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8673861

PUBLICATIONS REFERENCE DRAWING

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MACHINE NAME - Magnetic Tape Subsystem

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	336326	TNL SN32-0307 IEC 0011225741 (REA 12-25741, REA 12-11657) IEC 0021225741 (REA 12-11658, REA 12-25496)
SY32-5048-1	336389	Second Edition REA 12-15334 IEC 0011215156 IEC 0011225996
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SY32-5048-8	A47957C	Ninth Edition
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SY32-5048-10	A57721	Eleventh Edition
SY32-5048-11	A57723	Twelfth Edition
SY32-5048-12	A57724	Thirteenth Edition
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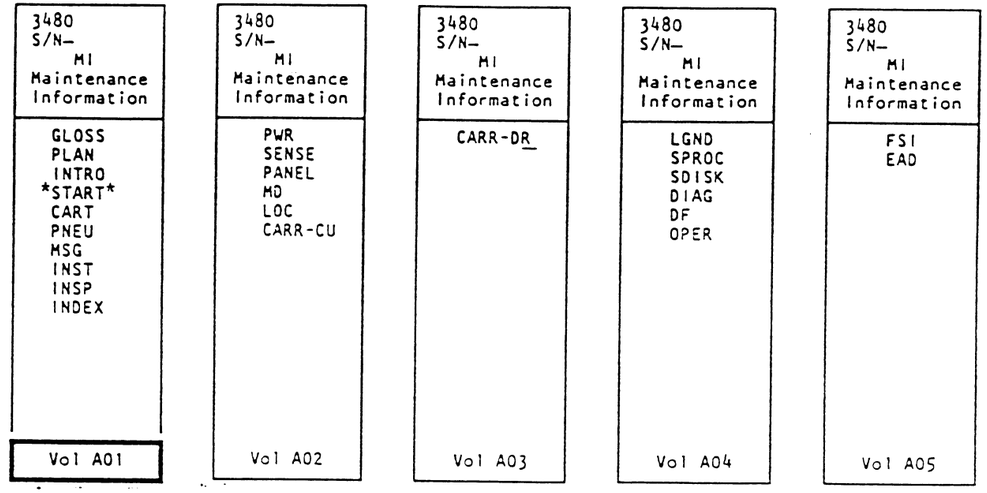
IBM Maintenance Information



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3480 Magnetic Tape Subsystem

SY32-5048-13

Preface

This manual contains maintenance information about the IBM 3480 Magnetic Tape Subsystem and is intended for customer engineers responsible for servicing the 3480 tape subsystem. This publication is designed to be used with the IBM Maintenance Device (MD). Therefore, CEs using this manual should be familiar with that tool.

Prerequisite Knowledge

It is assumed that you have a background in data processing concepts and that you are familiar with the hexadecimal numbering system, stored program concepts, and have a basic understanding of tape subsystems and their relationship to a processor I/O channel.

Related Publications

IBM System/360 and System/370 I/O Interface Channel to Control Unit Original Equipment Manufacturers' Information, GA22-6974.

IBM 3480 Magnetic Tape Subsystem Description, GA32-0042.

How to Update the Maintenance Information

This manual is form number controlled. The 3480 manuals will be updated by Technical Newsletters (TNLs). The TNL cover letter will indicate the new EC level. The entire manual will be updated by major revision. All updates are processed through normal MLC control. The Publications Reference Drawing (PRD) in the front of each volume contains the EC history.

How to Order This Manual

This manual or pages can be ordered from one of the following:

- United States
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Use the wiring Diagram/Logic Page Request form, Z150-0130. Be sure to include the form number of the manual when ordering the new manual or pages. Please write your telephone number on the form in case there are any questions regarding your order.

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Safety

Rules for Safety

If (1) you know the safety rules for working with electrical and mechanical equipment and (2) you observe the rules, you can work safely with IBM equipment.

Do not fear electricity, but respect it.

While you are maintaining IBM equipment, (1) observe every safety precaution possible and (2) observe the following safety rules.

Work Environment

- Do not work alone in hazardous conditions or near equipment that has dangerous voltages. Always inform your manager if the conditions or voltages are a possible problem.
- Always look for possible hazards in your work environment. Examples of hazards are: moist floors, nongrounded extension cables, power surges, and missing safety grounds.
- Do not perform any action that makes the product unsafe or that causes hazards for the customer personnel.
- Before you start the equipment, ensure that other Service Representatives (SRs) and customer personnel, are not in a hazardous position.
- Do not wear loose clothing that can be trapped in the moving parts of a machine. Ensure that the sleeves of your clothing are fastened or are rolled above the elbow. If your hair is long, or if you wear a neck scarf, fasten it to make it safe.
- Insert your necktie into your clothing or fasten it with a clip (preferably nonconductive) at approximately 8 centimeters (3 inches) from its end.
- Lift the equipment or parts by standing or pushing up with your stronger leg muscles; this action removes the strain from the muscles in your back. Do not lift any equipment or parts that are too heavy for you.
- Put removed machine covers in a safe place while you are servicing the machine. Reinstall the covers before returning the machine to the customer.
- Always keep your Service Representative (SR) tool kit away from walk areas so that other persons cannot trip over it. For example, keep the kit under a desk or table.
- Observe good housekeeping practices in the area of the machines while you are performing maintenance and after completing it.
- After maintenance, reinstall all safety devices, such as guards, shields, labels, and ground wires. Exchange safety devices that are worn or defective. (*Remember*: the safety devices protect you from a hazard. You destroy their purpose if you do not reinstall them when you have completed the service call.)

Electrical Safety

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

  Note: A non-IBM attachment to an IBM machine may be powered from another source and may be controlled by a different switch or circuit breaker.
- Switch off all power before (1) removing or assembling the main units of the equipment, (2) working near to power supplies, (3) inspecting power supplies, or (4) installing changes in machine circuits.
- Unless the maintenance documents specifically instruct you, do not service the following parts with power on *if the part is removed from its installed position in the machine*: power supplies, pumps, blowers, motor generators, and other units with voltages that are more than 30 V ac or 42.4 V dc. (This rule ensures that correct grounding is maintained.)
- If you really need to work on equipment that has exposed live electrical circuits, observe the following precautions:
  - Ensure that another person, who is familiar with the power-off controls, is near you. Another person must be there to switch off the power, if necessary.
  - Do not wear jewelry, chains, metal-frame eyeglasses, or other personal metal objects. (*Remember*: if the metal touches the machine, the flow of current increases because the metal is a conductor.)
  - Use only insulated probe tips or extenders. (*Remember*: worn or cracked insulation is unsafe.)
  - Use only one hand while you are working on live equipment. Keep the other hand in your pocket or behind your back. (*Remember*: there must be a complete circuit for an electrical shock to occur. This precaution prevents *your body* from completing the circuit!)
  - When you use a tester, set its controls correctly and use insulated probes that have the correct electrical specification.
  - Do not touch objects that are grounded, such as metal floor strips, machine frames, or other conductors. Use suitable rubber mats obtained locally, if necessary.
- When you are working with machines having voltages more than 30 V ac or 42.4 V dc, observe the special safety instructions given in customer engineering memorandums (CEMs).
- Never *assume* that power has been removed from a circuit. First, *check* that it has been removed.
- Do not touch live electrical circuits with the surface of a plastic dental mirror. (*Remember*: the surface of the dental mirror is conductive and can cause damage and personal injury.)
- If an electrical accident occurs:
  1. *Use caution; do not be a victim yourself.*
  2. *Switch off the power.*
  3. *Instruct another person to get medical aid.*
  4. *If the victim is not breathing, perform mouth-to-mouth rescue breathing. See "Electrical Accidents - First Aid" (below).*

Mechanical Safety

Do not touch moving mechanical parts when you are (1) lubricating a part, (2) checking for play, or (3) doing other similar work.

Safety Glasses

Wear safety glasses when:

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

Tools, Testers, and Field-Use Materials

- Do not use tools and testers that have not been approved by IBM. Ensure that electrical hand tools, such as Wire-Wrap[1] tools and power drills, are inspected regularly.
- Exchange worn and broken tools and testers.
- Do not use solvents, cleaners, or oils that have not been approved by IBM.

Summary

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

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

Never *assume* that a machine or a circuit is safe. No machine is *always* completely safe. You may not know the exact condition of a machine because, for example:

- The power receptacles could be wrongly wired.
- Safety devices or features could be missing or defective.
- The maintenance and/or changes history could be wrong or not complete.
- The design could have a problem.
- The machine could have damage, caused when it was shipped.
- The machine could have an unsafe change or attachment.
- An engineering change or a sales change could be wrongly installed.
- The machine could be deteriorated (1) because it is old or (2) because it operates in an extreme environment.
- A part could be defective, therefore causing a hazard.
- A part could be wrongly assembled.

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

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Safety SAFETY 10

Electrical Accidents - First Aid

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

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

- *Work Quickly*: If the victim is unconscious, he/she may need (1) mouth-to-mouth rescue breathing and possibly (2) external cardiac compression if the heart is not beating.

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

Determine if the victim needs mouth-to-mouth rescue breathing. If he/she does, perform the following steps.

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

1. Prepare for rescue breathing:

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

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

   c. Lift the neck with one hand, and tilt the head backward by pressing on the forehead with the other hand. See Figure 1.

Figure 1.

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

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

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

3. If the victim is not breathing correctly:

   a. Keep the victim's head tilted backward; (see Figure 1). Continue to press on the forehead with your hand; at the same time, rotate this same hand so that you can pinch together the victim's nostrils with your thumb and finger. See Figure 2.

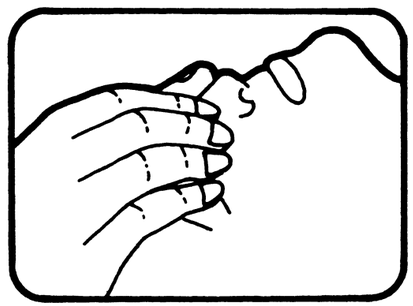

Figure 2.

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

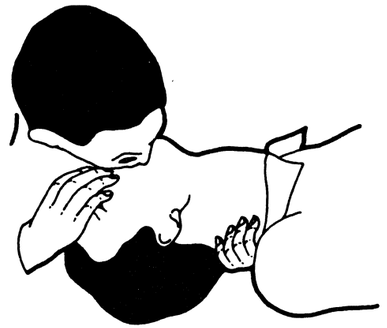

Figure 3.

   c. Remove your mouth to let the victim breathe-out, and check that the victim's chest moves down. See Figure 4.

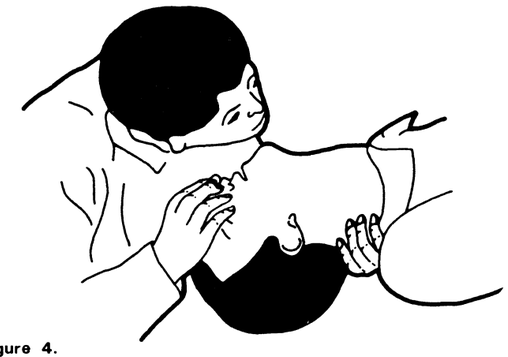

Figure 4.

   d. Repeat steps b and c once every 5 seconds either until the victim breathes for himself/herself or until medical aid comes.

Reporting Accidents

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

Report also all small electrical shocks. (*Remember*: a condition that causes a small shock need only differ slightly to cause serious injury.)

Danger Notices

A danger notice is used to notify the service representative that potentially lethal or extremely hazardous conditions exist.

The danger safety notices and their page locations contained in this MI are shown below.

DANGER
Electric shock. The Drive Power switch removes dc voltages (both ac and dc voltages on tape units without BM 6460006) to that drive only, and does not affect the other drive in the tape unit.

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CARR-DR 8.

DANGER
Electric shock. Hazardous voltages are present on the ac power circuit breaker and the line cord.

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CARR-DR 8.

DANGER
Electric shock. When setting the control unit ac power circuit breaker off, hazardous voltages are still present on the ac power circuit breaker and on the ac power line cord.

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CARR-CU 6.

DANGER
Hazardous electrical voltages are present in the receptacle.

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INST 6, 306.

DANGER
Hazardous electrical voltages are present in the connector. Do not touch the outlet case with anything other than test probes until step 3 is completed.

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INST 6, 306.

DANGER
Electric shock. Hazardous voltages can be present in the ac line cord connectors.

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CARR-CU 1440, 1490.

DANGER
Hazardous electrical voltages are present. Do not touch the internal parts (pins and sockets) of the outlet until step 5 is completed.

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INST 6, 306.

DANGER
Hazardous electrical voltages are present. Do not touch the outlet before meeting the following requirements of steps 1 and 2.

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INST 6, 306.

DANGER
Hazardous voltages are present. If the measured voltage values are less than 1.0 V ac, you can touch the outlet. Avoid contact with the internal parts (pins and sockets) of the outlet.

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INST 6, 306.

DANGER
Dangerous voltages are present at the ac power cable socket. The safety cover must be on when the socket is not being used.

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INST 10, 310.

CAUTION: TILT HAZARD

Do NOT open both drives of a tape unit that is not bolted to another tape unit or control unit. With the automatic cartridge feature installed and both drive drawers fully extended, a tape unit that is not bolted to another unit will tilt forward with about 20 lbs. of force applied to the top of either automatic cartridge loader.

INST 4, 11, 20, 135, 180, 304, 311, 320, 435, 480.

INSP 15, 115.

DANGER
Make sure the circuit breaker that supplies power to the customer receptacle is off.

If you are installing a Dual Control Unit subsystem, power to both customer receptacles must be off.

Make sure that there are no cables attached to the I/O tailgate assembly in the bottom rear of the control unit.

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INST 60, 360.

DANGER
Lethal voltages are present in the power servicing area. Safety is most important. Treat all circuits as live until measured.

Capacitors are possible exploding devices. Wear safety glasses when working in the power area. Always reinstall all safety covers before powering on the machine.

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PWR 130-1, 400-1.

DANGER
High voltage.

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PWR 400-7.

Notes SAFETY 40

Notes SAFETY 40

Tab List

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LGND	Legend
SPROC	Support Procedures
SDISK	Support Diskette Procedures
DIAG	Support Diagnostic Descriptions
DF	Data Fields and Registers
OPER	Theory of Operation

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FSI	Fault Symptom Index
EAD	Error Analysis Diagrams

Glossary and Abbreviations

This glossary defines the special terms, abbreviations, and acronyms that are used in this publication. It does not include all terms previously established for the IBM System/370 or its operating systems; therefore, if you do not find the term you are looking for, refer to the index or to the *Vocabulary for Data Processing, Telecommunications, and Office Systems* GC20-1699.

This glossary includes definitions from:

- The *American National Dictionary for Information Processing,* published by the Computer and Business Equipment Manufacturers Association. This material is reproduced from the American National Dictionary for Information Processing, copyright 1977 by the Computer and Business Equipment Manufacturers Association, copies of which may be purchased from the American National Standards Institute, 1430 Broadway, New York, New York 10018. These definitions are identified by an asterisk (*).
- The *ISO Vocabulary of Data Processing,* developed by the International Standards Organization, Technical Committee 97, Subcommittee 1. Definitions from published sections of this vocabulary are identified by the symbol "(ISO)" preceding the definition. Definitions from draft proposals and working papers under development by the ISO/TC97 vocabulary subcommittee are identified by the symbol "(TC97)," indicating that final agreement has not yet been reached among its participating members.

access method. A technique for moving data between processor storage and input/output devices.

adj. Adjustment.

ALD. Automated logic diagram.

allocation. See resource allocation.

alter. To change.

amplifier. A device whose output is an enlarged reproduction of its input.

analog. Pertaining to data in the form of continuous variables, which are related to measurable physical quantities.

assignment. The naming of a specific device to perform a function.

assistance. Aid.

asynchronous. Without regular time relationship; unexpected or unpredictable with respect to the execution of a program's instructions.

att. Attachment.

B/M. Bill of material.

backhitch. A slight motion in the backward direction just before moving tape in a forward direction.

back up. To go back to a recovery point for retransmission.

BCC. Buffer channel command register.

BCPC. Buffer channel pad counter register.

BCPH. Buffer channel pointer high register.

BCPL. Buffer channel pointer low register.

BCR. Buffer channel remainder register.

BCSE. Buffer channel status/error register.

BCSH. Buffer channel stop high register.

BCSL. Buffer channel stop low register.

BCSS. Buffer channel storage sars register.

BDAT. Buffer data not real register.

BDC. Buffer device command register.

BDG0. Buffer diagnostic 0 register.

BDG1. Buffer diagnostic 1 register.

BDPH. Buffer device pointer high register.

BDPL. Buffer device pointer low register.

BDR. Buffer device remainder register.

BDSE. Buffer device status/error register.

BDSS. Buffer device storage sars register.

beginning of tape (BOT). The location on a magnetic tape that indicates the beginning of the permissible recording area.

bfr. Buffer.

bill of material. A list of part numbers.

BM. Bill of material.

BMR. Buffer mode register.

BOB. Beginning of block.

BOC. Bus-out check.

BOR. Beginning of record.

BOT. Beginning of tape.

bpi. Bits per inch.

BSB. Backspace block.

BSF. Backspace file.

buffer. * A routine or storage used to compensate for a difference in rate of flow of data, or time of occurrence of events, when transferring data from one device to another.

BWRP. Buffer wrap register.

CA. Channel adapter.

card extractor. A service representative tool.

CARR. Checks-Adjustments-Removal-Replacement.

CART. Cartridge Analysis.

CAUTION (Notice). A word to call attention to possible personal harm to people. Contrast with DANGER.

CB. Circuit breaker.

centimeter. One hundredth of a meter. See meter.

CC. Condition code.

CCA. Channel card address register.

CCB. Communication control block.

CCC. Channel card control register.

CCR. Channel command retry.

ccw. Counterclockwise.

CCW. Channel command word.

CCW chain. A list of channel command words to be performed in sequence.

CDR. Channel data register.

CDTI. Channel diagnostic tag-in register.

CER. Channel error register.

channel command. An instruction that directs a data channel, control unit, or device to perform an operation or set of operations.

char. Character.

checklist. A list of items to be checked.

CHK. Check.

CHL. Channel.

CHPID. Channel path identification.

clk. Clock.

cm. Centimeter.

CMD. Command.

CMR. Channel modifier register.

command. A control signal that initiates an action or the beginning of a sequence of actions.

condition code. A code that reflects the result of an input/output, arithmetic, or logical operation.

contaminant. Something that contaminates.

contingent connection. A connection between a channel path and a drive caused when a unit check occurs during an I/O operation.

control unit. A device that controls input/output operations of one or more devices.

CP. Circuit protector.

CPS. Cycles per second. See Hz.

CRC. Cyclic redundancy check.

CS. Control storage.

CRR. Channel request register.

CST. Command status table.

CSW. Channel status word.

CTO. Channel tag out.

ctr. Counter.

ctrl. Control.

CU. Control unit.

CUA. Channel unit address.

CUT. Control unit operations table.

DANGER (Notice). A word to call attention to possible lethal harm to people. Contrast with CAUTION.

data. * Any representations such as characters or analog quantities to which meaning is, or might be, assigned.

data buffer. The storage buffer in the control unit. This buffer is used to increase the data transfer rate between the control unit and the channel.

data check. A synchronous or asynchronous indication of a condition caused by invalid data or incorrect positioning of data. Some data checks can be suppressed.

DBI. Data buffer in.

DBO. Data buffer out.

dc. Direct current.

DCB. Data control block.

DCK. Data check.

DCR. Device control register.

DDR. Dynamic device reconfiguration.

DE. device end.

degauss. To demagnetize an object.

degradation. A decrease in quality of output or throughput, or increase in machine error rate.

degraded. Decreased in quality of output or throughput or increased machine error rate.

demark. Mark to show that the buffer segment is not usable.

designed. Has as a purpose.

detent. A mechanical device for holding moving parts in position.

detented. Held in position by a detent.

DEV. Device.

DF. Data Fields and Registers.

DGHELO. Diagnostic hardware error log.

DGOVLY. Diagnostic overlay log.

DIAG. Diagnostic.

DIDO. Data in data out bus.

DIR. Device interrupt register.

direct access storage. (1) * A storage device in which the access time is in effect independent of the location of the data. (2) (TC97) A storage device that provides direct access to data. (2) See also immediate access storage.

directories. Data sets at the beginning of the MD diskettes that contain the names and locations of the other data sets on the diskette.

DLR. Device level register.

DOT. Device operation table.

Double-stick cellophane tape.. Cellophane tape that has adhesive on both sides of the tape.

drive, magnetic tape. (ISO) A mechanism for moving magnetic tape and controlling its movement.

DSC. Device secondary clock register.

DSE. Data security erase.

DSE (register). Device status and error register.

DSH. Control unit serial high register.

DSL. Control unit serial low register.

DSR. Device secondary register.

DTR. Device tag register.

EAD. Error Analysis Diagrams.

EBCDIC. Extended binary-coded decimal interchange code.

EC. Edge connector. Engineering change.

ECA. Engineering change activity.

ECC. Error correction code.

elsewhere. To or at another place.

end of block (EOB). A code that marks the end of a block of data.

end of file (EOF). A code that marks the end of a file of data.

end of tape (EOT). The end of the recording area on a tape.

EOB. End of block.

EOF. End of file.

EOJ. End of job.

EOR. End of record.

EOT. End of tape.

EPO. Emergency power off.

EQC. Equipment check.

EQU. Equate.

equipment check. An asynchronous indication of a malfunction.

ERA. Error register A register.

ERB. Error register B register.

EREP. Environmental recording, editing, and printing.

ERG. Erase gap.

ERPA. Error recovery procedure action.

E/ME/A. Europe/Middle East/Asia.

exchange. (1) The act of removing an old or imperfect part and installing a new or perfect part. (2) Contrast with "swap."

explosive. Can explode or cause to explode.

F. Fuse.

fault symptom code (FSC). A hexadecimal code generated by the drive or control unit microcode in response to a detected subsystem error. This code is used as an MI entry point by the service representative.

FE. Field Engineering.

FEALD. Field Engineering automated logic diagram.

field replaceable unit (FRU). An assembly that is replaced in its entirety when any one of its components fails.

FIFO. First in first out.

file. * (ISO) A set of related records, treated as a unit, for example, in stock control, a file could consist of a set of invoices.

file protection. Prevention of the destruction of data recorded on a volume by disabling the write head of a unit.

format. * (ISO) The arrangement or layout of data on a data medium.

FP. File protect.

frayed. Damaged as if by an abrasive substance.

FRU. Field replaceable unit.

FSB. Forward space block.

FSC. Fault symptom code.

FSF. Forward space file.

FSI. Fault symptom index.

FTSC. Field Technical Support Center.

functional. Of, connected with, or being a function.

Functional microcode. Microcode that is resident in the machine during normal customer operation.

FVP. Functional verify program.

gnd. Ground.

g. Gram.

hertz (Hz). Unit of frequency. One hertz equals one cycle per second.

hex. Hexadecimal.

host system. See host processor.

HS. High speed.

HV. High voltage.

Hz. Hertz (cycles per second).

I/O. Input/output.

IBG. Interblock gap.

ID. Identification.

identifier. That difference by which one thing can be distinguished from another.

IML. Initial microprogram load.

immediate access storage. * A storage device whose access time is negligible in comparison with other operating times.

inertia. Tendency to remain at rest or continue in the same direction.

initial microprogram load (IML). The action of loading a microprogram from an external storage to writable control storage.

INST. Installation.

interblock gap (IBG). (1) * An area on a data medium to indicate the end of a block or physical record. (2) (TC97) The space between two consecutive blocks on a data medium.

interface. * A shared boundary. An interface might be a hardware component to link two devices, or it might be a portion of storage or registers accessed by two or more computer programs.

intervention required. Manual action is needed.

INTLK. Interlock.

INTRO. Introduction.

ips. inches per second.

irrecoverable error [n.]. (1) (TC97) An error that makes recovery impossible without the use of recovery techniques external to the computer program or run. (2) In item (1), the recovery techniques would be external to those that are incorporated, not only within the program that failed but also within the system, and would include human action such as analysis by a program support representative.

ITA. Interval timer A register.

ITB. Interval timer B register.

ITC. Interval timer C register.

IMR. Interrupt mask register.

JAL. Jump address low register.

JAH. Jump address high register.

K. (1) * When referring to storage capacity, two to the tenth power; 1024 in decimal notation. (2) Kelvin.

kb. Kilobyte; a unit of 1024 bytes.

land pattern. Wires and connections on or below the surface of a circuit board.

LD. Load.

LED. Light-emitting diode.

LGND. Legend.

load point. See beginning of tape.

LOC. Locations.

locate block. A subsystem operation in which a tape is moved so that a specific block is available for processing.

LRC. Longitudinal redundancy check.

LSB. Least-significant bit.

LSI. Large scale integration technology.

LSP. Local storage page register.

LSR. Local storage register.

LWR. Loop write-to-read.

m. Meter.

M/T. Multiple track.

magnetic recording. * (ISO) A technique of storing data by selectively magnetizing portions of a magnetizable material.

magnetic tape. (TC97) A tape with a magnetizable surface layer on which data can be stored by magnetic recording.

maintenance agreement. A contract between IBM and a customer for supplying service to the customer.

maintenance package. The maintenance aids that IBM supplies for servicing the subsystem.

MAP. Maintenance analysis procedure.

MAQ. Maintenance agreement qualification.

mask. * (ISO) (1) A pattern of characters that is used to control the retention or elimination of portions of another pattern of characters. (2) To use a pattern of characters to control the retention or elimination of portions of another pattern of characters.

master file. * (ISO) A file that is used as an authority in a given job and that is relatively permanent, even though its contents may change. Synonymous with main file.

MCR. Maintenance control register.

MD. Maintenance device. Microcode diagrams.

MDA. Maintenance device adapter.

MDD. Maintenance device display.

MDI. Maintenance data in register.

MDO. Maintenance data out register.

media capacity. The amount of data that can be contained on a storage medium, such as tape, expressed in bytes of data.

meter (m). A unit of measure equal to 0.9144 yard.

MICR. Micro instruction register.

micro. One millionth of.

MICRO. Microcode.

microcode. (1) One or more micro instructions. (2) A code, representing the instructions of an instruction set, implemented in a part of storage that is not program-addressable. (2) To design, write, and test one or more micro instructions. (3) See also microprogram.

microdiagnostic routine. A program that runs under the control of a supervisor, usually to isolate field-replaceable units.

microdiagnostic utility. A program that is run by the service representative to test the machine.

micro instruction. A basic or elementary machine instruction.

microprogram. * (1) (ISO) A sequence of elementary instructions that corresponds to a specific computer operation, that is maintained in special storage, and whose execution is started by the introduction of a computer instruction into an instruction register of a computer. (2) A group of micro instructions that, when executed, performs a preplanned function.

> **Note:** The term microprogram represents a dynamic arrangement or selection of one or more groups of micro instructions for execution in order to perform a particular function. The term microcode represents micro instructions used in a product as an alternative to "hard-wired" circuitry to implement certain functions of a processor or other system component.

microprogram load. See initial microprogram load.

milli. One thousandth of.

millimeter. One thousandth part of a meter.

MI. Maintenance information.

MLC. Machine level control.

mm. Millimeter.

modifier. That which changes the meaning.

MP. Microprocessor.

MPL. Microprogram load.

ms. Millisecond.

MSB. Most-significant bit.

MSG. Message.

MTE. Multiple track error.

MTI. Maintenance tag in register.

MTO. Maintenance tag out register.

multipath. Pertaining to using more than one path.

nano. One billionth part of.

N/A. Not applicable.

net wire list. A list that shows the wiring connections for the logic boards.

net. Network.

network. The interconnection of electrical components.

NOP. No operation.

NRZI. Non-return-to-zero change-on-ones recording.

ns. Nanosecond.

OBR. Outboard recorder.

offline. (TC97) Pertaining to the operation of a functional unit without the continual control of a computer. Contrast with online.

OLT. Online test.

online. (TC97) Pertaining to the operation of a functional unit that is under the continual control of a computer. Contrast with offline.

OP. Operator panel.

OPER. Operation.

osc. Oscillator.

oscillator. A device that periodically varies a voltage.

OSU panel. Operator setup panel.

outstanding. Waiting for processing.

ov. Over voltage.

overrun. Loss of data because a receiving device is unable to accept data at the rate it is transmitted.

owner. One who owns something.

parameter. * (ISO) A variable that is given a constant value for a specified application and that may denote the application.

part. Part number.

p bit. Parity bit.

PC. Parity check.

PCR. Processor control register.

PDR. Processor diagnostic register.

PE. Parity error.

PER. Processor error register.

PG. Parity generator.

pgm. Program.

PGID. Path group identification.

PGM (map). Path group map.

PGT. Path group ID table.

PLAN. Maintenance Plan.

PM. Preventive maintenance.

PNEU. Pneumatics.

pneumatic. The parts of the subsystem that control the pressurized air and vacuum.

POR. Power-on reset.

primed. Pertaining to a condition of a tape drive when the controlling computer has addressed the drive but the drive was not in a ready state.

PS. Power supply.

PSR. Processor status register. Program support representative.

PST. Product support trained.

PT. Product trained.

PWR. Power.

R/W. Read/write.

RAM. Random access memory.

Random access memory. See direct access storage.

RCR. Read control register.

RD. Read.

RDB. Read backward.

RDC. Read diagnostic control register.

RDF. Read forward.

RECL. Record length.

reconnect. To physically or electrically put back together.

record. * (ISO) A collection of related data or words, treated as a unit; for example, in stock control, each invoice could constitute one record.

recording density. The number of bits in a single linear track measured per unit of length of the recording medium.

recoverable error. (1) An error condition that permits continued execution of a program. (2) Contrast with "irrecoverable error."

ref. Reference.

reg. Register.

reinstall. To put back the original part that was removed.

remove. To take a part off of the machine.

RER. Read error register.

resource allocation. (ISO) The assignment of the facilities of a data processing system for the accomplishment of jobs.

resume. To continue.

retry. To attempt again.

REW. Rewind.

ROS. Read-only storage.

RPM. Revolutions per minute.

RPR. Read pattern register.

RRC. Read residual count register.

RSR. Read status register.

RUN. Rewind-unload.

SAR. Storage address register.

SB. Sense byte.

SCR. Silicon-controlled rectifier.

SDR. Statistical data recorder. Storage data register.

s. Second(s) of time.

saturate. To completely fill.

sel. Select.

segment. A part.

SERDES. Serializer/deserializer.

serialize. To change from parallel-by-byte to serial-by-bit.

serializer. (ISO) A device that converts a space distribution of simultaneous states representing data into a corresponding time sequence of states.

SM. Service Memorandum.

SR. Service Representative.

servo [n.], servos. An adjectival noun for use in qualifying some part or aspect of a servomechanism.

servomechanism [n.]. * A feedback control system in which at least one of the system signals represents mechanical motion.

special feature. A feature that can be ordered to enhance the capability, storage capacity, or performance of an IBM product, but is not essential for its basic work.

SIO. Start I/O.

SNERRH. Sense error history table.

SNS. Sense.

SS. Status store.

ST. Store.

standard feature. The significant design elements of an IBM product that are included as part of the fundamental product.

START. Start maintenance.

Stoplock. A position-hold mode used when the tape is in a stopped position and under tension.

subsystem. A secondary or subordinate system, usually capable of operating independently of, or asynchronously with, a controlling system.

SUPP. Support.

swap. (1) The act of interchanging two identical field-replaceable units within the same machine for test purposes. (2) Contrast with "exchange."

sync. Synchronous, synchronize.

synchronous. (1) (ISO) Pertaining to two or more processes that depend upon the happening of specific events such as common timing signals. (2) Occurring with a regular or predictable time relationship.

tach. Tachometer.

tachometer. A device that emits pulses that are used to measure/check speed or distance.

tailored. Changed to meet individual specifications.

tape cartridge. A container holding magnetic tape that can be processed without separating it from the container.

tape void. An area in the tape in which no signal can be detected; may be caused by a machine failure.

TB. Terminal board.

TCC. Top-card connector.

tension [n.]. (1) The force tending to produce elongation. (2) The condition of being stretched.

thread/load operation. A procedure that places tape along the tape path.

TI. Tape indicate.

TIE. Track in error.

TM. Tapemark.

tp. Test point.

TU. Tape Unit.

TUBI. Tape unit bus-in.

TUBO. Tape unit bus-out.

UEPO. Unit emergency power off.

unload. Prepare the tape cartridge for removal from the drive. and so on.

utilities. Utility programs.

Utility programs.. (1) * (ISO) A computer program in general support of the processes of a computer; for instance, a diagnostic program. (2) a program that enables the service representative to maintain (or prepare to maintain) data or other programs.

uv. Under voltage.

VES. Volume error statistics.

volume. (ISO) A certain portion of data, together with its data carrier, that can be handled conveniently as a unit.

VOM. Volt ohmmeter.

VRC. Vertical redundancy check.

WARNING (Notice). A word to call attention to possible damage to a program, device, or system. Contrast with CAUTION.

WCR. Write control register.

word. (1) (ISO) A character string that is convenient for some purpose to consider as an entity. (2) In 3480 and System/7, 16 bits, or 2 bytes. (3) In System/360 and System/370, 32 bits, or 4 bytes.

WSE. Write status/error register.

WRITE. Write command.

WTM. Write tape mark.

XR. External register.

XRA. External register address register.

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The 3480 maintenance package has two parts, the maintenance diskettes and the 3480 Maintenance Information manual.

The Maintenance Device

The maintenance device (MD) is the primary maintenance tool for the 3480 Magnetic Tape Subsystem.

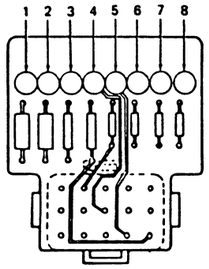
The 3480 maintenance package supplies two diskettes for the MD, a product diskette and a support diskette. All 3480 maintenance analysis procedures (MAPs), except power MAPs, are resident on the product diskette. In addition, the product diskette contains utility programs. The support diskette contains diagnostics, subsystem display and alter controls, support utility programs, and microcode patch programs.

When the product diskette is inserted into the maintenance device, the maintenance device processes MAPs to analyze machine symptoms and display log data and to guide you to the failure. When necessary, you enter symptom information on the MD keyboard/display as additional input to the MAPs.

Special Tools and Test Equipment

DC Test Tool

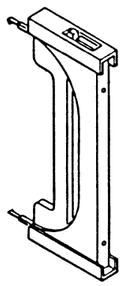
This tool (part 8492781) is shipped with the subsystem. Use this tool to determine if subsystem power supplies are supplying output voltages. See PWR 10 or PWR 12 for a description of this tool and a description of how to use it.



DC Test Tool (part 8492781)

Card Extractor

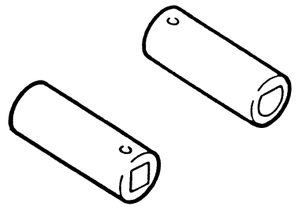
This tool (part 1310707) is a site tool but must be obtained separately. It is used to remove logic cards from the subsystem. This tool is the same extractor tool as used on other IBM devices.



Card Extractor (part 1310707)

Tape Removal Tool

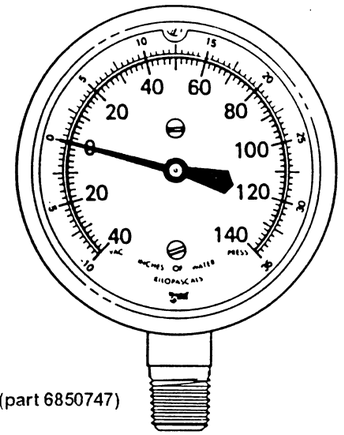
This tool (part 6850663) is shipped with the subsystem. Use it to rewind tape into the cartridge when the tape must be rewound by hand. See CART 12 for instructions on how to use the tape removal tool.



Tape Removal Tool (part 6850663)

Pressure/Vacuum Gauge

This tool (part 6850747) is used to measure the pneumatic system pressure or vacuum. See PNEU 5 for instructions on how to use the pressure/vacuum gauge.



Pressure/Vacuum Gauge (part 6850747)

Pressure/Vacuum Kit

(Part 6857823)

This kit contains hoses, fittings and the Pressure/Vacuum gauge (shown above) for measuring the pneumatic system pressure or vacuum. This kit is not shipped with the subsystem and must be ordered.

Oscilloscope

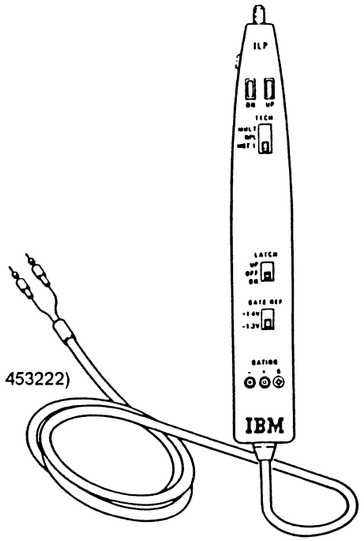
The error analysis diagrams in the maintenance information manual instruct the service representative to use an oscilloscope. A Tektronix* Model 453/454 or 475 or equivalent oscilloscope is needed.

*Trademark of Tektronix, Inc.

Integrated Logic Probe

The integrated logic probe (ILP) (part 453222) can be used instead of an oscilloscope for all measurements except those that show timing between signals or the need to measure voltage values and tolerances. See "Integrated Logic Probe" in this section for instructions on how to use the probe.

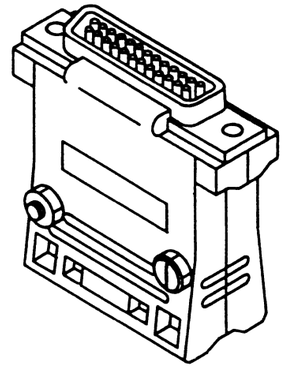
For more instructions, see the *Integrated Logic Probe Operators Guide*, S226-3951.



Integrated Logic Probe (part 453222)

Cartridge Automation Facility (CAF) WRAP Tool

The cartridge automation facility (CAF) wrap tool (part 39F3884) is used when running diagnostic EE15 to verify the cartridge automation feature. See DIAG "Cartridge Automation Facility WRAP test – Routine EE15" for more information on how to use this tool. This tool is shipped with the RPQ.



Cartridge Automation Facility (CAF) WRAP Tool 1.14

0 0 0 0 0 0 0 0 0 0

3480 Maintenance Package Summary (Continued)

All Maintenance action begins at the Maintenance Information (MI) START section.

START 10 defines problem determination and SR actions to follow in the MI and MD Diskettes.

Trouble Call Information Source:
- System Console Error Message.
- Drive Message Display Check Msg.
- Internal Subsystem error Logs.
- EREP Output.
- Audible/Visual Indications.
- Customer Description of Problem.

Failure	Subsystem Check Out	Miscellaneous Procedures
START identifies those failures that do not require the MD diskette, making reference to the MI sections to use, or defines actions to be performed before you use the MD Product Diskette.		START indicates MI sections that define non-repair procedures or provides supplemental information to assist repair. Included are items such as: Predictive Maintenance; Operating the Tape Drive; MD Use; Installation/Removal procedures; Analysis of system console messages; EREP, Sense; Manual cartridge removal procedures.

MI procedures prior to use of MD Product Diskette. For repair follow MI pre-MD repair procedures.

Non-MD repair procedures follow MI repair procedures until fixed.

MI sections for non-repair procedures.
MI sections for supplemental information.

Connect MD and IML Product Diskette. When main menu is displayed select START REPAIR.

Connect MD and IML Product Diskette. When main menu is displayed select UNIT TEST.

MD Product Diskette

PLAN 35, 50
C

Main Menu Display

Option 1. Start Repair	Option 2. Defer Call	Option 3. Unit Test	Option 4. Display FRU	Option 5. Utilities

A → PLAN 40 Start Repair

B → PLAN 35 Defer Call

D → PLAN 35 Unit Test

FSC Error. Key FSC into the MD and hit enter.

Note:
Use the product diskette. This gives a list of possible defective FRUs to exchange. This diskette can be run without the MD attached to the Control Unit.

Utilities

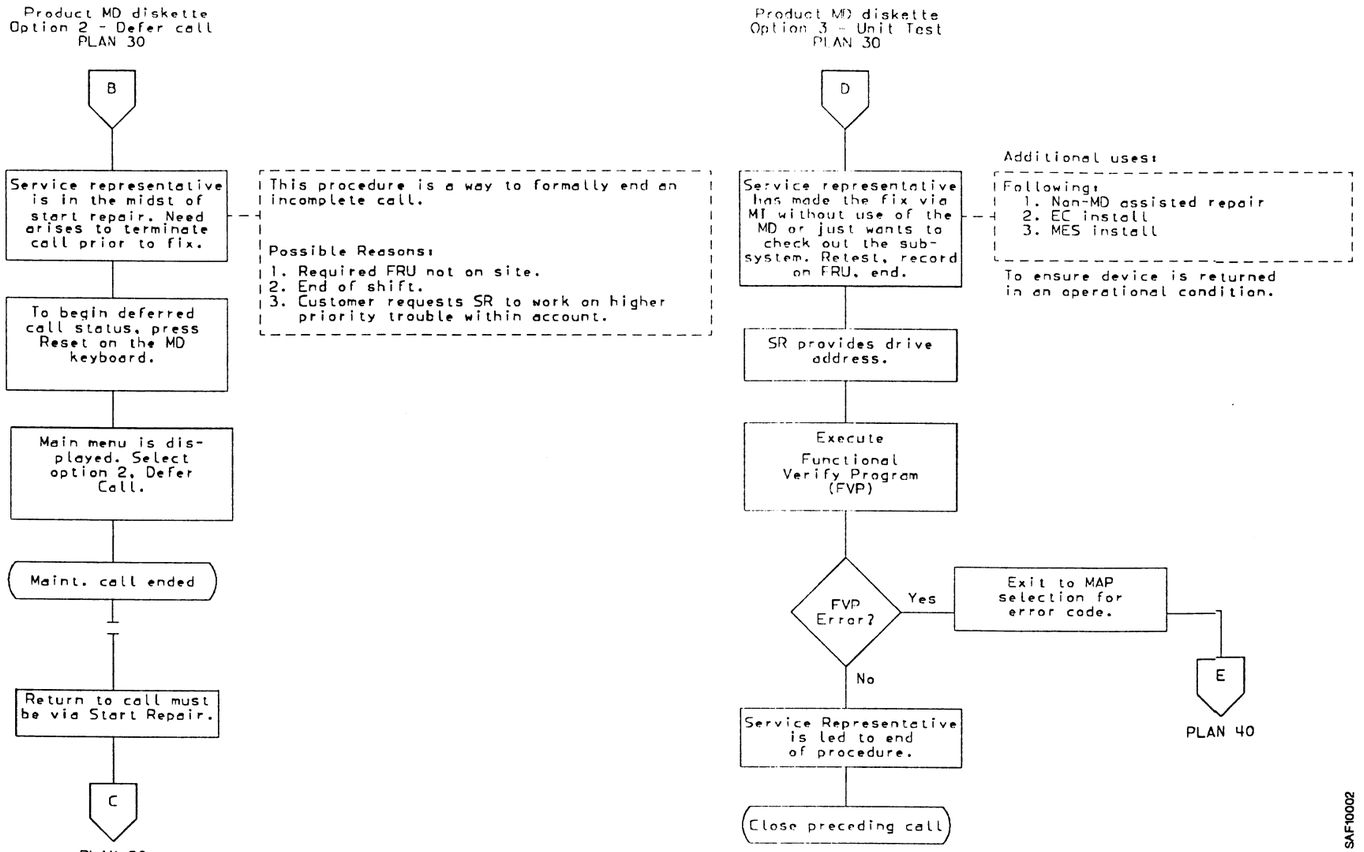
Option 1. Read Tape	Option 2. Real Time Analysis	Option 3. Main Menu

This is a non-directed option that gives the service representative the ability to read customer tapes and display the first 80 characters of the record on the MD.

This option gives the service representative the ability to Enable or Disable Real Time Statistical Analysis and Reporting System.

N → PLAN 45 Read Tape

3480 Maintenance Package Summary (Continued)



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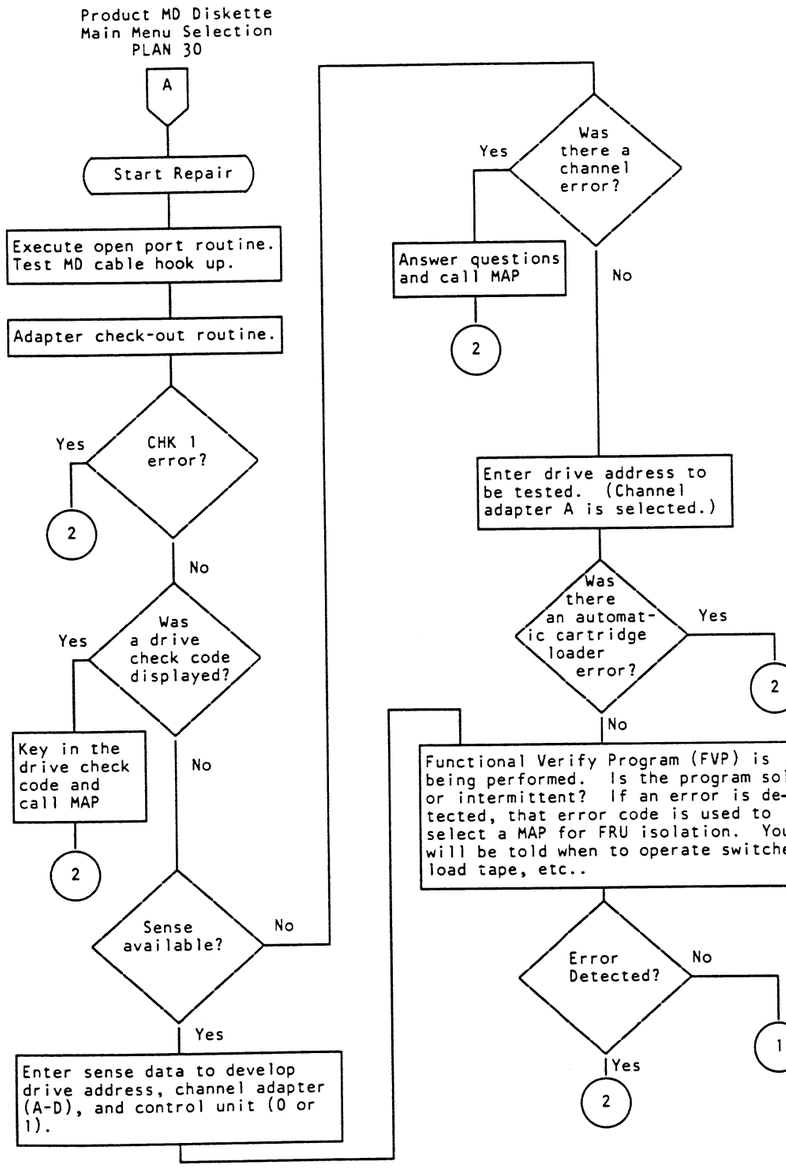
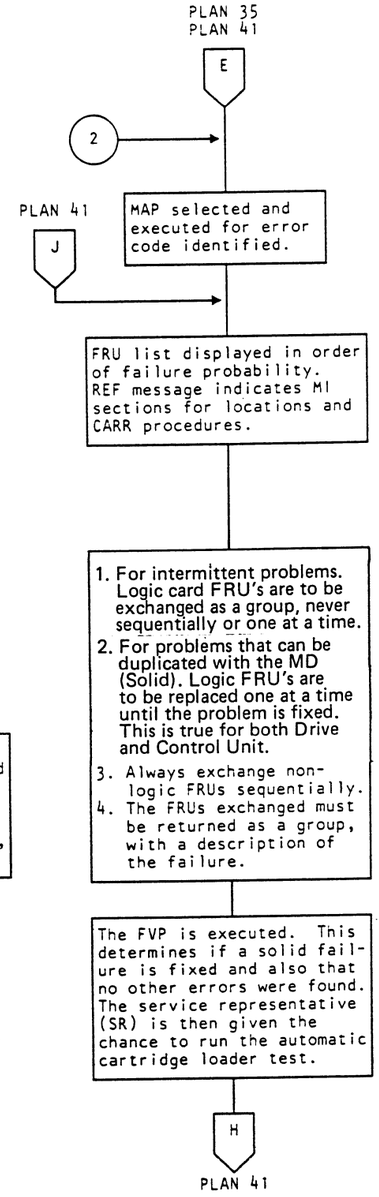
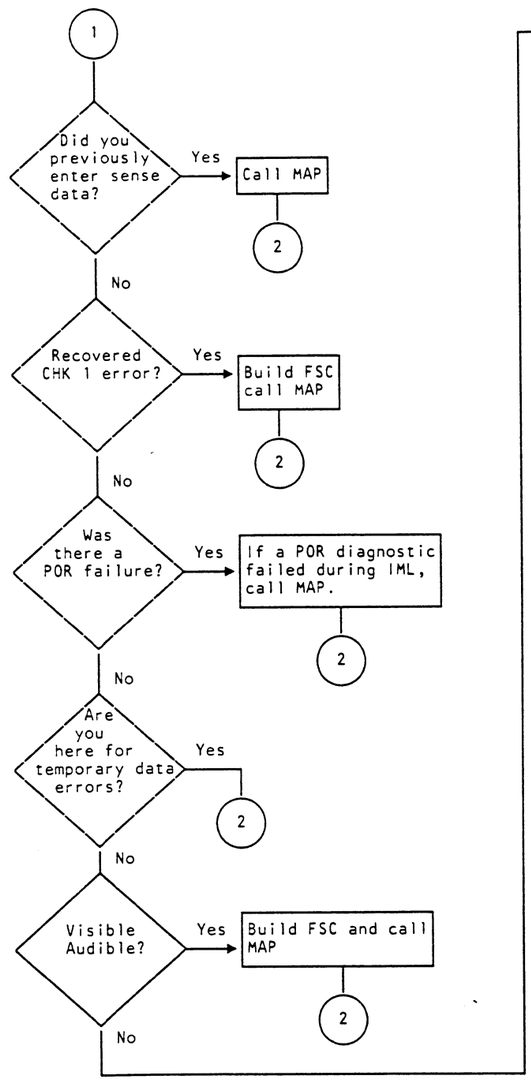
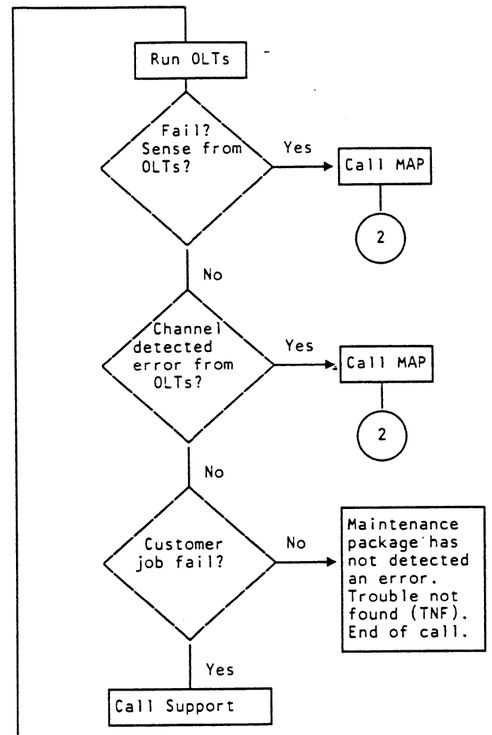
3480 Maintenance Package Summary (Continued)









0 0 0 0 0 0 0 0 0 0

Vary Offline

Before you perform a maintenance action on a drive, the drive address must be offline to the operating system. Before you perform a maintenance action on a control unit, all drives attached to the control unit must be offline to the operating system in a single control unit configuration or have the paths offline for all drives in a dual control unit configuration.

Failure to have the drive or control unit offline during a maintenance action could affect the operation of the operating system.

How to Vary a Drive Offline (Single or Dual Control Unit Subsystem)

Have the customer:

1. Determine all of the channel addresses that have access to the drive.
2. Vary each of these addresses offline to the operating system.

Be sure to verify that the customer has completed the vary offline procedure before starting the maintenance procedure.

How to Vary a Subsystem Offline (Single or Dual Control Unit Subsystem)

Have the Customer:

1. Determine all channel paths that have access to the subsystem.
2. Vary all channel path addresses, to each drive that is attached to the control unit, offline to the operating system.

   Be sure to verify that the customer has completed the vary offline procedure before starting the maintenance procedure.

Do the following:

1. If you have dual Control Units, verify all paths to all drives are offline.
2. Remove all cartridges from the drives. If the cartridges cannot be removed, see MI VOL A01, CART 10, for further instructions.
3. Open the control unit front cover.
4. Set the control unit Online/Offline switch to the Offline position. Wait for up to one minute for the green Offline LED to come on.

   Note: The Offline LED does not light until all control unit to channel processes have stopped.
5. If the green Offline LED does not come on see MI VOL A02, CARR-CU 5.

Intermittent Failures

Intermittent failures are defined as those that cannot be duplicated during a service call.

When you start a repair call, you are instructed to attach the MD and follow this sequence:

1. Enter a drive check code, if available.

   If not,
2. Enter a sense data, if available.

   If not,
3. Enter a host detected symptom, if available.

   If not,
4. Enter a drive address.
5. If there is an automatic cartridge loader problem, go to the MAP for that problem

   If not,
6. The Functional Verify program is run. If there are no errors, the intermittent leg is run. The intermittent leg is performed in this sequence.

   a. A test to see if sense data was entered previously.

      If not,

   b. A test for recovered check 1 is performed.

      If none are found,

   c. A test for power on diagnostic errors is performed.

      If no errors are found, the program asks,
7. If there are any high temperature errors. Answer the question.

   If there are no errors the program asks,
8. Check for visible or audible symptoms.

   If there are none,
9. Run all 3480 Online Tests (OLTS).

   If no errors are found, no trouble found.

0 0 0 0 0 0 0 0 0 0

Related Publications

Although there is no prerequisite reading for using this book, additional information related to the IBM 3480 subsystem can be found in:

- *IBM 3480 Magnetic Tape Subsystem Reference: Channel Command, Status and Sense Bytes, and Error Recovery Procedures*, GA32-0042.
- *IBM Input/Output Equipment: Installation manual— Physical Planning for System 360, System/370, and 4300 Processors*, GC22-7064.
- *IBM S/370 Installation Manual: Physical Planning*, GC22-7004.
- *IBM 3480 Magnetic Tape Subsystem Introduction*, GA32-0041.
- *IBM 3480 Magnetic Tape Subsystem Planning and Migration Guide*, GC35-0098.
- *IBM 3480 Magnetic Tape Subsystem Operator's Guide*, GA32-0066.
- *IBM 3480 Magnetic Tape Subsystem User's Reference*, GC35-0099.
- *Care and Handling of the IBM Magnetic Tape Cartridge*, GA32-0047.
- *Tape and Cartridge Requirements for the IBM Magnetic Tape Cartridge Drives*, GA32-0048.
- *IBM System/370 Principles of Operation*, GA22-7000.
- *IBM System/370 Extended Architecture Principles of Operation*, SA22-7085.

Contents

3480 Maintenance Summary

The 3480 maintenance package has two parts, the maintenance diskettes and the 3480 Maintenance Information manual.

The Maintenance Device

The maintenance device (MD) is the primary maintenance tool for the 3480 Magnetic Tape Subsystem.

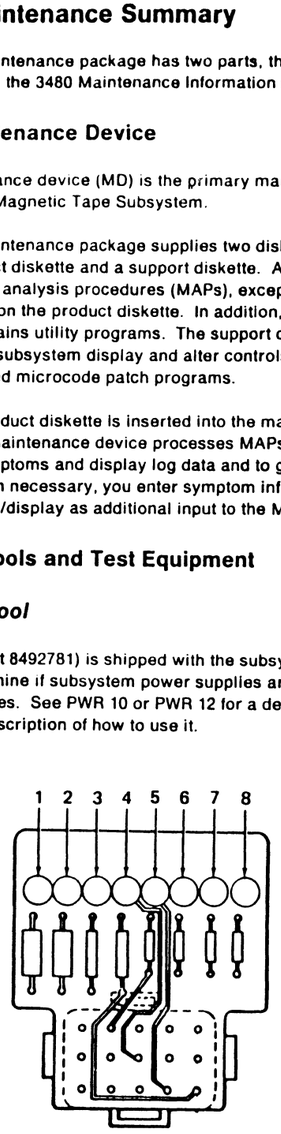
The 3480 maintenance package supplies two diskettes for the MD, a product diskette and a support diskette. All 3480 maintenance analysis procedures (MAPs), except power MAPs, are resident on the product diskette. In addition, the product diskette contains utility programs. The support diskette contains diagnostics, subsystem display and alter controls, support utility programs, and microcode patch programs.

When the product diskette is inserted into the maintenance device, the maintenance device processes MAPs to analyze machine symptoms and display log data and to guide you to the failure. When necessary, you enter symptom information on the MD keyboard/display as additional input to the MAPs.

Special Tools and Test Equipment

DC Test Tool

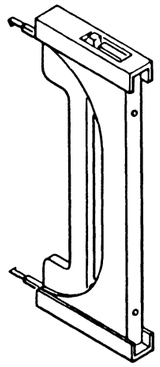
This tool (part 8492781) is shipped with the subsystem. Use this tool to determine if subsystem power supplies are supplying output voltages. See PWR 10 or PWR 12 for a description of this tool and a description of how to use it.



DC Test Tool (part 8492781)

Card Extractor

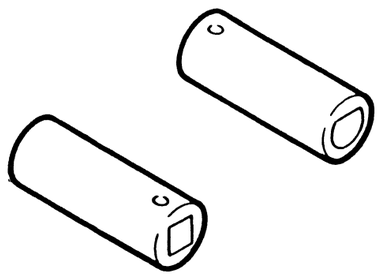
This tool (part part 1310707) is a site tool but must be obtained separately. It is used to remove logic cards from the subsystem. This tool is the same extractor tool as used on other IBM devices.



Card Extractor (part 1310707)

Tape Removal Tool

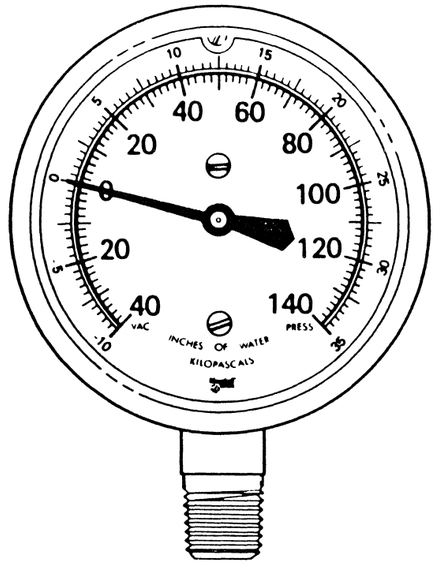
This tool (part 6850663) is shipped with the subsystem. Use it to rewind tape into the cartridge when the tape must be rewound by hand. See CART 12 for instructions on how to use the tape removal tool.



Tape Removal Tool (part 6850663)

Pressure/Vacuum Gauge

This tool (part 6850747) is used to measure the pneumatic system pressure or vacuum. See PNEU 5 for instructions on how to use the pressure/vacuum gauge.



Pressure/Vacuum Gauge (part 6850747)

Pressure/Vacuum Kit (Part 6857823)

This kit contains hoses, fittings and the Pressure/Vacuum gauge (shown above) for measuring the pneumatic system pressure or vacuum. This kit is not shipped with the subsystem and must be ordered.

Oscilloscope

The error analysis diagrams in the maintenance information manual instruct the service representative to use an oscilloscope. A Tektronix* Model 453/454 or 475 or equivalent oscilloscope is needed.

*Trademark of Tektronix, Inc.

Integrated Logic Probe

The integrated logic probe (ILP) (part 453222) can be used instead of an oscilloscope for all measurements except those that show timing between signals or the need to measure voltage values and tolerances. See "Integrated Logic Probe" in this section for instructions on how to use the probe.

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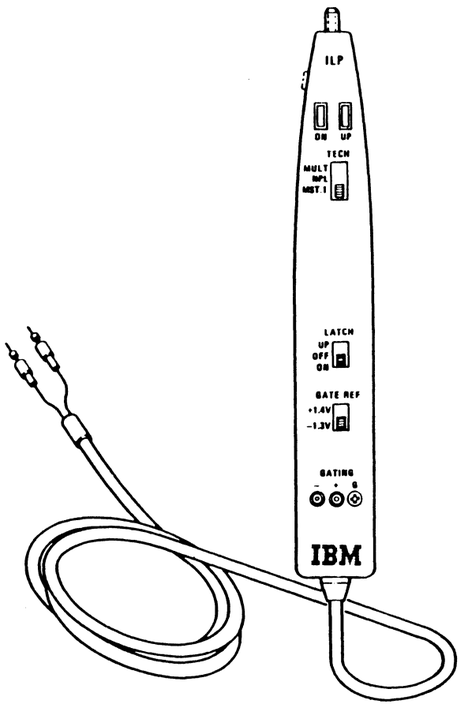
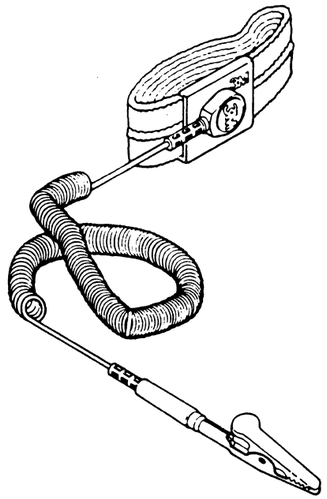


Integrated Logic Probe (part 453222)

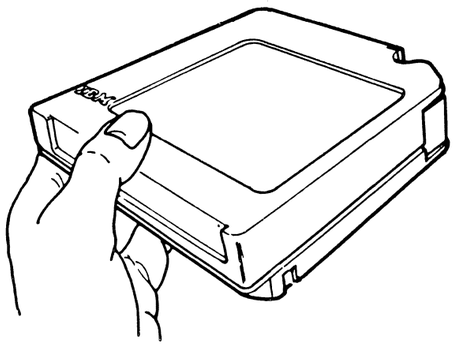
ESD Grounding Wrist Strap Tool

This tool (use the most current part number available) is used to prevent damage when you work with electrostatic discharge (ESD) sensitive parts. See CARR-CU 1-9 or CARR-DR 1-9 for information on using the ESD grounding wrist strap tool. This tool is **not** shipped with the subsystem and must be ordered.



Cleaning Cartridge

This tool (part 4780527) is used to clean the head guide assembly. To use, load the cartridge on a drive, and the cleaning procedure occurs automatically. The cartridge unloads when the cleaning procedure is done. This tool is shipped with the subsystem.



Leader Block Replacement Kit

The Leader Block Replacement Kit (part 4780625) is a customer purchased kit that includes the clutch tool and the attachment tool. See Cart 20 for information on using these tools.

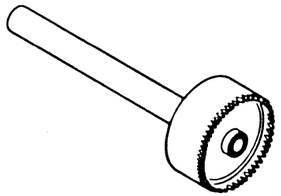


Figure 1. Clutch Tool

Figure 2. Attachment Tool

Channel Wrap Blocks

There are two channel wrap blocks: part 4299873 for the tag wrap and part 4299876 for the bus wrap. These blocks are used when running diagnostics on the channel interface. In addition, there is a wrap terminator (part 6315622) used with the two channel wrap blocks. See DIAG "Channel Interface Wrap Test – Routine EE62" for more information on how to use the channel wrap blocks. These tools are shipped with the subsystem.

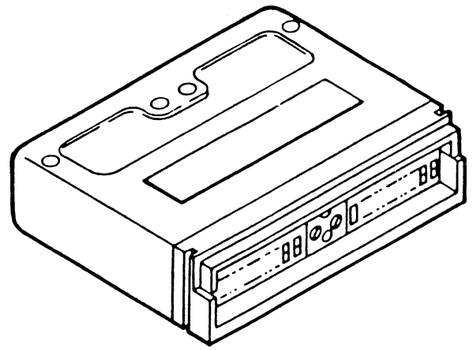


Figure 3. Wrap Block

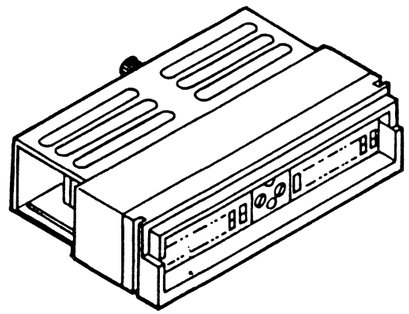
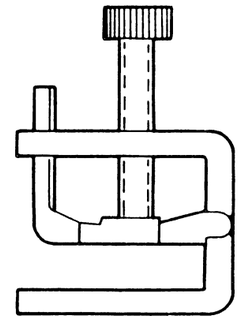


Figure 4. Wrap Terminator

Hose Clamp Tool

This tool (part 2496268) is used to clamp various air pressure hoses for use in FRU isolation and for concurrent maintenance. See CARR-DR 3-1 for information on how to use the hose clamp tool. This tool is shipped with the subsystem.



File Protect Gauge

This tool (part 6178974) is used to adjust the file protect switch to ensure correct contact is made with the tape cartridge. This tool is shipped with the subsystem.

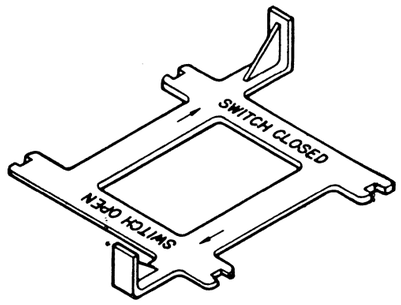


Figure 5. File Protect Gauge

Maintenance Information Description

This section describes the 3480 Maintenance Information and explains how to use the maintenance information to repair the 3480.

The maintenance information (MI) is a five-volume manual that supplies maintenance procedures and theory of operation information. This information is contained in the following five volumes:

- A01--Maintenance procedures
- A02--Maintenance procedures and control unit checks, adjustments, removals, and replacements
- A03--Drive checks, adjustments, removals, and replacements
- A04--Support procedures
- A05--Error analysis diagrams.

Each volume of maintenance information is divided into sections that are marked with tabs for quick identification and access. The following describes the sections contained in each of the maintenance information volumes.

Volume A01 – Maintenance Procedures

The sections contained in this volume supply maintenance procedures and repair information needed to diagnose and repair the 3480.

GLOSS

This section supplies descriptions of terms and abbreviations used in the 3480 Maintenance Information. Use this section to look up the meaning of any word or abbreviation that you do not understand.

PLAN

This section (the section you are now using) describes the 3480 Maintenance Information, supplies a summary of the maintenance package, and explains how to use the maintenance information to repair the 3480. Use this section to learn what aids the maintenance package supplies and how to use the maintenance package to service the subsystem.

INTRO (Introduction)

This section supplies a summary of the 3480 Magnetic Tape Subsystem, describes the tape cartridge, and describes the subsystem features. Use this section to learn what the subsystem consists of and what it does.

START

This section supplies the initial entry into the maintenance package. It contains problem-finding procedures that guide the service representative to a diagnostic or repair procedure. Use this section to start your analysis of a problem. This section aids you in analyzing the problem or instructs you to use the maintenance device to analyze the problem.

CART (Cartridge)

This section contains analysis and error-recovery procedures for tape cartridge problems. The START section or the maintenance device will send you to the CART section to perform specific repair procedures.

PNEU (Pneumatics)

This section supplies analysis procedures to isolate failures in the pneumatic system. The START section or the maintenance device will send you to the PNEU section.

MSG (Message)

This section describes the system console messages and the Environmental Recording Editing and Printing (EREP) program. It contains examples of console messages and EREP printouts and explains how to use the information. Use this section to analyze the console messages and printouts from the EREP program. This analysis will send you to the correct entry in the START section.

INST (Installation/Removal)

This section supplies the information necessary for you to install or remove the subsystem. Use this section when the customer wants the subsystem (or a machine from the subsystem) installed, removed, or relocated.

INSP (Safety Check Procedures)

This section supplies the safety check procedures to ensure that a machine that has not been under an IBM Maintenance Agreement has the needed safety items installed and that no other changes were made to make it unsafe. Use this section when servicing status 3 machines and when preparing a status 3 machine to be covered by a maintenance agreement.

INDEX

This section supplies an alphabetic list of key words and phrases in maintenance information volumes A01, A02, A03, A04, and A05. Use this section to find the subject you want.

Volume A02 – Maintenance Procedures and Control Unit Checks, Adjustments, Removals, and Replacements

The sections contained in this volume supply maintenance procedures and repair information needed to diagnose and repair the 3480 and the removal and replacement procedures for all FRUs in the control unit.

PWR (Power)

This section contains the MAPs to isolate failures in the power areas. It also contains voltage reference tables and charts, wiring diagrams, and a description of the dc test card. The START section or the maintenance device will send you to the PWR section to analyze power failures.

SENSE

This section supplies summary charts and descriptions of the subsystem sense bytes and the channel status byte. This section describes how to analyze the sense bits. Use this section to determine the correct entry point to the START section and to answer the maintenance device when it requests data about sense bytes.

PANEL

This section describes the switches and indicators on the control unit and tape unit panels, and supplies tape drive operating instructions. Use this section to learn the function of the control unit and tape unit panels. You can also use this section for directions about performing operations as instructed by the START section and the maintenance device.

MD (Maintenance Device)

This section describes the maintenance device (MD), MD messages, and MD menus. Instructions on how to use the MD are provided. Use this section to learn about the MD and how to use it with the 3480 subsystem.

LOC (Locations)

This section shows the location of FRUs, assemblies, and parts in the control unit and tape unit. Use this section to find the locations of items you are sent to by the maintenance device or by other sections of this manual.

CARR-CU (Control Unit Checks, Adjustments, Removals, and Replacements)

This section supplies the removal and replacement procedures for all FRUs in the control unit. The check or adjustment procedures are included. At the front of the section is a list of all FRU numbers, which you can use for FRU identification and to find required procedures. Use this section when the START section or the maintenance device instructs you to check, adjust, or exchange a FRU in the control unit.

Volume A03 – Drive Checks, Adjustments, Removals, and Replacements

This volume contains the section that supplies the drive removal and replacement procedures.

CARR-DR (Drive Checks, Adjustments, Removals, and Replacements)

This section supplies the removal and replacement procedures for all FRUs in the tape unit. The check or adjustment procedures are included. At the front of the section is a list of all FRU numbers, which you can use for FRU identification and to find required procedures. Use this section when the START section or the maintenance device instructs you to check, adjust, or exchange a FRU in the tape unit.

Volume A04 – Support Procedures

The sections contained in this volume supply diagnostic procedures and information, theory of operation, microcode data field, and register information to aid you in diagnosing problems.

LGND (Legend)

This section describes with graphics the symbols used in the maintenance information. In addition, examples and descriptions of logic, net wire, and voltage pin lists are supplied. Use this section to learn how to read the diagrams in the maintenance package.

SPROC (Support Procedures)

This section provides a step by step procedure for entering and using the support maintenance package. It reminds you of what error data is available and gives hints on analyzing that data.

SDISK (Support Diskette Procedures)

This section describes the support diskette procedures and gives directions on using the maintenance device (MD) to display registers, run the trace program, and do other support MD operations that are resident on the support diskette.

DIAG (Support Diagnostics)

This section contains a description of the diagnostic control program, the diagnostic tests, and the Drive Command Exerciser that are resident on the support diskette.

Maintenance Information Description (Continued) **PLAN 11**

DF (Data Fields)

This section describes the control unit and drive microcode data fields, logs, and registers that are useful to you in diagnosis of subsystem hardware failures.

The data field definitions are predominantly used to define bit meanings within a register or field when EADs make reference to them. Additionally, support diagnostics display register contents, and the data fields section can be used to define their meanings.

OPER (Theory of Operations)

This section supplies the theory information necessary to understand subsystem operations. Included are card, command, and data flow descriptions.

Volume A05–Error Analysis Diagrams

This volume contains a Fault Symptom Index (FSI) and Error Analysis Diagrams (EAD) that are used to diagnose problems when detailed troubleshooting is necessary.

FSI (Fault Symptom Index)

This section contains a listing of error codes generated by the control unit or drive. A description of each error code, a FRU list associated with the error code, and troubleshooting references are provided. Use this section when you are sent here by the Support Procedures to diagnose problems that were not corrected by the product procedures.

EAD (Error Analysis Diagrams)

This section contains error diagrams, error condition theory, and troubleshooting guides for error codes that are generated by the control unit or drive. Use this section when you are sent here by the FSI for diagnosing problems that were not corrected by the product procedures.

Maintenance Information Description (Continued) **PLAN 11**

3480 Maintenance Package Summary

The flowcharts on pages PLAN 30 through PLAN 51 show the process that the maintenance package follows to lead you to a repair. The flowcharts do not make up a repair procedure. The repair procedure is completely contained in the sections starting at START and in the maintenance device diskettes.

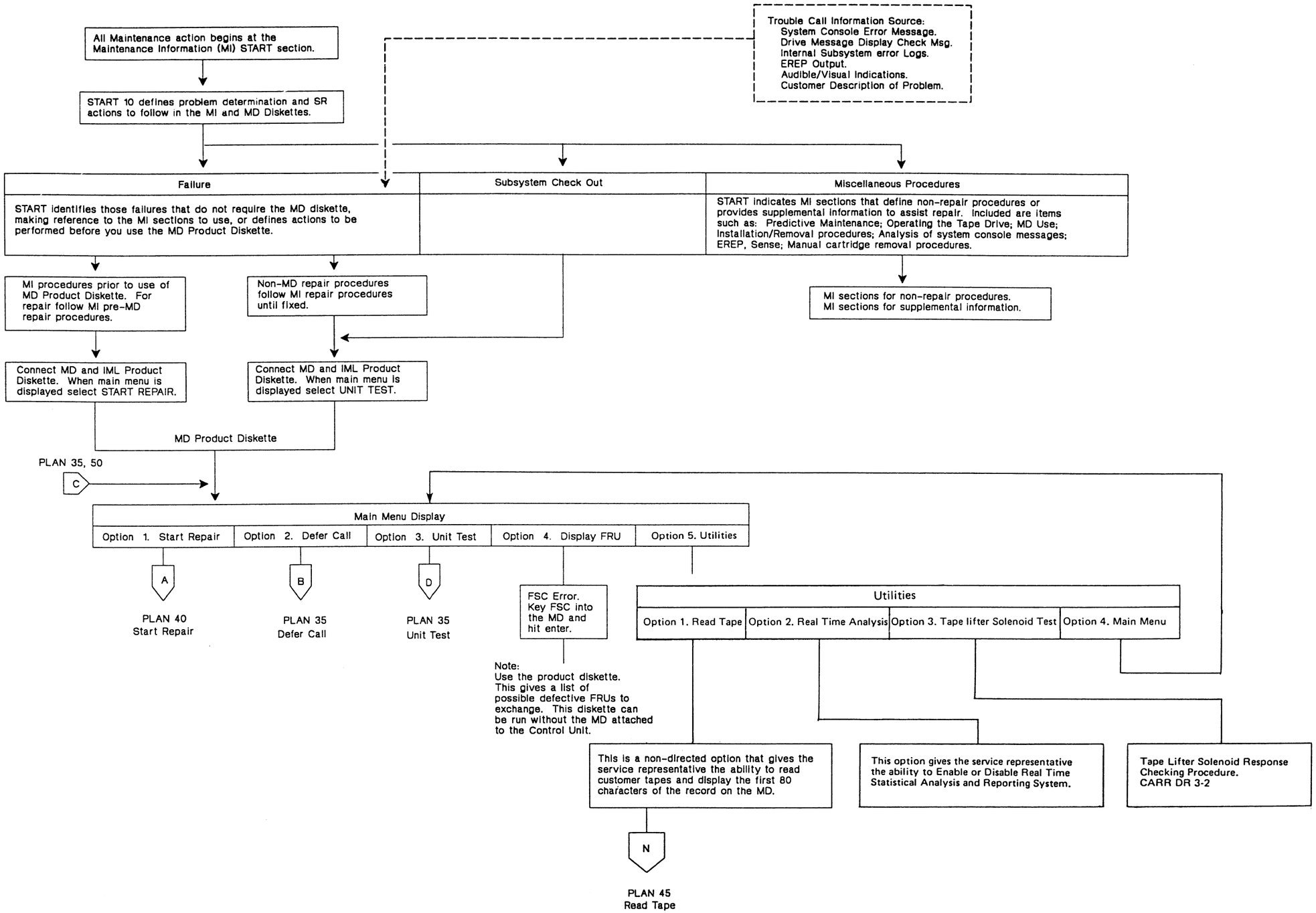
PLAN 30 shows the process up to the selection of an action from the MD main menu.

PLAN 35 shows the process the maintenance package follows for an interrupted service procedure. PLAN 35 also shows the procedure that the maintenance package follows when you want to test the subsystem for correct operation.

PLAN 40 and PLAN 41 show the procedure the maintenance package follows when you select Start Repair from the MD main menu. They show how the package diagnoses the problem from the information you supply.

PLAN 50 and PLAN 51 describe the maintenance package tools available to the service representative with support education.

3480 Maintenance Package Summary (Continued)



3480 Maintenance Package Summary (Continued) PLAN 35

Product MD diskette
Option 2 - Defer call
PLAN 30

B

Service representative is in the midst of start repair. Need arises to terminate call prior to fix.

This procedure is a way to formally end an incomplete call.

Possible Reasons:
1. Required FRU not on site.
2. End of shift.
3. Customer requests SR to work on higher priority trouble within account.

To begin deferred call status, press Reset on the MD keyboard.

Main menu is displayed. Select option 2, Defer Call.

Maint. call ended

Return to call must be via Start Repair.

C

PLAN 30

Product MD diskette
Option 2 - Difer call
PLAN 30

D

Service representative has made the fix via MI without use of the MD or just wants to check out the subsystem. Retest, record on FRU, end.

Additional uses:

Following:
1. Non-MD assisted repair
2. EC install
3. MES install

To ensure device is returned in an operational condition.

SR provides drive address.

Execute Functional Verify Program (FVP)

FVP Error?

Yes

Exit to MAP selection for error code.

E

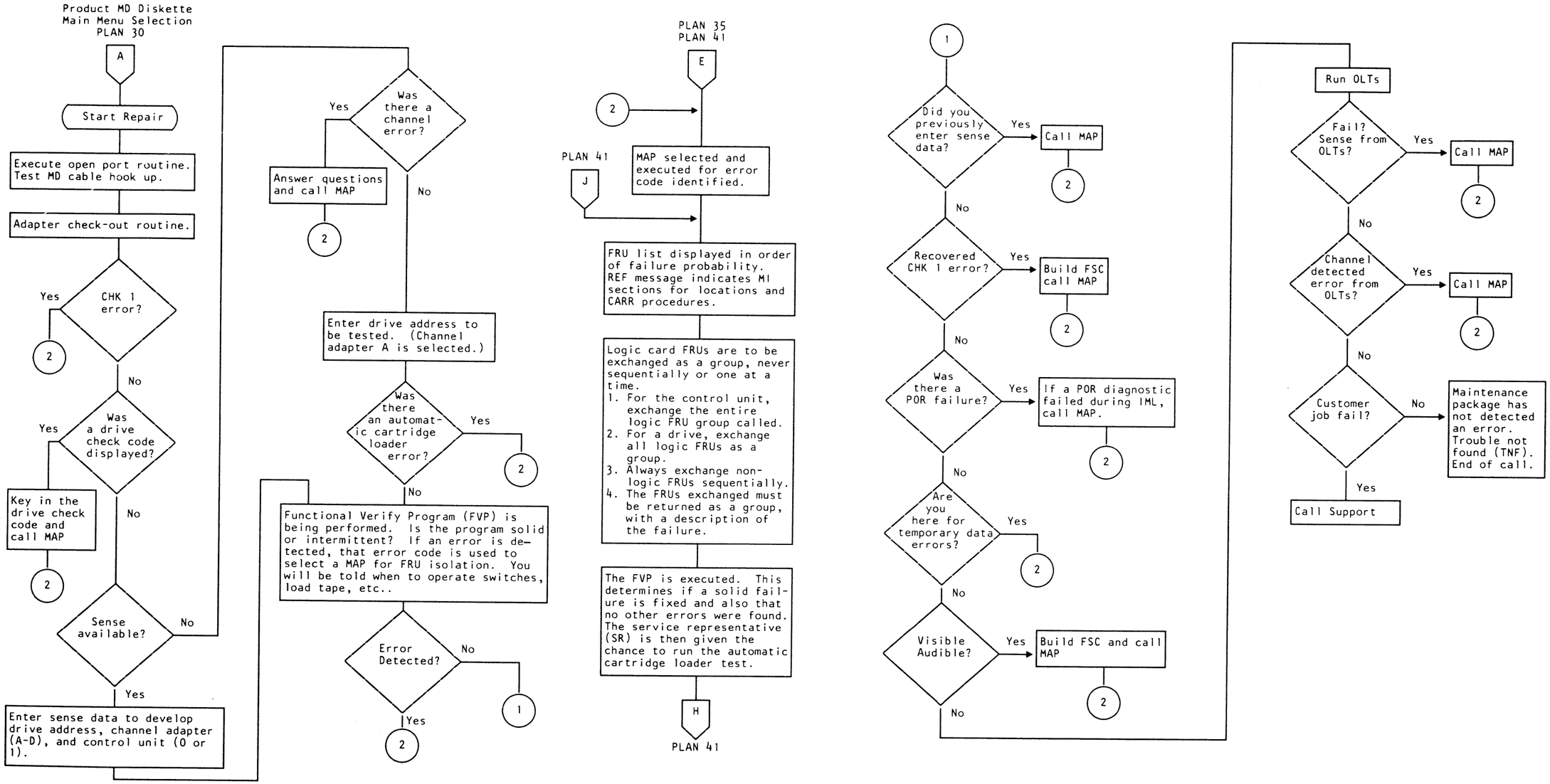
PLAN 40

No

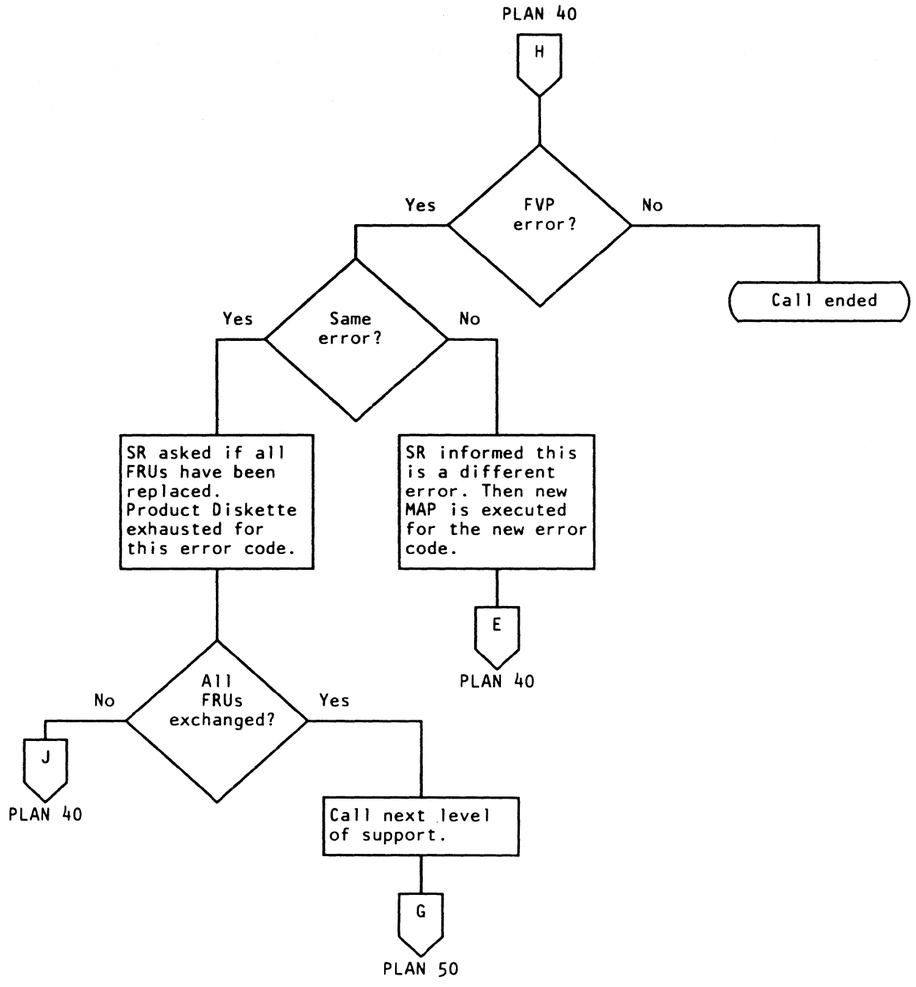
Service Representative is led to end of procedure.

Close preceding call

3480 Maintenance Package Summary (Continued) PLAN 35



3480 Maintenance Package Summary (Continued) **PLAN 41**



3480 Maintenance Package Summary (Continued) **PLAN 41**

Read Tape/Tape Read Program

The Tape Read program will read a record and display up to 80 characters of data on the MD panel. The program will also perform motion commands associated with locating blocks or files of data. This program makes no attempt to define a tape problem and as such is not part of the normal product maintenance package. Its use requires a knowledge of the layout of data on tape. Further information about the MVS/370 or MVS/XA system with Data Facility Product processes, magnetic tape labels can be obtained by consulting the publication titled *Magnetic Tape Labels and File Structure Administration* (GC26-4064 for MVS/370 or GC26-4003 for MVS/XA) if that program product is installed.

This utility is located on the product disk because of space requirements and to separate the program from the Drive Command Exerciser which has the ability to write data. The tape read program will run concurrent with customer operations and the data on the tapes being used cannot be altered.

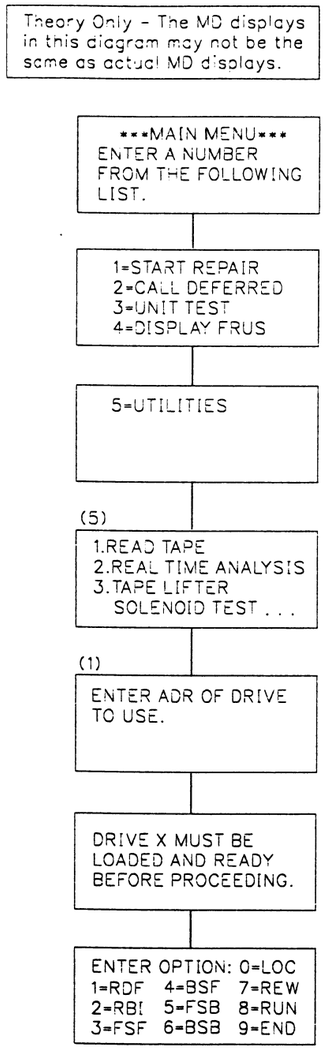
The following commands are not provided:

Write

- To prevent altering data

Read backward

- Data would be placed into the buffer backwards.



0 = LOC = Locate

Parameters are required for the locate command as follows:

XXYYYY

XX = Segment

YY = Block ID

1 = RDF = Read forward

Will read and fill the buffer until either a Tape Mark is detected or the buffer fills.

2 = RBI = Read block ID

Provides data in the same format as indicated in the locate command above but shows the beginning and ending buffer "pointers."

Note: *If a Tape Mark is the record that the RBI is issued for, the beginning and ending pointers will be equal.*

3 = FSF = Forward space file

4 = BSF = Backward space file

Spaces the tape either forward or backward until a Tape Mark is detected.

5 = FSB = Forward space block

6 = BSB = Backward space block

Spaces the tape either forward or backward one block.

7 = REW = Rewind

8 = RUN = Rewind unload

9 = END = Returns to menu

EXAMPLE: RESULTS OF A READ BLOCK ID COMMAND (RBI)

```
BLOCK ID.............
02  000042
02  000044
```

02 = SECTOR

000042 = Blk ID of next record to send to the channel.

000044 = Blk ID of last record in buffer.

EXAMPLE: RESULTS OF A LOCATE COMMAND (LOC)

```
ENTER LOCATE ADDRESS
AS 01000005. ERROR
OCCURS IF PAST AREA
WRITTEN.
```

EXAMPLE: READ FORWARD PAST VALID DATA

```
FAILED READ FWD
COMMAND
```

```
SNS:0850204100078C20
    000270C270C20000
    0000000200000000
    F08002E101431101
```

EXAMPLE: READ FORWARD ON A BLANK TAPE (NEVER INITIALIZED)

```
FAILED READ FWD
COMMAND
```

```
SNS:0041202E00000020
    0000716171617153
    0000000200000000
    F08002E101431100
```

The following is presented for the use of the service representative and does not cover all possible combinations of tape label structure. The information is presented ***only*** as an example.

Tapes can be used that have IBM standard labels, non-standard labels, user labels and no labels. If IBM standard label processing is used, a tape that has been used for output will consist of a volume label plus data set header and trailer labels. The volume label is created by either a utility program or user's program when the tape is first received.

The IBM standard volume label (VOL1) appears at the beginning of each tape. The volume label identifies the volume and its owner and is used to verify that the correct volume is mounted.

The data set header label group consists of IBM standard data set label 1 (HDR1) and IBM standard data set label 2 (HDR2). The HDR1 label contains operating system and device-dependent data that relates to the data set. It also contains the year and Julian date that the tape was created.

The HDR2 label contains additional data set characteristics. These labels are used to identify and describe the data set and to protect it from unauthorized use. It also contains the last four digits of the control unit serial followed by the drive number that created the tape.

These labels are created automatically by data management each time a data set is recorded on tape.

The data set trailer label group consists of IBM standard data set label 1 (EOV1 or EOF1) and IBM standard data set label 2 (EOV2 or EOF2). These labels duplicate the IBM data set header labels so that the tape can be read backward. The trailer labels are identical to the header labels except that:

- The identifier is EOV or EOF instead of HDR.
- A block count is recorded in the first trailer label (EOV1 or EOF1) and is used on input to verify that all blocks of the data set are processed. The block count field in the HDR1 label contains zeros.

EXAMPLE: READ FORWARD ON A TAPE THAT HAS BEEN INITIALIZED BY IEHINITT BUT HAS NEVER BEEN USED FOR OUTPUT.

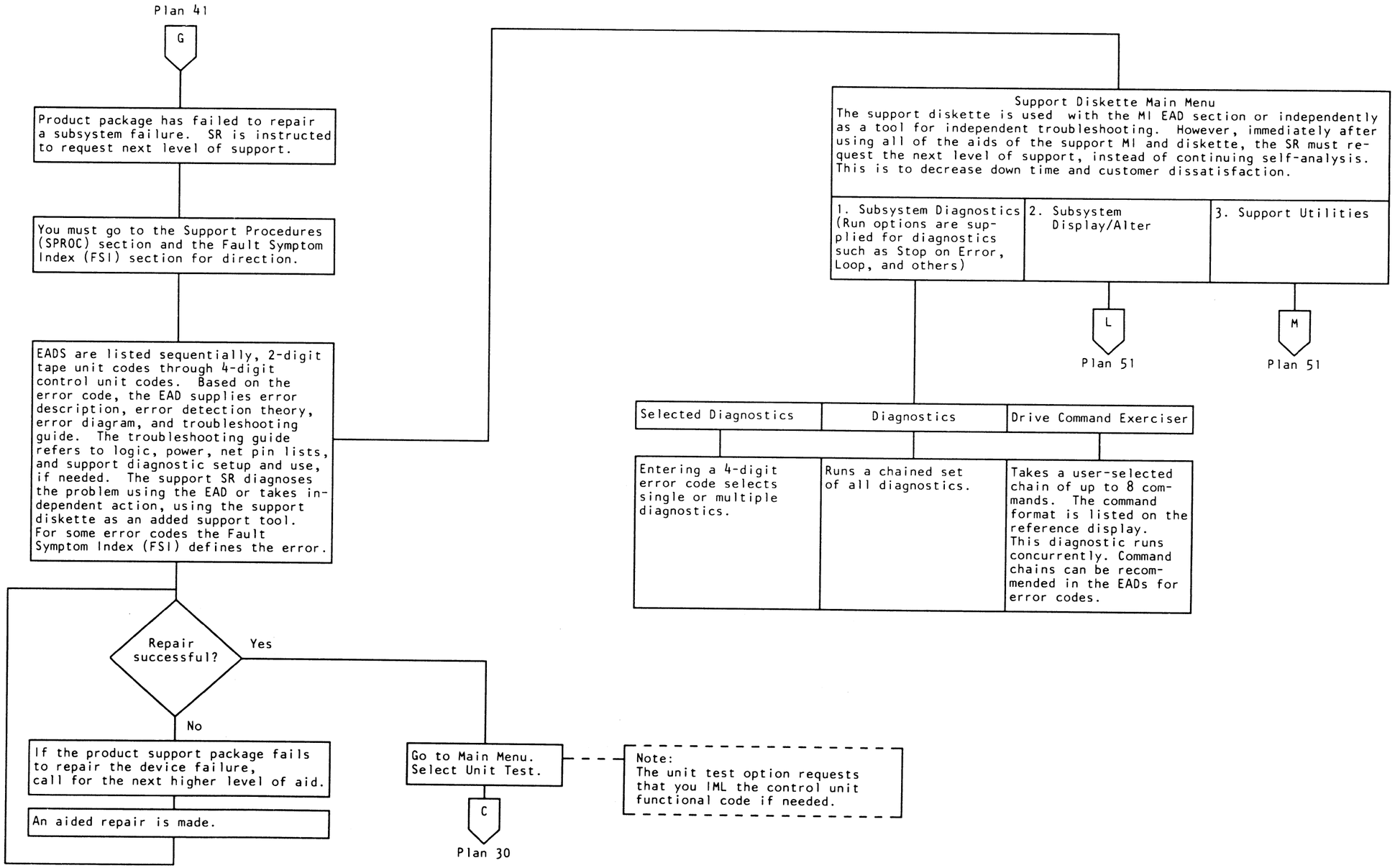
```
VOL1X12345

HDR100000000000000000
00000000000000000000
00000000000000000000
00000000000000000000

TAPE MARK
```

EXAMPLE: READ FORWARD ON A TAPE THAT HAS AN IBM STANDARD LABEL AND HAS BEEN USED FOR OUTPUT.

```
VOL1X12345                          Volser = X12345

HDR1ABC.OPEN.T000001
 X1234500010001
  86029 000000000000
IBM OS/VS 370                       Created on day 29 of 1986.

HDR2F2318023180000ABC
IX   /PP          S
  01436                             Created on drive 6 using control unit 10143

TAPE MARK

(Customer data records)

TAPE MARK

EOF1ABC.OPEN.T000001
 X1234500010001
  86029 000000057000
IBM OS/VS 370                       Format of EOF1 and EOV1 is the same as HDR1.

EOF2F2318023180000ABC
IX   /PP          S
  01436                             Format of EOF2 and EOV2 is the same as HDR2.

TAPE MARK

TAPE MARK
```

3480 Product Support Summary

Note: Registers displayed by programs/diagnostics on the support diskettes are useful in isolating hardware failures and are explained in the DF (Data Fields) section. See "Contents" on DF 1.



Plan 50

L

1. Storage Display/Alter	2. Register Display/Alter
Supplies access to the control unit tables, control unit storage, channel storage, status storage, and drive storage.	Supplies access to the control unit and drive external registers and local storage registers and the control unit scan ring.

Plan 50

M

1. Control unit trace/match control	2. Microprocessor control	3. Control unit subsystem dump
Prompts the user for setup data. Action taken at the time selected errors occur.	Permits control operations in these areas: maintenance adapter registers and microprocessor, control storage, and maintenance adapter commands.	Dump files can be written for the control unit and drives, of long or short format. Dump files are written on the support diskette.

1. Product maintenance adapter registers	Microprocessor commands	Control storage commands	Product maintenance adapter commands
Displays the follow- registers: MCR, MSB, MTI, ADR, and D REG.	Provides microprocessor control similar to an SR panel. (For example, stop, step, start, reset, etc.)	Allows control storage read and write operations.	Allows product maintenance adapter control via commands. (For example, set address, comp sync/stop, ignore errors, etc.)

Procedures

Vary Offline

Before you perform a maintenance action on a drive, the drive address must be offline to the operating system. Before you perform a maintenance action on a control unit, all drives attached to the control unit must be offline to the operating system in a single control unit configuration or have the paths offline for all drives in a dual control unit configuration.

Failure to have the drive or control unit offline during a maintenance action could affect the operation of the operating system.

How to Vary a Drive Offline (Single or Dual Control Unit Subsystem)

Have the customer:

1. Determine all of the channel addresses that have access to the drive.
2. Vary each of these addresses offline to the operating system.

Be sure to verify that the customer has completed the vary offline procedure before starting the maintenance procedure.

How to Vary a Subsystem Offline (Single or Dual Control Unit Subsystem)

Have the Customer:

1. Determine all channel paths that have access to the subsystem.
2. Vary all channel path addresses, to each drive that is attached to the control unit, offline to the operating system.

   Be sure to verify that the customer has completed the vary offline procedure before starting the maintenance procedure.

Do the following:

1. Switch the control unit Online/Offline switch to the Offline position.

   Note: *A delay can be expected because the Offline green LED does not light until all channel processes have stopped.*

2. If the Offline green LED does not light, press the IML/Reset switch to the Reset position.

   Note: *Check with the customer to ensure that the subsystem has been varied offline completely before pressing Reset.*

Intermittent Failures

Intermittent failures are defined as those that cannot be duplicated during a service call.

When you start a repair call, you are instructed to attach the MD and follow this sequence:

1. Enter a drive check code, if available.

   If not,

2. Enter a sense data, if available.

   If not,

3. Enter a host detected symptom, if available.

   If not,

4. Enter a drive address.
5. If there is an automatic cartridge loader problem, go to the MAP for that problem.

   If not,

6. The Functional Verify program is run. If there are no errors, the intermittent leg is run. The intermittent leg is performed in this sequence.

   a. A test to see if sense data was entered previously.

      If not,

   b. A test for recovered check 1 is performed.

      If none are found,

   c. A test for power on diagnostic errors is performed.

      If no errors are found, the program asks,

7. If there are any high temperature errors. Answer the question.

   If there are no errors the program asks,

8. Check for visible or audible symptoms.

   If there are none,

9. Run all 3480 Oline Tests (OLTS).

   If no errors are found; no trouble found.

End a Call

During normal maintenance actions the maintenance device (MD) will guide you through the End a Call procedure. However, if the maintenance action you have performed did not use the MD, connect the MD to the control unit and select option 3, Unit Test. The Unit Test option will run the Functional Verify Program to check out the subsystem and guide you through the End a Call procedure.

Note: *The Unit Test option will request that you IML the control unit functional code if needed.*

Engineering Change

To install an engineering change, follow the instructions supplied with the engineering change. These instructions should specify that you run the Unit Test option at the end of the rework. If the instructions do not specify that you run the Unit Test option, run this option to check out the subsystem.

Note: *The Unit Test option will request that you IML the control unit functional code if needed.*

If a failure occurs, check your rework.

Online Tests (OLTS)

If you have any question concerning the use of the 3480 Online Tests (OLTs) see the Online Tests (OLTs) Users Guide, Document Number D99-3480.

The 3480 Online Tests (OLTs) program contains four test sections:

- Section A - Control Unit Functional Test
- Section B - Pathing Commands Test
- Section C - Read/Write Reliability
- Section D - Tape Interchange
  - Section A contains 2 routines
  - Section B contains 1 routine
  - Section C contains 1 routine
  - Section D contains 3 routines

Section A: Control Unit Functional Test

Section A determines that all valid 3480 commands, except Control Access, Assign, Unassign, and Suspend Multipath Reconnection commands, can be correctly performed.

Most of the commands are performed chained to a 'Mode Set' command to inhibit the Error Recovery Program (ERP), and are executed as a single CCW. There may be requirements for chaining commands, such as the Data Security Erase or Set Tape Immediate commands or to obtain faster test completion time by chaining multiple write commands.

Section B: Pathing Commands Test

Section B is used to check the five pathing commands of the IBM 3480 tape subsystem. These commands are Set Path Group ID, Sense Path Group ID, Assign, Unassign, and Control Access.

Section C: Read/Write Reliability

This section is a motions-intensive read/write/reliability test based on the read/write reliability tests for the 3420 and 3430 tape subsystems (T342x and T3430F, respectively).

Section D: Tape Interchange

The tape interchange test is used to verify that a tape written on one tape drive can be correctly read on another tape drive. The test runs in the buffered write and read mode of the 3480 subsystem.

The subsystem automatic error recovery is not disabled for this test. All errors received by the program are treated as permanent and Section D is ended after appropriate error messages are issued.

Procedures (Continued)

Integrated Logic Probe

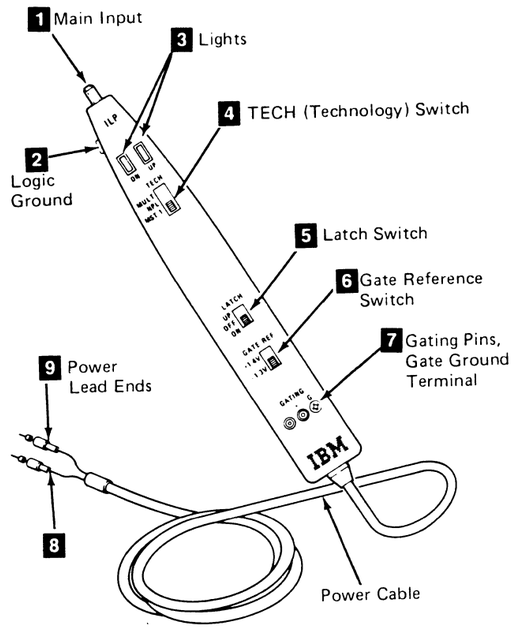
Use the integrated logic probe (part 453222) for all probing specified by the MAPs.

Use it as follows:

1. Connect the red power lead **9** to any D03 (+5 V dc) logic board pin in any column except A, B, and K.
2. Connect the black power lead **8** to any D08 (ground) logic board pin.
3. Ensure that the gating pins **7** have no inputs.
4. Set the GATE REF **6** switch to any position.
5. Set the LATCH **5** switch off.
6. Connect the logic ground **2** lead to a convenient ground (D08) pin.
7. Set the TECH **4** switch to MULTI.
8. Connect the main probe **1** test lead to the pin to be tested.
9. Test the general logic probe as follows:
   a. With nothing connected to the main probe test lead, neither the UP or DOWN light should be on.
   b. Connect the main probe test lead to any D08 (ground) pin; the DOWN light should be on.
   c. Connect the main probe test lead to any D03 (+5 V dc) pin; the UP light should be on.

When an up or down signal is detected, the associated light is held on by the probe circuits for enough time to see it, even though the signal may be of short duration.

For more instructions, see the *Integrated Logic Probe Operators Guide*, S226-3951.



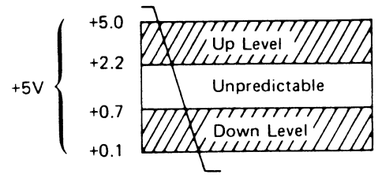
Scoping (Using Oscilloscope)

An oscilloscope, Tektronix [1] 454A, 475, or equivalent, may be used.

Set the oscilloscope controls as follows:

Use a X10 probe, sync=auto, volts=1 volt/cm, sweep=as required.

1. Probe the points as directed by the MAPs.
2. If the MAP indicates the UP light is on, the line level should be in the up signal level area. See the voltage signal levels below.
3. If the MAP indicates the DOWN light is on, the line level should be in the down signal level area. See the voltage signal levels below.
4. If the MAP indicates the light is flashing, the line level should be changing between up and down level. Ensure that the up and down levels are within limits. See the voltage signal levels below.



[1] Trademark of Tektronix, Inc.

Notes **PLAN 70**

Notes **PLAN 70**

Contents

Introduction to the 3480 Subsystem

The 3480 is a high performance buffered magnetic tape storage subsystem. The subsystem consists of a Model A22 or Model A11 Control Unit and up to four Model B22 or Model B11 Tape Units. Each tape unit contains two drives. Therefore, each control unit can have a maximum of eight drives connected to it. By adding the Dual Control Unit Coupler accessory, a second control unit and up to four tape units can be connected to the first control unit to form a two-control unit, sixteen-drive subsystem.

The 3480 subsystem attaches to the host processors through a block multiplexer data channel or a block multiplexer high speed data streaming feature channel.

Each control unit can have one to four block multiplexer data channel adapters. Each channel adapter permits the subsystem to attach to a host processor along a data channel path that operates in any of the following modes:

- DC interlock 1.5 megabyte/second
- Data streaming 2 megabyte/second
- Data streaming 3 megabyte/second
- Data streaming 4.5 megabyte/second.

Operating Characteristics

Some of the subsystem operating characteristics are:

- A compact design with front loading.
- A small reel of half-inch tape enclosed in a compact cartridge for greater tape protection.
- Automatic tape threading.
- A control unit with a 512K, 1 megabyte or 2 megabyte data buffer and a microprocessor that controls the data flow within the subsystem.
- A Dual Control Unit Communication accessory that has the ability to interconnect two control units into a single subsystem configuration.
- A drive with microprocessor control that moves tape without capstans or vacuum columns.
- A message display panel for each drive that provides visual information for the operator or service representative.

Operating Systems

The programming support for the subsystem is provided within the following operating systems and their future extensions:

- MVS
- VM/370.

Optional Features

The 3480 subsystem has the following optional feature:

Additional Channel Interface (1, 2, or 3).

An enhanced channel feature that permits 4.5 megabytes/second data streaming (standard on current A22 control units).

The 3480 tape drive has the following optional feature:

An automatic cartridge loading feature that handles up to six cartridges that load and unload automatically.

Physical Characteristics

Dimensions

- Control Unit:

  Height: 1.000 m (39.37 in.)
  Width: .660 m (25.98 in.)
  Depth: .750 m (29.53 in.)

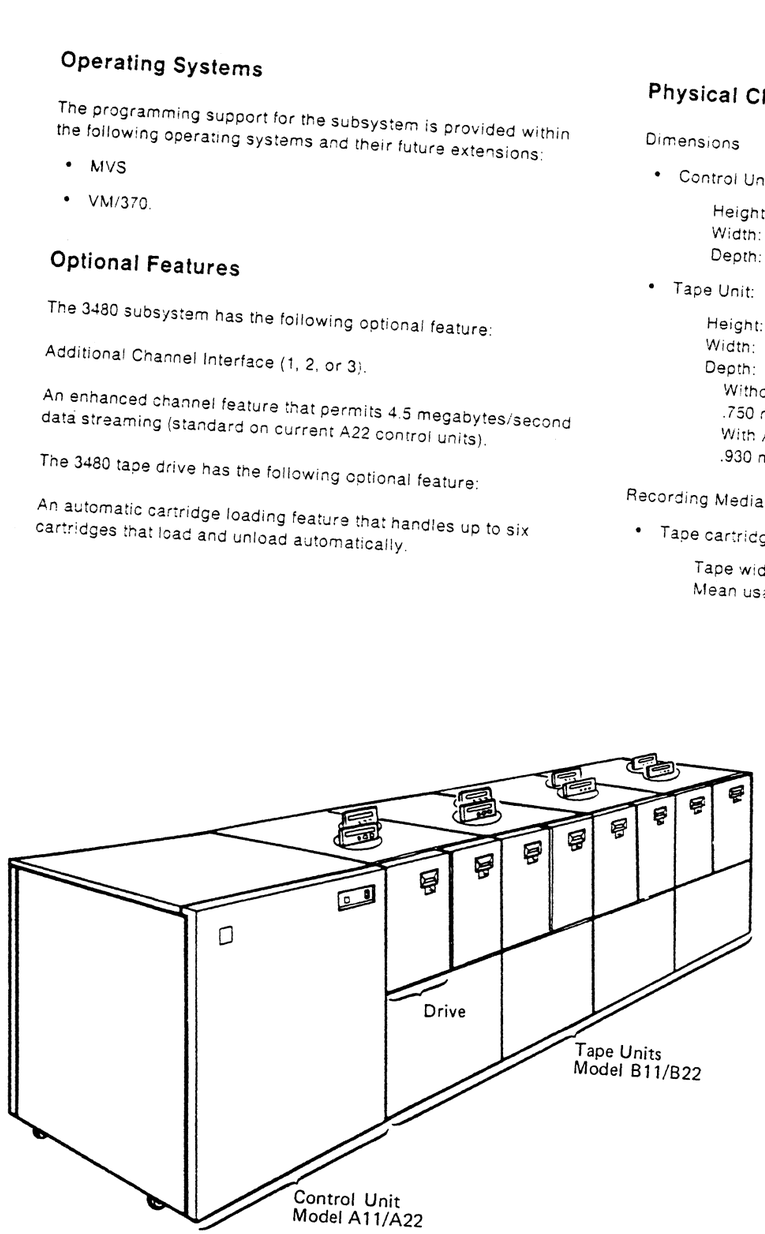
- Tape Unit:

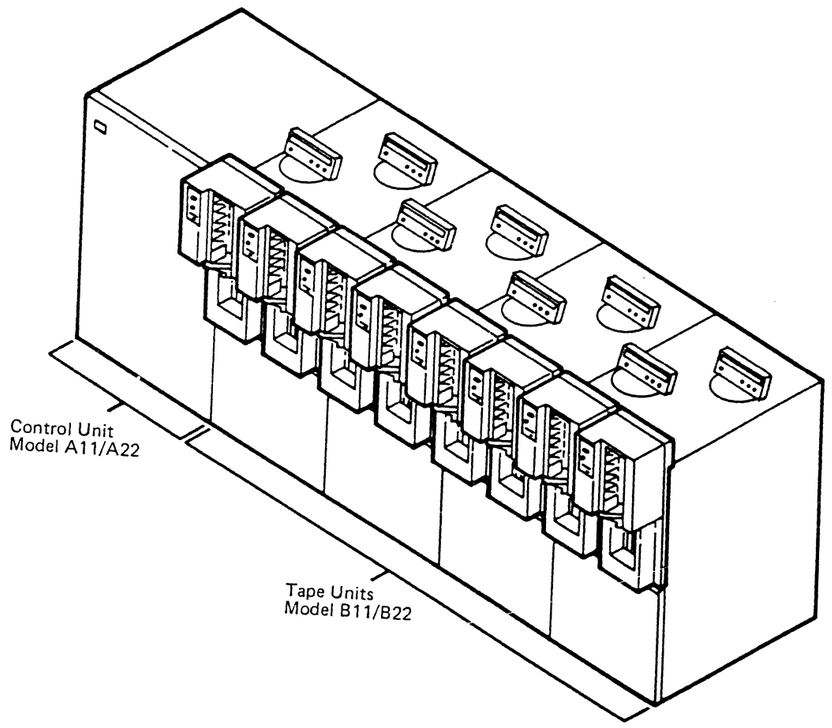
  Height: 1.000 m (39.37 in.)
  Width: .517 m (20.11 in.)
  Depth:
  Without Automatic Cartridge Loaders
  .750 m (29.53 in.)
  With Automatic Cartridge Loaders
  .930 m (36.63 in.)

Recording Media

- Tape cartridge

  Tape width: 12.7 mm (0.5 in.)
  Mean usable tape length: 154 m (505 ft.)





Tape Transport

- Type: Reel-to-reel, automatic self threading
- Number of tracks: 18
- Reading speed: 2000 mm/sec (78.7 in./sec)
- Load time:
  Without Automatic Cartridge Loaders
  5 to 10 seconds
  With Automatic Cartridge Loaders
  7 to 30 seconds
- Unload time: 5 to 10 seconds
- Rewind speed: 4000 mm/sec (157 in./sec)
- Rewind time: maximum 48 seconds.

3480 MI ECA57721

Introduction to the 3480 Subsystem

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- Data streaming 3 megabyte/second
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Some of the subsystem operating characteristics are:

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- A Dual Control Unit Communication accessory that has the ability to interconnect two control units into a single subsystem configuration
- A drive with microprocessor control that moves tape without capstans or vacuum columns
- A message display panel for each drive that provides visual information for the operator or service representative.

Operating Systems

The programming support for the subsystem is provided within the following operating systems and their future extensions:

- MVS
- VM/370.

Optional Features

The 3480 subsystem has the following optional feature:

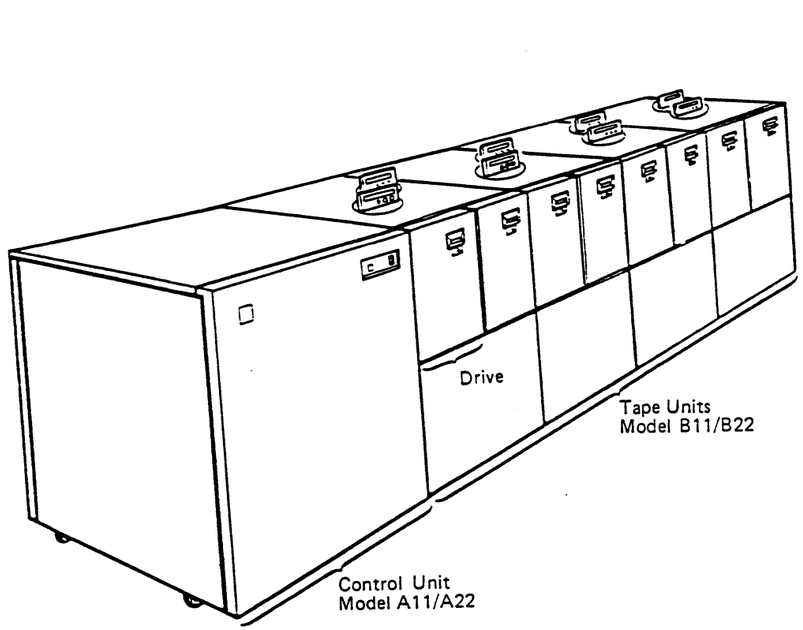
Additional Channel Interface (1, 2, or 3).

An enhanced channel feature that permits 4.5 megabytes/second data streaming (standard on current A22 control units).

Improved Data Recording Capability

The 3480 tape drive has the following optional feature:

An automatic cartridge loading feature that handles up to six cartridges that load and unload automatically.



Physical Characteristics

Dimensions

- Control Unit:

  Height: 1.000 m (39.37 in.)
  Width: .660 m (25.98 in.)
  Depth: .750 m (29.53 in.)

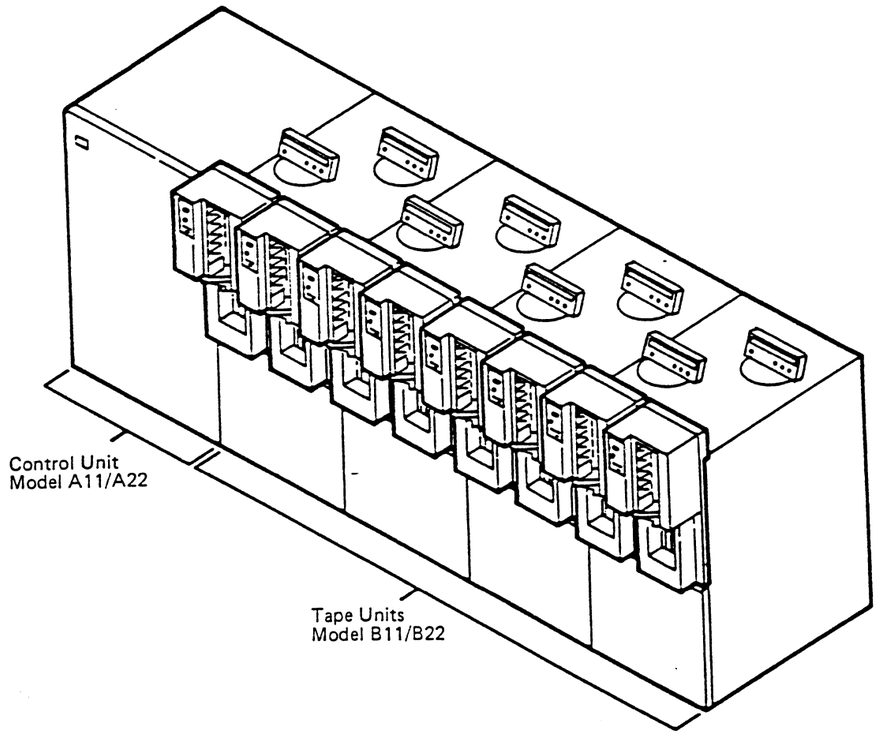
- Tape Unit:

  Height: 1.000 m (39.37 in.)
  Width: .517 m (20.11 in.)
  Depth:
  Without Automatic Cartridge Loaders
  .750 m (29.53 in.)
  With Automatic Cartridge Loaders
  .930 m (36.63 in.)

Recording Media

- Tape cartridge

  Tape width: 12.7 mm (0.5 in.)
  Mean usable tape length: 154 m (505 ft.)



Tape Transport

- Type: Reel-to-reel, automatic self threading
- Number of tracks: 18
- Reading speed: 2000 mm/sec (78.7 in./sec)
- Load time:
  Without Automatic Cartridge Loaders
  5 to 10 seconds.
  With Automatic Cartridge Loaders
  7 to 30 seconds
- Unload time: 5 to 10 seconds
- Rewind speed: 4000 mm/sec (157 in./sec)
- Rewind time: maximum 48 seconds.

0 0 0 0 0 0 0 0 0 0

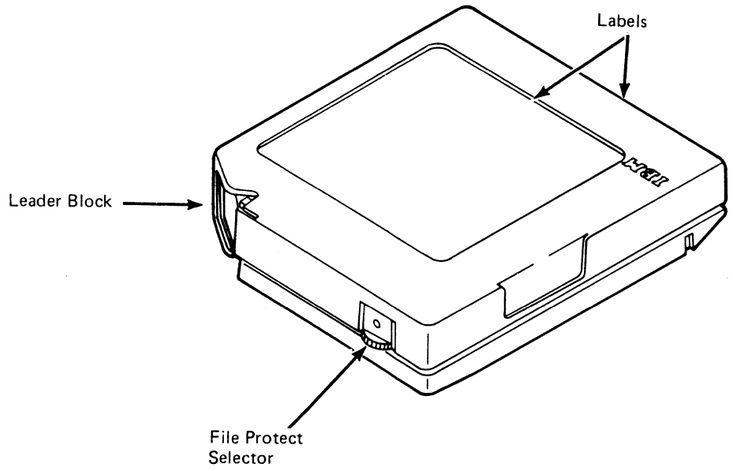
Introduction to the 3480 Subsystem

Cartridge

The drive uses a compact cartridge that has a nominal data capacity of 200 megabytes.

The tape cartridge remains closed during storage and handling to protect the tape from external contaminants. When a cartridge is inserted into a drive, the drive automatically pulls the tape from the cartridge and threads it onto a fixed machine reel.

Each cartridge has a physical file protect selector. When the selector is set to file protect, data is prevented from being written on or erased from tape. For additional cartridge information see the CART section.



Drive Message Display

Each drive has an operator panel on the top of the tape unit, which contains an eight-character visual message display. The operator panel is mounted on a swiveling fixture that can be adjusted by hand to make the message display visible from various operator positions.

The drive microprocessor, the error sensing logic, and the host software can cause the following types of messages to be displayed for the operator or the service representative.

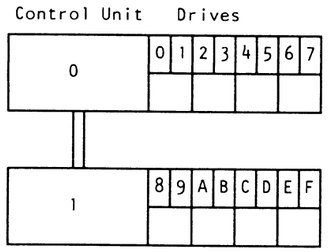
- Error message
- Service representative information
- Drive status
- Host response.

Addressing

The drive addresses and control unit address are set during installation.

The control unit address can be any value in the range of hexadecimal 0 through F.

The drive address can be any value in the range of hexadecimal 0 through 7 for a single control unit subsystem. When dual control units are installed, the address can be any address within the range of hexadecimal 0 through F. However, all drives physically attached to a control unit must be addressed within the group of hexadecimal 0 through 7 or the group of hexadecimal 8 through F.



Initial Microprogram Load (IML)

During an IML, a microcode image that permits the subsystem to become functional is loaded into the control unit.

The IML diskette contains the microcode image and patches for the control unit. This diskette must be kept in the IML device at all times. The microcode image and patches contained on the IML diskette are related to the EC level of the control unit and attached drives, therefore, only the specific IML diskette designated for a control unit should be used in that control unit.

Anytime the control unit is powered on, or the IML button is pushed on an offline control unit, the control unit will attempt to IML itself from the diskette in its IML device. The IML device is also accessed when drive patches are loaded.

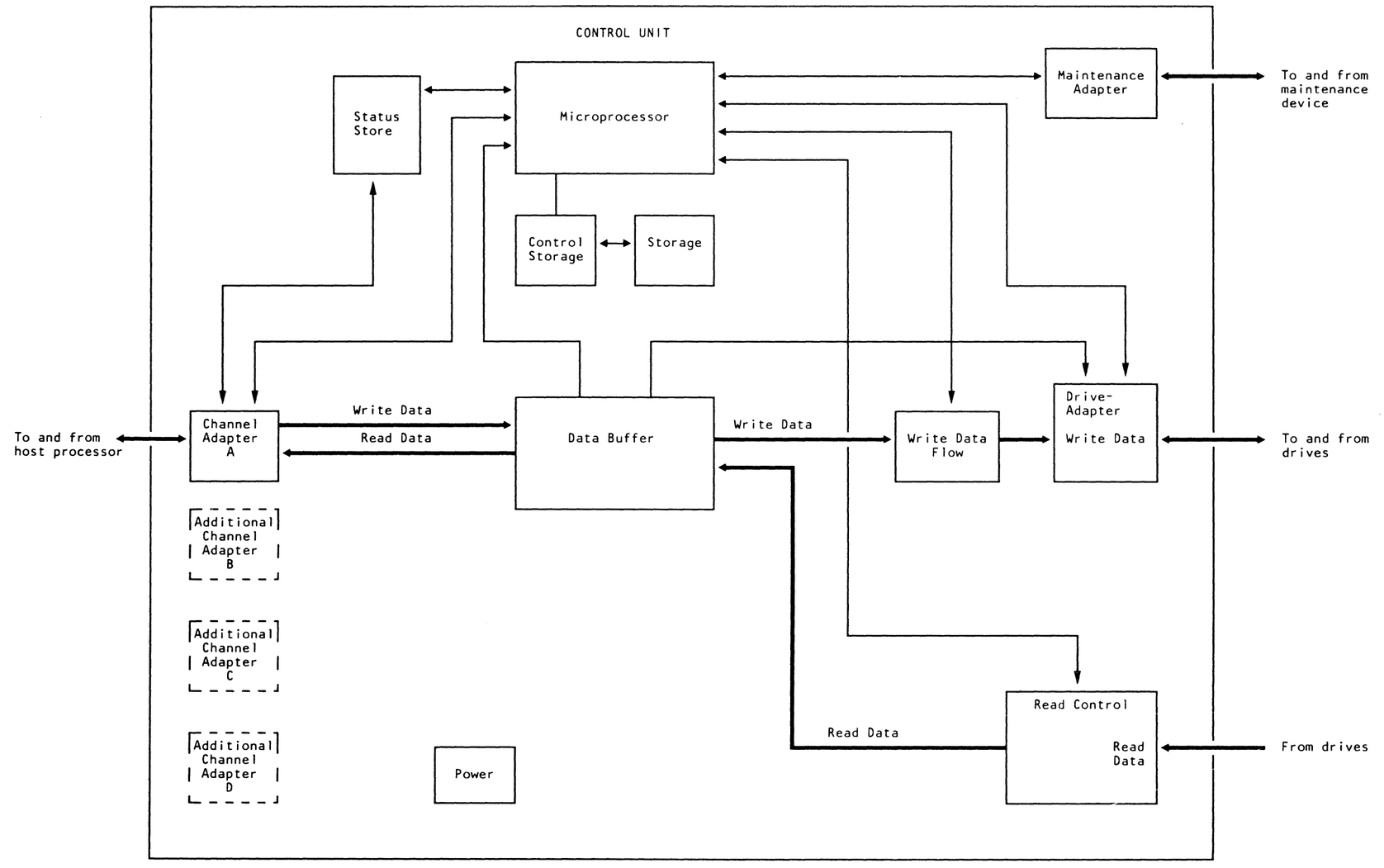
Introduction to the 3480 Control Unit

The control unit, under control of the microprocessor, moves read and write data between the host processor, the data buffer, and the attached drives. In addition, the control unit:

- Receives, interprets, and executes data commands from the host processor
- Generates and sends control commands to the attached drives
- Processes read and write data into and out of the data buffer
- Schedules various I/O and drive operations
- Detects control unit errors
- Collects and sends sense and status information to the host processor
- Stores the sense and status information for error recovery or analysis
- Performs stand alone error recovery on some subsystem failures.

Control Unit Diagram

This is a high level drawing showing theory only. For detailed point-to-point wiring see the machine logics.



Data Buffer

The data buffer provides data buffering between the drives and the data channel. This improves system performance by permitting the high speed channel to perform other operations while the selected drive is reading or writing tape.

All data transferred between the channel and the control unit passes through the data buffer.

If Improved Data Recording Capability is installed, data is compacted before entering the buffer on a write operation and uncompacted after leaving the buffer on a read operation.

Write Data Flow Card

The write data flow card receives data that is to be written on tape from the data buffer. It contains the logic required to process and format the data and to control the write operation. It also generates clocking and parity lines that are transferred with the data to a selected drive through the control unit drive adapter.

Read Control

The read control area consists of:

- A read clock and format card
- A read ECC/correction card
- One or three detect cards (EC sensitive)
- Three read skew cards
- A read buffer card.

The read area receives data from the drive; interprets, verifies and formats the data; and transfers it to the data buffer.

The size of the data buffer is EC sensitive and can be 0.5 megabyte, 1 megabyte, or 2 megabyte in size.

Maintenance Adapter

The maintenance adapter (MA) card provides a means for the maintenance device (MD) to monitor and change the status of the control unit. The adapter logic permits the MD to communicate with the subsystem components, to load and run diagnostics, and to interrogate registers.

Status Store and Status Store Communication

The status store provides a common storage area for status information in the control unit and contains the status of each drive. Drive status information is used by the microprocessor and channel adapter areas for allocation of common resources. The channel adapter and microprocessor use this drive status information to keep track of each drive's status. The status store communication card provides a communication path between control units when the dual-control-unit communication cables are installed.

Microprocessor and Control Storage

The microprocessor card contains the microprocessor, storage for the local store register, and associated logic for control of and communication with the other areas of the control unit. In addition, all processor related external registers, the external interrupt hardware, and most of the processor error detection and reporting logic are located on this card. The processor executes microprograms to control and monitor control unit activity through external registers that are accessed by way of the external register bus.

Control storage consists of tables accessible only by the microprograms and the microprocessor. It contains the initial microprogram load (IML) data that has been read from the IML diskette. Any time the microprocessor needs a microprogram to perform a function, it communicates with control storage to obtain the microprogram.

Power

The power area of the control unit consists of an AC power supply and two DC power supplies. The AC power supply furnishes power for the DC power supplies, the cooling fans, and the AC power for each of the tape units. The DC power supply PS02 furnishes dc power to the control unit only. DC power for the tape units is developed within the tape units.

Voltage Regulator

The voltage regulator card, located in the 01A-A1 logic board controls the voltages needed for the storage cards in the control unit.

Power-On Reset and Undervoltage Detector

The power-on reset (POR) card contains POR and undervoltage circuitry. In addition to resetting the control unit circuitry power on, the POR and undervoltage pulses are used to provide POR to the channels . A POR during a power off clamps the channel interface off before power is lost. During a power-on sequence, the channel interface is clamped off for approximately 800 ms to permit the voltages to stabilize.

0 0 0 0 0 0 0 0 0 0

Introduction to the 3480 Control Unit (Continued)

Data Buffer

The data buffer provides data buffering between the drives and the data channel. This improves system performance by permitting the high speed channel to perform other operations while the selected drive is reading or writing tape.

All data transferred between the channel and the control unit passes through the data buffer.

Write Data Flow Card

The write data flow card receives data that is to be written on tape from the data buffer. It contains the logic required to process and format the data and to control the write operation. It also generates clocking and parity lines that are transferred with the data to a selected drive through the control unit drive adapter.

Read Control

The read control area consists of:

- A read clock and format card
- A read ECC/correction card
- One or three detect cards (EC sensitive)
- Three read skew cards
- A read buffer card.

The read area receives data from the drive; interprets, verifies and formats the data; and transfers it to the data buffer.

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Writing Data

Two modes of writing can be selected by the host system when using this subsystem: buffered write and tape write. When in **buffered write mode**, the control unit signals completion as soon as the data has been written correctly to the buffer. The subsystem does any error recovery required to physically write the data block on tape. **Tape write mode** is for writing critical, non-restartable data files. This mode requires a dedicated channel until the data has been written and read-back-checked (verified).

Buffered Write Mode

When the control unit receives a write command from the channel in buffered write mode, it loads the data buffer and ends the operation by presenting channel end and device end status to the channel. The control unit writes the buffered data blocks when the drive is available. This increases channel efficiency by freeing the channel before the data is written.

Sending data between the data buffer and channel and between the data buffer and drive are asynchronous operations, which can overlap because of independent controls on the buffer. Data can be loaded into the buffer for the next record while the current write operation finishes; drive motion is maintained and writing continues. This is called streaming.

With the correct features, the control unit has the following streaming modes.

- 2 megabyte/second data streaming
- 3 megabyte/second data streaming
- 4.5 megabyte/second data streaming

Tape Write Mode

When the control unit receives a write command in tape write mode, it moves the data from the channel adapter into the buffer at channel speed. As soon as the drive is moving tape at recording speed the data is sent to the drive.

The control unit sends the ending status to the host after the data has been written on the tape and a read-back-check has been completed. When the host receives the ending status, it sends another write command and block of data to the control unit.

In tape write mode, each write command from the host causes the drive to perform a backhitch (reposition the tape to a position before the gap called stoplock). Because of the physical construction of the recording head, the host can never send the next data block fast enough to avoid a backhitch. The read portion of the head, which is involved in the read-back-check, trails the write portion of the head by more than a gap-length. Once the read-back-check is finished for the current record, the write portion of the head is far beyond the place it needs to be to write the next data block. After the backhitch, tape motion is started and the next data block is written.

Reading Data

Data is read from the drives into a control unit buffer. The contents of the control unit buffer is transferred to the host processor on an I/O channel.

Data Compaction

If data compaction is installed and enabled, data is compacted in the buffer adapter card before entering the buffer during a WRITE operation, and decompacted after leaving the buffer during a READ operation.

Data compaction supports both buffered and tape write modes, but does not support read backward mode.

Introduction to the 3480 Control Unit (Continued) INTRO 22

0 0 0 0 0 0 0 0 0 0

Introduction to the 3480 Control Unit (Continued)

Writing Data

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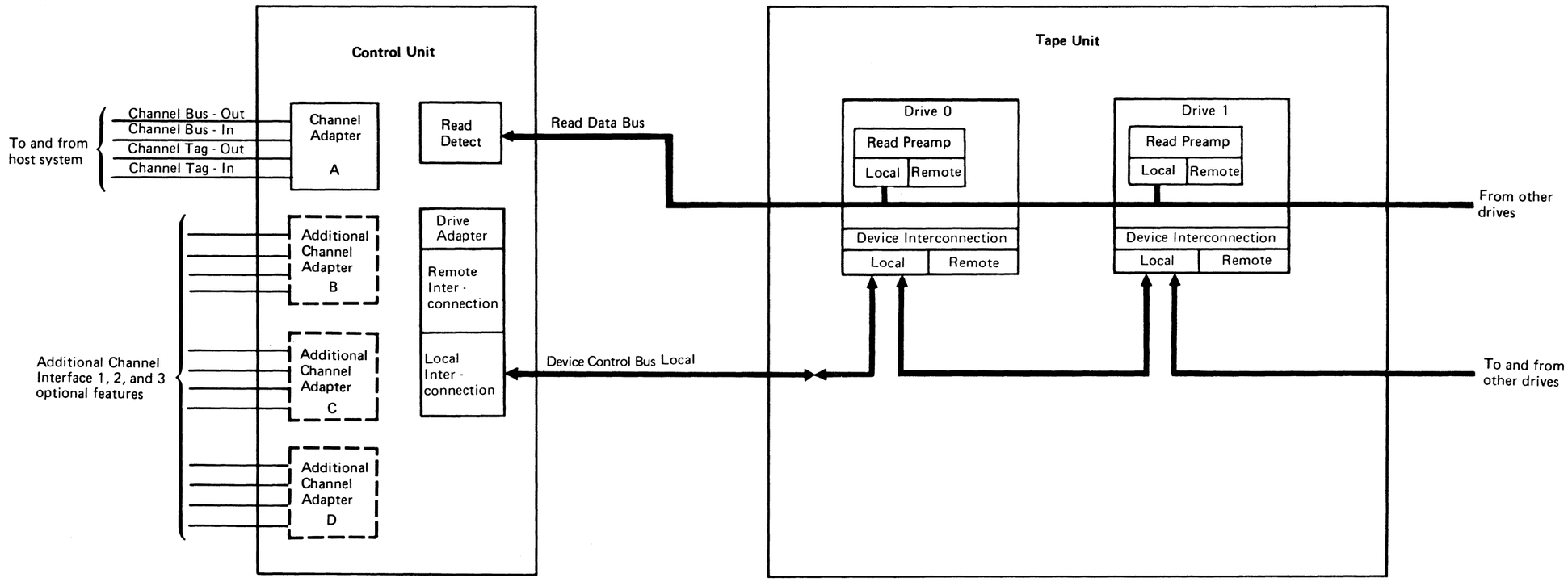
Reading Data

Data is read from the drives into a control unit buffer. The contents of the control unit buffer is transferred to the host processor on an I/O channel.

Introduction to the 3480 Control Unit (Continued)

Single Control Unit Subsystem Diagram

This is a high level drawing showing theory only. For detailed point-to-point wiring see the machine logics.



Introduction to the 3480 Control Unit (Continued)

Channel Adapter

The channel adapter connects the control unit to the host processor data channel through a standard System/370 interface. The channel must block multiplex, have command retry capability , and have the I/O error alert feature . In addition, the control unit must be connected to non-shared subchannels.

The channel adapter moves data between the data channel and the control unit buffer. Data is also compacted and uncompacted if the data compaction feature is installed. The data rate used by the channel adapter is specified by the setting of the control unit channel type switch. The following types of channels and their data rate can be specified:

- **DC Interlocked:** The maximum data rate is controlled by the channel's interlocking of tag lines, up to a control unit limited data rate of 1.5 megabytes per second, ± 5 percent.
- **2 Megabyte Data Streaming:** The control unit clocks the data rate to 2.0 megabytes per second, ± 5 percent.
- **3 Megabyte Data Streaming:** The control unit clocks the data rate to 3.0 megabytes per second, ± 5 percent.
- **4.5 Megabyte Data Streaming** The control unit clocks the data rate to 4.5 megabytes/second, +1 –5 percent. This is only applicable to an A22 3480 control unit with both the 4,5 megabyte/second buffer adapter card, and the 4.5 megabyte/second channel attachment installed.

  The 4.5 megabyte/second channel attachment feature (bus/tag shoe connectors and cards) will not enable the 3480 to clock data at the 4.5 megabyte/second rate without the 4.5 megabyte/second buffer adapter card. But it will permit propagation of the 4.5 megabyte/second data rate to devices down stream.

Each channel adapter operates as an asynchronous unit. It decodes all commands and provides initial status for each command. The channel adapter also causes the channel to disconnect, using channel command retry, if the command cannot be executed immediately.

Additional Channel Interface (1, 2, or 3) Optional Feature

The control unit has one channel adapter as part of the base equipment. Up to three more channel adapters can be added with the optional additional interface features. The additional interface features permit the control unit to operate with up to four channels at the same time.

When a channel adapter is processing an I/O operation for a specific drive, additional channel adapters in the control unit can process I/O operations for other drives.

Drive Adapter

The drive adapter provides the write data and control information path between the control unit and:

- One serial string of up to eight drives in a single control unit subsystem
- Two serial strings of up to eight drives each in a dual control unit subsystem.

The control unit drive adapter contains two interconnections, local and remote. In a single-control unit subsystem, the drives must be connected to the local interconnection. The remote interconnection is not used. In a dual-control unit subsystem, each control unit has one set of drives connected to the local interconnection and another set of drives connected to the remote interconnection.

The drives physically attached to a control unit are connected to that control unit's local interconnection. The drives physically attached to the other control unit are connected to the remote interconnection. Therefore, each drive is connected to the local interconnection on one control unit, and the remote interconnection on the other control unit, at the same time.

The drives physically attached to control unit 0 (CU0) are addressed hexadecimal 0 through 7, and the drives physically attached to control unit 1 (CU1) are addressed 8 through F. Drives 0 through 7 are attached to the local interconnection of CU0, and the remote interconnection of CU1. Drives 8 through F are attached to the local interconnection of CU1 and the remote interconnection of CU0.

The device control bus is a single flat cable that connects the control unit drive adapter to the drives. There is one device control bus for the drives attached to the local interconnection, and another device control bus for the drives attached to the remote interconnection. The device control bus is terminated at the last drive on a set of drives.

Read Data Bus

The read data bus sends analog read data from the drives to the control unit. The read data bus is a single flat cable that connects the drive read buffer directly to the control unit read clock/detect cards. The devices are connected to this bus similar to the way the devices are connected to the device control bus. The read data bus consists of two selectable groups, A and B. Each group has 18 line pairs that send the analog data on the 18 read data tracks to the control unit.

0 0 0 0 0 0 0 0 0 0

Introduction to the 3480 Control Unit (Continued)

Channel Adapter

The channel adapter connects the control unit to the host processor data channel through a standard System/370 interface. The channel must block multiplex, have command retry capability, and have the I/O error alert feature. In addition, the control unit must be connected to non-shared subchannels.

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Additional Channel Interface (1, 2, or 3) Optional Feature

The control unit has one channel adapter as part of the base equipment. Up to three more channel adapters can be added with the optional additional interface features. The additional interface features permit the control unit to operate with up to four channels at the same time.

When a channel adapter is processing an I/O operation for a specific drive, additional channel adapters in the control unit can process I/O operations for other drives.

Drive-Adapter

The drive-adapter provides the write data and control information path between the control unit and:

- One serial string of up to eight drives in a single control unit subsystem
- Two serial strings of up to eight drives each in a dual control unit subsystem.

The control unit drive-adapter contains two interconnections, local and remote. In a single-control-unit subsystem, the drives must be connected to the local interconnection. The remote interconnection is not used. In a dual-control-unit subsystem, each control unit has one set of drives connected to the local interconnection and another set of drives connected to the remote interconnection.

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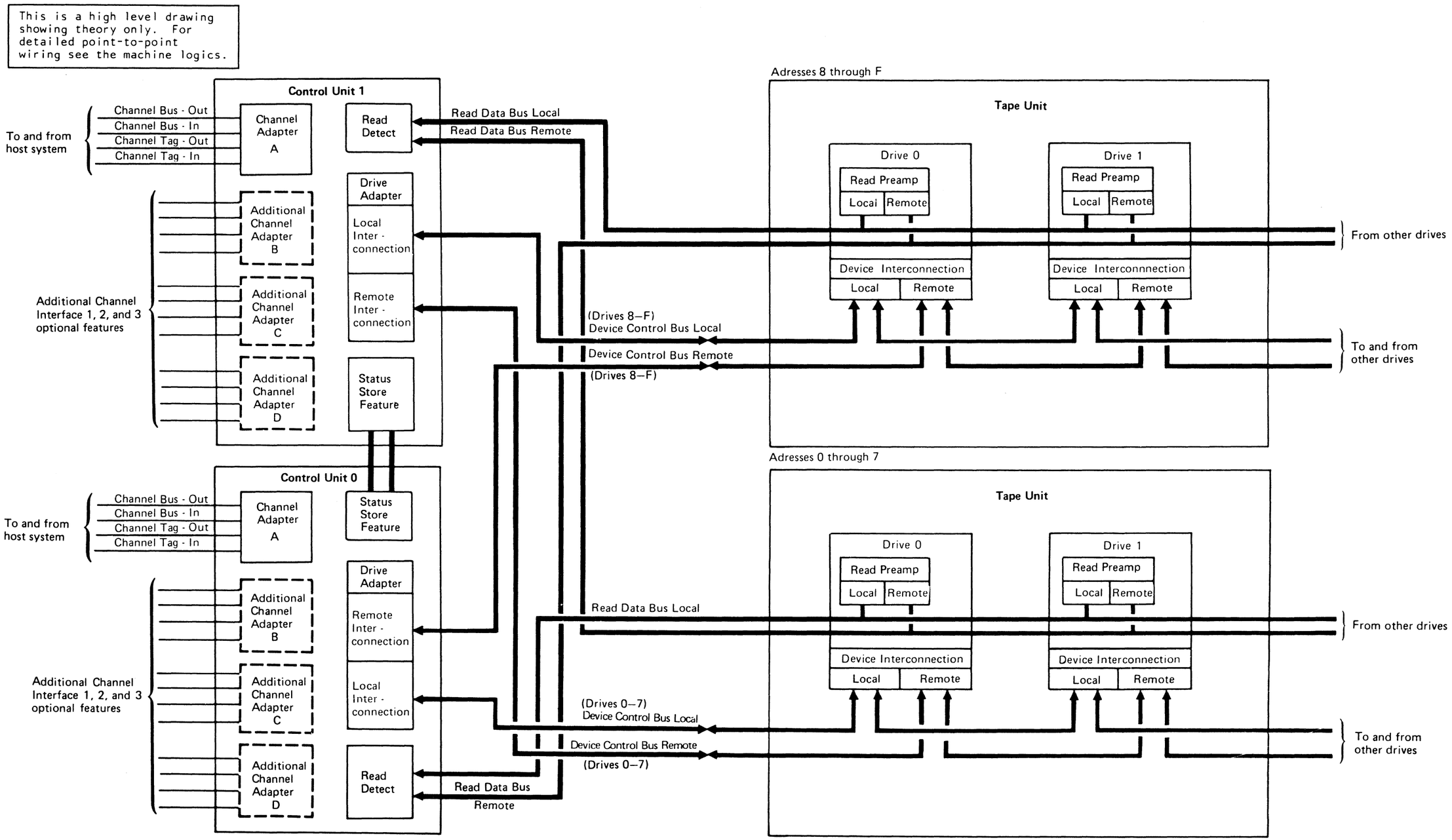
Read Data Bus

The read data bus sends analog read data from the drives to the control unit. The read data bus is a single flat cable that connects the drive read buffer directly to the control unit read clock/detect cards. The devices are connected to this bus similar to the way the devices are connected to the device control bus. The read data bus consists of two selectable groups, A and B. Each group has 18 line pairs that send the analog data on the 18 read data tracks to the control unit.

Introduction to the 3480 Control Unit (Continued)

Dual Control Unit Subsystem Diagram



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Introduction to the 3480 Control Unit (Continued)

Dual Control Unit

Two control units can be connected together for dual control unit operation. With dual control units, all channel path interfaces are common between the two control units, as are all attached drives. Load balancing between the resources of the two control units is automatically performed under control of the microprocessors in the control units. When I/O operations are directed to a drive along a single channel path, those I/O operations can be handled in either control unit, depending on the internal subsystem load.

Each control unit can have up to four channel adapters, permitting the entire subsystem to be accessible from a maximum of eight channel paths. Each channel adapter on either control unit can communicate at full internal data path speeds with the data buffer in either control unit. While such data movement is going on, each control unit data buffer can also move data to or from a drive. Therefore, the entire dual-control-unit subsystem can move data with four operations occurring at the same time. The microprocessors in each control unit agree and establish the internal data paths to be used between the drive and the channel path. This agreement is independent of host processor program control.

The status store communication card provides the control-unit-to-control-unit communication path. It also permits the two control units to share control and status information about all the drives in the subsystem.

Drive Attachment

The drives are attached to each control unit as shown in the following table:

CU ID	DR ADR	BUS
0	0 – 7	Local
0	8 – F	Remote
1	0 – 7	Remote
1	8 – F	Local

Introduction to the 3480 Tape Unit

A tape unit consists of two drives (drive 0 and drive 1). The drives operate independently of each other, except for the shared use of the tape unit pneumatic supply and the tape unit dc power supply.

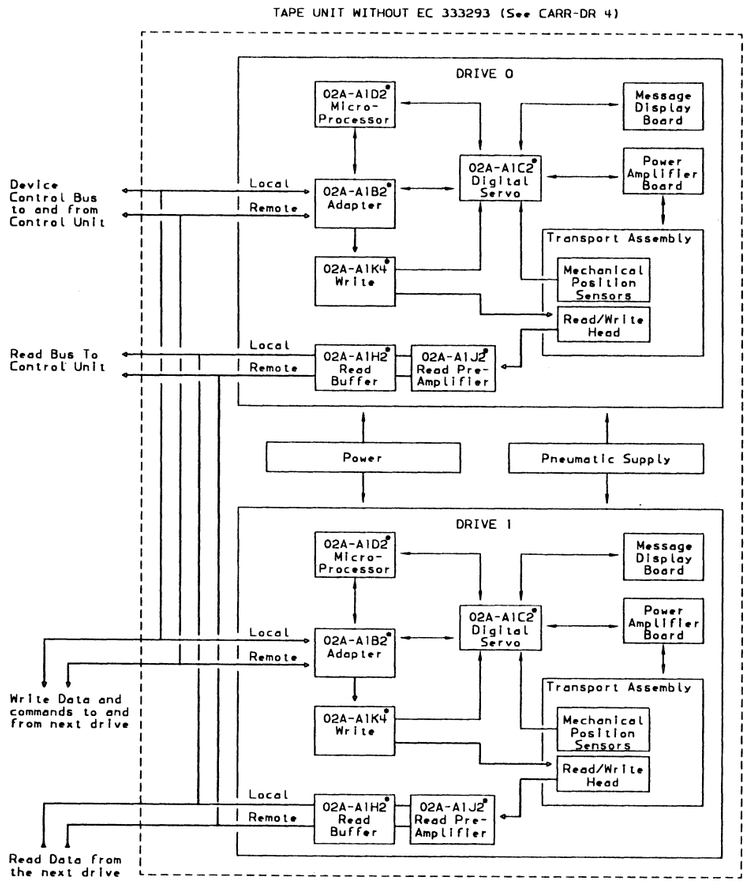
A drive, under control of the control unit:

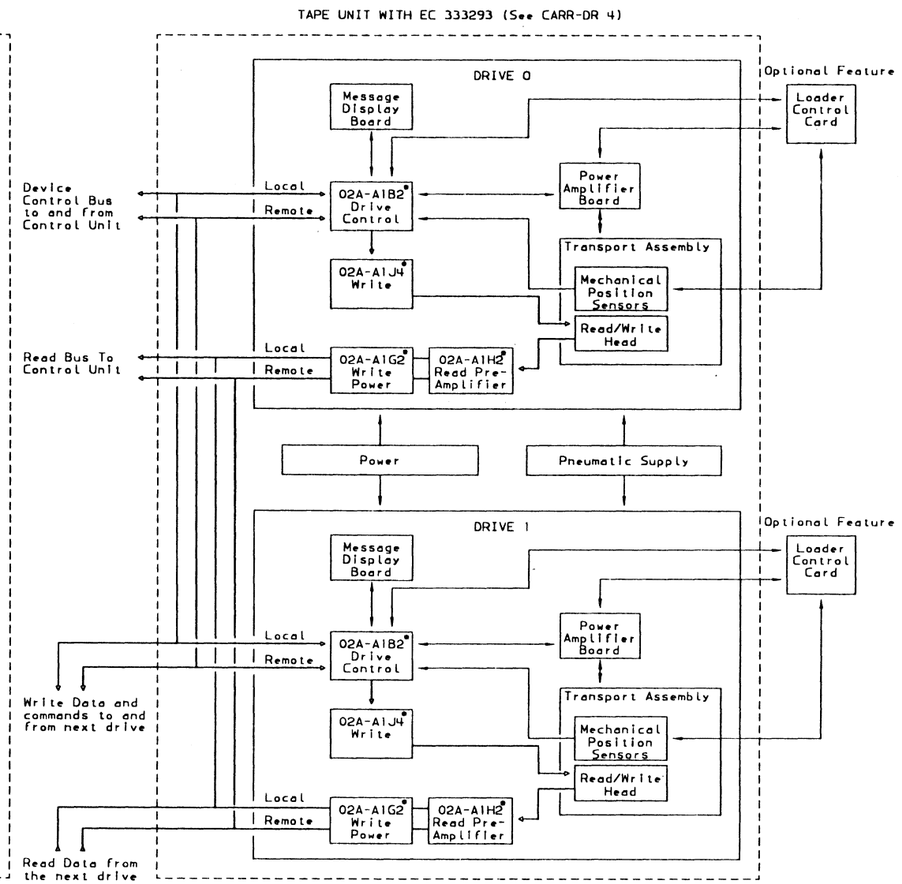
- Receives, interprets, and performs data commands sent from the control unit
- Receives, interprets, and performs motion control commands sent from the control unit
- Sends and receives read and write data to and from the control unit
- Sends sense and status information to the control unit.

Tape Unit Diagram

These are high level drawings showing theory only. For detailed point-to-point wiring see the machine logics.

* This FRU is EC sensitive. See CARR-DR 4.





Power

The tape unit ac power is supplied by the control unit. Up to 4 tape units (8 drives) can be connected to a single control unit, and the ac power is cabled from the control unit to the first tape unit then cabled from that tape unit to the next tape unit and so on.

The dc power for the tape unit is developed in each tape unit's dc power supply. The dc power supply furnishes the dc power for both drives in that tape unit.

Pneumatic Supply

The tape unit contains one pneumatic supply that is shared by both drives. The pressure side of the pneumatic supply consists of a pump, a regulator, and an output filter. The vacuum side of the pneumatic supply uses the same pump and an inlet filter.

Drive Logic

The drive logic controls the data flow and tape motion within the tape unit.

*Microprocessor Card**

The microprocessor card contains the microprocessor, storage for the local storage register, and associated logic for control and communication.

Some external registers (XRs), the external interrupt hardware, and most of the processor error detection and reporting logic are located on this card.

The microprocessor performs microcode to control and monitor control unit activity through the external registers, which are accessed by way of the external register interconnection.

*Digital Servo Card**

The digital servo card serves as a buffer and interconnection to and from the processor and the rest of the drive. The digital servo card gathers information from sensors, mechanical switches, and error lines from other cards in the drive and presents these to the drive processor.

Because the drive is a microprocessor based system operating in a real time mode and because tight control is needed to maintain proper tape tension and tape velocity, high speed control processing is required. The digital servo card is designed to relieve the processor of having to do certain simple housekeeping work.

*Adapter Card**

A drive can attach to one or two control units. The adapter card contains two buses and the controls that permit communication between the drive and one or both of the control units.

In the two-control-unit environment, only one control unit is permitted to communicate with a specific drive at any one time. The other control unit cannot access the drive until the first control unit has finished its operation.

