Selected Alert, or Sync In during execution (Tag =X '01').	A230
Multiple Sync In.	A232
Control line timeout on a Poll command (Tag =X '02').	A240
Control line timeout on Read Control (Tag =X '0A').	A250
Normal End not received with Tag Valid on select, immediate, disconnected, or poll commands.	A310
Select Active on when not expected.	A320
Normal end (control line) equals 1 early on a write operation.	A321
Normal/Check End received early on a write operation.	A330
Select Active dropped before deselection.	A340
During selection, the returned address did not compare with the selected address.	A400

Figure 2.

If none of the host-detected error conditions exist, then go to SCGEN 11 to continue the symptom code generation procedure, using the sense data logged at the time of failure.

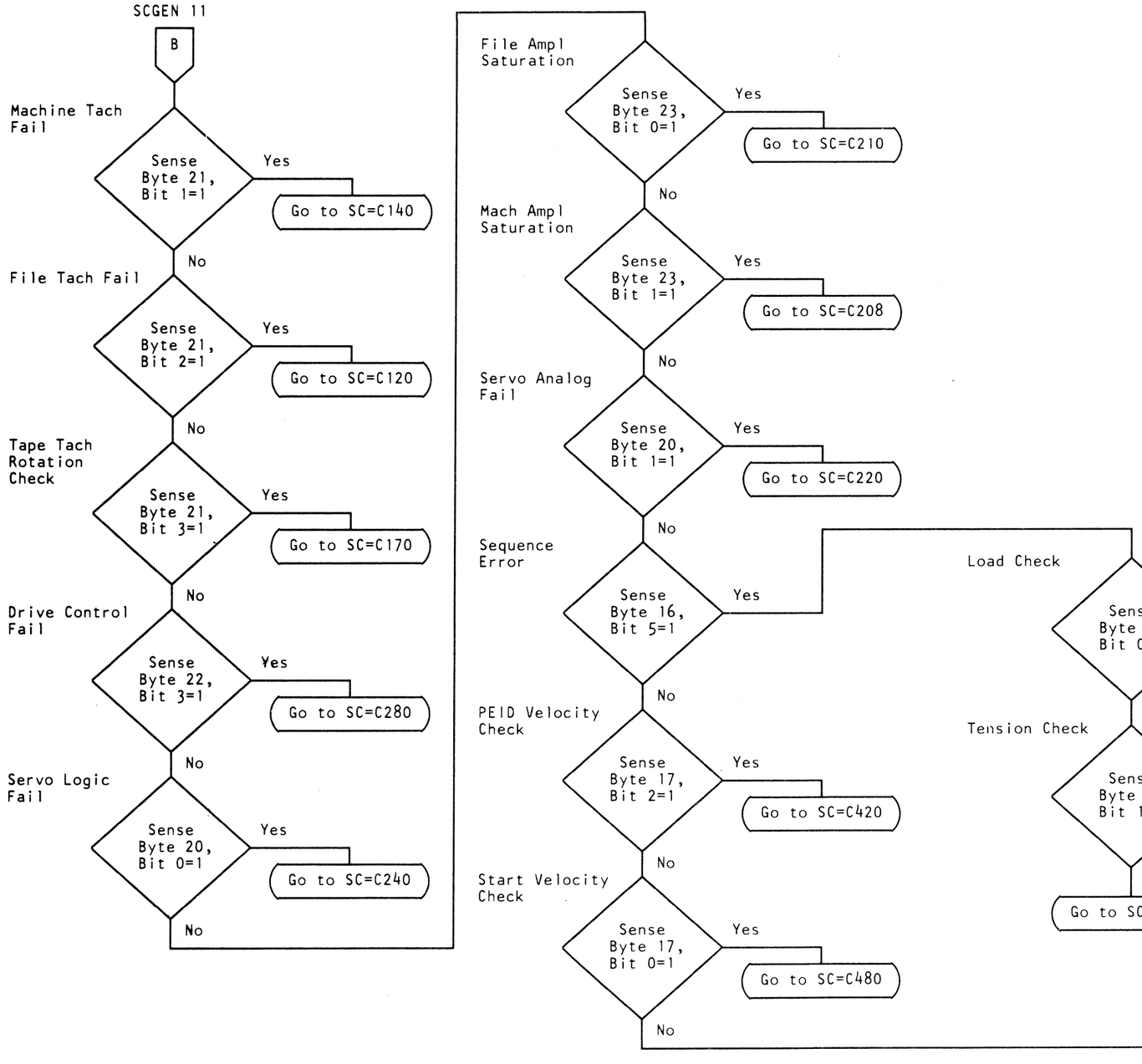


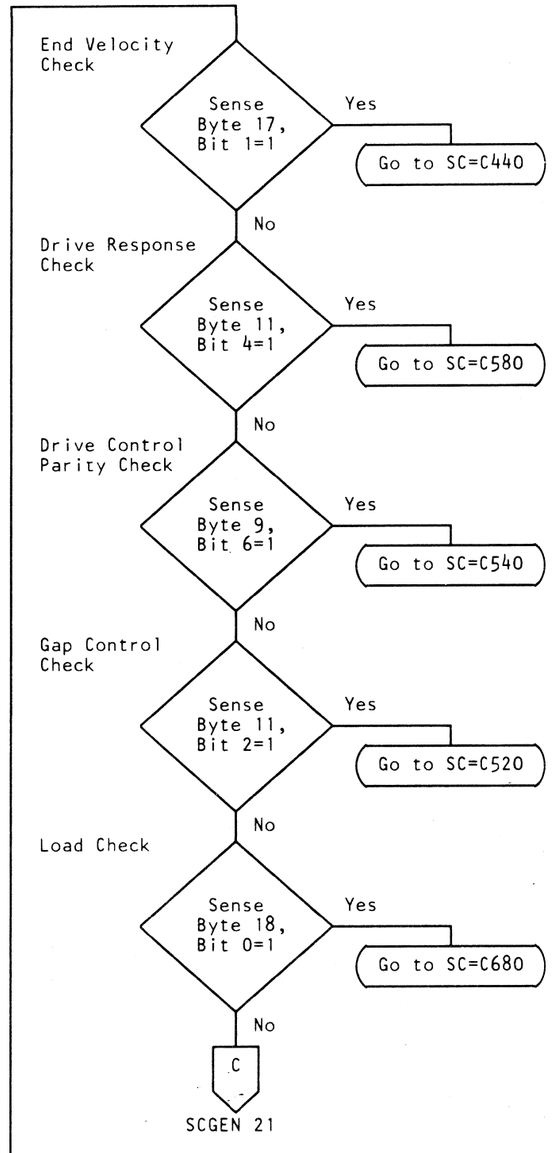




Note: All SCs are in FCD

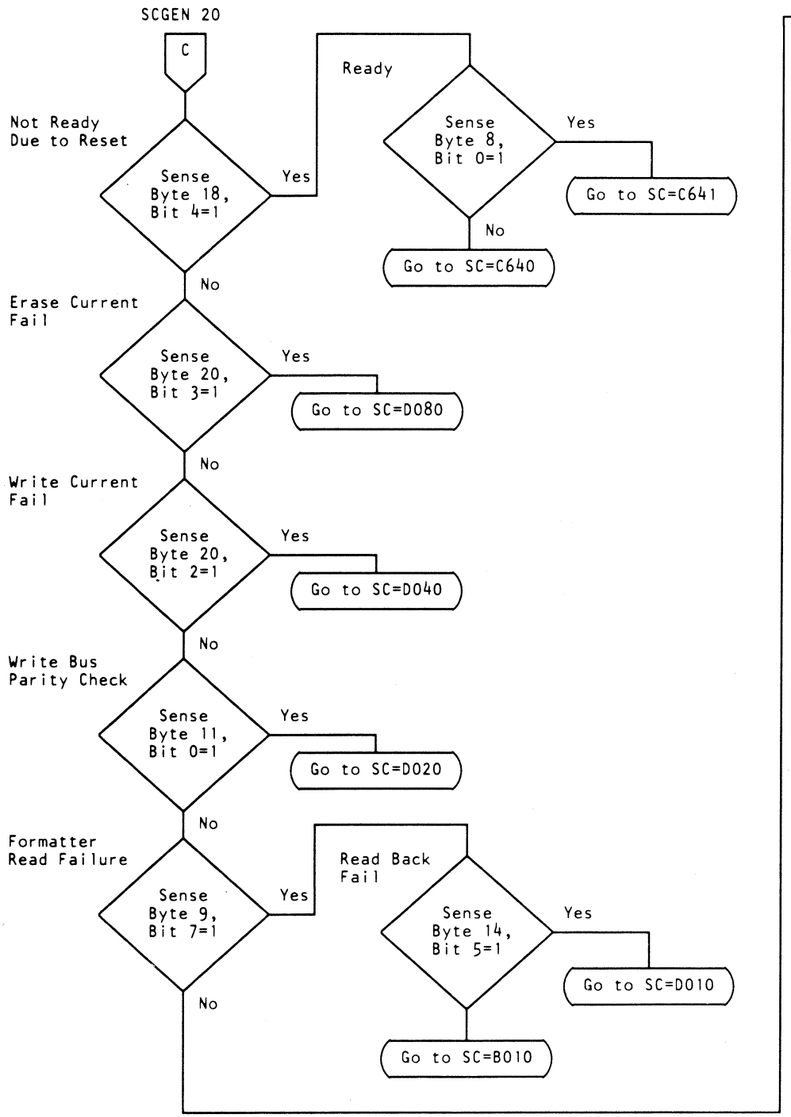
SYMPTOM CODE GENERATION (Continued)

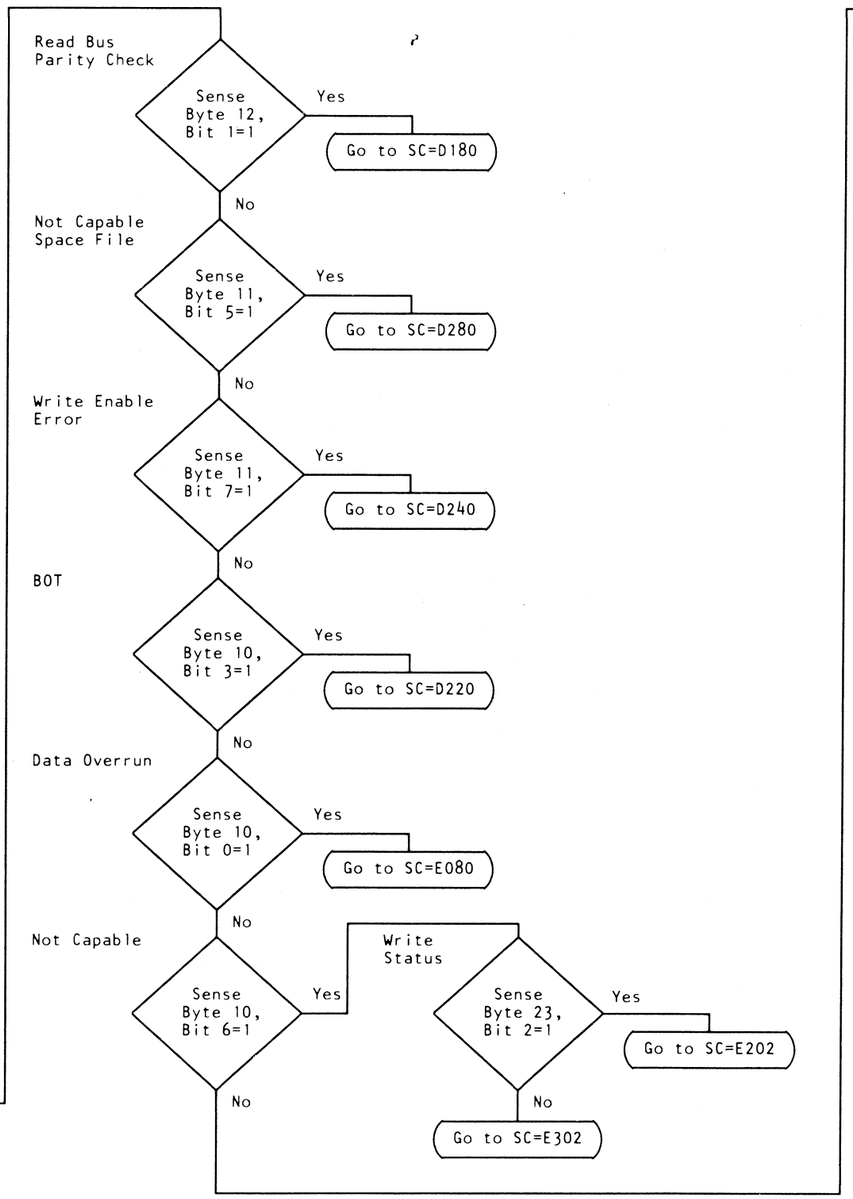


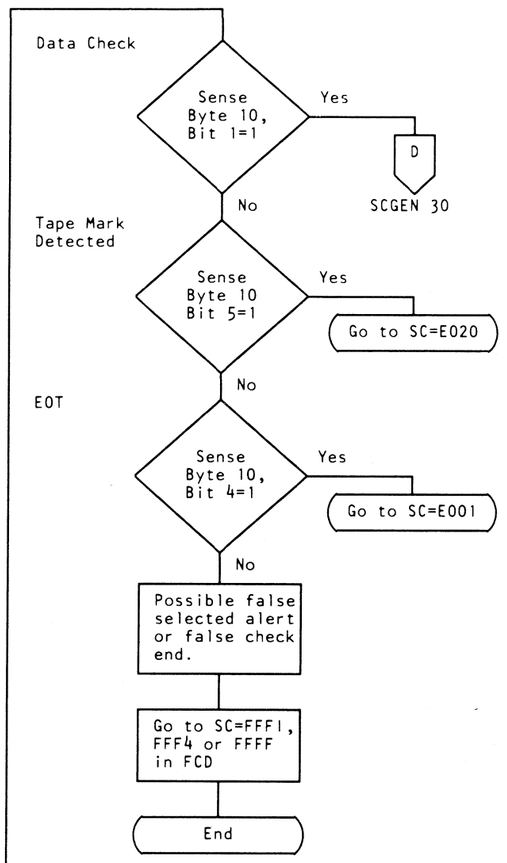


Note: All SCs are in FCD.

SYMPTOM CODE GENERATION (Continued)

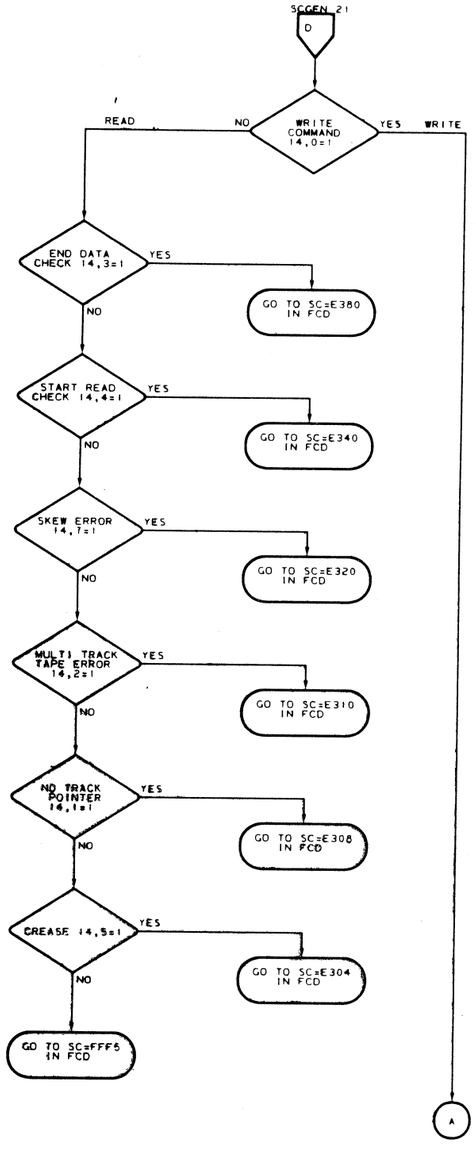


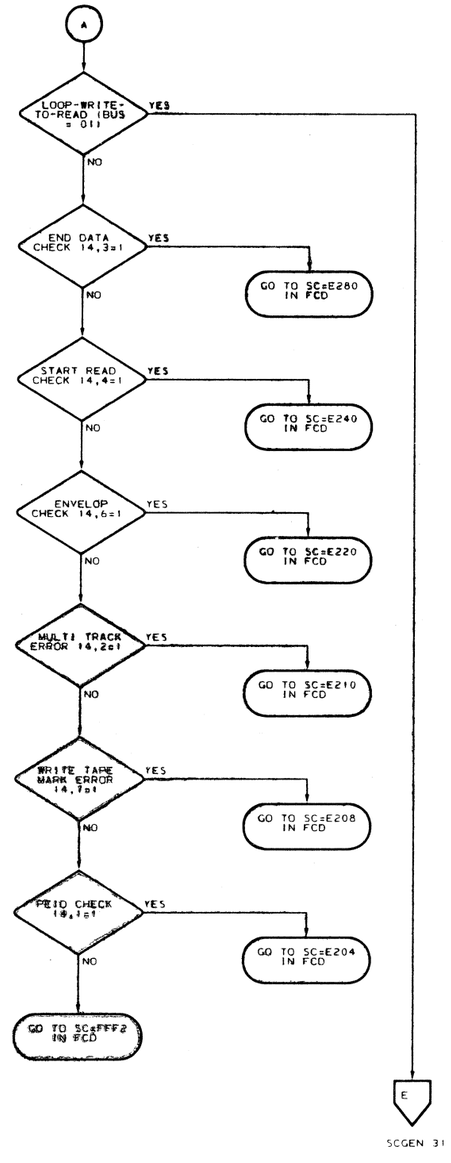




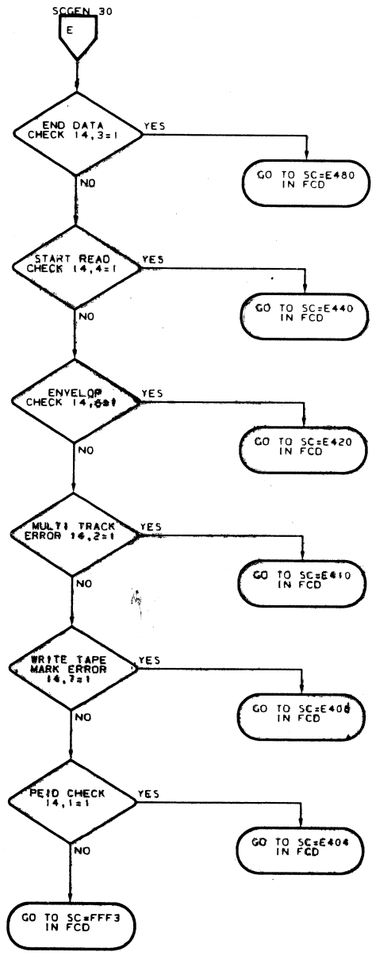
Note: All SCs are in FCD.

SYMPTOM CODE GENERATION (Continued)





SYMPTOM CODE GENERATION (Continued)



CONTENTS

NOTES:

8809 DEVICE CHARACTERISTICS

INTRODUCTION

The 8809 is a nine track, half-inch magnetic tape unit. It uses the 1600 BPI Phase Encoded tape format. The 8809 accepts 158.75, 177.8, 215.9 and 266.7 mm (6.25, 7.0, 8.5 and 10.5 in.) reel sizes.

The 8809 Magnetic Tape Unit consists of tape drive and control electronics to provide the device and format dependent functions. The 8809 contains a tailgate assembly and long-line drivers that allow connection to a host system via an attachment card.

The 8809 operates in either a 0.318 m/s (12.5 ips) start/stop mode or a 2.54 m/s (100 ips) data streaming mode. Tapes written in either mode are identical. In the start/stop mode, the 8809 starts and stops within the interblock gap. In the streaming mode the 8809 takes advantage of the large amounts of data that are generally transmitted in Save/Restore applications. It maintains tape velocity through the gap, anticipating the next command. If the command occurs within the gap crossing, the operation continues without loss of time due to start/stop or repositioning. When commands from the host are discontinued, or if they arrive after the gap crossing (command overrun), the 8809 automatically repositions the tape for the next command.

The control logic in the 8809 performs the device- and format-dependent functions such as motion control, gap timings, prefield and postfield formatting, data clocking, readback check after write, single track error correction and repositioning of tape on command overrun. The host system supplies functional commands, command sequence integrity, tape label processing, error recovery procedures and logging.

PHYSICAL CHARACTERISTICS

The 8809 is packaged in an enclosure that is supported by a frame. Mounted to the enclosure is the Tape Deck which includes the Machine Reel, File Reel, tape path, motors, read/write and control electronics, and cooling. The power supply is also mounted in the enclosure of Models 1A and 3.

8809 MODELS

The following items are standard on all 8809 models.

- Single Tape Deck assembly
- Device and format dependent logic
- One meter high enclosure
- Mechanism to hold the Tape Deck assembly in the open position for service
- Cover interlock as a safety feature
- Operator panel with pushbuttons and indicators

Model 1A

The Model 1A contains the necessary logic and hardware to allow the 8809 to attach to external control lines. Only a single-ended connection is supplied and therefore the 8809 must be the last device on the control lines. A Model 1A provides power for itself and one attached Model 2.

Additional 8809 units may be physically attached to this model and are connected with cables internal to the 8809. Up to five additional 8809 units may be physically attached. Connection of additional units must always be to the right of the Model 1A when viewed from the front.

Model 2

The Model 2 is a secondary 8809 drive without self-contained power. It connects to and is supplied power by either a Model 1A or Model 3.

Model 3

The Model 3 is a secondary 8809 drive with self-contained power. It attaches to the right of a Model 2 and supplies power for itself and one additional Model 2.

TAPE REELS

The reel sizes used by the 8809 are 158.75, 215.9, and 266.7 mm (6.25, 8.5, and 10.5 in.) in diameter, with hubs of styrene, glass filled plastic or aluminum. Also 177.8 mm (7.0 in.) reels with inner hubs of styrene or glass filled plastic may be used.

Reels with inner hubs substantially different from those defined for 266.7 mm (10.5 in.) reels in the "Tape Requirements for IBM One-Half Inch Tape Units" (Form GA32-0006-5) are not suitable for use on the 8809.

A write-enable ring must be present on the File Reel to activate the write circuitry.

MULTIPLE UNIT CONFIGURATIONS

GENERAL

The figure on this page illustrates the most common configurations for the 8809 magnetic tape units. Other combinations are possible.

Three factors are required to make an 8809 operational. They are:

1. System control lines
2. Power
3. Terminator cards

System Control Lines

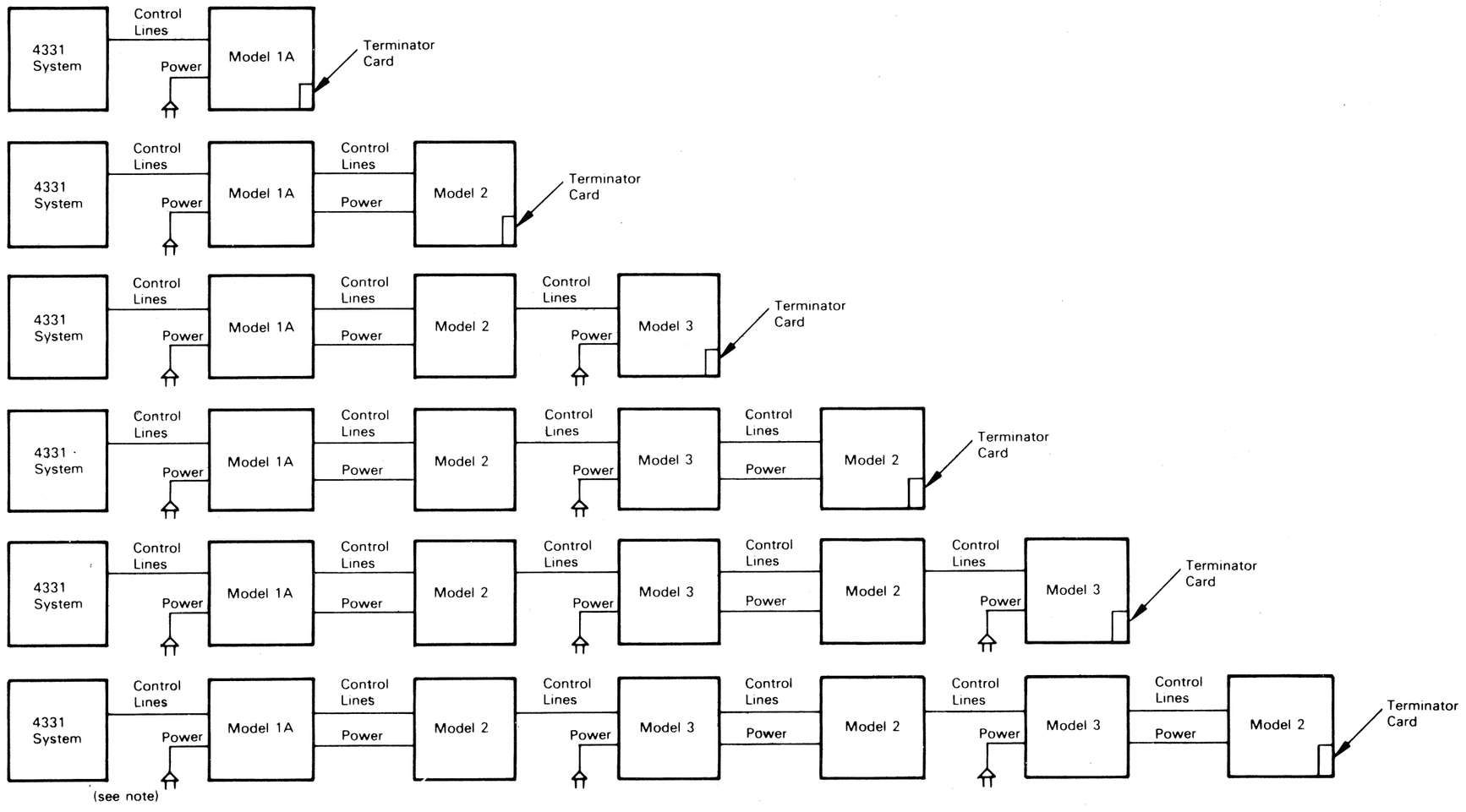
The only model that can be attached to a host system is a Model 1A. A tailgate located in Model 1A accepts system attachment cables. The other models do not, but they are supplied with cables to attach to the Model 1A.

Power

Models 1A and 3 contain power supplies that supply power for themselves and one additional Model 2. The Model 2 does not contain a power supply and must receive power from either a Model 1A or 3. The Model 2 has the appropriate cables to attach to a Model 1A or Model 3 with a power supply.

Terminator Card

The terminator cards are supplied with all Model 1A tape units. As shown on this page, terminator cards are always installed in the 8809 located farthest from the host system.



MAGNETIC TAPE GENERAL INFORMATION

GENERAL

This page contains general information about magnetic tape and its use on the 8809.

Beginning of Tape (BOT) Mark

The beginning-of-tape (BOT) mark is the initial reference point for all tape operations.

The BOT mark is an adhesive backed reflective strip 28 mm (1.1 in.) long. It is attached to the magnetic tape approximately 5 m (16 ft.) from the machine reel end on the top edge (the edge furthest from the tape deck).

When the magnetic tape is loaded (threaded through the tape path and onto the machine reel) and the Load Rewind pushbutton is pressed, the 8809 automatically positions on the BOT mark and maintains tape tension.

Phase Encoded Identification (PEID)

The purpose of the phase encoded identification (PEID) is to verify that the magnetic tape being used is the correct density for the 8809. It consists of a burst of recording written in the parity (P) track of the magnetic tape. The PEID starts 43 mm (1.7 in.) before the BOT mark and continues for 63.5 mm (2.5 in.), thereby overlapping both ends of the BOT mark.

Initial Gap

After the PEID is written, and before the start of any data transfer to the magnetic tape, an initial gap is established by the 8809. This gap is a minimum of 76.2 mm (3.0 in.) and a maximum of 6.35 m (25.0 ft.) long.

Preamble

After the initial gap, the 8809 automatically writes a preamble. The preamble consists of 40 bytes of all zeros and one byte of of all ones.

This preamble is used by the 8809 to recognize the start of a data block. As the last byte of the preamble is written, the 8809 sends the first Sync-In to the host system to signal that it is ready to write data on the magnetic tape.

Data Block

The data block contains the information written or read by the 8809. Because a write operation continues until terminated by the host system, data block may be of any length.

Postamble

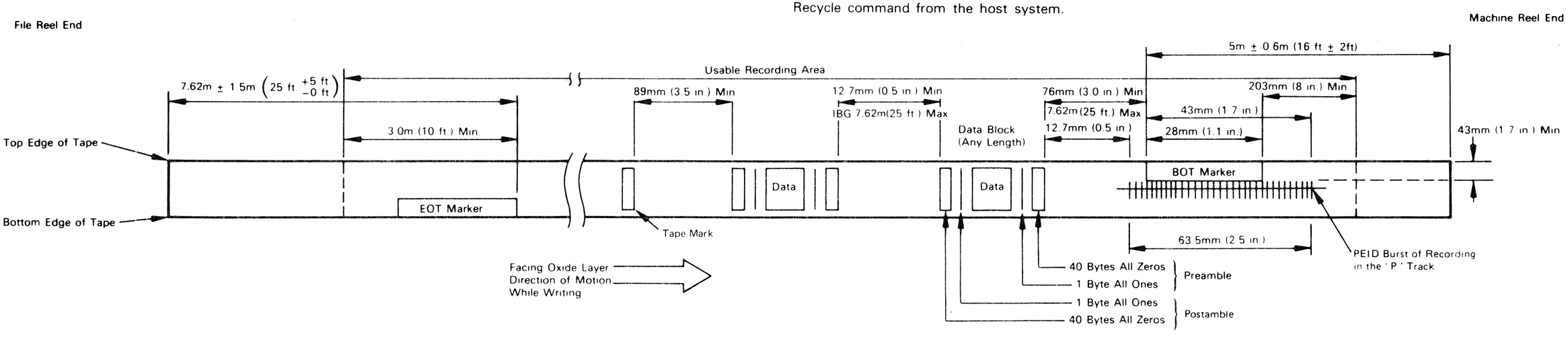
The postamble identifies the end of a data block. It consists of one byte of all ones and 40 bytes of all zeros. The postamble is automatically written by the 8809 tape unit when it senses the loss of the Recycle command from the host system.

Tape Mark

The tape mark indicates the end of a file of data. It is composed of 64 bytes of recording on tracks 0, 2, 5, 6, 7, and parity. The remaining tracks are erased. A tape mark is always preceded by an 89 mm (3.5 in.) erased gap.

End of Tape Mark (EOT)

The EOT mark signals the host system that the end of the tape is near. The EOT mark is exactly like the BOT mark except it is located on the bottom (machine) edge of the tape 7.62 m (25.0 ft.) -1.5 m, -0 m (-5.0 ft. -0 ft.) from the file reel end of the tape or 3.0 m (10.0 ft.) from the end of the usable data field.



MAGNETIC TAPE PROBLEMS

One of the major factors affecting the performance of an operating system is the condition of the magnetic tape. During use, it is stretched, flexed, and rubbed, causing its oxide coating to crack or to be eroded. Fingerprints, dust, and eroded particles of oxide, can contaminate its surface. This factors multiply erosion and causes contact to be broken between the tape and the read/write head.

Tape is also susceptible to operator damage that will cause read and write failures. It is difficult for the customer engineer (CE) to analyze whether it is tape, operator error, or a hardware malfuncton causing failure.

In all cases of tape failure analysis, the success of problem definition depends on the housekeeping in the account. In order to trace the history of the tape, adequate tape records must be maintained. It is the responsiblility of IBM personnel to educate the customer to the need for such housekeeping. The primary objective of good housekeeping is to be able to reference the device address or the tape volume number associated with a tape error.

The customer engineer should be familiar with the number of incidents to date, the number of reels involved, and the total customer impact. With this information, the CE will know if a general degradation of tape is occurring or if it is an isolated incident. The recommended method for the CE to get this information is to monitor the error logging and data analysis programs. See page ESDR 80.

Tape velocity or motion problems due to magnetic tape are not common.

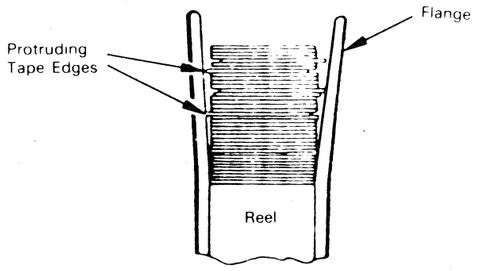
TAPE DAMAGE

The cause of tape damage is difficult to analyze. However, there are some common causes which can be determined by their location on the reel and their form. To make this analysis the CE needs the reel of tape which has been damaged and the tape drive on which it was processed.

Tape damage is most often discovered while the tape drive is reading and the resulting error appears as a permanent read failure. The tape drive on which the read failure is detected is usually not at fault. However, if the tape is machine damaged, the chances are good that the unit on which the reel was last mounted is at fault.

Edge Creases

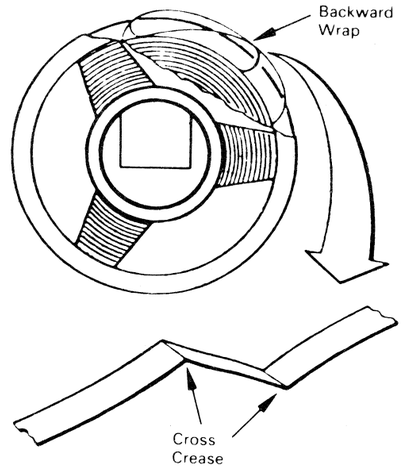
Short creases, 51 mm to 152 mm (2 in. to 6 in.), at any point in the reel can be the result of uneven winding and rough handling. The uneven wind can be a result of the tape, reel, and machine. Tapes with high degree of curvature tend to wind unevenly. The lack of constant rewind tension by the machine also contributes to this problem. The width of the reel flange spacing is also a contributing factor. Tape that is wound with a few protruding edges on a reel can be creased if the flange is squeezed. This usually happens when mounting and unmounting the tape.



Cross Creases

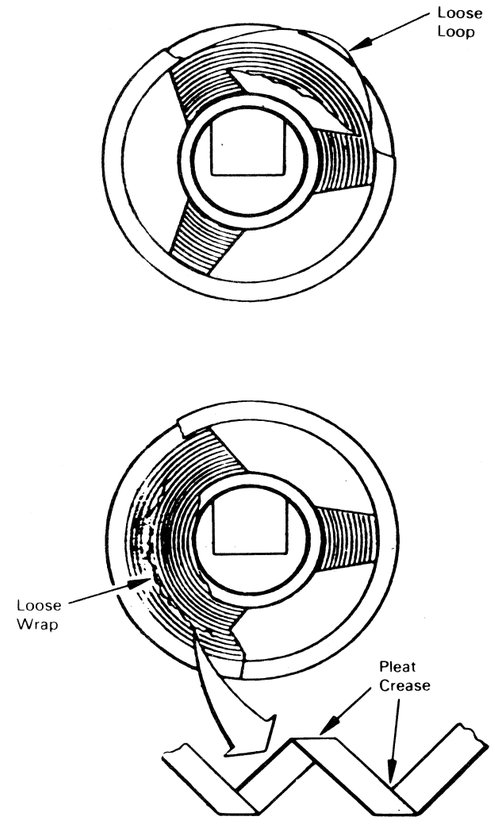
Cross creases usually come in pairs; one crease toward the coating and one away from the coating, 1 m (3.37 ft.) or less apart. This type of crease is created by a backward wrap and can be caused by the tape going slack, or by a severely warped reel during motion reversal.

A high static charge can also prevent the creased loops pulling out of reel during motion reversal.



Pleat Creases

A pleat crease is caused when one or more loose wraps of tape is placed on a reel during high speed rewind. During later processing of that reel, the outer mass of tape shifts on the loose wrap causing it to pleat.



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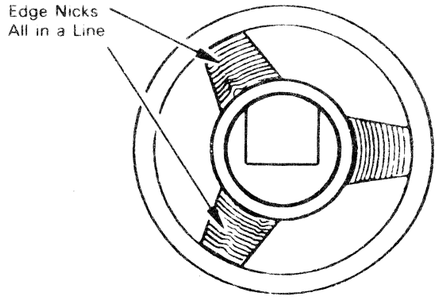
MAGNETIC TAPE PROBLEMS

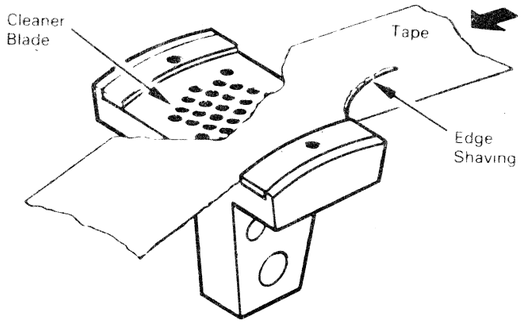
Edge Nicks

In most cases, edge nicks are caused by the operator. The open flange reel with uneven wraps is subject to edge damage. Fingernails or stacking tapes out of containers are the most common causes of edge nicks.



Edge Shavings

Many times a small edge nick is caught on the cleaner blade and causes the edge of the tape to be shaved. A worn or rough cleaner blade can also cause the tape edge to be shaved. This shaving can continue for several hundred meters and cause the tape to track incorrectly on subsequent passes.



Indentations

Any foreign or tape particle causes an indentation in the coating surface when the tape is wound tight on the reel. When tape is wound extremely tight, the end-of-file mark often embosses the tape.

Interlayer Slippage

Interlayer slippage is caused by loose wraps on a reel of tape. These most commonly occur in the last 50 wraps on a reel. When a tape with loose wraps is loaded, the tape layers on the reel may move when no tape motion is desired. This may cause loss of tape tension or tape positioning and data checks or other errors. A loose wrap condition can be corrected on the 8809 by performing a loose wrap load procedure (OPER 80).

Notes: OPER 46

ENVIRONMENTAL PROBLEMS

TEMPERATURE

Temperature changes within the operating specifications have little effect on the performance of magnetic tape. However, extremely high temperature during storage combined with heavy winding tension will cause a gap in the oxide layer when contamination is present.

HUMIDITY

High humidity, within reason, has little influence on tape performance. However, low humidity has two pertinent effects.

1. Low humidity causes the backing to become stiff and the coating less flexible. As a result, dust particles build up faster.
2. Static charges build up faster at low humidity. Applications where short sections of tape (several meters) are moved forward and backward repeatedly are very sensitive to a low humidity environment. A combination of static charges and smoothness of the tape causes clinging in the area of the idlers and head. This inhibits tape motion and, if severe enough, can stop tape movement.

CONTAMINATION

Prolonged or unnecessary exposure of tape to dust and dirt can contaminate the tape surface and result in signal loss and errors. The following rules help minimize the tape contamination.

1. Maintain recommended temperature and humidity conditions in areas where tape is used and stored.
2. Thoroughly clean the entire floor daily using a damp mop. Avoid sweeping, dry mopping, or dusting in areas where tape is used or stored.
3. Keep floor waxing to a minimum. When necessary, the floor should be machine buffed to remove excess wax, damp mopped with cold water to harden the surface, then machine buffed again when dry. NEVER use steel wool or other metal abrasives for buffing.
4. Periodically inspect and clean tape drives and remove any particles accumulated during normal tape use.

TAPE HANDLING

The tape reel should be in only one of two places: (1) in use on the tape drive, or (2) in storage in its container. Adequate procedures should be established to protect magnetic tape from contamination.

The following are some rules of good housekeeping:

1. Do not leave tape reels or containers exposed to contaminatents. In addition to the possibility of physical damage, dust in the air can accumulate on the tape or in the container and eventually damage the tape.
2. Do not use the top of a tape unit for a working surface. Tape reels or containers sitting on top of a unit are exposed to heat and dust from the blowers, and interfere with the cooling of the tape unit.
3. Do not erase labels that are on the reel. Eraser crumbs are a primary source of contamination. Select a label with an adhesive backing that does not leave a residue and that can be easily applied and removed.
4. Do not drag the free end of tape on the floor. Dirt picked up can be deposited on the transport areas of the drive and passed on to other sections of the tape causing damage to them.
5. Do not permit smoking in areas where tape is in use. Ashes are a source of contamination and sparks can permanently damage the tape surface if they come in contact with it.
6. Seat the tape reel on the hub properly. If the reel is not properly seated it causes the edge of the tape to wear and become burred. The burred edge winds to a larger diameter than the undamaged edge and causes the center of the tape to collapse. The burred edge of the tape will then be permanently stretched.
7. Always handle tape reels by the hub. Improper handling while loading and unloading tape on drives causes tape damage. Any touching of the exposed tape through the reel flanges will compress the tape and damage the edges.
8. Do not remove the file protect ring while tape is in the tape path.

TAPE STORAGE

To prevent tape contamination and damage during storage, follow these procedures:

1. Place rubber grommets or tape end retainers on the reel before a tape is stored. This will prevent the free end of tape from unwinding in the storage container.
2. Always store tape in an upright position. Never store tapes flat, singly or in stacks; accidental damage or reel warp can result.
3. Store tapes in a cabinet or on a shelf elevated from the floor and away from sources of paper and card dust. This minimizes the transfer of dust from the outside of the container to the reel during loading and unloading operations.

TAPE UNIT CLEANING

GENERAL

Attention: The tape path should be cleaned after eight hours of operation (one shift) or after ten reel passes, whichever occurs first.

This procedure describes how to clean the tape path. Normal tape cleaning is a customer responsibility. However, after installation or maintenance, clean the tape path. The items used in this procedure are contained in the IBM Tape Cleaning Kit, part 352465.

Use IBM Tape Cleaner, part 453511, or formulations of the same chemical composition as a dampening agent ONLY where specfied. Use of other chemical formulations may impair performance or cause damage to the tape unit or tape.

Caution

- Avoid prolonged skin contact with any type of tape cleaner.
- Do not allow any cleaning fluid to contact the Sensor lenses or plastic parts.
- Do not clean the Tape Idlers **2** **8**
- Never clean the tape unit with a metal object. Use only the materials specified for each operation.
- DO NOT USE WATER IN THE READ/WRITE HEAD AREA.
- Avoid splashing of tape cleaner on areas not being cleaned.

The cleaning sequence is:

1. Sensor lenses
2. Read/Write and Erase Heads
3. Cleaner Block
4. Tape Guides
5. File Reel Hub

Cleaning Procedure

Unload the tape and remove file reel from the tape unit.

Sensor Lenses

1. Use a dry cotton swab to clean the six lenses found on the Reel Size Sensor **1** and the Tape Present Sensor **3** .
2. The BOT/EOT Sensor **5** should be wiped with a dry lint-free cloth (part 2108930). To reach the BOT/EOT lenses, wrap the cloth around a cotton swab.

Read/Write and Erase Head **6**

1. Dampen a clean area of the lint-free cloth with tape cleaner fluid.
2. Clean the Read/Write and Erase Heads with the dampened cloth, using a circular motion.
3. Repeat Steps 1 and 2 until the cloth remains clean.
4. Visually check the heads. If they are clean, dry the heads with a clean cloth and proceed to the next area to be cleaned. If they do not appear to be clean, use either style Head Cleaning brush dampened with tape cleaner to remove the residue and then return to Step 1.

Cleaner Block **6**

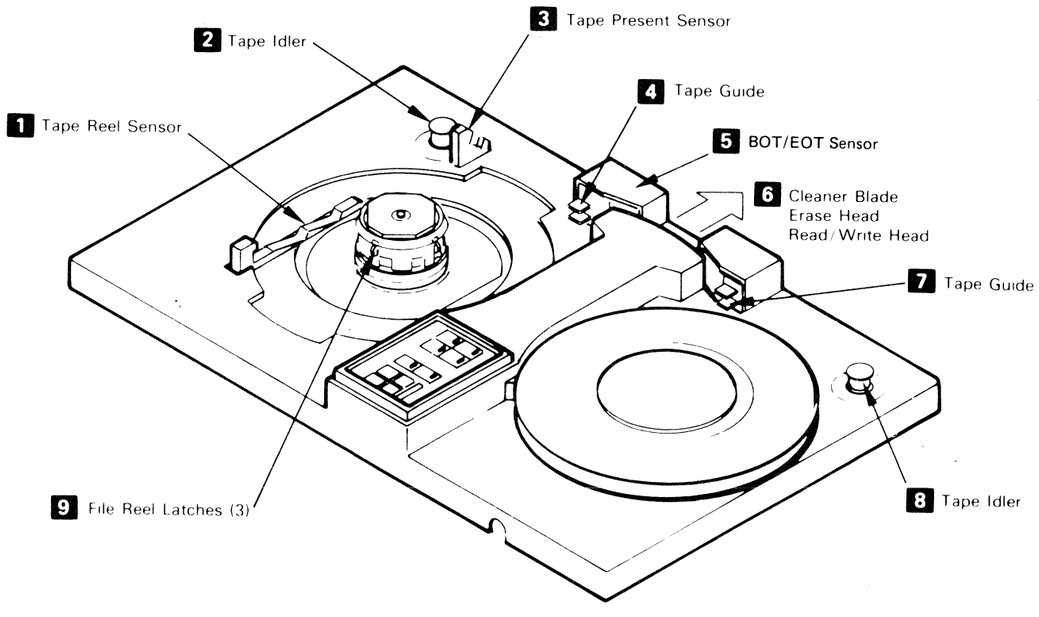
1. Fold a lint-free cloth into a one-inch wide strip and dampen center area with a small amount of tape cleaner fluid.
2. Insert the cloth over the Cleaner Block and move the cloth with a back and forth (or shoeshine) motion over the Cleaner Block.
3. Fold a dry lint-free cloth as in Step 1 and dry the Cleaner Block in same manner as Step 2.

Tape Guides **4** **7**

1. Use a lint-free cloth dampened with tape cleaner to clean both guides.
2. If residue remains in corners of guides, perform Steps a, b, and c, otherwise go to next cleaning sequence.
   a. Put clean felt pad on handle making sure the handle does not go through the end of the pad.
   b. Dampen felt pad with tape cleaner and clean corners of guides.
   c. Use a lint-free cloth dampened with tape cleaner to remove any residue left by the felt pad.

File Reel Hub **9**

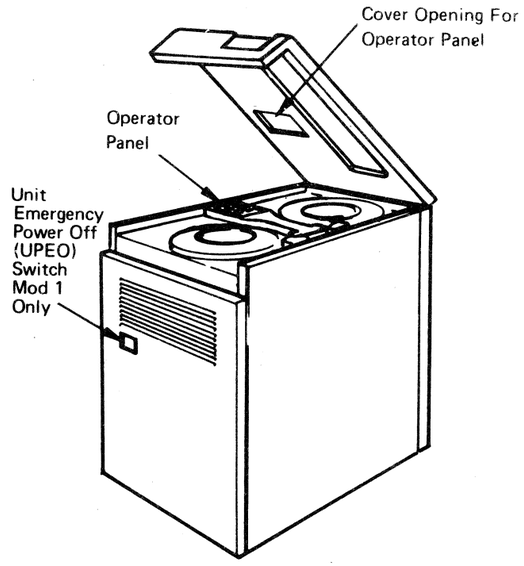
1. Dampen a lint-free cloth with a small amount of tape cleaner and use light pressure to clean the three sets of rubber pads on the File Reel Hub. Take care that no tape cleaner comes in contact with any plastic part.



OPERATOR PANEL/UNIT EMERGENCY POWER OFF SWITCH (UEPO)

GENERAL

The Operator Panel is mounted on the tape deck of the 8809, and can be operated with all machine covers closed. The panel permits you to turn power on or off, load tape, rewind tape, unload tape, and reset the tape unit.



Removal and replacement procedures for the Operator Panel are described on CARR 160.

UNIT EMERGENCY POWER OFF SWITCH (UEPO)

The Unit Emergency Power Off switch is located on the front cover of the Models 1A and 1B. Under normal conditions, this switch must be in the Power Enable position. When the switch is in the Power Off position, all power except that on the power board is turned off to all 8809s.

To turn power on, place the switch in the Power Enable position and turn on the tape units using the Power On pushbutton.

PUSHBUTTONS AND INDICATORS

The following is a description of the pushbuttons and indicators on the Operator Panel.

Note: *Intermittent power problems can cause the Operator Panel to stop working. If this occurs, press the Power Off and then the Power On pushbuttons before you try other pushbutton operations.*

Power On

The Power On pushbutton **3** is present only on a Model 1A, 1B and a Model 3. When the pushbutton is pressed, it supplies dc power to the Model 1A, 1B or 3 and to any Model 2 that shares the power supply.

Power Off

The Power Off pushbutton **8** is present on all tape unit models. When the pushbutton is pressed, it removes all dc voltages except -5 and -24 volts from the units that are sharing the power supply.

Reset

When the Reset pushbutton **5** is pressed, the tape unit Ready indicator goes off. If Reset is pressed when the tape is Ready and not at load point, the Not Ready Due to Reset sense bit is set. All tape motion and operations are stopped.

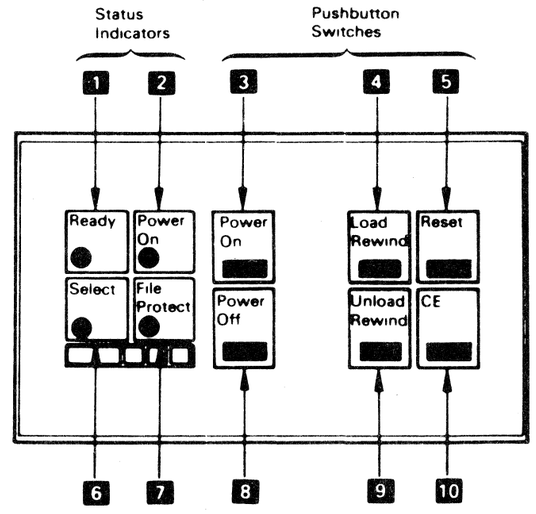
Load Rewind

The Load Rewind pushbutton **4** works only when the tape unit's Ready indicator **1** is off. During a load operation, the tape unit performs a normal load or a loose-wrap load operation, depending on where the BOT mark is positioned when the tape reel is mounted.

If the tape speed mode is set to 2.54 m/s (100 ips) the BOT mark will stop approximately 330 mm (13.0 in.) toward the File Reel side of the BOT/EOT Sensor at the completion of the rewind operation (near Sense Idler). At the end of any load rewind operation, the Ready indicator should be on.

If a tape operation ends without rewinding the tape, pressing Load Rewind rewinds the tape to the load point unless tape tension has been lost. When tape tension is lost, pressing the Load Rewind causes a loose-wrap load operation (see Loose-Wrap Load, below).

Normal Load: A normal load operation occurs when the tape is mounted with the BOT mark positioned toward the File Reel side of the BOT/EOT Sensor.



Loose-Wrap Load: A spooling operation occurs when the BOT mark is positioned toward the machine reel side of the BOT/EOT sensor. When the Load Rewind pushbutton is pressed, the tape unit moves the tape forward for about 90 seconds searching for the BOT mark and then rewinds to the load point. This operation rewinds the tape to tighten the wraps of loosely-wound tape on the reel.

OPERATOR PANEL (CONTINUED)

Unload Rewind

The Unload Rewind pushbutton 9 works only when the tape unit Ready indicator 1 is off. Pressing this pushbutton causes the tape to rewind onto the file reel and unload. The tape unit sends busy to the host system during the unload rewind and sets the Operation Complete status bit when the unload rewind operation is finished.

CE

The CE pushbutton is enabled by installing a jumper wire on the Logic Board from A1H2D11 to A1J1C11. The CE pushbutton 10 bypasses the control logic of the tape unit and permits Operator Panel control of tape motion. When other panel pushbuttons are used with the CE pushbutton, tape unit speed and direction can be controlled from the panel.