*Drive Control Card**

The Drive control card controls all functions within the drive. Write data and commands are received by the adapter section and are passed, under control of the microprocessor section, to the digital servo section and the write card. Read data is read from the tape by the read head and sent to the read preamplifier card, under control of the digital servo section, as directed by the microprocessor section. All motion controls are controlled by the digital servo section, power amplifier card, and the microprocessor section.

Microprocessor

The microprocessor section of the drive control card contains the microprocessor, storage for the local storage register, and associated logic for control and ccmmunication.

Some external registers (XRs), the external interrupt hardware, and most of the processor error detection and reporting logic are located in this part of the card.

The microprocessor performs microcode to control and monitor control unit activity through the external registers, which are accessed by way of the external register interconnection.

Digital Servo

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Message Display

The message display provides the operator with visual messages sent from the host processor or the tape subsystem. The message display, using eight LEDs and two bar LEDs, displays messages sent from the microprocessor through the digital servo.

*Write Card**

The write card contains the 18 write drivers, the head connector, parity checking circuits, and error checking circuits. The error checking circuits check for open head or head cable, shorted write drivers, and various other write problems.

*Read Preamplifier Card**

The read preamplifier card amplifies the 18 read signals generated at the read/write head. The card sends the read data to the control unit by way of read bus local or remote. The bus is selected by the control unit.

The read preamplifier card also provides isolation from the read bus when the drive is powered off.

Power Amplifier Board

The power amplifier board accepts digital current inputs from the processor through the digital servo, converts them to analog signals, and applies necessary gain and phase shifting to drive the reel motors.

The power amplifier board uses the input from the tension transducer to keep correct tension on the tape. The power amplifier board also controls power on, power off, and power-on reset.

Loader Control Card

The automatic cartridge loader - loader control card has its own microprocessor and storage. The storage is loaded from the control unit IML diskette using the "Patching Path" each time the drive patches are loaded. This code is used by the loader control card to control the functions within the automatic cartridge loader. The loader control card uses the information from sensors, mechanical switches, and cards in the drive to control the loading and unloading of the tape cartridge.

* This FRU is EC sensitive. See CARR-DR 4.

Drive Transport Assembly

The drive transport contains the read/write head, the mechanical components, sensors, and motors necessary to thread the tape, and move the tape forward or backward. The microprocessor controls all mechanical motion in the drive transport, using the digital servo and power amplifier to change the digital signals into analog signals and to drive the motors. The sensors feed back information to the digital servo to indicate motion errors and tape position so the digital servo can modify the velocity or direction of tape motion. The sensors also signal irrecoverable tape motion errors.

Tape Loading and Unloading

On drives without the automatic cartridge loaders tape loading is an automatic operation. The operation starts after a cartridge has been inserted, latched in place, and the sensors in the tape transport have been checked by the sensor checking circuits of the digital servo.

On drives with the automatic cartridge loaders tape loading starts after a cartridge has been inserted, the load assembly cammed down to the load position, and the sensors in the tape transport have been checked by the sensor checking circuits of the digital servo.

To load tape, the threader arm pulls the leader block from the cartridge. After the threading operation begins, the machine reel is positioned so that it can receive the leader block. A tach pulse senses when the leader block is contained in the machine reel hub. Once the leader block is contained, the tape is moved to BOT.

BOT is the beginning-of-tape and is the first place that a record can be written on tape.

Tape unloading begins when the Unload switch is pressed with the Ready/Not Ready switch in the Not Ready position. Tape unloading can also result from a Rewind/Unload command. Tape rewinds onto the file reel at high speed until BOT is detected. At this point tape motion is slowed to permit the threader mechanism to pull the leader block from the machine reel and to remove the tape from the transport. The threader motor is driven clockwise until tape path sensor A is blocked, at which point the cartridge is automatically unlatched.

> **Note:** On drives without the automatic cartridge loaders the cartridge latch should be closed when the tape drive is not being used. (A cartridge need **not** be in the drive.) When the tape drive is needed, open the cartridge latch by pressing the Unload switch.

Motion Control

The drive motion control logic is used for tape tension control, velocity control, backhitch (reposition) control, and stoplock (position) control.

The tension control function provides constant tape tension, essential for motion control.

The velocity control provides controlled acceleration up to recording speed or rewind speed, precise control of recording speed independent of the distribution of tape on the reels, and controlled deceleration. Control is provided for both forward and backward tape movement.

The stoplock (position-hold) condition is used when the tape is stopped and under tension.

Stoplock Positions

Once loaded, the drive maintains one of three stoplock positions in anticipation of the next command:

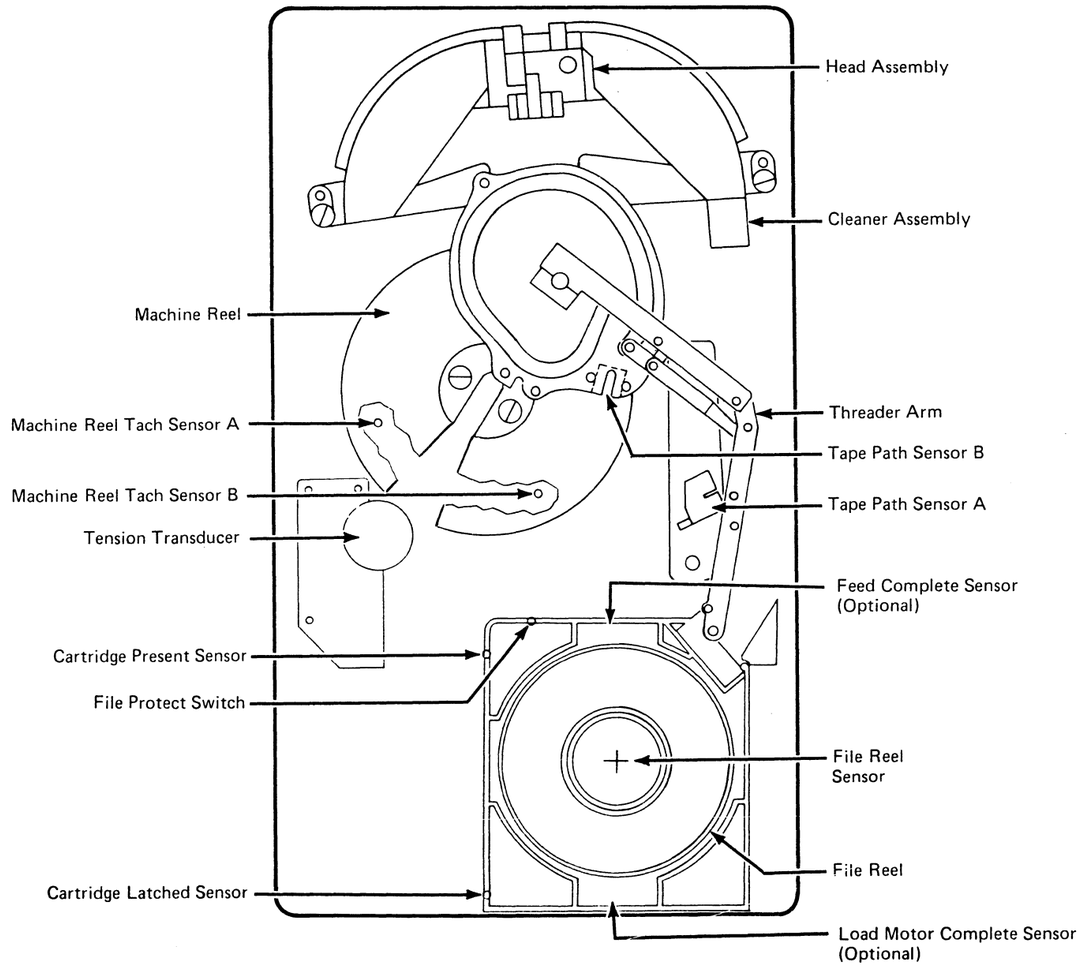
- Read forward stoplock, ready for a read forward.
- Read backward stoplock, ready for a read backward.
- Write stoplock, ready for a write.

All of these stoplock positions are achieved automatically by the drive and are based on the command just executed. At the end of a particular command where no similar command is immediately following, the drive always prepares for the next command to be performed to be of the same type as the last one. The drive therefore repositions to the correct stoplock to accomplish the next (like) command. The exception to this is a Backspace Block command, which repositions to the read forward stoplock to prepare for a subsequent Read command.

Tape Transport Sensors

Sensing devices in the drive transport area monitor tape velocity and tension, protection status of the tape, and loading and unloading operations. Transport monitoring is accomplished by:

- Cartridge present sensor, which indicates that a tape cartridge has been inserted into the drive.
- Cartridge latched sensor, which indicates that the cartridge is latched in place.
- Tape path sensor A, which indicates that the tape leader block is at the file reel.
- Tape path sensor B, which indicates when the tape leader block is at the machine reel.
- Machine reel tach sensor A, which senses the position of the machine reel. Machine reel tach sensor A is used in conjunction with machine reel tach sensor B to generate a tach pulse.
- Machine reel tach sensor B, which senses the position of the machine reel. Machine reel tach sensor B is used in conjunction with machine reel tach sensor A.
- Tension transducer, which senses tension of the tape. The microprocessor uses the tension transducer to control the reel motor power amplifiers.
- File reel tachometer (tach 2), which monitors speed and direction of the file reel motor.



Introduction to the 3480 Tape Unit (Continued)

Introduction to Channel Commands

The tape subsystem operates on the System/370 block multiplex channel and on the block multiplexor high speed streaming feature channel. The 3480 executes the channel commands described in the following channel command summary table.

All commands that are not usually ended immediately (channel end status sent at initial status time) can be received by the control unit when the drive is not executing an I/O operation for another channel path. If there is a delay between receiving and completing a command, the control unit disconnects the channel by a channel command retry. While the channel is disconnected from the control unit, the subsystem can process some or all of the command. This aids in keeping the channel open much of the time.

Channel Command Summary

CHANNEL COMMAND	HEX CODE	DESCRIPTION
Assign	B7	Reserves the addressed drive to a specified channel path.
Backspace Block	27	Causes the drive to move the tape backward to the last block ID.
Backspace File	2F	Causes the drive to move the tape backward to the last tape mark.
Control Access	E3	Permits a specified drive to be used by a host processor to which it is not assigned.
Data Security Erase	97	Causes the drive to erase the tape to the end of the tape.
Erase Gap	17	Causes the drive to write an erase gap pattern.
Forward Space Block	37	Causes the drive to move the tape forward to the next block ID.
Forward Space File	3F	Causes the drive to move the tape forward to the next tape mark.
Load Display	9F	Causes a message to be displayed on the message display panel and is also used to control the automatic cartridge loader.
Locate Block	4F	Causes the drive to move the tape to the specified location of data.
Mode Set	DB	Causes a drive to be set to a specified operating mode.
No Operation	03	No operation is performed.
Perform Sub-system Function	77	Passes up to 3 bytes of control information to the subsystem.
Read Backward	0C	Causes the drive to read in a backward direction.
Read Block ID	22	Causes the tape block ID to be sent to the host processor.
Read Buffer	12	Causes the buffer data to be sent to the host processor.
Read Buffered Log	24	Causes the stored buffered log data to be sent to the host processor.
Read Device Characteristics	64	Causes up to 64 bytes of data containing installed feature information to be sent to the host processor.
Read	02	Causes the drive to read in a forward direction.
Rewind	07	Causes the drive to rewind the tape to the load point.
Rewind Unload	0F	Causes the drive to rewind the tape and unload the cartridge.
Sense	04	Causes the CU to send 32 bytes of sense data to the host processor.
Sense ID	E4	Causes the CU to send 7 bytes of subsystem ID information to the host processor.
Sense Path Group ID	34	Causes the CU to send the path state byte and the 11 bytes of path group ID information to the host processor.
Set Path Group ID	AF	Sends the function control byte and 11 path group ID bytes to the control unit.
Suspend Multipath Reconnection	5B	Causes a temporary connection between the addressed drive and the channel path that issued the command.
Synchronize	43	Causes the drive to be synchronized with the host processor after a buffered operation.
Test I/O	00	Causes the CU to send the status byte to the host processor.
Unassign	C7	Releases the addressed drive from the channel path group to which it had been reserved.
Write	01	Causes the drive to write data on the tape.
Write Tape Mark	1F	Causes the drive to write a tape mark pattern on the tape.

0 0 0 0 0 0 0 0 0 0

Introduction to Channel Commands

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CHANNEL COMMAND	HEX CODE	DESCRIPTION
Sense ID	E4	Causes the CU to send 7 bytes of subsystem ID information to the host processor.
Sense Path Group ID	34	Causes the CU to send the path state byte and the 11 bytes of path group ID information to the host processor.
Set Path Group ID	AF	Sends the function control byte and 11 path group ID bytes to the control unit.
Suspend Multipath Reconnection	5B	Causes a temporary connection between the addressed drive and the channel path that issued the command.
Synchronize	43	Causes the drive to be synchronized with the host processor after a buffered operation.
Test I/O	00	Causes the CU to send the status byte to the host processor.
Unassign	C7	Releases the addressed drive from the channel path group to which it had been reserved.
Write	01	Causes the drive to write data on the tape.
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Notes START 2

Notes START 2

Maintenance Starting Point

Begin all maintenance action here. Find the reason you're here in the left column and perform the action in the right column.

See NOTE

IF YOU'RE HERE FOR THIS REASON...	PERFORM THIS ACTION...
Service call (solid and intermittent failures).	Is this service call on a status 3 machine? YES / NO
Device(s) failing EREP Exception Report – temporary Read/Write errors or ECC count.	
Predictive maintenance.	Go to "Predictive Maintenance" on MSG 360.
Install the 3480.	Go to "3480 Installation" see INST 1.
Relocate or discontinue the 3480.	Go to "3480 Relocate or Discontinue" see INST 1.
Perform an engineering change.	Go to "Engineering Change" on PLAN 60.
Inspection for maintenance agreement qualification.	See "General Instructions" on INSP 10 for safety inspection procedures.

YES:

1. See "General Instructions" on INSP 10 for safety inspection procedures.
2. Return here to continue the service call.

Continue

Action

Write down any failing indications such as a "CHK XX" (XX equals a hexadecimal error code) or other messages and indications on the drive message display for future use.

IF YOU HAVE THIS PROBLEM...	PERFORM THIS ACTION...
The control unit Power–On indicator is off. (For the location of the Power–On indicator see "Control Unit Locations" on LOC 1.)	Go to "MAP 0100—Power Start", Entry A on PWR 100-1.
The control unit DC Power indicator is off. (For the location of the DC Power indicator see "Control Unit Locations" on LOC 1.)	Go to "MAP 0400—Control Unit DC Power", Entry A on PWR 400–1.
The control unit Error indicator is on or blinking, or ... the Wait indicator is off. See PANEL 10.	1. Connect the MD to the control unit that has the indicator conditions described in the left column (beside this column). 2. Select option 1, Start Repair. See MD 40. WARNING: Two MDs cannot be run on one 3480 subsystem at the same time.

Action

1. Connect the MD to a control unit.

2. Select option 1, Start Repair.
WARNING: Two MDs connot be run on one 3480 subsystem at the same time.

Note

To find out how to connect the MD to a control unit see "How to Use the MD With the 3480" on MD 40.

NOTE: It may be necessary to remove the automatic loader decorative cover from an adjacent drive for some service procedures. If it is necessary to remove the decorative cover, go to CARR–DR 2–9.

MISCELLANEOUS PROCEDURES	
Vary a drive offline.	Go to PLAN 55
Vary a subsystem offline.	Go to PLAN 55
Operate the drive.	Go to PANEL 5
Use the MD with the 3480.	Go to MD 40
Analyze a console message.	Go to MSG 10
Hardcopy analyze an EREP printout.	Go to MSG 100
Run On Line Tests (OLTs).	Go to PLAN 60
Analyze sense bytes.	Go to SENSE 100
Remove a cartridge by hand.	Go to CART 10
Replace a leader block.	Go to CART 20
Attach tape to a cartridge hub.	Go to CART 30
Review how to use the 3480 maintenance information.	Go to PLAN 10
Locate switches and indicators.	Go to LOC 1 (Control unit) LOC 1 (Tape unit)
Drive operator panel messages.	Go to PANEL 30
Main menu option list.	Go to MD 50
Utilities menu option list	GO to MD 50

Fault Symptom Codes Caused by other than 3480 Hardware Failures

You are here because you were sent here by the MD after you had entered requested sense data, or by the FSI section. This is a listing of fault symptom codes (FSC) that can also be caused by other than 3480 hardware failures. It also provides a definition of the FSC, the causes, and the action you should perform.

Find your fault symptom code in the FSC column (beginning on this page) and do the actions in the Action column.

FSC	FSC Definition	Causes Other than 3480 Hardware Failures	Action
1600	The two control units are not at the same microcode EC level.	This error could result from operating condition.	1. The EC level of the control unit microcode is different in a two control unit subsystem. Check the diskettes and ensure they are at the same EC level. 2. Try the backup diskettes. 3. Call your next level of support.
1601	The two control units do not have the same Check Sums. (The two control units are not at the same microcode EC level.)	This error is an operating condition.	1. The EC level of the control unit microcode is different in a two control unit subsystem. Check the diskettes and ensure they are at the same EC level. 2. Try the backup diskettes. 3. Call your next level of support.
2200	A channel transfer time-out occurred on a write operation.	Possible host processor channel problem or overrun condition.	See "Possible Host Processor Channel Problem or Overrun Condition" on START 135.
2201	A channel transfer time-out occurred on a read operation.	Possible host processor channel problem or overrun condition.	See "Possible Host Processor Channel Problem or Overrun Condition" on START 135.
2600	A System Reset was received on the last path of a path group.	The host error recovery actions did not complete or were not started.	1. Search your sense data for a previous record for the same device. 2. IPL the MD. 3. Select option 1, Start Repair. 4. Enter the new sense data from the record identified in step 1 when requested.
3300	A channel command retry has been stacked of refused by the channel after a channel adapter command retry attempt.	Possible host processor channel problem or overrun condition.	See "Possible Host Processor Channel Problems or Overrun Condition" on START 135.
33E4	The addressed drive is assigned to a path group that does not contain the channel path on which the command was received.	Possible software problem or host processor channel problem or overrun condition.	1. See "Possible Software Problem" on START 130. 2. If the problem is not software, return to the MD and continue. 3. If the MD package runs error-free, see "Possible Host Processor Channel Problems or Overrun Condition" on START 135.
33E5	A command reject occurred because of an invalid command code.	Possible software problem or host processor channel problem or overrun condition.	1. See "Possible Software Problem" on START 130. 2. If the problem is not software, return to the MD and continue. 3. If the MD package runs error-free, see "Possible Host Processor Channel Problems or Overrun Condition" on START 135.
33E7	The drive is not online.	The Power On/Off switch is set to Off. The Online/Offline switch is set to offline. The Drive Address switch is not set to the correct address.	1. Verify that these switches are set to the correct position; if not, set the switches to the following position: • The Power On/Off switch to On • The Online/Offline switch to online • The Drive Address switch to the correct address. 2. Do one of the following: • If any of these switches were determined to be in the wrong position at the time this error occurred, IPL the MD and select option 3, Unit Test. • If these switches were determined to be in the correct position at the time this error occurred, return to the MD and press the ENTER key.

FSC	FSC Definition	Causes Other than Hardware Failures	Action
33E8	The drive is not ready.	The Ready/Not Ready switch is set to Not Ready, the tape is not loaded in the drive or the drive dc power supply voltages are out of tolerance.	1. Verify that the Ready/Not Ready switch is set to the Ready position and that tape has been loaded; if not, set the Ready/Not Ready switch to Ready and insert a cartridge into the drive. 2. Do one of the following: • If the Ready/Not Ready switch was determined to be in the wrong position at the time this error occurred; IPL the MD and select option 3, Unit Test. • If the Ready/Not Ready switch was determined to be in the correct position at the time this error occurred, measure the drive dc power supply voltages using a voltmeter. Reference PWR 20 for tolerance charts. If the voltages are out of tolerance, exchange the drive dc power supply (FRU 095), then IPL the MD and select option 3, Unit Test. If the voltages are in tolerance, return to the MD and press the ENTER key.
33E9	The drive is file protected.	The cartridge File Protect switch is set to File Protect.	1. Verify that the File Protect switch, on the customer's volume being used at the time this error occurred, was set to the File Protect position. 2. Do one of the following: • If the File Protect switch was set to File Protect, IPL the MD and select option 3, Unit Test. • If the File Protect switch was not set to File Protect, return to the MD and press the ENTER key.
3A10	A channel command was received before the host error recovery actions were completed after a permanent write error had occurred on a different channel.	The host error recovery actions had not completed, were not desired, or a second host attempted to gain access to a shared device.	1. Search your sense data for a previous record for the same device. 2. IPL the MD 3. Select option 1, Start Repair 4. Enter the new sense data from the record identified in step 1 when requested.
3C60	An incorrect byte count was detected during a channel-to-control-unit operation.	Possible software problem.	See "Possible Software Problem" on START 130.
3F13	Information only; shows that a previous permanent write error had occurred.	The host error recovery actions did not complete or were not started.	1. Search your sense data for a previous record for the same device. 2. IPL the MD 3. Select option 1, Start Repair 4. Enter the new sense data from the record identified in step 1 when requested.
3F14	The drive is not online to either control unit.	The Power On/Off switch is set to Off. The Online/Offline switch is set to offline. The Drive Address switch is not set to the correct address.	1. Verify that these switches are set to the correct position; if not, set the switches to the following position: • The Power On/Off switch to On • The Online/Offline switch to online • The Drive Address switch to the correct address. 2. Do one of the following: • If any of these switches were determined to be in the wrong position at the time this error occurred, IPL the MD and select option 3, Unit Test. • If these switches were determined to be in the correct position at the time this error occurred, return to the MD and press the ENTER key.

FSC	FSC Definition	Causes Other than 3480 Hardware Failures	Action
4200	An invalid tape-format bit combination was detected in the 3480 Mode Set command.	Possible software problem.	See "Possible Software Problem" on START 130.
4260	No channel paths in the grouped state for this drive that have a path group ID matching the path group received as the argument to the Assign command.	Possible software problem.	See "Possible Software Problem" on START 130.
4261	The channel path that issued an Unassign command did not have assignment of the drive.	Possible software problem.	See "Possible Software Problem" on START 130.
4262	The Unassign command was issued and no channel paths with path group IDs matching the Unassign command argument have assignment of the drive.	Possible software problem.	See "Possible Software Problem" on START 130.
4280	An invalid function-control byte has been received; an invalid function was specified.	Possible software problem.	See "Possible Software Problem" on START 130.
47B0	The Space File operation is not making any progress down the tape.	The tape was blank or the tape had been positioned beyond the last written data.	IPL the MD and select option 3, Unit Test.
4B20	A Set Path Group ID command was received with an invalid function control byte in the argument; bits 3 through 7 were not 0.	Possible software problem.	See "Possible Software Problem" on START 130.
4B21	A path group ID in the argument of the Set Path Group ID command is equal to 0.	Possible software problem.	See "Possible Software Problem" on START 130.
4B22	The path group ID in the argument of the Set Path Group ID command does not match the path group ID received in a prior Set Path Group ID command over the same channel.	Possible software problem.	See "Possible Software Problem" on START 130.
4B23	The received path mode bit in the function-control byte does not match the path mode set in a prior Set Path Group ID command addressed to a channel interface with the same path group ID as the interface that issued the current command.	Possible software problem.	See "Possible Software Problem" on START 130.
4B24	The received path mode bit was on, indicating multipath mode. Multipath mode is not supported by this machine.	Possible software problem.	See "Possible Software Problem" on START 130.
4D70	The received password for the Control Access command is zero. Multipath mode is not supported by this machine.	Possible software problem.	See "Possible Software Problem" on START 130.
4D71	An invalid function byte has been received for the Control Access command.	Possible software problem.	See "Possible Software Problem" on START 130.
4D72	The password received with the Control Access command does not match the password received during a prior Control Access command.	Possible software problem.	See "Possible Software Problem" on START 130.
4D73	A Control Access command attempted to establish a password, but the channel path that issued the command did not have assignment of the drive.	Possible software problem.	See "Possible Software Problem" on START 130.

FSC	FSC Definition	Causes Other than 3480 Hardware Failures	Action
4200	An invalid tape-format bit combination was detected in the 3480 Mode Set command.	Possible software problem.	See "Possible Software Problem" on START 130.
4204	Bit 4 of a mode set command, specifying write data should be in the Improved Data Recording Capability mode, it was issued to a control unit that does not have the Improved Data Recording Capability feature.	Possible software problem.	See "Possible Software Problem" on START 130.
4260	No channel paths in the grouped state for this drive that have a path group ID matching the path group received as the argument to the Assign command.	Possible software problem.	See "Possible Software Problem" on START 130.
4261	The channel path that issued an Unassign command did not have assignment of the drive.	Possible software problem.	See "Possible Software Problem" on START 130.
4262	The Unassign command was issued and no channel paths with path group IDs matching the Unassign command argument have assignment of the drive.	Possible software problem.	See "Possible Software Problem" on START 130.
4263	The drive is not online.	The Power On/Off switch is set to Off. The Online/Offline switch is set to offline. The Drive Address switch is not set to the correct address.	1. Verify that these switches are set to the correct position; if not set the switches to the following positions: • The Power On/Off switch to On. • The Online/Offline switch to Online. • The Drive Address switch to the correct address. 2. Do one of the following: • If any of these switches were determined to be in the wrong position at the time this error occurred, IPL the MD and select option 3, Unit Test. • If these switches were determined to be in the correct position at the time this error occurred, return to the MD and press the ENTER key.
4280	An invalid function-control byte has been received; an invalid function was specified.	Possible software problem.	See "Possible Software Problem" on START 130.
47B0	The Space File operation is not making any progress down the tape.	The tape was blank or the tape had been positioned beyond the last written data.	IPL the MD and select option 3, Unit Test.
4B20	A Set Path Group ID command was received with an invalid function control byte in the argument; bits 3 through 7 were not 0.	Possible software problem.	See "Possible Software Problem" on START 130.
4B21	A path group ID in the argument of the Set Path Group ID command is equal to 0.	Possible software problem.	See "Possible Software Problem" on START 130.
4B22	The path group ID in the argument of the Set Path Group ID command does not match the path group ID received in a prior Set Path Group ID command over the same channel.	Possible software problem.	See "Possible Software Problem" on START 130.
4B23	The received path mode bit in the function-control byte does not match the path mode set in a prior Set Path Group ID command addressed to a channel interface with the same path group ID as the interface that issued the current command.	Possible software problem.	See "Possible Software Problem" on START 130.
4B24	The received path mode bit was on, indicating multipath mode. Multipath mode is not supported by this machine.	Possible software problem.	See "Possible Software Problem" on START 130.
4D70	The received password for the Control Access command is zero. Multipath mode is not supported by this machine.	Possible software problem.	See "Possible Software Problem" on START 130.
4D71	An invalid function byte has been received for the Control Access command.	Possible software problem.	See "Possible Software Problem" on START 130.
4D72	The password received with the Control Access command does not match the password received during a prior Control Access command.	Possible software problem.	See "Possible Software Problem" on START 130.
4D73	A Control Access command attempted to establish a password, but the channel path that issued the command did not have assignment of the drive.	Possible software problem.	See "Possible Software Problem" on START 130.

0 0 0 0 0 0 0 0 0 0

FSC	FSC Definition	Causes Other than 3480 Hardware Failures	Action
4D74	A Control Access command attempted the temporary unassign function, but a prior command had not established a password.	Possible software problem.	See "Possible Software Problems" on START 130.
4D75	A Control Access command attempted the generalized unassign function, but the channel path that issued the command did not have assignment of the drive.	Possible software problem.	See "Possible Software Problems" on START 130.
4E80	An invalid function-control byte has been received.	Possible software problem.	See "Possible Software Problems" on START 130.
4E81	A Library Function command has been received but not on a library system.	Possible software problem.	See "Possible Software Problems" on START 130.
4E8A	The drive is not online.	The Power On/Off switch is set to off. The Online/Offline switch is set to offline. The Drive Address switch is not set to the correct address.	1. Verify that these switches are set to the correct position; if not, set the switches to the following position: The Power On/Off snitch is set to on. The Online/Offline switch is set to online. The Drive Address switch is not set to the correct address. 2. Do one of the following: If any of these switches are determined to be in the wronged position at the time this error occurred, IPL the MD and select option 3 - Unit Test. If these switches were determined to be in the correct position at the time this error occurred, return to the MD and press the ENTER key.
4E8B	The addressed drive is assigned to a path group that does not contain the channel path on which the command was received.	Possible software problem or host processor channel problem or overrun condition.	See "Possible Software Problem" on START 130.

0 0 0 0 0 0 0 0 0 0

FSC	FSC Definition	Causes Other than 3480 Hardware Failures	Action
4D8D	The Perform Subystem Command received an invalid order or flag byte.	Possible software problem.	See "Possible Software Problems" on START 130.
52nn	The channel command did not match.	Possible host processor channel problem or overrun condition.	See "Possible Host Processor Channel Problems or Overrun Condition" on START 135.
5343	A CU-CU message was invalid or lost.	Both CU ID switches are set to the same ID.	See "Setting the Control Unit Addresses" on PANEL 12. • If the switches are correct, press ENTER on the MD. • If the switches are incorrect: 1. IML the control unit (see PANEL 7). 2. IPL the MD and select option 3, Unit Test.
5605	The channel adapter detected a parity error on a channel command.	Possible host processor channel problem or overrun condition.	See "Possible Host Processor Channel Problems or Overrun Condition" on START 135.
5AD4	A Collision Detect was sensed as the control unit was coming up.	Both CU ID switches are set to the same ID.	See "Setting the Control Unit Addresses" on PANEL 12. • If the switches are set correctly, press ENTER on the MD. • If the switches are incorrectly set: 1. IML the control unit (see PANEL 7). 2. IPL the MD and select option 3, Unit Test.
5BB0	The buffer switch was made free because of no activity on the channel path. Sense byte 9 contains the failing channel adapter address. 80 = Channel adapter A 40 = Channel adapter B 20 = Channel adapter C 10 = Channel adapter D	Possible host processor channel problem or overrun condition.	See "Possible Host Processor Channel Problems or Overrun Condition" on START 135.
5BB1	The buffer switch was made free because of no activity on the channel path. Sense byte 9 contains the failing channel adapter address. 80 = Channel adapter A 40 = Channel adapter B 20 = Channel adapter C 10 = Channel adapter D	Possible host processor channel problem or overrun condition.	See "Possible Host Processor Channel Problems or Overrun Condition" on START 135.
7093	In read mode, an interblock gap was not detected within 2.0 mm (0.08 in.) after 'gap in'.	Possible tape media problem.	See "Possible Tape Media Problems" on START 130.
7094	The status from the drive did not indicate 'beginning of tape' or 'density mark successfully written' at 'gap in' time in a write operation. The control unit ERP will be called to rewind and retry the write density mark operation.	Possible tape media problem.	See "Possible Tape Media Problems" on START 130.
70C2	A block ID mismatch occurred on a read forward operation. The block just read from the tape does not have the expected block ID sequence number.	The tape was written with the wrong ID or a permanent write error ERPA was ignored.	IPL the MD and select option 3, Unit Test.
70C3	A block ID mismatch occurred on a read backward operation. The block just read from the tape does not have the expected block ID sequence number.	The tape was written with the wrong ID or a permanent write error ERPA was ignored.	IPL the MD and select option 3, Unit Test.

0 0 0 0 0 0 0 0 0 0

FSC	FSC Definition	Causes Other than 3480 Hardware Failures	Action
7093	In read mode, an interblock gap was not detected within 2.0 mm (0.08 in.) after 'gap in'.	Possible tape media problem.	See "Possible Tape Media Problems" on START 130.
7094	The status from the drive did not indicate 'beginning of tape' or 'density mark successfully written' at 'gap in' time in a write operation. The control unit ERP will be called to rewind and retry the write density mark operation.	Possible tape media problem.	See "Possible Tape Media Problems" on START 130.
70C2	A block ID mismatch occurred on a read forward operation. The block just read from the tape does not have the expected block ID sequence number.	The tape was written with the wrong ID or a permanent write error ERPA was ignored.	IPL the MD and select option 3, Unit Test.
70C3	A block ID mismatch occurred on a read backward operation. The block just read from the tape does not have the expected block ID sequence number.	The tape was written with the wrong ID or a permanent write error ERPA was ignored.	IPL the MD and select option 3, Unit Test.
70D2	A block ID mismatch occurred on a read forward operation in extended data format. The block just read from the tape does not have the expected block ID sequence number.	The tape was written with the wrong ID or a permanent write error ERPA was ignored.	IPL the MD and select option 3, Unit Test.
70D3	A block ID mismatch occurred on a read backward operation in extended data format. The block just read from the tape does not have the expected block ID sequence number.	The tape was written with the wrong ID or a permanent write error ERPA was ignored.	IPL the MD and select option 3, Unit Test.

0 0 0 0 0 0 0 0 0 0

FSC	FSC Definition	Causes Other than 3480 Hardware Failures	Action
4D74	A Control Access command attempted the temporary unassign function, but a prior command had not established a password.	Possible software problem.	See "Possible Software Problems" on START 130.
4D75	A Control Access command attempted the generalized unassign function, but the channel path that issued the command did not have assignment of the drive.	Possible software problem.	See "Possible Software Problems" on START 130.
52nn	The channel command did not match.	Possible host processor channel problem or overrun condition.	See "Possible Host Processor Channel Problems or Overrun Condition" on START 135.
5343	A CU-CU message was invalid or lost.	Both CU ID switches are set to the same ID.	See "Setting the Control Unit Addresses" on PANEL 12. • If the switches are correct, press ENTER on the MD. • If the switches are incorrect: 1. IML the control unit (see PANEL 7). 2. IPL the MD and select option 3, Unit Test.
5605	The channel adapter detected a parity error on a channel command.	Possible host processor channel problem or overrun condition.	See "Possible Host Processor Channel Problems or Overrun Condition " on START 135.
5BB0	The buffer switch was made free because of no activity on the channel path. Sense byte 9 contains the failing channel adapter address. 80 = Channel adapter A 40 = Channel adapter B 20 = Channel adapter C 10 = Channel adapter D	Possible host processor channel problem or overrun condition.	See "Possible Host Processor Channel Problems or Overrun Condition" on START 135.
5BB1	The buffer switch was made free because of no activity on the channel path. Sense byte 9 contains the failing channel adapter address. 80 = Channel adapter A 40 = Channel adapter B 20 = Channel adapter C 10 = Channel adapter D	Possible host processor channel problem or overrun condition.	See "Possible Host Processor Channel Problems or Overrun Condition" on START 135.
7093	In read mode, an interblock gap was not detected within 2.0 mm (0.08 in.) after 'gap in'.	Possible tape media problem.	See "Possible Tape Media Problems" on START 130.
7094	The status from the drive did not indicate 'beginning of tape' or 'density mark successfully written' at 'gap in' time in a write operation. The control unit ERP will be called to rewind and retry the write density mark operation.	Possible tape media problem.	See "Possible Tape Media Problems" on START 130.
70C2	A block ID mismatch occurred on a read forward operation. The block just read from the tape does not have the expected block ID sequence number.	The tape was written with the wrong ID or a permanent write error ERPA was ignored.	IPL the MD and select option 3, Unit Test.
70C3	A block ID mismatch occurred on a read backward operation. The block just read from the tape does not have the expected block ID sequence number.	The tape was written with the wrong ID or a permanent write error ERPA was ignored.	IPL the MD and select option 3, Unit Test.

FSC	FSC Definition	Causes Other than 3480 Hardware Failures	Action
7141	A density mark criteria was not met after five retries. A valid density pattern must be detected in 40 out of 50 samples of the read pattern register (RPR) (every 500 microseconds).	Possible tape media problem.	See "Possible Tape Media Problems" on START 130.
7142	A time-out occurred after waiting 2.5 milliseconds for the 'density separator' (beginning of block interrupt, level 2 interrupt).	Possible tape media problem.	See "Possible Tape Media Problems" on START 130.
7143	A time-out occurred after waiting 1.3 milliseconds for the 'interblock gap' that follows the 'density separator'.	Possible tape media problem.	See "Possible Tape Media Problems" on START 130.
7144	A time-out occurred after waiting 1.3 milliseconds for 'write end' in the write status/error (WSE) register when trying to to write a 'density separator'.	Possible tape media problem.	See "Possible Tape Media Problems" on START 130.
7152	A read back check of an 'interblock gap' detected that the 'interblock gap' was too long. Maximum 'interblock gap' length is 3.0 mm (0.12 in.).	Possible tape media problem.	See "Possible Tape Media Problems" on START 130.
7153	A void was detected during a read operation.	The tape was blank or the tape had been positioned beyond the last written data.	IPL the MD and select option 3, Unit Check.
7154	A data transfer time-out was detected during a read operation. No valid 'interblock gap' was detected within 67 milliseconds after 'beg sync' was detected. (The timer is not set if the subsystem is in synchronous mode).	Possible tape media problem.	See "Possible Tape Media Problems" on START 130.
7155	A data transfer time-out was detected during a read back check operation. No valid 'interblock gap' was detected within 67 milliseconds after 'beg sync' was detected. (The timer is not set if the subsystem is in synchronous mode).	Possible tape media problem.	See "Possible Tape Media Problems" on START 130.
7159	A read back check time-out occurred waiting for the 'interblock gap' following an 'erase gap'. 'Interblock gap' must be detected with 6.1 milliseconds after the 'write erase gap' is started.	Possible tape media problem.	See "Possible Tape Media Problems" on START 130.
7161	'Density separator' was not detected before 45 sets of samples were taken (1025 mm - 40.4 in.).	Attempted to read a blank tape.	IPL the MD and select option 3, Unit Test.
7162	'Density separator' was detected, but no set of samples met the read criteria.	Possible tape media problem.	See "Possible Tape Media Problems" on START 130.

FSC	FSC Definition	Causes Other than 3480 Hardware Failures	Action
7171	When in synchronous mode, the device transfer overran the channel transfer.	Possible host processor channel problem or overrun condition.	See "Possible Host Processor Channel Problems or Overrun Condition" on START 135.
74nn	A read back check error occurred on the last record.	Possible tape media problem.	See "Possible Tape Media Problems" on START 130.
7503	During the read back check of a record, the microprocessor received a level 3 interrupt because 'end sync' timed out waiting for 'interblock gap' (100 microseconds).	Possible tape media problem.	See "Possible Tape Media Problems" on START 130.
76nn	A read error occurred on the last record. A level 3 interrupt was received because 'end sync' timed out waiting for 'interblock gap' (100 microseconds).	Possible tape media problem.	See "Possible Tape Media Problems" on START 130.
7702	256 'erase gaps' have been read without detecting a block or tape mark.	Tape was written with only 'erase gaps'.	IPL the MD and select option 3, Unit Test.
8100	No patches are available for this drive's EC level.	Possible EC compatibility problem.	See "Possible EC Level Compatibility Problems" on START 135.
8101	Possible hardware EC compatibility problem.	Possible EC compatibility problem.	See "Possible EC Level Compatibility Problems" on START 135.
8102	Possible hardware EC compatibility problem.	Possible EC compatibility problem.	See "Possible EC Level Compatibility Problems" on START 135.
8202	The Unload switch was pressed.	The operator manually unloaded a drive.	1. Search your sense data for a previous record for the same device. 2. IPL the MD. 3. Select option 1, Start Repair. 4. Enter the new sense data from the record identified in step 1 when requested.
8204	Manual rewind.	The operator pressed the Rewind switch.	IPL the MD and select option 3, Unit Test.
86C0	Bit 0 of status byte 2 from the drive did not indicate the correct control unit	A drive or drives are set to the wrong range of logical addresses. Drives attached to control unit 0 must be addressed from 0-7. Drives attached to control unit 1 must be addressed from 8-F. Both Control Unit ID switches are set to the same ID.	Check the drive logical address and the Control Unit ID switches. If the drive address and Control Unit ID switches are set correctly, return to the procedure that sent you here and continue with that procedure. If the drive address or Control Unit ID switches are set incorrectly, set the switches correctly, IPL the MD and select option 3, Unit Test. IPL the MD and select option 3, Unit Test.
9000	Two drives with logical address in sense byte 9 and sense byte 30 are indicating the same physical address.	Two drives may have the same physical address set in their Physical Address switches.	Check the drive physical address switch settings for the two indicated drives. If the physical address switches are not set to the same value, return to procedure that sent you here and continue with that procedure. If the physical address switches are set to the same value, change one or both physical address switches to a unique value. IPL the MD and select option 3, Unit Test.
A112	A packet ID mismatch occurred on a read operation in 3480 extended data format. The data read from the tape does not have the expected packet ID sequence number.	The tape was written with the wrong packet ID or a permanent write error ERPA was ignored.	IPL the MD and select option 3, Unit Test.

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FSC	FSC Definition	Causes Other than 3480 Hardware Failures	Action
7171	When in synchronous mode, the device transfer overran the channel transfer.	Possible host processor channel problem or overrun condition.	See "Possible Host Processor Channel Problems or Overrun Condition" on START 135.
74nn	A read back check error occurred on the last record.	Possible tape media problem.	See "Possible Tape Media Problems" on START 130.
7503	During the read back check of a record, the microprocessor received a level 3 interrupt because 'end sync' timed out waiting for 'interblock gap' (100 microseconds).	Possible tape media problem.	See "Possible Tape Media Problems" on START 130.
76nn	A read error occurred on the last record. A level 3 interrupt was received because 'end sync' timed out waiting for 'interblock gap' (100 microseconds).	Possible tape media problem.	See "Possible Tape Media Problems" on START 130.
7702	256 'erase gaps' have been read without detecting a block or tape mark.	Tape was written with only 'erase gaps'.	IPL the MD and select option 3, Unit Test.
8100	No patches are available for this drive's EC level.	Possible EC compatibility problem.	See "Possible EC Level Compatibility Problems" on START 135.
8101	Possible hardware EC compatibility problem.	Possible EC compatibility problem.	See "Possible EC Level Compatibility Problems" on START 135.
8102	Possible hardware EC compatibility problem.	Possible EC compatibility problem.	See "Possible EC Level Compatibility Problems" on START 135.
8202	The Unload switch was pressed.	The operator manually unloaded a drive.	1. Search your sense data for a previous record for the same device. 2. IPL the MD. 3. Select option 1, Start Repair. 4. Enter the new sense data from the record identified in step 1 when requested.
8204	Manual rewind.	The operator pressed the Rewind switch.	IPL the MD and select option 3, Unit Test.
86C0	Bit 0 of status byte 2 from the drive did not indicate the correct interface.	A drive or drives are set to the wrong range of logical addresses. Drives attached to control unit 0 must be addressed from 0-7. Drives attached to control unit 1 must be addressed from 8-F.	Check the drive logical address switch settings. If the drive address switches are set correctly, return to the procedure that sent you here and continue with that procedure. If the drive address switches are set incorrectly, set the switches to the proper addresses. IPL the MD and select option 3, Unit Test.
9000	Two drives with logical address in sense byte 9 and sense byte 30 are indicating the same physical address.	Two drives may have the same physical address set in their Physical Address switches.	Check the drive physical address switch settings for the two indicated drives. If the physical address switches are not set to the same value, return to procedure that sent you here and continue with that procedure. If the physical address switches are set to the same value, change one or both physical address switches to a unique value. IPL the MD and select option 3, Unit Test.
A130	A buffer-to-channel transfer caused a check 2 condition.	Possible host processor channel problem or overrun condition.	See "Possible Host Processor Channel Problems or Overrun Condition" on START 135.
A170	A channel-to-buffer transfer caused a check 2 condition.	Possible host processor channel problem or overrun condition.	See "Possible Host Processor Channel Problems or Overrun Condition" on START 135.
CCDD	Fifty consecutive errors have occurred.	Information message only.	Using the host processor console messages or EREP, look for other sense records with a different FSC for this control unit. Use the new determined FSC for troubleshooting.

FSC	FSC Definition	Causes Other than 3480 Hardware Failures	Action
CCEE	An error occurred during a synchronous read or write operation. **Note:** *Error recovery is not performed for errors that occur in 'synchronous mode'.*	Information message only.	Using the host processor console messages or EREP, look for other sense records with a different FSC for this control unit. Use the new determined FSC for troubleshooting.
D0nn	The read status register (RSR) contains active bits 5, 6, or 7. The nn indicates which bits are active in the RSR.	Possible tape media problem.	See "Possible Tape Media Problems" on START 130.
D584	During channel/buffer communication, a buffer checker had detected an error.	Possible host processor channel problem or overrun condition.	See "Possible Host Processor Channel Problems or Overrun Condition" on START 135.
E501	A condition code 3 (CC3) or path inoperative condition has occurred.	Possible host processor channel problem or overrun condition.	See "Possible Host Processor Channel Problems or Overrun Condition" on START 135.
E502	A condition code 3 (CC3) or path inoperative condition has occurred and the control unit will not go online.	Possible host processor channel problem or overrun condition.	See "Possible Host Processor Channel Problems or Overrun Condition" on START 135.
E505	A solid condition code 3 (CC3) or path inoperative condition has occurred and channel adapters are enabled.	Possible host processor channel problem or overrun condition.	See "Possible Host Processor Channel Problems or Overrun Condition" on START 135.
E511	An interface control check or channel data check has occurred.	Possible host processor channel problem or overrun condition.	See "Possible Host Processor Channel Problems or Overrun Condition" on START 135.
E513	There is an IFCC or channel data check and a tag failure is indicated.	Possible host processor channel problem or overrun condition.	See "Possible Host Processor Channel Problems or Overrun Condition" on START 135.
E514	There is an IFCC or channel data check and a bus failure is indicated.	Possible host processor channel problem or overrun condition.	See "Possible Host Processor Channel Problems or Overrun Condition" on START 135.
E520	The host processor channel has detected a timeout or a hang condition.	Possible host processor channel problem or overrun condition.	See "Possible Host Processor Channel Problems or Overrun Condition" on START 135.
E800	The service representative has informed the MD that there are too many temporary data errors based on Format 21 sense records from EREP or processor Console message information.	Possible tape media problem.	See "Possible Tape Media Problems" on START 130.

FSC	FSC Definition	Causes Other than 3480 Hardware Failures	Action
A130	A buffer-to-channel transfer caused a check 2 condition.	Possible host processor channel problem or overrrun condition.	See "Possible Host Processor Channel Problems or Overrun Condition" on START 135.
A170	A buffer-to-channel transfer caused a check 2 condition.	Possible host processor channel problem or overrrun condition.	See "Possible Host Processor Channel Problems or Overrun Condition" on START 135.
A2nn	A buffer-to-channel transfer caused a check 2 condition.	Possible host processor channel problem or overrrun condition.	See "Possible Host Processor Channel Problems or Overrun Condition" on START 135.
A3nn	A buffer-to-channel transfer caused a check 2 condition.	Possible host processor channel problem or overrrun condition.	See "Possible Host Processor Channel Problems or Overrun Condition" on START 135.
A5nn	A buffer-to-channel transfer caused a check 2 condition.	Possible host processor channel problem or overrrun condition.	See "Possible Host Processor Channel Problems or Overrun Condition" on START 135.
A6nn	A buffer-to-channel transfer caused a check 2 condition.	Possible host processor channel problem or overrrun condition.	See "Possible Host Processor Channel Problems or Overrun Condition" on START 135.
A7nn	A buffer-to-channel transfer caused a check 2 condition.	Possible host processor channel problem or overrrun condition.	See "Possible Host Processor Channel Problems or Overrun Condition" on START 135.
A8nn	A buffer-to-channel transfer caused a check 2 condition.	Possible host processor channel problem or overrrun condition.	See "Possible Host Processor Channel Problems or Overrun Condition" on START 135.
CCDD	Fifty consecutive errors have occurred.	Information message only.	Using the host processor console messages or EREP, look for other sense records with a different FSC for this control unit. Use the newly determined FSC for troubleshooting.
CCEE	An error occurred during a synchronous read or write operation. **Note:** Error recovery is not performed for errors that occur in 'synchronous mode'.	Information message only.	Using the host processor console messages or EREP, look for other sense records with a different FSC for this control unit. Use the newly determined FSC for troubleshooting.
D0nn	The read status register (RSR) contains active bits 5, 6, or 7. The nn indicates which bits are active in the RSR.	Possible tape media problem.	See "Possible Tape Media Problems" on START 130.
D584	During channel/buffer communication, a buffer checker had detected an error.	Possible host processor channel problem or overrun condition.	See "Possible Host Processor Channel Problems or Overrun Condition" on START 135.
DAnn	The CMS register indicates an error, where nn = the BCSE register.	Possible tape media problem.	See "Possible Tape Media Problems" on START 130.
DCnn	The CMS register indicates an error, where nn = the CTXE or CPEO register.	Possible tape media problem.	See "Possible Tape Media Problems" on START 130.
E501	A condition code 3 (CC3) or path inoperative condition has occurred.	Possible host processor channel problem or overrun condition.	See "Possible Host Processor Channel Problems or Overrun Condition" on START 135.
E502	A condition code 3 (CC3) or path inoperative condition has occurred and the control unit will not go online.	Possible host processor channel problem or overrun condition.	See "Possible Host Processor Channel Problems or Overrun Condition" on START 135.
E505	A solid condition code 3 (CC3) or path inoperative condition has occurred and channel adapters are enabled.	Possible host processor channel problem or overrun condition.	See "Possible Host Processor Channel Problems or Overrun Condition" on START 135.
E511	An interface control check or channel data check has occurred.	Possible host processor channel problem or overrun condition.	See "Possible Host Processor Channel Problems or Overrun Condition" on START 135.
E513	There is an IFCC or channel data check and a tag failure is indicated.	Possible host processor channel problem or overrun condition.	See "Possible Host Processor Channel Problems or Overrun Condition" on START 135.
E514	There is an IFCC or channel data check and a bus failure is indicated.	Possible host processor channel problem or overrun condition.	See "Possible Host Processor Channel Problems or Overrun Condition" on START 135.
E520	The host processor channel has detected a timeout or a hang condition.	Possible host processor channel problem or overrun condition.	See "Possible Host Processor Channel Problems or Overrun Condition" on START 135.
E800	The service representative has informed the MD that there are too many temporary data errors based on Format 21 sense records from EREP or processor Console message information.	Possible tape media problem.	See "Possible Tape Media Problems" on START 130.

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Actions for Possible Non-FRU Caused Error Codes.

Possible Tape Media Problems

The following error codes can indicate possible tape media problems.

47B0	7142	7155	74nn
7093	7143	7159	7503
7094	7144	7161	76nn
70C2	7152	7162	7702
70C3	7153	7163	D0nn
7141	7154		E800

Errors detected in the data-flow area of the 3480 subsystem can also be caused by the tape media. The FSC/Error Code correctly points to the possible subsystem hardware FRUs. However, sometimes the replacement of these FRUs does not correct the problem. You should determine if the problem was caused by the tape media before replacing the subsystem FRUs.

This procedure assumes that you have an error code that is listed in the above list. This error code came from the 3480 product-trained maintenance package failure detection process (without a fix), the sense data from the host processor console message, or EREP. To determine if the problem could be caused by the tape media, do the following action.

Perform EREP analysis to determine if the problem is related to a unique tape volume. See MSG 1 for "EREP Analysis/Predictive Maintenance." Look at the subsystem exception report to determine if a tape volume is shown on the "Volume or Creating Drive Permanent Read or Write Errors on One or More Drive" or "Volume or Creating Drive Failed Temporary Read or Write Limits on More Than One Drive" or "Volume Failed Temporary Read or Write Limits." Follow the directions defined in the EREP Analysis/Predictive Maintenance Procedures.

- If the EREP Analysis/Predictive Maintenance Procedures indicate that the tape media ***is not*** the problem, continue with the maintenance specified for the product trained service representative in the product maintenance package, or for the support trained service representative, the additional actions specified in the FSI for the failing FSC.
- If the EREP Analysis/Predictive Maintenance Procedures indicate that tape media ***is*** the problem and multiple cartridges are failing, go to Media Contamination Fault Determination Criteria on START 140.
- If the EREP Analysis/Predictive Maintenance Procedures indicate that the tape media ***is*** the problem and a single cartridge is failing, go to Single Cartridge Fault Determination Criteria on START 145.

Possible Software Problems

The following error codes can indicate possible software problems.

33E4	4261	4B21	4D71	4E80
33E5	4262	4B22	4D72	4E81
3C60	4280	4B23	4D73	4E8A
3F13	47B0	4B24	4D74	4E8B
4200	4B20	4D70	4D75	
4260				

There are error codes that can be caused by either hardware or software problems. For example:

- A programmer could accidentally use an illegal 3480 subsystem command.
- The 3480 hardware could have a malfunction that decodes a correct command as an illegal command.

For these possible software problems suspect:

1. New programs or jobs, new PTFs, APARs, or program versions have been installed.
2. New applications of existing programs or jobs are being run.
3. Configuration changes have been made and the description of the error code relates to assignment or path group problems. This assumes that the 3480 Product MD Diskette, Start Repair option run without detecting an error.

If there is a potential software problem, you should ask for software aid.

Assistance in identifying software problems can be found by looking at the failing CCW in the EREP OBR edit report (SEE MSG 1). The *3480 Magnetic Tape Subsystem* manual, GA32-0042, can also be used as a reference. This manual defines all of the legal 3480 commands and any necessary prerequisites. By identifying the failing CCW chain, you can determine if the commands are correct. If they are correct, you can use OLT 0200A (FRIEND) to execute a loop of the failing CCW string for the drive reporting the error code.

Problems relating to Assign, Unassign, Control Access, or Path Group ID, usually can be related to the host processor I/O generation. See the host processor problem determination manual for the operating processor in use at the time of failure (for example, *3033/MVS Processor Problem Determination Guide*, Z229-0344).

This can be used to determine if the processor is set up to provide access to the device specified in the user's failing CCW program. It may be necessary to take processor traces of the I/O operations. The access paths set up for the operating processor in use are defined in the host processor's UCBs.

- If the software ***is not*** the problem, continue with the maintenance specified for the product trained service representative in the product maintenance package, or for the support trained service representative, the additional actions specified in the FSI for the failing FSC.
- If the **software is the problem**, inform the customer of the problem and do one of the following:

  1. IML the control unit (see PANEL 7)
  2. Re-IPL the MD
  3. Select option 3, Unit Test.

0 0 0 0 0 0 0 0 0 0

Actions for Possible Non-FRU Caused Error Codes.

Possible Tape Media Problems

The following error codes can indicate possible tape media problems.

47B0	7142	7155	74nn
7093	7143	7159	7503
7094	7144	7161	76nn
70C2	7152	7162	7702
70C3	7153	7163	D0nn
7141	7154		E800

Errors detected in the data flow area of the 3480 subsystem can also be caused by the tape media. The FSC/Error Code correctly points to the possible subsystem hardware FRUs. However, sometimes the replacement of these FRUs does not correct the problem. You should determine if the problem was caused by the tape media before replacing the subsystem FRUs.

This procedure assumes that you have an error code that is listed in the above list. This error code came from the 3480 product-trained maintenance package failure detection process (without a fix), the sense data from the host processor console message, or EREP. To determine if the problem could be caused by the tape media, do the following action.

Perform EREP analysis to determine if the problem is related to a unique tape volume. See MSG 1 for "EREP Analysis/Predictive Maintenance." Look at the subsystem exception report to determine if a tape volume is shown on the "Volume or Creating Drive Permanent Read or Write Errors on One or More Drive" or "Volume or Creating Drive Failed Temporary Read or Write Limits on More Than One Drive" or "Volume Failed Temporary Read or Write Limits." Follow the directions defined in the EREP Analysis/Predictive Maintenance Procedures.

- If the EREP Analysis/Predictive Maintenance Procedures indicate that the tape media ***is not*** the problem, continue with the maintenance specified for the product trained service representative in the product maintenance package, or for the support trained service representative, the additional actions specified in the FSI for the failing FSC.

- If the EREP Analysis/Predictive Maintenance Procedures indicate that tape media ***is*** the problem and multiple cartridges are failing, go to Media Contamination Fault Determination Criteria on START 140.

- If EREP Analysis/Predictive Maintenance Procedures indicate that the tape media ***is*** the problem and a single cartridge is failing, go to Single Cartridge Fault Determination Criteria on START 145.

Possible Software Problems

The following error codes can indicate possible software problems

33E4	4261	4B21	4D71
33E5	4262	4B22	4D72
3C60	4280	4B23	4D73
3F13	47B0	4B24	4D74
4200	4B20	4D70	4D75
4260			

There are error codes that can be caused by either hardware or software problems. For example:

- A programmer could accidentally use an illegal 3480 subsystem command.

- The 3480 hardware could have a malfunction that decodes a correct command as an illegal command.

For these possible software problems suspect:

1. New programs or jobs, new PTFs, APARs, or program versions have been installed.

2. New applications of existing programs or jobs are being run.

3. Configuration changes have been made and the description of the error code relates to assignment or path group problems. This assumes that the 3480 Product MD Diskette, Start Repair option run without detecting an error.

If there is a potential software problem, you should ask for software aid.

Assistance in identifying software problems can be found by looking at the failing CCW in the EREP OBR edit report (SEE MSG 1). The *3480 Magnetic Tape Subsystem* manual, GA32-0042, can also be used as a reference. This manual defines all of the legal 3480 commands and any necessary prerequisites. By identifying the failing CCW chain, you can determine if the commands are correct. If they are correct, you can use OLT 0200A (FRIEND) to execute a loop of the failing CCW string for the drive reporting the error code.

Problems relating to Assign, Unassign, Control Access, or Path Group ID, usually can be related to the host processor I/O generation. See the host processor problem determination manual for the operating processor in use at the time of failure (for example, *3033/MVS Processor Problem Determination Guide*, Z229-0344).

This can be used to determine if the processor is set up to provide access to the device specified in the user's failing CCW program. It may be necessary to take processor traces of the I/O operations. The access paths set up for the operating processor in use are defined in the host processor's UCBs.

- If the software ***is not*** the problem, continue with the maintenance specified for the product trained service representative in the product maintenance package, or for the support trained service representative, the additional actions specified in the FSI for the failing FSC.

- If the **software is the problem**, inform the customer of the problem and do one of the following:

  1. IML the control unit (see PANEL 7)

  2. Re-IPL the MD

  3. Select option 3, Unit Test.

Possible Host Processor Channel Problems or Overrun Condition

The following error codes can indicate possible host processor channel problems or overrun conditions.

2200	5605	D584
2201	5BB0	E501 (CC=3)
3300	5BB1	E511
33E4	7171	E520
33E5	A130	52nn
	A170	

Note: *An overrun condition on an MVS system may be caused by customers canceling a job.*

1. Run OLT 3480A to determine that the subsystem operates correctly with the host processor channel.

2. If OLT 3480A runs correctly, suspect a possible overrun condition. Go to "Actions for Possible Overrun Conditions" on START 135.

3. If OLT 3480A fails, run the internal electronic wrap test diagnostic. (See DIAG 1 for "Channel Adapter Function Test - routine EE64.")

4. If diagnostic EE64 fails, the problem is in the 3480 control unit. Do one of the following:

   - **Product Trained Service Representative**

     a. IML the control unit (see PANEL 7)

     b. IPL the MD

     c. Select option 1, Start Repair.

   - **Support Trained Service Representative**

     Follow the procedures for additional actions in the FSI for the failing FSC.

5. If diagnostic EE64 runs correctly, run the external wrap test diagnostic. (See DIAG 1 for "Channel Interface Wrap Test - routine EE62.")

   Warning: Use care when running this diagnostic. Disconnecting the channel interface cables will cause interference to host processor operation for other units on the same channel.

6. If diagnostic EE62 runs successfully, suspect the host processor channel to be the problem and contact the service representative responsible for the host processor.

7. If diagnostic EE62 fails, the 3480 is the cause of the problem. The area most likely to be causing the problem is the channel adapter driver/receiver cards or the bus and tag shoe cards.

   Prior to replacing FRU's, ensure that the terminators used for this test are not defective.

8. If the original product maintenance package internal wrap diagnostics continue to fail even after all FRUs called out were replaced, diagnostic EE64 (see DIAG 3) can be used to isolate board interconnection problems.

- If the host processor channel ***is not*** the problem, do one of the following:

  – **Product Trained Service Representative**

    1. IML the control unit (see PANEL 7)

    2. IPL the MD

    3. Select option 1, Start Repair.

  – **Support Trained Service Representative**

    Follow the procedures for additional actions in the FSI for the failing FSC.

- If the **host processor channel is the problem**, do one of the following:

  – **Product Trained Service Representative**

    1. IML the control unit (see PANEL 7)

    2. Re-IPL the MD

    3. Select option 1, Start Repair.

  – **Support Trained Service Representative**

    Follow the procedures for additional actions in the FSI for the failing FSC.

Actions for Possible Overrun Conditions

Two types of overrun conditions are possible:

- Overruns that occur between host processor channel and the 3480 subsystem.

- Overruns that occur between the 3480 control unit and the 3480 drive.

The 3480 buffer synchronizes the data rate between the 3480 drive and the host processor channel.

Intermittent overruns should not be a concern. However, if overruns occur repeatedly, the following areas should be considered:

- Verify that the 3480 control unit address (mode) switches are set for the correct channel (see PANEL 12).

- Verify that the host operating processor in use has the UCW for the 3480 subsystem assigned in the 'unshared' and 'streaming' mode.

Some additional non-3480 subsystem causes of overruns are:

- Host processor loading can cause throughput to deteriorate. For example, the operating processor access method (Indirect Addressing List pointer) slowing down can cause 3480 overruns.

- When the host processor is operating in Interlock Mode (3033 or low end host processors) and the 3480 subsystem is operating in tape synchronous mode, large blocks of data are being processed. This can occur during data chaining when the CCW count is more than 128 kilobytes.

  Inform the customer to reduce the chained block size to less than 128 kilobytes to resolve the specific overrun condition.

If the overrun condition ***is not*** the problem, continue with the maintenance specified for the product trained service representative in the product maintenance package, or for the support trained service representative, the additional actions specified in the FSI for the failing FSC.

If the overrun condition ***is*** the problem, inform the customer of the problem and do one of the following:

- **Product Trained Service Representative**

  1. IPL the MD
  2. Select option 3, Unit Test.

- **Support Trained Service Representative**

  Follow the procedures for additional actions in the FSI for the failing FSC.

Possible EC Level Compatibility Problems

The following error codes can indicate possible EC compatibility problems.

8100 - Microcode patches not available
8101 - Possible hardware EC compatibility problem
8102 - Possible hardware EC compatibility problem

There are several types of EC level compatibility problems. The most common mismatches are:

- In the drive compared to the control unit.
- In the control unit functional microcode compared to the hardware.

The error codes listed above apply to specific EC compatibility problems. Almost any error can be caused by some type of EC compatibility problem. For problems that cannot be resolved by corrective action specified by the maintenance package (for that FSC/Error Code), the EC levels of the subsystem must be verified.

Review the current ECA listing to determine the EC levels and required EC companions. Review the EC history to determine that all of the required ECs have been installed.

The MD Support diskette (see "Display Subsystem Configuration" on SDISK 105) is used to indicate the EC levels of the control unit and the microcode. Verify that the correct functional microcode IML diskette is inserted in the control unit.

If any EC levels or microcode patches are not correct, order any required ECs and end this maintenance call. When the ECs are available for installation, follow the directions given with the ECs.

If all EC levels and microcode patches are correct, and there still is an EC compatibility problem, contact your next level of support.

Possible Host Processor Channel Problems or Overrun Condition

The following error codes can indicate possible host processor channel problems or overrun conditions.

2200	5605	D584
2200	5605	D584
2201	5BB0	E501 (CC=3)
3300	5BB1	E502
33E4	7171	E505
33E5	A130	E513
	A170	E514
	A2nn	E520
	A3nn	52nn
	A5nn	A6nn
		A7nn
		A8nn

Note: An overrun condition on an MVS system may be caused by customers canceling a job.

1. Run OLT 3480A to determine that the subsystem operates correctly with the host processor channel.

2. If OLT 3480A runs correctly, suspect a possible overrun condition. Go to "Actions for Possible Overrun Conditions" on START 135.

3. If OLT 3480A fails, run the internal electronic wrap test diagnostic. (See DIAG 1 for "Channel Adapter Function Test - routine EE64.")

4. If diagnostic EE64 fails, the problem is in the 3480 control unit. Do one of the following:

   - **Product Trained Service Representative**

     a. IML the control unit (see PANEL 7)

     b. IPL the MD

     c. Select option 1, Start Repair.

   - **Support Trained Service Representative**

     Follow the procedures for additional actions in the FSI for the failing FSC.

5. If diagnostic EE64 runs correctly, run the external wrap test diagnostic. (See DIAG 1 for "Channel Interface Wrap Test - routine EE62.")

   Warning: Use care when running this diagnostic. Disconnecting the channel interface cables will cause interference to host processor operation for other units on the same channel.

6. If diagnostic EE62 runs successfully, suspect the host processor channel to be the problem and contact the service representative responsible for the host processor.

7. If diagnostic EE62 fails, the 3480 is the cause of the problem. The area most likely to be causing the problem is the channel adapter driver/receiver cards or the bus and tag shoe cards.

   Prior to replacing FRU's, ensure that the terminators used for this test are not defective.

8. If the original product maintenance package internal wrap diagnostics continue to fail even after all FRUs called out were replaced, diagnostic EE64 (see DIAG 3) can be used to isolate board interconnection problems.

- If the host processor channel ***is not*** the problem, do one of the following:

  – **Product Trained Service Representative**

    1. IML the control unit (see PANEL 7)

    2. IPL the MD

    3. Select option 1, Start Repair.

  – **Support Trained Service Representative**

    Follow the procedures for additional actions in the FSI for the failing FSC.

- If the **host processor channel is the problem**, do one of the following:

  – **Product Trained Service Representative**

    1. IML the control unit (see PANEL 7)

    2. Re-IPL the MD

    3. Select option 1, Start Repair.

  – **Support Trained Service Representative**

    Follow the procedures for additional actions in the FSI for the failing FSC.

Actions for Possible Overrun Conditions

Two types of overrun conditions are possible:

- Overruns that occur between host processor channel and the 3480 subsystem.
- Overruns that occur between the 3480 control unit and the 3480 drive.

The 3480 buffer synchronizes the data rate between the 3480 drive and the host processor channel.

Intermittent overruns should not be a concern. However, if overruns occur repeatedly, the following areas should be considered:

- Verify that the 3480 control unit address (mode) switches are set for the correct channel (see PANEL 12).
- Verify that the host operating processor in use has the UCW for the 3480 subsystem assigned in the 'unshared' and 'streaming' mode.

Some additional non-3480 subsystem causes of overruns are:

- Host processor loading can cause throughput to deteriorate. For example, the operating processor access method (Indirect Addressing List pointer) slowing down can cause 3480 overruns.
- When the host processor is operating in Interlock Mode (3033 or low end host processors) and the 3480 subsystem is operating in tape synchronous mode, large blocks of data are being processed. This can occur during data chaining when the CCW count is more than 128 kilobytes.

  Inform the customer to reduce the chained block size to less than 128 kilobytes to resolve the specific overrun condition.

If the overrun condition ***is not*** the problem, continue with the maintenance specified for the product trained service representative in the product maintenance package, or for the support trained service representative, the additional actions specified in the FSI for the failing FSC.

If the overrun condition ***is*** the problem, inform the customer of the problem and do one of the following:

- **Product Trained Service Representative**

  1. IPL the MD
  2. Select option 3, Unit Test.

- **Support Trained Service Representative**

  Follow the procedures for additional actions in the FSI for the failing FSC.

Possible EC Level Compatibility Problems

The following error codes can indicate possible EC compatibility problems.

```
8100 - Microcode patches not available
8101 - Possible hardware EC compatibility
       problem
8102 - Possible hardware EC compatibility
       problem
```

There are several types of EC level compatibility problems. The most common mismatches are:

- In the drive compared to the control unit.
- In the control unit functional microcode compared to the hardware.

The error codes listed above apply to specific EC compatibility problems. Almost any error can be caused by some type of EC compatibility problem. For problems that cannot be resolved by corrective action specified by the maintenance package (for that FSC/Error Code), the EC levels of the subsystem must be verified.

Review the current ECA listing to determine the EC levels and required EC companions. Review the EC history to determine that all of the required ECs have been installed.

The MD Support diskette (see "Display Subsystem Configuration" on SDISK 105) is used to indicate the EC levels of the control unit and the microcode. Verify that the correct functional microcode IML diskette is inserted in the control unit.

If any EC levels or microcode patches are not correct, order any required ECs and end this maintenance call. When the ECs are available for installation, follow the directions given with the ECs.

If all EC levels and microcode patches are correct, and there still is an EC compatibility problem, contact your next level of support.

0 0 0 0 0 0 0 0 0 0

3480 Media Fault Determination Criteria

Note: You were sent to this page because of a possible media problem with multiple cartridges and/or multiple drives. There should be a pattern of similar unscheduled service calls.

This procedure should be followed for each suspected media service call. After following this procedure, do **NOT** approach the customer about a potential media problem until further analysis is completed by the next level of support. Notify your manager at this time of a possible media problem.

Description/Definition

Tape media can create a number of failure modes similar to those caused by actual hardware problems and the severity can be significant if not properly handled. For this reason, it is important that careful analysis and problem determination be made if a media failure is suspected.

One failure mode is media generated debris. Debris can be caused by minute particles separating from the tape and will normally appear as a thin line of deposits (very difficult to see without magnification) across the tape, the Read/Write head or the cleaner blade.

Some typical failure modes commonly associated with media problems include but are not limited to:

- Permanent read or write errors caused by:
  - deposits transferred to and from the cleaner blade
  - transfer of media particles to the Read/Write head
  - media particles left on the tape surface may cause the tape to be lifted from the head thereby causing a failure.
- Dropping records due to debris deposits and subsequent loss of tape position indicated by block sequence errors.
- High temporary error rate.
  - evidenced by highly erratic drive performance day to day
  - not definable to a single drive, control unit or subsystem
  - not the result of repeat failures on a particular volume.

The following information provides some basic considerations and guidelines relative to handling media problems.

ISOLATION

ENSURE HARDWARE

The integrity of the hardware must be established. This requires utilization of the maintenance package to ensure there are no hardware malfunctions in the subsystem which could be causing the degradation. The hardware must be able to run all diagnostics error free.

Once hardware problems have been eliminated as the reason for poor performance, and media is suspected, the following items need to be verified:

ENSURE ENVIRONMENT

Temperature and humidity of both the tape storage area and the computer room should be observed to assure they are within acceptable limits. The operating limits are given in the *Care and Handling of the Magnetic Tape Cartridge*, GA32-0047.

ENSURE ADEQUATE DRIVE CLEANING

Customer drive cleaning procedures should be studied. The drives should be cleaned by the customer:

- whenever a 'CLEAN' message is displayed on the pod
- every 8 hours
- after every permanent R/W error
- whenever an increase in temporary errors is observed.

The customer should be encouraged to install all error recovery and error recording modules available for his operating system.

If the failure is the result of a media oriented problem, contact your next level of support for further media analysis. Notify your manager of a possible media problem. **DO NOT** notify the customer of the possible media problem at this time.

Single Cartridge Fault Determination Criteria

The hardware has been verified by running all diagnostics error free.

You were sent to this page because a single cartridge is failing for one of the following reasons:

1. The maintenance package has found a physical defect with this cartridge such as a broken tape.
2. A single cartridge fails on multiple drives.
3. EREP analysis indicates a single cartridge in the tape library is causing a high number of read/write problems.

If the failure is caused by a single cartridge, notify the customer to purge the tape from the library.

Determining a Fault Symptom Code

Determining a Fault Symptom Code

The Determining a Fault Symptom Code procedures are written to guide you through the process of determining which sense byte error code to use as a fault symptom code (FSC). Normally the MD identifies the fault symptom code, determines the corrective action, and prompts you to perform the corrective action. However, there can be conditions where you would manually determine a fault symptom code. The following is a list of these conditions:

- To develop fault symptom codes from sense records in EREP analysis and predictive maintenance.
- To determine FRU's ahead of time for a problem when you are away from the subsystem or are unable to connect the MD to the subsystem.
- To develop multiple fault symptom codes from several records in EREP reports, system console messages, or other external symptoms for comparison purposes.
- To verify that the correct fault symptom code was used by the MD product diskette analysis procedures.

If you have any of these conditions, or should you chose to manually determine a fault symptom code for any reason, use the following maps to determine the fault symptom code. After you have determined the fault symptom code, return to the procedure that sent you here.

Look for sense error codes that are used to select an FSC in the following sense bytes: (four digit error codes) 10-11, 12-13, 14-15, 16-17, (two digit error codes) 21, and 23. When two digit error codes (from sense bytes 21, or 23) are described in the maintenance information (MI) or displayed on the MD, they are preceded by two zeros (example: drive error code 25 in sense byte 21 becomes fault symptom code 0025).

MAP 0310: Determining a Fault Symptom Code

001

Is sense data available?

Yes **No**

002

Do you have a drive CHK code?

Yes **No**

003

– Go to Maintenance Starting Point on START 10.

004

Does the CHK Code equal 75, 76, A3 or A4?

Yes **No**

005

Does the CHK Code equal EC, ED, EE or EF?

Yes **No**

006

– Preceed the CHK Code with two zeros (ie Check 25 becomes FSC 0025).

Continue at Step 001 on page START-325.

007

– Get the two digit code from the Loader Card (see LOC 1). If blank enter 00.
– Preceed the Loader Code with "E7" (ie Code 96 becomes FSC E796).

Continue at Step 001 on page START-325.

008

Could be Normal operation (see FSI).
– Preceed the CHK Code with two zeros (ie Check 75 becomes FSC 0075)

Continue at Step 001 on page START-325.

009

Does Sense Byte 7 = 19, 20 or 22?

Yes **No**

010

This is sense data for statistical or frequent temporary errors.

(Step 010 continues)

010 (continued)

Is there other format 19, 20 or 22 sense data for this address?

Yes **No**

011

Are you here for frequent temporary Read/Write errors or High ECC's?

Yes **No**

012

– Go to Maintenance Starting Point on START 10.

013

– Perform EREP analysis for temporary errors (see MSG 360).

Does EREP indicate temporary errors?

Yes **No**

014

– Turn of Forced Error Logging (see MSG 1).

Continue at Step 017, when you have format 19 data for temporary errors.

015

– Use E800 as the FSC.

Continue at Step 001 on page START-325.

016

Continue at Step 017.

017

Does Sense Byte 21 = 64, 75, A3 or FF?

Yes **No**

018

Does Sense Byte 21 = 00?

Yes **No**

019

Does Sense Byte 21 = EC, ED, EE or EF?

Yes **No**

020

– Preceed Sense Byte 21 with two zeros and use as the FSC.

(Step 020 continues)

020 (continued)

Continue at Step 001 on page START-325.

021

– Preceed Sense Byte 18 with "E7" and use as the FSC.

Continue at Step 001 on page START-325.

022

Continue at Step 003 on page START-315.

023

Continue at Step 001 on page START-315.

MAP 0315: Format 19 and 20 Sense Analysis

001

Does Sense Byte 23 equal 00, 64, 75 or A3?
Yes No

002

– Preceed Sense Byte 23 with two zeros and use as the FSC.
Continue at Step 001 on page START-325.

003

Do sense bytes 10-11 equal 0000?
Yes No

004

Do sense bytes 10-11 equal 33E7, 33E8, 33E9, 8202, or 8204?
Yes No

005

Do sense bytes 16-17 equal 0000?
Yes No

006

– Use sense bytes 16-17 as the FSC.
Continue at Step 001 on page START-325.

007

Do sense bytes 10-11 equal 8E06?
Yes No

008

Continue at Step 012.

009

Continue at Step 001 on page START-320.

010

Continue at Step 010 on page START-320.

011

– Call your next level of support.

012

(Step 012 continues)

012 (continued)
Do sense bytes 10-11 equal 2000 or 2010?
Yes No

013

– Use sense bytes 10-11 as the FSC.
Continue at Step 001 on page START-325.

014

Do sense bytes 12-13 equal 0000?
Yes No

015

– Use sense bytes 12-13 as the FSC.
Continue at Step 001 on page START-325.

016

– Call your next level of support.

MAP 0320: Format 19 and 20 Sense Analysis (continued)

001

Do sense bytes 12-13 equal 2000 or 2010?
Yes No

002

Do sense bytes 12-13 equal 0000?
Yes No

003

Continue at Step 006.

004

Continue at Step 010.

005

Continue at Step 007.

006

Do sense bytes 12-13 equal 8E06?
Yes No

007

– Use sense bytes 12-13 as the FSC.
Continue at Step 001 on page START-325.

008

Do sense bytes 14-15 equal 0000 or 8E06?
Yes No

009

Use sense bytes 14-15 as the FSC.
Continue at Step 001 on page START-325.

010

This can be a normal operating condition.
– Using the last non-zero error code that sent you to this step (as an FSC), see the FSI and determine if the problem has a non-FRU cause.
– Perform any action as necessary.

Is the problem a non-FRU?
Yes No

011

(Step 011 continues)

011 (continued)

Do sense bytes 16-17 equal 0000?
Yes No

012

– Use sense bytes 16-17 as the FSC.
Continue at Step 001 on page START-325.

013

– Use the last non-zero error code that sent you to this step as the FSC.
Continue at Step 001 on page START-325.

014

Is other sense data available for this control unit's address?
Yes No

015

Go to Maintenance Starting Point on START 10.

016

Continue at Step 017 on page START-310.

MAP 0325: Action After A Fault Symptom Code Has Been Determined

An FSC has been determined. FRU's for this FSC can now be identified and ordered.

001

Do you wish to perform corrective action and is the subsystem hardware (CU or Drive) relating to this FSC available for corrective action?
Yes No

002

– Do one of the following procedures to generate the FRU list:

Note: The following do not require connecting the MD to a control unit.

1. Display FRU's program
   a. Connect the MD AC power to an AC power outlet.
   b. Power on the MD.
   c. Insert the product diskette into the MD.
   d. When the Main Menu is displayed, select option 4 (Display FRU's).
   e. Enter the data when it is requested by the MD. An FSC is determined and the FRU list for the FSC is displayed on the MD.
2. Maintenance Information (MI) FSC FRU list.
   a. Look up the FRU's and possible additional causes of failure for the FSC in the FSI section of the MI.
   b. Record the FRU list for later use in your corrective action.

Schedule, with the customer, a time for corrective action.

These FRU's can be obtained in advance so that when you perform the corrective action, the FRU's are available for exchanging.

– Return to the step that brought you here, and continue any remaining actions.

003

(Step 003 continues)

003 (continued)
Is this a two control unit configuration?
Yes No

004

Does the FSC error description in the FSI relate to a channel adapter problem?
Yes No

005

Continue at Step 008.

006

– Follow the "Error Path Isolation" procedures (see Start 400) to determine the failing channel adapter (A-D) for the channel adapter FRU's to be exchanged

Continue at Step 008.

007

– Follow the "Determining the Control-Unit-to-MD Connection" procedure (see START 420) to determine which control unit the MD should be connected to and also which FRU's should be exchanged in which control unit.

Continue at Step 008.

008

– Follow the vary offline procedures on PLAN 55 and have the customer vary offline the units needed for corrective action.
– Connect the MD to the control unit, insert the product diskette, and IPL the MD (see MD 40).
– Select Main Menu option 1, Start Repair.
– Enter the data when it is requested by the MD.

An FSC is determined and the FRU list for the FSC is displayed on the MD.

Did the message 'ANALYZING PREVIOUSLY ENTERED SENSE DATA' appear on the MD display?
Yes No

009

– Record the displayed FRU list.
– Follow the MD/MI directions and exchange the FRU's on the list, then continue with the MD directions until completed.
– Compare the FSC code from the MD start repair action with the FSC code from your analysis.

Are the FSC codes the same or associated with the same area?
Yes No

010

(Step 010 continues)

010 (continued)
– Consider the error that was detected by Start Repair a new error that occurred after the list you analyzed.
– Repair action is completed.
– Return to the procedure that brought you here, and continue with any remaining actions.

011

– Consider the error that was detected by Start Repair to be the same error that was identified by your analysis.
– Repair action is completed.
– Return to the procedure that brought you here, and continue with any remaining actions.

012

The MD then displays a FRU list based on the entered data.
– Follow the procedure in the MI and exchange the FRU's on the displayed list.
– Repair action is completed.
– Return to the procedure that brought you here, and continue with any remaining actions.

An FSC has been determined; FRUs for this FSC can now be identified and ordered.

001

(Entry Point D)

Do you wish to perform corrective action and is the subsystem hardware (CU or drive) relating to this FSC available for corrective action?

YES NO

002
Do one of the following procedures to generate the FRU list:

Note.
The following does not require connecting the MD to a control unit.

1. Display FRUs program

   a. Connect the MD ac power to an ac power outlet.

   b. Power on the MD.

   c. Insert the product diskette into the MD.

   d. IPL the MD.

   e. When the Main Menu is displayed, select option 4 (Display FRUs).

   f. Enter the sense data when it is requested by the MD. An FSC is determined and the FRU list for the FSC is displayed on the MD.

2. Maintenance Information (MI) FSC FRU list

   Look up the FRUs and possible additional causes of failure for the FSC in the FSI and EAD, if applicable.

   Record the FRU list for later use in your corrective action. Schedule, with the customer, a time for corrective action. These FRUs can be obtained in advance so that when you perform the corrective action, the FRUs are available for exchanging. Also, have the sense data available.

   Return to the step that brought you here, and continue any remaining actions.

003
Is this a two control unit configuration?

YES NO

004
Does the FSC error description in the FSI or EAD relate to a channel adapter problem?

YES NO

A B C

A B C

005
BEFORE YOU START CORRECTIVE ACTION, YOU SHOULD REVIEW THE CUSTOMER'S CLEANING PROCEDURE. THEN DETERMINE THE CLEANLINESS OF THE SUSPECTED DRIVE HEAD AND GUIDE ASSEMBLY AS DESCRIBED ON CARR-DR 130 (SEE "HEAD, DECOUPLER, AND CLEANER BLOCK CLEANING PROCEDURE*). IF THE HEAD AND GUIDE ASSEMBLY NEEDS CLEANING, CLEAN THE DRIVE USING THE TAPE CLEANER CARTRIDGE, IBM PART 4780527, OR EQUIVALENT (SEE THE 3480 MAGNETIC TAPE SUBSYSTEM OPERATORS GUIDE, GA32-0066. IF ADDITIONAL CLEANING IS NEEDED, PERFORM THE CLEANING PROCEDURE DESCRIBED ON CARR-DR 130. INFORM THE CUSTOMER TO CLEAN THEIR DRIVES MORE OFTEN.

1. Follow the vary offline procedure on PLAN 55 and have the customer vary offline the units needed for corrective action.

2. Connect the MD to the control unit, insert the product diskette, and IPL the MD (see MD 40).

3. Select Main Menu option 1, Start Repair.

   The MD asks if a 'CHK' message is displayed on the drive; respond NO to this question.
   The MD then asks if sense data is available for the suspected failure; respond YES to this question, then enter the requested sense data from the sense record that was used to determine the FSC.

Does the message 'ANALYZING PREVIOUSLY ENTERED SENSE DATA' appear on the MD display?
(This message means that the functional verify program completed without detecting an error.)

YES NO

006
1. Record the displayed FRU list. Follow the MD/MI directions and exchange the FRUs on the displayed FRU list, then verify that the error was corrected.

2. Select Main Menu option 1, Start Repair again.

3. The MD asks if a 'CHK' message is displayed on the drive; respond NO to this question.

   The MD then asks if sense data is available for the suspected failure; respond YES to this question, then enter the requested sense data again, using the sense error record that was used to determine the FSC.

A B D

A B D

4. Compare this FRU list with your recorded FRU list (from the functional verify program error).

Are the FRU lists either the same or associated with the same area.

YES NO

007
Consider the error that was detected by the functional verify program a new error that occurred after the EREP report you analyzed was printed.

Follow the MD/MI directions and exchange the FRUs on the displayed list, the MD will verify correct subsystem operation.

Return to the EREP analysis procedure step that brought you here, and continue with any remaining actions.

008
Consider the error that was detected by the functional verify program to be the same error that was identified by your analysis.

Any more corrective actions to be performed?

YES NO

Repair action is completed.

Return to the procedure step that brought you here, and continue with any remaining actions.

009
Repeat this procedure for each identified error that you are to perform corrective action on.

1. Select Main Menu option 3, Unit Test, to verify subsystem operation and to complete the end of call actions.

2. Have the customer vary online the drives that were varied offline.

3. Return to the procedure step that brought you here, and continue with any remaining actions.

A B D

010
The MD then displays a FRU list based on the entered EREP sense data.

Follow the procedures in the MI (see CARR-DR 1-1) and exchange the FRUs on the displayed list.

Go to step 009.

011
Follow the "Error Path Isolation" procedures (see START 400) to determine the failing channel adapter (A-D) for the channel adapter FRU to be exchanged.

Go to step 005.

012
Follow the "Determining the Control-Unit-to-MD Connection" procedure (see START 420) to determine which control unit the MD should be connected to and also which FRUs should be exchanged in which control unit.

Go to step 005.

Error Path Isolation

The purpose of the following procedure is to identify the failing path and to determine which control unit to connect the MD to, which channel adapter (CA) to test for a problem, and which control unit FRUs are to be exchanged in which control unit.

1. Analyze sense byte 2 bit 4 to determine the control unit that detected the failure. This will determine in which control unit you should exchange the FRUs (except for the channel adapter) and to which control unit the MD should be connected.

2. Use the error description theory of the EAD or the FSI for the fault symptom code (FSC) selected by the MD or the FSC you determined from "Determining a Fault Symptom Code" procedure (see START 300).

   If the error description relates to the channel adapter or a channel adapter FRU is identified, look at sense byte 9, of the sense record for the FSC. This will determine the failing channel adapter (A through D) for the control unit identified by sense byte 2 bit 4. You should replace the identified FRU in the channel adapter identified in sense byte 9.

3. Return to the MI section that sent you here. When requested to connect the MD, connect it to the control unit with the failure as defined by sense byte 2 bit 4.

4. Replace all FRUs (except the channel adapter) in the control unit specified by sense byte 2 bit 4. For channel adapters FSCs, or when a channel adapter FRU is identified, replace the channel adapter specified in sense byte 9, in the control unit specified in sense byte 2 bit 4.

When errors occur in multi-path processors or in 3480 dual control unit subsystems, it may be necessary to determine the actual path to the failing device. EREP lists the errors of its selected CUA while the 3480 subsystem is using another control unit for a data path. For example, data load balancing can cause this condition.

Error Path Sense Byte Definitions

Sense Byte 2 - Reporting Path and Failing Path (Except Channel Adapter) Definitions

Bits 0, 1 and 2 – Indicates the channel adapter reporting the problem for the control unit that detected the problem as specified in bit 4.

001 = Channel adapter A reported the problem.

010 = Channel adapter B reported the problem.

011 = Channel adapter C reported the problem.

100 = Channel adapter D reported the problem.

Bit 3 – Indicates the control unit location of the channel adapter reporting the problem.

0 = The channel adapter reporting the problem is in control unit 0.

1 = The channel adapter reporting the problem is in control unit 1.

Note: *Bits 0 through 3 have very little meaning for troubleshooting. For troubleshooting, bit 4, and for channel adapter problems, sense byte 9 provides useful information.*

Bit 4 – Indicates the control unit that detected the failure. This bit determines in which control unit the control unit FRUs (except the channel adapter) should be exchanged, and to which control unit to connect the MD.

0 - Control unit 0 detected this error.

1 - Control unit 1 detected this error.

Sense Byte 9 - Failing Channel Adapter Identified for Channel Adapter FSCs

For channel adapter FSCs, sense byte 9 identifies the failing channel adapter (A through D) that is in the control unit that detected this error, as defined by sense byte 2 bit 4. Only sense byte 9 bits 0 through 3 have meaning to identify the failing channel adapter for channel adapter FSCs.

Sense Byte 9 Bits 0-3	Failing Channel Adapter
1000	A
0100	B
0010	C
0001	D

The control unit is specified by sense byte 2 bit 4.

Examples of EREP and Actual Data Path Differences

Single 3480 Control Unit

See Figure 1 and assume the following conditions:

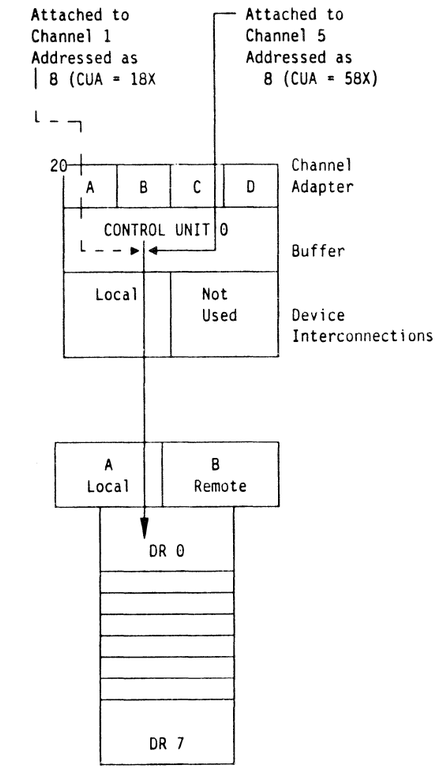
- The drive selected at the time of the error is drive 0.
- The 3480 channel adapter A is connected to host system channel 1 and is addressed as 8 (CUA = 180).
- The 3480 channel adapter C is connected to host system channel 5 and is addressed as 8 (CUA = 580).
- The host processor I/O GEN has 180 as the primary CUA and 580 as the alternate CUA.
- The host processor channel 1 is busy with another drive and a program wants to process data through CUA 180. The host then selects CUA 580 as an alternate to process the data on drive 580.
- An error occurs on drive 0 while processing the data. The host operating processor will report the CUA/PCUA as 180, which is not the correct data path to drive 0.

When instances such as the above occur, sense byte 2 has no useful information. Because there is only one control unit, sense byte 2 bit 4 will always be zero. Only the channel adapter must be determined if the FSC error description relates to the channel adapter or a channel adapter FRU is identified. For channel adapter FSCs, sense byte 9 bits 0 through 3 identify the failing channel adapter.

Assume the FSC is 5CC3, and sense byte 9 is 0010xxxx. In this example, sense byte 9 indicates channel adapter C, which is attached to host channel 5, although the host operating processor reports channel 1, which is attached to channel adapter A.

If interface or host processor channel problems are indicated by the FSC, run OLT 3480A (Channel Interface Test) using the suspected channel, or use the appropriate host processor channel tests on the control unit channel adapter identified in sense byte 9.

To determine the host processor channel connection to the 3480 control unit channel adapter, see the customer's host processor channel configuration drawing or the I/O GEN.



– – – Failing Data Path Reported by EREP
——— Actual Failing Data Path

Figure 1. Single Control Unit

Error Path Isolation (Continued)

Examples of EREP and Actual Data Path Differences (Continued)

Dual 3480 Control Units

See Figure 1 and assume the following conditions:

- The drive selected at the time of the error is drive 8.
- In control unit 1, channel adapter A is addressed as 8 and is channel 1 (CUA = 188).
- All 3480 channel adapters in control unit 0 are addressed as 8 (CUA = X88).
- CUA 188 is selected in control unit 1, however, control unit 0 has the least data load. The 3480 routes the data through the channel adapter in control unit 1, through control unit 0's buffer and drive interconnections, to drive 8.
- An error occurs while drive 8 is processing the data. EREP will report the PCUA as 180, which is not the true data path.

In cases such as the above, the actual data path will be defined in sense byte 2 bit 4, and for channel adapter FSCs the actual failing channel adapter will be defined in sense byte 9 bits 0 through 3.

For the following two examples, the data path at the time of failure is the same, and is shown in Figure 1 on START 401. However, because each example has a failure in a different part of the subsystem, the sense data troubleshooting information is different.

Example A:

Assume the FSC is 70E4 (buffer problem), sense byte 2 is hexadecimal 30 and sense byte 9 contains no useful information.

```
Sense Byte 2 = 30
0 1 2 3 4 5 6 7
0 0 1 1 0 X X X
---------------
| | | | | | | |
| | | | | | | └ Does not apply.
| | | | | | └ Indicates that CU 0 was the
| | | | | |   failing control unit.
| | | | | └ Indicates the reporting channel adapter
| | | | |   and control unit at the time of the
| | | | |   error, not useful for troubleshooting.
```

Looking up the 70E4 FSC in the FSI indicates that the problem relates to a buffer error. As a result, sense byte 9 has no useful meaning. In this case, all control unit FRUs identified by the 70E4 FSC are in control unit 0, as defined by sense byte 2 bit 4.

Example B:

Assume the FSC is 5CC1 (channel adapter problem), sense byte 2 is hexadecimal 38 and sense byte 9 contains 0010xxxx.

```
Sense Byte 2 = 38
0 1 2 3 4 5 6 7
0 0 1 1 1 X X X
---------------
| | | | | | | |
| | | | | | | └ Does not apply.
| | | | | | └ Indicates that CU 1 was the
| | | | | |   failing control unit.
| | | | | └ Indicates the reporting channel adapter
| | | | |   and control unit at the time of the
| | | | |   error, not useful for troubleshooting.
```

Looking up the 5CC1 FSC in the FSI indicates that the problem relates to a channel adapter error. As a result, sense byte 9 identifies the failing channel adapter. In this case, sense byte 9 contains 0010xxxx and indicates the channel adapter is for channel C in control unit 1 (as defined by sense byte 2 bit 4).

If the channel adapter or host processor channel problems are indicated (either by a channel adapter FSC in the sense data or a host detected channel error), the product trained service representative should follow the Product Maintenance package beginning at the MI START section. The MD should be connected to the control unit defined by sense byte 2 bit 4, and the channel adapter defined by sense byte 9 for channel adapter FSCs; or to the host processor that reported the host detected error.

For any other FSCs in sense data, connect the MD to the control unit specified by sense byte 2 bit 4. For any other error condition, (audible, or visual), connect the MD to the control unit with the error condition.

- Run OLT 3480A to the identified control unit channel adapter (as determined for channel adapter FSCs by sense byte 2 bit 4, and sense byte 9, in the sense data or to the control unit and channel adapter connected to the host processor that reported the host detected error. When a failure is found, isolation between the control unit and the host processor channel or cables must be determined. Use support diagnostics as follows:

  - EE64 (DIAG) runs an internal wrap that tests the control unit channel adapter but not the bus and tag shoe card drivers and receivers to the host processor channel cable.

  - EE62 (DIAG) is an external control unit wrap test that tests the bus and tag shoe card drivers and receivers.

If both support diagnostics run successfully, suspect the host system channel or cables. Inform the person responsible for maintenance of the host processor channel and cabling.

To determine the host processor channel connected to the 3480 control unit channel adapter, refer to the customer host processor channel configuration drawing or the I/O GEN.

To determine which control unit is control unit 0 and which is control unit 1, look at the position of the CU 0/CU 1 switch on the control unit. (See LOC 1).

In some cases an error can be caused by either control unit. When this occurs, it may be necessary to use the maintenance package on both control units.

For single drive failures, the data path will have less meaning, and the maintenance device (MD) can be used with either control unit to troubleshoot the failing drive.

- Use the FSC selected by the MD or by following the "Determining a Fault Symptom Code" procedure. See START 300.

Determining the Control-Unit-to-MD Connection

This flowchart determines which FRUs are exchanged in which control unit, in a 2 control unit configuration, and which channel adapter the channel adapter FRU should be exchanged in.

001 **(Entry Point A)**

Does the FSC equal 8007?

YES NO

002
Does the FSC equal a CHK code or 00nn?

YES NO

003
Does the FSC equal Ennn?

YES NO

004
Do sense bytes 10 and 11 or 12 and 13 equal 2000?

YES NO

005
Do sense bytes 10 and 11 or 12 and 13 equal 2010?

YES NO

006
Use sense byte 2 to find the failing path. See START 400.

See the FSI for the description of the failing FSC.

Does the FSC relate to a channel adapter problem?

YES NO

007
Connect the MD to the control unit specified by sense byte 2 bit 4.

Unless otherwise specified by the MD or FRU list, exchange all the control unit FRUs specified by sense byte 2 bit 4.

A B C D E F

A B C D E F

008
Connect the MD to the control unit specified in sense byte 2 bit 4. Replace the channel adapter FRU in the channel adapter specified in sense byte 9 bits 0-3.

009
Connect the MD to control unit 1 (CU1). Replace FRUs in CU1.

010
Connect the MD to control unit 0 (CU0). Replace FRUs in CU0.

011
Ennn error codes are MD generated FSCs that are usually caused by audio or visual indications, including host-detected errors without any sense data or CHK codes available.
See the error description of the FSC in the FSI.

Does the FSC relate to a channel problem?

YES NO

012
Connect the MD to the control unit that the MD was connected to when the Ennn error code was generated. Replace FRUs in this CU.

013
Connect the MD to the control unit that is connected to the channel on which the host detected an error. Replace FRUs in this CU.

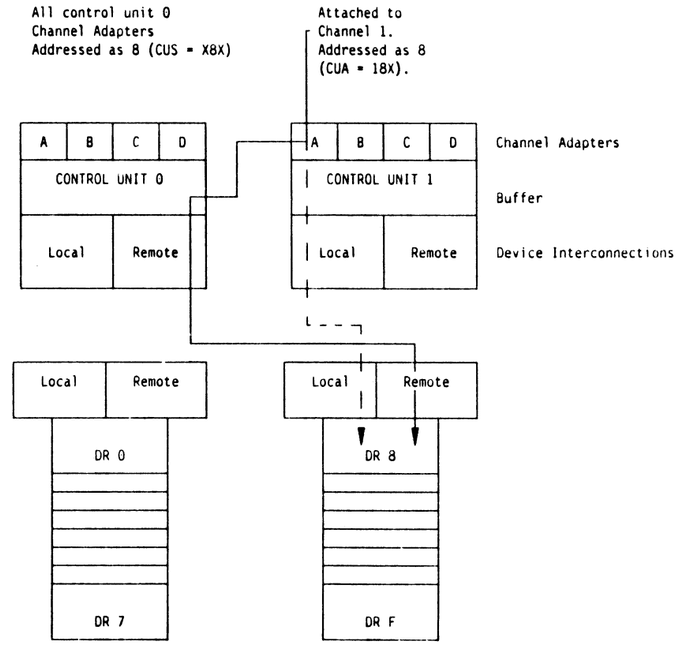
014
Connect the MD to either control unit. (You may have to change the Control Unit to MD connection based on the MD results). Replace FRUs in the failing drive, and CU FRUs in the CU that the MD is attached to.

015
Connect the MD to the control unit specified in the control unit address that was recorded when the FSC was determined. Any control unit FRUs called out are for the control unit specified by this control unit's address.

Determining MD/Control Unit Connection (For a 2 CU Configuration)

To determine which CU to connect the MD to, you must:

- For any problem, connect the MD to the failing control unit specified by sense byte 2 bit 4.
- Use the error description from the EAD or the FSI.
- If the error description indicates a channel adapter problem, sense byte 9 (indicates the failing channel adapter). This is the failing channel adapter that should be exchanged when a channel adapter FRU is called out.
- For single drive failures, the maintenance device (MD) can be used with either control unit to troubleshoot the failing drive.



- - - Failing Data Path Reported by EREP (CUA/PCUA = 180)
——— Actual Failing Data Path (As Established by the Load Balancing)

Figure 1. Dual Control Units

Contents

Tape Media Dimensions

Tape Media Dimensions

3480 models support Cartridge System Tape (CST) only. The 3490 models capable of writing 3480-2 XF format support two tape lengths, Cartridge System Tape (CST) and Cartridge System Tape - 2 (CST-2).

Table 1. Tape Media Dimensions

Characteristic	CST	CST-2	Unit
Tape Width	12.65 (0.498)	12.57 (0.495)	mm (in)
Tape Length	165	332	m
Reel Circumference	280-307	310-314	mm

IBM Enhanced Capacity Cartridge System Tapes should not be mounted in a 3480 subsystem. Only the 3490E has the design updates needed to support the use of the enhanced capacity cartridge.

Tape that exceeds the length of IBM Cartridge System Tape could cause damage to either the tape or the drive, if processed to its Physical-End-Of-Tape. When an enhanced capacity cartridge is mounted in a 3480 Magnetic Tape Subsystem, the subsystem will return an ERA code to the operating system, indicating a tape length incompatibility. If this occurs, the job will not run and should be rerun with the cartridge mounted in a 3490E Magnetic Tape Subsystem. See MSG section for a discussion of ERA codes.

Additional information related to the IBM magnetic tape cartridge may be found in:

- Care and Handling of the IBM Magnetic Tape Cartridge, GA32-0047.
- Tape and Cartridge Requirements for IBM Magnetic Tape Cartridge Drives, GA32-0048.

Cartridge Description

A magnetic tape cartridge is used in the 3480 subsystem. Within the cartridge is:

- A single reel of magnetic tape
- A leader block
- The cartridge file protect mechanism
- The clutch surface.

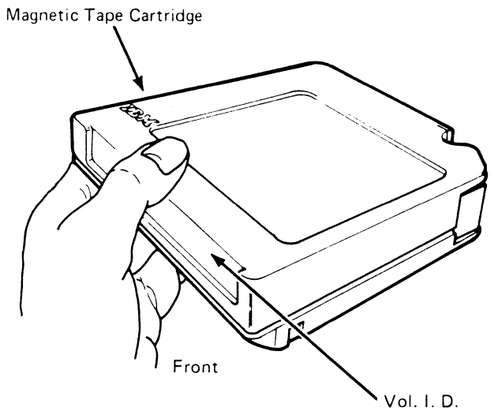
The leader block **1** is attached to the end of the magnetic tape. During the threading operation, the leader block is pulled out of the cartridge by the threader pin and moved along the tape path to the machine reel.

The cartridge file protect mechanism **2** is a thumbwheel that is moved by hand to either the File Protected or the Not File Protected position. A white dot on the face of the thumbwheel indicates that the cartridge is file protected.

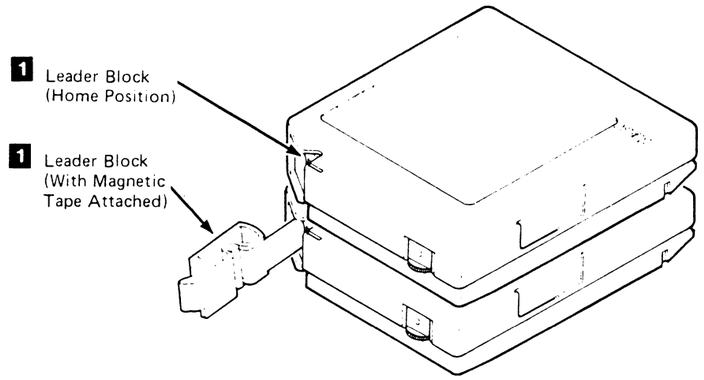
The clutch surface **3** is engaged by the file reel clutch to rotate the tape reel.

On the outside of the cartridge housing can be found:

- Space for the volume identification, which is at the rear of the cartridge housing.
- Cartridge manufacturing information, which is stamped on the bottom of the cartridge housing.

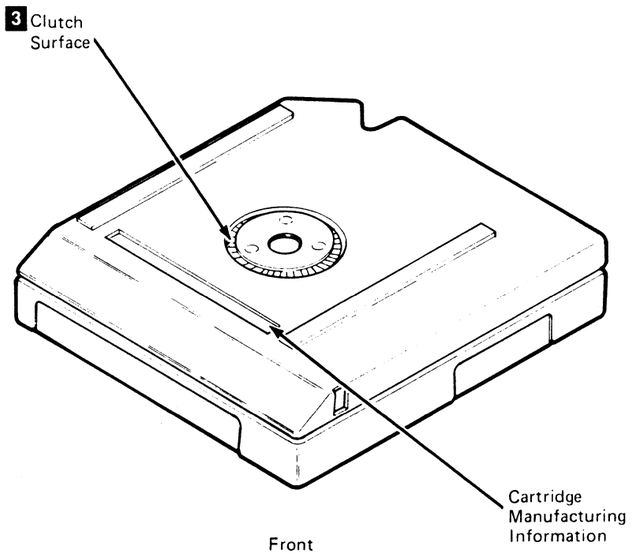


Top View



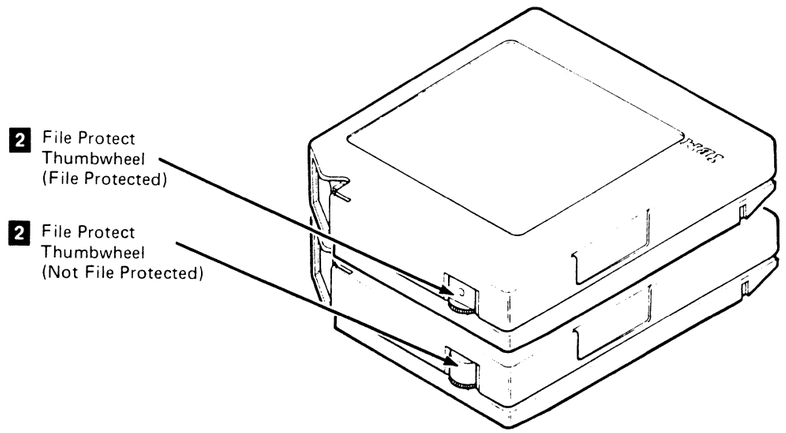
Rear

Top View



Front

Bottom View



Rear

Top View

Cartridge Removal by Hand

This procedure aids you in removing a cartridge from a drive when it cannot be removed following an unload operation.

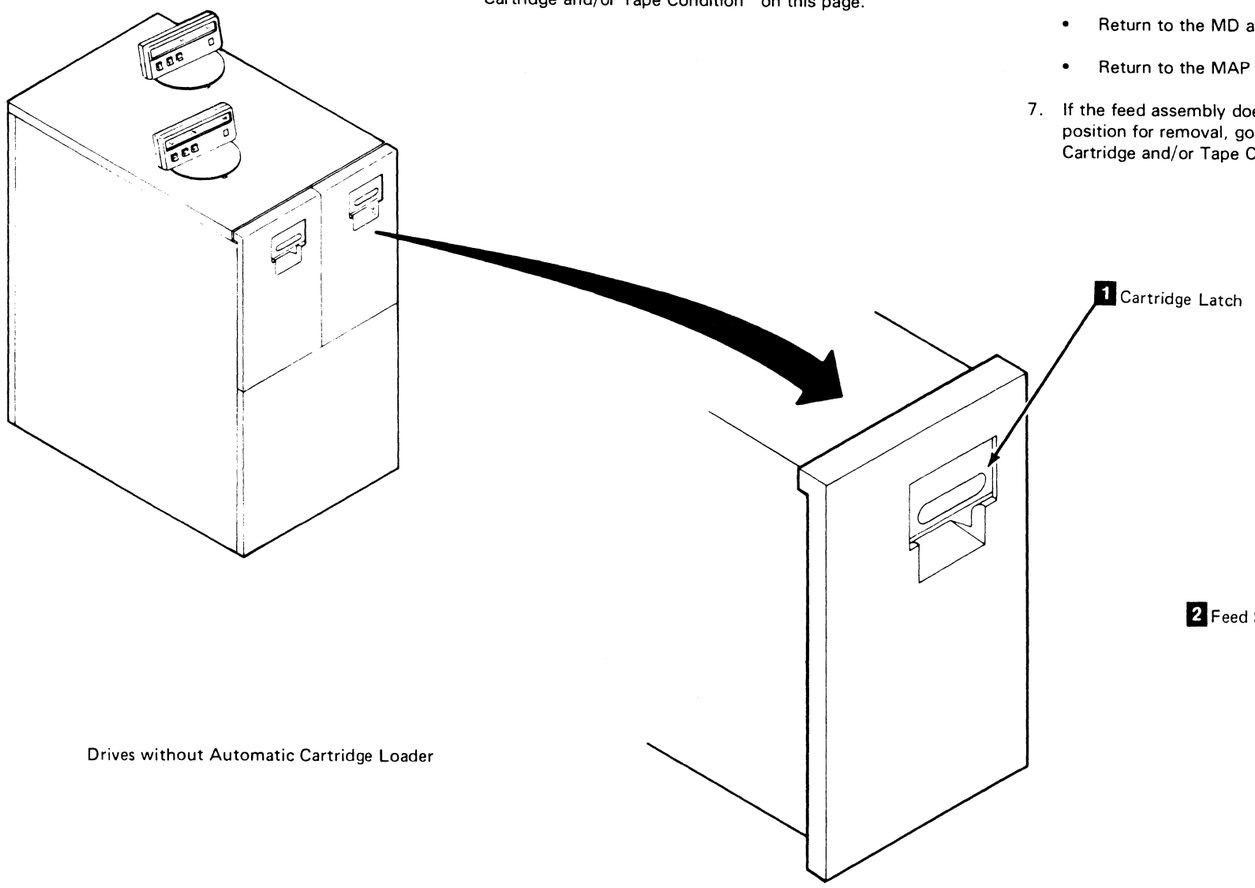
Use this page and the following pages as an aid in determining the condition of the cartridge and/or magnetic tape. After you have determined the condition, you will be directed to a procedure that will aid you in removing the cartridge.

Before You Begin

First, if you haven't already done so, attempt to remove the cartridge under power using the following procedure:

Notes:

1. For drives without the automatic cartridge loader go to procedure A.
2. For drives with the automatic cartridge loader go to procedure B.



Drives without Automatic Cartridge Loader

Procedure A, Drives Without Automatic Cartridge Loader

1. Set the drive Ready/Not Ready switch to Not Ready (see LOC 1).
2. Press the drive Unload switch (see LOC 1).

   Note: It may take up to 3.5 minutes for the cartridge to rewind and unload.

3. If the cartridge latch **1** opens and you can remove the cartridge, do one of the following:
   - Return to the MD and press the ENTER key.
   - Return to the MAP or procedure that sent you here.
4. If the latch does not open and move the cartridge into position for removal, go to step 1 of "Identifying the Cartridge and/or Tape Condition" on this page.

Procedure B, Drives With Automatic Cartridge Loader

1. Remove all cartridges from the input stack, see LOC 1.
2. Remove all cartridges from the output stack, see LOC 1.
3. Set the mode selection switch to Manual, see LOC 1.
4. Set the drive Ready/Not Ready switch to Not Ready, see LOC 1.
5. Press the drive Unload switch, see LOC 1.

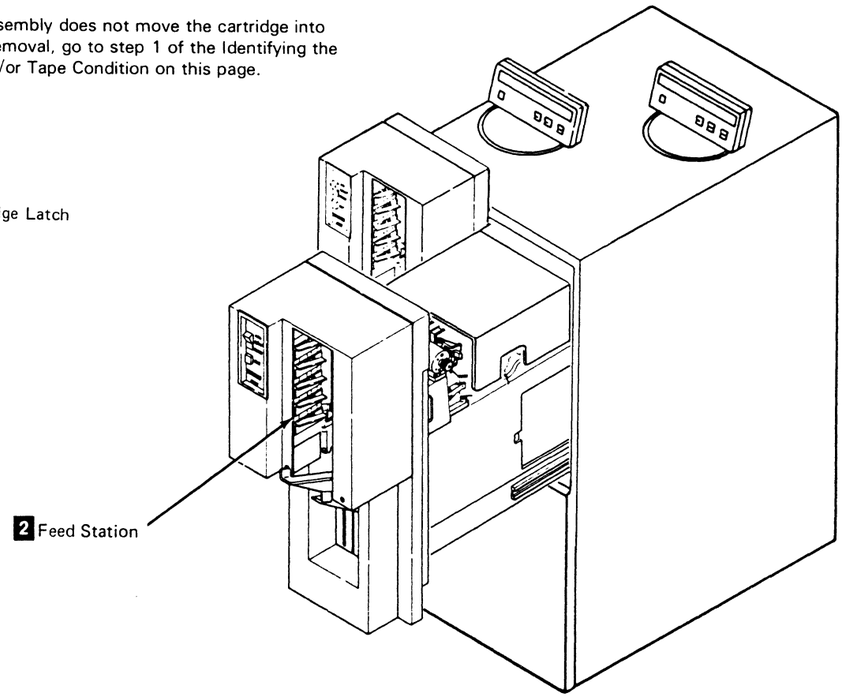
   Note: It may take up to 3.5 minutes for the cartridge to rewind and unload.

6. If the feed assembly moves the cartridge back to the feed station **2** and you can remove the cartridge, do one of the following:
   - Return to the MD and press the Enter key.
   - Return to the MAP or procedure that sent you here.
7. If the feed assembly does not move the cartridge into position for removal, go to step 1 of the Identifying the Cartridge and/or Tape Condition on this page.

Identifying the Cartridge and/or Tape Condition

Perform the following steps to determine the cartridge and/or tape condition:

1. Set the Online/Offline switch to Offline (see LOC 1).
2. Go to CARR-DR 8 for the procedure to ***power off*** the drive or the tape unit.
3. Open the drive drawer and remove the drive safety cover (see CARR-DR 2-5).
4. Inspect the drive for the cartridge and/or tape conditions shown on CART 10-1, CART 10-2, and CART 10-3. Match the cartridge/tape condition with the example and follow the directions given with that example.

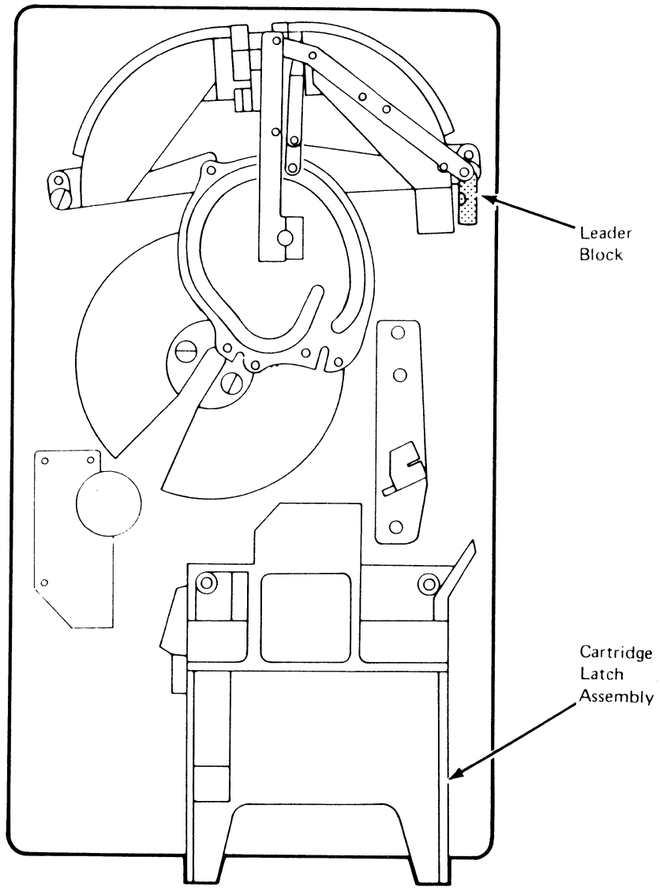


Drives with Automatic Cartridge Loader

Cartridge Removal by Hand (Continued)

Example of a Leader Block Separated From the Magnetic Tape

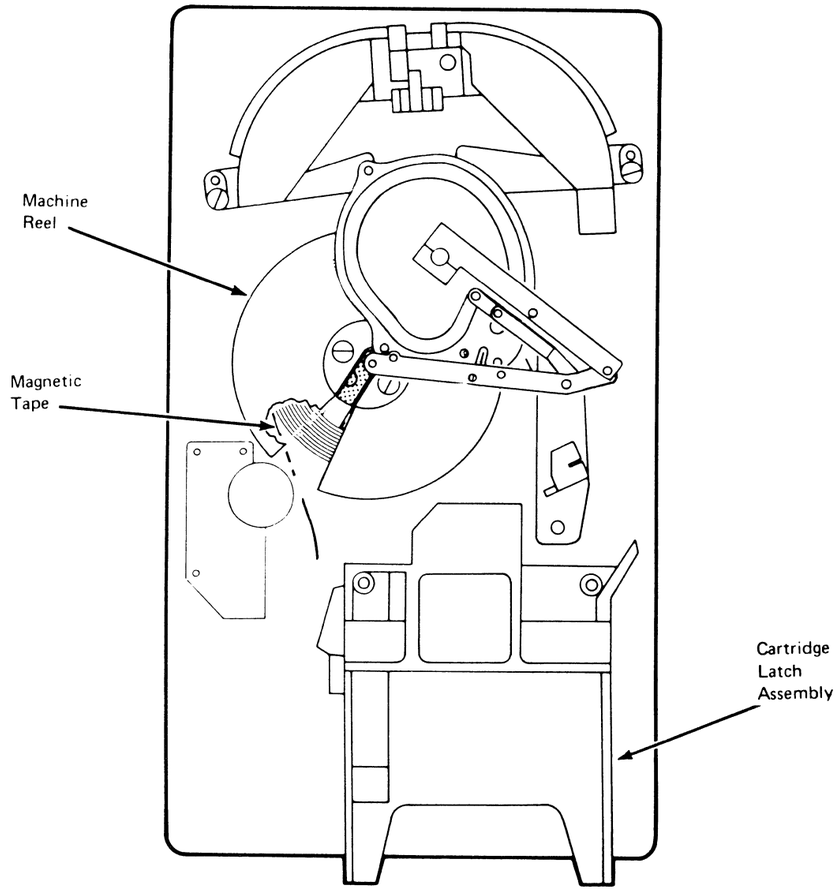
If the cartridge/tape condition matches this example, do the "Leader Block Replacement Procedure" on CART 20.



Top View

Example of Magnetic Tape Pulled Out of the Cartridge

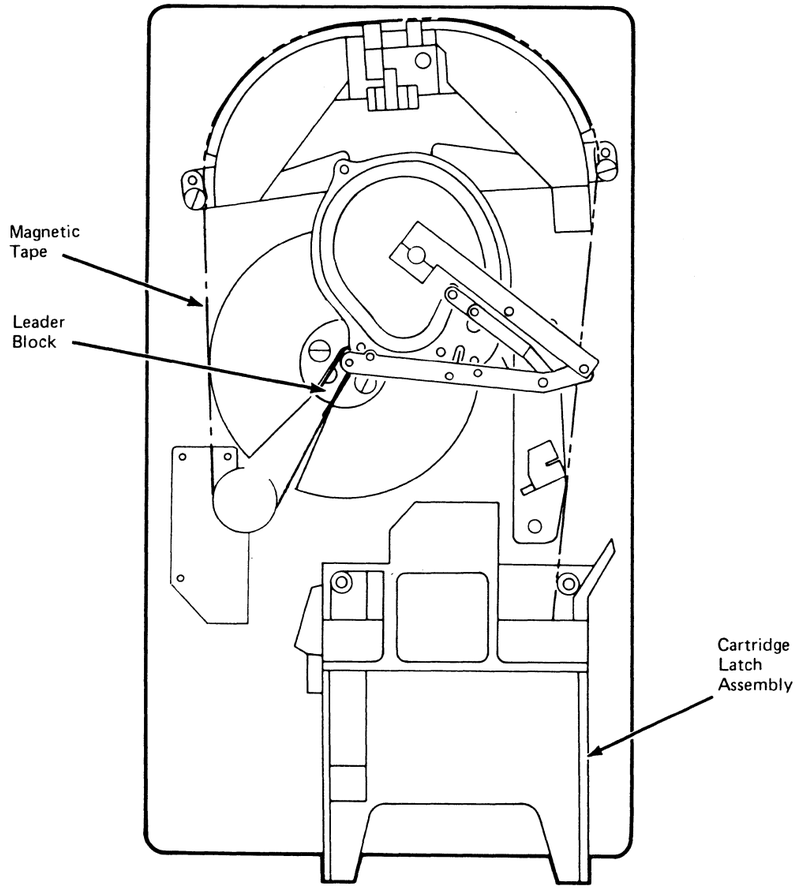
If the cartridge/tape condition matches this example, the magnetic tape has pulled out of the cartridge and has wound onto the machine reel. Do the "Magnetic Tape Attachment Procedure" on CART 30.



Top View

Example of the Leader Block and Threader Pin in the Machine Reel Hub

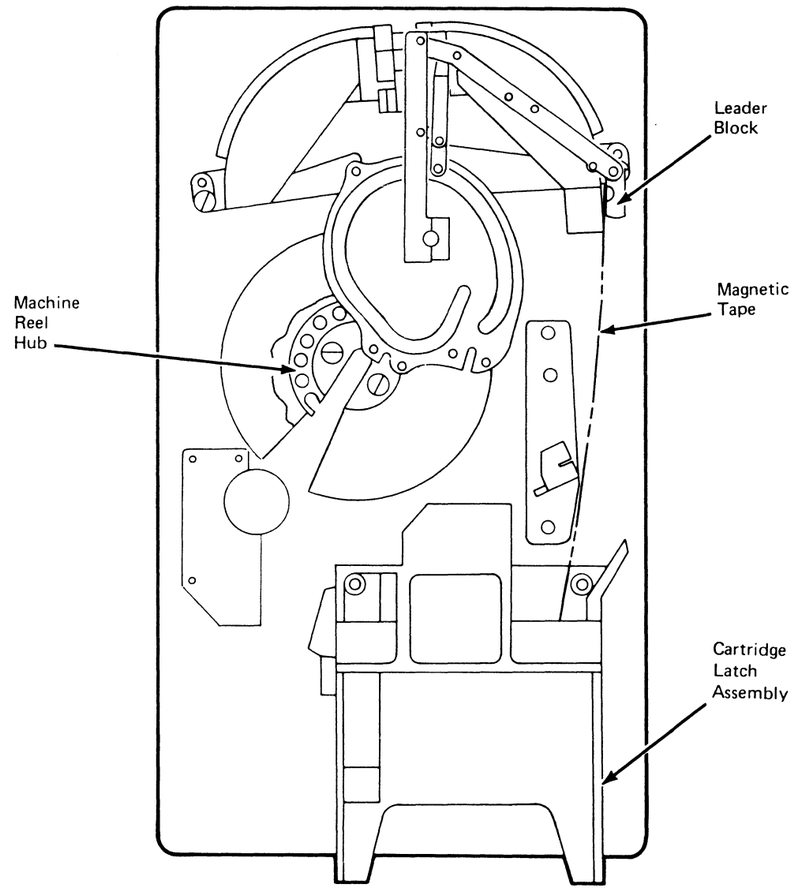
If the cartridge/tape condition matches this example, the leader block and threader pin are in the machine reel hub. Do the "Leader Block and Threader Pin in the Machine Reel Hub" procedure on CART 12.



Top View

Example of the Leader Block and Threader Pin Stopped in the Tape Path

If the cartridge/tape condition matches this example, the leader block and threader pin have stopped in the tape path between the machine reel hub and the cartridge latch assembly. Do the "Leader Block and Threader Pin Stopped in the Tape Path" procedure on CART 14.

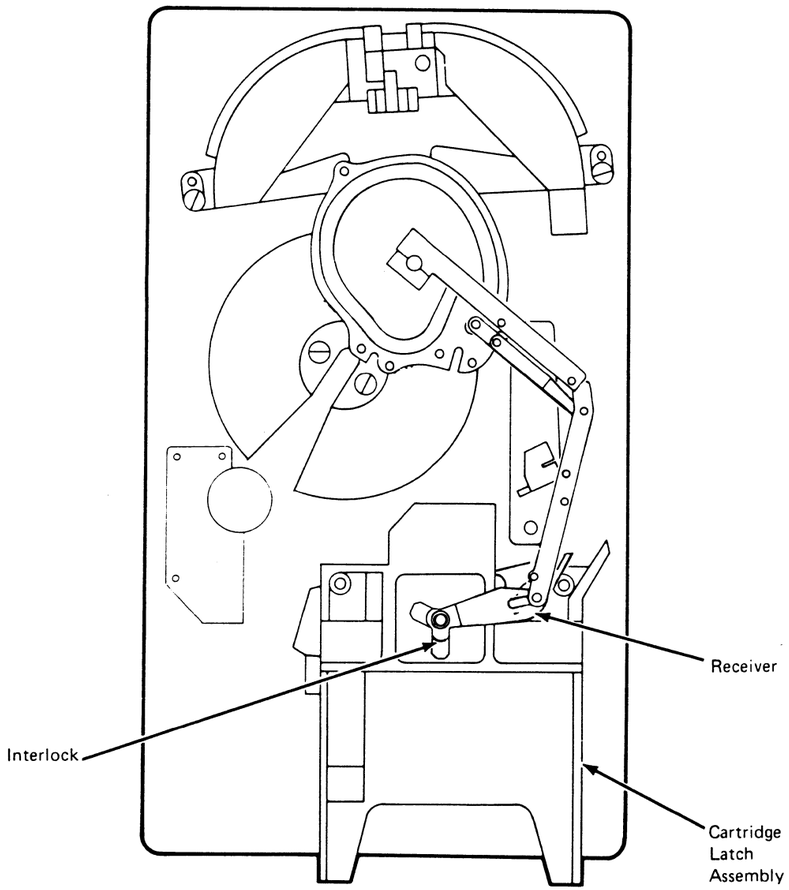


Top View

Cartridge Removal by Hand (Continued)

Example of the Leader Block and Threader Pin at the Cartridge Latch Assembly

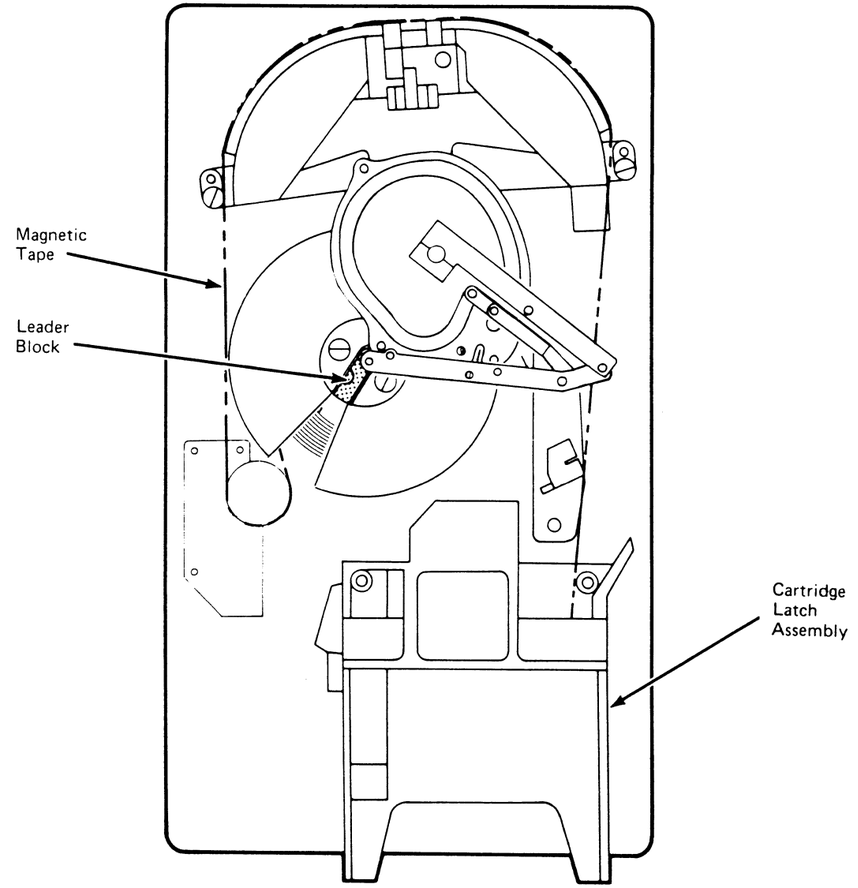
If the cartridge/tape condition matches this example, the leader block and threader pin are at the cartridge latch assembly (home position), but the interlock has not rotated away from the latch. Do the "Leader Block and Threader Pin at the Cartridge Latch Assembly" procedure on CART 16.



Top View

Example of Operation Stopped with Tape on the Machine Reel

If the cartridge/tape condition matches this example, the operation has stopped with tape on the machine reel. Do the "Leader Block and Threader Pin in the Machine Reel Hub" procedure on CART 12.



Top View

Leader Block and Threader Pin in the Machine Reel Hub

Perform the following steps to remove the cartridge by hand when the leader block and threader pin are still in the machine reel hub.

Note: See CART 13 for the following locations.

CAUTION
The motor and shaft may be hot.

. . . . . .

. . . . . .

1. Find the file reel motor shaft **3**. Attach the tape removal tool **2** (part 6850663) to your socket wrench handle **1**.

2. From the bottom of the drive, slide the tape removal tool through the slot in the air baffle and onto the file reel motor shaft.

3. Turn the tool clockwise (as seen from the top of the drive) to wind the tape into the cartridge.

   Warning: Do not touch the magnetic tape because you may damage it and affect tape guiding.

   . . . . . .

   . . . . . .

   If the machine reel motor binds so that the file reel motor cannot move the tape, place your finger on the machine reel hub **4** as shown.

4. Move the hub counterclockwise, and at the same time turn the file reel motor shaft clockwise to move the tape.

5. Turn the hub until the file reel motor shaft is free to turn.

6. Continue to turn the file reel motor shaft until the leader block **5** is in position to leave the machine reel hub as shown.

7. Find the threader arm pivot point **6** above the threader assembly. Move the arm clockwise and at the same time rotate the file reel motor shaft clockwise until the leader block is in the cartridge.

   The threader pin will move the receiver **7** when the leader block is in the cartridge.

Notes:

a. For drives with the automatic cartridge loader go to procedure B.

b. For drives without the automatic cartridge loader go to procedure A.

Procedure A, Drives Without Automatic Cartridge Loader

1. Press down on the latch assembly **11** to open the cartridge latch.

   If the latch does not open, go to step 3.

2. If the latch opens and the cartridge has moved into position for removal, remove the cartridge and continue the repair action by selecting either a or b:

   a. If you were sent here by the MD:

      1) Set the Drive Power switch or the ac power circuit breaker to On. (see LOC 1).

      2) Install the front safety cover (see CARR-DR 2-2 or 2-4) if removed.

      3) Set the Online/Offline switch to Online.

      4) Return to the MD and press the ENTER key.

   b. Return to the MAP or procedure that sent you here.

3. Look at the top of the latch assembly and find the pivot position **8** where the receiver **7** and the interlock **9** overlap. Move the pivot so the interlock rotates away from the latch assembly, as shown **10**.

4. Press down on the latch assembly **11** to open the cartridge latch.

   If the latch does not open, request aid from your next level of support.

5. If the latch bar opens and the cartridge has moved into position for removal, remove it and continue the repair action by selecting either a or b:

   a. If you were sent by the MD:

      1) Set the Drive Power switch or the ac power circuit breaker to On. (see LOC 1).

      2) Install the front safety cover (see CARR-DR 2-2 or 2-4) if removed.

      3) Set the Online/Offline switch to Online.

      4) Return to the MD and press the ENTER key.

   b. Return to the MAP or procedure that sent you here.

Procedure B, Drives With Automatic Cartridge Loader

1. Remove all cartridges from the input stack, see LOC 1.

2. Remove all cartridges from the output stack, see LOC 1.

3. Set the mode selection switch to Manual, see LOC 1.

4. Turn the knurled knob **13** on the load motor counterclockwise (as viewed from the end of the motor) until the latch is fully raised.

5. Place your finger on the cartridge at the point indicated **12** and push toward the front of the machine until the cartridge can be removed from the feed assembly.

6. Continue the repair action by selecting the following, step a or step b.

   a. If you were sent here by the MD:

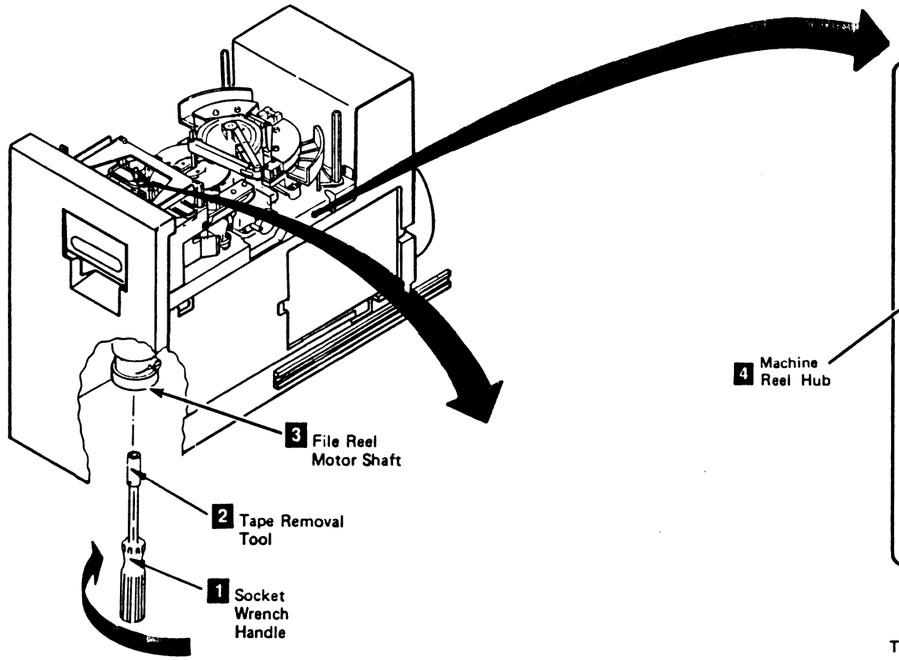
      1) Set the drive power switch on the ac power circuit breaker to On, see LOC 1.

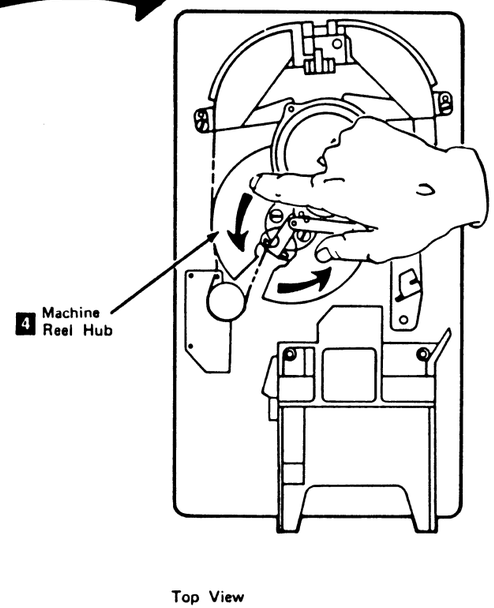
      2) Install the drive safety cover, see CARR-DR 2-2 or 2-4 if removed.

      3) Set the Online/Offline switch to Online.

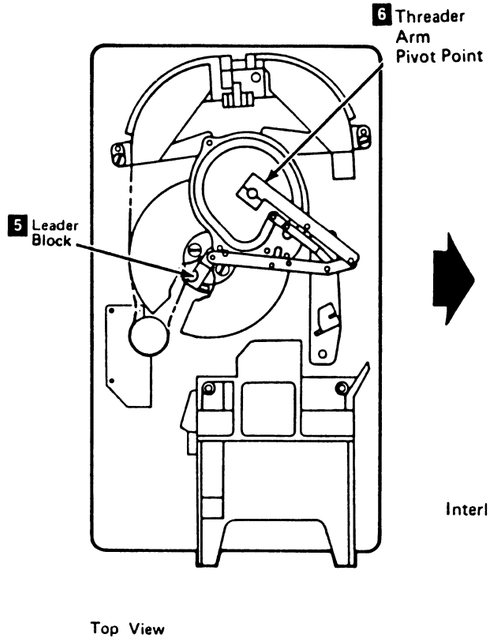
      4) Return to the MD and press the Enter key.

   b. Return to the MAP or procedure that sent you here.

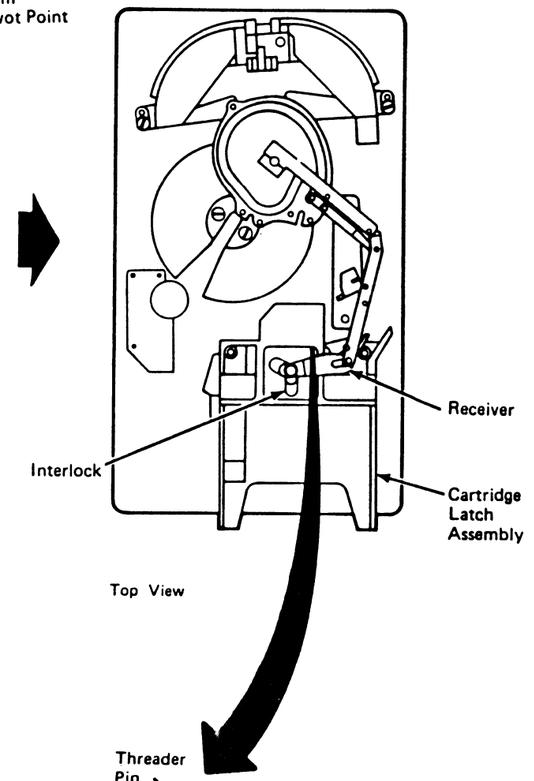




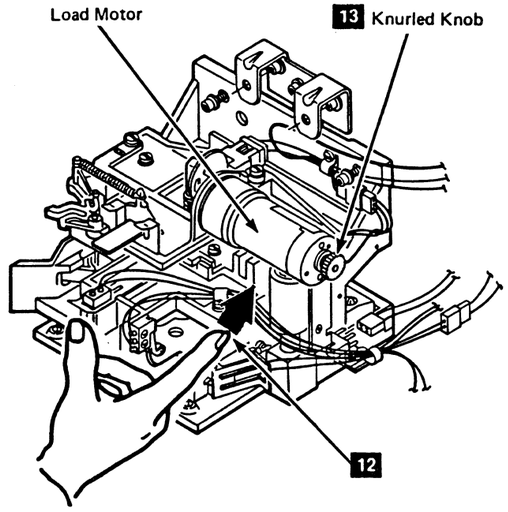
Top View



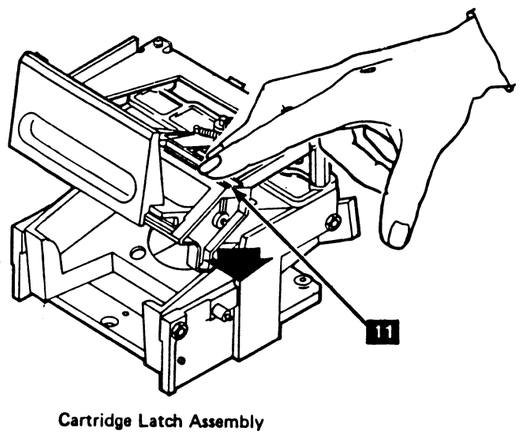
Top View



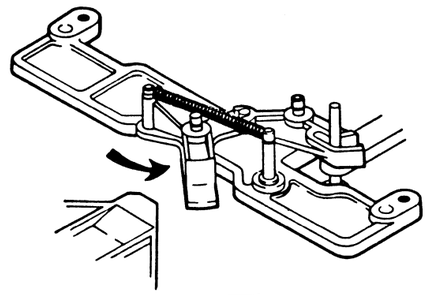
Top View



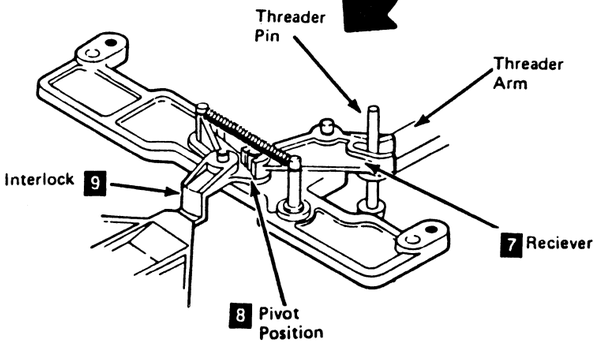
Load Assembly (Drives With Automatic Cartridge Loader)



Cartridge Latch Assembly



10 Receiver And Interlock In The Correct Position



Cartridge Removal by Hand (Continued)

Leader Block and Threader Pin Stopped in the Tape Path

Perform the following steps to remove the cartridge by hand when the leader block and threader pin have stopped in the tape path between the machine reel hub and the cartridge latch assembly.

Note: See CART 15 for the following locations.

CAUTION
The motor and shaft may be hot.

. . . . . .

. . . . . .

1. Find the file reel motor shaft 3. Attach the tape removal tool 2 (part 6850663) to your socket wrench handle 1. From the bottom of the drive, slide the tape removal tool through the slot in the air baffle and onto the file reel motor shaft.
2. Find the threader arm pivot point 5 above the threader assembly. Move the threader arm clockwise and at the same time turn the file reel motor shaft clockwise (as seen from the top of the drive) to wind the tape into the cartridge.
3. Continue winding the tape into the cartridge until the leader block 4 is in the cartridge.
4. The threader pin will move the receiver 6 when the leader block is in the cartridge.
5. For drives with the automatic cartridge loader go to procedure B.
6. For drives without the automatic cartridge loader go to procedure A.

Procedure A, Drives Without Automatic Cartridge Loader

1. Press down on the latch assembly 10 to open the cartridge latch.

   If the latch does not open, go to step 3.

2. If the latch opens and the cartridge has moved into position for removal, remove the cartridge and continue the repair action by selecting either a or b:

   a. If you were sent to this procedure by the MD:

      1) Set the Drive Power switch or the ac power circuit breaker to On (see LOC 1).

      2) Install the front safety cover (see CARR-DR 2-2 or 2-4) if removed.

      3) Set the Online/Offline switch to Online.

      4) Return to the MD and press the ENTER key.

   b. Return to the MAP or procedure that sent you here.

3. Look at the top of the latch assembly and find the pivot position 7 where the receiver 6 and the interlock 8 overlap. Move the pivot so the interlock rotates away from the latch assembly, as shown 9.

Procedure B, Drives With Automatic Cartridge Loader

1. Remove all cartridges from the input stack, see LOC 1.
2. Remove all cartridges from the output stack, see LOC 1.
3. Set the mode selection switch to Manual, see LOC 1.
4. Turn the knurled knob 12 on the load motor counterclockwise (as viewed from the end of the motor) until the latch is fully raised.
5. Place your finger on the cartridge at the point indicated 11 and push toward the front of the machine until the cartridge can be removed from the feed assembly.
6. Continue the repair action by selecting the following, step a or step b.

   a. If you were sent here by the MD:

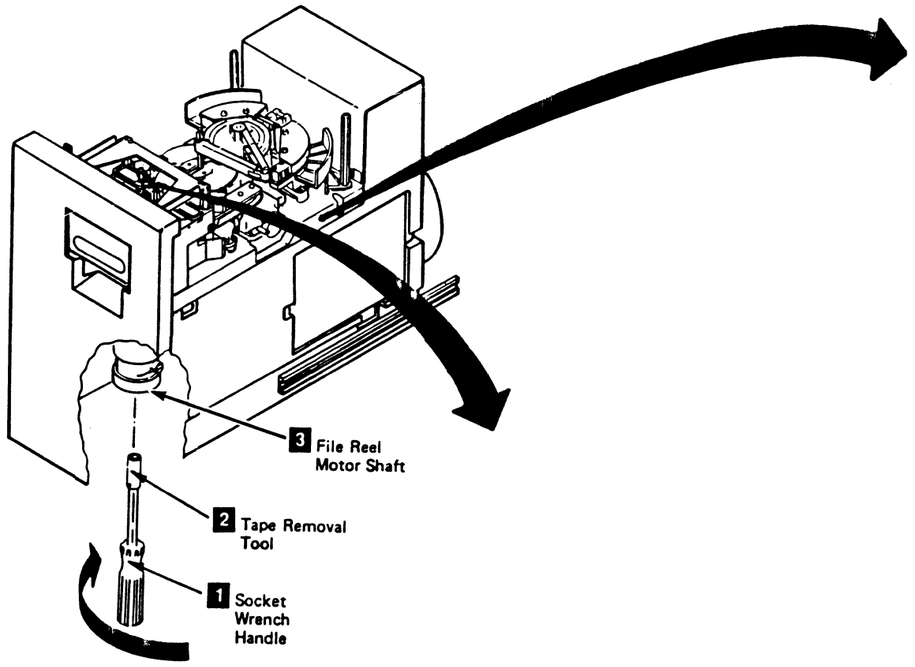
      1) Set the drive power switch on the ac power circuit breaker to On, see LOC 1.

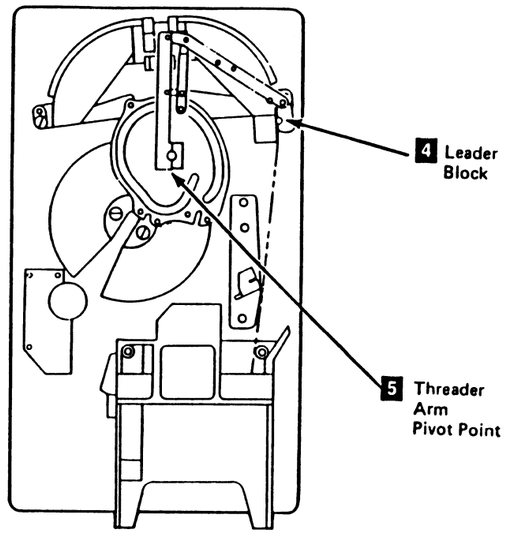
      2) Install the drive safety cover, see CARR-DR 2-2 or 2-4 if removed.

      3) Set the Online/Offline switch to Online.

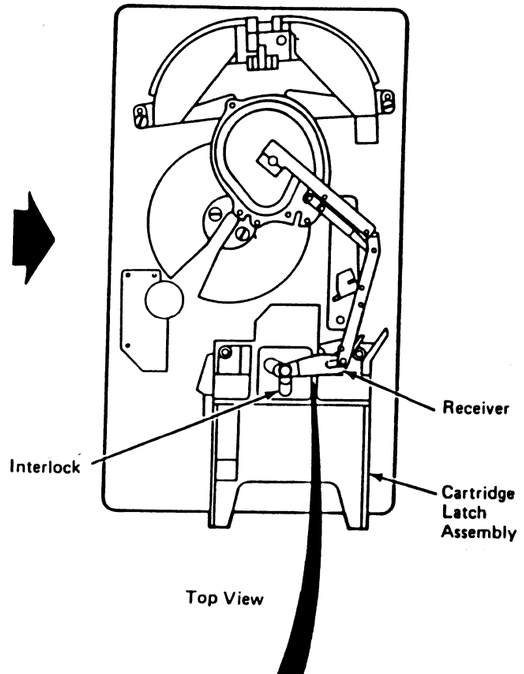
      4) Return to the MD and press the Enter key.

   b. Return to the MAP or procedure that sent you here.

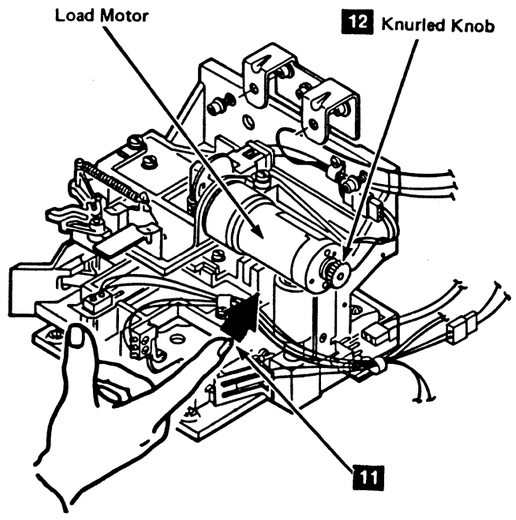




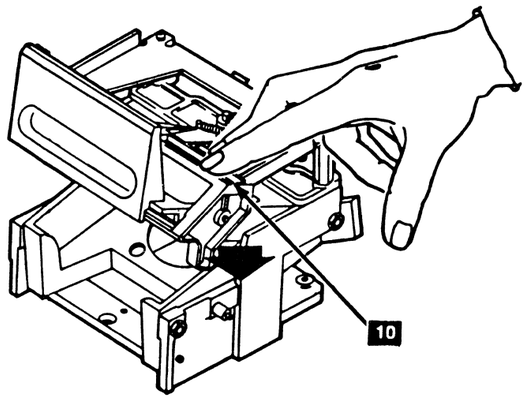
Top View



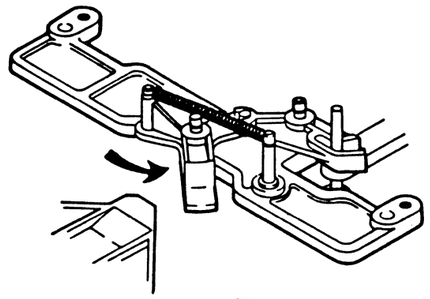
Top View



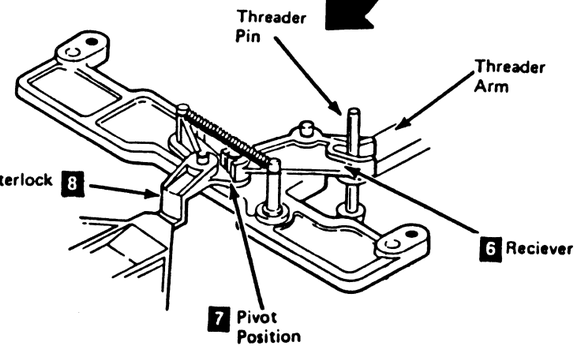
Load Assembly (Drives With Automatic Cartridge Loader)



Cartridge Latch Assembly



9 Receiver And Interlock In The Correct Position



Leader Block and Threader Pin at The Cartridge Latch Assembly

Perform the following steps to remove the cartridge by hand when the leader block and threader pin are at the cartridge latch assembly (home position), but the interlock has not rotated away from the latch.

Note: *See CART 17 for the following locations.*

1. Look at the top of the latch assembly and find the pivot position 6 where the receiver 7 and the interlock 5 overlap.
2. Move the pivot so the interlock rotates away from the latch assembly, as shown 4.
3. For drives with the automatic cartridge loader go to procedure B.
4. For drives without the automatic cartridge loader go to procedure A.

Procedure A, Drives Without Automatic Cartridge Loader

1. Press down on the latch assembly 3 to open the cartridge latch.

   If the latch does not open, request aid from your next level of support.

2. If the latch opens and the cartridge has moved into position for removal, remove the cartridge and continue the repair action by selecting either a or b:

   a. If you were sent to this procedure by the MD:

      1) Set the Drive Power switch or the ac power circuit breaker to On (see LOC 1).

      2) Install the front safety cover (see CARR-DR 2-2 or 2-4) if removed.

      3) Set the Online/Offline switch to Online.

      4) Return to the MD and press the ENTER key.

   b. Return to the MAP or procedure that sent you here.

Procedure B, Drives With Automatic Cartridge Loader

1. Remove all cartridges from the input stack, see LOC 1.
2. Remove all cartridges from the output stack, see LOC 1.
3. Set the mode selection switch to Manual, see LOC 1.
4. Turn the knurled knob 1 on the load motor counterclockwise (as viewed from the end of the motor) until the latch is fully raised.
5. Place your finger on the cartridge at the point indicated 2 and push toward the front of the machine until the cartridge can be removed from the feed assembly.
6. Continue the repair action by selecting the following, step a or step b.

   a. If you were sent here by the MD:

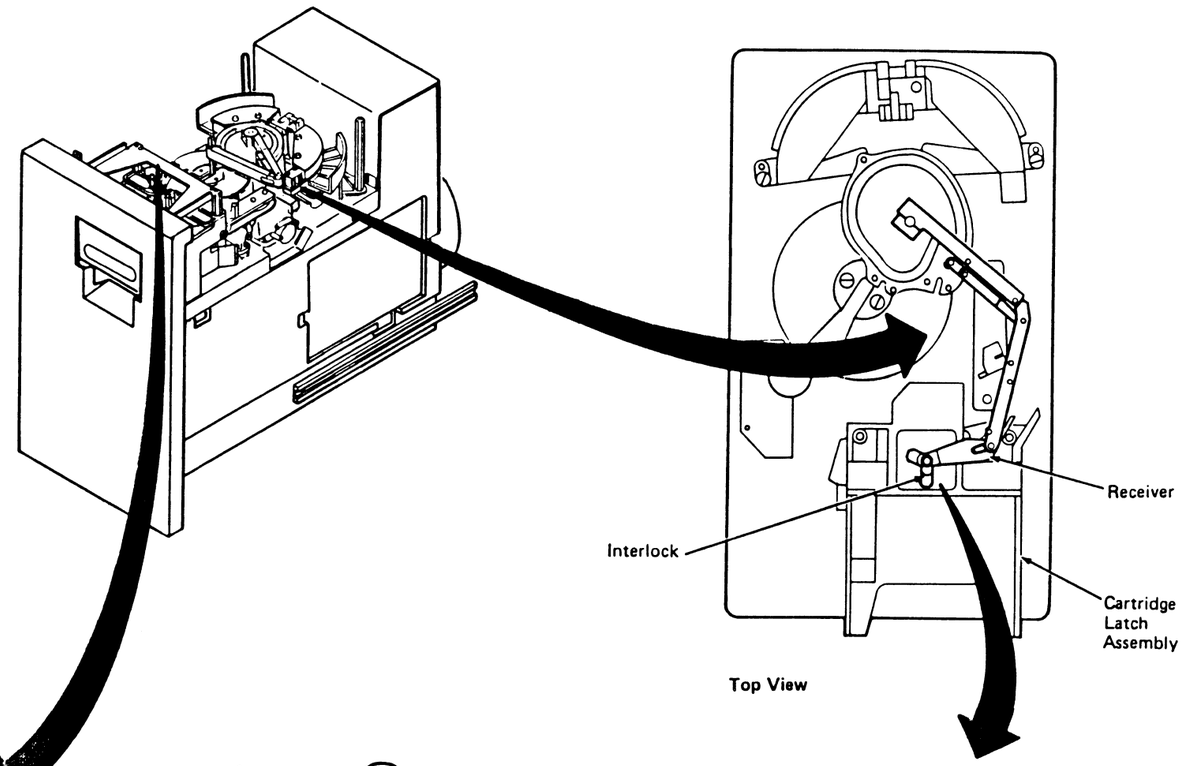
      1) Set the drive power switch on the ac power circuit breaker to On, see LOC 1.

      2) Install the drive safety cover, see CARR-DR 2-2 or 2-4 if removed.

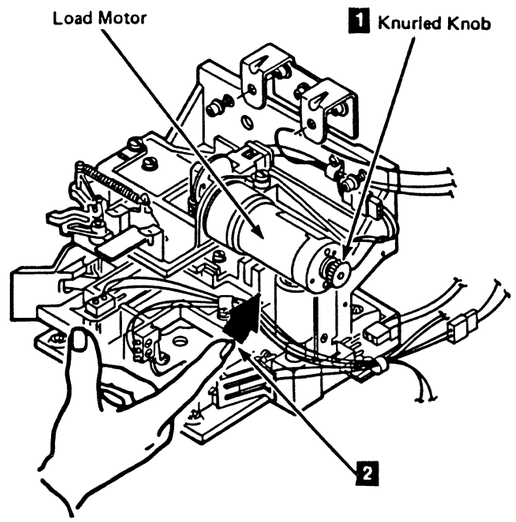
      3) Set the Online/Offline switch to Online.

      4) Return to the MD and press the Enter key.

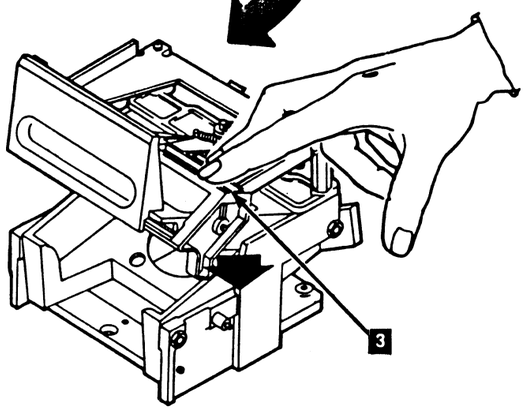
   b. Return to the MAP or procedure that sent you here.



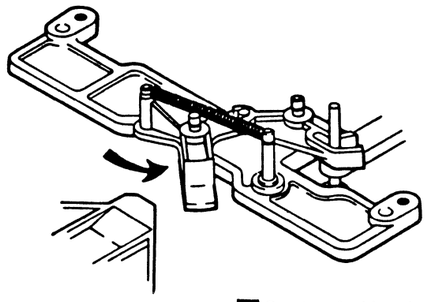
Top View



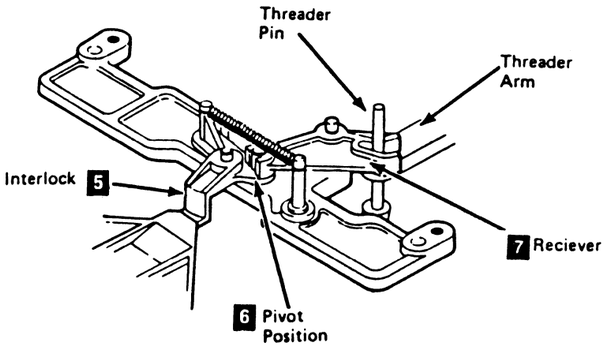
Load Assembly (Drives With Automatic Cartridge Loader)



Cartridge Latch Assembly



4 Receiver And Interlock In The Correct Position



Leader Block Replacement Procedure

Perform the following steps to replace the leader block when it has separated from the magnetic tape.

Note: See CART 20 and 21 for the following locations.

Warning: This procedure should be used only when data must be copied onto another cartridge. Use of this procedure may affect the performance of the leader block during threading and unloading. Recommend that the customer destroy the cartridge after the data has been copied.

The use of any tool to remove the customer's tape may cause damage to the tape. Inform the customer before continuing with this procedure.

Do not damage the edges of the tape because edge damage can affect tape guiding.

1. Remove the leader block **1** from the threader pin.
2. Move the threader arm **2** clockwise until the threader pin is at the cartridge and causes the receiver **3** to move.
3. On drives with the automatic cartridge loaders go to CART 14 for the procedure to remove the cartridge by hand, and when completed return to step 5.

   On drives without the automatic cartridge loaders press down on the latch assembly **5** to open the cartridge latch.
4. Remove the cartridge.
5. Use the clutch tool **4** to release the clutch in the cartridge. Then turn the tool to unwind about 12 inches of tape from the cartridge. Use care so as not to damage the tape.
6. Remove the clutch tool.
7. Cut the tape end so that it is 90° to the tape edge.
8. Place a new leader block in the cavity **6** of the attachment tool **8** .
9. Place the tape so that the inside (the side facing the center of the cartridge) is up, in the guide groove **7** and over the leader block. Move the end of the tape against the end of the guide cavity.
10. Close the insert guide as shown **10** , and then place the insert pin **11** into the opening of the guide.
11. Close the insertion lever **9** until it touches the insert pin.
12. Push on the handle of the insertion lever to force the insert pin and the tape into the leader block.
13. Open the insertion lever and the insert guide.
14. Remove the leader block from the attachment tool.
15. Make sure that edges of the tape are aligned with the edges of the leader block. If the edges are not aligned, go back to step 7 and repeat the procedure.
16. Use the clutch tool to wind the tape back into the cartridge.
17. Put the leader block in the cartridge.
18. Using the clutch tool carefully turn the tape reel to tighten the tape inside the cartridge.
19. Remove the clutch tool.
20. Continue the repair action by selecting either a or b:

    a. If you were sent here by the MD:

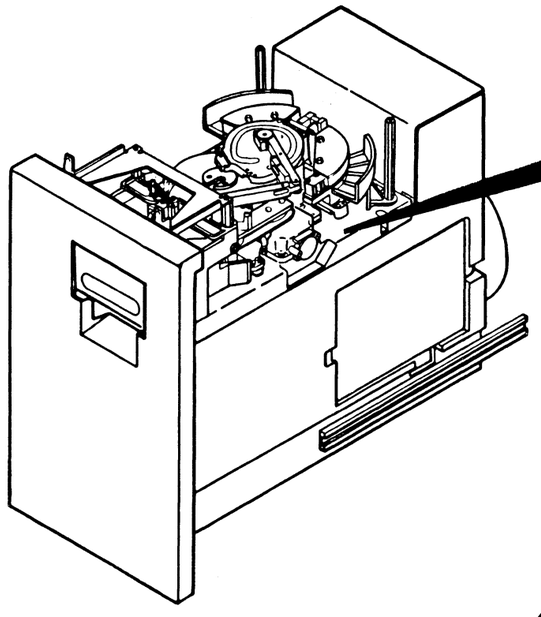
       1) Set the Drive Power switch or the ac power circuit breaker to On (see LOC 1).

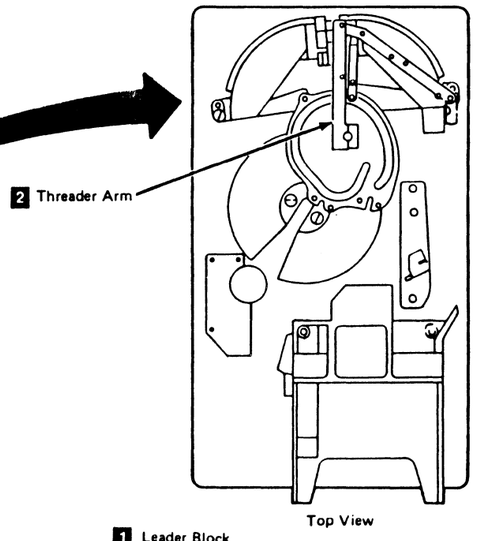
       2) Install the front safety cover (see CARR-DR 2-2 or 2-4) if removed.

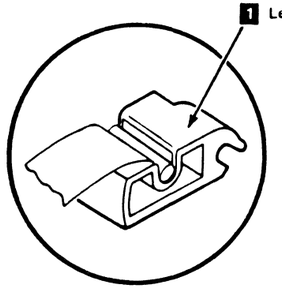
       3) Set the drive Online/Offline switch to Online.

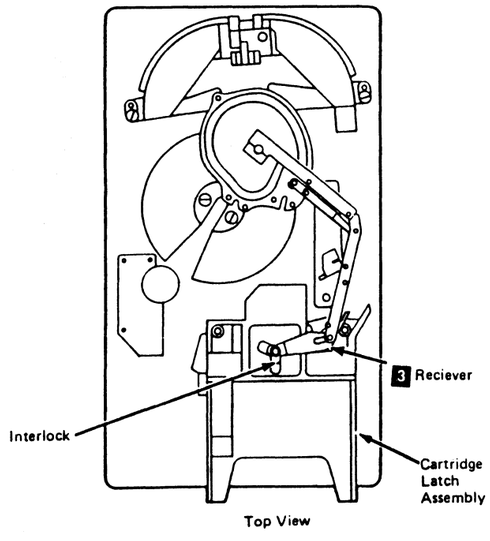
       4) Return to the MD and press the ENTER key.

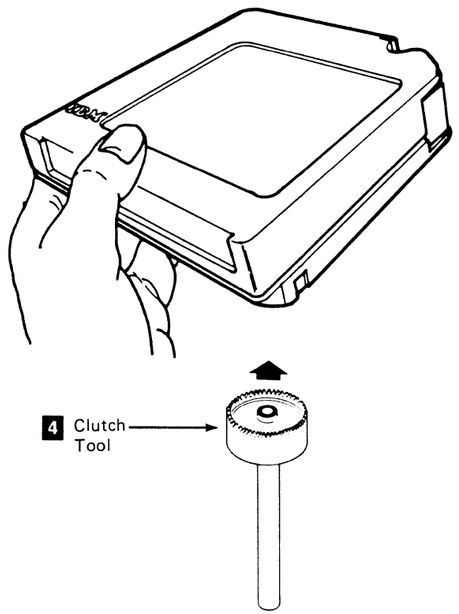
    b. Return to the MAP or procedure that sent you here.

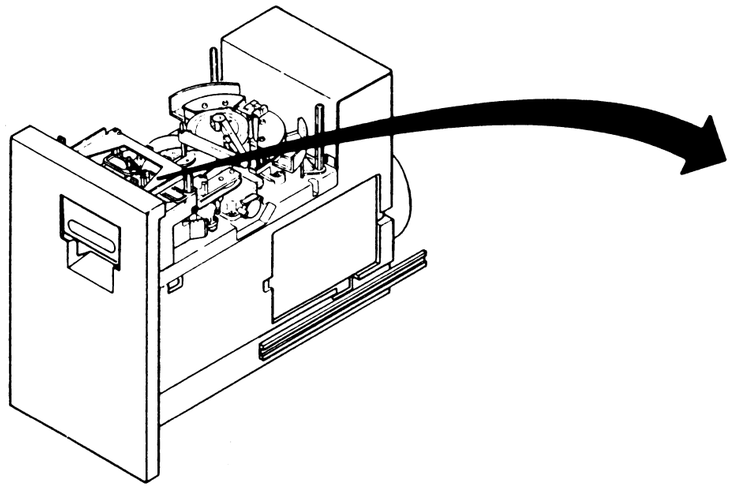


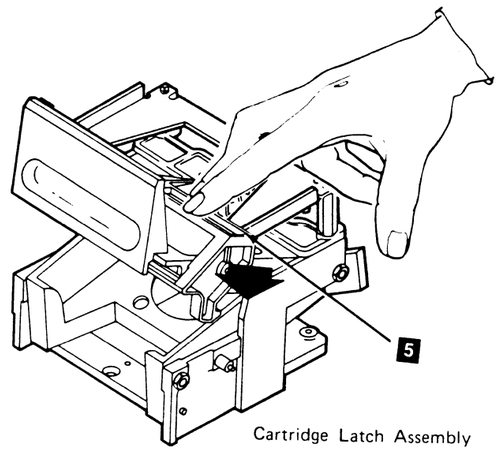


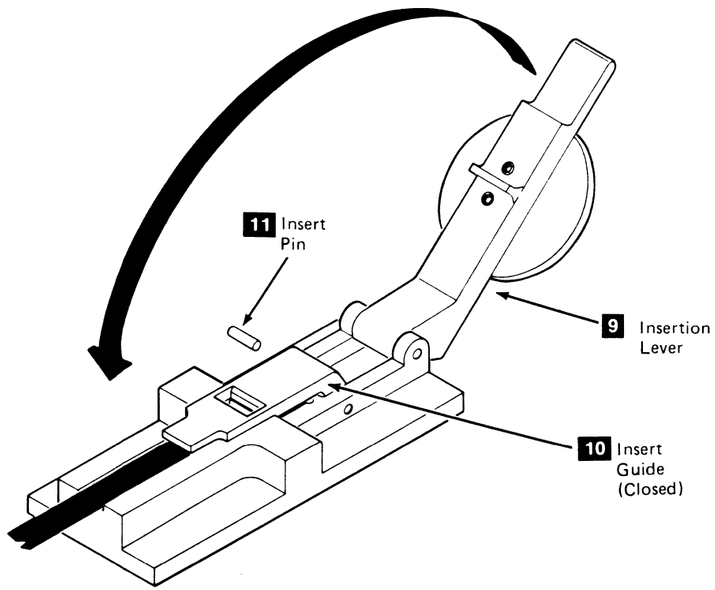


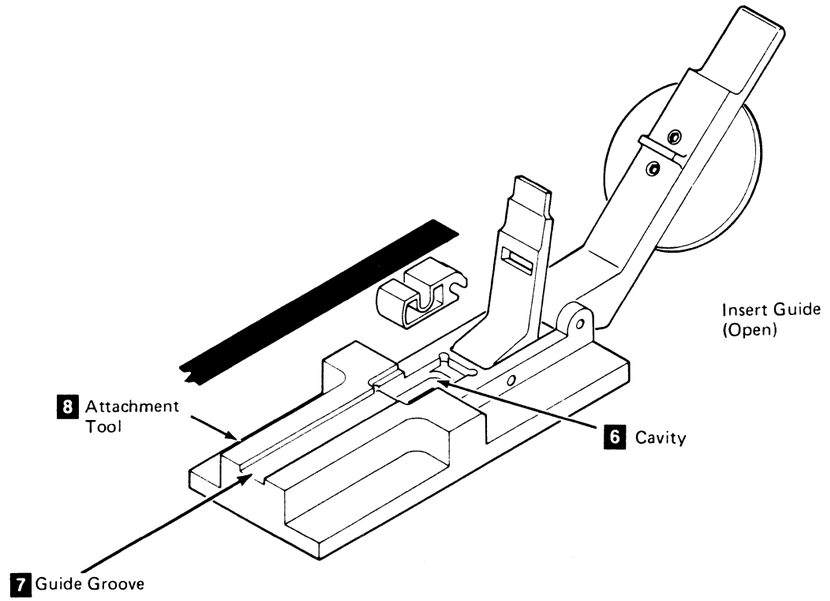












Magnetic Tape Attachment Procedure

Perform the following steps when the end of the magnetic tape has pulled out of the cartridge and has wound onto the machine reel.

Warning: This procedure should be used only when data must be copied onto another cartridge. Use of this procedure may affect the performance of the leader block during threading and unloading. Recommend that the customer destroy the cartridge after the data has been copied.

The use of any tool to remove the customer's tape may cause damage to the tape. Inform the customer before continuing with this procedure.

Do not damage the edges of the tape because edge damage can affect tape guiding.

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1. Pull the tape by hand along the tape path until it is at the opening to the cartridge.

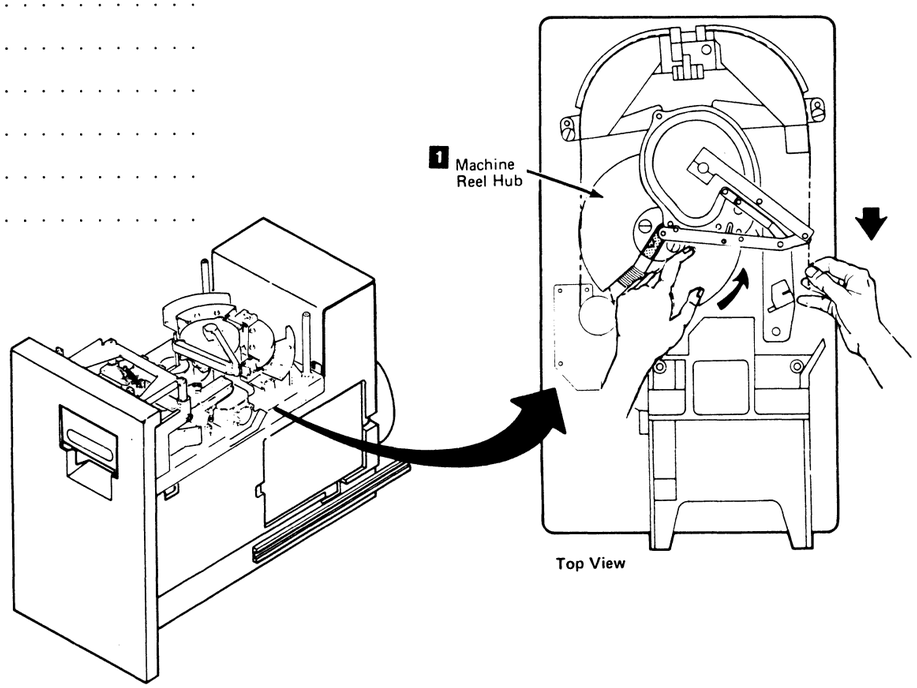
   Note: If the machine reel motor binds and does not allow the tape to move, place your finger on the machine reel hub **1** as shown. Move the hub counterclockwise, and at the same time move the magnetic tape.

2. Attach a 5 centimeter (2-inch) piece of double-stick cellophane tape to the shiny side of the magnetic tape. Leave a 2.5 centimeter (1-inch) overlap of cellophane tape.

   Attach the protruding end of the cellophane tape to the eraser end of a pencil or similar object.

   Note: Make sure the cartridge is in the latched position.

3. Insert the pencil and the tape with the cellophane tape into the cartridge opening and attach the cellophane tape to the cartridge hub **2** . Remove the pencil without disturbing the cellophane tape that is attached to the hub.



CAUTION
The motor and shaft may be hot.

. . . . . .

. . . . . .

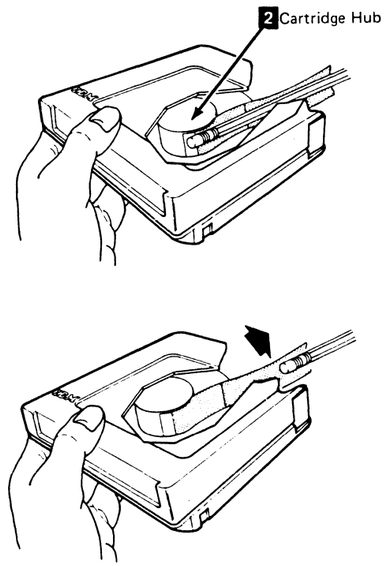
4. Find the file reel motor shaft **3**. Attach the tape removal tool **4** (part 6850663) to your socket wrench handle **5** .

5. From the bottom of the drive, slide the tape removal tool through the slot in the air baffle and onto the file reel motor shaft.

6. Turn the tool clockwise (as seen from the top of the drive) to wind the magnetic tape onto the cartridge. Make at least one complete revolution of the hub.

   Note: If the cellophane tape pulls off the hub, attach the cellophane tape again.

7. Rotate the machine reel hub counterclockwise, and at the same time rotate the file reel motor shaft clockwise to make it easier to wind the tape onto the cartridge hub.



8. Set the Drive Power switch or the ac power circuit breaker to On (see LOC 1).

9. Install the front safety cover (see CARR-DR 2-2 or 2-4) if removed.

10. Press the Unload switch to fully wind the tape into the cartridge. If the tape does not fully wind into the cartridge, request aid from your next level of support.

11. Remove the cartridge from the drive.

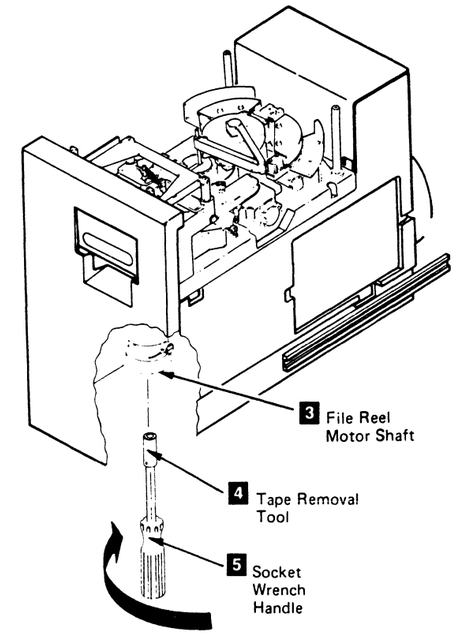
12. Continue the repair action by selecting either a or b:

    a. If you were sent here by the MD:

       1) Set the drive Online/Offline switch to Online.

       2) Return to the MD and press the ENTER key.

    b. Return to the MAP or procedure that sent you here.



This page contains the steps needed to determine if the drive failure is caused by a cartridge. You should have been directed here from the MD. Follow the procedure on this page for the CHK code you have. At the end of the procedure return to the MD and be prepared to answer the question "Was the Failure due to a cartridge?"

CHK 14

CHK 14 occurs when the drive times out while trying to remove tape slack (loose wraps) at the beginning of the load operation, before the thread operation starts. The file reel motor is slowly turned backwards until it is stopped by the tape which is attached to the leader block.

CHK 14 can be caused by a cartridge if:

- There are excessive loose wraps in the cartridge
- The tape is not attached to the leader block.

1. Load a cartridge, different from the cartridge that caused the original failure on the drive.

   Does CHK 14 appear on the drive display ?

   YES – Go to Chart A.

   NO – Go to Chart B.

CHK 21

CHK 21 occurs when the drive threading mechanism is slow or stalled. This can occur at the time the leader block is being put into the slot in the machine reel.

CHK 21 can be caused by a cartridge if:

- The leader block is not attached to the tape correctly
- The leader block is damaged (burrs or marks)
- The cartridge clutch is sticking.

1. Load a cartridge, different from the cartridge that caused the original failure on the drive.

   Does CHK 21 appear on the drive display ?

   YES – Go to Chart A.

   NO – Go to Chart B.

CHK 25

CHK 25 occurs when the drive threading mechanism is slow or stalled during an unload operation or the leader block is not attached during a load retry.

CHK 25 can be caused by a cartridge if the leader block is loose when the cartridge is loaded.

If the leader block is loose, the threader pin doesn't catch the leader block when the load operation starts. When the drive tries to recover, it cannot return to the home position because the leader block is in the way.

1. Load a cartridge, different from the cartridge that caused the original failure on the drive.

   Does CHK 25 appear on the drive display ?

   YES – Go to Chart A.

   NO – Go to Chart B.

CHK 28

CHK 28 occurs when the tape is not attached to the threader pin, or the file reel motor turns backwards during the threading operation.

CHK 28 can be caused by a cartridge if, during a threading operation:

- The leader block falls off the threader pin
- The tape breaks or is damaged.

1. Load a cartridge, different from the cartridge that caused the original failure on the drive.

   Does CHK 28 appear on the drive display ?

   YES – Go to Chart A.

   NO – Go to Chart B.

CHK 2B

CHK 2B occurs when the drive times out while trying to remove tape slack after tape tension is lost. Tension is lost as a result of a power failure or a device hard error condition. The file reel motor is slowly turned backwards until two machine reel revolutions have been detected. An unload operation is performed automatically.

CHK 2B can be caused by the cartridge if:

- The leader block is not attached to the tape
- The cartridge clutch is sticking
- The tape breaks or is damaged
- Some foreigh object is between the file reel and the cartridge.

1. Load a cartridge.

   Note: Do not use the cartridge that caused the original failure on the drive.

   Does CHK 2B appear on the drive display?

   YES – Go to Chart A.

   NO – Go to Chart B.

Chart A

Press the Unload button and remove the cartridge from the drive.

Because the problem occures on more than one cartridge, the problem is not caused by a cartridge.

Return to the MD

Chart B

Remove the cartridge from this drive and load that cartridge on several different drives.

Does that cartridge fail on other drives?

```
YES NO
|   |
|   The problem is NOT caused by the cartridge.
|
|   Return to the MD.
|
The problem is caused by the cartridge.

Disconnect the MD and go to START 145.
```

0 0 0 0 0 0 0 0 0 0

Procedure to Determine if the Cartridge Caused the Failure

This page contains the steps needed to determine if the drive failure is caused by a cartridge. You should have been directed here from the MD. Follow the procedure on this page for the CHK code you have. At the end of the procedure return to the MD and be prepared to answer the question "Was the Failure due to a cartridge?"

CHK 14

CHK 14 occurs when the drive times out while trying to remove tape slack (loose wraps) at the beginning of the load operation, before the thread operation starts. The file reel motor is slowly turned backwards until it is stopped by the tape which is attached to the leader block.

CHK 14 can be caused by a cartridge if:

- There are excessive loose wraps in the cartridge
- The tape is not attached to the leader block.

1. Load a cartridge, different from the cartridge that caused the original failure on the drive.

   Does CHK 14 appear on the drive display ?

```
YES NO
 |   |
 |   Remove the cartridge from this drive and load
 |   that cartridge on several different drives.
 |
 |   Does that cartridge fail on other drives?
 |
 |   YES NO
 |    |   |
 |    |   The problem is NOT caused by the cartridge.
 |    |
 |    |   Return to the MD.
 |    |
 |   The problem is caused by the cartridge.
 |
 |   Disconnect the MD and go to START 145.
 |
Press the Unload button and remove the
cartridge from the drive.

Because the problem occurs on more than one
cartridge, the problem is NOT caused by a
cartridge.

Return to the MD.
```

CHK 21

CHK 21 occurs when the drive threading mechanism is slow or stalled. This can occur at the time the leader block is being put into the slot in the machine reel.

CHK 21 can be caused by a cartridge if:

- The leader block is not attached to the tape correctly
- The leader block is damaged (burrs or marks)
- The cartridge clutch is sticking.

1. Load a cartridge, different from the cartridge that caused the original failure on the drive.

   Does CHK 21 appear on the drive display ?

```
YES NO
 |   |
 |   Remove the cartridge from this drive and load
 |   that cartridge on several different drives.
 |
 |   Does that cartridge fail on other drives?
 |
 |   YES NO
 |    |   |
 |    |   The problem is NOT caused by the cartridge.
 |    |
 |    |   Return to the MD.
 |    |
 |   The problem is caused by the cartridge.
 |
 |   Disconnect the MD and go to START 145.
 |
Press the Unload button and remove the
cartridge from the drive.

Because the problem occurs on more than one
cartridge, the problem is NOT caused by a
cartridge.

Return to the MD.
```

CHK 25

CHK 25 occurs when the drive threading mechanism is slow or stalled during an unload operation or the leader block is not attached during a load retry.

CHK 25 can be caused by a cartridge if the leader block is loose when the cartridge is loaded.

If the leader block is loose, the threader pin doesn't catch the leader block when the load operation starts. When the drive tries to recover, it cannot return to the home position because the leader block is in the way.

1. Load a cartridge, different from the cartridge that caused the original failure on the drive.

   Does CHK 25 appear on the drive display ?

```
YES NO
 |   |
 |   Remove the cartridge from this drive and load
 |   that cartridge on several different drives.
 |
 |   Does that cartridge fail on other drives?
 |
 |   YES NO
 |    |   |
 |    |   The problem is NOT caused by the cartridge.
 |    |
 |    |   Return to the MD.
 |    |
 |   The problem is caused by the cartridge.
 |
 |   Disconnect the MD and go to START 145.
 |
Press the Unload button and remove the
cartridge from the drive.

Because the problem occurs on more than one
cartridge, the problem is NOT caused by a
cartridge.

Return to the MD.
```

CHK 28

CHK 28 occurs when the tape is not attached to the threader pin, or the file reel motor turns backwards during the threading operation.

CHK 28 can be caused by a cartridge if, during a threading operation:

- The leader block falls off the threader pin
- The tape breaks or is damaged.

1. Load a cartridge, different from the cartridge that caused the original failure on the drive.

   Does CHK 28 appear on the drive display ?

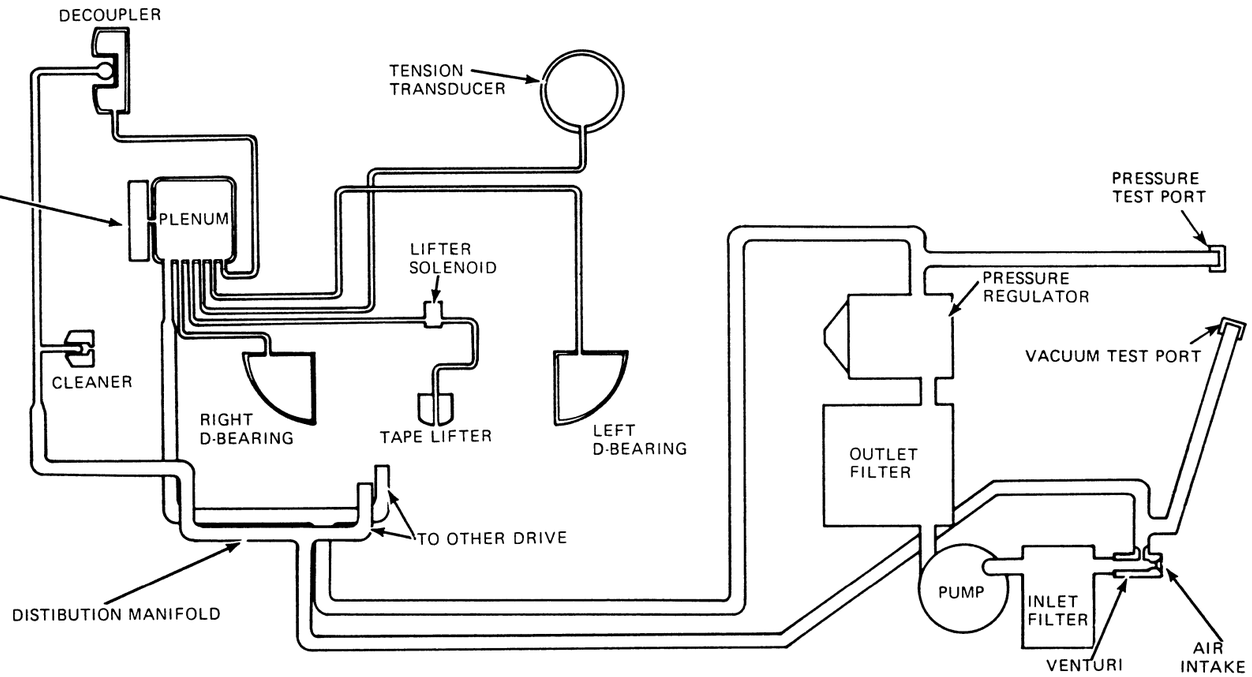
```
YES NO
 |   |
 |   Remove the cartridge from this drive and load
 |   that cartridge on several different drives.
 |
 |   Does that cartridge fail on other drives?
 |
 |   YES NO
 |    |   |
 |    |   The problem is NOT caused by the cartridge.
 |    |
 |    |   Return to the MD.
 |    |
 |   The problem is caused by the cartridge.
 |
 |   Disconnect the MD and go to START 145.
 |
Press the Unload button and remove the
cartridge from the drive.

Because the problem occurs on more than one
cartridge, the problem is NOT caused by a
cartridge.

Return to the MD.
```

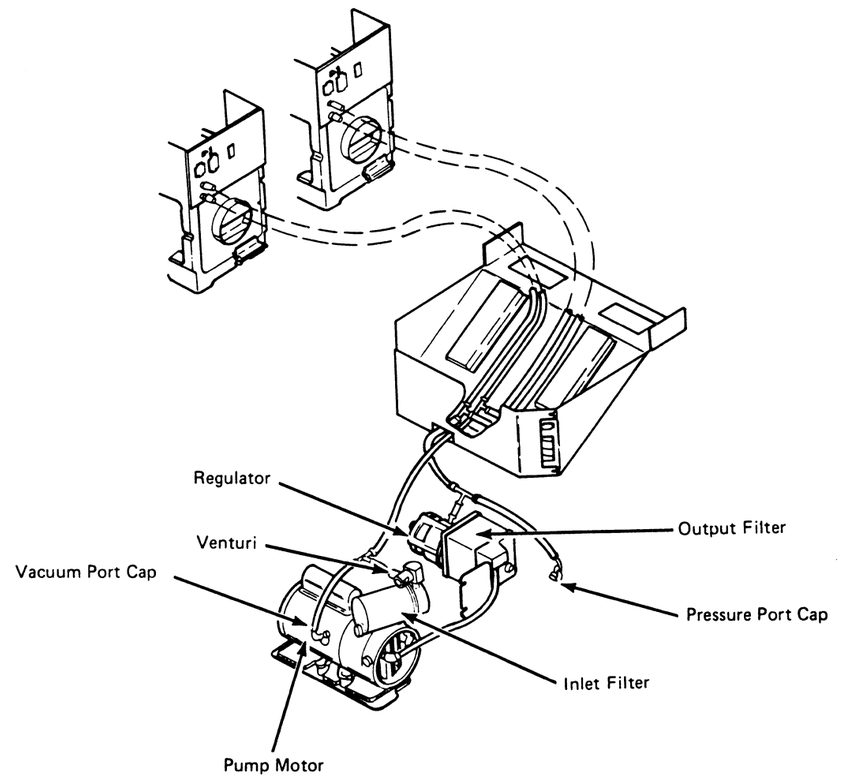
Contents

The following pages are for tape units with BM 6460006

The following pages are for tape units without BM 6460006

This page is for tape units with BM 6460006





Pneumatics Supply Assembly

Notes

Pneumatic System Measurements

This page is for tape units with BM 6460006

The following procedures are for measuring the air pressure and the vacuum of the pneumatic system. Use pressure/vacuum gauge kit, part 6857823, to take the measurements.

Warning: Ensure that both drives in the Tape Unit are offline to the system(s) before continuing with the following measurements or adjustments.

. . . . . .

. . . . . .

. . . . . .

Note: *See PNEU 6 for the following locations.*

Pressure Measurement

1. Set the tape unit ac power circuit breaker to off (see LOC 1).
2. Remove the pressure port cap **2**.
3. Connect a hose between the pneumatic assembly pressure port and the gauge.
4. Set the tape unit ac power circuit breaker to on.
5. Load tapes into both drives of the tape unit.
6. The meter should indicate 31 + 3, - 0.6 kilopascals (125 + 12, - 2.5 inches). Record the pressure.

   If regulator adjustment is required, go to Step 7; if adjustment is not required, go to Step 8.

To Adjust the Regulator

Note: *Do not make any regulator adjustments unless the pneumatics system for this tape unit has been checked for a dirty filter, loose, clogged, open or pinched hoses. A defect in the pneumatic system can give false pressure readings.*

7. Remove the small plastic plug from the adjustment port (end, center) of the regulator.
   a. Insert an allen wrench into the adjustment port and engage the recessed adjustment screw.
   b. To decrease the pressure, turn the adjustment screw clockwise. To increase the pressure, turn the adjustment screw counterclockwise.
   c. When the pressure is correct (31 + 3, - 0.6 kilopascals), (125 + 12, - 2.5 inches) remove the wrench and replace the plastic plug.
8. Remove the tapes from both the drives of the tape unit.
9. Set the tape unit ac power circuit breaker to OFF (see LOC 1).
10. Disconnect the hose from the pressure/vacuum gauge to the pressure port.
11. Replace the pressure port cap.
12. Set the tape unit ac power circuit breaker to on.
13. Continue by selecting one of the following:
    - If you were sent to this procedure by the maintenance device (MD), return to the MD and press the ENTER key.
    - If you were sent to this procedure by the maintenance information, return to the MAP or procedure that sent you here.

Vacuum Measurement

1. Set the tape unit ac power circuit breaker to off (see LOC 1).
2. Remove the vacuum port cap **1**.
3. Connect a hose between the pneumatic assembly vacuum port and the gauge.
4. Set the tape unit ac power circuit breaker to on.
5. Load tapes into both drives of the tape unit.
6. The gauge should indicate 5.75 ± 2.25 kilopascals (23 ± 9.0 inches).

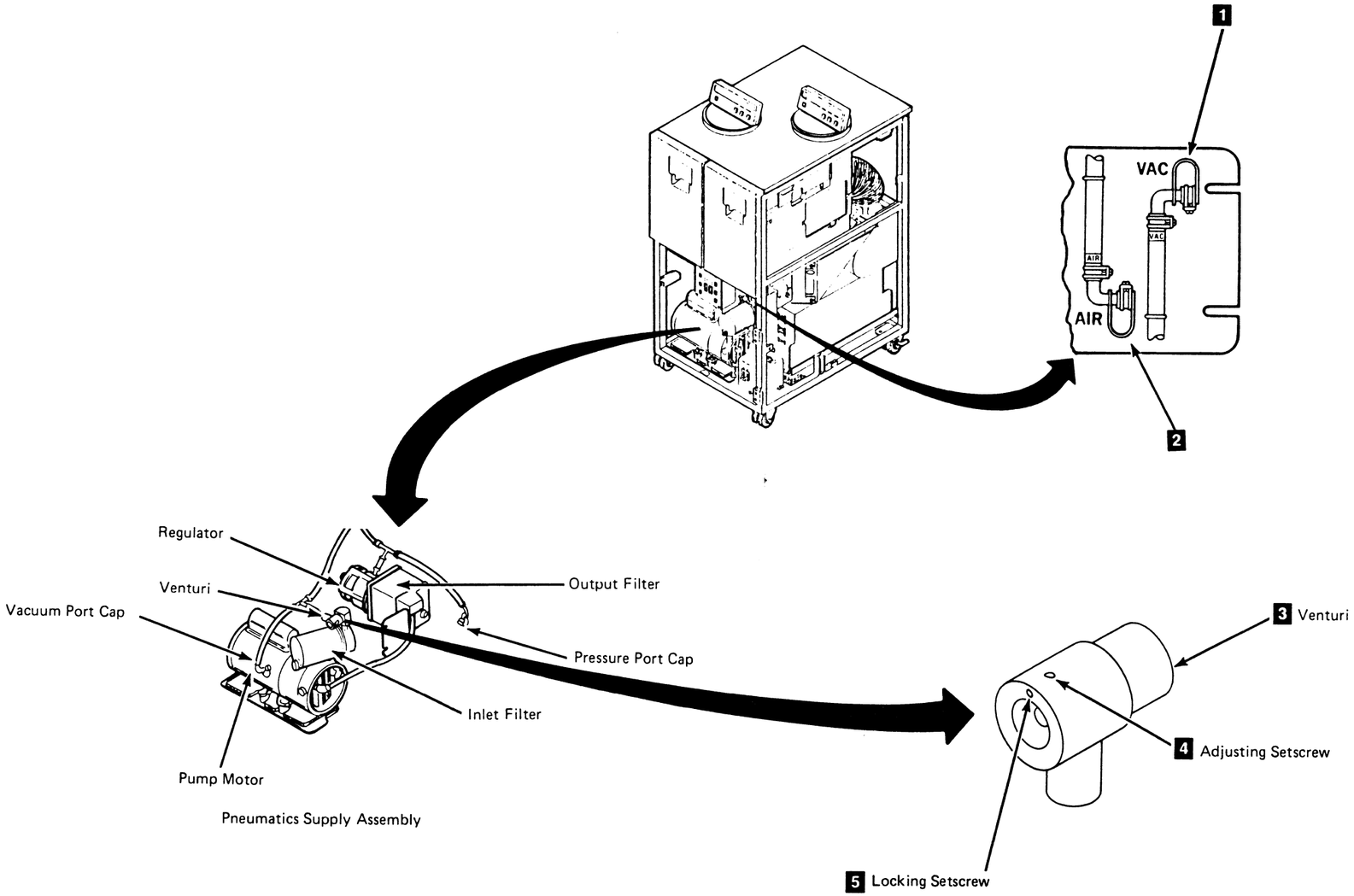
   If vacuum adjustment is required, go to Step 7; if adjustment is not required, go to Step 8.

To Adjust the Vacuum

Note: *Do not make any vacuum adjustments unless the pneumatics system for this tape unit has been checked for a dirty filer, loose, clogged, open or pinched hoses. A defect in the pneumatic system can give false vacuum readings.*

7. The venturi **3** has a locking setscrew and an adjusting setscrew.
   a. Loosen the locking setscrew **5**.
   b. Turn the adjusting setscrew **4** until the vacuum gauge is correct (5.75 ± 2.25 kilopascals).
   c. Tighten the locking setscrew.
8. Remove the tapes from both the drives of the tape unit.
9. Set the tape unit ac power circuit breaker to off.
10. Disconnect the hose from the pneumatic assembly.
11. Replace the vacuum port cap.
12. Set the tape unit ac power circuit breaker to on.
13. Continue by selecting one of the following:
    - If you were sent to this procedure by the maintenance device (MD), return to the MD and press the ENTER key.
    - If you were sent to this procedure by the maintenance information, return to the MAP or procedure that sent you here.

This page is for tape units with BM 6460006



Air Pressure Loss

This page is for tape units with BM 6460006

The following procedure helps you in isolating pneumatic system failures when the problem indication is CHK 46.

A CHK 46 occurs when the plenum pressure sensor does not get enough air pressure to close the pressure sensor contacts.

Follow this procedure, unless otherwise directed, until the repair is made. After the repair is made, this procedure will direct you to your next action.

Note: See PNEU 11 for the following locations.

Before You Begin

Set the drive Online/Offline switch to Offline on both drives (see LOC 1).

If there is a cartridge in either drive, try to remove it using the following procedure. If the cartridge cannot be removed, go to "Cartridge Removal by Hand" on CART 10 for further aid.

1. Set the drive Ready/Not Ready switch on both drives to Not Ready (see LOC 1).
2. Remove the cover on pin side of the drive logic board **1**, and jumper pin 02A-A1G6A02 (+ air pressure loss) to pin 02A-A1B2U08 (Ground).
3. Press the Reset switch (see LOC 1).
4. Press the Unload switch (see LOC 1).
5. After the cartridge has unloaded, remove the jumper.
6. Remove the cartridge.

Analysis Procedure

7. Remove the tape unit front cover (See CARR-DR 2-1), and find the pump motor **4**.
8. Determine if the pump motor is running.

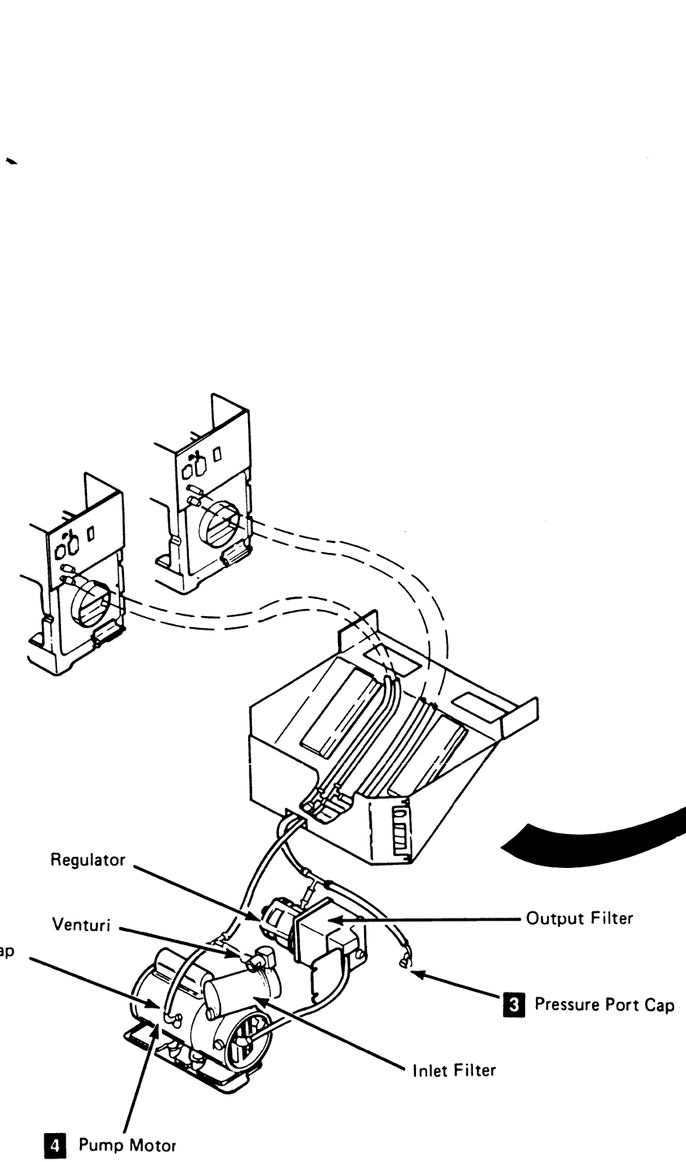
   Note: To determine if the pump motor is running, listen for the sound of the motor running or remove the pressure port cap **3** and feel for escaping air.

```
001
Is the pump motor running?

YES NO
|   |
|   002
|   Check for 220 V ac at J4 on the tape unit dc
|   power supply (see LOC 1) as follows:
|
|   a.  Remove plug P4.
|
|   b.  Measure the voltage between pins 1 and 3.
|       See PWR 20 for the voltage tolerance.
|
|   Is the voltage within tolerance?
|
|   YES NO
|   |   |
|   |   003
|   |   Exchange the following FRU.
|   |   For the removal and replacement
|   |   procedures, see CARR-DR 1-1.
|   |
|   |     FRU095 - DC power supply
|   |
|   |   Is the voltage within tolerance now?
|   |
|   |   YES NO
|   |   |   |
|   |   |   004
|   |   |   Request aid from your next level of
|   |   |   support.
|   |   |
|   |   005
|   |   Replace plug P4.
|   |
|   |   Go to "Exit Procedure" on this page.
|   |
|   006
|   Exchange the following FRU.  For the removal
|   and replacement procedures, see CARR-DR 1-1.
|
|     Note:  If the pump motor (FRU030) or the
|     regulator (FRU031) is exchanged, the output
|     filter (FRU032) must also be exchanged.
|
|     FRU030 - Pump motor
|
|   Is the pump motor running now?
|
|   YES NO
|   |   |
|   |   007
|   |   Request aid from your next level of support.
|   |
|   008
|   Go to "Exit Procedure" on this page.
|
009
Go to step 010.

010
Measure the pressure at the regulator
(see PNEU 5).

     DO NOT attempt to adjust the pressure
     regulator during the failure isolation
     procedure.

Is the pressure out of tolerance (see PNEU 5)?

YES NO
|   |
|   011
|   Because the pressure is within tolerance,
|   the problem must be a single drive failure.
|
|   Go to PNEU 20, "Pneumatics Problem on a
|   Single Drive," for the failing drive.
|
012
The pressure is out of tolerance.  Clamp the
plenum supply hose 2 on drive 0.  See
CARR-DR 3-1.  Measure the pressure at the
regulator.

Is pressure within tolerance (see PNEU 5)?

YES NO
|   |
|   013
|   Go to step 018.
|
014
Remove the clamp from drive 0.  Clamp the
plenum supply hose on drive 1.  Measure the
pressure at the regulator.

Is pressure within tolerance (see PNEU 5)?

YES NO
|   |
|   015
|   Remove the clamp from drive 1.
|
|   Go to PNEU 20, "Pneumatics Problem on a
|   Single Drive," for drive 0.
|
016
Go to step 017.

017
The failure is in the primary pneumatic system
and not in either drive.

Remove any clamps on the plenum supply hoses.

See PNEU 3 for a diagram of the pneumatic
system, and PNEU 5 for the correct pressure
and vacuum tolerances; then go to "Analysis
Procedure" on PNEU 12 and follow the steps.

018
Remove the clamp from drive 0.  Clamp the plenum
supply hose on drive 1.  Measure the pressure at
the regulator.

Is pressure within tolerance (see PNEU 5)?

YES NO
|   |
|   019
|   Go to step 017.
|
020
Remove the clamp from drive 1.

Go to PNEU 20, "Pneumatics Problem on a
Single Drive," for drive 1.
```

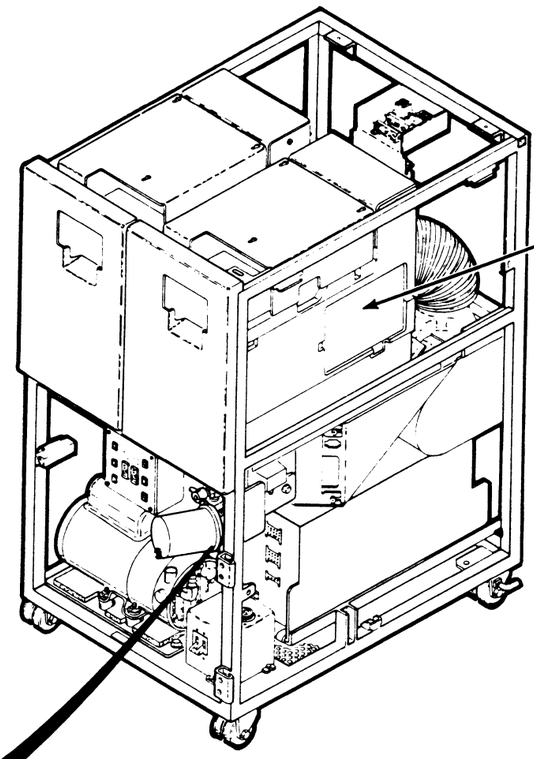
Exit Procedure

1. Refer to PNEU 5 to measure the pressure and vacuum. Adjust if necessary.
2. If you are still having problems, call your next level of support.
3. Set the Online/Offline switch to Online on BOTH drives.
4. Return to the MD and press the ENTER key.

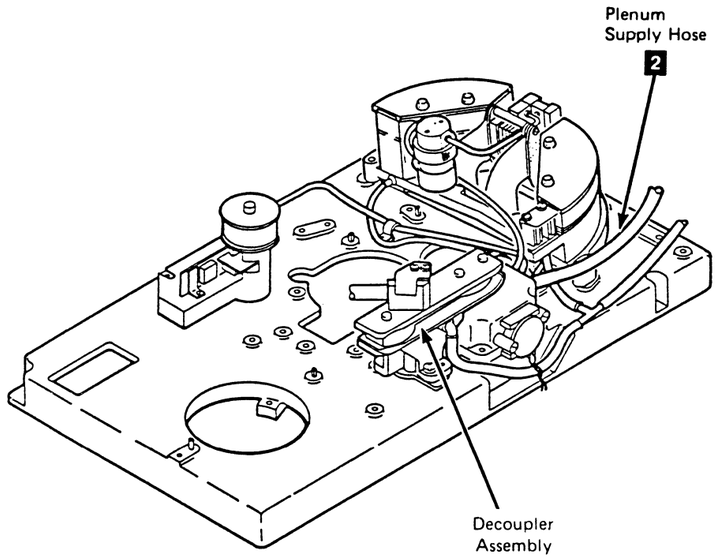
Procedure EC Sensitive (See CARR-DR 9) **PNEU 10**



Pneumatics Supply Assembly



Tape Unit



Tape Deck - Top View

This page is for tape units with BM 6460006

You were sent here after the preceding procedures showed a failure in the primary pneumatics system. This procedure will isolate the problem.

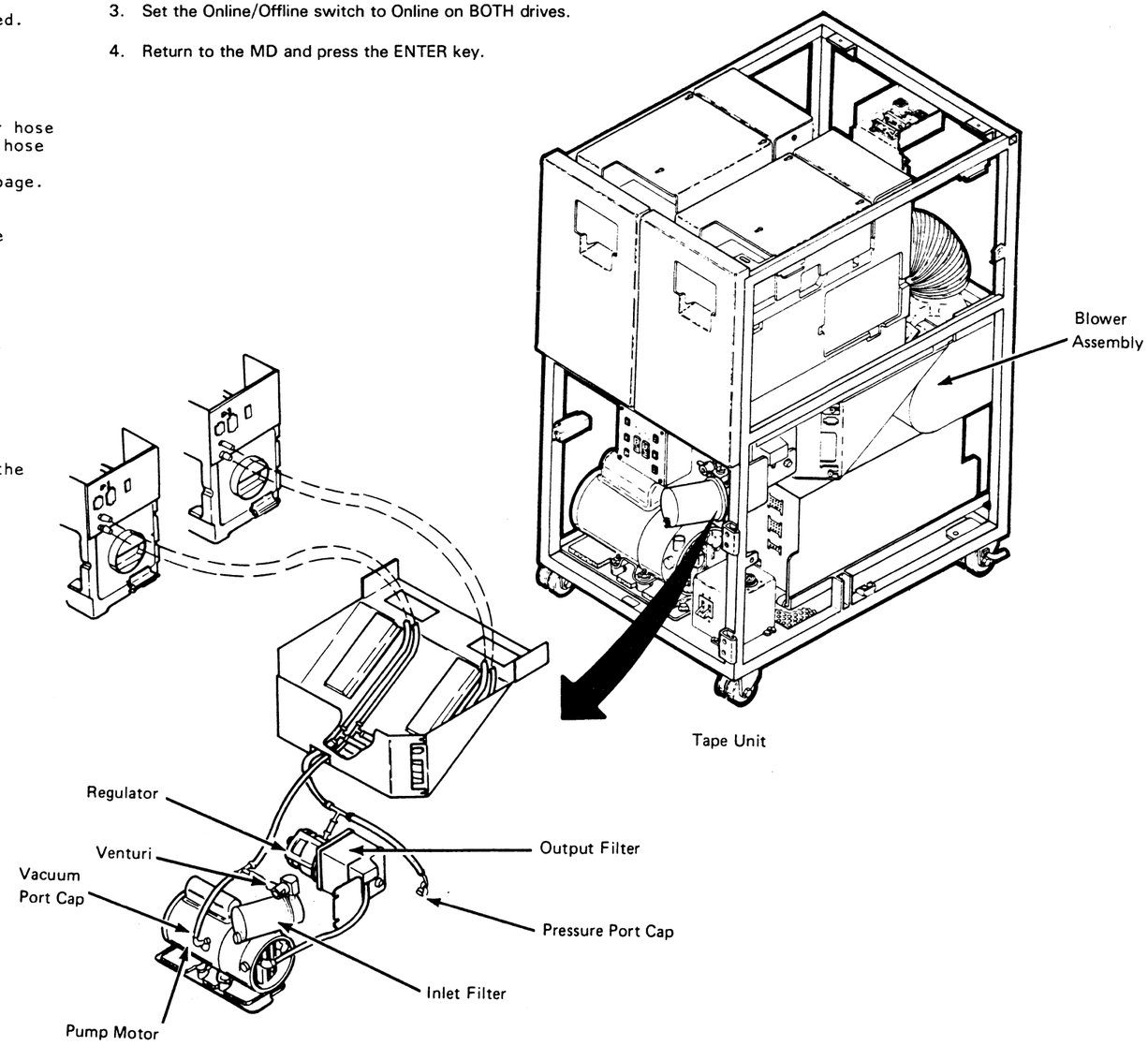
Failure in the Primary Pneumatics System

```
001
Is the pressure high?

YES NO
|   |
|   001
|   The pressure is low.
|
|   Is the vacuum high?
|
|   YES NO
|   |   |
|   |   002
|   |   Is the vacuum low?
|   |
|   |   YES NO
|   |   |   |
|   |   |   003
|   |   |   The vacuum is within tolerance.
|   |   |   Exchange the following FRUs.  For
|   |   |   the removal/replacement procedures
|   |   |   see CARR-DR 1-1.
|   |   |
|   |   |     Note:  If the pump motor (FRU030)
|   |   |     or the regulator (FRU031) is
|   |   |     exchanged, the output filter
|   |   |     (FRU032) must also be exchanged.
|   |   |
|   |   |     FRU031 - Regulator
|   |   |     FRU032 - Output filter
|   |   |     FRU034 - Pressure hose assembly
|   |   |     FRU037 - Manifold-in pressure hose
|   |   |     FRU039 - Plenum supply hose
|   |   |
|   |   |   Go to "Exit Procedure" on this page.
|   |   |
|   |   004
|   |   Remove the inlet filter (FRU033) and
|   |   canister from the pump motor.  See MI
|   |   CARR-DR 1-1 to find the removal page
|   |   for FRU033.
|   |
|   |   Do not replace the canister at this
|   |   time.
|   |
|   |   Set the tape unit ac power circuit
|   |   breaker to ON (see LOC 1).
|   |
|   |   Refer to PNEU 5 and measure, but
|   |   DO NOT adjust, the pressure.
|   |
|   |   Is the pressure within tolerance?
|   |
|   |   YES NO
|   |   |   |
A   B   C   D
```

```
A   B   C   D
|   |   |   |
|   |   |   005
|   |   |   Exchange the following FRUs.  For
|   |   |   the removal/replacement procedures
|   |   |   see CARR-DR 1-1.
|   |   |
|   |   |     Note:  If the pump motor (FRU030)
|   |   |     or the regulator (FRU031) is
|   |   |     exchanged, the output filter
|   |   |     (FRU032) must also be exchanged.
|   |   |
|   |   |     FRU030 - Pump motor
|   |   |     FRU031 - Regulator
|   |   |     FRU032 - Output filter
|   |   |     FRU065 - Pump to output filter hose
|   |   |     FRU037 - Manifold-in pressure hose
|   |   |
|   |   |   Go to "Exit Procedure" on this page.
|   |   |
|   |   006
|   |   Exchange the following FRU.  For the
|   |   removal/replacement procedures see
|   |   CARR-DR 1-1.
|   |
|   |     FRU033 - Inlet filter
|   |
|   |   Go to "Exit Procedure" on this page.
|   |
|   007
|   Exchange the following FRUs.  For the
|   removal/replacement procedures see
|   CARR-DR 1-1.
|
|     Note:  If the pump motor (FRU030) or the
|     regulator (FRU031) is exchanged, the
|     output filter (FRU032) must also be
|     exchanged.
|
|     FRU030 - Pump motor
|     FRU031 - Regulator
|     FRU065 - Pump to output filter hose
|     FRU037 - Manifold-in pressure hose
|
|   Go to "Exit Procedure" on this page.
|
008
Exchange the following FRU.  For the
removal/replacement procedures see
CARR-DR 1-1.

  Note:  If the pump motor (FRU030) or the
  regulator (FRU031) is exchanged, the
  output filter (FRU032) must also be
  exchanged.

  FRU031 - Regulator

Go to "Exit Procedure" on this page.
```

Exit Procedure

1. Refer to PNEU 5 to measure the pressure and vacuum. Adjust if necessary.
2. If you are still having problems, call your next level of support.
3. Set the Online/Offline switch to Online on BOTH drives.
4. Return to the MD and press the ENTER key.



Pneumatics Problem on a Single Drive

This page is for tape units with BM 6460006

You were sent here for further problem isolation, after the measurements taken on the primary pneumatics system were correct.

Pneumatics Problem on a Single Drive

001
Press the reset switch on the drive.

Does CHK 46 appear on the drive display?

YES NO

NO:
002
Exchange the following FRUs. For the removal/replacement procedures see CARR-DR 1-1.

FRU040 - Pressure sensor
FRU085 - Drive control card *

Go to "Exit Procedure" on this page.

YES:
003
Remove the cover on pin side of the drive logic board **1**, and jumper pin 02A-A1G6A02 (+ air pressure loss) to pin 02A-A1B2U08 (Ground).

Press the Reset switch (see LOC 1).

Did the CHK 46 disappear?

YES NO

NO:
004
Remove the jumper and exchange the following FRU. For removal/replacement procedures, see CARR-DR 1-1.

FRU085 - Drive control card *

Go to "Exit Procedure" on this page.

A

A
005
Remove the jumper.

Pinch each hose that leaves the plenum **2**, one at a time (except the plenum supply hose), and press the drive reset switch.

Did the CHK 46 reappear on the display after each hose was pinched and the drive reset?

YES NO

NO:
006
Exchange or attach the hose causing the failure.

Go to "Exit Procedure" on this page.

YES:
007
Exchange the following FRUs. For the removal-replacement procedures, see CARR-DR 1-1.

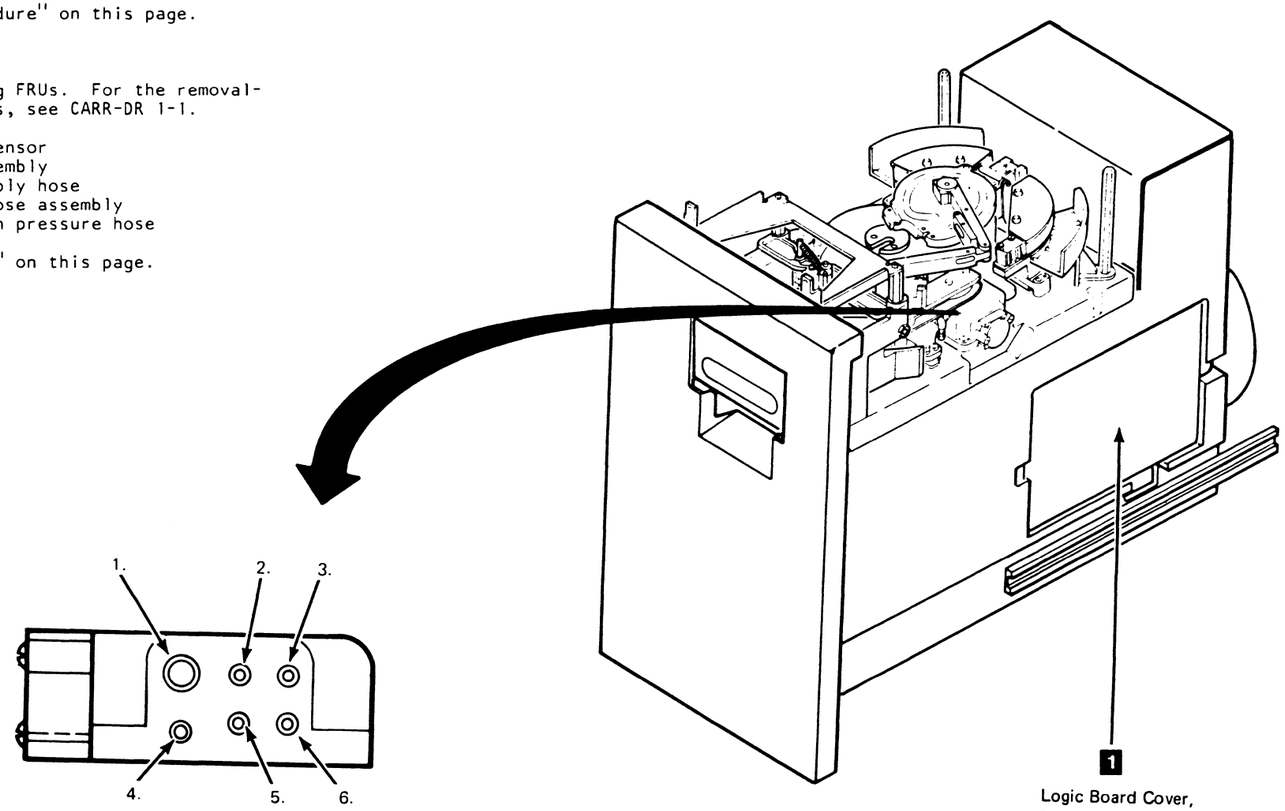
FRU040 - Pressure sensor
FRU041 - Plenum assembly
FRU039 - Plenum supply hose
FRU034 - Pressure hose assembly
FRU037 - Manifold-in pressure hose

Go to "Exit Procedure" on this page.

* This FRU is EC sensitive.
See CARR-DR 4.

Exit Procedure

1. Refer to PNEU 5 to measure the pressure and vacuum. Adjust if necessary.
2. If you are still having problems, call your next level of support.
3. Set the Online/Offline switch to Online on BOTH drives.
4. Return to the MD and press the ENTER key.



2 Plenum Hose Locations
1. Plenum Supply
2. Tape Lifter Solenoid
3. Decoupler Pressure
4. Right Guide Bearing
5. Transducer
6. Left Guide Bearing

Pneumatic Checkout Procedure

This page is for tape units with BM 6460006

Introduction

Read/write and data check errors can be caused by vacuum missing at the tape cleaner assembly or at the decoupler assembly. Pneumatic pressure problems are indicated by CHK 46 (air pressure loss) on the operator panel, but there is no indication of a detached or clogged vacuum hose.

Vacuum Checks

See CARR-DR 2-3 for cover removal. Figure 2 shows the components that are on the top of the tape deck (some pressure hoses have been removed for clarity). Figure 1 shows the pneumatic components at the front of the tape unit.

Analysis Procedure

1. Set the drive Online/Offline switch to Offline (see LOC 1).

2. With power on the drive, detach the vacuum supply hose **1** from the vacuum distribution tee and sense for vacuum by covering the hose end with a finger.

```
001
Is there vacuum?

YES NO
|   |
|   002
|   Reconnect the vacuum supply hose to the
|   vacuum distribution tee.  Open the vacuum
|   port cap 2  and sense for vacuum as before.
|
|   Is there vacuum?
|
|   YES NO
|   |   |
|   |   003
|   |   Reseat or exchange the following FRU.
|   |   See CARR-DR 1-1 for the removal and
|   |   replacement procedures if necessary.
|   |
|   |     Note:  If the pump motor (FRU030) or
|   |     the regulator (FRU031) is exchanged,
|   |     the output filter (FRU032) must also
|   |     be exchanged.
|   |
|   |     FRU030 - Pump motor
|   |
|   |   Close the vacuum port cap.
|   |
|   |   Go to "Exit Procedure" on this page.
|   |
|   |
A   B
```

```
A   B
|   |
|   004
|   Reseat or exchange the following FRU.
|   See CARR-DR 1-1 for the removal and
|   replacement procedures if necessary.
|
|     FRU035 - Vacuum hose assembly
|     FRU212 - Vacuum supply hose
|     FRU038 - Manifold-in vacuum hose
|
|   Close the vacuum port cap.
|
|   Go to "Exit Procedure" on this page.
|
005
Reseat or exchange the following FRUs.
See CARR-DR 1-1 for the removal and
replacement procedures if necessary.

  FRU043 - Decoupler vacuum hose
  FRU047 - Cleaner supply hose.
  FRU219 - Vacuum distribution tee

Reconnect the vacuum supply hose.

Go to "Exit Procedure" on this page.
```

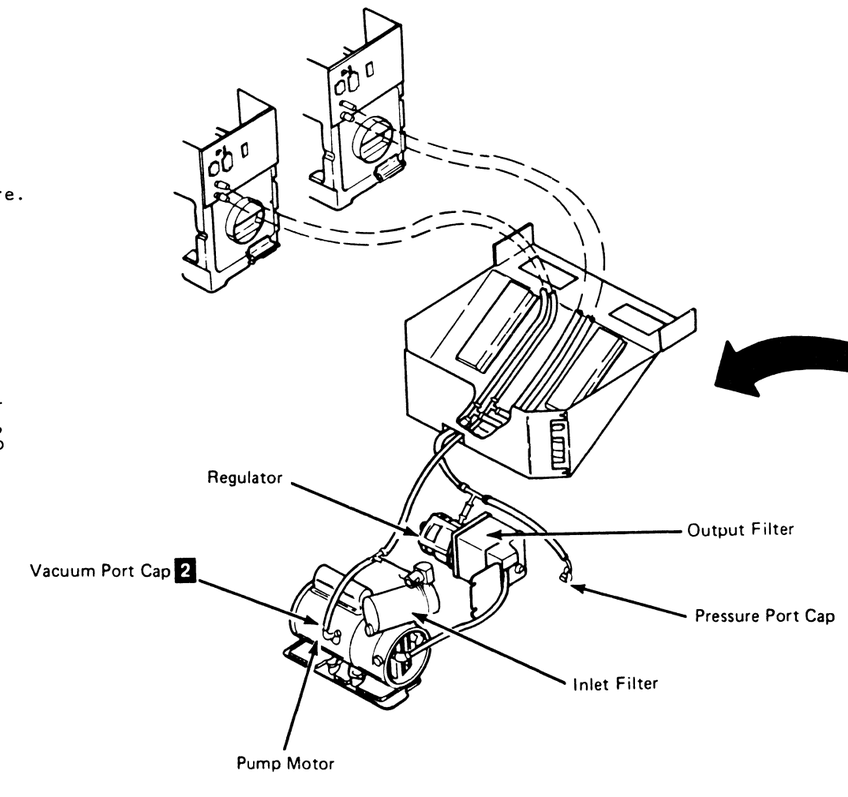


Figure1. Pneumatics Supply Assembly

Exit Procedure

1. See PNEU 5 to measure the pressure and vacuum. Adjust if necessary.

2. If you are still having problems, call your next level of support.

3. Set the Online/Offline switch to Online on BOTH drives.

4. Return to the MD and press the ENTER key.

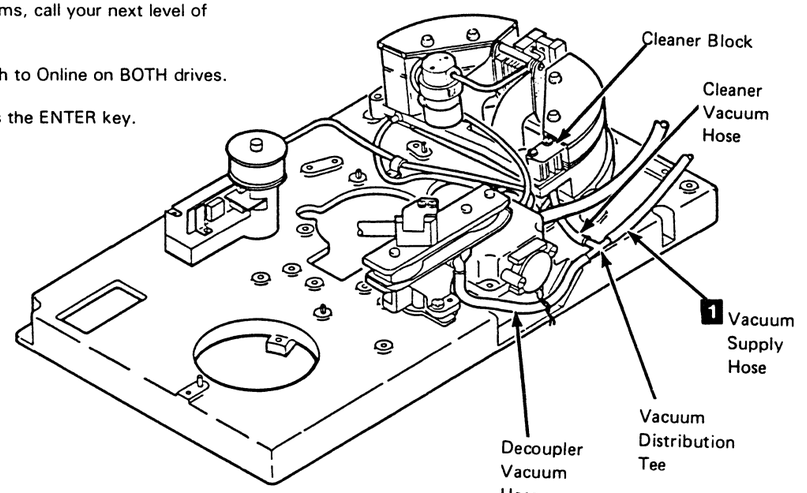
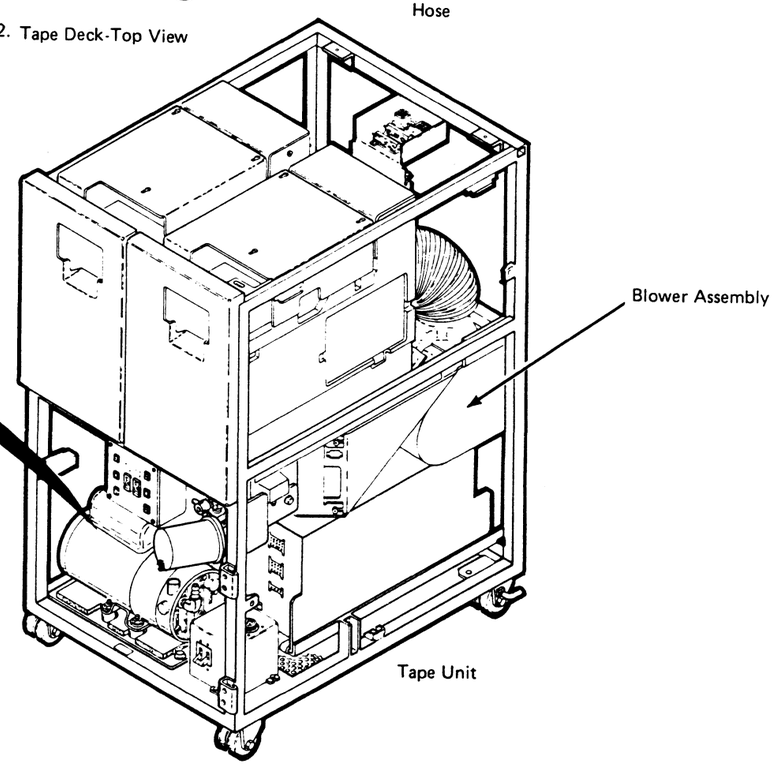
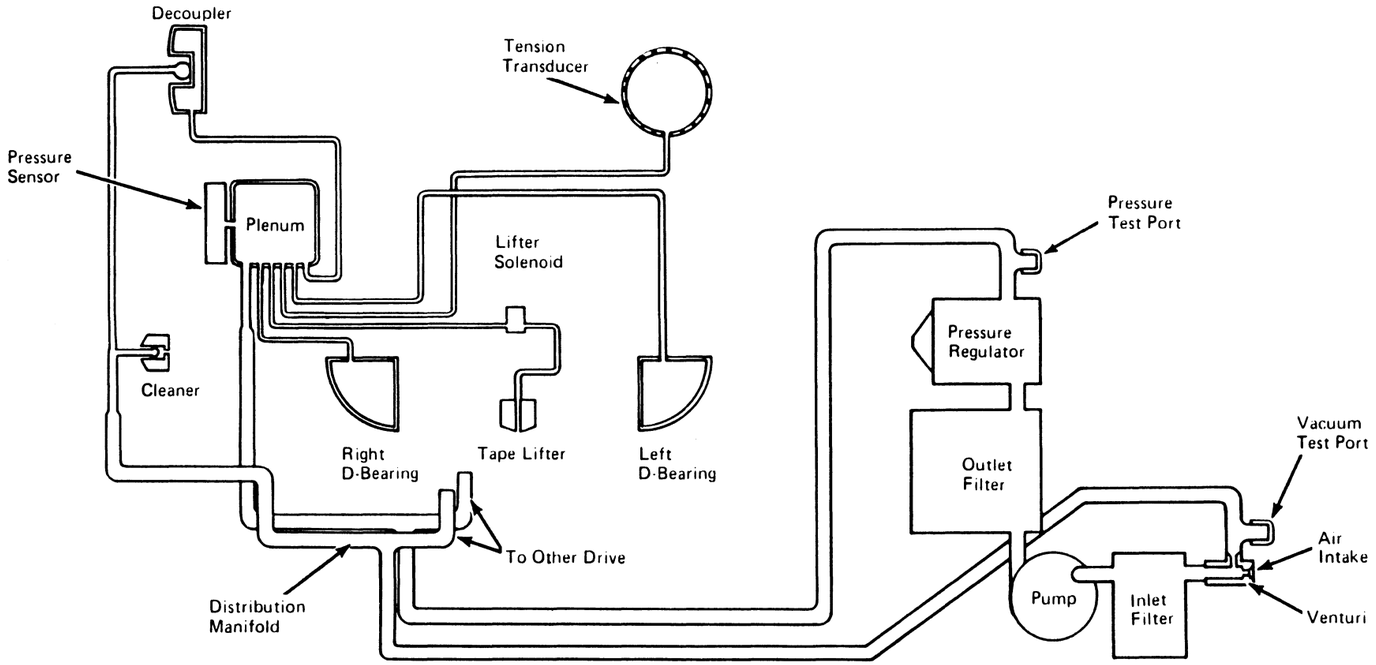


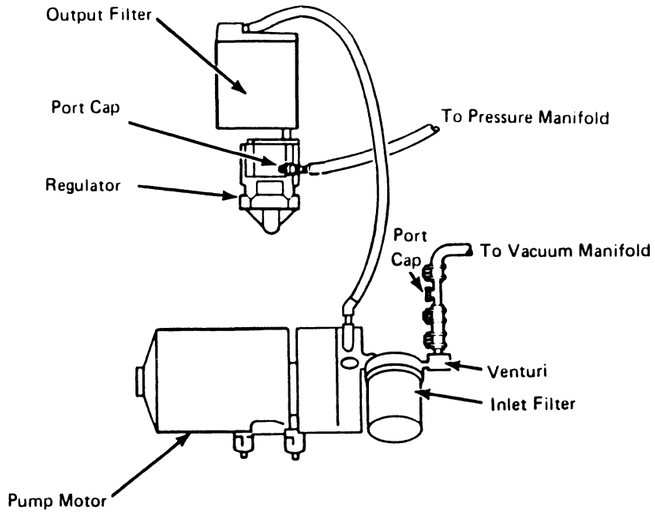
Figure 2. Tape Deck-Top View



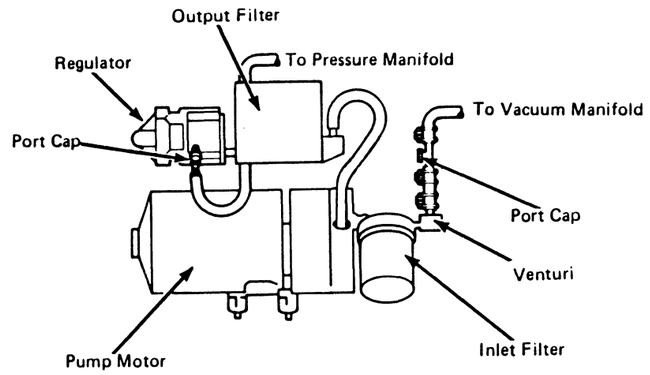
Procedure EC Sensitive (See CARR-DR 9) **PNEU 30**

This page is for tape units without BM 6460006





Pneumatics Supply Assembly, 50 Hz



Pneumatics Supply Assembly, 60 Hz

Pneumatic System Measurements

This page is for tape units without BM 6460006

The following procedures are for measuring the air pressure and the vacuum of the pneumatic system. Use pressure/vacuum gauge kit, part 6857823, to take the measurements.

Warning: Ensure that both drives in the Tape Unit are offline to the system(s) before continuing with the following measurements or adjustments.

. . . . . .

. . . . . .

. . . . . .

Note: See PNEU 106 for the following locations.

Pressure Measurement

1. Set the tape unit ac power circuit breaker to off (see LOC 1).
2. Remove the pressure port cap **1**.
3. Connect a hose between the pneumatic assembly pressure port and the gauge.
4. Set the tape unit ac power circuit breaker to on.
5. Load tapes into both drives of the tape unit.
6. The meter should indicate 31 + 3, - 0.6 kilopascals (125 + 12, - 2.5 inches). Record the pressure.

   If regulator adjustment is required, go to Step 7; if adjustment is not required, go to Step 8.

To Adjust the Regulator

Note: *Do not make any regulator adjustments unless the pneumatics system for this tape unit has been checked for a dirty filter, loose, clogged, open or pinched hoses. A defect in the pneumatic system can give false pressure readings.*

7. Remove the small plastic plug from the adjustment port (end, center) of the regulator.
   a. Insert an allen wrench into the adjustment port and engage the recessed adjustment screw.
   b. To decrease the pressure, turn the adjustment screw clockwise. To increase the pressure, turn the adjustment screw counterclockwise.
   c. When the pressure is correct (31 + 3, - 0.6 kilopascals), remove the wrench and replace the plastic plug.
8. Remove the tapes from both the drives of the tape unit.
9. Set the tape unit ac power circuit breaker to OFF (see LOC 1).
10. Disconnect the hose from the pressure/vacuum gauge to the pressure port.
11. Replace the pressure port cap.
12. Set the tape unit ac power circuit breaker to on.
13. Continue by selecting one of the following:
    - If you were sent to this procedure by the maintenance device (MD), return to the MD and press the ENTER key.
    - If you were sent to this procedure by the maintenance information, return to the MAP or procedure that sent you here.

Vacuum Measurement

1. Set the tape unit ac power circuit breaker to off (see LOC 1).
2. Remove the vacuum port cap **2**.
3. Connect a hose between the pneumatic assembly vacuum port and the gauge.
4. Set the tape unit ac power circuit breaker to on.
5. Load tapes into both drives of the tape unit.
6. The gauge should indicate 5.75 ± 2.25 kilopascals (23 ± 9.0 inches).

   If vacuum adjustment is required, go to Step 7; if adjustment is not required, go to Step 8.

To Adjust the Vacuum

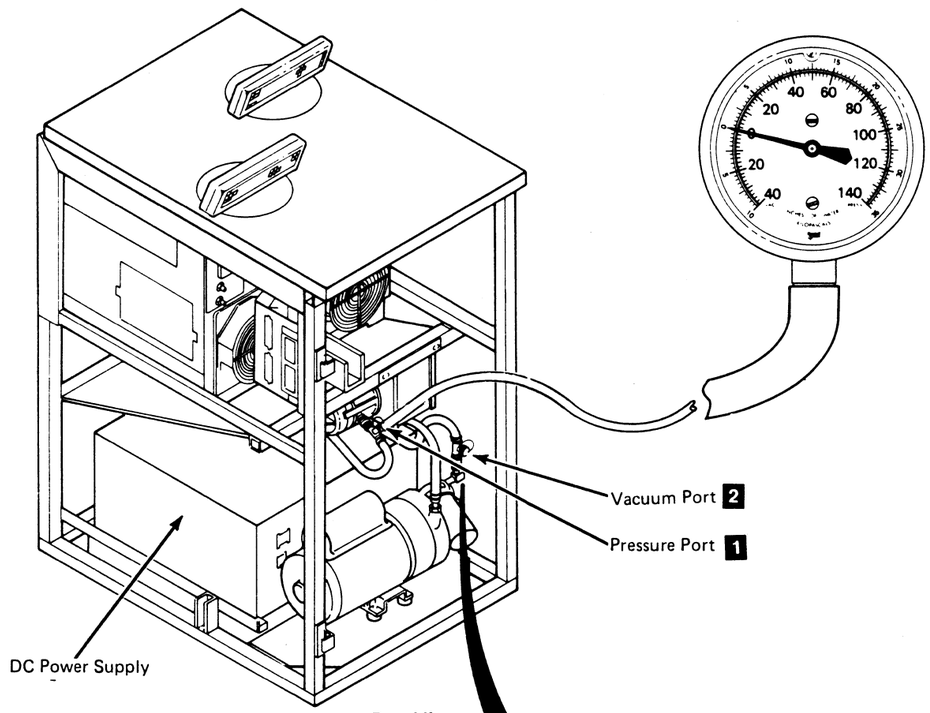
Note: *Do not adjust the vacuum unless the pneumatics system for this tape unit has been checked for a dirty filter, loose, clogged, open or pinched hoses. A defect in the pneumatic system can give false vacuum readings.*

7. The venturi **3** has a locking setscrew and an adjusting setscrew.
   a. Loosen the locking setscrew **5**.
   b. Turn the adjusting setscrew **4** until the vacuum gauge is correct (5.75 ± 2.25 kilopascals).
   c. Tighten the locking setscrew.
8. Remove the tapes from both the drives of the tape unit.
9. Set the tape unit ac power circuit breaker to off.
10. Disconnect the hose from the pneumatic assembly.
11. Replace the vacuum port cap.
12. Set the tape unit ac power circuit breaker to on.
13. Continue by selecting one of the following:
    - If you were sent to this procedure by the maintenance device (MD), return to the MD and press the ENTER key.
    - If you were sent to this procedure by the maintenance information, return to the MAP or procedure that sent you here.

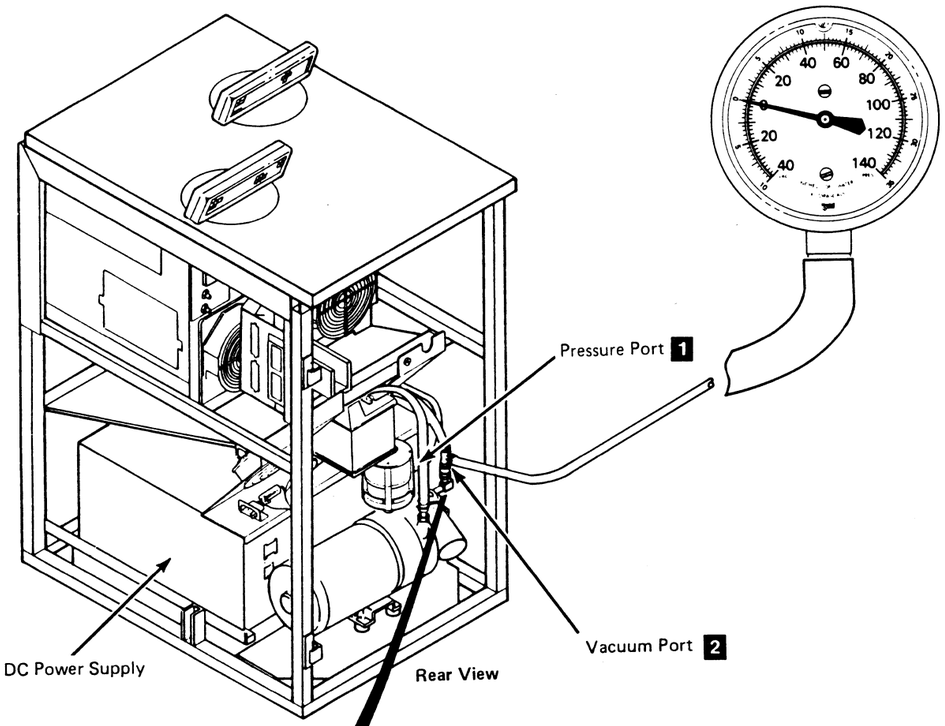
Procedure EC Sensitive (See CARR-DR 9) PNEU 105

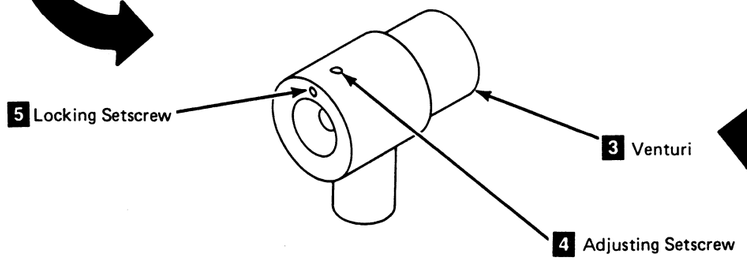
This page is for tape units without BM
6460006

Tape Unit, 60 Hz



Tape Unit, 50 Hz





This page is for tape units without BM 6460006

The following procedure helps you in isolating pneumatic system failures when the problem indication is CHK 46.

A CHK 46 occurs when the plenum pressure sensor does not get enough air pressure to close the pressure sensor contacts.

Follow this procedure, unless otherwise directed, until the repair is made. After the repair is made, this procedure will direct you to your next action.

Note: See PNEU 111 for the following locations.

Before You Begin

Set the drive Online/Offline switch to Offline on both drives (see LOC 1).

If there is a cartridge in either drive, try to remove it using the following procedure. If the cartridge cannot be removed, go to "Cartridge Removal by Hand" on CART 10 for further aid.

1. Set the drive Ready/Not Ready switch on both drives to Not Ready (see LOC 1).
2. Remove the cover on pin side of the drive logic board **1**, and jumper pin 02A-A1G6A02 (+ air pressure loss) to pin 02A-A1B2U08 (Ground).
3. Press the Reset switch (see LOC 1).
4. Press the Unload switch (see LOC 1).
5. After the cartridge has unloaded, remove the jumper.
6. Remove the cartridge.

Analysis Procedure

7. Remove the tape unit rear cover (See CARR-DR 2-3), and find the pump motor **3**.
8. Determine if the pump motor is running.

   Note: To determine if the pump motor is running, listen for the sound of the motor running or remove the pressure port cap **2** and feel for escaping air.

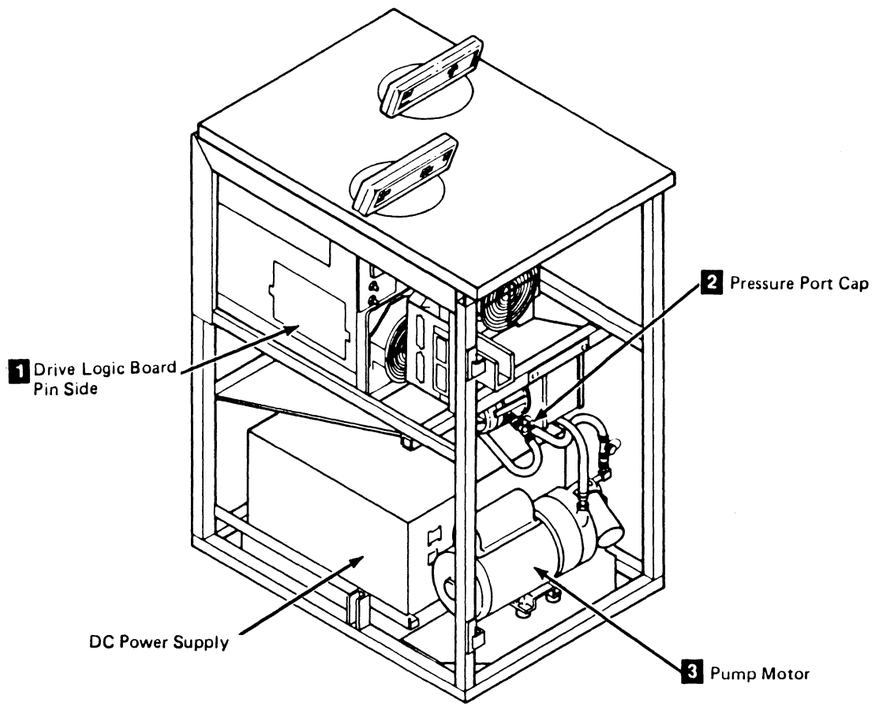
```
001
Is the pump motor running?

YES NO
|   |
|   002
|   Check for 220 V ac at J4 on the tape unit dc
|   power supply (see LOC 1) as follows:
|
|   a.  Remove plug P4.
|
|   b.  Measure the voltage between pins 1 and 3.
|       See PWR 20 for the voltage tolerance.
|
|   Is the voltage within tolerance?
|
|   YES NO
|   |   |
|   |   003
|   |   Exchange the following FRU.
|   |   For the removal and replacement
|   |   procedures, see CARR-DR 1-1.
|   |
|   |     FRU095 - DC power supply
|   |
|   |   Is the voltage within tolerance now?
|   |
|   |   YES NO
|   |   |   |
|   |   |   004
|   |   |   Request aid from your next level of
|   |   |   support.
|   |   |
|   |   005
|   |   Replace plug P4.
|   |
|   |   Go to "Exit Procedure" on this page.
|   |
|   006
|   Exchange the following FRU.  For the removal
|   and replacement procedures, see CARR-DR 1-1.
|
|     Note:  If the pump motor (FRU030) or the
|     regulator (FRU031) is exchanged, the output
|     filter (FRU032) must also be exchanged.
|
|     FRU030 - Pump motor
|
|   Is the pump motor running now?
|
|   YES NO
|   |   |
|   |   007
|   |   Request aid from your next level of support.
|   |
|   008
|   Go to "Exit Procedure" on this page.
|
009
Go to step 010.

010
Measure the pressure at the regulator
(see PNEU 105).

     DO NOT attempt to adjust the pressure
     regulator during the failure isolation
     procedure.

Is the pressure out of tolerance (see PNEU 105)?

YES NO
|   |
|   011
|   Because the pressure is within tolerance,
|   the problem must be a single drive failure.
|
|   Go to PNEU 120, "Pneumatics Problem on a
|   Single Drive," for the failing drive.
|
012
The pressure is out of tolerance.  Clamp the
plenum supply hose 4 on drive 0.  See
CARR-DR 3-1.  Measure the pressure at the
regulator.

Is pressure within tolerance (see PNEU 105)?

YES NO
|   |
|   013
|   Go to step 018.
|
014
Remove the clamp from drive 0.  Clamp the
plenum supply hose on drive 1.  Measure the
pressure at the regulator.

Is pressure within tolerance (see PNEU 105)?

YES NO
|   |
|   015
|   Remove the clamp from drive 1.
|
|   Go to PNEU 120, "Pneumatics Problem on a
|   Single Drive," for drive 0.
|
016
Go to step 017.

017
The failure is in the primary pneumatic system
and not in either drive.

Remove any clamps on the plenum supply hoses.

See PNEU 103 for a diagram of the pneumatic
system, and PNEU 105 for the correct pressure
and vacuum tolerances; then go to "Analysis
Procedure" on PNEU 112 and follow the steps.

018
Remove the clamp from drive 0.  Clamp the plenum
supply hose on drive 1.  Measure the pressure at
the regulator.

Is pressure within tolerance (see PNEU 105)?

YES NO
|   |
|   019
|   Go to step 017.
|
020
Remove the clamp from drive 1.

Go to PNEU 120, "Pneulmatics Problem on a
Single Drive," for drive 1.
```

Exit Procedure

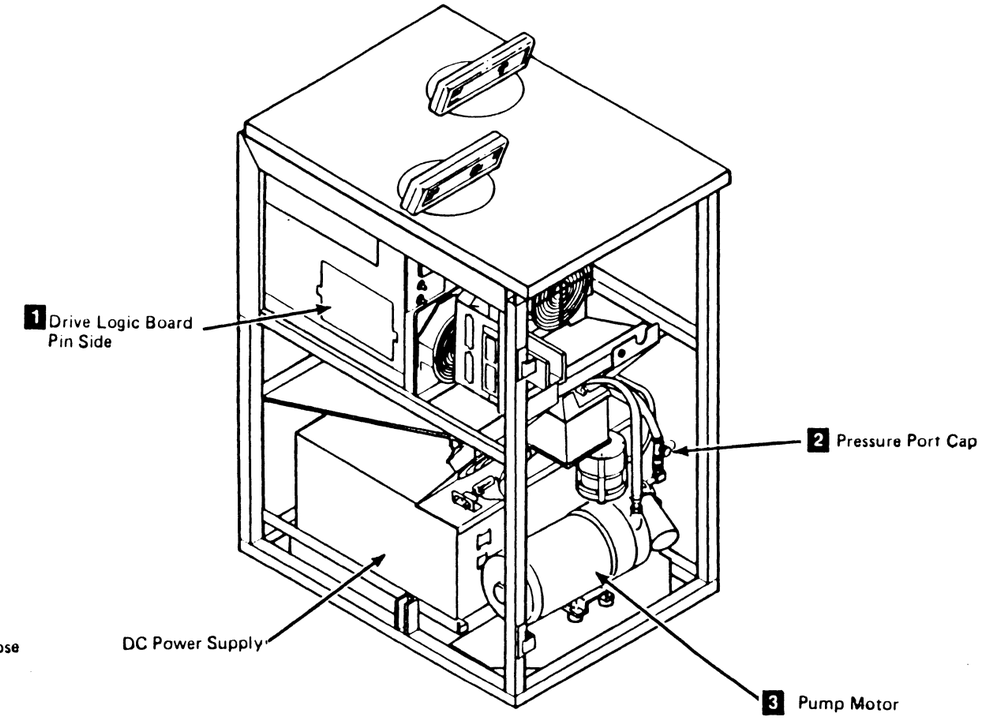
1. Refer to PNEU 105 to measure the pressure and vacuum. Adjust if necessary.
2. If you are still having problems, call your next level of support.
3. Set the Online/Offline switch to Online on BOTH drives.
4. Return to the MD and press the ENTER key.

Air Pressure Loss (Continued)

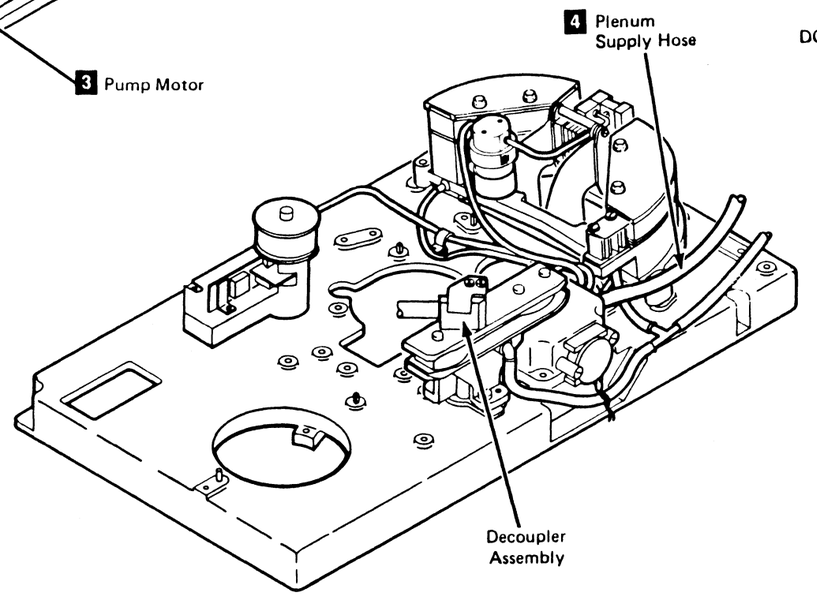
This page is for tape units without BM 6460006



Tape Unit, 60 Hz Rear View



Tape Unit, 50 Hz Rear View



Tape Deck - Top View

Air Pressure Loss (Continued)

This page is for tape units without BM 6460006

You were sent here after the preceding procedures showed a failure in the primary pneumatics system. This procedure will isolate the problem.

Failure in the Primary Pneumatics System

001
Is the pressure high?

YES NO
| |
| 001
| The pressure is low.
|
| Is the vacuum high?
|
| YES NO
| | |
| | 002
| | Is the vacuum low?
| |
| | YES NO
| | | |
A B C D

A B C D
| | | |
| | | 003
| | | The vacuum is within tolerance.
| | | Exchange the following FRUs. For
| | | the removal/replacement procedures
| | | see CARR-DR 1-1.
| | |
| | | Note: If the pump motor (FRU030)
| | | or the regulator (FRU031) is
| | | exchanged, the output filter
| | | (FRU032) must also be exchanged.
| | |
| | | FRU031 - Regulator
| | | FRU032 - Output filter
| | | FRU034 - Pressure hose assembly
| | | FRU037 - Manifold-in pressure hose
| | | FRU039 - Plenum supply hose
| | |
| | | Go to "Exit Procedure" on this page.
| | |
| | 004
| | Remove the inlet filter (FRU033) and
| | canister from the pump motor. See MI
| | CARR-DR 1-1 to find the removal page
| | for FRU033.
| |
| | Do not replace the canister at this
| | time.
| |
| | Set the tape unit ac power circuit
| | breaker to ON (see LOC 1).
| |
| | Refer to PNEU 105 and measure, but
| | DO NOT adjust, the pressure.
| |
| | Is the pressure within tolerance?
| |
| | YES NO
| | | |
A B E F

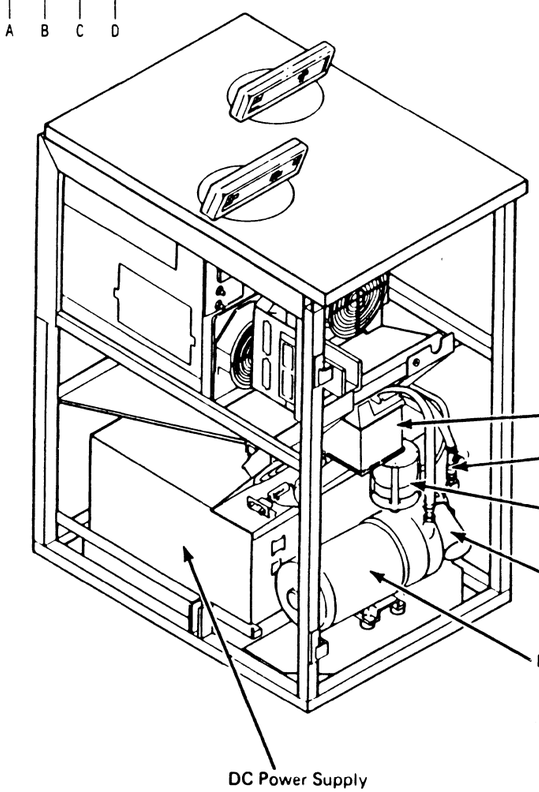
A B E F
| | | |
| | | 005
| | | Exchange the following FRUs. For
| | | the removal/replacement procedures
| | | see CARR-DR 1-1.
| | |
| | | Note: If the pump motor (FRU030)
| | | or the regulator (FRU031) is
| | | exchanged, the output filter
| | | (FRU032) must also be exchanged.
| | |
| | | FRU030 - Pump motor
| | | FRU031 - Regulator
| | | FRU032 - Output filter
| | | FRU065 - Pump to output filter hose
| | | FRU037 - Manifold-in pressure hose
| | |
| | | Go to "Exit Procedure" on this page.
| | |
| | 006
| | Exchange the following FRU. For the
| | removal/replacement procedures see
| | CARR-DR 1-1.
| |
| | FRU033 - Inlet filter
| |
| | Go to "Exit Procedure" on this page.
| |
A B

A B
| |
| 007
| Exchange the following FRUs. For the
| removal/replacement procedures see
| CARR-DR 1-1.
|
| Note: If the pump motor (FRU030) or the
| regulator (FRU031) is exchanged, the
| output filter (FRU032) must also be
| exchanged.
|
| FRU030 - Pump motor
| FRU031 - Regulator
| FRU065 - Pump to output filter hose
| FRU037 - Manifold-in pressure hose
|
| Go to "Exit Procedure" on this page.
|
008
Exchange the following FRU. For the
removal/replacement procedures see
CARR-DR 1-1.

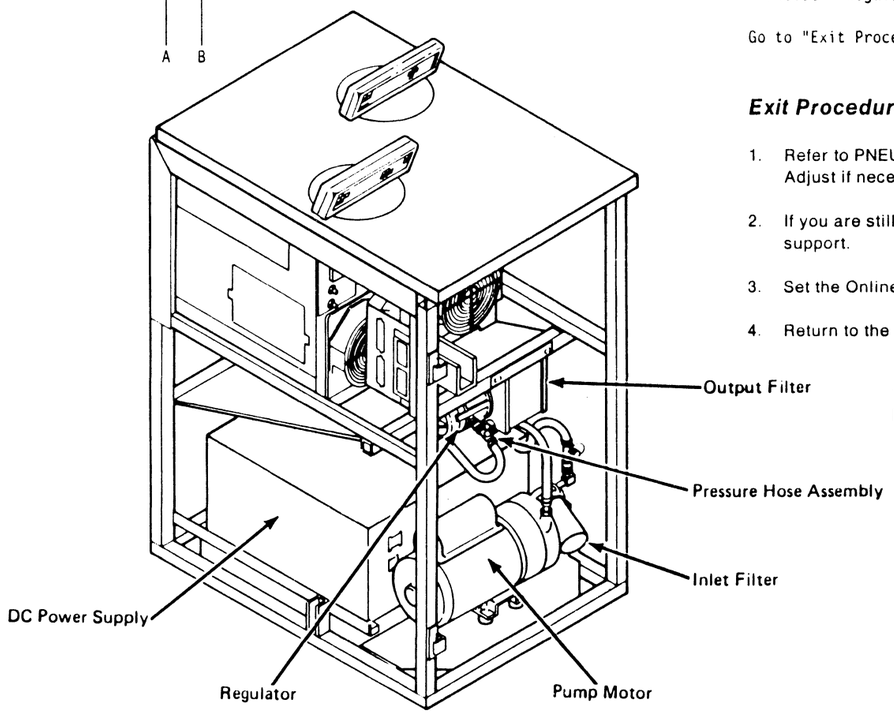
Note: If the pump motor (FRU030) or the
regulator (FRU031) is exchanged, the
output filter (FRU032) must also be
exchanged.

FRU031 - Regulator

Go to "Exit Procedure" on this page.



Tape Unit, 50 Hz
Rear View



Tape Unit, 60 Hz
Rear View

Exit Procedure

1. Refer to PNEU 105 to measure the pressure and vacuum. Adjust if necessary.
2. If you are still having problems, call your next level of support.
3. Set the Online/Offline switch to Online on BOTH drives.
4. Return to the MD and press the ENTER key.

Pneumatics Problem on a Single Drive

This page is for tape units without BM 6460006

You were sent here for further problem isolation, after the measurements taken on the primary pneumatics system were correct.

Pneumatics Problem on a Single Drive

001
Press the reset switch on the drive.

Does CHK 46 appear on the drive display?

YES NO
| |
| 002
| Exchange the following FRUs. For the
| removal/replacement procedures see
| CARR-DR 1-1.
|
| FRU040 - Pressure sensor
| FRU085 - Drive control card *
|
| Go to "Exit Procedure" on this page.
|
003
Remove the cover on pin side of the drive logic board !1!, and jumper pin 02A-A1G6A02 (+ air pressure loss) to pin 02A-A1B2U08 (Ground).

Press the Reset switch (see LOC 1).

Did the CHK 46 disappear?

YES NO
| |
| 004
| Remove the jumper and exchange the
| following FRU. For removal/replacement
| procedures, see CARR-DR 1-1.
|
| FRU085 - Drive control card *
|
| Go to "Exit Procedure" on this page.
|
A

A
|
005
Remove the jumper.

Pinch each hose that leaves the plenum !2!, one at a time (except the plenum supply hose), and press the drive reset switch.

Did the CHK 46 reappear on the display after each hose was pinched and the drive reset?

YES NO
| |
| 006
| Exchange or attach the hose causing the
| failure.
|
| Go to "Exit Procedure" on this page.
|
007
Exchange the following FRUs. For the removal-replacement procedures, see CARR-DR 1-1.

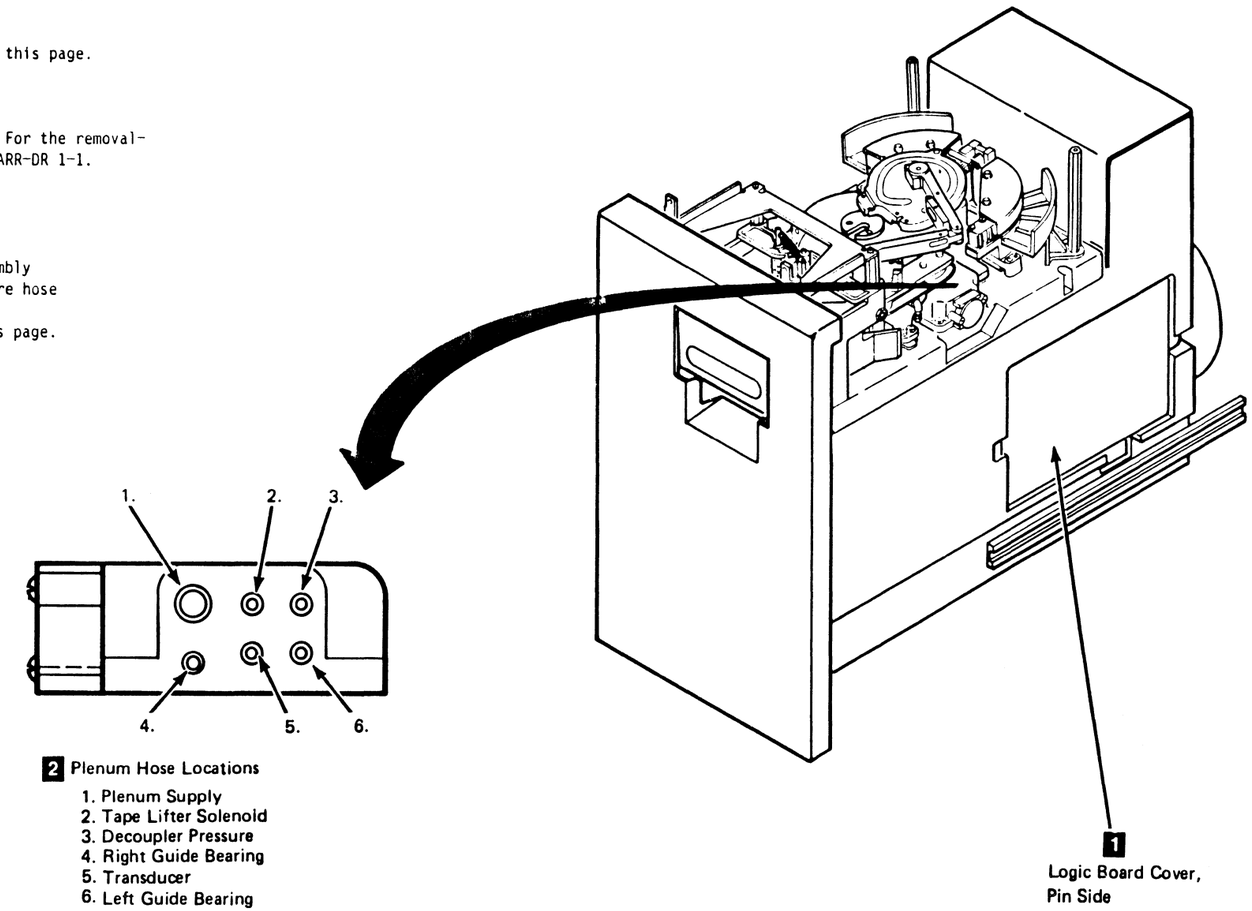
FRU040 - Pressure sensor
FRU041 - Plenum assembly
FRU039 - Plenum supply hose
FRU034 - Pressure hose assembly
FRU037 - Manifold-in pressure hose

Go to "Exit Procedure" on this page.

* This FRU is EC sensitive.
See CARR-DR 4.

Exit Procedure

1. Refer to PNEU 105 to measure the pressure and vacuum. Adjust if necessary.
2. If you are still having problems, call your next level of support.
3. Set the Online/Offline switch to Online on BOTH drives.
4. Return to the MD and press the ENTER key.



2 Plenum Hose Locations
1. Plenum Supply
2. Tape Lifter Solenoid
3. Decoupler Pressure
4. Right Guide Bearing
5. Transducer
6. Left Guide Bearing

1 Logic Board Cover, Pin Side

Pneumatic Checkout Procedure

This page is for tape units without BM 6460006

Introduction

Read/write errors and data check errors can be caused by vacuum missing at the tape cleaner assembly or at the decoupler assembly. Pneumatic pressure problems are indicated by CHK 46 (air pressure loss) on the operator panel, but there is no indication of a detached or clogged vacuum hose.

Vacuum Checks

See CARR-DR 2-3 for cover removal. Figure 1 shows the components that are on the top of the tape deck (some pressure hoses have been removed for clarity). Figures 2 and 3 show the pneumatic components at the rear of the 50 Hz and 60 Hz tape units.

Analysis Procedure

1. Set the drive Online/Offline switch to Offline (see LOC 1).

2. With power on the drive, detach the vacuum supply hose **1** from the vacuum distribution tee and sense for vacuum by covering the hose end with a finger.

001
Is there vacuum?

YES NO

YES

002
Reconnect the vacuum supply hose to the vacuum distribution tee. Open the vacuum port cap 12! and sense for vacuum as before.

Is there vacuum?

YES NO

YES

003
Reseat or exchange the following FRU. See CARR-DR 1-1 for the removal and replacement procedures if necessary.

Note: If the pump motor (FRU030) or the regulator (FRU031) is exchanged, the output filter (FRU032) must also be exchanged.

FRU030 - Pump motor

Close the vacuum port cap.

Go to "Exit Procedure" on this page.

NO

004
Reseat or exchange the following FRU. See CARR-DR 1-1 for the removal and replacement procedures if necessary.

FRU035 - Vacuum hose assembly
FRU212 - Vacuum supply hose
FRU038 - Manifold-in vacuum hose

Close the vacuum port cap.

Go to "Exit Procedure" on this page.

NO

005
Reseat or exchange the following FRUs. See CARR-DR 1-1 for the removal and replacement procedures if necessary.

FRU043 - Decoupler vacuum hose
FRU047 - Cleaner supply hose.
FRU219 - Vacuum distribution tee

Reconnect the vacuum supply hose.

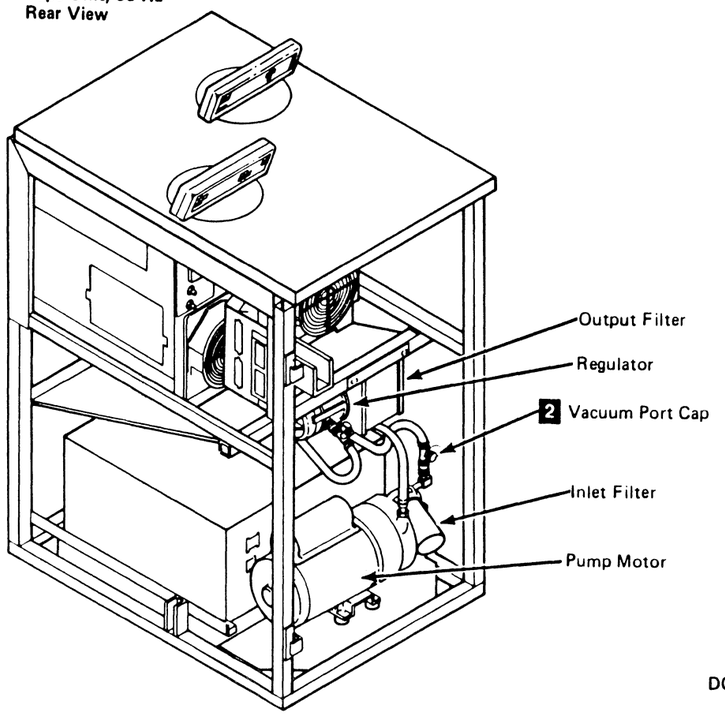
Go to "Exit Procedure" on this page.

NO

Reconnect the vacuum supply hose.

Go to "Exit Procedure" on this page.

Figure 2.
Tape Unit, 60 Hz
Rear View



Exit Procedure

1. Refer to PNEU 105 to measure the pressure and vacuum. Adjust if necessary.
2. If you are still having problems, call your next level of support.
3. Set the Online/Offline switch to Online on BOTH drives.
4. Return to the MD and press the ENTER key.

Figure 1. Tape Deck - Top View

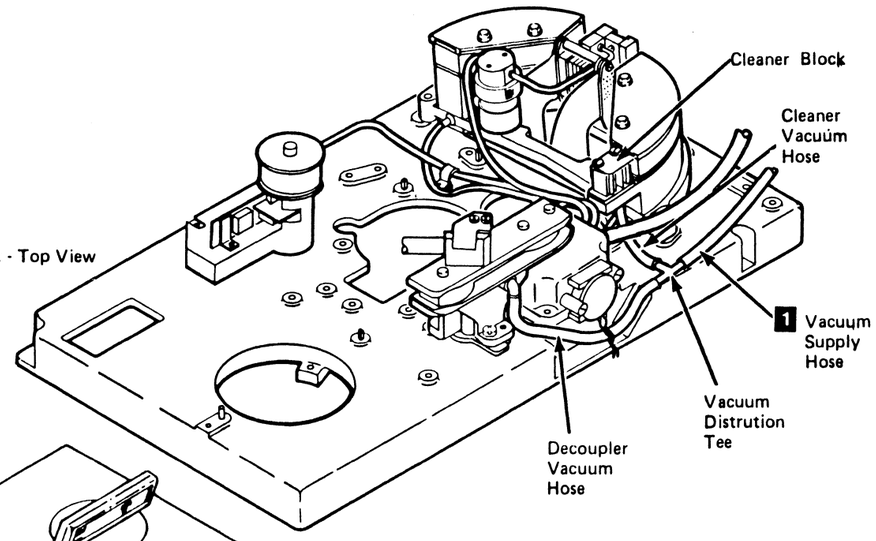
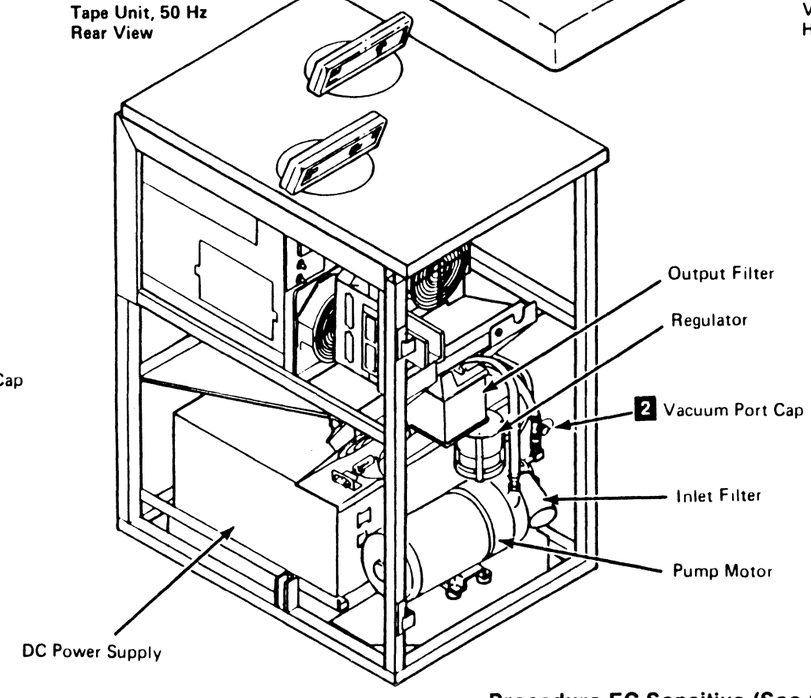


Figure 3.
Tape Unit, 50 Hz
Rear View



0 0 0 0 0 0 0 0 0 0

Contents

Two types of MVS message formats are defined by the first seven characters of the message line, called the message identifier. The message identifiers are:

IEA000A - which indicates that some action is required by the operator.

IEA000I - which indicates that the message contains failure information, or it contains statistical information.

The IEA000A message is described on this page. The IEA000I message is described on MSG 15.

IEA000A - Action Messages

The IEA000A messages inform the operator about conditions on the subsystem and give specific actions that should be performed. The "IEA" means that the message is from the supervisor. The "000" is called the sequence number. The "A" means this is an action message.

The action messages are intervention required and condition code 3/no paths available. A secondary error message describes the recovery action to be performed by the operator.

Intervention Required Message Format

1	2	3	4	5	6	7
IEA000A	CUA,	INT REQ,	CMD,	STAT,	SENSE,	SER,	JOB ID

8
IEA000A	CUA,	SECONDARY ERROR MESSAGE

CUA: CUA is the channel, control unit, and drive address **1**. The primary CUA (PCUA) is from the outboard recorder (OBR). This message may refer to a condition on the alternate channel path. See START 400 to determine the actual channel and data path.

INT REQ: Intervention required **2** indicates that operator intervention is needed as indicated in the secondary error message **8**.

CMD: The command **3** from the active CCW.

STAT: The status **4** from the CSW (bits 32-47).

SENSE: Contains sense bytes 0-6 **5** (indicates the condition that caused the intervention required).

SER: The serial number or the identification number **6** of the volume.

JOB ID: The job identification **7** name or number.

Secondary Error Message

The secondary error message **8** defines the needed recovery action as indicated by sense byte 3 (ERPA byte).

Secondary error message examples are:

Reload the cartridge	ERPA=33 - load failure
Unload the cartridge	ERPA=34 - manual unload
Ready the drive	ERPA=3A - Ready/Not Ready switch is in the Not Ready position
Intervention Required	ERPA=43 - A Start I/O was issued to a drive that does not have a volume correctly mounted

Service Information

To ready the drive, the cartridge must be correctly seated in the cartridge latch assembly. The tape must be threaded and at or beyond BOT. The Ready/Not Ready switch must be in the Ready position.

If a problem continues, gather information about this CUA from other messages, EREP, and sense bytes 2, 3, 9-17, 20, 21, and 23. Follow the troubleshooting procedures on START 10. If those procedures have been completed without a fix, go to SPROC for support maintenance procedures.

Condition Code 3/No Path Available Message

9
IEA000A	CUA,	CC=3/NO PATH AVAILABLE,,,	JOB ID

CC=3/NO PATH AVAILABLE: A condition code=3/no path available message **9** indicates that an addressed device (CUA) does not respond to an initial selection sequence. This message also indicates that both the primary and alternate paths, when used, are unavailable. It may be necessary to see a customer configuration list to determine if alternate paths are being used.

Possible problem areas are:

Host processor channel or channel unit.
Any other control unit on the channel.
Channel interface.
Channel adapter in the 3480.

The IEA000I messages provide failure information and statistical information about the 3480 tape subsystem. The IEA000I messages are described on this page. The IEA000A message descriptions are on MSG 10.

IEA000I - Information Messages

IEA000I messages contain information about a failure on the subsystem. An IEA000I message also gives the operator information about a condition on the subsystem or provides statistical information about that subsystem.

A secondary error message describes the recovery action to be performed by the operator.

The "IEA" means that the message is from the supervisor. The "000" is called the sequence number. The "I" means this is an information message.

CUA: 1 The channel, control unit, and drive address.

CS ID: The channel set identification number 2 is a numbered group of system channels.

ERR: A three character message describing the type of error 3 that has happened. The error messages are described on MSG 20.

CMD: The command 4 from the active CCW.

STAT: The status 5 from the CSW (bits 32-47).

SENSE 0-6: The first seven bytes of sense 6 that contain the cause for an intervention required.

*****:*** This field does not apply to the 3480 subsystem.

SER: The serial number or identification number 7 of the volume.

JOB ID: The job identification 8 name or number.

TIME: The CPU time 9 when the error was detected.

SENSE 7-31: The sense data 10 that defines the error condition or contains statistical data. There are 25 bytes (50 characters) of sense data in this field.

Sense byte 7 defines the format of bytes 8-31 (see SENSE).

- When byte 7 contains X'20', bytes 8-31 are control unit status and drive error status.
- When byte 7 contains X'21', bytes 8-31 are environmental data and buffered log data.

SECONDARY ERROR MESSAGE

The secondary error message 11 gives additional error information for some permanent error codes, and is used as an aid in the operator procedure for error recovery.

Service Information

If a problem continues, gather the information about this CUA from other console messages, EREP, and the customer. Sense bytes 2, 3, 9-17, 20, 21, and 23 are needed when using the MD. The information gathered will be used in different ways by the product and support service representatives (SRs).

Product SR: Follow the troubleshooting procedures beginning on START 10. The maintenance device (MD) will run the functional verification test to isolate the error. If the tests do not isolate the error, the MD will guide you through sense byte analysis to define a corrective action.

Product Support SR: The support SR follows the procedures in SPROC. The sense data can be used to verify the product maintenance package actions and allows the SR to take additional actions while using the EADs or FSI.

IEA000I Message Formats

1	2	3	4	5	6	7	8	9
IEA000I	CUA,	CS ID,	ERR,	CMD,	STAT,	SENSE 0-6,	**,	SER,	JOB ID,	TIME

10			
IEA000I	CUA,	CS ID,,	SENSE 7-31

11		
IEA000I	CUA,	SECONDARY ERROR MESSAGE

Error Description List

The 3480 subsystem depends on controlling computer facilities for the correct handling of error conditions that cannot be resolved within the subsystem and for the recording of error data reported by the subsystem.

The 3480 subsystem has sense data format and error recovery procedures (ERP) for errors that occur during tape processing.

When errors occur in the subsystem, the subsystem's error recovery procedures are used first in an attempt to recover. If the subsystem recovers successfully, the error is counted in the buffered log. If the subsystem cannot recover from an error by ERPA, it uses the unit-check status bit and sense byte 3 to inform the controlling computer that an error occurred and the action that should be taken. The code in sense byte 3 can indicate specific retry or recovery actions that the controlling computer should perform, or the code can indicate that the error should be logged for historical purposes only.

Operating system console messages that indicate permanent subsystem hardware failures and that contain information such as status and sense are flagged to alert the operator. Messages requiring operator intervention remain active until appropriate action is taken by the operator. For more information on errors that require operator intervention, see *IBM 3480 Magnetic Tape Subsystem Operator's Guide*.

Error Recovery Procedure Action Codes

Sense byte 3 identifies the error recovery procedure action (ERPA) code. The following pages describe the code, the error, and the action taken by the controlling computer to recover from the error.

Code	Description of Error	Error Recovery Action
00	**Unsolicited Sense** ERPA code 00 is sent in response to a Sense command when no contingent allegiance occurs after a unit check.	1. Enter a permanent record in the OBR. 2. Write a console message NON-ERROR SENSE. 3. Signal a permanent error.
01–20	**Reserved**	Not used
21	**Data Streaming Not Operational** After repeated attempts to transfer data to or from the controlling computer in streaming mode, as set on the control unit operator panel, the control unit switches the data transfer mode to interlock. Interlock mode is used until the control unit detects a system reset or until the current volume is demounted.	1. Enter a temporary error in the OBR. 2. Write a console message DATA STREAMING ERROR. 3. Reissue the command.
22	**Path Equipment Check** The following errors cause this error code: • Drive adapter error. • Inability to recover from a buffer error on the lower interface. • Inability to use internal path (sense byte 2 identifies the path in error). • Inability to recover from an error detected during a cartridge index/load cycle on the cartridge loader. The cartridge is manually retrievable by the operator.	1. Enter a permanent record in the OBR. 2. Write a console message EQUIPMENT CHECK. 3. Use DDR (see "Dynamic Device Reconfiguration" on page MSG-22). or Signal a permanent error.
23	**Read Data Check** A permanent read error occurs, or a temporary read error occurs with one of the following conditions: • The controlling computer inhibits control-unit error recovery with Mode Set bit 7. • Tape synchronous mode is in effect. When a permanent error is indicated for ERPA code 23, the data read from the tape and sent to the controlling computer may not be correct.	1. Enter a permanent record in the OBR. 2. Write a console message DATA CHECK. 3. Use DDR (see "Dynamic Device Reconfiguration" on page MSG-22). or Signal a permanent error.
24	**Load Display Check** A Load Display command is issued for a device displaying a drive check code message.	1. Write a console message LOAD DISPLAY CHECK. 2. Signal a permanent error.
25	**Write Data Check** Buffered data cannot be written on the tape successfully. The subsystem ERP tries erase gaps and rewrites but cannot complete the write operation successfully. A permanent error occurs when trying to write data, an IBG, or a tape mark on the tape. All attempts to retry the operation are completed but they are not successful. A temporary write error occurs with one of the following conditions: • The controlling computer inhibits control-unit error recovery by Mode Set bit 7. • Tape synchronous mode is in effect.	1. Enter a permanent record in the OBR. 2. Write a console message DATA CHECK. 3. Use DDR (see "Dynamic Device Reconfiguration" on page MSG-22). or Signal a permanent error.
26	**Data Check (Read Opposite)** A read recovery is in progress, and a Read command (in the opposite direction) must be issued to the subsystem before the data can be recovered. If the command at channel command word (CCW) address pointer minus 8 is X'02' (Read Forward), issue X'0C' (Read Backward) chained to X'37' (Forward Space Block). If the command at CCW address pointer minus 8 is X'0C' (Read Backward), issue X'02' (Read Forward) chained to X'27' (Backward Space Block). **Notes:** 1. If the controlling computer cannot issue a command to the subsystem to read the block in the opposite direction, enter a permanent record in the OBR. 2. If the subsystem cannot complete the command to read the record in the opposite direction, issue a unit check. The associated sense information contains the ERPA code. 3. If a Read Backward command is issued for a 3480 XF format or 3480-2 XF format logical block with IDRC enabled, the format mode presented in sense byte 4 always indicates 3480 XF or 3480-2 XF format, as appropriate. If a Read Backward command is issued for a 3480 XF format with IDRC not enabled, the control unit presents unit status check with ERPA code 2E, Not Capable, indicated in the associated sense data.	1. Move the tape to the correct position, if necessary. 2. Issue a Read command in the opposite direction, followed by the appropriate Space Block command. 3. Resume processing. 4. If the read opposite recovery fails, enter a permanent record in the OBR and write a console message DATA CHECK.

Code	Description of Error	Error Recovery Action
27	**Command Reject** Command reject can occur for any of the following: • Invalid argument for a command • Command sequence error. • A DSE command is not chained to an erase gap command. • An Unidentified command.	1. Write a console message COMMAND REJECT. 2. Signal a permanent error.
28	**Write ID Mark Check** The ID mark cannot be written successfully at the beginning of tape. Any data to be written to the drive is still in the buffer.	1. Enter a permanent record in the OBR. 2. Write a console message WRITE ID CHECK. 3. Use DDR (see "Dynamic Device Reconfiguration" on page MSG-22). or Signal a permanent error.
29	**Function Incompatible** One of the following conditions occurs: • A Mode Set command is issued that specifies Improved Data Recording Capability and it is not enabled. • A Perform Subsystem Function command is issued that specifies a Pin order and the designated control unit is not online in the subsystem.	1. Write a console message FUNCTION INCOMPATIBLE. 2. Signal a permanent error.
2A	**Unsolicited Environmental Data** A statistical counter or an error counter in the buffered log overflows.	1. Enter a miscellaneous data record (MDR). 2. Reissue the command.
2B	**Environmental Data Present** A Rewind Unload command is completed successfully or a Read Buffered Log command is issued.	1. Enter a miscellaneous data record (MDR). 2. Resume the channel program at the next CCW or at the first CCW if no CCWs are processed.
2C	**Permanent Equipment Check** The control unit cannot recover because an error occurs in the subsystem hardware or microprogram. The control unit recovery action is unsuccessful.	1. Enter a permanent record in the OBR. 2. Write a console message EQUIPMENT CHECK. 3. Signal a permanent error.
2D	**Data Security Erase Failure** The drive becomes not-ready after the command is issued, or an error occurs while the command is processing.	1. Enter a permanent record in the OBR. 2. Write a console message DSE FAILURE. 3. Signal a permanent error.
2E	**Not Capable (BOT Error)** The control unit failed to detect a format identification mark at the beginning of tape and a Read command, other than a Locate Block command, is issued. The subsystem may fail to detect a valid format identification mark if the recorded format mark is inconsistent with tape length. **Note:** Unit check status is presented with associated sense data indicating ERPA code 2E, Not Capable, if the program issues a Read Forward or Read Backward Command for a logical block which is written in 3480 XF format and the Data Compaction and Auto-Blocking facility is not both installed and allowed.	1. Enter a permanent record in the OBR. 2. Write a console message NOT CAPABLE. 3. Use DDR (see "Dynamic Device Reconfiguration" on page MSG-22). or Signal a permanent error.
2F	**Reserved**	Not used

Code	Description of Error	Error Recovery Action
30	**Write Protected** A write-type operation is attempted on a tape cartridge that is file protected (physically or logically).	1. Write a console message FILE PROTECTED. 2. Use operator intervention to verify that the file protection is correct and, if correct, cancel the job. If the file protection is not correct, restart the job. 3. Signal a permanent error.
31	**Tape Void** No patterns or data are found on the tape during a read operation. The tape can be positioned after the last data block or tape mark that is written on the tape.	1. Enter a permanent record in the OBR. 2. Write a console message TAPE VOID. 3. Use DDR (see "Dynamic Device Reconfiguration" on page MSG-22). or Signal a permanent error.
32	**Tension Loss** An error causes the drive to lose tape tension.	1. Enter a permanent record in the OBR. 2. Write a console message TENSION LOSS. 3. Signal a permanent error.
33	**Load Failure** The cartridge is not inserted correctly, or the tape is not threaded correctly.	1. Write a console message INTERVENTION REQUIRED. 2. Write a second console message RELOAD CARTRIDGE. 3. Enter a temporary record in the OBR (at the first occurrence of the error only). 4. Reissue the command.
34	**Unload Failure** The drive cannot maintain tape tension and control tape movement during an unload operation.	1. Enter a temporary record in the OBR (at the first occurrence of the error only). 2. Write a console message INTERVENTION REQUIRED. 3. Write a second message UNLOAD CARTRIDGE. 4. Reissue the command.
35	**Drive Equipment Check** One of the following conditions occurs: • The control unit cannot recover from a drive detected error. • A check code message is displayed on the drive message display, and a Load Display command is issued (drive display is busy). • The cartridge loader does not respond across the interconnection to the tape drive. • The cartridge loader does not respond to an initial microprogram load (IML) correctly. • A failure occurs during an index/load or unload cycle. The tape cartridge is not manually retrievable by the operator.	1. Enter a permanent record in the OBR. 2. Write a console message EQUIPMENT CHECK. 3. Signal a permanent error.
36	**End of Data** The control unit detects an end-of-data mark while processing a Read or Space command. **Note:** End-of-data marks are only written by 3490 control units in 3480-2 XF format.	1. Enter a permanent record in the OBR. 2. Write a console message END OF DATA. 3. Signal a permanent error.
37	**Tape Length Error** The tape length in the cartridge is too short. The error occurs when the leader block is replaced (the length of tape ahead of the beginning of tape is trimmed).	1. Enter a permanent record in the OBR. 2. Write a console message TAPE LENGTH CHECK. 3. Signal a permanent error.

Code	Description of Error	Error Recovery Action
38	**Physical End of Tape** A read or write operation is processing when the physical end-of-tape pattern is reached. The drive does not pull the tape out of the cartridge.	1. Write a console message PHYSICAL END OF TAPE. 2. Signal a permanent error.
39	**Backward at BOT** The beginning-of-tape pattern is reached while moving the tape backward.	1. If the block ID is not zero, enter a permanent record in the OBR and write a console message EQUIPMENT CHECK. 2. If the block ID is zero, do not enter a record in the OBR and do not use DDR. 3. Signal a permanent error.
3A	**Drive Switched Not Ready** The Ready/Not Ready switch is set to the Not Ready position, and the command requires the device to be in the ready state.	If a command is issued to the drive: 1. Write a console message INTERVENTION REQUIRED. 2. Write a second console message MAKE DRIVE X READY. 3. Reissue the command when the drive is in the ready state.
3B	**Manual Rewind/Rewind-Unload** The Rewind Unload switch or the rewind switch on the drive is pressed, and the cartridge is rewound or unloaded.	If a command is issued to the drive: 1. Enter a permanent record in the OBR. 2. Write a console message UNLOAD ERROR. 3. Use DDR (see "Dynamic Device Reconfiguration" on page MSG-22). or Signal a permanent error.
3C–3F	**Reserved**	Not used
40	**Overrun** A data overrun between the channel and the control unit buffer occurs while processing a large block that does not fit in the buffer.	1. Write a console message OVERRUN. 2. Enter a permanent record in the OBR. 3. Use DDR (see "Dynamic Device Reconfiguration" on page MSG-22). or Signal a permanent error. 4. Operator intervention: If a 1.5 or 2.0 megabyte per second channel is being used, switch to an alternate 3 megabyte per second channel if the configuration allows it.
41	**Record Sequence Error** The control unit detects an incorrect block ID sequence.	1. Enter a permanent record in the OBR. 2. Write a console message SEQUENCE. 3. Signal a permanent error.
42	**Degraded Mode** A condition that can cause degraded subsystem performance is detected within the subsystem.	1. Enter a permanent record in the OBR. 2. Write a console message SUBSYSTEM IN DEGRADED MODE. 3. Reissue the command.
43	**Drive Not Ready** A Start I/O or Start Subchannel instruction is received by a drive that is not ready.	1. Write a console message INTERVENTION REQUIRED. 2. Write a second console message MAKE DRIVE X READY. 3. Reissue the command.
44	**Locate Block Unsuccessful** The control unit cannot find the block preceding the desired block.	1. Write a console message RECORD NOT FOUND. 2. Signal a permanent error.

Code	Description of Error	Error Recovery Action
45	**Drive Assigned Elsewhere** The drive is not assigned to the channel path on which the command was issued. It is assigned to a different channel path.	1. Write a console message DRIVE ASSIGNED ELSEWHERE. 2. Signal a permanent error.
46	**Drive Not Online** A command is issued to a drive that is not online in the subsystem: • The drive may be switched offline. • The drive power may be switched off. • The drive address may not be set correctly.	1. Write a console message DRIVE OFFLINE. 2. Signal a permanent error.
47	**Volume Fenced** The control unit develops an error that results in loss of volume integrity due to lost positioning or assignment.	1. Enter a permanent record in the OBR. 2. Write a console message VOLUME FENCED. 3. Signal a permanent error.
48	**Unsolicited Informational Data** The control unit generates a deferred unit check to report a channel adapter error.	1. Enter a temporary record in the OBR. 2. Reissue the command.
49	**Bus Out Check** The bus out parity error is detected on the command or parameter transfer.	1. Enter a permanent record in the OBR. 2. Write a console message BUS OUT CHECK. 3. Use DDR (see "Dynamic Device Reconfiguration" on page MSG-22). or Signal a permanent error.
4A	**Control Unit ERP Failed** The control unit is unsuccessful in an attempt to recover from a data-handling failure.	1. Enter a permanent record in the OBR. 2. Write a console message CONTROL UNIT ERP FAILED. 3. Signal a permanent error.
4B	**Control Unit and Drive Incompatible** The drive requests microprogram patches, but none is available.	1. Enter a permanent record in the OBR. 2. Write a console message CU/DRIVE INCOMPATIBLE. 3. Use DDR (see "Dynamic Device Reconfiguration" on page MSG-22).
4C	**Recovered Check-One Failure** The control unit develops a hardware error but is able to recover.	1. Enter a permanent record in the OBR. 2. Write a console message CU CHECK ONE ERROR. 3. Reissue the command.
4D	**Resetting Event** An event notification is pending for a device-path pair, and a command is issued that is eligible to receive this indication.	Invoke the resetting event recovery of the control program. **Note:** This code is a function of the operating system. Its responsibility is to: • Clear the interrupt. • Log the sense information. • Reissue the command that was presented the unit check.
4E	**Maximum Block Size Exceeded** A data block that exceeds the maximum block size allowed for buffered mode is sent to 3490. The data block is not written to tape.	1. Write a console message MAXIMUM BLOCK SIZE EXCEEDED. 2. Signal a permanent error.
4F	**Reserved**	Not used
50	**Read Buffered Log (Overflow)** A counter in buffered log data overflows while the control unit is operating in extended buffered log mode.	1. Issue a Read Buffered Log command (without inhibiting supervisor commands) to retrieve the buffered log data. 2. Reissue the command.

Code	Description of Error	Error Recovery Action
51	**Read Buffered Log (EOV)** End-of-volume (EOV) processing occurs while the control unit is operating in extended buffered log mode.	1. Issue a Read Buffered Log command (without inhibiting supervisor commands) to retrieve the buffered log data. 2. Reissue the command.
52	**End of Volume Complete** A Rewind Unload command is completed successfully.	Resume the channel program at the next CCW.
53	**Global Command Intercept** A global command is issued on a channel path associated with a path group when the global command intercept condition is active.	Reissue the command.
54	**Channel Interface Recovery (Temporary)** The channel requested channel-initiated entry or unit check. The unit check is appropriate for the request. The command in progress is reissued. An abnormal condition is detected that results in a device level error. The command retry is not appropriate. The command in progress is reissued.	1. Enter a temporary record in the OBR. 2. Reissue the command.
55	**Channel Interface Recovery (Permanent)** The channel requested channel-initiated entry or unit check. The unit check is appropriate for the request. The command in progress is not reissued. An abnormal condition is detected that results in a device level error. The command retry is not appropriate. The command in progress is not reissued.	1. Enter a permanent record in the OBR. 2. Write a console message CHANNEL INTERFACE ERROR. 3. Signal a permanent error.
56	**Channel Protocol Error** The channel stacks a command response on a parallel channel interface. A unit check is presented in ending status. A device level error is detected on an ESCON channel interface. An input-output operation is in progress for the device. A unit check is presented in ending status. A device level error is detected on an ESCON channel interface. No input-output operation is in progress for the device. A deferred unit check is generated for the device.	1. Enter a permanent record in the OBR. 2. Write a console message CHANNEL PROTOCOL ERROR. 3. Signal a permanent error.
57	**Attention Intercept** The control unit presents attention-intercept status to the host program.	1. Reissue the command. 2. Process the attention-intercept status as for the case of attention status. **Note:** The attention-intercept status is received as an unsolicited status condition in the absence of input-output activity or presented in initial status to the first command of a command chain.
58–59	**Reserved**	Not used
5A	**Tape Length Incompatible** On an 18-track write-capable drive, a unit check indicating ERA 5A is presented along with associated sense data, each time a command is issued to a drive loaded with an IBM Enhanced Capacity Cartridge System Tape or any tape that is too long. Tape that exceeds the length of IBM Cartridge System Tape could cause damage to either the tape or the drive, if processed to its Physical-End-Of-Tape.	1. Log a permanent record in the OBR. 2. Write a console message: TAPE LENGTH INCOMPATIBLE.
5B	**Format 3480 XF Incompatible** A cartridge with a 3480 format identification mark is loaded in a device that writes 3480-2 XF format and a Write command is received from the control program. **Notes:** 1. An error message is issued if the tape is not positioned to Beginning of Tape (BOT). 2. An error message is not issued if the tape is positioned to Beginning of Tape (BOT).	1. Enter a permanent record in the OBR. 2. Write a console message FORMAT INCOMPATIBLE 3480 XF. 3. Signal a permanent error.
5C	**Format 3480-2 XF Incompatible** A Read command is received from the control program and the device is not capable of reading 3480-2 XF format, that is, the device only reads or writes 3480 or 3480 XF format.	1. Enter a permanent record in the OBR. 2. Write a console message FORMAT INCOMPATIBLE 3480-2 XF. 3. Signal a permanent error.
5D	**Tape Length Violation** On a 36-track write-capable drive, a unit check indicating ERA 5D is presented along with associated sense data, when a tape that exceeds the length of an IBM Enhanced Capacity Cartridge System Tape is mounted. Tape that exceeds the length of IBM Enhanced Capacity Cartridge System Tape could cause damage to either the tape or the drive, if processed to its Physical-End-Of-Tape.	1. Log a permanent record in the OBR. 2. Write a console message: TAPE LENGTH VIOLATION 3. Signal a permanent error.
5E	**Compaction Algorithm Incompatible** The control unit generates a unit check whenever a compaction algorithm is read that is not supported by the subsystem.	1. Write a console message COMPACTION ALGORITHM INCOMPATIBLE 2. Signal a permanent error.
5F–FF	**Reserved**	Not used

Dynamic Device Reconfiguration

Dynamic device reconfiguration (DDR) allows the operator to move a tape cartridge from a failing tape drive to another tape drive without restarting the job. If DDR is not available, a permanent error indication is sent to the access method or user program.

If DDR is available in your controlling computer control program, use DDR to move the cartridge to a different tape drive. DDR action presumes the tape drive that indicated the error is suspect. To correctly save the data that may be in the control unit buffer, DDR must:

1. Save the CSW that indicated the original unit-check status bit for use in Step 6. The CSW shows where to resume the user's channel program.
2. Issue a succession of Read Buffer commands to recover write data from the buffer to the controlling computer main storage if the user's program was writing data when the error occurred.
3. Issue a Read Block ID command to identify the current tape position. If the error occurred while the tape was moving forward, the tape is positioned immediately ahead of the failing block. If the error occurred while the tape was moving backward, the tape is positioned immediately ahead of the failing block.
4. Issue a Locate Block command to position the tape correctly after the operator has moved the tape to a different tape drive.
5. Use the tape-write-immediate operation to write the data that was read in Step 2 on the tape cartridge that has been inserted in a different tape drive.

6. Continue with the user's channel program. If the program was being performed in buffered write, the user can continue with that type of operation. The address field of the CSW saved in Step 1 points to the place where the user's program can be resumed (plus eight). Data chaining may be taken into account when determining the actual location to restart the user's I/O command chain.

Permanent Error

The controlling computer builds an outboard recorder (OBR) for logging and sends an appropriate operator message to the console.

Operator Intervention

The operator must perform some manual action, such as moving a tape, to resume processing on the subsystem.

Resume Processing

The channel program resumes processing at the point of interruption after the system control program has performed any required action. No error signal is sent to the user, or the channel program resumes processing at the command following the command that was in error. In this instance, the channel status word (CSW) address field contains the address of the next command if command chaining was specified in the command in error and data chaining was not specified.

The controlling computer program analyzes the channel command words (CCWs) when the program is to resume processing at a command beyond the failing CCW. Data-chained CCWs must be taken into consideration when determining the actual location for the program to resume processing.

When a read recovery is in progress and a read-opposite command must be issued to the subsystem before the data can be recovered, the command at CCW address pointer minus 8 shows the direction of the original command.

If the command is X'02', issue Read Backward (X'0C') command-chained to a Forward Space Block command.

If the command is X'0C', issue Read Forward (X'02') command-chained to a Backward Space Block command.

If the read-opposite recovery is not successful, the tape stays at the position pointed to by the CCW address when the original error occurred—not the CCW address minus 8.

Error Handling

The more extensive error checking in the 3480 subsystem permits better detection of and recovery from various types of errors. The value of sense byte 2 bit 7 should be saved until the controlling computer finishes its error recovery procedure actions.

Errors can occur in either read or write operations and either before or after data blocks are read and written. During error recovery, the controlling computer must be able to identify the exact physical position of the tape relative to the read/write head. The Tape Positioning Indicator is saved immediately after a unit check. The controlling computer determines whether the value in the block ID argument of the Locate Block command should be altered before performing a Backspace Block, Locate Block ID, or other command in response to recoverable errors that usually lead to DDR. The block ID is given in the sense data or in the result of a Read Block ID command. The operation that was tried affects the interpretation of the value of sense byte 2 bit 7.

Generally, when sense byte 2 bit 7 is set to 0, the block ID in the sense data (or obtained in response to a Read Block ID command) can be used to move the tape into position by performing a Locate Block command. When sense byte 2 bit 7 is set to 1, the block ID is offset by plus or minus 1.

The offset of the block ID aids the controlling computer error recovery procedures; that is, the controlling computer uses the dynamic device reconfiguration (DDR) action to move the tape cartridge to another drive. The controlling computer issues a Locate Block ID command to the tape drive after the cartridge has been moved. The Tape Positioning Indicator (sense byte 2 bit 7) permits the controlling computer to adjust the argument in the Locate Block ID command. Therefore, the user's channel command does not have to be changed, nor must the controlling computer issue any channel commands (Forward Space Block, Backward Space File, and so forth) to move the tape into position before resuming the user's channel program.

Buffered Read Forward Operations

When an error occurs during a read forward operation (sense byte 2 bit 7 is 0), the block ID in sense bytes 4 through 6 (or the block ID in sense bytes 0 through 3 obtained by performing a Read Block ID command) identifies the data block or file mark that the controlling computer was trying to read. The block ID, when used as an argument in a Locate Block ID command issued after the cartridge is moved, causes the tape to be positioned correctly for reissuing the channel command that could not be performed. When sense byte 2 bit 7 is 1, the block ID identified is one higher than the data block or file mark that the controlling computer was trying to read. Therefore, the value of 1 should be subtracted from the block ID in sense bytes 4 through 6 or sense bytes 0 through 3. The value remaining after subtracting 1 from the block ID is the value that should be used as the argument in a Locate Block ID command issued after the cartridge is moved.

Buffered Read Backward Operations

When the error occurred during a read backward operation (sense byte 2 bit 7 is 0), the block ID in sense bytes 4 through 6 or sense bytes 0 through 3 identifies the data block or file mark that the controlling computer was going to read backward next. The block ID is used as the argument in a Locate Block ID command issued after the cartridge is moved to move the tape to the correct position for reissuing the Read Backward channel command.

Buffered Write Operations

During buffered write operations, sense byte 2 bit 7 is not set. The block ID identifies the area on tape where the data block or file mark should have been written. When the control unit determines that the data cannot be written on the tape, the controlling computer performs a Read Buffer command to retrieve the buffered data. After the cartridge is moved as a dynamic device reconfiguration (DDR) action, the controlling computer issues a Read Block ID command using the block ID as the argument to move the tape to the correct position to perform the reissued write channel command.

Tape-Write-Immediate Mode Operations

When sense byte 2 bit 7 is 0, the block ID identifies the area of tape where the data block or file mark should have been written. When sense byte 2 bit 7 is 1, part of the data was written on the tape, and the tape moved to a position beyond the beginning of the block ID. The value remaining after subtracting 1 from the block ID is the value that should be used as the argument in a Locate Block ID command issued after the cartridge is moved. Therefore, a 1 should be subtracted from the block ID and the remaining value used as the argument in a Locate Block ID command issued after the cartridge has been moved to move the tape to the correct position.

Volume Fencing

When a condition results in a volume integrity exposure, the control unit will prevent further access to the volume. This process is called Volume Fencing and is primarily related to loss of buffered write data, tape positioning, or assignment protection.

The control unit prevents further access to the tape volume by conditioning itself to generate deferred unit checks with associated sense data indicating ERPA code 47, Volume Fenced, for all commands that are eligible to receive the deferred unit check until the condition is reset or until the cartridge is unloaded. The condition that caused the fencing to occur has already been indicated by the previous unit check and associated sense data.

System Recovery Action for Channel Control Check or Interface Control Check.