Caution: DO NOT leave the jumper in place when the CE pushbutton is not being used.

When the pushbutton is pressed and held while pressing other panel pushbuttons, it selects alternate functions for the other panel pushbuttons, as follows:

- **Reset:** Starts tape motion from a reset condition. Pressing Reset again stops all motion.
- **Load Rewind:** Changes the tape unit motion fro.n forward to backward, or from backward to forward.
- **Unload Rewind:** Changes the tape unit speed from .318 m/s to 2.54 m/s (12.5 ips to 100 ips) or from 2.54 m/s to .318 m/s (100 ips to 12.5 ips).

If the CE pushbutton is not held down, the other panel pushbuttons will perform their normal functions with the jumper in place.

When the CE functions are invoked after a load rewind operation has been completed, Load Point Status and BOT are not reset in the tape unit logic. Therefore, tape motion can not be started by pressing the Load Rewind pushbutton after the tape is moved away from BOT. To rewind tape back on the File Reel, press the Unload Rewind pushbutton and then the Reset pushbutton before the tape reaches BOT. This is called a mid-tape load. Now when pressing Load Rewind the tape will move toward BOT. When BOT is reached, the tape unit is ready.

Ready

The Ready indicator 1 is activated by the Ready signal from the Drive Control card after tape is loaded, tape tension is established, and the beginning-of-tape (BOT) mark is sensed. When Ready is on, the tape unit can execute commands sent by the host system.

Power On

The Power On indicator 2 is on when +5vdc is present in the tape unit.

Select

The Select Indicator 6 is on when the tape unit is selected by the host system. The Select Active signal from the Formatter Card activates this indicator.

File Protect

The File Protect indicator 7 is on when a file-protected reel of tape is mounted, or when the tape unit is rewinding or unloading tape. A file-protected reel is one from which the write-enable ring has been removed. This ring is put into the back of the tape reel, and is removed when the information recorded on tape must be protected from being accidentally erased or written over. The Not Write Enable signal from the Drive Control Card activates this indicator.

8809 DEVICE COMMANDS

GENERAL

The 8809 tape unit performs the following operations in response to commands issued by the 4331 Processor. Commands are shown in parentheses ( ).

Write (01)

This command measures a gap and writes a block of data in the forward direction. If this command is received when the tape is at load point, the 1600 bpi format identification burst is written prior to the data block. Before writing the data, the 8809 tape unit creates the proper length gap and writes the preamble. When the command is terminated, the 8809 writes the postamble and completes the readback check.

Read (02)

This command reads the next block in the forward direction.

Rewind (07)

This command rewinds the tape to beginning-of-tape mark.

Rewind Unload (0F)

This command rewinds the tape to the beginning-of-tape mark, releases tension, and unloads the tape leader from the machine reel.

Erase Gap (17)

This command erases a gap of 100 millimeters (3.9 inches) in the forward direction. This command is used to increase the gap preceding a block in order to position the head beyond a point on the tape containing a defect.

Write Tape Mark (1F)

This command erases a gap of 90 millimeters (3.6 inches) and then writes a tape mark in the forward direction. If this command is issued when the tape is at load point, the 1600 bpi format identification burst is written prior to the gap and the tape mark.

Backspace Block (27)

This command moves tape over the next block in the backward direction.

Backspace File (2F)

This commmand searches for the next tape mark in the backward direction. If no tape mark is detected, the tape rewinds until the BOT mark is detected, causing an error condition to interrupt the processing unit.

Forward Space Block (37)

This command spaces over the next block in the forward direction.

Forward Space File (3F)

This command searches for the next tape mark in the forward direction. If there is no tape mark, the search continues until the tape is unwound from the file reel.

Data Security Erase (97)

This command erases the tape in the forward direction from the point where the command is issued to a point approximately one meter beyond the EOT mark.

Set Low Speed (83)

This command sets tape velocity to 0.318 meters per second (12.5 inches per second) start and stop mode.

Set Long Gap (13)

This command sets the 8809 tape unit to generate an IBG of 30.5 millimeters (1.2 inches), independent of speed setting.

Set Normal Gap (23)

This command sets the 8809 tape unit to generate an IBG of 15.2 millimeters (0.6 inch), independent of speed setting.

Set High Speed and Long Gap (93)

This command sets tape velocity to 2.54 meters per second (100 inches per second) streaming mode, and sets the 8809 tape unit to generate an IBG of 30.5 millimeters (1.2 inches).

Set High Speed and Normal Gap (33)

This command sets tape velocity to 2.54 meters per second (100 inches per second) streaming mode, and sets the 8809 tape unit to generate an IBG of 15.2 millimeters (0.6 inch).

Set Low Speed and Long Gap (53)

This command sets tape velocity to 0.318 meters per second (12.5 inches per second) start and stop mode, and sets the 8809 tape unit to generate an IBG of 30.5 millimeters (1.2 inches).

Set Low Speed and Normal Gap (63)

This command sets tape velocity to 0.318 meters per second (12.5 inches per second) start and stop mode, and sets the 8809 tape unit to generate an IBG of 15.2 millimeters (0.6 inch).

Set High Speed (E3)

This command sets tape velocity to 2.54 meters per second (100 inches per second) streaming mode.

Loop Write to Read (8B)

This command logically connects the write path to the read path to help isolate data path failures. No tape motion is initiated.

Set Diagnose (See Table Below)

This command transfers one byte of data representing a diagnostic operation code from storage to the file/tape adapter. The following are the possible diagnostic codes:

Operation Code	Diagnostic Operation
0C	Set Ready
E0	Check Reset

The specified operation is executed at the addressed tape unit. For example, Set Ready and Check Reset make the tape unit ready and reset any checks.

Control No Op (03)

This command stores status information in main storage. There is no action at the tape unit.

Sense (04)

This command stores up to 24 bytes of sense information in main storage.

Sense I/O (E4)

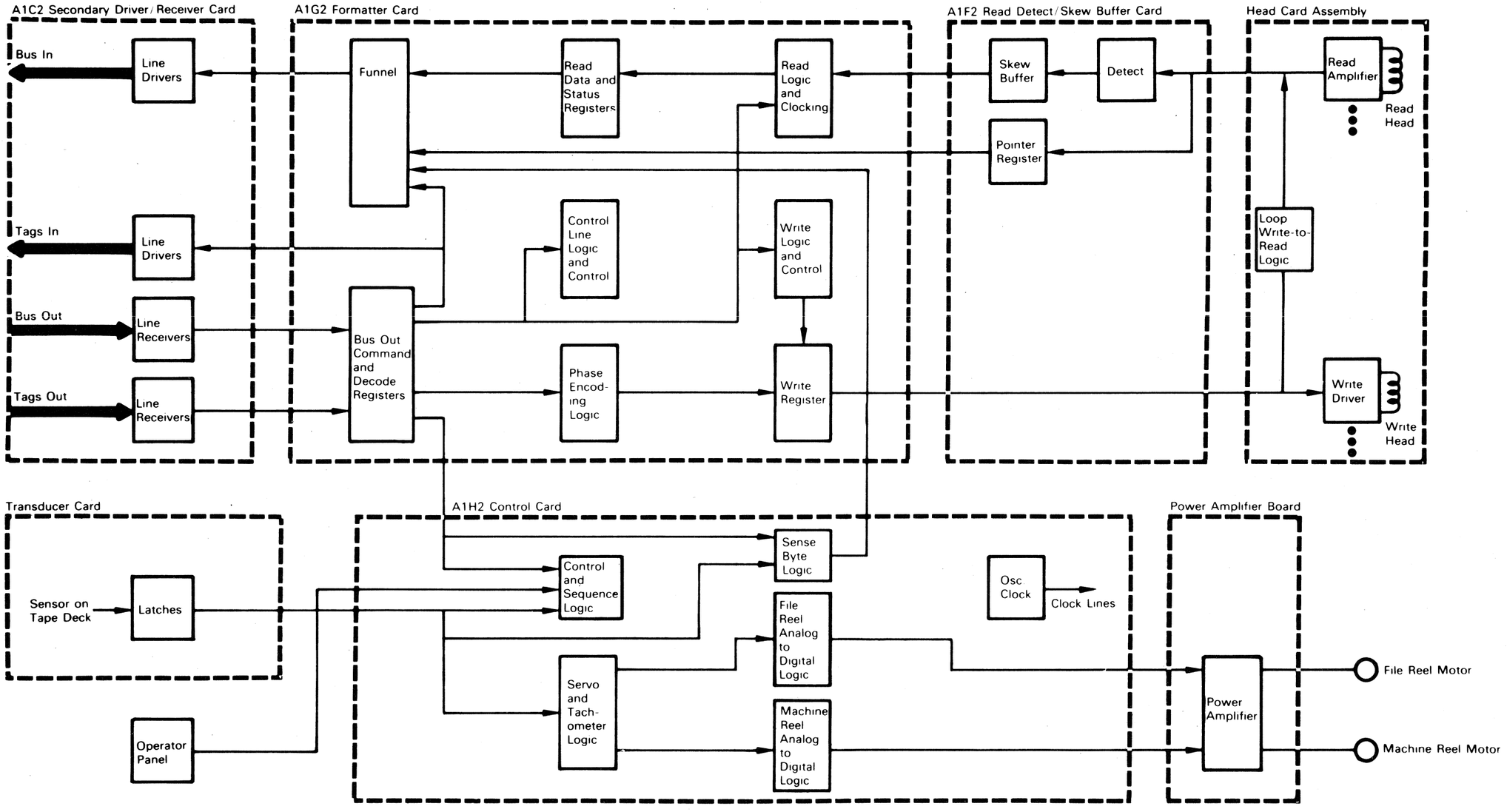
This command provides seven bytes of device identification information as follows:

Byte	Contents
0	X'FF'
1	Control unit type number
2	Control unit type number
3	Control unit model number
4	Device type number
5	Device type number
6	Device model number

Note: *With the direct attachment by the file/tape adapter, the 4331 processing unit type and model number are used as the control unit identification.*

Read and Reset Buffered Log (A4)

This command stores up to 32 bytes of sense information in main storage. All usage and error counters are reset to zero.



TAPE UNIT — FUNCTIONAL OVERVIEW

GENERAL

The Functional Overview diagram, OPER 100, presents a block diagram of the major functional areas of the 8809 Tape Unit and an identification of the cards, panel, and board that contain these functions. The read/write data path is shown in greater detail on OPER 120. The drive control functions are shown in greater detail on OPER 130.

Secondary Driver/Receiver Card

The attachment card logic lines are routed through the Driver/Receiver Card. The Bus In, Tags In, Bus Out, and Tags Out logic lines are described on OPER 140. The logic line drivers and receivers needed to power the control lines are located on this card.

Additional information about how this card functions in a multidrive configuration is located on REF 50.

Formatter Card

The logic and control circuits for the Bus Out register, Command register, Command decode function, Phase Encoding logic, the Read and Write registers and the write, read, and control line functions are located on this card. The functions of gating read data or sense data to the block labeled 'Funnel' and the read and write data paths are also on this card. The drive control functions receive command register information from the Formatter Card. Drive control sense data is received from the Drive Control Card.

Read Detect/Skew Buffer Card

The data detection circuits and buffers in this card are part of the read data path. The pointer register and other detection circuits provide signals that are used for error correction and control logic for the read data path.

Head Card Assembly

The Head Card Assembly consists of a read amplifier card, a write driver card, the read/write head, and the erase head. These cards and components are electrically matched as a single field replaceable unit (FRU) called the Head Card Assembly. The Erase Head and Cleaner Block are exceptions and can be replaced separately.

The detection and amplifier circuits for the read head are located on the read amplifier card as is the logic for the Loop Write-to-Read function.

The write amplifier circuits and the erase head circuits are located on the write driver card.

Transducer Card

The circuits required to convert the analog signals from the LED photo sensors on the tape deck and reel motors are located on this card. This card also contains the latches needed to gate the logic lines into the control and sequence logic circuits.

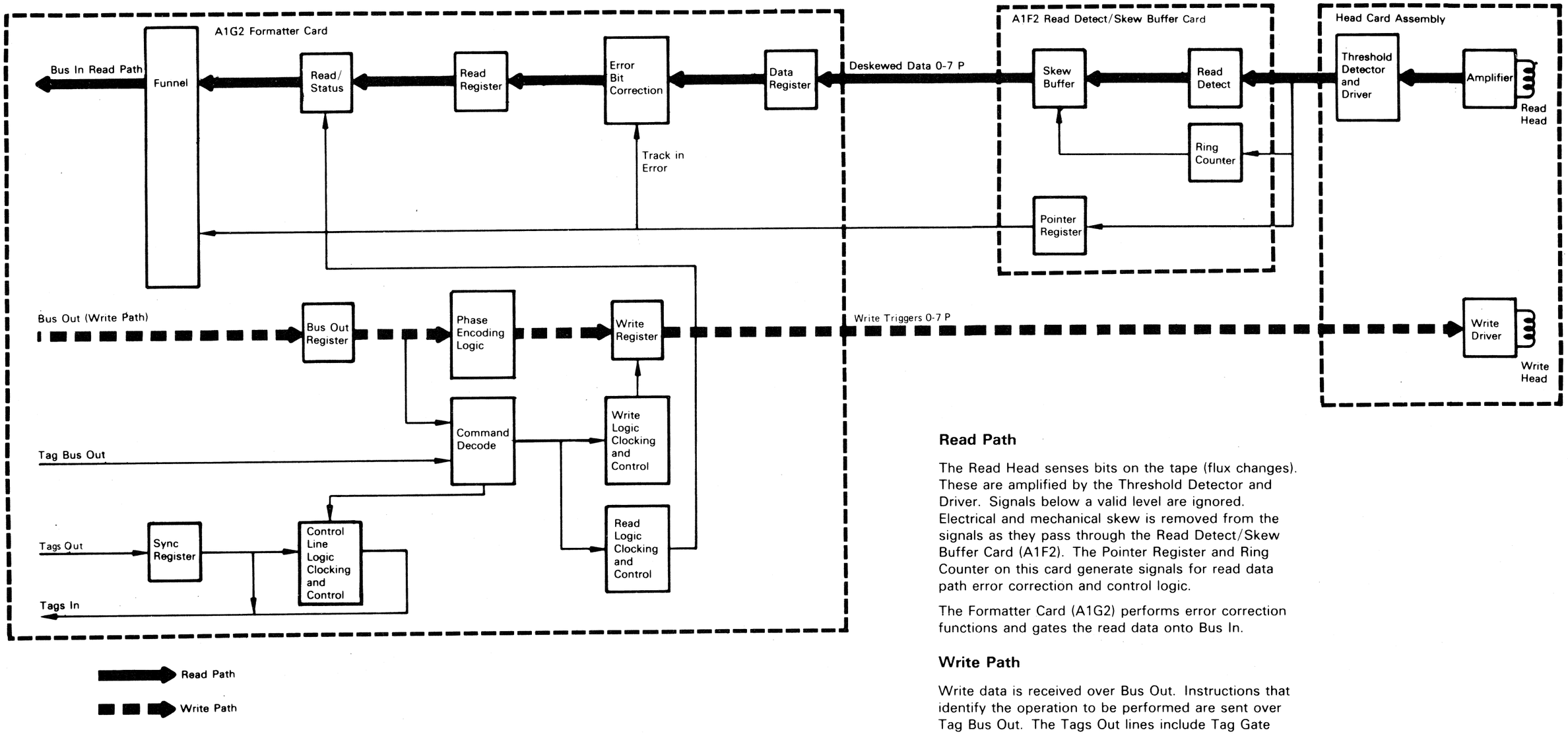
Drive Control Card

The logic and control circuits for the servo control of the file and machine reel motors, the control and sequencing of tape motion operations, and the gating of sense byte information to the funnel are located on this card. The oscillator and clock generation circuits are also located on this card.

Power Amplifier Board

The amplifiers needed to control the file and machine reel motors are located on this board.

Tape Unit — Functional Overview **OPER 101**



Read Path

The Read Head senses bits on the tape (flux changes). These are amplified by the Threshold Detector and Driver. Signals below a valid level are ignored. Electrical and mechanical skew is removed from the signals as they pass through the Read Detect/Skew Buffer Card (A1F2). The Pointer Register and Ring Counter on this card generate signals for read data path error correction and control logic.

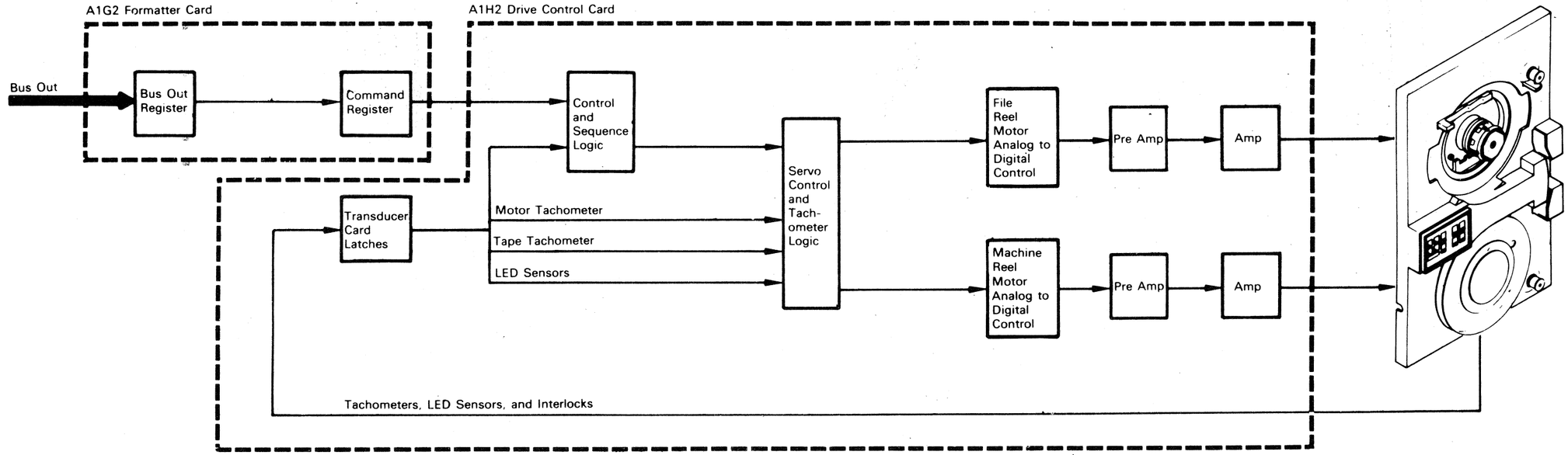
The Formatter Card (A1G2) performs error correction functions and gates the read data onto Bus In.

Write Path

Write data is received over Bus Out. Instructions that identify the operation to be performed are sent over Tag Bus Out. The Tags Out lines include Tag Gate which validates Tag Bus Out. All of these lines are received at the Formatter Card (A1G2). The Formatter Card contains circuits that identify and decode commands, do phase encoding for the write data, and clock the write data through the Write Register to the Write Drivers.

TAPE UNIT — DRIVE CONTROL

Commands are received over Bus Out and decoded by the Formatter Card (A1G2). The Control and Sequence logic on the Drive Control Card (A1H2) converts the command into reel motor movement and signals Servo Control to start the motors in the proper direction and speed. The transducers, LED sensors, and interlocks provide feedback to the servo control to maintain tape tension, speed, and direction of movement. Another signal from the Control and Sequence logic to the Servo Control stops the reel motors.



8809

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GENERAL

- The control lines are the common connections between the attachment card and all attached tape units.
- The tape units are connected in parallel to one set of signal lines, allowing simultaneous addressing or polling by the attachment card.
- A tape unit is connected to the attachment card until transfer of all information is complete and the attachment card signals to disconnect.
- Only one tape unit is logically connected to the attachment card at a time.
- Signals from different tape units are ORed together for transmission to the host system on common lines.

OUTBOUND LINES (to 8809)

Bus Out (1 Byte, Odd Parity)

See OPER 160 for byte summary.

Bus Out lines transfer data, control or address information to the tape unit. When the Tag Gate line is active, Bus Out contains tag modifiers. When the Sync Out line is active, Bus Out transmits the information that is to be recorded on the tape.

All Bus Out data defined for tape unit operations or data required by the tape unit must be valid for at least 100 ns before the Tag Gate line is active and must remain valid for at least 150 ns after Tag Gate is deactivated.

All Bus Out data validated by Sync Out must be valid at least 100 ns before Sync Out is active and must remain valid for at least 100 ns after Sync Out is deactivated.

Tag Bus Out (5 Bits, Odd Parity)

See OPER 160 for byte summary.

Tag Bus Out sends control information or instructions to the tape unit to identify the operation to be performed. This bus is validated by Tag Gate.

All Tag Bus Out data defined for tape unit operations or data required by the tape unit must be valid for at least 100 ns before Tag Gate is active and must remain valid for at least 150 ns after Tag Gate is deactivated.

Tag Gate

Tag Gate indicates presence of an instruction on Tag Bus. Bus Out can further modify the tag information. Tag Gate remains active until the tape unit activates Tag Valid.

An operation must be decoded in the tape unit within 100 ns after Tag Gate is activated.

Select Hold

The Select Hold line activates during any Select Tag. It remains active to maintain selection of a tape unit until the end signal of the last operation performed on the drive is received and acknowledged.

Sync Out

The Sync Out line is used during tape unit data transfers and orientation clocking to check the data count.

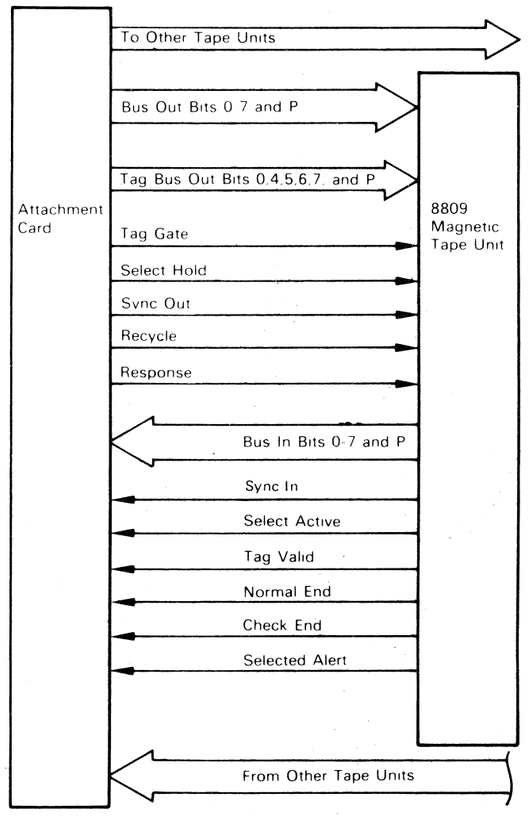
Sync Out is not dc-interlocked with any inbound line, but is required to have a minimum pulse width of 60 ns.

Recycle

The Recycle line is active only during write data transfers. Sync Out active with Recycle deactivated indicates to the tape unit that the last byte of data is being transferred.

Response

This line indicates acknowledgment of a Normal or Check End condition. Response is not dc-interlocked with any line but must have a minimum pulse width of 60 ns.



INBOUND LINES (from 8809)

Bus In (1 Byte, Odd Parity)

See OPER 160 for byte summary.

Bus In transmits data from the tape unit to the attachment card when Sync In is active. Certain commands cause status, error, or information originating in the drive to be transmitted on Bus In while Tag Valid is active.

If an abnormal condition occurs during a Read, Write, or Loop Write-to-Read operation (Extended Operations), Check End is activated and the error information relating to the abnormal condition is presented on Bus In.

During read data transfers, Bus In activates at least 125 ns before Sync In and remains active for at least 125 ns after Sync In is deactivated.

During information transfers, Bus In is activated with or before the end tag and is valid until the tag ends.

Sync In

During data transfers from the tape unit to the attachment, the Sync In line validates and times Bus In. It is activated after Bus In is valid.

Bus In remains valid until after Sync In is deactivated. During data transfers from the attachment card to the tape unit, Sync In provides timing for data transferred.

Select Active

This line becomes active as a result of the selection sequence. It remains active to indicate proper selection as long as Select Hold is active and selection of the tape unit is correctly maintained by the attachment card.

Tag Valid

Tag Valid line indicates that the tape unit has validated and accepted a tag instruction sent from the attachment card. When required, it indicates to the attachment card that Bus In information is valid.

CONTROL LINES

Normal End

This line indicates that the normal ending of an operation occurred with the expected results obtained. Normal End is activated with or before Tag Valid for immediate operations. For Read, Write, and other extended operations, Tag Gate is deactivated and the operation is complete before Normal End is activated.

Normal End is activated at the successful completion of the operation. Information on Bus In is valid at the start of Normal End.

When Normal End is generated under Tag Gate, it remains active until Tag Gate is deactivated; otherwise it remains active until Response starts.

Check End

Check End line indicates that an abnormal ending condition exists. The abnormal condition is presented on Bus In with proper parity during the time Check End is active.

For Read or Write operations, Check End stays active and Bus In maintains proper parity until the attachment card acknowledges the receipt of the status information with the Response line.

Check End is not presented on an Immediate or Disconnected command.

Selected Alert

Selected Alert line indicates that certain special events have occurred in the selected tape unit. It is active only if Select Active is present.

Selected Alert does not indicate an equipment malfunction when:

1. Backspacing into BOT.
2. Attempting to write when not write enabled.
3. Detecting Not Capable during a Space File command from BOT.
4. Attempting motion commands with the safety cover open.
5. Dropping selection prior to completion of a command other than the disconnected portion of a disconnected command.
6. Host errors such as Bus Out parity check, Sync Out check, and Tag Bus parity check occur.
7. The Reset pushbutton on the Operator Panel is pressed when the tape is not at load point.

TAG SEQUENCE OPERATIONS

SELECTION

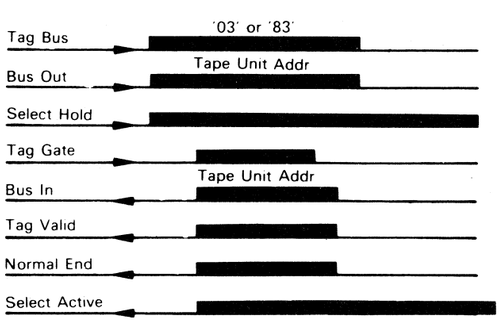
A selection sequence connects the host system to a specified tape unit. The appropriate select tag is placed on the Tag Bus. When the modifiers and address information are placed on Bus Out, Select Hold and Tag Gate are activated. If a selection error occurs within the tape unit, no response is generated.

When selection has been completed, the tape unit activates Tag Valid, Select Active and Normal End. When these tags are acknowledged by the host, Tag Gate is deactivated. While Tag Valid is active, Bus In returns the address of the selected tape unit. The address contains coding which allows the host to check for double selection.

Select Hold maintains selection and must remain active until all operations are complete on the selected tape unit. Select Active remains active until Select Hold is deactivated.

Note: *The charts below are for instructional use and do not represent actual timing.*

Selection



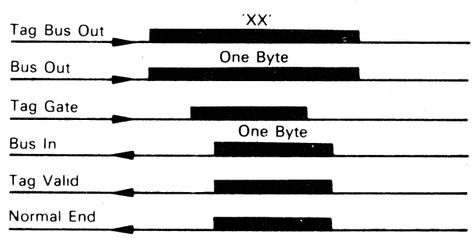
IMMEDIATE OPERATION

An immediate operation transfers a single control instruction to the tape unit in addition to the transfer of a single byte of information to or from the tape unit.

The appropriate tag is placed on the Tag Bus. At the same time, a single byte of data, either an instruction modifier or a byte of information, may be placed on Bus Out. Tag Gate is activated after allowing for a 200 ns interval to remove skew from the signals.

The tape unit responds with Tag Valid which forces Normal End. Data sent by the tape unit is placed on Bus In along with Normal End. The host system must remove any skew in the signals for the control lines. When Normal End is returned, data on Bus In is the expected response from the tape unit. Tag Gate is deactivated when Tag Valid and Normal End are recognized by the host. The tape unit resets Tag Valid and Normal End when Tag Gate is deactivated. The host cannot activate Tag Gate again until Tag Valid is deactivated. Check End is not presented on Immediate operations.

Immediate Operation



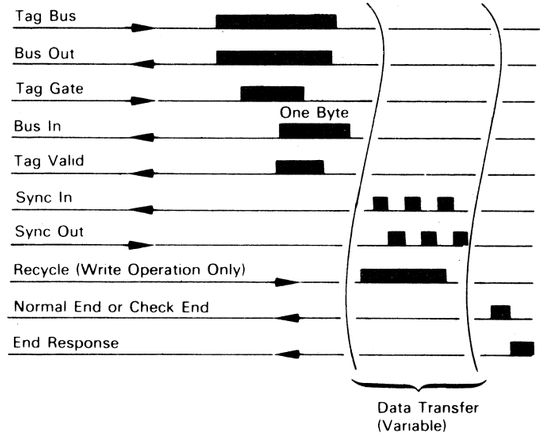
EXTENDED OPERATION

An Extended operation starts a sequence of events in the tape unit that requires extended time or many transfers across the control lines. The Extended operations are Read Block, Write Block and Loop Write-to-Read. The appropriate tag is placed on the Tag Bus. Simultaneously, a single byte of data or modifier information is placed on Bus Out. Tag Gate activates after a 200 ns interval to remove skew from the signals.

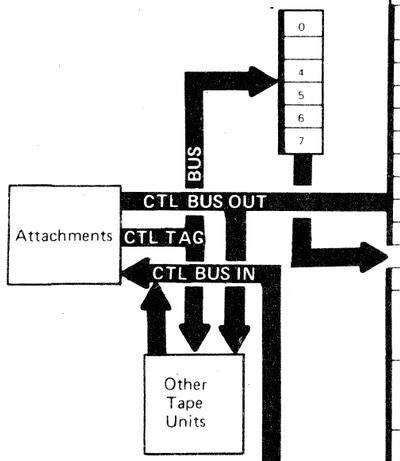
The tape unit responds by activating Tag Valid indicating acceptance of the tag which causes the host to deactivate Tag Gate.

Normal End is activated at the completion of the operation. If an abnormal condition occurs, the tape unit responds by activating Check End. When Check End is activated, Bus In indicates the unusual condition. Normal End or Check End remains active until Response is returned to the tape unit to acknowledge either end condition.

Extended Operation



CONTROL LINE TAG SUMMARY



		Command	Loop Write-to-Read	Diagnostic Set Ready		Forward Space Block	Read	Forward Space File	Backspace Block	Backspace File		Erase Gap	Write	Write Tape Mark		
		Bus Value	01	0C		20	21	22	28	2A		41	44	47		
CONTROL LINES	P		0	1		0	1	1	1	0		1	1	1		
	0		0	0		0	0	0	0	0		0	0	0		
	1		0	0		0	0	0	0	0		1	1	1		
	2		0	0		1	1	1	1	1		0	0	0		
	3		0	0		0	0	0	0	0		0	0	0		
	4		0	1		0	0	0	1	1		0	1	0		
	5		0	1		0	0	0	0	0		0	0	1		
	6		0	0		0	0	1	0	1		0	0	1		
	7		1	0		0	1	0	0	0		1	0	1		
	Tag		01 Execute													
CONTROL LINES	P															
	0		Data Over run			Data Over run	Data Over run		Data Over run	Data Over run		Data Over run	Data Over run	Data Over run		
	1		Data Chk			Data Chk	Data Chk		Data Chk			Data Chk	Data Chk	Data Chk		
	2		0			0	0		0			0	0	0		
	3		BOT			BOT	BOT		BOT			BOT	BOT	BOT		
	4		EOT			EOT	EOT		EOT			EOT	EOT	EOT		
	5		TM Det			TM Det	TM Det		TM Det			TM Det	TM Det	TM Det		
	6		Not Cap			Not Cap	Not Cap		Not Cap			Not Cap	Not Cap	Not Cap		
	7		0			0	0		0	0		0	0	0		
			Note 1 Note 2			Note 2	Note 2		Note 2			Note 1 Note 2	Note 1 Note 2	Note 1 Note 2		

		Sense Bytes																					
		Unit Status	9	Check End	11	12	13	Non Write Commands	Write Commands	15	16	17	18	19	20	21	23	23	
		8		10				14	14										
		80	81	82	83	84	85	86	86	87	88	89	8A	8B	8C	8D	8E	8F	Bus Value
CONTROL LINES	P	0	1	1	0	1	0	0	0	1	1	0	0	1	0	1	1	0	
	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	To OPER 161
	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	4		0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	
	5	0	0	0	0	1	1	1	1	1	0	0	0	0	1	1	1	1	
	6	0	0	1	1	0	0	1	1	1	0	0	1	1	0	0	1	1	
	7	0	1	0	1	0	1	0	0	1	0	1	0	1	0	1	0	1	
	Tag																		To OPER 161
CONTROL LINES	P																		
	0	Ready	Check End Sense	Data Over run	Write Bus Parity Check	Write Bus Parity Check	TIE Track 0	0 = Non write Cmmd	1 = Write Cmmd	U	Bit 0 Trans State	Start Velocity Check	Load Check	Bit 0 Pre sent Tran St	Servo Logic Failure	Idler Tach Failure	BOT EOT LED Failure	File Ampl Satur		
	1	Busy	Bus Out Parity Check	Data Chk	Bus Out Reg. Par. Check	Read Bus Parity Check	TIE Track 1	No Track Pointer	PEID Check	N	Bit 1 Trans State	End Velocity Check	Tension Check	Bit 1 Pre sent Tran St	Servo Analog Failure	Mach Tach Failure	Tape Pre sent LED Failure	Mach Ampl Satur		To OPER 161
	2	Write Enable	Tag Bus Parity Check	0	Gap Ctl Check	Gap Ctl Check	TIE Track 2	Multi Track Error	Multi Track Error	U	Bit 2 Trans State	PEID Velocity Check	Cover Reel Latch Inter rupt	Bit 2 Pre sent Tran St	Write Current Failure	File Tach Failure	Reel Size Failure	Write Status	
	3	BOT	Frm Wr / Int Fail	BOT	Sync Out Ck (Write Only)	Sync Out Ck (Write Only)	TIE Track 3	End Data Check	End Data Check	S	Bit 3 Trans State	Clock Parity Error	Ten sion Status	Bit 3 Pre sent Trans St	Erase Cor rect Failure	Idex Tach Rota tion Check	Drive Con trol Fail ure	Power Ampl Cable Un seated	
	4	EOT	Ctl Seq Check	EOT	Drive Resp Check	0	TIE Track 4	Start Read Check	Start Read Check	E	Bit 4 Trans State	Servo State Bit 0	Not Rdy Due to Reset	Bit 4 Pre sent Trans St	Bit 0 Pre sent Servo State	Unused *	Unused *	Unused *	
	5	Op Comp	Cmmd Reg Par Check	TM Det	Not Capab Space File	0	TIE Track 5	Crease		D	Seq Error	Servo State Bit 1	Long Gap Mode	Cover / Reel Lt Inter rupt Status	Bit 1 Pre sent Servo State	Unused *	Unused *	Unused *	
	6	Low Speed	Drive Ctl Par Check	Not Cap	Track in Error P	Track in Error P	TIE Track 6	Unused *	Envel ope Check	*	Sense Bus Parity Check	Sense Bus Parity Check	Sense Bus Parity Check	Sense Bus Parity Check	Sense Bus Parity Check	Sense Bus Parity Check	Sense Bus Parity Check	Sense Bus Parity Check	
	7	Posit	Form Rd Fail	0	Write Enable Error	Write Enable Error	TIE Track 7	Skew Error	WTM Error	*	Unused *	Unused *	Unused *	Unused *	Unused *	Unused *	Unused *	Unused *	
			Note 1 Note 2		Note 1 Note 2	Note 1 Note 2													

Notes:

1. *During a normal ending for this command, the Bus In lines could have BOT (bit 3) or EOT (bit 4) active. During a normal ending for other commands the Bus In lines equal 0.*
2. *Shown on Bus In are all bits (and their meanings) that could be active during a Check End condition. Immediate operations cannot set Check End active.*

8809

AX1000 Seq 1 of 2	**2699256** Part Number	**846318** 15 Mar 79	**846481** 15 Dec 79					

CONTROL LINE TAG SUMMARY (Continued)

From OPER 160 CTL TAG BUS

Tag

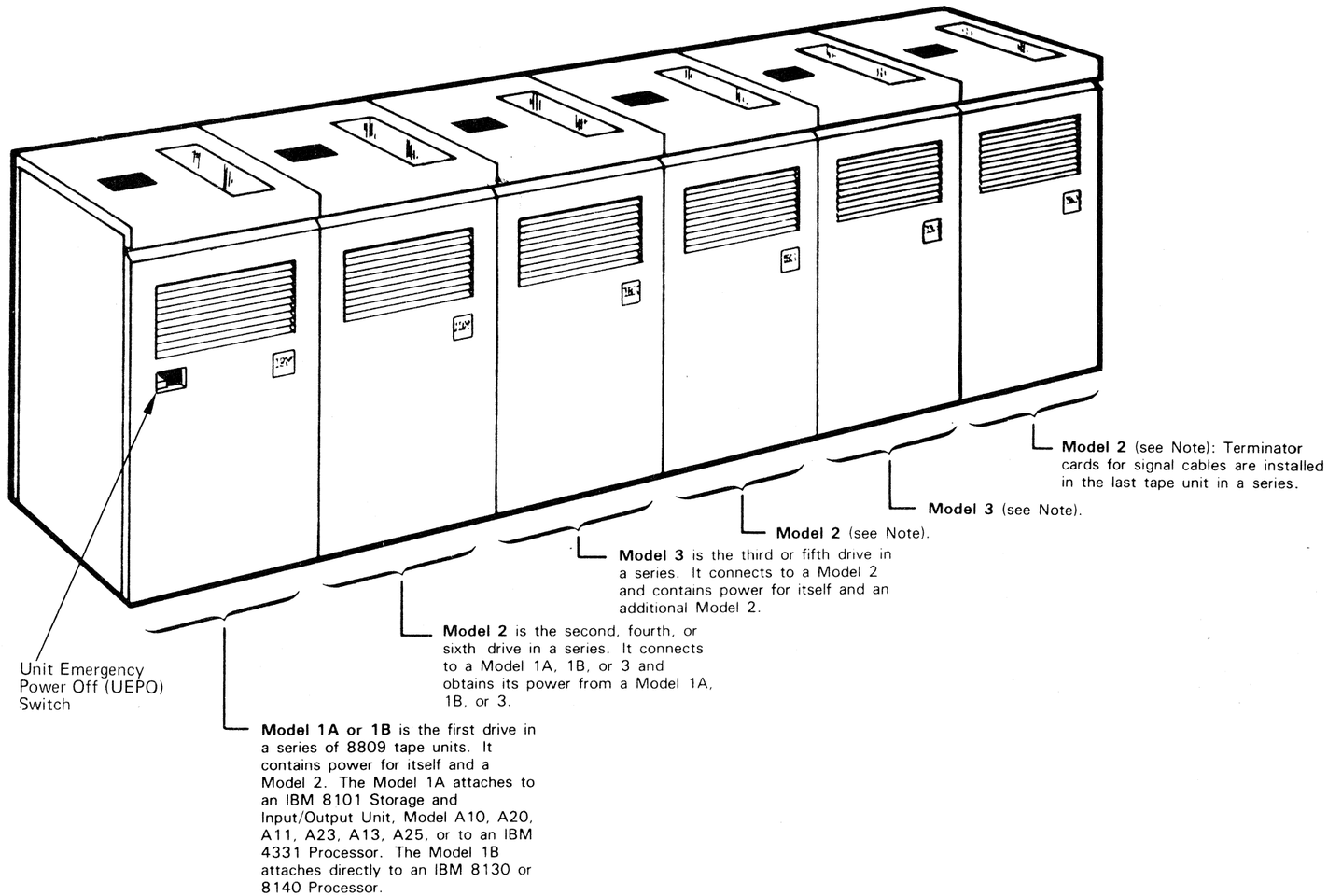
From OPER 160 CTL BUS OUT

To OPER 160 CTL BUS IN

		Command	Check Reset	Date Security Erase	Set Low Speed	Set High Speed	Rewind	Rewind Unload	Set Long Gap	Reset Long Gap	Execute	Poll Controller	Read Control	Diagnostic Bus In	Select Device	
	CONTROL	Bus Value (hex)	E0	E1	E2	E3	E4	E5	E8	E9						
P	CONTROL LINES		0	1	1	0	1	0	1	1	←	1	Not Used			
0	CONTROL LINES		1	1	1	1	1	1	1	1	←	0	1	TU Address 4	TU Address 4	
1	CONTROL LINES		1	1	1	1	1	1	1	1	←	0	Not Used	TU Address 2	TU Address 2	
2	CONTROL LINES		1	1	1	1	1	1	1	1	←	0	Not Used	TU Address 1	TU Address 1	
3	CONTROL LINES		0	0	0	0	0	0	0	1	←	0	Not Used	0	0	
4	CONTROL LINES		0	0	0	0	0	0	1	1	←	0	Not Used	0	0	
5	CONTROL LINES		0	0	0	0	1	1	0	0	←	0	Not Used	1	0	
6	CONTROL LINES		0	0	1	1	0	0	0	0	←	0	Not Used	1	0	
7	CONTROL LINES		0	1	0	1	0	1	0	1	←	0	Not Used	1	0	
Tag	CONTROL LINES		01 Execute (Cont.)									02	0A	82	83	
P	CONTROL LINES											Not Used	Not Used	1		
0	CONTROL LINES											Device Address 0	1 = 8809	1	TU Address 4	
1	CONTROL LINES											Device Address 1	Not Used	1	TU Address 2	
2	CONTROL LINES											Device Address 2	Not Used	1	TU Address 1	
3	CONTROL LINES											Device Address 3	Not Used	1	0	
4	CONTROL LINES											Device Address 4	1 = 3350	1	0	
5	CONTROL LINES											Device Address 5	1 = 3340 3344	1	Not TU Address 4	
6	CONTROL LINES											Device Address 6	11 = 3330 Mod 11	1	Not TU Address 2	
7	CONTROL LINES											Device Address 7	Not Used	1	Not TU Address 1	

8809 INSTALLATION PROCEDURES

CONTENTS



Note: *A maximum of four 8809s can attach to an IBM 8100 Information System; a maximum of six 8809s can attach to an IBM 4331 Processor.*

9.0 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 which exceed 30V ac or 42.4V dc 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 (form 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 energized equipment. 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, etc.), use suitable rubber mats purchased locally if necessary.

6. Follow special safety instructions when working with extremely high voltages. These instructions are outlined in 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, etc.] 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. Don't defeat their purpose by not replacing them at the completion of the service call.)

10. Safety glasses must be worn when:

    - Using a hammer to drive pins, etc.
    - Power hand drilling
    - Using spring hooks, attaching springs
    - Soldering, wire cutting, removing steel bands
    - Parts cleaning, using solvents, chemicals, and cleaners
    - All other conditions which might be hazardous to your eyes

11. Never assume that a circuit is deenergized. (Check it first.)

12. Always be alert to potential hazards in your working environment (i.e., damp floors, nongrounded extension cords, power surges, missing safety grounds, etc.).

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--DON'T 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. Each customer engineer is responsible to be certain that no action on his/her part renders the product unsafe or exposes hazards to customer personnel.

18. Place removed machine covers in a safe out-of-the-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 CE tool kit away from walk areas where no one can trip over it (i.e., under desk or table).

20. Avoid wearing loose clothing that may be caught in machinery. Shirt sleeves must be left 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 non-conductive) approximately three inches from the end when servicing a machine.

22. Before starting equipment, make sure that fellow CEs and customer personnel 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, etc.

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 which can retain a charge from the machine, review the procedure in the maintenance documentation. 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* the time. The exact condition of a machine may be unknown. Here are some of the reasons why:

- The power receptacle could be incorrectly wired.
- Safety devices or features could be missing or defective.
- The maintenance and/or modification 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 due to age or environmental extremes.
- A component could be defective, creating a hazard.
- Some component of the machine may have been incorrectly assembled.

Relating to safety, these are some of the ways the condition of the machine can be affected. *Before you begin a service call or procedure, exercise good judgment and proceed with caution.*

INSTALLATION PROCEDURES — SAFETY

Safety Guidelines (Continued)

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 EPO (Emergency Power Off) or disconnect switch to remove the electrical current. If the EPO or disconnect switch 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, he/she may need rescue breathing and possibly external cardiac compression if the heart is not beating.
- *Call Fire Rescue* (Rescue Squad, Emergency, Ambulance, Hospital, etc.). Have someone summon medical aid.

Determine if the victim needs rescue breathing.

1. Make certain that the victim's airway is open and that it is 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 as shown in Figure 1.
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 the exhaling of air.

Figure 1.

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 as shown in Figure 1, 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 (See Figure 2).

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.

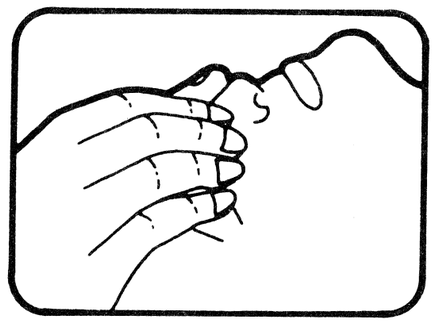


Figure 2.

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 (See Figure 3).

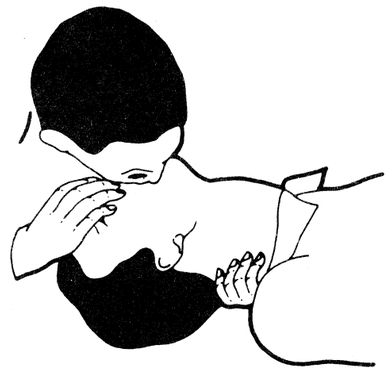


Figure 3.

c. Remove your mouth and allow the victim to exhale while watching for the victim's chest to fall (See Figure 4).

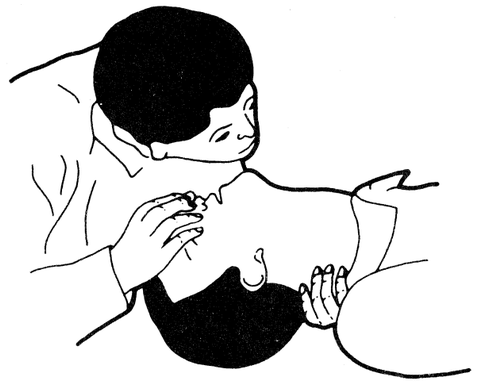


Figure 4.

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

Reporting Accidents

It is a CE's 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 will ensure that the situation will be resolved quickly.

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

8809 INSTALLATION CHECK LIST

INTRODUCTION

The 8809 tape drive is not designed like any previous tape drive. Careful effort is needed when following the installation instructions. Be sure to read all of the applicable instructions and refer to the reference material when instructed to do so.

Check each item as completed

A. PREINSTALLATION (See INST 10)

☐ 1. Physical Planning Check with the branch office or area physical planning representative that the:

- Service voltages are correct at wall outlet
- Cables are the correct length and routed correctly
- Correct attachment feature is installed in the host system

When converting from system to system, you may need:

- To obtain grey covers for the 8100 installations only
- To check for required voltage changes (see Figure 9, INST 50)
- To obtain a Russel-Stohl power connector

☐ 2. It is important that all applicable steps of the installation instructions are performed before turning the drive or drives over to the customer! The last step is disposition of shipping materials (step 68) on INST 80.

8809 INSTALLATION PROCEDURES

BEFORE INSTALLATION

INTRODUCTION

The installation procedures are for the IBM 8809 Magnetic Tape Unit, Models 1A, 1B, 2, and 3, attached to either an IBM 8100 System Information System or an IBM 4331 Processor. Cabling between the tape units in a series is identical, but control line connections from the system to the Model 1A or 1B will be different, depending on system type.

Follow each procedure in sequence. Some of the steps can be omitted, depending on the model of 8809 being installed and the system to which you are attaching. Before you begin installation, identify the system type and 8809 model. As you complete each installation step, place a check mark in the box to the left of the step number.

PREINSTALLATION CHECK

☐ 1. Check with the IBM branch office or area physical planning representative to ensure that all installation planning requirements are met (service outlet voltage, grounding, and cable lengths). Verify that the correct attachment is installed in the host system. The attachment should be ordered on an MES form by the branch office before installation of the 8809.

Prerequisites

For a Model 1A attached to an IBM 4331 Processor, an 8809 Magnetic Tape Unit Adapter, #4910, is required in the host system.

For a Model 1A attached to an IBM 8100 Information System a Magnetic Tape Attachment, #4521, is required on the 8101 Storage and Input/Output Unit (Model A10, A20, A11, A23, A13, A25).

If the 8809 attaches to an 8101 Model A10 or A20, a Diskette Drive and Magnetic Tape Attachment #1507 is required in the 8101 in addition to the Magnetic Tape Attachment #4521. The functions supplied by the Diskette Drive and Magnetic Tape Attachment are standard in the 8101 Models A11, A23, A13, and A25.

For a Model 1B attached directly to an IBM 8130 or 8140 Processor, the magnetic-tape attachment electronics are located in the 8809 Model 1B. An 8100 System Multi-drive Feature (#4920, B/M 4297864), is required in the Model 1B if additional 8809s (Models 2 and 3) are attached.

Concurrent

None

Companion

None

PROGRAMMING

☐ 1. The 8809, when attached to an IBM 4331 Processor, is supported by two operating systems: Disk Operating System/Virtual Storage Extended (DOS/VSE) and Virtual Machine/Base System Extension (VM/BSE) Release 2.

The 8809, when attached to the 8100 Information System, is supported by two programming systems: Distributed Processing Control Executive (DPCX) and Distributed Processing Programming Executive (DPPX).

Utility programs are available for volume dumps in streaming mode.

8809 diagnostic diskettes are shipped to the host system.

INSTALLATION TIME

	Man Hours	System Hours	No. of CEs
All models	2.0	0.4	1

TOOLS AND TEST EQUIPMENT

Metric tool kit	PN 1749235
Master skew tape	PN 432641
Test pattern tape	PN 4297736
Skew adjustment card	PN 8492415
Logic card extractor	PN 2360375
Logic card extractor extender (In Model 1A and 1B ship group)	PN 2337369
Logic card extractor. Extender not needed with this extractor.	PN 1310707
5/16 inch socket	PN 153704
Jumper wire 12.7 cm (5 in.) (In ship group)	PN 452655
Pin extractor tool (if required for voltage conversion - see INST 60)	PN 2108398
A full 10.5 inch reel of IBM Multi-System Tape or equilvalent scratch tape (no tape removed)	PN 2742516
IBM tape cleaner kit	PN 352465
High voltage probe tips	PN 1749249 Red
	PN 1749250 Black

INSTALLATION

UNPACKING AND PLACEMENT OF THE TAPE UNITS

The customer is responsible for removing the external packaging material and moving the 8809 to its approximate final area. Ensure that all cables connecting the 8809 to the host system are routed and ready to install, and the necessary ac power outlets are installed. See the appropriate host system documentation for cable connections at the host system.

☐ • Follow the packing/unpacking instructions taped to the top cover and inspect the tape drive for damage.

☐ • Check that all items listed on the shipping group are received. Use the Bill of Material listing for verification.

B/M 2337795	Model 1A or 1B
B/M 2337769	Models 2 or 3

☐ • If this is a multidrive installation, the drives must be arranged in the sequence shown on INST 1, OPER 10, and OPER 20. The Model 1A or 1B is the first 8809 in the series, followed by a Model 2, a Model 3, and then another Model 2. A maximum of four 8809s can attach to an IBM 8100 Information System; a maximum of six 8809s can attach to the IBM 4331 Processor.

If you are installing a Model 1A or 1B only, omit steps 5 through 22 of this procedure.

☐ 1. Use the packing/unpacking instructions taped to the cover. Remove the packing material and check for damage.

☐ 2. Put the Model 1A or 1B unit in position, and open the top cover.

☐ 3. See Figure 1. To remove the front and rear covers **4**, insert a tool (screwdriver) **1** into the holes in top of the front and rear frames **2**, use a sidewise and gentle downward pressure to unlatch the two latch springs **3** (one at a time) and pull the cover outward.

Figure 1. Cover Removal

☐ 4. Use a 5/16 inch socket to raise the tape deck to its service position (see Figure 2).

☐ 4.1. If you are installing a Model 1A or Model 1B only, lower the four level jacks **5**, Figure 4 until the machine weight is off the casters. Skip to Power Checks—General (INST 45).

FOR MULTIPLE UNIT INSTALLATION ONLY

(See INST 1 for required physical sequence of models.)

☐ 5. See Figure 3. Remove the right cover **1** from the Model 1A or 1B by removing the four screws **2** as shown.

☐ 6. Lift the top covers, and remove the front cover from other 8809s being installed.

☐ 7. Move all the 8809s to their approximate final locations if they have not already been moved.

☐ 8. Tape units are shipped with spacers bolted to the left side of Models 2 and 3. See Figure 4 to remove the spacers **1** by unscrewing four screws **4**, removing four nuts **2**, and removing eight starwashers **3**.

☐ 9. Partially lower the leveling jacks on all the machines to the point where they will not roll.

☐ 10. Place the spacers **1** between the frames and use the hardware removed in step 8 to bolt the frames together. Use the leveling jacks as necessary to align holes.

Note: *Put a starwasher under the head of the bolt and under the nut. Do not tighten the nuts yet.*

☐ 11. Raise the tape deck of the other 8809s to the service position.

☐ 12. Install the right cover (removed from the Model 1A or 1B in step 5) on the last 8809 in the series.

☐ 13. Adjust the leveling jacks **5** on the corners of each 8809 so all machines are even, and then tighten the nuts and screws that hold the frames together.

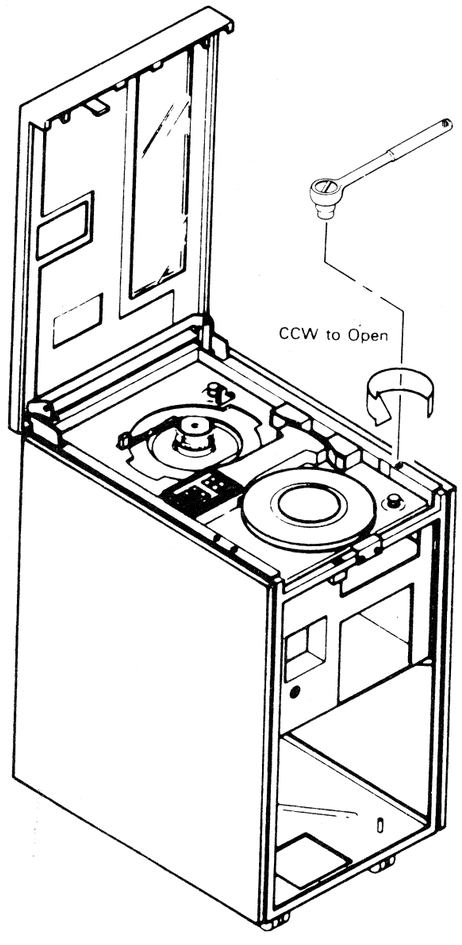


Figure 2. Raising Tape Deck

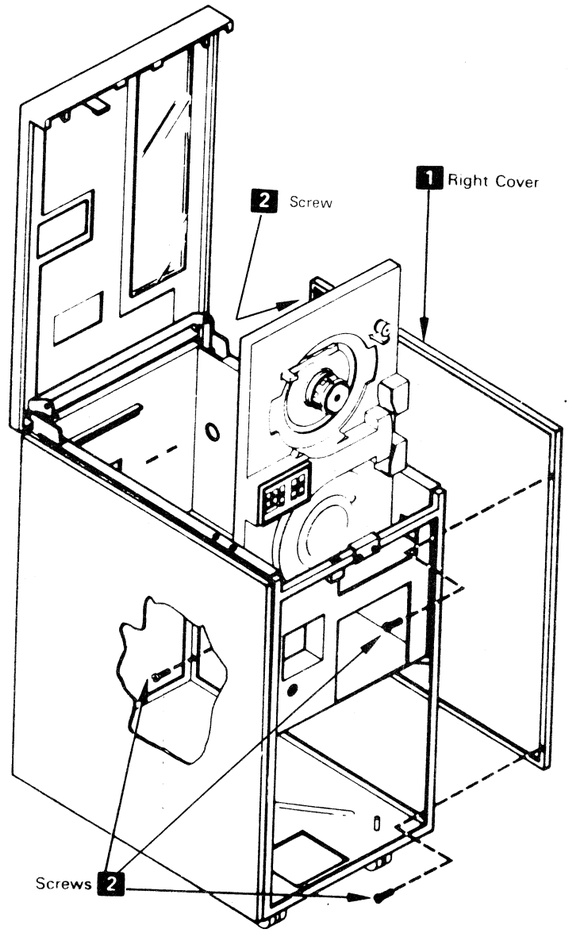


Figure 3. Removal of Right Cover

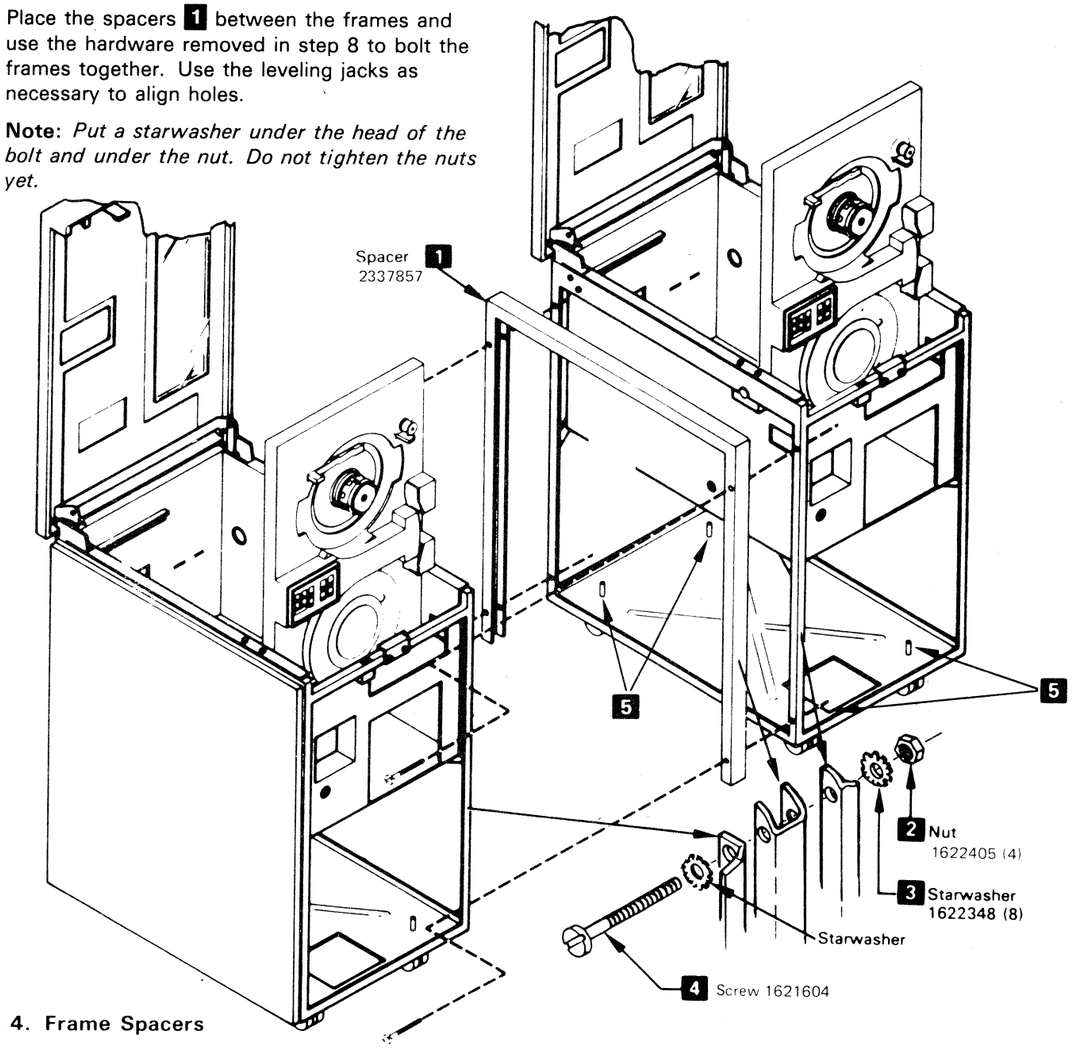


Figure 4. Frame Spacers

FOR MULTIPLE UNIT INSTALLATION ONLY (Continued)

See Figure 5, **4** to route the flat cables from the Model 1A, 1B, or 3 to the Model 2.

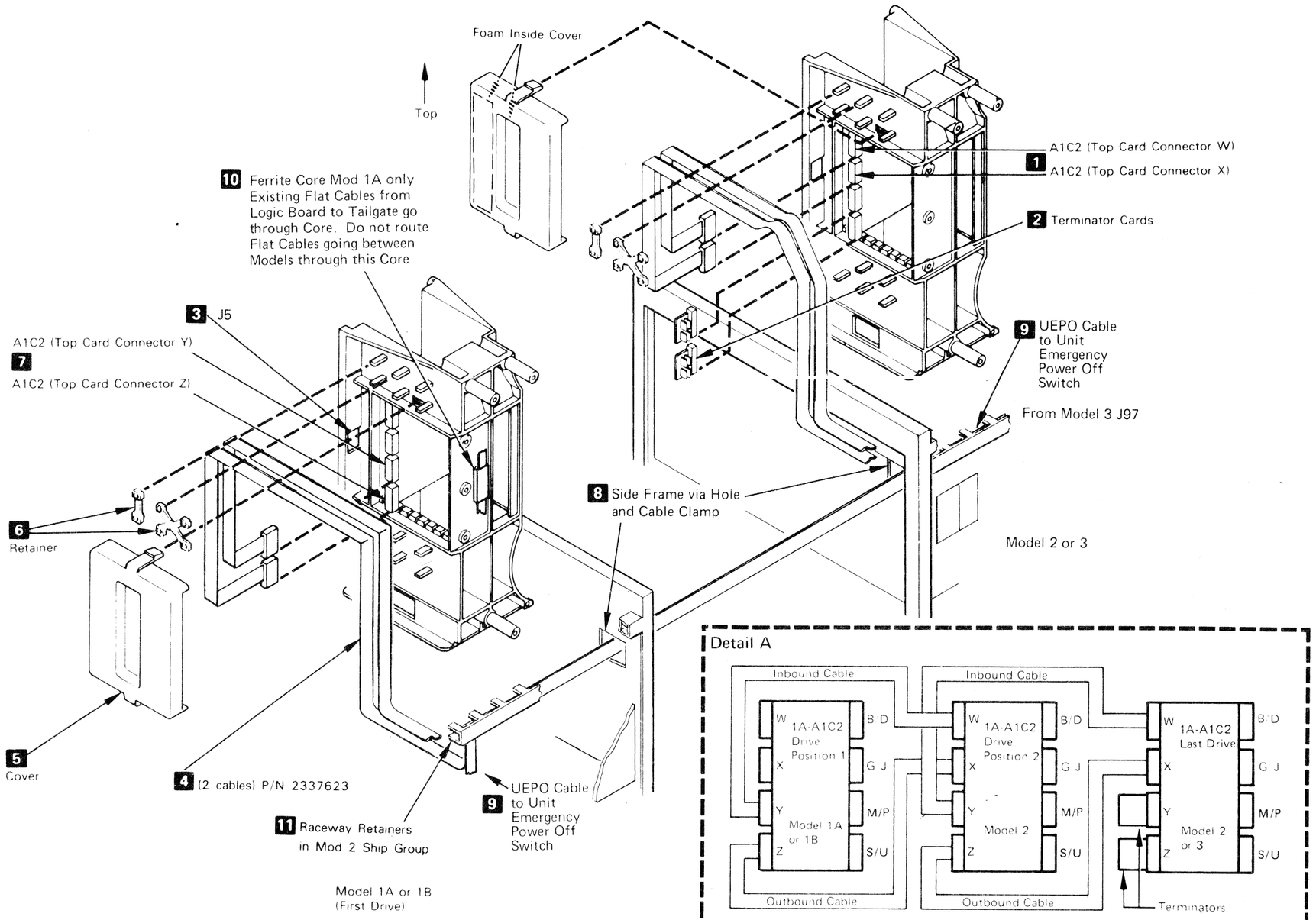
☐ 14. Before installing these cables, the logic board covers (Figure 5, **5**) must be removed from all 8809s. Press on the latches at each end of the cover and pull off the cover.

☐ 15. The cable retainers (PN 811519 and PN 811427) and cable raceways (PN 2306491) (Figure 5, **11**) to be installed in the Model 1 are part of the Model 2 shipping group. Remove the paper backing from the cable raceways to expose the adhesive and install them in the Model 1, as shown in Figure 5, **11**. Install the cable raceways in the same position as those already installed in the Model 2.

☐ 16. Remove the terminator cards **2** from the Model 1A for new installations or from the last drive if you are adding a drive to a previously installed 8809. The terminator cards are located in A1C2 top card connectors Y and Z. Save these terminators for installation in the last drive in the series. (For a multiple unit installation with a Model 1B, the terminators are in the shipping group.)

☐ 17. Install the cables **4** and retainers **6** as shown in Figure 5. Hold each cable with fold marks toward you and fold inward along the fold marks. The cable must be routed through and clamped at the side frame by means of the hole and cable clamps as shown in (Figure 5, **8**). Do not route the cables through the ferrite core in the Model 1A (Figure 5, **10**). Remove J5 on Power Amplifier. (See **3**.) Route the cables under the existing flat cables.

☐ 18. Connect the two flat cables (Figure 5, **4**) from the Model 2 or Model 3 top card connector A1C2 W and X (Figure 5, **1**) to the unit to the left at the top card connector A1C2 Y and Z (Figure 5, **7**). See Detail A. Reinstall J5.



This diagram shows the connection of inner drive flat cables to A1C2 card in the drives and the location of terminators in last drive of the series.

Figure 5. Cabling From One Model to Another

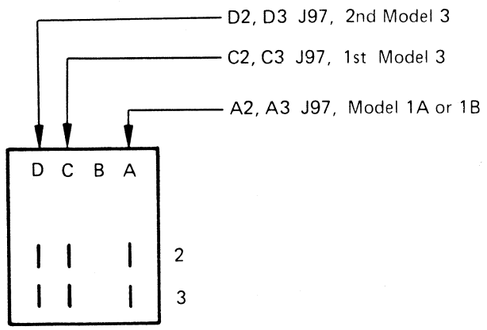
8809 INSTALLATION PROCEDURES (CONTINUED)

FOR MULTIPLE UNIT INSTALLATION ONLY (Continued)

Model 3 only:

Caution: Lethal voltage present at UEPO switch. Disconnect all the power cables if connected in the Model 1A, 1B, or 3 at the customer outlet or receptacle.

☐ 19. The unit emergency power off (UEPO) cables go from J97 of each 8809 Model 3 in the series to the Unit Emergency Switch in the Model 1A or 1B. Route these cables along the flat cable path (Figure 16, 7 or (Figure 5, 9) and connect as shown below:



Model 1A or 1B UEPO Switch—wiring side

See Figure 6 on INST 40 or LOC 40 for location of J97.

Notes:

1. *The logic board cover and terminator cards will be installed at later time.*
2. *See INST 1 for drive locations.*

8809 INSTALLATION PROCEDURES (CONTINUED)

FOR MULTIPLE UNIT INSTALLATION ONLY (Continued)

Power Cables (Model 2 only)

Turn off CP1 in Model 1A, 1B or 3 that this Model 2 is attached to.

The DC Extension Cable shown on (Figure 6, **1**) provides dc power from a Model 1A, 1B, or 3 to a Model 2. The Model 2 is shipped with this cable preinstalled.

☐ 20. Route the DC Extension Cable in the Model 1A, 1B, or 3 as shown in (Figure 6, **1**). The cables attach to J46, J48, and J49 **3** in Models 1A, 1B, or 3. Remove the load resistor cables installed in J46 and J48, and remove the jumper plug in the J49 position. Plug in the DC Extension Cable coming from Model 2. The load resistor cables removed from J46 and J48 remain inside the Model 1A, 1B, or 3, and should be placed so they do not touch any electrical or mechanical parts of the machine.

Note: *Store the J49 jumper plug in the base of the machine. It may be needed at a future time.*

There are six ground leads that attach to G7, and G8. Install them as shown in (Figure 6, **2**).

Fan Cables (Model 2 only)

☐ 21. The fan cable shown in (Figure 6, **4**) supplies ac fan power from a Model 1A, 1B, or 3 to a Model 2. Install the fan cable as shown in Figure 6.

There are two fan connectors in a Model 1B. Plug the fan cable from the Model 2 into the connector (J44) closest to the Model 2. The other connector is for the Model 1B SSCF fan.

Cable and Connector Seating

☐ 22. Check that all cables and connectors are correctly seated.

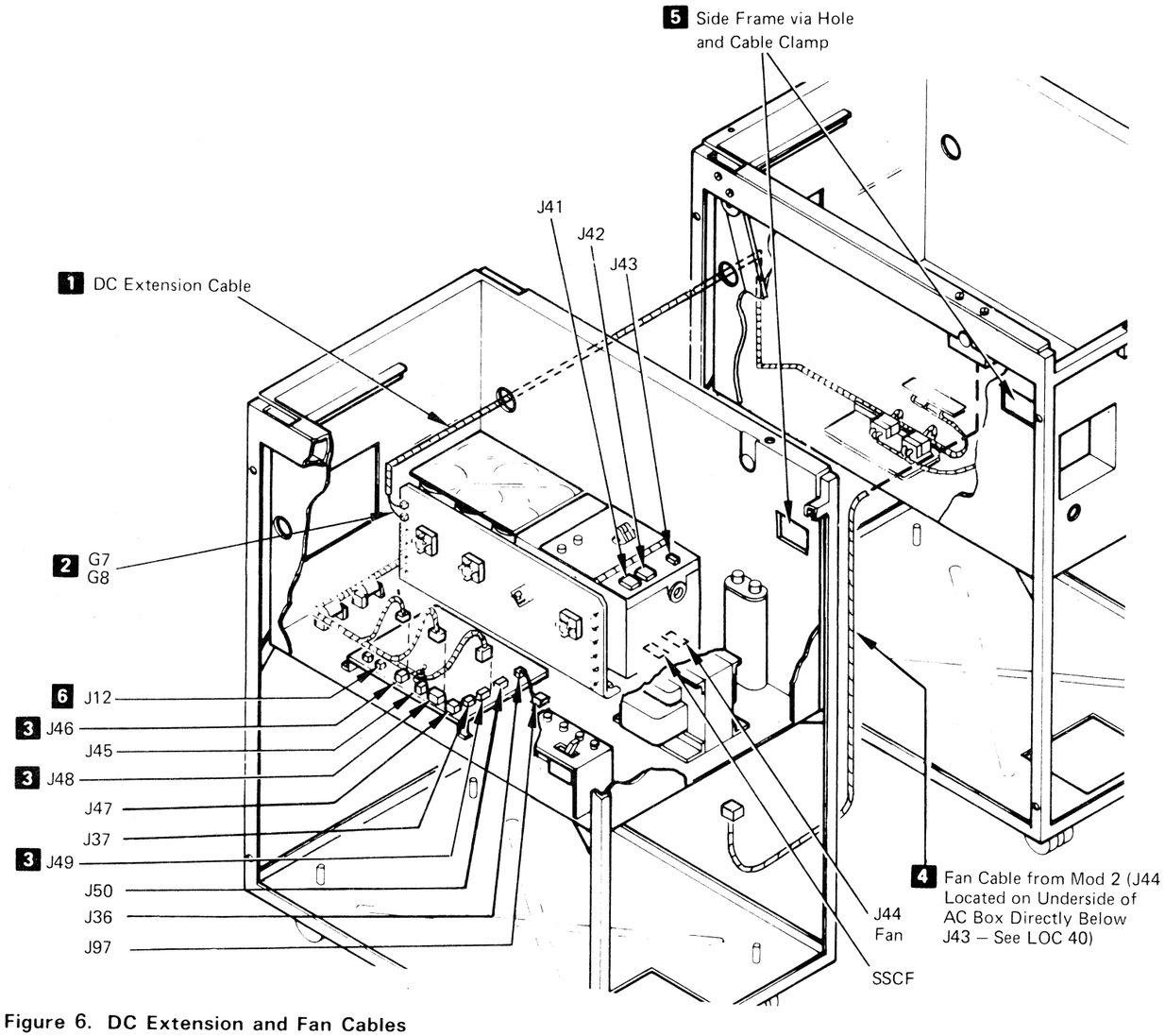


Figure 6. DC Extension and Fan Cables

POWER CHECKS—GENERAL

When installing a Model 1A, 1B, or 3, perform the following procedure. When installing a Model 2, go directly to "Power Checks Model 2, 50 or 60 Hz" (INST 55).

Check Grounding Model 1A, 1B, or 3

You should read and be familiar with General Safety CEM 59 and the electrical safety training course, before connecting the 8809 to the customer's wall receptacle.

DANGER

Lethal Voltage

Any device that locks the wall outlet circuit breaker in the On position is a potential safety hazard. Report any such hazard to your Field Manager.

Note: *The term "wall outlet" includes any form of the customer's power supply.*

☐ 23. Switch the wall outlet circuit breaker to Off.

☐ 24. Verify with a multimeter and high voltage probe tips that there is no voltage on the outlet pins.

☐ 25. Verify that a short circuit of 0.1 ohm or less exists between the outlet ground pin, outlet case, and building ground. See Figure 7 for wall outlet configurations.

☐ 26. For 200 to 240V, verify that the resistance is greater than 1 megohm between each pin of the outlet and the ground pin. For 100 to 127V, neutral and ground are the same.

Power Check—Model 1A, 1B, or 3, 50 or 60 Hz

☐ 27. Ensure that the Local/Remote switch, located on the Power Control Board within the power supply area (Figure 8, **1**), is set to Local.

☐ 28. Turn off the circuit protector CP1. CP1 is located on top of the ac power box in the power supply area (Figure 8, **2**).

☐ 29. Verify with a multimeter and high voltage probe tips that a short circuit of 0.1 ohm or less exists between the ground pin of the tape unit power plug and the tape unit unpainted frame ground. On World Trade units, the short circuit must exist between the green and yellow lead of the line cord and frame ground. If this short circuit does not exist, find out why and correct the problem.

DANGER:

Lethal voltage.

Turn the wall circuit breaker off before connecting the voltmeter and before removing it from the line circuit.

☐ 30. Verify if voltage conversion is required. Turn on the wall circuit breaker and check ac voltage with a multimeter and high voltage probe tips at the outlet. Compare the outlet voltage to the input voltage marked on plugs J41 and J42. If you need to convert voltages, exchange plugs J41 and J42 using the corresponding part numbers as shown in Figure 9, INST 50. See Figure 8 for locations of J41 and J42. See Note 1 in Figure 9.

If the correct plug is not available, Figure 9 shows correct jumper connections on J41 and J42. J41 and J42 are jumpered identically. See notes on Figure 9 before making any changes.

If you change plug jumpers, mark the machine voltage on plugs J41 and J42, and order the correct plug.

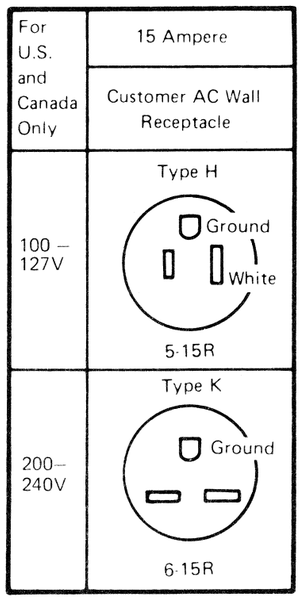


Figure 7. Wall Outlet Configuration

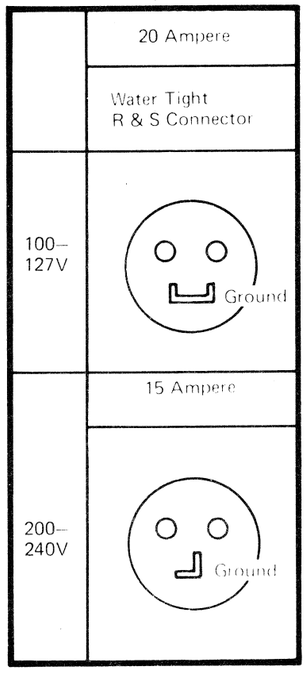


Figure 7A. R and S Plug Configuration

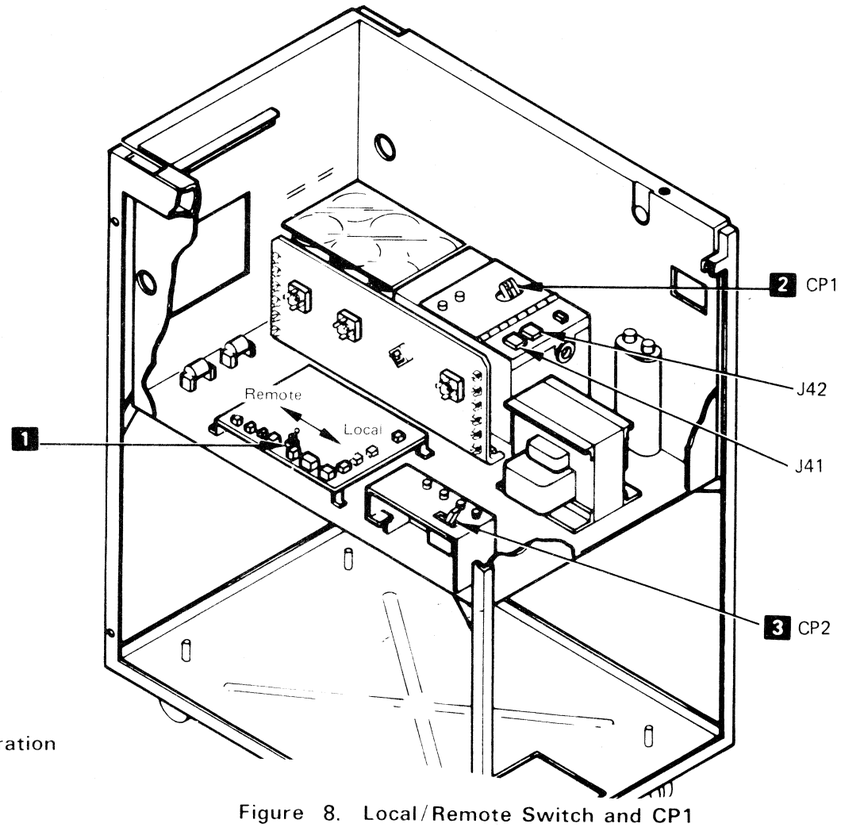
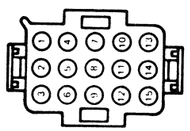


Figure 8. Local/Remote Switch and CP1 Locations

Input Voltage	Part Number	J41 and J42 Jumpers	Voltage Range	
100 Vac	2337636	12 to 6 15 to 1 11 to 2 14 to 7	90 to 110	Note 2
110 Vac	2337637	12 to 6 15 to 1 11 to 8 14 to 3	96.5 to 119	Note 1
120 Vac	2337638	12 to 6 15 to 1 11 to 9 14 to 4	104 to 127	
127 Vac	2337639	12 to 6 15 to 1 11 to 5 14 to 10	111 to 137	
200/208 Vac	2337640	11 to 1 12 to 7 6 to 2 10 to 13	180 to 220	Note 1
220 Vac	2337641	11 to 1 12 to 8 6 to 3 10 to 13	193 to 238	
230 Vac	2337642	11 to 1 12 to 9 6 to 3 10 to 13	202 to 249	
240 Vac	2337643	11 to 1 12 to 9 6 to 4 10 to 13	208 to 254	



Notes:

1. *Voltage conversions can only be made between 100 to 127 Vac or between 200 to 240 Vac because the cables and connectors are different for the 1xx Vac and 2xx Vac units. If the conversion cannot be made, the 8809 will have to exchanged, or a conversion kit ordered on an MES.*
2. *Use pin extractor tool (PN 2108398) to change jumpers, if necessary.*

Figure 9. Voltage Conversion

☐ 31. Make sure the Local/Remote switch is set to Local. Turn off the wall circuit breaker and plug in the Model 1A, 1B, or 3 power cables. Turn on the wall circuit breaker; turn on the Unit Emergency (UEPO) switch located on the front of the Model 1A or 1B; turn on circuit protector CP1; verify that CP2 is turned on (Figure 8, 3) (INST 45) and press the Power On pushbutton. Power is supplied to the Model 1A, 1B, or 3, and to any attached Model 2. Assume power is on at the 8809 when the Power On indicator is on. If power is not supplied, go to MAP 6000 and correct the problem.

Note: *If power does not come on, press Power Off and then Power On again.*

You may proceed to addressing on INST 60 without measuring the dc voltages. However, if you encounter any problems or diagnostic errors, you must come back to step 32 to measure the voltages before going to the MAPs to troubleshoot the failure.

☐ 32. Use the CE multimeter (PN 1749231), or a similar meter that has a tolerance of 5% or less, to measure the voltages at the points shown in Figure 10. The voltages are measured at test points on the power control board. The test points are marked on the safety cover over the board. If any voltage is missing or out of tolerance, go to MAP 6000 and correct the problem.

☐ 33. If Model 2s are being installed in the series, complete the power check of those units.

Supply	Tolerance	Measured at Test Point:
+24 Vdc	+22.5 V to +26.4 V	TP 1
24 Vdc	22.5 V to 26.4 V	TP 2
+5 Vdc	+4.7 V to +5.5 V	TP 3
5 Vdc	4.7 V to 5.5 V	TP 4
+8.5 Vdc	+7.9 V to +9.35 V	TP 5
+5 Vdc regulated	+4.75 V to +5.25 V	TP 9

Note: *Voltages are measured with reference to system ground (heat sink on the rectifier assembly). See LOC 40.*

Figure 10. Model 1A, 1B, or 3 Voltage Test Points

☐ 34. If the last 8809 in the series is a Model 1A, 1B, or 3, ensure that the load resistor cables are installed in J46 and J48.

If you are installing a Model 1A, check for the load resistor cables in J12 (Figure 6, 6); a Model 1B will have a cable plugged in J12 that goes to the Magnetic Tape Attachment.

Power Check—Model 2, 50 or 60 Hz

A Model 2 8809 does not contain a power supply nor does it have a Power On pushbutton. It receives power through a DC Extension Cable from a Model 1A, 1B, or 3. Power to the Model 2 is turned on when the Power On pushbutton is pressed at the Model 1A, 1B, or 3 to which the Model 2 is attached, or when the host system sequences power to the 8809s.

The Model 2 does have a Power Off pushbutton that turns power off to itself and to the Model 1A, 1B, or 3 supplying its power.

Note: *The DC Extension Cable from a Model 2 to a Model 1A, 1B, or Model 3 was installed earlier.*

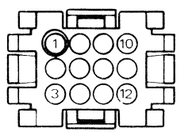
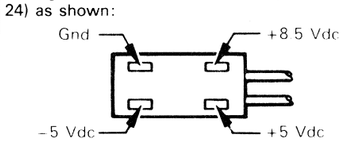
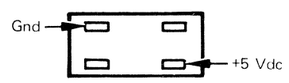
☐ 35. Press the Power On pushbutton at the Model 1A, 1B, or 3.

You can go directly to "System Power Check" without measuring dc voltages. However, if you have any problems or diagnostic errors, you must come back to step 36 to measure the voltages before using MAPs to troubleshoot the problem.

☐ 36. Use the CE multimeter (PN 1749231), or a similar meter that has a tolerance of 5% or less, to measure voltages at the test points shown in Figure 11.

If any voltage is missing or out of tolerance, go to MAP 6000 to correct the problem.

☐ 37. After power has been checked at each 8809, go to the next section to continue installation.

Supply	Test Point		Tolerance
+24 Vdc	J5-1	**Note:** *With the tape deck in its service position, remove the cover from the Power Amplifier Board. See LOC 30 for layout of pins. Put cover back after measurements are made.*	+22.5 V to +26.4 V
24 Vdc	J5-7		22.5 V to 26.4 V
+5 Vdc regulated	J47-8	J47 pins 	+4.7 V to +5.5 V
+5 Vdc	On logic board minibus connector (J22 and 24) as shown: 		4.7 V
5 Vdc			4.7 V to 5.5 V
+8.5 Vdc			+7.9 V to +9.35 V
+5 Vdc	On logic board minibus connector (J16, 20, and 21) as shown: 		4.75 V to +5.25 V

Note: *Voltages are measured with reference to ground at TB2-8 for Model 2. See LOC 50 for location of J47 and TB2.*

Figure 11. Model 2 Voltage Test Points

SYSTEM POWER CHECK (Model 1B Only)

Go to MAP 6000 to correct any problems found while performing the following steps. However, if you have not measured the dc voltages shown in Figures 10 and 11, do so before going to the MAPs.

Note: *Not all host systems have 8809 power control capability. In those installations, the Local/Remote switch in each 8809 must be left in the Local position at all times. Power is turned on by pressing the Power On pushbutton at the 8809.*

☐ 38. After power has been checked at each tape unit, set the Local/Remote switch to Remote (see Figure 8, INST 45).

☐ 39. Verify that the host system can cause power to go on and off at each tape unit. When controlled by the host system, the 8809s power on at about eight-second intervals. Verify that the fans are operating in all 8809s.

☐ 40. With the Local/Remote switch set to Local, verify that power can be turned off by pressing the Power Off pushbutton at each of the 8809s in the series. Power will go off in both 8809s that share power supplies.

☐ 41. Continue to the next section.

8809 INSTALLATION PROCEDURES (CONTINUED)

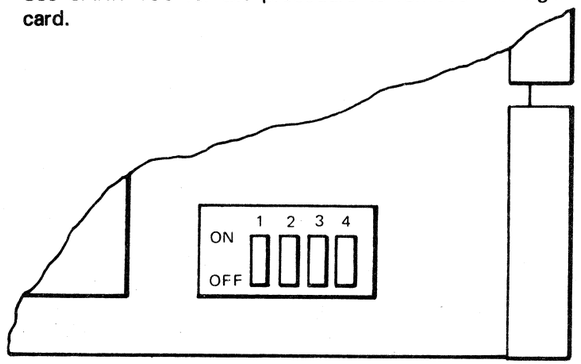
ADDRESSING (All Models)

All models 1, 2 and 3 have the address switches preset to 0, 1, and 2 respectively. If you are installing drive address 0, 1 or 2 skip to step 44.

The tape drive address is determined by switches mounted on the A1G2 Formatter Card. The switches are labeled and located near the top card connector side of the card as shown in Figure 12.

Caution: Turn power off before removing the logic card.

See CARR 190 for the procedure to remove the logic card.



IMPORTANT

Press rocker switch "on" side, down for on and "off" side, down for off. Ignore any dots on the switches.

Figure 12. Address Switches on the G-2 Card

□ 42. Set the address for the tape drive addresses 3-7 by setting the switches as shown in Figure 13.

Drive Address	Switch Position 1	2	3	4
0	ON	ON	ON	Not Used
1	ON	ON	OFF	
2	ON	OFF	ON	
3	ON	OFF	OFF	
4	OFF	ON	ON	
5	OFF	ON	OFF	
6	OFF	OFF	ON	
7	OFF	OFF	OFF	

Note: *Each tape drive must be set for its own address.*

Figure 13. Address Switch Positions

□ 43. **Check for loose cards or cables.** Reseat any loose components. Replace all the logic board covers.

□ 44. The address can now be placed on the address label position below the switches on the Operator Panel.

□ 45. If you are installing a single drive, Model 1A, go to initial checkout (INST 65). If you are installing multiple drives, including a Model 1A, go to termination (INST 65). If you are installing a Model 1B in an 8100 system, go to the next column, step 46.

Note: *When the 8809 attaches to a 8100 or 4331 System, the 8809 addresses must also be entered in the configuration tables on the diagnostic diskette.*

For the Model 1A, you must enter the drive addresses. For the Model 1B, you must enter the System Control Facility (SCF), magnetic tape attachment, and drive addresses.

Refer to the 8100 Maintenance Information Manual (MIM), Chapter 2, or to the 4331 Maintenance Information, Volume 13, DIAGN section, for details on how to update the configuration tables on the diskette.

FOR 8100 MODEL 1B ONLY

□ 46. If you have an 8809 Model 1B, the address of the SSCF card must be entered. The switch positions for the SSCF card in the 8809 are set as follows:

Module 1 Switches	1	2	3	4	5	6	7	8	9	10
Set To	Off	On	On	On	On	Off	On	On	Off	Off

Module 2 Switches 1-8 are always all set to Off (all zeros) in the 8809 Model 1B.

See Figure 14 for SSCF card location and switch settings.

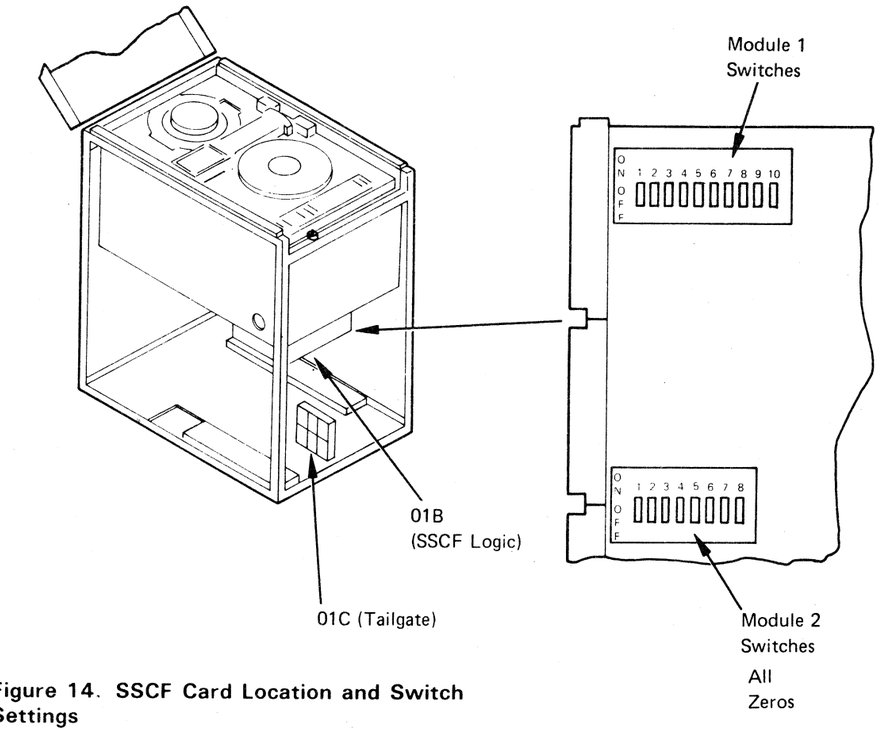


Figure 14. SSCF Card Location and Switch Settings

TERMINATION

See Figures 15 and 5. Two terminator cards are to be installed in the A1C2 top card connector positions Y and Z when:

- This is a Model 2 or 3 and the last 8809 in a series.
- This is a Model 1A with no Model 2 or 3 attached.

Note: *A single Model 1B drive installation does not require terminator cards.*

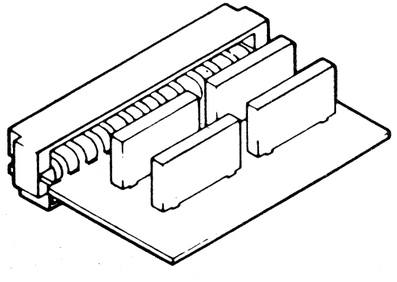


Figure 15. Terminator Cards

□ 47. If this is a multidrive installation, the terminator cards were removed earlier from the Model 1A (or they are shipped with a Model 1B that has an 8100 System Multi-drive Feature). Install them in the A1C2 top card connector positions Y and Z in the last 8809 in the series (see Figure 5). Check for loose cards and cables and reseat any loose components.

□ 48. Again, install the logic board cover. See Figure 5. The cover is shaped so that it can be installed in only one direction.

INITIAL CHECKOUT

If during these procedures you encounter any problems or diagnostic errors, verify that the voltages are correct before going to the MAPs. See 'Power Checks Model 1A, 1B, or 3, 50 or 60 Hz' on INST 45, or 'Power Checks Model 2, 50 or 60 Hz' on INST 55.

□ 49. Clean the Read/Write Head before running the diagnostic routines. Load a scratch tape on the 8809. Position the beginning of tape (BOT) mark toward the file reel side of the read/write head to prevent a loose-wrap tape load operation.

Note: *Check the position of the top cover interlock switch. The 8809 can be operated with the top cover lifted, if this switch is pulled up.* (See LOC 20)

□ 50. Press the Reset and Load pushbuttons. If the tape does not load correctly, see MIM START 10.

□ 51. If the Ready indicator does not come on, see MIM START 10.

□ 52. Press the Reset and Unload pushbuttons. If the tape does not unload correctly, see MIM START 10.

□ 53. Load a full 10.5 in. (267 mm) or 8 in. (203 mm) reel of scratch tape, with no tape removed, on the 8809 with the BOT mark toward the machine reel side of the read/write head. If a loose-wrap tape load operation does not occur, see MIM START 10. OPER 80 gives a description of the loose-wrap tape load operation.

□ 54. Remove the scratch tape from the tape unit.

□ 55. Load a tape with the write-enable ring removed. If the File Protect indicator does not come on when the tape unit becomes ready, see MIM START 10.

□ 56. Continue to skew check, step 57.

SKEW CHECK

□ 57. Go to CARR 50 and verify or perform the skew adjustment. If installing a Model 1A or 1B, continue to host system cabling page INST 70. If installing only a Model 2 or 3, go to Diagnostic Routines, page INST 80.

8809 INSTALLATION PROCEDURES (CONTINUED)

CABLE INSTALLATION

Cables From the Host System to 8809

If you are installing a Model 1A, perform steps 58 and 59 or 59A and 59B. If you are installing a Model 1B, proceed to step 60.

See the appropriate host system documentation for cable connections at the host system. On the 8100 Information System, ensure that the 8809 is placed to the right of the processor or 8101 when you are facing the front of the units.

Model 1A — Tailgate Cables

See Note 1 for cable limitations. Steps 58 and 59 are for 4300 Systems only. For 8100 Systems, go to Step 59A.

☐ 58. Refer to Figure 17, Detail A. Connect the light gray cable connector flanges to the 8809 tailgate connectors. Tape the cable shield lead back along the cable and ensure that it does not touch the frame. Not all cables have a cable shield. See Note 2. Connect bus cable and tag cable as shown in Figure 17, Detail A.

☐ 59. Connect the cable shield lead at the host system. Refer to the appropriate documentation for cable connections at the host system.

1. Minimum cable length: 4 m (13 ft)
2. Maximum cable length on a 4331:
   a. 1 to 3 8809s: 30 m (99 ft)
   b. 4 to 6 8809s: 15 m (49 ft)

Notes:

1. *No EPO cable is required for the 8809 from the host system. To EPO the 8809 string, turn off the UEPO switch on front of the Model 1A or 1B.*
2. *Cable group 3900, cable PN 2281630 (2X).*

☐ a. For Model 1A on 8100 systems, connect the bus and tag cables as shown in Figure 17, Detail A. Connect the light gray cable connector flanges to the 8809 tailgate connectors.

☐ b. Connect the shield to the ground lugs as shown in Figure 17, Detail A. Refer to appropriate documentation for cable connections at host system.

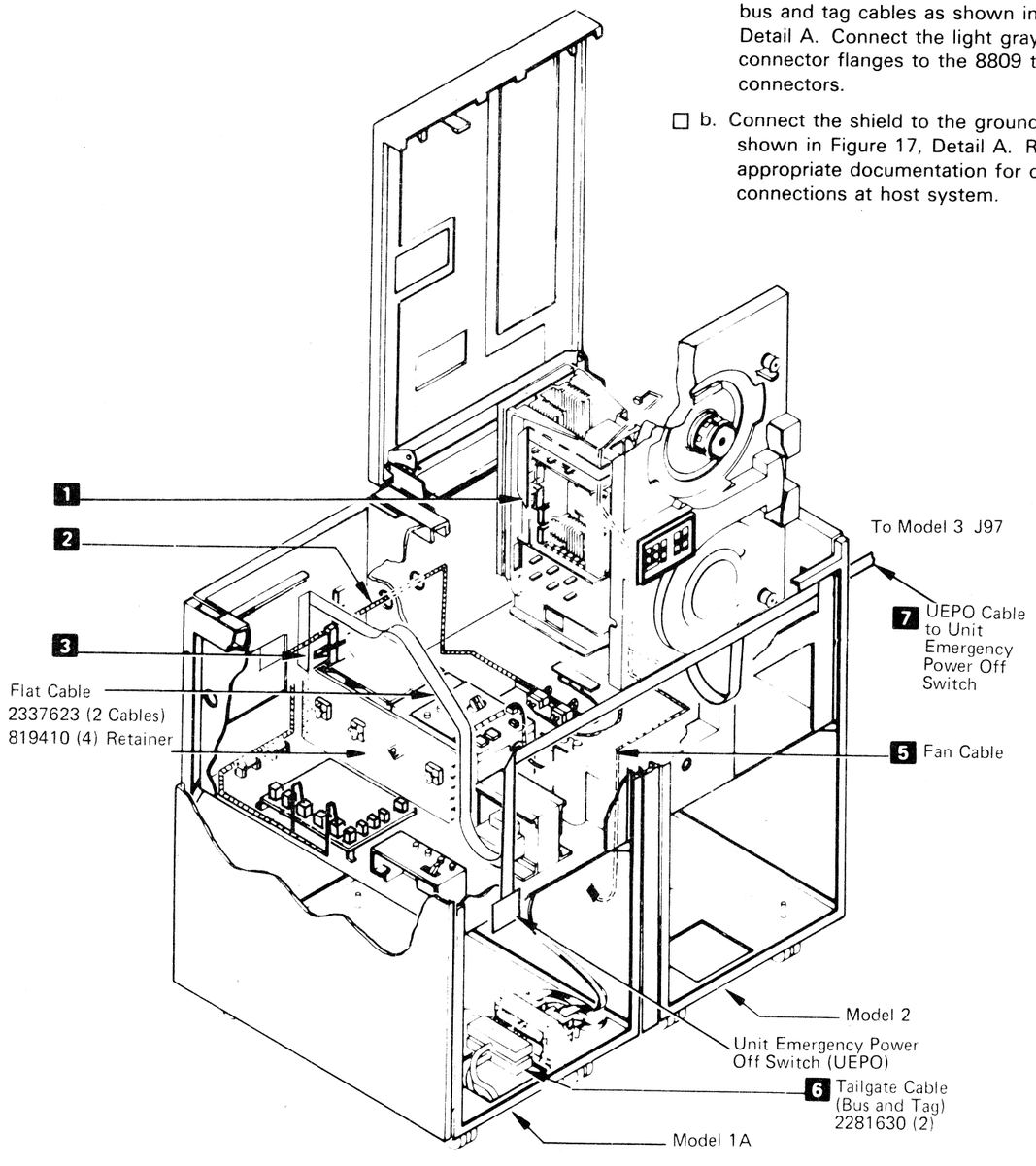


Figure 16. Cable Placement and Routing

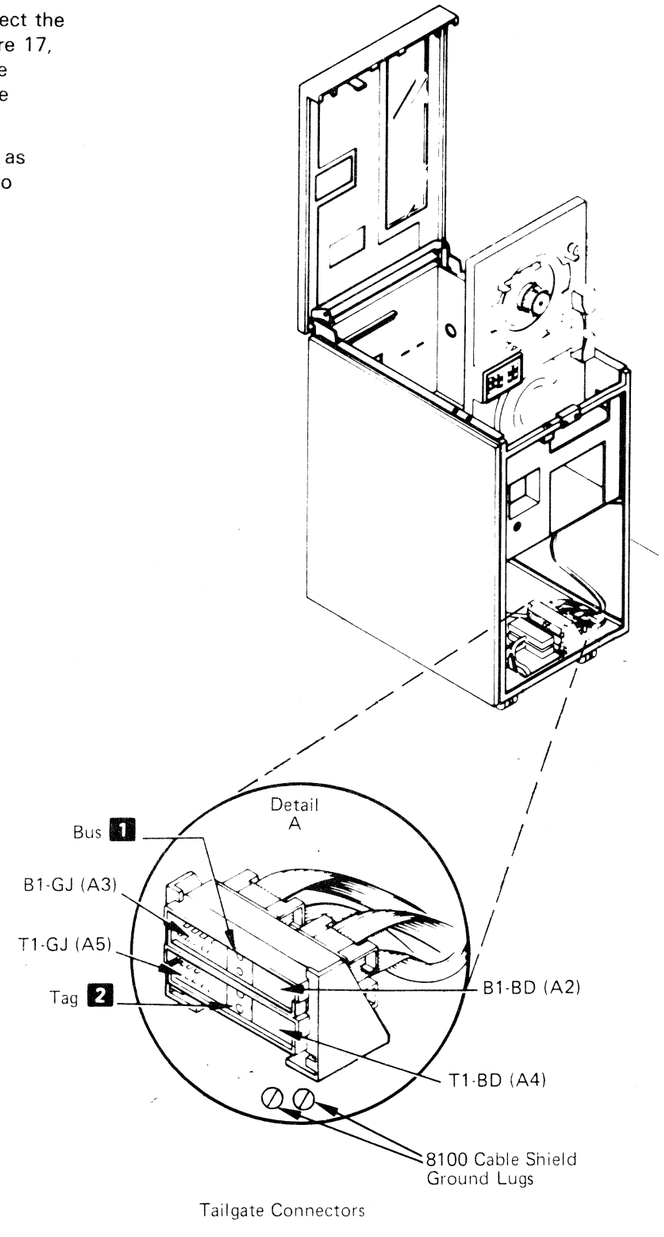


Figure 17. Host System to 8809 Mod 1A Cables

Model 1B — Tailgate Cables and System Terminators

☐ 60. The tailgate cables connect the Model 1B to an IBM 8100 Information System and transfer data. The cables are coiled in the 8809 base. The cabling and the placement of the system terminators depend on the type of processor. The system terminators are located in the processor or in the 8101. Install the terminators and cables as follows:

Maximum cable length on a 8101: 10 m (33 ft)

Processor	Terminators		Cables	
	Remove from 8101 or processor connectors	Plug in 8809 at connectors	Plug into 8101 or processor connectors	Plug shielded end in 8809 at connectors
8130	E1, E2, E3	E1, E2, E3	E1, E2, E3	D1, D2, D3
8140	D1, D2, D3	D1, D2, D3	D1, D2, D3	E1, E2, E3

The cables are labeled 1, 2, and 3 and are installed between the processor or the 8101 and the Model 1B in the corresponding D or E positions listed in the above table.

The cable end with the shielded, pigtailed connector must always be installed in the Model 1B. Connect the shielded connector to the frame grounding connector shown in Figure 18, Detail B.

Refer to the appropriate host system documentation for connections to the system.

For the 8140 system, you must remove the electrical tape to expose the shield before installing the cables to the system. Care should be taken to ensure that the exposed shield is under the cable clamps provided in the 8100 system.