When a channel control check or an interface control check occurs, the system program determines if the error should be retried. If it can be retried, the program determines where, during the operation, the error occurred.

Errors That Cannot Be Retried.

Some errors cannot be retried because of the command or other conditions at the time of the error. Some of the reasons that errors cannot be retried are:

- The error has already been retried once.
- Intercept is on (this error is caused by a previous I/O error).
- The error is on a Test I/O.
- The error is on a Halt I/O.
- Retry is not allowed (the no retry bit is on).
- The SIO and interrupt bits are both on.
- The SIO and interrupt bits are both off.
- The SIO bit is on and unit status is invalid.
- The SIO bit is on and the command address is invalid.
- The SIO bit is on and the channel address is invalid.
- Both command and data chaining are used.
- CSW unit check and sense byte 3 are not equal to one of the following:

  26, 2A, 2B, 32, 33, 34, 3A, 41, 42, or 43.

  (Definition of sense byte 3 can be found on page SENSE 15.)

When the error cannot be retried, the system program performs the following actions:

1. System pointers are reset.
2. A permanent error is posted.
3. A permanent error message is generated.
4. If the error is an intercepted error, change the error code from X'7E' to X'44'.

Errors That Can Be Retried

Errors that can be retried are treated differently, depending on the command. The commands and the conditions examined for a retry are listed below:

For Read, Write, ERG, WTM, Read Buffer, Locate Block, Read Buffered Log, or any Space command.

These conditions are tested and may be retried.

- Interface disconnect and command out sent.
- Stop, stack, normal termination, and command out sent.
- Selective reset and command out sent.

For Read Block ID, Sense, Sense I/O, Sense Path, Assign, Unassign,

Control Access, Load Display, Mode-set, or Set Path

(Data transfer commands with no tape motion):

These conditions are tested and may be retried.

- Interface disconnect and command out sent.
- Interface disconnect and no data transfer.
- Interface disconnect and some data transferred.
- Stop, stack, normal termination and command out sent.
- Interface disconnect and some data transferred.
- Stop, stack, normal termination and command out sent.
- Stop, stack, normal termination and no data transfer.
- Stop, stack, normal termination and some data transferred.
- Selective reset and command out sent.
- Selective reset and no data transferred.
- Selective reset and some data transferred.

For Rewind, RUN, Synchronize, DSE, Suspend, NOP, Old Mode-sets, LWR, and TIE (Non-data-transfer commands):

These conditions are tested and may be retried.

- Interface disconnect and command out sent.
- Interface disconnect and no data transfer.
- Stop, stack, normal termination, and command out sent.
- Stop, stack, normal termination, and no data transferred.
- Selective reset and command out sent.
- Selective reset and no data transferred.

When one of the above error conditions is found, the system program retries the failing CCW one time.

System Recovery Action for Channel Data Checks or Chaining Checks

If command chaining and data chaining is used, or the SIO condition code is 1:

- Indicate a permanent error.
- Generate a permanent error message.
- Log the EREP OBR record.

If Unit Check is not on and the command is a read, read backward, or write:

- Reposition the tape and retry the failing CCW.
- Read commands are retried six times.
- Write commands are retried eleven times.

If Unit Check is on and Bus Out Check (ERPA = 49) is on:

- Reposition the tape and retry the failing CCW.
- Read commands are retried six times
- Write commands are retried eleven times.

If Unit Check is on and the command is not a read or write:

- Retry the failing CCW once.

System Recovery Action for Channel Protection Checks or Channel Program Checks.

- Indicate a permanent error 41 unless the ERPA is 4A, then indicate a permanent error 4B.
- Generate a permanent error message.
- Log the EREP OBR record.

Tape Report Description

The following section describes the format and content of the 3480 tape reports produced by release 2.2 of EREP. All 3480 tape subsystem reports should be run daily. Use of data more than three days old may result in improper diagnosis of errors and exception codes. Shared device control cards are required for 3480 tape systems operating on multiple CPUs. See the following manuals for more information on the use of EREP:

- *OS/VS REL2 SYS1.LOGREC Error Recording Manual*, GC28-0638
- *OS/VS1 REL3 SYS1.LOGREC Error Recording Manual*, GC28-0668
- *OS/VS1 REL3 SYS1.LOGREC Error Recording Logic*, SY28-0669
- *OS/VS Environmental Recording Editing and Printing (EREP) Program*, GC28-0772
- *OS/VS Environmental Recording Editing and Printing (EREP) Program Logic (SU 1)*, SY28-0773
- *OS/VS Independent component: Environmental Recording Editing and Printing (EREP) Program system information (SU 1)*, GC38-1045
- *OS/VS, DOS/VSE, VM/370 Environmental Recording Editing and Printing (EREP) Program*, GC28-0772
- *Environmental Record Editing and Printing Program (EREP) User's Guide and Reference*, GA28-1378

All of the following reports except those listed as "Other Useful Reports" on this page are generated by inserting SYSEXN in the JCL selection parameters for EREP (see the referenced manuals for detailed information).

Subsystem Exception Report

The purpose of this report is to determine whether the 3480 tape subsystem has permanent errors and if the subsystem is operating within limits that are acceptable to the user. The user specifies "limit" controls for both the hardware and the tape volumes, which prevent temporary errors from being printed if they are within the specified limit. If corrective action is to be taken, failure details will be found in the various types of reports in this section.

When no limits are specified, only permanent errors will appear on the exception report. Exceptions are ranked by severity and error rate, based on accumulated statistics.

All the errors will be listed by the Channel Unit Address (CUA) for hardware errors and the Volume Identifier (VOLID) for volume errors.

The errors will be listed by the Channel Unit Address (CUA) unless the errors occur on the same volume identifier (VOLID) on at least two different drive addresses, and in that case, the errors will be listed by volume identifier (VOLID).

For example, write errors on drives 280 and 380 would be listed separately under hardware for address 280 and 380 or write errors for volume identifier SSB001, occurring on drives 280 and 281 would be listed separately under volume by VOLID SSB001.

For an example of the 3480 Subsystem Exception Report Tape, and a listing of field definitions, see MSG 200.

Refer to MSG 105 for limit setting procedures.

Forced Error Logging/Permanent Error Summary Report

The Forced Error Logging report is generated whenever an intermittent error occurs and the MD sets the Forced Error Logging bit.

The Permanent Error Summary contains all permanent errors that have occurred.

Both reports list the errors by Channel Unit Address (CUA) for hardware errors and by Volume Identifier (VOLID) for volume errors.

The errors will be listed by the Channel Unit Address (CUA) unless the errors occur on the same volume identifier (VOLID) on at least two different drive addresses, and in that case, the errors will be listed by volume identifier (VOLID).

For example, write errors on drives 280 and 380 would be listed separately under hardware for address 280 and 380 or write errors for volume identifier SSB001, occurring on drives 280 and 281 would be listed separately under volume by VOLID SSB001.

For an example of the 3480 Forced Error Logging/Permanent Error Summary, and a listing of field definitions, see MSG 205.

3480 Temporary Error Summary Report

All temporary error statistics are shown. Limit controls do not affect this report. All temporary errors are listed by Channel Unit Address (CUA).

For an example of the 3480 Temporary Error Summary, and a listing of field definitions, see MSG 210.

Volume Statistics Report

All activity is shown for each volume that is listed as an exception on the Tape Subsystem Exception Report. This includes volumes that have permanent errors or have exceeded the volume temporary error limits. If a volume does not exceed the limits for the Tape Subsystem Exception Report, its statistics are not listed. Entries are grouped by VOLID and are listed in chronological order.

For an example of the 3480 Volume Statistics Report, and a listing of field definitions, see MSG 215.

Error Code Summary Report

The error code summary report will provide a summary of all error codes logged, and will be listed by CUA.

For an example of the 3480 Error Code Summary Report, and a listing of field definitions, see MSG 225.

Other Useful Reports

The following are other useful EREP reports. Details and examples of these reports are found in the "Environmental Record and Editing and Printing Program (EREP) Users's Guide and Reference, GA28-1378."

OBR Edit Report

The OBR Edit Report is generated by inserting PRINT=PS in the JCL selection parameters for EREP (see the reference manual for detailed information).

The Outboard Record (OBR) Edit Report will be a detailed report of each OBR record logged against a control unit address (CUA).

For an example of the 3480 OBR Edit Report, and a listing of field definitions, see MSG 230.

Event History Report

The Event History Report is generated by inserting EVENT in the JCL selection parameters for EREP (see the reference manual for detailed information).

The Event History Report provides a chronological list of all select activity and units on the host system.

Trends Report

The Trends Report is generated by inserting TRENDS in the JCL selection parameters for EREP (see the reference manual for detailed information).

The Trends Report provides a chronological list of all error data in Julian date for all selected units on the host system.

Tape Report Description

The following section describes the format and content of the 3480 tape reports produced by release 2.2 of EREP. All 3480 tape subsystem reports should be run daily. Use of data more than three days old may result in improper diagnosis of errors and exception codes. Shared device control cards are required for 3480 tape systems operating on multiple CPUs. See the following manuals for more information on the use of EREP:

- *OS/VS REL2 SYS1.LOGREC Error Recording Manual*, GC28-0638
- *OS/VS1 REL3 SYS1.LOGREC Error Recording Manual*, GC28-0668
- *OS/VS1 REL3 SYS1.LOGREC Error Recording Logic*, SY28-0669
- *OS/VS Environmental Recording Editing and Printing (EREP) Program*, GC28-0772
- *OS/VS Environmental Recording Editing and Printing (EREP) Program Logic (SU 1)*, SY28-0773
- *OS/VS Independent component: Environmental Recording Editing and Printing (EREP) Program system information (SU 1)*, GC38-1045
- *OS/VS, DOS/VSE, VM/370 Environmental Recording Editing and Printing (EREP) Program*, GC28-0772
- *Environmental Record Editing and Printing Program (EREP) User's Guide and Reference*, GA28-1378

All of the following reports except those listed as "Other Useful Reports" on this page are generated by inserting SYSEXN in the JCL selection parameters for EREP (see the referenced manuals for detailed information).

Subsystem Exception Report

The purpose of this report is to determine whether the 3480 tape subsystem has permanent errors and if the subsystem is operating within limits that are acceptable to the user. The user specifies "limit" controls for both the hardware and the tape volumes, which prevent temporary errors from being printed if they are within the specified limit. If corrective action is to be taken, failure details will be found in the various types of reports in this section.

When no limits are specified, only permanent errors will appear on the exception report. Exceptions are ranked by severity and error rate, based on accumulated statistics.

All the errors will be listed by the Channel Unit Address (CUA) for hardware errors and the Volume Identifier (VOLID) for volume errors.

The errors will be listed by the Channel Unit Address (CUA) unless the errors occur on the same volume identifier (VOLID) on at least two different drive addresses, and in that case, the errors will be listed by volume identifier (VOLID).

For example, write errors on drives 280 and 380 would be listed separately under hardware for address 280 and 380 or write errors for volume identifier SSB001, occurring on drives 280 and 281 would be listed separately under volume by VOLID SSB001.

For an example of the 3480 Subsystem Exception Report Tape, and a listing of field definitions, see MSG 200.

Refer to MSG 105 for limit setting procedures.

Forced Error Logging/Permanent Error Summary Report

The Forced Error Logging report is generated whenever an intermittent error occurs and the MD sets the Forced Error Logging bit.

The Permanent Error Summary contains all permanent errors that have occurred.

Both reports list the errors by Channel Unit Address (CUA) for hardware errors and by Volume Identifier (VOLID) for volume errors.

The errors will be listed by the Channel Unit Address (CUA) unless the errors occur on the same volume identifier (VOLID) on at least two different drive addresses, and in that case, the errors will be listed by volume identifier (VOLID).

For example, write errors on drives 280 and 380 would be listed separately under hardware for address 280 and 380 or write errors for volume identifier SSB001, occurring on drives 280 and 281 would be listed separately under volume by VOLID SSB001.

For an example of the 3480 Forced Error Logging/Permanent Error Summary, and a listing of field definitions, see MSG 205.

3480 Temporary Error Summary Report

All temporary error statistics are shown. Limit controls do not affect this report. All temporary errors are listed by Channel Unit Address (CUA).

For an example of the 3480 Temporary Error Summary, and a listing of field definitions, see MSG 210 thru 213 .

Volume Statistics Report

All activity is shown for each volume that is listed as an exception on the Tape Subsystem Exception Report. This includes volumes that have permanent errors or have exceeded the volume temporary error limits. If a volume does not exceed the limits for the Tape Subsystem Exception Report, its statistics are not listed. Entries are grouped by VOLID and are listed in chronological order.

For an example of the 3480 Volume Statistics Report, and a listing of field definitions, see MSG 215.

Error Code Summary Report

The error code summary report will provide a summary of all error codes logged, and will be listed by CUA.

For an example of the 3480 Error Code Summary Report, and a listing of field definitions, see MSG 226.

Other Useful Reports

The following are other useful EREP reports. Details and examples of these reports are found in the "Environmental Record and Editing and Printing Program (EREP) Users's Guide and Reference, GA28-1378."

OBR Edit Report

The OBR Edit Report is generated by inserting PRINT=PS in the JCL selection parameters for EREP (see the reference manual for detailed information).

The Outboard Record (OBR) Edit Report will be a detailed report of each OBR record logged against a control unit address (CUA).

For an example of the 3480 OBR Edit Report, and a listing of field definitions, see MSG 230.

Event History Report

The Event History Report is generated by inserting EVENT in the JCL selection parameters for EREP (see the reference manual for detailed information).

The Event History Report provides a chronological list of all select activity and units on the host system.

Trends Report

The Trends Report is generated by inserting TRENDS in the JCL selection parameters for EREP (see the reference manual for detailed information).

The Trends Report provides a chronological list of all error data in Julian date for all selected units on the host system.

0 0 0 0 0 0 0 0 0 0

Limit Controls

Limit controls are used to specify the point when temporary errors begin to be reported on the Subsystem Exception Report (see MSG 200). Limit controls are limits set on the megabytes per error rate and the count of errors for the following errors:

- Temporary hardware write
- Temporary hardware read
- Temporary volume write
- Temporary volume read.

If the limit controls are set, temporary errors are not reported on the Subsystem Exception Report until the following conditions specified by the limit controls are met:

- The temporary error megabytes processed per error rate is less than the specified megabytes per error limit.
- The number of errors that occur are more than the number specified by the count limit.

If the limit controls are not set, no temporary errors are reported on the Subsystem Exception Report.

Determining the Limits

The limits are determined by you and the customer through analysis of the Temporary Error Summary Report to:

- establish an acceptable temporary error rate for normal account operation

and

- indicate when corrective action is needed.

Use the following procedure to determine the limits:

1. As a starting point, set the limits as follows:
   - HW3480=500 (5) = Hardware Write Limit
   - HR3480=999 (1) = Hardware Read Limit
   - VW3480=040 (3) = Volume Write Limit
   - VR3480=200 (1) = Volume Read Limit.
2. Allow the subsystem to operate for 30 days with the limits as set in step 1. After the 30 days have passed, review the limit requirements for the account. If adjustments are needed, follow these steps:
   a. Analyze the Temporary Error Summary Report to identify the actual account error conditions. Use the actual account error conditions to establish limits that are acceptable to the customer for normal account operation in the next step.
   b. Determine the number of megabytes per error and the number of times that the error can occur before the error is reported on the Subsystem Exception Report for the following errors:
      - Temporary hardware write
      - Temporary hardware read
      - Temporary volume write
      - Temporary volume read.

After you have determined the limits for normal account operation it may be necessary to adjust the limits by a variable factor (such as 10%) to meet the needs of the account.

Setting the Limit Controls

Limit controls are set by limit control cards. There are two limit control cards; one is used to set the temporary hardware write and read limits and the other to set the temporary volume write and read limits. The limit control can be either punched card or terminal input. The following is a description of the keyword parameters for the 3480 limit control cards. For detailed procedures on limit control cards see *OS/VS, DOS/VSE, VM/370 Environmental Recording Editing and Printing (EREP) Program,* GC28-1178.

- LIMIT 3480,HW3480=XXX(CT),HR3480=XXX(CT)
- LIMIT 3480,VW3480=XXX(CT),VR3480=XXX(CT).
- HW3480=XXX(CT) = Hardware Write Limit
- HR3480=XXX(CT) = Hardware Read Limit
- VW3480=XXX(CT) = Volume Write Limit
- VR3480=XXX(CT) = Volume Read Limit.

Definition of XXX and CT

- **XXX** is a decimal value from 1 to 999 that defines the limit for the number of megabytes per error.
- **Count Limit (CT)** is a decimal value from 1 to 99 that defines the limit for the number of times an error needs to occur (with the exception of the "Volume or Creating Drive Permanent Read or Write Errors on More Than One Drive" which defaults to one).
- **XXX and CT** define the temporary error limits. If the number of megabytes processed per error is less than the number of megabytes specified by XXX and the number of times the error occurs is more than the number specified by CT the error will be reported on the Subsystem Exception Report.

For example:

If you wanted the Subsystem Exception Report to report hardware temporary read errors only when the megabytes read per error are less than 75 megabytes per error and only when the errors occur at least five times, the hardware read limit control card would be set as follows:

HR3480=075(5) where XXX=075 and CT=5

With this setting for a given reporting period:

- If temporary read errors were occurring at a rate of 50 megabytes per error and 15 errors occurred, the errors would be reported on the Subsystem Exception Report.
- If temporary read errors were occurring at a rate of 50 megabytes per error and 4 errors occurred, the errors would not be reported on the Subsystem Exception Report.
- If temporary read errors were occurring at a rate of 100 megabytes per error and 10 errors occurred, the errors would not be reported on the Subsystem Exception Report.

If only a hardware read (HR) limit is specified, the volume read (VR) limit will default to the values used for the hardware read (HR) limit.

For example: Assume that the following limits were specified for a 3480. Note that the volume read (VR) limit is not specified.

- LIMIT 3480,HW3480=003(15),HR3480=001(02)
- LIMIT 3480,VW3480-003(15).

In this example, the unspecified volume read (VR) limit would default to the hardware read (HR) limit of 001(02).

If only a hardware write (HW) limit is specified, the volume write (VW) limit will default to the values used for the hardware write (HW) limit.

If only a volume read (VR) limit is specified, the hardware read (HR) limit will default to the values used for the volume read (VR) limit.

For example: Assume that the following limits were specified for a 3480. Note that the hardware read (HR) limit is not specified.

- LIMIT 3480,HW3480=005(15)
- LIMIT 3480,VW3480=001(02)VR3480=003(15).

In this example, the unspecified hardware read (HR) limit would default to the volume read (VR) limit of 003(15).

If only a volume write (VW) limit is specified, the hardware write (HW) limit will default to the values used for the volume write (VW) limit.

Subsystem Exception Report

The purpose of this report is to determine whether the 3480 tape subsystem has had permanent errors and if the subsystem has been operating within limits that are acceptable to the user. The user specifies "limit" controls for both the hardware and the tape volumes. These limits prevent the printing of temporary errors if the number of temporary errors detected is within the specified limits. If corrective action is to be taken, failure details can be found in the various reports in this section.

When no limits are specified, only permanent errors will appear on the exception report. Exceptions are ranked by severity and error rate, based on accumulated statistics.

All errors shown are for the period 1 indicated. Refer to MSG 105 for limit setting procedures.

```
3480 EXCEPTION                                  1 REPORT DATE  063 86
    TAPE                                          PERIOD FROM  049 86
                                                        TO     052 86

                                          TEMP WRT(CT)    TEMP RD(CT)
2 CURRENT LIMITS              HARDWARE        999  5          999  1
  MBYTES/ERR                  VOLUME           40  3          200  1
```

3 EXCEPTION	4 VOLUME SERIAL	5 DEVNO /CUA	6 CPU	7 EQU CHK	8 ----MB/ERR PERM---- READ(CT)		WRITE(CT)		9 ----MB/ERR TEMP---- WRITE(CT)		READ(CT)		10 BUS OUT	11 OVR RUN	12 TOTAL - MBYTES READ	WRITE	13 HDR SER
HARDWARE																	
PERMANENT ERROR																	
		5A3	E	1	0	0	0	0	1339	1	0	0	0	0	3249	1339	
		5A7	E	0	0	0	0	0	0	0	0	0	0	0	3985	1160	
HARDWARE																	
FAILED TEMPORARY READ OR WRITE LIMITS																	
		5BC	E	0	0	0	0	0	0	0	428	1	0	0	428	1	
VOLUME OR CREATING DRIVE																	
PERMANENT READ OR WRITE ERRORS ON MORE THAN ONE DRIVE																	
	L30570	5A5	F	1	0	0	3	1	0	0	0	0	0	0	0	3	00000
	L27530	5A2	E	0	0	0	5	1	0	0	0	0	0	0	0	5	00000
VOLUME OR CREATING DRIVE																	
FAILED TEMPORARY READ OR WRITE LIMITS ON MORE THAN ONE DRIVE																	
	L70630	5A4	F	0	0	0	0	0	0	12	0	0	0	0	0	0	00000
	L72930	5B2	F	0	0	0	0	0	0	0	39	1	0	0	39	0	00000
VOLUME																	
FAILED TEMPORARY READ OR WRITE LIMITS																	
	B42750	5BC	E	0	0	0	0	0	0	0	0	1	0	0	0	0	
	B07146	5A2	E	0	0	0	0	0	0	0	73	1	0	0	73	73	

```
                                                          16
TOTAL NUMBER OF DRIVES FAILING LIMITS   004 (20%)     TOTAL NUMBER OF  VOLUMES USED   = 823
                       PASSING LIMITS   016 (80%)      TOTAL NUMBER OF VOLUMES LISTED =   6

14 CPU  MODEL SERIAL NUMBER
    E   3081      210819
    F   3081      010819
```


0 0 0 0 0 0 0 0 0 0

Field Definitions

Report Date, Period From, Period To 1

REPORT DATE is the Julian date the report ran.

PERIOD FROM is the Julian date of the earliest record.

PERIOD TO is the Julian date of the latest record.

Current Limits, Mbytes/Err 2

CURRENT LIMITS and megabytes/error for both the hardware and the volume are the limit values from the limit control cards. See MSG 105 for more information on setting limit controls.

Exception 3

There are five exception categories:

- **Hardware Permanent Error**

  All CUAs with a tape permanent error are listed, or there are read/write errors on more than one drive not identified by a common volume identifier. Details of the permanent errors are found on the Tape Permanent Error Summary report. When the CUA has an X as the last digit, sense bytes 16-17 have indicated a control unit failure.

- **Hardware Failed Temporary Read or Write Limits**

  All CUAs that had an error rate equal to, or exceeding, the specified limits are shown (but are not identified by a common volume identifier). Use the Temporary Error Summary report and the Volume Statistics Summary report to get more details.

- **Volume or Creating Drive Permanent Read or Write Errors on More Than One Drive**

  The indicated volume had permanent errors on more than one drive. The volume may have been written (created) on one drive and had read errors detected on another drive. Use the Permanent Error Summary report and the Volume Statistics Summary report to get more details.

- **Volume or Creating Drive Failed Temporary Read or Write Limits on More Than One Drive**

  The indicated volume had an error rate equal to or exceeding the specified limit on more than one drive. The volume may have been written (created) on one drive and had read errors detected on another drive. Use the Temporary Error Summary report and the Volume Statistics Summary report to get more details.

- Volume Failed Temporary Read or Write Limits

  The indicated volumes had an error rate equal to, or exceeding, the specified volume limits as shown. Use the Temporary Error Summary report and the Volume Statistics report to get more details.

Volume Serial 4 is the volume serial number.

DEVNO/CUA 5 is the device number in XA mode or the primary control unit address (PCUA). The message may refer to a condition that occurred on an alternate CU path. (See START 400 to determine the actual path.)

CPU 6 identifies the host processor reporting the exception, and is shown as a value of A thru H. The actual CPU model and serial number are shown at the bottom of the report 14.

EQU CHK 7 is the number of equipment checks that have occurred.

MB/ERR PERM 8

READ is the average number of megabytes read per permanent read error.

CT is the number of permanent read errors that have occurred.

WRITE is the average number of megabytes written per permanent write error.

CT is the number of permanent write errors that have occurred.

MB/ERR TEMP 9

WRITE is the average number of megabytes written per temporary write error.

CT is the number of temporary write errors that have occurred.

READ is the average number megabytes read per temporary read error.

CT is the number of temporary read errors that have occurred.

BUS OUT 10 is the number of bus out checks that have occurred.

OVR RUN 11 is the number of overruns that have occurred.

Total-MBYTES 12

READ is the total number of megabytes read.

WRITE is the total number of megabytes written.

HDR SER 13 is the header serial number on the tape volume. The header number is derived from the last 4 digits of the control unit serial number that wrote the volume, with the drive address added to the last position.

For example:

Header serial is 3892F.

The last 4 digits of control unit serial number are 3892.

Drive address is F.

CPU, MODEL, SERIAL NUMBER 14 further identifies the CPU 6 listed in the error summary lines of the report.

TOTAL NUMBER OF DRIVES ON REPORT, NOT ON REPORT 15

DRIVES ON REPORT lists the number and the percentage of drives that exceeded the limit controls for temporary errors, and lists all drives that had permanent errors.

DRIVES NOT ON REPORT lists the number and the percentage of drives that were within the limit controls for temporary errors, and had no permanent errors.

TOTAL VOLUMES USED/LISTED 16

VOLUMES USED is the number of volumes used during the report period that did not exceed the limit controls for temporary errors and had no permanent errors.

LISTED is the number of volumes used during the report period that exceeded the limit control values for temporary errors and all volumes that had permanent errors.

Forced Error Log/Permanent Error Summary Reports (EREP 3.1.1)

Both types of reports have the same format. The only difference is the heading, one titled Permanent Error Summary, the other Forced Error Log.

All errors are listed by channel unit address (CUA) for hardware errors and by volume identifier (VOLID) for suspected volume errors.

The errors are listed by the channel unit address (CUA) unless the errors occur on the same volume identifier (VOLID) on at least two different drive addresses, and in that case, the errors are listed by volume identifier (VOLID).

All errors are for the report period indicated **1**.

Notes:

1. The Forced Error Log report is generated only when the MD has set the forced error logging bit. In this case temporary errors, (FMT 19) are presented with sense data the same as permanent errors (FMT 20).

2. Sense byte 7 on the Forced Error Log report will be 19 to indicate format 19 sense. Sense byte 7 on the Permanent Error Summary report will be 20 to indicate format 20 sense.

Forced Error Log/Permanent Error Summary Example

```
                                                   [1]REPORT DATE 063 86
                                                      PERIOD FROM 049 86                 [10]
                                                             TO   052 86
                                                      ┌─────────────────────────────────────────────────────────────────┐
**** HARDWARE ****                                                                1    1    1    1    1    2    2    2    2    2    3
       [4]                       [8]     [17] [18]
[2] [3] C  [5]  [6]        [7]   R  [9] SENSE BYTES--> 0    2    4    6    8    0[11]2[12]4[13]6[14]8    0[15]2[16]4    6    8    0
CHP DEVNO P       TIME           W       CCW SCSW64-95                             -------CU----------       ---DR----           CU
-ID /CUA  U DTE HHMMSS   VOLID   E CMD FLG /CSW32-63                               ERR1 ERR2 ERRL  HW        ERR1 ERR2            SER#

 22  5A3  E 051 192213 B35790 E  01  64 060079E0  1044 394A 0000 2C20 0000 7151 7607 CCBB D708 0002 0000 0000 F680 0CE1 0813 3319
 06  5A4  F 051 214532        0  00  00 26000000  4048 3934 0000 0020 730C 8E06 0000 0000 0000 0002 192C 0000 F680 0CE1 0813 4419
 22  5A7  E 051 221637 TAPENO 0  02  44 06000050  0049 402E 0000 0020 0000 7161 7161 7161 0000 0002 0000 0000 F680 0CE1 0813 7700

**** VOLUME OR CREATING DRIVE ****

     5A5  F 051 190322 L30570 W  01  64 0E007FF8  0A44 7025 0007 3F20 0000 7404 7401 7407 D007 0002 0000 0000 F680 0CE1 0819 5519
     5A2  E 051 203122 L27530 W  01  64 06002090  0A44 3025 000C C620 0000 7401 7407 7401 D002 0002 0000 0000 F680 09E1 0813 2219
     5B2  F 051 183221 L30570 W  01  64 0E007FF8  0A44 7025 0007 3F20 0000 7405 7405 7407 D012 0002 0000 0000 F680 0CE1 0819 2219

**** OPERATOR OR OPERATIONAL ****

 06  5A3  E 051 205124 M11047 0  01  64 0E002B63  4244 783B 0001 BF20 0000 8202 0000 0000 0000 0002 0000 0000 F680 0CE1 0819 3319


CPU  MODEL  SERIAL NUMBER
 E    3081     210819
 F    3081     010819


                                                                                              [10]
3480 FORCED LOG REPORT                                                          ┌────────────────────────────────────────────┐
                                                                                1[11]1[12]1[13]1[14]1    2[15]2[16]2    2    2    3
           C                    R   SENSE BYTES---> 0    2    4    6          0    2    4    6    8    0    2    4    6    8    0
CHP DEVNO P                     W        CCW SCSW64-95                        --------CU---------       ---DR----            CU
-ID /CUA  U DTE  TIME   VOLID   E CMD  FLG /CSW32-63                          FC-1 FC-2 FC-L HWFC       FC-1 FC-2            SER#

 06  05B3 F 051 192536 B04012 0  01  64   00000000  0244 6048 000F 5619 0000 7401 7401 0000 D002 0002 0000 0000 F680 0CE1 1249 330E

 06  05BB F 051 155433 TAPENO 0  03  20   00000000  4240 6048 0000 0019 6C00 8E06 0000 0000 0000 0302 0075 0075 F680 0CE1 1249 BB00

[19]
CPU  MODEL  SERIAL NUMBER
 E    3081     210819
 F    3081     010819
```

Field Definitions

REPORT DATE, PERIOD FROM, PERIOD TO 1

REPORT DATE is the Julian date the report ran.

PERIOD FROM is the Julian date of the earliest record.

PERIOD TO is the Julian date of the latest record.

CHPID 2 is the channel path ID (used in XA mode).

DEVNO/CUA 3 is the device number in XA mode or the Primary Control Unit Address (PCUA). The message may refer to a condition that occurred on an alternate CU path. (See START 400 to determine the actual path.)

CPU 4 identifies the host processor reporting the exception and is shown as a value of A thru H. The actual CPU model and serial number are shown at the bottom of the report.

DTE 5 is the Julian date from the OBR record.

TIME 6 is the time from the OBR record.

VOLID 7 is the volume serial number.

R/W/E/O 8 defines the type of check as read, write, equipment OR other check.

CMD 9 is the command code from the channel command word (CCW) in the OBR record.

SENSE BYTES 10 is the sense data from the OBR record.

For sense byte definitions see the SENSE section of the MI.

CU-ERR1 11 is the microcode-detected error code for the first error (control unit or drive), from the OBR record (sense bytes 10 and 11). This error code should not be used as an entry to the maintenance package unless efforts using CU-HW 14 and/or DR-ERR1 15 have not corrected the subsystem problem.

CU-ERR2 12 is the microcode-detected error code for the second error (control unit or drive), from the OBR record (sense bytes 12 and 13). This error code can be a result of the first error indicated in CU-HW 14, DR-ERR1 15, or CU-ERR1 11.

CU-ERRL 13 is the microcode-detected error code for the last error (control unit or drive), from the OBR record (sense bytes 14 and 15). This error code can be a result of the first error indicated in CU-HW 14, DR-ERR1 15, CU-ERR1 11, DR-ERR2 16, or CU-ERR2 12.

CU-HW 14 is the control unit hardware-detected error code from the OBR record (sense bytes 16 and 17). This error code defines a control unit failure and should be used to enter the Maintenance Package if you have multiple drive failures.

DR-ERR1 15 is the drive hardware-detected error code, from the OBR record (sense bytes 20 and 21). This error code defines the first failure for any drive and should be used to enter the maintenance package if you have single drive failures.

DR-ERR2 16 is the drive hardware-detected error code, from the OBR record (sense bytes 22 and 23). This error code defines the second or last failure for any drive and should not be used to enter the maintenance package if you have single drive failures. This error information provides supplemental information and may be a result of the first failure (DR-ERR1) in the drive.

CCW FLG 17 is CCW bits 32 to 39 from the OBR.

SCSW/CSW 18 is:

SCSW64 - 95 (in XA Mode)

CSW32 - 63

These are the SCSW or CSW bits from the OBR record.

CPU, MODEL, SERIAL NUMBER 19 provides further information on the CPU listed 4 in the error summary lines of the report.

Note: More information on CSW and SCSW (used in XA mode) can be found in *IBM Extended Architecture Principles of Operation*, SA22-7085.

Temporary Error Summary Report (EREP 3.1.1)

All temporary error statistics are shown, listed by CUA for the period indicated 1. The Temporary Error Summary report is a summary of all MDR records. Because limit controls can not be established for this report, all temporary errors are listed.

Temporary Error Summary Example

1 DAY YR TO DAY YR
049 86 052 86

2 DEVNO /CUA	3 DRIVE ID	4 CPU	5 MOUNTS	6 --WRITE-- MB/ERR	ERRCT	7 --READ-- MB/ERR	ERRCT	8 TOTAL MBYTES READ	WRITE	9 TOTAL BLOCKS -PROCESSED- READ	WRITE	10 --READ-- MB/COR	ECC	11 --WRITE-- MB/COR	ECC	12 READ RECVY ACTS	13 WRITE ERASE GAPS	14 BLOCKS/ERR READ	WRITE
5A0	08160	E	101	--	0	--	0	2495	2328	530176	300288	68	71	62	100	0	0	--	--
5A1	08151	E	94	--	0	--	0	4070	1691	458240	237824	74	146	49	101	0	0	--	--
5A2	08152	E	118	866	1	7030	1	7030	866	653056	94720	35	391	33	56	3	0	315904	--
5A3	08153	E	151	2108	1	--	0	5563	2108	793088	330752	34	318	20	207	0	0	--	167168
5A4	08154	E	94	179	12	--	0	6114	2148	802408	243968	49	243	41	102	0	0	--	--
5A5	08155	E	109	1516	1	--	0	6492	1516	797440	200448	60	215	59	51	0	0	--	--
5A6	08156	E	106	--	0	--	0	1676	1590	190464	283392	45	79	20	166	0	0	--	--
5A7	08157	E	127	--	0	--	0	5697	1970	705792	227072	85	248	56	121	0	0	--	--
5B0	12450	E	23	--	0	--	0	42	142	5376	13568	27	1	10	13	0	0	--	--
5B1	12451	E	35	--	0	--	0	2584	195	173070	25600	27	182	4	42	0	0	--	--
5B2	12452	E	29	--	0	528	1	528	55	95744	4096	132	15	44	1	0	0	--	--
5B3	12453	E	25	383	1	--	0	22	383	4864	46848	--	0	82	22	0	1	--	23040
5B4	12454	E	18	--	0	--	0	541	481	48384	26112	19	87	80	17	0	0	--	--
5B5	12455	E	17	--	0	--	0	19	8	2048	1024	14	3	8	1	0	0	--	--
5B8	12458	E	21	--	0	--	0	5	553	3840	18432	--	0	66	21	0	0	--	--
5B9	12459	E	25	--	0	--	0	856	185	77568	6144	35	53	185	1	0	0	--	--
5BA	1245A	E	19	--	0	--	0	6	4	768	0	--	0	0	0	0	0	--	--
5BB	1245B	E	15	--	0	--	0	12	256	1024	23040	--	0	42	15	0	0	--	--
5BC	1245C	E	12	--	0	609	1	609	13	53760	3328	64	26	3	4	0	0	37888	--
5BD	1245D	E	16	--	0	--	0	728	83	65792	6912	52	43	41	4	0	0	--	--
TOTAL			1155	16	3			45076	17076	5534K	1899K		1843		950	3	1		

15
AVERAGE MEGABYTES/TEMPORARY READ ERRORS = 15025
AVERAGE MEGABYTES/TEMPORARY WRITE ERRORS = 1067
AVERAGE MEGABYTES/PERMANENT READ ERRORS = *
AVERAGE MEGABYTES/PERMANENT WRITE ERRORS = 8538
AVERAGE MEGABYTES/PERMANENT ERROR = 15538
TOTAL MEGABYTES PROCESSED = 62152
TOTAL MEGABYTES READ = 45076
TOTAL MEGABYTES WRITTEN = 17076

16

CPU	MODEL	SERIAL NUMBER
E	3081	210819
F	3081	010819

0 0 0 0 0 0 0 0 0 0

Temporary Error Summary Report (Channel) (EREP 3.4)

All temporary error statistics are shown, listed by CUA for the period indicated 1. The Temporary Error Summary report is a summary of all MDR records. Because limit controls can not be established for this report, all temporary errors are listed.

Temporary Error Summary Example

1 DAY YR TO DAY YR
049 86 052 86

2 DEVNO /CUA	3 DRIVE ID	4 CPU	5 MOUNTS	6 --WRITE-- HB/ERR	6 --WRITE-- ERRCT	7 --READ-- HB/ERR	7 --READ-- ERRCT	8 TOTAL READ	8 MBYTES WRITE	9 TOTAL BLOCKS -PROCESSED- READ	9 TOTAL BLOCKS -PROCESSED- WRITE	10 --READ-- HB/COR	10 --READ-- ECC	11 --WRITE-- HB/COR	11 --WRITE-- ECC
5A0	08160	00	101	--	0	--	0	2495	2328	530176	300288	68	71	62	100
5A1	08151	00	94	--	0	--	0	4070	1691	458240	237824	74	146	49	101
5A2	08152	00	118	866	1	7030	1	7030	866	653056	94720	35	391	33	56
5A3	08153	00	151	2108	1	--	0	5563	2108	793088	330752	34	318	20	207
5A4	08154	00	94	179	12	--	0	6114	2148	802408	243968	49	243	41	102
5A5	08155	00	109	1516	1	--	0	6492	1516	797440	200448	60	215	59	51
5A6	08156	00	106	--	0	--	0	1676	1590	190464	283392	45	79	20	166
5A7	08157	00	127	--	0	--	0	5697	1970	705792	227072	85	248	56	121
5B0	12450	01	23	--	0	--	0	42	142	5376	13568	27	1	10	13
5B1	12451	01	35	--	0	--	0	2584	195	173070	25600	27	182	4	42
5B2	12452	01	29	--	0	528	1	528	55	95744	4096	132	15	44	1
5B3	12453	01	25	383	1	--	0	22	383	4864	46848	--	0	82	22
5B4	12454	01	18	--	0	--	0	541	481	48384	26112	19	87	99	17
5B5	12455	01	17	--	0	--	0	19	8	2048	1024	14	3	8	1
5B8	12458	01	21	--	0	--	0	5	553	3840	18432	--	0	66	21
5B9	12459	01	25	--	0	--	0	856	185	77568	6144	35	53	185	1
5BA	1245A	01	19	--	0	--	0	6	4	768	0	--	0	0	0
5BB	1245B	01	15	--	0	--	0	12	256	1024	23040	--	0	42	15
5BC	1245C	01	12	--	0	609	1	609	13	53760	3328	64	26	3	4
5BD	1245D	01	16	--	0	--	0	728	83	65792	6912	52	43	41	4
TOTAL			1155		16		3	45076	17076	5534K	1899K	1843	950	3	1	1	0	0

12
AVERAGE MEGABYTES/TEMPORARY READ ERROR = 15025
AVERAGE MEGABYTES/TEMPORARY WRITE ERROR = 1067
AVERAGE MEGABYTES/RECOVERED ERROR = 15538
AVERAGE MEGABYTES/PERMANENT READ ERROR = *
AVERAGE MEGABYTES/PERMANENT WRITE ERROR = 8538
AVERAGE MEGABYTES/PERMANENT ERROR = 12430
AVERAGE MEGABYTES/PERMANENT HARDWARE ERROR = 20717
AVERAGE MEGABYTES/PERMANENT VOLUME ERROR = 31076
AVERAGE MEGABYTES/PERMANENT OTHER ERROR = *
TOTAL MEGABYTES PROCESSED = 62152

(*) = There were no errors logged for calculation.

13
CPU	MODEL	SERIAL NUMBER
00	3081	210819
01	3081	010819

0 0 0 0 0 0 0 0 0 0

Temporary Error Summary Report Channel (Continued)

Field Definitions

DEVNO/CUA 2 is the device number in XA mode or the primary control unit address (PCUA). The message may refer to a condition that occurred on an alternate CU path. (See START 400 to determine the actual path.)

DRIVE ID 3 is the last 4 digits of the control unit serial number that wrote the volume, with the drive address added as the last digit.

CPU 4 identifies the host processor reporting the exception. The actual CPU model and serial number are shown at the bottom of the report.

MOUNTS 5 is the total number of all mounts on this device.

WRITE 6

MB/ERR is the average number of megabytes written per temporary write error from the channel.

ERRCT is the total count of all temporary write errors from the channel.

READ 7

MB/ERR is the average number of megabytes read per temporary read error from the channel.

ERRCT is the total count of all temporary read errors from the channel.

TOTAL MBYTES READ WRITE 8

READ is the total number of megabytes read on the channel.

WRITE is the total number of megabytes written on the channel.

TOTAL BLOCKS PROCESSED READ WRITE 9

READ is the total number of blocks read on the channel.

WRITE is the total number of blocks written from the channel.

READ MB/COR ECC 10

MB/COR is the average number of megabytes read on the device, per read ECC error.

ECC is the number of read ECC corrected blocks read from the device.

WRITE MB/COR ECC 11

MB/COR is the average number of megabytes written on the device, per correctable error.

ECC is the number of blocks that have been written with read ECC correctable errors, as determined by read-back ECC checking.

TOTAL and AVERAGE 12

AVERAGE is the total number of megabytes divided by the total number of errors of a particular type, for all 3480 drives that were used by the operating system.

For example:

Average Megabytes/Temporary Read Errors is the total number of the megabytes read divided by the total number of the temporary read errors.

The PERMANENT ERROR values are meant to provide a source of performance information for all 3480 drives in the operating system.

The TOTAL MEGABYTES read, written and processed are for all 3480 drives used by the operating system.

An asterisk (*) in the calculation field (to the right of the "=") indicates that no errors were logged.

CPU, MODEL, SERIAL NUMBER 13 further identifies the CPU listed in the error summary lines of the report.

0 0 0 0 0 0 0 0 0 0

Temporary Error Summary Report (Device) (EREP 3.4)

All temporary error statistics are shown, listed by CUA for the period indicated 1. The Temporary Error Summary report is a summary of all MDR records. Because limit controls can not be established for this report, all temporary errors are listed.

Temporary Error Summary Example—Device

1 DAY YR TO DAY YR
049 86 052 86

DEVNO /CUA 2	DRIVE ID 3	CPU 4	MOUNTS 5	--WRITE-- MB/ERR 6	--WRITE-- ERRCT 6	--READ-- MB/ERR 7	--READ-- ERRCT 7	TOTAL MBYTES READ 8	TOTAL MBYTES WRITE 8	TOTAL BLOCKS -PROCESSED- READ 9	TOTAL BLOCKS -PROCESSED- WRITE 9	--READ-- MB/COR 10	--READ-- ECC 10	--WRITE-- MB/COR 11	--WRITE-- ECC 11	READ RECVY ACTS 12	WRITE ERASE GAPS 13	DRV DET ERR 14	CU EQC CHK 15	16 TRA ERR
5A0	08160	0E	101	--	0	--	0	2495	2328	530176	300288	68	71	62	100	0	0	0	0	0
5A1	08151	0E	94	--	0	--	0	4070	1691	458240	237824	74	146	49	101	0	0	0	0	0
5A2	08152	0E	118	866	1	7030	1	7030	866	653056	94720	35	391	33	56	3	0	0	0	0
5A3	08153	0E	151	2108	1	--	0	5563	2108	793088	330752	34	318	20	207	0	0	0	0	0
5A4	08154	0E	94	179	12	--	0	6114	2148	802408	243968	49	243	41	102	0	0	1	0	0
5A5	08155	0E	109	1516	1	--	0	6492	1516	797440	200448	60	215	59	51	0	0	0	0	0
5A6	08156	0E	106	--	0	--	0	1676	1590	190464	283392	45	79	20	166	0	0	0	0	0
5A7	08157	0E	127	--	0	--	0	5697	1970	705792	227072	85	248	56	121	0	0	0	0	0
5B0	12450	F0	23	--	0	--	0	42	142	5376	13568	27	1	10	13	0	0	0	0	0
5B1	12451	F0	35	--	0	--	0	2584	195	173070	25600	27	182	4	42	0	0	0	0	0
5B2	12452	F0	29	--	0	528	1	528	55	95744	4096	132	15	44	1	0	0	0	0	0
5B3	12453	F0	25	383	1	--	0	22	383	4864	46848	--	0	82	22	0	1	0	0	0
5B4	12454	F0	18	--	0	--	0	541	481	48384	26112	19	87	80	17	0	0	0	0	0
5B5	12455	F0	17	--	0	--	0	19	8	2048	1024	14	3	8	1	0	0	0	0	0
5B8	12458	F0	21	--	0	--	0	5	553	3840	18432	--	0	66	21	0	0	0	0	0
5B9	12459	F0	25	--	0	--	0	856	185	77568	6144	35	53	185	1	0	0	0	0	0
5BA	1245A	F0	19	--	0	--	0	6	4	768	0	--	0	0	0	0	0	0	0	0
5BB	1245B	F0	15	--	0	--	0	12	256	1024	23040	--	0	42	15	0	0	0	0	0
5BC	1245C	F0	12	--	0	609	1	609	13	53760	3328	64	26	3	4	0	0	0	0	0
5BD	1245D	F0	16	--	0	--	0	728	83	65792	6912	52	43	41	4	0	0	0	0	0
TOTAL			1155		16		3	45076	17076	5534K	1899K		1843		950	3	1	1	0	0

17

AVERAGE MEGABYTES/TEMPORARY READ ERROR = 15025
AVERAGE MEGABYTES/TEMPORARY WRITE ERROR = 1067
AVERAGE MEGABYTES/RECOVERED ERROR = 15538
AVERAGE MEGABYTES/PERMANENT READ ERROR = *
AVERAGE MEGABYTES/PERMANENT WRITE ERROR = 8538
AVERAGE MEGABYTES/PERMANENT ERROR = 12430
AVERAGE MEGABYTES/PERMANENT HARDWARE ERROR = 20717
AVERAGE MEGABYTES/PERMANENT VOLUME ERROR = 31076
AVERAGE MEGABYTES/PERMANENT OTHER ERROR = *
TOTAL MEGABYTES PROCESSED = 62152

(*) = There were no errors logged for calculation.

18

CPU	MODEL	SERIAL NUMBER
0E	3081	210819
F0	3081	010819

0 0 0 0 0 0 0 0 0 0

Field Definitions

DEVNO/CUA 2 is the device number in XA mode or the primary control unit address (PCUA). The message may refer to a condition that occurred on an alternate CU path. (See START 400 to determine the actual path.)

DRIVE ID 3 is the last 4 digits of the control unit serial number that wrote the volume, with the drive address added as the last digit.

CPU 4 identifies the host processor reporting the exception. The actual CPU model and serial number are shown at the bottom of the report.

MOUNTS 5 is the total number of all mounts on this device.

WRITE 6

MB/ERR is the average number of megabytes written per temporary write error on the device.

ERRCT is the total count of all temporary write errors on the device.

READ 7

MB/ERR is the average number of megabytes read per temporary read error on the device.

ERRCT is the total count of all temporary read errors on the device.

TOTAL MBYTES READ WRITE 8

READ is the total number of megabytes read from the device.

WRITE is the total number of megabytes written to the device.

TOTAL BLOCKS PROCESSED READ WRITE 9

READ is the total number of blocks read on the device.

WRITE is the total number of blocks written on the device.

READ MB/COR ECC 10

MB/COR is the average number of megabytes read on the device, per read ECC error.

ECC is the number of read ECC corrected blocks read from the device.

WRITE MB/COR ECC 11

MB/COR is the average number of megabytes written on the device, per correctable error.

ECC is the number of blocks that have been written with read ECC correctable errors, as determined by read-back ECC checking.

READ RECVY ACTS 12 is the total number of correctable read errors detected during 3480 read error recovery.

WRITE ERASE GAPS 13 is the total number of blocks rewritten during error recovery.

DRV DET ERR 14 is the number of unit checks set by the drive.

CU EQU CHK 15 is the number of errors found in the use of external regs in the CU for a given device.

TRA ERR 16 Flag indicating that transient errors have been detected by hardware checkers.

TOTAL and AVERAGE 17

AVERAGE is the total number of megabytes divided by the total number of errors of a particular type, for all 3480 drives that were used by the operating system.

For example:

Average Megabytes/Temporary Read Errors is the total number of the megabytes read divided by the total number of the temporary read errors.

The PERMANENT ERROR values are meant to provide a source of performance information for all 3480 drives in the operating system.

The TOTAL MEGABYTES read, written and processed are for all 3480 drives used by the operating system.

An asterisk (*) in the calculation field (to the right of the "=") indicates that no errors were logged.

CPU, MODEL, SERIAL NUMBER 18 further identifies the CPU listed in the error summary lines of the report.

0 0 0 0 0 0 0 0 0 0

Field Definitions

DEVNO/CUA 2 is the device number in XA mode or the primary control unit address (PCUA). The message may refer to a condition that occurred on an alternate CU path. (See START 400 to determine the actual path.)

DRIVE ID 3 is the last 4 digits of the control unit serial number that wrote the volume, with the drive address added as the last digit.

CPU 4 identifies the host processor reporting the exception, and is shown as a value of A thru H. The actual CPU model and serial number are shown at the bottom of the report.

MOUNTS 5 is the total number of all mounts on this device.

WRITE 6

MB/ERR is the average number of megabytes written per temporary write error on the device.

ERRCT is the total count of all temporary write errors on the device.

READ 7

MB/ERR is the average number of megabytes read per temporary read error on the device.

ERRCT is the total count of all temporary read errors on the device.

TOTAL MBYTES READ WRITE 8

READ is the total number of megabytes read on the device.

WRITE is the total number of megabytes written on the device.

TOTAL BLOCKS PROCESSED READ WRITE 9

READ is the total number of blocks read on the device.

WRITE is the total number of blocks written on the device.

READ MB/COR ECC 10

MB/COR is the average number of megabytes read on the device, per read ECC error.

ECC is the number of read ECC corrected blocks read from the device.

WRITE MB/COR ECC 11

MB/COR is the average number of megabytes written on the device, per correctable error.

ECC is the number of blocks that have been written with read ECC correctable errors, as determined by read-back ECC checking.

READ RECVY ACTS 12 is the total number of correctable read errors detected during 3480 read error recovery.

WRITE ERASE GAPS 13 is the total number of blocks rewritten during error recovery.

BLOCKS/ERR READ WRITE 14

READ is the average number of blocks read per temporary read error.

WRITE is the average number of blocks written per temporary write error.

TOTAL and AVERAGE 15

AVERAGE is the total number of megabytes divided by the total number of errors of a particular type, for all 3480 drives that were used by the operating system.

For example:

Average Megabytes/Temporary Read Errors is the total number of the megabytes read divided by the total number of the temporary read errors.

The PERMANENT ERROR values are meant to provide a source of performance information for all 3480 drives in the operating system.

The TOTAL MEGABYTES read, written and processed are for all 3480 drives used by the operating system.

An asterisk (*) in the calculation field (to the right of the "=") indicates that no errors were logged.

CPU, MODEL, SERIAL NUMBER 16 further identifies the CPU listed in the error summary lines of the report.

Temporary Error Summary Report (EREP 3.2)

All temporary error statistics are shown, listed by CUA for the period indicated 1. The Temporary Error Summary report is a summary of all MDR records. Because limit controls can not be established for this report, all temporary errors are listed.

Temporary Error Summary Example

1 DAY YR TO DAY YR
049 86 052 86

2 DEVNO /CUA	3 DRIVE ID	4 CPU	5 MOUNTS	6 --WRITE-- MB/ERR	ERRCT	7 --READ-- MB/ERR	ERRCT	8 TOTAL MBYTES READ	WRITE	9 TOTAL BLOCKS -PROCESSED- READ	WRITE	10 --READ-- MB/COR	ECC	11 --WRITE-- MB/COR	ECC	12 READ RECVY ACTS	13 WRITE ERASE GAPS	14 DRV DET ERR	15 CU EQC CHK	16 SPD VAR
5A0	08160	E	101	--	0	--	0	2495	2328	530176	300288	68	71	62	100	0	0	0	0	0
5A1	08151	E	94	--	0	--	0	4070	1691	458240	237824	74	146	49	101	0	0	0	0	0
5A2	08152	E	118	866	1	7030	1	7030	866	653056	94720	35	391	33	56	3	0	0	0	0
5A3	08153	E	151	2108	1	--	0	5563	2108	793088	330752	34	318	20	207	0	0	0	0	0
5A4	08154	E	94	179	12	--	0	6114	2148	802408	243968	49	243	41	102	0	0	1	0	0
5A5	08155	E	109	1516	1	--	0	6492	1516	797440	200448	60	215	59	51	0	0	0	0	0
5A6	08156	E	106	--	0	--	0	1676	1590	190464	283392	45	79	20	166	0	0	0	0	0
5A7	08157	E	127	--	0	--	0	5697	1970	705792	227072	85	248	56	121	0	0	0	0	0
5B0	12450	E	23	--	0	--	0	42	142	5376	13568	27	1	10	13	0	0	0	0	0
5B1	12451	E	35	--	0	--	0	2584	195	173070	25600	27	182	4	42	0	0	0	0	0
5B2	12452	E	29	--	0	528	1	528	55	95744	4096	132	15	44	1	0	0	0	0	0
5B3	12453	E	25	383	1	--	0	22	383	4864	46848	--	0	82	22	0	1	0	0	0
5B4	12454	E	18	--	0	--	0	541	481	48384	26112	19	87	80	17	0	0	0	0	0
5B5	12455	E	17	--	0	--	0	19	8	2048	1024	14	3	8	1	0	0	0	0	0
5B8	12458	E	21	--	0	--	0	5	553	3840	18432	--	0	66	21	0	0	0	0	0
5B9	12459	E	25	--	0	--	0	856	185	77568	6144	35	53	185	1	0	0	0	0	0
5BA	1245A	E	19	--	0	--	0	6	4	768	0	--	0	0	0	0	0	0	0	0
5BB	1245B	E	15	--	0	--	0	12	256	1024	23040	--	0	42	15	0	0	0	0	0
5BC	1245C	E	12	--	0	609	1	609	13	53760	3328	64	26	3	4	0	0	0	0	0
5BD	1245D	E	16	--	0	--	0	728	83	65792	6912	52	43	41	4	0	0	0	0	0
TOTAL			1155		16		3	45076	17076	5534K	1899K		1843		950	3	1	1	0	0

17

AVERAGE MEGABYTES/TEMPORARY READ ERROR = 15025
AVERAGE MEGABYTES/TEMPORARY WRITE ERROR = 1067
AVERAGE MEGABYTES/RECOVERED ERROR = 15538
AVERAGE MEGABYTES/PERMANENT READ ERROR = *
AVERAGE MEGABYTES/PERMANENT WRITE ERROR = 8538
AVERAGE MEGABYTES/PERMANENT ERROR # = 12430 (#) = COMPARABLE TO 3420 AVERAGE MB/PERM. ERROR RATE
AVERAGE MEGABYTES/PERMANENT HARDWARE ERROR = 20717
AVERAGE MEGABYTES/PERMANENT VOLUME ERROR = 31076
AVERAGE MEGABYTES/PERMANENT OTHER ERROR = *
TOTAL MEGABYTES PROCESSED = 62152

18

CPU	MODEL	SERIAL NUMBER
E	3081	210819
F	3081	010819

0 0 0 0 0 0 0 0 0 0

Field Definitions

DEVNO/CUA **2** is the device number in XA mode or the primary control unit address (PCUA). The message may refer to a condition that occurred on an alternate CU path. (See START 400 to determine the actual path.)

DRIVE ID **3** is the last 4 digits of the control unit serial number that wrote the volume, with the drive address added as the last digit.

CPU **4** identifies the host processor reporting the exception, and is shown as a value of A thru H. The actual CPU model and serial number are shown at the bottom of the report.

MOUNTS **5** is the total number of all mounts on this device.

WRITE **6**

MB/ERR is the average number of megabytes written per temporary write error on the device.

ERRCT is the total count of all temporary write errors on the device.

READ **7**

MB/ERR is the average number of megabytes read per temporary read error on the device.

ERRCT is the total count of all temporary read errors on the device.

TOTAL MBYTES READ WRITE **8**

READ is the total number of megabytes read on the device.

WRITE is the total number of megabytes written on the device.

TOTAL BLOCKS PROCESSED READ WRITE **9**

READ is the total number of blocks read on the device.

WRITE is the total number of blocks written on the device.

READ MB/COR ECC **10**

MB/COR is the average number of megabytes read on the device, per read ECC error.

ECC is the number of read ECC corrected blocks read from the device.

WRITE MB/COR ECC **11**

MB/COR is the average number of megabytes written on the device, per correctable error.

ECC is the number of blocks that have been written with read ECC correctable errors, as determined by read-back ECC checking.

READ RECVY ACTS **12** is the total number of correctable read errors detected during 3480 read error recovery.

WRITE ERASE GAPS **13** is the total number of blocks rewritten during error recovery.

DRV DET ERR **14** is the number of unit checks set by the drive.

CU EQU CHK **15** is the number of errors found in the use of external regs in the CU for a given device.

SPD VAR **16** Flag indicating that tape speed variations have been detected by hardware checkers.

TOTAL and AVERAGE **17**

AVERAGE is the total number of megabytes divided by the total number of errors of a particular type, for all 3480 drives that were used by the operating system.

For example:

Average Megabytes/Temporary Read Errors is the total number of the megabytes read divided by the total number of the temporary read errors.

The PERMANENT ERROR values are meant to provide a source of performance information for all 3480 drives in the operating system.

The TOTAL MEGABYTES read, written and processed are for all 3480 drives used by the operating system.

An asterisk (*) in the calculation field (to the right of the "=") indicates that no errors were logged.

CPU, MODEL, SERIAL NUMBER **18** further identifies the CPU listed in the error summary lines of the report.

Volume Statistics Report

All activity is listed for each volume shown as an exception on the Tape Subsystem Exception report. This includes volumes that have permanent errors or have failed the volume temporary error limits. No other volumes are listed.

Entries are grouped in VOLID order and are listed by date and time for the period indicated **1**.

Volume Statistics Report Example

```
      [1] DAY YR  TO  DAY YR
          049 86      052 86

                              VOLUMES EXCEEDING LIMITS OR PERMANENT ERRORS
                                 TEMP WRT(CT) TEMP RD(CT)
          [2]                          40( 3)     200( 1)
   CURRENT LIMITS
      (MB/ERR)
                                     [8]                                                      [12]                                           [17]
 [3]      [4]        [5]       [6]  [7]  R  [9]           [10]              [11]              READ  [13]     [14]       [15]     [16]     C
VOLUME  DATE       TIME      CHP DEVNO W BLOCK ----MB/ERR PERM--- ----MB/ERR TEMP---- RECVY ERASE -BLKS PROC-   BLK   --JOB--- P
SERIAL DAY YR    HH:MM:SS    -ID  /CUA E  ID   READ(CT) WRITE(CT) WRITE(CT) READ(CT) ACTNS GAPS  READ  WRITE   LEN   --NAME-- U

B07146 051 86   18:48:31    00    5A2          -- (  0) --  (  0)  -- (  0) -- (  0)     3    0  6144  6144   0000            E

B42750 051 86   15:34:33    00    5BC          -- (  0) --  (  0)  -- (  0)  0 (  1)     0    0     0     0   0000            E

M11407 051 86   20:51:24    06    5A3 O 001BF -- (  0) --  (  0)  -- (  0) -- (  0)     0    0     0     0   2EE4  C4KCC33E  E
M11407 051 86   20:57:53    00    5A3   001BF -- (  0) --  (  0)  -- (  0) -- (  0)     0    0     0   256   0000            E
M11407 051 86   21:07:11    00    5A1   001C5 -- (  0) --  (  0)  -- (  0) -- (  0)     0    0     0     0   0000

TAPENO 051 86   22:16:18    22    5A7          -- (  0) --  (  0)  -- (  0) -- (  0)     0    0     0     0   0000   EOX EXIT E
TAPENO 051 86   22:16:37    22    5A7 O        -- (  0) --  (  0)  -- (  0) -- (  0)     0    0     0     0   0050   OPERX    E
TAPENO 051 86   22:18:40    22    5A7          -- (  0) --  (  0)  -- (  0) -- (  0)     0    0     0     0   0000   EOS EXIT E

L30570 051 86   19:03:22    22    5A5 W        -- (  0) --  (  0)   3 (  1) -- (  0)     0    0     0  5934   0234   EOS EXIT E

L27530 051 86   20:31:22    06    5A2 W        -- (  0) --  (  0)   5 (  1) -- (  0)     0    0     0 10120   0256   EOS EXIT E

L70630 051 86   16:24:33    06    5A4          -- (  0) --  (  0)  -- ( 12) -- (  0)     0    0     0  9050   1250   EOS EXIT E

L72930 051 86   11:22:19    22    5B2          -- (  0) --  (  0)  -- (  0) 39 (  1)     0    0 20302     0   2350   EOS EXIT E

B35790 051 86   19:22:13    22    5A3 E        -- (  0) --  (  0)  -- (  0) -- (  0)     0    0     0     0   0000            E


      COLUMN TOTALS:                              (  0)     (  0)      ( 14)     (  2) (  3) (  0)


             TOTALS:     MOUNTS =         9
             TOTALS:     MEGABYTES PROCESSED =   201
[18]
CPU MODEL   SERIAL NUMBER
 A   3081     210819
 B   3081     010819
```

Volume Statistics Report (Continued)

Field Definitions

CURRENT LIMITS (MB/ERR) **2** is the megabyte per temporary error limit threshold from the limit control cards (See MSG 105 for more information on the limit cards.)

VOLUME SERIAL **3** is the volume serial number.

DATE DAY YR **4** is the Julian date and year from the OBR or MDR record.

TIME **5** is the time from the OBR or MDR record.

CHP-ID **6** is the channel path ID (used in XA mode) and only appears if all errors have occurred on 1 CHP-ID.

DEVNO/CUA **7** is the device number in XA mode or the primary control unit address (PCUA). The message may refer to a condition that occurred on an alternate CU path. (See START 400 to determine the actual path.)

R/W/E **8** defines the type of permanent error as a read, write, or equipment check.

BLOCK ID **9** is the logical block position for permanent errors.

MB/ERR PERM **10**

READ is the average number of megabytes read per permanent read error.

CT is the total count of all permanent read errors.

WRITE is the average number of megabytes written per permanent write error.

CT is the total count of all permanent write errors.

MB/ERR TEMP **11**

READ is the average number of megabytes read per temporary read error.

CT is the total count of all temporary read errors.

WRITE is the average number of megabytes written per temporary write error.

CT is the total count of all temporary write errors.

READ RECVY ACTNS **12** is the total count of recoverable read errors detected during 3480 read error recovery.

ERASE GAPS **13** is the number of times a block is rewritten during error recovery for the listed volumes.

BLKS PROCESSED **14**

READ is the total number of blocks read for a volume that has had at least one temporary, but no permanent, errors.

WRITE is the total number of blocks written for a volume that has had at least one temporary error, but no permanent errors.

BLK LEN **15** is the block length as taken from the OBR record for any listed volume that had permanent errors.

JOB NAME **16** is the job name from the OBR record for any listed volume that had permanent errors.

CPU **17** identifies the host processor reporting the exception.

CPU, MODEL, SERIAL, NUMBER **18** further identifies the CPU listed in the error summary lines of this report.

Permanent/Recovered Error Summary Report (EREP 3.2)

All permanent and recovered errors will be recorded on this report. The errors are catagorized by 'CONTROL UNIT', 'DRIVE', 'OPERATOR OR OPERATIONAL' and 'OTHER'.

Sense byte 7 on the permanent errors will be 20 to indicate format 20 sense. Sense byte 3 will be a value other that 48.

Sense byte 7 on the recovered errors will also be 20 but sense byte 3 will always indicate 48. This is indication that an error ocurred and it took host interaction to recover from the error (CU error recovery was not adequate).

All errors are for the report period indicated.

Permanent/Recovered Error Summary Example

```
                                               1  REPORT DATE 063 86
                                                  PERIOD FROM 049 86
                                                         TO   052 86                  10
              4                        8    17    18                             1 11 1 12 1 13 1 14 1    2 15 2 16 2     2     2     3
2    3        C    5      6            R  9  SENSE BYTES--> 0    2    4    6    8    0    2    4    6    8    0    2    4    6    8    0
CHP  DEVNO    P       TIME       7     W     CCW SCSW64-95                          -------CU----------      ---DR----            CU
-ID  /CUA     U  DTE  HHMMSS   VOLID   E CMD FLG /CSW32-63                          ERR1 ERR2 ERRL  HW       ERR1 ERR2            SER#
                                               *****  PERMANENT ERRORS *****
**** DRIVE ****

22   05A3   E 051 192213 B35790 E  01  64 060079E0  1044 394A 0000 2C20 0000 7151 7607 CCBB D708 0002 0000 0000 F680 0CE1 0813 3319
06   05A4   F 051 214532        0  00  00 26000000  4048 3934 0000 0020 730C 8E06 0000 0000 0000 0002 192C 0000 F680 0CE1 0813 4419
22   05A7   E 051 221637 TAPENO 0  02  44 06000050  0049 402E 0000 0020 0000 7161 7161 7161 0000 0002 0000 0000 F680 0CE1 0813 7700

**** VOLUME OR CREATING DRIVE ****

     05A5   F 051 190322 L30570 W  01  64 0E007FF8  0A44 7025 0007 3F20 0000 7404 7401 7407 D007 0002 0000 0000 F680 0CE1 0819 5519
     05A2   E 051 203122 L27530 W  01  64 06002090  0A44 3025 000C C620 0000 7401 7407 7401 D002 0002 0000 0000 F680 0CE1 0813 2219

**** OPERATOR OR OPERATIONAL ****

06   05A3   E 051 205124 M11047 0  01  64 0E002B63  4244 783B 0001 BF20 0000 8202 0000 0000 0000 0002 0000 0000 F680 0CE1 1249 330E

                                               *****  RECOVERED ERRORS *****

**** CONTROL UNIT ****

22   05A7   E 051 040633        0  01  64 0E007FF8  0A44 7048 0000 0020 0000 A130 3300 0000 D5C1 0002 0000 0000 F680 0CE1 0813 7719
22   05A7   E 051 221838        0  02  43 00000000  0044 4048 0002 1720 0040 3300 0000 0000 0000 0002 0000 0000 F680 0CE1 0819 7700

**** DRIVE ****

06   05A7   F 051 221618        0  02  24 00000000  0048 3948 0000 0020 0000 7161 7161 7161 0000 0002 0000 0000 F680 0CE1 0813 7700
22   05A7   F 051 221840        0  02  24 00000000  0048 3948 0000 0020 0000 7161 7161 7161 0000 0002 0000 0000 F680 0CE1 0819 7719

CPU  MODEL  SERIAL NUMBER                                        Note: CU SER# = last four digits
 E   3081      210819
 F   3081      010819  19
```

All permanent and recovered errors will be recorded on this report.

Sense byte 7 on the permanent errors will be 20 to indicate format 20 sense. Sense byte 3 will be a value other that 48.

Sense byte 7 on the recovered errors will also be 20 but sense byte 3 will always indicate 48. This is indication that an error ocurred and it took host interaction to recover from the error (CU error recovery was not adequate).

All errors are for the report period indicated.

Permanent/Recovered Error Summary Example

Permanent/Recovered Error Summary Report MSG 220

```
                                        1   REPORT DATE 063 86
                                       PERIOD FROM 049 86
                                            TO   052 86

                                                                                                                    10
                                                                                  1    1    1    1    1    2    2    2    2    2    3
          C                    R    SENSE BYTES--> 0    2    4    6    8    0    2    4    6    8    0    2    4    6    8    0
CHP DEVNO P     TIME           W     CCW SCSW64-95                           -------CU----------     ---DR----          CU
-ID /CUA  U DTE HHMMSS  VOLID E CMD FLG /CSW32-63                           ERR1 ERR2 ERRL  HW      ERR1 ERR2          SER#
 2  3   4  5   6       7   8  9   17      18                                 11   12   13   14      15   16

                                        *****  PERMANENT ERRORS *****
**** CONTROL UNIT ****

22  0186 07 262 081934 TAP1A0 0  00  00 0E004000  0244 2049 002F 8820 0000 7407 0000 0000 D007 0002 0000 0000 F680 08E1 0140 6F00
06  0187 07 262 081931 TAP1A7 0  00  00 0E004000  0244 2040 002F 8820 0000 7407 0000 0000 D007 0002 0000 0000 F680 08E1 0140 6F00

**** DRIVE ****

22  0181 07 262 081935 TAP1A1 0  00  00 0E004000  0244 2022 002F 8820 0000 7407 0000 0000 D007 0002 0000 0000 F680 08E1 0140 6F00
22  0183 17 262 081936 TAP1A2 W  00  00 0E004000  0244 2025 002F 8820 0000 7407 0000 0000 D007 0002 0000 0000 F680 08E1 0140 6F00
22  0183 17 262 081937 TAP1A3 W  00  00 0E004000  0244 2025 002F 8820 0000 7407 0000 0000 D007 0002 0000 0000 F680 08E1 0140 6F00
06  0286 07 262 081940 TAP1B6 0  00  00 0E004000  0244 2031 002F 8820 0000 7407 0000 0000 D007 0002 0000 0000 F680 08E1 0140 6F00
22  0287 07 262 081910 TAP1C5 0  00  00 0E004000  0244 2032 002F 8820 0000 7407 0000 0000 D007 0002 0000 0000 F680 08E1 0140 6F00

**** VOLUME FAILED MORE THAN ONE DRIVE ****

06  0182 17 262 081936 TAP1A2 W  00  00 0E004000  0244 2025 002F 8820 0000 7407 0000 0000 D007 0002 0000 0000 F680 08E1 0140 6F00

**** VOLUME ****

22  0288 07 262 081920 TAP1D6 0  00  00 0E004000  0244 2037 002F 8820 0000 7407 0000 0000 D007 0002 0000 0000 F680 08E1 0140 6F00

**** OTHER ****

    0286 07 262 081940 TAP1F6 W  00  24 0E004000  0244 2039 002F 8820 0000 7407 0000 0000 D007 0002 0000 0000 F680 08E1 0140 6F00


                                        ****  RECOVERED ERRORS *****

**** CONTROL UNIT ****

06  0186 17 262 081930 TAP1A6 0  00  00 0E004000  0244 2048 002F 8820 0000 7407 0000 0000 D007 0002 0000 0000 F680 08E1 0140 6F00

**** OPERATOR OR OPERATIONAL ****

06  0186 17 262 081930 TAP1A6 0  00  00 0E004000  0244 2048 002F 8820 0000 7407 0000 0000 D007 0002 0000 0000 F680 08E1 0140 6F00
```

0 0 0 0 0 0 0 0 0 0

Field Definitions

REPORT DATE, PERIOD FROM, PERIOD TO 1

REPORT DATE is the Julian date the report ran.

PERIOD FROM is the Julian date of the earliest record.

PERIOD TO is the Julian date of the latest record.

CHPID 2 is the channel path ID (used in XA mode).

DEVNO/CUA 3 is the device number in XA mode or the Primary Control Unit Address (PCUA). The message may refer to a condition that occurred on an alternate CU path. (See START 400 to determine the actual path.)

CPU 4 identifies the host processor reporting the exception. The actual CPU model and serial number are shown at the bottom of the report.

DTE 5 is the Julian date from the OBR record.

TIME 6 is the time from the OBR record.

VOLID 7 is the volume serial number.

R/W/E/O 8 Defines the type of check as read, write, equipment OR other check.

CMD 9 is the command code from the channel command word (CCW) in the OBR record.

SENSE BYTES 10 is the sense data from the OBR record. For sense byte definitions see the SENSE section of the MI.

CU-ERR1 11 is the microcode-detected error code for the first error (control unit or drive), from the OBR record (sense bytes 10 and 11). This error code should not be used as an entry to the maintenance package unless efforts using CU-HW 14 and/or DR-ERR1 15 have not corrected the subsystem problem.

CU-ERR2 12 is the microcode-detected error code for the second error (control unit or drive), from the OBR record (sense bytes 12 and 13). This error code can be a result of the first error indicated in CU-HW 14, DR-ERR1 15, or CU-ERR1 11.

CU-ERRL 13 is the microcode-detected error code for the last error (control unit or drive), from the OBR record (sense bytes 14 and 15). This error code can be a result of the first error indicated in CU-HW 14, DR-ERR1 15, CU-ERR1 11, DR-ERR2 16, or CU-ERR2 12.

CU-HW 14 is the control unit hardware-detected error code from the OBR record (sense bytes 16 and 17). This error code defines a control unit failure and should be used to enter the Maintenance Package if you have multiple drive failures.

DR-ERR1 15 is the drive hardware-detected error code, from the OBR record (sense bytes 20 and 21). This error code defines the first failure for any drive and should be used to enter the maintenance package if you have single drive failures.

DR-ERR2 16 is the drive hardware-detected error code, from the OBR record (sense bytes 22 and 23). This error code defines the second or last failure for any drive and should not be used to enter the maintenance package if you have single drive failures. This error information provides supplemental information and may be a result of the first failure (DR-ERR1) in the drive.

CCW FLG 17 is CCW bits 32 to 39 from the OBR.

SCSW/CSW 18 is:

SCSW64 - 95 (in XA Mode)

CSW32 - 63

These are the SCSW or CSW bits from the OBR record.

CPU, MODEL, SERIAL NUMBER 19 provides further information on the CPU listed 4 in the error summary lines of the report.

Note: More information on CSW and SCSW (used in XA mode) can be found in *IBM Extended Architecture Principles of Operation*, SA22-7085.

0 0 0 0 0 0 0 0 0 0

Permanent/Recovered Error Summary Report (Service Alerts) (EREP 3.4)

Sense byte 7 on the service alert errors will be 20, but sense byte 3 will always indicate 48. This is an indication that an error occurred and it took host interaction to recover from the error (CU error recovery was not adequate).

All errors are for the report period indicated.

Permanent/Recovered Error Summary Example

```
                                         1 REPORT DATE 217 88
                                           PERIOD FROM 262 84
                                                  TO   262 84
                                                                                           10
                                                                                  1    1    1    1    1    2    2    2    2    2    3
        C                      R   SENSE BYTES--> 0    2    4    6    8    0    2    4    6    8    0    2    4    6    8    0
CHP DEVNO P                    W    CCW SCSW64-95
-ID /CUA  U DTE  TIME   VOLID  E CMD FLG /CSW32-63                     HDW- STR- V/C-
                                                                        PSC  DEV  FSC
 2    3   4 5    6        7    8 9  17     18                           11   12   13
                                         *****  SERVICE ALERTS  *****  HARDWARE DEGRADED  *****
**** CONTRL UNIT ****

   0188  FF 262 081932       0  00  00 0E004000  0244 2048 002F 8820 0000 B010 8000 B180 D007 0002 0000 0000 F680 08E1 0140 6F00

**** STRING 0 - 7 ****

   0185  FF 262 081932       0  00  00 0E004000  0244 2048 002F 8820 0000 B011 0400 B181 D007 0002 0000 0000 F680 08E1 0140 6F00

**** STRING 8 - F ****

   0189  FF 262 081932       0  00  00 0E004000  0244 2048 002F 8820 0000 B012 2000 B140 D007 0002 0000 0000 F680 08E1 0140 6F00

**** DEVICES ****

   0186  FE 262 081932       0  00  00 0E004000  0244 2048 002F 8820 0000 B013 0200 B108 D007 0002 0000 0000 F680 08E1 0140 6F00

   0189  FE 262 081933       0  00  00 0E004000  0244 2048 002F 8820 0000 B013 1000 B120 D007 0002 0000 0000 F680 08E1 0140 6F00


CPU  MODEL  SERIAL NUMBER                                           Note: CU SER# = last four digits
 FE  3081     010847  19
 FF  3081     010819
```

0 0 0 0 0 0 0 0 0 0

Field Definitions

REPORT DATE, PERIOD FROM, PERIOD TO 1

REPORT DATE is the Julian date the report ran.

PERIOD FROM is the Julian date of the earliest record.

PERIOD TO is the Julian date of the latest record.

CHPID 2 is the channel path ID (used in XA mode).

DEVNO/CUA 3 is the device number in XA mode or the Primary Control Unit Address (PCUA). The message may refer to a condition that occurred on an alternate CU path. (See START 400 to determine the actual path.)

CPU 4 identifies the host processor reporting the exception. The actual CPU model and serial number are shown at the bottom of the report.

DTE 5 is the Julian date from the OBR record.

TIME 6 is the time from the OBR record.

VOLID 7 is the volume serial number.

R/W/E/O 8 Defines the type of check as read, write, equipment OR other check.

CMD 9 is the command code from the channel command word (CCW) in the OBR record.

SENSE BYTES 10 is the sense data from the OBR record.

With the exception of bytes 10 through 15, the sense record is a normal Format 20 sense record. For sense byte definitions see the SENSE section of the MI. Sense bytes 10 through 15 are described below.

HDW-FSC 11 Sense bytes 10 and 11 are the error code for statistical analysis of temporary errors and will always be a B0nn type error code. This error code can be used for entry into the maintenance package.

STR-DEV 12 Sense bytes 12 and 13 identify the drives within the string that are failing. See the MI FSI section for FSC B011 or B012 for a detailed description.

V/C-FSC 13 Sense bytes 14 and 15 identify the types of unacceptable temporary errors. If sense byte 14 = B1 then byte 15 identifies the type of temporary errors that are unacceptable. See the MI FSI section for FSC B011 or B012 for a detailed explanation.

CCW FLG 17 is CCW bits 32 to 39 from the OBR.

SCSW/CSW 18 is:

SCSW64 - 95 (in XA Mode)

CSW32 - 63

These are the SCSW or CSW bits from the OBR record.

CPU, MODEL, SERIAL NUMBER 19 provides further information on the CPU listed 4 in the error summary lines of the report.

Note: More information on CSW and SCSW (used in XA mode) can be found in *IBM Extended Architecture Principles of Operation*, SA22-7085.

0 0 0 0 0 0 0 0 0 0

Field Definitions

REPORT DATE, PERIOD FROM, PERIOD TO 1

REPORT DATE is the Julian date the report ran.

PERIOD FROM is the Julian date of the earliest record.

PERIOD TO is the Julian date of the latest record.

CHPID 2 is the channel path ID (used in XA mode).

DEVNO/CUA 3 is the device number in XA mode or the Primary Control Unit Address (PCUA). The message may refer to a condition that occurred on an alternate CU path. (See START 400 to determine the actual path.)

CPU 4 identifies the host processor reporting the exception and is shown as a value of A thru H. The actual CPU model and serial number are shown at the bottom of the report.

DTE 5 is the Julian date from the OBR record.

TIME 6 is the time from the OBR record.

VOLID 7 is the volume serial number.

R/W/E/O 8 Defines the type of check as read, write, equipment OR other check.

CMD 9 is the command code from the channel command word (CCW) in the OBR record.

SENSE BYTES 10 is the sense data from the OBR record.

For sense byte definitions see the SENSE section of the MI.

CU-ERR1 11 is the microcode-detected error code for the first error (control unit or drive), from the OBR record (sense bytes 10 and 11). This error code should not be used as an entry to the maintenance package unless efforts using CU-HW 14 and/or DR-ERR1 15 have not corrected the subsystem problem.

CU-ERR2 12 is the microcode-detected error code for the second error (control unit or drive), from the OBR record (sense bytes 12 and 13). This error code can be a result of the first error indicated in CU-HW 14, DR-ERR1 15, or CU-ERR1 11.

CU-ERRL 13 is the microcode-detected error code for the last error (control unit or drive), from the OBR record (sense bytes 14 and 15). This error code can be a result of the first error indicated in CU-HW 14, DR-ERR1 15, CU-ERR1 11, DR-ERR2 16, or CU-ERR2 12.

CU-HW 14 is the control unit hardware-detected error code from the OBR record (sense bytes 16 and 17). This error code defines a control unit failure and should be used to enter the Maintenance Package if you have multiple drive failures.

DR-ERR1 15 is the drive hardware-detected error code, from the OBR record (sense bytes 20 and 21). This error code defines the first failure for any drive and should be used to enter the maintenance package if you have single drive failures.

DR-ERR2 16 is the drive hardware-detected error code, from the OBR record (sense bytes 22 and 23). This error code defines the second or last failure for any drive and should not be used to enter the maintenance package if you have single drive failures. This error information provides supplemental information and may be a result of the first failure (DR-ERR1) in the drive.

CCW FLG 17 is CCW bits 32 to 39 from the OBR.

SCSW/CSW 18 is:

SCSW64 - 95 (in XA Mode)

CSW32 - 63

These are the SCSW or CSW bits from the OBR record.

CPU, MODEL, SERIAL NUMBER 19 provides further information on the CPU listed 4 in the error summary lines of the report.

Note: More information on CSW and SCSW (used in XA mode) can be found in *IBM Extended Architecture Principles of Operation*, SA22-7085.

FRU SUMMARY REPORT (EREP 3.1.1)

THE FRU summary report provides a summary of error codes logged and is listed by CUA.

THE FRU codes can provide an entry into the MI for both drive and control unit failures.

Field Definitions

DAY YR TO DAY YR [1]

The first DAY YR is the Julian date of the first record.

The second DAY YR is the Julian date of the latest record.

DEVNO/CUA [2] is the device number in XA mode or the primary control unit address (PCUA). The message may refer to a condition that occurred on an alternate CU path. (See START 400 to determine the actual path.)

CPU [3] identifies the host processor reporting the exception and is shown as a value of A through H. The actual CPU model and serial number are shown at the bottom of the report.

CHA [3] identifies the channel adapter that was in use at the time of error.

CU [3] identifies the control unit containing the channel adapter.

PTH [3] identifies the control unit containing the buffer and data flow in use at the time of error.

CU-ERR1 [4] is the microcode-detected error code for the first error (control unit or drive), from the OBR record (sense bytes 10 and 11). This error code should not be used as an entry to the maintenance package unless efforts using CU-HW [8] and/or DR-ERR1 [9] have not corrected the subsystem problem.

CU-F [5] is a microcode-developed flag byte, from the OBR record (sense byte 9). This byte provides additional information, if available, for CU-ERR1 [4]. This byte, when available, is further defined in the MI EAD section under the error code in CU-ERR1.

CU-ERR2 [6] is the microcode-detected error code for the second error (control unit or drive), from the OBR record (sense bytes 12 and 13). This error code can be a result of the first error indicated in CU-HW [8], DR-ERR1 [9] or CU-ERR1 [4].

CU-ERRL [7] is the microcode-detected error FRU code for the last error (control unit or drive), from the OBR record (sense bytes 14 and 15). This error code can be a result of the first error indicated in CU-HW [8], DR-ERR1 [9], CU-ERR1 [4], DR-ERR2 [11], or CU-ERR2 [6].

CU-HW [8] is the control unit hardware-detected error code from the OBR record (sense bytes 16 and 17). This error code defines a control unit failure and should be used to enter the maintenance package if you have multiple drive failures.

DR-ERR1 [9] is the drive hardware-detected error code, from the OBR record (sense bytes 20 and 21). This error code defines the first failure for any drive and should be used to enter the maintenance package if you have single drive failures.

DR-F [10] is a microcode-developed flag byte, from the OBR record (sense byte 18). This byte provides additional information, if available, for DR-ERR1 [9]. This byte, when available, is further defined in the MI EAD section under the error code in CU-ERR1.

DR-ERR2 [11] is the drive hardware-detected error code, from the OBR record (sense bytes 22 and 23). This error code defines the second or last failure for any drive and should not be used to enter the maintenance package if you have single drive failures. This error information provides supplemental information and can be a result of the first failure (DR-ERR1) in the drive.

OCCURRENCES [12] is the total number of times this error code occurred.

DATE/TIME [13] is the Julian date and time of the last occurrence.

CPU, MODEL, SERIAL NUMBER [14] further identifies the CPU listed in the FRU SUMMARY REPORT.

FRU SUMMARY REPORT EXAMPLE

[1] DAY YR 049 86 TO DAY YR 052 86

DEVICE TYPE 3480

[2] DEVNO /CUA	CPU	[3] CHA	CU	PTH	[4] CU-1	[5] F	[6] CU-2	[7] CU-L	[8] CUHW	[9] DR-1	[10] F	[11] DR-2	[12] OCCURRENCES	[13] **** DATE/TIME **** **** LAST ENTRY ****	
5A2	E	B	0	0	7401	00	7407	7401	D002	0000	00	0000	00001	051/86	19:22:13:31
5A3	E	B	0	1	7151	00	7607	CCBB	D708	0000	00	0000	00001	051/86	19:03:22:23
5A4	F	B	0	1	8E06	0C	0000	0000	0000	192C	00	0000	00001	051/86	21:45:32:21
5A5	F	B	1	0	7407	00	7401	7407	D007	0000	00	0000	00001	051/86	20:31:22:45
5A7	F	B	0	0	A130	00	3300	0000	D5C1	0000	00	0000	00001	051/86	04:06:33:44
5A7	E	B	0	0	7161	00	7161	7161	0000	0000	00	0000	00001	051/86	22:16:37:22
5A7	E	B	0	1	7161	00	7161	7161	0000	0000	00	0000	00001	051/86	22:16:18:54
5A7	F	B	0	0	3300	40	0000	0000	0000	0000	00	0000	00001	051/86	22:18:38:52
5A7	F	B	0	0	7161	00	7161	7161	0000	0000	00	0000	00001	051/86	22:18:40:60

CPU	MODEL	SERIAL NUMBER [14]
E	3081	210819
F	3081	010819

0 0 0 0 0 0 0 0 0 0

The Error Code Summary report provides a summary of error codes logged and is listed by CUA.

The error codes can provide an entry into the MI for both drive and control unit failures.

Field Definitions

DAY YR TO DAY YR 1

The first DAY YR is the Julian date of the first record.

The second DAY YR is the Julian date of the latest record.

DEVNO/CUA 2 is the device number in XA mode or the primary control unit address (PCUA). The message may refer to a condition that occurred on an alternate CU path. (See START 400 to determine the actual path.)

CPU 3 identifies the host processor reporting the exception. The actual CPU model and serial number are shown at the bottom of the report.

CHR 3 identifies the channel adapter that was in use at the time of error.

CUR 3 identifies the control unit containing the channel adapter.

CUD 3 identifies the control unit containing the buffer and data flow in use at the time of error.

CU-ERR1 4 is the microcode-detected error code for the first error (control unit or drive), from the OBR record (sense bytes 10 and 11). This error code should not be used as an entry to the maintenance package unless efforts using CU-HW 8 and/or DR-ERR1 9 have not corrected the subsystem problem.

CU-F 5 is a microcode-developed flag byte, from the OBR record (sense byte 9). This byte provides additional information, if available, for CU-ERR1 4. This byte, when available, is further defined in the MI EAD section under the error code in CU-ERR1.

CU-ERR2 6 is the microcode-detected error code for the second error (control unit or drive), from the OBR record (sense bytes 12 and 13). This error code can be a result of the first error indicated in CU-HW 8, DR-ERR1 9 or CU-ERR1 4.

CU-ERRL 7 is the microcode-detected error FRU code for the last error (control unit or drive), from the OBR record (sense bytes 14 and 15). This error code can be a result of the first error indicated in CU-HW 8, DR-ERR1 9, CU-ERR1 4, DR-ERR2 11, or CU-ERR2 6.

CU-HW 8 is the control unit hardware-detected error code from the OBR record (sense bytes 16 and 17). This error code defines a control unit failure and should be used to enter the maintenance package if you have multiple drive failures.

DR-ERR1 9 is the drive hardware-detected error code, from the OBR record (sense bytes 20 and 21). This error code defines the first failure for any drive and should be used to enter the maintenance package if you have single drive failures.

DR-F 10 is a microcode-developed flag byte, from the OBR record (sense byte 18). This byte provides additional information, if available, for DR-ERR1 9. This byte, when available, is further defined in the MI EAD section under the error code in CU-ERR1.

DR-ERR2 11 is the drive hardware-detected error code, from the OBR record (sense bytes 22 and 23). This error code defines the second or last failure for any drive and should not be used to enter the maintenance package if you have single drive failures. This error information provides supplemental information and can be a a result of the first failure (DR-ERR1) in the drive.

OCCURRENCES 12 is the total number of times this error code occurred.

DATE/TIME 13 is the Julian date and time of the last occurrence.

CPU, MODEL, SERIAL NUMBER 14 further identifies the CPU listed in the Error Code Summary report.

Error Code Summary Example

```
 1  REPORT DATE 063 86
    PERIOD FROM 049 86
           TO   052 86


                 3
        C   C   C   C+
DEVNO   P   H   U   U    ----------CU---------- -----DR-------              **** DATE/TIME  ****
/CUA    U   R   R   D    ERR1 F  ERR2 ERRL HW   ERR1 F  ERR2    OCCURRENCES **** LAST ENTRY ****
 2                       4  5   6    7    8    9  10  11        12          13
 5A2    E0  B   0   0    7401 00 7407 7401 D002 0000 00 0000        00001  051/86  19:22:13:31

 5A3    E0  B   0   1    7151 00 7607 CCBB D708 0000 00 0000        00001  051/86  19:03:22:23

 5A4    E0  B   0   1    8E06 0C 0000 0000 0000 192C 00 0000        00001  051/86  21:45:32:21

 5A5    F0  B   1   0    7407 00 7401 7407 D007 0000 00 0000        00001  051/86  20:31:22:45

 5A7    F0  B   0   0    A130 00 3300 0000 D5C1 0000 00 0000        00001  051/86  04:06:33:44
 5A7    E0  B   0   0    7161 00 7161 7161 0000 0000 00 0000        00001  051/86  22:16:37:22
 5A7    E0  B   0   1    7161 00 7161 7161 0000 0000 00 0000        00001  051/86  22:16:18:84
 5A7    F0  B   0   0    3300 40 0000 0000 0000 0000 00 0000        00001  051/86  22:18:38:52
 5A7    F0  B   0   0    7161 00 7161 7161 0000 0000 00 0000        00001  051/86  22:18:40:60

 CPU MODEL  SERIAL NUMBER  14
  E0 3081      210819
  F0 3081      010819
```

0 0 0 0 0 0 0 0 0 0

Error Code Summary Report (EREP 3.2)

The Error Code Summary report provides a summary of error codes logged and is listed by CUA.

The error codes can provide an entry into the MI for both drive and control unit failures.

Field Definitions

DAY YR TO DAY YR 1

The first DAY YR is the Julian date of the first record.

The second DAY YR is the Julian date of the latest record.

DEVNO/CUA 2 is the device number in XA mode or the primary control unit address (PCUA). The message may refer to a condition that occurred on an alternate CU path. (See START 400 to determine the actual path.)

CPU 3 identifies the host processor reporting the exception and is shown as a value of A through H. The actual CPU model and serial number are shown at the bottom of the report.

CHR 3 identifies the channel adapter that was in use at the time of error.

CUR 3 identifies the control unit containing the channel adapter.

CUD 3 identifies the control unit containing the buffer and data flow in use at the time of error.

CU-ERR1 4 is the microcode-detected error code for the first error (control unit or drive), from the OBR record (sense bytes 10 and 11). This error code should not be used as an entry to the maintenance package unless efforts using CU-HW 8 and/or DR-ERR1 9 have not corrected the subsystem problem.

CU-F 5 is a microcode-developed flag byte, from the OBR record (sense byte 9). This byte provides additional information, if available, for CU-ERR1 4. This byte, when available, is further defined in the MI EAD section under the error code in CU-ERR1.

CU-ERR2 6 is the microcode-detected error code for the second error (control unit or drive), from the OBR record (sense bytes 12 and 13). This error code can be a result of the first error indicated in CU-HW 8, DR-ERR1 9 or CU-ERR1 4.

CU-ERRL 7 is the microcode-detected error FRU code for the last error (control unit or drive), from the OBR record (sense bytes 14 and 15). This error code can be a result of the first error indicated in CU-HW 8, DR-ERR1 9, CU-ERR1 4, DR-ERR2 11, or CU-ERR2 6.

CU-HW 8 is the control unit hardware-detected error code from the OBR record (sense bytes 16 and 17). This error code defines a control unit failure and should be used to enter the maintenance package if you have multiple drive failures.

DR-ERR1 9 is the drive hardware-detected error code, from the OBR record (sense bytes 20 and 21). This error code defines the first failure for any drive and should be used to enter the maintenance package if you have single drive failures.

DR-F 10 is a microcode-developed flag byte, from the OBR record (sense byte 18). This byte provides additional information, if available, for DR-ERR1 9. This byte, when available, is further defined in the MI EAD section under the error code in CU-ERR1.

DR-ERR2 11 is the drive hardware-detected error code, from the OBR record (sense bytes 22 and 23). This error code defines the second or last failure for any drive and should not be used to enter the maintenance package if you have single drive failures. This error information provides supplemental information and can be a a result of the first failure (DR-ERR1) in the drive.

OCCURRENCES 12 is the total number of times this error code occurred.

DATE/TIME 13 is the Julian date and time of the last occurrence.

CPU, MODEL, SERIAL NUMBER 14 further identifies the CPU listed in the Error Code Summary report.

Error Code Summary Example

```
1  REPORT DATE 063 86
   PERIOD FROM 049 86
          TO   052 86
```

2 DEVNO /CUA	CPU	3 CHR	CUR	C+ UD	4 CU ERR1	5 CU F	6 CU ERR2	7 CU ERRL	8 CU HW	9 DR ERR1	10 DR F	11 DR ERR2	12 OCCURRENCES	13 **** DATE/TIME **** **** LAST ENTRY ****	
5A2	E	B	0	0	7401	00	7407	7401	D002	0000	00	0000	00001	051/86	19:22:13:31
5A3	E	B	0	1	7151	00	7607	CCBB	D708	0000	00	0000	00001	051/86	19:03:22:23
5A4	F	B	0	1	8E06	0C	0000	0000	0000	192C	00	0000	00001	051/86	21:45:32:21
5A5	F	B	1	0	7407	00	7401	7407	D007	0000	00	0000	00001	051/86	20:31:22:45
5A7	F	B	0	0	A130	00	3300	0000	D5C1	0000	00	0000	00001	051/86	04:06:33:44
5A7	E	B	0	0	7161	00	7161	7161	0000	0000	00	0000	00001	051/86	22:16:37:22
5A7	E	B	0	1	7161	00	7161	7161	0000	0000	00	0000	00001	051/86	22:16:18:84
5A7	F	B	0	0	3300	40	0000	0000	0000	0000	00	0000	00001	051/86	22:18:38:52
5A7	F	B	0	0	7161	00	7161	7161	0000	0000	00	0000	00001	051/86	22:18:40:60

```
CPU MODEL   SERIAL NUMBER  14
 E  3081      210819
 F  3081      010819
```

3480 DEVNO/CUA Statistics Summary Report

The data in this report is listed by CUA for all device addresses that exceed hardware limits or had permanent errors. The data is a summary of all activity on the device for the given period in which the report was run. This includes permanent, temporary and statistical data.

Field Definitions

Report Date, Period From, Period To 1.

REPORT DATE is the Julian date the report ran.

PERIOD FROM is the Julian date of the earliest record.

PERIOD TO is the Julian date of the latest record.

Current Limits, Mbytes/Err 2

CURRENT LIMITS and megabytes/error for both the hardware and the volume are the limit values from the limit control cards. (See MSG 105 for more information on the limit control cards.)

DATE DAY YR 3 is the Julian date and year from the OBR or MDR record.

VOLID 4 is the volume serial number.

ERPA 5 is the error recovery action code to the host (contents of Sense Byte 3).

FMT 6 is the format of the sense record. Valid formats are 19, 20, or 21.

MBPROC 7 is the number of megabytes processed. (Data from sense byte 14 – 15 for write and 16 – 17 for read in the format 21 Statistical Record.)

DATA CHK 8 is the number of data checks corrected. (Criteria) (Data from sense byte 22 for write and 23 for read in format 21 Statistical Record.)

DATA ERR 9 is the number of Hardware ERP made. (Data from sense byte 10 for write, sense byte 8 for read forward, and 9 for read backward in format 21 Statistical Record.)

MB/ERR 10

WRITE is the average number of megabytes written per temporary write error.

READ is the average number of megabytes read per temporary read error.

ERSE GAPS 11 is the total number of blocks re-written during error recovery. (Data from sense byte 24 of the format 21 Statistical Record.)

READ RTY 12 is the total number of correctable read errors detected during 3480 read error recovery. (Data from sense byte 30 of the format 21 Statistical Record.)

DRV DET 13 is the number of unit checks set by the drive. (Data from sense byte 25 of the format 21 Statistical Record.)

CU EQU CHKS 14 is the number of errors found in the use of external regs in the CU for a given device. (Data from sense byte 13 of the format 21 Statistical Record.)

INSTANT SPD VAR 15 flag indication that tape speed variations have been detected by hardware checkers. (A function of Control Unit microcode.)

BLK PROC 16 is the total number of blocks processed. (Data from sense byte 19 on a write and 18 on a read of the format 21 Statistical Record.)

BLK COR 17 is the total number of blocks corrected. (ECC corrected) (Data from sense byte 12 on a write and 11 on a read of the format 21 Statistical Record.)

HDR SER 18 is the header serial number on the tape volume. The header number is derived from the last 4 digits of the control unit serial number that wrote the volume, with the drive address added to the last position.

For Example:

Header Serial is 3892F

The last 4 digits of control unit serial number is 3892

Drive address is F

CPU 19 is the host processor reporting the data.

All error and statistical data (MDR records) are shown for devices which were listed in the Subsystem Exception Report. They are listed by CUA for the period indicated. ****NOTE**** Due to space limitations, this report will not show activity on all devices that were listed in the Subsystem Exception Report.

3480 DEVNO/CUA STATISTICS SUMMARY FOR-0480

1 REPORT DATE 063 86
PERIOD FROM 049 86
TO 052 86

DEVICES FAILING LIMITS OR PERMANENT ERRORS

2 CURRENT LIMITS MBYTES/ERR — HARDWARE — TEMP WRT (CT) 999 (5) — TEMP READ (CT) 999 (1)

3 DTE	TIME	4 VOLID	5 ER PA	6 F M T	7 MB WRT	PROC RD	8 CRITERIA DATA WRT	CHK RD	9 ERP DATA WRT	ERROR RD FWD	RD BKWD	10 MB/ERROR TEMPORARY WRITE	READ	11 ERSE GAPS	12 READ RTY	13 DRV DET	14 CU EQU CHKS	15 INSTANT SPD RD	VAR WRT	16 BLK WRT	PROC READ	17 ECC BLK WRT	COR READ	18 HDR SER	19 C P U
049	021022	L32345	2B 21	40	0	0	0	0	0	0	—	—	0	0	0	0	0	0	96	12	1	0	00000	E
049	021228	L32345	2B 21	1	45	0	0	0	0	0	—	—	0	0	0	0	0	0	866	12	0	0	00000	E
049	025623	L32345	2B 21	1	76	0	0	0	0	0	—	—	0	0	0	0	0	0	2821	14	7	9	00000	E
050	069527	L18500	2B 21	201	0	0	0	0	0	0	—	—	0	0	0	0	0	0	2097	12	1	0	00000	E
050	182840	L33825	2B 21	1	23	0	0	0	0	0	—	—	0	0	0	0	0	0	12	12	0	0	00000	E
050	185954	L31800	2B 21	1	56	0	0	0	0	0	—	—	0	0	0	0	0	0	262	12	0	0	00000	E
050	193136	L16550	2B 21	119	0	0	0	0	0	0	—	—	0	0	0	0	0	0	197	12	0	0	00000	E
050	200742	L31720	2B 21	1	79	0	0	0	0	0	—	—	0	0	0	0	0	0	4198	6368	11	7	00000	E
050	232824	L31918	2B 21	200	0	0	0	0	0	0	—	—	0	0	0	0	0	0	2884	12	0	0	00000	E
051	022619	L13221	2B 21	173	1	0	0	0	0	0	—	—	0	0	0	0	0	0	544	32	0	0	00000	E
051	035419	L22277	2B 21	178	1	7	0	7	0	0	178	—	0	0	0	0	0	0	5375	12	3	0	00000	E
051	035510	L22814	2B 21	1	29	0	0	0	0	0	—	—	0	0	0	0	0	0	5505	12	12	0	00000	E
051	035849	L22814	2B 21	1	41	0	0	0	0	0	—	—	0	0	0	0	0	0	1966	12	1	0	00000	E
051	050204	L22814	2B 21	1	68	0	0	0	0	0	—	—	0	0	0	0	0	0	64	12	0	0	00000	E
051	193036	L34645	2B 21	1	92	0	0	0	0	0	—	—	0	0	0	0	0	0	66	12	0	0	00000	E
051	214532		34 20	0	0	0	0	0	0	0	—	—	0	0	1	0	0	0					43000	E
051	230711	L16553	2B 21	147	2	0	0	0	0	0	—	—	0	0	0	0	0	0	2687	12	2	0	00000	E
051	233355	L16546	2B 21	200	1	5	0	5	0	0	200	—	0	0	0	0	0	0	3808	224	0	0	00000	E

CPU	MODEL	SERIAL NUMBER
A	3081	210819
B	3081	010819
C	3081	170563
D	3081	371074
E	3081	271280

OBR Edit Report

The OBR Edit Report is a detailed report of any OBR/Unit Check Log record. Service representative (SR) selection/options control if the OBR records are printed.

See the following manuals for further information on SR selection of options for the OBR/Edit report:

- *OS/VS REL2 SYS1.LOGREC Error Recording Manual*, GC28-0638
- *OS/VS REL3 SYS1.LOGREC Error Recording Manual*, GC28-0668

The following information is presented in a condensed form for the 3480 Tape Subsystem.

- Counter overflow statistics for devices.
- Demount conditions.
- Permanent device failures (unit checks and uncorrectable errors).
- Temporary or intermittent device failures.

OBR Edit Report Example

```
RECORD TYPE -UNIT CHECK  SOURCE - OUTBOARD   CPU  MODEL - XXXX   SERIAL NO. XXXXX

OS/VS RELEASE XX.X


                                                          3
          DAY  YEAR      2  HH MM SS TH          JOB NAME    XXXXXXXX
     1DATE- 123    84     TIME 14:27:14:01
                                          4
DEVICE TYPE                3480          BLOCK ID              XXXXXXXX
FAILING 5 DEVNO/CUA        XXXX        6 BLOCK LENGTH          XXXXXXXX
7 VOLUME SERIAL            XXXXXX


             CC    CA    FL       CT              K     CA    US  CS   CT
FAILING CCW  XX  XXXXXX  XX  XX  XXXX      CSW    XX  XXXXXX  XX  XX  XXXX


               UNIT STATUS                          CHANNEL STATUS
ATTENTION          X   CHANNEL END       X  PRGM-CTLD IRPT   X   CHAN DATA CHECK  X
STATUS MODIFIER    X   DEVICE END        X  INCORRECT LENGTH X   CHAN CTL CHECK   X
CONTROL UNIT END   X   UNIT CHECK        X  PROGRAM CHECK    X   I/F CTL CHECK    X
BUSY               X   UNIT EXCEPTION    X  PROTECTION CHECK X   CHAINING CHECK   X

8 SENSE BYTE DATA

  0    2    4    6    8    10   12   14   16   18   20   22   24   26   28   30
  XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXXX


 9 CU ERR1      XXXX XX  10 DR ERR1     XXXX XX
11 CU ERR2      XXXX     12 DR ERR2     XXXX
13 CU ERRL      XXXX
14 CU HW        XXXX
```

3480 Temporary Error Summary

For best error analysis, use all of the data contained in the body of this report, not just the averages listed at the bottom. The averages are indicators of overall account performance, such as TOTAL MEGABYTES PROCESSED versus AVERAGE MEGABYTES/PERMANENT ERROR.

Note: If more than one entry appears for the same device, the SHARE cards are either not present or not correct. For more information see SHARE cards in *EREP Users Guide and Reference*, GA28-1378.

Looking at this report, attempt to "weight" the data in a general manner, without placing restrictions on any particular columns of data. Observe the following columns:

1. Mounts

Is the number of mounts consistent across the range of devices?

Is the number of mounts high enough to reflect meaningful data (such as 10 to 15 mounts or more)?

2. MB/ERR and ERRCT

MB/ERR is calculated by EREP by dividing the total megabytes read and written by the error count (ERRCT).

If the MB/ERR column is less than the number in the LIMIT card (500) and the error count is equal to or greater than the LIMIT CARD (5) an entry on the exception report will occur.

The 3480 subsystem is capable of performing well in excess of the LIMIT card values. Any MB/ERR values less than 500 should be suspect. Set 'Force Logging' in the control unit and use the FORCED LOG REPORT to obtain the sense data for further isolation

a. Pursue values from 0-10 MB/ERR first.

b. Pursue values from 10-99 MB/ERR second, and so on.

3. MB/COR

This column represents the number of megabytes of data processed between ECC's.

Any drive that indicates a value of '0' is processing less than one megabyte of data between ECC's and requires attention.

ECC's may or may not result in temporary errors. To further isolate, turn on 'Force Logging' in the control unit.

Current field data indicates that the nominal value for this column should be approximately 10-15.

4. WRITE ERASE GAPS

An entry is generated each time the following sequence occurs:

a. A write error occurs

b. The tape is repositioned for a retry

c. An error is detected on the second attempt

d. The tape is repositioned for another retry

e. A data pattern is written on the tape indicating an "erase gap."

If the value in this column is 10 or more, look for one or two single cartridges as the source of the error and perform these steps:

a. Refer to the VOLUME STATISTICS REPORT for volumes exhibiting erase gaps on particular control unit addresses.

b. If unable to isolate to one or two cartridges, suspect the drive. Use the MD and the START REPAIR option to further isolate the problem.

3480 Volume Statistics Summary

Analysis must be done for time periods greater than a couple of days. Use the EREP history tape to obtain data for a week or more.

If the volume is listed and shows poor performance before and after the time period in question (Permanent or high Temporary Errors) suspect the media.

If the volume does not show poor performance, use the other EREP reports (PERMANENT and TEMPORARY ERROR SUMMARY) to isolate the problem.

3480 Error Code Summary Report

This report shows Error codes for the control unit (CU) and the drive (DRV) in sense bytes 10-17 and 20-23 for selected subsystem errors.

The control unit involved is displayed in column 'CUR'.

The control unit sending the sense data to the host is identified in column 'CUD'.

The channel adapter in use is indicated in column 'CHR'.

This report is helpful when investigating a drive check code, as in the following example:

If an error results in a check code, sense data is sent to the host. This sense data may have byte 0 bit 1 on, which indicates "intervention required." This permits the operator the opportunity of attempting to clear the check condition without the job ending abnormally.

0 0 0 0 0 0 0 0 0 0

OBR Edit Report (Continued)

Field Definitions

DATE DAY YEAR **1** is the Julian date and year the report ran.

TIME **2** is the time the error occurred, taken from the OBR record.

JOB NAME **3** is the job name taken from the OBR record for any listed volume with permanent errors.

BLOCK ID **4** is the logical block position for permanent errors.

DEVNO/CUA **5** is the device number in XA mode or primary control unit address (PCUA). The message may refer to a condition that occurred on an alternate CU path. (See START 400 to determine the actual path.)

BLK LEN **6** is the block length as taken from the OBR record for any listed volume with permanent errors.

Volume Serial **7** is the volume serial number.

SENSE **8** are the sense bytes from the OBR record.

Note: The correct maintenance device connection point is determined from the information in sense byte 2, using the procedures described on START 400.

CU-ERR1 **9** is the microcode-detected error code for the first error (control unit or drive), taken from the OBR record (sense bytes 9, 10 and 11). This error code is to be used as the entry code to the Maintenance Package if troubleshooting with CU-HW and/or DR-ERR1 has not corrected the problem.

A microcode-developed flag byte, taken from the OBR record (sense byte 9) is also provided. This byte provides additional information, if available, for CU-ERR1. This byte, when available, is further defined in the MI EAD section under the error code in CU-ERR1.

DR-ERR1 **10** is the drive hardware-detected error code, from the OBR record (sense bytes 20, and 21). This error code defines the first failure for any drive and should be used to enter the maintenance package if you have single drive failures.

A microcode-developed flag byte, taken from the OBR record (sense byte 18) is also provided. This byte provides additional information, if available, for DR-ERR1. This byte, when available, is further defined in the MI EAD section under the error code in DR-ERR1.

CU-ERR2 **11** is the microcode-detected error code for the second error (control unit or drive), taken from the OBR record (sense bytes 12 and 13).

DR-ERR2 **12** is the drive hardware-detected error code, from the OBR record (sense bytes 22 and 23). This error code defines the second or last failure for any drive and should not be used to enter the maintenance package if you have single drive failures. This error information is supplemental information and may be a result of the first failure (DEV FRU #1) in the drive.

CU-ERRL **13** is the microcode-detected error FRU code for the last error (control unit or drive), taken from the OBR record (sense bytes 14 and 15).

CU-HW **14** is the control unit hardware detected error code taken from the OBR record (sense bytes 16 and 17). This error code defines a control unit failure and should be used to enter the maintenance package if you have multiple drive failures.

EREP Analysis/Predictive Maintenance Overview

EREP analysis/predictive maintenance is the process of:

- Analyzing EREP reports to identify existing problems and error trends that indicate potential problems.
- Determining when corrective action should be performed.
- Deciding what corrective action to perform before the problem results in a customer service request.

EREP analysis can also be used when system console messages are not readily available or when trends of errors are to be analyzed for current problems.

Note: The EREP reports are described in detail in this section starting on MSG 100. For the page number of each report see "Contents" on MSG 1.

About the 3480 Subsystem EREP Analysis/Predictive Maintenance Procedure

This page provides an overview of the 3480 subsystem EREP analysis/predictive maintenance procedure. To perform the EREP analysis/predictive maintenance procedure go to "Starting EREP Analysis/Predictive Maintenance" on MSG 360.

The 3480 subsystem EREP analysis/predictive maintenance procedure is designed to aid you in analyzing EREP reports, in determining when corrective action should be performed, and in deciding what corrective action to perform. The procedure guides you through the analysis of EREP reports to:

- Identify permanent errors that have not been corrected.
- Monitor temporary errors that, if permitted to continue, could cause a customer service request.
- Determine the units in the subsystem that should be worked on first by identifying the units with the highest number of failures.

After you have identified the errors and determined that corrective action is needed, the procedure guides you through additional analysis to determine if you have a control unit problem or a drive problem. If you determine that you have a creating-drive problem, you are directed to the procedure for hardware errors on that drive.

If you determine that you have hardware temporary errors that require corrective action, you are directed to an MD procedure.

Use of EREP History Tapes

At times it can be more useful to have more than daily information on the EREP reports, to determine on-going trends of performance. Most accounts have the necessary data on a history tape.

A method to get this data is to build a temporary data set, using selected parameters to pull the data from the data set. For detailed information, see *EREP User's Guide and Reference*, GA28-1378.

The temporary data set can then be used to run history reports using a program such as SYSEXN. EVENT and TRENDS reports can be run by using KEYWORD parameters. The following JCL is an example of how to build a temporary data set for history. It must be modified to apply to your specific account:

```
//EREPSP    JOB  MSGLEVEL=1
//STEP1     EXEC PGM=IFCEREP1,PARM='CARD'
//ACCIN     DD   DSN=EREP.HIST.TAPE
//               DCB=(RECFMT=VB,
//               BLKSIZE=12000),DISP=(OLD,KEEP),
//               UNIT=3480,VOL=SER=LBJ995
//ACCDEV    DD   UNIT=SYSDA,DSN=EHISTORY
//          DD   DISP=(NEW,PASS),SPACE=(CLY,(5,5)),
//          DD   DCB=(RECMFT=VB,BLKSIZE=4000)5,5)),
//DIRECTWK  DD   UNIT,SYSDA,SPACE=(CYL,(8))
//EREPPT    DD   SYSOUT=A,DCB=BLKSIZE=133
//TOURIST   DD   SYSOUT=A,DCB=BLKSIZE=133
//SYSIN     DD   *
HIST=Y
ACC=Y
CUA=(280)
DATE=(84020-84040)
VOLID=(TAPE1,TAPE2)
```

Notes:

1. //STEP1 specifies that the parm cards are shown after SYSIN.
2. //ACCIN defines the input as a history tape.
3. //ACCDEV defines EHISTORY as the temporary data set, to be used by the next program run.
4. CUA, DATE, and VOLID are specific selection parameters to be included in the temporary data set.

Analysis Of EREP Reports

The EREP analysis/predictive maintenance procedure depends on a thorough analysis of the EREP reports. EREP reports should be reviewed daily to determine changing trends in the performance of the 3480 subsystem. This is of particular importance in identifying creating-drive problems. Remember when you analyze these reports, it is possible that the problem which caused a reported error may have been fixed.

EREP reports are analyzed for hardware errors (such as potential creating-drive problems) to determine whether the problem exists across multiple drives, which may indicate a control unit problem, or is a single drive problem. Corrective action is based on selected error codes, in the sense data, which are used to determine a fault symptom code (FSC).

EREP analysis for temporary errors cannot be directly used to define an error code or fault symptom code (FSC). Temporary errors are reported as statistical data (megabytes read or written per temporary error), which does not provide error codes for corrective action. Corrective action is based on a list of FRUs generated by the MD procedure for temporary errors.

Use the Subsystem Exception report (See MSG 200) as the starting point for your analysis of EREP reports. Depending on the results of your Subsystem Exception report analysis, you will be directed to, and guided through, the analysis of the detailed EREP reports. The Subsystem Exception report shows a summary of the following permanent errors:

- Hardware permanent errors.
- Volume or creating-drive permanent read or write errors on more than one drive.

The Subsystem Exception report also shows a summary of the following temporary errors when the limits are specified by the limit controls (which are described in MSG 105) and the limits are exceeded:

- Hardware failed temporary read or write limits.
- Volume or creating drive failed temporary read or write limits on more than one drive.
- Volume failed temporary read or write limits.

The limits can also be adjusted for specific conditions such as:

- When you want any temporary error to initiate a corrective action.
- When you want to track deteriorating volumes.
- When you want to track increasing temporary error rates.

The predictive maintenance procedure guides you through the analysis of EREP reports to identify problems in the following order:

1. Hardware permanent errors
2. Volume or creating-drive permanent read or write errors on more than one drive:
   a. Identify any read permanent errors that are potential creating-drive problems.
   b. Identify any read permanent errors that are potential control unit problems relating to the reading drive.
   c. Identify any remaining volume permanent read errors.
   d. Identify any write permanent errors that are potential control unit problems.
   e. Identify any remaining volume permanent write errors.
3. Volume or creating-drive failed temporary read or write limits on more than one drive:
   a. Identify any temporary write errors that exceed the limits and could have been caused by subsystem hardware.
   b. Identify any temporary read errors that exceed the limits and are potential creating-drive problems.
   c. Identify any temporary read errors that exceed the limits and are potential control unit problems relating to the reading drive.
   d. Identify any remaining volume-caused temporary write errors that exceed the limits.
   e. Identify any remaining volume-caused temporary read errors that exceed the limits.
4. Hardware failed temporary read or write limits:
   a. Identify any hardware temporary write errors that exceed the limits.
   b. Identify any hardware temporary read errors that exceed the limits.
5. Volume failed temporary read or write limits:
   a. Identify any temporary write errors that exceed the limits and could have been caused by subsystem hardware.
   b. Identify any temporary read errors that exceed the limits and are potential creating-drive problems.
   c. Identify any temporary read errors that exceed the limits and are potential control unit problems relating to the reading drive.
   d. Identify any remaining volume-caused temporary write errors that exceed the limits.
   e. Identify any remaining volume-caused temporary read errors that exceed the limits.

Before You Start Corrective Action

Before you start corrective action, you should review the customer cleaning procedure. Then determine the cleanliness of the suspected drive head and guide assembly as described on CARR-DR 130 (Head, Decoupler, and Cleaner Block Cleaning Procedure).

If the head and guide assembly needs cleaning, clean the drive using the tape cleaner cartridge, part 4780527, or equivalent.

Refer to *IBM 3480 Magnetic Tape Subsystem Operators Guide*, GA32-0066 for additional information. ***If additional cleaning is needed, perform the cleaning procedure described on CARR-DR 130. Inform the customer to clean the head more often.***

Using The Subsystem Exception Reports

The Subsystem Exception Report is like a window to the 3480 subsystem. In it you can define acceptable performance and the report will flag those items outside the acceptable range. For this reason, each entry in the report must be pursued. If the report contains no entries, no further activity is needed. See MSG 200 for an example of the report.

Errors on the Subsystem Exception Report should be approached in the following sequence:

Hardware Permanent Error

Go to the **Permanent Error Summary** to view the data for each entry and then:

1. Attach the maintenance device (MD) to the control unit.

2. Select the **Start Repair** option. When you are prompted to select the sense, select sense from permanent errors.

   Note: The maintenance package will analyze sense data to determine if the MD is connected to the correct control unit (CU). You will be directed to move the MD if it is not attached to the correct CU.

Volume or Creating Drive Permanent Read or Write Errors on More Than One Drive

Entries appear in this area because the same volume failed on more than one drive. Go to the **Permanent Error Summary** and:

1. Determine the Volume ID (see MSG 205).

2. Use sense bytes 4, 5 and 6 to determine which block ID's had problems.

3. Determine if the error was detected during read or write by looking at sense byte 1, bit 5. A write operation is shown by the bit being on.

4. If the errors are on the same block ID and the operation was a read operation, perform these steps:

   a. Determine the creating drive by either:

   Ask the customer to determine when and where the cartridge was created. (The customer should be able to do this.)

   or

   Dumping HDR2 of the label on the failing VOL serial number indicates the last four digits of the control unit serial number and the drive that created the tape.

   b. Use the System Log (SYSLOG) to determine why the drive did not close the volume correctly.

   c. Use the LOGREC data to determine the date and possible reason a bad tape was created.

   d. If the errors were detected at the time of creation, run the **Start Repair** option on the MD to the suspected drive. If no errors are detected, suspect the media.

5. Compare sense bytes 4, 5, and 6. If the errors, shown by the block ID, are at the same place on the tape during a write operation, suspect the media.

Volume or Creating Drive Failed Temporary Read or Write Limits on More Than One Drive

Entries appear in this area because the same volume failed on more than one drive. Use the **Temporary Error** and **Volume Statistics** reports to help determine if the volume or creating drive is at fault and then perform these steps:

1. Determine if the errors are read or write errors by locating the volume in the **Volume Statistics** report and looking for entries (read or write) under MB/ERR TEMP. Once you have determined whether the error is a read or write, do these steps:

   a. If the operation was a write, use the **Vol Serial** and the **Volume Statistics** reports to determine which drives had the errors. One drive may have many errors while other drives show very few. In this case, run the **Start Repair** option on the MD to the drive showing the largest number of errors. If the errors occur equally on several drives where the volume serial was mounted, suspect the media.

   b. If the errors are on the same block ID and the operation being performed was a read, determine the creating drive by asking the customer when and where the cartridge was created.

   Dumping HDR2 of the label on the failing VOL serial number indicates the last four digits of the control unit serial number and the drive that created the tape.

   c. If errors were detected at creation time, use LOGREC to determine the date the tape was created and, if the drive shows errors on the creation of the volume serial, run the **Start Repair** option on the MD on the suspected drive. If no errors were detected at the time of creation, suspect the media.

2. Resolve all entries that exceed established limits.

Hardware Failed Temporary Read or Write Limits

If the hardware limit is not met, perform these steps:

1. Use the MD to detect the error, if the MD does not detect an error, set **Forced Logging** in the control unit (see MSG 411) and use the FORCED LOG report to obtain sense data for further isolation.

2. When prompted by the MD for an answer to, "HIGH NUMBER OF TEMPORARY DATA ERRORS INDICATED?," answer yes.

   Note: Even if no errors are detected by the **Start Repair** option, a FRU group will be indicated. Exchange this group before proceeding any further. This FRU group will be smaller than that indicated by the FSI pages. This is the result of failure isolation of a detected error or isolation based on entered sense data.

3. Use the **Temporary Error Summary** and the **FRU Summary** reports to further define the problem.

Volume Failed Temporary Read or Write Limits

If the volume limit is not met, perform these steps:

1. Use the **Temporary Error Summary** to determine if the volume that failed limits was also associated with a drive having a high temporary error rate. If the drive error rate is high (see **Temporary Error Summary** definition on MB/ERR-ERRCT). Run the **Start Repair** option on the MD.

   Note: Volume analysis is not possible using EREP on a daily basis. Setting EREP to run on a weekly basis will provide more accurate volume data.

2. Request the customer copy data, if necessary, to another cartridge.

3480 Forced Log Report

1. Temporary error data is presented in the same manner as permanent error data if 'Force Logging' is set in the control unit. Sense byte 7 of the sense records will always be '19'.

2. Look for clusters of errors that occur within a string of drives or at specific times. This could indicate a control unit problem.

3. Examine the contents of sense byte 2 and look for errors that occur on the same data path (see SENSE 110).

4. Examine sense bytes 4, 5, and 6 for errors that occur on one volume or near the same place on the tape.

3480 Temporary Error Summary

For best error analysis, use all of the data contained in the body of this report, not just the averages listed at the bottom. The averages are indicators of overall account performance, such as TOTAL MEGABYTES PROCESSED versus AVERAGE MEGABYTES/PERMANENT ERROR.

> **Note:** *If more than one entry appears for the same device, the SHARE cards are either not present or not correct. For more information see SHARE cards in EREP Users Guide and Reference, GA28-1378.*

Looking at this report, attempt to "weight" the data in a general manner, without placing restrictions on any particular columns of data. Observe the following columns:

1. Mounts

Is the number of mounts consistent across the range of devices?

Is the number of mounts high enough to reflect meaningful data (such as 10 to 15 mounts or more)?

2. MB/ERR and ERRCT

MB/ERR is calculated by EREP by dividing the total megabytes read and written by the error count (ERRCT).

If the MB/ERR column is less than the number in the LIMIT card (500) and the error count is equal to or greater than the LIMIT CARD (5) an entry on the exception report will occur.

The 3480 subsystem is capable of performing well in excess of the LIMIT card values. Any MB/ERR values less than 500 should be suspect. Set 'Force Logging' in the control unit and use the FORCED LOG REPORT to obtain the sense data for further isolation

a. Pursue values from 0-10 MB/ERR first.

b. Pursue values from 10-99 MB/ERR second, and so on.

3. MB/COR

This column represents the number of megabytes of data processed between ECC's.

Any drive that indicates a value of '0' is processing less than one megabyte of data between ECC's and requires attention.

ECC's may or may not result in temporary errors. To further isolate, turn on 'Force Logging' in the control unit.

Current field data indicates that the nominal value for this column should be approximately 10-15.

4. WRITE ERASE GAPS

An entry is generated each time the following sequence occurs:

a. A write error occurs

b. The tape is repositioned for a retry

c. An error is detected on the second attempt

d. The tape is repositioned for another retry

e. A data pattern is written on the tape indicating an "erase gap."

If the value in this column is 10 or more, look for one or two single cartridges as the source of the error and perform these steps:

a. Refer to the VOLUME STATISTICS REPORT for volumes exhibiting erase gaps on particular control unit addresses.

b. If unable to isolate to one or two cartridges, suspect the drive. Use the MD and the START REPAIR option to further isolate the problem.

3480 Volume Statistics Summary

Analysis must be done for time periods greater than a couple of days. Use the EREP history tape to obtain data for a week or more.

If the volume is listed and shows poor performance before and after the time period in question (Permanent or high Temporary Errors) suspect the media.

If the volume does not show poor performance, use the other EREP reports (PERMANENT and TEMPORARY ERROR SUMMARY) to isolate the problem.

3480 FRU Summary Report

This report shows FRU codes for the control unit (CU) and the drive (DRV) in sense bytes 10-17 and 20-23 for selected subsystem errors.

The control unit involved is displayed in column 'CU'.

The control unit sending the sense data to the host is identified in column 'PTH'.

The channel adapter in use is indicated in column 'CHA'.

This report is helpful when investigating a drive check code, as in the following example:

> If an error results in a check code, sense data is sent to the host. This sense data may have byte 0 bit 1 on, which indicates "intervention required." This permits the operator the opportunity of attempting to clear the check condition without the job ending abnormally.
>
> Because the "intervention required" bit is on, the sense data is not treated by the host in the same manner as other sense data. In EREP version 3.1.1 and 3.2, this results in an entry in the FRU SUMMARY/ERROR CODE SUMMARY. In EREP version 3.2, the error is also reported, along with 32 sense bytes in the RECOVERED section of the PERMANENT/RECOVERED ERROR REPORT.

Forced Error Logging

Turn On Forced Error Logging

Forced error logging provides the ability for logging temporary read or write errors.

The 3480 subsystem provides error codes in the sense data which defines error conditions for permanent errors. These error codes can have different corrective actions depending on the functional events occurring in the subsystem at the time of failure. The error codes must be analyzed in a specific order depending on whether the problem points to a specific drive, or a control unit problem.

Once the problem is determined to be either in a drive or a control unit, the first specified error code that is not zero is considered the fault symptom code (FSC). This FSC defines the corrective action to perform, including which FRUs to exchange.

However, in normal operating mode, sense data for temporary errors is reported as statistical data (megabytes read or written per temporary error, not the error code). This statistical data does not provide direct corrective action.

Invoking forced error logging causes each temporary error to be logged by the host system, the same as a permanent error. The sense data causes error codes to be developed so the FSC can be determined.

Corrective action for temporary errors is determined by predictive maintenance using EREP. After you have determined that corrective action for the temporary errors is necessary, start forced error logging as follows:

1. Connect the MD to the control unit.

2. Insert the support diskette into the MD and IPL it.

3. Select Main Menu option 3, Support Utilities option 1, Trace/Match option 3, and Control option 9 (see "Trace/Match Control Diagram" on SDISK 1). Continue pressing ENTER until a question asking if the options are correct is displayed. Reply 'yes' if the options are correct. This turns on forced error logging.

4. The MD can remain connected or removed from the control unit without changing the status of forced error logging. Resetting the control unit, or using the MD procedure "Turn Off Forced Error Logging" will turn off forced error logging. Removing the MD from the control unit depends on the frequency of occurrence of the temporary errors.

   Warning: Every temporary error will be logged, and if the host system error logs become full, the host system will stop processing. If the frequency of temporary errors is high, and the customer will not permit an EREP printout to reset the log, forced error logging must be turned off (see "Turn Off Forced Error Logging" for the procedure).

   . . . . . .

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5. If the frequency of temporary errors is low and the customer agrees to monitor his error log capacity messages, perform an EREP printout and reset the error logs (the MD can be removed). The customer can later inform you that temporary errors have been logged and you can then turn off forced error logging.

6. After the sense data error codes have been recorded for the temporary errors using forced error logging, corrective action can be performed in the same way as permanent errors, using "Determining A Fault Symptom Code" procedure on START 300.

Turn Off Forced Error Logging

Do the following to turn off forced error logging.

1. Connect the MD to the control unit.

2. Insert the support diskette into the MD and IPL it.

3. Select Main Menu option 3, Support Utilities option 1, and Trace/Match option 6 to reset forced error logging (see "Trace/Match Control Diagram" on SDISK 1).

   The MD can be left connected or removed to perform corrective action.

Notes MSG 412

Notes MSG 412

Contents

The following pages are for control units with BM 6460460 (See CARR-CU 9) and tape units with BM 6460006 (See CARR-DR 9)

If you are attaching a tape unit *with* BM 6460006 to a control unit *without* BM 6460460, go to INST 500 before you begin the installation.

If you are attaching a tape unit *with* BM 6460006 to a tape unit *without* BM 6460006, go to INST 505 before you begin the installation.

The following pages are for control units without BM 6460460 (See CARR-CU 9) and tape units without BM 6460006 (See CARR-DR 9)

If you are attaching a tape unit *without* BM 6460006 to a control unit *with* BM 6460460, go to INST 510 before you begin the installation.

If you are attaching a tape unit *without* BM 6460006 to a tape unit *with* BM 6460006, go to INST 510 before you begin the installation.

Notes INST 2

Notes INST 2

This page is for control units with BM 6460460 (See CARR-CU 9) and tape units with BM 6460006 (See CARR-DR 9)

Before Installation

CAUTION:

TILT HAZARD CAUTION

Do NOT open both drives of a tape unit that is not bolted to another tape unit or control unit. With the automatic cartridge loader feature installed and both drive drawers fully extended, a tape unit that is not bolted to another unit will tilt forward with about 20 lbs. of force applied to the top of either automatic cartridge loader.

This procedure describes all installation actions in detail, step by step. Mark off each step as it is completed. Two CE's are needed for the mechanical installation of a dual tape unit subsystem, to reduce the install time. Only one CE is needed to run the checkout and diagnostic procedures.

The Installation Overview chart shows the sequence of steps to complete the installation. However, the chart provides an overview only; follow the step-by-step instructions as you proceed through the installation.

Pre-Installation Checks

Check with the IBM branch office or physical planning representative to ensure that installation planning specifications have been met (correct power service outlet or connector, line voltage, phase rotation, grounding, cable lengths, service space, environment, and so forth). See INST 6, for pre-installation safety checks.

Preparation

__ 1. Inventory the items on each Bill of Material to verify that all items were received.

BILL OF MATERIAL TITLE	3480 MODEL	B/M NUMBER
Basic Shipping Group	A22, A11	6460460
Basic Shipping Group	B22, B11	6460006
MI Manuals, 5 Volumes	A22, B22 A11, B11	8673712
Wiring Diagram and Logic Block Diagrams	A22, A11	6390353
Wiring Diagram and Logic Block Diagrams	B22, B11	4470093

Tools and Test Equipment Needed

The following items are needed to complete the installation:

- Cleaner cartridge (part 4780527)
- IML Diskette

  Note: Ensure for dual CU Installations, all IML Diskettes are at the same EC level.

- 3480 Online Test routines
- Maintenance device
  - Product diskette
  - Support diskette
- S/370 Channel Tag Terminator (part 2282676)
- Blank scratch cartridge.

  Only one blank cartridge is required; however, a second blank cartridge, if available, reduces the installation time.

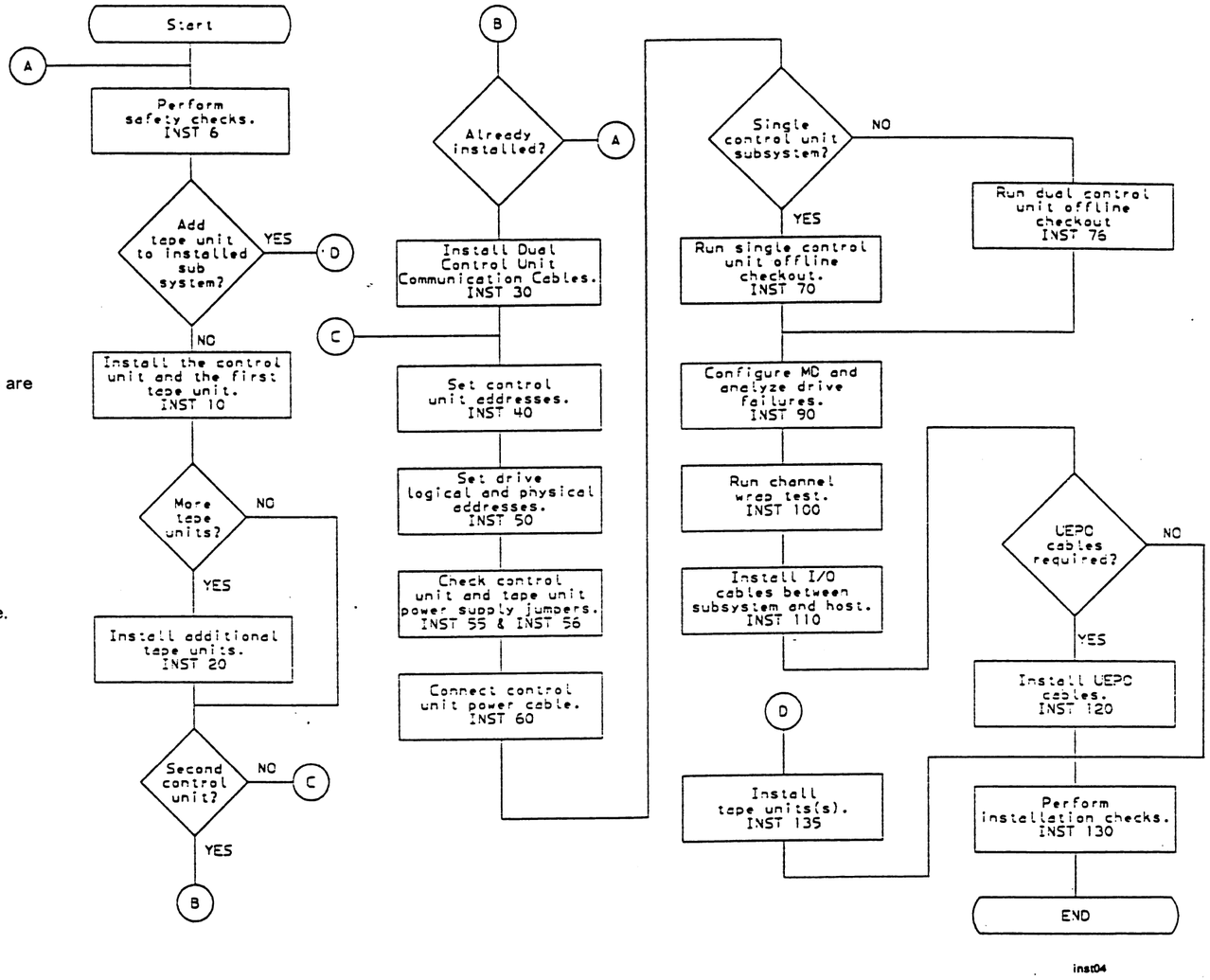

Figure 1. Installation Overview

0 0 0 0 0 0 0 0 0 0

3480 Installation Instructions

This page is for control units with BM 6460460 (See CARR-CU 9) and tape units with BM 6460006 (See CARR-DR 9)

Before Installation

CAUTION

TILT HAZARD CAUTION

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This procedure describes all installation actions in detail, step by step. Mark off each step as it is completed. Two service representatives are needed for the mechanical installation of a dual control unit subsystem, to reduce the install time. Only one service representative is needed to run the checkout and diagnostic procedures.

The Installation Overview chart shows the sequence of steps to complete the installation. However, the chart provides an overview only; follow the step-by-step instructions as you proceed through the installation.

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Check with the IBM branch office or physical planning representative to ensure that installation planning specifications have been met (correct power service outlet or connector, line voltage, phase rotation, grounding, cable lengths, service space, environment, and so forth). See INST 6, for pre-installation safety checks.

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- IML Diskette

  Note: *Ensure for dual CU Installations, all IML Diskettes are at the same EC level.*

- 3480 Online Test routines
- Maintenance device
  - Product diskette
  - Support diskette
- Blank scratch cartridge.

Only one blank cartridge is required; however, a second blank cartridge, if available, reduces the installation time.

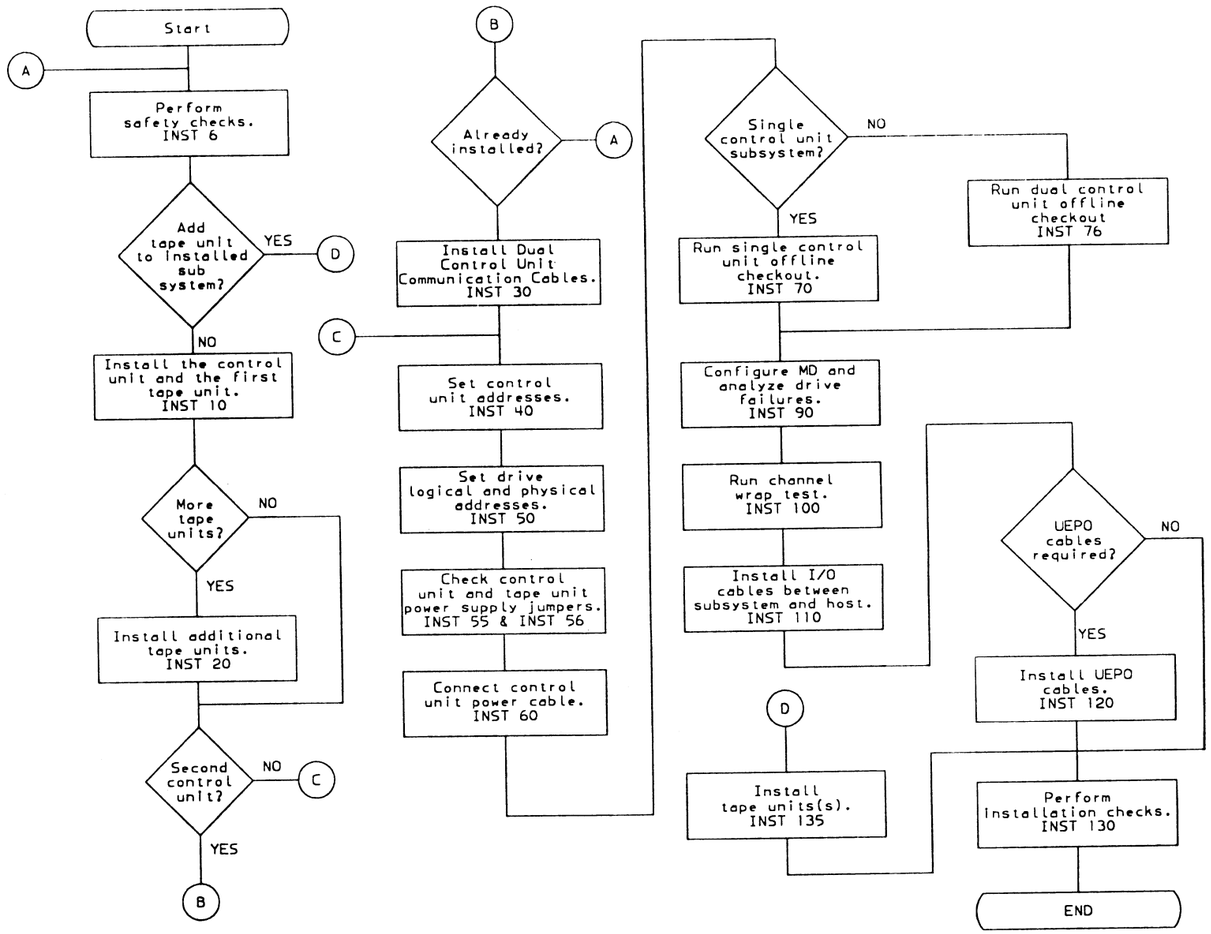

Figure 1. Installation Overview

This page is for control units with BM 6460460 (See CARR-CU 9) and tape units with BM 6460006 (See CARR-DR 9)

ACTION Messages

The following procedures are used to correct or help isolate drive problems. The service representative is sent here from the INST section following an ACTION message on a drive display. ACTION messages are generated for problems encountered after loading a cartridge into a drive during the installation checkout procedures.

Go to the message that matches the message on the drive display that sent you here and perform the actions listed in the Actions column.

Return to the procedure that sent you here when you have completed the actions listed in the Actions column.

Messages	Description	Actions
ACTION 1	The cartridge failed to load correctly.	1. Unload and reload the cartridge. 2. If the same failure occurs, stop testing and note the address of the failing drive and the CU controlling that drive. 3. Return to the procedure that sent you here and continue testing with the next drive displaying TEST.
ACTION 2	The cartridge may be set to file protect.	1. Unload the cartridge and check to see that it is not set to file protect. 2. Reload the cartridge and if it fails again, try a different cartridge. 3. If the second cartridge fails in the same way, stop testing and note the address of the failing drive and the CU controlling that drive. Return to the procedure that sent you here and continue testing with the next drive displaying TEST.
ACTION 3	Incorrect address.	1. Restart testing using the next drive. 2. If the next drive to be tested fails in the same way, a cable connection problem may exist. 3. Note the address(es) of the failing drive(s) and the CU controlling the drive(s), then return to the procedure that sent you here and continue testing.
ACTION 4	Channel address parity error.	1. Go to INST 40 and check the address switch settings. 2. If the problem remains, run the product maintenance package, then return to the procedure that sent you here and continue testing.
ACTION 5	Drive did not get patches correctly. This could be the drive patch or the Automatic Cartridge Loader code load.	1. Ensure that the IML diskette is the correct one for the subsystem. If not, replace it and start the installation checkout again from power on. 2. If the diskette is correct, continue using only the drives that display TEST.
ACTION A	Channel address parity error on channel A.	1. Go to INST 40 and check the address switch settings. 2. If the problem remains, run the product maintenance package, then return to the procedure that sent you here and continue testing.
ACTION B	Channel address parity error on channel B.	1. Go to INST 40 and check the address switch settings. 2. If the problem remains, run the product maintenance package, then return to the procedure that sent you here and continue testing.
ACTION C	Channel address parity error on channel C.	1. Go to INST 40 and check the address switch settings. 2. If the problem remains, run the product maintenance package, then return to the procedure that sent you here and continue testing.
ACTION D	Channel address parity error on channel D.	1. Go to INST 40 and check the address switch settings. 2. If the problem remains, run the product maintenance package, then return to the procedure that sent you here and continue testing.

3480 Installation Instructions

This page is for control units with BM 6460460 (See CARR-CU 9) and tape units with BM 6460006 (See CARR-DR 9)

Before starting the installation, perform the following safety checks:

Safety Checks

Machine Ground Wire Check

__ 1. ***DANGER***
Hazardous electrical voltages are present in the receptacle.

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Use the volt/ohm meter to ensure that:

a. The resistance between the machine frame and the ground pin on the power plug is less than 0.1 ohm.

b. The resistance between the machine frame and ground pin (pin 4) on the output socket of the control unit and each tape unit is less than 0.1 ohm. See diagram A below.

c. The resistance between the machine frame and ground pin (pin 4) on the input cable assembly connector of each tape unit is less than 0.1 ohm. See diagram B below.

If the resistance is greater than 0.1 ohm, determine the cause and correct it before proceeding with the installation.

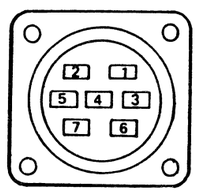

Diagram A
Output Socket (CU and TU)

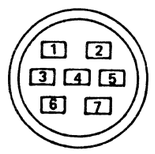

Diagram B
Input Cable Assembly (TU)

Branch Circuit CB Switched Off Check

__ 1. ***DANGER***
Hazardous electrical voltages are present in the connector. Do not touch the outlet case with anything other than test probes until step 3 is completed.

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Have the customer find and switch off the branch circuit CB.

__ 2. Check the voltage from the outlet case to the building ground for less than 1.0 V ac. (Begin with the meter scale that is appropriate for normal line voltage checks.)

__ 3. Check the voltage from the ground pin to the building ground for less than 1.0 V ac. If the voltage is less than 1.0 V ac, the outlet is now safe to touch.

__ 4. ***DANGER***
Hazardous electrical voltages are present. Do not touch the internal parts (pins and sockets) of the outlet until step 5 is completed.

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Check the resistance from the ground pin to the outlet case for a reading of less than 0.1 ohm.

Check the resistance from the ground pin to the building ground for reading of less than 0.1 ohm.

A reading of less than 0.1 ohm indicates the presence of a safe, continuous grounding conductor.

__ 5. Measure the phase-to-phase voltage and the phase-to-ground voltage at the outlet.

Measure the phase-to-neutral voltage (if present) and the neutral-to-ground voltage (if present).

All voltage values are to be less than 1.0 V ac.

Branch Circuit CB Switched On Check

__ 1. ***DANGER***
Hazardous electrical voltages are present. Do not touch the outlet before meeting the following requirements of steps 1 and 2.

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Have the customer switch on the CB that supplies voltage to the receptacle.

__ 2. ***DANGER***
Hazardous voltages are present. If the measured voltage values are less than 1.0 V ac, you can touch the outlet. Avoid contact with the internal parts (pins and sockets) of the outlet.

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Measure the voltages from the outlet case to the building ground and the outlet case to the ground pin. Voltage values are to be less than 1.0 V ac.

__ 3. At the outlet, measure the voltages from the ground pin and the neutral pin (if present) to all phases, and measure the voltages from phase to phase. This ensures that the outlet is wired correctly.

__ 4. Have the customer's branch circuit CB switched off before connecting the 3480 power cord into the outlet.

3480 Installation Instructions

This page is for control units with BM 6460460 (See CARR-CU 9) and tape units with BM 6460006 (See CARR-DR 9)

Installing the Control Unit and the First Tape Unit

Warning: The 3480 A22 control units with the 4.5 megabyte channel feature must be cabled ahead of slower devices on the channel.

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Control Unit

Note: For dual control unit subsystems, two service representatives should be present to install the two control units and their attached tape drives at the same time to reduce the install time for the subsystem.

__ 1. Before you start installation:

__ a. Place the cables that run between the control units (on dual control unit subsystems) in the positions they need to be in for installation. Either end of the cables attaches to either of the control units.

__ b. Place the channel cables that come from the host system(s) in the positions they need to be in for installation.

These steps ensure that the cables are easily accessible when it is time to install them.

__ 2. Place the control unit (CU) in the position where it is to be installed.

__ 3. Place the rear casters of the CU so that the caster lock thumbscrews **4** are accessible.

__ 4. Lock the rear casters by turning the caster lock thumbscrews clockwise until they are tight.

__ 5. Open the front and rear covers.

__ 6. Remove the left and right outside covers. See CARR-CU 2-1 for procedures to remove the covers from the control unit.

The covers are not reinstalled until after the hardware is completely installed.

__ 7. Remove the rear safety cover. See CARR-CU 2-1 for the control unit cover removal procedures.

Do not reinstall the safety cover until after you have installed the Unit Emergency Power Off (UEPO) cable (INST 120).

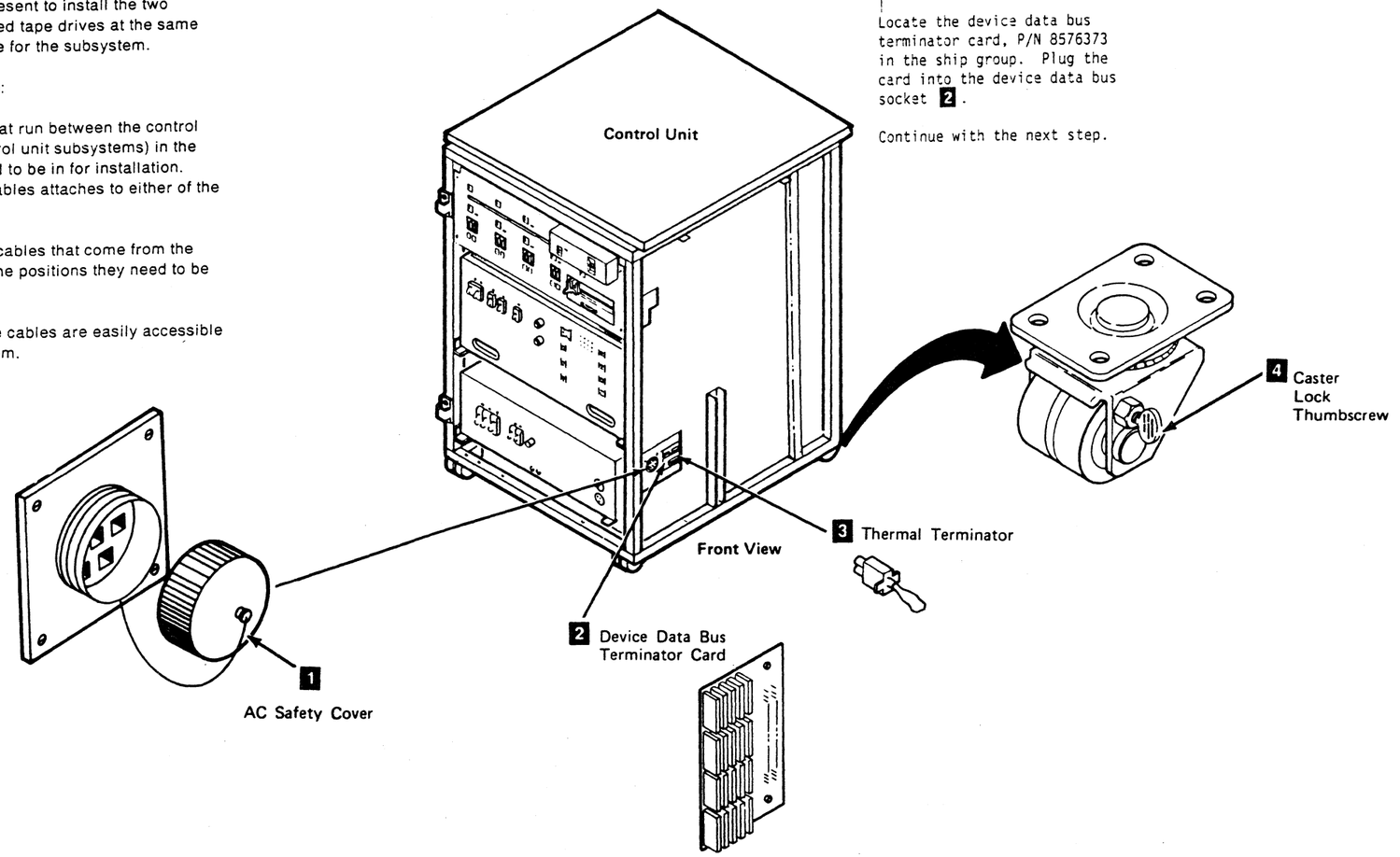
__ 8. If the control unit has the vertical style I/O connectors, remove the drip-screen guard. See CARR-CU 2-1 for the control unit cover removal procedures.

Do not reinstall the drip-screen guard until after you have installed the Unit Emergency Power Off (UEPO) cable (INST 120).

__ 9. Is this control unit being installed without any tape units attached?

```
YES NO
 |   |
 |   Go to INST 11, step 1.
 |
Locate the device data bus
terminator card, P/N 8576373
in the ship group.  Plug the
card into the device data bus
socket 2 .

Continue with the next step.
```



__ 10. Install the safety cover **1** on the ac power cable socket.

DANGER

Dangerous voltages are present at the ac power cable socket. The safety cover must be on when the socket is not being used.

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__ 11. Plug the thermal terminator into the thermal connector **3** .

__ 12. Go to INST 22, step 18.

This page is for control units with BM 6460460 (See CARR-CU 9) and tape units with BM 6460006 (See CARR-DR 9)

Installing the Control Unit and the First Tape Unit

Warning: The 3480 A22 control units with the 4.5 megabyte channel feature must be cabled ahead of slower devices on the channel.