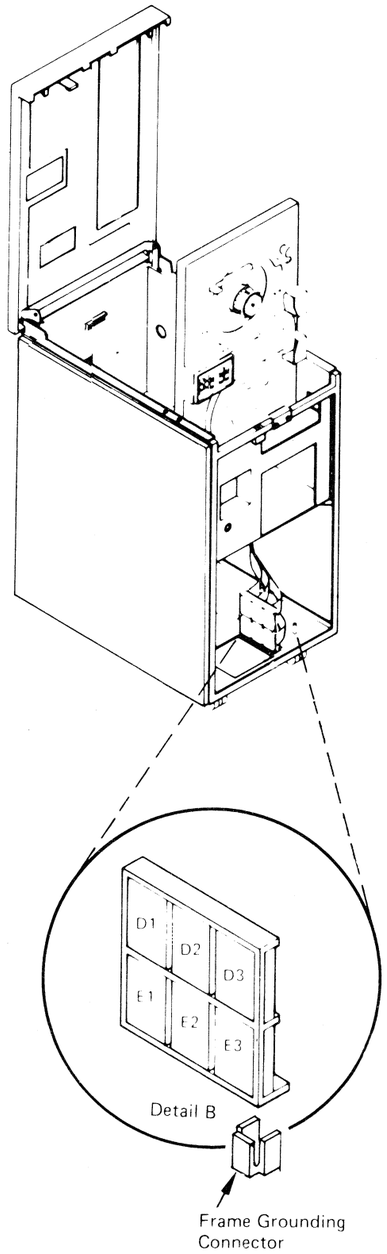


Figure 18. Host System to 8809 1B Cables

DIAGNOSTIC ROUTINES

Before DLS (inlines) or customer jobs can run, each 8809 must be configurated on the customer diskette. See 4331 Vol 13 CONFIG section or the 8100 MIM Chapter 2.

☐ 61. If installing an 8809 Model 1B on an 8100 system, go to step 61a. Otherwise, go to step 61b.

☐ a. Run SCF test to SCF address 78. See REF 20 for instructions. If an error occurs, go to the ST section of the 8100 MIM. If the SCF test runs error-free, go to step 61b.

☐ b. Load a scratch tape of good quality. See REF 20 for instructions, and run the diagnostic linked series (DLS) inline routines.

If errors occur, use the isolation code (IC) to enter the Fault Code Dictionary (FCD). Follow the directions given in the "Action" column. Correct the condition that caused the IC and continue running the DLS inline routines until they run error-free.

☐ 62. After all the DLS inline routines run error-free, unload the scratch tape, and load the test pattern tape (PN 4297736). Run routines 5A and 5B (see REF 40).

If an error occurs in these routines, leave the test tape in the failing condition. Verify that you do not have a damaged test tape by marking the test tape at the R/W head with a marking pen. Rerun routines 5A and 5B and if the tape stops with an error and the mark is in the same location in relation to the R/W head, suspect a damaged tape. If this procedure is inconclusive, try the test tape on another tape unit drive or use another test tape. If the test tape checks out good, use the isolation code (IC) to enter the Fault Code Dictionary (FCD).

☐ 63. After these routines run error-free, unload the test pattern tape and continue with the next step.

☐ 64. Return the tape decks on all 8809s to their normal operating position, and install all covers.

AFTER INSTALLATION

RECORDS

☐ 65. Fill out all installation documents.

☐ 66. Report completed installation to the branch office.

☐ 67. Update the Account Management Plan book as required.

DISPOSITION OF SHIPPING MATERIAL

☐ 68. Dispose of all shipping material according to local procedure.

CONTENTS

Relocation/Removal Procedures (sheet 1 of 3) **REMOV 1**

NOTES:

8809 RELOCATION/REMOVAL PROCEDURES

INTRODUCTION

This section contains the instructions for preparing the 8809 for shipment to another location or return to plant of manufacture.

Follow each procedure in sequence. As you complete each step, place a check mark in the box provided.

You may not need to perform all of the following procedures, depending on the model 8809 being relocated or removed.

FIELD PACKING

□ 1. Check the packing bill of material (B/M) to ensure you have the correct B/M on hand to pack the 8809s that are to be shipped.

These B/Ms contain required shipping and packing parts, CE Packing Instructions, and Customer Packing Instructions.

The responsible sales office will obtain the correct B/M.

Caution: Do not attempt to ship any 8809 without the proper packing B/M. Emergency order the correct group B/M if it is not available.

CABLE REMOVAL

DANGER
Remove all power from the 8809s by unplugging the power cord from the wall outlet before removing cables.

Remove cables from the 8809s as follows:

□ 2. Remove the front and rear covers from 8809s being removed or relocated (see page INST 10 of Installation Procedures).

□ 3. Raise the top cover and tape decks on the 8809s being removed or relocated (see page INST 20 of Installation Procedures).

Tailgate Cables

□ 4. These cables attach the 8809 Model 1A or 1B to the host system. They will be removed if a Model 1A or 1B is being removed/relocated. For the location and routing of these cables, refer to pages INST 70 and 80 of the Installation Procedures. Remove the cables from the Model 1A or 1B. If all 8809s are being removed from the host system, remove these cables also from the host system. Refer to the appropriate host system documentation for instructions for cable removal at the host system.

DC Extension Cable

□ 5. This cable connects dc power from a Model 1A, 1B, or 3 to a Model 2 and fan dc sensor voltage from a Model 2. Remove this cable when a Model 2 is being removed or relocated. Refer to page INST 40 of the Installation Procedures for cable location and routing.

Remove this cable at the Model 1A, 1B, or 3. Do not remove the cable from the Model 2. Pull through the side openings, and wrap and store the cable inside the Model 2 for shipment.

UEPO Cables (Model 3)

□ 6. Refer to INST 35, step 19 and remove these cables. Wrap and store the cables as described in the "CE Packing Instructions."

Fan Cable (Model 2)

□ 7. This cable connects ac fan power from a Model 1A, 1B, or 3 to a Model 2, and is removed when a Model 2 is removed or relocated. Refer to page INST 40 of the Installation Procedures for cable location and routing. Remove the cable at the Model 1A, 1B, or 3. Do not remove the cable from the Model 2. Pull through the side openings, and wrap and store inside the Model 2 for shipment. Install fan bypass jumper plug J49 in Model 1.

Logic-to-Logic Inter-Model Flat Cables

□ 8. These flat cables connect 8809s in a series. Refer to page INST 30 for location and routing. Remove them from the Model 1A, 1B, or 3. Store cable in Model 2.

□ 9. Pack the cables for shipment as described in the "CE Packing Instructions."

ADDRESSING/TERMINATION

Address Terminators

If you are relocating an 8809 within a customer account rather than packing for discontinuance, you may have to change the addressing and/or termination of the 8809s in the series. Refer to page INST 60 and 65 for instructions.

□ 10. If you are not removing all 8809 in the series, move the terminators from the last removed 8809 in the previous series to the last remaining 8809 in the series.

□ 11. When packing an entire series of 8809s for discontinuance, remove the terminator cards from the last 8809 in the series and install them in the top card connectors Y and Z (A1C2) of the Model 1A for shipment.

Voltage Terminators

□ 12. If you are removing all 8809s except the Model 1A or 1B, plug the voltage terminators that were removed when the Model 2 was installed into J46 and J48. Refer to INST 40 for location and replace these plugs.

□ 13. Replace all logic board covers.

DISASSEMBLE

Leveling Jacks

□ 14. Lower all tape decks to their normal operating position.

□ 15. Move the leveling jacks away from the floor so the machines can be moved.

Remove Spacers

□ 16. Remove the spacers between the 8809s by referring to page INST 20 of the Installation Procedures.

□ 17. Reinstall the spacer on the left side of the Models 2 or 3 (using screws removed in step 3) for shipment.

Right End Cover

☐ 18. Remove the right cover from the last 8809 in the series and install it on the Model 1A or 1B, or on the last remaining 8809 in the series. Refer to page INST 20 of the Installation Procedures.

PACKING FOR SHIPMENT

CE Packing Instructions

☐ 19. Follow the procedures in the "CE Packing Instructions" for all internal bracing and packing that is required for machine shipment.

Customer Packing Instructions

☐ 20. Advise the customer to pack the machine for shipment as described in the "Customer Packing Instructions."

SHIP GROUP ITEMS

☐ 21. Pack the following tools and documentation and ship them with the 8809s.

Field Logic Diagrams (FLDs), with all 8809 models.

Card extractor extender (P/N 2337369) not required with new card extractor (P/N 1310707). Parts Catalog, and MIMs (five volumes) with 8809 Models 1A or 1B.

RECORDS UPDATING

☐ 22. Complete all removal records according to existing procedures, and notify the branch office when machine(s) are ready for removal.

CONTENTS

8809

BC0100 Seq 1 of 2	2699267 Part Number	846318 15 Mar 79	846481 15 Dec 79	847323 1 Oct 80	847314 1 Apr 82			

COVER REMOVALS, RAISING TAPE DECK

COVER REMOVALS

1. The top cover is hinged at the rear and lifts toward the back of the tape unit.
2. The cover interlock switch is located at the front of the machine and is operated by a portion of the top cover. This switch can be overridden by lifting up on the switch-operating arm after the tape deck is raised.

Front and Rear Covers

1. Open the top cover of the tape unit.
2. Refer to Figure 1. To Remove front and rear covers 4, insert a screwdriver 1 into the holes in the top of front and rear frames 2, apply sidewise and slight downward pressure, to unhook the two latch springs 3 (one at a time) and then pull the cover outward.

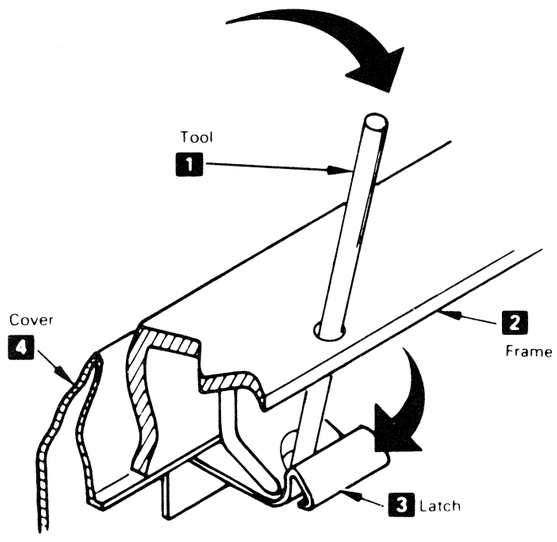


Figure 1. Front and Rear Cover Removal

Side Covers

1. Open the top cover of the tape unit.
2. Remove the front and rear covers.
3. Remove the side covers 1 from the tape unit by removing the four screws 2 as shown in Figure 2.

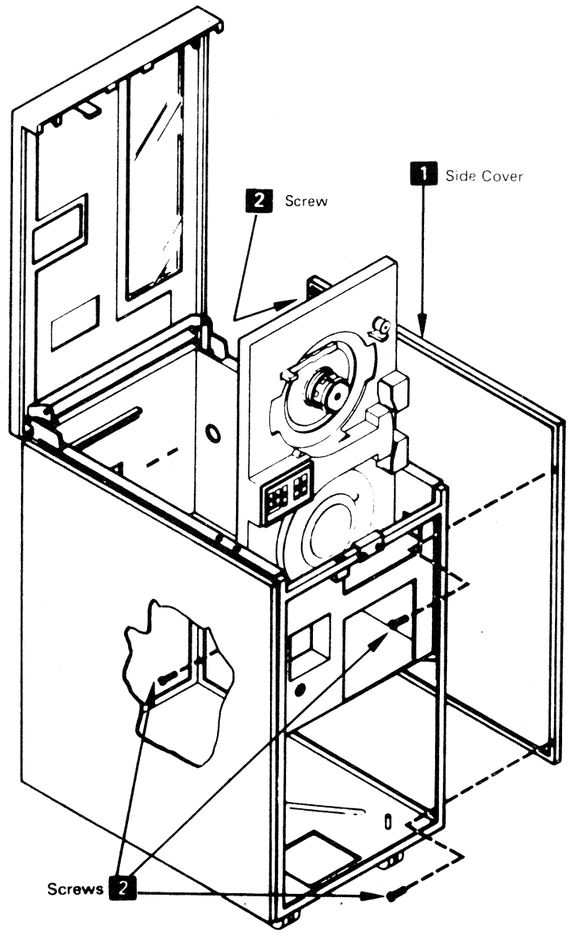


Figure 2. Side Cover Removal

RAISING THE TAPE DECK

Use a 5/16 inch (8 mm) socket to raise the tape deck to its service position (see Figure 3).

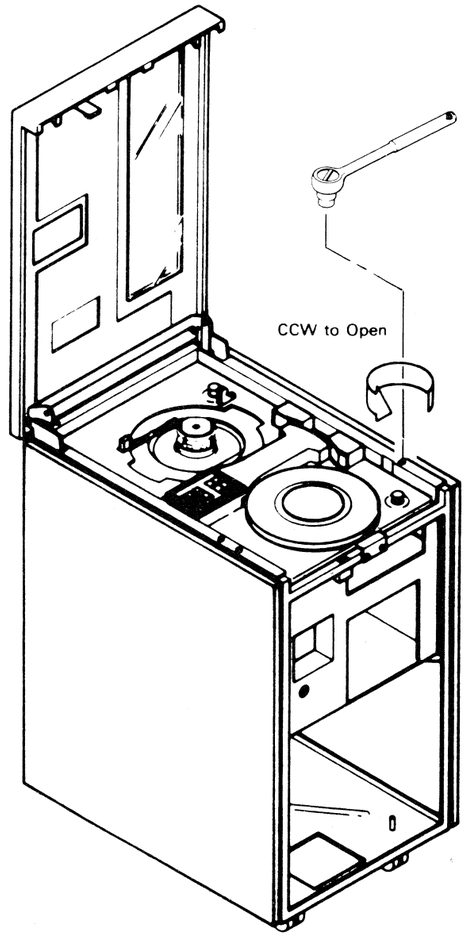


Figure 3. Raising the Tape Deck

8909

BC0100 Seq 2 of 2	2699267 Part Number	846318 15 Mar 79	846481 15 Dec 79	847323 1 Oct 80	847314 1 Apr 82			

RECTIFIER CHECKOUT PROCEDURE, REMOVAL AND REPLACEMENT

This page describes the procedure to verify that the rectifiers have not failed. Use the CE multimeter to perform the following tests.

RECTIFIER TEST

DANGER

Power may still be present in the tape unit when the machine power is off. Press the Power Off pushbutton to turn power off, and turn CP1 off before beginning this procedure. Turning power off in the tape unit will remove power from it and one additional tape unit, if they are attached.

1. Remove the wires one at a time from each rectifier to be tested and identify them for ease of replacement.
2. Set the CE multimeter to the R X 100 ohms scale.
3. If you are testing rectifiers 1-4, 7-8, or 5-6, there are four pairs of side-by-side terminals. Attach one lead from the CE multimeter to the top rectifier terminal. Attach the other lead to the first terminal in the clockwise direction. Note the resistance indicated on the ohms scale.
4. Reverse the position of the two CE multimeter leads on the terminals. Note the resistance indicated on the ohms scale. If the two readings differ by a factor of at least ten to one, the rectifier is not defective.
5. If the first check was good, move one of the meter leads to the next terminal in a clockwise direction. The other meter lead remains on the most clockwise terminal tested in steps 3 and 4. Note the resistance indicated on the ohms scale.
6. Reverse the position of the two CE multimeter leads and note the resistance indicated on the ohms scale. If the two readings differ by a factor of at least ten to one, the rectifier is not defective.
7. If the last check was good, repeat steps five and six until all terminals have been tested. The last test should be between the top terminal (the one you began with in step 3) and the terminal counterclockwise to it.
8. If you are testing rectifier 9-10, attach one lead from the CE multimeter to the center of the three terminals. Attach the other lead to either terminal to the left or right of the center terminal. Note the resistance indicated on the ohms scale.
9. Reverse the two leads from the CE multimeter. Note the resistance indicated on the ohms scale. If the two readings differ by a factor of at least ten to one, the rectifer is not defective.
10. If the first test was good, keep the lead attached to the center terminal and attach the other lead to the remaining untested terminal (left or right of center). Note the resistance indicated on the ohms scale.
11. Reverse the CE multimeter leads, and note the resistance indicated on the ohms scale. If the readings differ by a factor of at least ten to one, the rectifier is not defective.
12. A loose rectifier can cause intermittent problems. Be sure all rectifiers are tightened and secure.
13. If the rectifier is not defective, put the wires back on the correct terminals, turn CP1 on, and return to the MAP that sent you here.
14. If the rectifier is bad, go to Removal and Replacement.

REMOVAL

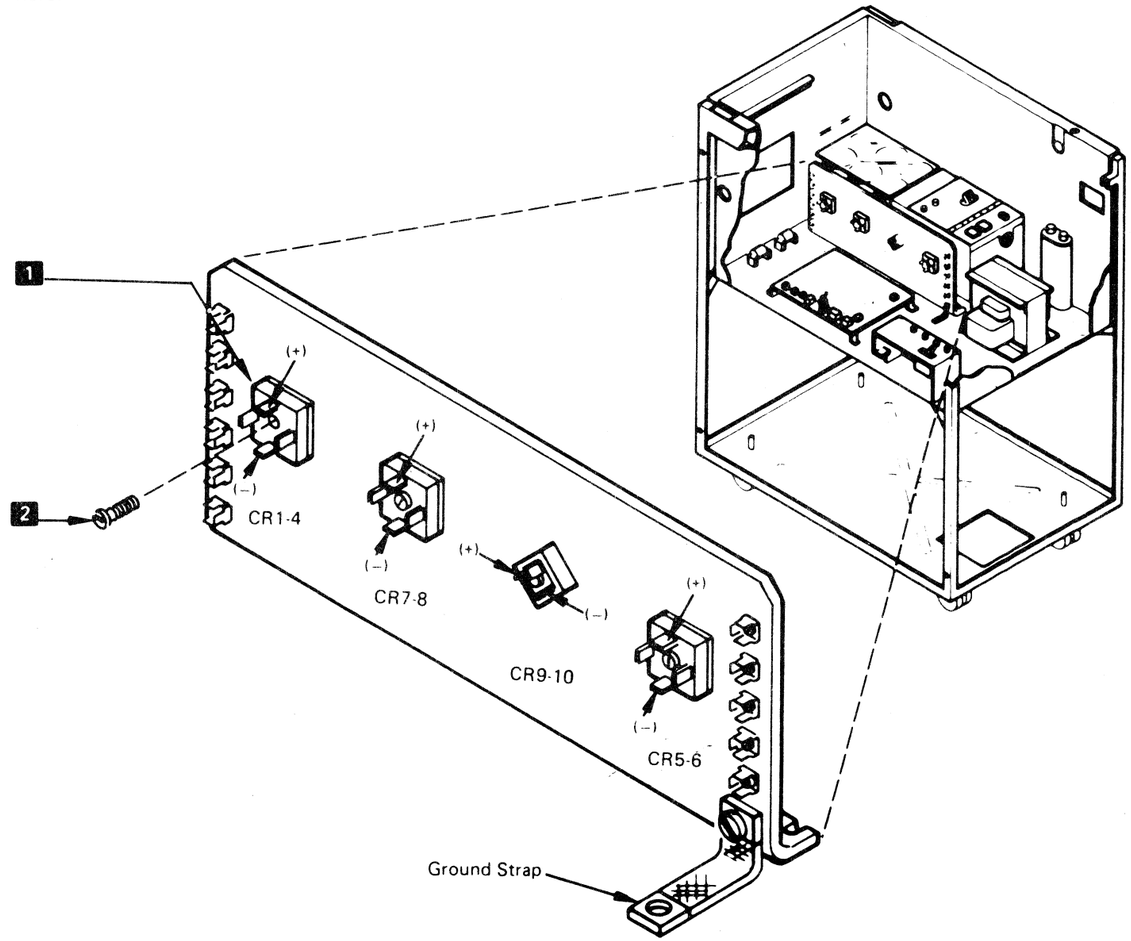
DANGER

Power may still be present in the tape unit with machine power off. Press the Power Off pushbutton to turn power off, and turn CP1 off before beginning this procedure. Turning power off in a tape unit will remove power from it and one additional tape unit, if they are attached.

1. Ensure that all wires have been removed from the rectifier and identified for ease of replacement.
2. Hold the rectifier **1**, to prevent it from falling, remove the mounting screw **2**, and remove the rectifier from the machine.

REPLACEMENT

1. Apply silicone paste (PN 2517837) to the back of the rectifier.
2. Place the new rectifier **1** on the mounting plate and align the mounting hole to the threaded hole in the plate.
3. Insert the mounting screw **2** and tighten it.
4. Connect the wires to the appropriate terminals.
5. Turn CP1 on and return to the MAP that sent you here.



8809

BC0200 Seq 1 of 2	2699268 Part Number	846318 15 Mar 79	846481 15 Dec 79	847308 1 Aug 81	847314 1 Apr 82			

POWER SUPPLY VOLTAGE CHECKS

This page shows voltage distribution and test points. Figure 1 shows the oscilloscope test points for ac ripple measurement, and the voltages and tolerances. Figure 3 shows test points for voltage levels in all models. The test points shown for the Model 1A, 1B, or 3 are on the Power Control Card. The test points are indicated on the safety cover over the board, and voltages can be measured without removing the safety cover. Figure 4 shows the fuses associated with each of the dc voltages, and Figure 2 shows dc voltage distribution from a Model 1A, 1B, or 3, to a Model 2. Figure 2 also shows dc voltage distribution within each of the models. Figure 4A shows the control line distribution between models.

DANGER

Lethal Voltages are present.

AC RIPPLE CHECKS

If the peak-to-peak (p-p) ac ripple exceeds the maximum value listed in Figure 1, it is probable that a part in the power supply has failed.

To measure the ac ripple, use the ac input on an oscilloscope that has a 0.01 volt/centimeter range and an X1 probe placed on the test points shown in Figure 1. Place the probe ground on any convenient ground point.

DC Volts	Voltage Tolerance	Test Point	Maximum ac Ripple	MAP Number, Entry
+5 Vdc	+4.5 to +5.5	Capacitor C4	0.15 Vac p-p	7000, A
−5 Vdc	−4.5 to −5.5	Capacitor C6	0.10 Vac p-p	7000, A
+8.5 Vdc	+7.65 to +9.35	Capacitor C7	0.17 Vac p-p	7000, A
+5 Vdc Regulated	+4.75 to +5.25	Control Board Test Point 9	0.025 Vac p-p	7000, A
+24 Vdc	(See Note)	Capacitor C2	No limit	--
−24 Vdc	(See Note)	Capacitor C3	No limit	--

Note: *When the tape unit is loaded and tape tension established, the voltage tolerance is (±)10%.*

When the tape unit is not loaded, the voltage tolerance is (±)20%.

Figure 1. AC Ripple Measurement

VOLTAGE DISTRIBUTION

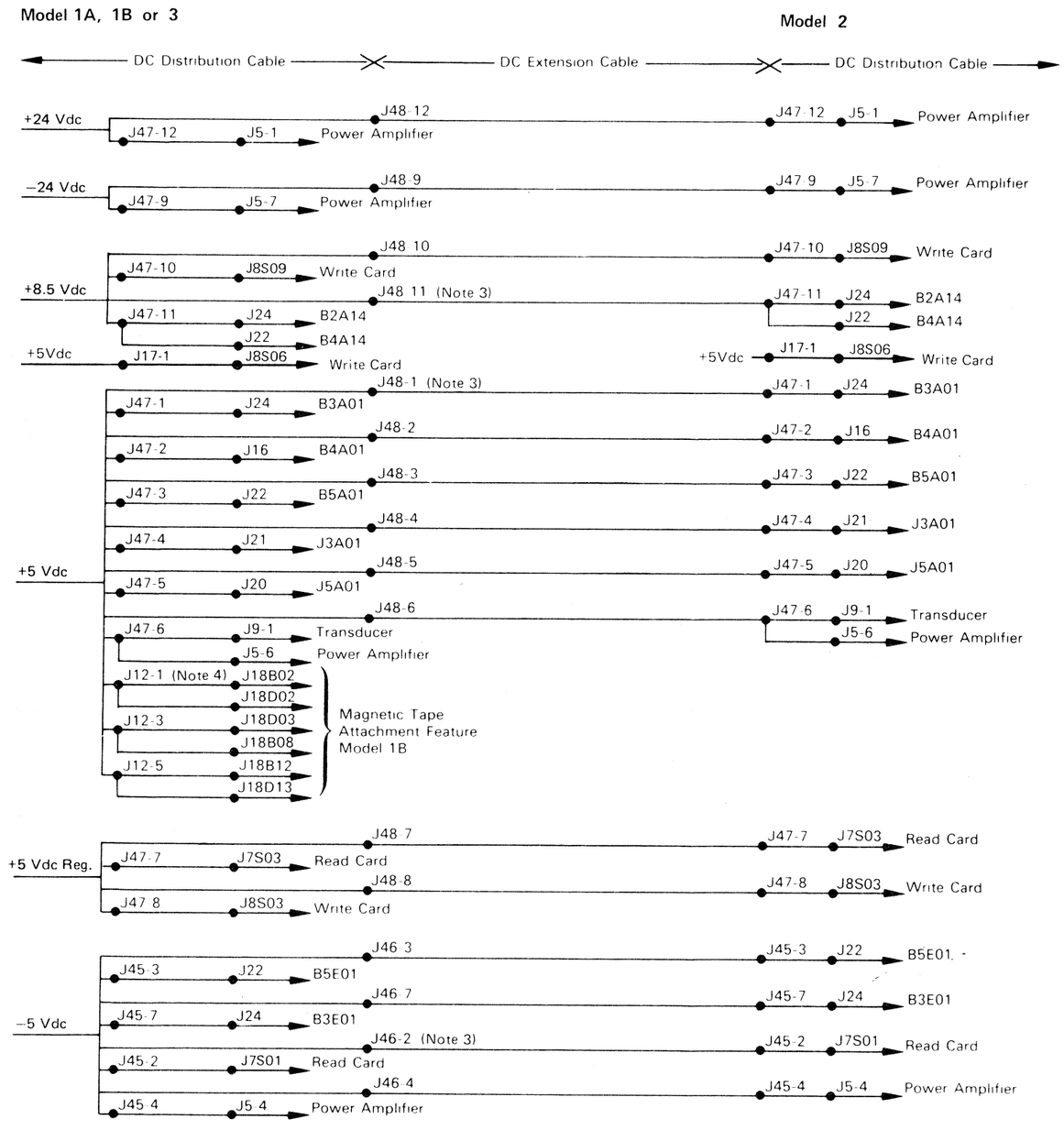


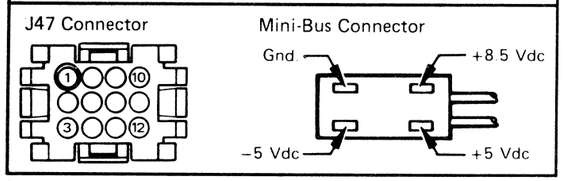
Figure 2. DC Voltage Distribution

POWER SUPPLY VOLTAGE CHECKS (CONTINUED)

VOLTAGE CHECKS

DC Voltage	Models 1A, 1B, and 3 Test Point	Model 2 Test Point
+24 Vdc	TP 1 *	J5-1 (Note 5)
−24 Vdc	TP 2 *	J5-7 (Note 5)
+5 Vdc	TP 3 *	on logic board minibus connector
−5 Vdc	TP 4 *	on logic board minibus connector
+8.5 Vdc	TP 5 *	on logic board minibus connector
0 Vdc overvoltage (Note 1)	TP 6	not present
0 Vdc undervoltage (Note 2)	TP 7	not present
+5 Vdc control	TP 8	not present
+5 Vdc regulated	TP 9 *	J47-8
+2.5 Vdc reference	TP 10	not present

* Voltage tolerances are shown on CARR 20, Figure 1. See below for J5, J47, and minibus connector pin locations.



Notes:

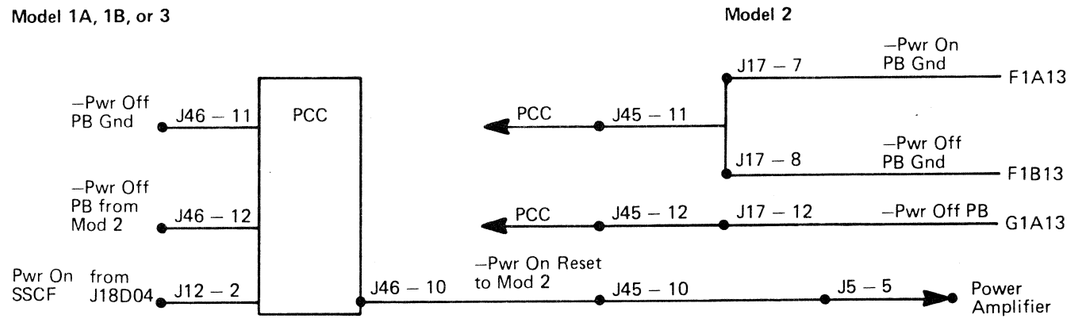
1. *Under normal conditions this is 0 Vdc. If the regulated +5 Vdc has an overvoltage condition, TP 6 will have +24 Vdc.*
2. *Under normal conditions, this is 0 Vdc. If the regulated −5 Vdc has an undervoltage condition, TP 7 will be +2.5 to +5.5 Vdc.*
3. *If a Model 2 is not connected, a dummy load is connected to J48-11 and J46-2.*
4. *In a Model 1A or 3, a dummy load is connected to J12.*
5. *J5 Connector: Raise the tape deck to the service position and remove the cover over the Power Amplifier Board. This exposes the pins on the back of J5 as shown on LOC 30, detail A. Reinstall the cover after making measurements.*

Figure 3. Voltage Test Points

Fuse	Voltage	FRU
CP3	100-127 Vac 200-240 Vac	Power Control Card, T1
F2	100-127 Vac 200-240 Vac	Fan, Power Control Card, T2
F3	−5 Vdc *	Read Card, Power Amplifier Board, Logic Board, Power Control Board
F4	+24 Vdc *	Power Amplifier Board, Power Control Board
Fuse on PCC	+5 Vdc control	Power Control Card
F6	+8.5 Vdc *	Write Card, Logic Board, Power Control Board
F7	−24 Vdc *	Power Amplifier Board, Power Control Board
CP1	ac line	
CP2	+5 Vdc *	Logic Board, Transducer Card, Power Amplifier Board, Power Control Board

** Voltage tolerances are shown on CARR 20, Figure 1.*

Figure 4. Fuse Voltage



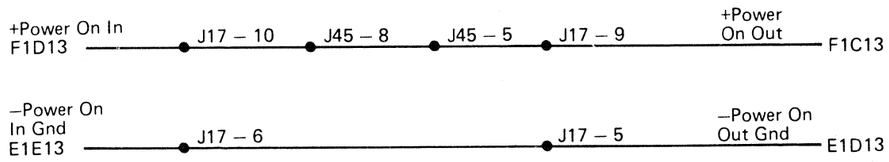


Figure 4A. Control Line Distribution

TOP COVER (SPRING STYLE) REMOVAL AND REPLACEMENT

Caution: Do not reuse the old clips. New clips must be installed using the proper tool. The clips and tool are included with the new top cover.

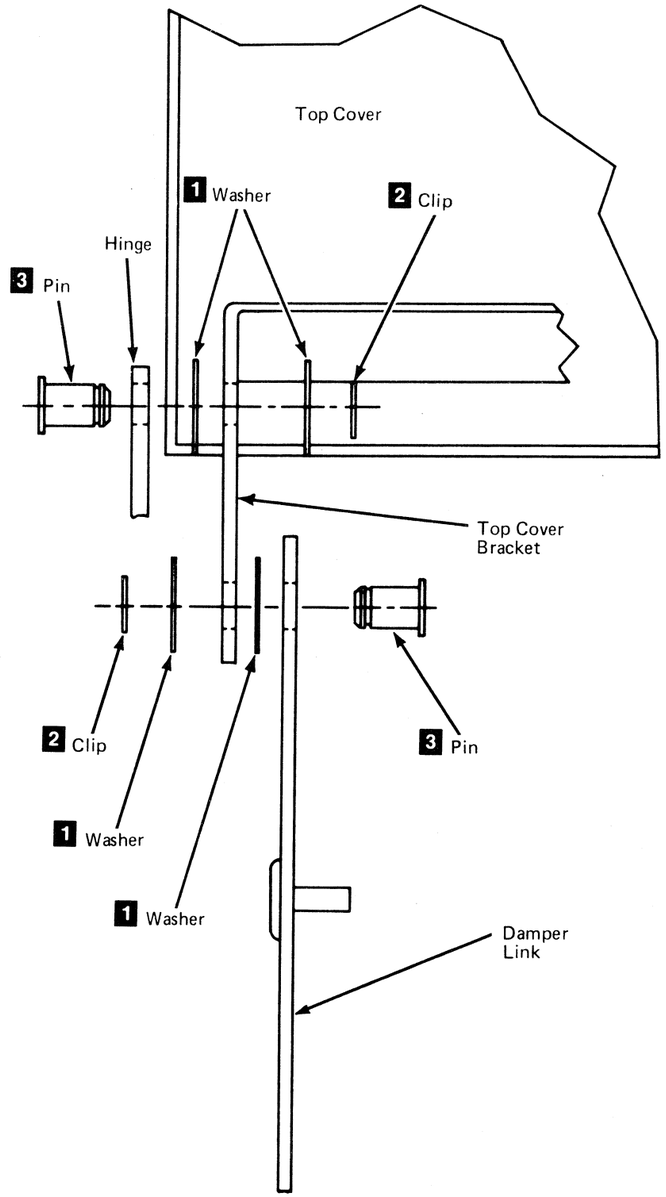
REMOVAL

1. Raise the top cover.
2. Remove the rear covers (see CARR 5 for procedure).
3. Remove both side covers or unbolt the tape drive from adjacent machines (see CARR 5 and INST 20).
4. Unplug the reel latch switch cable connector (see CARR 180 **12**) and remove the top cover.
5. Remove the clips **2** and the pins **3** being careful to save the washers **1** for reuse.
6. Repeat step 5 on the opposite side of the top cover.
7. Remove the top cover.

REPLACEMENT

1. Align the new top cover with the two hinges.
2. Install the hinge pin **3** so the head of the pin is toward the outside of the machine.
3. Install the two hinge pin washers **1** on the hinge pins **3**.
4. Adjust the Truarc® tool so it opens the new clip just far enough to slip over the hinge pin.

   Caution: Do not open the clip too far because it is easily damaged.
5. Install the hinge pin clip **2**.
6. Install the link pin **3** at the top of the link so the head of the pin is toward the inside of the machine.
7. Install the two link pin washers **1** on the link pins **3**.
8. Install the new link pin clip **2** (see step 4).
9. Repeat steps 2 through 8 on the opposite side of the top cover.
10. Reconnect the cable to the reel latch switch on the top cover (see CARR 180 **12**).
11. Replace all covers and/or bolt machines together.



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TOP COVER (SPRING STYLE) DAMPER ASSEMBLY REMOVAL AND REPLACEMENT

Caution: Do not reuse the link pin clip. A new clip must be installed using the proper tool. The clip and tool are included with the new damper assembly.

REMOVAL

1. Raise the top cover.
2. Remove the rear cover (see CARR 5 for procedure).
3. Remove the left cover or unbolt machines as necessary (see CARR 5 and INST 20).
4. Disconnect the damper link from the top cover bracket. See CARR 26, step 5, then return to this page step 5.
5. Loosen damper adjusting allen-head screw to loosen damper (see CARR 55 **3**).
6. Remove the two mounting screws **2** and lower the damper assembly **3**.
7. Remove spring **4** from the damper assembly.

REPLACEMENT

1. Be sure the new damper assembly adjusting screw (see CARR 55 **3**) is toward the rear of the machine and writing on damper sleeve and link **1** is towards the tub.
2. Attach spring **4** to the damper assembly.
3. Position the damper assembly.
4. Install mounting screws **2**.
5. Loosen allen-head screw to loosen the damper assembly, (see CARR 55 **3**).
6. Attach damper link **1** to top cover bracket (see CARR 26) with washer **1** with link pin **3** head toward the inside of the machine.
7. Install the second washer **1** on link pin **3**.
8. Adjust the Truarc tool® so it opens the clip just far enough to slip over the link pin **3**.

   Caution: Do not open the clip too far because it is easily damaged.
9. Install clip on link pin **3**.
10. Adjust the top cover damper allen-head screw (CARR 55 **3**) so the top cover holds its position when the rubber bumper is 222 mm (8.75 inches) or higher (measured from where the bumper hits the frame) and the cover falls when the rubber bumper is 165 mm (6.5 inches) or lower.
11. Replace the left cover or bolt machines together.

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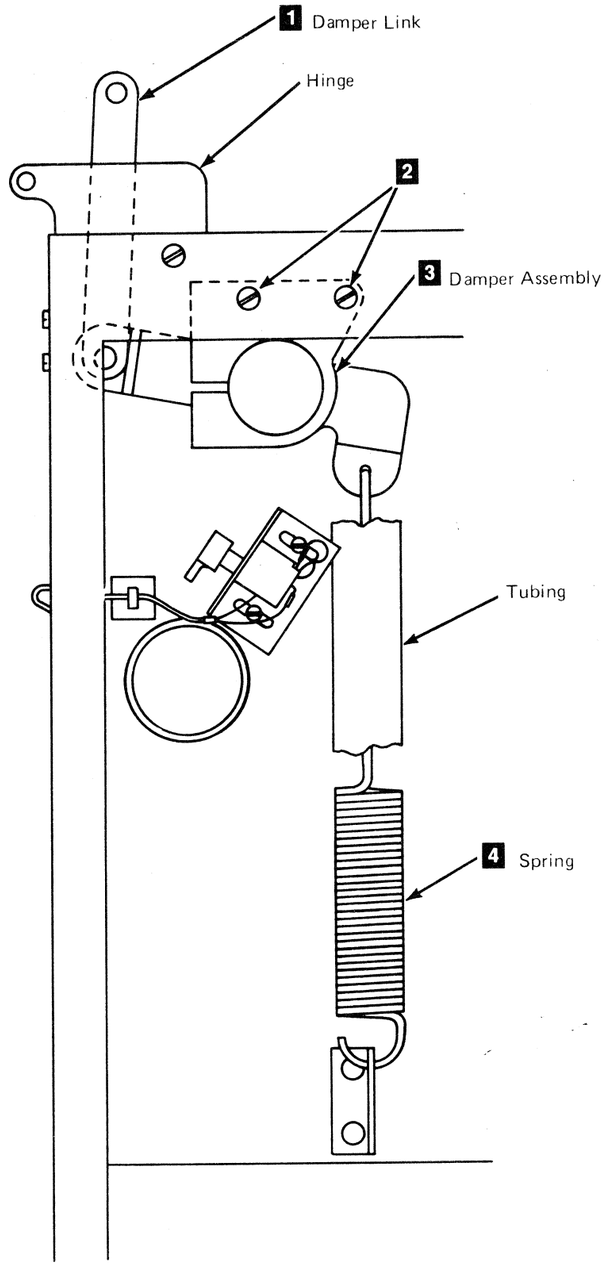


TOP COVER (SPRING STYLE) RIGHT SIDE PLATE ASSEMBLY REMOVAL AND REPLACEMENT

Caution: Do not reuse the pin clips. New clips must be installed using the proper tool. The clips and tool are included with the new assembly.

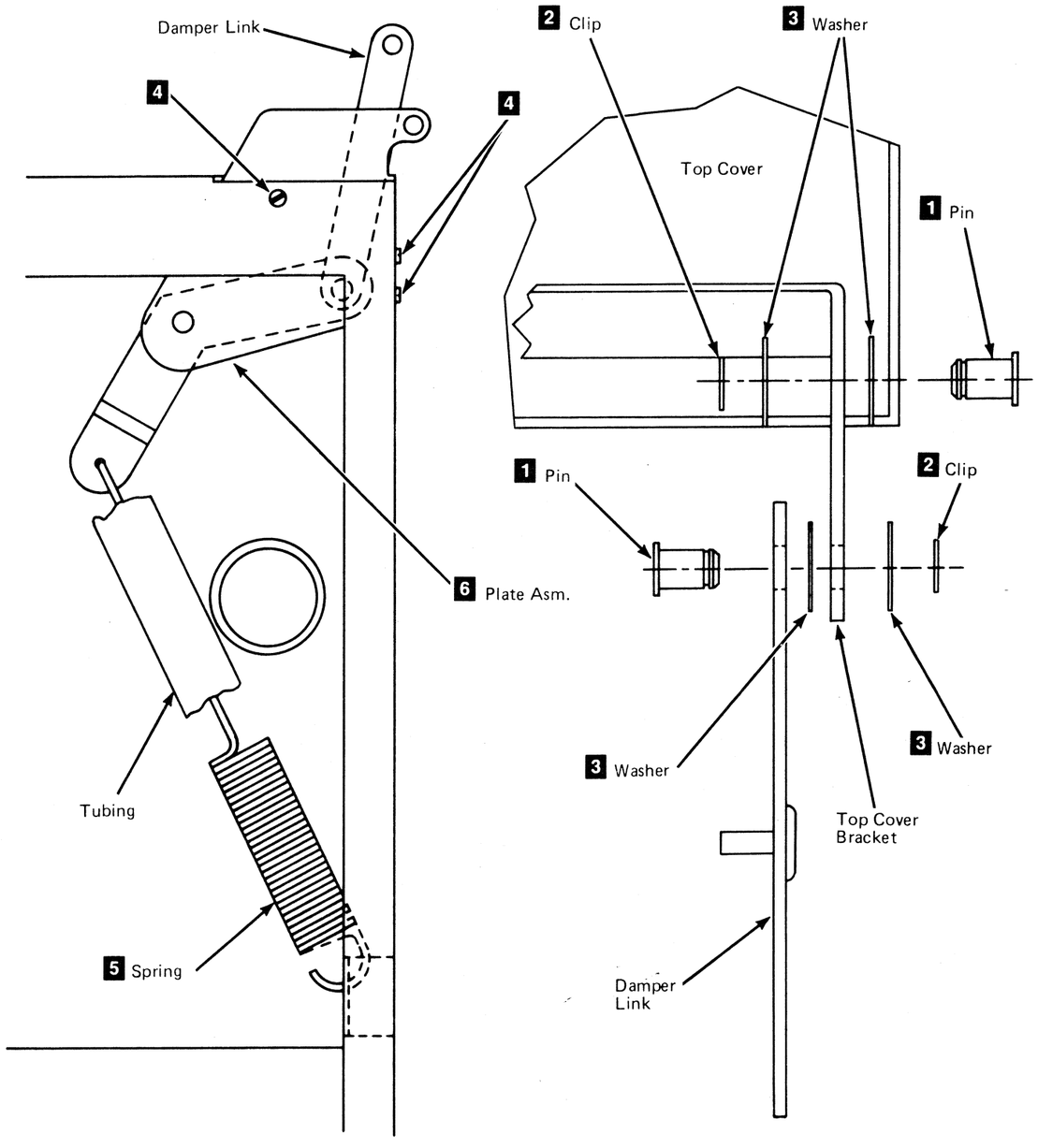
REMOVAL

1. Raise the top cover.
2. Remove the rear cover (see CARR 5 for procedure).
3. Remove the right side cover or unbolt machines.
4. Remove from the damper link the clips **2** and the pins **1** being careful to save the washers **3** for reuse.
5. Remove three mounting screws **4**.
6. Lower the plate assembly and remove spring **5** from plate assembly **5**.

REPLACEMENT

1. Attach spring **5** to the plate assembly.
2. Position the plate assembly with the mounting holes.
3. Install three mounting screws **4**.
4. Install hinge pin **1** so head of pin is toward the outside of the machine.
5. Install washers **3**.
6. Adjust the Truarc® tool so it opens the clip just far enough to slip over the hinge pin **1**.

   Caution: Do not open the clip too far because it is easily damaged.
7. Install hinge pin clip **2**.
8. Install link pin **1** so the head of the pin is toward the inside of the machine.
9. Install link pin washers **3**.
10. Install the link pin clip **2**.
11. Replace the right cover or bolt the machines together.
12. Replace the rear cover.



Right Side View

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POWER CONTROL CARD REMOVALS AND REPLACEMENTS

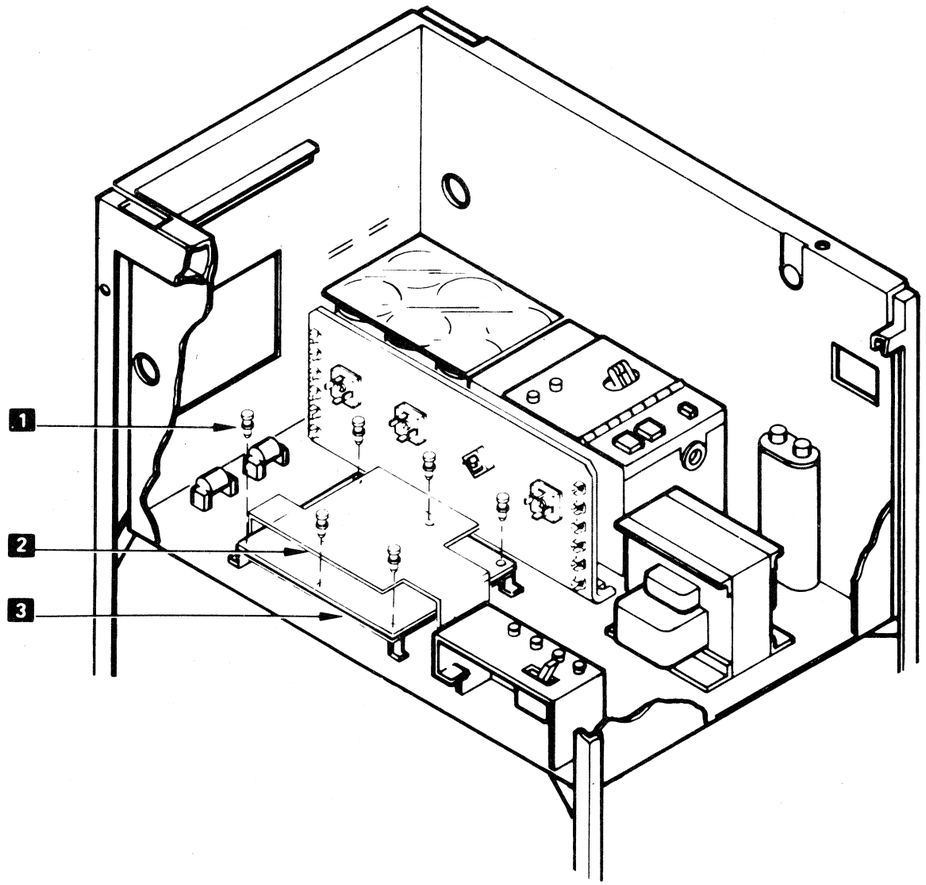
This page describes the removal and replacement procedures for the Power Control Card.

REMOVAL

DANGER

Power may still be present in the tape unit with machine power off. Press the Power Off pushbutton to turn power off, and turn CP1 off before beginning this procedure. Turning power off in a tape unit will remove power from it and one additional tape unit, if they are attached.

1. Remove the safety cover **2**.
2. Remove wires and/or connectors from the Power Control Card **3** and mark them for ease of replacement. LOC 40 shows all power supply component locations.
3. Pull up on the six white fasteners **1**, toward the top of the machine, until they are disengaged.
4. Lift the Power Control Card **3** out of the machine.



REPLACEMENT

1. Place the Power Control Card **3** on the six studs in the base of the power supply.
2. Press the six white fasteners **1** down until they are engaged.
3. Connect wires and/or connectors removed previously. If no model 2 attached to this drive be sure jumper plug J49 is in the new Power Control Card. (See LOC 40.) Be certain that the safety cover **2** is replaced.
4. Turn CP1 on and return to the MAP that sent you here.

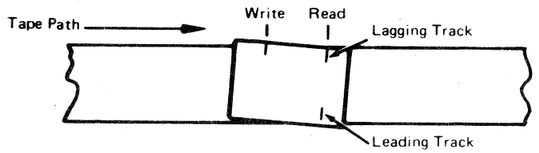
SKEW ADJUSTMENT

This page describes the skew adjustment procedure for the Read/Write head.

Skew is the misalignment of bits within a byte (with reference to the edge of the magnetic tape), and occurs during the reading or writing process. Skew problems can be mechanical or electrical.

MECHANICAL SKEW

Mechanical skew is usually caused by a misalignment of the Read/Write Head on the tape unit. If a line drawn through the two outside write tracks is not 90 degrees to the edge of the tape, there is a mechanical skew problem. See figure below:



ELECTRICAL SKEW

Electrical skew is caused by head manufacturing tolerances or track-to-track circuit differences. The Read/Write Head and read/write circuits used in the tape unit are contained on a single field replaceable unit (FRU). This FRU has been factory-adjusted to compensate for electrical skew. Also, special buffers in the tape unit compensate for any remaining electrical skew. There are no field adjustments for electrical skew.

MASTER SKEW TAPE

The master skew tape is a field tool, manufactured to rigid specifications. The tapes are written at the factory on a special tape unit designed to produce tapes with minimum skew. Master skew tapes are written with one solid bit across the width of the tape at each flux change. Mechanical skew is corrected by physically aligning the Read/Write Head to the bits written on the master skew tape.

MECHANICAL SKEW ADJUSTMENT

Special tools required:

Master skew tape PN 432641
Skew adjustment card PN 8492415

If the skew adjustment card is not available, an alternate skew adjustment procedure using an oscilloscope is given on CARR 51.

Caution: Pressing the Power Off pushbutton on this tape unit will cause a loss of power to this tape unit and to one additional tape unit, if they are attached.

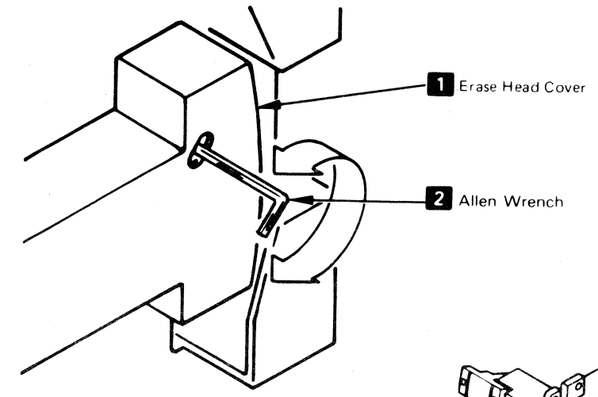
1. Press the tape unit Power Off pushbutton.
2. Open machine cover, and raise the tape deck to the open position.
3. Remove the Read Flat Cable 12 and Loop Read/Write Flat Cable 11 from the read card.
4. Insert the skew adjustment card 9 (P/N 8492415) into the socket locations where the Read Flat Cable and Loop Read/Write Flat Cables were removed.
5. Place a jumper wire on the Logic Board from A1H2D11 to A1J1C11. This jumper enables the CE switch on the Operator Panel and permits control of the tape motion by use of pushbuttons on the panel.
6. Pull the Cover Interlock switch upward to the Bypass position. Press the Power On pushbutton.
7. Install the master skew tape (PN 432641). Make sure the beginning-of-tape (BOT) mark is toward the file reel side of the Read/Write Head to prevent a loose-wrap tape load operation, or press the Reset pushbutton to stop the loose-wrap load operation. Press the Load Rewind pushbutton, and make the tape unit Ready (Ready indicator lights).
8. Place the tracks select switch 8 to the inside tracks position 3.

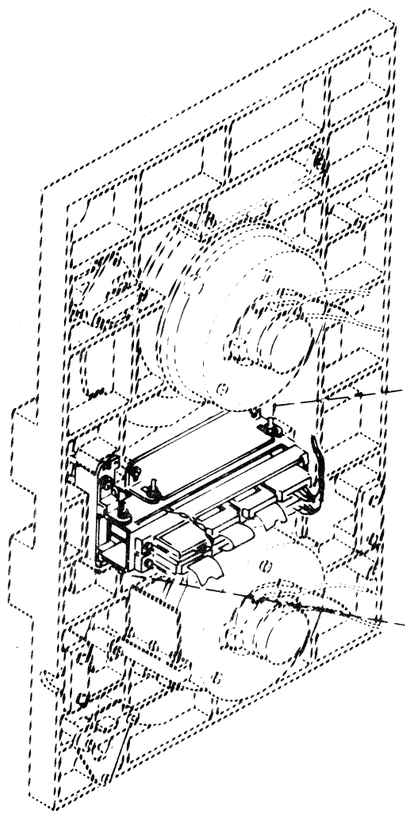
Caution: Use care when turning the skew adjustment screw. Turning the screw too much can damage the skew plate. If more than two and half turns are required, ensure that:

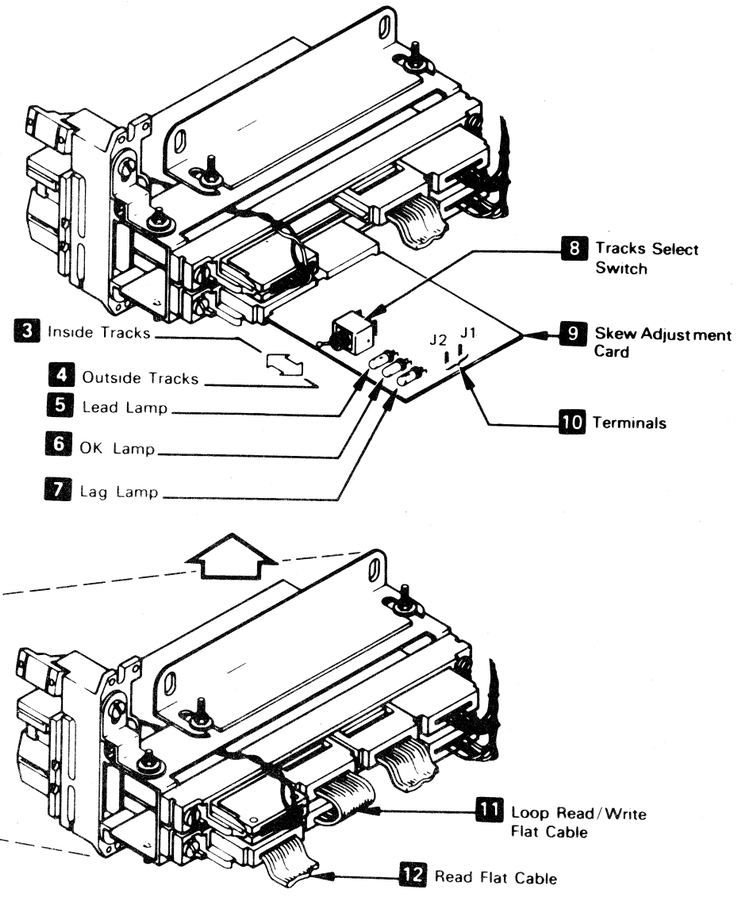
a. **The Head Card Assembly is correctly installed.**

b. **The skew adjustment screw is being turned in the correct direction.**

9. Insert a 0.093 inch hexagon or Allen wrench 2 through the opening in the erase head cover 1 on the operator side of the tape deck.







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SKEW ADJUSTMENT (Continued)

10. Adjust the skew at 2.54 m/s (100 ips) and use the CE pushbutton to move tape forward. Press the CE pushbutton and, at the same time, press the following pushbuttons. If tape will not operate at slow or fast speed, see MAP 4080.

    a. Reset will start tape. Pressing this switch again will stop tape.

    b. Load Rewind will change tape direction from forward to reverse, or reverse to forward.

    c. Unload Rewind will change tape speed from 0.3715 m/s (12.5 ips) to 2.54 m/s (100 ips), or from 2.54 m/s (100 ips) to 0.3175 m/s (12.5 ips).

    See OPER 81 for more detailed description of the CE switch operations.

11. If the lead lamp **5** is on, turn the Allen wrench clockwise until the OK lamp **6** is on.

12. If the lag lamp **7** is on, turn the Allen wrench counterclockwise until the OK lamp **6** is on.

    Note: *It is possible that the Read/Write Head could be so far out of alignment that bits from two consecutive bytes are being read. If this were to happen, the Allen wrench would have to be turned in the opposite direction to that indicated in these instructions. If this condition is present, it will be obvious when you try to adjust the outside tracks in the next steps.*

13. Place the tracks select switch **8** to the outside tracks **4** position.

14. If the lead lamp **5** is on, turn the Allen wrench clockwise until the OK lamp **6** is on.

15. If the lag lamp **7** is on, turn the Allen wrench counterclockwise until the OK lamp **6** is on.

    Note: *When adjusting the inside data tracks (steps 8 through 12), the OK lamp **6** will be on continuously with very little flicker on the lead **5** and lag **7** lamps. When adjusting the outside data tracks, this same condition may result. It is possible that the lead **5** and lag **7** lamps may flicker brightly, with a very dim OK lamp **6**. This is normal and may vary from machine to machine.*

16. When adjustment is complete, rewind and remove the master skew tape. See OPER 81 for rewind procedure after being in CE mode.

    Note: *A very accurate skew adjustment can be performed with the skew adjustment card. Two terminals **10** are provided on the card for scoping read signals. With the tracks select switch set to the inside tracks position, J1 will display data track 1 and J2 will display data track 2. With the switch set to the outside tracks position, J1 will display data track 4 and J2 will display data track 5.*

Caution: Pressing the Power Off pushbutton on this tape unit will cause a loss of power to this tape unit and to one additional tape unit, if they are attached.

17. Press the tape unit Power Off pushbutton.
18. Remove the skew adjustment card **9**.
19. Replace the Read Flat Cable **12** and Loop Read/Write Flat Cable **11**.
20. Remove the jumper wire on the Logic Board from A1H2D11 to A1J1C11.
21. Press the Power On pushbutton, and return to the MAP or instruction that sent you here.

ALTERNATE SKEW ADJUSTMENT

If the skew adjustment card is not available, the mechanical skew adjustment can be done with an oscilloscope.

Special tools required:

Master skew tape P/N 432641

1. Obtain an oscilloscope (Tektronix* 454 or equivalent) having the following features:

   2 vertical channels
   capability of adding both channels
   time base capability of 10 microseconds/division

Caution: Pressing the Power Off pushbutton on this tape unit will cause a loss of power to this tape unit and to one additional tape unit, if they are attached.

2. Press the tape unit Power Off pushbutton.
3. Open machine cover and raise the tape deck to the open position.
4. Place a jumper wire on the Logic Board from A1H2D11 to A1J1C11. This jumper enables the CE switch on the Operator Panel and permits tape motion control by use of the pushbuttons on the panel.
5. Press the Power On pushbutton.
6. Install the master skew tape, press the Load Rewind pushbutton, and make the tape unit ready. Make sure that the beginning-of-tape (BOT) mark is toward the file reel side of the Read/Write Head to prevent a loose-wrap tape load operation, or press the Reset pushbutton until the loose-wrap load operation ends.
7. Set up the oscilloscope as follows:

   Sweep - 10 microseconds/division
   Mode - Channel 1, Channel 2 added
   Trigger - Slope (+) internal
   Volts/div .05
   Probe X10

8. Connect the oscilloscope to the Logic Board:

   Probe 1 to pin F2B04 (data track 1)
   Probe 2 to pin F2D02 (data track 2)

Caution: Use care when turning the skew adjustment screw. Turning the screw too much can damage the skew plate. If more than two and half turns are required, ensure that:

a. The Head Card Assembly is correctly installed.

b. The skew adjustment screw is being turned in the correct direction.

9. Insert a 0.093 inch Allen wrench **2** through the opening in the erase head cover **1** on the operator side of the tape deck.
10. Adjust skew at 2.54 m/s (100 ips) and use the CE pushbutton to move tape forward. Press the CE pushbutton and, at the same time, press the following pushbuttons. If tape will not operate at slow or fast speed, see MAP 4080.

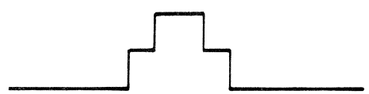
    a. Reset will start tape. Pressing this pushbutton again will stop tape.

    b. Load Rewind will change tape direction from forward to reverse, or reverse to forward.

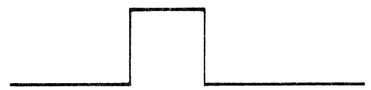
    c. Unload Rewind will change tape speed from 0.3175 m/s (12.5 ips) to 2.54 m/s (100 ips), or from 2.54 m/s (100 ips) to 0.3175 m/s (12.5 ips).

    See OPER 81 for more detailed description of the CE switch operations.

11. There should be a waveform as follows:



12. If the leading edges are not perfectly aligned, turn the Allen wrench until the edges are aligned, as shown below.



13. Change connections of the oscilloscope on the Logic Board:

    Probe 1 to F2S03 (data track 4)
    Probe 2 to F2S02 (data track 5)

14. Again, turn the Allen wrench to make the leading edges align perfectly.
15. After skew has been adjusted for tracks 4 and 5, go back and look at tracks 1 and 2. They may be slightly out of alignment but should be very close. This is normal.
16. When the adjustment is complete, rewind and remove the master skew tape.

Caution: Pressing the Power Off pushbutton on this tape unit will cause a loss of power to this tape unit and to one additional tape unit, if they are attached.

17. Press the tape unit Power Off pushbutton.
18. Remove the jumper wire on the Logic Board from A1H2D11 to A1J1C11.
19. Press the Power On pushbutton. Return to the MAP or instruction which sent you here.

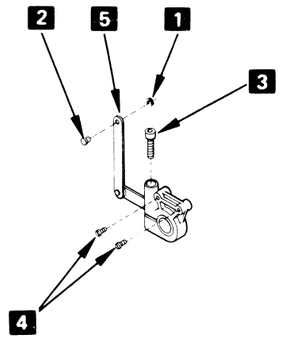
TOP COVER DAMPER REMOVAL AND REPLACEMENT

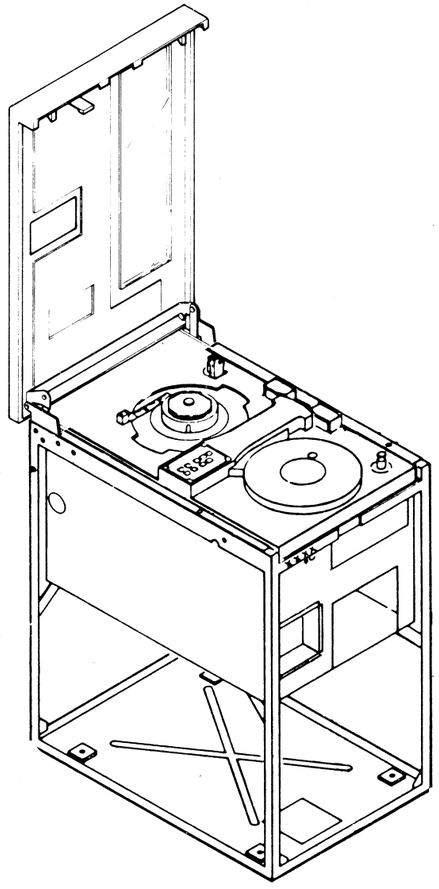
REMOVAL

1. Lift top cover.
2. Remove front and rear covers. (See CARR 5 for cover removal).
3. Remove the left cover or disassemble machines as necessary.
4. Support top cover and remove clip 1 and pin 2.
5. Loosen damper adjusting allen head screw 3.
6. Remove two mounting screws 4 and lower damper assembly.

REPLACEMENT

1. Insure new damper assembly adusting screw 3 is towards rear of machine, writing on damper sleeve is towards tub, and link 5 is installed towards tub.
2. Position damper assembly.
3. Install mounting screws 4.
4. Attach damper link 5 to top cover bracket with pin 2 and C-clip 1.
5. Tighten adjusting screw 3 so that the top cover starts to close at 292 mm (11.5 inches) and stays open at 349 mm (13.75 inches) as measured from the rubber bumper on the top cover to where it makes contact on the frame.





GUIDE AND BOT/EOT SENSOR REMOVAL AND REPLACEMENT

This page describes the removal and replacement procedures for the following:

- Guide assembly.
- Beginning-of-tape (BOT) and end-of-tape (EOT) sensors.
- Guide flanges.

These assemblies are located in cavities in the tape deck and are accessible from the service side of the tape deck.

REMOVAL

1. Turn the power off.

   Caution: Pressing the Power Off pushbutton on this tape unit will cause a loss of power to this tape unit and to one additional tape unit, if they are attached.

2. Be sure the magnetic tape has been removed from the tape path.

   Note: *A single mounting screw* **6** *is used to attach both the BOT/EOT Sensor* **4**, *and the top-right guide assembly* **3**.

3. If you are here to remove or replace either the BOT/EOT Sensor **4**, the top guide **3**, or the flanges **1** **2** for the top guide **3**, do the following:

   a. Remove the mounting screw **6**.

   b. Disconnect the BOT/EOT Sensor cable **5** and remove the parts from the machine.

4. If you are here to remove the bottom guide assembly **8**, or to replace the bottom guide flanges **7** **9**, remove the mounting screw **10**, and remove the part from the machine.

5. Removal and replacement of the guide flanges is the same for either the top or the bottom guides. If you are here to remove or replace the guide flanges, remove the four mounting screws **11**, and take the flanges off the assembly.

REPLACEMENT

1. If you have removed the flanges from the guide, do the following:

   a. Position the flanges **1** **2** or **7** **9** on the mounting holes of the guides.

   b. Insert the screws **11**, and tighten them.

2. If you have removed the bottom guide assembly **8**, do the following:

   a. Position the guide assembly in the mounting hole in the casting.

   b. Insert the mounting screw **10**, and tighten it.

3. If you have removed the BOT/EOT Sensor **4** and the top guide assembly **3**, do the following:

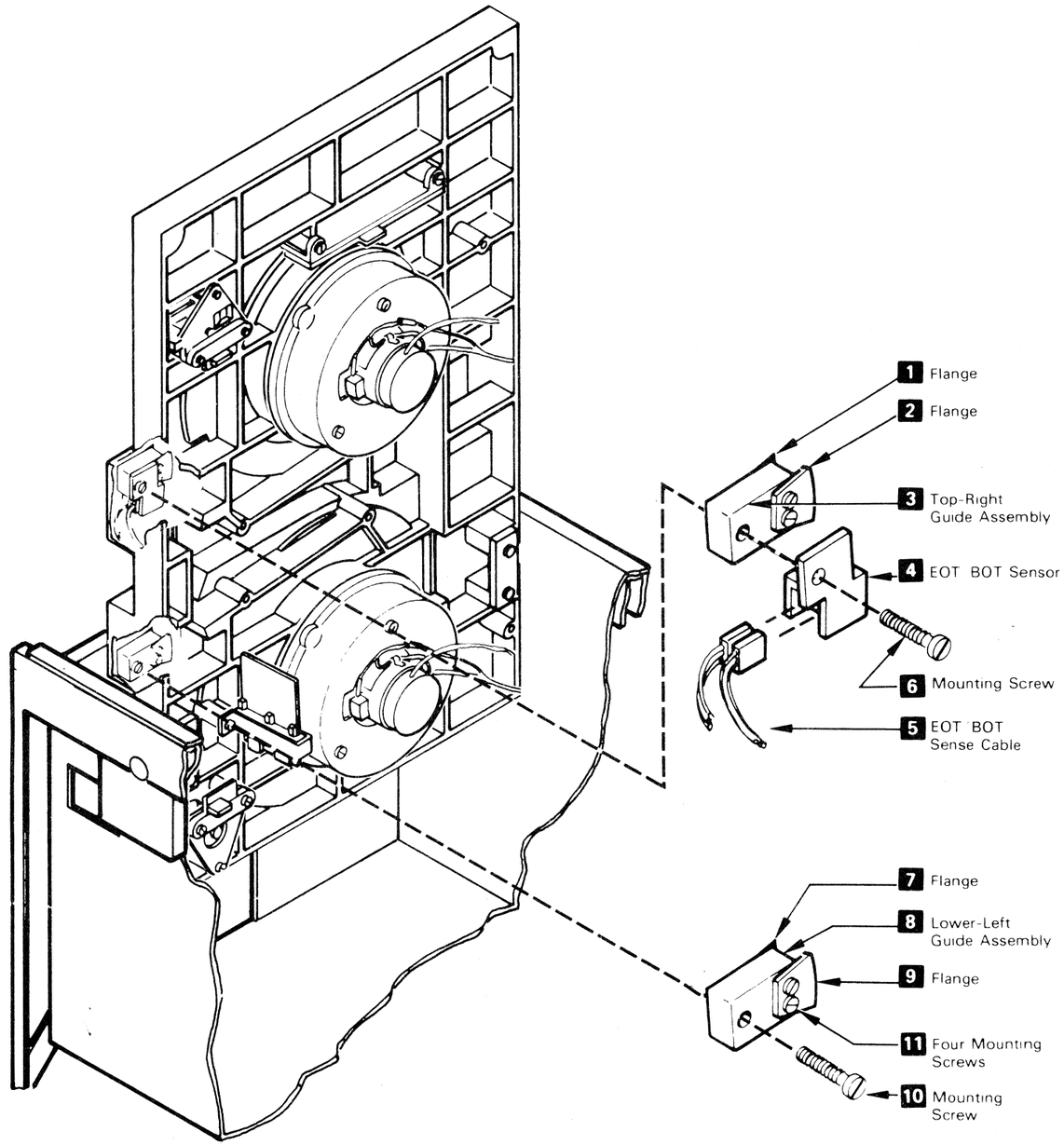
   a. Connect the BOT/EOT Sensor cable **5** to the BOT/EOT Sensor assembly.

   b. Line up the mounting holes in the two assemblies and position them on the mounting hole on the casting.

   c. Hold the sensor assembly so that it contacts and aligns with the sidewalls of the guide assembly. Insert the mounting screw **6** and tighten it.

4. Turn the power on and return to the MAP that sent you here.

Caution: Do not pinch the wires on the frame when installing BOT/EOT sensor cable.



HEAD CARD ASSEMBLY REMOVAL AND REPLACEMENT

This page describes the removal and replacement procedures for the Head Card Assembly. Read all of the text on this page before you attempt to remove or replace the Head Card Assembly.

The Head Card Assembly includes the Read/Write and Erase Heads, Cleaner Block, and mounting and connector hardware. The Erase Head and Cleaner Block can be ordered and replaced as individual field replaceable units (FRUs); they are also included as part of the Head Card Assembly FRU. See CARR 130 for removal and replacement procedures for the Erase Head and Cleaner Block.

When installed in the 8809, the Head Card Assembly is supported by two tape deck brackets 3 and 4, and by the skew plate 13 which attaches to a machined surface on the tape deck to provide accurate vertical alignment of the Read/Write Head.

Two positioning brackets 9 and 14 attach the skew plate to the assembly frame when the assembly is not installed in the machine (and during removal or replacement).

REMOVAL

Note: *The lower tape deck angle bracket 4 is not shown in the figure on CARR 71. It is fastened to the tape deck by two screws 2, and to the connector block mounting frame 7 by two studs and nuts 1.*

Caution: Pressing the Power Off pushbutton on this tape unit will cause a loss of power to this tape unit and to additional tape unit, if they are attached.

1. Remove magnetic tape from the 8809, and press the Power Off pushbutton to turn power off.

   Caution: Permanent damage to the Head Card Assembly can result if any force is used during removal/replacement. If the parts do not fit easily, check previous steps to determine cause. See R/W FRU handling notice (CARR 71.)

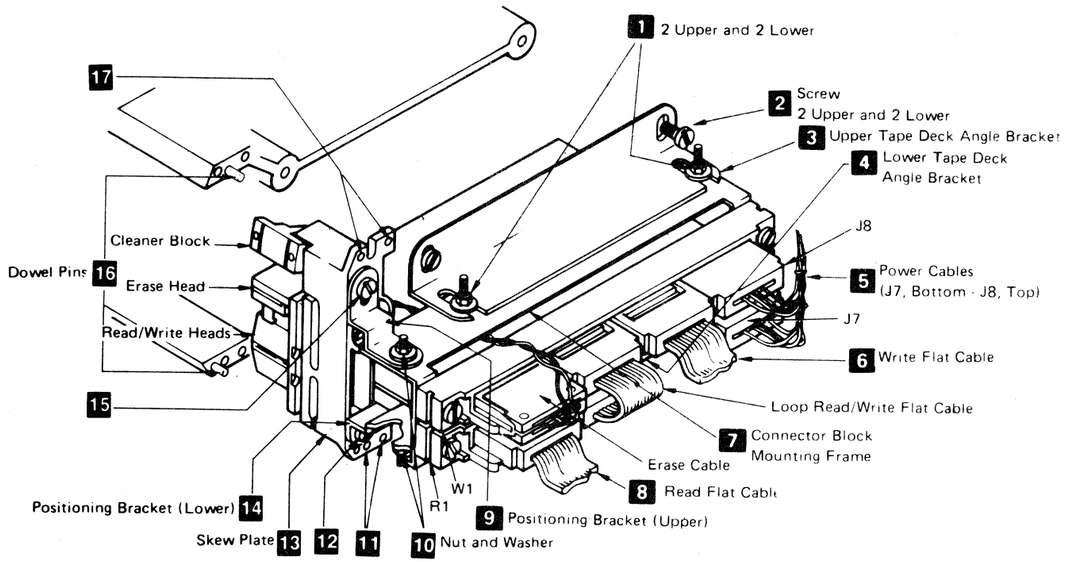
2. Unplug the Read Flat Cable 8, Write Flat Cable 6, and both power cables 5 from the connector.
3. Loosen the two screws 12 and 15 which fasten the positioning brackets to the skew plate. Move the brackets so they touch the connector block mounting frame 7. Retighten the two screws 12 and 15.
4. Use two nuts and washers 10 to fasten the positioning brackets to the connector block frame. These two nuts and washers are normally stored on top of the nuts and washers 1 which fasten the upper and lower tape deck angle bracket to the connector block frame. If they are there, remove the top nut and washer from each stud and use. If they are not stored there, you will have to get two Number 4 nuts and washers before continuing.
5. Remove the four screws (two upper and two lower) 2 that hold the tape deck angle brackets to the tape deck.
6. Remove the four skew plate mounting screws (two upper 17 and two lower 11).
7. While holding the Head Card Assembly, gently remove the skew plate from the dowel pins 16 in the tape deck. Support the weight of the assembly and remove it from the machine.

REPLACEMENT

Caution: Permanent damage to the Head Card Assembly can result if any force is used during removal/replacement. If the parts do not move easily, check previous steps to determine cause. See R/W FRU handling notice (CARR 71.)

1. Check the Head Card Assembly for possible shipping damage and misalignment.
2. Slide the Head Card Assembly onto the tape deck dowel pins 16. Be certain the skew plate is flush with the machined surface of the tape deck. Install four skew plate mounting screws 11 and 17 and tighten.
3. Install the four screws 2 (two upper and two lower) that hold the angle brackets to the tape deck.
4. Loosen and remove the two nuts and washers 10 which are fastening the upper and lower positioning brackets 9 and 14 to the connector block mounting frame. Store these two nuts and washers on the two studs that fasten the assembly to the upper and lower tape deck angle bracket 1. These nuts and washers will be needed the next time the Head Card Assembly is removed.
5. Loosen screws 12 and 15 that hold the positioning brackets to the skew plate. Move the brackets approximately 1.5 mm (0.1 inch) away from the connector block mounting frame 7. Center the studs on the mounting frame through the holes in the positioning brackets and tighten screws 12 and 15.
6. Plug Read Flat 8, Write Flat 6, and power cables 5 into connector block.
7. Press the Power On pushbutton to turn power on. Check and if necessary, perform the skew adjustment on CARR 50 before returning to the MAP which sent you here.

HEAD CARD ASSEMBLY REMOVAL AND REPLACEMENT (Continued)



WARNING

1. **When you move the R/W FRU assembly, grasp the side brackets and lift the assembly as shown in Figure 1. Grasp the assembly, holding it as shown in Figure 2.**

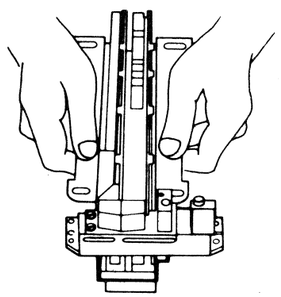


Figure 1

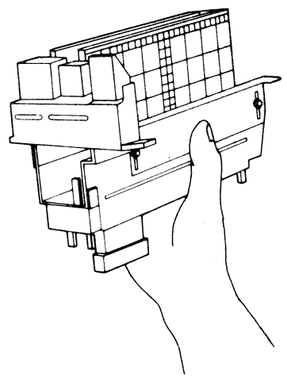


Figure 2

WARNING (Continued)

- **Do not touch the tape path area, as shown in Figure 3.**
- **Do not hold the R/W FRU assembly as shown in Figure 4.**
- **Do not put adhesive tape, labels, etc. on the head.**
- **If you should touch the head surface with your hands, clean the surface using the IBM tape cleaner kit, before loading a tape.**

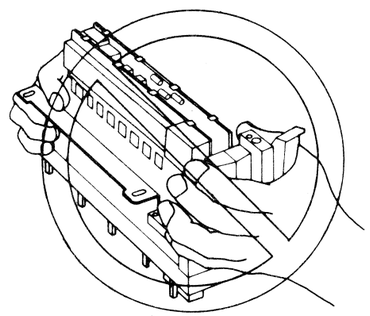


Figure 3

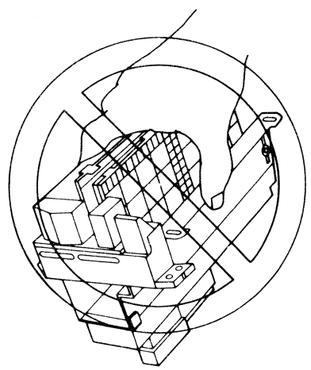


Figure 4

2. **If you place the R/W FRU assembly on a work table or hard surface, position it with the tape cleaner side up, as shown in Figure 5. Do not allow the tape path area to touch the work surface.**
3. **If the R/W FRU assembly is dropped or if it receives a hard shock, it is recommended that you return it with a note, describing the circumstance to your parts control department.**

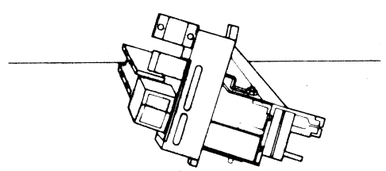


Figure 5

FILE REEL LATCH REMOVAL AND REPLACEMENT

This page describes the removal and replacement procedures for the File Reel Latch. This procedure must also be done before the File Reel Motor can be removed and/or replaced.

REMOVAL

1. Remove the file tape reel from the machine.
2. Examine the flat cap on the File Reel Latch to find the small notch 3 that permits a screwdriver tip to be inserted for cap removal. Do not confuse the small notch with the large slots 4 located above the rollers. Be careful when removing the cap because the center button 5 and spring 6 are retained by the pressure of the cap and may fall out when the cap is removed.
3. Insert the screwdriver, and with a gentle twisting or prying motion, move the cap up far enough to grasp it with your fingers. Hold the cap and work it off evenly. Remove the cap 1, center button 5, and spring 6 from the File Reel Latch Handle.
4. With the cap removed, you can see the access holes 7, for the recessed mounting screws. Do not completely remove the mounting screws because they are dual purpose. In addition to holding the cover to the file-protect ring assembly 11, they also hold other parts, internal to the cover, in place.

   Remove the cover 8 from the file-protect ring 11 by loosening the three recessed mounting screws approximately six turns.
5. Slide the cover 8 off the file-protect ring 11.
6. On the File Reel Latch Base, find the three inner mounting screws 9, arranged in a triangular pattern near the motor shaft 10. Remove the three mounting screws 9, and slide the file-protect ring 11 off the motor shaft 10.

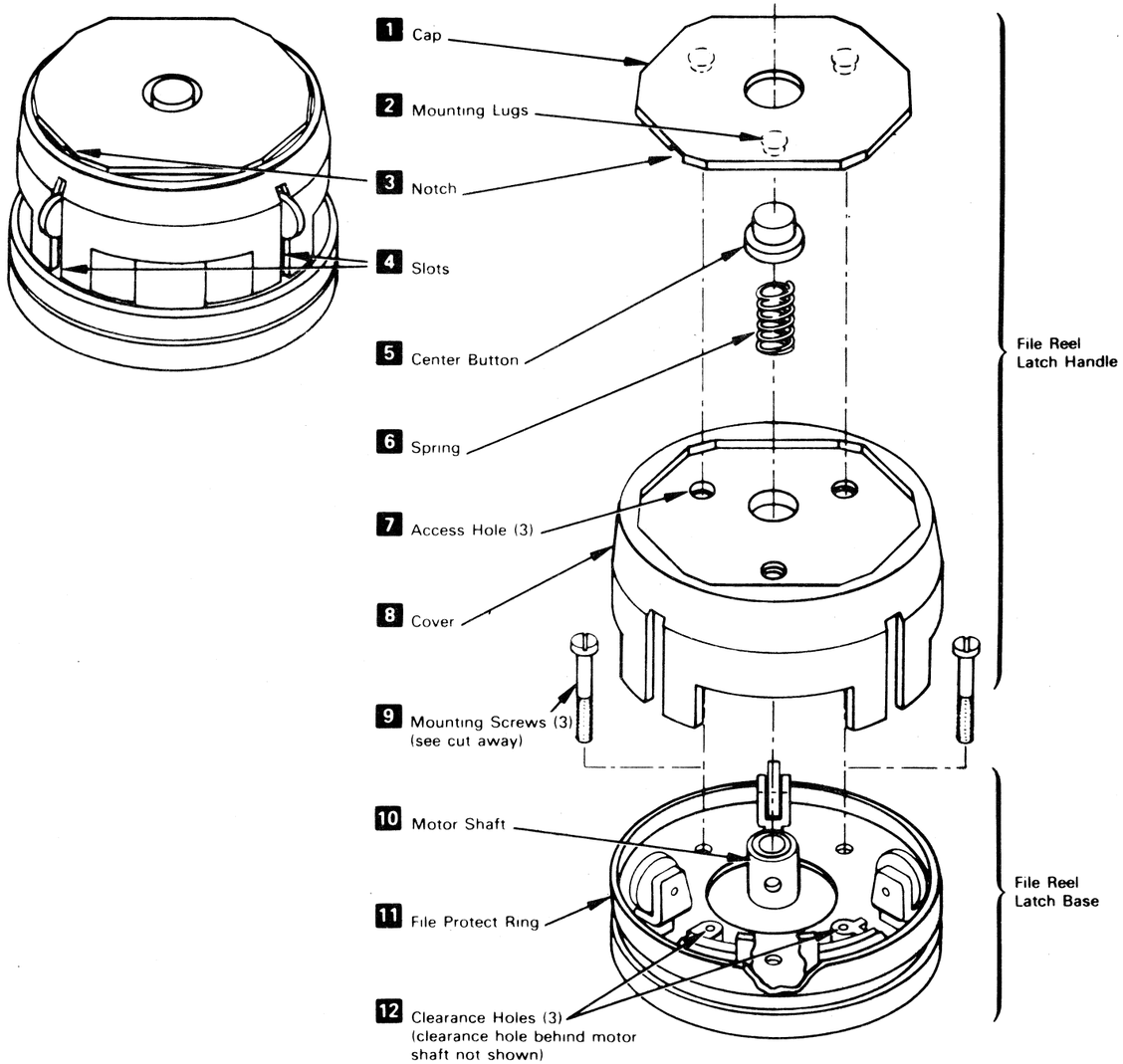
If you are replacing the File Reel Latch, go to the replacement procedure on this page.

If you have removed the File Reel Latch to replace the motor, go to the File Reel Motor Removal and Replacement procedure on CARR 90. When the File Reel Motor replacement procedure is completed, return here and go on to the File Reel Latch Replacement procedure on this page.

REPLACEMENT

1. Slide the file-protect ring 11 onto the motor shaft 10.
2. Align the three mounting holes 12 in the fileprotect ring 11 with the three mounting holes on the motor flange. Insert the three mounting screws 9 and tighten.
3. Align the three slots 4 in the cover with the three rollers on the file protect ring 11, and slide the cover into place. Be certain the cover 8 is seated on the flange of the fileprotect ring 11, then tighten the three recessed mounting screws.
4. Insert the spring 6 into the center hole of the cover 8. Place the center button 5 over the spring 6 and hold them in place while aligning the mounting lugs 2 of the flat cap 1 in the mounting holes of the cover. The three mounting lugs 2 on the flat cap are circular, and will fit into the access holes 7 in which the mounting screws are recessed in the cover. Press the flat cap into place.
5. Assembly of the flat cap may result in activating the locking action of the File Reel Latch. To release the lock, press firmly on the center button. If the latch is properly assembled it will snap into the unlocked position.
6. Place the file tape reel on the machine.

   Return to the MAP that sent you here.



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FILE REEL MOTOR REMOVAL AND REPLACEMENT

GENERAL

This page describes the removal/replacement procedures for the File Reel Motor and the motor brushes.

The File Reel Latch removal procedure (CARR 80) must be completed before the File Reel Motor is removed.

Although this procedure describes the removal and replacement of one motor brush, brushes must be replaced in pairs. Do not replace only one motor brush. Brush removal and replacement can be done without removing the motor from the machine.

FILE REEL MOTOR REMOVAL

1. Verify that the File Reel Latch has been removed according to the procedure on CARR 80. Press the Power Off pushbutton to turn power off.

   Caution: Pressing the Power Off pushbutton on this tape unit, will cause a loss of power to all tape units in the series.

2. Remove the decorative cover **1** by inserting the tip of a screwdriver under the edge of the cover and gently loosening the adhesive. Order new adhesive PN 2337619 when a new motor is ordered.
3. On the service side of the tape deck, disconnect the motor cable **3**. Note the orientation of the cable exit because it will be important when the new File Reel Motor is installed.
4. On the operator side of the tape deck, in a triangular pattern, are three motor mounting screws **2** that mount the File Reel Motor to the tape deck. Support the motor from the service side of the tape deck, and remove the three motor mounting screws from the operator side of the tape deck. When all three screws are removed, the File Reel Motor **4** can be taken out of the machine.

FILE REEL MOTOR REPLACEMENT

1. Position the motor **4** with the motor cable **3** in the same orientation it was when the motor was removed.
2. Place the motor in position from the service side of the tape deck and insert the three motor mounting screws **2** from the operator side of the tape deck. Hold the motor to ensure clearance between the Write Enable Sensor and the motor, and tighten the screws. Be sure the screws are properly tightened before going to the next step.
3. Reinstall the decorative cover **1**. New decorative cover adhesive (PN 2337619) must be replaced each time the cover is removed. Be certain the adhesive backing and tape deck surface are not contaminated, or the cover will not stick in place.
4. Connect the motor cables from the service side of the tape deck.
5. Turn power on and go to CARR 80, File Reel Latch Removal and Replacement, to install the File Reel Latch.

MOTOR BRUSH REMOVAL

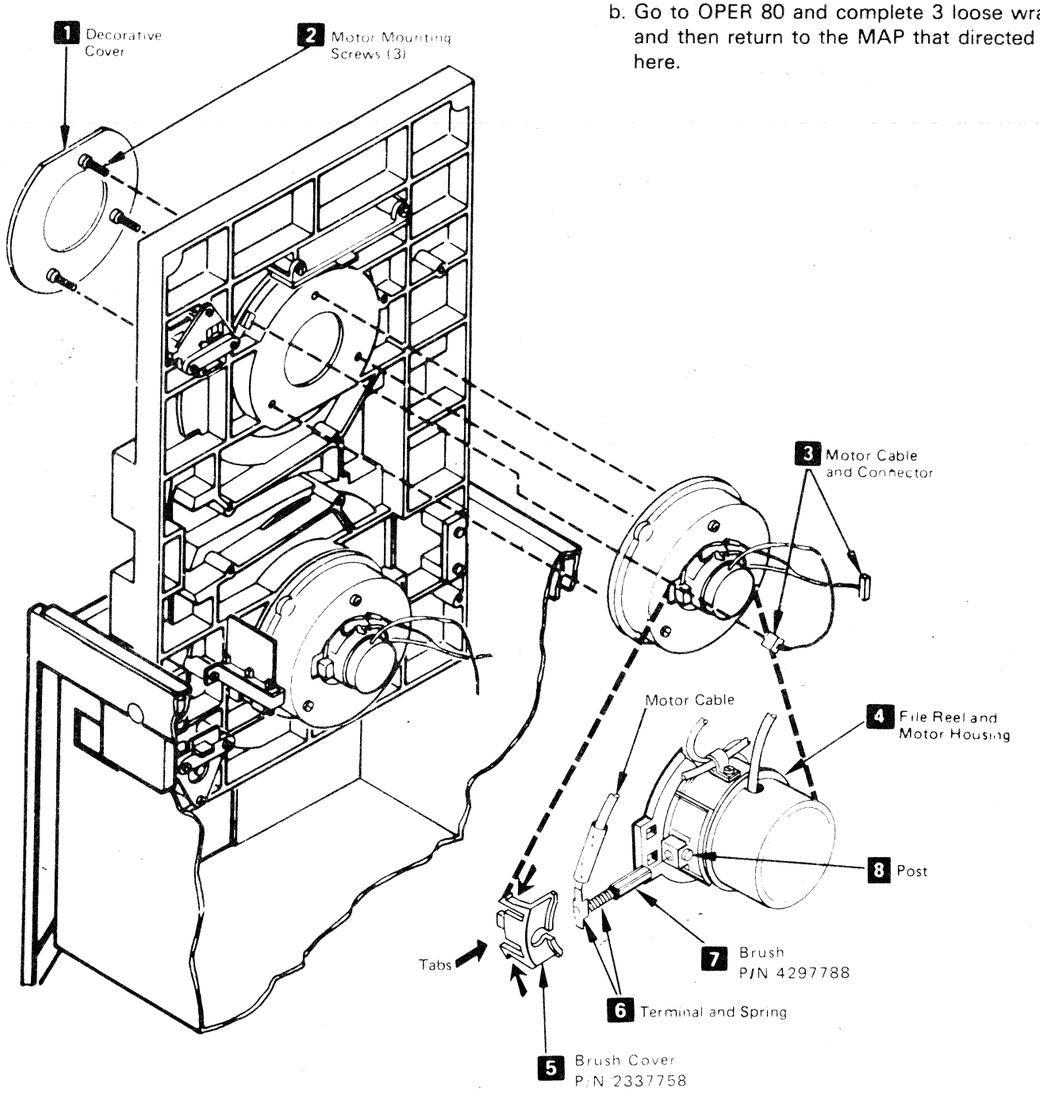
If brush cover **5** is visible, the brush assembly may be replaced. If brush cover is not visible, the motor is sealed and brushes are not replaceable and motor must be exchanged.

Caution: Pressing the Power Off pushbutton on this tape unit will cause a loss of power to all tape units in the series.

1. Press the Power Off pushbutton to turn power off. Hold the brush cover **5** on the sides between your thumb and forefinger. Press toward the center until the tabs disengage, and pull the cover away from the motor. Do not discard the cover.
2. Pull the terminal and spring **6** with brush attached **7** out of the motor housing.
3. Disconnect the terminal from the motor cable by pulling them apart at the slide-on connector.

MOTOR BRUSH REPLACEMENT

1. Connect the brush **7** to the motor cable **3** by inserting the terminal into the slide-on connector and pressing until engaged.
2. Insert the brush and spring into the motor brush housing **4**. The housing is designed so the brush cannot be inserted wrong.
3. With one hand, press the brush into the housing until it is fully seated and hold it there.
4. With the other hand, hold the brush cover between the thumb and forefinger and press the tabs.



5. Fit the circular opening in the cover over the small round post **8** on the brush housing. Then, press down until the brush cover tabs are engaged in the bottom slots of the housing.
6. a. Be certain you have replaced both brushes. Then, turn power on.
   b. Go to OPER 80 and complete 3 loose wrap loads and then return to the MAP that directed you here.

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REEL SIZE SENSOR REMOVAL AND REPLACEMENT

This page describes the removal and replacement procedures for the Reel Size Sensor assembly.

The screws that mount the assembly to the tape deck are accessible from the service side of the tape deck.

REMOVAL

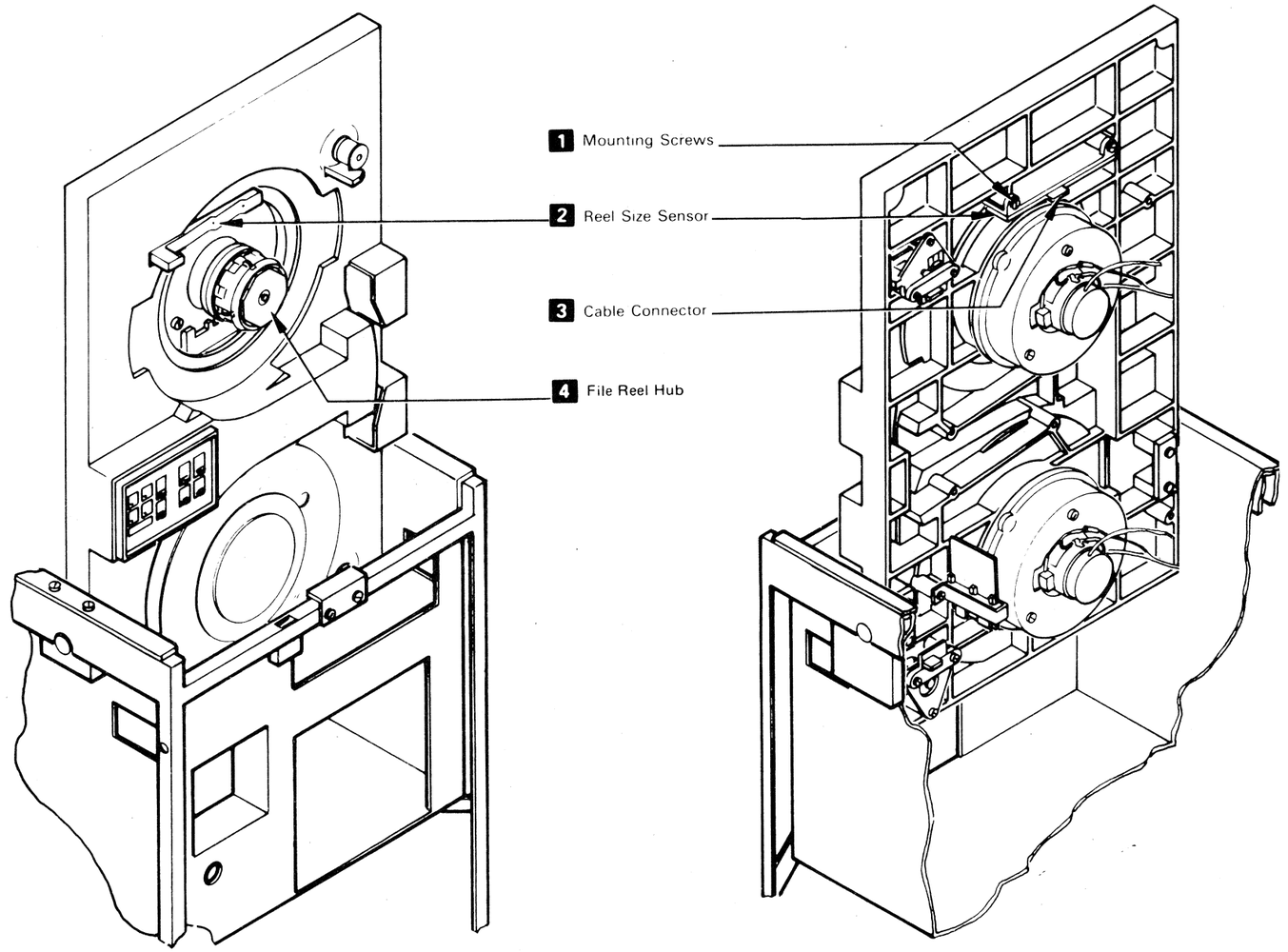
1. Press the Power Off pushbutton to turn power off.

   Caution: Pressing the Power Off pushbutton will remove power fromt this tape unit and from one additional tape unit, if they are attached.

2. Remove the magnetic tape reel from the file reel hub **4**.
3. From the service side of the tape deck, remove the cable connector **3**, which is attached to the Reel Size Sensor **2**.
4. Remove the two mounting screws **1** from the Reel Size Sensor assembly.
5. Remove the Reel Size Sensor assembly from the service side of the deck.

REPLACEMENT

1. Insert the Reel Size Sensor assembly **2** in the opening on the service side of the tape deck.
2. From the service side of the tape deck, insert the two mounting screws **1** and tighten them.
3. Plug in the connector **3** to the Reel Size Sensor assembly.
4. Put the magnetic tape reel back on the file reel hub **4**.
5. Turn the power on.
6. Return to the MAP that sent you to here.



TAPE PRESENT SENSOR AND SENSE IDLER ASSEMBLY, REMOVAL AND REPLACEMENT

This page describes the removal and replacement procedures for the Tape Present Sensor and the Sense Idler assembly.

Removal of the Tape Present Sensor is required before removing and replacing the Sense Idler assembly.

REMOVAL

Caution: Pressing the Power Off pushbutton will remove power to this tape unit and from one additional tape unit, if they are attached.

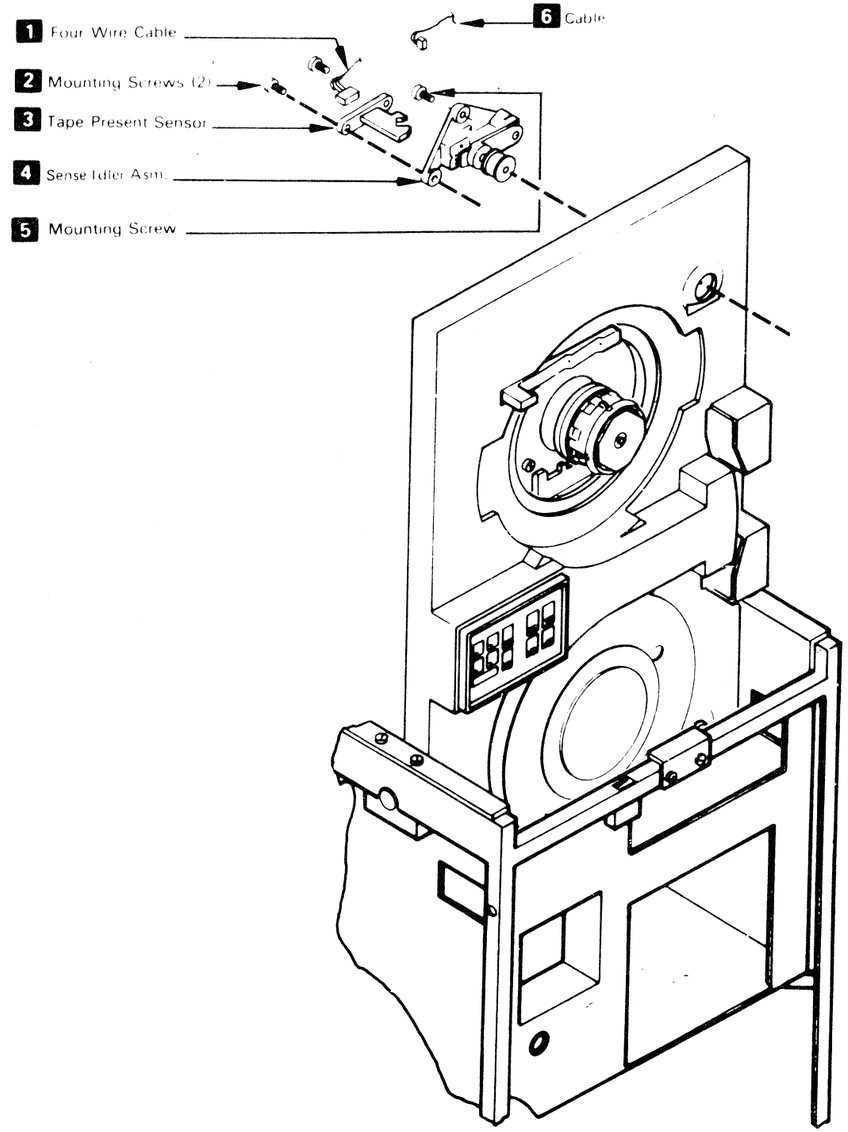
1. Remove the magnetic tape from the tape unit, and press the Power Off pushbutton to turn power off.
2. Unplug the four-wire cable **1** attached to the Tape Present Sensor **3** on the service side of the tape deck.

   Caution: Do not scratch or otherwise damage the machined surfaces of the Sense Idler assembly, because damage to customer tapes may result.
3. Remove the two mounting screws **2** from the Tape Present Sensor.
4. Slide the Tape Present Sensor **3** out of the opening in the tape deck.
5. If you are removing and replacing the Sense Idler assembly, do the next step. If not, you are finished with the removal procedure.
6. Remove the mounting screw **5** and slide the Sense Idler assembly **4** out of the opening in the tape deck.
7. Remove the six-wire cable **6** attached to the Sense Idler assembly.

REPLACEMENT

If the Sense Idler assembly has been removed, do step 1. If the Sense Idler assembly is still in place, go to step 3.

1. Insert the Sense Idler assembly **4** into the opening in the tape deck and align the mounting holes. Insert the mounting screw **5**, but do not tighten it.
2. Plug the six-wire cable **6** into the Sense Idler Assembly.
3. Insert the Tape Present Sensor **3** into the opening in the tape deck with the sensors facing toward the edge of the tape deck.
4. Align the mounting holes, insert the two mounting screws **2**, and tighten all mounting screws **5**.
5. Plug the four-wire cable **1** into the Tape Present Sensor.
6. Clean the surfaces of the Sense Idler assembly with lint-free cloth and tape cleaner to remove finger marks or other contamination.
7. Turn power on and return to the MAP that sent you here.



MACHINE REEL REMOVAL AND REPLACEMENT

This page describes the removal and replacement procedures for the Machine Reel. You must remove the Machine Reel before removing the Machine Reel Motor.