_____

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Control Unit

Note: For dual control unit subsystems, two service representatives should be present to install the two control units and their attached tape drives at the same time to reduce the install time for the subsystem.

__ 1. Before you start installation:

__ a. Place the cables that run between the control units (on dual control unit subsystems) in the positions they need to be in for installation. Either end of the cables attaches to either of the control units.

__ b. Place the channel cables that come from the host system(s) in the positions they need to be in for installation.

These steps ensure that the cables are easily accessible when it is time to install them.

__ 2. Place the control unit (CU) in the position where it is to be installed.

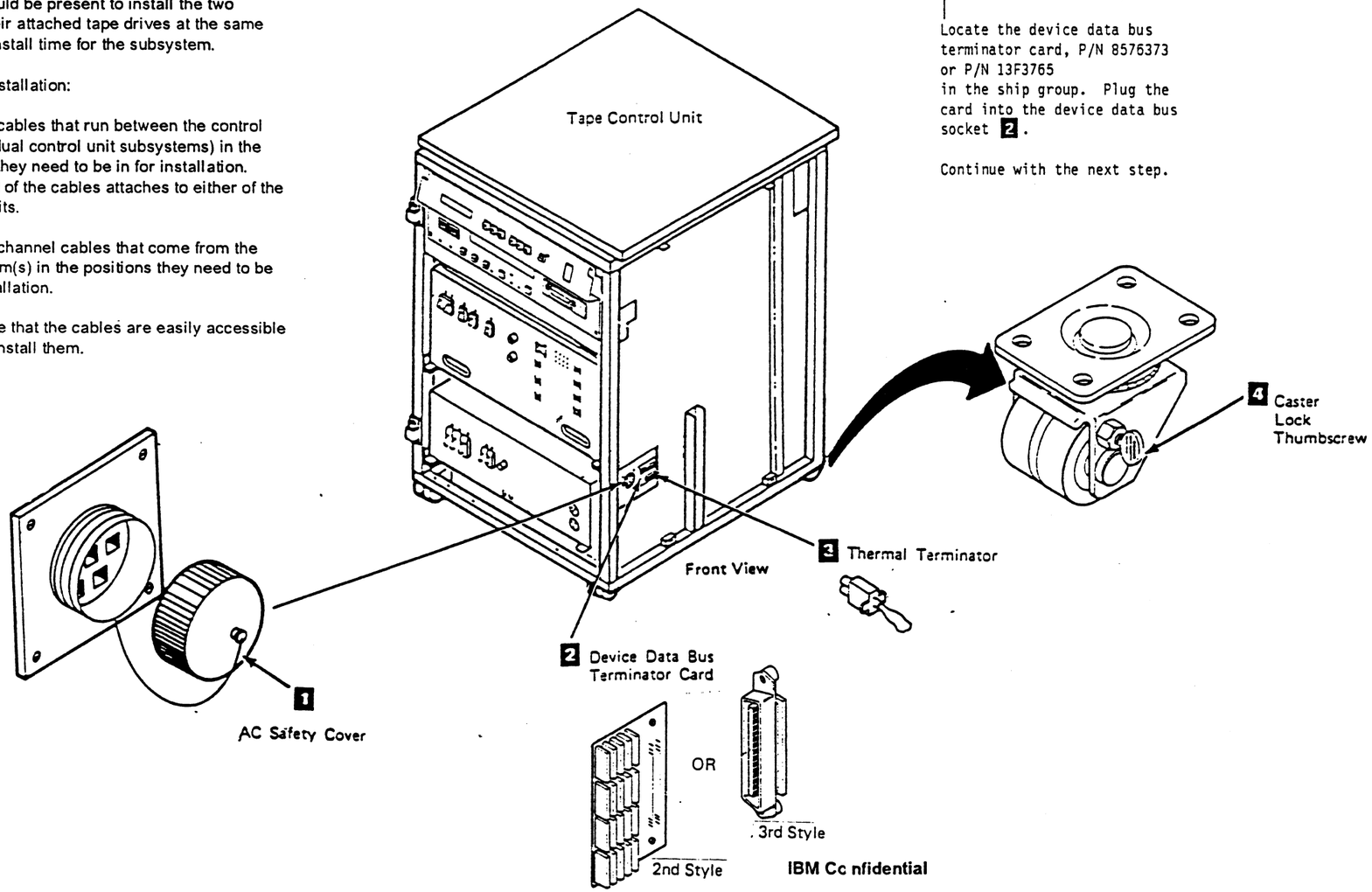
__ 3. Place the rear casters of the CU so that the caster lock thumbscrews **4** are accessible.

__ 4. Lock the rear casters by turning the caster lock thumbscrews clockwise until they are tight.

__ 5. Open the front and rear covers.

__ 6. Remove the left and right outside covers. See CARR-CU 2-1 for procedures to remove the covers from the control unit.

The covers are not reinstalled until after the hardware is completely installed.



__ 7. Remove the rear safety cover. See CARR-CU 2-1 for the control unit cover removal procedures.

Do not reinstall the safety cover until after you have installed the Unit Emergency Power Off (UEPO) cable (INST 120).

__ 8. If the control unit has the vertical style I/O connectors, remove the drip-screen guard. See CARR-CU 2-1 for the control unit cover removal procedures.

Do not reinstall the drip-screen guard until after you have installed the Unit Emergency Power Off (UEPO) cable (INST 120).

__ 9. Is this control unit being installed without any tape units attached?

```
YES NO
|   |
|   Go to INST 11, step 1.
|
Locate the device data bus
terminator card, P/N 8576373
or P/N 13F3765
in the ship group.  Plug the
card into the device data bus
socket 2.

Continue with the next step.
```


__ 10. Install the safety cover **1** on the ac power cable socket.

DANGER

Dangerous voltages are present at the ac power cable socket. The safety cover must be on when the socket is not being used.

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__ 11. Plug the thermal terminator into the thermal connector **3**.

__ 12. Go to INST 22, step 18.

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3480 Installation Instructions

This Page is for Control Units with BM 6460460 (See CARR-CU 9) and Tape Units with BM 6460006 (See CARR-DR 9)

Installing the Control Unit and the First Tape Unit (Continued)

First Tape Unit

CAUTION

TILT HAZARD CAUTION

Do NOT open both drives of a tape unit that is not bolted to another tape unit or control unit. With the automatic cartridge feature installed and both drive drawers fully extended, a tape unit that is not bolted to another unit will tilt forward with about 20 pounds of force applied to the top of either automatic cartridge loader.

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__ 1. Place the tape units near the area where they are to be installed.

__ 2. Place the first tape unit **2**, to the right of the control unit **1**, (as you face the front of the control unit) about 20 cm (8 in.) from the control unit.

__ 3. Open the front and rear covers.

__ 4. Plug the tape unit AC power connector **7** into the control unit AC socket **10**.

Ensure that the AC power cable is routed away from the compressor motor and is fastened to the back of the frame **11** to prevent pinching the cable when the units are moved together.

__ 5. Connect the read bus cables **6** from the tape unit to the control unit read bus connectors **5**.

Ensure that the local (bus A) and the remote (bus B) cables are plugged into the proper sockets on the control unit, making sure they are not crossed.

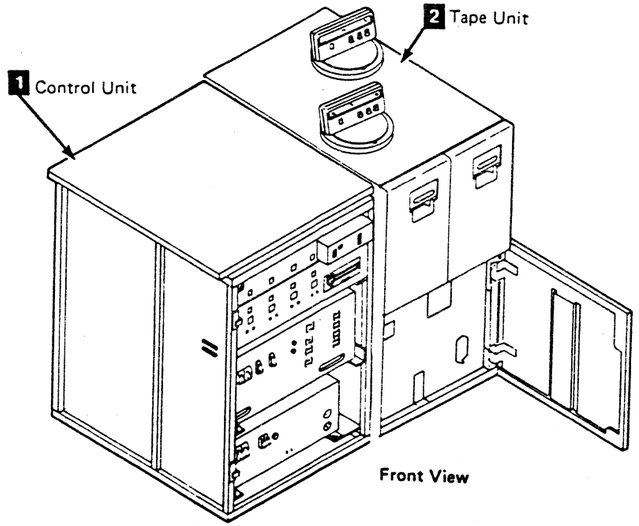
Note: *When installing a Model A11 control unit that does not have the dual communications feature (3203) installed, the A11 will not have the remote read bus connector. The first B11 remote cable is not needed and should be secured out of the way.*

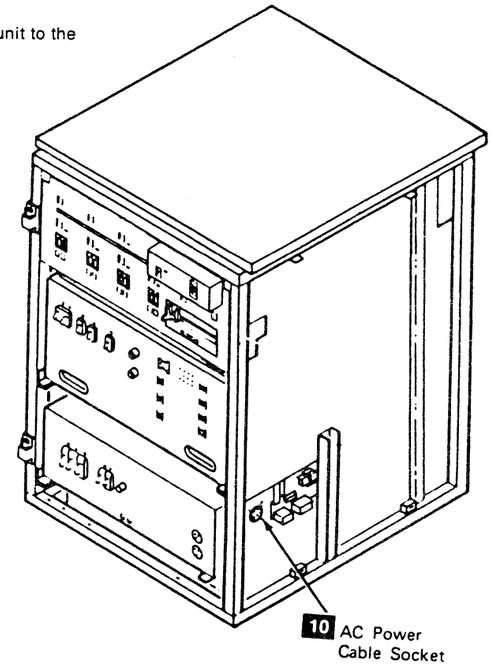
__ 6. Connect the device data bus cable **9** from the tape unit to the control unit device data bus connector **3**.

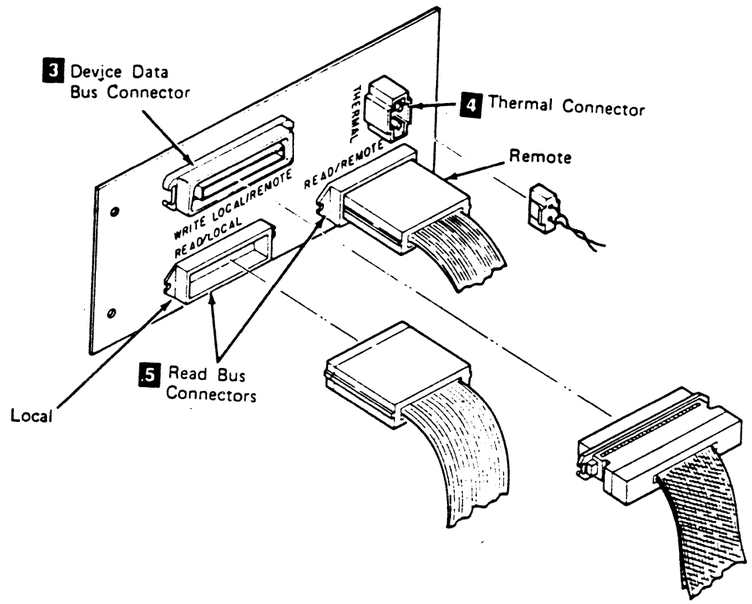
Fasten the cable in place with the retaining screws.

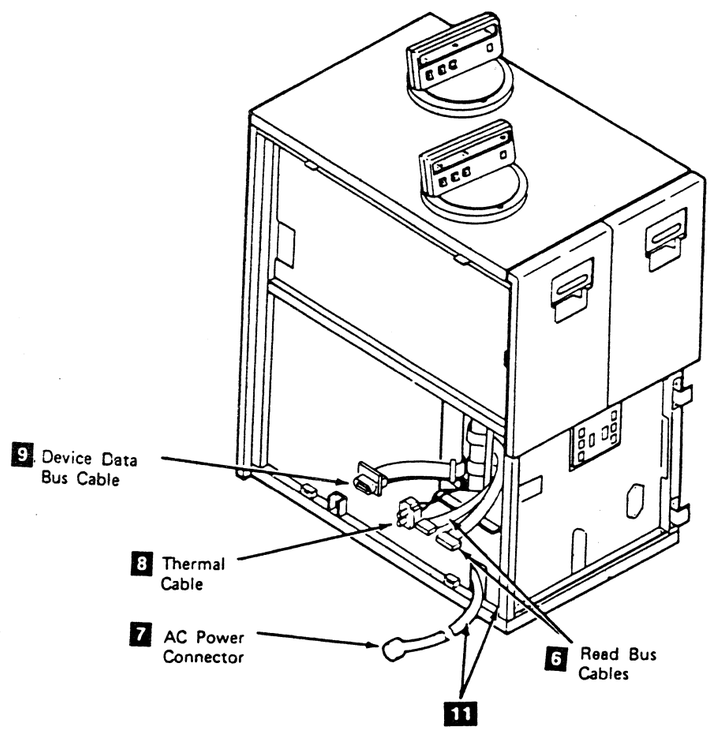
__ 7. Connect the thermal cable **8**, on the tape unit to the thermal connector **4**, on the control unit.

__ 8. Continue to the next step on INST 13.









This page is for control units with BM 6460460 (See CARR-CU 9) and tape units with BM 6460006 (See CARR-DR 9)

Installing the Control Unit and the First Tape Unit (Continued)

First Tape Unit (Continued)

__ 9. **Warning:** Be careful that the cables do not get pinched between the frames or covers.

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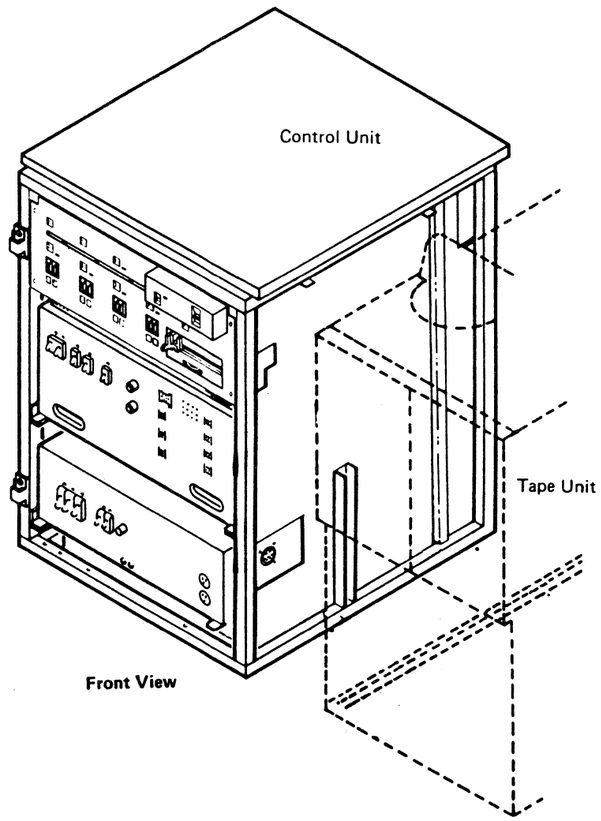
The device data and read bus cables should be folded in toward the middle of the machines. Ensure the power cable is not pinched between the machine frames.

Push the tape unit against the control unit.

Note: *Be sure the position of the casters does not prevent the tape unit frame from fitting snugly against the control unit frame.*



__ 10. Fasten the control unit to the tape unit by installing a hex bolt and washer at the rear of the control unit **1**, and at the front of the tape unit **2**. It may be necessary to remove the Tape Unit Front Safety cover to install hex bolt **2**. See CARR-DR 2-1 if the cover needs to be removed.

Hex bolts and washers are part of the ship group.

Note: *If the control unit and tape unit are not correctly aligned, the covers may bind. Ensure that the covers are not binding.*

__ 11. Place the rear casters so the caster lock thumbscrews **3** are accessible.

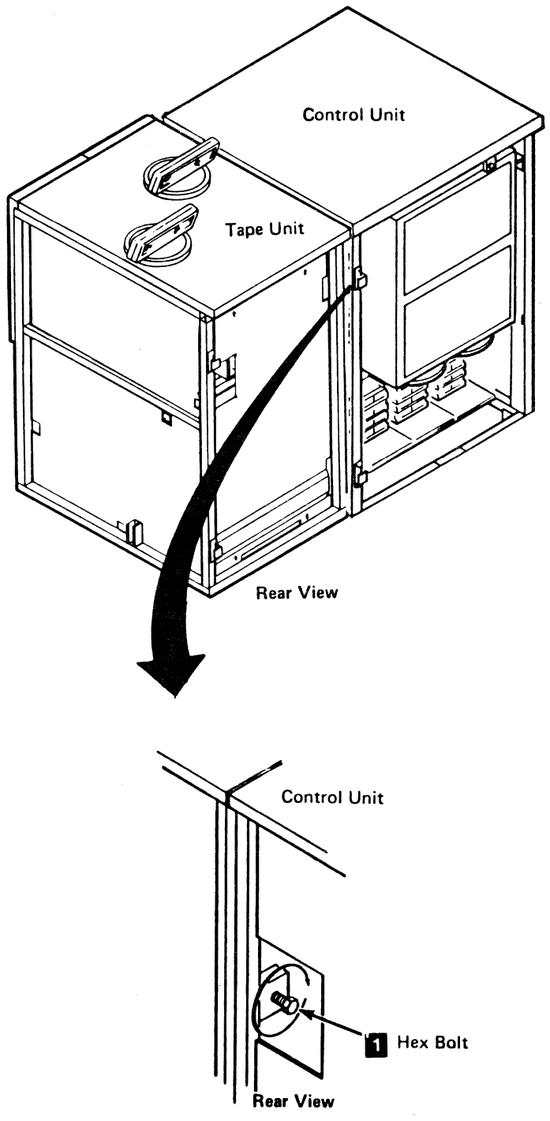
__ 12. Lock the rear casters on the tape unit by turning the caster lock thumbscrews clockwise until they are tight.

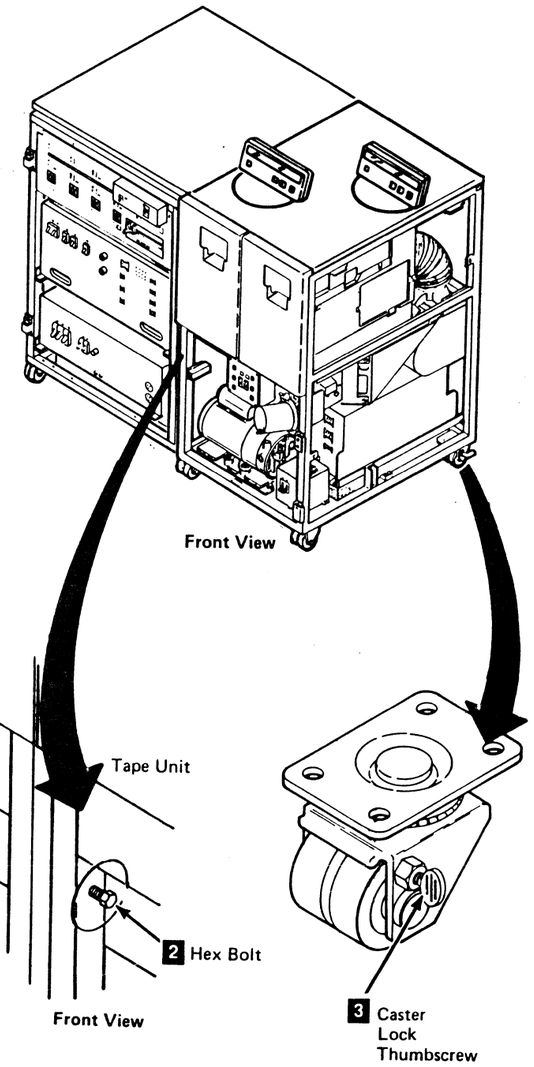
Before You're Through...

Are you installing additional tape units to this control unit?

YES NO
| |
| Go to INST 22, step 14.
|

Go to INST 20 to install additional tape units.





This page is for control units with BM 6460460 (See CARR-CU 9) and tape units with BM 6460006 (See CARR-DR 9)

Installing Additional Tape Units

CAUTION:

TILT HAZARD CAUTION

Do NOT open both drives of a tape unit that is not bolted to another tape unit or control unit. With the automatic cartridge feature installed and both drive drawers fully extended, a tape unit that is not bolted to another unit will tilt forward with about 20 lbs. of force applied to the top of either automatic cartridge loader.

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__ 1. Place the the next tape unit into position.

__ 2. Open the front and rear covers.

Warning: Ensure that the power cable is not pinched between the machine frames.

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__ 3. If the safety cover has the retainer tightened over it, loosen the screw holding the retainer to the ac power cap, rotate the retainer and retighten the screw.

__ 4. Connect the next tape unit's ac power cable **5** to the preceding tape unit's power cable socket **8** after removing the socket safety cover (if not already removed).

Ensure that the ac power cable is routed away from the compressor motor and is fastened to the back of the frame **9** to prevent pinching the cable when the units are moved together.

__ 5. Connect the device data bus cable **7** from the next tape unit to the preceding tape unit **3**.

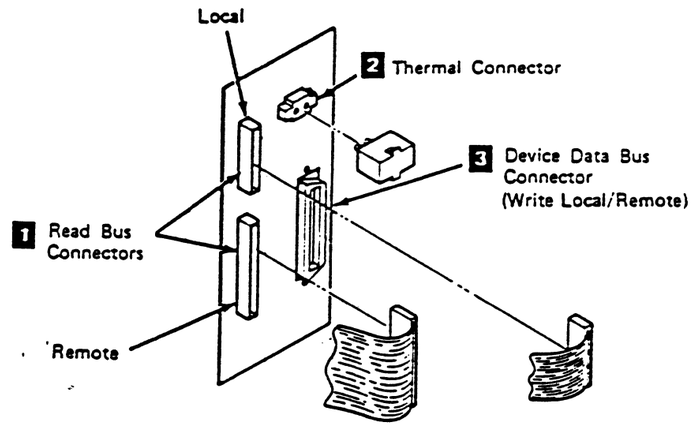
Fasten the cable in place with the retaining screws.

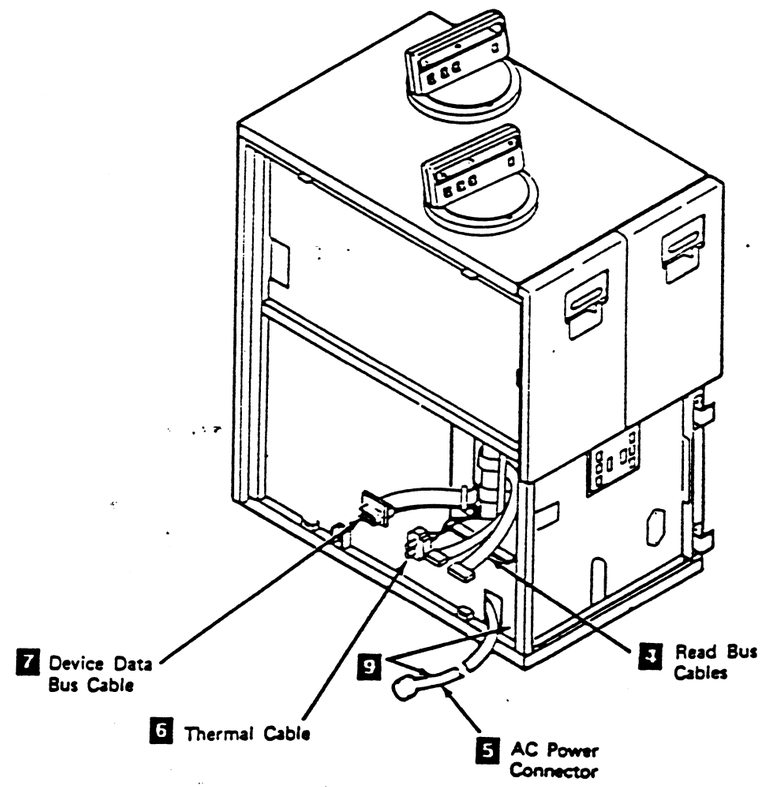
__ 6. Connect the two read bus cables **4** from the next tape unit to the preceding tape unit **1**.

Ensure that the local (bus A) and the remote (bus B) cables are plugged into the proper sockets on the tape unit, making sure they are not crossed.

__ 7. Connect the thermal cable **6** on the next tape unit to the thermal connector **2** on the preceding tape unit.

__ 8. Continue with the next step on INST 21.





Installation Instructions INST 20

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3480 Installation Instructions

This page is for control units with BM 6460460 (See CARR-CU 9) and tape units with BM 6460006 (See CARR-DR 9)

Installing Additional Tape Units

CAUTION

TILT HAZARD CAUTION

Do NOT open both drives of a tape unit that is not bolted to another tape unit or control unit. With the automatic cartridge feature installed and both drive drawers fully extended, a tape unit that is not bolted to another unit will tilt forward with about 20 lbs. of force applied to the top of either automatic cartridge loader.

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__ 1. Place the the next tape unit into position.

__ 2. Open the front and rear covers.

Warning: Ensure that the power cable is not pinched between the machine frames.

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__ 3. If the safety cover has the retainer tightened over it, loosen the screw holding the retainer to the ac power cap, rotate the retainer and retighten the screw.

__ 4. Connect the next tape unit's ac power cable **5** to the preceding tape unit's power cable socket **8** after removing the socket safety cover (if not already removed).

Ensure that the ac power cable is routed away from the compressor motor and is fastened to the back of the frame **9** to prevent pinching the cable when the units are moved together.

__ 5. Connect the device data bus cable **7** from the next tape unit to the preceding tape unit **3**.

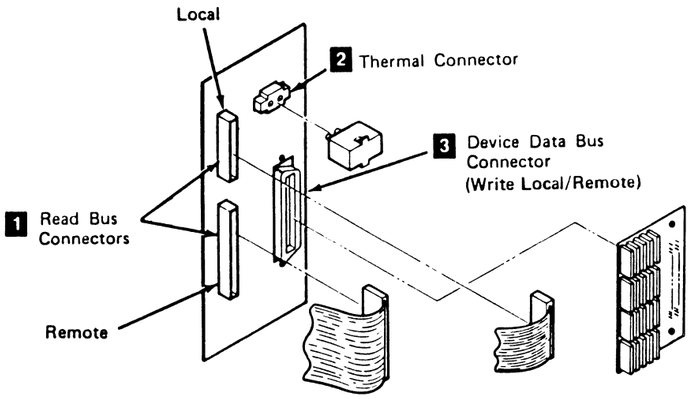
Fasten the cable in place with the retaining screws.

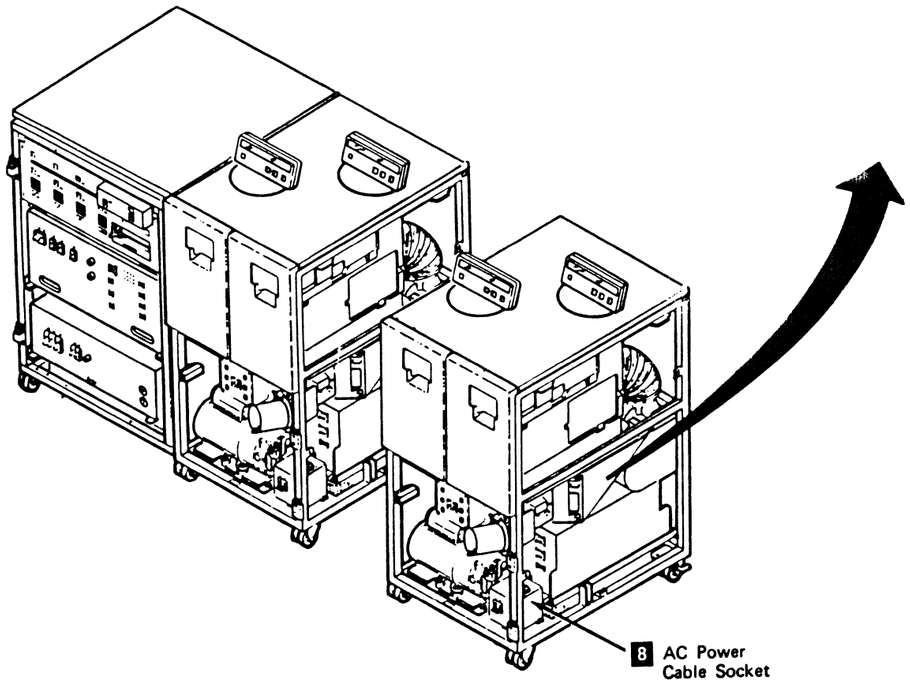
__ 6. Connect the two read bus cables **4** from the next tape unit to the preceding tape unit **1**.

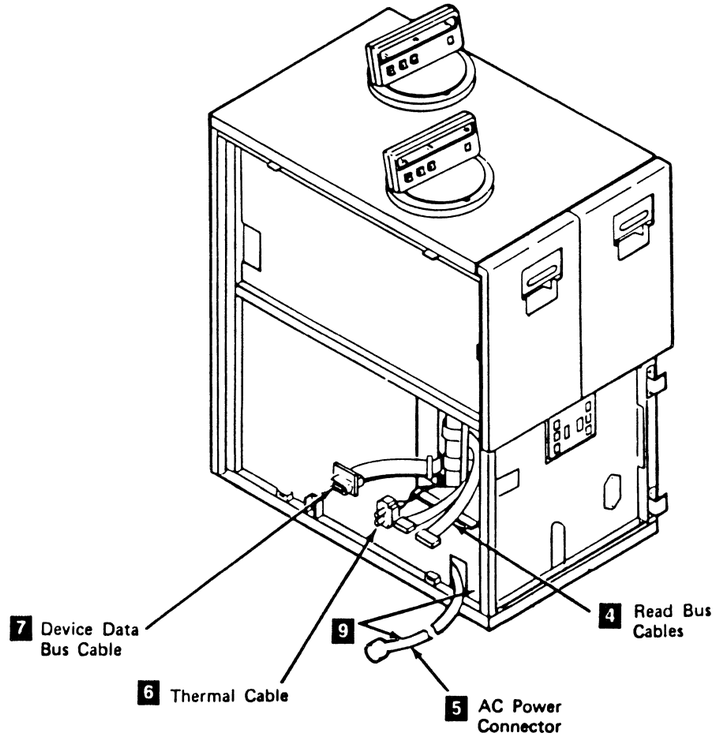
Ensure that the local (bus A) and the remote (bus B) cables are plugged into the proper sockets on the tape unit, making sure they are not crossed.

__ 7. Connect the thermal cable **6** on the next tape unit to the thermal connector **2** on the preceding tape unit.

__ 8. Continue with the next step on INST 21.







This page is for control units with BM 6460460 (See CARR-CU 9) and tape units with BM 6460006 (See CARR-DR 9)

Installing Additional Tape Units (Continued)

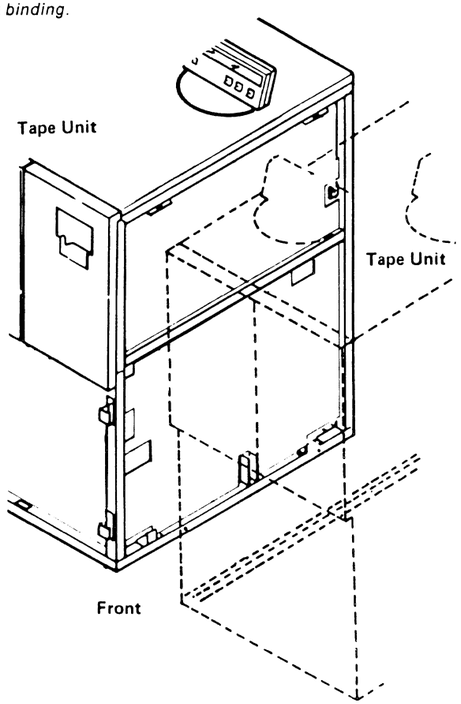
__ 8. Place the next tape unit against the preceding tape unit.

Warning: When installing a B box to a B box with the automatic cartridge loader feature installed on drive 1, drive 1 must be opened approximately 5 cm (2 in.) to prevent the conductive seal from being pinched between the tape unit frames.

Note: *Be sure the position of the casters does not prevent the tape units from fitting snugly together.*

__ 9. Fasten the new tape unit to the preceding tape unit by installing a hex bolt and washer at the rear of the tape unit **1**, and at the front of the tape unit **2**. It may be necessary to remove the Tape Unit Front Safety cover to install hex bolt **2**. See CARR-DR 2-1 if the cover needs to be removed.

Note: *If the tape units are not correctly aligned, the covers may bind. Ensure that the covers are not binding.*

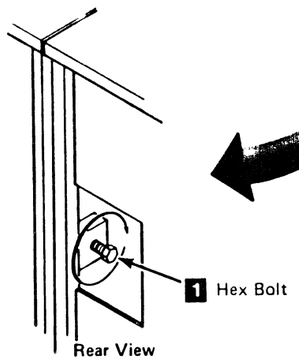


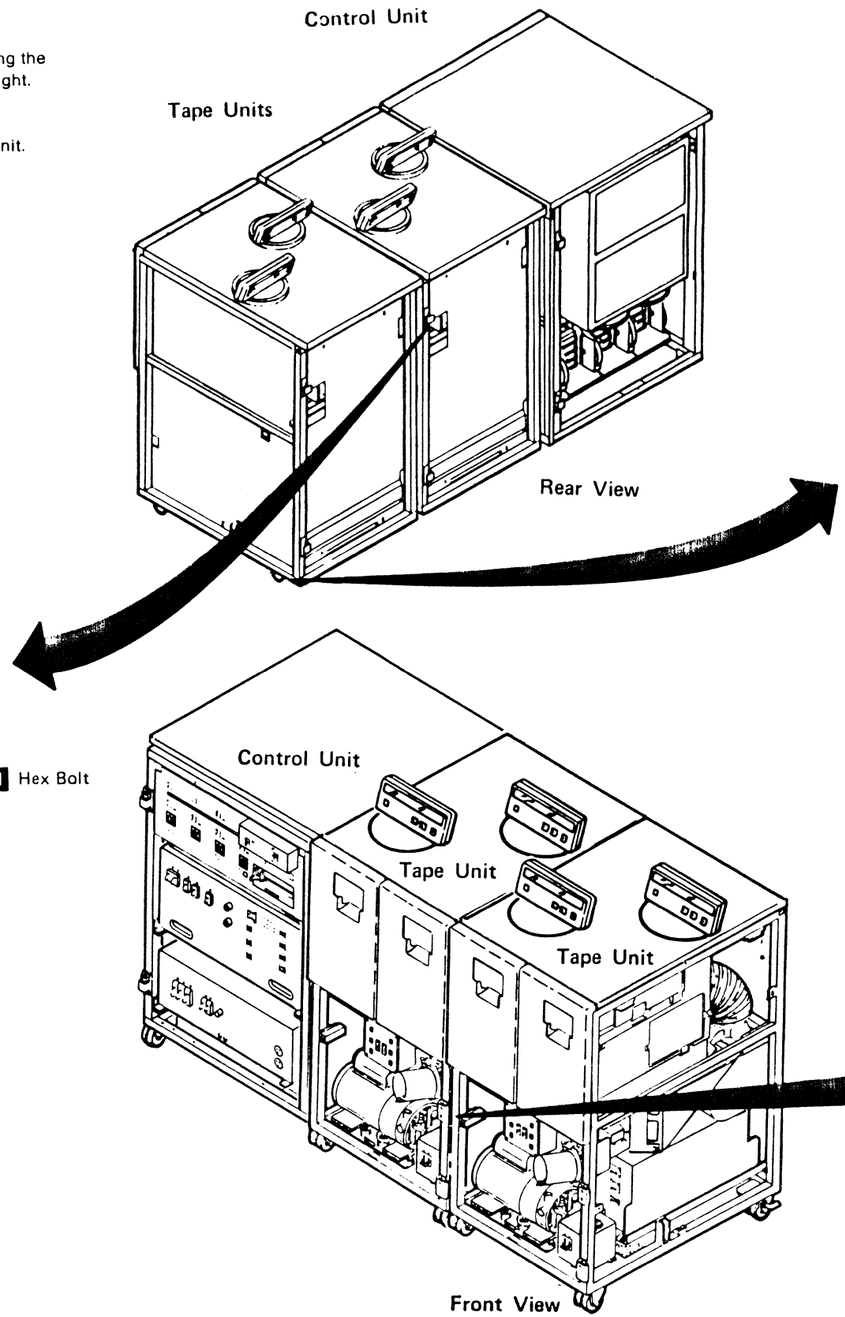
__ 10. Place the rear casters on the new tape unit so the caster lock thumbscrews **3** are accessible.

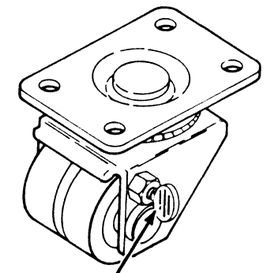
__ 11. Lock the rear casters on the new tape unit by turning the caster lock thumbscrews clockwise until they are tight.

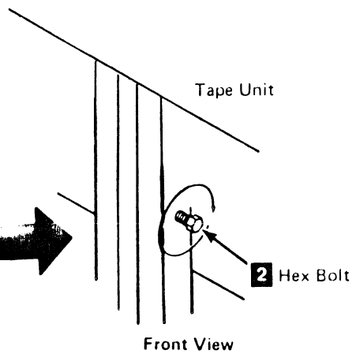
__ 12. Repeat the steps on INST 20 and INST 21, for each additional tape unit that is attached to the control unit.

__ 13. Go the next step on INST 22.









This page is for control units with BM 6460460 (See CARR-CU 9) and tape units with BM 6460006 (See CARR-DR 9)

Installing Additional Tape Units (Continued)

On the last tape unit attached to the control unit:

__ 14. Locate the device data bus terminator card P/N 8576373 or P/N 13F3765 in the ship group. Plug the card into the device data bus socket **4**.

If a "C" clip is attached to the terminator card **4** remove and discard the clip.

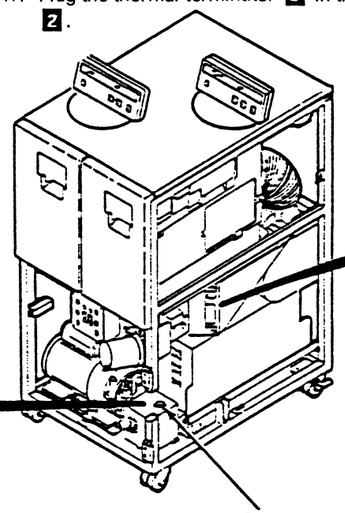
__ 15. Screw the safety cover **1** onto the ac power cable socket.

DANGER

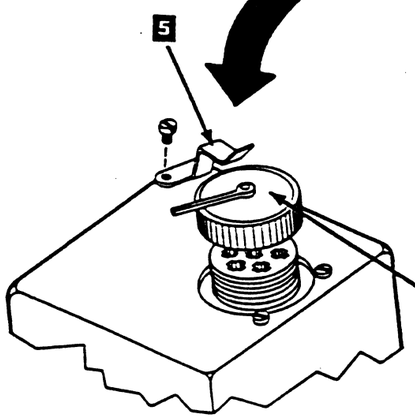
Dangerous voltages are present at the ac power cable socket. The safety cover must be on when the socket is not being used.

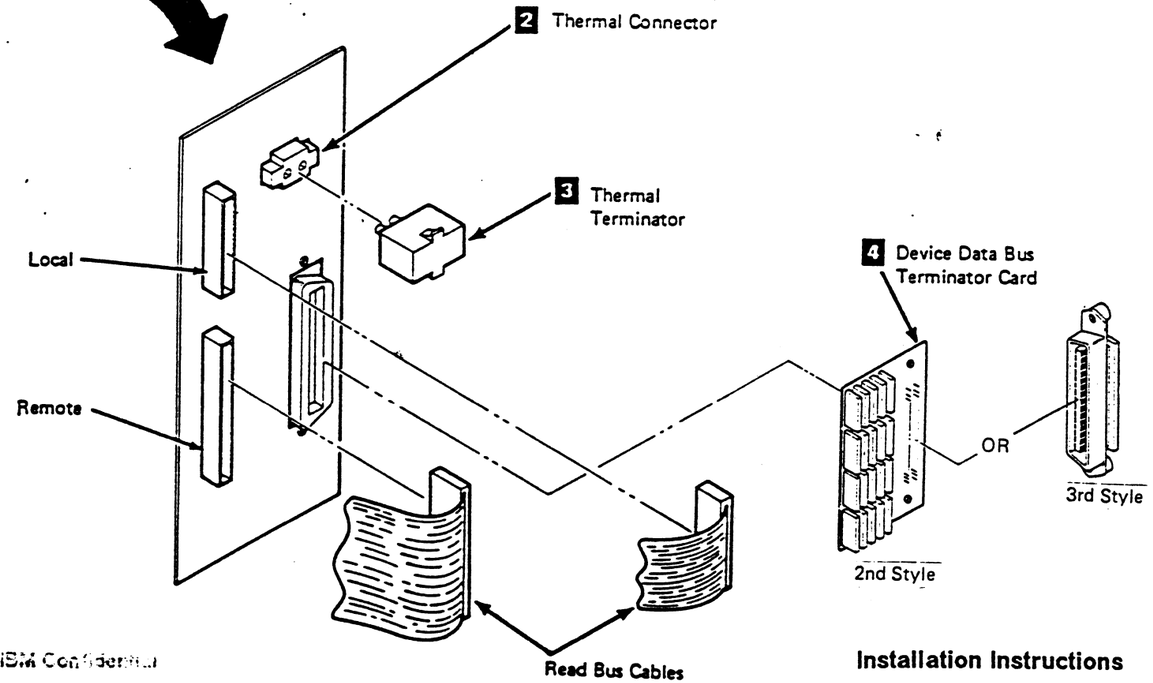
__ 16. After the safety cover is in place, loosen the screw holding retainer **5** to the ac power box. Rotate the retainer and tighten the screw with the retainer positioned to prevent the safety cover from being removed.

__ 17. Plug the thermal terminator **3** in the thermal connector **2**.



AC Power Cable Socket





__ 18. Are you installing a second control unit that is to be attached to this control unit with feature cables?

```
YES NO
|   |
|   Go to INST 40.
|
Have you already installed the second
control unit and the attached
tape unit?

YES NO
|   |
|   Return to INST 10 and repeat the
|   procedure for the second
|   control unit
|
For a dual control unit subsystem, each
control unit has a unique identity:  CU0
or CU1.  The identification switches
will be set later during the installation.

Go to INST 30 to connect the dual control
unit communication cables.
```

0 0 0 0 0 0 0 0 0 0

This page is for control units with BM 6460460 (See CARR-CU 9) and tape units with BM 6460006 (See CARR-DR 9)

Installing Additional Tape Units (Continued)

On the last tape unit attached to the control unit:

__ 14. Locate the device data bus terminator card P/N 8576373 in the ship group. Plug the card into the device data bus socket **4**.

If a "C" clip is attached to the terminator card **4** remove and discard the clip.

__ 15. Screw the safety cover **1** onto the ac power cable socket.

DANGER
Dangerous voltages are present at the ac power cable socket. The safety cover must be on when the socket is not being used.

. . . . . .

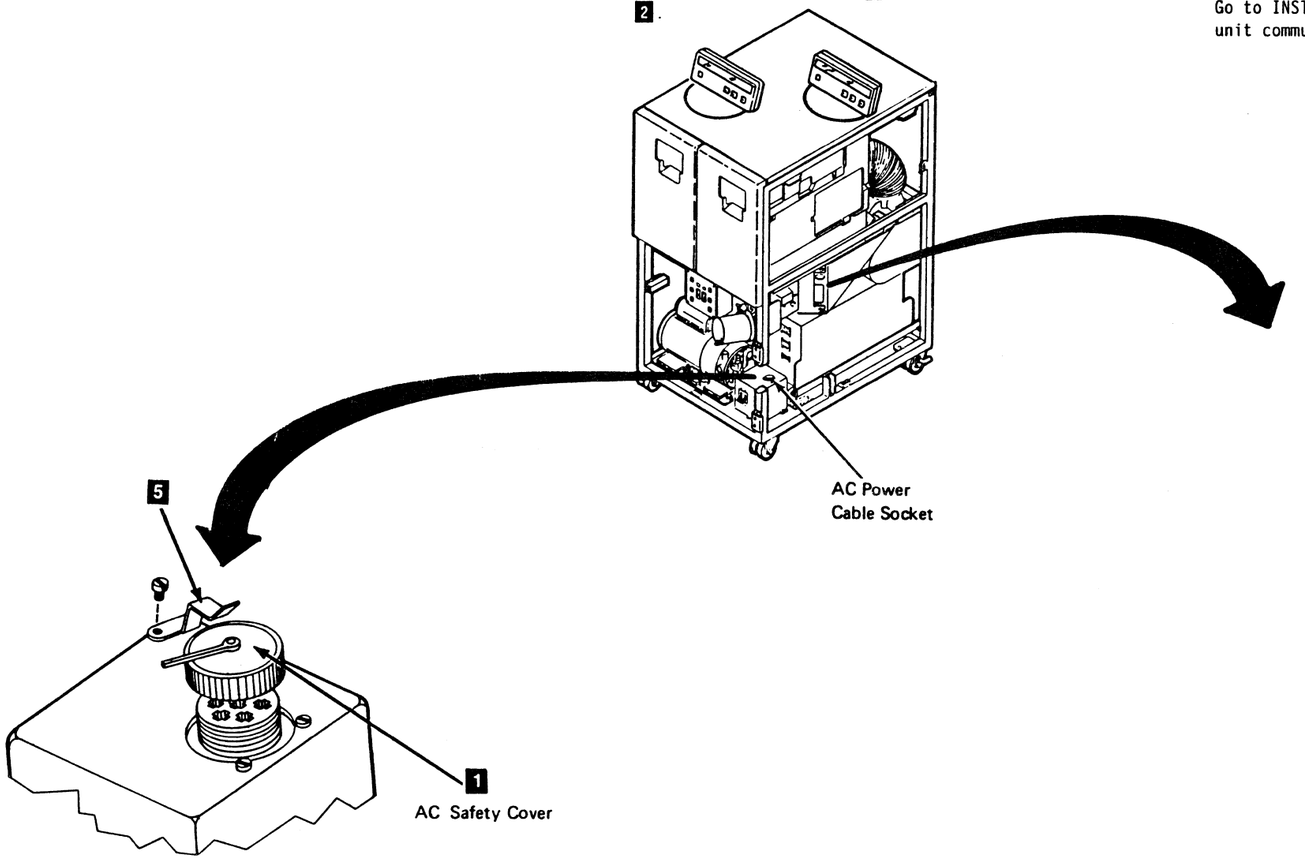
. . . . . .

. . . . . .

. . . . . .

__ 16. After the safety cover is in place, loosen the screw holding retainer **5** to the ac power box. Rotate the retainer and tighten the screw with the retainer positioned to prevent the safety cover from being removed.

__ 17. Plug the thermal terminator **3** in the thermal connector **2**.

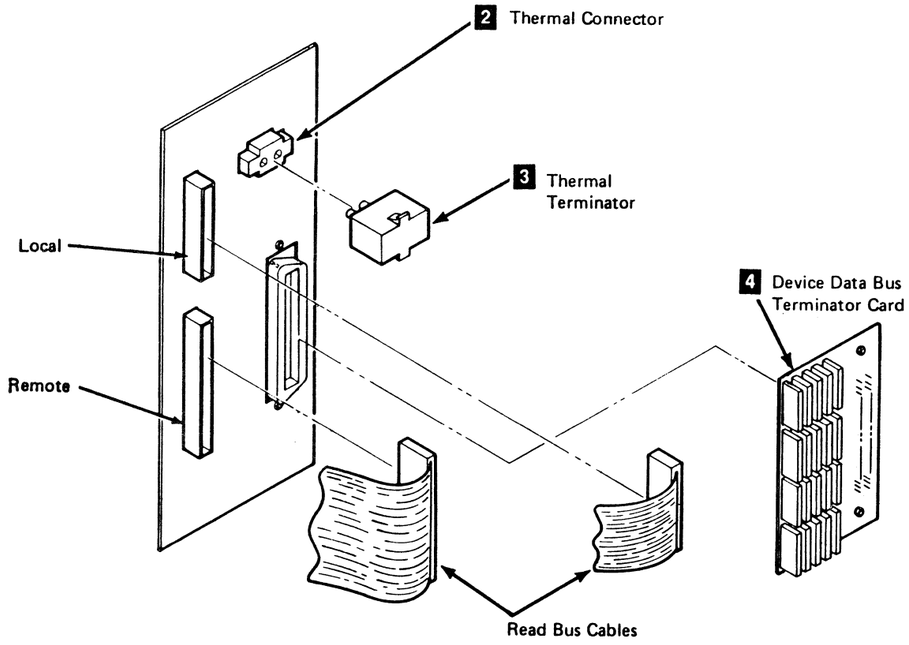


__ 18. Are you installing a second control unit that is to be attached to this control unit with feature cables?

```
YES NO
 |   |
 |   Go to INST 40.
 |
Have you already installed the second
control unit and the attached tape
units?

YES NO
 |   |
 |   Return to INST 10 and repeat the
 |   procedure for the second control
 |   unit.
 |
For a dual control unit subsystem, each
control unit has a unique identity:  CU0
or CU1.  The identification switches
will be set later during the installation.

Go to INST 30 to connect the dual control
unit communication cables.
```



3480 Installation Instructions

This Page is for Control Units with BM 6460460 (See CARR-CU 9) and Tape Units with BM 6460006 (See CARR-DR 9)

Connecting the Dual Control Unit Communication Cables*

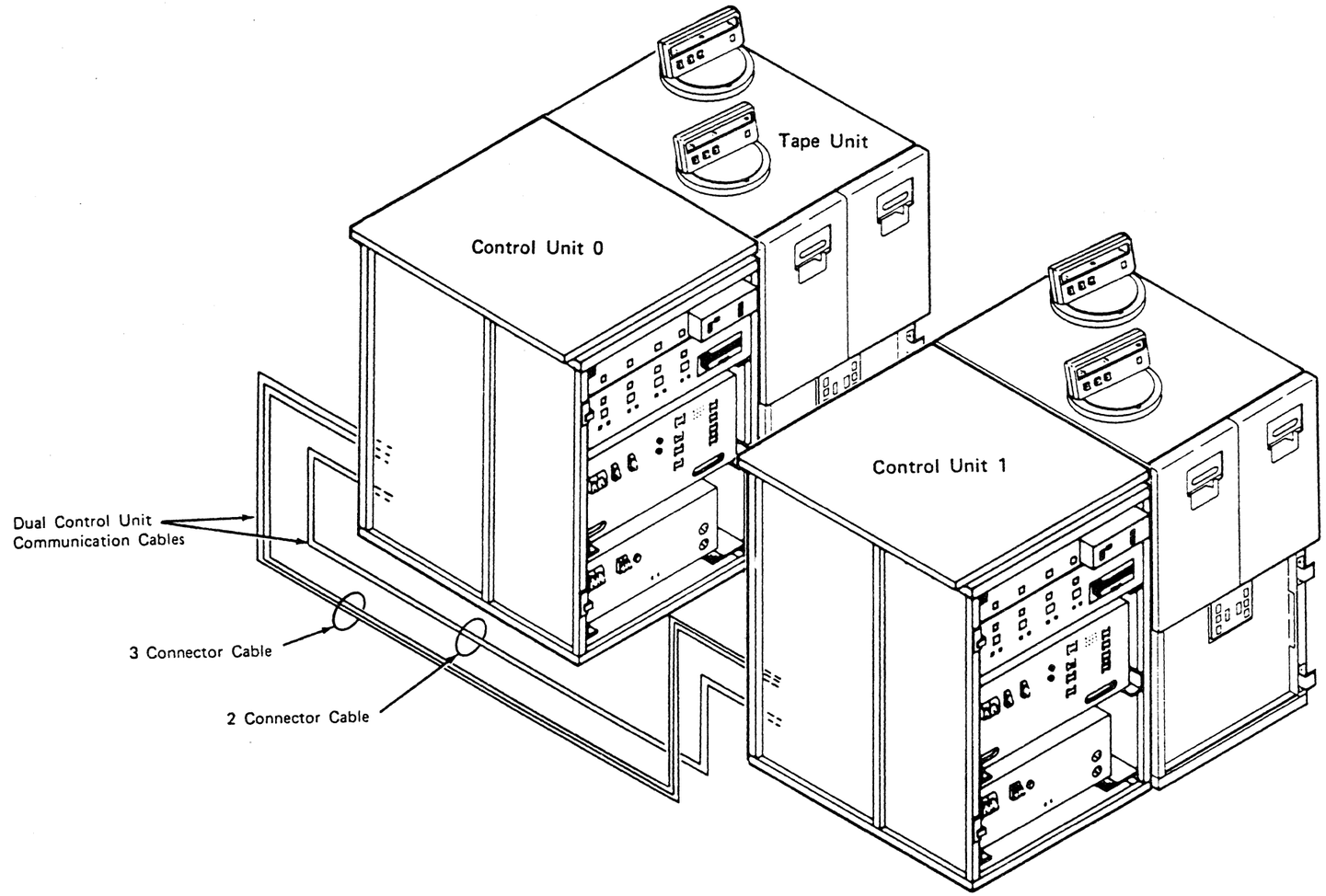
Note: *Two service representatives should perform the following steps at the same time to reduce the install time.*

__ 1. Bring the cable ends up from the bottom of the control unit, inside the machine frame, at the rear of the control unit.

Note: *Ensure that the cables are positioned so the cable connectors line up correctly with the cable sockets.*

__ 2. Continue to the next step on INST 31.

*This is a feature on the 3480 Model A11 and standard on the 3480 Model A22.



3480 MI ECA57693

This Page is for Control Units with BM 6460460 (See CARR-CU 9) and Tape Units with BM 6460006 (See CARR-DR 9)

Connecting the Dual Control Unit Communication Cables*

Note: Two service representatives should perform the following steps at the same time to reduce the install time.

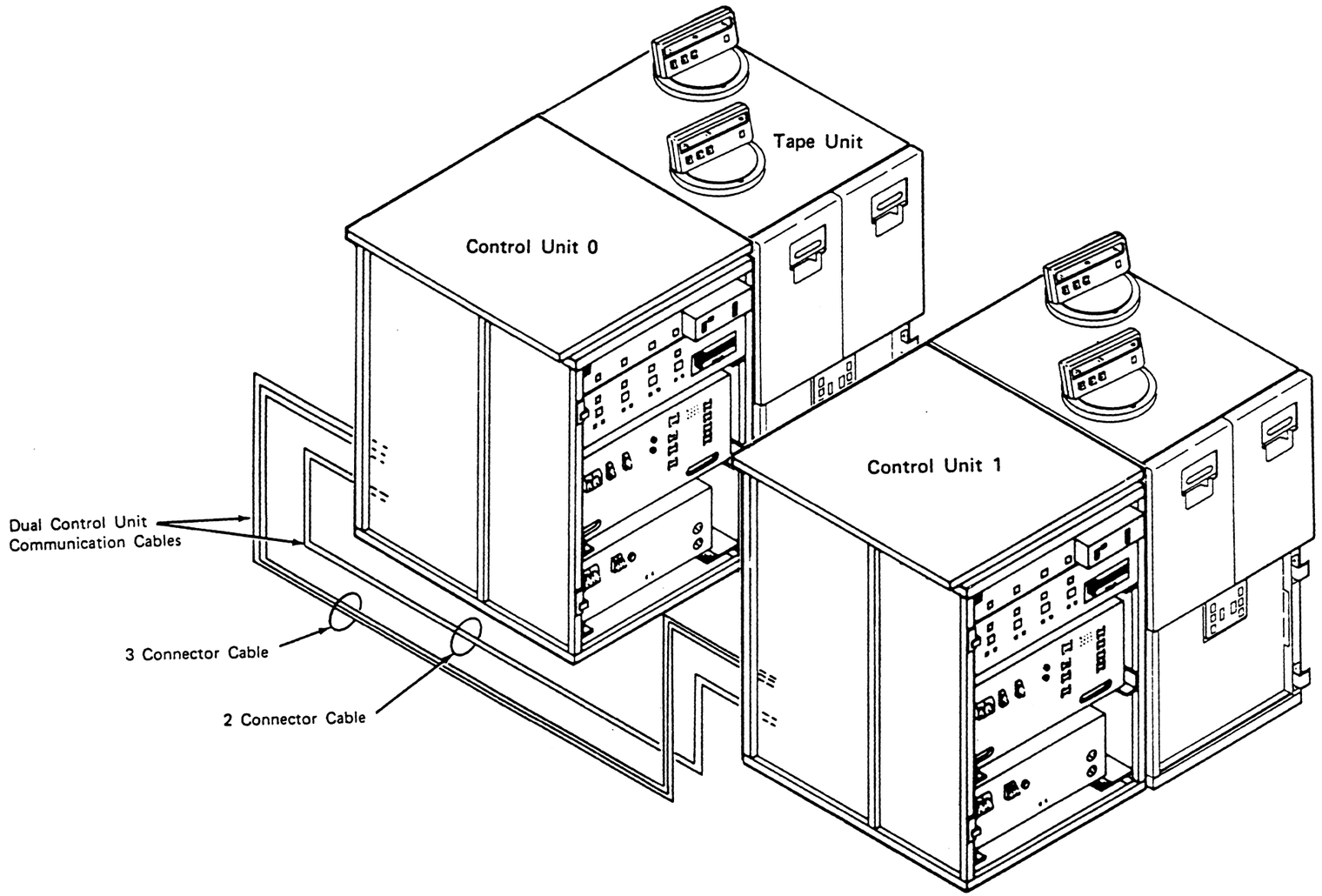
__ 1. Bring the cable ends up from the bottom of the control unit, inside the machine frame, at the rear of the control unit.

Note: Ensure that the cables are positioned so the cable connectors line up correctly with the cable sockets.

__ 2. Continue to the next step on INST 31.

Note: Both control units of a dual control unit subsystem must have the Improved Data Recording Capability feature before the Improved Data Recording Capability allowed switch can be set. If only one control unit has the feature, the Improved Data Recording Capability allowed switch must be set off. See CARR-CU 1200 for switch position assignments.

*This is a feature on the 3480 Model A11 and standard on the 3480 Model A22.



3480 MI EC A57723

0 0 0 0 0 0 0 0 0 0

3480 Installation Instructions

This page is for control units with BM 6460460 (See CARR-CU 9) and tape units with BM 6460006 (See CARR-DR 9)

Connecting the Dual Control Unit Communication Cables (Continued)

__ 3. Before installing the cables, press the cable contacts firmly against the ESD pad **8** to remove any electrostatic discharge.

__ 4. Connect the grounding straps from both the 3-connector cable and the 2-connector cable to the frame at **5**.

__ 5. Plug the 2-connector cable connectors **2** in sockets A1, and A2.

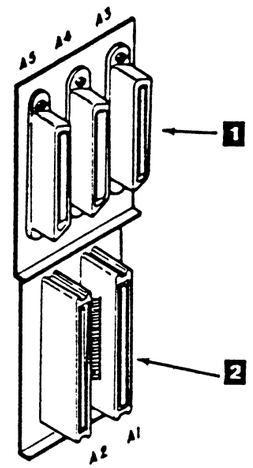
__ 6. Plug the 3-connector cable connectors A3, A4, and A5 **1** in sockets A3, A4, and A5, and fasten them in place with the retaining screws.

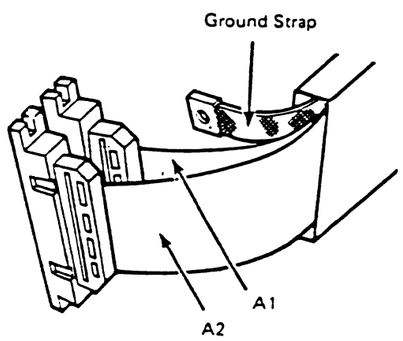
__ 7. Loosen the wingnuts **3** on the cable retaining brackets **4** and rotate the brackets away from the center guide post.

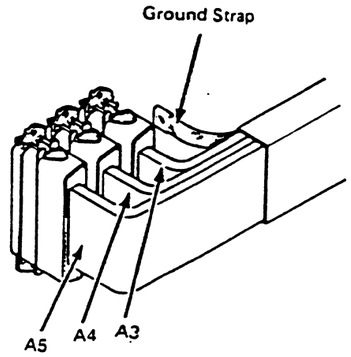
__ 8. Place the cables between the guide posts **6** and rotate the retaining brackets in to the center guide post **7**.

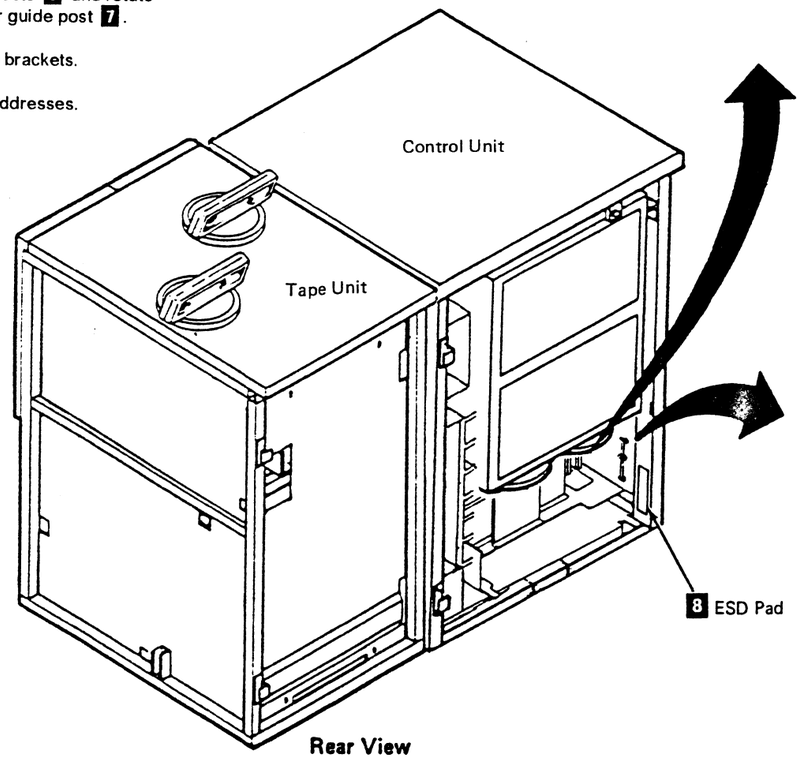
__ 9. Tighten the wingnuts on the retaining brackets.

__ 10. Go to INST 40 to set the control unit addresses.

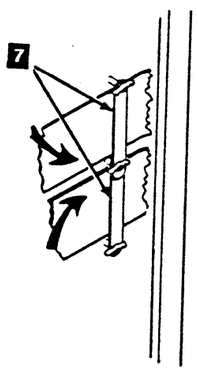


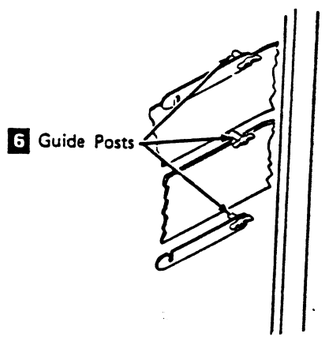


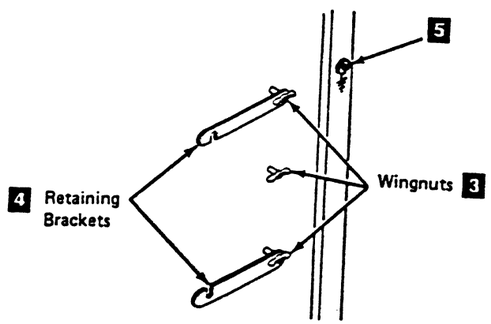




Rear View







This page is for control units with BM 6460460 (See CARR-CU 9)

Setting the Control Unit Addresses

The following procedures are used to set the control unit addresses.

Depending on what features the control unit has, there may be address switches in positions A, B, C, and D on the control unit operator setup panel.

Each switch pair has two thumbwheel switches. The left switch is set to the control unit address. The right switch is set to a value to be determined by the Switch Setting Chart on INST 41.

Attention: The 3480 is a non-shared device. Check the system requirements for control unit addressing and unit control word (UCW) assignment before setting the address switches. All unit control word (UCW) specifications for the 3480 addresses must be set to block, unshared. Also, the proper channel protocal (data streaming or DC Interlock) must be specified. All 16 possible addresses for a 3480 subsytem must be specified, even if some of the drives will not be present. The 3480 control unit can address all 16 addresses, and may generate error information or interrupts for non-existent devices in certain circumstances.

Setting the Control Unit CU0/CU1 Switch

On a single control unit subsystem:

__ 1. Set the CU0/CU1 switch **1** to CU0.

__ 2. Go to "Setting the Channel Address Switches" on this page.

On a dual control unit subsystem:

__ 1. On CU0, set the CU0/CU1 switch **1** to CU0.

Note: CU0 has drive addresses 0 – 7 physically attached to the control unit.

__ 2. On CU1, set the CU0/CU1 switch **1** to CU1.

Note: CU1 has drive addresses 8 – F physically attached to the control unit.

__ 3. Go to "Setting the Channel Address Switches" on this page.

Setting the Channel Address Switches

On each control unit being installed, set the control unit address switches **2** as follows:

__ 1. If the "Channel Information Chart" on INST 41 has been completed, go to step 2. If the "Channel Information Chart" has not been completed, obtain the channel address, control unit address, and type of channel being used from the customer, the installation planning representative, or the systems assurance representative. Record this information in the "Channel Information Chart."

The channel types are:

- Interlocked (DCI)
- 2-Megabyte data streaming (2 Mb)
- 3-Megabyte data streaming (3 Mb)
- 4.5-Megabyte data streaming (4.5 Mb).

__ 2. Start with switch position A: set the left thumbwheel switch to the control unit address from the "Channel Information Chart."

__ 3. Use the "Switch Setting Chart" on INST 41 to find the value for the right thumbwheel switch as follows:

a. Find your control unit address on the left.

b. Move to the right to your channel type.

The point of intersection contains the value to use for the right thumbwheel switch.

c. Set the right thumbwheel switch.

__ 4. Repeat steps 2 and 3 for all installed channels.

Attention: All channel adapters installed on the control unit must be set to a valid configuration, as shown on the table on INST 41, even if the channel is not connected to a host system. Failure to set a valid configuration causes symptoms of hardware failure.

__ 5. Attach the control unit address labels **3** to match the setting on the address selectors.

__ 6. Determine if the control unit has the Improved Data Recording Capability (IDRC) feature installed. If the customer does NOT have software to support IDRC, ensure that the feature is disabled on FRU 120.

__ 7. Go to INST 55 if no drives are to be attached to this control unit.

__ 8. Go to INST 50 to set the drive addresses.

3480 Installation Instructions

This page is for control units with BM 6460460 (See CARR-CU 9) and tape units with BM 6460006 (See CARR-DR 9)

Setting the Control Unit Addresses (Continued)

Channel Information Chart

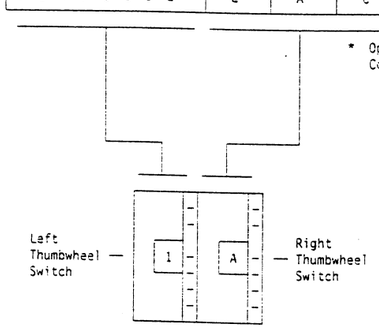
CONTROL UNIT 0			
SWITCH POSITION	CHANNEL ADDRESS	CONTROL UNIT ADDRESS	CHANNEL TYPE
A			
B			
C			
D			

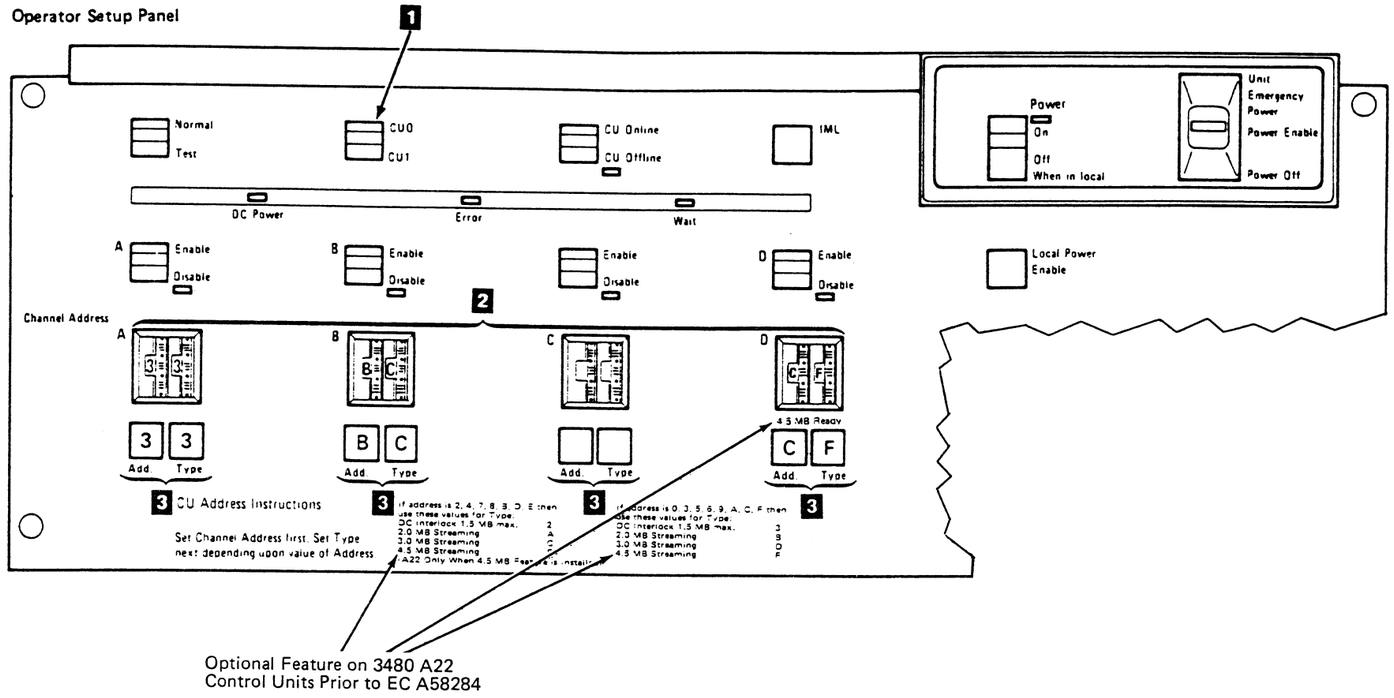
CONTROL UNIT 1			
SWITCH POSITION	CHANNEL ADDRESS	CONTROL UNIT ADDRESS	CHANNEL TYPE
A			
B			
C			
D			

Switch Setting Chart

CONTROL UNIT ADDRESS	CHANNEL TYPES			
	DCI 1.5 MB	2MB	3MB	4.5MB*
0 3 5 6 9 A C F	3	B	D	F
1 2 4 7 8 B D E	2	A	C	E

* Optional feature on 3480 A22 Control Units prior to EC A58284.





3480 Installation Instructions

This page is for control units with BM 6460460 (See CARR-CU 9) and tape units with BM 6460006 (See CARR-DR 9)

Setting the Drive Logical and Physical Addresses

Use the following procedures to set the drive logical address, and physical address. There are separate procedures for a single control unit subsystem and a dual control unit subsystem --- be sure to use the correct procedure.

Single Control Unit Subsystem

__ 1. Set the drive logical address switches **1** to 0 through 7; set the drive next to the control unit to 0, set the next drive to 1, and so forth. See figure 1.

__ 2. Attach the address labels **2** to the drive operator panels. Each label should match the number set on the drive logical address switch.

__ 3. Open the rear cover of the tape units.

__ 4. Find the physical address switch **3** on the back of the drive drawer.

__ 5. Set the drive physical address switches to match the logical address switches.

__ 6. Close the rear cover of the tape units.

__ 7. Ensure that the logical and physical address switches are set on all drives before continuing.

__ 8. Go to INST 55 to check the control unit power supply jumpers.

Dual Control Unit Subsystem

__ 1. Set the drive logical address switches **1** on the drives attached to CU0, to 0 through 7; set the drive next to the control unit to 0, set the next drive to 1, and so forth. See figure 1.

__ 2. Set the drive logical address switches **1** on the drives attached to CU1, to 8 through F; set the drive next to the control to 8, set the next drive to 9, and so forth. See figure 1.

__ 3. Attach the address labels **2** to the drive operator panels. Each label should match the number set on the drive logical address switch.

__ 4. Open the rear cover of the tape units.

__ 5. Find the physical address switch **3** on the back of the drive drawer.

__ 6. Set the drive physical address switches to match the logical address switches.

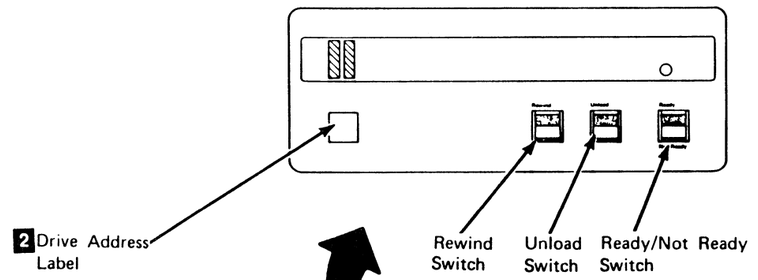
__ 7. Close the rear cover of the tape units.

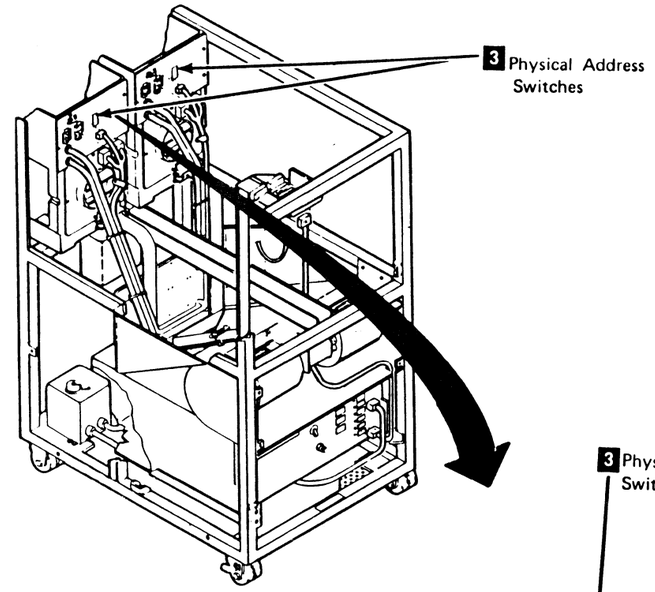
__ 8. Ensure that the logical and physical address switches are set on all drives before continuing.

__ 9. Go to INST 55 to check the control unit power supply jumpers.

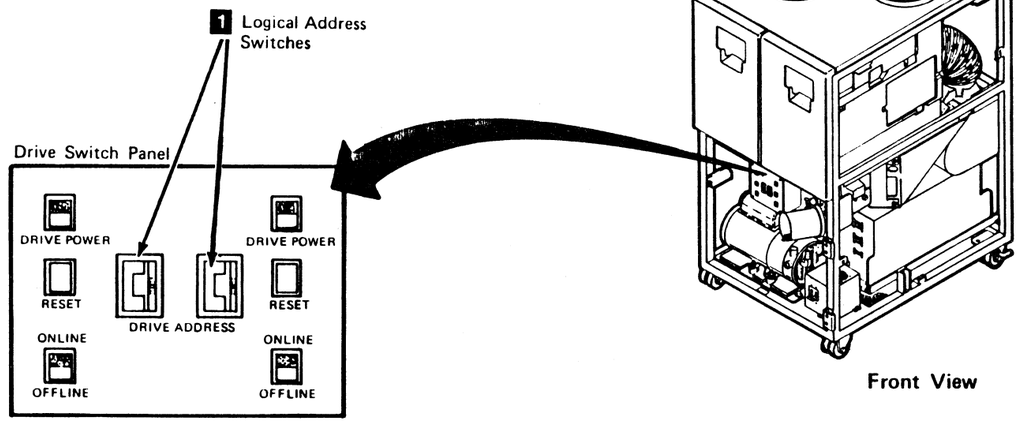
CU0	0	1	2	3	4	5	6	7
CU1	8	9	A	B	C	D	E	F

Figure 1. Required Drive Address Values

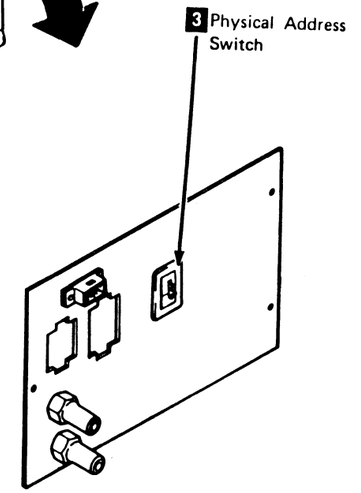




Rear View



Front View



This page is for control units with BM 6460460 (See CARR-CU 9) and tape units with BM 6460006 (See CARR-DR 9)

Checking Control Unit Power Supply Jumpers

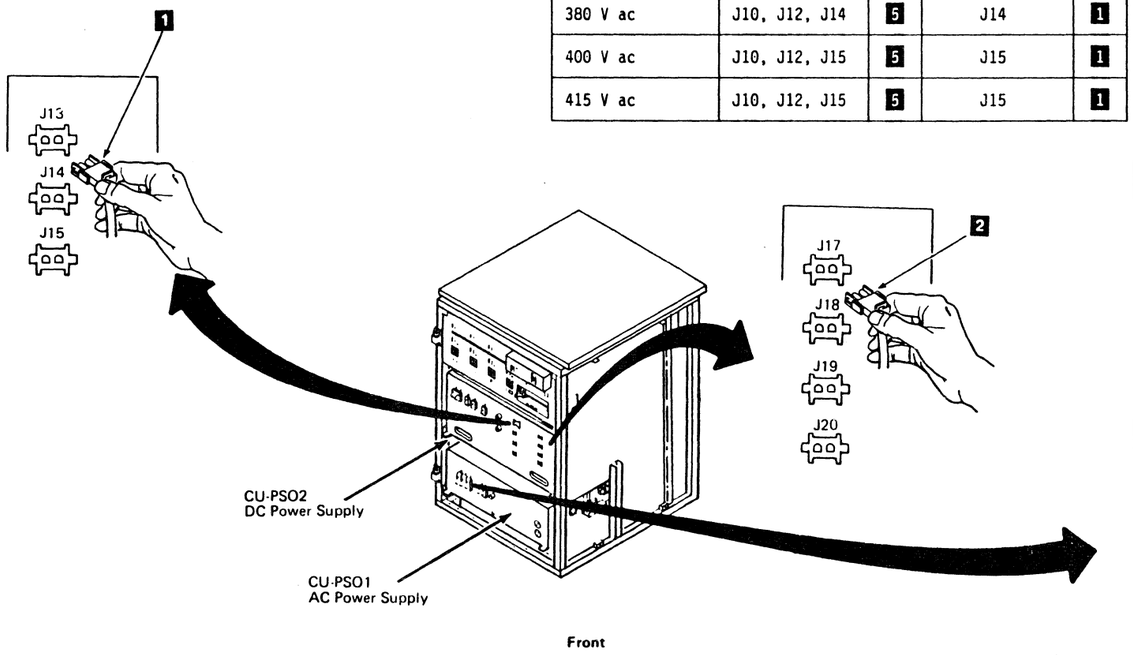
Check the jumpers for the control unit ac (PS01) and dc (PS02) power supplies. If the installation is a dual control unit subsystem, check both control units.

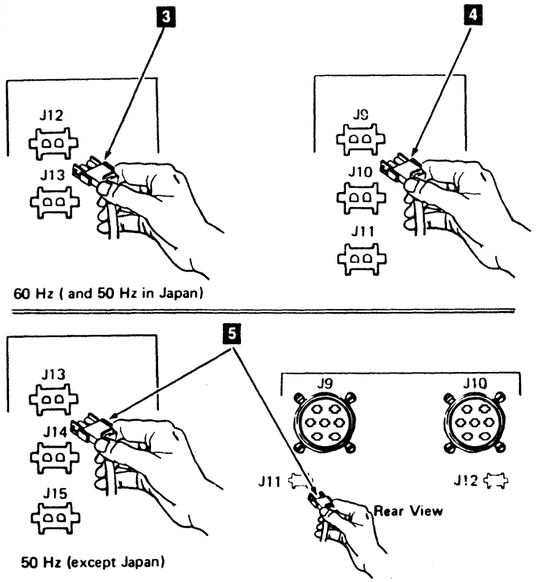
__ 1. Use one of the following two tables to check the voltage settings. Ensure the jumpers are installed correctly for the voltage being used.

Note: *For 50 Hz (except Japan) machines, if the Delta/Wye jumper has to be changed (J09 and J10 on CU-PS01), ensure that the cap is reinstalled on the empty socket.*

CONTROL UNIT VOLTAGE JUMPERS – 60 HZ AND 50 HZ JAPAN				
CU INPUT VOLTAGE	POSITION OF AC (PS01) JUMPER	REF	POSITION OF DC (PS02) JUMPER	REF
200/208 V ac	J09	4	J13	1
220 V ac	J10	4	J14	1
230/240 V ac	J11	4	J15	1
CONVENIENCE OUTLET				
100 V ac	J12	3		
120 V ac	J13	3		

CONTROL UNIT VOLTAGE JUMPERS – 50 HZ (EXCEPT JAPAN)				
CU INPUT VOLTAGE	POSITION OF AC (PS01) JUMPERS	REF	POSITION OF DC (PS02) JUMPER	REF
200/208 V ac	J09, J11, J13	5	J13	1
220 V ac	J09, J11, J14	5	J14	1
230/240 V ac	J09, J11, J15	5	J15	1
380 V ac	J10, J12, J14	5	J14	1
400 V ac	J10, J12, J15	5	J15	1
415 V ac	J10, J12, J15	5	J15	1





__ 2. A control unit has from 1 to 4 channel adapters. The position of the jumper plug for CU-PS02-J17 through CU-PS02-J20 2 is determined by the number of channel adapters in the control unit. Use the following table to ensure that the CU is jumpered for the correct number of channel adapters.

Note: *If the Power Supply on the CU has different Jumper Labels than described here, follow the instructions on the Power Supply Template.*

CONTROL UNIT CHANNEL JUMPERS	
NUMBER OF CHANNEL ADAPTERS	POSITION OF DC (PS02) JUMPER
1	J17
2	J18
3	J19
4	J20

__ 3. Switch all of the circuit breakers on each control unit off then back on. See LOC 1 for the CU dc and ac power supplies.

__ 4. Open the back of each CU and ensure that the Service switch mounted on the gate is in the On position. See LOC 1.

__ 5. Go to INST 60 if no tape units are to be connected to this control unit.

__ 6. Go to INST 56 to check the tape unit power supply jumpers.

This page is for control units with BM 6460460 (See CARR-CU 9) and tape units with BM 6460006 (See CARR-DR 9)

Checking Tape Unit Power Supply Jumpers

Use the following table to check for correct voltage jumpering on each tape unit dc power supply.

Attention: The correct position of the tape unit's dc (PS01) jumper is determined by the control unit's input voltage, NOT the tape unit's input voltage. See the table below.

__ 1. Open the rear cover to gain access to the dc power supply.

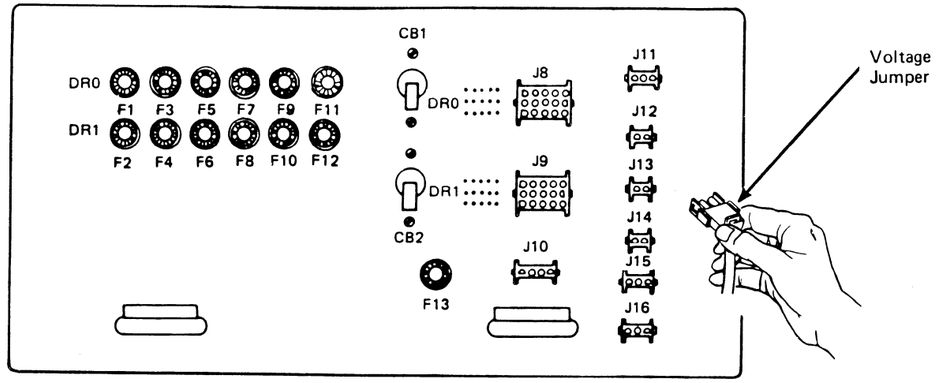
There are two dc power supplies: see the illustrations to determine which supply is in the tape unit.

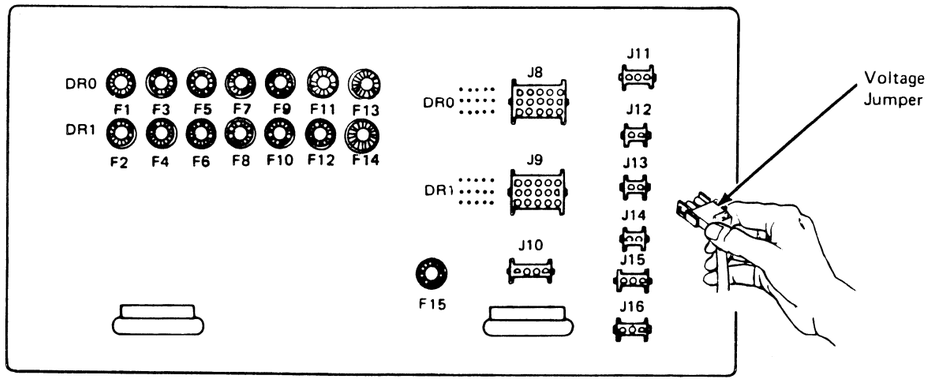
TAPE UNIT VOLTAGE JUMPER	
CU INPUT VOLTAGE	POSITION OF DC (PS01) JUMPER
200/208 V ac	J12
220 V ac	J13
230/240 V ac	J14
380 V ac	J13
400 V ac	J14
415 V ac	J14

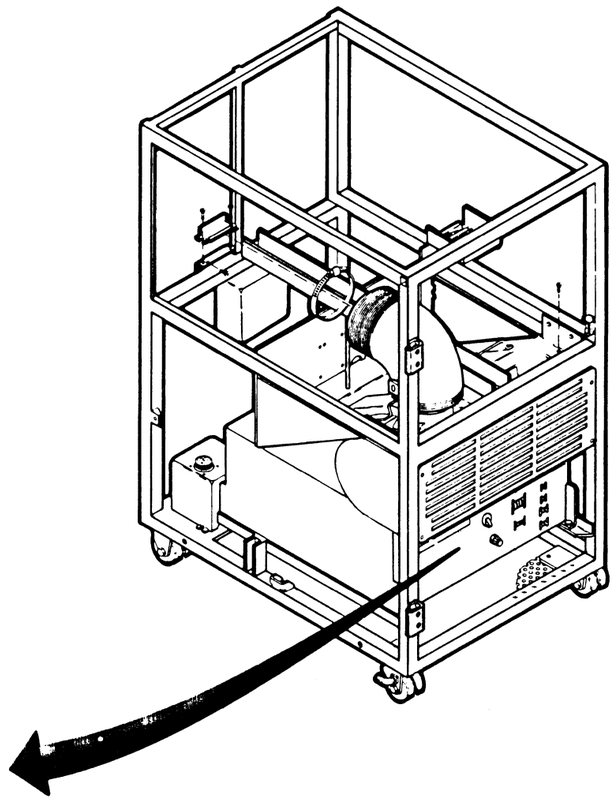
__ 2. Switch all circuit breakers on each tape unit off then back on. See LOC 1 for circuit breaker locations.

Close the rear cover.

__ 3. Go to INST 60 to connect the control unit ac power cable.







This page is for control units with BM 6460460 (See CARR-CU 9) and tape units with BM 6460006 (See CARR-DR 9)

Connecting the Control Unit AC Power Cable

DANGER
Make sure the circuit breaker that supplies power to the customer's receptacle is OFF.

If you are installing a dual control unit subsystem, power to both customer receptacles must be OFF.

Make sure that there are no cables attached to the I/O tailgate assembly in the bottom rear of the control unit.

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Note: See INST 61 for the following locations.

__ 1. On the control unit operator setup (OSU) panel, set the Power On/Off switch **3** to Off. Set the Unit Emergency Power Off (UEPO) switch **4** to Power Off.

Are you satisfied that the customer receptacle and control unit power connector are wired correctly? See INST 6 for safety checks.

```
YES NO
|   |
|   Inform the customer to have the
|   wiring corrected.
|
Continue to the next step.
```

__ 2. Connect the control unit ac power connector **12** to the customer receptacle.

__ 3. On the control unit operator setup panel:

__ a. Set the Power On/Off switch **3** to On.

__ b. Set the CU Online/CU Offline switch **2** to CU Offline.

__ c. Set the Local/Remote switch **6** to Local.

__ 4. On each drive switch panel:

__ a. Set the Drive Power switches **13** to On.

__ b. Set the Online/Offline switches **14** to Online.

__ 5. Have the customer switch on the circuit breaker that supplies power to the customer receptacle.

__ 6. On the control unit operator setup panel:

__ a. Set the UEPO switch **4** to Power Enable.

__ b. Press the Local Power Enable switch **5** to supply power to the control unit and its attached drives.

Is the DC Power light on the control unit operator setup panel **1** On?

```
YES NO
|   |
|   Is the Service switch on the 01A
|   gate in the CU 9 set to On?
|
|   YES NO
|   |   |
|   |   Set the switch to On and press
|   |   the Local Power Enable switch 5.
|   |
|   |   Is the DC Power light on the CU
|   |   operator setup panel 1 On?
|   |
|   |   YES NO
|   |   |   |
|   |   |   Go step 7 on this page.
|   |   |
|   |   Go step 14 on this page.
|   |
|   Go step 7 on this page.
|
Go step 14 on this page.
```

__ 7. Vibration or temperatures exceeding operating temperatures during shipping may trip the upper or lower thermal switches on the logic gate.

Set the UEPO switch **4** to Off.

__ 8. Loosen the two screws **10** on the top of the logic gate **7**, and raise the top cover to gain access to the upper thermal switch **8**.

__ 9. Press the reset button located on the upper thermal switch, then lower the top cover, and tighten the two top cover screws.

__ 10. Locate the lower thermal switch **11** on the bottom of the logic gate.

__ 11. Press the lower thermal switch reset button.

__ 12. Set the UEPO switch **4** to Power Enable.

__ 13. Press the Local Power Enable switch **5** to supply power to the control unit and its attached drives.

Is the DC Power light on the control unit operator setup panel **1** On?

```
YES NO
|   |
|   Go to MAP 0100-Power Start, on PWR
|   100, to repair the power failure;
|   then return to this page, INST 60,
|   step 2 and continue.
|
Continue with the next step.
```

Checking the Unit Emergency Power Off (UEPO) switch

__ 14. Set the control unit Power On/Off switch **3** to the Off position.

__ 15. Set the UEPO switch **4** to the Power Off position.

__ 16. Attempt to power on the control unit with the UEPO switch in the Power Off position, by doing the following:

__ a. Set the Power On/Off switch **3** to the On position.

__ b. Press the Local Power Enable switch **5**.

Does the control unit power on with the UEPO switch in the Power Off position?

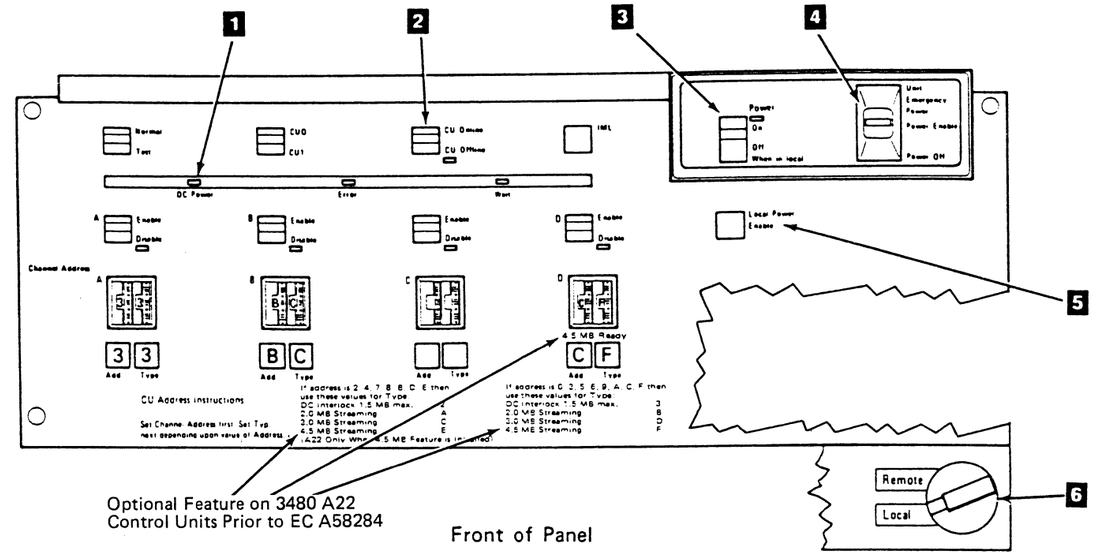
```
YES NO
|   |
|   Go to step 17 on this page.
|
There is a problem with the UEPO switch
(FRU198) or the ac power supply (FRU144).
Follow the instructions in the CARR
section of the Maintenance Information
for the removal and replacement of those
FRUs.  Return here and repeat steps 14
through 16 after each FRU is replaced.

Does the control unit power on with the
UEPO switch in the Power Off position?

YES NO
|   |
|   Go to step 17 on this page.
|
Go to MAP 0100-Power Start, on PWR 100,
to repair the power failure; then return
here to complete the installation.
```

__ 17. Are you installing a single control unit subsystem?

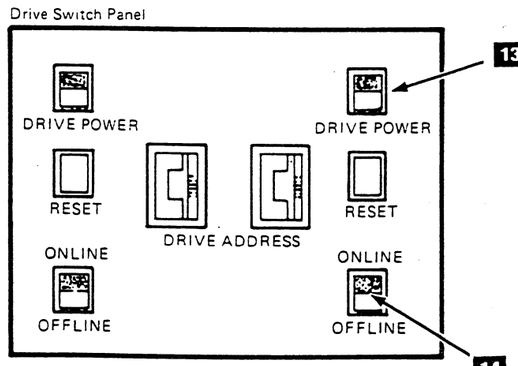
```
YES NO
|   |
|   Are two service representative's installing
|   this subsystem at the same time?
|
|   YES NO
|   |   |
|   |   Repeat steps 1 through 16 for
|   |   the second control unit, then
|   |   set the Power ON/OFF switch 3
|   |   to OFF on both control units
|   |   and go to INST 76.
|   |
|   Set Power ON/OFF switch 3 to OFF
|   and go to INST 76.
|
Set Power ON/OFF switch 3 to OFF
and go to INST 70.
```

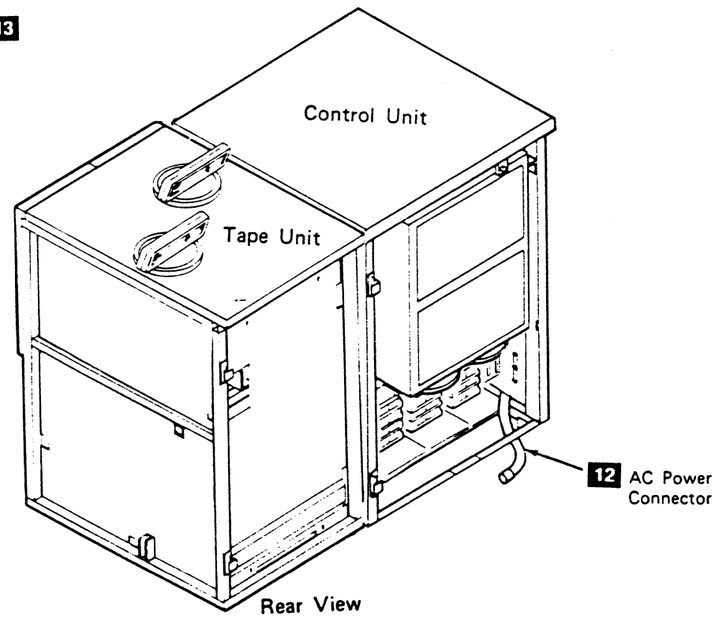
3480 Installation Instructions

This page is for control units with BM 6460460 (See CARR-CU 9) and tape units with BM 6460006 (See CARR-DR 9)

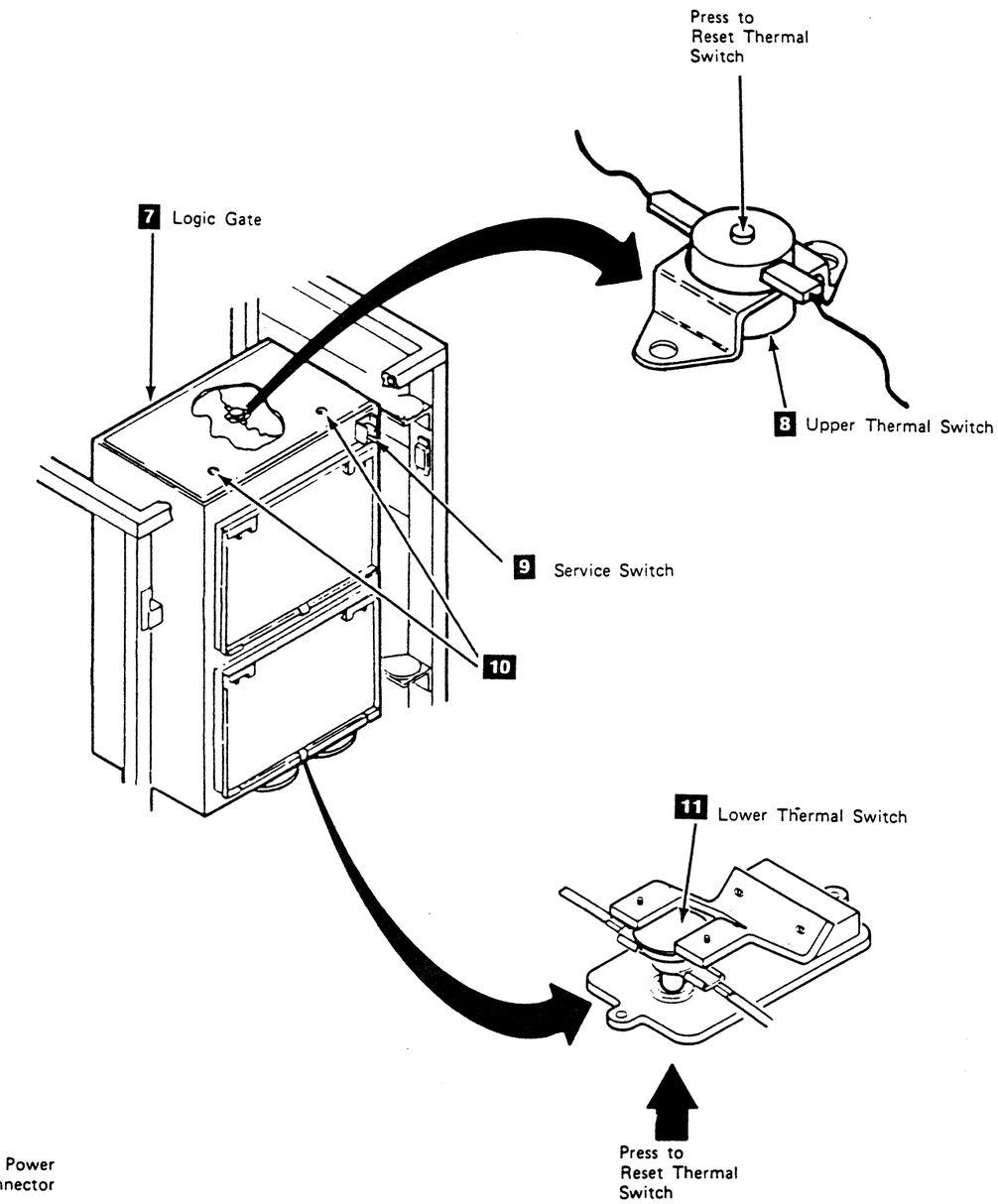


Front of Panel





Rear View



This page is for control units with BM 6460460 (See CARR-CU 9) and tape units with BM 6460006 (See CARR-DR 9)

Running Offline Checkout for a Single Control Unit Subsystem

Note: See INST 71 for the physical locations.

This procedure is used for offline checkout of a single control unit subsystem only. Go to INST 76 if you have a dual control unit subsystem.

The offline checkout tests whether the control unit can communicate with all the drives in the subsystem.

As you progress through the tests, you are asked to note the address of any drive that does not show the display response expected. After the offline checkout is complete, you will be sent to INST 90 to analyze the drives that failed during the checkout.

The error light 3 will light when certain portions of the offline tests are run. This condition is normal and does not indicate a failure in the control unit unless you are asked to note the status of the error light.

Setting Up for the Checkout

Note: If you are adding a tape unit to a previously installed subsystem, do the following procedures testing only that tape unit you are adding.

__ 1. On the control unit operator setup panel:

- __ a. Verify that the Power On/Off switch **5** is set to Off.
- __ b. Set the Normal/Test switch **1** to Test.
- __ c. Verify that the CU0/CU1 switch **2** is set to CU0. Recommended (but not required) for single control unit subsystems.
- __ d. Verify that the CU Offline/CU Online switch **4** is set to CU Offline.

__ 2. On each drive operator panel:

- __ a. Set the Ready/Not Ready switch **12** to Ready.

__ 3. On each drive switch panel:

- __ a. Verify that the Drive Power switch **9** is set to On.
- __ b. Verify that the Online/Offline switch **11** is set to Online.

__ 4. On each drive with the Automatic Cartridge Loader feature, set the Loader switch **13** to Auto.

__ 5. On the control unit:

3.5 Inch IML Disk Drive

- __ a. Push the release button on the IML disk drive **8** and remove the head protector.
- __ b. Insert the IML diskette (label up and toward you) and push until the drive closes.
- __ c. Set the Power On/Off switch **5** to On.

5.25 Inch IML Disk Drive,

- __ a. Open the latch on the IML disk drive **8** and remove the head protector.
- __ b. Insert the IML diskette, label up and towards you, and close the drive latch.
- __ c. Set the Power On/Off switch **5** to On.

Switching on the Power

__ 6. Ensure that the main circuit breaker on the control unit (CB1 on the ac power supply) is off; then switch it on.

__ 7. Set Unit Emergency Power Off switch on the control unit **6** to Power Enable.

__ 8. Press the Local Power Enable pushbutton **7** on the control unit operator setup panel.

__ 9. Does a single asterisk (*) show for ten seconds or longer on each drive message display?

```
YES NO
|   |
|   Are all the switches set correctly?
|
|   YES NO
|   |   |
|   |   Switch off the mainline circuit
|   |   breaker (CB1 on the ac power
|   |   supply) and set the switches as
|   |   specified in steps 1, 2, and 3;
|   |   then perform steps 5 through 7.
|   |
|   |   Does a single asterisk show for
|   |   ten seconds or longer on each
|   |   drive message display?
|   |
|   |   YES NO
|   |   |   |
|   |   |   Note the drive addresses
|   |   |   without a single
|   |   |   asterisk and continue to
|   |   |   the next step.
|   |   |
|   |   Continue to the next step.
|   |
|   Note the drive addresses
|   without a single asterisk and
|   continue to the next step.
|
Continue to the next step.
```

__ 10. On each drive switch panel, set the Drive Power switch **9** to Off; then set it back to On.

Does a single asterisk (*) show for ten seconds or longer on each drive message display?

```
YES NO
|   |
|   Note the drive addresses without
|   a single asterisk and continue to
|   the next step.
|
Continue to the next step.
```

__ 11. On each drive switch panel, press then release the Reset switch **10**.

Does a single asterisk (*) show for ten seconds or longer on each drive message display?

```
YES NO
|   |
|   Note the drive addresses
|   without a single asterisk and
|   continue to the next step.
|
Continue to the next step.
```

__ 12. On each drive switch panel, set the Online/Offline switch **11** to Offline.

Do special box-shaped symbols show in the first and last positions of the message display?

```
YES NO
|   |
|   Note the drive addresses
|   without the special box-shaped
|   symbols and continue to the next
|   step.
|
Continue to the next step.
```

__ 13. On the drive switch panel, set the Online/Offline switch **11** to Online and verify that the special box-shaped symbols go away.

Do the special box-shaped symbols go away?

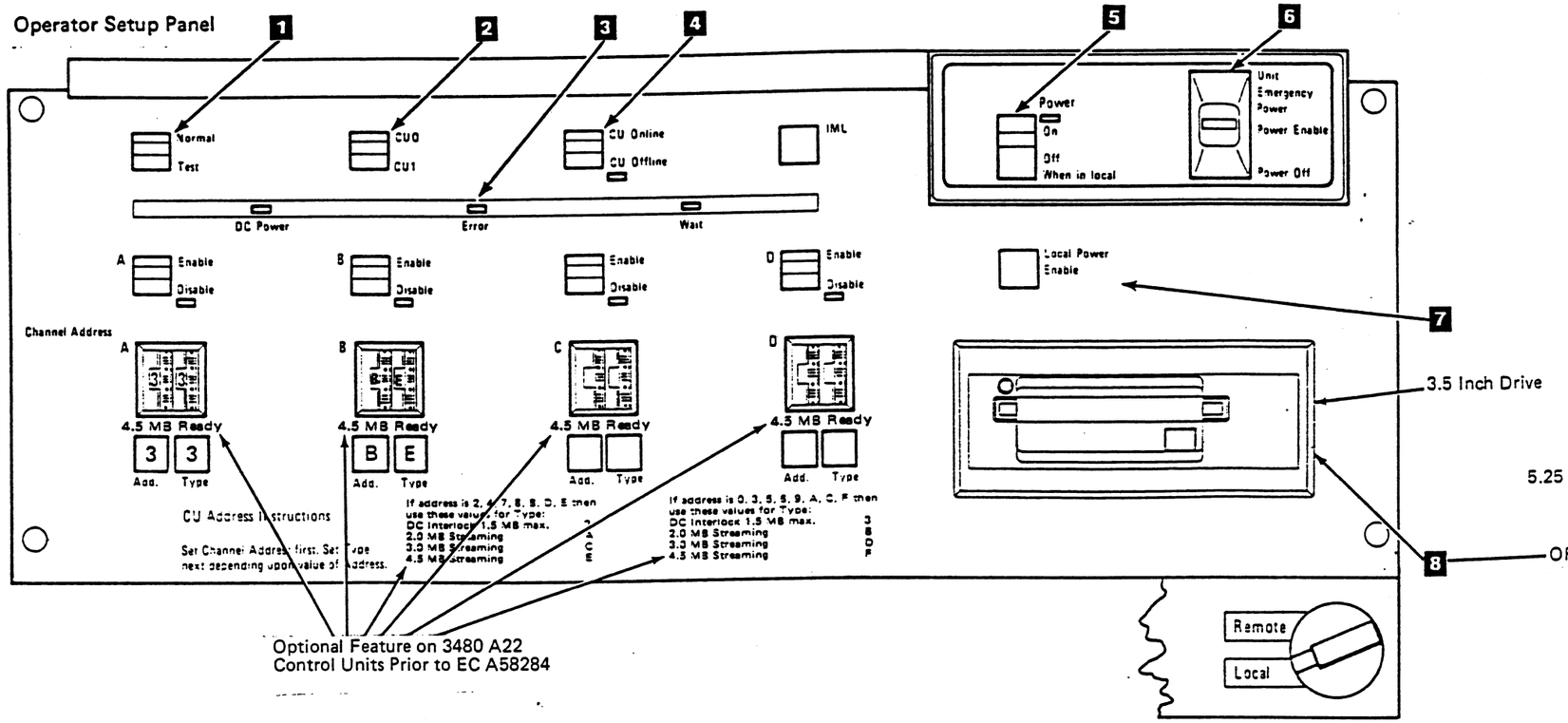
```
YES NO
|   |
|   Note the drive addresses where the
|   special box-shaped symbols do not go
|   away, and continue with the next step.
|
Continue with the next step.
```

__ 14. Go to INST 72 to continue the offline checkout.

Installation Instructions INST 70

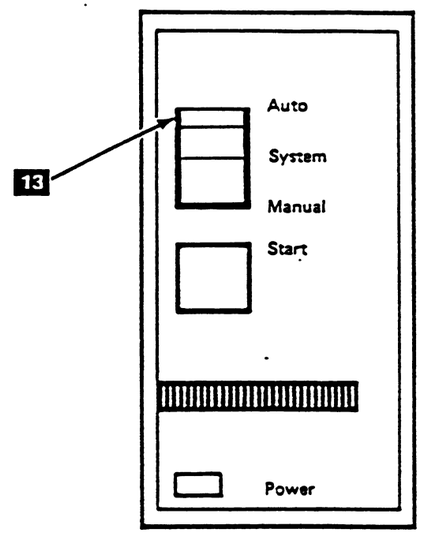
This page is for control units with BM 6460460 (See CARR-CU 9) and tape units with BM 6460006 (See CARR-DR 9)

Operator Setup Panel

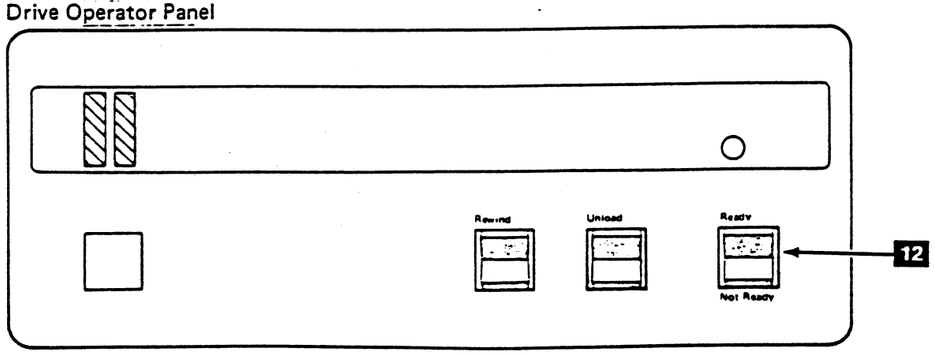


Optional Feature on 3480 A22 Control Units Prior to EC A58284

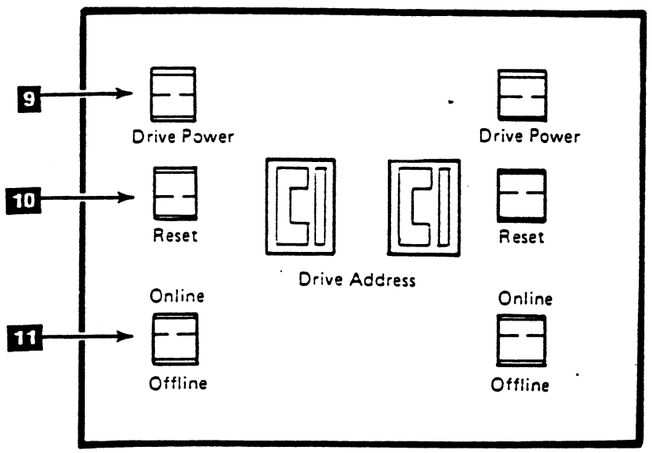
Automatic Cartridge Loader Operator Panel



Drive Operator Panel



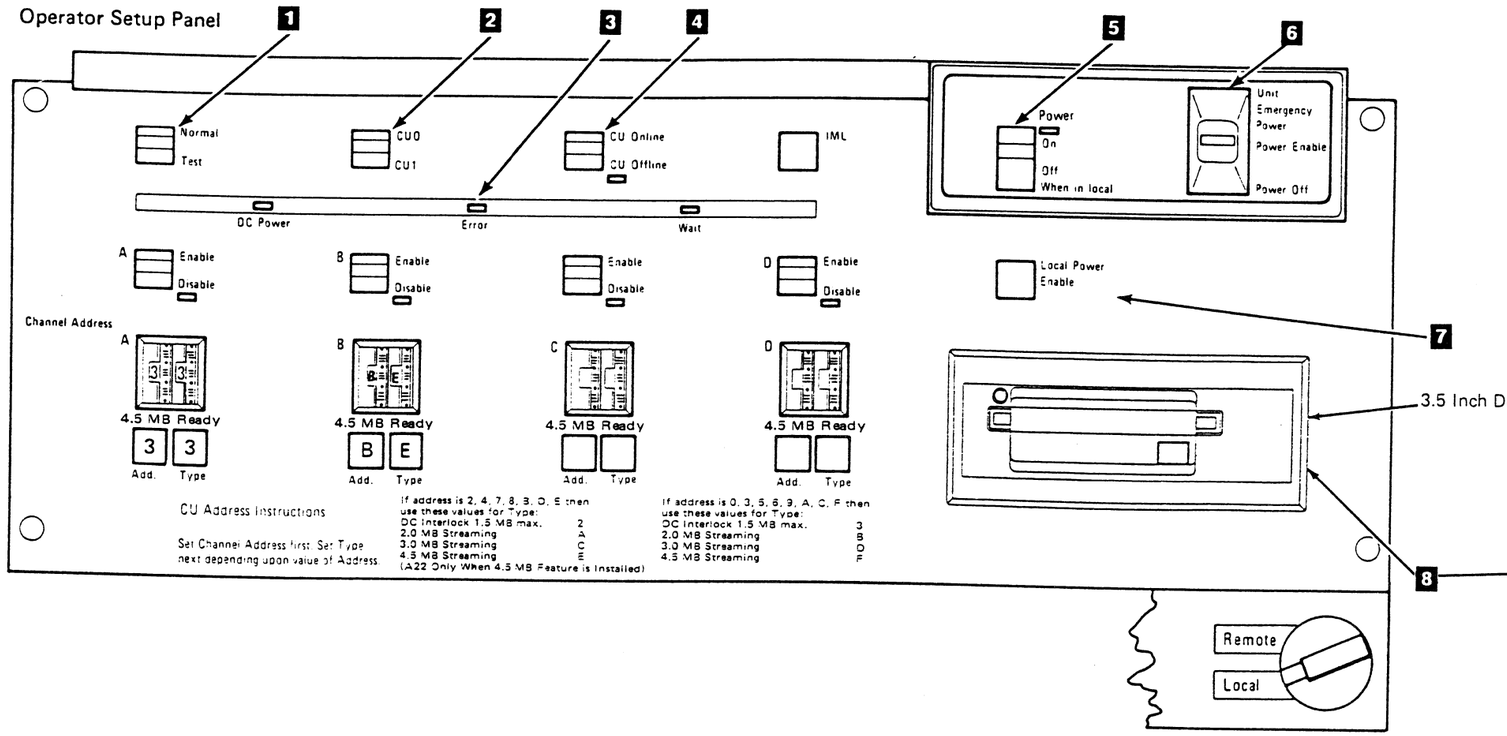
Drive Switch Panel

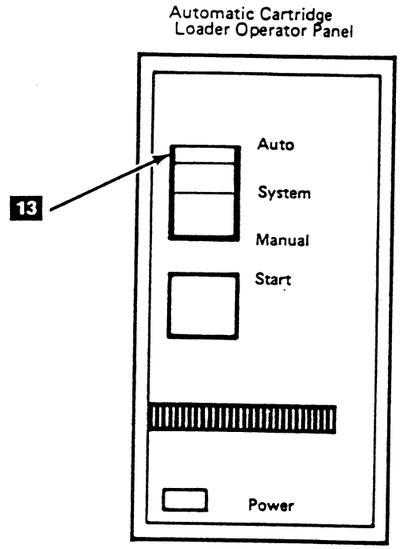


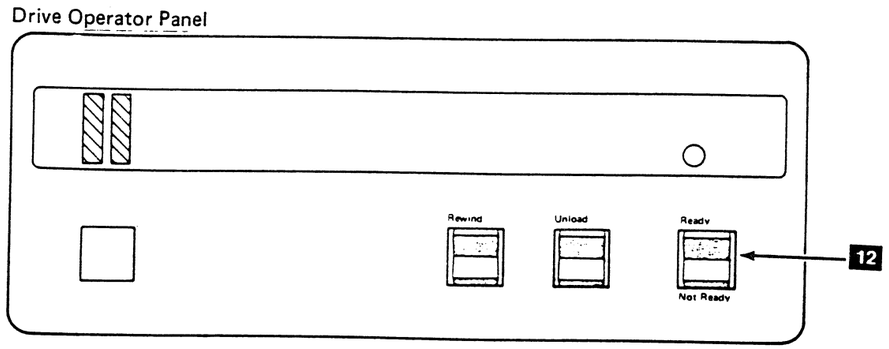
0 0 0 3 0 0 0 0 0 0

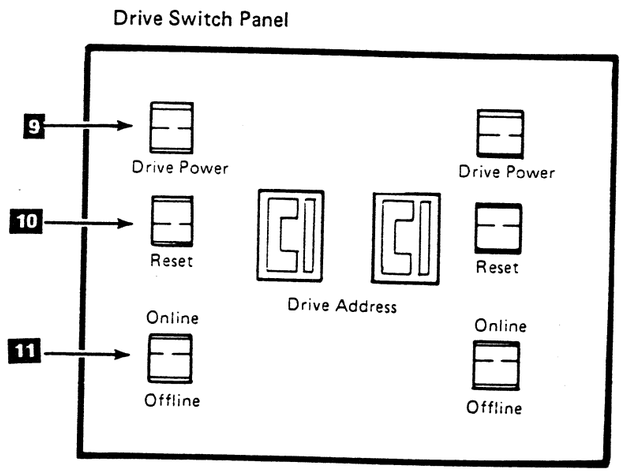
3480 Installation Instructions

This page is for control units with BM 6460460 (See CARR-CU 9) and tape units with BM 6460006 (See CARR-DR 9)









This page is for control units with BM 6460460 (See CARR-CU 9) and tape units with BM 6460006 (See CARR-DR 9)

Running Offline Checkout for a Single Control Unit Subsystem (Continued)

Note: See INST 73 for the following locations.

Checking the Addresses

__ 15. On the control unit operator setup panel, set the CU Online/CU Offline switch **2** to CU Online.

After a short delay (1 1/2 minutes or less) does "L=x P=x" (x being any number between 0 and 7) appear on any drive display?

```
YES NO
|   |
|   Power off the control unit with the
|   Power On/Off switch 4 and verify that
|   the switches are set correctly on the
|   control unit and tape unit panels.  See
|   "Setting Up for the Checkout" steps 1,
|   2, and 3 on INST 70 for the correct
|   switch settings.  Correct any switch
|   settings that are wrong.  Power up and
|   repeat the actions you performed in
|   step 14.
|
|   Does "L=x P=x" appear on any tape
|   drive display?
|
|   YES NO
|   |   |
|   |   The CU will not load the micro-
|   |   program and must be fixed to
|   |   continue.  Set the Normal/Test
|   |   switch 1 to Normal and press
|   |   the IML switch 3.  Insert the
|   |   product maintenance diskette into
|   |   the MD and do an IPL on the MD.
|   |   Follow the maintenance package to
|   |   correct the problem and return
|   |   here when the problem is fixed.
|   |
|   |   Set the Normal/Test switch to Test
|   |   and check the CU and tape unit
|   |   switch settings again.  See
|   |   "Setting Up for the Checkout" steps
|   |   1, 2, and 3 on INST 70 for the
|   |   correct switch settings.  Correct
|   |   any switch settings that are wrong.
|   |   Power up and repeat the actions
|   |   you performed in step 14.
|   |
|   |   Does "L=x P=x" appear on any tape
|   |   drive display?
|   |
|   |   YES NO
|   |   |   |
A   B   C   D
```

```
A   B   C   D
|   |   |   |
|   |   |   Call your next level of
|   |   |   support.
|   |   |
|   |   Note the addresses of any drives
|   |   that do not show the correct
|   |   display, then continue with the
|   |   next step.
|   |
|   Note the addresses of any drives that
|   do not show the correct display, then
|   continue with the next step.
|
Note the addresses of any drives that do
not show the correct display, then
continue with the next step.
```

__ 16. Compare the "L=x" (logical address) portion of each drive display to the address label **6** on each display.

Does each drive display match the label?

```
YES NO
|   |
|   Ensure that all the drive logical
|   addresses are set correctly.  See
|   "Setting the Drive Logical and
|   Physical Addresses" on INST 50.
|
|   Leaving the control unit online, power
|   it off then back on again.  Note the
|   addresses of any drives whose display
|   labels 6 still do not match the "L=x"
|   portion of the display, then continue
|   to the next step.
|
Ensure that the "P=x" (physical address)
portion of each display does not match the
"P=x" portion of any other drive display
in the subsystem.
```

Does each drive display have a "P=x" number not shared by any other drive?

```
YES NO
|   |
|   Ensure that all of the drive physical
|   addresses are set correctly.  See
|   "Setting the Drive Logical and
|    Physical Addresses" on INST 50.
|
|   Leaving the control unit online, power
|   it off then on again.  Note any drive
|   physical addresses that are still
|   incorrect and continue to the next step.
|
Continue with the next step.
```

Checking Read/Write

__ 17. On the control unit operator setup panel, set the CU Online/CU Offline switch **2** to CU Offline.

After a delay of 1 1/2 minutes or less, does TEST show with the indicator bars **5** flashing on the message display of any drive?

Note: If an Action message appears on any drive display, go to INST 5 and perform the action described for that message. Return here when finished, and set the Power On/Off switch **4** to Off then On and go to step 14 on this page.

```
YES NO
|   |
|   The CU will not load the microprogram
|   and must be fixed to continue.  Set
|   the Normal/Test switch 1 to Normal
|   and press the IML switch 3.  Insert
|   the product maintenance diskette into
|   the MD and do an IPL on the MD.
|   Follow the maintenance package to
|   correct the problem and return here
|   when the problem is fixed.
|
|   Set the Normal/Test switch 1 to Test
|   and the Online/Offline switch 2 to
|   Online.  Wait until addresses appear on
|   the drive displays, then repeat step 16
|   on this page.
|
Continue to the next step.
```

__ 18. Set a blank cartridge **7** to not file protect.

__ 19. If the Automatic Cartridge Loader feature is installed, skip the next step.

__ 20. Insert the cartridge into the drive that is nearest the control unit and displaying TEST. Close the cartridge latch and skip the next TWO steps.

__ 21. Put a cartridge in the top position of the loader on the drive nearest the control unit and displaying TEST.

__ 22. Ensure that the Loader mode switch **8** is set to Auto mode and press the Start switch **9**.

__ 23. If the display shows Action Message 1, 2, 3, or 5 after you load the tape cartridge, go to "Action Messages" on INST 5 and perform the procedure as directed. Return here when you have completed the required procedure.

__ 24. The diagnostic will show various messages on the drive display as it executes, indicating the action the drive is performing.

Each drive will require about 1 3/4 minutes to execute the test, and when complete, will show a single asterisk on the display.

__ 25. While the first drive is being tested, set another blank cartridge **7** to not file protect and insert it into the next drive displaying TEST. The display will show READY U.

When UNLOAD appears on the display of the first drive, the next drive with a tape loaded will begin testing.

Note: This testing procedure can be performed with one scratch tape, but you must wait for each drive to unload the tape. This increases the test time to 2 1/2 minutes for each drive.

__ 26. When the first drive UNLOADs, move that tape to the next drive showing TEST. If the cartridge does not unload, go to "Cartridge Removal by Hand" on CART 10.

__ 27. Repeat this procedure for all drives in the subsystem showing TEST.

__ 28. If failures occur on multiple drives in a string, there may be a cable connection problem. Check the seating of the device data and read bus cables, and the dual control unit communication cables (for dual control unit subsystems). See LOC 1 for the control unit and tape unit cable locations.

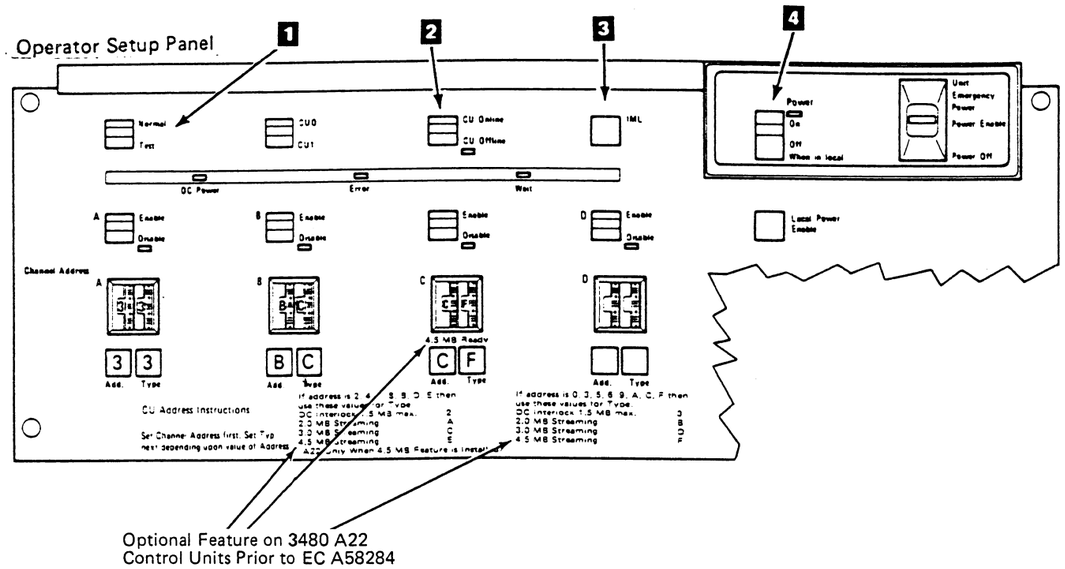
When you have finished checking the cables, insert a cartridge into those drives that were failing and the tests will be rerun.

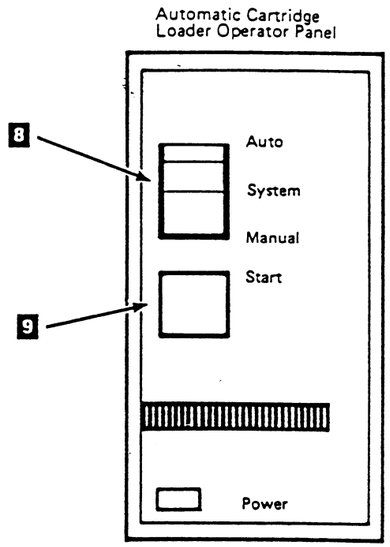
__ 29. If any drives will not run the tests to completion, note the failing drive addresses and that CU0 was running the test. This will be used later on INST 90 when the product package is run.

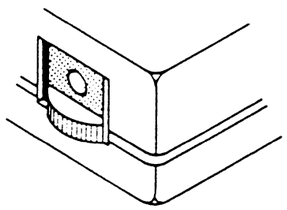
__ 30. Go to the next step on INST 74.

Installation Instructions INST 72

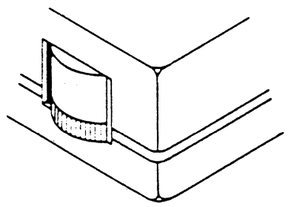
This page is for control units with BM 6460460 (See CARR-CU 9) and tape units with BM 6460006 (See CARR-DR 9)



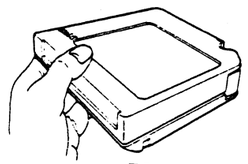




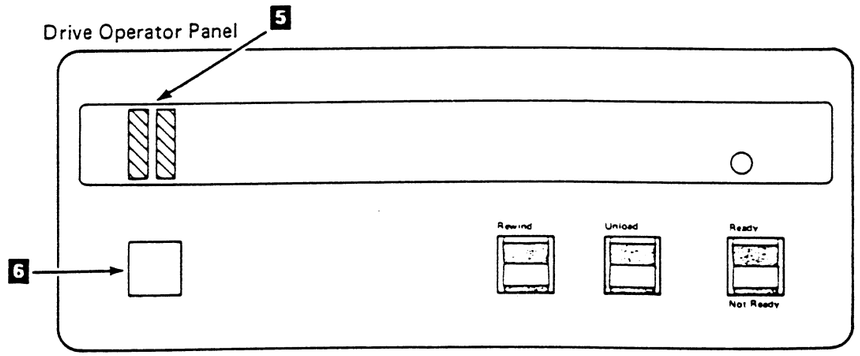
File Protect Position



Not File Protect Position



7 Blank Cartridge



This page is for control units with BM 6460460 (See CARR-CU 9) and tape units with BM 6460006 (See CARR-DR 9)

Running Offline Checkout for a Single Control Unit Subsystem (Continued)

Final Checkout

__ 31. On the control unit operator setup panel, set the Normal/Test switch 1 to Normal.

Do eight asterisks (********) show on all drive displays not showing TEST?

```
YES NO
|   |
|   Is the Normal/Test switch 1 set
|   to Normal?
|
|   YES NO
|   |   |
|   |   Set the switch to Normal and
|   |   repeat step 26.
|   |
|   |   Do eight asterisks show on all
|   |   drive displays not showing TEST?
|   |
|   |   YES NO
|   |   |   |
|   |   |   Note the drive addresses
|   |   |   that do not show eight
|   |   |   asterisks or TEST and
|   |   |   continue to the next step.
|   |   |
|   |   Continue to the next step.
|   |
|   Note the drive addresses that do
|   not show eight asterisks or TEST
|   and continue to the next step.
|
Continue to the next step.
```

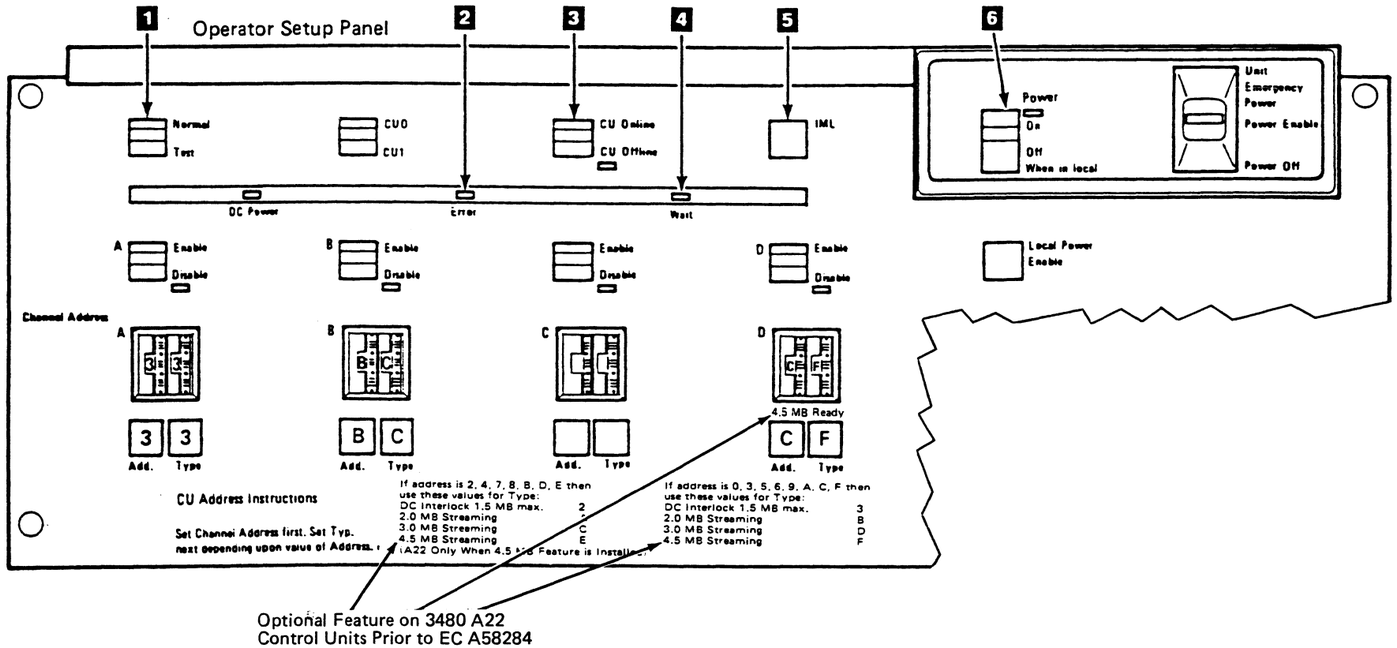
Checking the Initial Microprogram Load (IML)

__ 32. On the control unit operator setup panel, set the Power On/Off switch 6 to Off, then On.

After approximately 60 seconds the Wait light 4 on the control unit operator setup panel should be on solidly, and the Error light 2 should be off.

Are all the lights correct?

```
YES NO
|   |
|   The control unit will not load the micro-
|   program and must be fixed to continue.
|   Ensure the Normal/Test switch 1 is set
|   to Normal and the Online/Offline switch
|   3 is Offline.  Press the IML switch 5.
|   Insert the product maintenance diskette
|   into the MD and do an IPL on the MD.
|   Follow the maintenance package to correct
|   the problem, and return here when the
|   problem is fixed.
|
Go to INST 90, the Offline checkout is complete.
```



Notes

This page is for control units with BM 6460460 (See CARR-CU 9) and tape units with BM 6460006 (See CARR-DR 9)

Running Offline Checkout for a Dual Control Unit Subsystem

Note: See INST 77 for the physical locations.

This procedure is used for offline checkout of a dual control unit subsystem only. Go to INST 70 if you have a single control unit subsystem.

The offline checkout tests whether both control units can communicate with all the drives in the subsystem. Therefore, some steps in the following procedure appear to be repeated.

As you progress through the tests, you are asked to note the addresses of any drives without the display response expected. Also, you should note whether the drive failed during checkout from CU0 or CU1. After the offline checkout is complete, you will be sent to INST 90 to analyze any drives that failed during the checkout.

The error light 3 will light when certain portions of the offline tests are run. This condition is normal and does not indicate a failure in the control unit unless you are asked to note the status of the error light.

Setting Up for the Checkout

Note: The offline checkout should be performed by only one service representative.

__ 1. On both control unit operator setup panels:

- __ a. Verify that the Power On/Off switch 5 is set to Off.
- __ b. Set the Normal/Test switch 1 to Test.
- __ c. Verify that the CU0/CU1 switch 2 is set to CU0 on control unit 0 and is set to CU1 on control unit 1.
- __ d. Verify that the CU Online/CU Offline switch 4 is set to CU Offline.

__ 2. On all drive operator panels:

- __ a. Set the Ready/Not Ready switches 12 to Ready.

__ 3. On all drive switch panels:

- __ a. Verify that the Drive Power switches 9 are set to On.
- __ b. Verify that the Online/Offline switches 11 are set to Online.

__ 4. On each drive with the Automatic Cartridge Loader feature, set the Loader switch 13 to Auto.

__ 5. On both control units:

3.5 Inch IML Disk Drive

- __ a. Push the release button on the IML disk drive 8 and remove the head protector.
- __ b. Insert the IML diskette (label up and toward you) and push until the drive closes.
- __ c. Set the Power On/Off switch 5 to On.

5.25 Inch IML Disk Drive,

- __ a. Open the latch on the IML disk drive 8 and remove the head protector.
- __ b. Insert the IML diskette (label up and toward you) and close the drive latch.
- __ c. Set the Power On/Off switch 5 to On.

Switching on the Power

__ 6. Ensure that the main circuit breaker on the CU (CB1 on the ac power supply) is off; then switch it On.

__ 7. On both control units, set the Unit Emergency Power switch 6 to Power Enable.

__ 8. Press the Local Power Enable pushbutton 7 on both control units.

__ 9. Does a single asterisk (*) show for ten seconds or longer on each drive display?

```
YES NO
 |  |
 |  Are all the switches set correctly?
 |
 |  YES NO
 |   |  |
 |   |  Switch off the mainline circuit
 |   |  breaker (CB1 on the ac power
 |   |  supply) and set the switches as
 |   |  specified in steps 1, 2, and 3;
 |   |  then perform steps 5 through 7.
 |   |
 |   |  Does a single asterisk show for
 |   |  ten seconds or longer on each
 |   |  drive display?
 |   |
 |   |  YES NO
 |   |   |  |
 |   |   |  Note the drive addresses of
 |   |   |  the drives without a
 |   |   |  single asterisk, and which CU
 |   |   |  those drives are attached to,
 |   |   |  and continue to the next step.
 |   |   |
 |   |   Continue to the next step.
 |   |
 |   Note the drive addresses of the
 |   drives without a single
 |   asterisk, and which CU those drives
 |   are attached to, and continue to
 |   the next step.
 |
Continue to the next step.
```

__ 10. On each drive switch panel, set the Drive Power switch 9 to Off; then set it back to On.

Does a single asterisk (*) show for ten seconds or longer on each drive display?

```
YES NO
 |  |
 |  Note the drive addresses of the
 |  drives without a single
 |  asterisk, and which CU those drives
 |  are attached to, and continue to the
 |  next step.
 |
Continue to the next step.
```

__ 11. On each drive switch panel, press then release the drive Reset switch 10.

Does a single asterisk (*) show for ten seconds or longer on each drive display?

```
YES NO
 |  |
 |  Note the drive addresses of the
 |  drives without a single
 |  asterisk, and which CU those drives
 |  are attached to, and continue to the
 |  next step.
 |
Continue to the next step.
```

__ 12. On each drive switch panel, set the Online/Offline switch 11 to Offline.

Do special box-shaped symbols show in the first and last positions of the message display?

```
YES NO
 |  |
 |  Note the drive addresses of the drives
 |  without the special box-shaped
 |  symbols and which CU those drives are
 |  attached to, and continue to the next
 |  step.
 |
Continue to the next step.
```

__ 13. On each drive switch panel, set the Online/Offline switch 11 to Online and verify that the special box-shaped symbols go away.

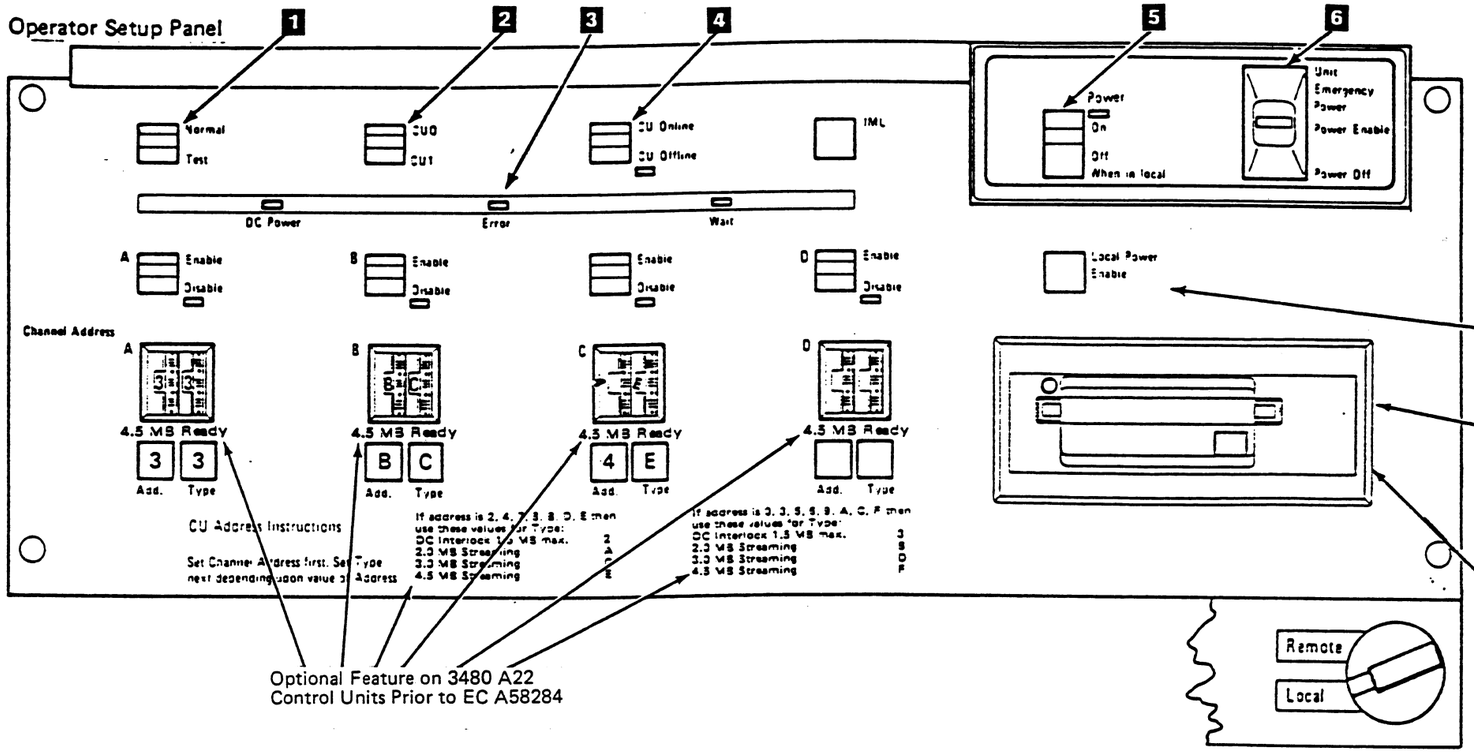
Do the special box-shaped symbols go away?

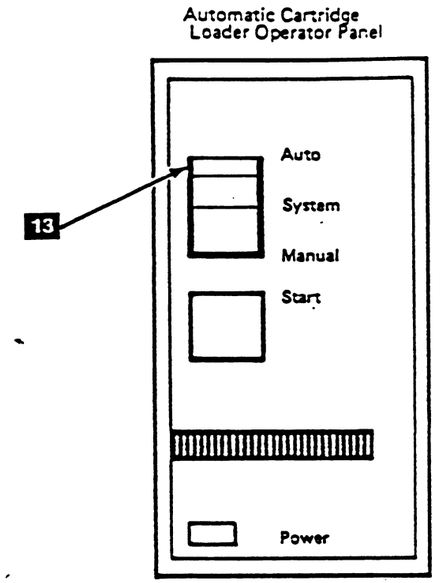
```
YES NO
 |  |
 |  Note the drive addresses of the drives
 |  where the special box-shaped symbols
 |  do not go away, and which CU those
 |  drives are attached to; then continue
 |  to the next step.
 |
Continue with the next step.
```

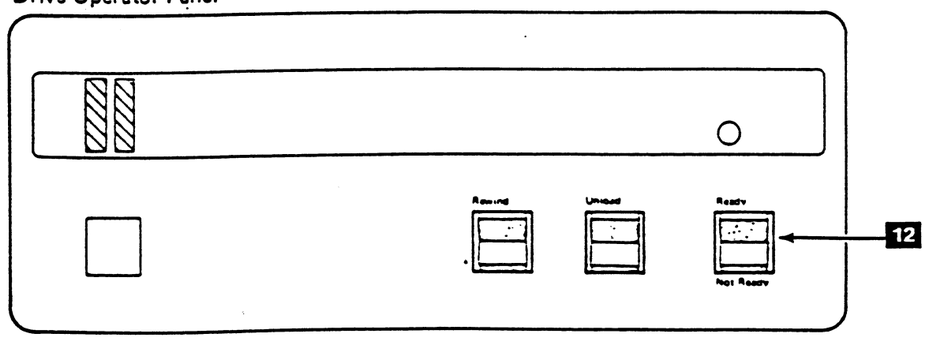
__ 14. Go to INST 78 to continue the offline checkout.

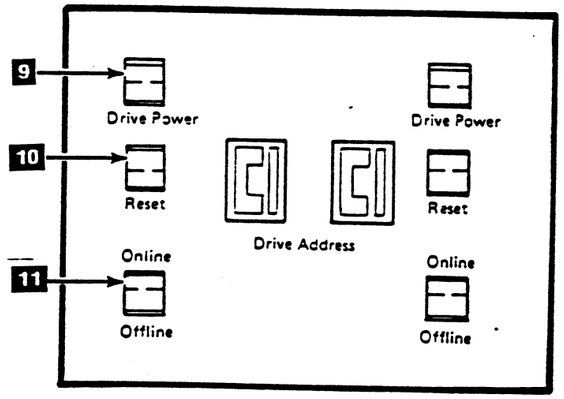
Installation Instructions INST 76

This page is for control units with BM 6460460 (See CARR-CU 9) and tape units with BM 6460006 (See CARR-DR 9)





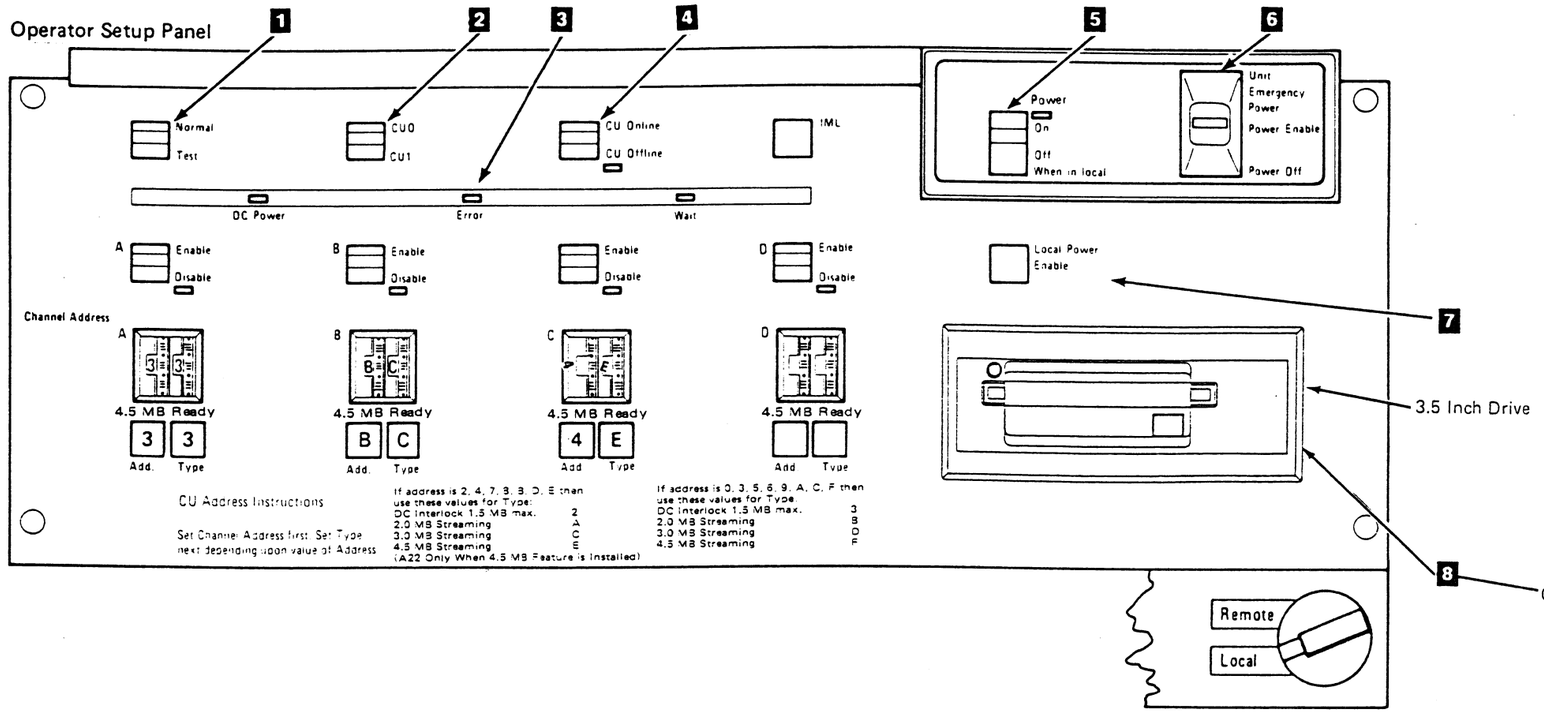


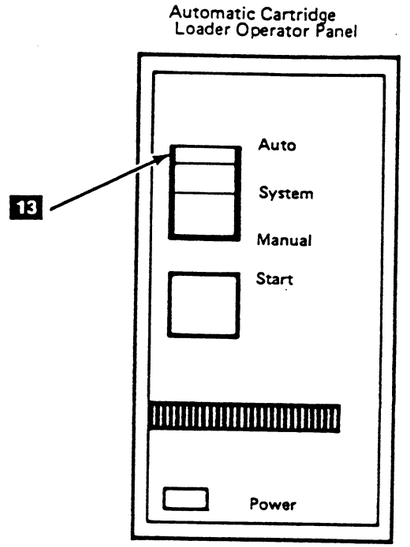


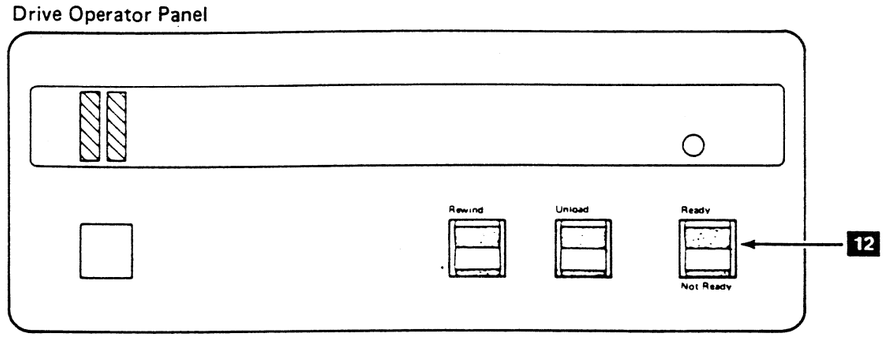
0 0 0 0 0 0 0 0 0 0

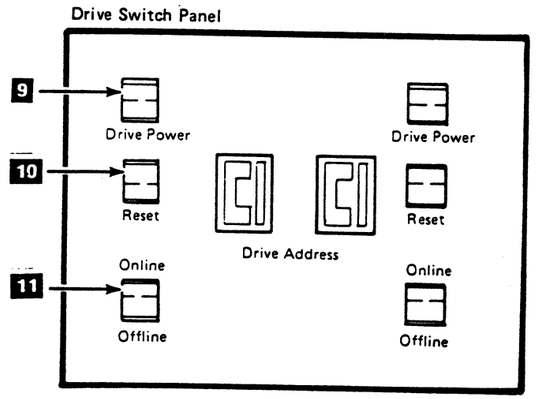
3480 Installation Instructions

This page is for control units with BM 6460460 (See CARR-CU 9) and tape units with BM 6460006 (See CARR-DR 9)









This page is for control units with BM 6460460 (See CARR-CU 9) and tape units with BM 6460006 (See CARR-DR 9)

Running Offline Checkout for a Dual Control Unit Subsystem (Continued)

Note: See INST 79 for the following locations.

Checking the Addresses, Control Unit 0

___ 15. On the CU0 operator setup panel, set the CU Online/CU Offline switch **2** to CU Online.

After a short delay (2 1/2 seconds or less) does "L=x P=x" (x being any number between 0 and F) appear on any drive display?

YES NO

Power off the control unit with the Power On/Off switch **4** and verify that the switches are set correctly on the control unit and tape unit panels. See "Setting Up for the Checkout" steps 1, 2, and 3 on INST 76 for the correct switch settings. Correct any switch settings that are wrong. Power up and repeat the actions you performed in step 14.