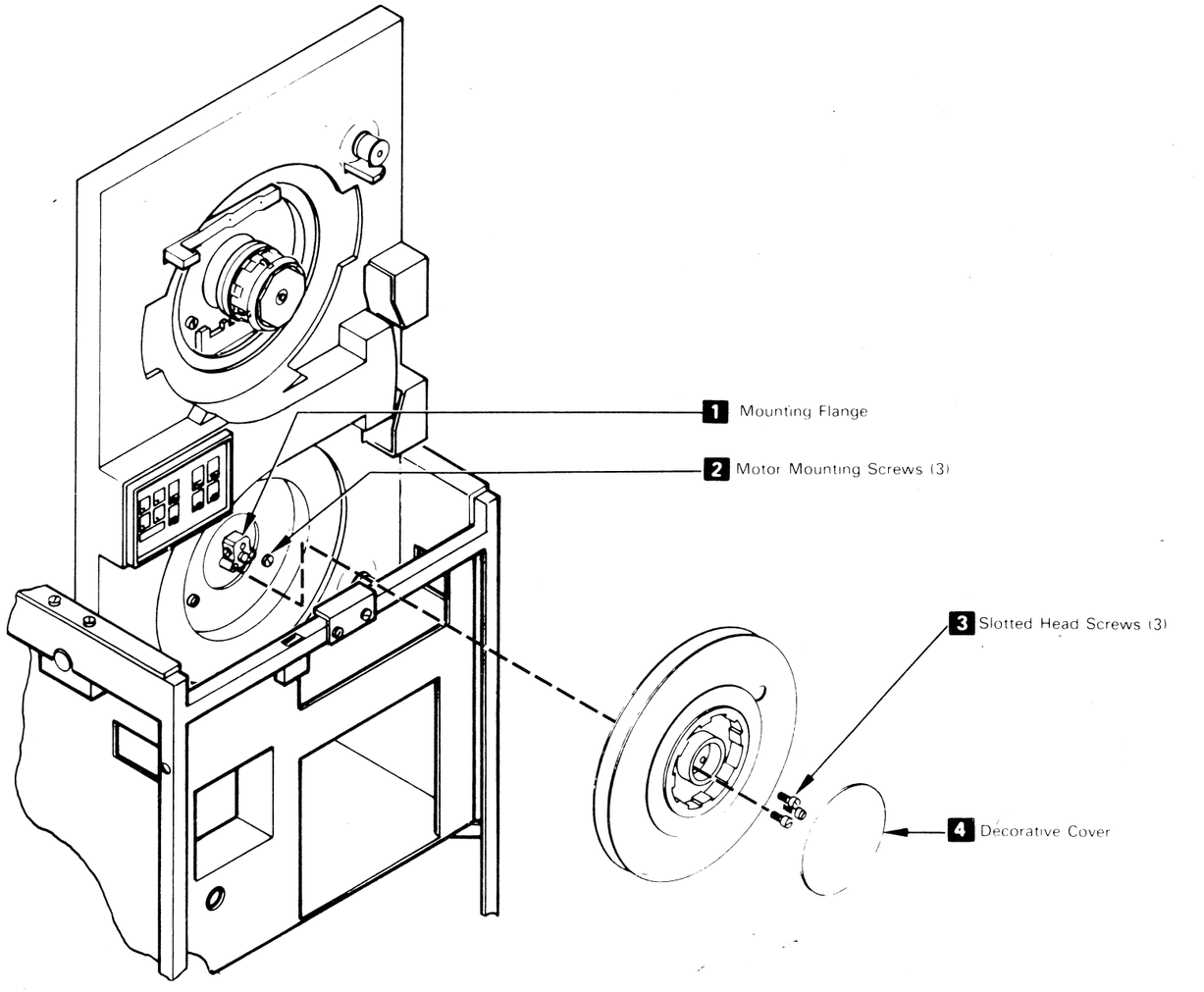
REMOVAL

1. Examine the edge of the decorative cover **4** on the center of the reel to find the small depression where you can insert a screwdriver.
2. Insert the screwdriver and, with a twisting motion, take off the decorative cover. Be careful when handling the cover to prevent contamination of the adhesive on the cover, or damage to the cover.
3. Find the three slotted head screws **3** in the center of the hub. Hold the reel to prevent it from falling, and remove the three screws **3**.

   The mounting flange **1** and motor mounting screws **2** are now accessible. To remove the motor, see the motor removal and replacement procedure on CARR 150.

REPLACEMENT

1. Place the machine reel against the mounting flange **1** and align the three mounting holes.
2. Insert the screws **3** and tighten them.
3. Examine the decorative cover **4** to ensure that the adhesive has not been contaminated. Put the decorative cover on the machine reel and press it firmly in position.
4. Return to the MAP that sent you here.



ERASE HEAD AND CLEANER BLOCK, REMOVAL AND REPLACEMENT

This page describes the removal and replacement procedures for the Erase Head and the Cleaner Block. The Erase Head 4 can be removed without removing the Head Card Assembly. To remove the Cleaner Block 2, first remove the Head Card Assembly (see CARR 70).

ERASE HEAD, REMOVAL

Caution: Pressing the Power Off pushbutton will remove power from this tape unit and from one additional tape unit, if they are attached.

1. Press the Power Off pushbutton to turn power off. Look at the Erase Head 4 and note that there are two holes 5 and 7. The small hole 7 allows access to the skew adjustment screw. The larger hole 5 contains a non-metallic mounting screw 8.
2. Insert a screwdriver into hole 5 and loosen the mounting screw 8.
3. Slide the Erase Head 4 from the Head Card Assembly 3.
4. Disconnect the black and yellow wires attached to the Erase Head connector 6. Note wire colors when you remove them so you can reinstall them correctly. See erase head-end view insert.

ERASE HEAD, REPLACEMENT

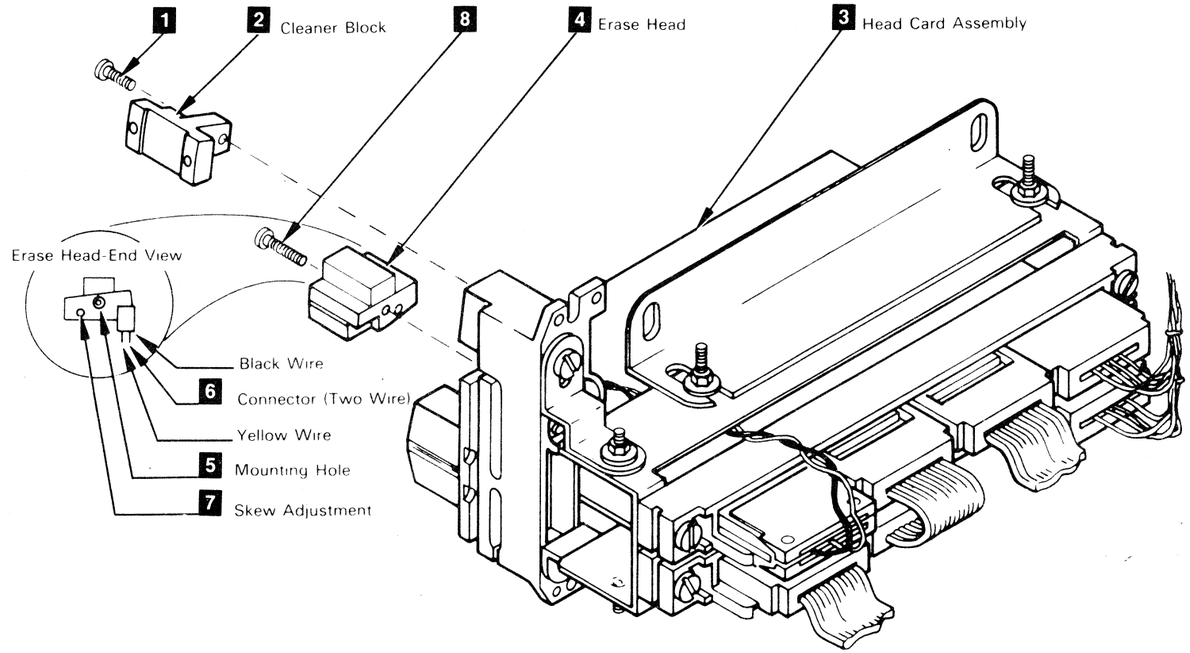
1. Connect the black and yellow wires to the connector 6 on the Erase Head 4. Be certain the wires are replaced exactly as removed in step 4 of the removal procedure.
2. Hold the Erase Head 4 so the smaller of the two holes 7 is over the skew adjustment screw.
3. Slide the Erase Head 4 into place so the two alignment pins fit into the holes in the Head Card Assembly 3.
4. Insert the non-metallic mounting screw 8 and tighten. Do not over tighten.
5. Turn power on and return to the MAP that sent you here.

CLEANER BLOCK, REMOVAL

1. The Head Card Assembly 3 must be removed before removing the Cleaner Block 2. Refer to CARR 70 for Head Card Assembly removal instructions.
2. After the Head Card Assembly 3 is removed, remove screw 1 and lift the Cleaner Block 2 off.

CLEANER BLOCK, REPLACEMENT

1. Hold the Cleaner Block 2 in place, insert screw 1, and tighten.
2. Go to CARR 70 for replacement procedures for the Head Card Assembly 3.



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TAPE TACHOMETER REMOVAL AND REPLACEMENT

This page describes the removal and replacement procedures for the Tape Tachometer. The Tape Tachometer comprises two parts: the sensor assembly, and the idler assembly. These two parts are always replaced as one field replaceable unit (FRU).

REMOVAL

Caution: Pressing the Power Off pushbutton will remove power from this tape unit and from one additional tape unit, if they are attached.

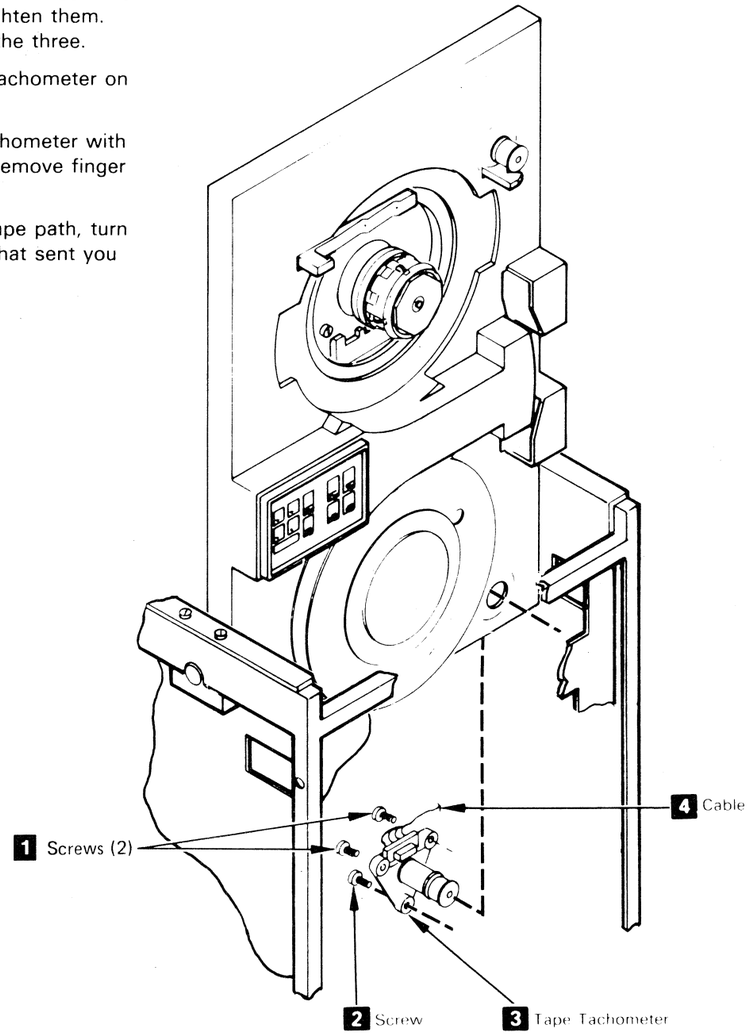
1. Remove the magnetic tape from the tape unit, and press the Power Off pushbutton to turn power off.
2. Unplug the cable **4**, attached to the Tape Tachometer on the service side of the tape deck.

   Caution: Use care doing the following steps. After the screws are removed, the cover on the sensor assembly may be loose. Do not remove the cover or permanent damage to the photosensor disk may result. Pieces of cellophane or masking tape can be used to hold the cover in place during removal and replacement.
3. First, remove the bottom screw **2** from the service side of the tape deck.

   Caution: Do not scratch or otherwise damage the machined surfaces of the Tape Tachometer. Damage to customer tapes may result.
4. Remove the remaining two screws **1** while holding both parts of the Tape Tachometer together.
5. Slide the Tape Tachometer **3** out of the opening in the tape deck.

REPLACEMENT

1. Insert the Tape Tachometer **3** into the opening in the tape deck from the service side.
2. While holding both parts of the Tape Tachometer together, align the mounting holes and insert the mounting screws **2** and **1** and tighten them. Screw **2** is the shortest screw of the three.
3. Plug in the cable **4**, to the Tape Tachometer on the service side of the tape deck.
4. Clean the surfaces of the Tape Tachometer with lint-free cloth and tape cleaner to remove finger marks and other contamination.
5. Replace the magnetic tape in the tape path, turn power on, and return to the MAP that sent you here.



MACHINE REEL MOTOR REMOVAL AND REPLACEMENT

This page describes the removal and replacement procedures for the Machine Reel Motor. The Machine Reel Removal and Replacement Procedure (CARR 120) must be completed before the Machine Reel Motor is removed.

REMOVAL

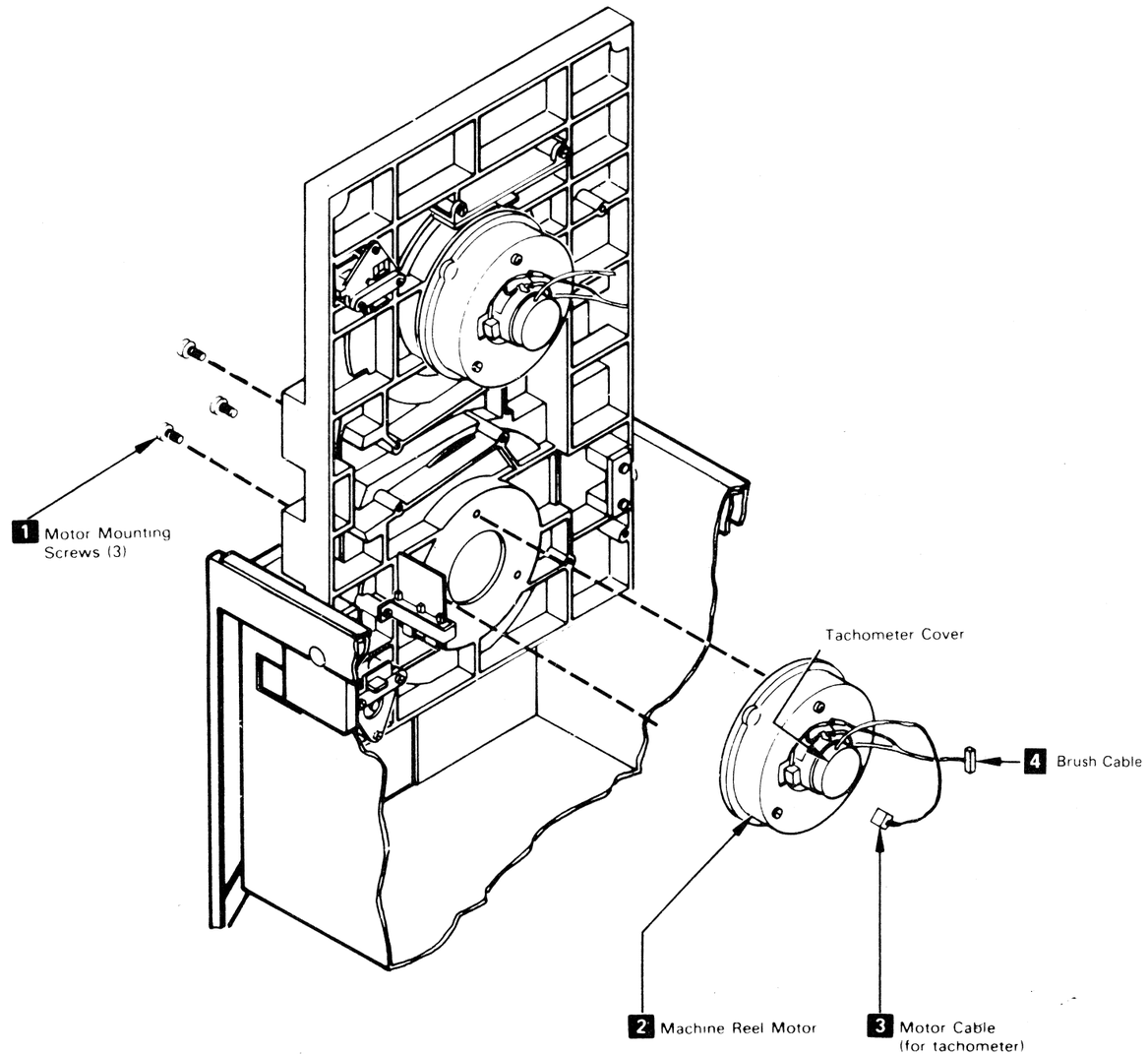
Caution: Pressing the Power Off pushbutton will remove power from this tape unit and from one additional tape unit, if they are attached.

1. Press the Power Off pushbutton to turn power off, and verify that the Machine Reel has been removed according to the procedure on CARR 120.
2. On the service side of the tape deck, disconnect the cables **3** and **4** coming from the Machine Reel Motor **2**. Note the orientation of the cable exits because it will be important when the new Machine Reel motor is installed.
3. On the operator side of the tape deck, there are three mounting screws **1** in a triangular pattern that hold the motor in place. Hold the motor from the service side of the tape deck, and remove the three motor mounting screws from the operator side of the tape deck. When all three screws are removed the Machine Reel Motor can be taken out of the machine.

REPLACEMENT

1. Position the Machine Reel Motor **2** with the motor cables in the same orientation they were in when the motor was removed.
2. Align the mounting holes from the operator side of the tape deck, insert the three mounting screws **1**, and tighten them. Be sure the screws are tight before going to the next step.
3. Connect the motor cable **3** and brush cable **4** on the service side of the tape deck.
4. Go to CARR 120 for the Machine Reel Removal and Replacement Procedure and install the Machine Reel.

Note: *For motor brush removal and replace (see CARR 90).*



OPERATOR PANEL REMOVAL AND REPLACEMENT

This page describes the removal and replacement procedures for the Operator Panel for all 8809 models. There are two designs of the Operator Panel. Either design is a single field replaceable unit (FRU), and the removal and replacement procedures are the same for all models.

REMOVAL

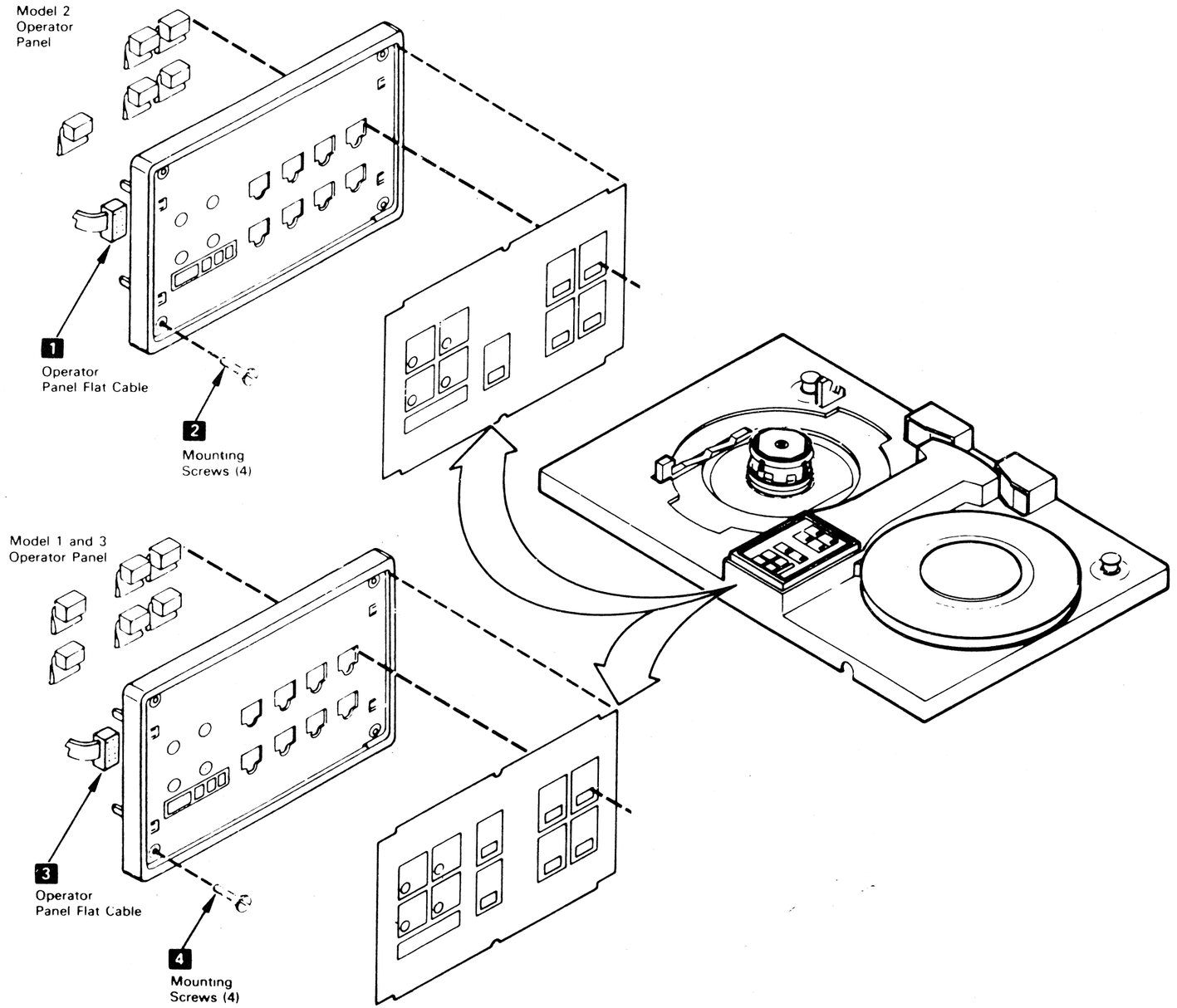
DANGER

Power may still be present in the tape unit with machine power off. Press the Power Off pushbutton to turn power off, and turn CP1 off before beginning this procedure. Turning power off in a tape unit will remove power from it and one additional tape unit, if they are attached.

1. Remove the plastic overlay by inserting the tip of a small screwdriver in the corner of the overlay and lifting it out.
2. Remove the four mounting screws **2** or **4** from the corners of the Operator Panel.
3. Remove the Operator Panel from the tape deck to get access to the cable **1** or **3** attached to the rear.
4. Disconnect the cable.
5. Remove the Operator Panel from the machine.

REPLACEMENT

1. Place the Operator Panel near the opening in the tape deck so the cable **1** or **3** can be attached to the Operator Panel.
2. Connect the cable to the Operator Panel.
3. Position the Operator Panel in the tape deck and align the mounting holes.
4. Insert the four mounting screws **2** or **4** and tighten.
5. Replace the plastic overlay.
6. Turn CP1 on for the 8809 tape unit.
7. Turn power on and return to the MAP that sent you here.



WRITE ENABLE SENSOR ADJUSTMENT, REMOVAL, AND REPLACEMENT

This page describes the removal and replacement procedures for the Write Enable Sensor. The Write Enable Sensor indicates the presence of the write enable ring in a reel of tape. When the ring is in place, the sensor permits writing on tape. When the ring is not in place, the Write Enable Sensor prevents writing on the tape in order to protect the file.

The Write Enable Sensor is located on the service side of the tape deck, in the casting where the File Reel motor is mounted.

ADJUSTMENT

The distance between the write enable sensor and the write enable ring must be adjusted so they do not touch each other, and the ring can break the light beam on the sensor. Accomplish this by adjusting the motor assembly so there is a gap of 1.4224 to 1.778 mm (1.60 nominal) .056 to .073 inches (.063 nominal) between the ring and the sensor.

For access to the motor adjustment screws **3**, remove decorative cover by inserting tip of screwdriver under the edge of cover, gently loosening the adhesive. (See **1** on CARR 90). (Order adhesive (PN 2337619) if needed to replace decorative cover.)

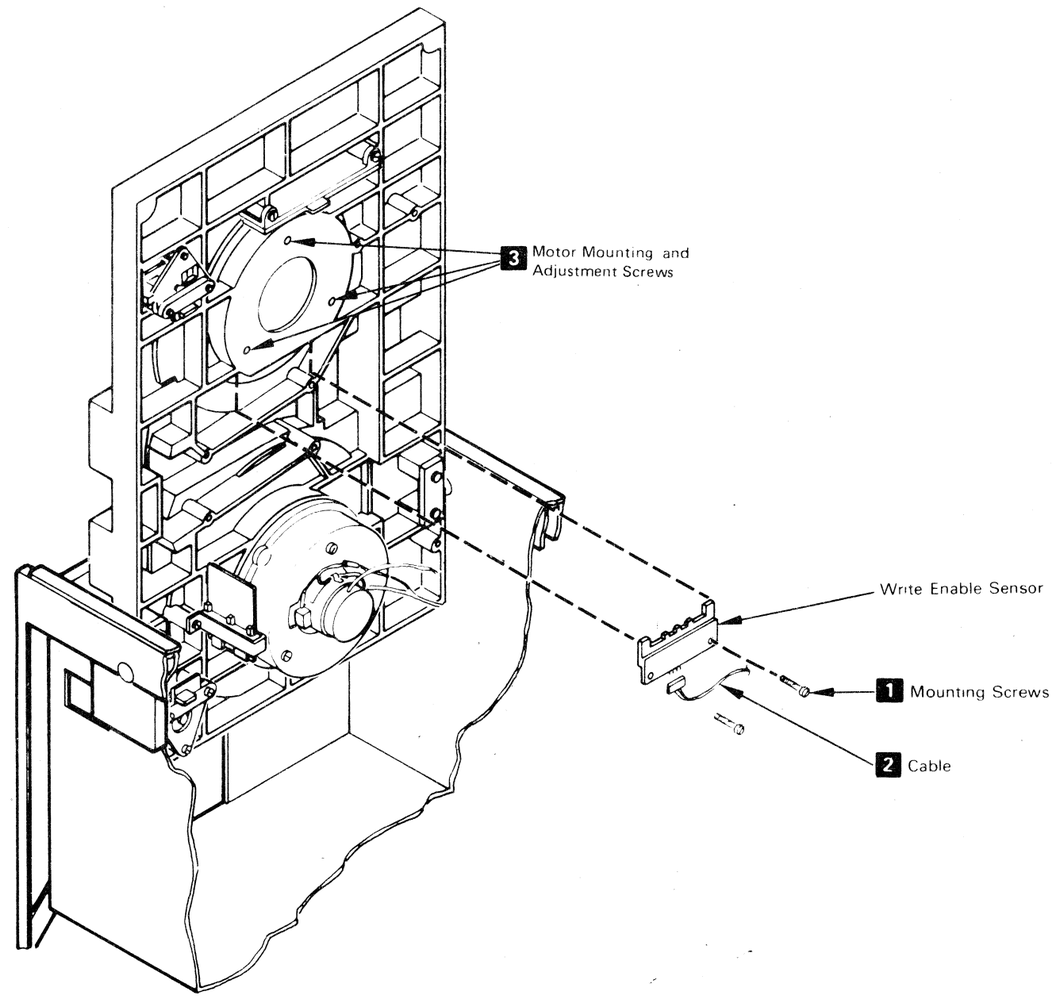
REMOVAL

Caution: Pressing the Power Off pushbutton will remove power from this tape unit and from one additional tape unit, if they are attached.

1. Remove the magnetic tape reel from the 8809, and press the Power Off pushbutton to turn power off.
2. On the service side of the tape deck, disconnect the cable connector **2** attached to the Write Enable Sensor.
3. Remove the two mounting screws **1** and save them to use when you put the part back.
4. Gently slide the Write Enable Sensor out of the opening in which it is mounted.

REPLACEMENT

1. Place the Write Enable Sensor in the opening in the casting and align the mounting holes.
2. Insert the two mounting screws **1**. Make sure there is clearance between the Write Enable Sensor and the File Reel Motor, and tighten the screws.
3. Connect the cable **2** to the Write Enable Sensor.
4. Replace the magnetic tape reel, removed at the start of this procedure, and make sure the File Reel Latch is engaged.
5. Turn power on and return to the MAP that sent you here.



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INTERLOCK SWITCHES REMOVAL AND REPLACEMENT

This page describes the removal/replacement procedures for the File Reel Latch and Top Cover Interlock switches. The File Reel Latch Interlock switch **3** prevents operation of the 8809 if the File Reel Latch is not engaged. The switch is located on the underside of the top cover.

The Top Cover Interlock switch prevents operation of the 8809 when the top cover is opened (unless the switch is in the override position).

FILE REEL LATCH INTERLOCK SWITCH, REMOVAL

Caution: Pressing the Power Off pushbutton will remove power from this tape unit and from one additional tape unit, if they are attached.

1. Press the Power Off pushbutton to turn power off, and raise the top cover **1** to get access to the switch **3**.
2. Squeeze ends of the switch cover **8** and remove from the top cover **1**.

   Note: *Observe the locations of the parts that make up the switch assembly. It is not necessary to remove the arm **4**, the spring **5**, or the retaining ring **11** from the bracket **6** that is welded to the top cover.*
3. Remove the two mounting screws **2** from the switch. Save these screws for use later.

   Note: *The switch **3** is soldered to the cable. Do not remove the switch from the cable.*
4. Remove any cable clamps that are holding the cable **9** to the top cover.
5. Unplug the cable **9** from the mating connector.

FILE REEL LATCH INTERLOCK SWITCH, REPLACEMENT

1. Plug the cable **9** into the mating connector.
2. Clamp the cable **9** to the top cover **1**.
3. Position the switch **3** on the bracket **6** and align the mounting holes.
4. Insert the mounting screws **2** in the two mounting holes and tighten them.
5. Loosen the locknut and adjust screw **7** to sense the file reel not latched condition. Tighten locknut. The arm **4** must not touch the File Reel Latch when the file reel latch is engaged.
6. Replace the switch cover **8** by pressing it into place.
7. Turn power on and return to the MAP that sent you here.

TOP COVER INTERLOCK SWITCH, REMOVAL (FRONT MOUNT)

Caution: Pressing the Power Off pushbutton will remove power from this tape unit and from one additional tape unit, if they are attached.

1. Press the Power Off pushbutton to turn the power off. Open the top cover.
2. Remove the two wires going to the switch.
3. The top cover interlock switch **11** mounts on a bracket which is fastened to the frame by two screws and a nut plate. Loosen left screw and remove right screw.
4. Swing down the switch and bracket.
5. Remove screws that fasten the switch to the bracket.

Notes:

1. *See LOC 20 for the location of your cover interlock switch.*
2. *See Figure 2 and CARR 181 for the physical layout of your Top Cover Interlock Switch.*

TOP COVER INTERLOCK SWITCH, REPLACEMENT (FRONT MOUNT)

1. Attach the switch to the bracket using the screws removed in step 5 of the Removal procedure.
2. Connect the wires to the switch.
3. Fasten the switch mounting bracket to the frame using the screw removed in step 3 of the Removal procedure.
4. Move the switch to the lowest point of adjustment.
5. Adjust the switch (Figure 2) so it transfers but cannot be bottomed by the top cover switch actuator arm **10**, (Figure 1).
6. Turn power on and return to the MAP that sent you here.

Top Cover Interlock Switch (Front Mount)

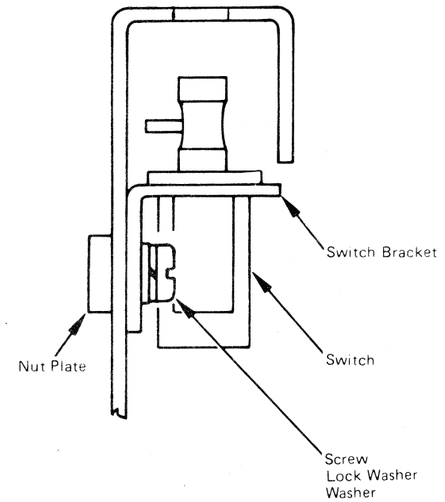

Figure 2

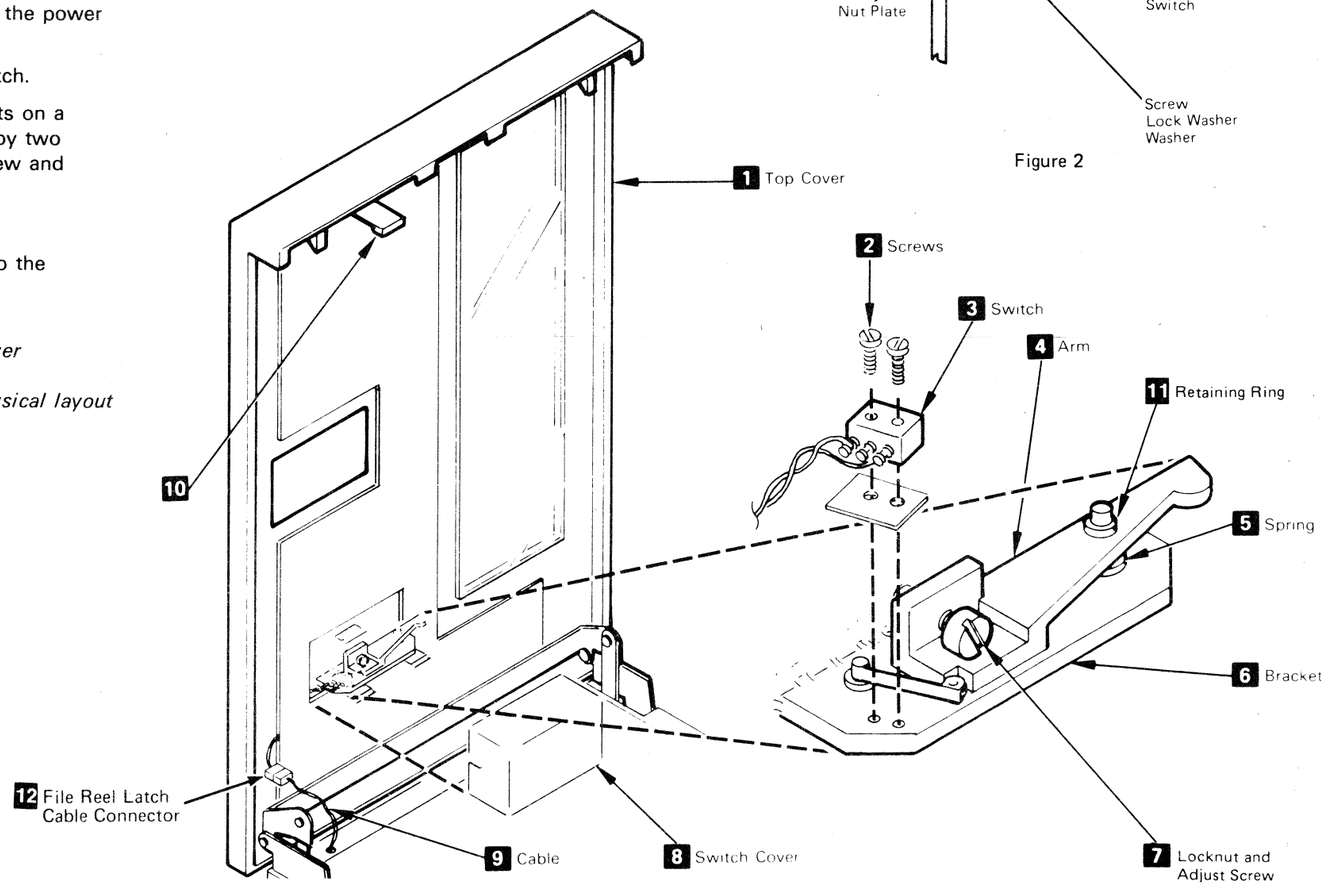

Figure 1

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INTERLOCK SWITCHES REMOVAL AND REPLACEMENT

TOP COVER INTERLOCK SWITCH, REMOVAL (SIDE MOUNT)

Caution: Pressing the Power Off pushbutton will remove power from this tape unit and from one additional tape unit, if they are attached.

1. Press the Power Off pushbutton to turn the power off. Open the top cover.
2. Remove the rear cover and left side cover to access the switch on a Model 1 tape unit. Remove the rear cover and separate the tape units to access the switch on a Model 2 or 3 tape unit.
3. Remove the two wires going to the switch.
4. The top cover interlock switch **1** mounts on a bracket which is fastened to the frame by two screws and a nut plate. Loosen left screw and remove right screw.
5. Swing down the switch and bracket and remove the switch.

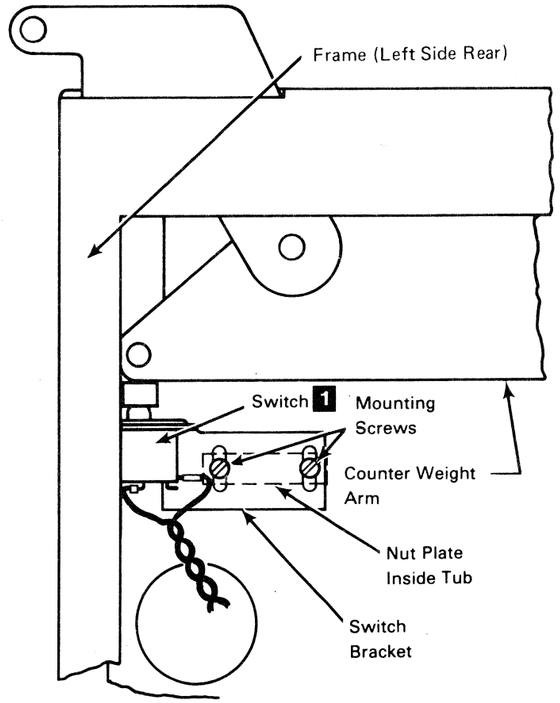
Notes:

1. *See LOC 20 for the location of your cover interlock switch.*
2. *See CARR 180/181 for the physical layout of your Top Cover Interlock Switch.*

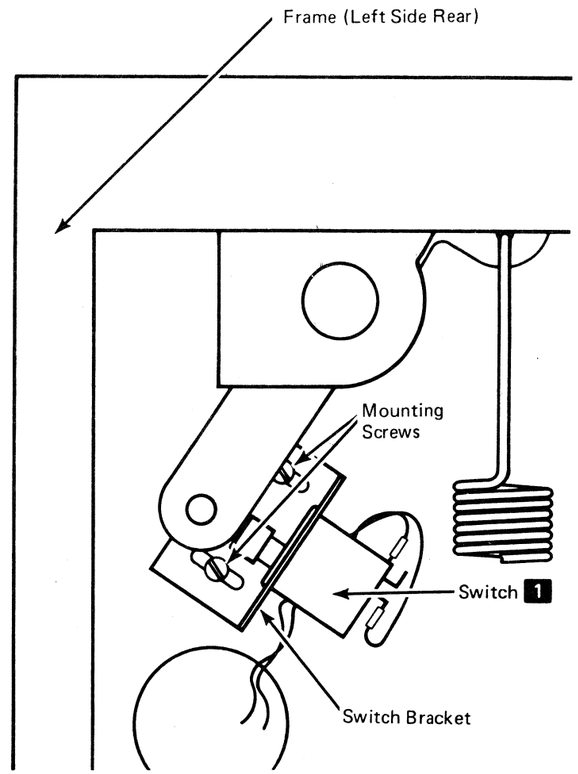
TOP COVER INTERLOCK SWITCH, REPLACEMENT (SIDE MOUNT)

1. Attach the switch to the bracket.
2. Connect the wires to the switch.
3. Fasten the switch mounting bracket to the frame using the screw removed in step 4 of the Removal procedure.
4. Adjust the switch so that it transfers but does not bottom when the top cover is fully closed. (There should be approximately 0.37 mm (0.015 inch) travel remaining before the switch plunger bottoms out.)
5. Replace the rear cover and left side cover on a Model 1 tape unit. Replace the rear cover and reconnect the tape units on a Model 2 or 3 tape unit.
6. Turn power on and return to the MAP that sent you here.

Top Cover Interlock Switch
(Counter Weighted Top Cover)



Top Cover Interlock Switch
(Damper Top Cover)



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NOTES:

Notes: **CARR 182**

LOGIC CARD REMOVAL AND REPLACEMENT

This page describes the use of the standard card extractor 1 (PN 2360375) with an extender 5 (PN 2337369). For card extractor (PN 1310707) an extender is not needed so skip to step 2. You will need these special tools to remove logic cards in the tape unit. If no extractor is available, use a screwdriver to loosen the card by prying at the top and bottom of the card guide.

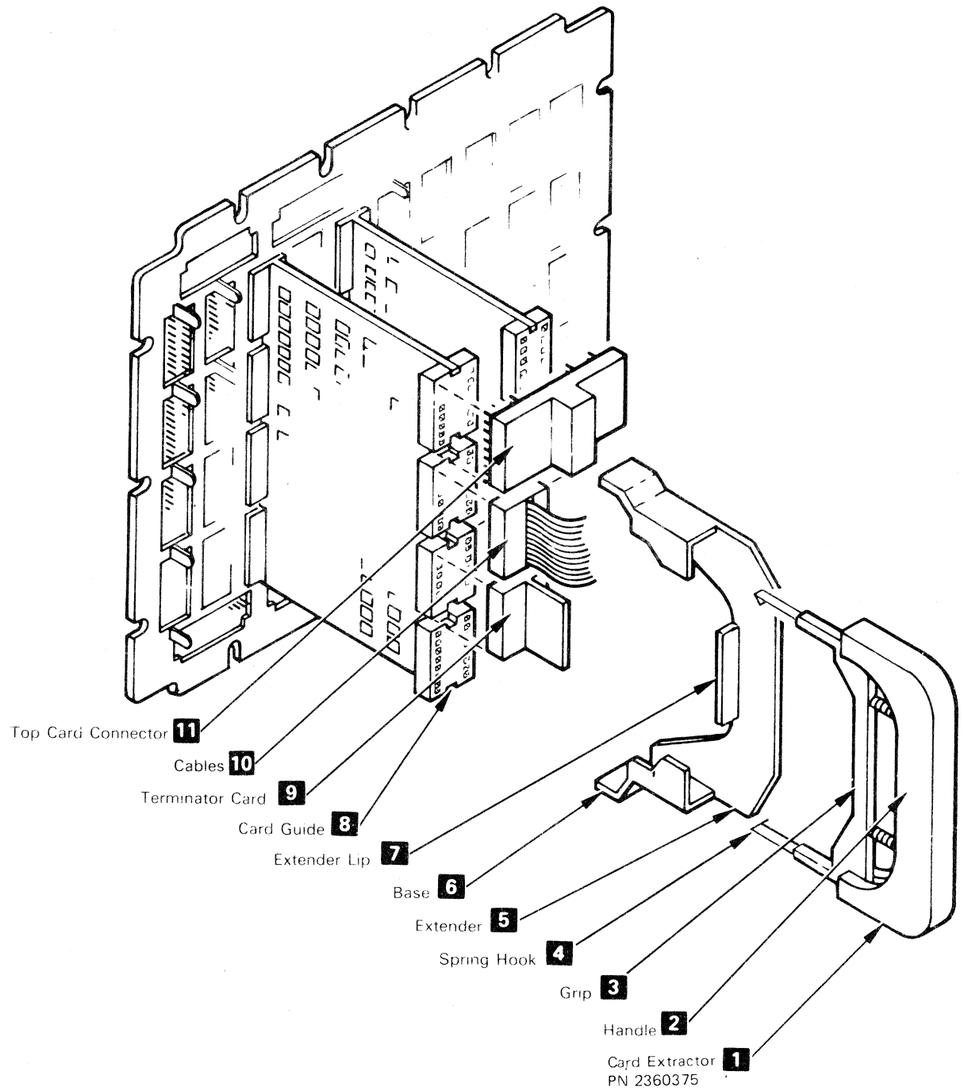
REMOVAL

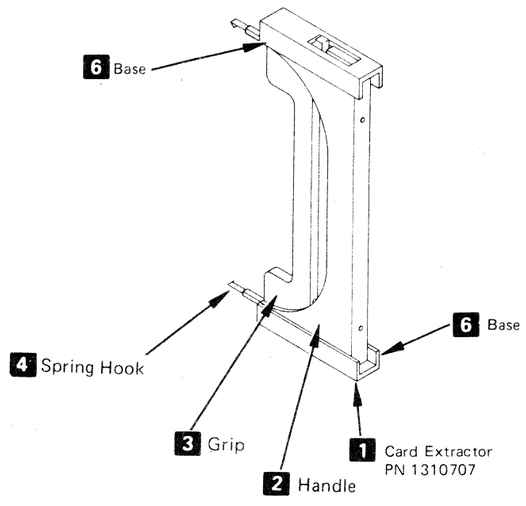
Caution: Pressing the Power Off pushbutton will remove power from this tape unit and from one additional tape unit, if they are attached.

1. Press the Power Off pushbutton to turn power off. Assemble the card extractor 1 in the extender 5 by sliding the extractor into the extender until the grip 3 passes over the extender lip 7 and the card extractor handle 2 is seated on the extender lip. The card extender is now ready for use.
2. Disconnect all cables 10, terminator cards 9, and top card connectors 11 from the logic card being removed. Mark their location so you can put them back easily.
3. Place the extractor 1 over the card being removed. Engage the spring hooks 4 in the holes on the top card guide 8. With the base 6 of the extractor against the housing, squeeze the grip toward the handle until the logic card is unseated from the logic board connector.

REPLACEMENT

1. The card extractor is not needed to plug in logic cards. To plug in a logic card, place it in position on the logic board and press it onto the board connector.
2. After you have seated the logic card, plug in the cables, terminator cards, and top card connectors removed at the beginning of this procedure.
3. If the Formatter Card (A1G2) is exchanged, see INST 60 to ensure that you enter the correct address.
4. Turn power on and return to the MAP that sent you here.





Note: *See the FLD book for the part numbers of:*

Top Card Connectors
Logic Cards
Power Amplifier Board
Power Control Card
Logic Board
Operator Panel Card
Transducer Card
R/W FRU
SSCF Card

POWER AMPLIFIER BOARD REMOVAL AND REPLACEMENT

This page describes the removal and replacement procedures for the Power Amplifier Board. The Power Amplifier Board is located in the stack assembly area of the tape unit.

Access for connecting and disconnecting cables to the Power Amplifier Board is provided through the flanges of the stack assembly.

REMOVAL

Caution: Be very careful when removing the screws holding the safety cover and the Power Amplifier Board, so that the screws do not fall into the power supply area.

DANGER

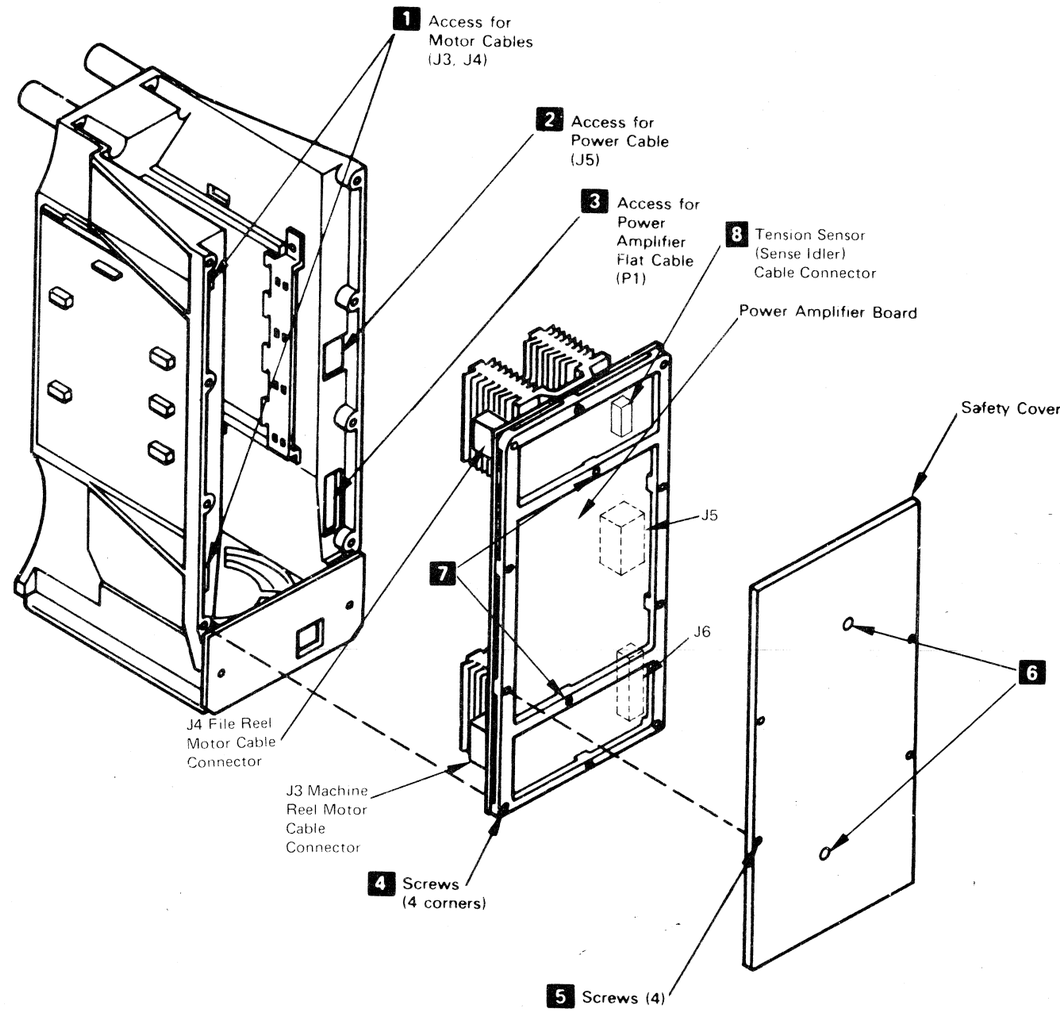
Power may still be present in the tape unit with machine power off. Press the Power Off pushbutton to turn power off, and turn CP1 off before beginning this procedure. Turning power off in the tape unit removes power and from one additional tape unit, if they are attached.

1. Hold the safety cover to prevent it from falling. Remove the four mounting screws **5** that attach the safety cover to the Power Amplifier Board, and remove the safety cover.
2. Through the flanges of the stack assembly, disconnect the two motor cables **1**, the flat cable **3**, the power distribution cable **2**, and the tension sensor cable **8** from the board.
3. Hold the Power Amplifier Board to prevent it from falling, and remove the four mounting screws **4** that attach it to the stack assembly.
4. Remove the Power Amplifier Board from the stack assembly.

REPLACEMENT

1. Place the Power Amplifier Board against the stack assembly and align the mounting holes. Insert the four mounting screws **4** and tighten them.
2. Through the flanges of the stack assembly, connect the two motor cables **1**, the flat cable **3**, the power distribution cable **2**, and the tension sensor cable **8**.
3. Place the safety cover against the Power Amplifier Board and align the mounting holes. Holes in the cover **6** must align with the screws **7** in power amp board when the cover is installed. Insert the four mounting screws **5** and tighten them.
4. Turn on CP1.

   Before returning the tape unit to the customer, verify that the fan is operating, and that air flow is present.
5. Turn power on and return to the MAP that sent you here.



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LOGIC BOARD REMOVAL AND REPLACEMENT

This page describes the removal and replacement procedures for the Logic Board.

REMOVAL

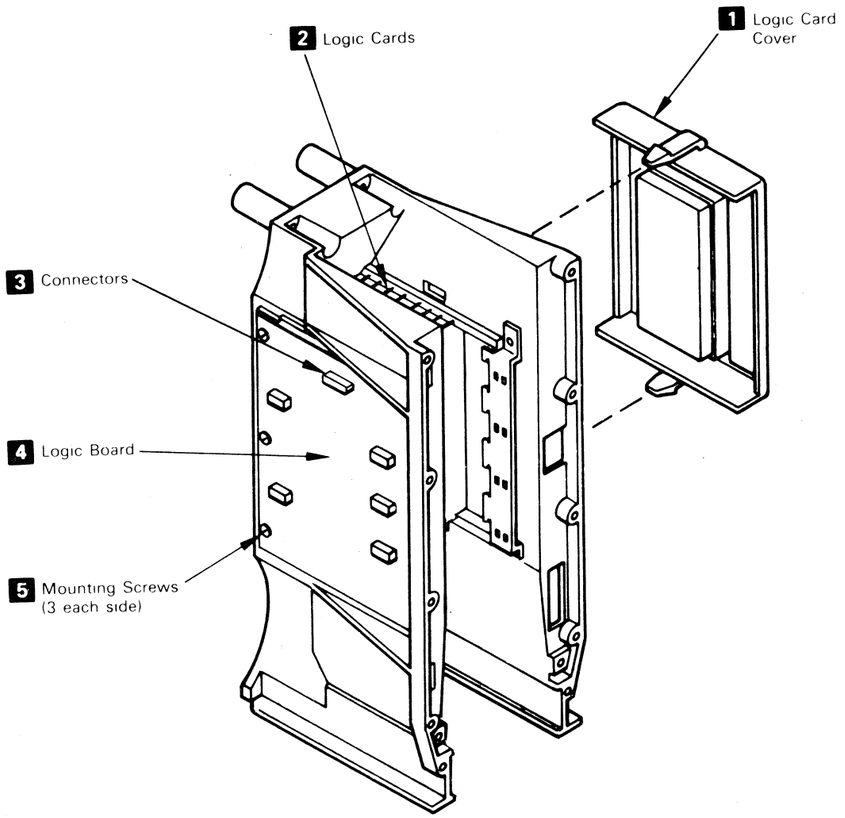
Caution: Pressing the Power Off pushbutton will remove power from this tape unit and from one additional tape unit, if they are attached.