Does "L=x P=x" appear on any tape drive display?

YES NO

The CU will not load the microprogram and must be fixed to continue. Set the Normal/Test switch **1** to Normal and press the IML switch **3**. Insert the product maintenance diskette into the MD and do an IPL on the MD. Follow the maintenance package to correct the problem and return here when the problem is fixed.

Set the Normal/Test switch to Test and check the CU and tape unit switch settings again. See "Setting up for the Checkout" steps 1, 2, and 3 on INST 76 for the correct switch settings. Correct any switch settings that are wrong. Power up and repeat the actions you performed in step 15.

Does "L=x P=x" appear on any tape drive display?

YES NO

Call your next level of support.

Note the addresses of any drives that do show correct display, then continue with the next step.

A B

A B

Note the addresses of any drives that do not show the correct display, then continue with the next step.

Note the addresses of any drives that do not show the correct display, then continue with the next step.

___ 16. Compare the "L=x" (logical address) portion of each drive display to the address label **6** on each display.

Does each drive display match the label?

YES NO

Ensure that all the drive logical addresses are set correctly. See "Setting the Drive Logical and Physical Addresses" on INST 50.

Leaving the control unit online, power it off then back on again. Note the addresses of any drives whose display labels **6** still do not match the "L=x" portion of the display, then continue to the next step.

Ensure that the "P=x" (physical address) portion of each display does not match the "P=x" portion of any other drive display in the subsystem.

Does each drive display have a "P=x" number not shared by any other drive in the subsystem?

YES NO

Ensure that all of the drive physical addresses are set correctly. See "Setting the Drive Logical and Physical Addresses" on INST 50.

Leaving the control unit online, power it off then on again. Note any drive physical addresses that are still incorrect and continue to the next step.

Continue with the next step.

Checking Read/Write, Control Unit 0

___ 17. On the control unit (CU0) operator setup panel, set the CU Online/CU Offline switch **2** to CU Offline.

After a delay of 1 1/2 minutes or less, does TEST show with the indicator bars **5** flashing on the message display of any drive?

Note: If an Action message appears on any display, go to INST 5 and perform the action described. Return here, set the Power On/Off switch **4** to Off then On and go to step 15 on this page.

YES NO

The CU will not load the microprogram and must be fixed to continue. Set the Normal/Test switch **1** to Normal and press the IML switch **3**. Insert the product maintenance diskette into the MD and do an IPL on the MD. Follow the maintenance package to correct the problem and return here when the problem is fixed.

Set the Normal/Test switch **1** to Test and the Online/Offline switch **2** to Online. Wait until addresses appear on the drive displays, then repeat step 17 on this page.

Continue to the next step.

___ 18. Set a blank cartridge **7** to not file protect.

___ 19. If the Automatic Cartridge Loader feature is installed, skip the next step.

___ 20. Insert the cartridge into the drive that is nearest the control unit and displaying TEST. Close the cartridge latch and skip the next TWO steps.

___ 21. Put a cartridge in the top position of the loader on the drive that is nearest the control unit and displaying TEST.

___ 22. Ensure that the Loader mode switch **8** is set to Auto mode and press the Start switch **9**.

___ 23. If the display shows Action Message 1, 2, 3, or 5 after you load the tape cartridge, go to "Action Messages" on INST 5 and perform the procedure as directed. Return here when you have completed the required procedure.

___ 24. The diagnostic will show various messages on the drive display as it executes, indicating the action the drive is performing.

Each drive will require about 1 3/4 minutes to execute the test, and when complete, will show a single asterisk on the display.

___ 25. While the first drive is being tested, set another blank cartridge **7** to not file protect and insert it into the next drive displaying TEST. The display will show READY U.

When UNLOAD appears on the display of the first drive, the next drive with a tape loaded will begin testing.

Note: This testing procedure can be performed with one scratch tape, but you must wait for each drive to unload the tape. This increases the test time to 2 1/2 minutes for each drive.

___ 26. When the first drive UNLOADs, move that tape to the next drive showing TEST. If the cartridge does not unload, go to "Cartridge Removal by Hand" on CART 10.

___ 27. Repeat this procedure for all drives in the subsystem showing TEST.

___ 28. If failures occur on multiple drives in a string, there may be a cable or terminator connection problem. Check the seating of the device data and read bus cables, and the dual control unit communication cables (for dual control unit subsystems). See LOC 1 for the control unit and tape unit cable locations.

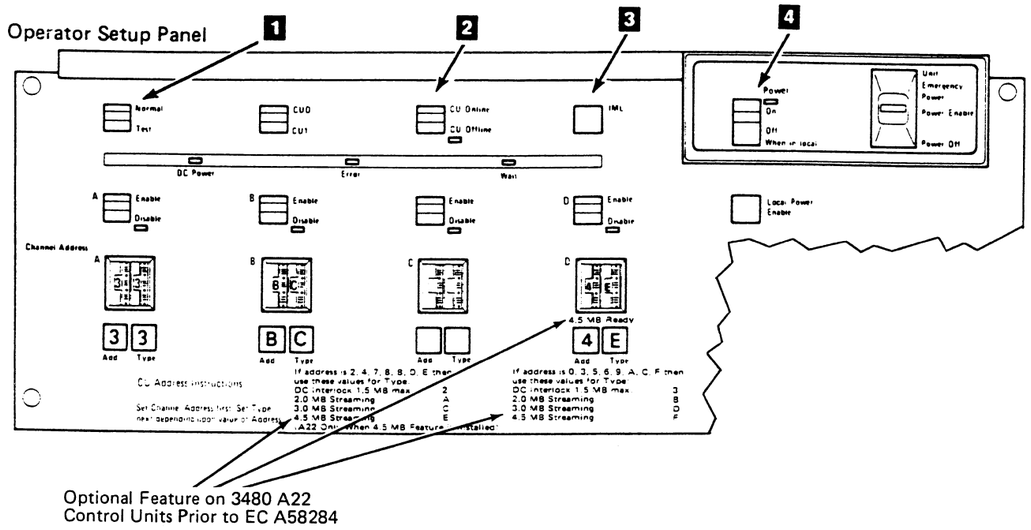
When you have finished checking the cables, insert a cartridge into those drives that were failing and the tests will be rerun.

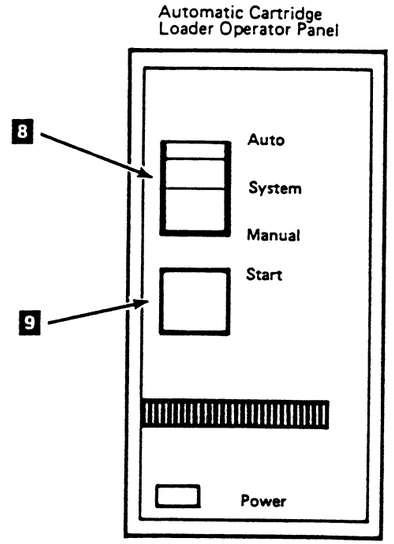
___ 29. If any drives will not run the tests to completion, note the failing drive addresses and that CU0 was running the test. This will be used later in INST 90 when the product package is run.

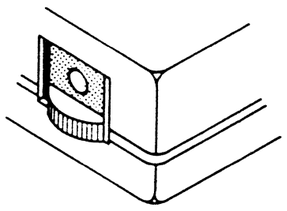
___ 30. Go to the next step on INST 81.

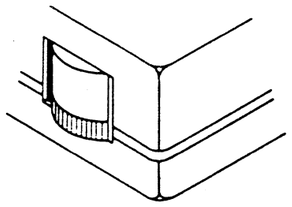
Installation Instructions INST 78

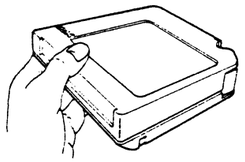
This page is for control units with BM 6460460 (See CARR-CU 9) and tape units with BM 6460006 (See CARR-DR 9)

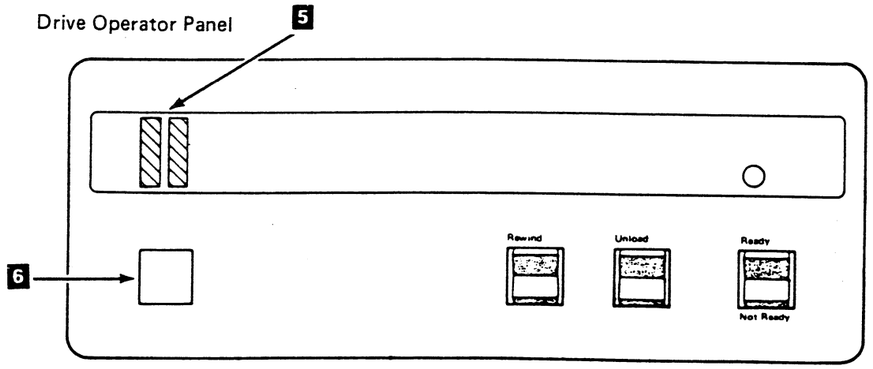





File Protect Position


Not File Protect Position


Blank Cartridge 7



This page is for control units with BM 6460460 (See CARR-CU 9) and tape units with BM 6460006 (See CARR-DR 9)

Running Offline Checkout for a Dual Control Unit Subsystem (Continued)

Note: See INST 82 for the following locations.

Final Checkout of Control Unit 0

__ 31. On the CU0 operator setup panel, set the Normal/Test switch **1** to Normal.

Do eight asterisks ("********") show on all drive displays not showing TEST?

```
YES NO
|   |
|   Is the Normal/Test switch 1 set to Normal?
|
|   YES NO
|   |   |
|   |   Set the switch to Normal and repeat step 31.
|   |
|   |   Do eight asterisks show on all drive displays
|   |   not showing TEST?
|   |
|   |   YES NO
|   |   |   |
|   |   |   Note the drive addresses that do not show
|   |   |   eight asterisks or TEST and continue to
|   |   |   the next step.
|   |   |
|   |   Continue to the next step.
|   |
|   Note the drive addresses that do not show eight
|   asterisks or TEST and continue to the next step.
|
Continue to the next step.
```

You have completed the checkout of CU0 and the drives attached to both control units. If the tests worked correctly, you know that CU0 can communicate with all the drives.

You must now check out CU1 and all the drives again to be sure that CU1 can communicate with all the drives.

Go to the next step to test CU1.

Note: Do not change the switch settings or power off CU0 during the following checkout of CU1.

Checking the Addresses, Control Unit 1

__ 32. On the CU1 operator setup panel, set the CU Online/CU Offline switch **2** to CU Online.

After a short delay (2 1/2 minutes or less) does "L=x P=x" (x being any number between 0 and F) appear on any drive display?

```
YES NO
|   |
|   Power off the control unit and verify that
|   the control unit and tape unit switches (for
|   CU1 and the drives physically attached to
|   CU1) are set correctly.  See "Setting Up for
|   the Checkout" steps 1, 2, and 3 on INST 76
|   for the correct switch settings.  Correct
|   any switch settings that are wrong.  Power
|   up and repeat the actions you performed in
|   step 32.
|
|   Does "L=x P=x" appear on any tape drive
|   display?
|
|   YES NO
|   |   |
|   |   The CU will not load the microprogram
|   |   and must be fixed to continue.  Set the
|   |   Normal Test switch 1 to Normal and
|   |   press the IML switch 3.  Insert the
|   |   product maintenance diskette into the MD
|   |   and do an IPL on the MD.  Follow the
|   |   maintenance package to correct the
|   |   problem and return here when the problem
|   |   is fixed.
|   |
|   |   Set the Normal/Test switch to Test and
|   |   check the CU and tape unit switch
|   |   settings again.  See "Setting Up for the
|   |   Checkout" steps 1, 2, and 3 on INST 76
|   |   for the correct switch settings.  Correct
|   |   any switch settings that are wrong. Power
|   |   up and repeat the actions you performed
|   |   in step 32.
|   |
|   |   Does "L=x P=x" appear on any tape
|   |   drive display?
|   |
|   |   YES NO
|   |   |   |
|   |   |   Call your next level of support.
|   |   |
|   |   Note the addresses of any drives that
|   |   do not show the correct display, then
|   |   continue with the next step.
|   |
|   Note the addresses of any drives that do not
|   show the correct display, then continue with
|   the next step.
|
Note the addresses of any drives that do not
show the correct display, then continue with
the next step.
```

__ 33. Compare the "L=x" (logical address) portion of each drive display to the address label **4** on each display.

Does each drive display match the label?

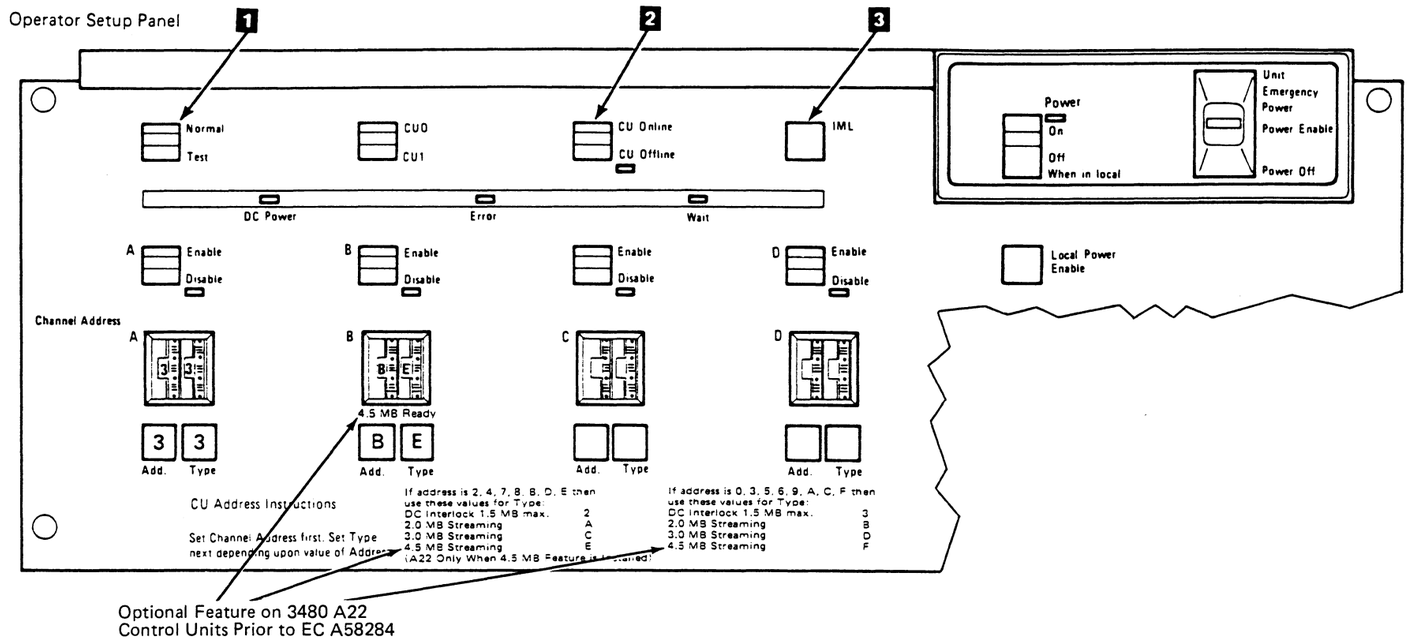
```
YES NO
|   |
|   There is a cable connection problem.
|   Power off CU1 and check the seating
|   of the device data and read bus
|   cables and the dual control unit
|   communication cables.  See LOC 1 for
|   the control unit and tape unit cable
|   locations.
|
|     NOTE:  Do not change any of the CU
|     switch settings while checking out
|     the cable connection problem except
|     for the Power On/Off switch.
|
|   When you have finished checking the
|   cables, power on the control unit.
|   After a delay of 2 1/2 minutes or less,
|   compare the "L=x" portion of each drive
|   display to the address label 4 on the
|   drive.
|
|   Does each drive display match the label?
|
|   YES NO
|   |   |
|   |   Call the next level of support.
|   |
|   Ensure that the "P=x" (physical address)
|   portion of each display does not match
|   the "P=x" portion of any other drive
|   display in the subsystem.
|
|   Does each drive display have a "P=x"
|   number not shared by any other drive?
|
|   YES NO
|   |   |
|   |   There is a cable connection problem.
|   |   Power off CU1 and check the seating
|   |   of the device data and read bus cables,
|   |   and the dual control unit communication
|   |   cables.  See LOC 1 for the control unit
|   |   and tape unit cable locations.
|   |
|   |    NOTE:  Do not change any of the CU
|   |    switch settings while checking the
|   |    cable connection problem, except
|   |    for the Power On/Off switch.
|   |
|   |   When you have finished checking the
|   |   cables, power on the CU.  After a
|   |   delay of 2 1/2  minutes or less,
|   |   compare the "P=x" portion of each
|   |   drive display to the "P=x" portion
|   |   of all the other drive displays.
|   |
|   |   Does each drive have a "P=x" number
|   |   not shared by any other drive?
|   |
|   |   YES NO
|   |   |   |
A   B   C   D
```

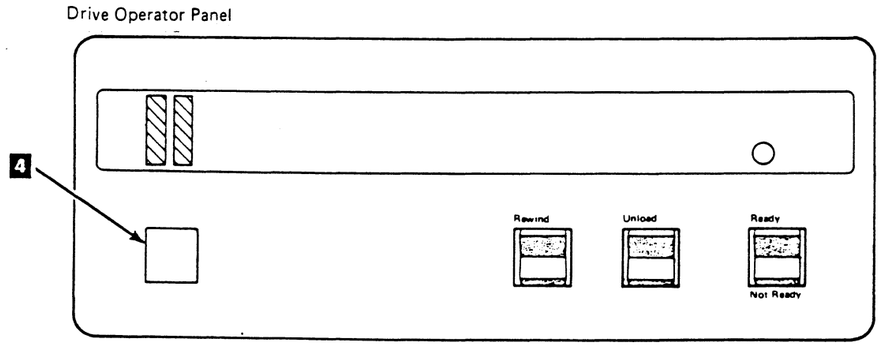
```
A   B   C   D
|   |   |   |
|   |   |   Call the next level of support.
|   |   |
|   |   Go to the next step on INST 83.
|   |
|   Go to the next step on INST 83.
|
Ensure that the "P=x" (physical address)
portion of each display does not match the
"P=x" portion of any other drive display
in the subsystem.

Does each drive display have a "P=x" number
not shared by any other drive?

YES NO
|   |
|   If this drive failed during the check-
|   out of CU0, note that it also failed on
|   on CU1 and go to the next step on INST 83.
|   If it did not fail during the checkout of
|   CU0, continue with this step.
|
|   There is a cable connection problem.
|   Power off CU1 and check the seating of
|   the device data and read bus cables
|   and the dual control unit communication
|   cables.  See LOC 1 for the control unit
|   and tape unit cable locations.
|
|      NOTE:  Do not change any of the CU
|      switch settings while checking out
|      the cable connection problem, except
|      for the Power On/Off switch.
|
|   When you have finished checking the
|   cables, power on the CU.  After a
|   delay of 2 1/2 minutes or less, compare
|   the "P=x" portion of each drive display
|   to the "P=x" portion of all the other
|   drive displays.
|
|   Does each drive have a "P=x" number
|   not shared by any other drive?
|
|   YES NO
|   |   |
|   |   Call the next level of support.
|   |
|   Go to the next step on INST 83.
|
Go to the next step on INST 83.
```


Installation Instructions INST 81

3480 Installation Instructions

This page is for control units with BM 6460460 (See CARR-CU 9) and tape units with BM 6460006 (See CARR-DR 9)





This page is for control units with BM 6460460 (See CARR-CU 9) and tape units with BM 6460006 (See CARR-DR 9)

Running Offline Checkout for a Dual Control Unit Subsystem (Continued)

Note: See INST 84 for the following locations.

Checking Read/Write, Control Unit 1

__ 34. On the control unit (CU1) operator setup panel, set the CU Online/CU Offline switch 3 to CU Offline.

Does TEST show with the indicator bars 8 flashing on the message display of any drive?

Note: If an Action message appears on any display, go to INST 5 and perform the action described. Return here and set the Power On/Off switch 6 to Off then On; then go to INST 81, step 32, and continue.

```
YES NO
|   |
|   The CU will not load the microprogram
|   and must be fixed to continue.  Set
|   the Normal/Test switch 1 to Normal
|   and press the IML switch 5.  Insert
|   the product maintenance diskette into
|   the MD and do an IPL on the MD.
|   Follow the maintenance package to
|   correct the problem and return here
|   when the problem is fixed.
|
|   Set the Normal/Test switch 1 to Test
|   and the Online/Offline switch 3 to
|   Online.  Wait until addresses appear on
|   the drive displays, then repeat step 34
|   on this page.
Continue to the next step.
```

__ 35. Set a blank cartridge 7 to not file protect.

__ 36. If the Automatic Cartridge Loader feature is installed, skip the next step.

__ 37. Insert the cartridge into the drive that is nearest the control unit and displaying TEST. Close the cartridge latch and skip the next TWO steps.

__ 38. Put a cartridge in the top position of the loader on the drive that is nearest the control unit and displaying TEST.

__ 39. Ensure that the Loader mode switch 9 is set to Auto mode and press the Start switch 10.

__ 40. If the display shows Action Message 1, 2, 3, or 5 after you load the tape cartridge, go to "Action Messages" on INST 5 and perform the procedure as directed. Return here when you have completed the required procedure.

__ 41. The diagnostic will show various messages on the drive display as it executes, indicating the action the drive is performing.

Each drive will require about 1 3/4 minutes to execute the test, and when complete, will show a single asterisk on the display.

__ 42. While the first drive is being tested, set another blank cartridge 7 to not file protect and insert it into the next drive displaying TEST. The display will show READY U.

When UNLOAD appears on the display of the first drive, the next drive with a tape loaded will begin testing.

Note: This testing procedure can be performed with one scratch tape, but you must wait for each drive to unload the tape. This increases the test time to 2 1/2 minutes for each drive.

__ 43. When the first drive UNLOADs, move that tape to the next drive showing TEST. If the cartridge does not unload, go to "Cartridge Removal by Hand" on CART 10.

__ 44. Repeat this procedure for all drives in the subsystem showing TEST.

__ 45. If failures occur on multiple drives in a string, there may be a cable connection problem. Check the seating of the device data and read bus cables, and the dual control unit communication cables (for dual control unit subsystems). See LOC 1 for the control unit and tape unit cable locations.

When you have finished checking the cables, insert a cartridge into those drives that were failing and the tests will be rerun.

__ 46. If any drives will not run the tests to completion, note the failing drive addresses and that CU1 was running the test. This will be used later on in INST 90 when the product package is run.

__ 47. Go to the next step and continue.

Final Checkout of Control Unit 1

__ 48. Set the Normal/Test switch 1 to Normal on the CU1 control unit operator setup panel.

Do eight asterisks (********) show on all drive displays not showing TEST?

```
YES NO
|   |
|   Is the Normal/Test switch 1 set
|   to Normal?
|
|   YES NO
|   |   |
|   |   Repeat step 39.
|   |
|   |   Do eight asterisks show on all
|   |   drive displays not showing TEST?
|   |
|   |   YES NO
|   |   |   |
|   |   |   Note the drive addresses
|   |   |   that do not show eight
|   |   |   asterisks or TEST and
|   |   |   continue to the next step.
|   |   |
|   |   Continue to the next step.
|   |
|   Note the drive addresses that do
|   not show eight asterisks or TEST
|   and continue to the next step.
|
Continue to the next step.
```


Checking the Initial Microprogram Load (IML)

__ 49. Ensure that the IML diskettes in CU0 and CU1 are at the same, or equivalent, microcode level; if not, you will get an error light when you attempt an IML.

Note: See the labels on the IML diskettes.

On both CU0 and CU1, set the Power On/Off switch 6 to Off, then On.

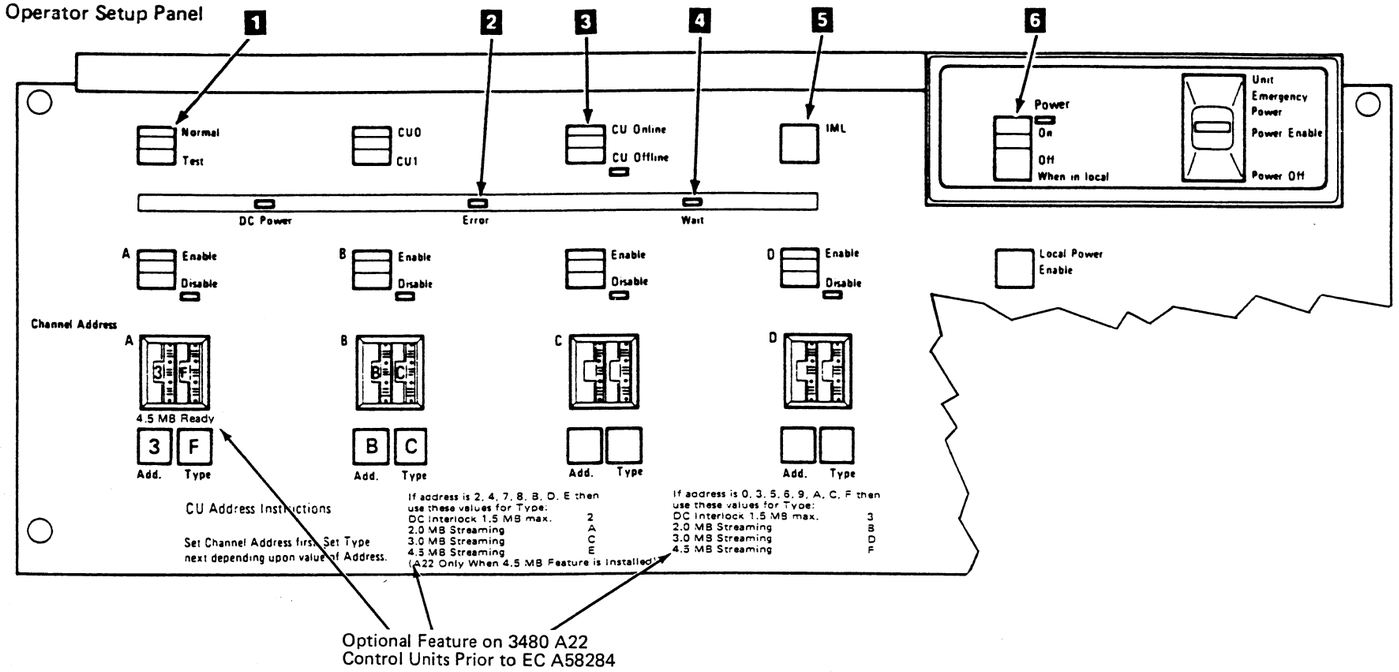
After approximately 60 seconds the Wait light 4 on the control unit operator setup panel should be on solidly, and the Error light 2 should be off.

Are all the lights correct?

```
YES NO
|   |
|   The control unit will not load the micro-
|   program and must be fixed to continue.
|   Ensure the Normal Test switch 1 is set
|   to Normal and the Online/Offline switch
|   3 is Offline.  Press the IML switch 5.
|   Insert the Product Maintenance diskette
|   into the MD and do an IPL on the MD.
|   Follow the maintenance package to correct
|   the problem, and return to this page and
|   repeat step 40 when the problem is fixed.
|
Go to INST 90; the Offline checkout is
complete.
```

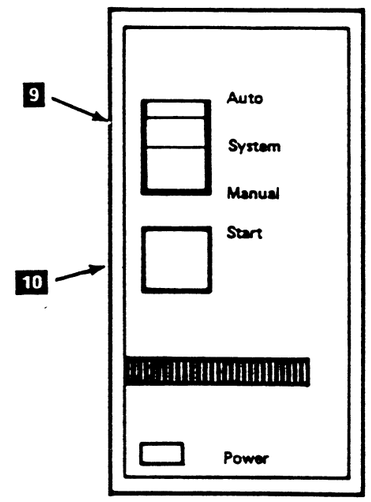
This page is for control units with BM 6460460 (See CARR-CU 9) and tape units with BM 6460006 (See CARR-DR 9)

Operator Setup Panel

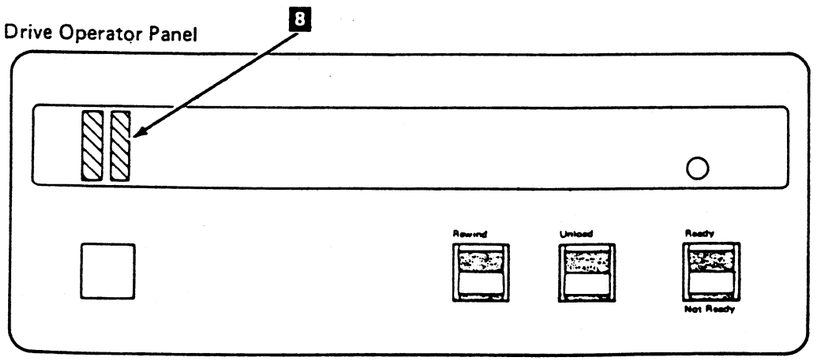


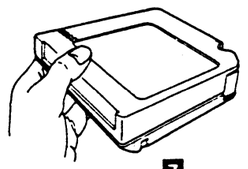
Optional Feature on 3480 A22 Control Units Prior to EC A58284

Automatic Cartridge Loader Operator Panel



Drive Operator Panel





7

Blank Cartridge

This page is for control units with BM 6460460 (See CARR-CU 9) and tape units with BM 6460006 (See CARR-DR 9)

Configuring the Maintenance Device Support Diskette and Analyzing Drives with the MD

__ 1. Connect the maintenance device (MD) to CU0. See MD 40.

__ 2. Insert the support diskette into the MD, and do an IPL on the MD.

__ 3. Enter the serial number requested by the MD. When configured, the main menu will be displayed.

Note: If the support diskette has already been configured, the main menu will display immediately. If the serial number of the control unit is wrong, the support diskette can be reconfigured using the following procedure:

__ a. Select option 3 (SUPPORT UTILITIES) and press enter.

__ b. Select option 4 (RE-CONFIGURE DSKT) and press enter.

__ c. Perform step 3 above.

__ 4. Check the CU serial number on the machine frame against the serial number set on the drive adapter card by performing the following steps:

__ a. Select Option 2 (SUBSYS DSPLY/ALTER) of the main menu.

__ b. Select Option 1 (SUBS CONFIG DSPLY), then compare the CU serial number on the MD display to the serial number on the CU machine frame.

```
Does the serial number on the MD display match
the serial number on the machine frame?

YES NO
|   |
|   Go to CARR-CU 1189, "Drive Adapter Card
|   Switch Setting."  Return here and repeat
|   step 4 when you have correctly set the
|   switches on the adapter card.
|
Continue with the next step.
```

__ 5. Insert the product maintenance diskette into the MD, and do an IPL on the MD.

__ 6. Select Option 1 for each drive whose address was noted during the offline checkout of CU0 (if any) and is physically attached to CU0. If no drive addresses were noted during the offline checkout of CU0, select Option 3 and run the last drive attached to CU0.

__ 7. If you are installing a dual control unit subsystem, connect the MD to CU1 and repeat steps 2-6 for CU1 where CU0 was called out. Use the other support and product diskettes which come with CU1 so they are configured and verified.

__ 8. After all the problems have been fixed (if any), insert the support diskette and go to INST 100 to run the channel wrap test on each channel in the subsystem.

This page is for control units with BM 6460460 (See CARR-CU 9) and tape units with BM 6460006 (See CARR-DR 9)

Configuring the Maintenance Device Support Diskette and Analyzing Drives with the MD

__ 1. Connect the maintenance device (MD) to CU0. See MD 40.

__ 2. Insert the support diskette into the MD, and do an IPL on the MD.

__ 3. Enter the serial number requested by the MD. When configured, the main menu will be displayed.

Note: If the support diskette has already been configured, the main menu will display immediately. If the serial number of the control unit is wrong, the support diskette can be reconfigured using the following procedure:

__ a. Select option 3 (SUPPORT UTILITIES) and press enter.

__ b. Select option 4 (RE-CONFIGURE DSKT) and press enter.

__ c. Perform step 3 above.

__ 4. Check the CU serial number on the machine frame against the serial number set on the drive adapter card by performing the following steps:

__ a. Select Option 2 (SUBSYS DSPLY/ALTER) of the main menu.

__ b. Select Option 1 (SUBS CONFIG DSPLY), then compare the CU serial number on the MD display to the serial number on the CU machine frame.

```
Does the serial number on the MD display match
the serial number on the machine frame?

YES NO
|   |
|   Go to CARR-CU 1189, ]Drive Adapter Card
|   Switch Setting."  Return here and repeat
|   step 4 when you have correctly set the
|   switches on the adapter card.
|
Continue with the next step.
```

__ 5. Insert the product maintenance diskette into the MD, and do an IPL on the MD.

__ 6. Select Option 1 for each drive whose address was noted during the offline checkout of CU0 (if any) and is physically attached to CU0. If no drive addresses were noted during the offline checkout of CU0, select Option 3 and run the last drive attached to CU0.

__ 7. If you are installing a dual control unit subsystem, connect the MD to CU1 and repeat steps 2-6 for CU1 where CU0 was called out. Use the other support and product diskettes which come with CU1 so they are configured and verified.

__ 8. If you are installing the Cartridge Automation Facility feature, go to DIAG 70 and run the CAF wrap test to verify the interface. Return here when complete. Otherwise, continue with step 9.

__ 9. After all the problems have been fixed (if any), insert the support diskette and go to INST 100 to run the channel wrap test on each channel in the subsystem.

0 0 0 0 0 0 0 0 0 0

3480 Installation Instructions

This page is for control units with BM 6460460 (see CARR-CU 9) and tape units with BM 6460006 (see CARR-DR 9)

Channel Wrap Test, Diagnostic Routine EE62

You use wrap blocks to wrap the channel adapter bus and tag lines, and the diagnostic program generates bit patterns and sends them through the wrap path. The wrap path is:

- From the channel adapter to the bus and tag shoe card drivers
- Through the wrap blocks to the bus and tag shoe card receivers
- Back to the channel adapter.

The pattern received at the end of the wrap is compared with an expected pattern. A non-compare produces an error and a maintenance device error display that provides data to define the error.

Setup Procedure for the Channel Wrap Test

For dual control unit subsystems, if two MDs are available, two service representatives (one on each control unit) should perform the wrap test on the control units at the same time to reduce the install time.

__ 1. Install the wrap terminator (part 6315622) **1** in the bus-out cable connector position of the I/O connector assembly. This part is included in the ship group.

__ 2. Install the bus wrap block (part 4299876) **2** in the bus-in cable connector position of the I/O connector assembly. This part is included in the ship group and is labeled 3880.

__ 3. Install the common 370 channel tag terminator (part 2282676) **3** in the tag-out cable connector position of the I/O connector assembly.

__ 4. Install the tag wrap block (part 4299873) **4** in the tag-in cable connector position of the I/O connector assembly. This part is included in the ship group and is labeled 3880.

__ 5. Ensure the support diskette is in the MD and IPL the MD.

- __ a. Select option 1, SUBSYS DIAGNOSTICS, and press enter.
- __ b. Select option 1, SELECTED DIAG, and press enter.
- __ c. Enter EE62 on the diagnostic selection screen, and follow the prompts.
- __ d. Enter channel A for channel selection.
- __ e. Follow prompts to run the diagnostic.

__ 6. See DIAG 1, "Channel Interface Wrap Test - Routine EE62" for the error displays and failure IDs that may occur during the test.

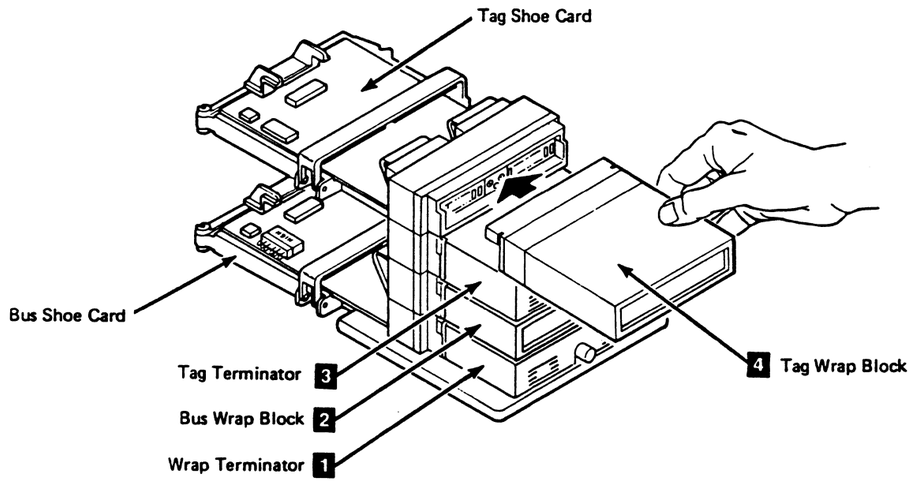
__ 7. Repeat the channel wrap test for each channel installed on the CUs. The wrap tools must be moved to each I/O connector assembly before running the test for each channel. Restart the diagnostic for each channel as follows:

- __ a. After the diagnostic is complete and the status is displayed, press enter until the option menu comes up on the MD.
- __ b. Enter option 2, TEST OPTN.
- __ c. Enter YES when asked to ALTER PARMS.
- __ d. Enter channel B, C, or D depending on which channel you are testing.
- __ e. Follow prompts, and enter option 7 to run.

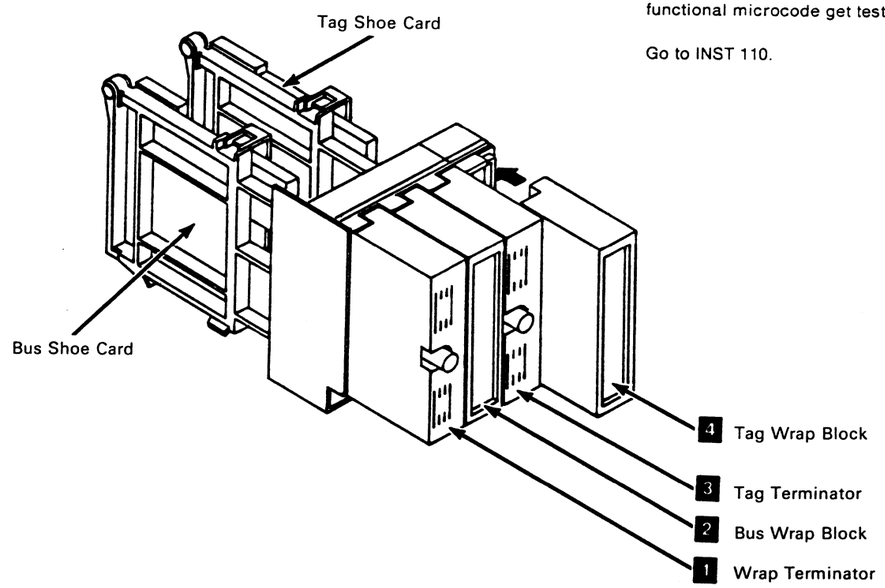
__ 8. Ensure that the IML diskettes in CU0 and CU1 are at the same microcode level; if not, you will get an error light when you attempt an IML.

When all channels on the control unit have been tested (all channels on both control units in a dual control unit subsystem), and any detected errors have been corrected, re-IML both control units. Use the backup IML diskette(s) when you re-IML so both copies of the functional microcode get tested.

Go to INST 110.



I/O Connector (Horizontal Style)



I/O Connector (Vertical Style)

This page is for control units with BM 6460460 (See CARR-CU 9) and tape units with BM 6460006 (See CARR-DR 9)

Checking the Priority Plug

The tag shoe cards are plugged for high priority from the factory. If the priority must be checked or changed on the 4.5 Mb/s channel I/O connectors, they must be removed from the mounting assembly.

For the 4.5 Mb/s channel tag shoe cards, perform the following steps:

__ 1. Remove the screw and hold down bracket that goes across the top of the connectors, and lift the four connectors from the mounting assembly.

__ 2. Check to see that the high or low priority plug on the tag shoe card **5**, **6** is correct. If the word high is facing out, the channel has high priority. If the word low is facing out, the channel has low priority.

__ 3. When you have checked for correct priority, install the four connectors into the mounting bracket and reinstall the top hold down bracket and screw.

For all other channel tag shoe cards, check to see that the high or low priority plug on the tag shoe card **3**, **4** is correct. If the word high is facing out, the channel has high priority. If the word low is facing out, the channel has low priority.

Installing the I/O Cable

Perform the following steps to install the subsystem I/O cables:

Note: 3480 Model A22 Control Units with the 4.5 megabyte channel feature (FC 3355) must be cabled ahead of slower devices on the channel.

__ 1. Find the I/O connectors **1** at the bottom of the control unit.

__ 2. Pass the cables **2** for channel A up through the opening in the bottom of the control unit.

Note: If the 3480 subsystem is the last control unit on this channel, you will have two cables and two terminators.

If the 3480 subsystem is not the last control unit on this channel, you will have four cables.

__ 3. **Warning:** The tailgate connectors are attached to logic cards which are sensitive to electrostatic discharge (ESD). See "Instructions for ESD-Sensitive Parts" in the CARR section of Volume A02.

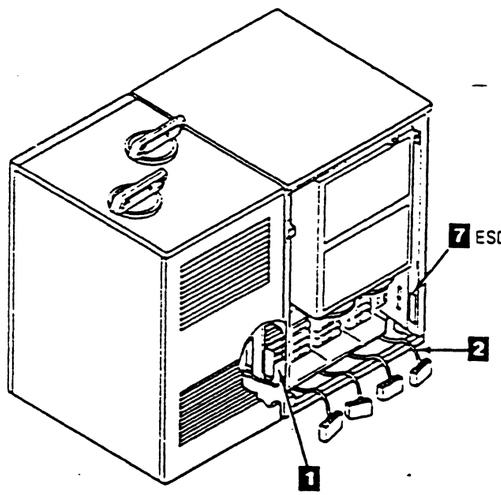
Check all tailgate connectors and cable connectors for bent pins.

__ 4. Before installing the interface cables, press the cable contacts firmly against the ESD pad **7** to remove any electrostatic charge.

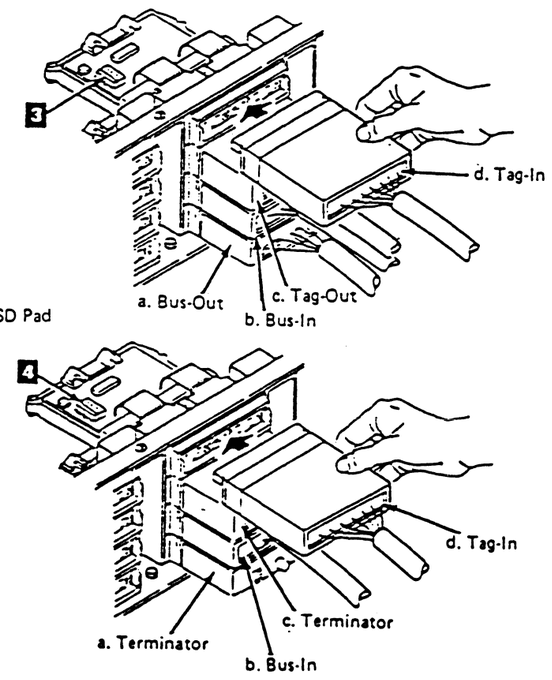
__ 5. Connect the four channel interface bus and tag cables, or the two channel interface cables and two terminators in the I/O connectors. Use the diagrams below as a guide.

__ 6. If there are more I/O cables to attach, repeat the preceding steps for each channel.

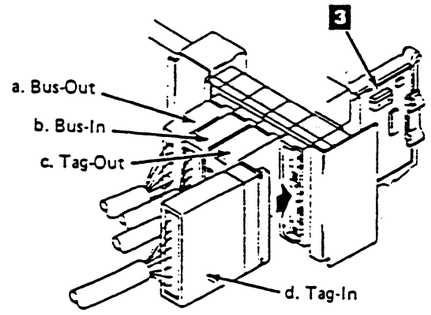
__ 7. Connect the I/O cables to the host systems.



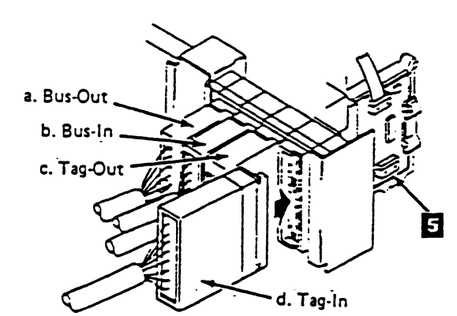
Rear View



I/O Connector (Horizontal Style)



I/O Connector (Vertical Style)



I/O Connector (4.5 MB/S Channel)

3480 Installation Instructions

This page is for control units with BM 6460460 (See CARR-CU 9) and tape units with BM 6460006 (See CARR-DR 9)

Installing the Unit Emergency Power Off (UEPO) Cable

Perform the following steps to install the Unit Emergency Power Off (UEPO) cable:

__ 1. Determine if UEPO cables are to be installed.

If no UEPO cables are to be installed, go to INST 130, "Installation Checks."

Note: *The 3480 subsystem does not require UEPO jumpers if the Local/Remote switch is set to the Local mode.*

__ 2. Pass the UEPO cables to be installed up through the opening in the bottom of the control unit.

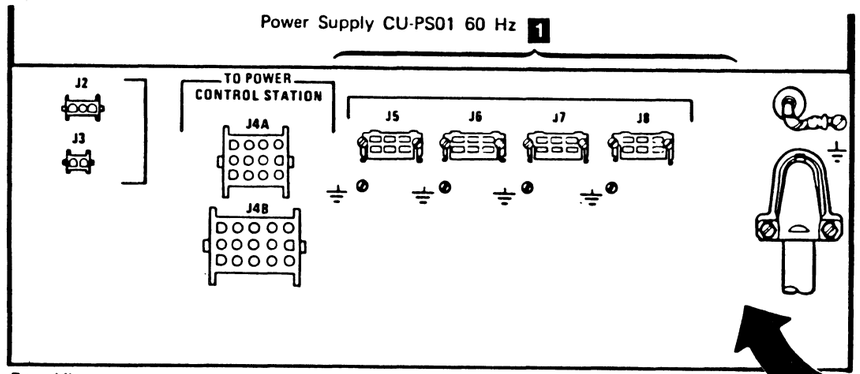
__ 3. Find the four UEPO cable sockets located at the rear of the control unit ac power supply.

Insert the UEPO cable connectors into any UEPO socket (J5 through J8) 1 .

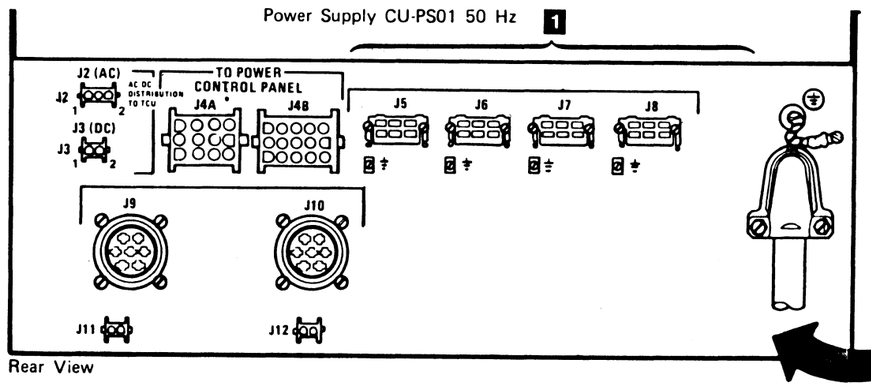
__ 4. Complete the cable installation:

__ a. Connect the UEPO cables to the host system.

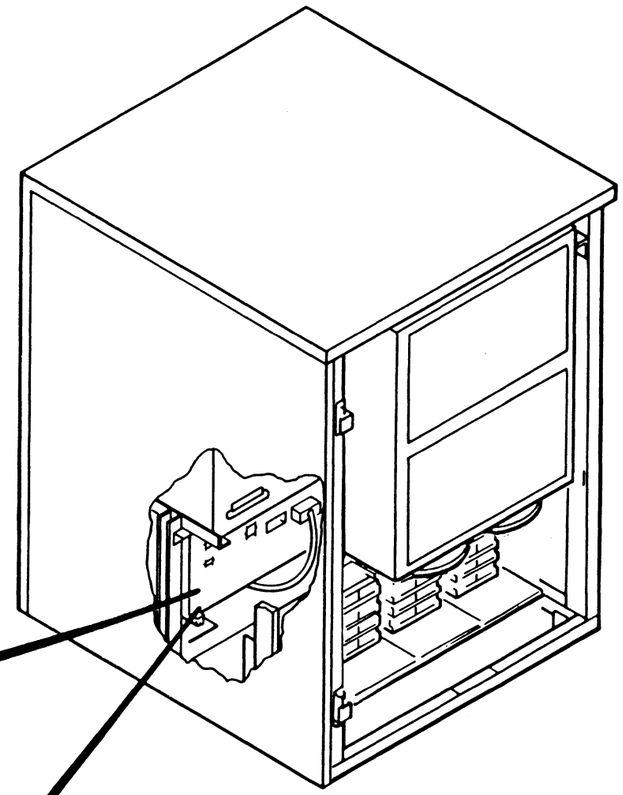
__ b. Continue the installation on INST 130, "Installation Checks."



Rear View



Rear View



3480 Installation Instructions

This page is for control units with BM 6460460 (See CARR-CU 9) and tape units with BM 6460006 (See CARR-DR 9)

Installation Checks

These procedures complete the checkout of the installation.

1. Installing the radio frequency interference (RFI) frame pans and end plates.
2. Replacing all the subcovers and covers
3. Running the Online Tests (OLTs) to verify correct subsystem operation.

Installing the Radio Frequency Interference (RFI) Frame Pans and End Plates.

The RFI frame pans and end plates are part of the ship group. There are two frame pans for each tape unit, one frame pan (of a different size) for each control unit, and two end plates (one for the side of the control unit, and one for the side of the last drive attached to that control unit).

Note: *When you are adding a tape unit(s) to an installed subsystem, ensure that you move the tape unit end plate (described in step 7) to the last tape unit attached to the control unit.*

___ 1. Place one tape unit frame pan under the front of the first tape unit attached to CU0 **3**. Attach the frame pan to the lower front frame of the tape unit with two screws

___ 2 Repeat step 1 for each tape unit attached to CU0.

___ 3. Place one tape unit frame pan under the rear of the first tape unit attached to CU0 **5**. Attach the frame pan to the lower rear frame of the tape unit with two screws

___ 4. Repeat step three for each tape unit attached to CU0

___ 5. Place one control unit frame pan under the front of CU0 **2**, and attach it to the lower front frame of the control unit with two screws.

___ 6 Place one end plate under the left side of the control unit (as you face the front of the control unit) **1**, and attach it to the lower control unit frame with three screws

___ 7 Place one end plate under the right side of the last tape unit attached to CU0 (as you face the front of the tape unit) **4**, and attach it to the lower tape unit frame with three screws.

___ 8 Repeat steps 1 through 7 for CU1 if you have a dual control unit subsystem.

Note: *If there are no tape units attached to CU1, there will be an extra end plate* **4** *to store for later use.*

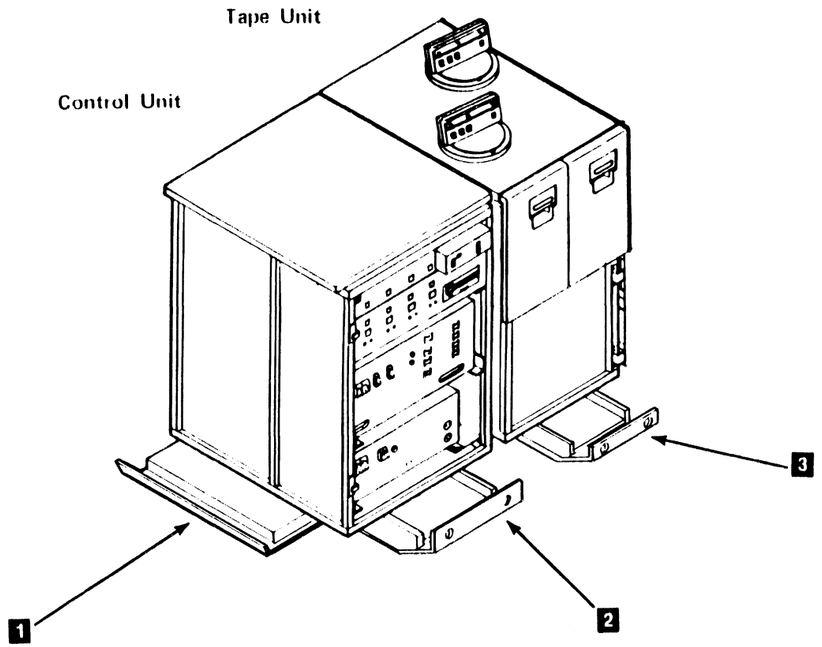
Reinstalling Subcovers and Covers

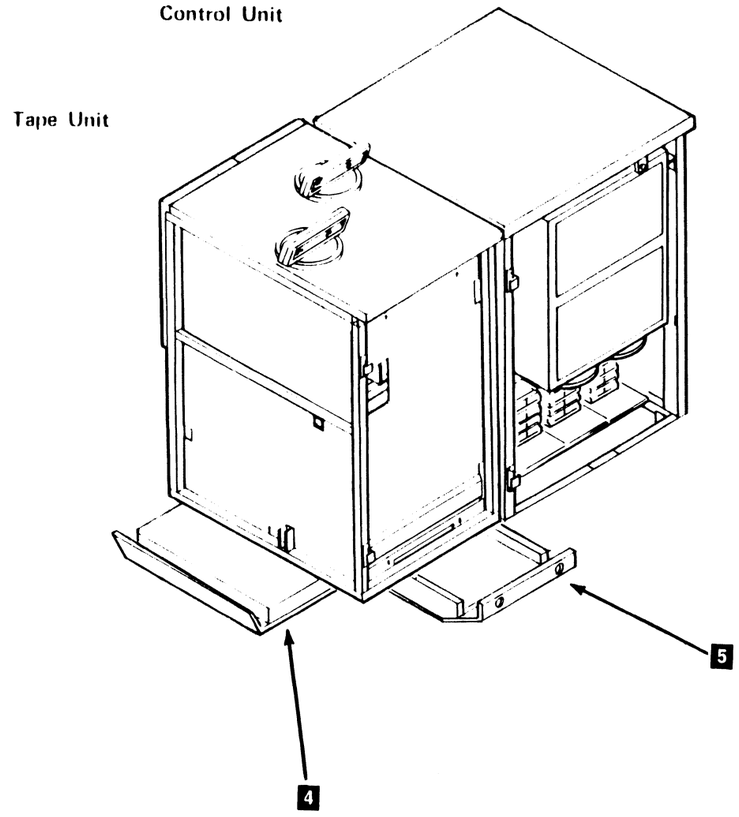
When the installation checks have been completed, all the subcovers and covers that were removed must be reinstalled

___ 1. Take the cover that was on the right side of the control unit, and install it on the right side of the last tape unit attached to that control unit.

___ 2. Go to CARR-CU 2-2, and CARR-DR 2-2 for procedures to adjust (if necessary) and reinstall the covers and subcovers on the control unit(s) and tape units.

___ 3. Go to INST 131 to continue the installation checks





3480 Installation Instructions

This page is for control units with BM 6460460 (See CARR-CU 9) and tape units with BM 6460006 (See CARR-DR 9)

Installation Checks (Continued)

Running Online Tests (OLTs)

Note: *Incorrect channel switch settings can cause overruns and other symptoms of hardware failures.*

Run the OLTs with the NSI (no spurious interrupts) option active if you are using OLTSEP.

There are different procedures for a single control unit subsystem and a dual control unit subsystem. Be sure to use the correct procedure.

Single Control Unit Subsystem

__ 1. Run OLT T3480A on each channel of the control unit, to the last drive attached to the control unit. The online test operating procedures are described in the *3480 Online Test User's Guide*, D99-3480.

__ 2. Run OLTs T3480B, T3480C, and T3480D on any channel on the control unit to any drive on the subsystem.

Note: *If the messages seen on the drive displays are not in the correct language, go to "Drive Adapter Card Switch Setting" on CARR-CU 1189 and set the switches to the language requested by the customer.*

__ 3. If any OLT fails, insert the product diskette in the MD, do an IPL on the MD, and select Option 1. Follow the maintenance package.

__ a. Obtain the OLT hard copy printout.

__ b. Verify that the control unit serial number in the OLT sense bytes is the same as the control unit serial number on the machine frame. If the serial number listed is different, see "Drive Adapter Card Switch Setting" on CARR-CU 1189 and correct the switch settings.

Dual Control Unit Subsystem

__ 1. Connect the MD to control unit 0, then insert and do an IPL on the support diskette.

__ 2. Select Option 3, Support Utilities, and press enter.

__ 3. Select Option 1, CU/Trace Match Control, and press enter.

__ 4. Select Option 3, Microcode Control, and press enter.

__ 5. Select Option B, Force Pathing, and press enter.

__ 6. Enter the address of the last drive attached to CU0. (The display will show your input and ask if it is correct, answer YES if it is correct.)

__ 7. Run OLT T3480A on each channel installed on CU0, to the last drive attached to CU0. The online test operating procedures are described in the *3480 Online Test User's Guide*, D99-3480.

__ 8. Run OLT T3480A on each channel installed on CU1, to the last drive attached to CU0.

__ 9. Run OLTs T3480B, T3480C, and T3480D on any channel on CU0 to any drive.

Note: *If the messages seen on the drive displays are not in the correct language, go to "Drive Adapter Card Switch Setting" on CARR-CU 1189 and set the switches to the language requested by the customer.*

__ 10. Remove the MD and connect it to CU1, then insert and do an IPL on the support diskette.

__ 11. Select Option 3, Support Utilities, and press enter.

__ 12. Select Option 1, CU/Trace Match Control, and press enter.

__ 13. Select Option 3, Microcode Control, and press enter.

__ 14. Select Option B, Force Pathing, and press enter.

__ 15. Enter the address of the last drive attached to CU1. (The display will show your input and ask if it is correct, answer YES if it is correct.)

__ 16. Run OLT T3480A on each channel installed on CU1, to the last drive attached to CU1.

__ 17. Run OLT T3480A on each channel installed on CU0, to the last drive attached to CU1.

__ 18. Run OLTs T3480B, T3480C, and T3480D on any channel on CU1 to any drive.

Note: *If the messages seen on the drive displays are not in the correct language, go to "Drive Adapter Card Switch Setting" on CARR-CU 1189 and set the switches to the language requested by the customer.*

__ 19. If any OLT fails while testing either CU, insert the product diskette in the MD, do an IPL on the MD, and select Option 1. Follow the maintenance package.

__ a. Obtain the OLT hard copy printout.

__ b. Verify that the control unit serial number in the OLT sense bytes is the same as the control unit serial number on the machine frame. If the serial number listed is different, see "Drive Adapter Card Switch Setting" on CARR-CU 1189 and correct the switch settings.

Before You're Through...

__ 1. Put the product and support diskettes, and the blank cartridge in the pocket in the front cover of the control unit.

__ 2. Check and repair any drive that did not operate correctly.

__ 3. If the Automatic Cartridge Loader feature is installed, skip the next step.

__ 4. Close all the tape drive cartridge latches.

Note: *The cartridge latch should be closed when the tape drive is not being used. (A cartridge need* **not** *be in the drive.) When the tape drive is needed, open the cartridge latch by pressing the Unload switch.*

Post-Installation

Installation Reporting

After the subsystem is installed and tested:

- Update the Account Management Plan book.
- Report the installation complete using the existing branch office procedure.
- If your account has EREP, go to MSG 1, "Limit Control Cards" to establish limits of reporting temporary errors to determine future maintenance action.

3480 Adding Tape Units to an Installed Subsystem

This page is for control units with BM 6460460 (See CARR-CU 9) and tape units with BM 6460006 (See CARR-DR 9)

If you are attaching a tape unit *with* BM 6460006 to a control unit *without* BM 6460460, go to INST 500 before you begin the installation.

If you are attaching a tape unit *with* BM 6460006 to a tape unit *without* BM 6460006, go to INST 505 before you begin the installation.

Adding Tape Units

The following procedures are used to add more tape units to an already installed subsystem:

__ 1. Have the customer vary offline all jobs and paths to the control unit and tape units that will be receiving the additional tape unit(s).

__ 2. Power off the control unit and tape units that will be affected.

__ 3. Remove the side cover from the end tape unit installed on the subsystem.

__ 4. Remove the radio frequency interference (RFI) endplate from the end tape unit installed on the subsystem.

__ 5. Place the the new tape unit into position.

__ 6. Open the front and rear covers.

Warning: Ensure that the power cable is not pinched between the machine frames.

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__ 7. If the safety cover has the retainer tightened over it, loosen the screw holding the retainer to the ac power cap, rotate the retainer and retighten the screw.

__ 8. Connect the next tape unit ac power cable **5** to the preceding tape unit's power cable socket **8** after removing the socket safety cover (if not already removed).

Ensure that the ac power cable is routed away from the compressor motor and is fastened to the back of the frame **10** to prevent pinching the cable when the units are moved together.

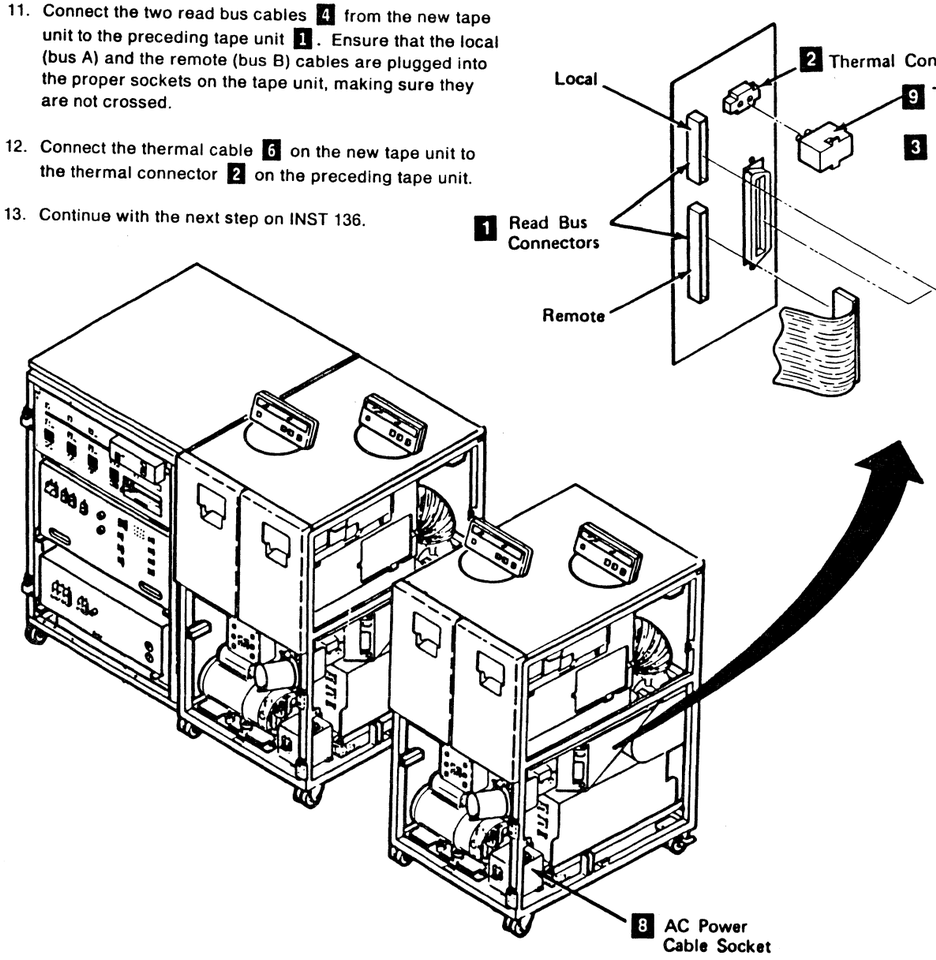
__ 9. Remove the device data bus terminator card, part 8576373 **3**, and thermal terminator **9** from the preceding tape unit.

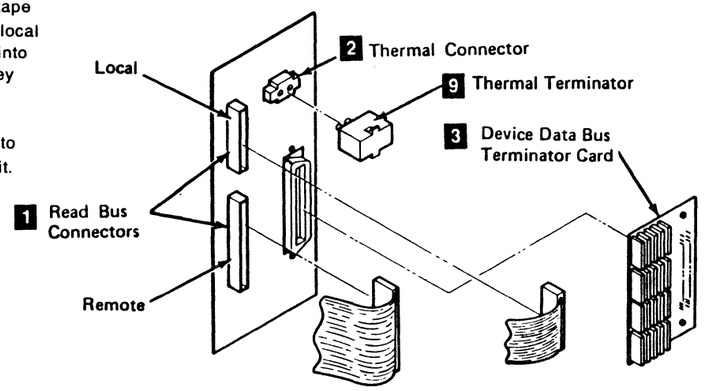
__ 10. Plug the device data bus cable **7** from the new tape unit into the preceding tape unit's device data bus connector, and fasten the cable in place with the retaining screws.

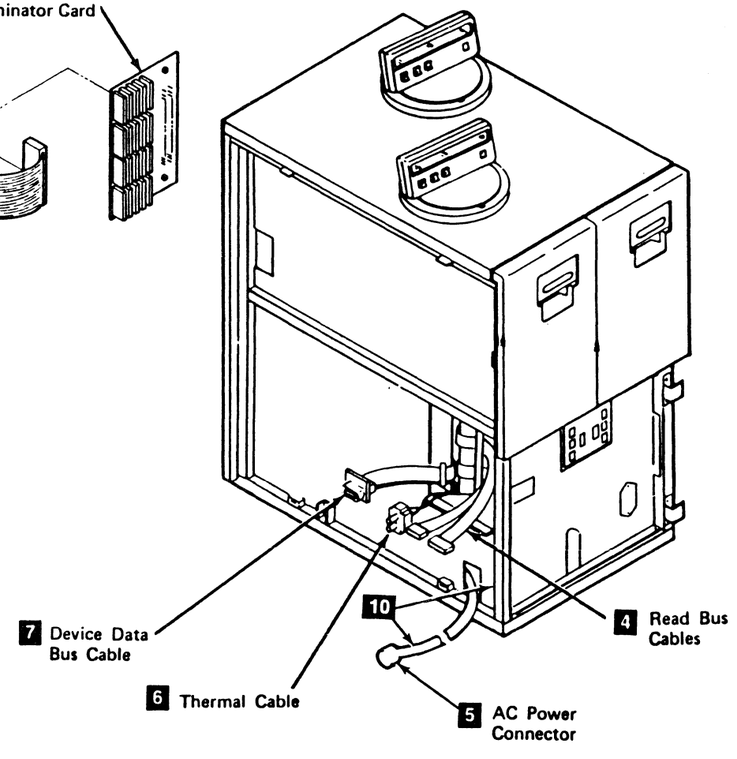
__ 11. Connect the two read bus cables **4** from the new tape unit to the preceding tape unit **1**. Ensure that the local (bus A) and the remote (bus B) cables are plugged into the proper sockets on the tape unit, making sure they are not crossed.

__ 12. Connect the thermal cable **6** on the new tape unit to the thermal connector **2** on the preceding tape unit.

__ 13. Continue with the next step on INST 136.







This page is for control units with BM 6460460 (See CARR-CU 9) and tape units with BM 6460006 (See CARR-DR 9)

If you are attaching a tape unit *with* BM 6460006 to a control unit *without* BM 6460460, go to INST 500 before you begin the installation.

If you are attaching a tape unit *with* BM 6460006 to a tape unit *without* BM 6460006, go to INST 505 before you begin the installation.

Adding Tape Units

The following procedures are used to add more tape units to an already installed subsystem:

__ 1. Have the customer vary offline all jobs and paths to the control unit and tape units that will be receiving the additional tape unit(s).

__ 2. Power off the control unit and tape units that will be affected.

__ 3. Remove the side cover from the end tape unit installed on the subsystem.

__ 4. Remove the radio frequency interference (RFI) endplate from the end tape unit installed on the subsystem.

__ 5. Place the the new tape unit into position.

__ 6. Open the front and rear covers.

Warning: Ensure that the power cable is not pinched between the machine frames.

_____

_____

_____

__ 7. If the safety cover has the retainer tightened over it, loosen the screw holding the retainer to the ac power cap, rotate the retainer and retighten the screw.

__ 8. Connect the next tape unit ac power cable **5** to the preceding tape unit's power cable socket **8** after removing the socket safety cover (if not already removed).

Ensure that the ac power cable is routed away from the compressor motor and is fastened to the back of the frame **10** to prevent pinching the cable when the units are moved together.

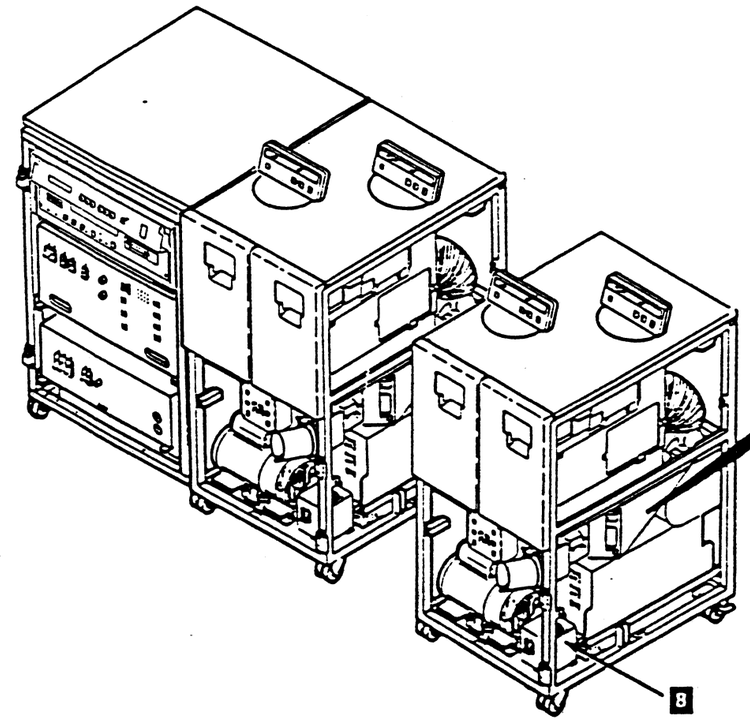
__ 9. Remove the device data bus terminator **3**, and thermal terminator **9** from the preceding tape unit.

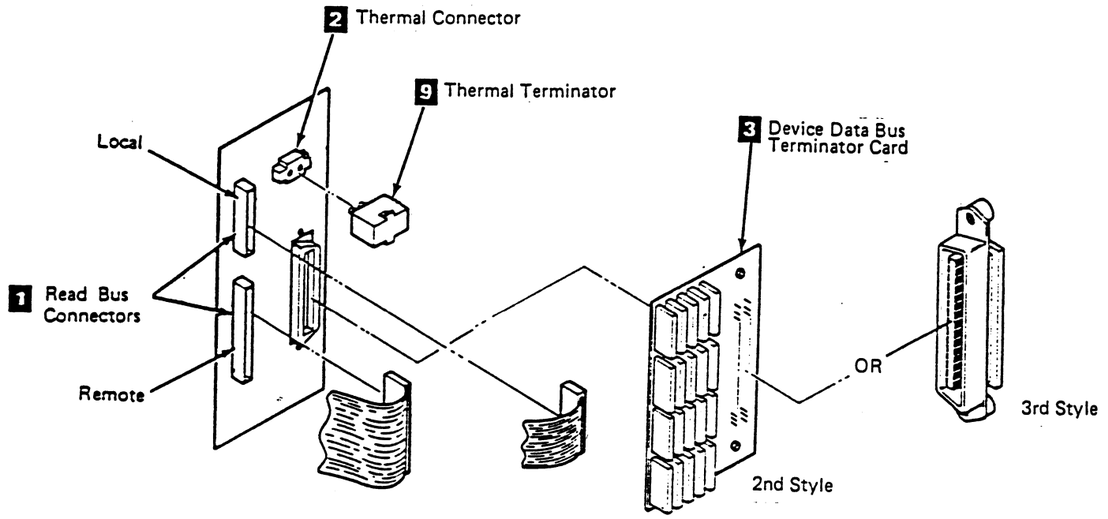
__ 10. Plug the device data bus cable **7** from the new tape unit into the preceding tape unit's device data bus connector, and fasten the cable in place with the retaining screws.

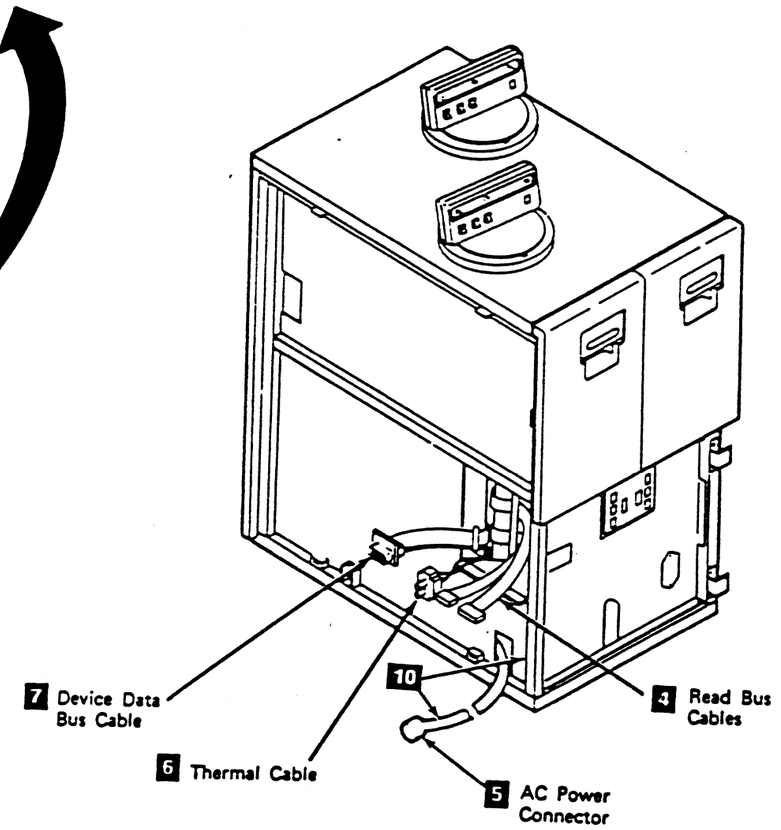
__ 11. Connect the two read bus cables **4** from the new tape unit to the preceding tape unit **1**. Ensure that the local (bus A) and the remote (bus B) cables are plugged into the proper sockets on the tape unit, making sure they are not crossed.

__ 12. Connect the thermal cable **6** on the new tape unit to the thermal connector **2** on the preceding tape unit.

__ 13. Continue with the next step on INST 136.







Installation Instructions - Adding Tape Units INST 135

0 0 0 0 0 0 0 0 0 0

3480 Adding Tape Units to an Installed Subsystem

This page is for control units with BM 6460460 (See CARR-CU 9) and tape units with BM 6460006 (See CARR-DR 9)

Adding Tape Units (Continued)

__ 13. Place the next tape unit against the preceding tape unit.

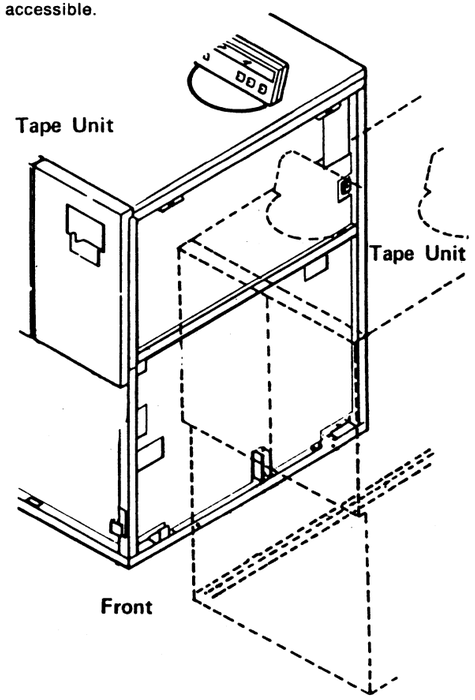
Warning: When installing a B box to a B box with the automatic cartridge loader feature installed on any drive, the drive must be opened approximately 5 cm (2 in.) to prevent the conductive seal from being pinched between the tape unit frames.

Note: *Be sure the position of the casters does not prevent the tape units from fitting snugly together.*

__ 14. Fasten the new tape unit to the preceding tape unit by installing a hex bolt and washer at the rear of the tape unit **1**, and at the front of the tape unit **2**. It may be necessary to remove the Tape Unit Front Safety cover to install hex bolt **2**. See CARR-DR 2-1 if the cover needs to be removed.

Note: *If the tape units are not correctly aligned, the covers may bind. Ensure that the covers are not binding.*

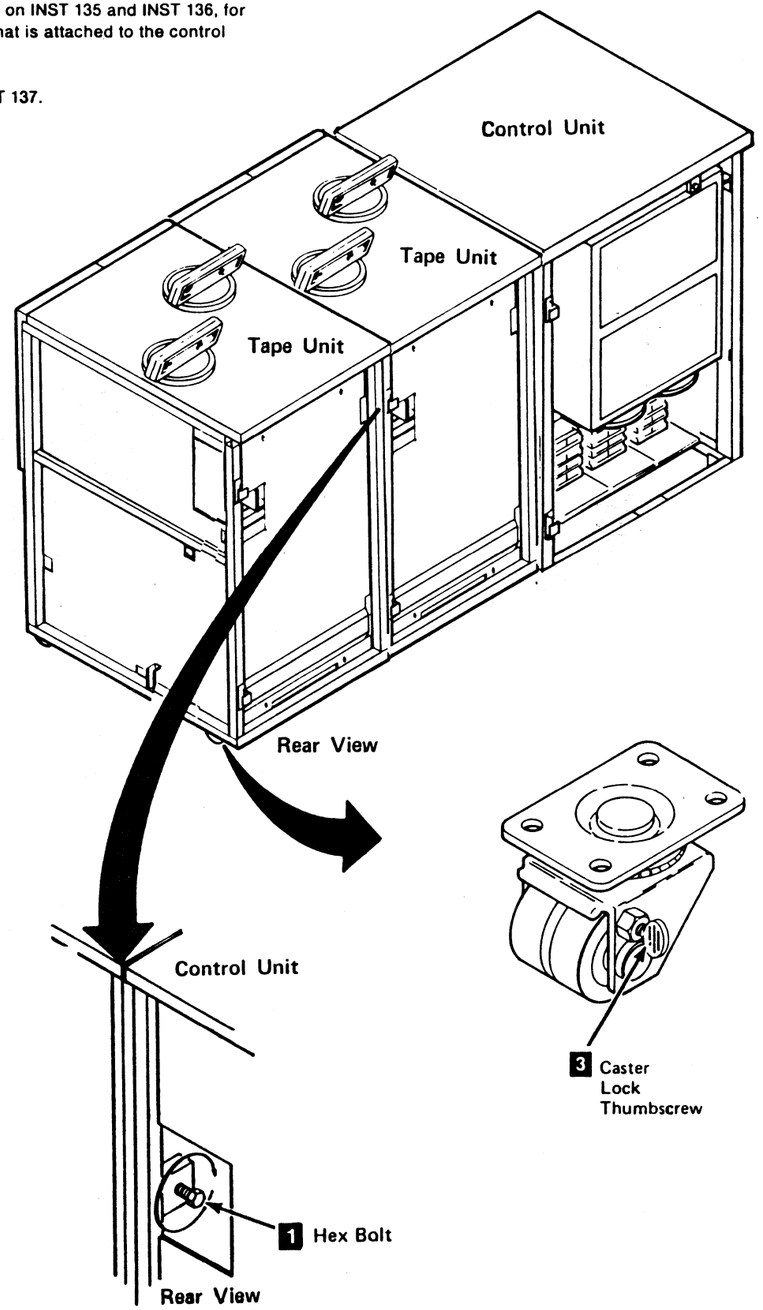
__ 15. Place the rear casters on the new tape unit so the caster lock thumbscrews **3** are accessible.

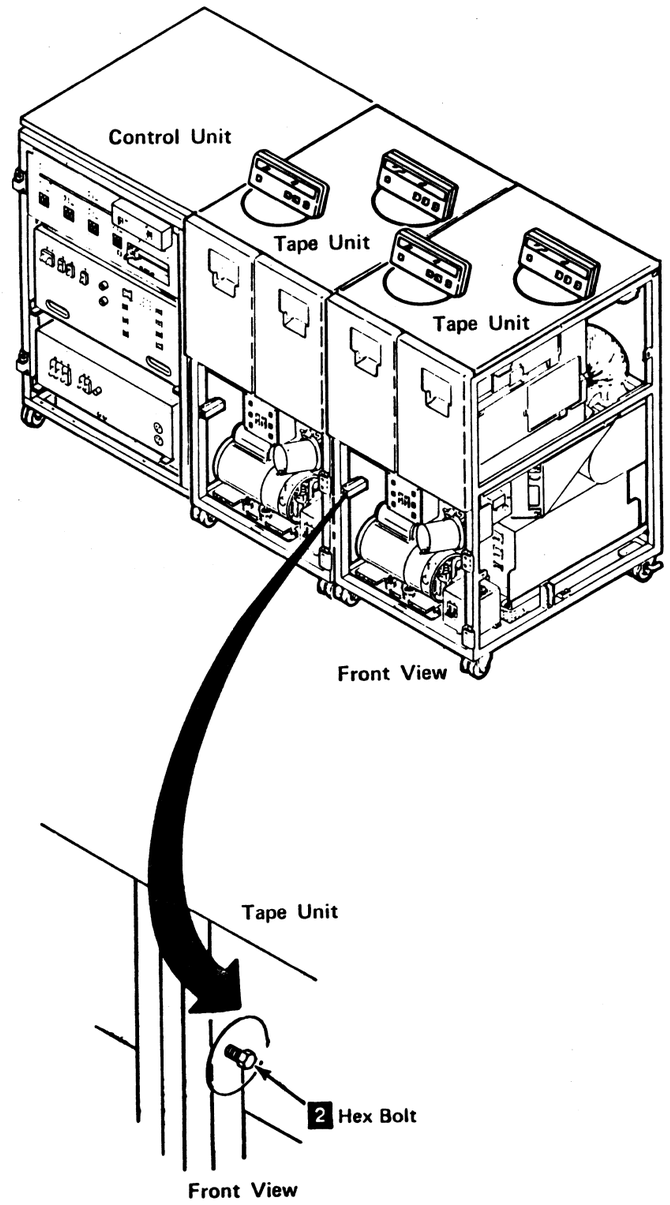


__ 16. Lock the rear casters on the new tape unit by turning the caster lock thumbscrews clockwise until they are tight.

__ 17. Repeat steps 4 through 16, on INST 135 and INST 136, for each additional tape unit that is attached to the control unit.

__ 18. Go to the next step on INST 137.





This page is for control units with BM 6460460 (See CARR-CU 9) and tape units with BM 6460006 (See CARR-DR 9)

Adding Tape Units (Continued)

On the last tape unit attached to the control unit:

__ 19. Place the device data bus terminator card P/N 8576373 [4] removed from the last tape unit installed in the new tape unit's device data bus connector [5].

__ 20. Plug the thermal terminator [3] into the thermal connector [2]. The thermal terminator was removed in a prior step from the preceding tape unit.

__ 21. Screw the safety cover [1] onto the ac power cable socket.

DANGER
Dangerous voltages are present at the ac power cable socket. The safety cover must be on when the socket is not being used.

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__ 22. After the safety cover [1] is installed, loosen the screw holding the retainer [6] to the ac power box. Rotate the retainer and tighten the screw with the retainer positioned to prevent the safety cover from being removed.

__ 23. Go to INST 50 for instructions on setting the drive logical and physical addresses, return here when finished.

__ 24. Go to INST 56 for instructions on checking tape unit power supply jumpers, return here when finished.

__ 25. Go to INST 70 if the tape unit is attached to a single control unit subsystem, return here when finished.

__ 26. Go to INST 76 if the tape unit is attached to a dual control unit subsystem, return here when finished.

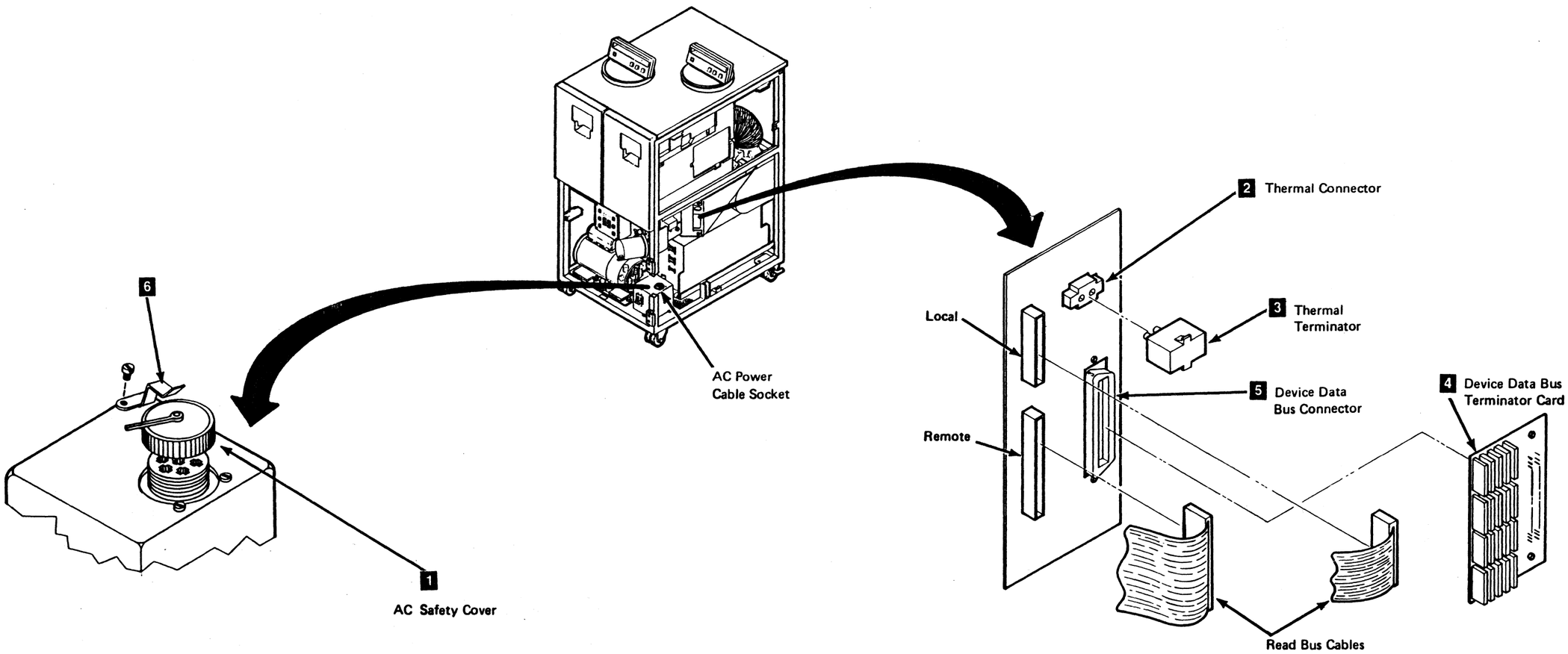
Before You're Through...

__ 1. Run the product maintenance diskette to the last drive attached to the affected control unit(s).

__ 2. Go to INST 130 and install the RFI frame pans and end plates, and reinstall all covers and subcovers that were removed.

__ 3. Go to INST 131 and run the OLTs.

__ 4. This completes the installation of additional drives to an existing subsystem. Return the subsystem to the customer.



This page is for control units with BM 6460460 (See CARR-CU 9) and tape units with BM 6460006 (See CARR-DR 9)

Adding Tape Units (Continued)

On the last tape unit attached to the control unit:

__ 19. Place the device data bus terminator card **4** removed from the last tape unit installed in the new tape unit's device data bus connector **5**.

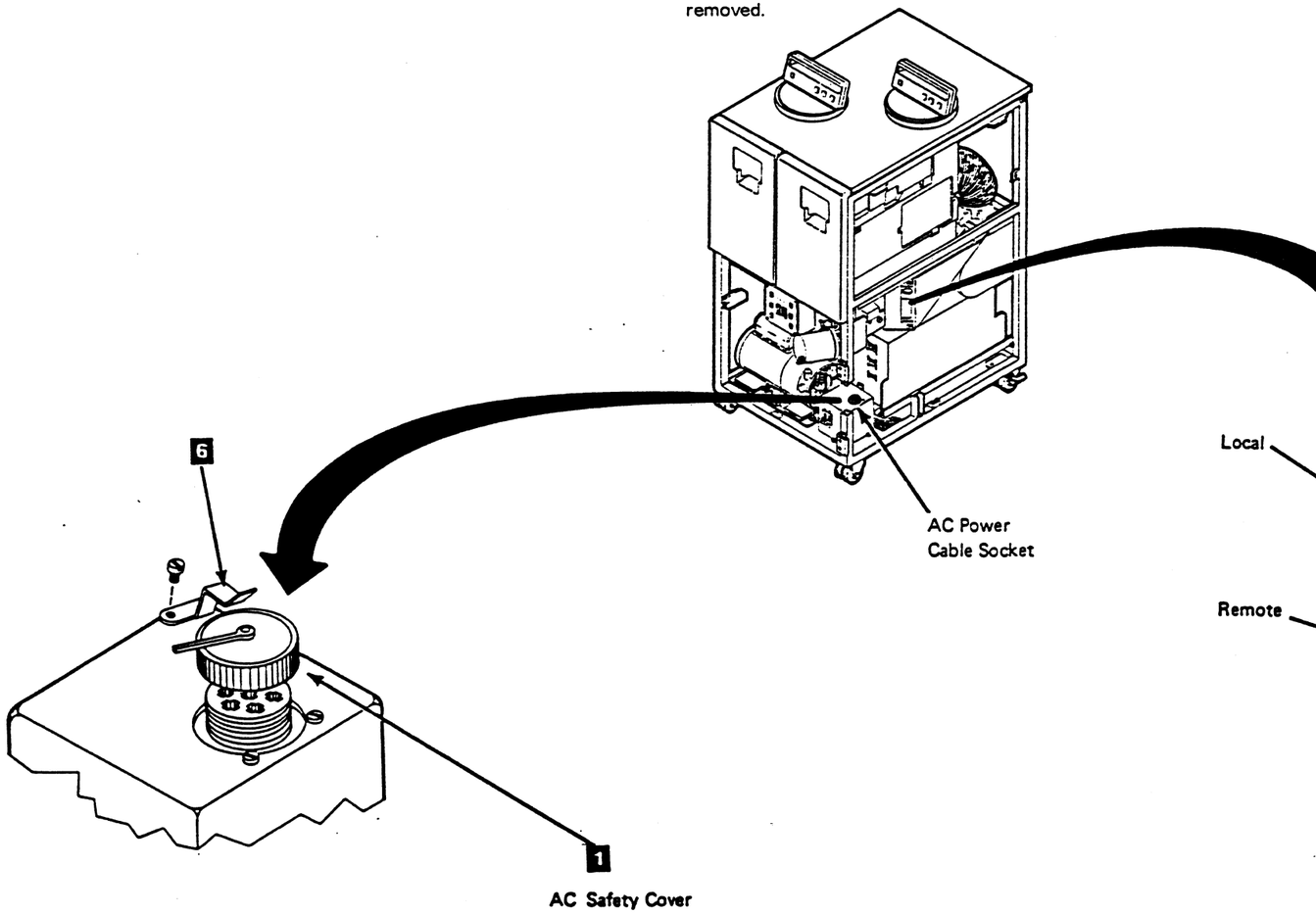
__ 20. Plug the thermal terminator **3** into the thermal connector **2**. The thermal terminator was removed in a prior step from the preceding tape unit.

__ 21. Screw the safety cover **1** onto the ac power cable socket.

DANGER

Dangerous voltages are present at the ac power cable socket. The safety cover must be on when the socket is not being used.

__ 22. After the safety cover **1** is installed, loosen the screw holding the retainer **6** to the ac power box. Rotate the retainer and tighten the screw with the retainer positioned to prevent the safety cover from being removed.

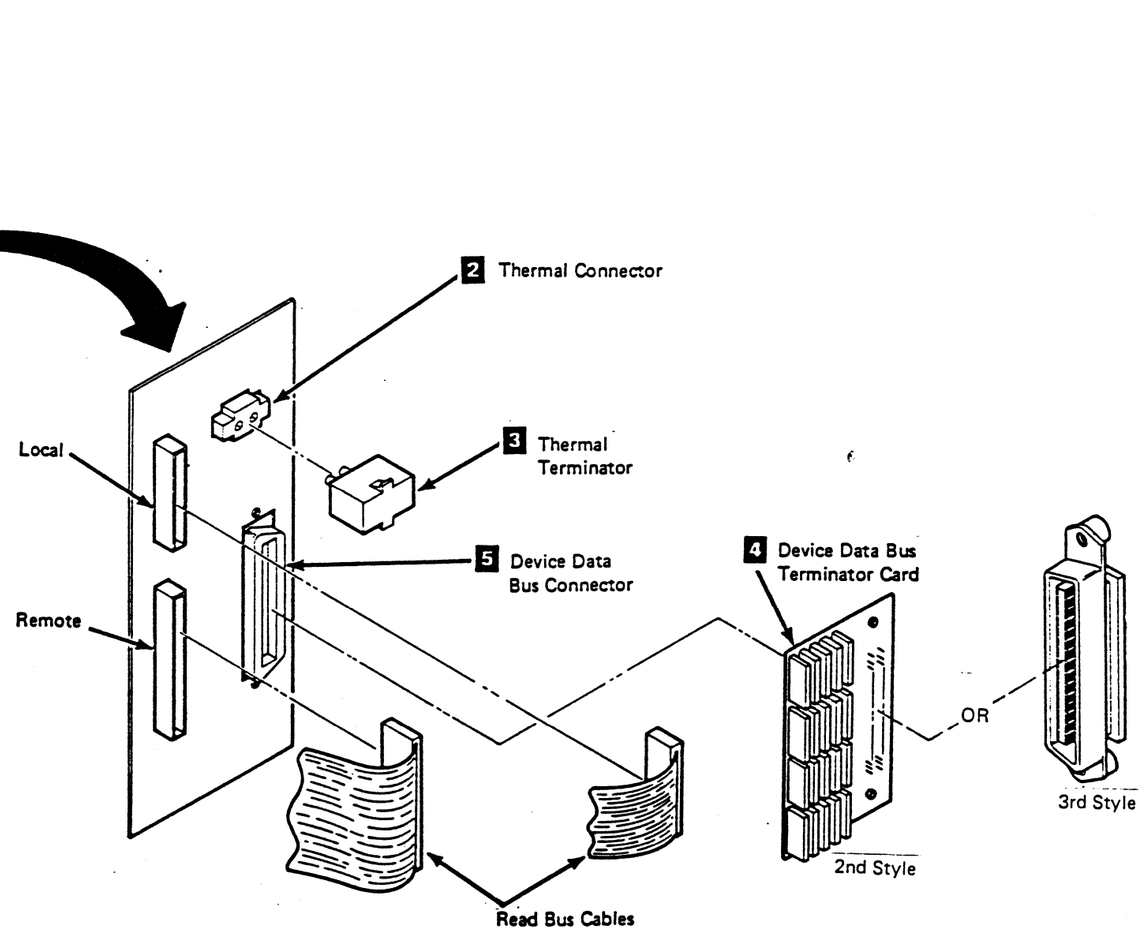


__ 23. Go to INST 50 for instructions on setting the drive logical and physical addresses, return here when finished.

__ 24. Go to INST 56 for instructions on checking tape unit power supply jumpers, return here when finished.

__ 25. Go to INST 70 if the tape unit is attached to a single control unit subsystem, return here when finished.

__ 26. Go to INST 76 if the tape unit is attached to a dual control unit subsystem, return here when finished.



Before You're Through...

__ 1. Run the product maintenance diskette to the last drive attached to the affected control unit(s).

__ 2. Go to INST 130 and install the RFI frame pans and end plates, and reinstall all covers and subcovers that were removed.

__ 3. Go to INST 131 and run the OLTs.

__ 4. This completes the installation of additional drives to an existing subsystem. Return the subsystem to the customer.

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3480 Relocate or Discontinue

This page is for control units with BM 6460460 (See CARR-CU 9) and tape units with BM 6460006 (See CARR-DR 9)

Notes:

1. For World Trade countries, refer to WT General CEM 257, "General Internal Packaging Instructions for Replant Machines."
2. Before attempting to relocate or discontinue a subsystem, ensure that you have the following packing material BMs on hand:
   - BM 7359079 (for tape units)
   - BM 7359073 (for control unit).

Getting Started

To remove or relocate a 3480 subsystem, perform the following steps:

___ 1. Before proceeding, check the following:

___ a. Make sure that all drives are unloaded and that the tape cartridges have been removed.

___ b. Make sure that the 3480 subsystem is offline to all host systems. (The vary offline procedures are described on PLAN 55.)

___ c. Make sure that any channels to be removed from the control unit have been varied offline to the operating system.

___ 2. Remove the front, rear, and left side covers from the control unit. See CARR-CU 2-1 for cover removal procedures.

Removing Power

___ 3. Remove the control unit rear safety cover.

___ 4. Set the CU Online/CU Offline switch **1** to CU Offline.

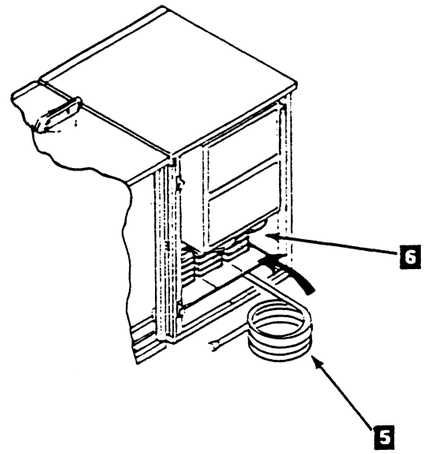
___ 5. Set the control unit Power On/Off switch **2** to Off.

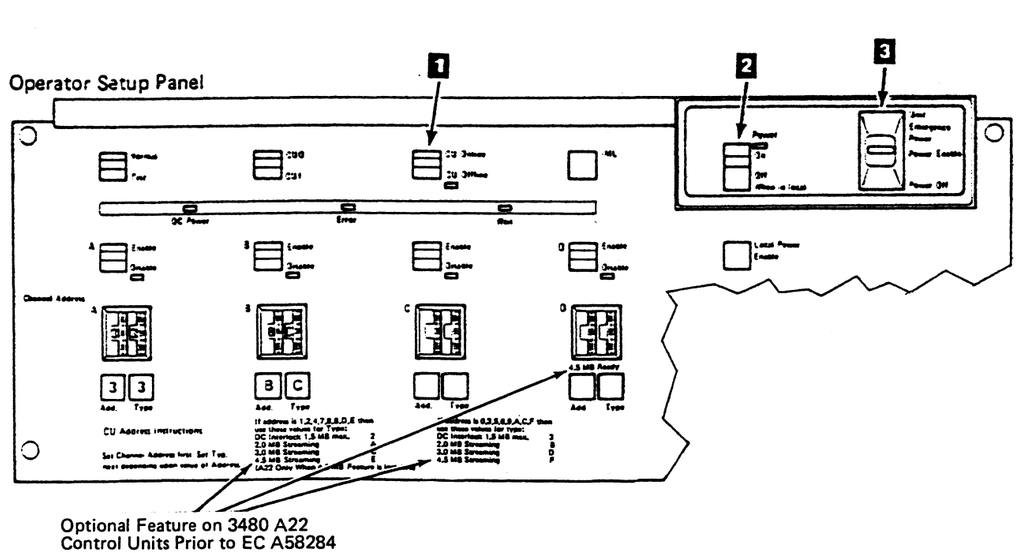
___ 6. Set the control unit Unit Emergency Power switch **3** to Power Off.

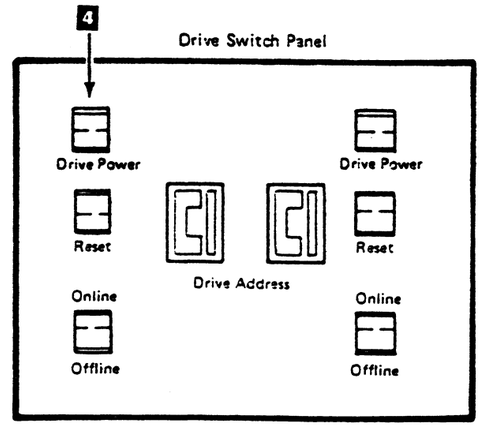
___ 7. Set the Drive Power switch **4** to Off on each drive.

___ 8. Have the customer remove power from the outlet.

___ 9. Remove the power cable **5** from the customer's outlet and tape the coiled cable behind the I/O cable connectors **6**.







3480 Relocate or Discontinue

This page is for control units with BM 6460460 (see CARR-CU 9) and tape units with BM 6460006 (see CARR-DR 9)

Removing I/O Cables

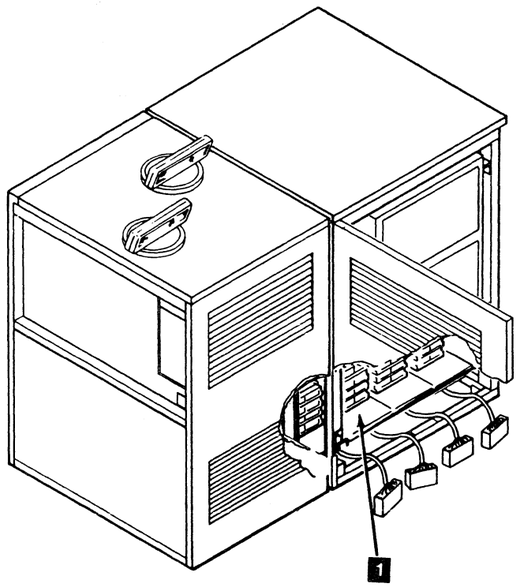
Note: *If the control unit has the vertical style I/O connectors, remove the drip-screen guard.*

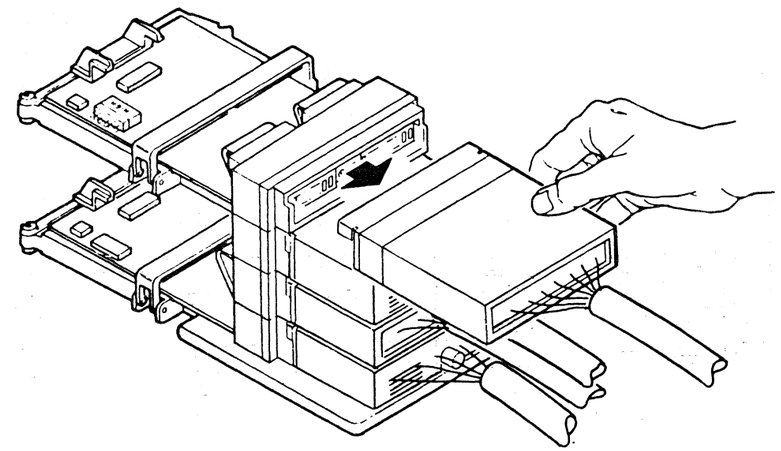
__ 10. *Start with channel A* **1** *. Unscrew and remove all the cables and terminators from the I/O connector assembly.*

__ 11. *Pass the channel cables down through the opening in the bottom of the control unit.*

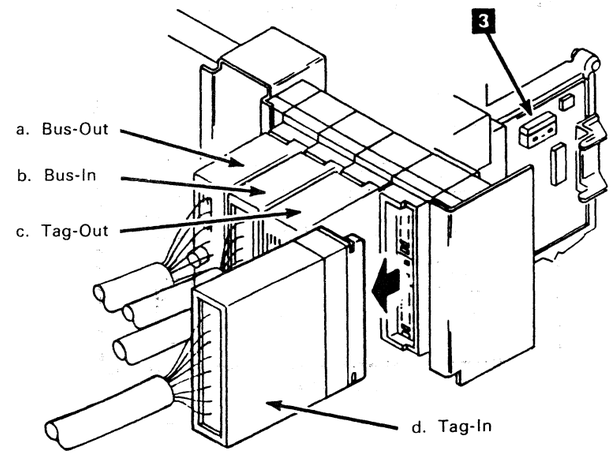
__ 12. *Disconnect all channel cables from the host system and ensure that the channels are correctly terminated.*

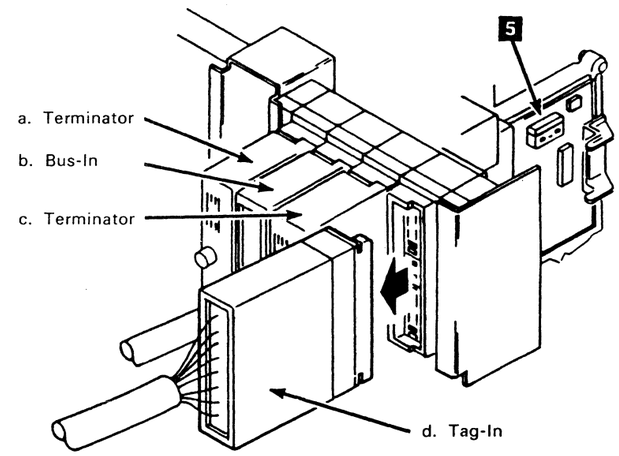
__ 13. *Repeat steps 10 through 12 for any remaining channel cables.*





I/O Connector (Horizontal Style)





I/O Connector (Vertical Style)

3480 Relocate or Discontinue

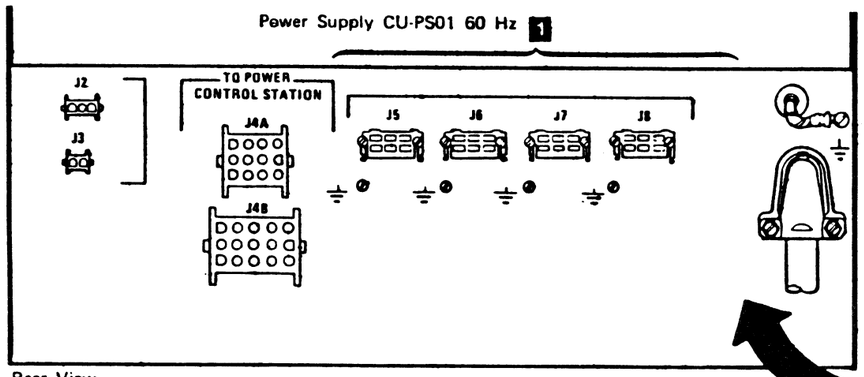
This page is for control units with BM 6460460 (See CARR-CU 9) and tape units with BM 6460006 (See CARR-DR 9)

Removing Unit Emergency Power Off (UEPO) Cables

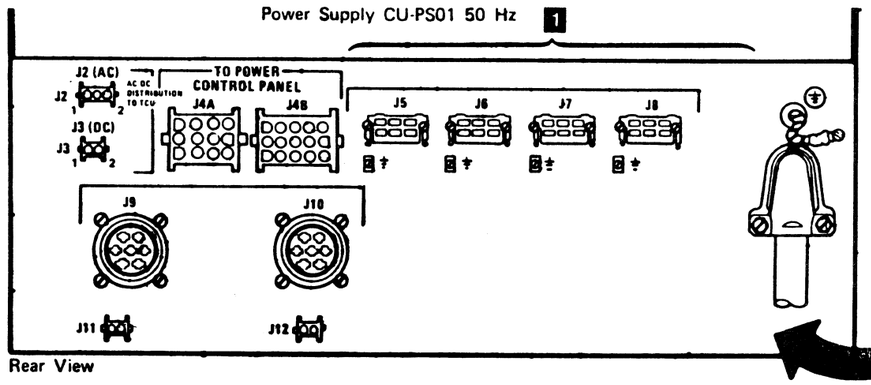
__ 14. Disconnect the UEPO cables from the controlling computer.

__ 15. Remove the four UEPO cables from connectors J5 through J8.

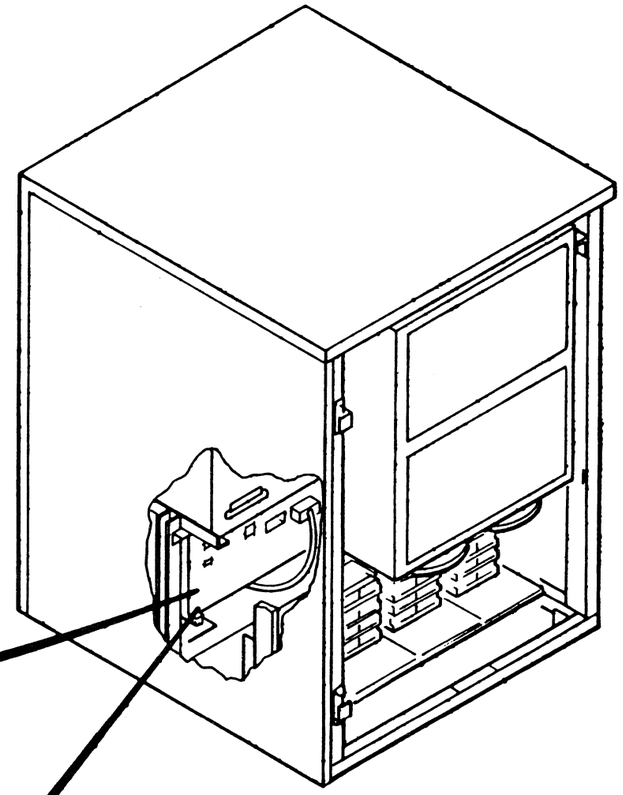
__ 16. Pass the UEPO cables down through the opening in the bottom of the control unit.



Rear View



Rear View



3480 Relocate or Discontinue

This page is for control units with BM 6460460 (See CARR-CU 9) and tape units with BM 6460006 (See CARR-DR 9)

Removing Dual Control Unit Communication Cables

Note: This is a feature on 3480 model A11, standard on model A22.

__ 17. Disconnect both ends **1** of the 3-connector cable (A3, A4, and A5), one end at each control unit.

__ 18. Disconnect both ends of the 2-connector feature cable (A1 and A2) **2** at the control units.

__ 19. Loosen the wingnuts **4** on the cable retaining brackets **5** and open the brackets.

__ 20. Slide the cables from between the guide posts.

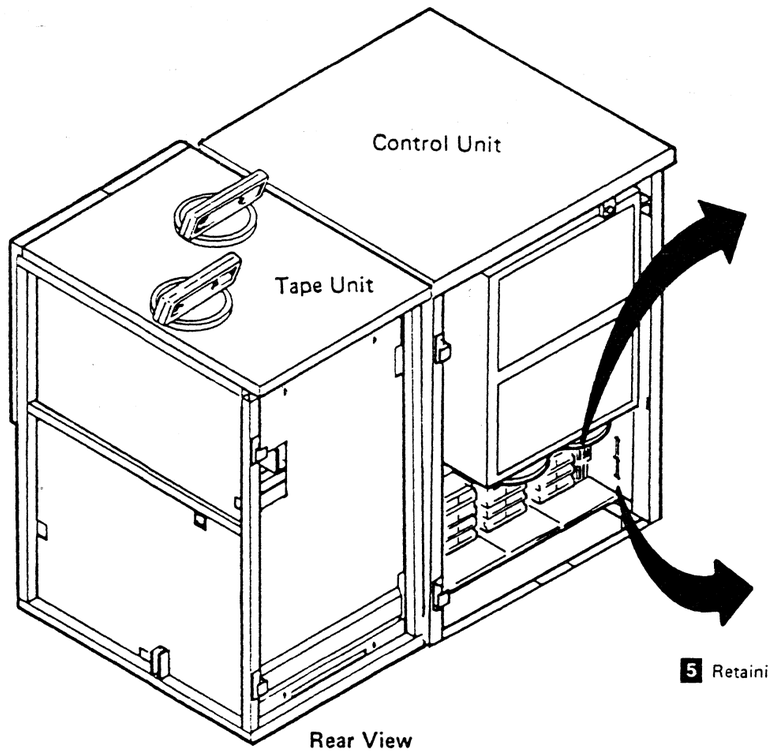
__ 21. Swing the retaining brackets closed and tighten all the wingnuts.

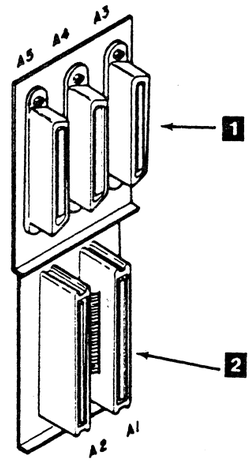
__ 22. Disconnect the cable ground straps **3** from each control unit.

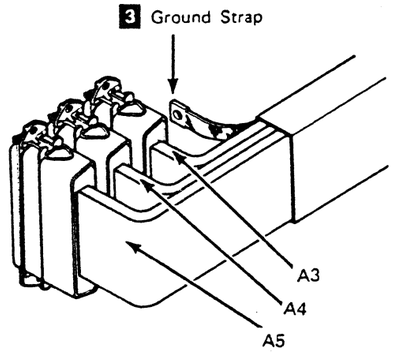
__ 23. Place protective covers over the connectors at both ends of the feature cable.

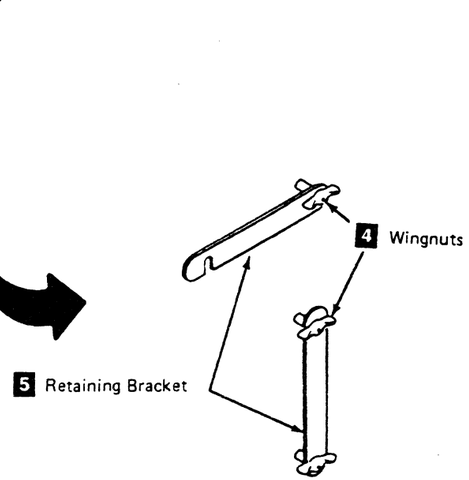
__ 24. Place the cables in the shipping carton.

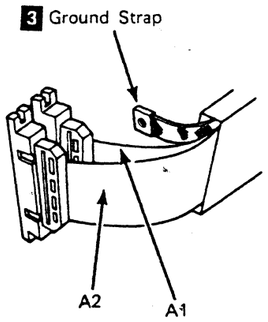
Note: If you are relocating the machines within the same room, you don't have to pack them.











3480 MI EC A57721

3480 Relocate or Discontinue

This page is for control units with BM 6460460 (See CARR-CU 9) and tape units with BM 6460006 (See CARR-DR 9)

Disconnecting the Tape Units and the Control Unit

__ 25. Unlock the rear casters **3** of the control unit and tape units.

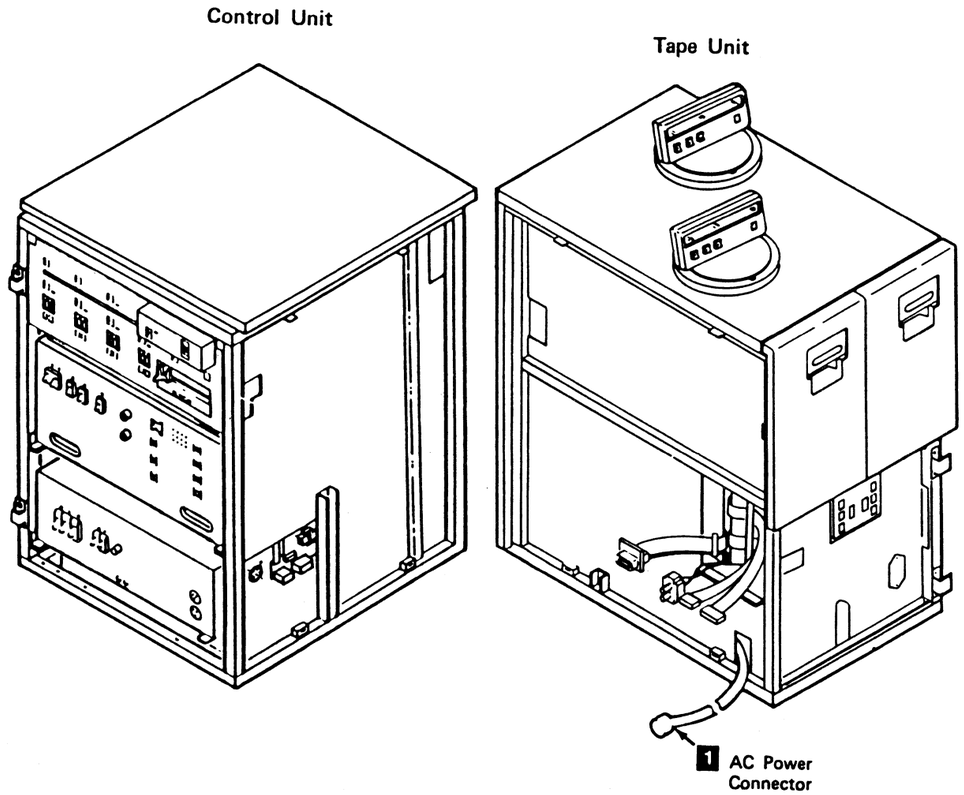
CAUTION: TILT HAZARD

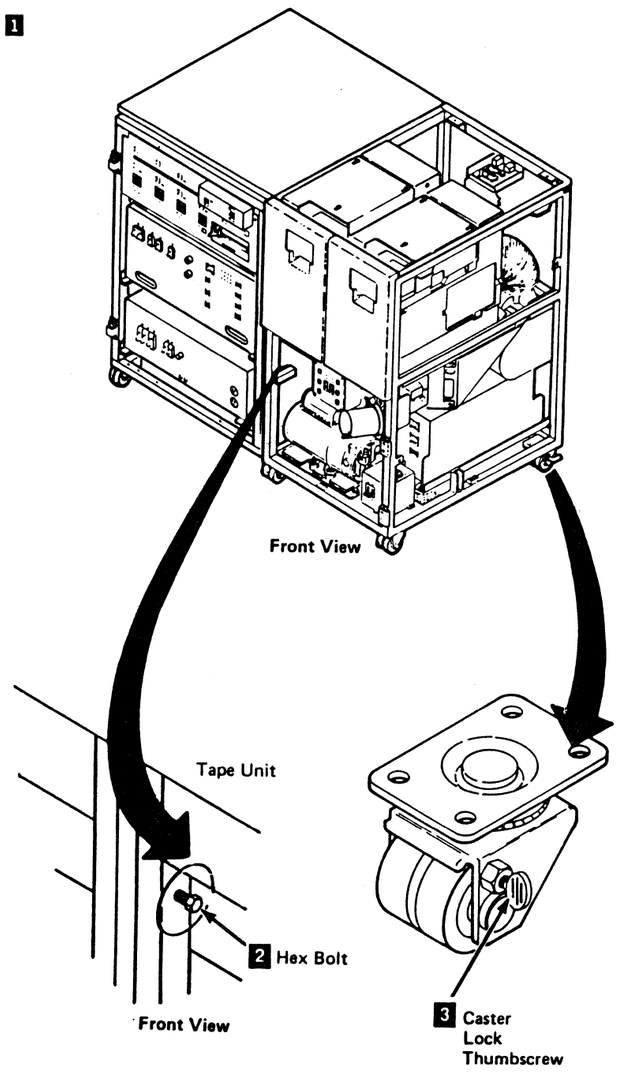
Do NOT open both drives of a tape unit that is not bolted to another tape unit or control unit. With the automatic cartridge loader feature installed and both drive drawers fully extended, a tape unit that is not bolted to another unit will tilt forward with about 20 lbs. of force applied to the top of either automatic cartridge loader.

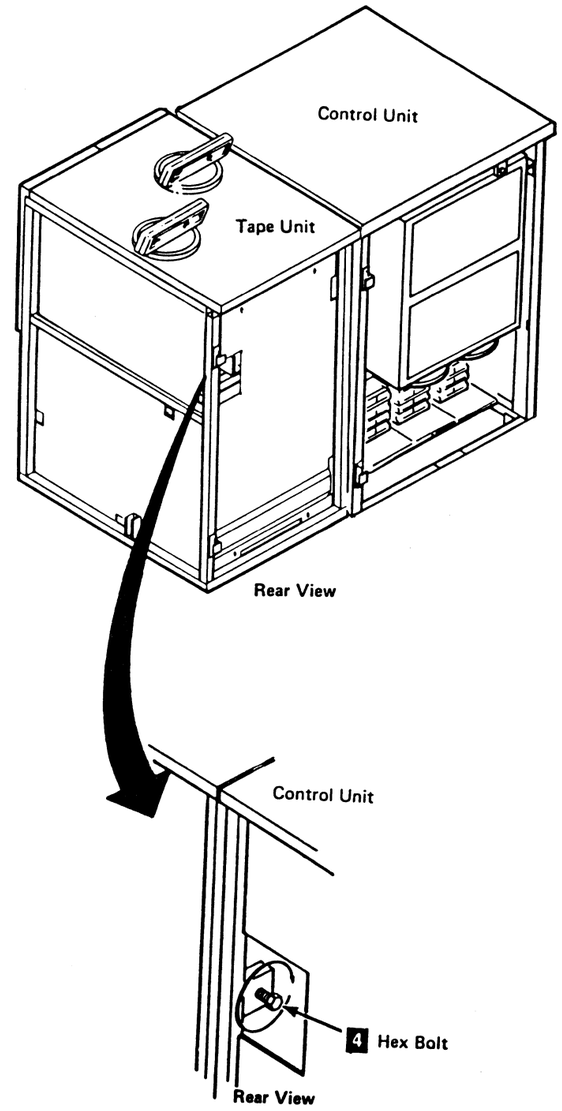
__ 26. Remove the hex bolts and washers **2** **4** from the front and rear of each unit. It may be necessary to remove the Tape Unit Front Safety cover to remove hex bolt **2**. See CARR-DR 2-1 if the cover needs to be removed.

__ 27. Push the control unit about 20 cm (8 in) away from the first tape unit.

__ 28. Disconnect the tape unit to control unit power cable **1** and tape it to the side of the tape unit.







This page is for control units with BM 6460460 (See CARR-CU 9) and tape units with BM 6460006 (See CARR-DR 9)

Disconnecting the Tape Units and the Control Unit (Continued)

__ 29. On the last tape unit attached to the control unit:

- __ a. Remove the side cover.
- __ b. Remove the device data terminator card P/N 6384571 **2**.
- __ c. Remove the thermal terminator **1**.
- __ d. Be sure the terminators are included with the control unit shipping group.

__ 30. Disconnect the device data and read bus cables **3** **5** and tape them to the side of the tape unit.

__ 31. Disconnect the thermal cable **4**.

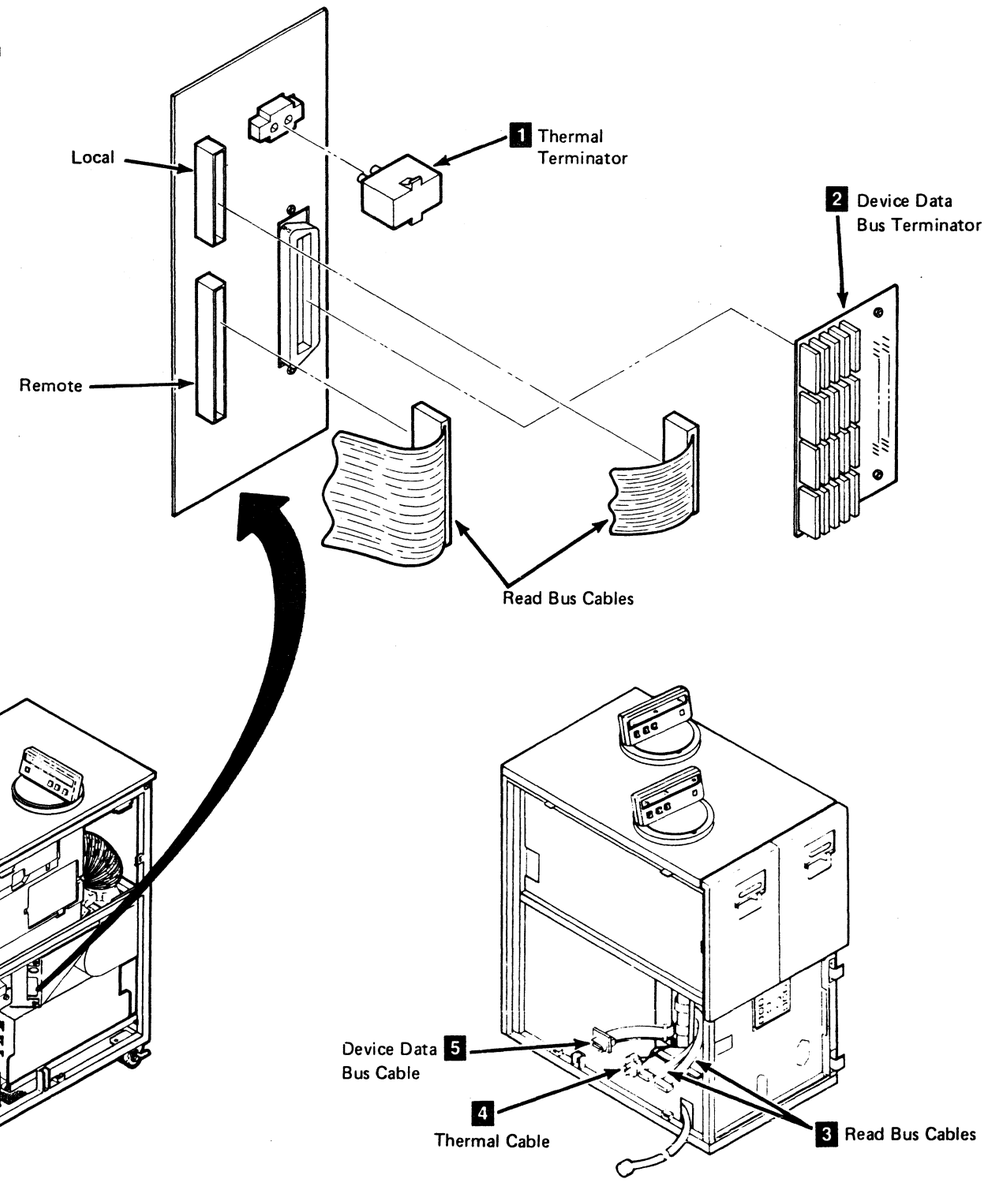
__ 32. Repeat steps 30 and 31 for each additional tape unit.

To complete the removal/replacement:

__ 33. Install the side cover you removed from the tape unit on the right side of the control unit (as you face the front of the control unit).

__ 34. Reinstall any covers that were removed.

__ 35. Report the activities performed, using the existing Branch Office procedures.



This page is for control units with BM 6460460 (See CARR-CU 9) and tape units with BM 6460006 (See CARR-DR 9)

Disconnecting the Tape Units and the Control Unit (Continued)

__ 29. On the last tape unit attached to the control unit:

- __ a. Remove the side cover.
- __ b. Remove the device data terminator card **2**.
- __ c. Remove the thermal terminator **1**.
- __ d. Be sure the terminators are included with the control unit shipping group.

__ 30. Disconnect the device data and read bus cables **3** **5** and tape them to the side of the tape unit.

__ 31. Disconnect the thermal cable **4**.

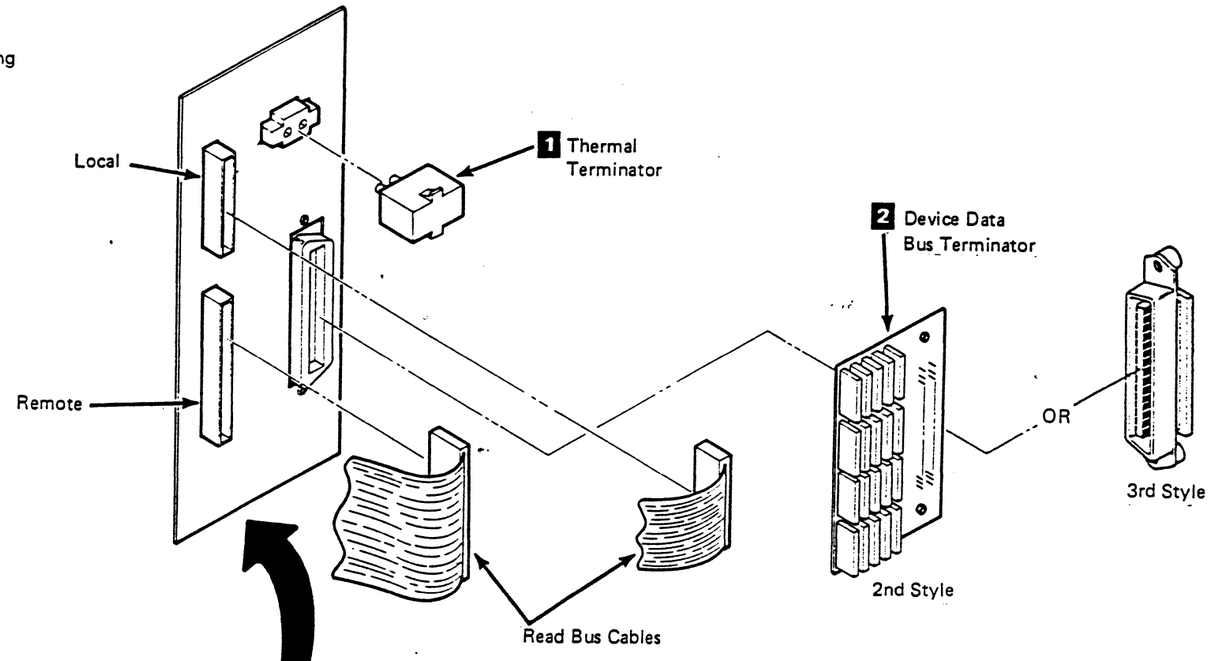
__ 32. Repeat steps 30 and 31 for each additional tape unit.

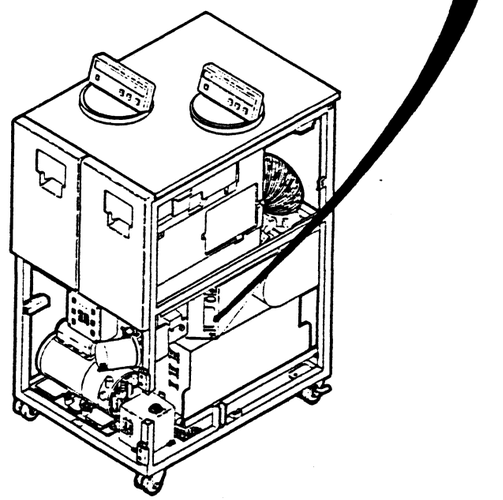
To complete the removal/replacement:

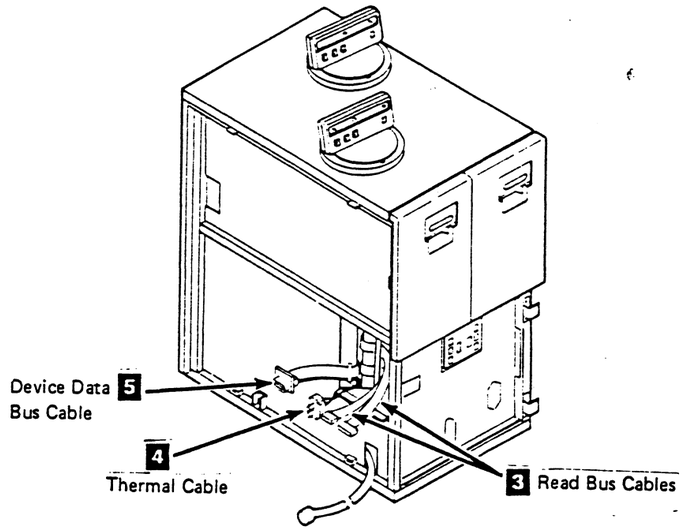
__ 33. Install the side cover you removed from the tape unit on the right side of the control unit (as you face the front of the control unit).

__ 34. Reinstall any covers that were removed.

__ 35. Report the activities performed, using the existing Branch Office procedures.







o o o o o o o o o o

This page is for control units without BM 6460460 (See CARR-CU 9) and tape units without BM 6460006 (See CARR-DR 9)

Before Installation

CAUTION: TILT HAZARD

Do NOT open both drives of a tape unit that is not bolted to another tape unit or control unit. With the automatic cartridge loader feature installed and both drive drawers fully extended, a tape unit that is not bolted to another unit will tilt forward with about 20 lbs. of force applied to the top of either automatic cartridge loader.

This procedure describes all installation actions in detail, step by step. Mark off each step as it is completed. Two service representatives (SRs) are needed for the mechanical installation of a dual control unit subsystem, to reduce the install time. Only one SR is needed to run the checkout and diagnostic procedures.

The Installation Overview chart shows the sequence of steps to complete the installation. However, the chart provides an overview only; follow the step-by-step instructions as you proceed through the installation.

Pre-Installation Checks

Check with the IBM branch office or physical planning representative to ensure that installation planning specifications have been met (correct power service outlet or connector, line voltage, phase rotation, grounding, cable lengths, service space, environment, and so forth). See INST 6, for pre-installation safety checks.

Preparation

__ 1. Inventory the items on each Bill of Material to verify that all items were received.

BILL OF MATERIAL TITLE	3480 MODEL	B/M NUMBER
Basic Shipping Group	A22	4799123
Basic Shipping Group	B22	4798853
MI Manuals, 5 Volumes	A22, B22	8673712
Wiring Diagram and Logic Block Diagrams	A22	4470092
Wiring Diagram and Logic Block Diagrams	B22	4470093

Tools and Test Equipment Needed

The following items are needed to complete the installation:

- Cleaner cartridge (part 4780527)
- IML Diskette

  Note: Ensure for dual CU Installations, all IML Diskettes are at the same EC level.

- 3480 Online Test routines
- Maintenance device
  - Product diskette
  - Support diskette
- S/370 Channel Tag Terminator (part 2282676)
- Blank scratch cartridge.

  Only one blank cartridge is required; however, a second blank cartridge, if available, reduces the installation time.

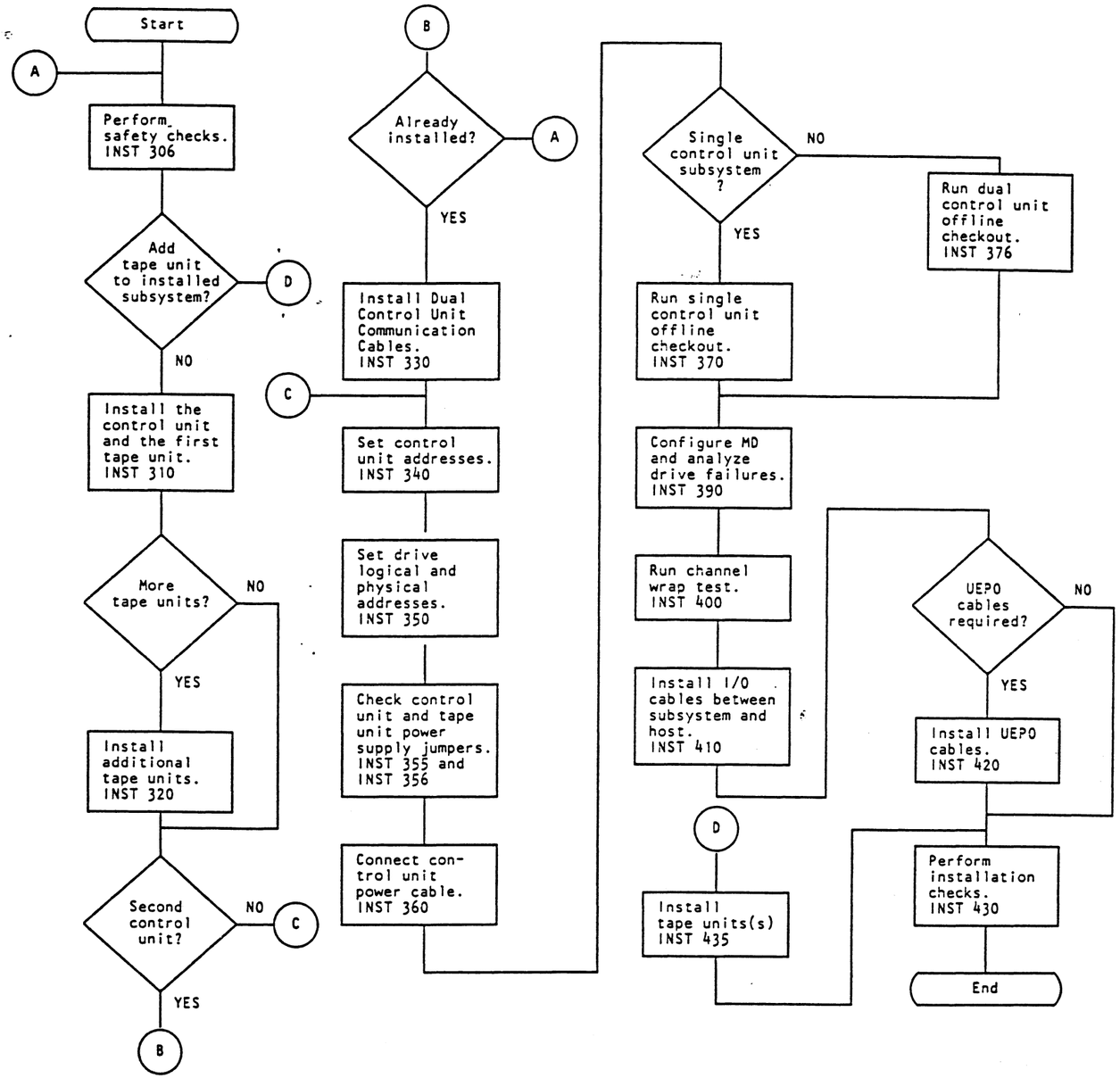


Figure 1. Installation Overview

0 0 0 0 0 0 0 0 0 0

3480 Installation Instructions

This page is for control units without BM 6460460 (See CARR-CU 9) and tape units without BM 6460006 (See CARR-DR 9)

Before Installation

CAUTION: TILT HAZARD

Do NOT open both drives of a tape unit that is not bolted to another tape unit or control unit. With the automatic cartridge loader feature installed and both drive drawers fully extended, a tape unit that is not bolted to another unit will tilt forward with about 20 lbs. of force applied to the top of either automatic cartridge loader.

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Check with the IBM branch office or physical planning representative to ensure that installation planning specifications have been met (correct power service outlet or connector, line voltage, phase rotation, grounding, cable lengths, service space, environment, and so forth). See INST 6, for pre-installation safety checks.

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The following items are needed to complete the installation:

- Cleaner cartridge (part 4780527)
- IML Diskette

  Note: Ensure for dual CU Installations, all IML Diskettes are at the same EC level.

- 3480 Online Test routines
- Maintenance device
  - Product diskette
  - Support diskette
- Blank scratch cartridge.

  Only one blank cartridge is required; however, a second blank cartridge, if available, reduces the installation time.

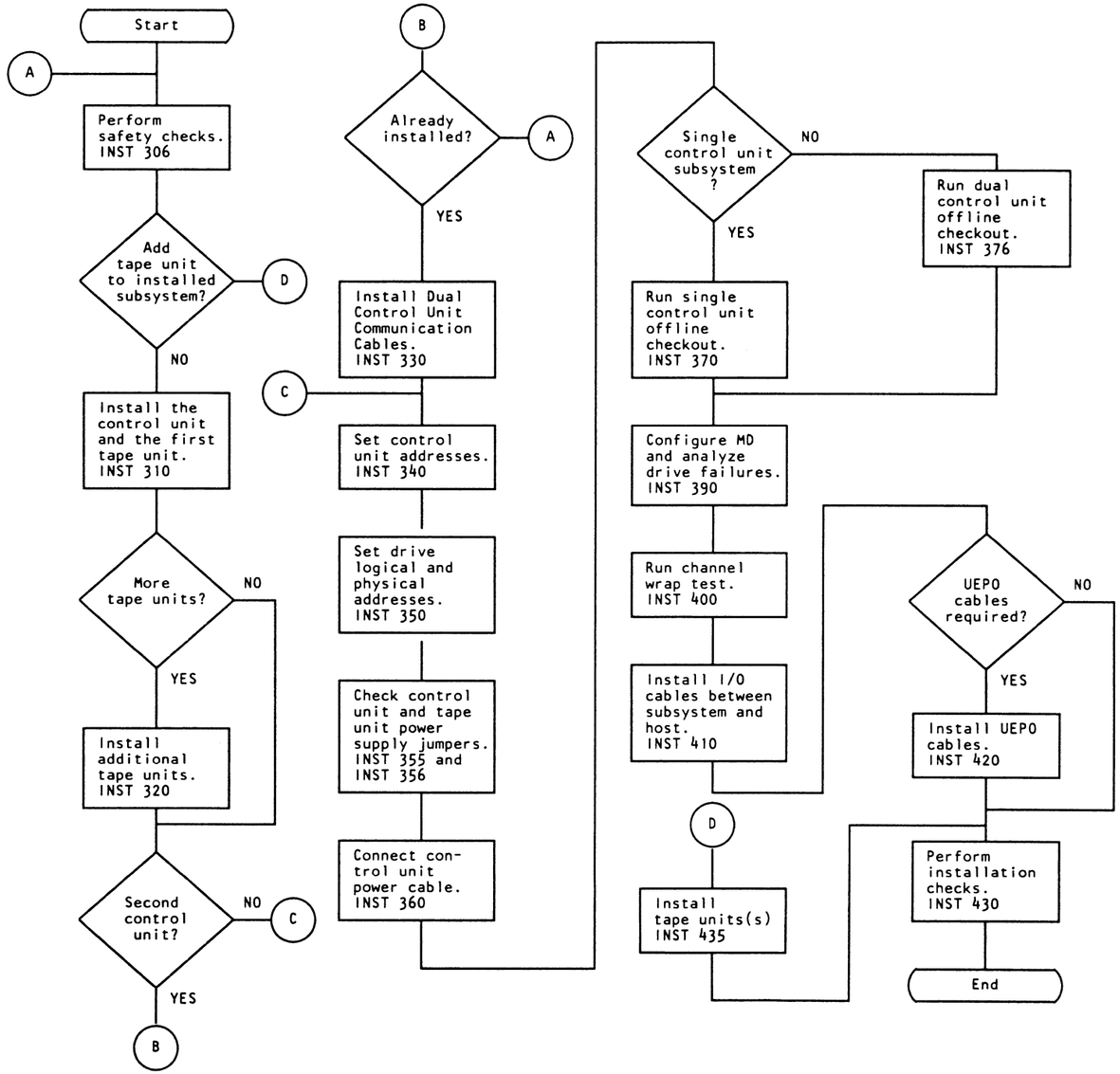

Figure 1. Installation Overview

This page is for control units without BM 6460460 (See CARR-CU 9) and tape units without BM 6460006 (See CARR-DR 9)

ACTION Messages

The following procedures are used to correct or help isolate drive problems. The service representative is sent here from the INST section following an ACTION message on a drive display. ACTION messages are generated for problems encountered after loading a cartridge into a drive during the installation checkout procedures.

Go to the message that matches the message on the drive display that sent you here and perform the actions listed in the Actions column.

Return to the procedure that sent you here when you have completed the actions listed in the Actions column.

Messages	Description	Actions
ACTION 1	The cartridge failed to load correctly.	1. Unload and reload the cartridge. 2. If the same failure occurs, stop testing and note the address of the failing drive and the CU controlling that drive. 3. Return to the procedure that sent you here and continue testing with the next drive displaying TEST.
ACTION 2	The cartridge may be set to file protect.	1. Unload the cartridge and check to see that it is not set to file protect. 2. Reload the cartridge and if it fails again, try a different cartridge. 3. If the second cartridge fails in the same way, stop testing and note the address of the failing drive and the CU controlling that drive. Return to the procedure that sent you here and continue testing with the next drive displaying TEST.
ACTION 3	Incorrect address.	1. Restart testing using the next drive. 2. If the next drive to be tested fails in the same way, a cable connection problem may exist. 3. Note the address(es) of the failing drive(s) and the CU controlling the drive(s), then return to the procedure that sent you here and continue testing.
ACTION 4	Channel address parity error.	1. Go to INST 340 and check the address switch settings. 2. If the problem remains, run the product maintenance package, then return to the procedure that sent you here and continue testing.
ACTION 5	Drive did not get patches correctly. This could be the drive patch or the Automatic Cartridge Loader code load.	1. Ensure that the IML diskette is the correct one for the subsystem. If not, replace it and start the installation checkout again from power on. 2. If the diskette is correct, continue using only the drives that display TEST.
ACTION A	Channel address parity error on channel A.	1. Go to INST 340 and check the address switch settings. 2. If the problem remains, run the product maintenance package, then return to the procedure that sent you here and continue testing.
ACTION B	Channel address parity error on channel B.	1. Go to INST 340 and check the address switch settings. 2. If the problem remains, run the product maintenance package, then return to the procedure that sent you here and continue testing.
ACTION C	Channel address parity error on channel C.	1. Go to INST 340 and check the address switch settings. 2. If the problem remains, run the product maintenance package, then return to the procedure that sent you here and continue testing.
ACTION D	Channel address parity error on channel D.	1. Go to INST 340 and check the address switch settings. 2. If the problem remains, run the product maintenance package, then return to the procedure that sent you here and continue testing.

3480 Installation Instructions

This page is for control units without BM 6460460 (See CARR-CU 9) and tape units without BM 6460006 (See CARR-DR 9)

Before starting the installation, perform the following safety checks:

Safety Checks

Machine Ground Wire Check

__ 1. ***DANGER***
Hazardous electrical voltages are present in the receptacle.

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Use the volt/ohm meter to ensure that:

a. The resistance between the machine frame and the ground pin on the power plug is less than 0.1 ohm.

b. The resistance between the machine frame and ground pin (pin 4) on the output socket of the control unit and each tape unit is less than 0.1 ohm. See diagram A below.

c. The resistance between the machine frame and ground pin (pin 4) on the input cable assembly connector of each tape unit is less than 0.1 ohm. See diagram B below.

If the resistance is greater than 0.1 ohm, determine the cause and correct it before proceeding with the installation.

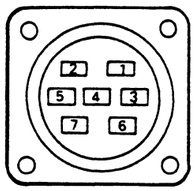

Diagram A
Output Socket (CU and TU)

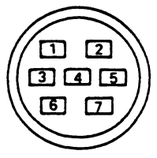

Diagram B
Input Cable Assembly (TU)

Branch Circuit CB Switched Off Check

__ 1. ***DANGER***
Hazardous electrical voltages are present in the connector. Do not touch the outlet case with anything other than test probes until step 3 is completed.

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Have the customer find and switch off the branch circuit CB.

__ 2. Check the voltage from the outlet case to the building ground for less than 1.0 V ac. (Begin with the meter scale that is appropriate for normal line voltage checks.)

__ 3. Check the voltage from the ground pin to the building ground for less than 1.0 V ac. If the voltage is less than 1.0 V ac, the outlet is now safe to touch.

__ 4. ***DANGER***
Hazardous electrical voltages are present. Do not touch the internal parts (pins and sockets) of the outlet until step 5 is completed.

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Check the resistance from the ground pin to the outlet case for a reading of less than 0.1 ohm.

Check the resistance from the ground pin to the building ground for reading of less than 0.1 ohm.

A reading of less than 0.1 ohm indicates the presence of a safe, continuous grounding conductor.

__ 5. Measure the phase-to-phase voltage and the phase-to-ground voltage at the outlet.

Measure the phase-to-neutral voltage (if present) and the neutral-to-ground voltage (if present).

All voltage values are to be less than 1.0 V ac.

Branch Circuit CB Switched On Check

__ 1. ***DANGER***
Hazardous electrical voltages are present. Do not touch the outlet before meeting the following requirements of steps 1 and 2.

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Have the customer switch on the CB that supplies voltage to the receptacle.

__ 2. ***DANGER***
Hazardous voltages are present. If the measured voltage values are less than 1.0 V ac, you can touch the outlet. Avoid contact with the internal parts (pins and sockets) of the outlet.

. . . . . .

. . . . . .

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Measure the voltages from the outlet case to the building ground and the outlet case to the ground pin. Voltage values are to be less than 1.0 V ac.

__ 3. At the outlet, measure the voltages from the ground pin and the neutral pin (if present) to all phases, and measure the voltages from phase to phase. This ensures that the outlet is wired correctly.

__ 4. Have the customer's branch circuit CB switched off before connecting the 3480 power cord into the outlet.

This page is for control units without BM 6460460 (See CARR-CU 9) and tape units without BM 6460006 (See CARR-DR 9)

Installing the Control Unit and the First Tape Unit

Warning: The 3480 A22 control units with the 4.5 megabyte channel feature must be cabled ahead of slower devices on the channel.

_____

_____

_____

Control Unit

Note: For dual control unit subsystems, two service representatives should be present to install the two control units and their attached tape drives at the same time to reduce the install time for the subsystem.

__ 1. Before you begin installation:

   __ a. Place the cables that run between the control units (on dual control unit subsystems) in the positions they need to be in for installation. Either end of the cables attaches to either of the control units.

   __ b. Place the channel cables that come from the host system(s) in the positions they need to be in for installation.

   These steps ensure that the cables are easily accessible when it is time to install them.

__ 2. Place the control unit (CU) in the position where it is to be installed.

__ 3. Place the rear casters of the CU so that the caster lock thumbscrews **6** are accessible.

__ 4. Lock the rear casters by turning the caster lock thumbscrews clockwise until they are tight.

__ 5. Open the front and rear covers.

__ 6. Remove the left and right outside covers. See CARR-CU 2-3 for procedures to remove the covers from the control unit.

   The covers are not reinstalled until after the hardware is completely installed.

__ 7. Remove the rear safety cover. See CARR-CU 2-3 for the control unit cover removal procedures.

   Do not reinstall the safety cover until after you have installed the Unit Emergency Power Off (UEPO) cable (INST 320).

__ 8. If the control unit has the vertical style I/O connectors, remove the drip-screen guard. See CARR-CU 2-1 for the control unit cover removal procedures.

   Do not reinstall the drip-screen guard until after you have installed the Unit Emergency Power Off (UEPO) cable (INST 120).

__ 9. Is this control unit being installed without any tape units attached?

```
YES NO
|   |
|   Go to INST 311, step 1.
|
Open the device data bus connector holding
clip 1.

Locate the two terminator cards, P/N 8492916,
and the card guides in the ship group.
Plug the cards into the device data bus
sockets 4.

Close the device data bus connector holding
clip 5.

Continue with the next step.
```

__ 10. Install the safety cover **7** on the ac power cable socket.

DANGER

> **Dangerous voltages are present at the ac power cable socket. The safety cover must be on when the socket is not being used.**
>
> _____
>
> _____
>
> _____
>
> _____

__ 11. Plug the thermal terminator **2** into the thermal connector **3**.

__ 12. Go to INST 321, step 19.

3480 Installation Instructions

This page is for control units without BM 6460460 and tape units without BM 6460006 (See CARR-DR 9)

Installing the Control Unit and the First Tape Unit (Continued)

First Tape Unit

CAUTION

TILT HAZARD CAUTION

Do NOT open both drives of a tape unit that is not bolted to another tape unit or control unit. With the automatic cartridge loader feature installed and both drive drawers fully extended, a tape unit that is not bolted to another unit will tilt forward with about 20 lbs. of force applied to the top of either automatic cartridge loader.

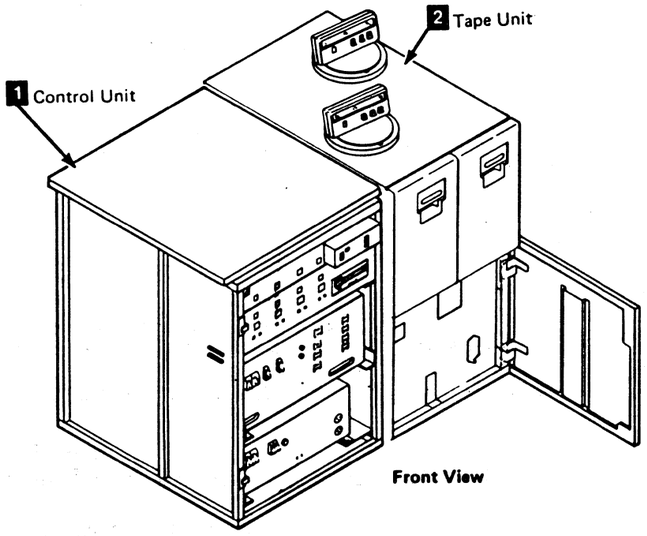
. . . . . .

. . . . . .

. . . . . .

__ 1. Place the tape units near the area where they are to be installed.

__ 2. Place the first tape unit **2** to the right of the control unit **1** (as you face the front of the control unit) about 20 cm (8 in) from the control unit.



__ 3. Open the front and rear covers.

__ 4. Plug the tape unit ac power connector **11** into the control unit ac socket **14**.

__ 5. Fasten the ac power cable to the side of the tape unit with the retaining strap **12**.

__ 6. Open the connector-holding clip **3** by pulling up on the top tab **4**, and pulling the clip outward.

__ 7. Connect the multi-colored read bus cables **5** **13** from the tape unit to the control unit.

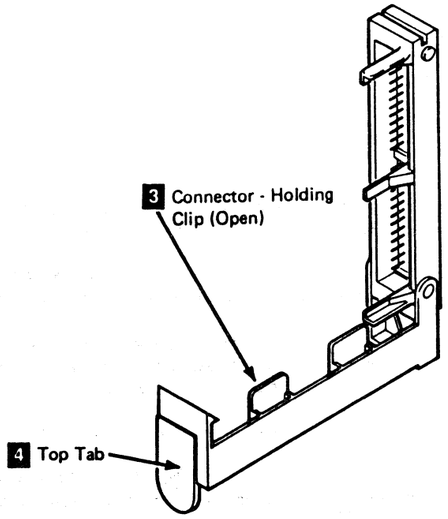
__ 8. Connect the device data bus cables **8** **9** from the tape unit to the control unit.

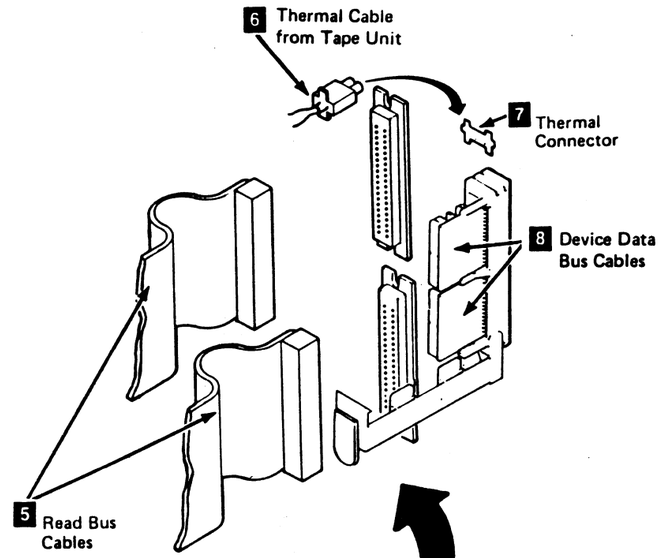
> **Note:** *Plug in the cable connectors to their matching sockets in the same positions as the cables are located in the rubber cable guide.* **Do not cross the cables.**

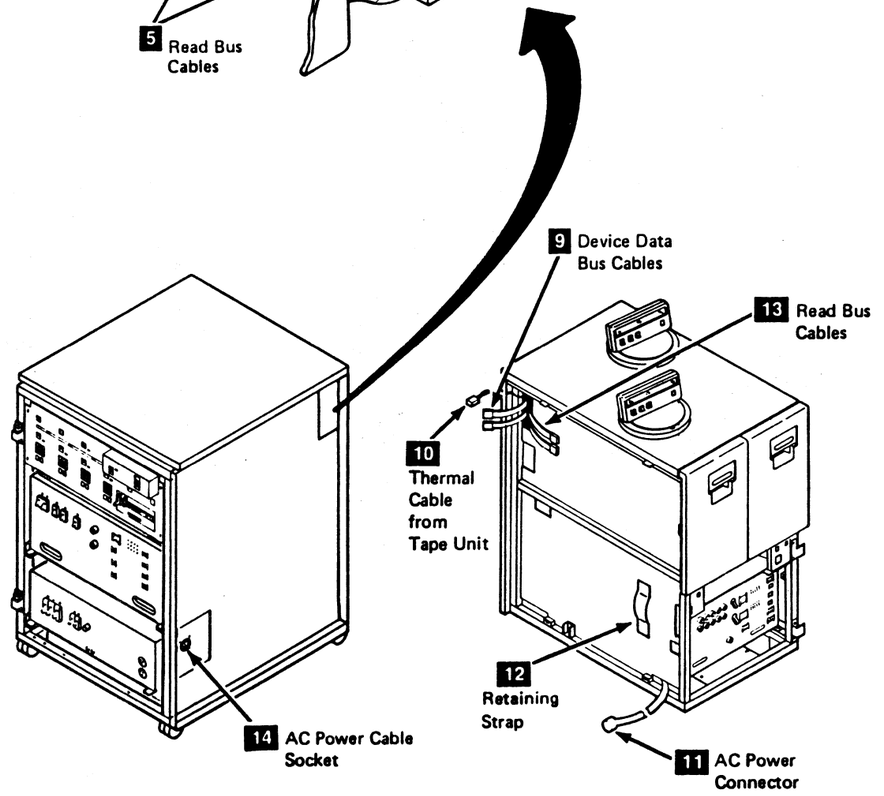
__ 9. Close the connector-holding clip **3**.

__ 10. Connect the thermal cable **6** **10** on the tape unit to the thermal connector **7** on the control unit.

__ 11. Continue to the next step on INST 313.







3480 Installation Instructions

This page is for control units without BM 6460460 (See CARR-CU 9) and tape units without BM 6460006 (See CARR-DR 9)

Installing the Control Unit and the First Tape Unit (Continued)

First Tape Unit (Continued)

__ 12. **Warning:** Be careful that the cables do not get pinched between the frames or covers.

. . . . . .

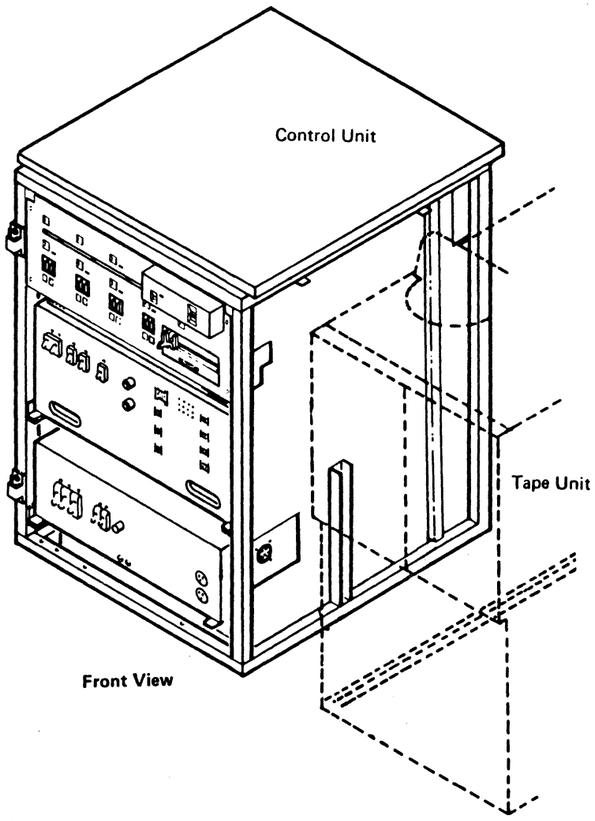
. . . . . .

. . . . . .

Fold the device data and read bus cables in toward the middle of the machines. Fold the power cable up toward the top of the machines. Ensure the power cable is not pinched between the machine frames.

Push the tape unit against the control unit.

Note: *Be sure the position of the casters does not prevent the tape unit frame from fitting snugly against the control unit frame.*



__ 13. Fasten the control unit to the tape unit by installing a hex bolt and washer at the rear of the control unit 1, and at the front of the tape unit 2.

Hex bolts and washers are part of the ship group.

Note: *If the control unit and tape unit are not correctly aligned, the covers may bind. Ensure that the covers are not binding.*

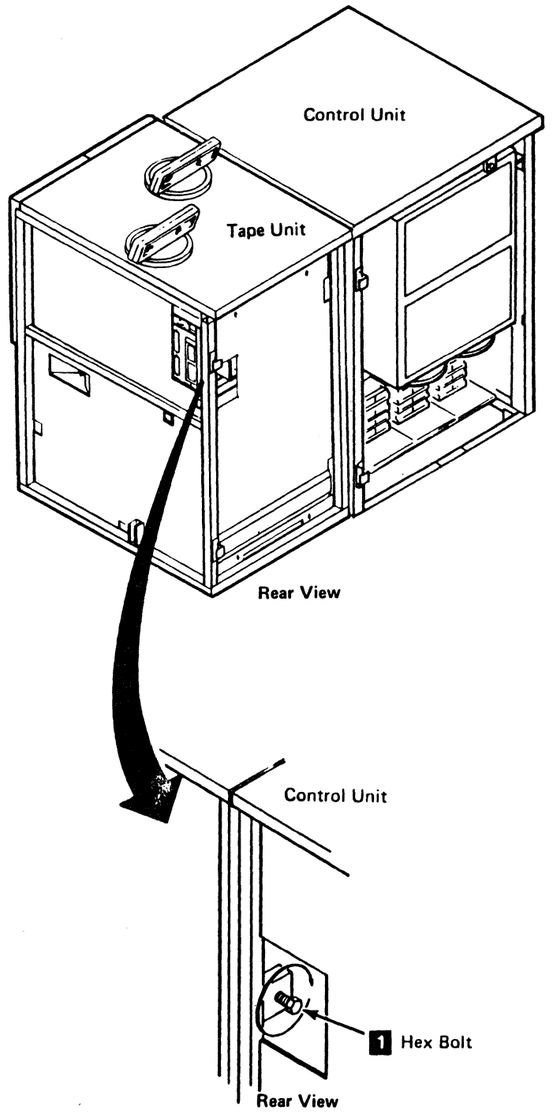
__ 14. Place the rear casters so the caster lock thumbscrews 3 are accessible.

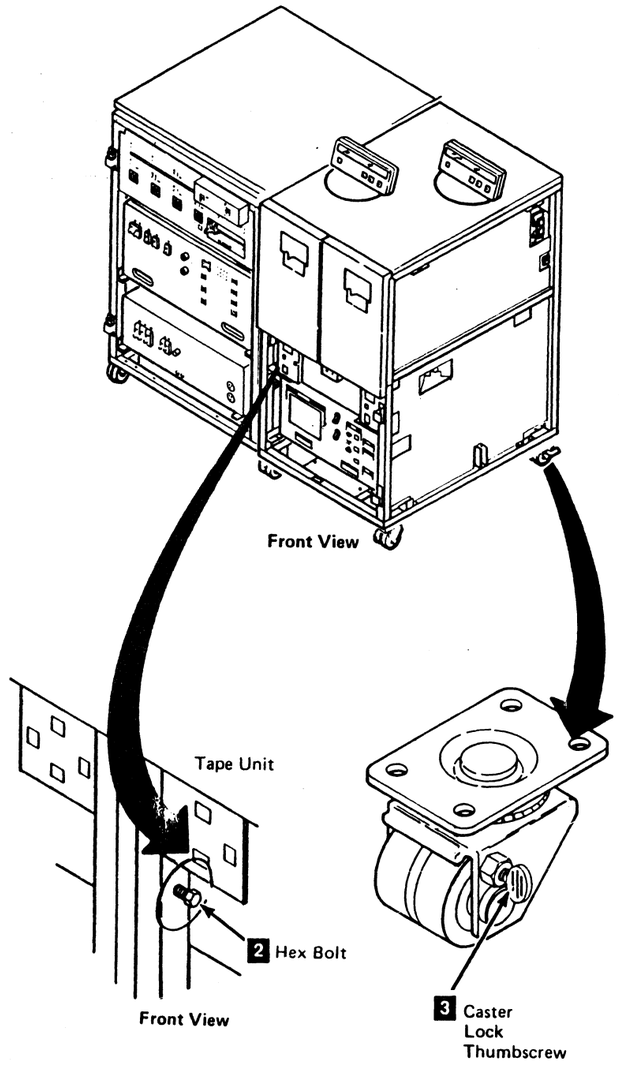
__ 15. Lock the rear casters on the tape unit by turning the caster lock thumbscrews clockwise until they are tight.

Before You're Through...

Are you installing additional tape units to this control unit?

YES NO
| |
| Go to INST 321, step 16.
|
Go to INST 320 to install additional tape units.





3480 MI EC336396

3480 Installation Instructions

This page is for control units without BM 6460460 (See CARR-CU 9) and tape units without BM 6460006 (See CARR-DR 9)

Installing Additional Tape Units

CAUTION: TILT HAZARD

Do NOT open both drives of a tape unit that is not bolted to another tape unit or control unit. With the automatic cartridge loader feature installed and both drive drawers fully extended, a tape unit that is not bolted to another unit will tilt forward with about 20 lbs. of force applied to the top of either automatic cartridge loader.

__ 1. Place the the next tape unit into position.

__ 2. Open the front and rear covers.

CAUTION
Ensure the power cable is not pinched between the machine frames.

. . . . . .

. . . . . .

. . . . . .

__ 3. Connect the next tape unit's ac power cable **6** to the preceding tape unit's power cable socket **9** after removing the safety socket (if not already removed).

__ 4. Fasten the ac power cable to the side of the tape unit with the retaining strap **7**.

__ 5. Open the connector-holding clip **1**.

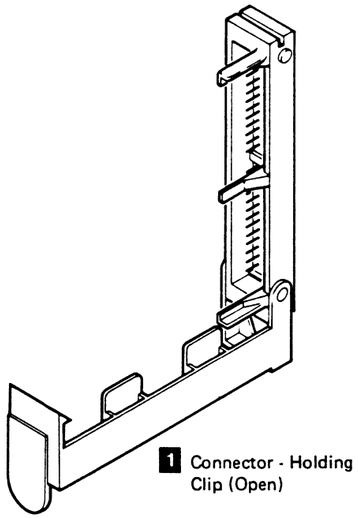
__ 6. Connect the two multi-colored read bus cables **8** from the next tape unit to the preceding tape unit.

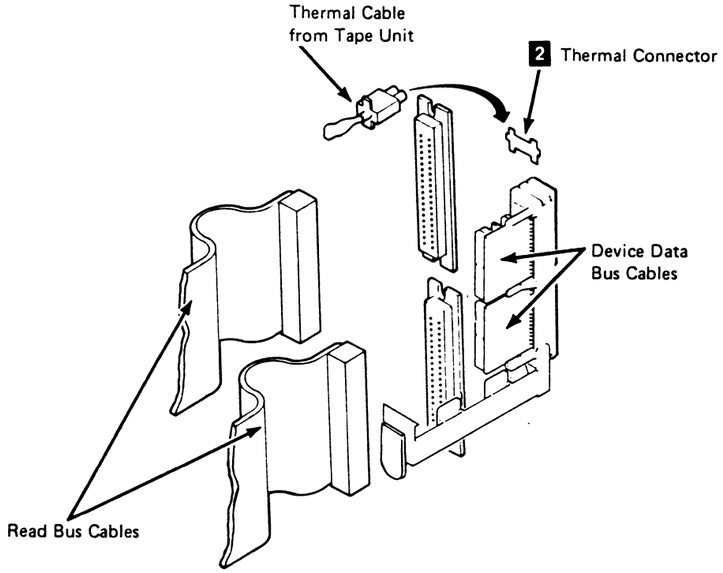
__ 7. Connect the two device data bus cables **5** from the next tape unit to the preceding tape unit.

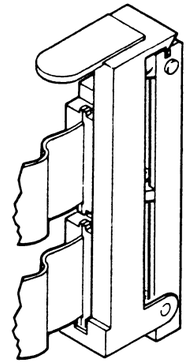
__ 8. Close the connector-holding clip **3**.

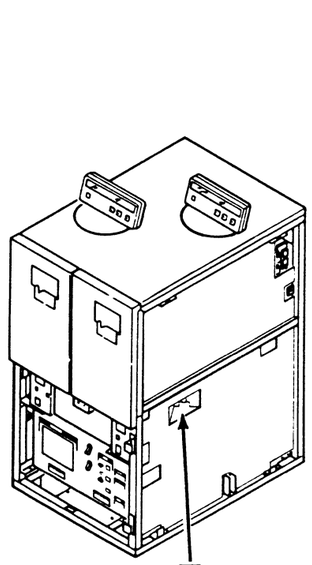
__ 9. Connect the thermal cable **4** on the next tape unit to the thermal connector **2** on the preceding tape unit.

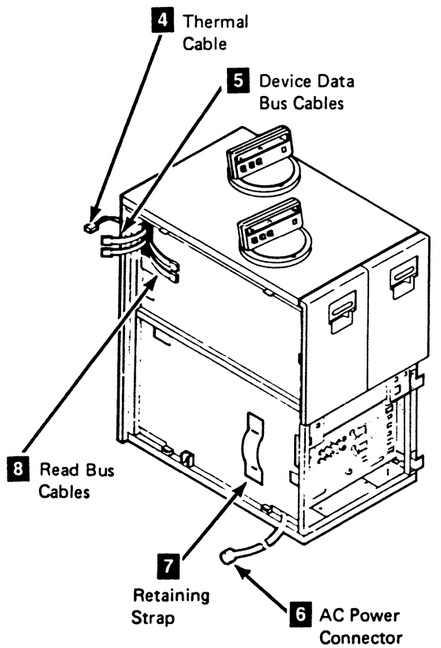
__ 10. Continue with the next step on INST 321.











This page is for control units without BM 6460460 (See CARR-CU 9) and tape units without BM 6460006 (See CARR-DR 9)

Installing Additional Tape Units (Continued)

See INST 321 and 325 for the following locations.

__ 11. Place the next tape unit against the preceding tape unit.

CAUTION
When installing a B box to a B box with the automatic cartridge loader feature installed on any drive, the drive must be opened approximately 5 cm (2 in.) to prevent the conductive seal from being pinched between the tape unit frames.

Note: Be sure the position of the casters does not prevent the tape units from fitting snugly together.

__ 12. Fasten the new tape unit to the preceding tape unit by installing a hex bolt and washer at the rear of the tape unit **8**, and at the front of the tape unit **7**.

Note: If the tape units are not correctly aligned, the covers may bind. Ensure that the covers are not binding.

__ 13. Place the rear casters on the new tape unit so the caster lock thumbscrews **6** are accessible.

__ 14. Lock the rear casters on the new tape unit by turning the caster lock thumbscrews clockwise until they are tight.

__ 15. Repeat steps 1 through 14, on INST 320 and INST 321, for each additional tape unit that is attached to the control unit.

On the last tape unit attached to the control unit:

__ 16. Locate the two terminator cards p/n 8492916 **4**, and the card guides, in the ship group. Plug the cards in the device data bus sockets.

a. Open the connector-holding clip **1**.

b. Push the terminator cards **4** straight in until tight.

c. Close the connector-holding clip **5**.

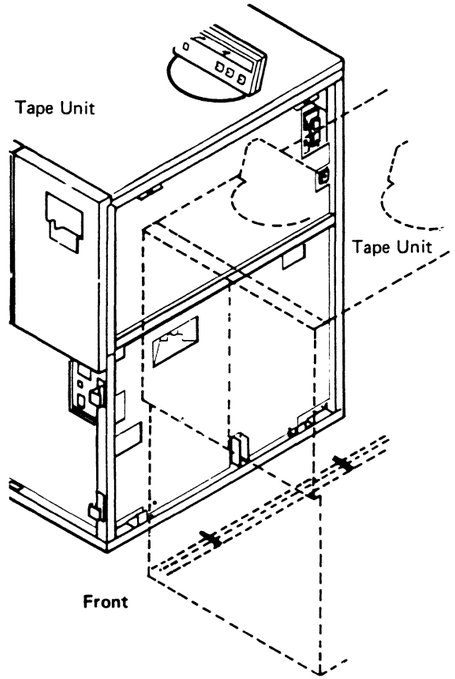
__ 17. Screw the safety cover **9** onto the ac power cable socket.

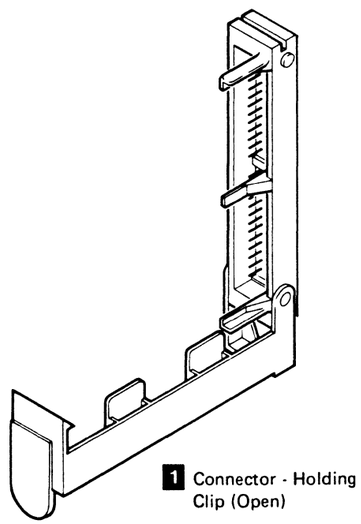
DANGER
Dangerous voltages are present at the ac power cable socket. The safety cover must be on when the socket is not being used. :ed.

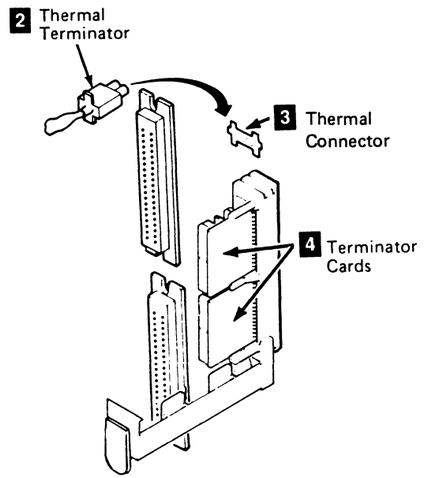
__ *18. Plug the thermal terminator **2** in the thermal connector **3**.*

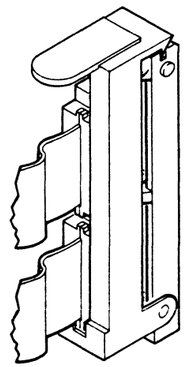
__ *19. Are you installing a second control unit that is to be attached to this control unit with feature cables?*

```
YES NO
|   |
|   Go to INST 340.
|
Have you already installed the second
control unit and the attached tape
units?

YES NO
|   |
|   Return to INST 310 and repeat the
|   procedure for the second control
|   unit.
|
For a dual control unit subsystem, each
control unit has a unique identity:  CU0
or CU1.  The identification switches
will be set later during the installation.

Go to INST 330 to connect the dual control
unit communication cables.
```





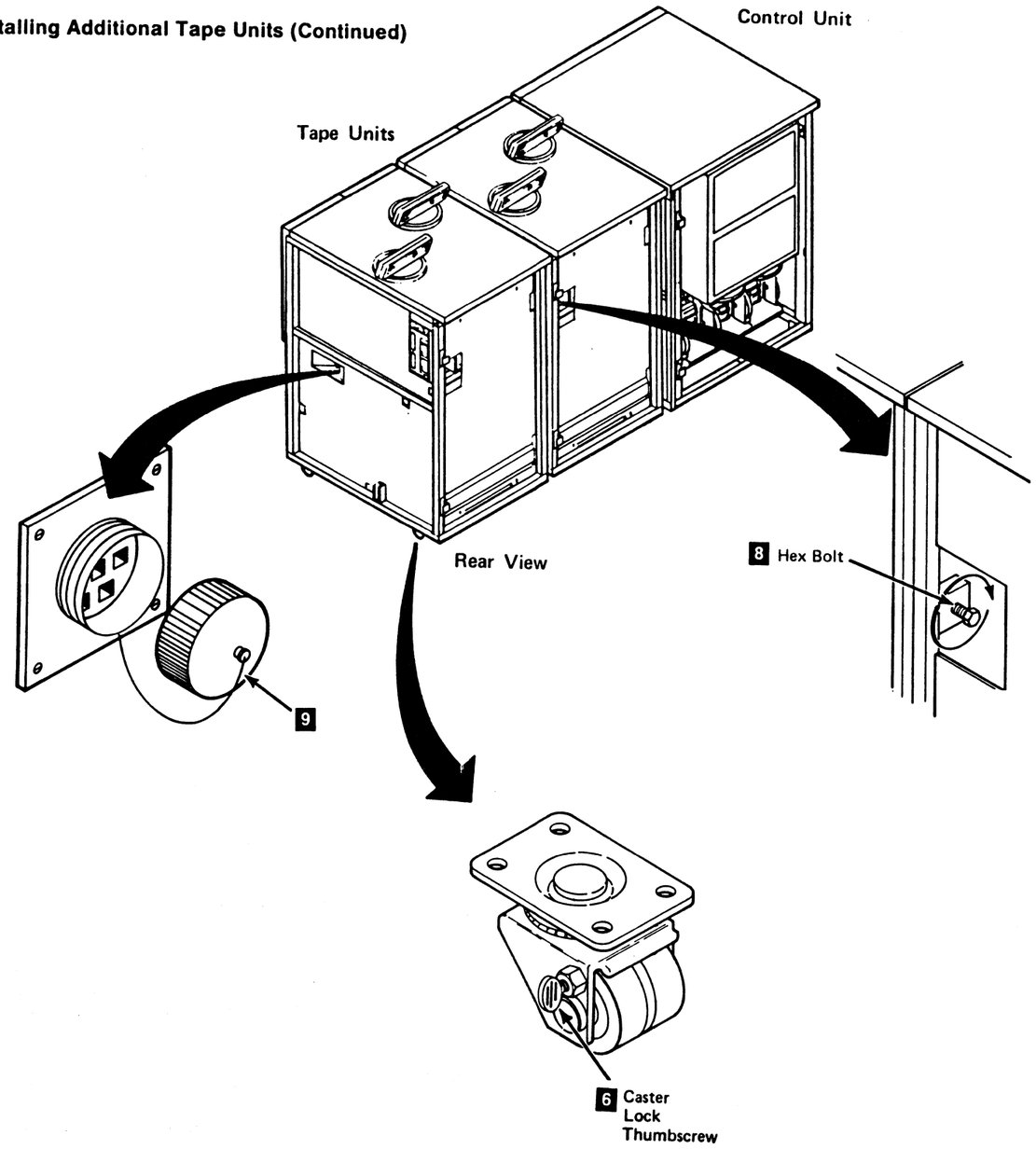


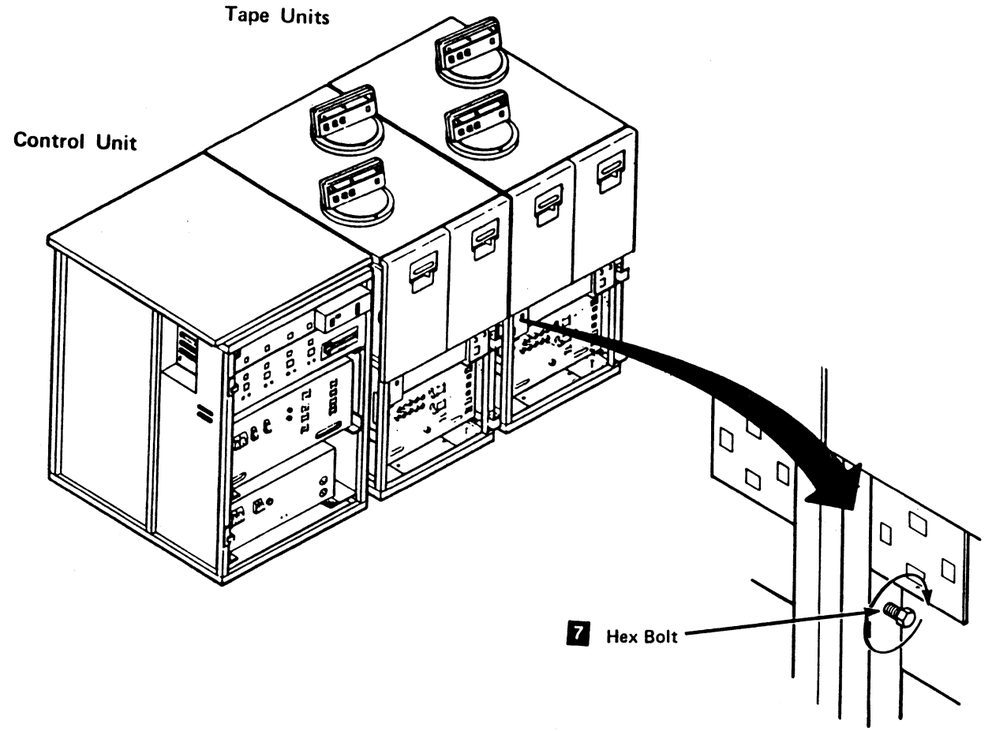


3480 Installation Instructions

This page is for control units without BM 6460460 (See CARR-CU 9) and tape units without BM 6460006 (See CARR-DR 9)

Installing Additional Tape Units (Continued)





3480 Installation Instructions

This page is for control units without BM 6460460 (See CARR-CU 9) and tape units without BM 6460006 (See CARR-DR 9)

Connecting the Dual Control Unit Communication Cables

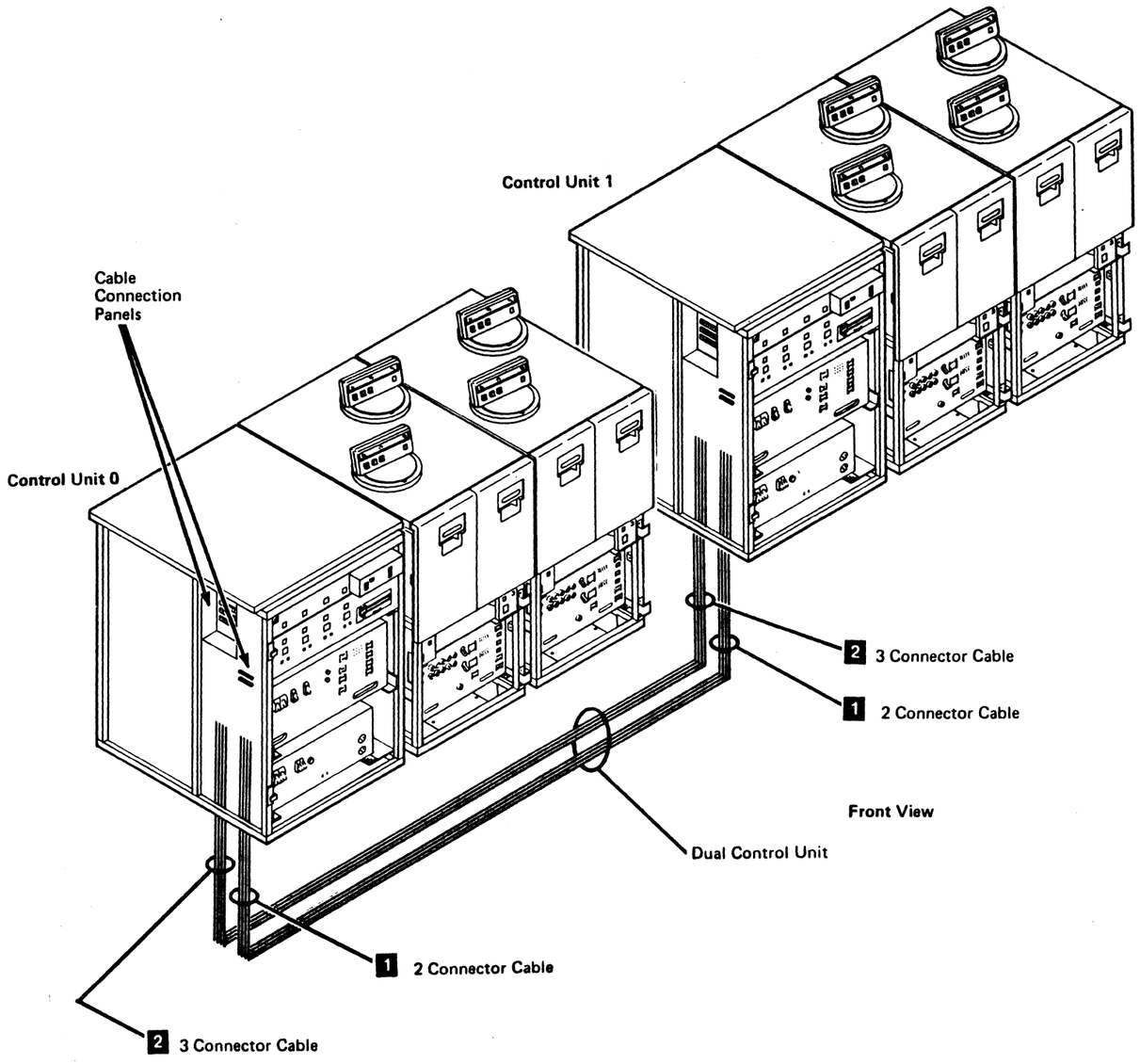
Note: *Two service representatives should perform the following steps at the same time, to reduce the install time.*

__ 1. The 2-connector cable **1** must be toward the front of the control unit; the 3-connector cable **2** must be toward the rear.

__ 2. Bring the cable ends up from the bottom of the control unit inside the machine frame.

Note: *Ensure that the cables are positioned so the cable connectors will line up correctly with the cable sockets* **before** *placing the cables inside the frame.*

__ 3. Continue to the next step on INST 331.



3480 MI EC336396

This page is for control units without BM 6460460 (See CARR-CU 9) and tape units without BM 6460006 (See CARR-DR 9)

Connecting the Dual Control Unit Communication Cables

Note: Two service representatives should perform the following steps at the same time, to reduce the install time.

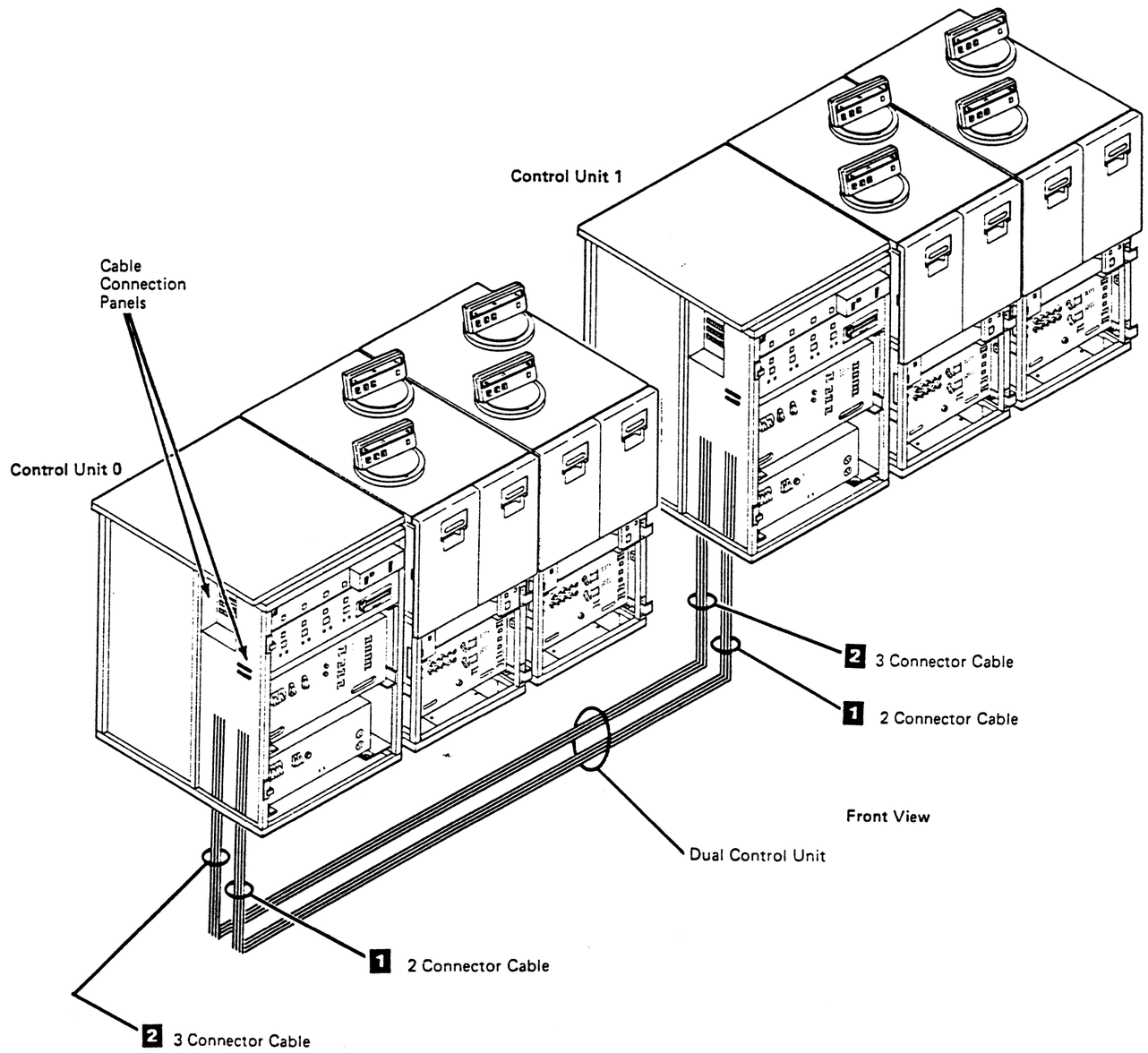
__ 1. The 2-connector cable **1** must be toward the front of the control unit; the 3-connector cable **2** must be toward the rear.

__ 2. Bring the cable ends up from the bottom of the control unit inside the machine frame.

Note: Ensure that the cables are positioned so the cable connectors will line up correctly with the cable sockets **before** placing the cables inside the frame.

__ 3. Continue to the next step on INST 331.

Note: Both control units of a dual control unit subsystem must have the Improved Data Recording Capability feature before the Improved Data Recording Capability allowed switch can be set. If only one control unit has the feature, the Improved Data Recording Capability allowed switch must be set off. See CARR-CU 1200 for switch position assignments.



0 0 0 0 0 0 0 0 0 0

This page is for control units without BM 6460460 (See CARR-CU 9) and tape units without BM 6460006 (See CARR-DR 9)

Connecting the Dual Control Unit Communication Cables (Continued)

__ 4. Before installing the cables, press the cable contacts firmly against the ESD pad **11** to remove any electrostatic discharge.

__ 5. Connect the grounding straps from both the 3-connector cable and the 2-connector cable to the frame at **2**.

__ 6. Plug the 2-connector cable connectors **1** in sockets A1, and A2 **5**.

__ 7. There are two types of cable retention hardware. If your control unit has a retaining plate and screw assembly for sockets A3, A4, and A5, go to step 7. If your control unit has connector holding clips on sockets A3, A4, and A5, do the following:

__ a. Open the connector-holding clips for sockets A3, A4, and A5 **3**.

__ b. Plug the 3-connector cable connectors A3, A4, and A5 **6** in sockets A3, A4, and A5.

Be sure that all cables are seated flat in the connectors; if not, they will damage the cable retention hardware in the next step.

__ c. Close the connector-holding clips.

__ d. Insert the 3-connector cable in the cable retaining bracket **4**.

__ e. Go to step 8.

__ 8. If your control unit has retaining screws for sockets A3, A4, and A5, do the following:

__ a. Plug the 3-connector cable connectors A3, A4, and A5 **6** in sockets A3, A4, and A5.

__ b. Fasten the cables in place with the retaining screws.

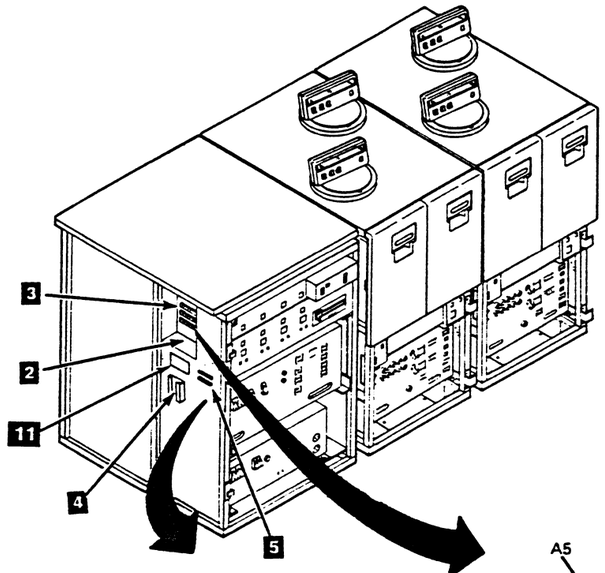
__ c. Insert the 3-connector cable in the cable retaining bracket **4**.

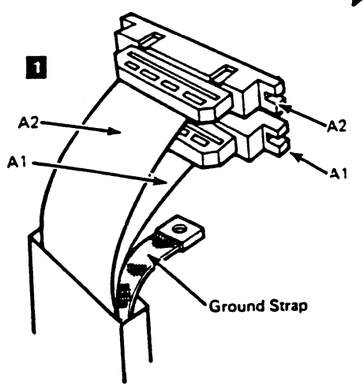
__ 9. Loosen the wingnuts **8** on the cable retaining brackets **7** and rotate the brackets upward.

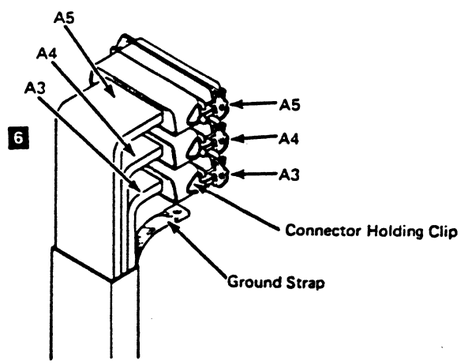
__ 10. Place the cables between the bracket guide posts **9** and ensure there is no excess cable between the connectors and the brackets, so the cable will remain flat against the side of the control unit. Rotate the retaining brackets downward **10**.

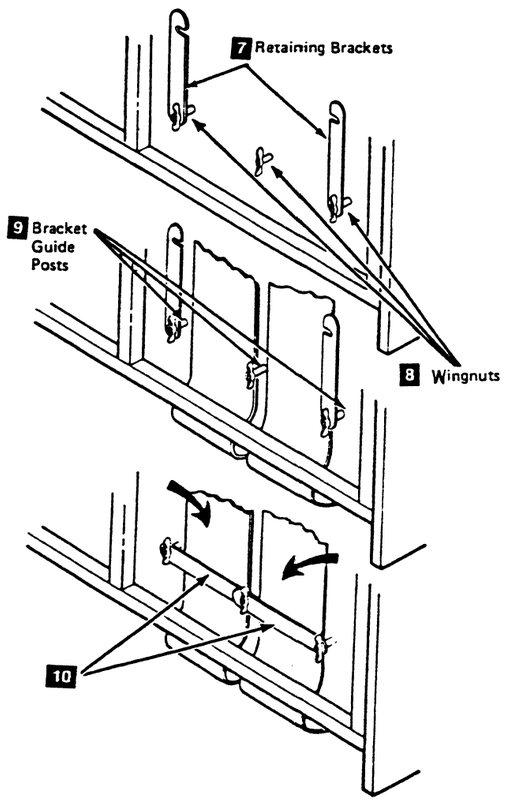
__ 11. Tighten the wingnuts on the retaining brackets.

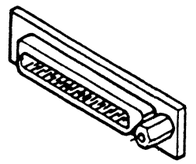
__ 12. Go to INST 340 to set the control unit addresses.











Retaining Screw Assembly

This page is for control units without BM 6460460 (See CARR-CU 9)

Setting the Control Unit Addresses

The following procedures are used to set the control unit addresses.

Depending on what features the control unit has, there may be address switches in positions A, B, C, and D on the control unit operator setup panel.

Each switch pair has two thumbwheel switches. The left switch is set to the control unit address. The right switch is set to a value to be determined by the "Switch Setting Chart" on INST 341.

Attention: The 3480 is a non-shared device. Check the system requirements for control unit addressing and unit control word (UCW) assignment before setting the address switches. All unit control word (UCW) specifications for the 3480 addresses must be set to block, unshared. Also, the proper channel protocal (data streaming or DC Interlock) must be specified. All 16 possible addresses for a 3480 subsystem must be specified, even if some of the drives will not be present. The 3480 control unit can address all 16 addresses, and may generate error information or interrupts for non-existent devices in certain circumstances.

Setting the Control Unit CU0/CU1 Switch

On a single control unit subsystem:

__ 1. Set the CU0/CU1 switch **1** to CU0.

__ 2. Go to "Setting the Channel Address Switches" on this page.

On a dual control unit subsystem:

__ 1. On CU0, set the CU0/CU1 switch **1** to CU0.

Note: CU0 has drive addresses 0 – 7 physically attached to the control unit.

__ 2. On CU1, set the CU0/CU1 switch **1** to CU1.

Note: CU1 has drive addresses 8 – F physically attached to the control unit.

__ 3. Go to "Setting the Channel Address Switches" on this page.

Setting the Channel Address Switches

On each control unit being installed, set the control unit address switches **2** as follows:

__ 1. If the "Channel Information Chart" on INST 341 has been completed, go to step 2. If the "Channel Information Chart" has not been completed, obtain the channel address, control unit address, and type of channel being used from the customer, the installation planning representative, or the systems assurance representative. Record this information in the "Channel Information Chart."

The channel types are:

- Interlocked (DCI)
- 2-Megabyte data streaming (2 Mb)
- 3-Megabyte data streaming (3 Mb)
- 4.5-Megabyte data streaming (4.5 Mb).

__ 2. Start with switch position A: set the left thumbwheel switch to the control unit address from the "Channel Information Chart."

__ 3. Use the Switch Setting Chart on INST 341 to find the value for the right thumbwheel switch as follows:

a. Find your control unit address on the left.

b. Move to the right to your channel type.

The point of intersection contains the value to use for the right thumbwheel switch.

c. Set the right thumbwheel switch.

__ 4. Repeat steps 2 and 3 for all installed channels.

Attention: All channel adapters installed on the control unit must be set to a valid configuration, as shown in the table on INST 341, even if the channel is not connected to a host system. Failure to set a valid configuration causes symptoms of hardware failure.

__ 5. Attach the control unit address labels **3** to match the setting on the address selectors.

__ 6. Determine if the control unit has the Improved Data Recording Capability (IDRC) feature installed. If the customer does NOT have software to support IDRC, ensure that the feature is disabled in FRU 120.

__ 7. Go to INST 355 if no tape units are to be attached to this control unit.

__ 8. Go to INST 350 to set the drive addresses.

3480 MI EC A57724

3480 Installation Instructions

This page is for control units without BM 6460460 (See CARR-CU 9) and tape units without BM 6460006 (See CARR-DR 9)

Setting the Control Unit Addresses (Continued)

Channel Information Chart

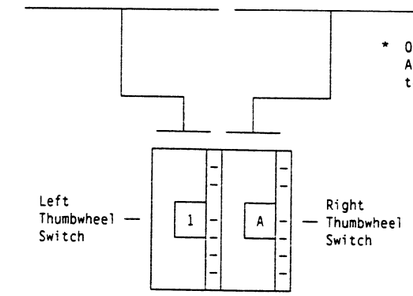
CONTROL UNIT 0			
SWITCH POSITION	CHANNEL ADDRESS	CONTROL UNIT ADDRESS	CHANNEL TYPE
A			
B			
C			
D			

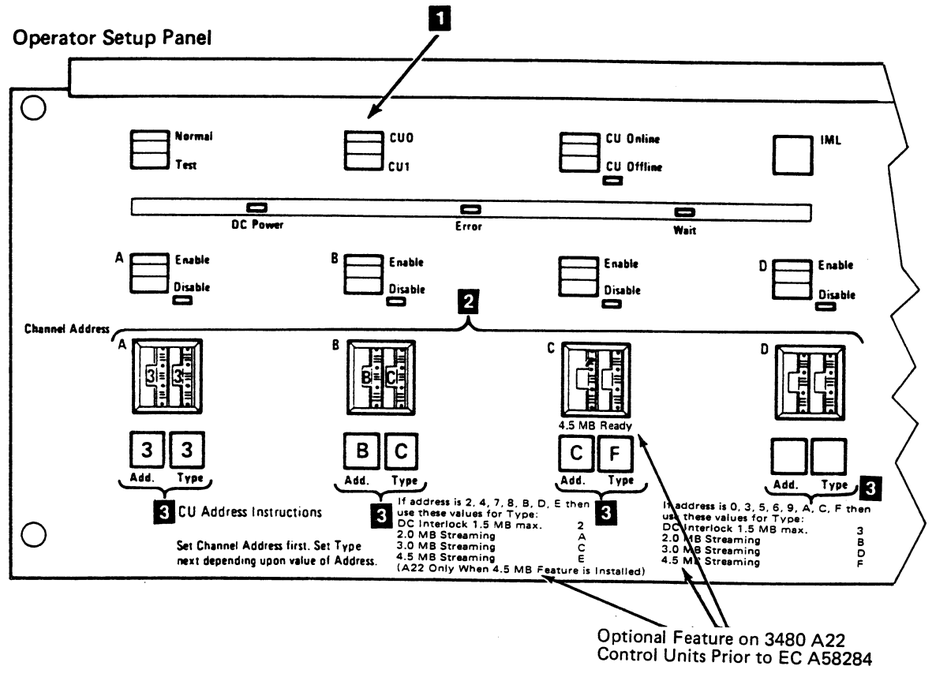
CONTROL UNIT 1			
SWITCH POSITION	CHANNEL ADDRESS	CONTROL UNIT ADDRESS	CHANNEL TYPE
A			
B			
C			
D			

Switch Setting Chart

CONTROL UNIT ADDRESS	CHANNEL TYPES			
	DCI 1.5MB	2MB	3MB	4.5MB*
0 3 5 6 9 A C F	3	B	D	F
1 2 4 7 8 B D E	2	A	C	E

* Optional feature on 3480 A22 control units prior to EC A58248.





3480 Installation Instructions

This page is for control units without BM 6460460 (See CARR-CU 9) and tape units without BM 6460006 (See CARR-DR 9)

Setting the Drive Logical and Physical Addresses

Use the following procedures to set the drive logical address, and physical address. There are separate procedures for a single control unit subsystem and a dual control unit subsystem --- be sure to use the correct procedure.

Single Control Unit Subsystem

__ 1. Set the drive logical address switches **2** to 0 through 7; set the drive next to the control unit to 0, set the next drive to 1, and so forth. See figure 1.

__ 2. Attach the address labels **1** to the drive operator panels. Each label should match the number set on the drive logical address switch.

__ 3. Open the drive drawers.

__ 4. Remove the drive safety cover (see CARR-DR 2-5).

__ 5. Find the physical address switch **4** at the rear of the tape deck, on the rear panel cover **3**.

__ 6. Set the drive physical address switches to match the logical address switches.

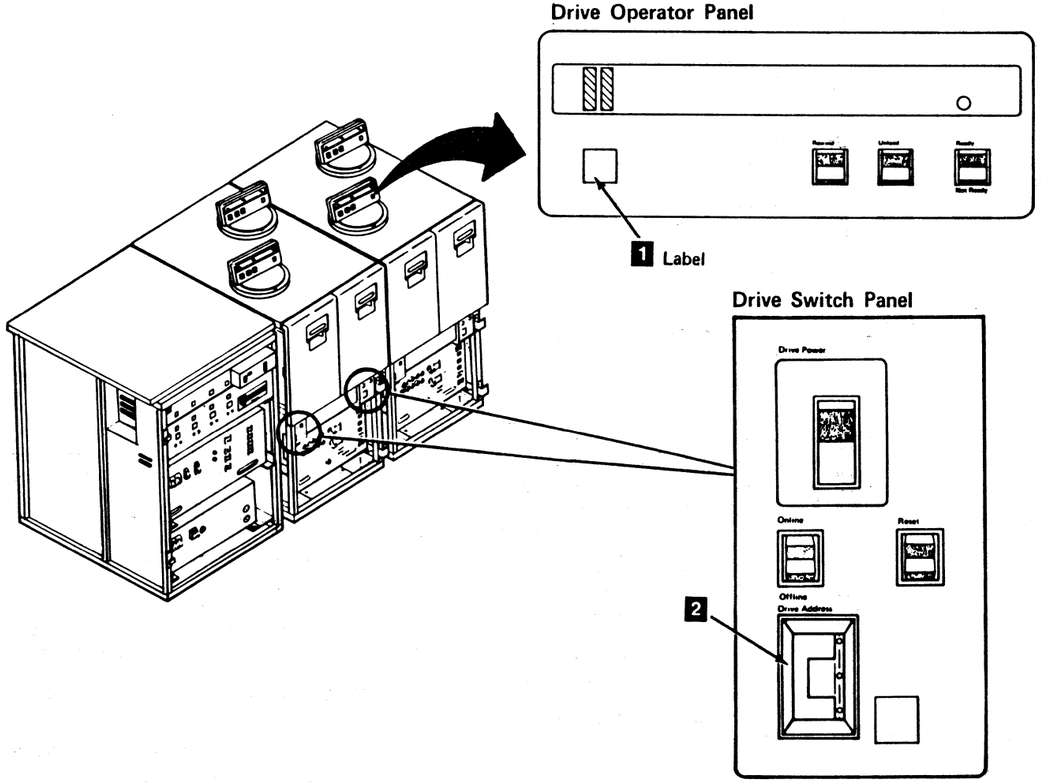
__ 7. Replace the drive safety cover (see CARR-DR 2-5), and close the drive drawer.

__ 8. Ensure that the logical and physical address switches are set on all drives before continuing.

__ 9. Go to INST 355 to check the control unit power supply jumpers.

CU0	0	1	2	3	4	5	6	7
CU1	8	9	A	B	C	D	E	F

Figure 1. Required Drive Address Values



Dual Control Unit Subsystem

__ 1. Set the drive logical address switches **2** on the drives attached to CU0, to 0 through 7; set the drive next to the control unit to 0, set the next drive to 1, and so forth. See figure 1.

__ 2. Set the drive logical address switches **2** on the drives attached to CU1, to 8 through F; set the drive next to the control unit to 8, set the next drive to 9, and so forth. See figure 1.

__ 3. Attach the address labels **1** to the drive operator panels. Each label should match the number set on the drive logical address switch.

__ 4. Open the drive drawers.

__ 5. Remove the drive safety cover (see CARR-DR 2-5).

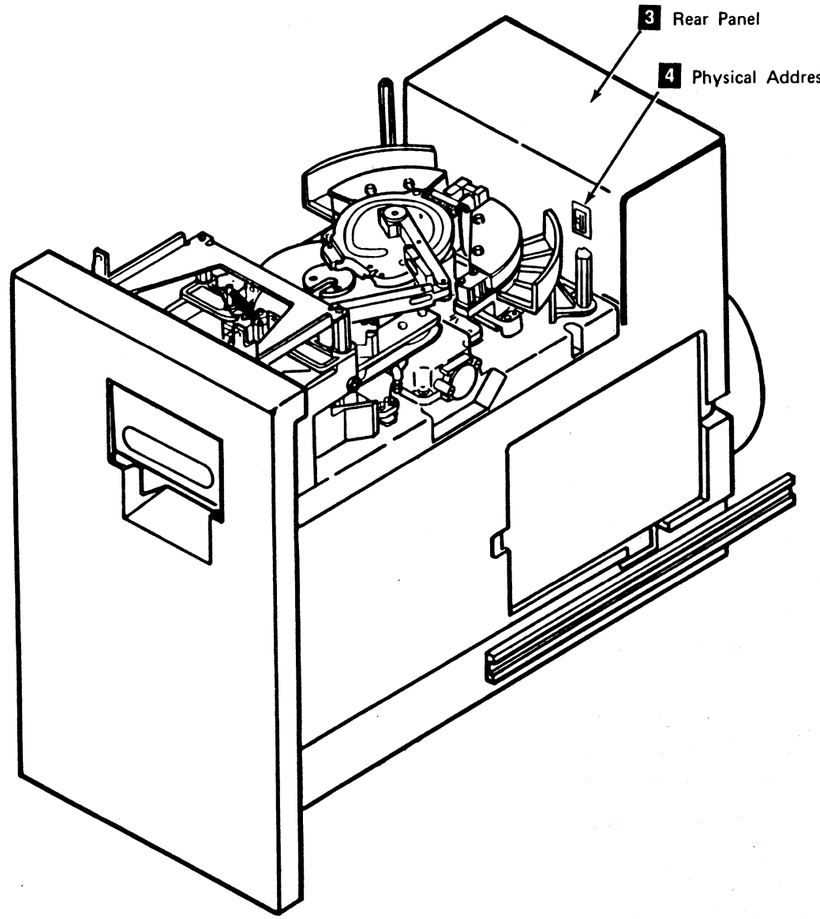
__ 6. Find the physical address switch **4** at the rear of the tape deck, on the rear panel cover **3**.

__ 7. Set the drive physical address switches to match the logical address switches.

__ 8. Replace the drive safety cover (see CARR-DR 2-5), and close the drive drawer.

__ 9. Ensure that the logical and physical address switches are set on all drives before continuing.

__ 10. Go to INST 355 to check the control unit power supply jumpers.



This page is for control units without BM 6460460 (See CARR-CU 9) and tape units without BM 6460006 (See CARR-DR 9)

Checking Control Unit Power Supply Jumpers

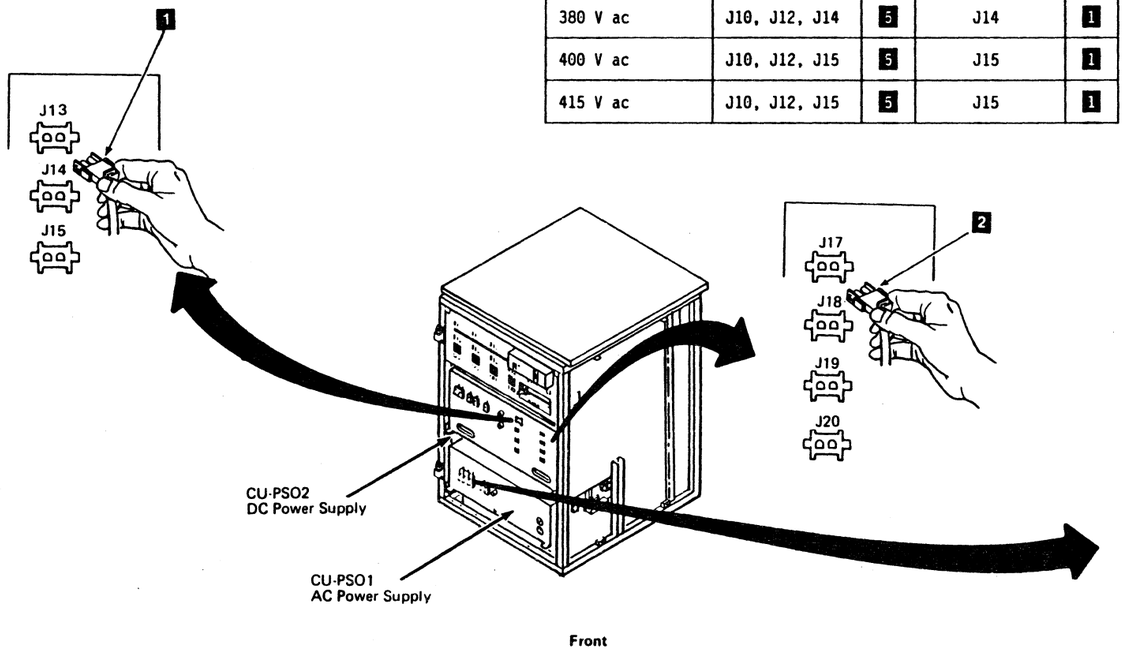
Check the jumpers for the control unit ac (PS01) and dc (PS02) power supplies. If the installation is a dual control unit subsystem, check both control units.

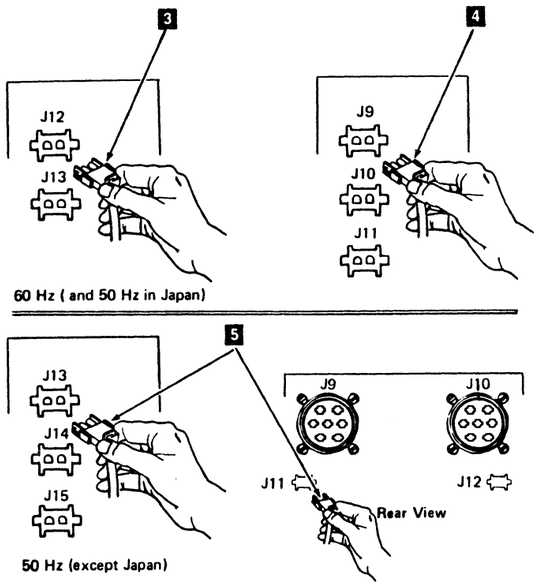
__ 1. Use one of the following two tables to check the voltage settings. Ensure the jumpers are installed correctly for the voltage being used.

Note: *For 50 Hz (except Japan) machines, if the Delta/Wye jumper has to be changed (J09 and J10 on CU-PS01), ensure that the cap is reinstalled on the empty socket.*

CONTROL UNIT VOLTAGE JUMPERS – 60 HZ AND 50 HZ JAPAN				
CU INPUT VOLTAGE	POSITION OF AC (PS01) JUMPER	REF	POSITION OF DC (PS02) JUMPER	REF
200/208 V ac	J09	4	J13	1
220 V ac	J10	4	J14	1
230/240 V ac	J11	4	J15	1
CONVENIENCE OUTLET				
100 V ac	J12	3		
120 V ac	J13	3		

CONTROL UNIT VOLTAGE JUMPERS – 50 HZ (EXCEPT JAPAN)				
CU INPUT VOLTAGE	POSITION OF AC (PS01) JUMPERS	REF	POSITION OF DC (PS02) JUMPER	REF
200/208 V ac	J09, J11, J13	5	J13	1
220 V ac	J09, J11, J14	5	J14	1
230/240 V ac	J09, J11, J15	5	J15	1
380 V ac	J10, J12, J14	5	J14	1
400 V ac	J10, J12, J15	5	J15	1
415 V ac	J10, J12, J15	5	J15	1





__ 2. A control unit has from 1 to 4 channel adapters. The position of the jumper plug for CU-PS02-J17 through CU-PS02-J20 2 is determined by the number of channel adapters in the control unit. Use the following table to ensure that the CU is jumpered for the correct number of channel adapters.

Note: *If the Power Supply on the CU has different Jumper Labels than described here, follow the instructions on the Power Supply Template.*

CONTROL UNIT CHANNEL JUMPERS	
NUMBER OF CHANNEL ADAPTERS	POSITION OF DC (PS02) JUMPER
1	J17
2	J18
3	J19
4	J20

__ 3. Switch all of the circuit breakers on each control unit off then back on. See LOC 1 for the CU dc and ac power supplies.

__ 4. Open the back of each CU and ensure that the Service switch mounted on the gate is in the On position. See LOC 1.

__ 5. Go to INST 360 if no tape units are to be connected to this control unit.

__ 6. Go to INST 356 to check the tape unit power supply jumpers.

This page is for control units without BM 6460460 (See CARR-CU 9) and tape units without BM 6460006 (See CARR-DR 9)

Checking Tape Unit Power Supply Jumpers

Use the following table to check for correct voltage jumpering on each tape unit dc power supply.

Attention: The correct position of the tape unit's dc (PS01) jumper is determined by the control unit's input voltage, NOT the tape unit's input voltage. See the table below.

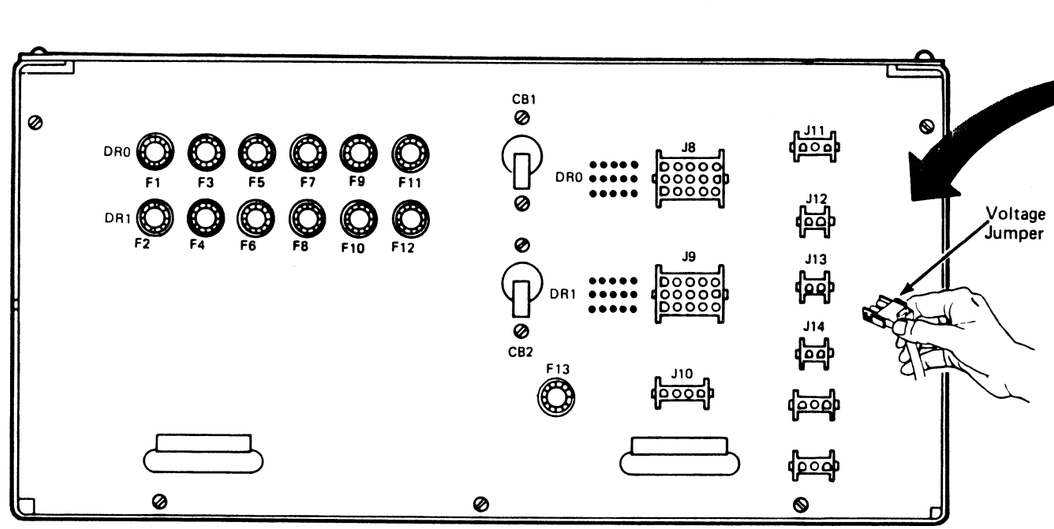
__ 1. Remove the front safety cover to gain access to the dc power supply. See CARR-DR 2-3 for removal/replacement procedures.

TAPE UNIT VOLTAGE JUMPER	
CU INPUT VOLTAGE	POSITION OF DC (PS01) JUMPER
200/208 V ac	J12
220 V ac	J13
230/240 V ac	J14
380 V ac	J13
400 V ac	J14
415 V ac	J14

__ 2. Switch all circuit breakers on each tape unit off then back on. See LOC 1 for circuit breaker locations.

Replace the front safety cover removed in step 1. See CARR-DR 2-4 for replacement procedures.

__ 3. Go to INST 360 to connect the control unit ac power cable.



Front

This page is for control units without BM 6460460 (See CARR-CU 9) and tape units without BM 6460006 (See CARR-DR 9)

Connecting the Control Unit AC Power Cable

DANGER
Make sure the circuit breaker that supplies power to the customer's receptacle is OFF.

If you are installing a dual control unit subsystem, power to both customer receptacles must be OFF.

Make sure that there are no cables attached to the I/O tailgate assembly in the bottom rear of the control unit.

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Note: See INST 361 for the following locations.

__ 1. On the control unit operator setup panel, set the Power On/Off switch **3** to Off. Set the Unit Emergency Power Off (UEPO) switch **4** to Power Off.

Are you satisfied that the customer receptacle and control unit power connector are wired correctly? See INST 306 for safety checks.

```
YES NO
|   |
|   Inform the customer to have the
|   wiring corrected.
|
Continue to the next step.
```

__ 2. Connect the control unit ac power connector **12** to the customer receptacle.

__ 3. On the control unit operator setup panel:

__ a. Set the Power On/Off switch **3** to On.

__ b. Set the CU Online/CU Offline switch **2** to CU Offline.

__ c. Set the Local/Remote switch **6** to Local.

Note: *Early control units have a Local Power On/Off switch located directly below the Power On/Off switch* **3**. *Ensure this is set to the On position if it is present.*

__ 4. On each drive switch panel:

__ a. Set the Drive Power switch **14** to On.

__ b. Set the Online/Offline switch **13** to Online.

__ 5. Have the customer switch on the circuit breaker that supplies power to the customer receptacle.

__ 6. On the control unit operator setup panel:

__ a. Set the UEPO switch **4** to Power Enable.

__ b. Press the Local Power Enable switch **5** to supply power to the control unit and its attached drives.

Is the DC Power light on the control unit operator setup panel **1** On?

```
YES NO
|   |
|   Is the Service switch on the 01A
|   gate in the CU 9 set to On?
|
|   YES NO
|   |   |
|   |   Set the switch to On and press
|   |   the Local Power Enable switch 5.
|   |
|   |   Is the DC Power light on the CU
|   |   operator setup panel 1 On?
|   |
|   |   YES NO
|   |   |   |
|   |   |   Go step 7 on this page.
|   |   |
|   |   Go step 14 on this page.
|   |
|   Go step 7 on this page.
|
Go step 14 on this page.
```

__ 7. Vibration or temperatures exceeding operating temperatures during shipping may trip the upper or lower thermal switches on the logic gate.

Set the UEPO switch **4** to Off.

__ 8. Loosen the two screws **10** on the top of the logic gate **7**, and raise the top cover to gain access to the upper thermal switch **8**.

__ 9. Press the reset button located on the upper thermal switch, then lower the top cover, and tighten the two top cover screws.

__ 10. Locate the lower thermal switch **11** on the bottom of the logic gate.

__ 11. Press the lower thermal switch reset button.

__ 12. Set the UEPO switch **4** to Power Enable.

__ 13. Press the Local Power Enable switch **5** to supply power to the control unit and its attached drives.

Is the DC Power light on the control unit operator setup panel **1** On?

```
YES NO
|   |
|   Go to MAP 0100-Power Start, on PWR
|   100, to repair the power failure;
|   then return to this page, INST 360,
|   step 2 and continue.
|
Continue with the next step.
```

Checking the Unit Emergency Power Off (UEPO) switch

__ 14. Set the control unit Power On/Off switch **3** to the Off position.

__ 15. Set the UEPO switch **4** to the Power Off position.

__ 16. Attempt to power on the control unit with the UEPO switch in the Power Off position, by doing the following:

__ a. Set the Power On/Off switch **3** to the On position.

__ b. Press the Local Power Enable switch **5**.

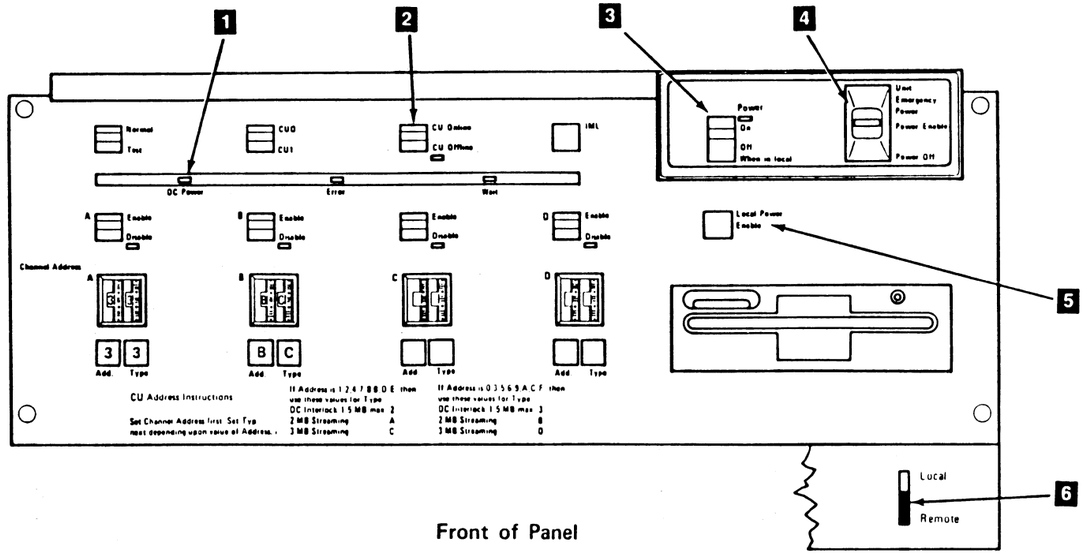
Does the control unit power on with the UEPO switch in the Power Off position?

```
YES NO
|   |
|   Go to step 17 on this page.
|
There is a problem with the UEPO switch
(FRU198) or the ac power supply (FRU144).
Follow the instructions in the CARR
section of the Maintenance Information
for the removal and replacement of those
FRUs.  Return here and repeat steps 14
through 16 after each FRU is replaced.

Does the control unit power on with the
UEPO switch in the Power Off position?

YES NO
|   |
|   Go to step 17 on this page.
|
Go to MAP 0100-Power Start, on PWR 100,
to repair the power failure; then return
here to complete the installation.
```

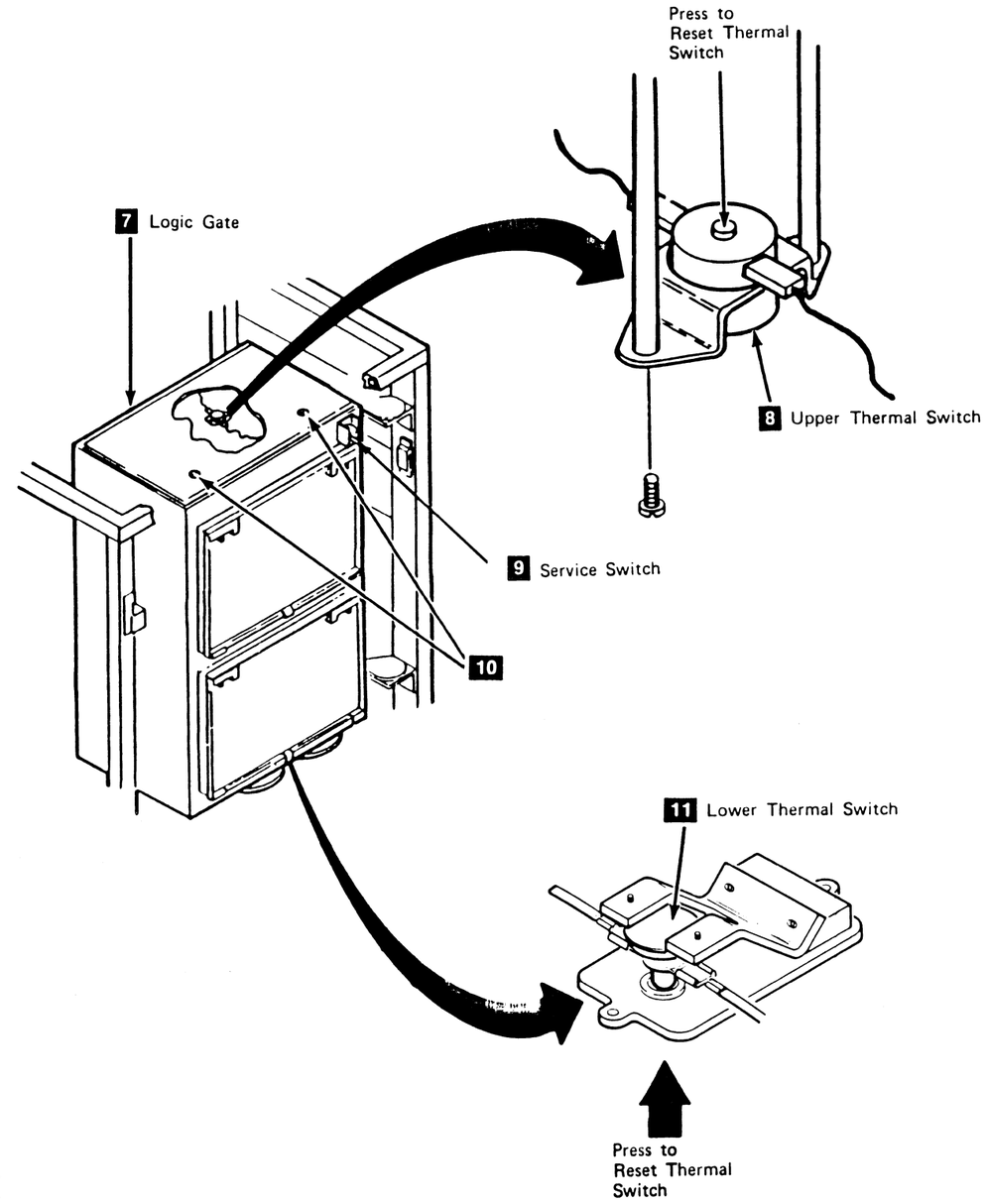
__ 17. Are you installing a single control unit subsystem?

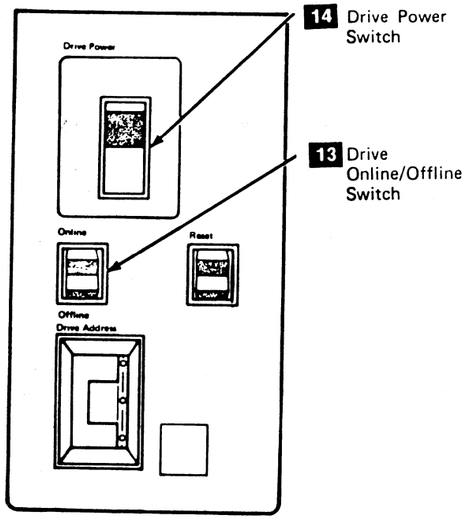
```
YES NO
|   |
|   Are two service representative's installing
|   this subsystem at the same time?
|
|   YES NO
|   |   |
|   |   Repeat steps 1 through 16 for
|   |   the second control unit, then
|   |   set the Power ON/OFF switch 3
|   |   to OFF on both control units
|   |   and go to INST 376.
|   |
|   Set Power ON/OFF switch 3 to OFF
|   and go to INST 376.
|
Set Power ON/OFF switch 3 to OFF
and go to INST 370.
```

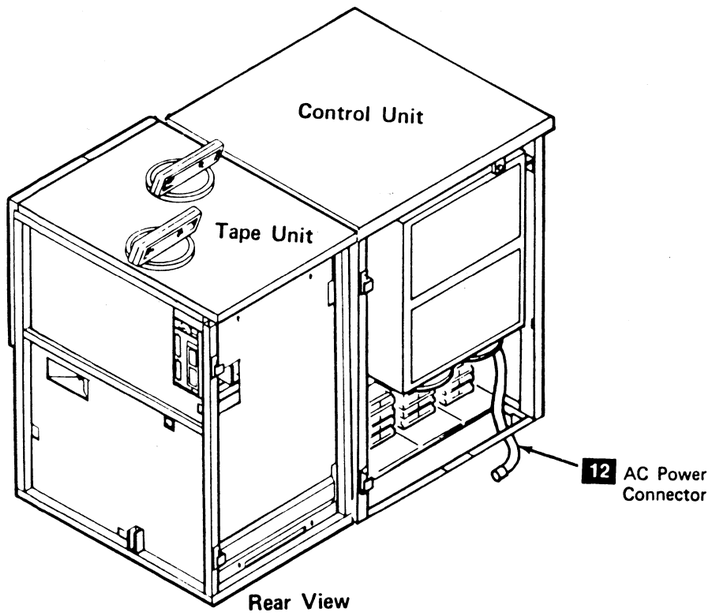
This page is for control units without BM 6460460 (See CARR-CU 9) and tape units without BM 6460006 (See CARR-DR 9)



Front of Panel







Rear View

This page is for control units without BM 6460460 (See CARR-CU 9) and tape units without BM 6460006 (See CARR-DR 9)

Running Offline Checkout for a Single Control Unit Subsystem

This procedure is used for offline checkout of a single control unit subsystem only. Go to INST 376 if you have a dual control unit subsystem.

The offline checkout tests whether the control unit can communicate with all the drives in the subsystem.

As you progress through the tests, you are asked to note the address of any drive that does not show the display response expected. After the offline checkout is complete, you will be sent to INST 390 to analyze the drives that failed during the checkout.

The error light 3 will light when certain portions of the offline tests are run. This condition is normal and does not indicate a failure in the control unit unless you are asked to note the status of the error light.

Note: See INST 371 for the following locations.

Setting Up for the Checkout

Note: If you are adding a tape unit to a previously installed subsystem, do the following procedures testing only that tape unit you are adding.

__ 1. On the control unit operator setup panel:

- __ a. Verify that the Power On/Off switch **5** is set to Off.
- __ b. Set the Normal/Test switch **1** to Test.
- __ c. Verify that the CU0/CU1 switch **2** is set to CU0. Recommended (but not required) for single control unit subsystems.
- __ d. Verify that the CU Offline/CU Online switch **4** is set to CU Offline.

__ 2. On each drive operator panel:

- __ a. Set the Ready/Not Ready switch **12** to Ready.

__ 3. On each drive switch panel:

- __ a. Verify that the Drive Power switch **7** is set to On.
- __ b. Verify that the Online/Offline switch **10** is set to Online.

__ 4. On each drive with the Automatic Cartridge Loader feature, set the Loader switch **13** to Auto.

__ 5. On the control unit:

3.5 Inch IML Disk Drive

- __ a. Push the release button on the IML disk drive **11** and remove the head protector.
- __ b. Insert the IML diskette (label up and toward you) and push until the drive closes.
- __ c. Set the Power On/Off switch **5** to On.

5.25 Inch IML Disk Drive

- __ a. Open the latch on the IML disk drive **11** and remove the head protector.
- __ b. Insert the IML diskette (label up and towards you) and close the drive latch.
- __ c. Set the Power On/Off switch **5** to On.

Switching on the Power

__ 6. Ensure that the main circuit breaker on the control unit (CB1 on the ac power supply) is off; then switch it On.

__ 7. Set Unit Emergency Power Off switch on the control unit **6** to Power Enable.

__ 8. Press the Local Power Enable pushbutton **9** on the control unit operator setup panel.

__ 9. Does a single asterisk (*) show for ten seconds or longer on each drive message display?

```
YES NO
|   |
|   Are all the switches set correctly?
|
|   YES NO
|   |   |
|   |   Switch off the mainline circuit
|   |   breaker (CB1 on the ac power
|   |   supply) and set the switches as
|   |   specified in steps 1, 2, and 3;
|   |   then perform steps 5 through 7.
|   |
|   |   Does a single asterisk show for
|   |   ten seconds or longer on each
|   |   drive message display?
|   |
|   |   YES NO
|   |   |   |
|   |   |   Note the drive addresses
|   |   |   that did not show a single
|   |   |   asterisk and continue to
|   |   |   the next step.
|   |   |
|   |   Continue to the next step.
|   |
|   Note the drive addresses that did
|   not show a single asterisk and
|   continue to the next step.
|
Continue to the next step.
```

__ 10. On each drive switch panel, set the Drive Power switch **7** to Off; then set it back to On.

Does a single asterisk (*) show for ten seconds or longer on each drive message display?

```
YES NO
|   |
|   Note the drive addresses that did not
|   show a single asterisk and continue to
|   the next step.
|
Continue to the next step.
```

__ 11. On each drive switch panel, press then release the Reset switch **8**.

Does a single asterisk (*) show for ten seconds or longer on each drive message display?

```
YES NO
|   |
|   Note the drive addresses that did
|   not show a single asterisk and
|   continue to the next step.
|
Continue to the next step.
```

__ 12. On each drive switch panel, set the Online/Offline switch **10** to Offline.

Do special box-shaped symbols show in the first and last positions of the message display?

```
YES NO
|   |
|   Note the drive addresses that do
|   not show the special box-shaped
|   symbols and continue to the next
|   step.
|
Continue to the next step.
```

__ 13. On the drive switch panel, set the Online/Offline switch **10** to Online and verify that the special box-shaped symbols go away.

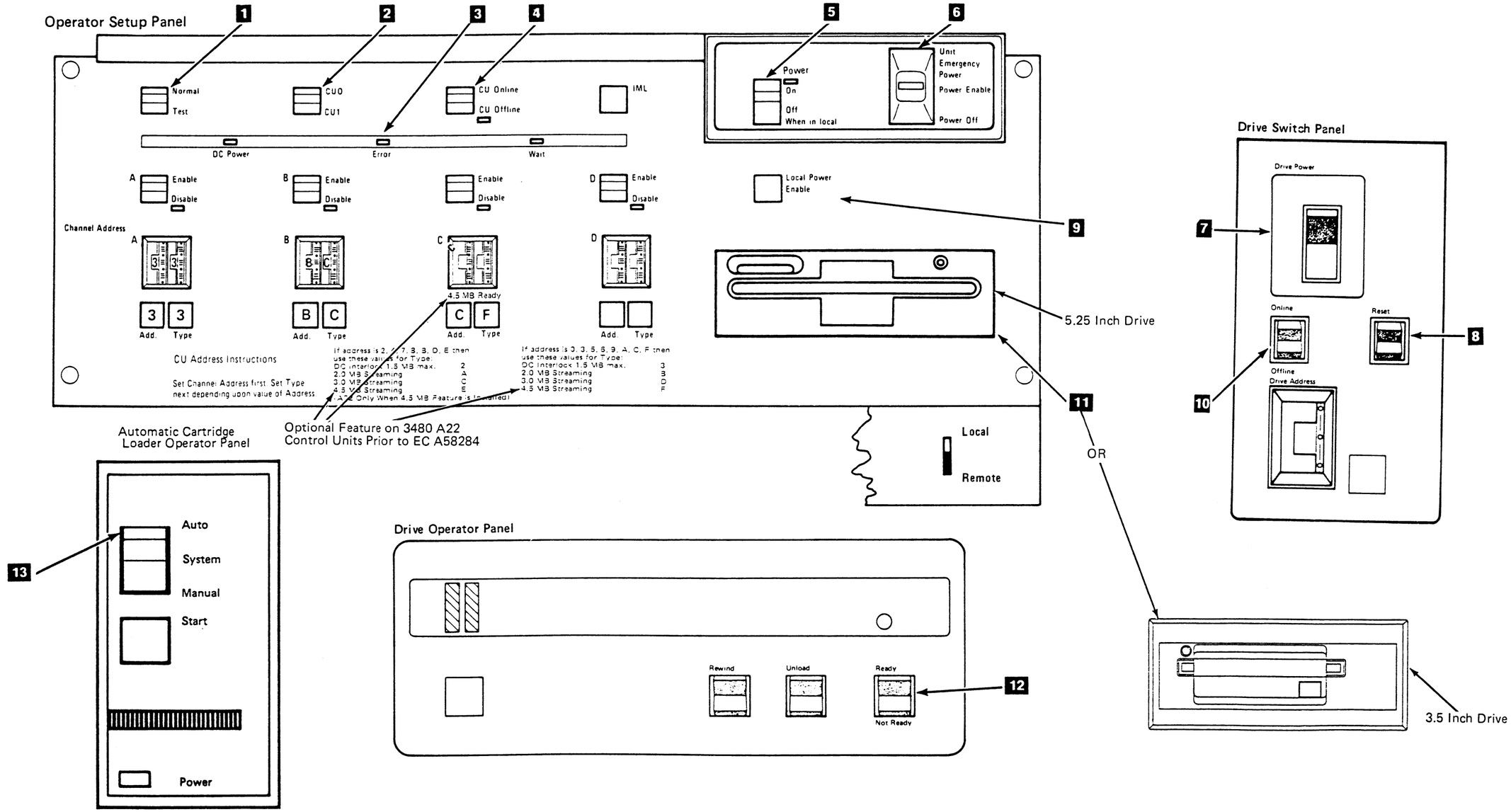
Do the special box-shaped symbols go away?

```
YES NO
|   |
|   Note the drive addresses where the
|   special box-shaped symbols do not go
|   away, and continue with the next step.
|
Continue with the next step.
```

__ 14. Go to INST 372 to continue the offline checkout.

3480 Installation Instructions

This page is for control units without BM 6460460 (See CARR-CU 9) and tape units without BM 6460006 (See CARR-DR 9)



This page is for control units without BM 6460460 (See CARR-CU 9) and tape units without BM 6460006 (See CARR-DR 9)

Running Offline Checkout for a Single Control Unit Subsystem (Continued)

Note: See INST 373 for the following locations.

Checking the Addresses

__ 15. On the control unit operator setup panel, set the CU Online/CU Offline switch **2** to CU Online.

After a short delay (1 1/2 minutes or less) does "L=x P=x" (x being any number between 0 and 7) appear on any drive display?

```
YES NO
 |
 Power off the control unit with the
 Power On/Off switch !4! and verify that
 the switches are set correctly on the
 control unit and tape unit panels.  See
 "Setting Up for the Checkout" steps 1,
 2, and 3 on INST 370 for the correct
 switch settings.  Correct any switch
 settings that are wrong.  Power up and
 repeat the actions you performed in
 step 14.

 Does "L=x P=x" appear on any tape
 drive display?

 YES NO
  |
  The CU will not load the micro-
  program and must be fixed to
  continue.  Set the Normal/Test
  switch 1 to Normal and press
  the IML switch 3.  Insert the
  product maintenance diskette into
  the MD and do an IPL on the MD.
  Follow the maintenance package to
  correct the problem and return
  here when the problem is fixed.

  Set the Normal/Test switch to Test
  and check the CU and tape unit
  switch settings again.  See
  "Setting Up for the Checkout" steps
  1, 2, and 3 on INST 370 for the
  correct switch settings.  Correct
  any switch settings that are wrong.
  Power up and repeat the actions
  you performed in step 14.

  Does "L=x P=x" appear on any tape
  drive display?

  YES NO
   |  |
A  B  C  D
```

```
A  B  C  D
|  |  |  |
|  |  |  Call your next level of
|  |  |  support.
|  |  |
|  |  Note the addresses of any drives
|  |  that do not show the correct
|  |  display, then continue with the
|  |  next step.
|  |
|  Note the addresses of any drives that
|  do not show the correct display, then
|  continue with the next step.
|
Note the addresses of any drives that do
not show the correct display, then
continue with the next step.
```

__ 16. Compare the "L=x" (logical address) portion of each drive display to the address label **6** on each display.

Does each drive display match the label?

```
YES NO
 |
 Ensure that all the drive logical
 addresses are set correctly.  See
 "Setting the Drive Logical and
 Physical Addresses" on INST 350.

 Leaving the control unit Online, power
 it off then back on again.  Note the
 addresses of any drives whose display
 labels 6 still do not match the "L=x"
 portion of the display, then continue
 to the next step.
 |
Ensure that the "P=x" (physical address)
portion of each display does not match the
"P=x" portion of any other drive display
in the subsystem.
```

Does each drive display have a "P=x" number not shared by any other drive?

```
YES NO
 |
 Ensure that all of the drive physical
 addresses are set correctly.  See
 "Setting the Drive Logical and
  Physical Addresses" on INST 350.

 Leaving the control unit Online, power
 it off then on again.  Note any drive
 physical addresses that are still
 incorrect and continue to the next step.
 |
Continue with the next step.
```

Checking Read/Write

__ 17. On the control unit operator setup panel, set the CU Online/CU Offline switch **2** to CU Offline.

After a delay of 1 1/2 minutes or less, does TEST show with the indicator bars **5** flashing on the message display of any drive?

Note: If an Action message appears on any drive display, go to INST 305 and perform the action described for that message. Return here when finished, and set the Power On/Off switch **4** to Off then On and go to step 14 on this page.

```
YES NO
 |
 The CU will not load the microprogram
 and must be fixed to continue.  Set
 the Normal/Test switch 1 to Normal
 and press the IML switch 3.  Insert
 the product maintenance diskette into
 the MD and do an IPL on the MD.
 Follow the maintenance package to
 correct the problem and return here
 when the problem is fixed.
 |
Continue to the next step.
```

__ 18. Set a blank cartridge **7** to not file protect.

__ 19. If the automatic cartridge loader feature is installed, skip the next step.

__ 20. Insert the cartridge into the drive that is nearest the control unit and displaying TEST. Close the cartridge latch and skip the next two steps.

__ 21. Put a cartridge in the top positions of the loader on the drive nearest the control unit and is displaying TEST.

__ 22. Ensure the loader mode switch **8** is set to Auto mode and press the Start switch **9**.

__ 23. If the display shows Action Message 1, 2, 3, or 5 after you load the tape cartridge, go to "Action Messages" on INST 305 and perform the procedure as directed. Return here when you have completed the required procedure.

__ 24. The diagnostic will show various messages on the drive display as it executes, indicating the action the drive is performing.

Each drive will require about 1 3/4 minutes to execute the test, and when complete, will show a single asterisk on the display.

__ 25. While the first drive is being tested, set another blank cartridge **7** to not file protect and insert it into the next drive displaying TEST. The display will show READY U.

When UNLOAD appears on the display of the first drive, the next drive with a tape loaded will begin testing.

Note: This testing procedure can be performed with one scratch tape, but you must wait for each drive to unload the tape. This increases the test time to 2 1/2 minutes for each drive.

__ 26. When the first drive unloads, move that tape to the next drive showing TEST. If the cartridge does not unload, go to "Cartridge Removal by Hand" on CART 10.

__ 27. Repeat this procedure for all drives in the subsystem showing TEST.

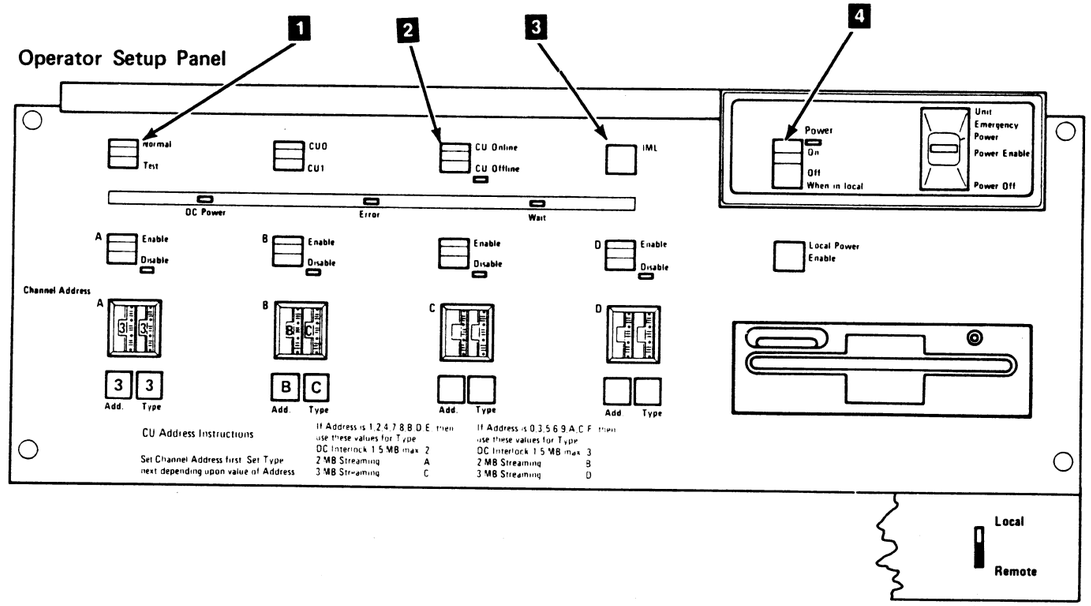
__ 28. If failures occur on multiple drives in a string, there may be a cable connection problem. Check the seating of the device data and read bus cables, and the dual control unit communication cables (for dual control unit subsystems). See LOC 1 for the control unit and tape unit cable locations.

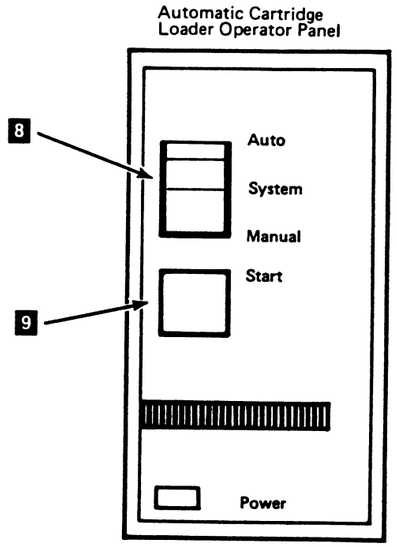
When you have finished checking the cables, insert a cartridge into those drives that were failing and the tests will be rerun.

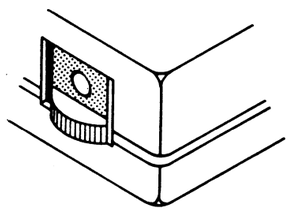
__ 29. If any drives will not run the tests to completion, note the failing drive addresses and that CU0 was running the test. This will be used later on INST 390 when the product package is run.

__ 30. Go to the next step on INST 374.

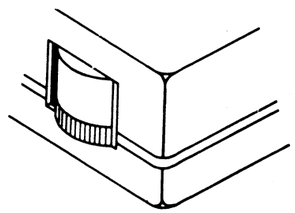
This page is for control units without BM 6460460 (See CARR-CU 9) and tape units without BM 6460006 (See CARR-DR 9)



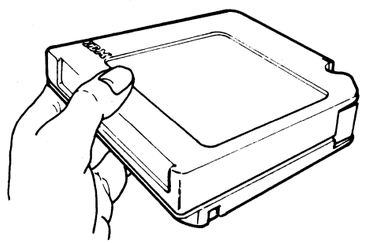




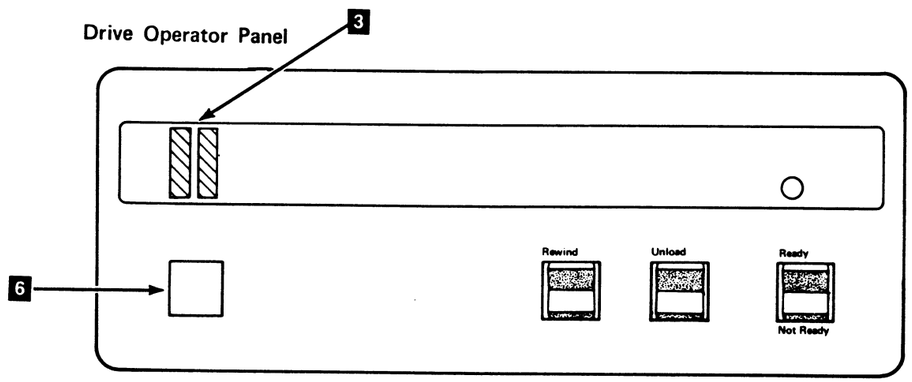
File Protect Position



Not File Protect Position



7 Blank Cartridge



This page is for control units without BM 6460460 (See CARR-CU 9) and tape units without BM 6460006 (See CARR-DR 9)

Running Offline Checkout for a Single Control Unit Subsystem (Continued)

Final Checkout

__ 31. On the control unit operator setup panel, set the Normal/Test switch 1 to Normal.

Do eight asterisks (********) show on all drive displays not showing TEST?

```
YES NO
 |   |
 |   Is the Normal/Test switch 1
 |   set to Normal?
 |
 |   YES NO
 |    |   |
 |    |   Set the switch to Normal and
 |    |   repeat step 26.
 |    |
 |    |   Do eight asterisks show on all
 |    |   drive displays not showing TEST?
 |    |
 |    |   YES NO
 |    |    |   |
 |    |    |   Note the drive addresses
 |    |    |   that do not show eight
 |    |    |   asterisks or TEST and
 |    |    |   continue to the next step.
 |    |    |
 |    |    Continue to the next step.
 |    |
 |    Note the drive addresses that do
 |    not show eight asterisks or TEST
 |    and continue to the next step.
 |
Continue to the next step.
```

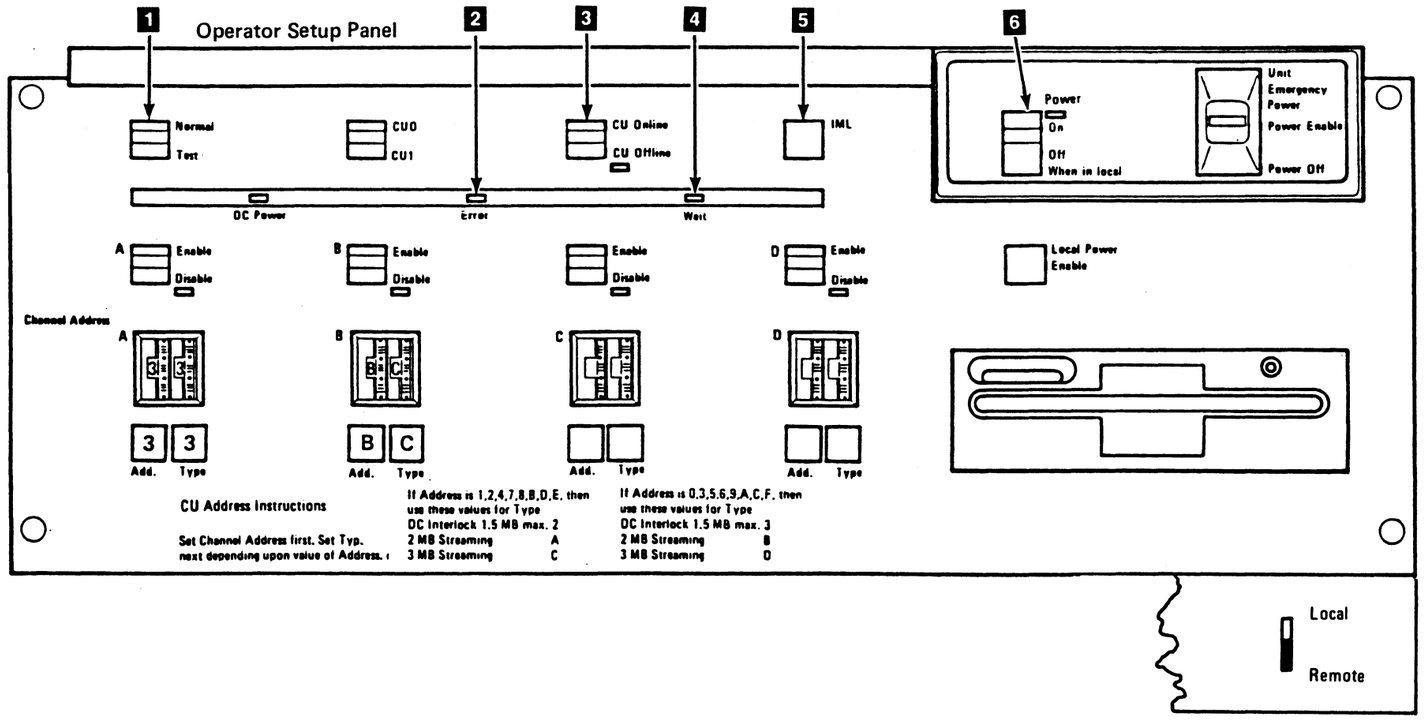
Checking the Initial Microprogram Load (IML)

__ 32. On the control unit operator setup panel, set the Power On/Off switch 6 to Off, then On.

After approximately 60 seconds the Wait light 4 on the control unit operator setup panel should be on solidly, and the Error light 2 should be off.

Are all the lights correct?

```
YES NO
 |   |
 |   The control unit will not load the micro-
 |   program and must be fixed to continue.
 |   Ensure the Normal/Test switch 1 is set
 |   to Normal and the Online/Offline switch
 |   3 is Offline.  Press the IML switch 5.
 |   Insert the product maintenance diskette
 |   into the MD and do an IPL on the MD.
 |   Follow the maintenance package to correct
 |   the problem, and return here when the
 |   problem is fixed.
 |
Go to INST 390, the Offline checkout is complete.
```



Notes

This page is for control units without BM 6460460 (See CARR-CU 9) and tape units without BM 6460006 (See CARR-DR 9)

Running Offline Checkout for a Dual Control Unit Subsystem

This procedure is used for offline checkout of a dual control unit subsystem only. Go to INST 370 if you have a single control unit subsystem.

The offline checkout tests whether both control units can communicate with all the drives in the subsystem. Therefore, some steps in the following procedure appear to be repeated.

As you progress through the tests, you are asked to note the addresses of any drives that do not show the display response expected. Also, you should note whether the drive failed during checkout from CU0 or CU1. After the offline checkout is complete, you will be sent to INST 390 to analyze any drives that failed during the checkout.

The error light 3 will light when certain portions of the offline tests are run. This condition is normal and does not indicate a failure in the control unit unless you are asked to note the status of the error light.

Note: See INST 377 for the following locations.

Setting Up for the Checkout

Note: The offline checkout should be performed by only one service representative.

__ 1. On both control unit operator setup panels:

- __ a. Verify that the Power On/Off switch 5 is set to Off.
- __ b. Set the Normal/Test switch 1 to Test.
- __ c. Verify that the CU0/CU1 switch 2 is set to CU0 on control unit 0 and is set to CU1 on control unit 1.
- __ d. Verify that the CU Online/CU Offline switch 4 is set to CU Offline.

__ 2. On all drive operator panels:

- __ a. Set the Ready/Not Ready switches 12 to Ready.

__ 3. On all drive switch panels:

- __ a. Verify that the Drive Power switches 7 are set to On.
- __ b. Verify that the Online/Offline switches 10 are set to Online.

__ 4. On each drive with the Automatic Cartridge Loader feature, set the Loader switch 13 to Auto.

__ 5. On both control units:

3.5 Inch IML Disk Drive

- __ a. Push the release button on the IML disk drive 11 and remove the head protector.
- __ b. Insert the IML diskette (label up and toward you) and push until the drive closes.
- __ c. Set the Power On/Off switch 5 to On.

5.25 Inch IML Disk Drive

- __ a. Open the latch on the IML disk drive 11 and remove the head protector.
- __ b. Insert the IML diskette (label up and toward you) and close the drive latch.
- __ c. Set the Power On/Off switch 5 to On.

Switching on the Power

__ 6. Ensure that the main circuit breaker on the CU (CB1 on the ac power supply) is off; then switch it On.

__ 7. On both control units, set the Unit Emergency Power switch 6 to Power Enable.

__ 8. Press the Local Power Enable pushbutton 9 on both control units.

__ 9. Does a single asterisk (*) show for ten seconds or longer on each drive display?

```
YES NO
|   |
|   Are all the switches set correctly?
|
|   YES NO
|   |   |
|   |   Switch off the mainline circuit
|   |   breaker (CB1 on the ac power
|   |   supply) and set the switches as
|   |   specified in steps 1, 2, and 3;
|   |   then perform steps 5 through 7.
|   |
|   |   Does a single asterisk show for
|   |   ten seconds or longer on each
|   |   drive display?
|   |
|   |   YES NO
|   |   |   |
|   |   |   Note the drive addresses of
|   |   |   the drives that do not show a
|   |   |   single asterisk, and which CU
|   |   |   those drives are attached to,
|   |   |   and continue to the next step.
|   |   |
|   |   Continue to the next step.
|   |
|   Note the drive addresses of the
|   drives that do not show a single
|   asterisk, and which CU those drives
|   are attached to, and continue to
|   the next step.
|
Continue to the next step.
```

__ 10. On each drive switch panel, set the Drive Power switch 7 to Off; then set it back to On.

Does a single asterisk (*) show for ten seconds or longer on each drive display?

```
YES NO
|   |
|   Note the drive addresses of the
|   drives that do not show a single
|   asterisk, and which CU those drives
|   are attached to, and continue to the
|   next step.
|
Continue to the next step.
```

__ 11. On each drive switch panel, press, then release the drive Reset switch 8.

Does a single asterisk (*) show for ten seconds or longer on each drive display?

```
YES NO
|   |
|   Note the drive addresses of the
|   drives that do not show a single
|   asterisk, and which CU those drives
|   are attached to, and continue to the
|   next step.
|
Continue to the next step.
```


__ 12. On each drive switch panel, set the Online/Offline switch 10 to Offline.

Do special box-shaped symbols show in the first and last positions of the message display?

```
YES NO
|   |
|   Note the drive addresses of the drives
|   that do not show the special box-shaped
|   symbols and which CU those drives are
|   attached to, and continue to the next
|   step.
|
Continue to the next step.
```

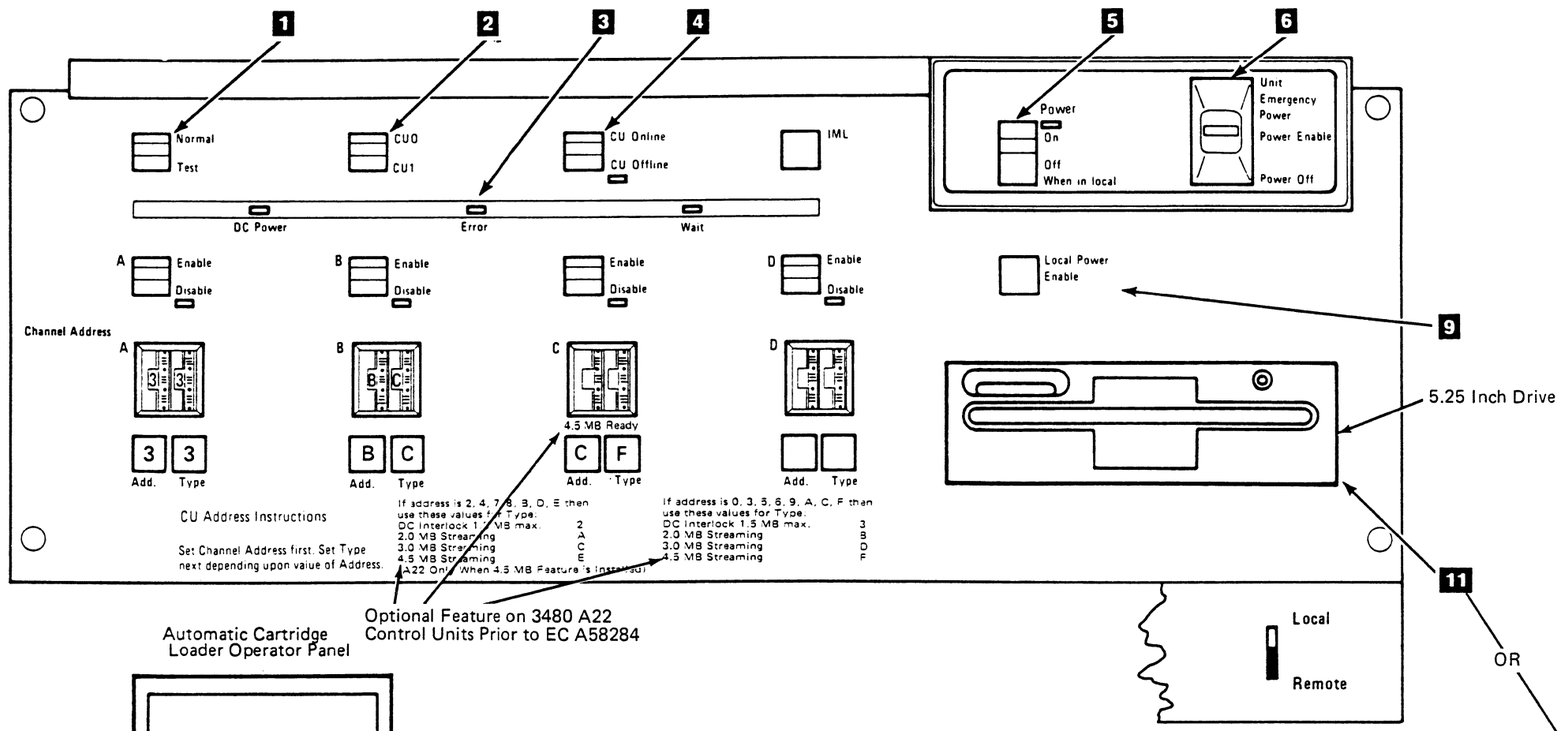
__ 13. On each drive switch panel, set the Online/Offline switch 10 to Online and verify that the special box-shaped symbols go away.

Do the special box-shaped symbols go away?

```
YES NO
|   |
|   Note the drive addresses of the drives
|   where the special box-shaped symbols
|   do not go away, and which CU those
|   drives are attached to; then continue
|   to the next step.
|
Continue with the next step.
```

__ 14. Go to INST 378 to continue the offline checkout.

This page is for control units without BM 6460460 (See CARR-CU 9) and tape units without BM 6460006 (See CARR-DR 9)



This page is for control units without BM 6460460 (See CARR-CU 9) and tape units without BM 6460006 (See CARR-DR 9).

Running Offline Checkout for a Dual Control Unit Subsystem (Continued)

Note: See INST 379 for the following locations.

Checking the Addresses, Control Unit 0

__ 15. On the CU0 operator setup panel, set the CU Online/CU Offline switch **2** to CU Online.

After a short delay (2 1/2 seconds or less) does "L=x P=x" (x being any number between 0 and F) appear on any drive display?

```
YES NO
|   |
|   Power off the control unit with the Power
|   On/Off switch 4 and verify that the
|   switches are set correctly on the control
|   unit and tape unit panels.  See "Setting Up
|   for the Checkout" steps 1, 2, and 3 on INST
|   375 for the correct switch settings.  Correct
|   any switch settings that are wrong.  Power
|   up and repeat the actions you performed in
|   step 14.
|
|   Does "L=x P=x" appear on any tape drive
|   display?
|
|   YES NO
|   |   |
|   |   The CU will not load the microprogram
|   |   and must be fixed to continue.  Set the
|   |   Normal/Test switch 1 to Normal and
|   |   press the IML switch 3.  Insert the
|   |   product maintenance diskette into the MD
|   |   and do an IPL on the MD.  Follow the
|   |   maintenance package to correct the
|   |   problem and return here when the problem
|   |   is fixed.
|   |
|   |   Set the Normal/Test switch to Test and
|   |   check the CU and tape unit switch
|   |   settings again.  See "Setting up for
|   |   the Checkout" steps 1, 2, and 3 on
|   |   INST 376 for the correct switch
|   |   settings.  Correct any switch settings
|   |   that are wrong.  Power up and repeat
|   |   the actions you performed in step 15.
|   |
|   |   Does "L=x P=x" appear on any tape
|   |   drive display?
|   |
|   |   YES NO
|   |   |   |
|   |   |   Call your next level of support.
|   |   |
|   |   Note the addresses of any drives that do
|   |   show correct display, then continue with
|   |   the next step.
|   |
A   B
```

```
A   B
|   |
|   Note the addresses of any drives that
|   do not show the correct display, then
|   continue with the next step.
|
Note the addresses of any drives that do
not show the correct display, then continue
with the next step.
```

__ 16. Compare the "L=x" (logical address) portion of each drive display to the address label **6** on each display.

Does each drive display match the label?

```
YES NO
|   |
|   Ensure that all the drive logical
|   addresses are set correctly.  See
|   "Setting the Drive Logical and
|   Physical Addresses" on INST 350.
|
|   Leaving the control unit online, power
|   it off then back on again.  Note the
|   addresses of any drives whose display
|   labels 6 still do not match the "L=x"
|   portion of the display, then continue
|   to the next step.
|
Ensure that the "P=x" (physical address)
portion of each display does not match the
"P=x" portion of any other drive display
in the subsystem.
```

Does each drive display have a "P=x" number not shared by any other drive in the subsystem?

```
YES NO
|   |
|   Ensure that all of the drive physical
|   addresses are set correctly.  See
|   "Setting the Drive Logical and
|   Physical Addresses" on INST 350.
|
|   Leaving the control unit online, power
|   it off then on again.  Note any drive
|   physical addresses that are still
|   incorrect and continue to the next step.
|
Continue with the next step.
```

Checking Read/Write, Control Unit 0

__ 17. On the control unit (CU0) operator setup panel, set the CU Online/CU Offline switch **2** to CU Offline.

After a delay of 1 1/2 minutes or less, does TEST show with the indicator bars **5** flashing on the message display of any drive?

Note: If an Action message appears on any display, go to INST 305 and perform the action described. Return here, set the Power On/Off switch **4** to Off, then On and go to step 15 on this page.

```
YES NO
|   |
|   The CU will not load the microprogram
|   and must be fixed to continue.  Set the
|   Normal/Test switch 1 to Normal and
|   press the IML switch 3.  Insert the
|   product maintenance diskette into the MD
|   and do an IPL on the MD.  Follow the
|   maintenance package to correct the
|   problem and return here when the problem
|   is fixed.
|
|   Set the Normal/Test switch 1 to Test
|   and the Online/Offline switch 2 to
|   Online.  Wait until addresses appear on
|   the drive displays, then repeat step 17
|   on this page.
|
Continue to the next step.
```

__ 18. Set a blank cartridge **7** to not file protect.

__ 19. If the automatic cartridge loader feature is installed, skip the next step.

__ 20. Insert the cartridge into the drive that is nearest the control unit and displaying TEST. Close the cartridge latch and skip the next two steps.

__ 21. Put a cartridge in the top positions of the loader on the drive nearest the control unit and is displaying TEST.

__ 22. Ensure the loader mode switch **8** is set to Auto mode and press the Start switch **9**.

__ 23. If the display shows Action Message 1, 2, 3, or 5 after you load the tape cartridge, go to "Action Messages" on INST 305 and perform the procedure as directed. Return here when you have completed the required procedure.

__ 24. The diagnostic will show various messages on the drive display as it executes, indicating the action the drive is performing.

Each drive will require about 1 3/4 minutes to execute the test. and when complete, will show a single asterisk on the display.

__ 25. While the first drive is being tested, set another blank cartridge **7** to not file protect and insert it into the next drive displaying TEST. The display will show READY U.

When UNLOAD appears on the display of the first drive, the next drive with a tape loaded will begin testing.

Note: This testing procedure can be performed with one scratch tape, but you must wait for each drive to unload the tape. This increases the test time to 2 1/2 minutes for each drive.

__ 26. When the first drive unloads, move that tape to the next drive showing TEST. If the cartridge does not unload, go to "Cartridge Removal by Hand" on CART 10.

__ 27. Repeat this procedure for all drives in the subsystem showing TEST.

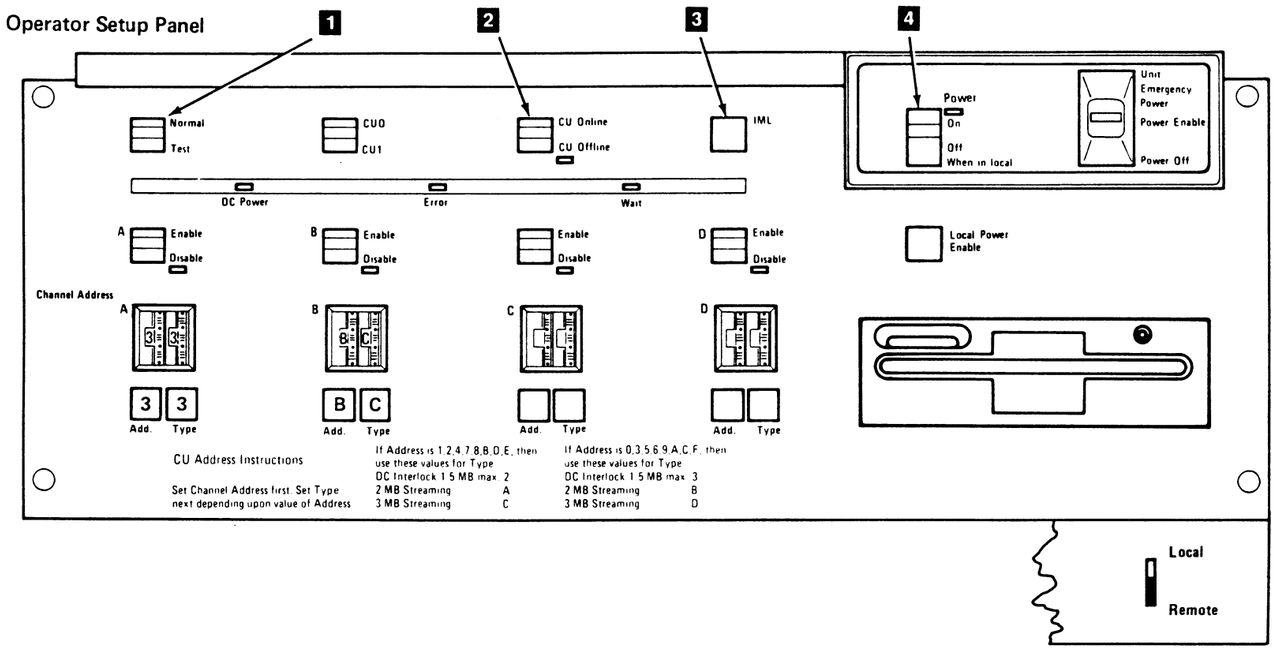
__ 28. If failures occur on multiple drives in a string, there may be a cable or terminator connection problem. Check the seating of the device data and read bus cables, and the dual control unit communication cables (for dual control unit subsystems). See LOC 1 for the control unit and tape unit cable locations.

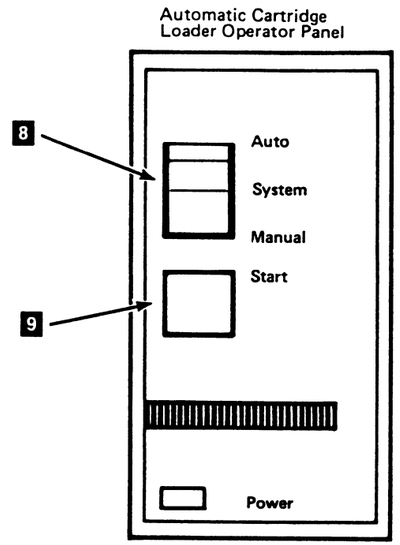
When you have finished checking the cables, insert a cartridge into those drives that were failing and the tests will be rerun.

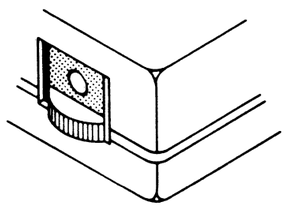
__ 29. If any drives will not run the tests to completion, note the failing drive addresses and that CU0 was running the test. This will be used later on INST 390 when the product package is run.

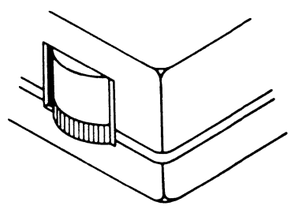
__ 30. Go to the next step on INST 381.

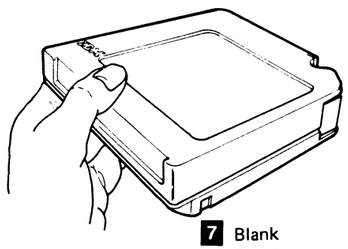
This page is for control units without BM 6460460 (See CARR-CU 9) and tape units without BM 6460006 (See CARR-DR 9)

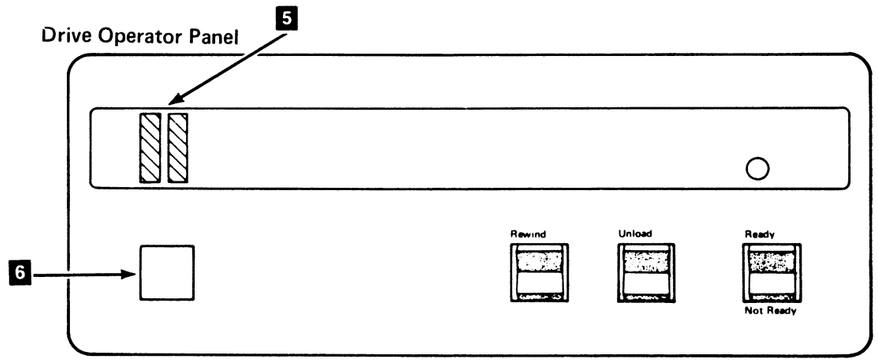





File Protect Position


Not File Protect Position


7 Blank Cartridge



This page is for control units without BM 6460460 (See CARR-CU 9) and tape units without BM 6460006 (See CARR-DR 9)

Running Offline Checkout for a Dual Control Unit Subsystem (Continued)

Note: See INST 382 for the following locations.

Final Checkout of Control Unit 0

__ 31. On the CU0 operator setup panel, set the Normal/Test switch **1** to Normal.

Do eight asterisks (********) show on all drive displays not showing TEST?

```
YES NO
 |   |
 |   Is the Normal/Test switch 1 set to Normal?
 |
 |   YES NO
 |    |   |
 |    |   Set the switch to Normal and repeat step 31.
 |    |
 |    |   Do eight asterisks show on all drive displays
 |    |   not showing TEST?
 |    |
 |    |   YES NO
 |    |    |   |
 |    |    |   Note the drive addresses that do not show
 |    |    |   eight asterisks or TEST and continue to
 |    |    |   the next step.
 |    |    |
 |    |    Continue to the next step.
 |    |
 |    Note the drive addresses that do not show eight
 |    asterisks or TEST and continue to the next step.
 |
Continue to the next step.
```

You have completed the checkout of CU0 and the drives attached to both control units. If the tests worked correctly, you know that CU0 can communicate with all the drives.

You must now check out CU1 and all the drives again to be sure that CU1 can communicate with all the drives.

Go to the next step to test CU1.

Note: Do not change the switch settings or power off CU0 during the following checkout of CU1.

Checking the Addresses, Control Unit 1

__ 32. On the CU1 operator setup panel, set the CU Online/CU Offline switch **2** to CU Online.

After a short delay (2 1/2 minutes or less) does "L=x P=x" (x being any number between 0 and F) appear on any drive display?

```
YES NO
 |   |
 |   Power off the control unit and verify that
 |   the control unit and tape unit switches (for
 |   CU1 and the drives physically attached to
 |   CU1) are set correctly.  See "Setting Up for
 |   the Checkout" steps 1, 2, and 3 on INST 75
 |   for the correct switch settings.  Correct
 |   any switch settings that are wrong.  Power
 |   up and repeat the actions you performed in
 |   step 32.
 |
 |   Does "L=x P=x" appear on any tape drive
 |   display?
 |
 |   YES NO
 |    |   |
 |    |   The CU will not load the microprogram
 |    |   and must be fixed to continue.  Set the
 |    |   Normal Test switch 1 to Normal and
 |    |   press the IML switch 3.  Insert the
 |    |   product maintenance diskette into the MD
 |    |   and do an IPL on the MD.  Follow the
 |    |   maintenance package to correct the
 |    |   problem and return here when the problem
 |    |   is fixed.
 |    |
 |    |   Set the Normal/Test switch to Test and
 |    |   check the CU and tape unit switch
 |    |   settings again.  See "Setting Up for the
 |    |   Checkout" steps 1, 2, and 3 on INST 376
 |    |   for the correct switch settings.  Correct
 |    |   any switch settings that are wrong. Power
 |    |   up and repeat the actions you performed
 |    |   in step 32.
 |    |
 |    |   Does "L=x P=x" appear on any tape
 |    |   drive display?
 |    |
 |    |   YES NO
 |    |    |   |
 |    |    |   Call your next level of support.
 |    |    |
 |    |    Note the addresses of any drives that
 |    |    do not show the correct display, then
 |    |    continue with the next step.
 |    |
 |    Note the addresses of any drives that do not
 |    show the correct display, then continue with
 |    the next step.
 |
Note the addresses of any drives that do not
show the correct display, then continue with
the next step.
```

__ 33. Compare the "L=x" (logical address) portion of each drive display to the address label **4** on each display.

Does each drive display match the label?

```
YES NO
 |   |
 |   There is a cable connection problem.
 |   Power off CU1 and check the seating
 |   of the device data and read bus
 |   cables and the dual control unit
 |   communication cables.  See LOC 1 for
 |   the control unit and tape unit cable
 |   locations.
 |
 |     NOTE:  Do not change any of the CU
 |     switch settings while checking out
 |     the cable connection problem except
 |     for the Power On/Off switch.
 |
 |   When you have finished checking the
 |   cables, power on the control unit.
 |   After a delay of 2 1/2 minutes or less,
 |   compare the "L=x" portion of each drive
 |   display to the address label 4 on the
 |   drive.
 |
 |   Does each drive display match the label?
 |
 |   YES NO
 |    |   |
 |    |   Call the next level of support.
 |    |
 |    Ensure that the "P=x" (physical address)
 |    portion of each display does not match
 |    the "P=x" portion of any other drive
 |    display in the subsystem.
 |
 |    Does each drive display have a "P=x"
 |    number not shared by any other drive?
 |
 |    YES NO
 |     |   |
 |     |   There is a cable connection problem.
 |     |   Power off CU1 and check the seating
 |     |   of the device data and read bus cables,
 |     |   and the dual control unit communication
 |     |   cables.  See LOC 1 for the control unit
 |     |   and tape unit cable locations.
 |     |
 |     |    NOTE:  Do not change any of the CU
 |     |    switch settings while checking the
 |     |    cable connection problem, except
 |     |    for the Power On/Off switch.
 |     |
 |     |   When you have finished checking the
 |     |   cables, power on the CU.  After a
 |     |   delay of 2 1/2  minutes or less,
 |     |   compare the "P=x" portion of each
 |     |   drive display to the "P=x" portion
 |     |   of all the other drive displays.
 |     |
 |     |   Does each drive have a "P=x" number
 |     |   not shared by any other drive?
 |     |
 |     |   YES NO
 |     |
A    B    C   D
```



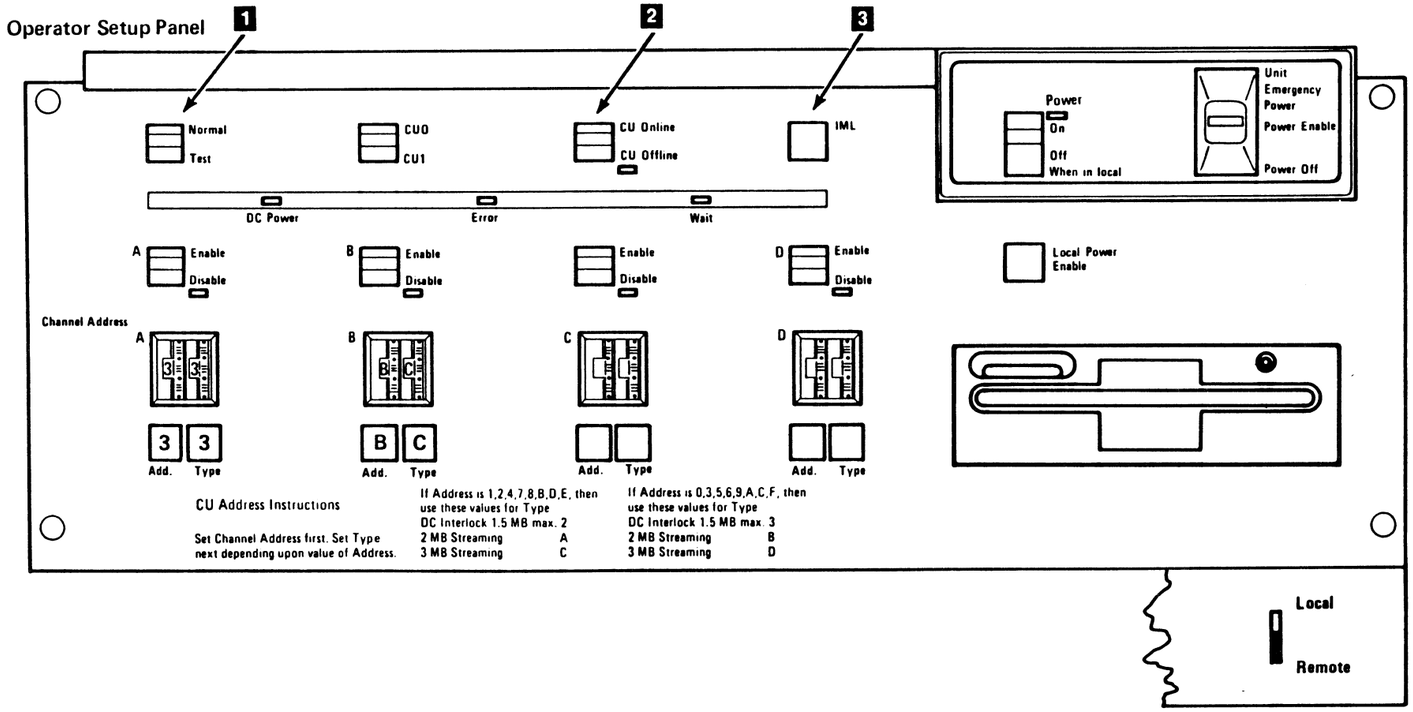
```
A   B    C   D
 |  |    |   |
 |  |    |   Call the next level of support.
 |  |    |
 |  |    Go to the next step on INST 383.
 |  |
 |  Go to the next step on INST 383.
 |
Ensure that the "P=x" (physical address)
portion of each display does not match the
"P=x" portion of any other drive display
in the subsystem.
```

Does each drive display have a "P=x" number not shared by any other drive?

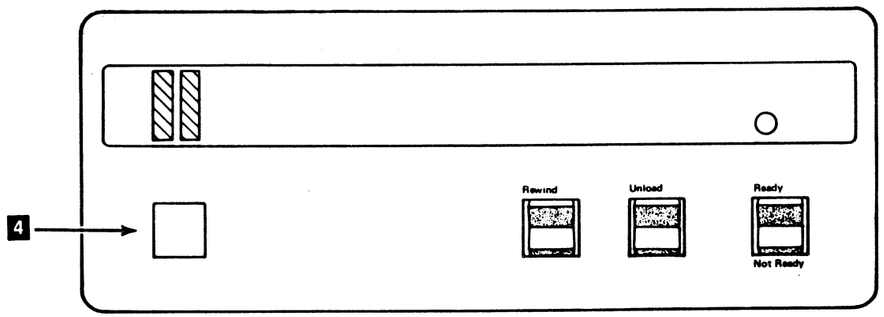
```
YES NO
 |   |
 |   If this drive failed during the check-
 |   out of CU0, note that it also failed on
 |   on CU1 and go to the next step on INST 383
 |   If it did not fail during the checkout of
 |   CU0, continue with this step.
 |
 |   There is a cable connection problem.
 |   Power off CU1 and check the seating of
 |   the device data and read bus cables
 |   and the dual control unit communication
 |   cables.  See LOC 1 for the control unit
 |   and tape unit cable locations.
 |
 |     NOTE:  Do not change any of the CU
 |     switch settings while checking out
 |     the cable connection problem, except
 |     for the Power On/Off switch.
 |
 |   When you have finished checking the
 |   cables, power on the CU.  After a
 |   delay of 2 1/2 minutes or less, compare
 |   the "P=x" portion of each drive display
 |   to the "P=x" portion of all the other
 |   drive displays.
 |
 |   Does each drive have a "P=x" number
 |   not shared by any other drive?
 |
 |   YES NO
 |    |   |
 |    |   Call the next level of support.
 |    |
 |    Go to the next step on INST 383.
 |
Go to the next step on INST 383.
```

This page is for control units without BM 6460460 (See CARR-CU 9) and tape units without BM 6460006 (See CARR-DR 9)

Operator Setup Panel



Drive Operator Panel



This page is for control units without BM 6460460 (See CARR-CU 9) and tape units without BM 6460006 (See CARR-DR 9)

Running Offline Checkout for a Dual Control Unit Subsystem (Continued)

Note: See INST 384 for the following locations.

Checking Read/Write, Control Unit 1

__ 34. On the control unit (CU1) operator setup panel, set the CU Online/CU Offline switch 3 to CU Offline.

Does TEST show with the indicator bars 8 flashing on the message display of any drive?

Note: If an Action message appears on any display, go to INST 305 and perform the action described. Return here and set the Power On/Off switch 6 to off then On; then go to INST 381, step 27, and continue.

```
YES NO
 |  |
 |  The CU will not load the microprogram
 |  and must be fixed to continue.  Set
 |  the Normal/Test switch 1 to Normal
 |  and press the IML switch 5.  Insert
 |  the product maintenance diskette into
 |  the MD and do an IPL on the MD.
 |  Follow the maintenance package to
 |  correct the problem and return here
 |  when the problem is fixed.
 |
 |  Set the Normal/Test switch 1 to Test
 |  and the Online/Offline switch 3 to
 |  Online.  Wait until addresses appear on
 |  the drive displays, then repeat step 29
 |  on this page.
Continue to the next step.
```

__ 35. Set a blank cartridge 7 to not file protect.

__ 36. If the automatic cartridge loader feature is installed, skip the next step.

__ 37. Insert the cartridge into the drive that is nearest the control unit and displaying TEST. Close the cartridge latch and skip the next two steps.

__ 38. Put a cartridge in the top positions of the loader on the drive nearest the control unit and is displaying TEST.

__ 39. Ensure the loader mode switch 9 is set to Auto mode and press the Start switch 10.

__ 40. If the display shows Action Message 1, 2, 3, or 5 after you load the tape cartridge, go to "Action Messages" on INST 305 and perform the procedure as directed. Return here when you have completed the required procedure.

__ 41. The diagnostic will show various messages on the drive display as it executes, indicating the action the drive is performing.

Each drive will require about 1 3/4 minutes to execute the test, and when complete, will show a single asterisk on the display.

__ 42. While the first drive is being tested, set another blank cartridge 7 to not file protect and insert it into the next drive displaying TEST. The display will show READY U.

When UNLOAD appears on the display of the first drive, the next drive with a tape loaded will begin testing.

Note: This testing procedure can be performed with one scratch tape, but you must wait for each drive to unload the tape. This increases the test time to 2 1/2 minutes for each drive.

__ 43. When the first drive unloads, move that tape to the next drive showing TEST. If the cartridge does not unload, go to "Cartridge Removal by Hand" on CART 10.

__ 44. Repeat this procedure for all drives in the subsystem showing TEST.

__ 45. If failures occur on multiple drives in a string, there may be a cable connection problem. Check the seating of the device data and read bus cables, and the dual control unit communication cables (for dual control unit subsystems). See LOC 1 for the control unit and tape unit cable locations.

When you have finished checking the cables, insert a cartridge into those drives that were failing and the tests will be rerun.

__ 46. If any drives will not run the tests to completion, note the failing drive addresses and that CU1 was running the test. This will be used later on INST 390 when the product package is run.

__ 47. Go to the next step and continue.

Final Checkout of Control Unit 1

__ 49. Set the Normal/Test switch 1 to Normal on the CU1 control unit operator setup panel.

Do eight asterisks (********) show on all drive displays not showing TEST?

```
YES NO
 |  |
 |  Is the Normal/Test switch 1
 |  set to Normal?
 |
 |  YES NO
 |   |  |
 |   |  Repeat step 39.
 |   |
 |   |  Do eight asterisks show on all
 |   |  drive displays not showing TEST?
 |   |
 |   |  YES NO
 |   |   |  |
 |   |   |  Note the drive addresses
 |   |   |  that do not show eight
 |   |   |  asterisks or TEST and
 |   |   |  continue to the next step.
 |   |   |
 |   |   Continue to the next step.
 |   |
 |  Note the drive addresses that do
 |  not show eight asterisks or TEST
 |  and continue to the next step.
 |
Continue to the next step.
```


Checking the Initial Microprogram Load (IML)

__ 50. Ensure that the IML diskettes in CU0 and CU1 are at the same microcode level; if not, you will get an error light when you attempt an IML.

Note: See the labels on the IML diskettes.

On both CU0 and CU1, set the Power On/Off switch 6 to off, then On.

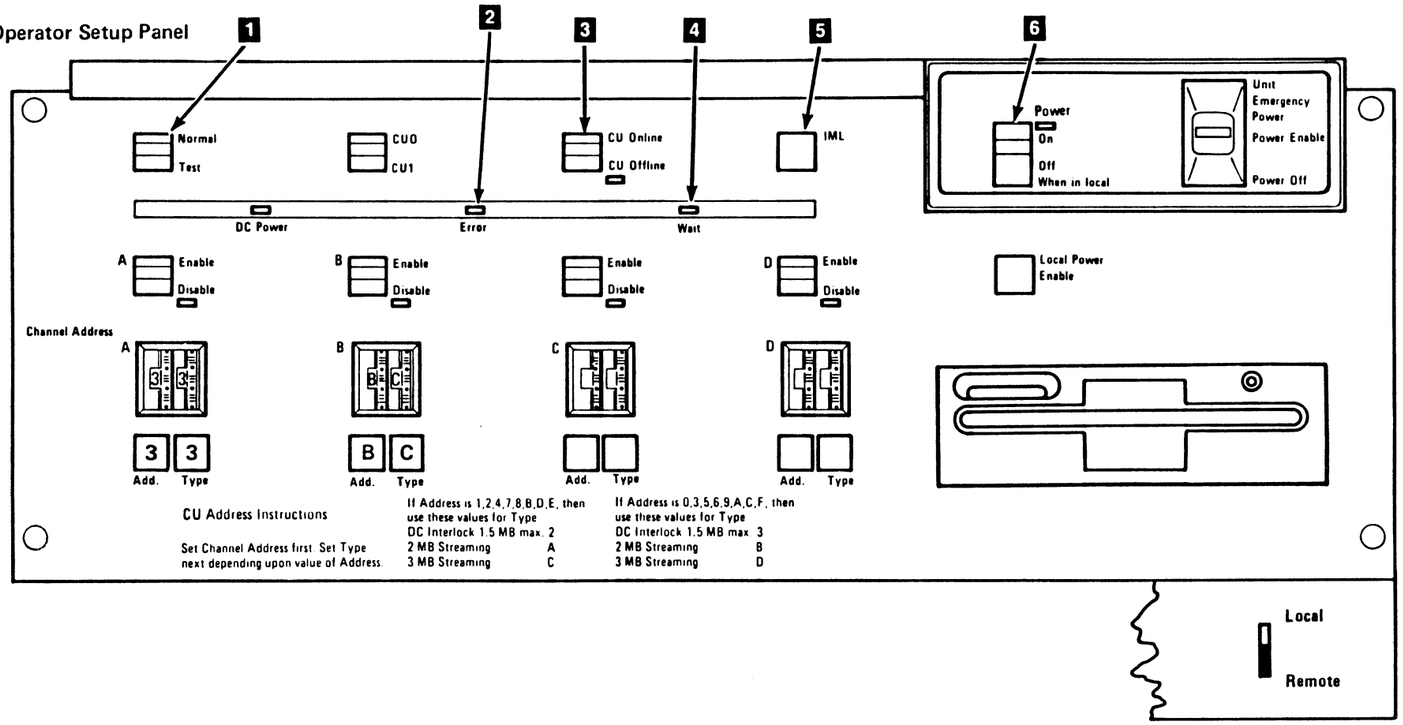
After approximately 60 seconds the Wait light 4 on the control unit operator setup panel should be on solidly, and the Error light 2 should be off.

Are all the lights correct?

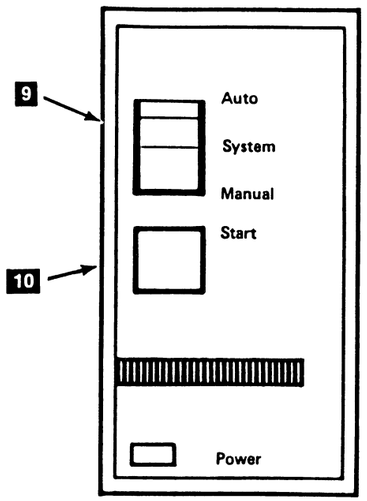
```
YES NO
 |  |
 |  The control unit will not load the micro-
 |  program and must be fixed to continue.
 |  Ensure the Normal Test switch 1 is set
 |  to Normal and the Online/Offline switch
 |  3 is Offline. Press the IML switch 5.
 |  Insert the Product Maintenance diskette
 |  into the MD and do an IPL on the MD.
 |  Follow the maintenance package to correct
 |  the problem, and return to this page and
 |  repeat step 40 when the problem is fixed.
 |
Go to INST 390; the Offline checkout is
complete.
```

This page is for control units without BM 6460460 (See CARR-CU 9) and tape units without BM 6460006 (See CARR-DR 9)

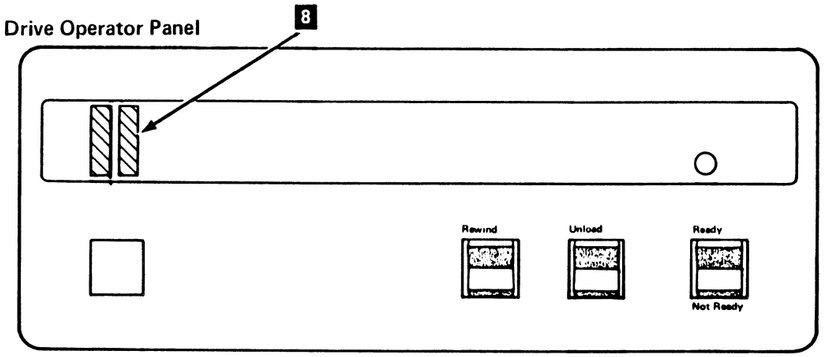
Operator Setup Panel

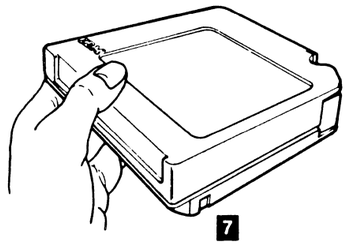


Automatic Cartridge Loader Operator Panel



Drive Operator Panel





Blank Cartridge

This page is for control units without BM 6460460 (See CARR-CU 9) and tape units without BM 6460006 (See CARR-DR 9)

Configuring the Maintenance Device Support Diskette and Analyzing Drives with the MD

__ 1. Connect the maintenance device (MD) to CU0. See MD 40.

__ 2. Insert the support diskette into the MD, and do an IPL on the MD.

__ 3. Enter the serial number requested by the MD. When configured, the main menu will be displayed.

Note: If the support diskette has already been configured, the main menu will display immediately. If the serial number of the control unit is wrong, the support diskette can be reconfigured using the following procedure:

__ a. Select option 3 (SUPPORT UTILITIES) and press enter.

__ b. Select option 4 (RE-CONFIGURE DSKT) and press enter.

__ c. Perform step 3 above.

__ 4. Check the CU serial number on the machine frame against the serial number set on the drive adapter card by performing the following steps:

__ a. Select Option 2 (SUBSYS DSPLY/ALTER) of the main menu.

__ b. Select Option 1 (SUBS CONFIG DSPLY), then compare the CU serial number on the MD display to the serial number on the CU machine frame.

```
Does the serial number on the MD display match
the serial number on the machine frame?

YES NO
|   |
|   Go to CARR-CU 1189, "Drive Adapter Card
|   Switch Setting."  Return here and repeat
|   step 4 when you have correctly set the
|   switches on the adapter card.
|
Continue with the next step.
```

__ 5. Insert the product maintenance diskette into the MD, and do an IPL on the MD.

__ 6. Select Option 1 for each drive whose address was noted during the offline checkout of CU0 (if any) and is physically attached to CU0. If no drive addresses were noted during the offline checkout of CU0, select Option 3 and run the last drive attached to CU0.

__ 7. If you are installing a dual control unit subsystem, connect the MD to CU1 and repeat steps 2-6 for CU1 where CU0 was called out. Use the other support and product diskettes which come with CU1 so they are configured and verified.

__ 8. After all the problems have been fixed (if any), insert the support diskette and go to INST 400 to run the channel wrap test on each channel in the subsystem.

This page is for control units without BM 6460460 (see CARR-CU 9) and tape units without BM 6460006 (see CARR-DR 9)

Channel Wrap Test, Diagnostic Routine EE62

You use wrap blocks to wrap the channel adapter bus and tag lines, and the diagnostic program generates bit patterns and sends them through the wrap path. The wrap path is:

- From the channel adapter to the bus and tag shoe card drivers
- Through the wrap blocks to the bus and tag shoe card receivers
- Back to the channel adapter.

The pattern received at the end of the wrap is compared with an expected pattern. A non-compare produces an error and a maintenance device error display that provides data to define the error.

Setup Procedure for the Channel Wrap Test

For dual control unit subsystems, if two MDs are available, two service representatives (one on each control unit) should perform the wrap test on the control units at the same time to reduce the install time.

__ 1. Install the wrap terminator (part 6315622) **1** in the bus-out cable connector position of the I/O connector assembly. This part is included in the ship group.

__ 2. Install the bus wrap block (part 4299876) **2** in the bus-in cable connector position of the I/O connector assembly. This part is included in the ship group and is labeled 3880.

__ 3. Install the common 370 channel tag terminator (part 2282676) **3** in the tag-out cable connector position of the I/O connector assembly.

__ 4. Install the tag wrap block (part 4299873) **4** in the tag-in cable connector position of the I/O connector assembly. This part is included in the ship group and is labeled 3880.

__ 5. If you have the horizontal or vertical style I/O connector, go to step 6.

Warning: Make sure the wrap blocks are installed correctly. The I/O connector assembly will not close if the blocks are installed wrong. Do not force the handle when closing the I/O connector assembly.

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

Close the I/O connector assembly.

__ 6. Ensure the support diskette is in the MD and IPL the MD.

__ a. Select option 1, SUBSYS DIAGNOSTICS, and press enter.

__ b. Select option 1, SELECTED DIAG, and press enter.

__ c. Enter EE62 on the diagnostic selection screen. and follow the prompts.

__ d. Enter channel A for channel selection.

__ e. Follow prompts to run the diagnostic.

__ 7. See DIAG 1, "Channel Interface Wrap Test - Routine EE62" for the error displays and failure IDs that may occur during the test.

__ 8. Repeat the channel wrap test for each channel installed on the CUs. The wrap tools must be moved to each I/O connector assembly before running the test for each channel. Restart the diagnostic for each channel as follows:

__ a. After the diagnostic is complete and the status is displayed, press enter until the option menu comes up on the MD.

__ b. Enter option 2, TEST OPTN.

__ c. Enter YES when asked to ALTER PARMS.

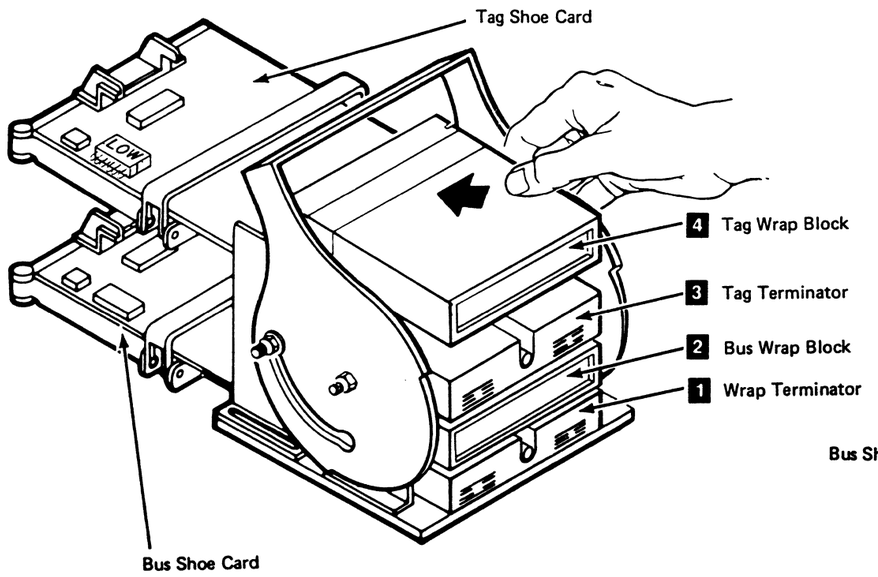
__ d. Enter channel B, C, or D depending on which channel you are testing.