DANGER:
Power may still be present in the tape unit when the machine power is off. Before beginning this procedure, press the Power Off pushbutton to turn the power off. Turn CP1 off.

1. Disconnect connectors J16, J17, J20, J21, J22, and J24 **3** from the pin side of the Logic Board **4**. Mark them so that you can put them back easily.
2. Remove the logic card cover **1** for access to the logic cards.
3. Disconnect all the cables from the logic cards **2**. Mark them so that you can put them back easily.
4. Remove the logic cards from the Logic Board. Use the removal procedure on CARR 190.
5. Disconnect all the cables from the logic board. Mark them so that you can put them back easily.
6. Remove the head card assembly (see CARR 70).
7. Hold the logic board to prevent it from falling, and remove the six mounting screws **5**.

REPLACEMENT

1. Place the Logic Board on the stack assembly and align the mounting holes. Ensure that it is correctly oriented with the 1 row on top and the A row to the right.
2. Insert the six mounting screws **5** and tighten them.
3. Install the head card assembly (see CARR 70).
4. Reconnect the connectors J16, J17, J20, J21, J22, and J24 **3** in the correct locations.
5. Reconnect all the cables to the logic board.
6. Put back the logic cards in their correct location and press them into the board connectors.
7. Attach the cables to the logic cards. Ensure that they are properly located and seated.
8. Press the logic card cover **1** in position on the stack, and ensure that the retaining tabs are engaged and the cover is fastened.
9. Turn on CP1.
10. Turn power on and return to the MAP that sent you here.



FAN REMOVAL AND REPLACEMENT

This page describes the removal and replacement of the Fan. The tape unit will power down, and power cannot be turned on again, if the fan is not operating.

DANGER
Lethal Voltage.

FAN REMOVAL

Caution: Pressing the Power Off pushbutton will remove power from this tape unit and from one additional tape unit, if they are attached.

1. Press the Power Off pushbutton to turn power off. Hold the cover plate **5** to prevent it from falling, and remove the two mounting screws **6** that hold the cover plate in place.
2. Disconnect the power cable **9**, on the right side, where it connects to the Fan **2** through an opening in the side of the stack. **1**
3. For a Model 1A, 1B, or 3, disconnect the fan sense connector **7** where the connector plugs into the power control card. For a Model 2, the fan sense connector plugs into a Berg connector from the dc extension cable in the Model 2.
4. Slide the Fan out **2** two or three inches to gain access to the ground lead **4** from the connector cable.
5. Remove the ground screw **3** that holds the ground lead **4** to the corner of the Fan **2**.
6. Slide the Fan **2** out of the stack.

Note: *Cooling fans with undersized power cable connectors can cause:*

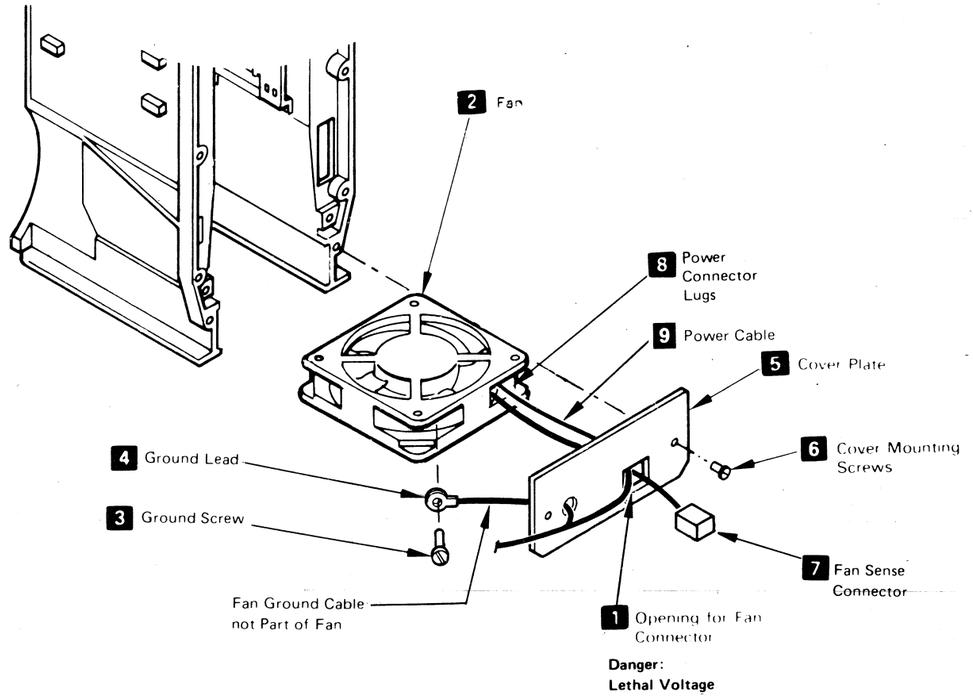
Intermittent dropping of power.

Dropping of power after one or two seconds during power up.

To fix, remove power cable wires at the fan connector lugs **8** *and crimp the connectors until they are tight when attached to the lugs.*

FAN REPLACEMENT

1. Slide the Fan **2** part way into the stack.
2. Attach the ground lead **4** to the Fan **2** with the ground screw **3** and tighten it.
3. Slide the Fan **2** into the stack.
4. Connect the power cable **9** to the connector on the side of the Fan through the opening in the side of the stack **1**.
5. Place the cover plate **5** on the stack. Align the mounting holes. Insert the two mounting screws **6** and tighten them.
6. Turn power on and return to the MAP that sent you here.



DECK RAISE GEAR BOX REMOVAL AND REPLACEMENT

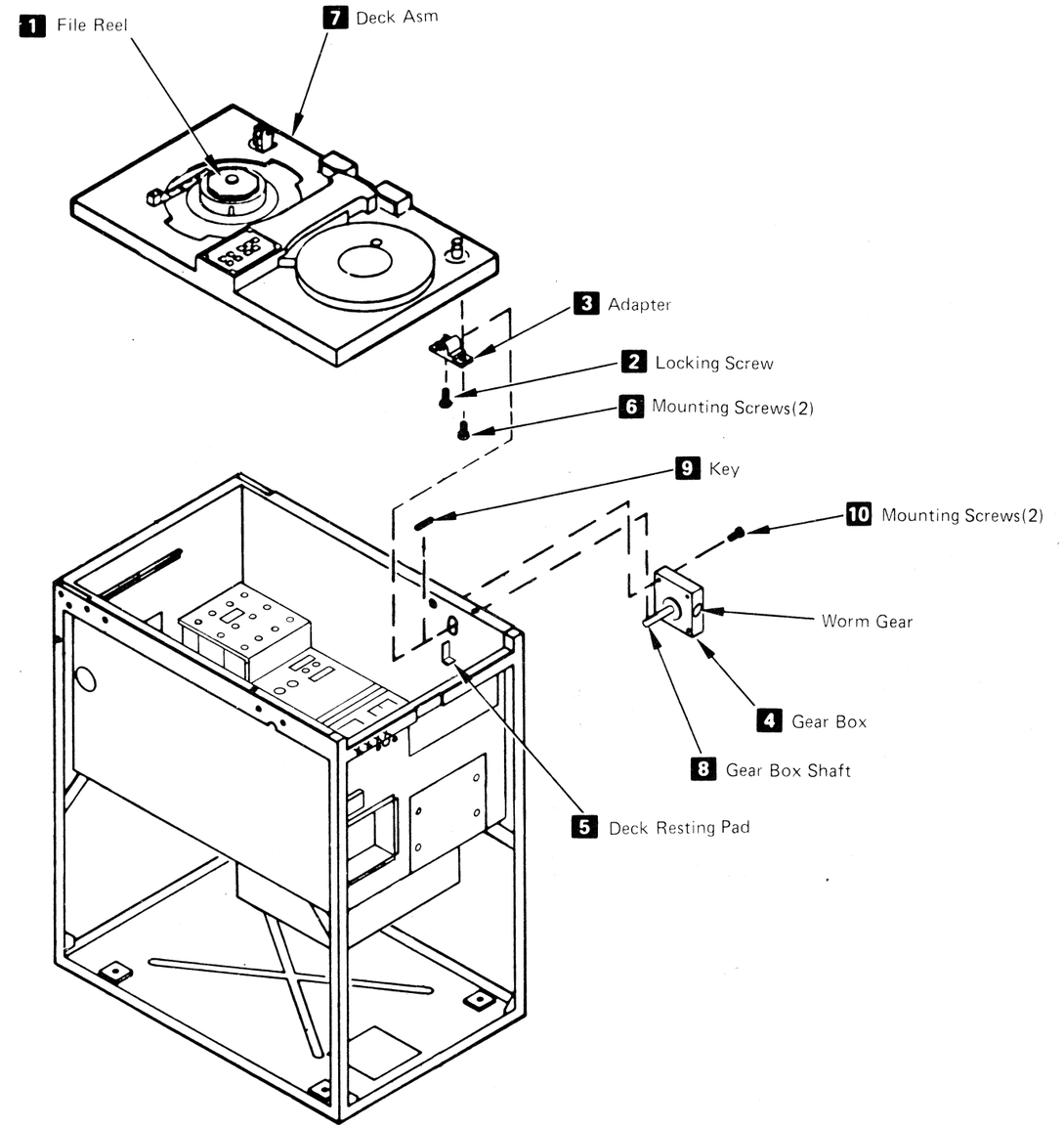
REMOVAL (A second CE may be required)

1. Raise the top cover and remove the front and rear covers.
2. Remove the right cover (see INST 20) or separate machines as necessary.
3. Crank deck 7 up to mechanical stop. If the deck will not raise, pull on the file reel 1 and, at the same time, push down on the front of the deck.
4. Place the CP1 to off.
5. Loosen shaft locking screw 2 on adapter 3.
6. Support the deck with your left hand under the deck (a second CE may be required to hold deck) and remove the two gear box mounting screws 10. Lower the deck to the pad 5.
7. Remove the two adapter mounting screws 6. Be careful not to drop the star washer off the bottom screw. Remove the ground strap from the mounting screw.

   Caution: Do not allow the deck to fall off the pad because the brake could be damaged.
8. Support and move the lower edge of the deck 7 toward the front of the machine until the adapter 3 can be slid off the shaft. Do not drop shaft key 9.
9. Continue to support the deck 7 and let the gear box shaft 8 down on the frame.
10. Continue to support the deck 7 and rotate the gear box 4 90 degrees counterclockwise, then lower the gear box 4 down and out.
11. Set the deck 7 back on pad 5.

REPLACEMENT

1. Crank the replacement gear box until the key lines up with the adapter when mounted on the deck.
2. Support the deck 7 and bring it forward. With the gear in the gear box up (not the worm gear), put the gear box 4 in the side-frame hole and rotate the gear box 90 degrees clockwise to position it.
3. Support the deck 7 and slide the adapter over the gear box shaft 8 with the lock screw at the top.
4. Let the deck rest on the pad 5.



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DECK BRAKE REMOVAL AND REPLACEMENT

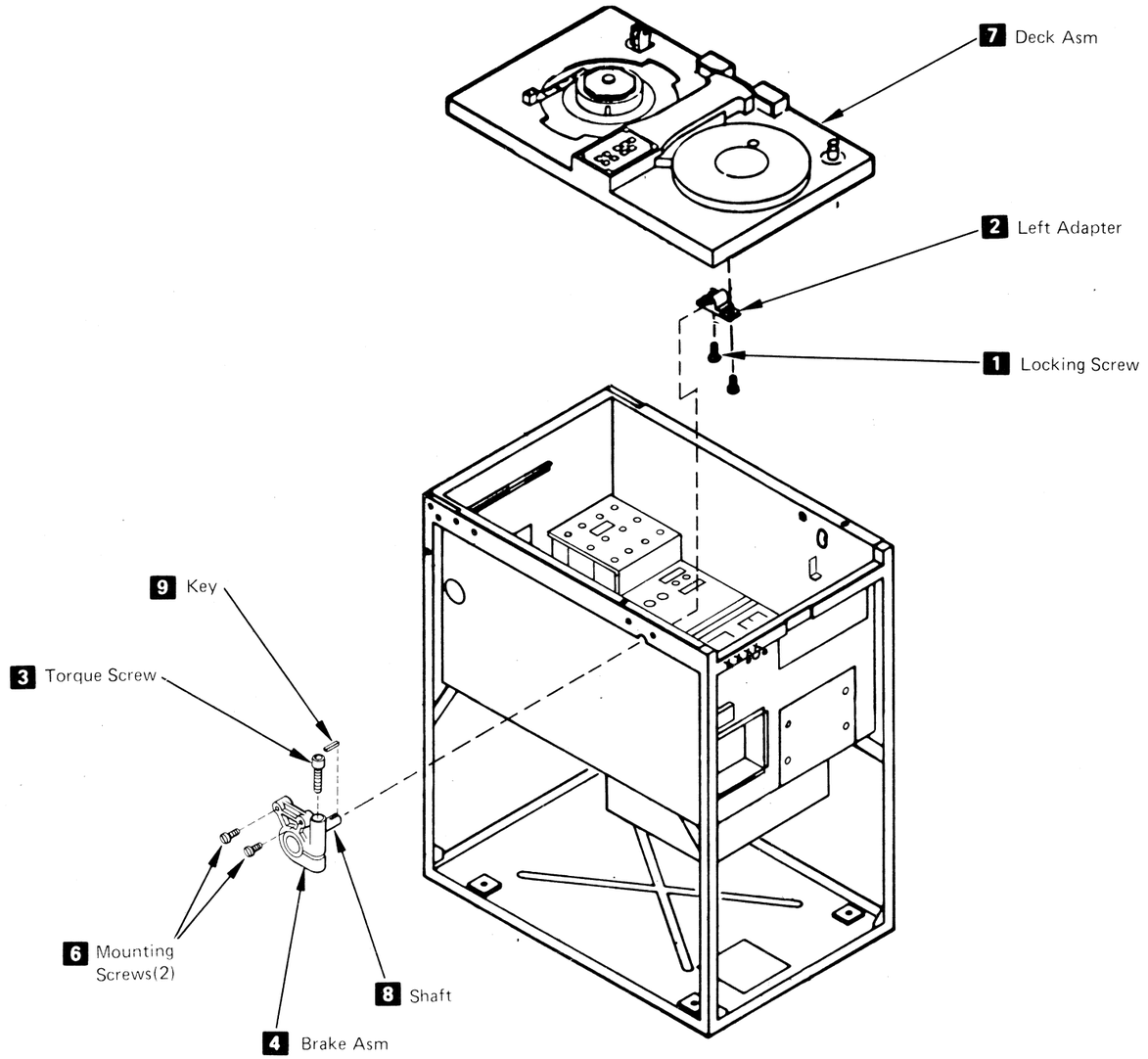
REMOVAL (A second CE may be required)

1. Lift the top cover and remove the front and rear covers.
2. Remove the left side cover (see INST 20) on Model 1A or 1B, or separate the machines on Model 2 or 3.
3. Crank the deck up to mechanical stop.
4. Place the CP1 to off.
5. Loosen the shaft locking screw **1** on the left adapter **2**.
6. Loosen the torque allen-head screw **3** in the brake assembly **4** through the hole in top of the frame **5** with an M6 allen wrench.
7. Support the deck (a second CE may be required to hold deck) and remove the two brake assembly mounting screws **6**. Permit the deck assembly **7** to rest against the right-side frame.
8. Rotate the brake assembly **4** approximately 180 degrees and remove.
9. Remove the brake assembly shaft **8** using care not to drop the shaft key **9**.

REPLACEMENT

1. Loosen the torque allen-head screw **3** on the replacement brake assembly.
2. Align the shaft key **9** and insert the shaft **8** in the left adapter **2**.
3. Install the brake assembly **4** on shaft **8** with the word "lock" stamped on the race on the inside and the torque screw **3** to the front.
4. Align the brake assembly **4** to the frame mounting holes **10** and install the mounting screws **6** loosely.
5. Pull the deck assembly **7** forward and tighten the brake assembly mounting screws **6**.
6. Push the shaft **8** in to the stop.
7. Tighten the locking screw **1**.
8. Tighten the torque screw **3** until it is finger tight, then tighten it further by rotating the allen wrench another 180 degrees.

Caution: Do not over-tighten the torque screw — the brake assembly could be damaged.



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CONTENTS

POWER SUPPLY CONNECTOR PINS AND VOLTAGES

This section identifies the power supply connectors, shows them, and lists the voltages present when the tape unit has power on.

All connectors shown are viewed from the wiring (probe) side of the connector.

Connector J12
Power Supply to SSCF 7

Connector J12		
Pin	**Voltage**	**To**
1	+5 Vdc to SSCF	J18-B02, J18-D03
2	–Power On SSCF	J18-D04
3	+5 Vdc to SSCF	J18-D07, J18-B08
4	+5 Vdc to SSCF	J18-B05
5	+5 Vdc to SSCF	J18-B12, J18-D13
6	+5vdc to SSCF CTNL	J18-D05

Connectors J43 1 and J44
Transformer 60 Hz Logic Fan

Connector J43 and J44*		
Pin	**Voltage**	**To**
1	AC Primary Voltage	Logic Fan
2	AC Ground	Logic Fan
3	AC Primary Voltage	Logic Fan
* J44 goes to Model 2 Logic Fan		

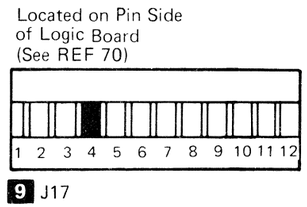
See INST 40 for location of J44.

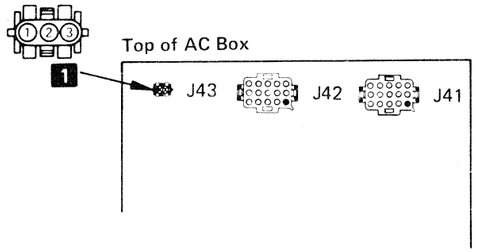
Connector J17 9
Power Distribution

Connector J17		
Pin	**Voltage**	**To**
1	+5 V	J8-S06
2	+Power On Reset	J8-S11
3	Fault	J8-U11
4	--	--
5	+Power On Out Ground	J45-1
6	+Power On In Ground	J45-1
7	–Power On Pushbutton Ground	J45-11
8	–Power Off Pushbutton Ground	J45-11
9	+Power On Out	J45-5
10	+Power On In	J45-8
11	–Power On Pushbutton	J45-9
12	–Power Off Pushbutton	J45-12

Connectors J45 and J46 5 6

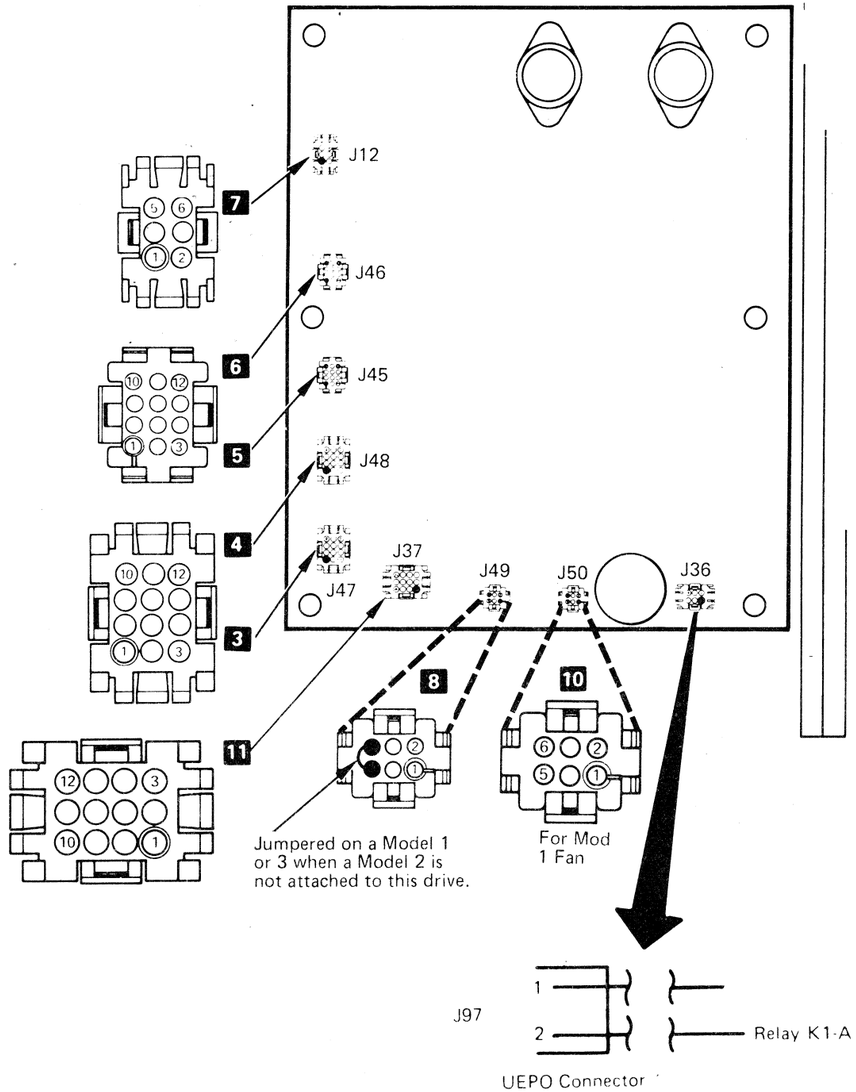
Connector J45 and J46 *		
Pin	**Voltage**	**To**
1	Ground	--
2	–5 Vdc to Read Card	J7S06
3	–5 Vdc to Logic Board	B5E01
4	–5 Vdc to Power Amplifier	J5-4
5	+Power On Out	J17-5
6	--	--
7	–5 Vdc to Logic Board	B3E01
8	+Power On In	J45-5
9	–Power On Pushbutton	
10	–Power On Reset to Pwr Amp	J5-5
11	–DC Return	Heat Sink
12	Power Off Pushbutton	--
*J45 is the DC Distribution Cable in the Model 1 and J46 is the DC Extension Cable to the Model 2.		





Connector J37 11

Connector Connector J37*		
Pin	**Voltage**	**From**
1	–24 V Supply 1	Fuse 7
2	+5 V Supply 1	CP2
3	+5 V Supply 2	CP2
4	+24 V Supply 1	Fuse 4
5	–24 V Supply 2	Fuse 7
6	+8.5 V	Fuse 6
7	Logic Routine Ground	Heat Sink G7
8	+24 V Supply 2	Fuse 4
9	--	--
10	–5 V	Fuse 3
11	--	--
12	--	--
*J37 is the DC Distribution Cable to the Power Control Card.		



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POWER SUPPLY CONNECTOR PINS AND VOLTAGES (Continued)

Connector J47 and J48 3 4 (REF 10)

Connector J47 and J48*			
Pin	Voltage	To Logic Board	Voltage Tolerances
1	+5 Vdc	B3A01	+4.5 to +5.5
2	+5 Vdc	B4A01	
3	+5 Vdc	B5A01	
4	+5 Vdc	J3A01	
5	+5 Vdc	J5A01	
6	+5 Vdc	J9-1, J5-6	
7	+5 Vdc	J7S03	
8	+5 Vdc	J8S03	
9	−24 Vdc	J5-7	See Note
10	+8.5 Vdc	J8S09	+7.65 to +9.35
11	+8.5 Vdc	B2A14 and B4A14	
12	+24 Vdc	J5-1	See Note
*J47 is the DC Distribution Cable in a Model 1 and J48 is the DC Extension Cable to a Model 2.			

Note: *When the tape unit is loaded and tape tension established, the voltage tolerance is ±10%. When the tape unit is not loaded, the voltage tolerance is ±20%.*

Connector J49 and J50 8 10 (REF 10)

Pin	Power Control Card	To Fan
1	--	--
2	−5V	White
3	--	--
4	+Fan Pulse	Red
5	Ground	Black
6	−Fan Bypass	--

DLS INLINE PROGRAM OPERATING INSTRUCTIONS

Diagnostic Linked Series (DLS) Inline Tests and Special Requirement Diagnostics

The Diagnostic Linked Series (DLS) inlines and Special Requirement Diagnostics programs consist of host-system operated routines that identify 8809 failures. This page tells you how to operate the DLS and Special Requirement Diagnostics programs.

Note: *Before running the DLS or Special Requirement Diagnostics read the following.*

- Only one device and its controller can be tested at a time.
- The device to be tested cannot be used by the customer and must be taken out of the operating system by respective control statements. (Vary the device offline if you want to run concurrent with customer jobs). If the customer program tries to access this device, the command is terminated and 'Intervention Required' is indicated.
- DLS routines consist of several tests, that run sequentially beginning with routine 40.
- Special Requirement Diagnostics programs are run only one at a time.
- Various run and control modes for execution can be selected, as directed by the MAPs.

Caution: Load a known good scratch tape with a write enable ring installed or other tapes as required by the Special Requirement Diagnostics program.

Note: *Numbers, for example* **7**, *are described below frame 4 on the next page.*

Prequisites

1. Control diskettes inserted. (4331)
2. Power on complete. (4331)
3. Initial machine load (IML) completed. (4331)
4. Customer tape job to drive under test must be terminated.

Note: *DLS and Special Requirement Diagnostics programs can be initiated from the operator console only.*

5. Drive ready and at load point! (8809)

Frame **1**

IBM MAINTENANCE AND SERVICE PROGRAM SELECTION

LOG	TEST	TOOL
0 =	5 =	B =
1 =	6 =	C =
2 =	7 =	– =
3 =	8 = DISK/TAPE Inline	– =
4 =	9 =	F =
	A =	

SELECTION : 8 — = NOT AVAILABLE

MAN VSC TIMER : OFF DATA : 0000 ADDR : 000000

0801 TOD : SEC CA ANSWER

Frame **2**

DISK AND TAPE INLINE TEST SELECTION

1 = 2 = 3 = } **5** See Notes on facing page

8 = 8809 9 = 0 = } **5** See Notes on facing page

ENTER DEVICE TYPE (T) AND (I/O) ADDRESS (CUU)
TCUU

SELECTION : 883XX
6

1MB RSC TIMER : OFF DATA : ADDR :
TOD : SEC

CA ANSWER

Frame **3**

8809 ROUTINE SELECTION

DIAGNOSTIC LINKED SERIES (DLS) SPECIAL REQUIREMENT DIAGNOSTICS

40 = Interface
⋮
56 = Data Sec **7**

5A = Test Pattern Tape Part 1
⋮
6D Parity Track Exerciser

SELECTION : 883XX40
8

1MB RSC TIMER : OFF DATA : ADDR :
TOD : SEC

13 CA ANSWER

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Select Inline Tests

1. Press down together the ALT key and the DIAG key to display MAINTENANCE AND SERVICE PROGRAM SELECTION, frame **1**.
2. Select the DISK/TAPE INLINE test 8, then press ENTER to display DISK AND TAPE INLINE TEST SELECTION, frame **2**.
3. Select the device type 8 and enter the device address **6**, frame 2. Press enter to display 8809 ROUTINE SELECTION, frame 2.
4. Enter routine 40 **8** for DLS or 5A thru 6D (frame 3) for Special Requirement Diagnostics and press enter.
5. Wait for message in status field **13**, line 23: 8809 CA ANSWER XXXXXXXX, frame 3.
6. Press CHG DPLY (change display) to display DISK/TAPE INLINE RUN/CONTROL OPTIONS, frame **4**. Then go to step 7.
7. To start inline routines:

   Caution: Do not press START at the keyboard when DLS is running 'standalone'.

   Press ENTER to run the selected inline routine.

   Note: *The inline tests can be stopped and started by pressing ENTER when control option 00 is selected.*
8. Press CHG DPLY to return to customer screen for concurrent operation. Lines 1 through 20 of the screen are now available for the customer.

   Caution: If an error is encountered while running DLS, DLS may be restarted from the beginning by entering 40 on the Run/Control Option Screen and press ENTER.

Note: *Status field* **13**, *line 23, frame 4 will indicate either LOADING, when a diagnostic routine is loading, or RUNNING, when the diagnostic routine is executing.*

To Terminate Inline Routines and Return Drive to Customer:

1. Enter 00 to stop routines.
2. Press ENTER.
3. Enter control option 30 in the SELECTION field **12** (frame **4**).
4. Press ENTER.

Note: *If option 30 fails to terminate the routine, customer programs must be terminated. Then press MODE SELECT and perform a System Reset Program.*

DLS INLINE PROGRAM OPERATING INSTRUCTIONS (Continued)

Execution of Routines

If the execution of a routine(s) is not stopped by pressing ENTER, the routine(s) are executed according to the run option selected.

Running Time (Approx. 5 minutes)

If the routine is started with control option 00 (default) the DLS run until the first error is detected or until one pass is completed. Line 23 = 8809 CF stopped D0560080.

Execution is stopped automatically after the last routine. Then another routine can be started, or other procedure effected as directed by MAPs. If an error is encountered during execution, an isolation code is generated in the status field 13. Line 23 = 8809 E1 error D8XXXXXX.

Caution: Abnormal conditions during execution of DLS cannot always be recovered automatically. In such instances, follow the operator message and the isolation code displayed on the screen. Refer to Disk/Tape Inline Test, –General in the DIA (Diagnostic Run Procedure) section located in Volume 13 of the 4331 MIM.

Change Run Option

1. Enter the ID 9 of the required run option, by overwriting 00 12 in SELECTION.
2. Press ENTER. The selected run option is then displayed in the run option field 14, and 00 is again displayed in SELECTION 12.

Change Control Option

1. Press ENTER to stop DLS if not already stopped.
2. Enter control options and parameters as directed by MAPs.

Change I/O Address

1. Key in '00' in selection field 12 and press ENTER to stop execution of routine.
2. Key in control option '31' in selection field.
3. Press ENTER.
4. Key in the channel address, format 'OC'; 'C' is the channel number, in selection field.

Example: 8809 is 03.

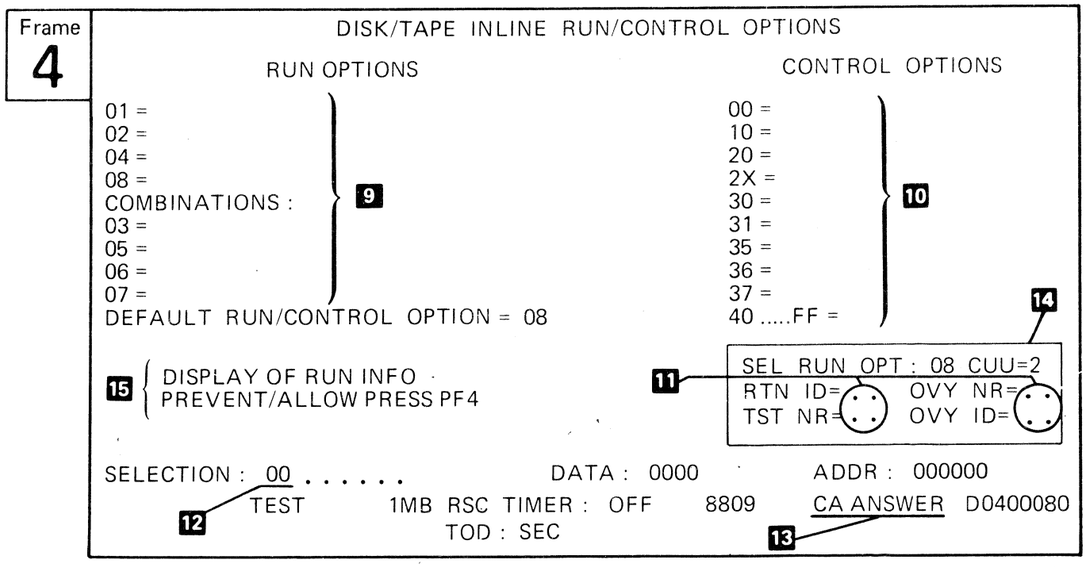
5. Press ENTER.
6. Key in the control unit and device address, format UU.

   Control Unit Address
   Device Address

   Example: 8809=01
7. Press ENTER.

   The status field 13 then shows: 8809 CE ANSWER DO XXXX 80 indicating the I/O address is accepted.
8. Key in the routine identifier of the desired routine and then press ENTER.

   Example: 40 to run tests 40 through 56.



Notes:

5 *Machine types to which inline tests apply.*

6 *Field in which to enter machine type. Take from 5 and DEVICE ADDRESS CUU.*

Example: Type = 8
CUU = 3XX (for example)
SELECTION = 883XX

7 *Available inline routines for selected I/O.*

8 *Enter field for the routine ID presented in 7.*

9 *Table of all run options.*

''Disk/Tape Inline Test,-General'' in the DIAGN (Diagnostic Run Procedure) section located in Volume 13 of the 4331 MIM.

10 *Table of all control options.*

11 *To display, press ALT and PF4.*

12 *Enter field for run and control options. Normally the selected control option (for example, 00) is displayed here.*

13 *Status field.*

14 *Run parameter field. The circled parameters are displayed from the program. The other parameters had to be entered before and can also be altered during inline selection.*

15 *Display of run information or error byte field.*

SPECIAL TOOLS

GENERAL

This page lists the special tools needed to service the 8809. They are not supplied in the basic CE tool kit and must be obtained through the local branch office.

Tool	Part Number
Skew adjustment card	8492415
Master skew tape	432641
Test pattern tape	4297736
Logic card extractor	2360375
Logic card extractor (no extender needed)	1310707
General logic probe (located in the CE tool kit)	453212
Logic probe extender cable	453605
Oscilloscope, Tektronix 454A, 475, or equivalent (located at branch office)	
Board wire add/delete tool (located at branch office)	
Scratch tape	2742516
Silicone paste	2517837
Adhesive	2337619

DIAGNOSTIC LINKED SERIES INLINES (DLS) ROUTINE DESCRIPTIONS (4300)

ROUTINE 40

Name: Control Line Diagnostic Routine

Description:

This test is used to test basic selection, the proper sequence of the control lines, and the Read Control command.

ROUTINE 42

Name: Check Byte Diagnostic Routine

Description:

This routine issues a Check Reset command to the tape unit. Sense bytes 8 through 23 are then read and checked for the expected value.

ROUTINE 43

Name: Loop Write-to-Read Diagnostic Routine

Description:

This routine tests the data path through the magnetic tape unit. Several data patterns and record sizes are used in this test. The records and data patterns are constructed from the following hexadecimal patterns:

1. X'FF FF FF FF FF FF FF FF'
2. X'88 44 22 11 88 44 22 11'
3. X'BB 77 EE DD BB 77 EE DD'
4. X'BC FF 43 00 34 FF BC 00'
5. X'08 08 08 08 08 08 08 08'

Data patterns within a record are the same.

ROUTINE 44

Name: Poll Test Routine

Description:

In this routine, the tape unit is selected, reset, and deselected. A Poll Controller command is issued and no response is expected. Then the unit is selected, rewound, deselected, and polled again. The responses to the Poll Controller, Op Complete (sense byte 8 bit 5), and Busy (sense byte 8 bit 1) are checked. A reset is then issued and Op Complete checked again. The unit is then selected, rewound, and a Poll Controller command is issued with Bus Out equal to X'10', which suppresses the poll response. The unit is then selected, reset, and deselected again.

ROUTINE 46

Name: Low Speed Routine

Description:

This routine tests forward and backward motion of the tape in low-speed mode. The tape unit is issued a Select Device command, a Check Reset command, and then a Set Low Speed command. The Erase Gap command is issued 37 times, which results in the movement of approximately 155 inches of tape across the head. A Rewind command is then issued.

ROUTINE 47

Name: Write/Read PEID Routine

Description:

A tape with no PEID burst is read, and the sense data is then checked for correct error indications. Correct writing of the PEID burst is also checked.

ROUTINE 48

Name: 12.5 IPS Write/Read Diagnostic Routine

Description:

Five records are written and read back. The data patterns used are:

1. X'FFFFFFFFFFFFFFFF'
2. X'8844221188442211'
3. X'BB77EEDDBB77EEDD'
4. X'BCFF430034FFBC00'
5. X'0808080808080808'

Writing and reading is continuous and no repositioning is expected. If this is not the case, the isolation code generated may be incorrect.

ROUTINE 49

Name: Dual Gap Diagnostic Routine

Description:

This test verifies that short gaps of 15.24 mm (0.6 inch) and long gaps of 30.48 mm (1.2 inches) can be written and long gap mode can be reset.

ROUTINE 4A

Name: Backward Creep Diagnostic Routine

Description:

This routine determines if a Backspace Block/Write Block command sequence destroys data in the record preceding the one being written. Backward creep occurs if, during repetitive Backspace Block commands, the tape moves close to or overlaps the preceding record.

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DIAGNOSTIC LINKED SERIES INLINES (DLS) ROUTINE DESCRIPTIONS (4300) (Continued)

ROUTINE 4C

Name: High Speed Diagnostic Routine

Description:

This routine determines if the tape unit can be set to high-speed mode and then reset to low-speed mode.

ROUTINE 4D

Name: Reposition Diagnostic Routine

Description:

This routine determines if the tape is being positioned correctly during write commands when system delays cause repositioning.

ROUTINE 4E

Name: Write Tape Mark Diagnostic Routine

Description:

In this routine, tape is rewound and a tape mark (TM) is written. The tape is then moved back and forth, and correct TM detection and sense indication is verified.

ROUTINE 4F

Name: High Speed Write Routine

Description:

In this routine, stress data patterns are written on tape and then read-back checked at 100 ips. The data patterns are:

1. X'FFFFFFFFFFFFFFFF'
2. X'8844221188442211'
3. X'BB77EEDDBB77EEDD'
4. X'BCFF430034FFBC00'
5. X'0808080808080808'

ROUTINE 52

Name: Erase Gap Diagnostic Routine

Description:

In this routine, a file containing a tape mark and six 4K-byte (4096) data records is written. The tape is positioned at the beginning of the file, and five Erase Gap (ERG) commands are issued. A Backspace Block command, followed by a Read Block command, is then issued to verify that the operation was successful and properly sensed.

ROUTINE 53

Name: Write High Speed/Read Low Speed Diagnostic Routine

Description:

In this routine, stress data patterns are written at 100 ips and read at 12.5 ips. The data read is compared to the data expected to verify the data handling capabilities of the tape unit. The data patterns are:

1. X'FFFFFFFFFFFFFFFF'
2. X'8844221188442211'
3. X'BB77EEDDBB77EEDD'
4. X'BCFF430034FFBC00'
5. X'0808080808080808'

ROUTINE 54

Name: Read High Speed Diagnostic Routine

Description:

In this routine, the stress data patterns written by routine 53 are read in both directions at 100 ips. The data is compared to the expected data to verify the data handling capability of the tape unit. The data patterns are:

1. X'FFFFFFFFFFFFFFFF'
2. X'8844221188442211'
3. X'BB77EEDDBB77EEDD'
4. X'BCFF430034FFBC00'
5. X'0808080808080808'

ROUTINE 55

Name: Magnetized Head Diagnostic Routine

Description:

This routine checks for the possible magnetization of the read/write head and the cleaner blade. If the read/write head is magnetized, the test will end without a Normal End control line.

ROUTINE 56

Name: Data Security Erase Diagnostic Routine

Description:

This routine verifies that the Data Security Erase command erases tape properly.

SPECIAL REQUIREMENT DIAGNOSTIC ROUTINE DESCRIPTIONS (4300)

ROUTINE 5A

Name: Read Test Pattern Tape (Part 1)

See Note.

Description:

This routine tests several recognition and correction functions of the tape unit. Included are:

Tape Mark (TM) Recognition: tests TM recognition with two different TM patterns.

Beginning of Record (BOR) Detection/Recognition: tests BOR detection logic for non-BOR data patterns and for valid BOR data patterns.

Interblock Gap (IBG) Recognition: tests the IBG decode logic for tracks equal-to-1 and for correct decode operation.

Crease Detection: tests for correct operation of the crease logic and correct operation of a positioning to the IBG.

Multi-track error (MTE): tests logic for track in error (TIE) identification and MTE signaling.

Forced End Data Check: checks end data check P code with false end-of-data pattern.

Skew correction: checks the skew buffer with records containing data skewed from one bit period to five periods.

Note: *A test pattern tape is required for this test. See INST 10 for the part number.*

ROUTINE 5B

Name: Read Test Pattern Tape (Part 2)

See Note.

Description:

This routine tests the ability of the tape unit to read records of varying size and complexity. The data patterns are:

1. X'FF'
2. X'88442211'
3. X'BB77EEDD'
4. X'BCFF430034FFBC00'
5. X'08'
6. X'00000000000000FF'
7. X'FFFFFFFFFFFFFF00'
8. X'FFFFFF...(256 bytes total)'
9. X'88442211...(256 bytes total)'
10. X'BB77EEDD...(256 bytes total)'
11. X'BCFF430034FFBC00...(256 bytes total)'
12. X'08...(256 bytes total)'
13. X'00000000000000FF...(256 bytes total)'
14. X'FFFFFFFFFFFFFF00...(256 bytes total)'

Performing Read Block operations over the three tape marks, written on the tape after the test patterns, should cause Check End control line and Tape Mark Detected (sense byte 10 bit 5) to equal one for each read operation.

ROUTINE 60

Name: Write Reliability Diagnostic Routine

Description:

This routine writes a series of 14 records at both low and high speeds. A check for Normal End is made after each write operation.

1. X'FFFFFFFFFFFFFFFF'
2. X'00...(62 bytes of FF)...00'
   Pattern repeats, 4032 bytes total
3. X'FF...(62 bytes of 00)...FF'
   Pattern repeats, 4032 bytes total
4. X'11...(62 bytes of 00)...11'
   Pattern repeats, 4032 bytes total
5. X'22...(62 bytes of 00)...22'
   Pattern repeats, 4032 bytes total
6. X'44...(62 bytes of 00)...44'
   Pattern repeats, 4032 bytes total
7. X'88...(62 bytes of 00)...88'
   Pattern repeats, 4032 bytes total
8. X'11FF...(27 bytes of 00FF)...
   FF00FF00FF00FF11'
9. X'22FF...(27 bytes of 00FF)...
   FF00FF00FF00FF22'
10. X'44FF...(27 bytes of 00FF)...
    FF00FF00FF00FF44'
11. X'88FF...(27 bytes of 00FF)...
    FF00FF00FF00FF88'
12. X'88442211'
    Pattern repeats, 4000 bytes total
13. X'BB77EEDD'
    Pattern repeats, 4000 bytes total
14. X'BCFF430034FFBC00'
    Pattern repeats, 4000 bytes total

SPECIAL REQUIREMENT DIAGNOSTIC ROUTINE DESCRIPTIONS (4300) (Continued)

ROUTINE 61

Name: Read Reliability Diagnostic Routine

Description:

This routine reads the 28 records that were written by Write Reliability diagnostic routine 60. The records are read in forward and backward directions. The data is compared with the expected patterns to make sure the data was read correctly.

ROUTINE 62

Name: Control Line Exerciser Diagnostic Routine

Description:

In this routine, a series of instructions is issued to check the control lines. A timeout is expected after each instruction. The routine then tests the next control line. Bus In parity, addresses, or Selected Alert conditions are not checked. System "waits" for expected control sequences are not allowed. An unconditional error exit is made at the end of the routine to allow the routine to loop.

ROUTINE 63

Name: Load, Rewind, Ready Analysis Routine

Description:

This routine analyzes load, rewind, and ready problems on the tape unit. With the tape unit in a failing condition, the sense data is analyzed to determine the failure. This diagnostic routine must be used with MAP 4010.

ROUTINE 64

Name: Command Reinstruct Timing Routine (Short Gap)

Description:

This routine requires the dedicated use of the system. If the system interrupts this routine, the results are incorrect. This routine checks the command reinstruct functions in the tape unit in the high speed and short gap modes. The tape unit writes continuously at high speed. If repositioning occurs, it indicates that the system is not issuing commands fast enough or the tape unit is not accepting commands fast enough to keep the tape unit in motion.

This routine will run to the End-of-Tape (EOT) mark unless it is manually interrupted. To stop the routine before it reaches the EOT, first enter run option '00' (stop routine), then reset the tape unit under test. This causes a normal routine stop.

ROUTINE 65

Name: Command Reinstruct Timing Routine (Long Gap)

Description:

The routine requires the dedicated use of the system. If the system interrupts this routine, the results are incorrect. This routine checks the tape unit command reinstruct functions in the high speed and long gap modes. The tape unit should write continuously at high speed. If repositioning occurs, it indicates that the system is not issuing commands fast enough or the tape unit is not accepting commands fast enough to keep the tape unit in motion.

This routine will run to the End-of-Tape (EOT) mark unless it is manually interrupted. To stop the routine before it reaches the EOT, first enter run option '00' (stop routine), then reset the tape unit under test. This causes a normal routine stop.

ROUTINE 66

Name: Read Continuous Routine (High Speed)

Description:

In this routine, the tape unit reads continuously at high speed. If repositioning occurs, it indicates that the system is not issuing commands fast enough or the tape unit is not accepting commands fast enough to keep the tape unit in motion.

This routine runs to the End-of-Tape (EOT) mark unless manually interrupted. To stop the routine before it reaches the EOT, enter run option '00' (stop routine), then reset the tape unit under test. This causes a normal routine stop.

ROUTINE 67

Name: IBG Measurement Diagnostic Routine

Description:

This routine verifies proper length of the interblock gap (IBG). The routine operates in short gap mode only. This routine requires the dedicated use of the system. If the system interrupts this routine, the results are incorrect.

SPECIAL REQUIREMENT DIAGNOSTIC PROGRAMS

DESCRIPTION

The Special Requirement Diagnostic programs are used on the 8809 during installation and when troubleshooting. Some of the routines are time-dependent or need a special tape to be mounted. In some cases, a dedicated system is needed to run these routines. A dedicated system means that no other jobs or programs can run while the Special Requirement Diagnostic programs are processing.

For operation of these routines, see REF 20.

Routine Number	Routine Description	Special Tape	Run Sequence	Dedicated System	Map Reference	Linked to Other Test	CE Actions
5A	Tests the read functions of the 8809 by reading a test pattern tape.	Test pattern tape	Run Routine 5A before 5B	No	2135 2137 2150 2100 0520	No	As instructed by the MAPs
5B	Tests the read function of the 8809 by reading a test pattern tape.	Test pattern tape	Routine 5A must be run first	No	2135 2137 2140 2150 2100 0520	No	As instructed by the MAPs
60	Tests the write reliability of the 8809 by writing on tape and reading data back.	Scratch tape with the write enable ring installed	Run the DLS routines error free first	No	0300	No	As instructed by the MAPs
61	Tests the read reliability of the 8809 by reading data written in routine 60.	Scratch tape containing routine 60 data present	Routine 60 must be run first	No	0300	No	As instructed by the MAPs
62	Performs a variety of commands that include: Select Check Reset, Diagnostic Bus In, and Backspace Block. All control lines except Check End are used.	No	No	Yes	0502 0503 0504 0507	No	The tape must be rewound to load point. The routine must be run in loop on bypass error mode.
63	Isolates load, rewind, and ready failures when they occur on the tape unit.	Scratch tape with the write enable ring installed	No	No	4010	No	As instructed by MAP 4010
64	Checks the command reinstruct timing function in the tape unit while it is writing in the high speed and short gap mode.	Scratch tape with the write enable ring installed	Run the DLS routines error-free first	Yes	See Note	No	Observe the tape to see if is repositioning. If it does occur, the system is not sending commands fast enough, or the 8809 is not repositioning the tape correctly. This routine runs continuously unless interrupted by errors, manual intervention, or end of tape. To stop the routine before end of tape, enter run option X'00' and then reset the 8809.
65	Checks the command reinstruct timing function while it is writing in the high speed and long gap mode.	Scratch tape with the write enable ring installed	Run the DLS routines error-free first	Yes	See Note	No	Observe the tape to see if is repositioning. If it does occur, the system is not sending commands fast enough, or the 8809 is not repositioning the tape correctly. This routine runs continuously unless interrupted by errors, manual intervention, or end of tape. To stop the routine before end of tape, enter run option X'00' and then reset the 8809.
66	Checks the tape unit command reinstruct timing function while it is reading in the high speed mode.	Use a tape written by routine 64 or 65	Run the DLS routines error free first and run routine 64 or 65 prior to running 66	Yes	See Note	No	Observe the tape to see if it is repositioning. If it does occur, the system is not issuing commands fast enough, or the 8809 is not repositioning the tape correctly. This routine runs continuously unless interrupted by errors, manual intervention, or end of tape. To stop the routine before end of tape, enter run option X'00' and then reset the 8809.
67	This routine verifies the IBG length while the 8809 is in the short gap mode.	Scratch tape with the write enable ring installed	Run the DLS routines error-free first	Yes	0200	No	Use the isolation code in the FCD and follow the instructions in the MAP.
6A	Returns the tape unit to normal operation.		No	No	0300	No	Run this routine during repair verification.
6B	Check byte display lists the 8809 sense bytes 8 to 23 from the most recent error.	No	No	No	0520	No	The sense data is displayed as message bytes. Sense bytes 8 to 15 are displayed after halt code 6B11. Message byte 2 is sense byte 8; Message Byte 3 is sense byte 9, and so on. To display the second 8 bytes stop routine and start again. Sense bytes 16 to 23 are displayed after halt code 6B12. This routine does stop for errors.
6C	The symptom code generator generates a symptom code from the most recent error.	No	No	No	0520	No	After a halt code 6C11, the high-order Symptom Code appears in Message Byte 2; the low-order Symptom Code in Message Byte 3. This routine does not stop for errors.
6D	Performs a Loop Write-to-Read of 5000 blocks of 32K bytes of X'00' to test the tape unit logic and to permit probing during PEID troubleshooting.	Scratch tape with the write enable ring installed	No	No	2060		As instructed by the MAPs. The tape does not move.

Note: *To be run only as directed by your next level of support.*

8809 ATTACHMENT TO THE 4331 PROCESSOR

This page shows the attachment of the 8809 to the 4331 Processor using up to six tape units.

There are 20 outbound lines from the 4331 to the 8809 and 15 inbound lines from the 8809 to the 4331.

Inbound/Outbound Line Schematic

For the names of the inbound/outbound lines, see the line name column in the tables on REF 51.

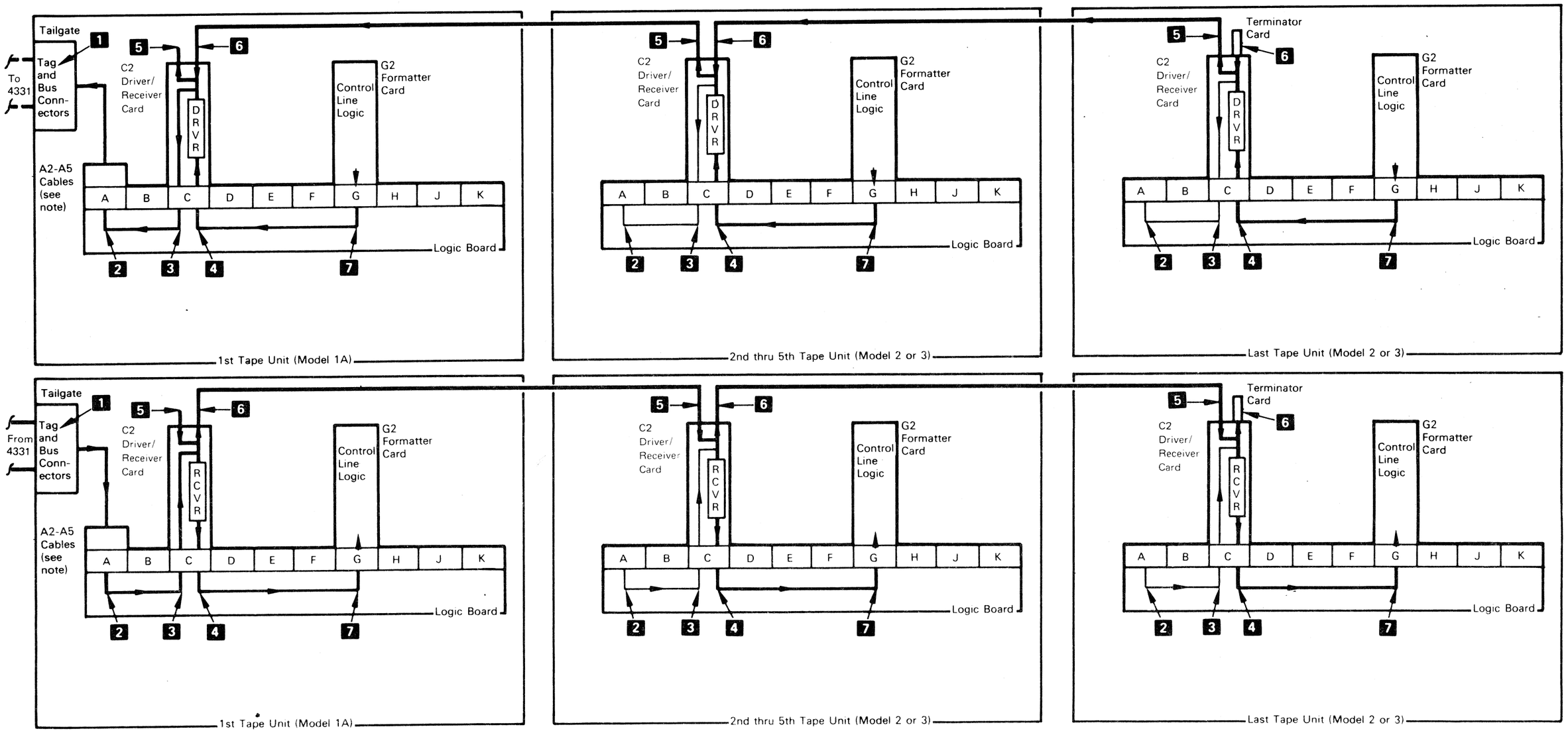
The number keys in the figures refer to the columns on the Inbound Lines and Outbound Lines tables on REF 51.

How to Use This Page

The MAP referred you to a key number on this page. Test point locations are found by matching the key on this page with the column key and line name in the tables on REF 51.

Cabling

For cable locations on a 4300 Processor, see the 4300 Supplement to MAPs (STM) 1070 (cable location) on the file-tape attachment. For diagnostic run procedures on the FTA 2 attachment, see STM section 4.



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8809 ATTACHMENT TO THE 4331 PROCESSOR (CONTINUED)

Use this page together with REF 50 to solve attachment problems.

How to Use This Page

Find the correct inbound line or outbound line column and name in the tables below to verify the correct connector or board location to be probed.

At the bottom of each column is a reference to a note giving the expected lamp status for the logic probe.

Refer to the figures on REF 50 to find the physical location to be probed.

INBOUND LINES (To 4331)

Inbound Line Name	1 Tail Gate Bus and Tag Connectors	2 A2–A5 Cables	3 A1C2 Driver/ Receiver Card Pins	4 A1C2 Driver/ Receiver Card Pins	5 Top Card Connector Positions W and X	6 Top Card Connector Positions Y and Z	7 Formatter on Board
Selected Alert	Tag–G08	A1A5–B08	A1C2–M13	A1C2–G12	A1C2–W25	A1C2–Y25	A1G2–G12
Sync In	Bus–J13	A1A3–D13	A1C2–M04	A1C2–G09	A1C2–W03	A1C2–Y03	A1G2–G09
Check End	Tag–J06	A1A5–B06	A1C2–M09	A1C2–J05	A1C2–W05	A1C2–Y05	A1G2–J05
Normal End	Tag–G05	A1A5–D05	A1C2–P09	A1C2–G05	A1C2–W24	A1C2–Y24	A1G2–G05
Select Active	Tag–G03	A1A5–D03	A1C2–P13	A1C2–G13	A1C2–W02	A1C2–Y02	A1G2–G13
Tag Valid	Tag–J04	A1A5–B04	A1C2–P05	A1C2–J06	A1C2–W22	A1C2–Y22	A1G2–J06
Bus In 0	Bus–J04	A1A3–B04	A1C2–M07	A1C2–J07	A1C2–W09	A1C2–Y09	A1G2–J07
Bus In 1	Bus–G05	A1A3–D05	A1C2–P04	A1C2–G10	A1C2–W29	A1C2–Y29	A1G2–G10
Bus In 2	Bus–J06	A1A3–B06	A1C2–P02	A1C2–G08	A1C2–W10	A1C2–Y10	A1G2–G08
Bus In 3	Bus–G08	A1A3–B08	A1C2–P06	A1C2–J11	A1C2–W30	A1C2–Y30	A1G2–J11
Bus In 4	Bus–J09	A1A3–D09	A1C2–M03	A1C2–J09	A1C2–W11	A1C2–Y11	A1G2–J09
Bus In 5	Bus–G10	A1A3–B10	A1C2–M05	A1C2–G07	A1C2–W07	A1C2–Y07	A1G2–G07
Bus In 6	Bus–J11	A1A3–D11	A1C2–M02	A1C2–J10	A1C2–W26	A1C2–Y26	A1C2–J10
Bus In 7	Bus–G12	A1A3–B12	A1C2–M12	A1C2–J12	A1C2–W06	A1C2–Y06	A1G2–J12
Bus In P	Bus–G03	A1A3–D03	A1C2–P12	A1C2–J13	A1C2–W28	A1C2–Y28	A1G2–J13
-	Note 1	Note 1	Note 1	Note 2	Note 1	Note 1	Note 2

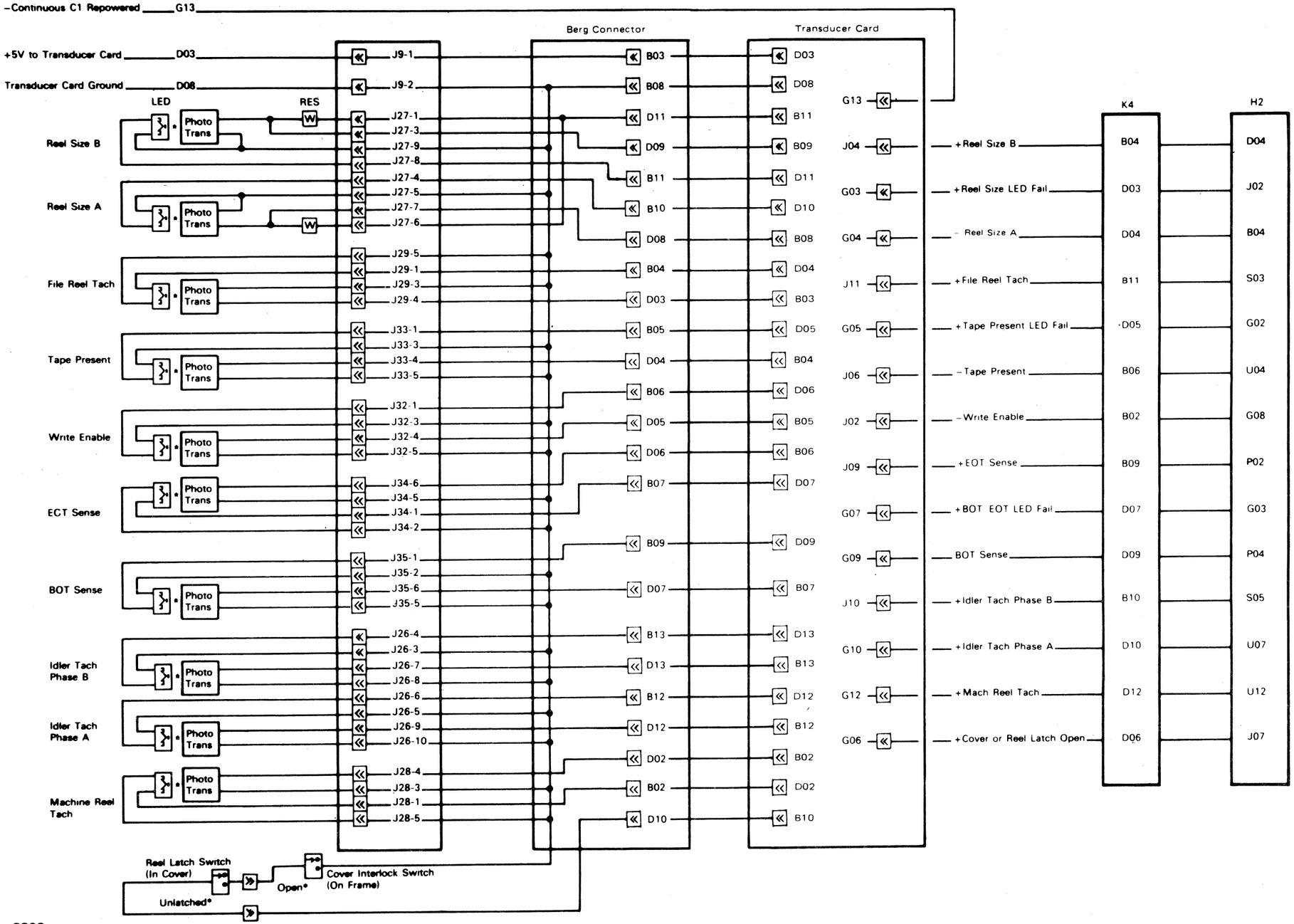
OUTBOUND LINES (From 4331)

Outbound Line Name	1 Tail Gate Bus and Tag Connectors	2 A2–A5 Cables	3 A1C2 Driver/ Receiver Card Pins	4 A1C2 Driver/ Receiver Card Pins	5 Top Card Connector Positions W and X	6 Top Card Connector Positions Y and Z	7 Formatter on Board
Recycle	Tag–D13	A1A4–D13	A1C2–U04	A1C2–B12	A1C2–X03	A1C2–Z03	A1G2–B12
Sync Out	Bus–D13	A1A2–D13	A1C2–M10	A1C2–D10	A1C2–W33	A1C2–Y33	A1G2–D10
Tag Gate	Tag–B10	A1A4–B10	A1C2–P11	A1C2–B09	A1C2–W13	A1C2–Y13	A1G2–B09
Select Hold	Tag–D11	A1A4–D11	A1C2–S02	A1C2–B05	A1C2–X22	A1C2–Z22	A1G2–B05
Response	Tag–B12	A1A4–B12	A1C2–P10	A1C2–B08	A1C2–W32	A1C2–Y32	A1G2–B08
Tag Bus 0	Tag–B03	A1A4–D03	A1C2–U02	A1C2–B13	A1C2–X02	A1C2–Z02	A1G2–B13
Tag Bus 4	Tag–B05	A1A4–D05	A1C2–S13	A1C2–D12	A1C2–X33	A1C2–Z33	A1G2–D12
Tag Bus 5	Tag–D04	A1A4–B04	A1C2–S07	A1C2–D13	A1C2–X06	A1C2–Z06	A1G2–D13
Tag Bus 6	Tag–B08	A1A4–B08	A1C2–S05	A1C2–B10	A1C2–X25	A1C2–Z25	A1G2–B10
Tag Bus 7	Tag–D06	A1A4–B06	A1C2–U05	A1C2–D09	A1C2–X05	A1C2–Z05	A1G2–D09
Tag Bus P	Tag–D09	A1A4–D09	A1C2–S04	A1C2–D02	A1C2–X24	A1C2–Z24	A1G2–D02
Bus Out 0	Bus–D04	A1A2–B04	A1C2–S09	A1C2–D07	A1C2–X09	A1C2–Z09	A1G2–D07
Bus Out 1	Bus–B05	A1A2–D05	A1C2–U09	A1C2–D04	A1C2–X29	A1C2–Z29	A1G2–D04
Bus Out 2	Bus–D06	A1A2–B06	A1C2–U10	A1C2–D06	A1C2–X10	A1C2–Z10	A1G2–D06
Bus Out 3	Bus–B08	A1A2–B08	A1C2–S10	A1C2–D05	A1C2–X30	A1C2–Z30	A1G2–D05
Bus Out 4	Bus–D09	A1A2–D09	A1C2–U11	A1C2–B03	A1C2–X11	A1C2–Z11	A1G2–B03
Bus Out 5	Bus–B10	A1A2–B10	A1C2–U06	A1C2–B02	A1C2–X26	A1C2–Z26	A1G2–B02
Bus Out 6	Bus–D11	A1A2–D11	A1C2–S12	A1C2–B07	A1C2–X32	A1C2–Z32	A1G2–B07
Bus Out 7	Bus–B12	A1A2–B12	A1C2–U13	A1C2–D11	A1C2–X13	A1C2–Z13	A1G2–D11
Bus Out P	Bus–B03	A1A2–D03	A1C2–S08	A1C2–B04	A1C2–X28	A1C2–Z28	A1G2–B04
-	Note 1	Note 1	Note 1	Note 2	Note 1	Note 1	Note 2

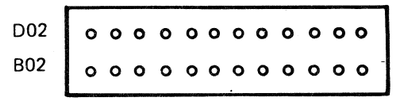
Notes:

1. *When the probe points in this column are active, the logic probe UP indicator is on.*
2. *When the probe points in this column are active, the logic probe DOWN indicator is on.*

TRANSDUCER CIRCUITS AND CONNECTORS



Transducer Card Socket



8809

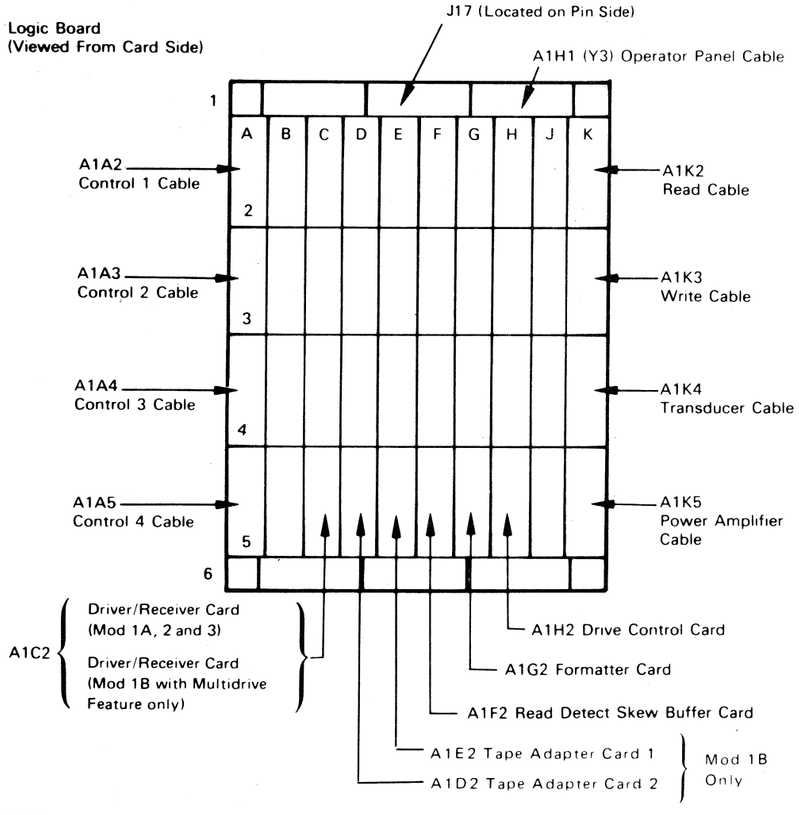
BE0500 Seq 2 of 2	2699285 Part Number	846318 15 Mar 79	846481 15 Dec 79	847323 1 Oct 80	847308 1 Aug 81			

DRIVE CONTROL CIRCUITS AND CONNECTORS

This page is referred to by the MAPs and should be used only with the MAPs for problem isolation.

PHYSICAL DESCRIPTION

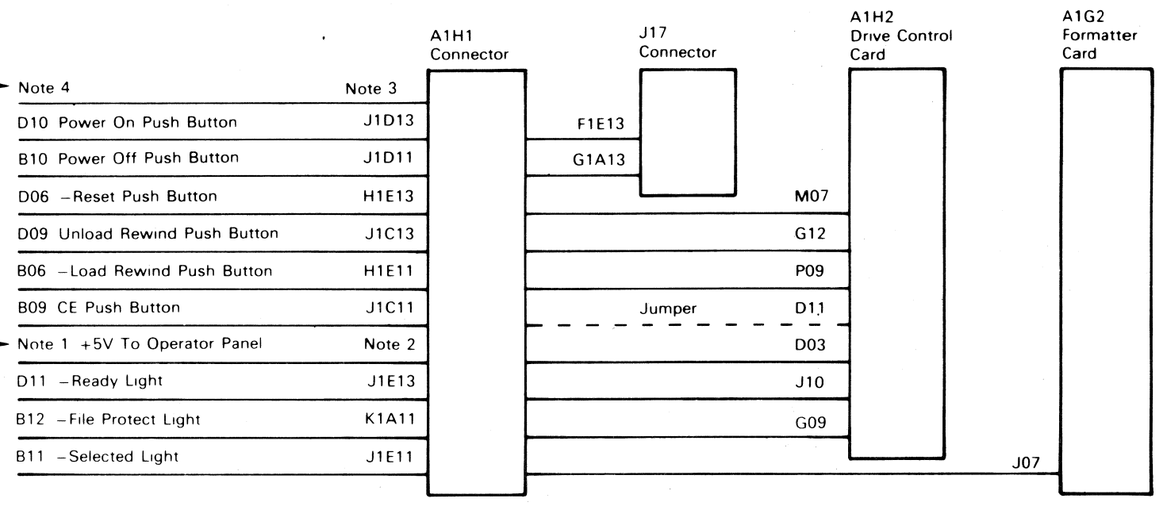
The figures show segments of circuits, the connectors, the line names, and their physical location in the machine. Use these descriptions with instructions from the MAPs to isolate specific problems in those circuits.



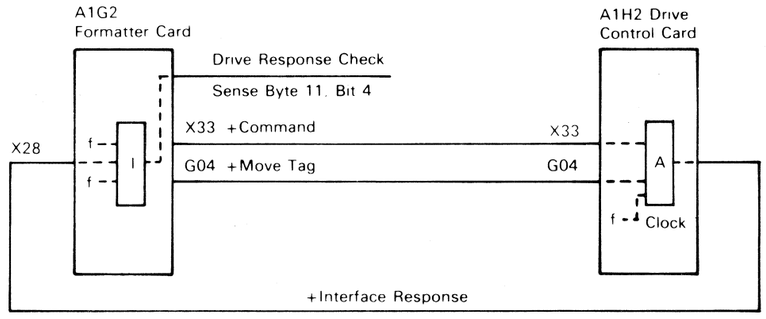
Ground	
Note 3	**Note 4**
From	**To**
Z1B02	J1A13
Z1B08	K1B13
Z1D07	H1A11
Z1D13	J1B11

+5 V to Operator Panel	
Note 1	**Note 2**
From	**To**
Z1D03	H1B13
Z1D05	H1D13
Z1B03	K1A13
Z1D11	H1B11

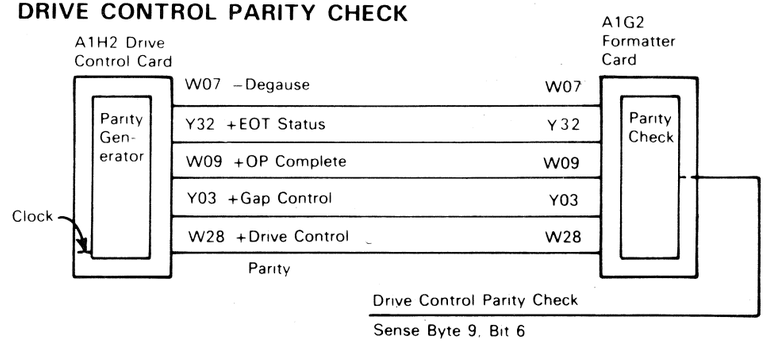
OPERATOR PANEL CONNECTIONS



DRIVE RESPONSE CHECK



DRIVE CONTROL PARITY CHECK



8809

BE0600	2699286	846318	846481	847308				
Seq 1 of 2	Part Number	15 Mar 79	15 Dec 79	1 Aug 81				

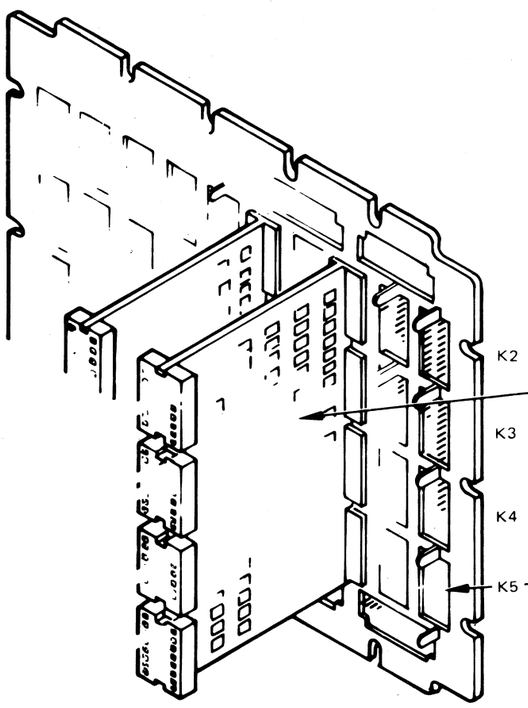
POWER AMPLIFIER CIRCUITS AND CONNECTORS

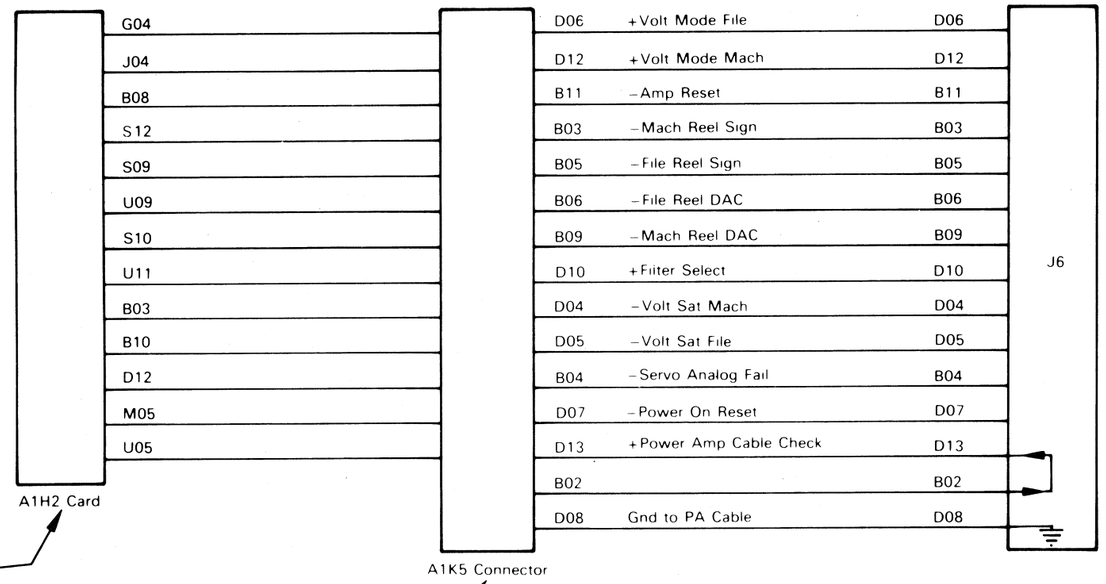
GENERAL

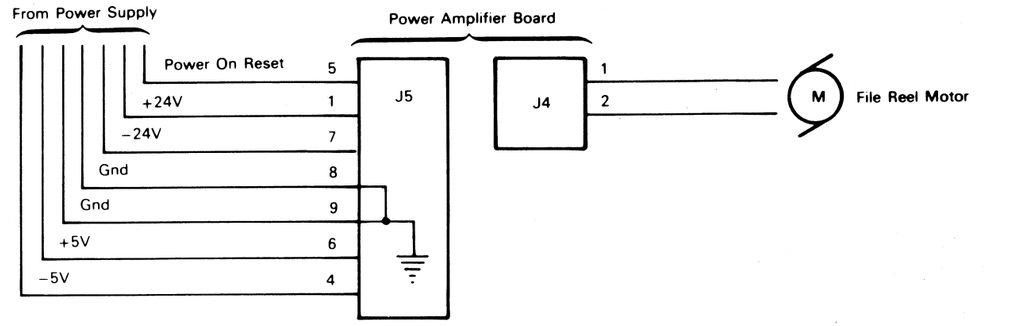
This page is referred to by the MAPs and should be used only with the MAPs for problem isolation.

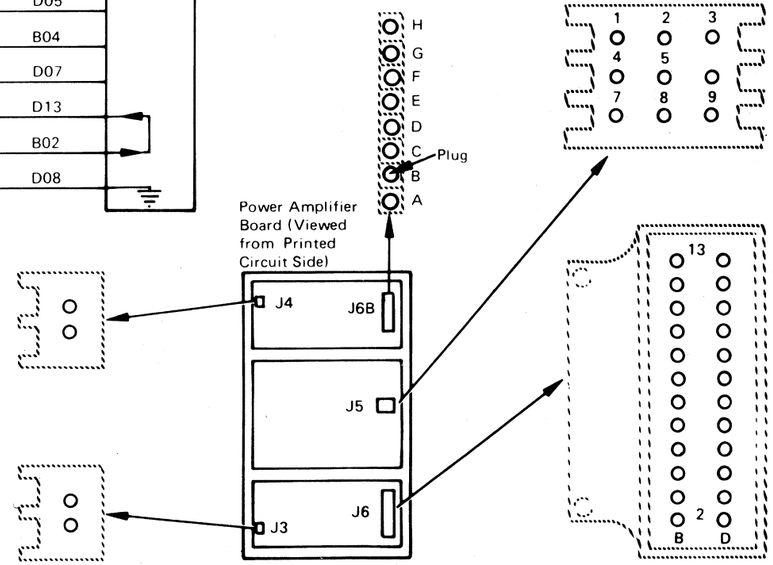
PHYSICAL DESCRIPTION

The illustrations show the physical appearance of the area being described. Follow the indicators to the schematic description for the location of connector pins and their line names.





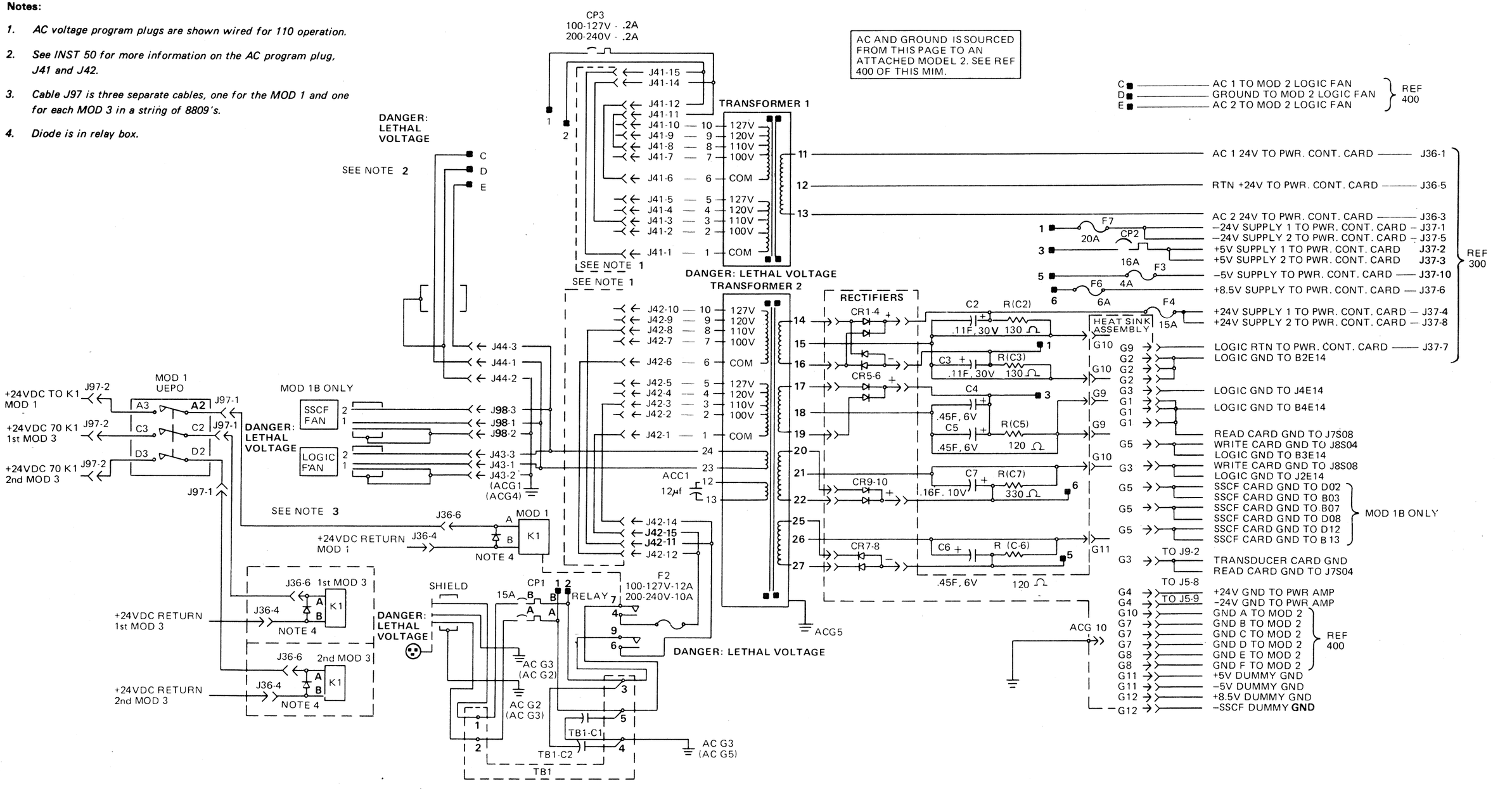




AC PRIMARY POWER-60 HZ-MODELS 1 AND 3

Notes:

1. *AC voltage program plugs are shown wired for 110 operation.*
2. *See INST 50 for more information on the AC program plug, J41 and J42.*
3. *Cable J97 is three separate cables, one for the MOD 1 and one for each MOD 3 in a string of 8809's.*
4. *Diode is in relay box.*



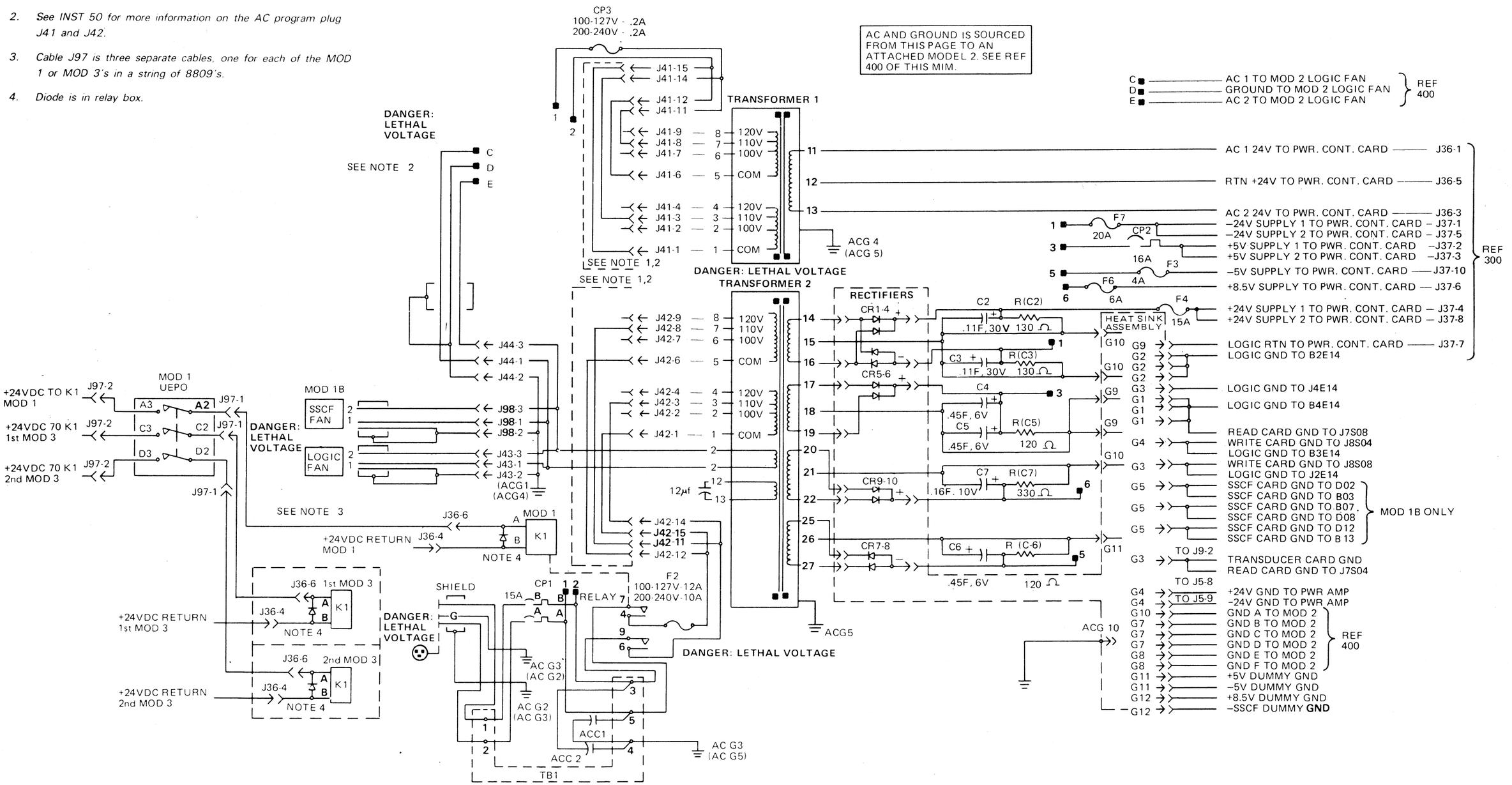
8809

BE0700 Seq 1 of 1	2699364 Part Number	846481 15 Dec 79	847323 1 Oct 80	847308 1 Aug 81	847314 1 Apr 82			

AC PRIMARY POWER-50 HZ-MODELS 1 AND 3

Notes:

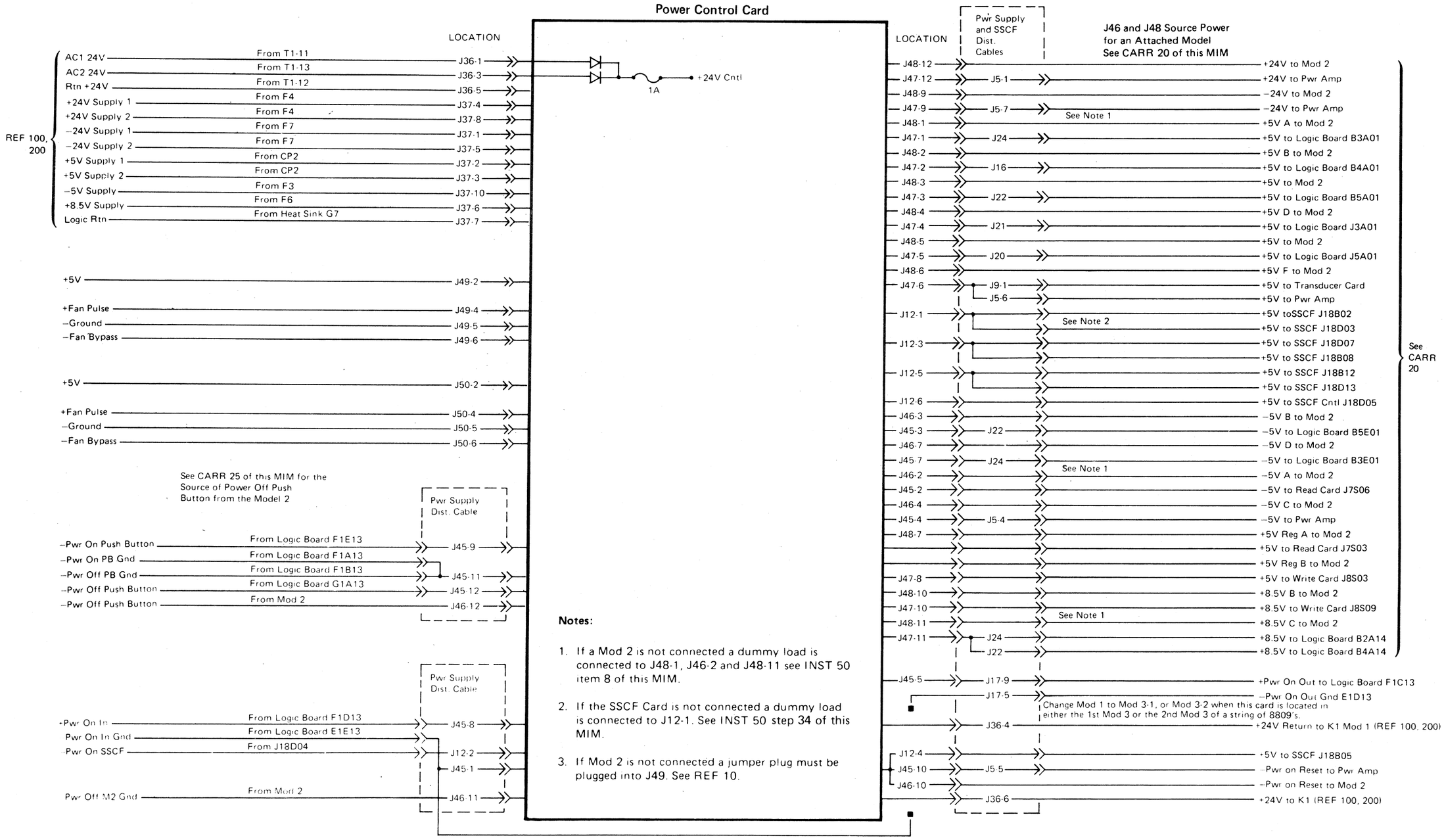
1. *AC voltage program plugs are shown wired for 110 operation.*
2. *See INST 50 for more information on the AC program plug J41 and J42.*
3. *Cable J97 is three separate cables, one for each of the MOD 1 or MOD 3's in a string of 8809's.*
4. *Diode is in relay box.*



8809

BE0800	2699365	846481	847323	847308	847314			
Seq 1 of 1	Part Number	15 Dec 79	1 Oct 80	1 Aug 81	1 Apr 82			

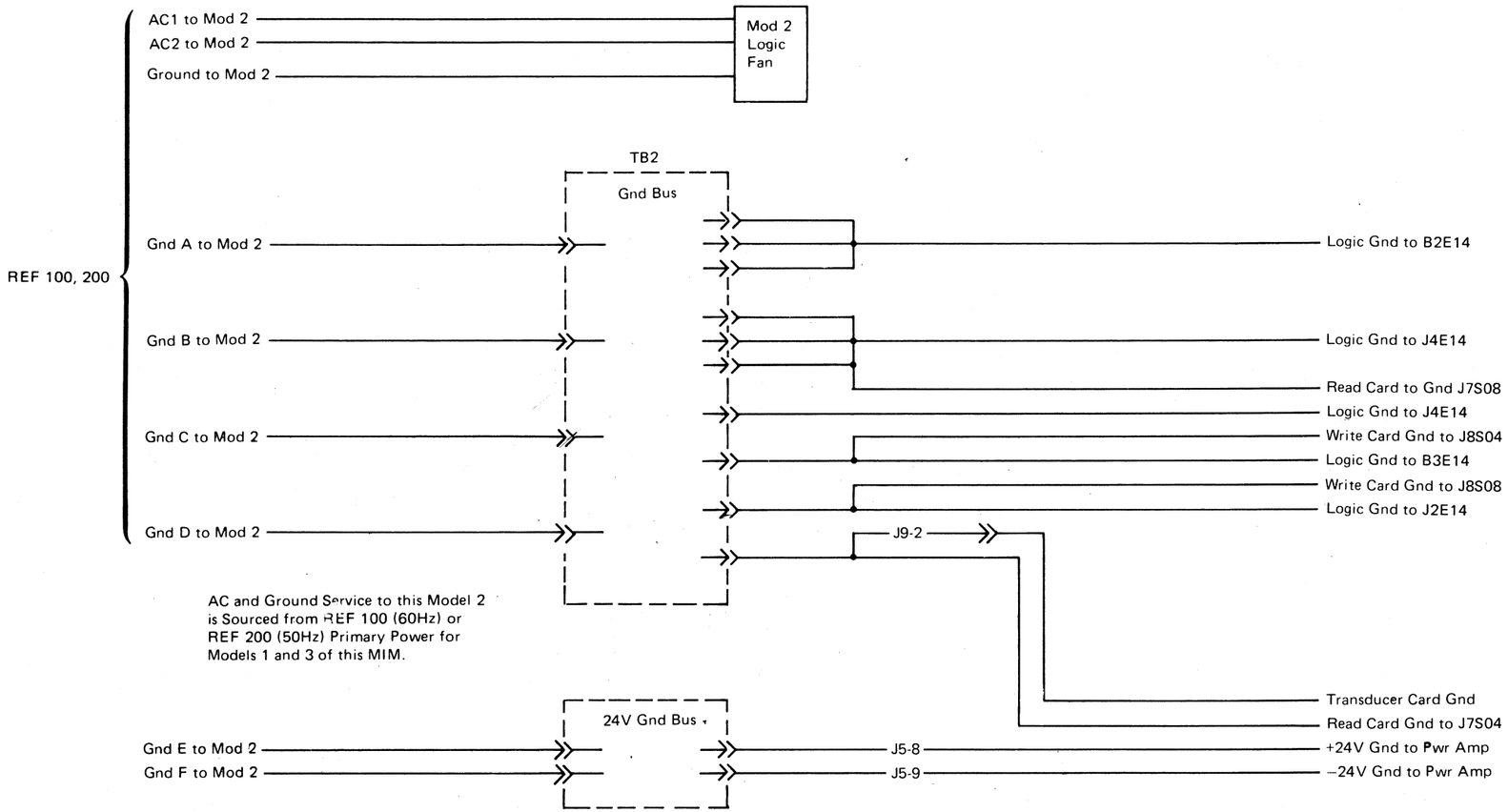
POWER CONTROL CARD-MODELS 1 AND 3



8809

BE0900	2699366	846481	847323	847314				
Seq 1 of 1	Part Number	15 Dec 79	1 Oct 80	1 Apr 82				

PRIMARY POWER-MODEL 2



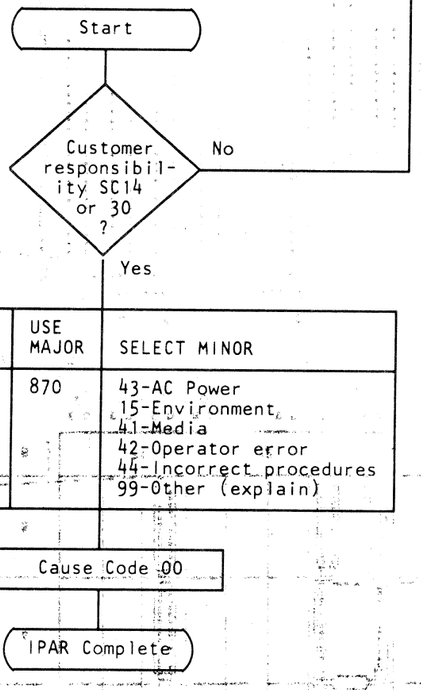
8809

BE1000 Seq 1 of 1	**2699367** Part Number	**846481** 15 Dec 79	**847323** 1 Oct 80					

INCIDENT REPORT CODE GUIDE

GENERAL

Use the guide when completing the FE Incident/Parts Activity Report. Begin at the block labeled START and proceed through the guide, answering the questions, selecting entries for the major, minor, cause, and symptom/error code fields of the IPAR, until the IPAR COMPLETE block is reached. The logic and data flow major-minor codes are found by referring the Chart 1.



CATEGORY	USE MAJOR	SELECT MINOR
Customer Responsibility	870	43-AC Power 15-Environment 41-Media 42-Operator error 44-Incorrect procedures 99-Other (explain)

Cause Code 00

IPAR Complete

FRU swapped, part replaced, adjustment made, etc.

Any corrective action taken?

No

Yes

SELECT MAJOR - MINOR CODE

CATEGORY	MAJOR	MINOR	
File Protect	220	07-Cables/Connectors 52-Reel/File Protect Ring 99-Other (explain)	56-File Protect Assembly 93-No trouble found
Logic Board	230	04-Board/Pin 93-No trouble found	57-Interposer/Card Crossover 99-Other (explain)
Logic/Data Flow	23X	See Chart 1	
Transducer Card	237	07-Cables/Connectors 93-No trouble found	09-Logic Card 99-Other (explain)
S.S.C.F. (Mod 1B only)	238	07-Cables/Connectors 93-No trouble found	09-Logic Card 99-Other (explain)
Op Panel	240	07-Cables/Connectors 24-Indicator 93-No trouble found	58-Op Panel Assembly 33-Switch 99-Other (explain)
Reel Drive	260	07-Cables/Connectors 59-Reel Latch Assembly 60-Reel Size Sensor 42-Reel Motor Brush 99-Other (explain)	04-Power Amp. Board 26-Reel Motor 30-Machine Reel 93-No trouble found
Tape Path	270	07-Cables/Connectors 49-Head (erase) 40-Tape Tachometer 48-Tape Guide 43-Cleaner Blade 99-Other (explain)	50-Head Asm. (Read/Write) 41-BOT/EOT Sensor 23-Sense Idler Assembly 61-Tape Present Sensor 93-No trouble found
Base/Cooling	299	07-Cables/Connectors 03-Fan 62-Deck Lifting/Lowering Assembly	33-Switch/Interlock 13-Cover/Latches/Hinges 93-No trouble found 99-Other (explain)
Power	600	07-Cables/Connectors 31-Relay 08-Capacitor 33-Thermal/Air Flow Switch	09-Power Control Card 10-CB/CP/Fuse 39-Rectifier Assembly 93-No trouble found 99-Other (explain)

01

IR 20

02

IR 20

CHART 1 - LOGIC BOARD, CARD SIDE

Locate card or cable in the chart. Select the MAJOR code in the left column and select the MINOR code from the proper row.

Example: H4 - Major=233, Minor=08
Y3 - Major=235, Minor=13

MAJOR	11	12	13
235	Y1	Y2	Y3

MINOR

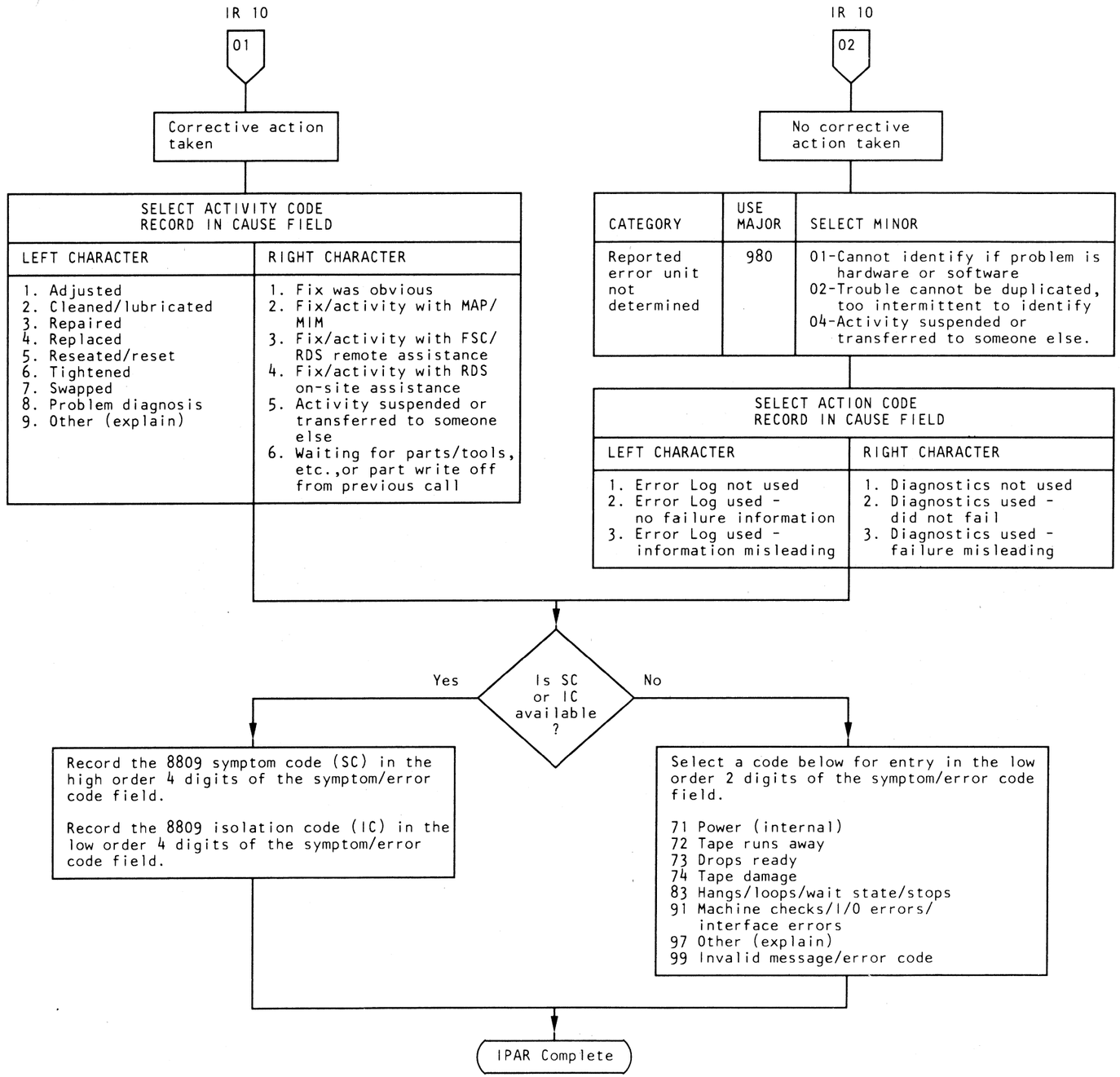
	01	02	03	04	05	06	07	08	09	10
231	A2	B2	C2	D2	E2	F2	G2	H2	J2	K2
232	A3									
233	A4									
234	A5									

MINOR

MAJOR	14	15	16
236	Z1	Z2	Z3

8809

FE0100 Seq 1 of 2	2699354 Part Number	846427 25 May 79	847314 1 Apr 82					



8809

FE0100 Seq 2 of 2	**2699354** Part Number	**846427** 25 Mar 79	**847314** 1 Apr 82					