__ e. Follow prompts and enter option 7 to run.

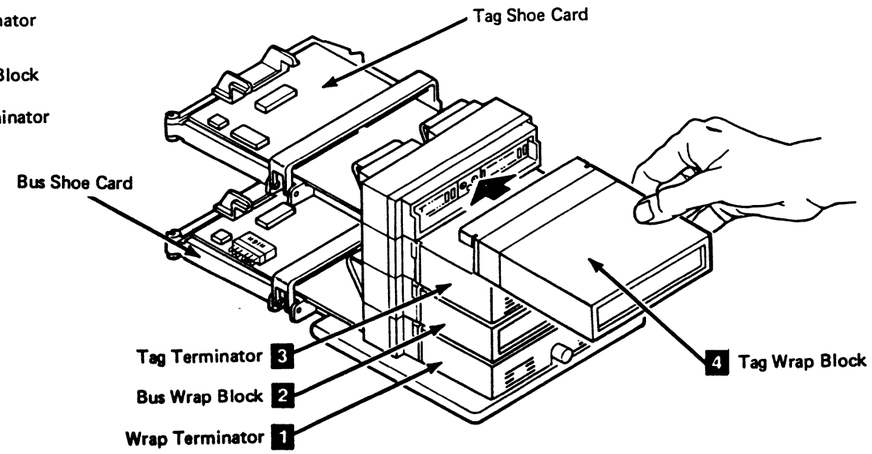
__ 9. Ensure that the IML diskettes in CU0 and CU1 are at the same microcode level; if not, you will get an error light when you attempt an IML.

When all channels on the control unit have been tested (all channels on both control units in a dual control unit subsystem), and any detected errors have been corrected, re-IML both control units. Use the backup IML diskette(s) when you re-IML so both copies of the functional microcode get tested.

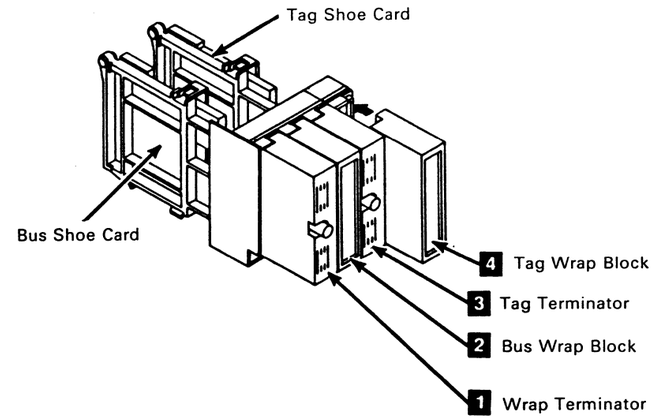
Go to INST 410.



I/O Connector (Movable Rail Style)



I/O Connector (Horizontal Style)



I/O Connector (Vertical Style)

This page is for control units without BM 6460460 (See CARR-CU 9)

Checking the Priority Plug

The tag shoe cards are plugged for high priority from the factory. If the priority must be checked or changed on the 4.5 Mb/s channel I/O connectors, they must be removed from the mounting assembly.

For the 4.5 Mb/s channel tag shoe cards perform the following steps:

__ 1. Remove the screw and hold down bracket that goes across the top of the connectors and lift the four connectors from the mounting assembly.

__ 2. Check that the high or low priority plug on the tag shoe card **7** or **8** is correct. If the word high is facing out, the channel has high priority. If the word low is facing out, the channel has low priority.

__ 3. When you have checked for the correct priority, install the four connectors into the mounting bracket and reinstall the top hold down bracket and screw.

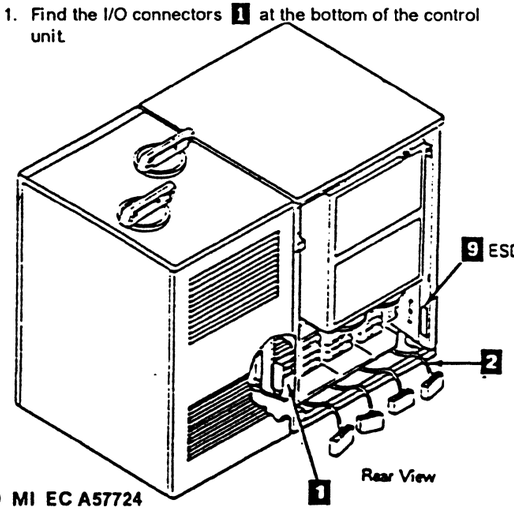
For all other channel tag shoe cards, check to see that the high or low priority plug on the tag shoe card **3**, **4** is correct. If the word high is facing out, the channel has high priority. If the word low is facing out, the channel has low priority.

Installing the I/O Cable

Perform the following steps to install the subsystem I/O cables:

Note: 3480 Model A22 Control Units with the 4.5 megabyte channel feature (FC 3355) must be cabled ahead of slower devices on the channel.

__ 1. Find the I/O connectors **1** at the bottom of the control unit.



__ 2. Pass the cables **2** for channel A up through the opening in the bottom of the control unit.

Note: If the 3480 subsystem is the last control unit on this channel, you will have two cables and two terminators.

If the 3480 subsystem is not the last control unit on this channel, you will have four cables.

__ 3. The following steps are different for movable rail style and horizontal or vertical style I/O connectors.

Go to step 4 if you have a movable rail style I/O connector.

Go to step 12 if you have a horizontal or vertical style I/O connector.

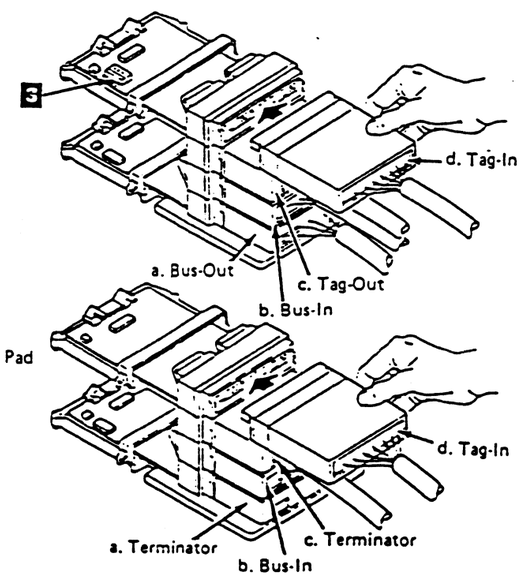
Movable Rail Style I/O Connector

__ 4. Open the I/O connector assembly for channel A by lifting the handle and pushing it toward the front of the machine **5** as far as it will go.

__ 5. The cable plugs should be connected to the opposite colored sockets in the I/O connector assembly. For example, a dark gray cable plug mates with a light gray socket.

__ 6. **Warning:** The tailgate connectors are attached to logic cards which are sensitive to electrostatic discharge (ESD). See "Instructions for ESD-Sensitive Parts" in the CARR section of Volume A02.

Check all tailgate connectors and cable connectors for bent pins.



I/O Connector (Horizontal Style) or I/O Connector (Fixed Style)

__ 7. Before installing the interface cables, press the contacts firmly against the ESD pad **9** to remove any electrostatic discharge.

__ 8. Slide the cables into the I/O connector in the following order (bottom to top): Use the diagrams below as a guide.

- __ a. Bus cable to next control unit or Bus Terminator
- __ b. Bus cable from the channel
- __ c. Tag cable to the next control unit or Tag Terminator
- __ d. Tag cable from the channel.

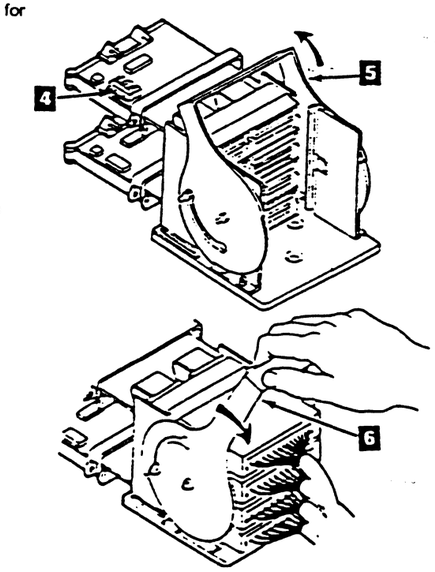
__ 9. Close the I/O connector assembly by pulling the handle **6** back and down as far as it will go. The connectors should seat firmly in the sockets.

__ 10. If there are more I/O cables to attach, repeat the preceding steps for each channel.

__ 11. Connect the I/O cables to the host system(s).

Horizontal, Fixed or Vertical Style I/O Connectors

__ 12. The cable plugs should be connected to the opposite colored sockets in the I/O connector assembly. For example, a dark gray cable plug mates with a light gray socket.



I/O Connector (Movable Rail Style)

__ 13. **Warning:** The tailgate connectors are attached to logic cards which are sensitive to electrostatic discharge (ESD). See "Instructions for ESD-Sensitive Parts" in the CARR section of Volume A02.

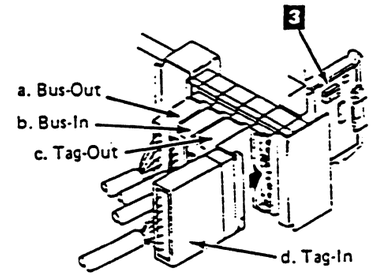
Check all tailgate connectors and cable connectors for bent pins.

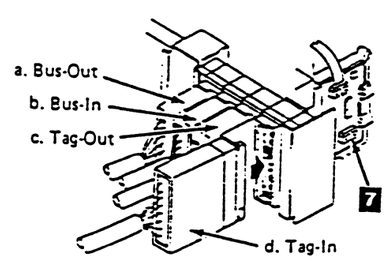
__ 14. Before installing the interface cables, press the the cable contacts firmly against the ESD pad **9** to remove any electrostatic discharge.

__ 15. Connect the four channel interface bus and tag cables, or the two channel interface cables and two terminators in the I/O connectors. Use the diagrams below as a guide.

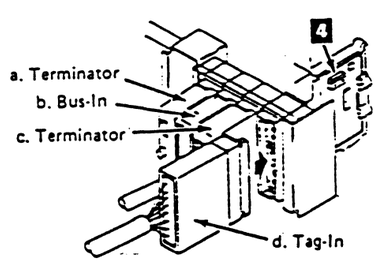
__ 16. If there are more I/O cables to attach, repeat the preceding steps for each channel.

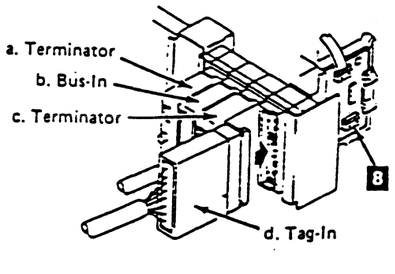
__ 17. Connect the I/O cables to the host system(s).





I/O Connector (Vertical Style)





I/O Connector (4.5 MB/S Channel)

Installation Instructions INST 410

3480 Installation Instructions

This page is for control units without BM 6460460 (See CARR-CU 9) and tape units without BM 6460006 (See CARR-DR 9)

Installing the Unit Emergency Power Off (UEPO) Cable

Perform the following steps to install the Unit Emergency Power Off (UEPO) cable:

__ 1. Determine if UEPO cables are to be installed.

If no UEPO cables are to be installed, go to INST 430, "Installation Checks."

Note: *The 3480 subsystem does not require UEPO jumpers if the Local/Remote switch is set to the Local mode.*

__ 2. Pass the UEPO cables to be installed up through the opening in the bottom of the control unit.

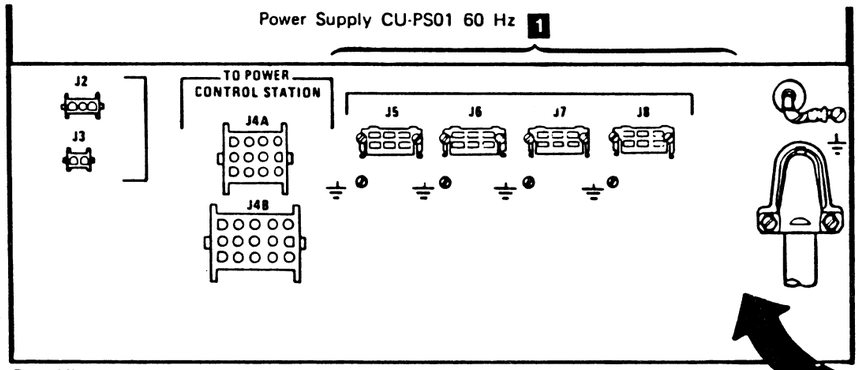
__ 3. Find the four UEPO cable sockets located at the rear of the control unit ac power supply.

Insert the UEPO cable connectors into any UEPO socket (J5 through J8) 1 .

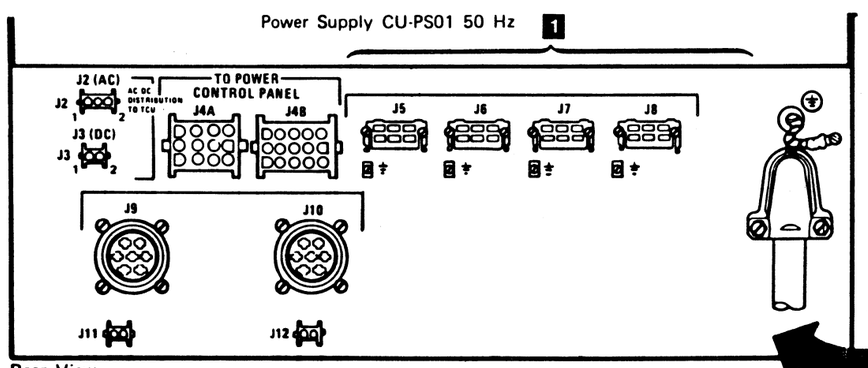
__ 4. Complete the cable installation:

__ a. Connect the UEPO cables to the host system.

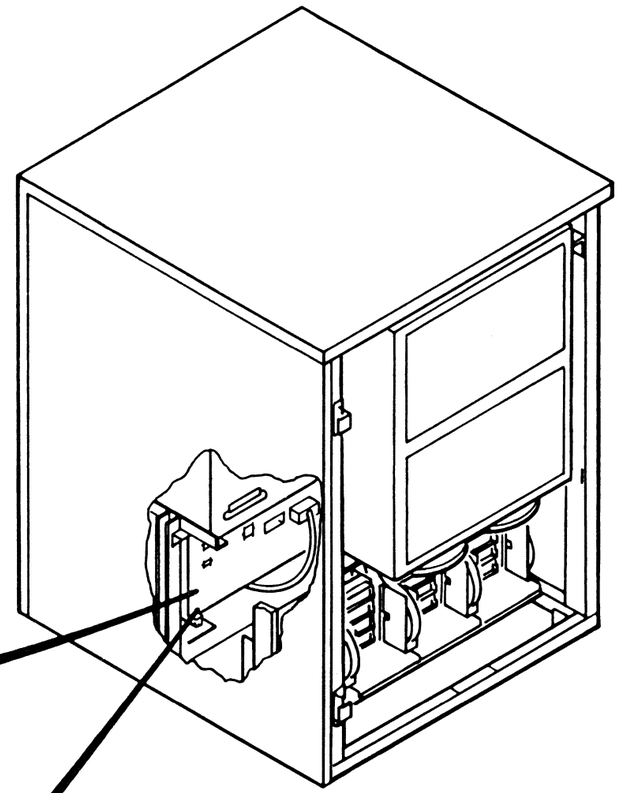
__ b. Continue the installation on INST 430, "Installation Checks."



Rear View



Rear View



This page is for control units without BM 6460460 (See CARR-CU 9) and tape units without BM 6460006 (See CARR-DR 9)

Installation Checks

These procedures complete the checkout of the installation:

1. Installing the radio frequency interference (RFI) shields.
2. Replacing all the subcovers and covers.
3. Running the Online Tests (OLTs) to verify correct subsystem operation.

Installing the Radio Frequency Interference (RFI) Shields

The radio frequency interference shields are provided in two lengths. Two of the shorter lengths are to be installed on the control unit, and one of the longer lengths is to be installed on each tape unit.

Warning: Do not put the RFI shields near the IML diskette or MD diskettes because the magnets at the ends of the shields can destroy the recorded data.

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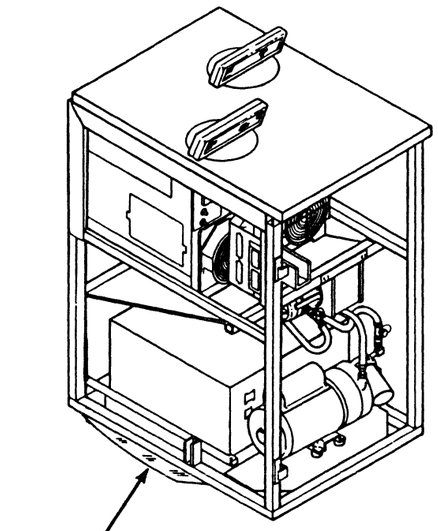
__ 1. Wrap one end of the shield one time to enclose the magnet. The metal side should be on the outside.

__ 2. Attach the shield, foam-side up, under the bottom front of each unit between the unit and the floor.

- Position the shield on the control unit to permit the installation of two shields, side by side. The shield should go from the front of the CU to the frame opening for the channel and power cables **1**. This leaves room for the cables to enter the CU.
- The shield on the tape unit should be positioned in the center. Be sure the shield is positioned inside the machine frame so it doesn't interfere with the covers.

__ 3. Push the shield under the unit toward the rear of the machine.



__ 4. Wrap the other end of the shield one time to enclose the magnet.

__ 5. Attach the shield, foam-side up, under the bottom rear of the machine, inside the frame.

Make sure the shield does not become twisted under the machine. The shield must sag, and touch the floor.

__ 6. Repeat steps 1 through 5 for each control unit and tape unit in the subsystem.

Warning: The RFI shields must be installed so they sag and touch the floor, for correct shielding to occur.

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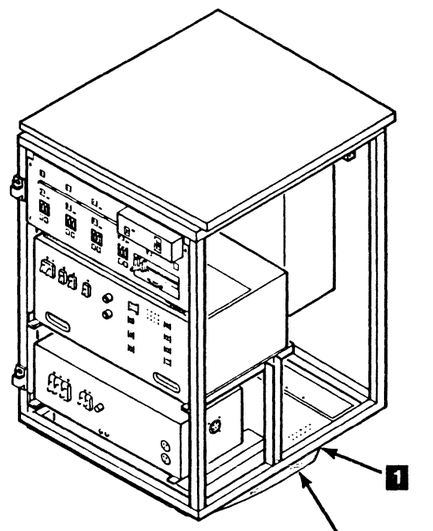

Reinstalling Subcovers and Covers

All the subcovers and covers that were removed must be reinstalled.

__ 1. Take the cover that was on the right side of the control unit, and install it on the right side of the last tape unit attached to that control unit.

__ 2. Go to CARR-CU 2-4, and CARR-DR 2-4 for procedures to adjust (if necessary) and reinstall the covers and subcovers on the control unit(s) and tape units.

__ 3. Go to INST 431 to continue the installation checks.

3480 Installation Instructions

This page is for control units without BM 6460460 (See CARR-CU 9) and tape units without BM 6460006 (See CARR-DR 9)

Installation Checks (Continued)

Running Online Tests (OLTs)

Note: Incorrect channel switch settings can cause overruns and other symptoms of hardware failures.

Run the OLTs with the NSI (no spurious interrupts) option active if you are using OLTSEP.

There are different procedures for a single control unit subsystem and a dual control unit subsystem. Be sure to use the correct procedure.

Single Control Unit Subsystem

__ 1. Run OLT T3480A on each channel of the control unit, to the last drive attached to the control unit. The online test operating procedures are described in the *3480 Online Test User's Guide,* D99-3480.

__ 2. Run OLTs T3480B, T3480C, and T3480D on any channel on the control unit to any drive on the subsystem.

> **Note:** If the messages seen on the drive displays are not in the correct language, go to "Drive Adapter Card Switch Setting" on CARR-CU 1189 and set the switches to the language requested by the customer.

__ 3. If any OLT fails, insert the product diskette in the MD, do an IPL on the MD, and select Option 1. Follow the maintenance package.

__ a. Obtain the OLT hard copy printout.

__ b. Verify that the control unit serial number in the OLT sense bytes is the same as the control unit serial number on the machine frame. If the serial number listed is different, see "Drive Adapter Card Switch Setting" on CARR-CU 1189 and correct the switch settings.

Dual Control Unit Subsystem

__ 1. Connect the MD to control unit 0, then insert and do an IPL on the support diskette.

__ 2. Select Option 3, Support Utilities, and press enter.

__ 3. Select Option 1, CU/Trace Match Control, and press enter.

__ 4. Select Option 3, Microcode Control, and press enter.

__ 5. Select Option B, Force Pathing, and press enter.

__ 6. Enter the address of the last drive attached to CU0. (The display will show your input and ask if it is correct, answer YES if it is correct.)

__ 7. Run OLT T3480A on each channel installed on CU0, to the last drive attached to CU0. The online test operating procedures are described in the *3480 Online Test User's Guide,* D99-3480.

__ 8. Run OLT T3480A on each channel installed on CU1, to the last drive attached to CU0.

__ 9. Run OLTs T3480B, T3480C, and T3480D on any channel on CU0 to any drive.

> **Note:** If the messages seen on the drive displays are not in the correct language, go to "Drive Adapter Card Switch Setting" on CARR-CU 1189 and set the switches to the language requested by the customer.

__ 10. Remove the MD and connect it to CU1, then insert and do an IPL on the support diskette.

__ 11. Select Option 3, Support Utilities, and press enter.

__ 12. Select Option 1, CU/Trace Match Control, and press enter.

__ 13. Select Option 3, Microcode Control, and press enter.

__ 14. Select Option B, Force Pathing, and press enter.

__ 15. Enter the address of the last drive attached to CU1. (The display will show your input and ask if it is correct, answer YES if it is correct.)

__ 16. Run OLT T3480A on each channel installed on CU1, to the last drive attached to CU1.

__ 17. Run OLT T3480A on each channel installed on CU0, to the last drive attached to CU1.

__ 18. Run OLTs T3480B, T3480C, and T3480D on any channel on CU1 to any drive.

> **Note:** If the messages seen on the drive displays are not in the correct language, go to "Drive Adapter Card Switch Setting" on CARR-CU 1189 and set the switches to the language requested by the customer.

__ 19. If any OLT fails while testing either CU, insert the product diskette in the MD, do an IPL on the MD, and select Option 1. Follow the maintenance package.

__ a. Obtain the OLT hard copy printout.

__ b. Verify that the control unit serial number in the OLT sense bytes is the same as the control unit serial number on the machine frame. If the serial number listed is different, see "Drive Adapter Card Switch Setting" on CARR-CU 1189 and correct the switch settings.

Before You're Through...

__ 1. Put the product and support diskettes, and the blank cartridge in the pocket in the front cover of the control unit.

__ 2. Check and repair any drive that did not operate correctly.

__ 3. If the Automatic Cartridge Loader feature is installed, skip the next step.

__ 4. Close all the tape drive cartridge latches.

Note: The cartridge latch should be closed when the tape drive is not being used. (A cartridge need **not** be in the drive.) When the tape drive is needed, open the cartridge latch by pressing the Unload switch.

Post-Installation

Installation Reporting

After the subsystem is installed and tested:

- Update the Account Management Plan book.
- Report the installation complete using the existing branch office procedure.
- If your account has EREP, go to MSG 1, "Limit Control Cards" to establish limits of reporting temporary errors to determine future maintenance action.

3480 Adding Tape Units to an Installed Subsystem

This page is for control units without BM 6460460 (See CARR-CU 9) and tape units without BM 6460006 (See CARR-DR 9)

If you are attaching a tape unit *with* BM 6460006 to a control unit *without* BM 6460460 or tape unit *without* BM 6460006, go to INST 510 before you begin the installation.

Adding Tape Units

CAUTION: TILT HAZARD

Do NOT open both drives of a tape unit that is not bolted to another tape unit or control unit. With the automatic cartridge loader feature installed and both drive drawers fully extended, a tape unit that is not bolted to another unit will tilt forward with about 20 lbs. of force applied to the top of either automatic cartridge loader.

The following procedures are used to add more tape units to an already installed subsystem:

__ 1. Have the customer vary offline all jobs and paths to the control unit and tape units that will be receiving the additional tape unit(s).

__ 2. Power off the control unit and tape units that will be affected.

__ 3. Remove the side cover from the last tape unit installed.

__ 4. Place the the new tape unit into position.

__ 5. Open the front and rear covers.

CAUTION
Ensure the power cable is not pinched between the machine frames.

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__ 6. Connect the next tape unit ac power cable **9** to the preceding tape unit's power cable socket **12**.

__ 7. Fasten the ac power cable to the side of the tape unit with the retaining strap **10**.

__ 8. Open the connector-holding clip **1** on the preceding tape unit and remove the terminator cards **5**.

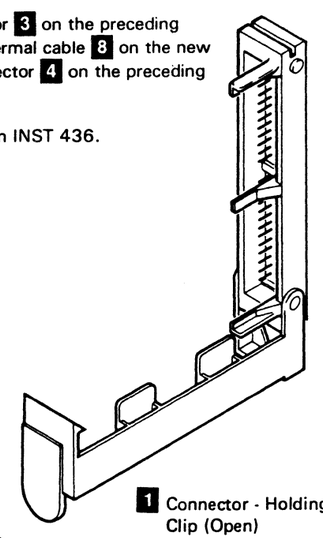
__ 9. Connect the two multi-colored read bus cables **2** **11** from the new tape unit to the previously installed tape unit.

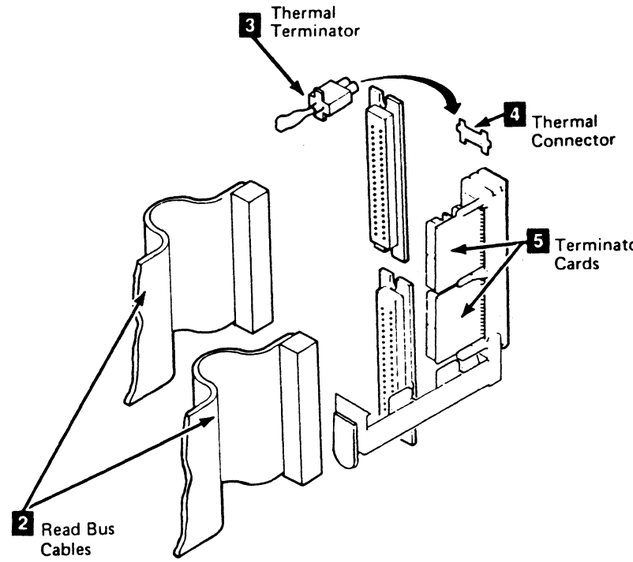
__ 10. Connect the two device data bus cables **7** from the new tape unit to the preceding tape unit.

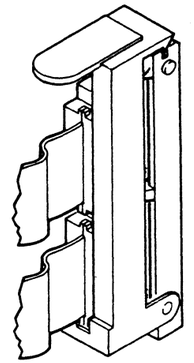
__ 11. Close the connector-holding clip **6**.

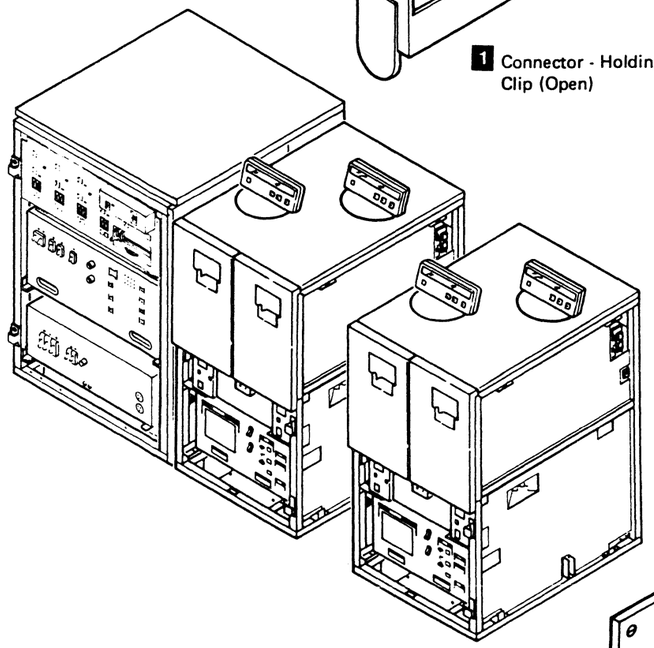
__ 12. Remove the thermal terminator **3** on the preceding tape unit, and connect the thermal cable **8** on the new tape unit to the thermal connector **4** on the preceding tape unit.

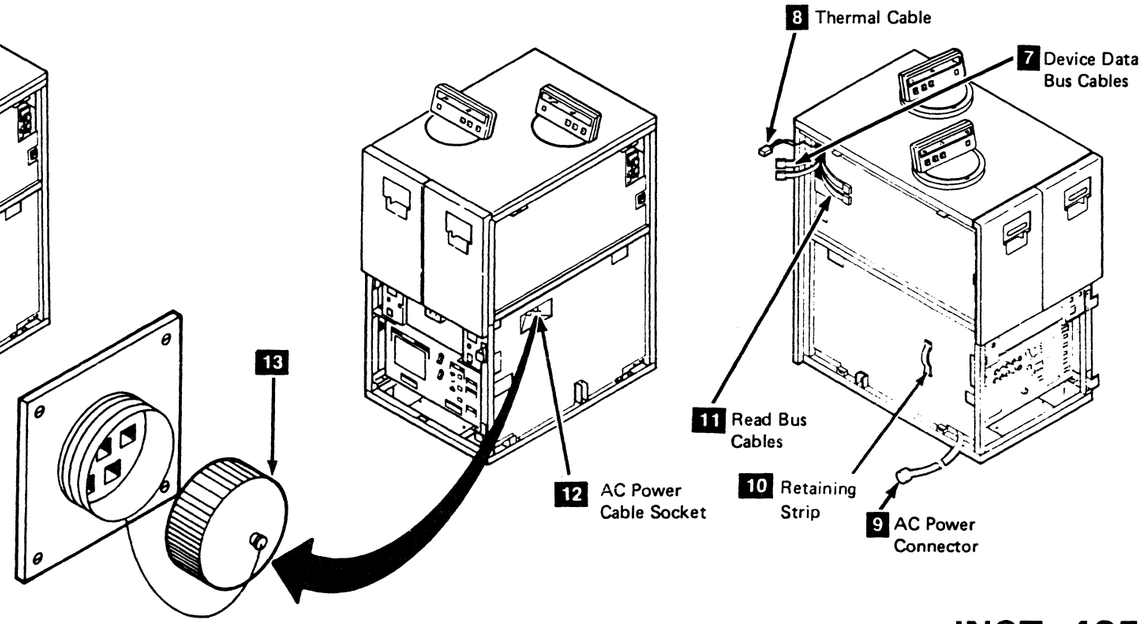
__ 13. Continue with the next step on INST 436.











3480 Adding Tape Units to an Installed Subsystem

This page is for control units without BM 6460460 (See CARR-CU 9) and tape units without BM 6460006 (See CARR-DR 9)

Adding Tape Units (Continued)

See INST 436 and 437 for the following locations.

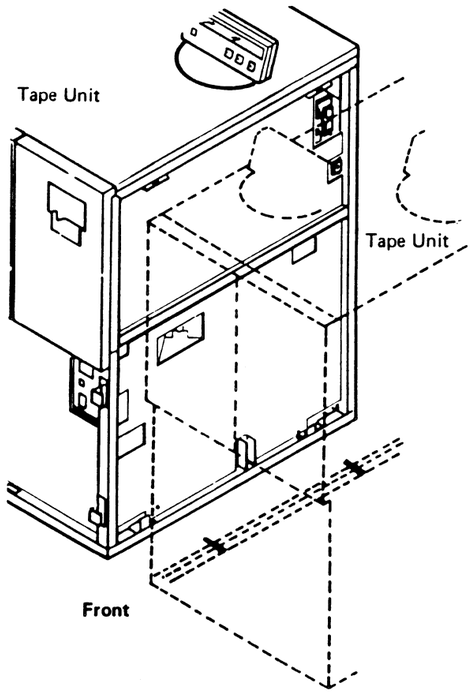
__ 14. Place the next tape unit against the preceding tape unit.

CAUTION
When installing a B box to a B box with the automatic cartridge loader feature installed on any drive, the drive must be opened approximately 5 cm (2 in.) to prevent the conductive seal from being pinched between the tape unit frames.

Note: *Be sure the position of the casters does not prevent the tape units from fitting snugly together.*

__ 15. Fasten the new tape unit to the preceding tape unit by installing a hex bolt and washer at the rear of the tape unit **8**, and at the front of the tape unit **7**.

Note: *If the tape units are not correctly aligned, the covers may bind. Ensure that the covers are not binding.*



__ 16. Place the rear casters on the new tape unit so the caster lock thumbscrews **6** are accessible.

__ 17. Lock the rear casters on the new tape unit by turning the caster lock thumbscrews clockwise until they are tight.

__ 18. Repeat steps 4 through 17, on INST 435 and INST 436, for each additional tape unit that is attached to the control unit.

On the last tape unit attached to the control unit:

__ 19. Locate the two terminator cards p/n 8492916 **4**, that you removed from the last tape unit installed. Plug the cards in the device data bus sockets of the new tape unit.

a. Open the connector-holding clip **1**.

b. Push the terminator cards **4** straight in until tight.

c. Close the connector-holding clip **5**.

__ 20. Screw the safety cover **9** onto the ac power cable socket.

DANGER
Dangerous voltages are present at the ac power cable socket. The safety cover must be on when the socket is not being used.

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__ 21. Plug the thermal terminator **2** into the thermal connector **3**. The thermal terminator was removed in a prior step from the preceding tape unit.

__ 22. Go to INST 350 for instructions on setting the drive logical and physical addresses, return here when finished.

__ 23. Go to INST 356 for instructions on checking tape unit power supply jumpers, return here when finished.

__ 24. Go to INST 370 if the tape unit is attached to a single control unit subsystem, return here when finished.

__ 25. Go to INST 376 if the tape unit is attached to a dual control unit subsystem, return here when finished.

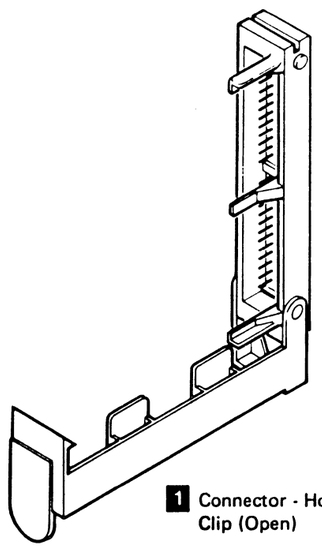
Before You're Through...

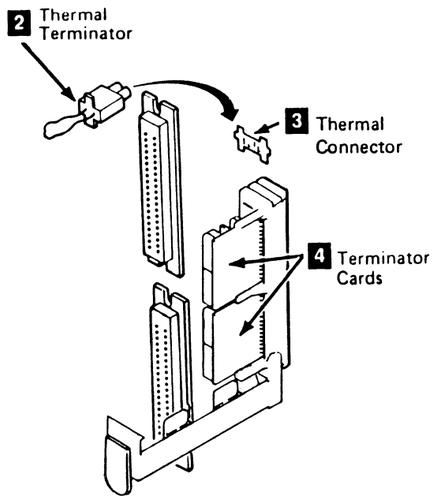
__ 1. Run the product maintenance diskette to the last drive attached to the affected control unit(s).

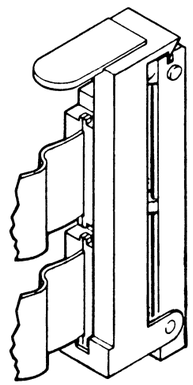
__ 2. Go to INST 430 and install the RFI shields and reinstall all covers and subcovers that were removed.

__ 3. Go to INST 431 and run the OLTs.

__ 4. This completes the installation of additional drives to an existing subsystem. Return the subsystem to the customer.

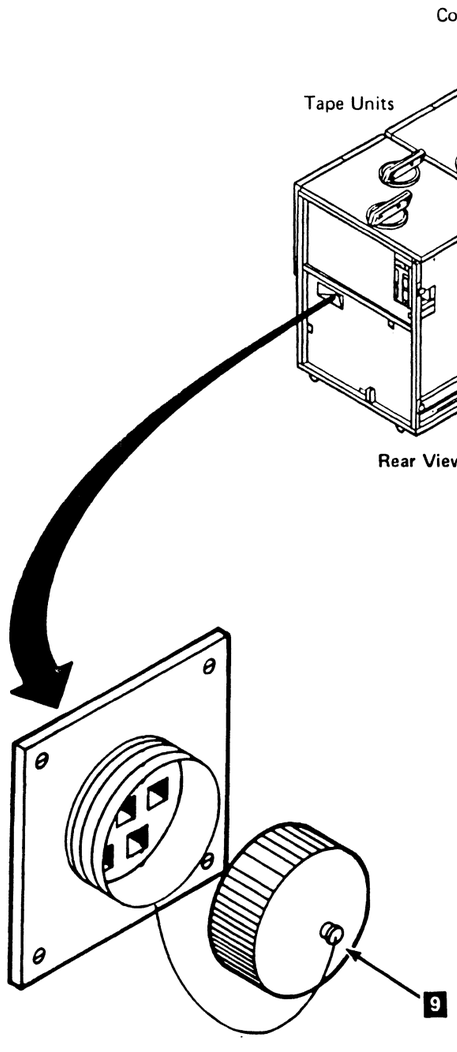


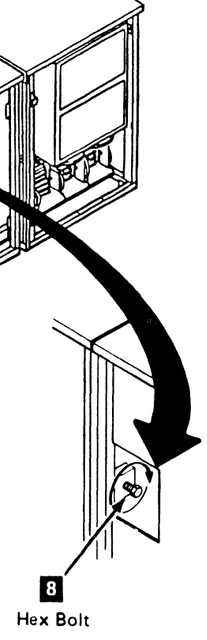


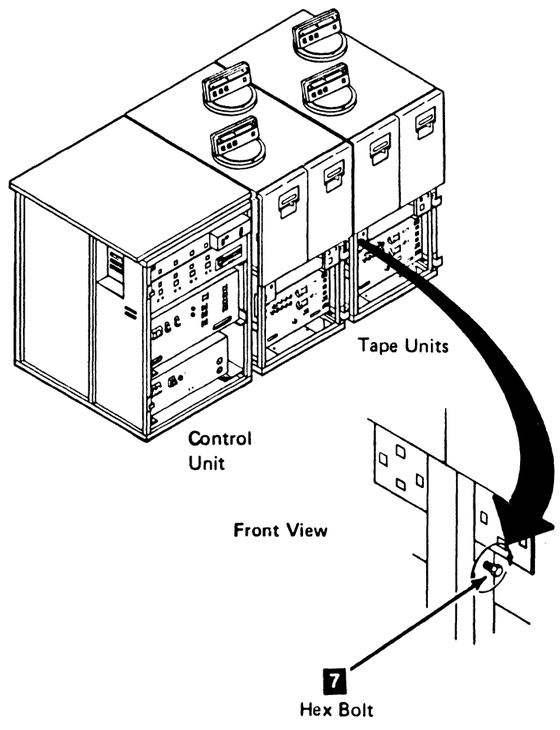


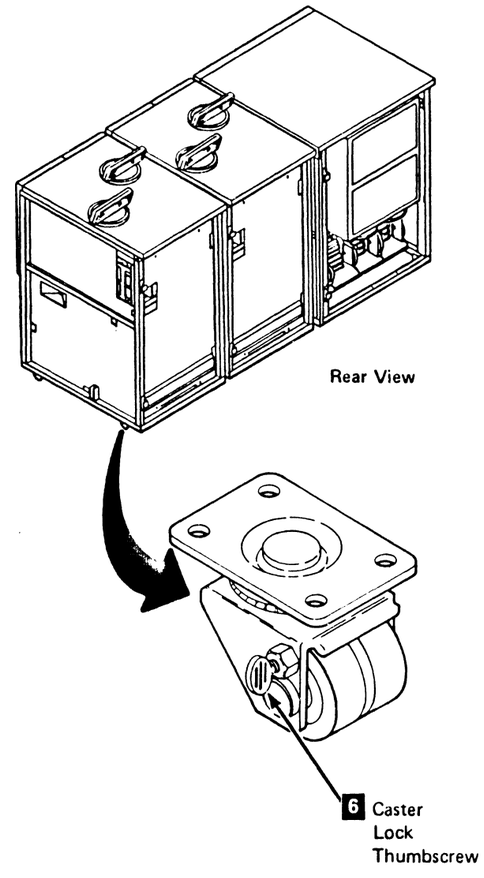
This page is for control units without BM 6460460 (See CARR-CU 9) and tape units without BM 6460006 (See CARR-DR 9)

Installing Additional Tape Units (Continued)









3480 Relocate or Discontinue

This page is for control units without BM 6460460 (See CARR-CU 9) and tape units without BM 6460006 (See CARR-DR 9)

Note: *For World Trade countries, refer to WT General CEM 257, "General Internal Packaging Instructions for Replant Machines."*

Note: *Before attempting to relocate or discontinue a subsystem, ensure that you have the following packing material BMs on hand:*

- *BM 7359079 (for tape units)*
- *BM 7359073 (for control unit).*

Getting Started

To remove or relocate a 3480 subsystem, perform the following steps:

__ 1. Before proceeding, check the following:

  __ a. Make sure that all drives are unloaded and that the tape cartridges have been removed.

  __ b. Make sure that the 3480 subsystem is offline to all host systems. (The vary offline procedures are described on PLAN 55.)

  __ c. Make sure that any channels to be removed from the control unit have been varied offline to the operating system.

__ 2. Remove the front, rear, and left side covers from the control unit. See CARR-CU 2-3 for cover removal procedures.

Removing Power

__ 3. Remove the control unit rear safety cover.

__ 4. Set the CU Online/CU Offline switch **1** to CU Offline.

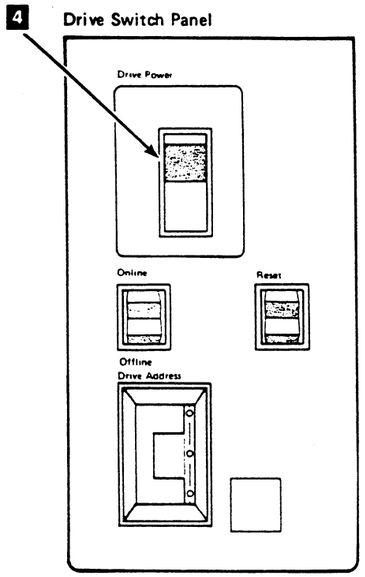
__ 5. Set the control unit Power On/Off switch **2** to Off.

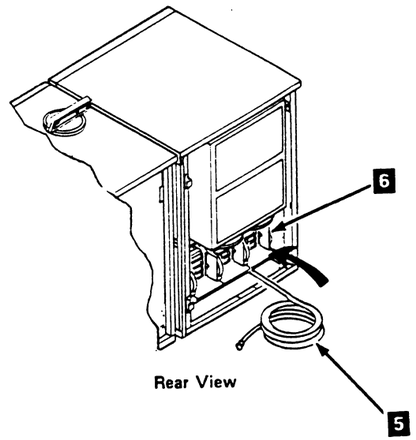
__ 6. Set the control unit Unit Emergency Power switch **3** to Power Off.

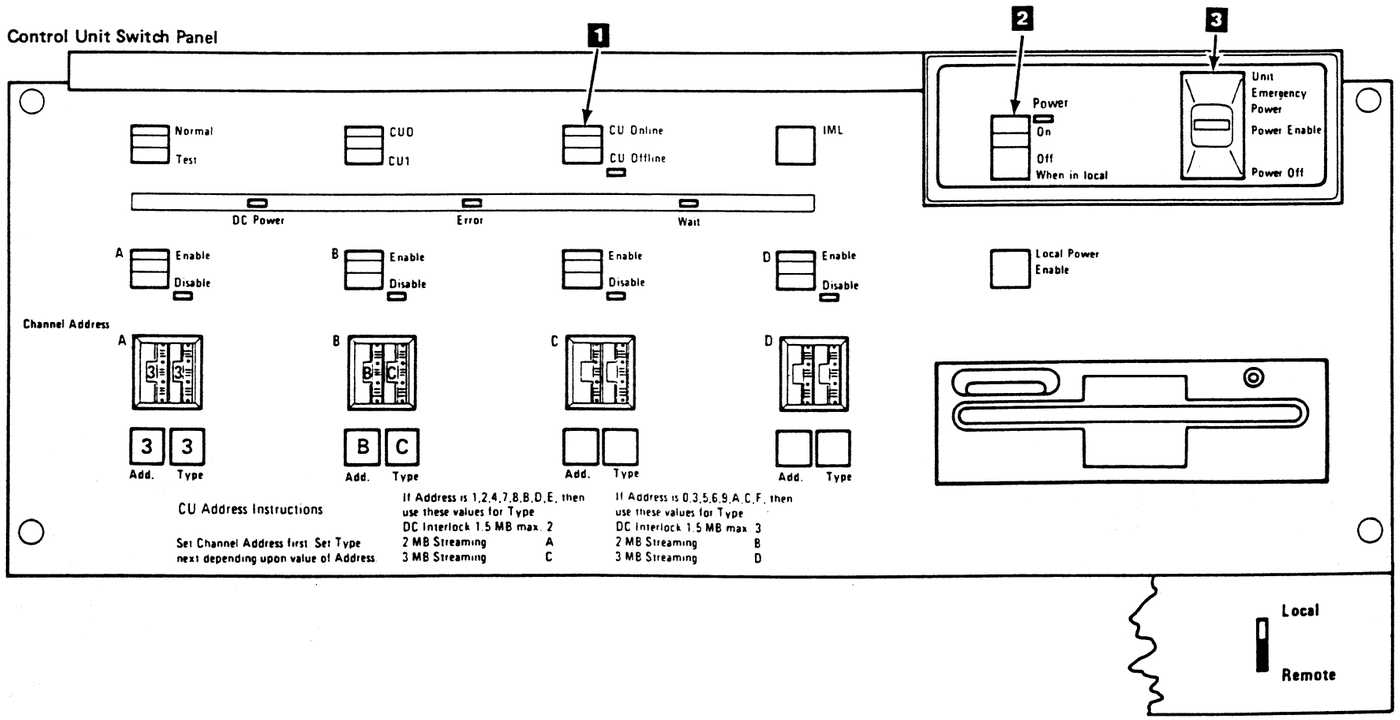
__ 7. Set the Drive Power switch **4** to Off on each drive.

__ 8. Have the customer remove power from the outlet.

__ 9. Remove the power cable **5** from the customer's outlet and tape the coiled cable behind the I/O cable connectors **6**.







This page is for control units without BM 6460460 (see CARR-CU 9) and tape units without BM 6460006 (see CARR-DR 9)

Removing I/O Cables

Note: *If the control unit has the vertical style I/O connectors, remove the drip-screen guard.*

__ 10. Start with channel A [1].

Do you have the movable rail style I/O connector?

NO YES

Open the movable rail style I/O connector assembly by lifting the handle and pushing it forward as far as it will go [4].

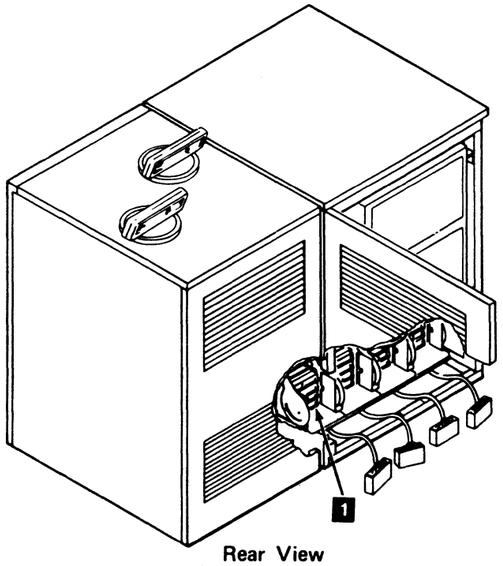
Lift all the cables and terminators from the I/O connector assembly.

Unscrew and remove all the cables and terminators from the horizontal or vertical style I/O connector assembly.

__ 11. Pass the channel cables down through the opening in the bottom of the control unit.

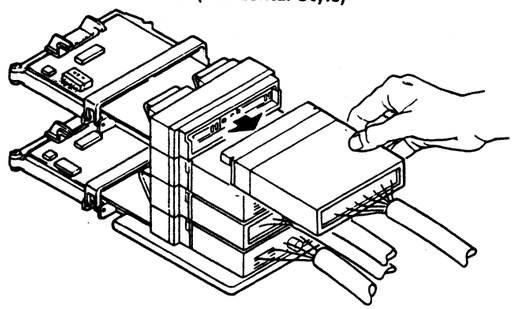
__ 12. Disconnect all channel cables from the host system and ensure that the channels are correctly terminated.

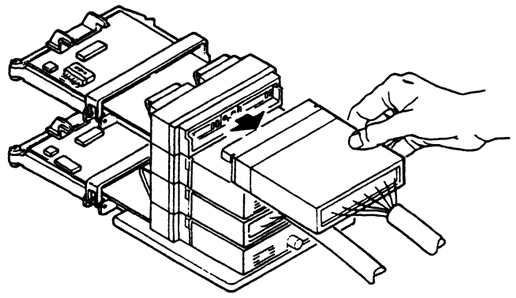
__ 13. Repeat steps 10 through 12 for any remaining channel cables.

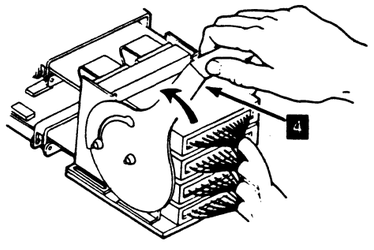


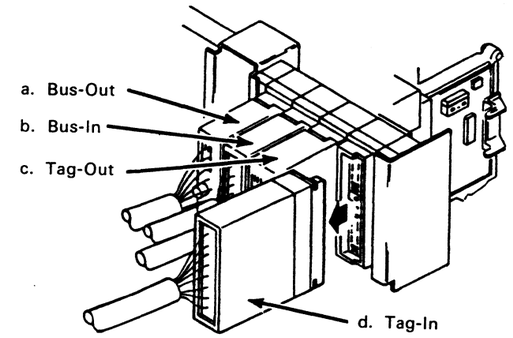
Rear View

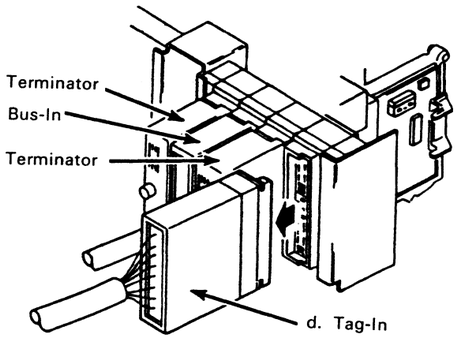
I/O Connector (Horizontal Style)





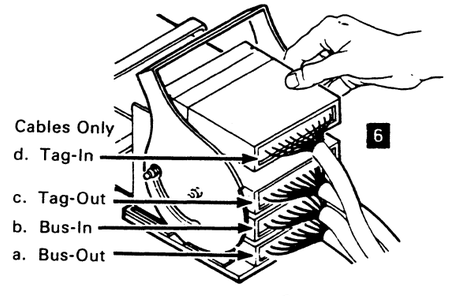


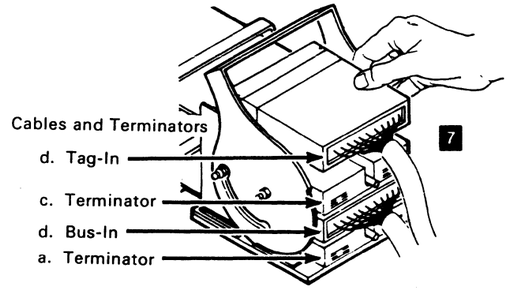




I/O Connector (Vertical Style)

I/O Connector (Movable Rail Style)





3480 Relocate or Discontinue

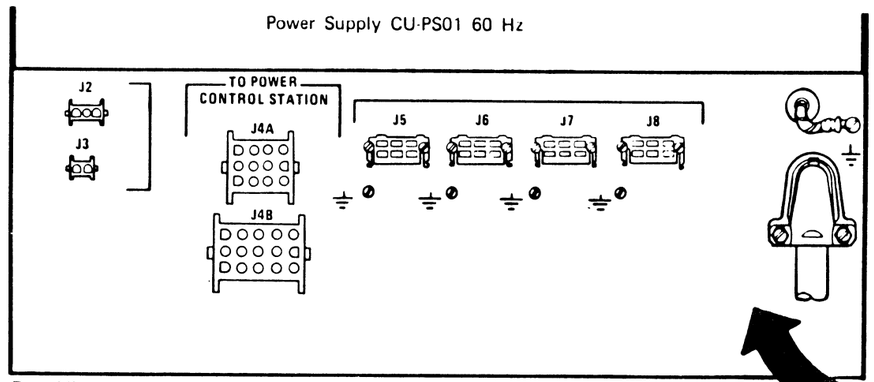
This page is for control units without BM 6460460 (See CARR-CU 9) and tape units without BM 6460006 (See CARR-DR 9)

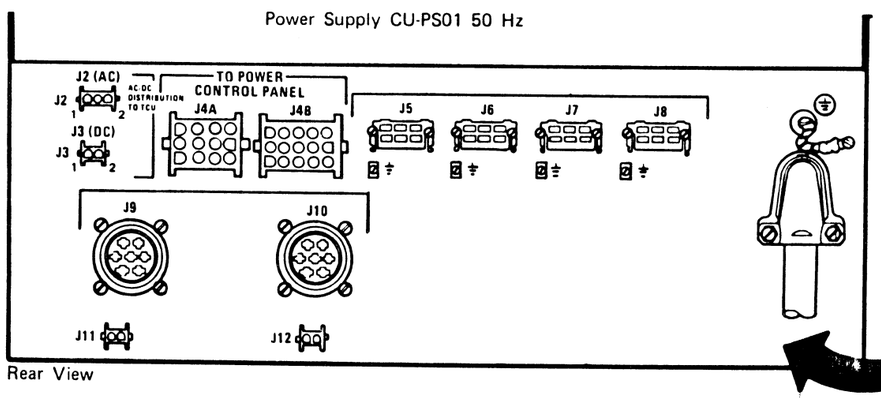
Removing Unit Emergency Power Off (UEPO) Cables

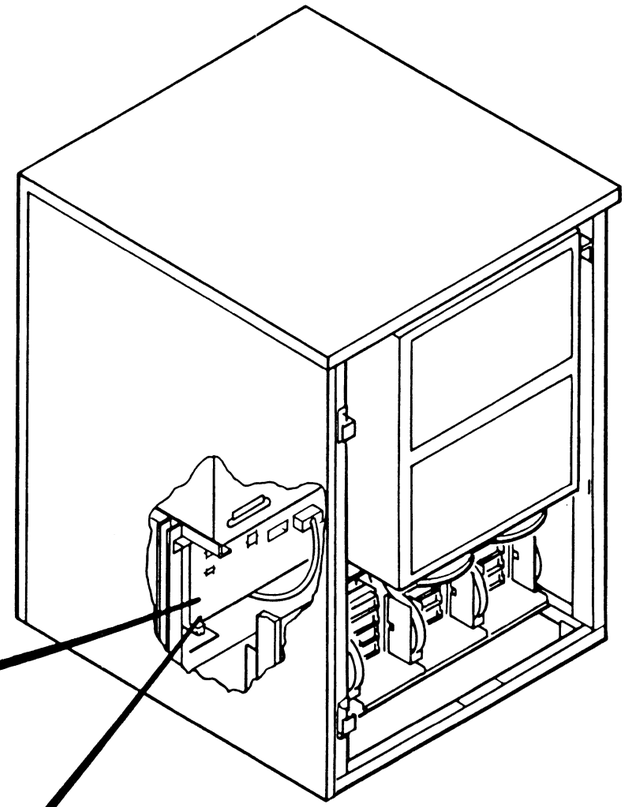
__ 14. Disconnect the UEPO cables from the controlling computer.

__ 15. Remove the four UEPO cables from connectors J5 through J8.

__ 16. Pass the UEPO cables down through the opening in the bottom of the control unit.







This page is for control units without BM 6460460 (See CARR-CU 9) and tape units without BM 6460006 (See CARR-DR 9)

Removing Dual Control Unit Communication Cables

__ 17. Disconnect the ground straps **9** from each control unit.

__ 18. Disconnect both ends **7** of the 3-connector cable: one end at each control unit.

There are two types of cable retention hardware. If your control unit has retaining screws for sockets A3, A4, and A5, go to step 19. If your control unit has connector holding clips on sockets A3, A4, and A5, do the following:

__ a. Open the connector-holding clips for sockets A5, A4, and A3.

__ b. Disconnect the 3-connector feature cable **10** (connectors A5, A4, and A3).

__ c. Close the connector-holding clips.

__ d. Go to step 20.

__ 19. If your control unit has retaining screws **1** for sockets A3, A4, and A5, do the following:

__ a. Unscrew the retaining screws.

__ b. Disconnect the 3-connector feature cable **10** (connectors A5, A4, and A3).

__ 20. Disconnect both ends of the 2-connector feature cable **8** at the control units **6**.

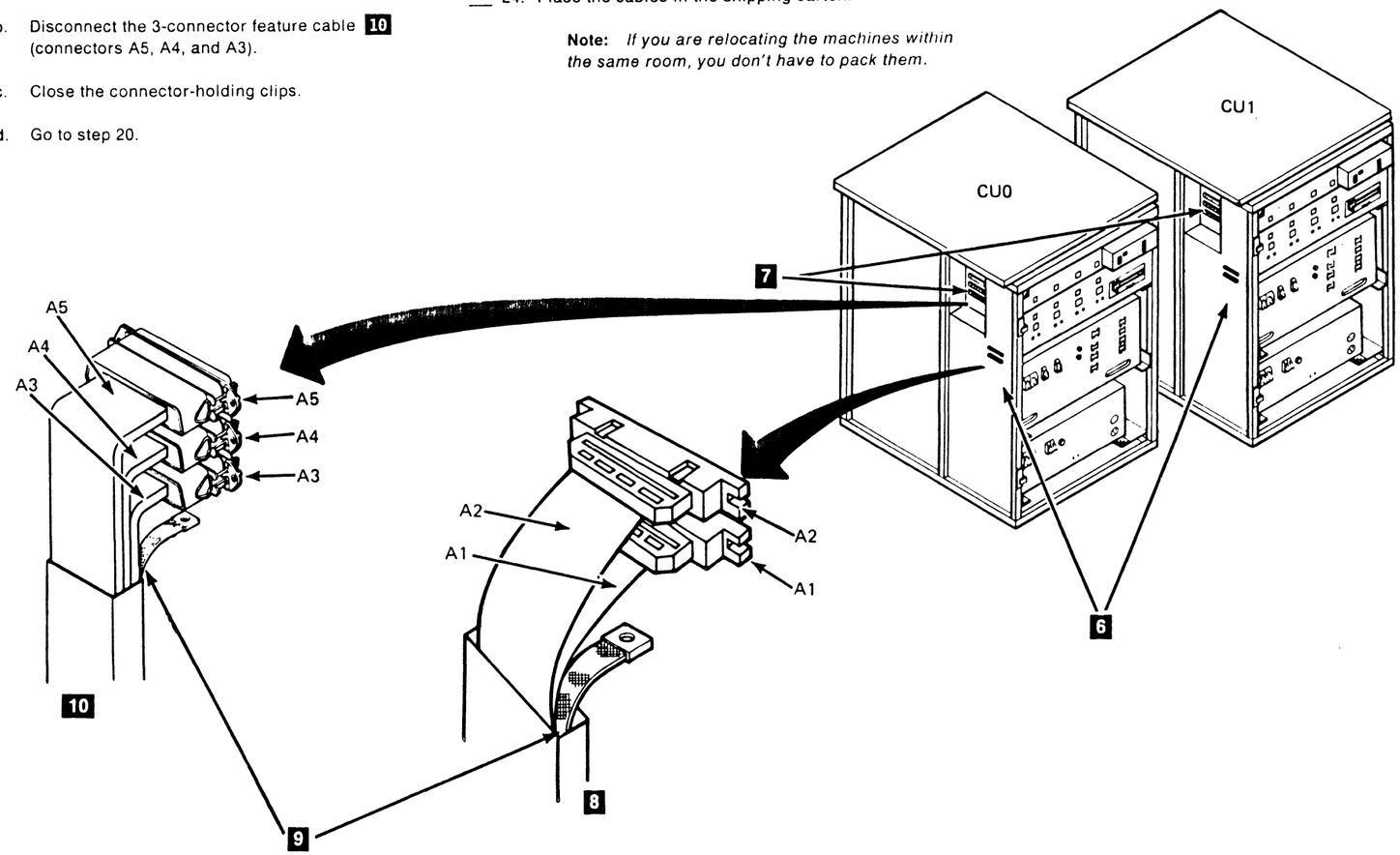
__ 21. Loosen the cable retaining brackets **5** and slide the cables from between the guide posts **3**.

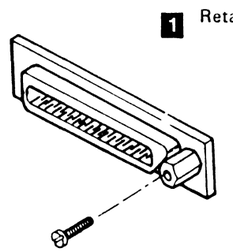
__ 22. Swing the retaining brackets closed and tighten all the wingnuts **4**.

__ 23. Place protective covers **2** over the connectors at both ends of the feature cable.

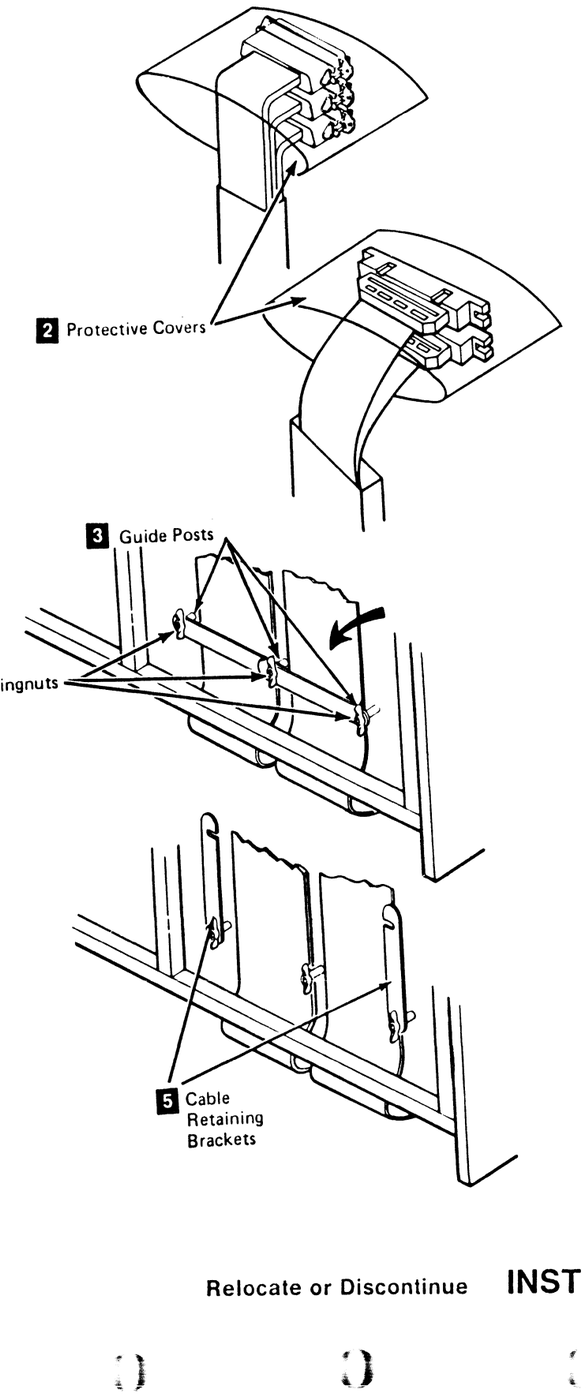
__ 24. Place the cables in the shipping carton.

Note: *If you are relocating the machines within the same room, you don't have to pack them.*





1 Retaining Assembly



3480 Relocate or Discontinue

This page is for control units without BM 6460460 (See CARR-CU 9) and tape units without BM 6460006 (See CARR-DR 9)

Disconnecting the Tape Units and the Control Unit

__ 25. Unlock the rear casters **1** of the control unit and tape units.

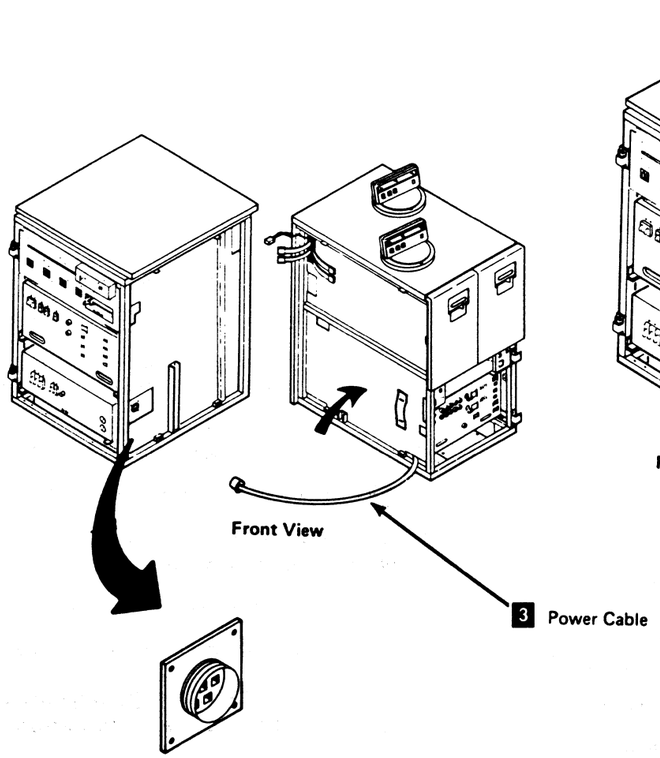
CAUTION: TILT HAZARD

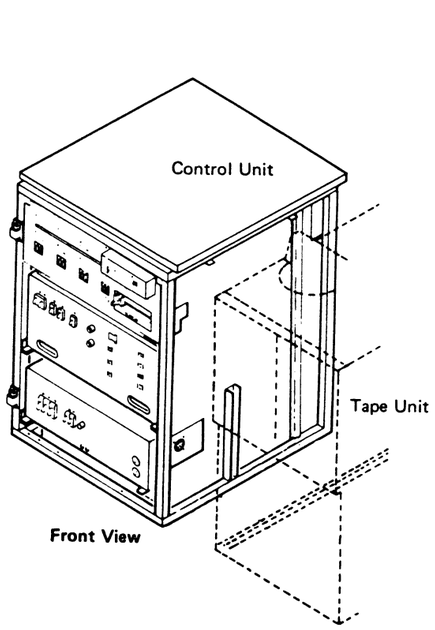
Do NOT open both drives of a tape unit that is not bolted to another tape unit or control unit. With the automatic cartridge loader feature installed and both drive drawers fully extended, a tape unit that is not bolted to another unit will tilt forward with about 20 lbs. of force applied to the top of either automatic cartridge loader.

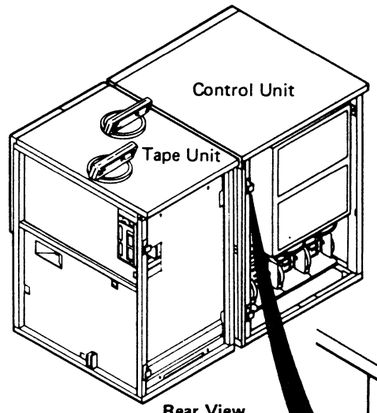
__ 26. Remove the hex bolts and washers **2** from the front and rear of each unit.

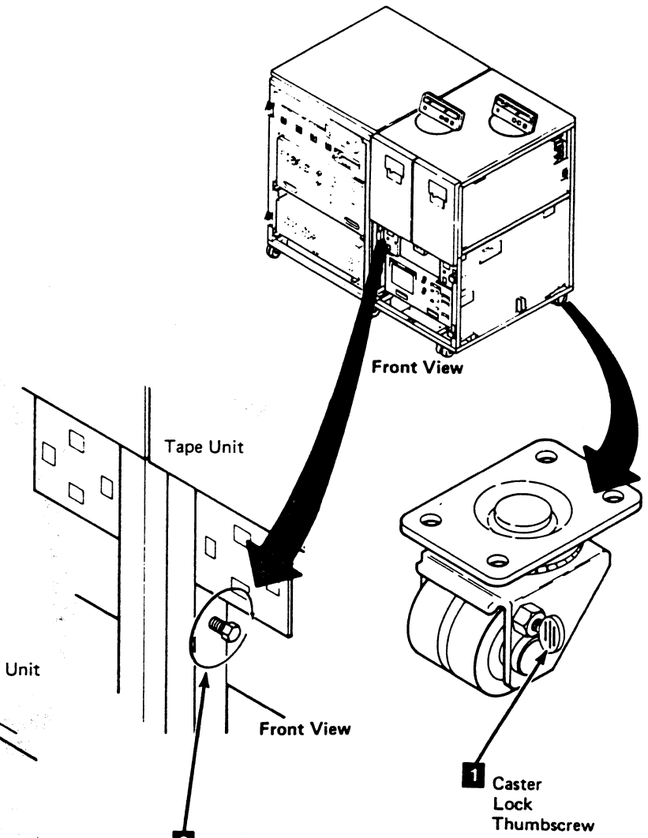
__ 27. Push the control unit about 20 centimeters (8 inches) away from the first tape unit.

__ 28. Disconnect the tape unit to control unit power cable **3** and tape it to the side of the tape unit.









3480 Relocate or Discontinue

This page is for control units without BM 6460460 (See CARR-CU 9) and tape units without BM 6460006 (See CARR-DR 9)

Disconnecting the Tape Units and the Control Unit (Continued)

— 29. On the last tape unit attached to the control unit:

  — a. Remove the side cover.

  — b. Open the device data bus connector holding clip, and remove the terminator cards 2.

  — c. Remove the thermal terminator 1.

  — d. Be sure the terminators are included with the control unit shipping group.

— 30. Disconnect the device data and read bus cables 3 and tape them to the side of the tape unit.

— 31. Disconnect the thermal cable 4.

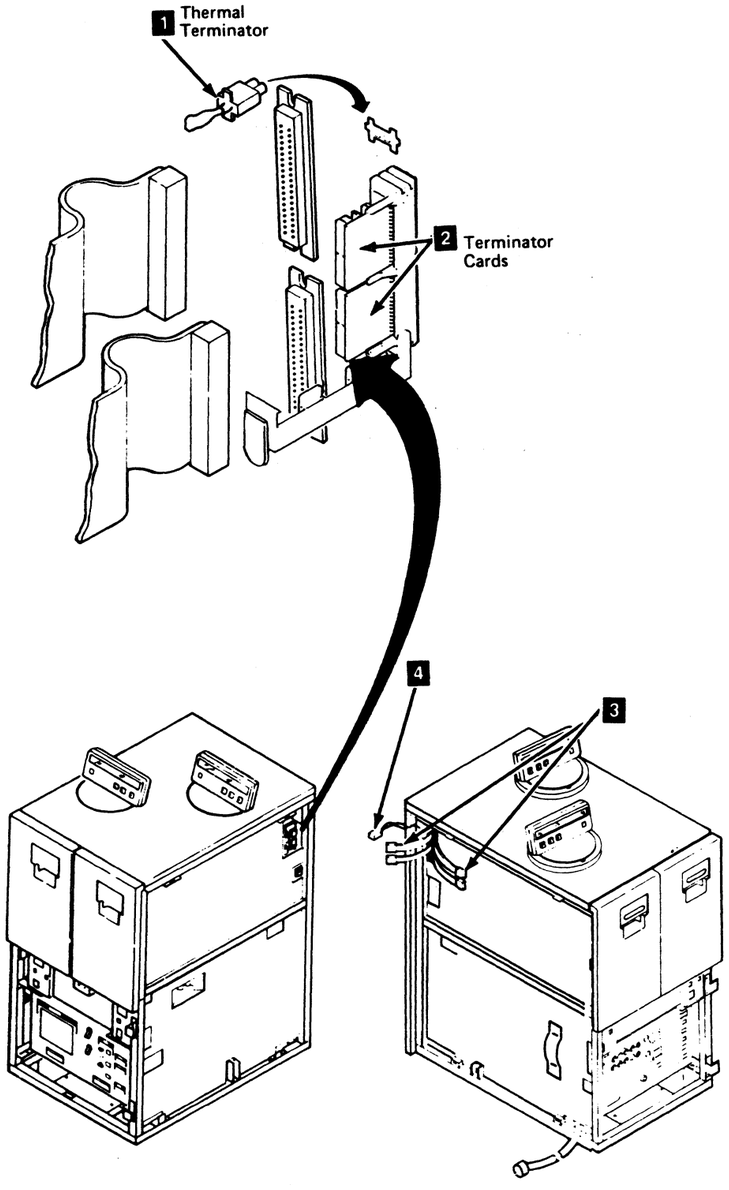
— 32. Repeat steps 30 and 31 for each additional tape unit.

To complete the removal/replacement:

— 33. Install the side cover you removed from the tape unit on the right side of the control unit (as you face the front of the control unit).

— 34. Reinstall any covers that were removed.

— 35. Report the activities performed, using the existing Branch Office procedures.



Relocate or Discontinue INST 490

Installing Adapter Assembly Part Number 8576623

Attaching Tape Units With BM 6460006 (See CARR-DR 9) to Control Units Without BM 6460460 (See CARR-CU 9)

Adapter assembly part number 8576623 is needed when:

- Adding a tape unit with BM 6460006 directly to the right (as you face the front) of a control unit without BM 6460460.
- Adding a tape unit with BM 6460006 directly to the right (as you face the front) of a tape unit without BM 6460006.

Note: *There are separate procedures for installing adapter assembly 8576623 on a control unit (on this page) and installing adapter assembly 8576623 on a tape unit (see INST 505). Ensure that you use the correct procedure.*

Note: *If you place all tape units with BM 6460006 side-by-side, and place all tape units without BM 6460006 side-by-side, you can reduce the number of adapter assemblies needed to one for each control unit with attached drives.*

Some control units **without** BM 6460460 have adapter assembly part number 8576623 included in their ship group. The assembly is stored, unused, inside the control unit (tied to the frame with cable ties) until needed.

If you need an adapter assembly and one has not been included with your control unit, you must order one.

If the adapter has already been installed, go to INST 1 "3480 Installation Instructions."

Go to "Installing Adapter Assembly 8576623 On A Control Unit" on this page for the installation instructions.

Installing Adapter Assembly Part Number 8576623

The adapter assembly contains:

- One read local cable
- One read remote cable
- One terminator cards
- One thermal cable
- One wire retainer bail
- One write cable
- Two channel grommets.

Installing Adapter Assembly 8576623 on a Control Unit

Install the adapter assembly on the control unit **without** BM 6460460 as follows:

__ 1. Go to CARR-CU 6 for the procedure to remove ***ac power*** from the control unit.

__ 2. Remove the right-side cover of the control unit, if present.

__ 3. Remove the magnetic catch and screws from the bottom frame member and set aside for later use.

__ 4. Find the write cable (part number 6460294). The write cable has two connectors on one end and one connector on the other. Plug the two connector end into the control unit as follows:

- __ a. Open the connector holding clip **2** by pulling upward and outward on the clip.
- __ b. Remove the connector holding clip and save it with the control unit ship group.
- __ c. Remove the terminator cards **8** (if present) and same them with the control unit ship group.
- __ d. Install the wire retainer bail (part number 8498864) **10** on the maple block connector. (It will be necessary to temporarily remove both read cable connectors to facilitate the installation of the wire bail retainer.)
- __ e. The write cable labeled "B2 Remote" **7** goes in the upper connector.
- __ f. The write cable labeled "A2 Local" **9** goes in the lower connector.
- __ g. Close the wire bail retainer **10**.

__ 5. Reinstall the read cable connectors (removed in step 4 d).

__ 6. Find the read local cable (part number 8576622) and read remote cable (part number 6178683) and plug them into the read connectors in the control unit as follows:

a. The read cable labeled "Remote (Bus B)" goes in the upper connector **4**.
b. The read cable labeled "Local (Bus A)" goes in the lower connector **3**.

__ 7. Remove the thermal terminator **5** (if present) and set it aside. You will need it later.

__ 8. Find the thermal cable (part number 8576630) and plug it into the thermal connector on the control unit **6**.

__ 9. Place the cables **11** on a path down inside of the control unit and towards the front. Bring the cables out the right side (as you face the front) of the control unit, near the ac power connector.

__ 10. Use the cable ties in the bill of material as needed to fasten the cables in place.

__ 11. Find the terminator card (part number 8576373). Remove and discard the metal clip from the terminator (if present). Install the terminator in the tape unit (this may be moved later, as it must be in the last tape unit attached to the control unit).

__ 12. Find the thermal plug that you removed in step 7 and plug it in the tape unit (this may be moved later, as it must be in the last tape unit attached to the control unit).

__ 13. Remove the latch bracket from the end unit and install the magnetic catch that was removed in step 3 to the bottom of the frame member. If the magnetic catch does not align with the frame holes, use only one screw to mount it to the frame. Save the removed cover latch bracket by adding it to the hold down screw for the magnetic catch **1**.

__ 14. Install the end cover.

__ 15. Go to INST 1 to continue with the normal installation of a tape without BM 6460006.

Attaching Tape Units With BM 6460006 (See CARR-DR 9) to Control Units Without BM 6460460 (See CARR-CU 9)

Adapter assembly part number 8576623 is needed when:

- Adding a tape unit with BM 6460006 directly to the right (as you face the front) of a control unit without BM 6460460.
- Adding a tape unit with BM 6460006 directly to the right (as you face the front) of a tape unit without BM 6460006.

Note: There are separate procedures for installing adapter assembly 8576623 on a control unit (on this page) and installing adapter assembly 8576623 on a tape unit (see INST 505). Ensure that you use the correct procedure.

Note: If you place all tape units with BM 6460006 side-by-side, and place all tape units without BM 6460006 side-by-side, you can reduce the number of adapter assemblies needed to one for each control unit with attached drives.

Some control units **without** BM 6460460 have adapter assembly part number 8576623 included in their ship group. The assembly is stored, unused, inside the control unit (tied to the frame with cable ties) until needed.

If you need an adapter assembly and one has not been included with your control unit, you must order one.

If the adapter has already been installed, go to INST 1 "3480 Installation Instructions."

Go to "Installing Adapter Assembly 8576623 On A Control Unit" on this page for the installation instructions.

Installing Adapter Assembly Part Number 8576623

The adapter assembly contains:

- One read local cable
- One read remote cable
- One terminator cards
- One thermal cable
- One wire retainer bail
- One write cable
- Two channel grommets.

Installing Adapter Assembly 8576623 on a Control Unit

Install the adapter assembly on the control unit **without** BM 6460460 as follows:

__ 1. Go to CARR-CU 6 for the procedure to remove ***ac power*** from the control unit.

__ 2. Remove the right-side cover of the control unit, if present.

__ 3. Remove the magnetic catch and screws from the bottom frame member and set aside for later use.

__ 4. Find the write cable (part number 6460294). The write cable has two connectors on one end and one connector on the other. Plug the two connector end into the control unit as follows:

- __ a. Open the connector holding clip **2** by pulling upward and outward on the clip.
- __ b. Remove the connector holding clip and save it with the control unit ship group.
- __ c. Remove the terminator cards **8** (if present) and save them with the control unit ship group.
- __ d. Install the wire retainer bail (part number 8498864) **10** on the maple block connector. (It will be necessary to temporarily remove both read cable connectors to facilitate the installation of the wire bail retainer.)
- __ e. The write cable labeled "B2 Remote" **7** goes in the upper connector.
- __ f. The write cable labeled "A2 Local" **9** goes in the lower connector.
- __ g. Close the wire bail retainer **10**.

__ 5. Reinstall the read cable connectors (removed in step 4 d).

__ 6. Find the read local cable (part number 8576622) and read remote cable (part number 6178683) and plug them into the read connectors in the control unit as follows:

- a. The read cable labeled "Remote (Bus B)" goes in the upper connector **4**.
- b. The read cable labeled "Local (Bus A)" goes in the lower connector **3**.

__ 7. Remove the thermal terminator **5** (if present) and set it aside. You will need it later.

__ 8. Find the thermal cable (part number 8576630) and plug it into the thermal connector on the control unit **6**.

__ 9. Place the cables **11** on a path down inside of the control unit and towards the front. Bring the cables out the right side (as you face the front) of the control unit, near the ac power connector.

__ 10. Use the cable ties in the bill of material as needed to fasten the cables in place.

__ 11. Locate the device data bus terminator card (P/N 8576373 or P/N 13F3765). Remove and discard the metal clip from the terminator (if present). Install the terminator in the tape unit (this may be moved later, as it must be in the last tape unit attached to the control unit).

__ 12. Find the thermal plug that you removed in step 7 and plug it in the tape unit (this may be moved later, as it must be in the last tape unit attached to the control unit).

__ 13. Remove the latch bracket from the end unit and install the magnetic catch that was removed in step 3 to the bottom of the frame member. If the magnetic catch does not align with the frame holes, use only one screw to mount it to the frame. Save the removed cover latch bracket by adding it to the hold down screw for the magnetic catch **1**.

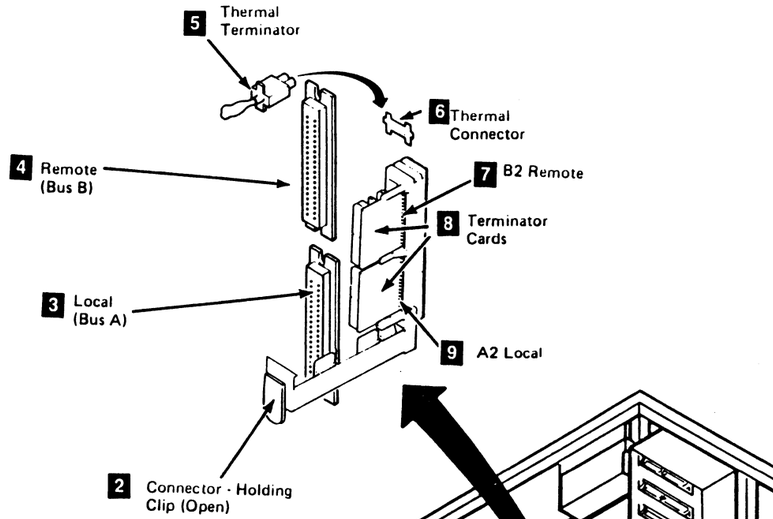
__ 14. Install the end cover.

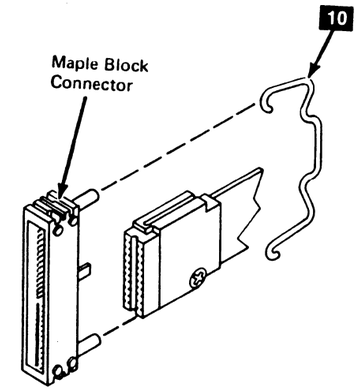
__ 15. Go to INST 1 to continue with the normal installation of a tape without BM 6460006.

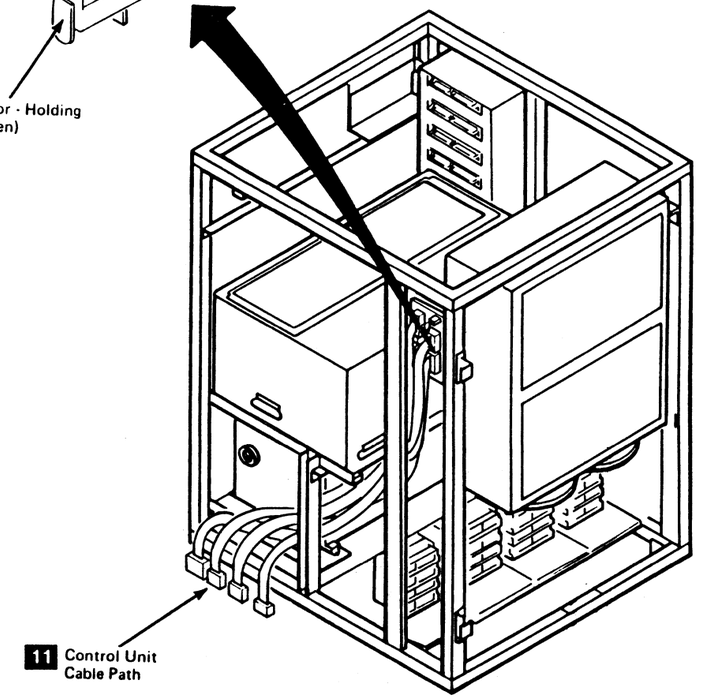
0 0 0 0 0 0 0 0 0 0

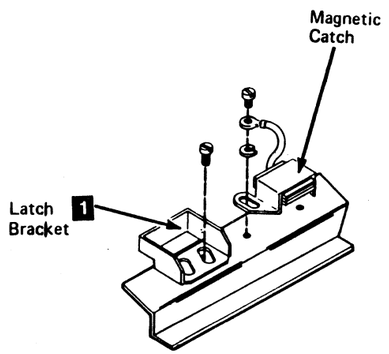
Installing Adapter Assembly Part Number 8576623 (Continued)

Attaching Tape Units With BM 6460006 (See CARR-DR 9) to Control Units Without BM 6460460 (See CARR-CU 9) (Continued)









Attaching Tape Units With BM 6460006 (See CARR-DR 9) to Tape Units Without BM 6460006 (See CARR-DR 9)

Adapter assembly part number 8576623 is needed when:

- Adding a tape unit with BM 6460006 directly to the right (as you face the front) of a control unit without BM 6460460.
- Adding a tape unit with BM 6460006 directly to the right (as you face the front) of a tape unit without BM 6460006.

Note: *There are separate procedures for installing adapter assembly 8576623 on a control unit (see INST 500) and installing adapter assembly 8576623 on a tape unit (on this page). Ensure that you use the correct procedure.*

Note: *If you place all tape units with BM 6460006 side-by-side, and place all tape units without BM 6460006 side-by-side, you can reduce the number of adapter assemblies needed to one for each control unit with attached drives.*

Some control units **without** BM 6460460 have adapter assembly part number 8576623 included in their ship group. The assembly is stored, unused, inside the control unit (tied to the frame with cable ties) until needed.

If you need an adapter assembly and one has not been included with your control unit, you must order one.

If the adapter has already been installed, go to INST 1"3480 Installation Instructions."

Go to "Installing Adapter Assembly 8576623 On A Tape Unit" on this page for the installation instructions.

Installing Adapter Assembly 8576623 On A Tape Unit

The adapter assembly contains:

- One read local cable
- One read remote cable
- One terminator card
- One thermal cable
- One wire retainer bail
- One write cable
- Two channel grommets.

Install the adapter assembly on the tape unit **without** BM 6460460 as follows:

__ 1. Go to CARR-CU 6 for the procedure to remove ***ac power*** from the control unit.

__ 2. Remove the right-side cover of the tape unit without BM 6460006, if present.

__ 3. Remove the upper subcover 5 from the right side of the tape unit.

__ 4. Remove the lower subcover 4 from the right side of the tape unit and let it hang by the attached power cable.

__ 5. Remove the magnetic catch and screws from the bottom frame member and set them aside for later use.

__ 6. Find the channel grommets (part number 6178684 and 6178690) and place them on the lower edge of the ac connector bracket 3. The longer of the two channels goes on the longest edge of the bracket.

__ 7. Find the write cable (part number 6460294). The write cable has two connectors on one end and one connector on the other. Plug the two connector end in the tape unit without BM 6460006 as follows:

- __ a. Open the connector holding clip 13 by pulling upward and outward on the clip.
- __ b. Remove the connector clip and save it with the control unit ship group.
- __ c. Remove the terminator cards 10 (if present) and save them with the control unit ship group.
- __ d. Install the wire bail retainer 6 (part number 8498864) on the maple block connector. (It will be necessary to temporarily remove both read cable connectors to facilitate the installation of the wire bail retainer.)
- __ e. The write cable labeled "B2 Remote" 9 goes in the upper connector.
- __ f. The write cable labeled "A2 Local" 11 goes in the lower connector.
- __ g. Close the wire bail retainer 6.

__ 8. Reinstall the read cable connectors (removed in step 7 d).

__ 9. Find the read local cable (part number 8576622) and read remote cable (part number 6178683) and plug them into the read connectors in the tape unit as follows:

a. The read cable labeled "Remote (Bus B)" goes in the upper connector 15.
b. The read cable labeled "Local (Bus A)" goes in the lower connector 14.

__ 10. Remove the thermal terminator 7 (if present) and set it aside. You will need it later.

__ 11. Find the thermal cable (part number 8576630) and plug it into the thermal connector on the tape unit 8. Place the thermal cable along the same route as the read and write cables.

__ 12. Route the cables so they hang towards the bottom of the tape unit. Let the cables 16 hang to just below the center horizontal bar of the tape unit frame, then bring the free ends up on top of the heat deflector assembly 1.

__ 13. Route the cables under the hoses at the copper manifold.

__ 14. Use one of the cable ties included in the bill of material to fasten the cables in place on top of the heat deflector.

__ 15. Place the cables under the ac power connector bracket and out the opening on the lower subcover 3.

__ 16. Reinstall the lower subcover 3 and upper subcover 5.

__ 17. Find the terminator card (part number 8576373). Remove and discard the metal clip from the terminator (if present). Install the terminator in the tape unit (this may be moved later, as it must be in the last tape unit attached to the control unit).

__ 18. Find the thermal plug that you removed in step 7 and plug it in the tape unit (this may be moved later, as it must be in the last tape unit attached to the control unit).

__ 19. Remove the latch bracket from the end unit and install the magnetic catch that was removed in step 3 to the bottom of the frame member. If the magnetic catch does not align with the frame holes, use only one screw to mount it to the frame. Save the removed cover latch bracket by adding it to the hold down screw for the magnetic catch 1.

__ 20. Install the end cover.

__ 21. Go to INST 1 to continue with the normal installation of a tape with BM 6460006.

Attaching Tape Units With BM 6460006 (See CARR-DR 9) to Tape Units Without BM 6460006 (See CARR-DR 9)

Adapter assembly part number 8576623 is needed when:

- Adding a tape unit with BM 6460006 directly to the right (as you face the front) of a control unit without BM 6460460.
- Adding a tape unit with BM 6460006 directly to the right (as you face the front) of a tape unit without BM 6460006.

Note: There are separate procedures for installing adapter assembly 8576623 on a control unit (see INST 500) and installing adapter assembly 8576623 on a tape unit (on this page). Ensure that you use the correct procedure.

Note: If you place all tape units with BM 6460006 side-by-side, and place all tape units without BM 6460006 side-by-side, you can reduce the number of adapter assemblies needed to one for each control unit with attached drives.

Some control units **without** BM 6460460 have adapter assembly part number 8576623 included in their ship group. The assembly is stored, unused, inside the control unit (tied to the frame with cable ties) until needed.

If you need an adapter assembly and one has not been included with your control unit, you must order one.

If the adapter has already been installed, go to INST 1"3480 Installation Instructions."

Go to "Installing Adapter Assembly 8576623 On A Tape Unit" on this page for the installation instructions.

Installing Adapter Assembly 8576623 On A Tape Unit

The adapter assembly contains:

- One read local cable
- One read remote cable
- One terminator card
- One thermal cable
- One wire retainer bail
- One write cable
- Two channel grommets.

Install the adapter assembly on the tape unit **without** BM 6460460 as follows:

__ 1. Go to CARR-CU 6 for the procedure to remove ***ac power*** from the control unit.

__ 2. Remove the right-side cover of the tape unit without BM 6460006, if present.

__ 3. Remove the upper subcover **5** from the right side of the tape unit.

__ 4. Remove the lower subcover **4** from the right side of the tape unit and let it hang by the attached power cable.

__ 5. Remove the magnetic catch and screws from the bottom frame member and set them aside for later use.

__ 6. Find the channel grommets (part number 6178684 and 6178690) and place them on the lower edge of the ac connector bracket **3**. The longer of the two channels goes on the longest edge of the bracket.

__ 7. Find the write cable (part number 6460294). The write cable has two connectors on one end and one connector on the other. Plug the two connector end in the tape unit without BM 6460006 as follows:

- __ a. Open the connector holding clip **13** by pulling upward and outward on the clip.
- __ b. Remove the connector clip and save it with the control unit ship group.
- __ c. Remove the terminator cards **10** (if present) and save them with the control unit ship group.
- __ d. Install the wire bail retainer **6** (part number 8498864) on the maple block connector. (It will be necessary to temporarily remove both read cable connectors to facilitate the installation of the wire bail retainer.)
- __ e. The write cable labeled "B2 Remote" **9** goes in the upper connector.
- __ f. The write cable labeled "A2 Local" **11** goes in the lower connector.
- __ g. Close the wire bail retainer **6**.

__ 8. Reinstall the read cable connectors (removed in step 7 d).

__ 9. Find the read local cable (part number 8576622) and read remote cable (part number 6178683) and plug them into the read connectors in the tape unit as follows:

a. The read cable labeled "Remote (Bus B)" goes in the upper connector **15**.
b. The read cable labeled "Local (Bus A)" goes in the lower connector **14**.

__ 10. Remove the thermal terminator **7** (if present) and set it aside. You will need it later.

__ 11. Find the thermal cable (part number 8576630) and plug it into the thermal connector on the tape unit **8**. Place the thermal cable along the same route as the read and write cables.

__ 12. Route the cables so they hang towards the bottom of the tape unit. Let the cables **16** hang to just below the center horizontal bar of the tape unit frame, then bring the free ends up on top of the heat deflector assembly **1**.

__ 13. Route the cables under the hoses at the copper manifold.

__ 14. Use one of the cable ties included in the bill of material to fasten the cables in place on top of the heat deflector.

__ 15. Place the cables under the ac power connector bracket and out the opening on the lower subcover **3**.

__ 16. Reinstall the lower subcover **3** and upper subcover **5**.

__ 17. Locate the device data bus terminator card (P/N 8576373 or P/N 13F3765). Remove and discard the metal clip from the terminator (if present). Install the terminator in the tape unit (this may be moved later, as it must be in the last tape unit attached to the control unit).

__ 18. Find the thermal plug that you removed in step 7 and plug it in the tape unit (this may be moved later, as it must be in the last tape unit attached to the control unit).

__ 19. Remove the latch bracket from the end unit and install the magnetic catch that was removed in step 3 to the bottom of the frame member. If the magnetic catch does not align with the frame holes, use only one screw to mount it to the frame. Save the removed cover latch bracket by adding it to the hold down screw for the magnetic catch **1**.

__ 20. Install the end cover.

__ 21. Go to INST 1 to continue with the normal installation of a tape with BM 6460006.

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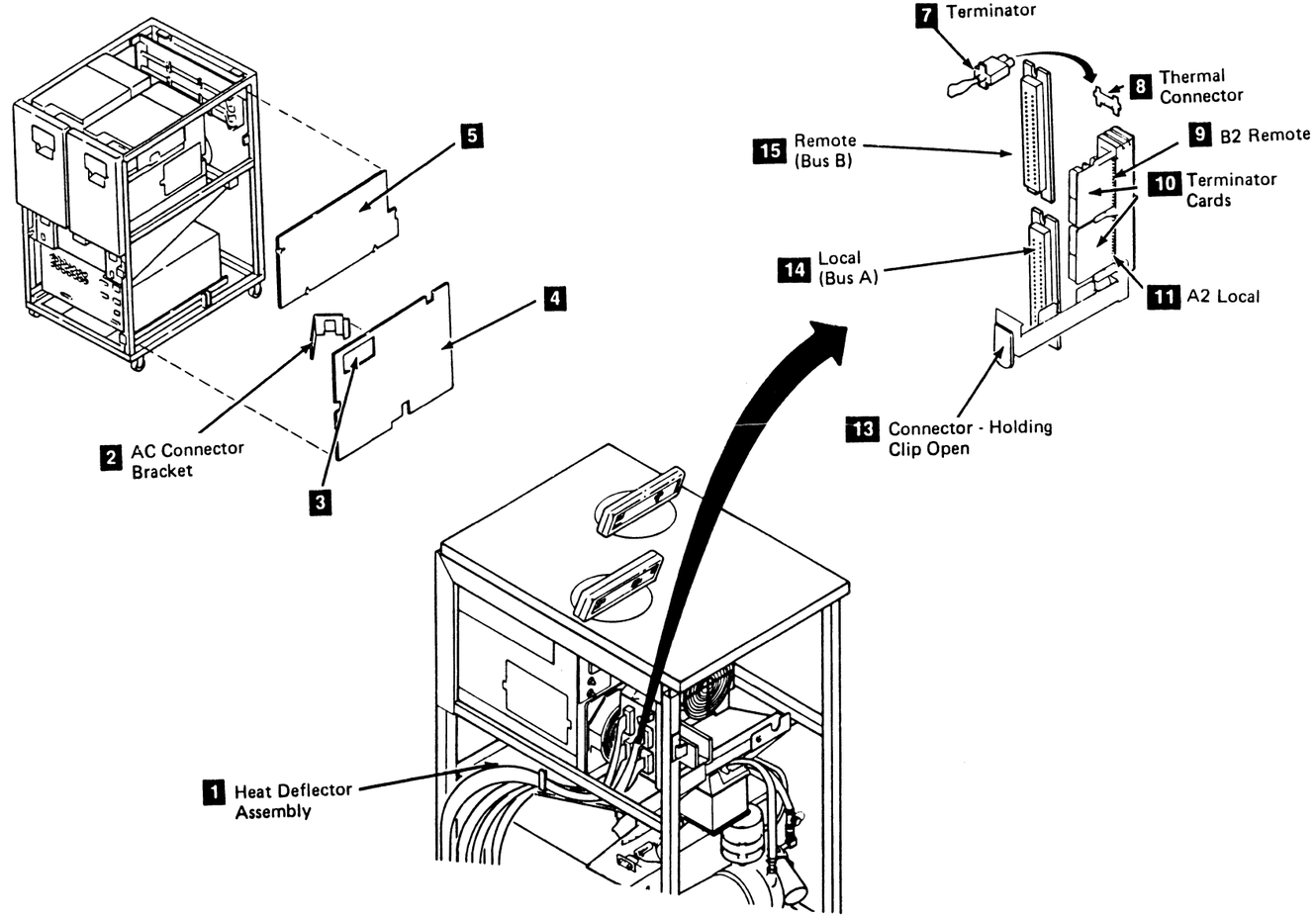
Installing Cable Adapter Assembly Part Number 8576623 (Continued)

Attaching Tape Units With BM 6460006 (See CARR-DR 9) to Tape Units Without BM 6460006 (See CARR-DR 9)



Attaching Tape Units Without BM 6460006 (See CARR-DR 9) to Control Units With BM 6460460 (See CARR-CU 9) or

Attaching Tape Units Without BM 6460006 (See CARR-DR 9) to Tape Units With BM 6460006 (See CARR-DR 9)

Adapter assembly part number 8576624 is needed when:

- Adding a tape unit without BM 6460006 directly to the right (as you face the front) of a control unit with BM 6460460.
- Adding a tape unit without BM 6460006 directly to the right (as you face the front) of a tape unit with BM 6460006.

Note: *If you place all tape units with BM 6460006 side-by-side, and place all tape units without BM 6460006 side-by-side, you can reduce the number of adapter assemblies needed to one for each control unit with attached drives.*

If you need an adapter assembly and one has not been included with your control unit, you must order one.

Note: *The procedure is the same for adding a tape unit to a tape unit, or adding a tape unit to a control unit.*

If the adapter has already been installed, go to INST 1"3480 Installation Instructions."

Installing Adapter Assembly Part Number 8576624

The adapter assembly contains:

- One channel grommet
- One maple block connector
- One read local cable
- One read remote cable
- One striker plate
- One thermal cable
- One write cable
- Two terminator cards.

Note: *See INST 515 for the following locations.*

Install the adapter assembly on the tape unit **without** BM 6460006 as follows:

__ 1. Go to CARR-CU 6 for the procedure to remove ***ac power*** from the control unit.

__ 2. Remove the upper and lower subcovers **2** from the left side of the tape unit without BM 6460006.

__ 3. Find the channel grommet (part number 6177155) in the adapter assembly and place it along the center of the upper edge of the lower subcover **1**.

__ 4. Find the maple block connector (part number 4780547) and the two wire retaining bails (part number 8498864) in the adapter assembly.

__ 5. Plug the write cables from the tape unit **4** into the maple block connector **5**.

__ 6. Install the wire ball retainer **3** to hold the write cables in place.

__ 7. Find the read local cable (part number 8576622) and remote cable (part number 6178683) in the adapter assembly and plug them into the tape unit read cable connectors as follows:

a. The read cable labeled "Remote (Bus B)" goes into the upper cable.

b. The read cable labeled "Local (Bus A)" goes into the lower cable.

__ 8. Find the write cable (part number 6460295) in the adapter assembly. The write cable has two connectors on one end and one connector on the other. Plug the two connector end of the cable into the maple block, opposite the tape unit write cables as follows:

__ a. The cable labeled "B2 Remote" goes into the maple block connector opposite the SLT cable labeled TTUWBIN.

__ b. The cable labeled "A2 Local" goes into the maple block connector opposite the SLT cable labeled TTUWAIN.

__ 9. Find the thermal cable (part number 8576630) in the adapter assembly and connect it to the thermal cable on the tape unit.

__ 10. Place the cables on a path down inside of the tape unit, then out the left side of the tape unit under the center horizontal bar of the tape unit frame **6**.

__ 11. Install the lower subcover, placing the cables over the channel grommet **1**.

__ 12. Use the cable ties in the adapter assembly as needed to fasten and hold the cables in place (to ensure proper routing **6** over the channel grommet).

__ 13. Install the upper subcover **2**.

__ 14. Find the terminator cards (part number 8492916) in the adapter assembly and install them in positions A2 **8** and B2 **7** in the tape unit.

__ 15. Remove the right end cover from the control unit or tape unit to which you are attaching this tape unit.

__ 16. Find the write connector on the control unit **10** or tape unit **20** to which you are attaching this tape drive.

__ 17. Remove the terminator card **19** from connector panel **16** or **13** (if present) and save it with the control unit ship group.

__ 18. There are two standoff screws holding the write connector. Remove the upper **17** standoff screw (if connecting to a tape unit) or left **9** standoff screw (if connecting to a control unit). Remove the lower **14** standoff screw (if connecting to a tape unit) or left **12** standoff screw (if connecting to a control unit).

Note: *Care must be taken not to lose the small nut **11**, **15** and lockwasher. Loosen the remaining standoff slightly and pull the connector out of the panel. Let the connector hang by its cable.*

__ 19. Install the hex standoff screws, nuts, and lockwashers onto the connector.

Note: *The write cable and connector must be left hanging; if they are mounted on the panel, they could be damaged when you push the two units together.*

__ 20. Remove the thermal terminator **18** (if present) and save it, you will need it later.

__ 21. Find the striker plate (part number 6178685) in the adapter assembly.

The striker plate goes on the previously removed right end cover. Perform the following steps to attach the striker to the cover:

a. Locate the latch assembly **22** at the bottom on the right end cover.

b. Remove the two screws that hold the latch assembly to the cover and remove the latch assembly.

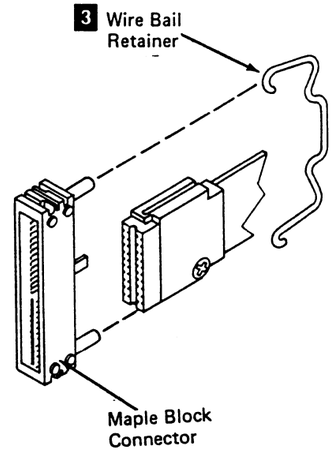
c. Place the striker plate on the cover so it lines up over the existing screw holes.

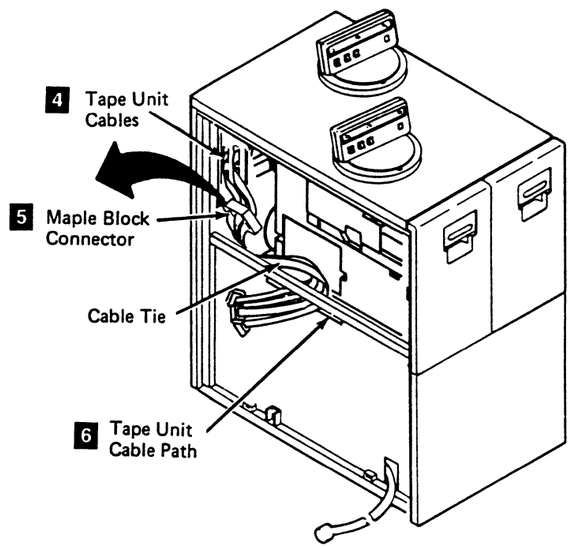
d. Place one corner of the latch assembly (removed in step b above) over one of the striker plate holes, but pivot the latch assembly 90 degrees from its previous position, towards the top of the cover **21** (this will ensure the latch assembly remains with the cover for possible future use).

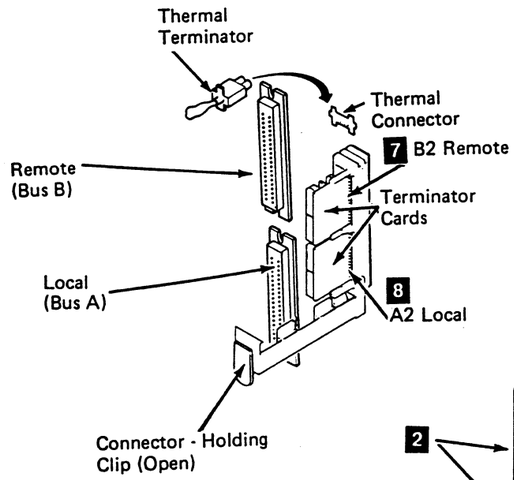
e. Fasten the striker plate and latch assembly to the cover with the two screws you removed from the latch assembly.

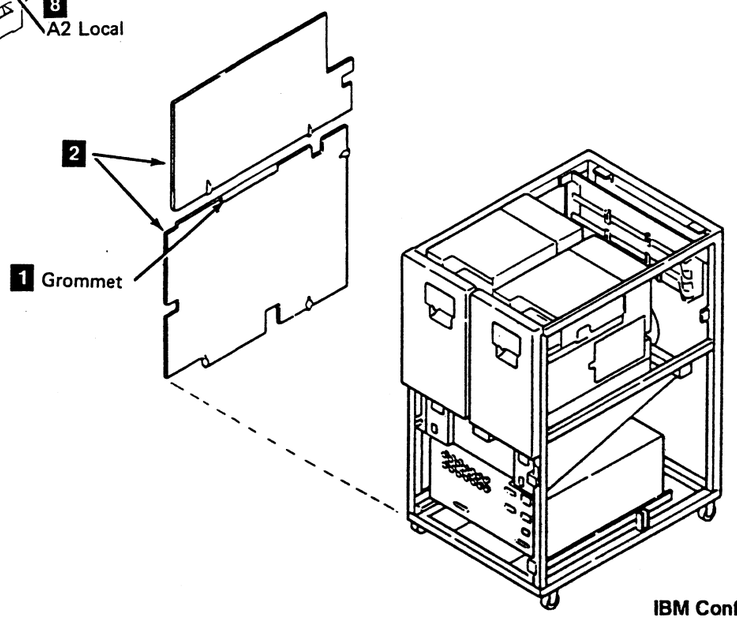
__ 22. Go to INST 1 to continue with the normal installation for tape units without BM 6460006

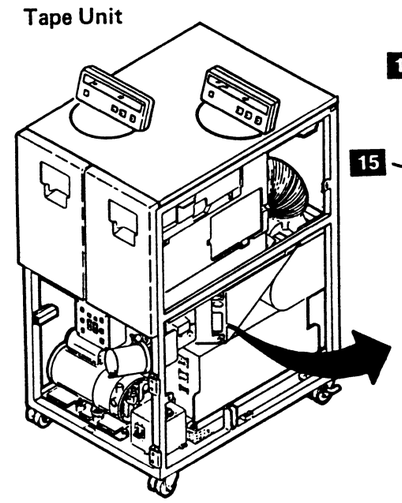
Note: *If the last tape unit attached to the control unit has BM 6460006, you will need the terminator card included in the ship group when you are ready to install that tape unit.*

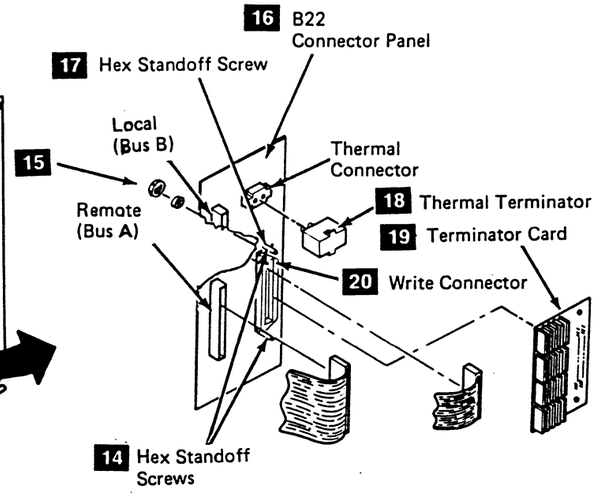


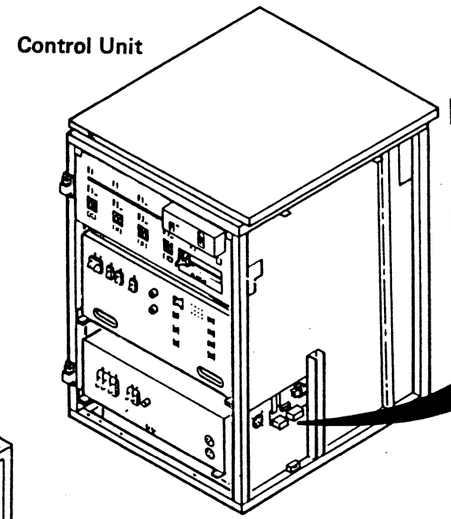


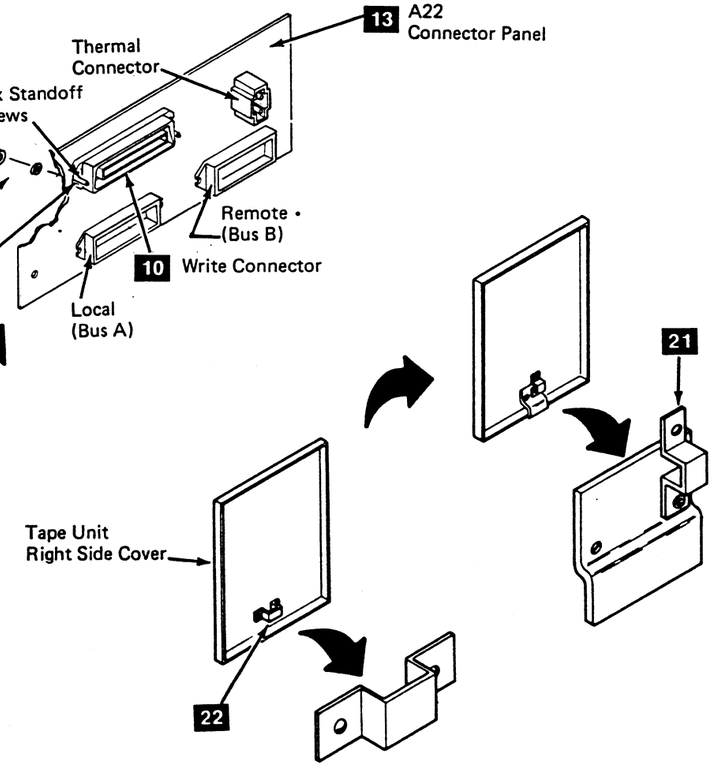












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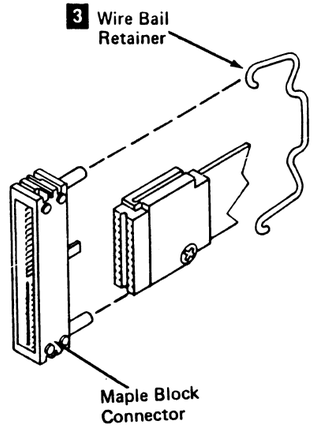
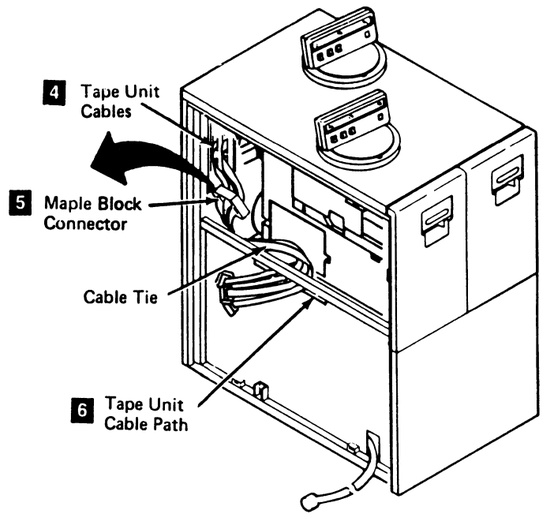
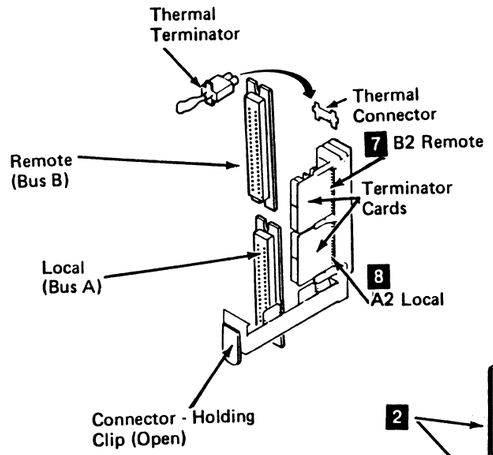
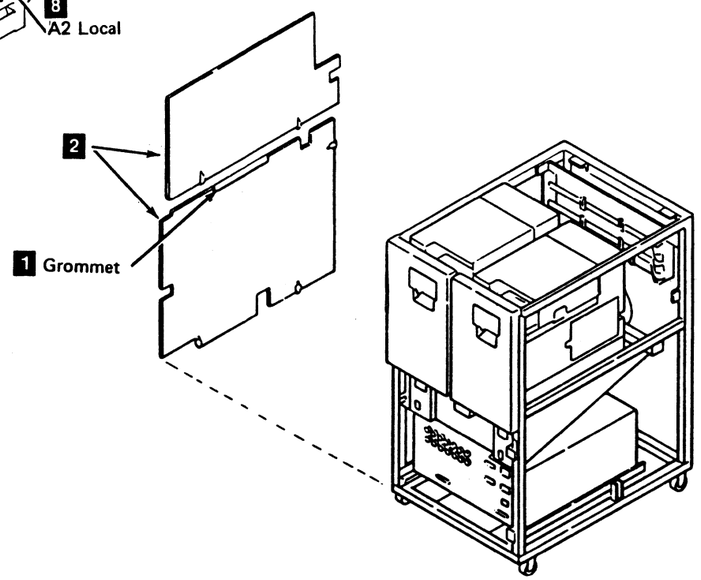
Installing Cable Adapter Assembly Part Number 8576624 (Continued)

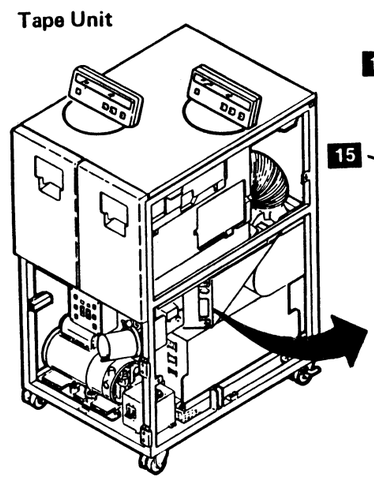


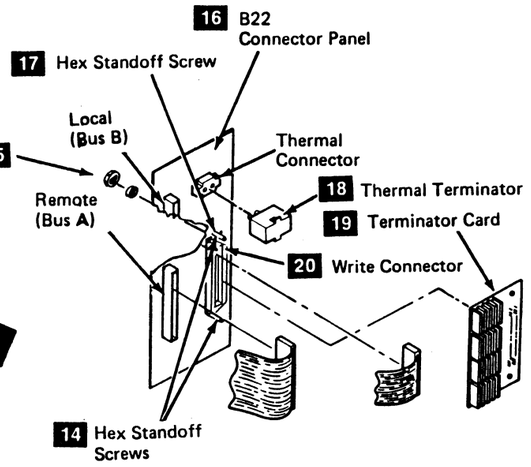


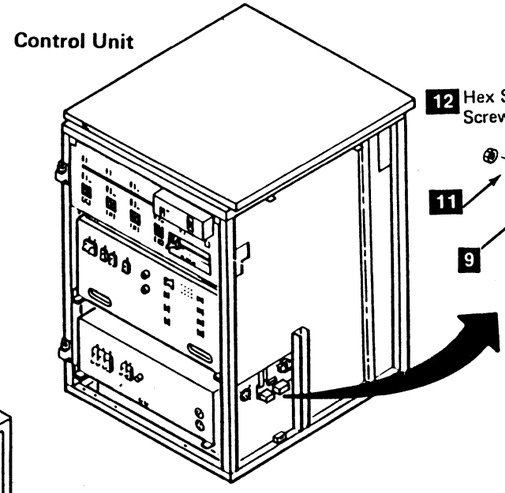


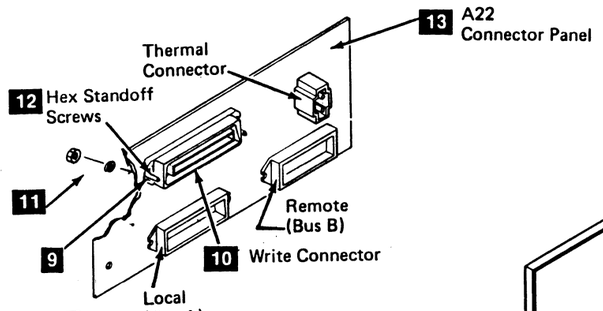


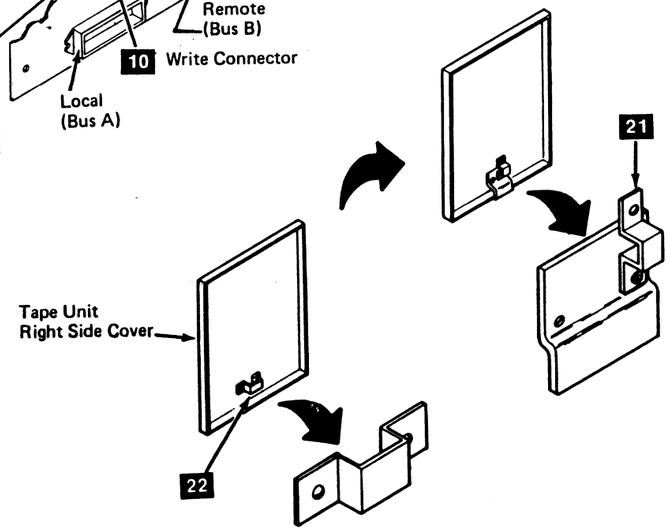
Cable Adapter Assembly Installation (Continued) INST 515











Contents

The following pages are for control units with BM 6460460 and tape units with BM 6460006 (See CARR-DR 9)

The following pages are for control units without BM 6460460 and tape units without BM 6460006 (See CARR-DR 9)

Notes INSP 2

Notes INSP 2

General Instructions

This page is for control units with BM 6460460 and tape units with BM 6460006 (See CARR-DR 9)

This safety checklist is to ensure that a machine that has not been under an IBM Maintenance Agreement has the necessary safety items installed and that no other changes were made that would make it unsafe. Each machine, as it was designed and assembled, had needed safety items installed to protect the owners, operators, and service personnel from injury. This checklist verifies only those items.

This checklist should be performed before the normal inspection for maintenance agreement. **The machine should be suspected to be unsafe and you should think it unsafe until you verify that it is safe.** If any unsafe conditions are present, you must decide how serious the hazard could be and whether you can continue without first correcting the problem.

Think about these conditions and the safety hazards they present:

- Electrical, especially primary power, for example: an electrically charged frame can cause serious or lethal electrical shock.
- Explosive, for example: damaged or expanding capacitors can cause serious injury.
- Mechanical hazards, such as a cartridge latch assembly cover missing, can cause injury to the body.

Some of the pages are for features and need not be checked if the features are not installed on the machine.

Needed Materials

The following items are needed or will be useful during the inspection.

- Logic/wiring diagrams
- Copies of safety SMs (service memorandums) and ECAs for this machine type
- Parts catalog
- Machine history
- FE Safety Handbook, S229-8124.
- Power and Electrical Safety, ZZ25-7205

Education

Service personnel must be trained on the new general maintenance agreement qualification (MAQ), tailored maintenance agreement qualification, and changed machine safety inspection procedures as part of the electrical safety course.

This page is for control units with BM 6460460 and tape units with BM 6460006 (See CARR-DR 9)

Note: See INSP 15 and INSP 16 for the following locations.

Preparation

CAUTION: TILT HAZARD

Do NOT open both drives of a tape unit that is not bolted on to another tape unit or control unit. With the automatic cartridge loader feature installed and both drive drawers fully extended, a tape unit that is not bolted to another unit will tilt forward with about 20 lbs. of force applied to the top of either automatic cartridge loader.

Start the checklist with the machine powered off and with all electrical power removed from the machine.

1. Power off the subsystem.
2. Have the customer open the CB/CP (circuit breaker/circuit panel) to the outlet supplying power to the subsystem.
3. Check the customer's plug housing to building ground.
   - There should be no voltage present.
   - Resistance should be less than 0.1 ohm.
4. Unplug the power cable.
5. Unplug the system attach cables (if any) from the control unit. They are located at the rear of control unit ac power supply CU-PS-01. See LOC 1.
6. Unplug the channel cables from the control unit. See LOC 1.
7. Disconnect the read/write bus connectors and the thermal connector 1, and the ac power connector 2, between the control unit and the first tape unit and between all the tape units.
8. Check that there is no equipment plugged into any of the convenience outlets in the control unit. They are located on the left front of the ac power supply CU-PS-01.
9. Obtain the items that are needed or will be useful before starting the inspection.
   a. Copy of the safety SMs/ECAs for this machine type.
   b. Latest machine history if possible.

Tape Unit and Control Unit Outside

Powered off with power cable and system attach cables disconnected

On the Tape Unit:

Check and Correct As Needed

1. That the machine is stable, that there are no defective casters or pedestals.
2. That the caster lock thumbscrews are in the two rear casters 7.
3. That all hinges and latches are in acceptable operating condition, not broken or corroded.
4. That the tape unit displays rotate without binding and the mechanical stops are not broken 3.

   Note: The displays have detented stop positions.

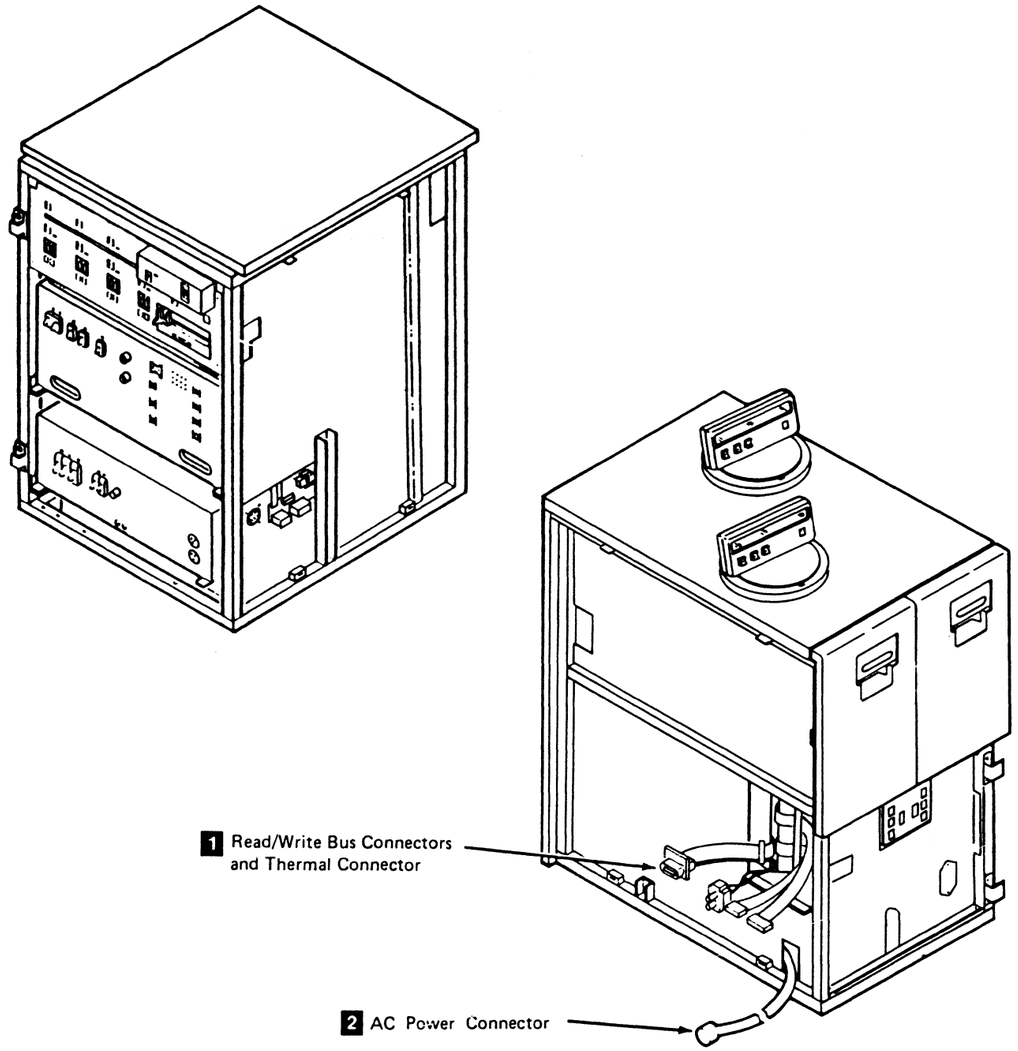
On the control unit:

Check and Correct As Needed

1. That the machine is stable, that there are no defective casters or pedestals.
2. That the caster lock thumbscrews are in the two rear casters 4.
3. That all hinges and latches are in acceptable operating condition, not broken or corroded.
4. That the ac mainline cord does not have frayed or damaged wiring at the plug end 6.
5. That the power cable is 10 gauge, 4 wire for 60 Hz and 50 Hz Japan, or 10 gauge 5 wire for 50 Hz World Trade machines.
   - The IBM part number for the correct power cable is 806997. This part number is stamped into the insulation of IBM power cables 5.
   - If the power cable is not stamped with the IBM part number, see if it is stamped with the wire size and number 5. A power cable with the correct size wire will be stamped 10/4.
   - If a non-IBM power cable is stamped with a vendor number instead of with the wire size and number, check the vendor number to ensure that the cord contains either four or five 10-gauge wires.
   - If the power cable is not marked, measure the diameter of a wire in the cord with the insulation removed. The diameter of a 10-gauge wire is 2.588 millimeters (0.102 inches).
6. That the power plug type is R&S* 3760 6.

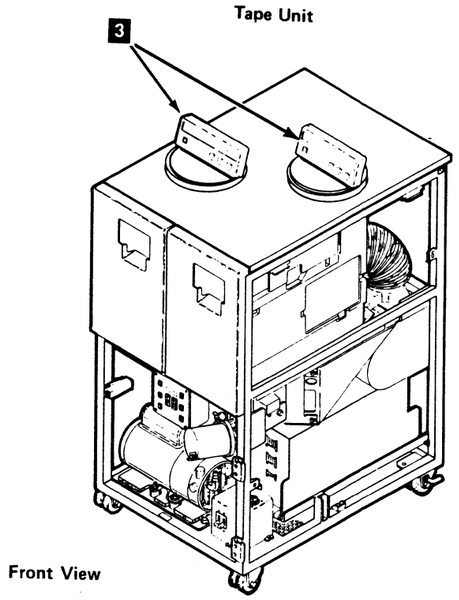
* R&S is Trademark of Russell & Stoll

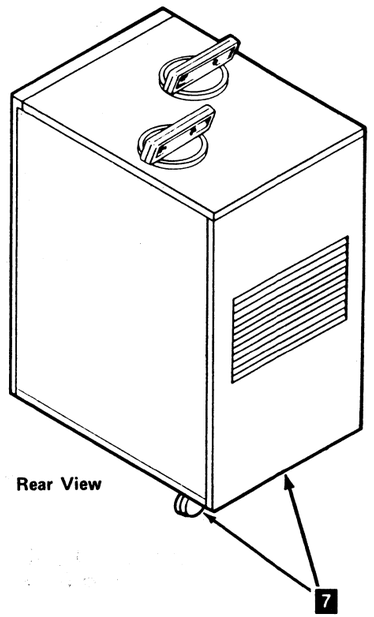
Note: The IBM part number for the EMEA 50 Hz power cable is 4798935. The R&S* 3760 plug is for 60 Hz machines only.

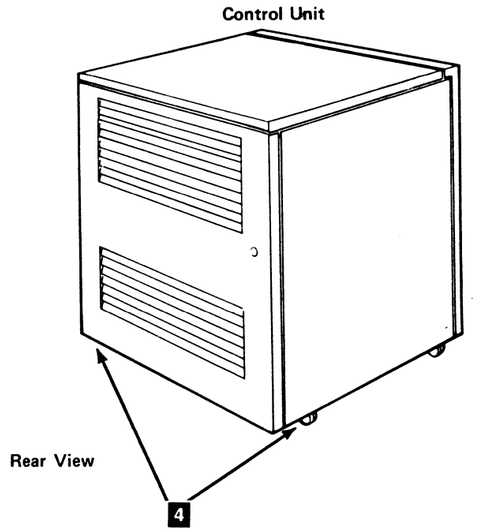


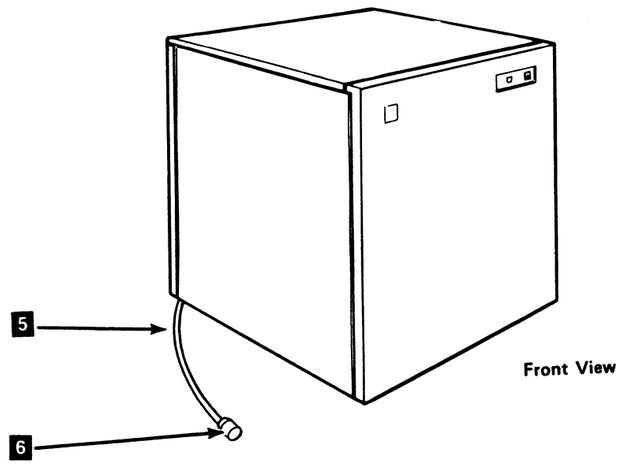
Inspection Procedures (Continued)

This page is for control units with BM 6460460 and tape units with BM 6460006 (See CARR-DR 9)









This page is for control units with BM 6460460 and tape units with BM 6460006 (See CARR-DR 9)

Note: See INSP 21 for the following locations.

Tape Unit Inside

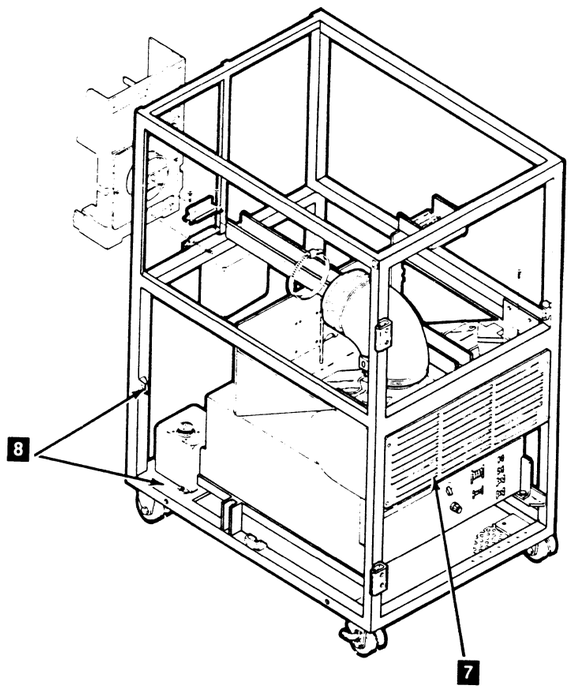
Powered Off with Power Cable and System Attach Cables Disconnected

Check and Correct As Needed

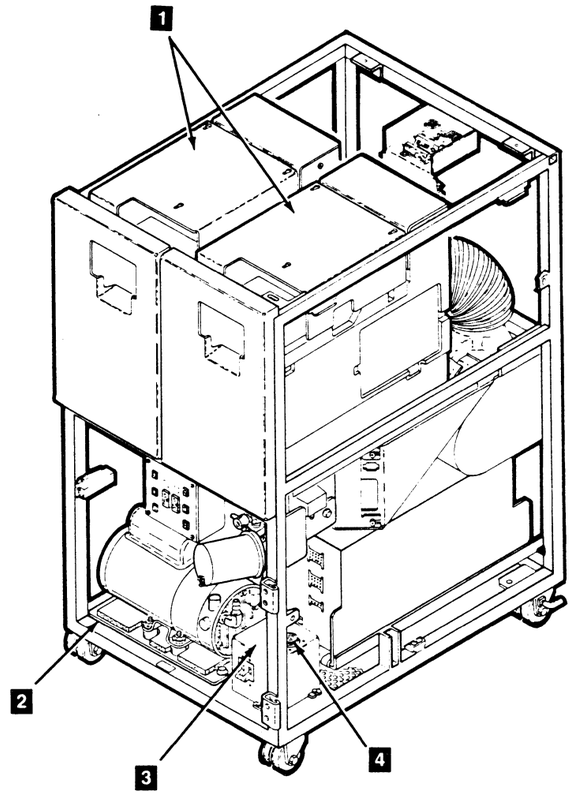
1. That all ground jumpers (normally green/yellow) are tightly attached by frame ground screws 8.
2. That all grounded metal has good ground continuity (less than 0.1 ohm) - covers, housings, metal box sides, and so on.
3. That all hinges and latches are in acceptable operating condition - not broken or corroded.
4. That all normal safety covers (operator and service areas) are in place including those protecting mechanical devices and hot surfaces - no sharp corners or edges should be unprotected.
   a. The ac CB1 safety cover is correctly in place 3.
   b. The ac power cap is present for each tape unit and securely attached to the safety cover 4.
   c. The logic board 02A-A1 covers (pin and card side) are in place 6.
   d. The drive and tape path safety cover is in place 1.
   e. The blower safety cover is in place 7.
   f. The ac terminal block cover is in place 2.
   g. The limited customer access covers are in place 5.

Inspection Procedures (Continued)

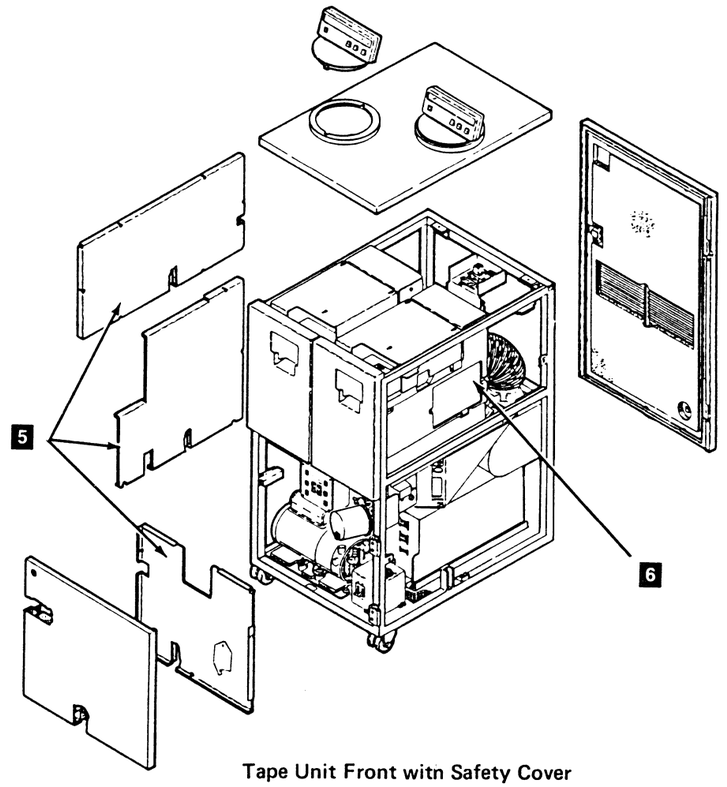
This page is for control units with BM 6460460 and tape units with BM 6460006 (See CARR-DR 9)



Tape Unit Rear



Tape Unit Front



Tape Unit Front with Safety Cover

Inspection Procedures (Continued)

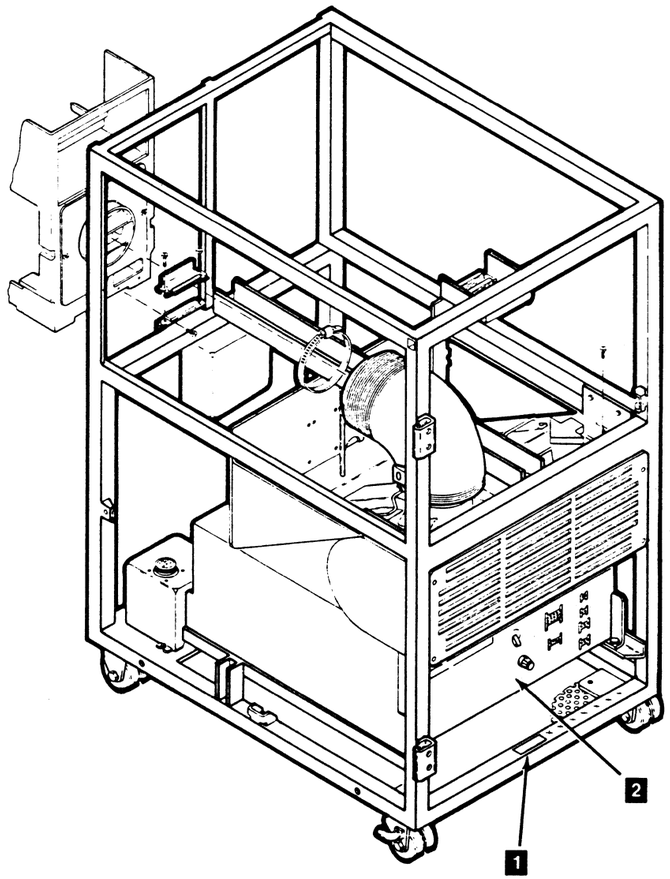
This page is for control units with BM 6460460 and tape units with BM 6460006 (See CARR-DR 9)

Tape Unit Inside (Continued)

Check and Correct As Needed

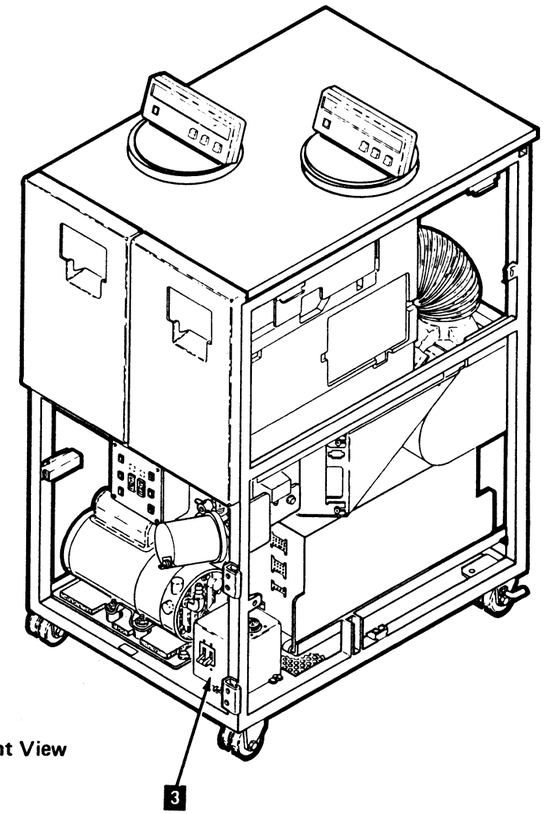
1. That all safety labels are located where indicated:
   a. That all labels reading "LINE VOLTAGE PRESENT WITH POWER OFF" are attached in the following locations:
      - Terminal strip at lower rear 1.
      - Main tape unit circuit breaker 3.
   b. That a label reading "Unit Weight 101 LB (46 KG)" is located on the dc power supply TU-PS-01 2.
2. That the thermal switches are not bypassed. See CARR-DR 1100 and CARR-DR 820 for a procedure to get access to the thermal switches.
3. No obvious non-IBM changes.
4. No metal filings, dirt or contaminants, water or other fluids, or marks of earlier smoke or burning are present.

   If there are any marks of earlier smoke or burning, and so on, check the Maintenance Agreement Qualification (MAQ) report for correct procedures for repair action if needed.



Tape Unit Rear

Tape Unit



Front View

Inspection Procedures (Continued)

This page is for control units with BM 6460460 and tape units with BM 6460006 (See CARR-DR 9)

Tape Unit-DC Power Supplies

Powered Off with Power Cable and System Attach Cables Disconnected

Check and Correct As Needed

1. That all power supplies are attached tightly. The dc power supply TU-PS-01 has two screws 1.
2. That all grounded metal has good ground continuity (less than 0.1 ohm) - covers, housings, metal box sides, and so on.
3. The power wiring for frayed or damaged wiring.
4. That the following ac/dc CBs and fuses are the correct size:

CB1	AC	Drive frame	10 A	
F1/2		Drive 0/1	12 A	Medium blow
F3/4		Drive 0/1	5 A	Long blow
F5/6		Drive 0/1	1 A	Long blow
F7/8		Drive 0/1	3 A	Long blow
F9/10		Drive 0/1	8 A	Medium blow
F11/12		Drive 0/1	.75 A	Immediate blow
F13/14		Drive 0/1	15 A	Medium blow
F15			2 A	Long blow

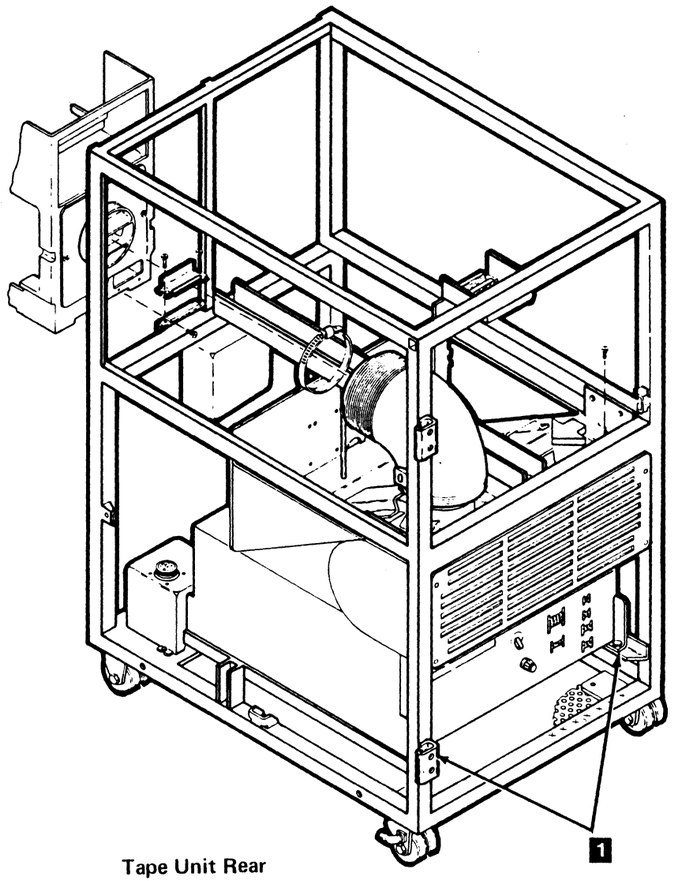
These values can be EC sensitive, so check the fuses and CBs against the machine logic.

Tape Unit Inside-Miscellaneous

Powered Off with Power Cable and System Attach Cables Disconnected

Check and Correct As Needed

1. All cables, connections, plugs, and so on for frayed or damaged wiring.
2. All connections, plugs and so on for damaged latches and/or clamps.



Tape Unit Rear

Inspection Procedures (Continued)

This Page is for Control Units with BM 6460460 and Tape Units with BM 6460006 (See CARR-DR 9)

Control Unit Inside

Powered Off with Power Cable and System Attach Cables Disconnected

Check and Correct As Needed

1. That all ground jumpers (normally green/yellow) are tightly attached by frame ground screws 6. See INSP 65 for the AC grounding diagram.

2. That all grounded metal has good ground continuity (less than 0.1 ohm) - covers, housings, metal box sides, and so on.

3. That all hinges and latches are in acceptable operating condition - not broken or corroded.

4. That all normal safety covers (operator and service areas) are in place including those protecting mechanical devices and hot surfaces - no sharp corners or edges should be unprotected.

   - The logic gate card covers (A1, A2) are in place 8.
   - All three gate DC voltage strip (TB) covers are in place 1.
   - The AC safety cover is in place 4.
   - All four limited customer access covers are in place 5.
   - Machines with vertical style I/O connectors have the drip-screen guard in place 10.

5. That all safety labels are located where indicated.

   - Labels reading, "Hazardous Area, etc..." must be located on the frame members at 3 and 9.

6. Mark the customer's circuit breaker/circuit panel (CB/CP) number for the circuit controlling AC power to subsystem at CB1 (main line CB) 2 and on the main line power cable plug.

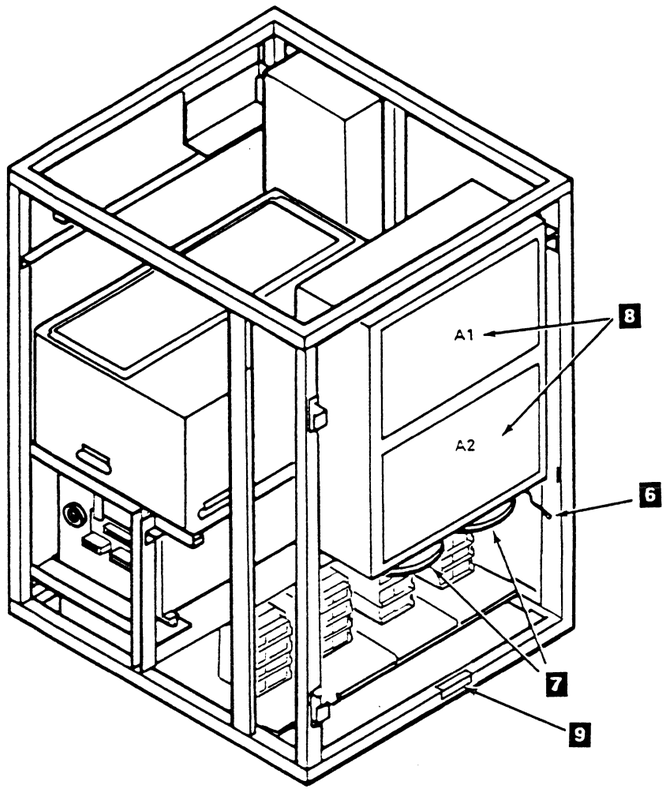
7. That the thermal switches are not bypassed. These are located at the top and the bottom of 01-A gate. See CARR-CU 1430 for a procedure to get access to the thermal switch.

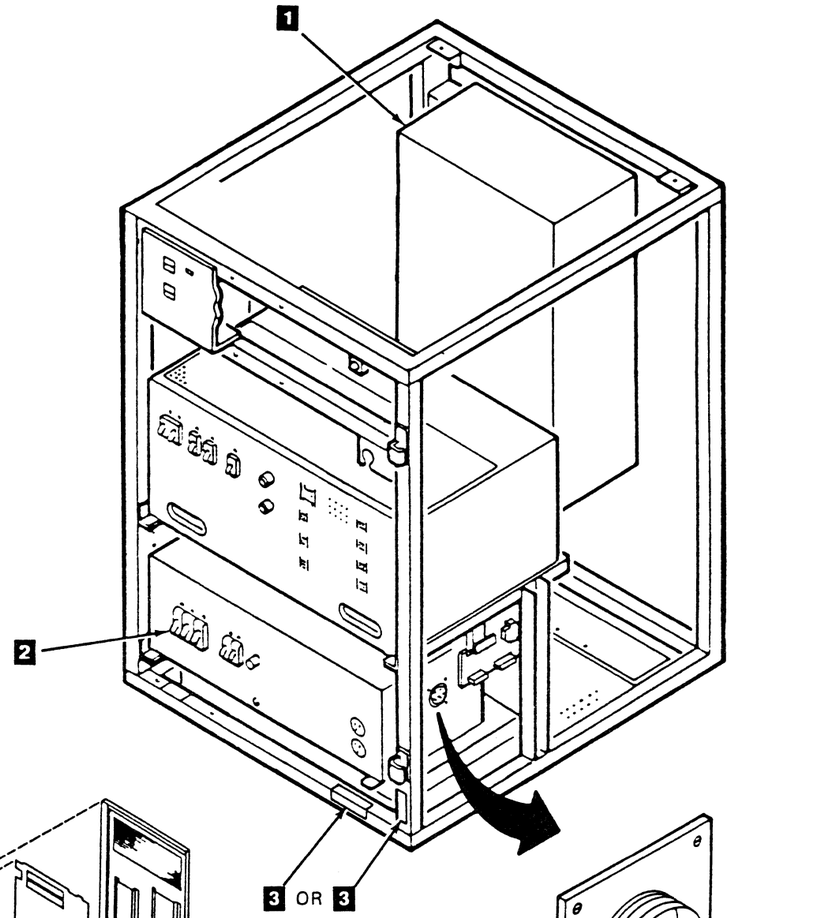
8. That no obvious non-IBM changes have been made.

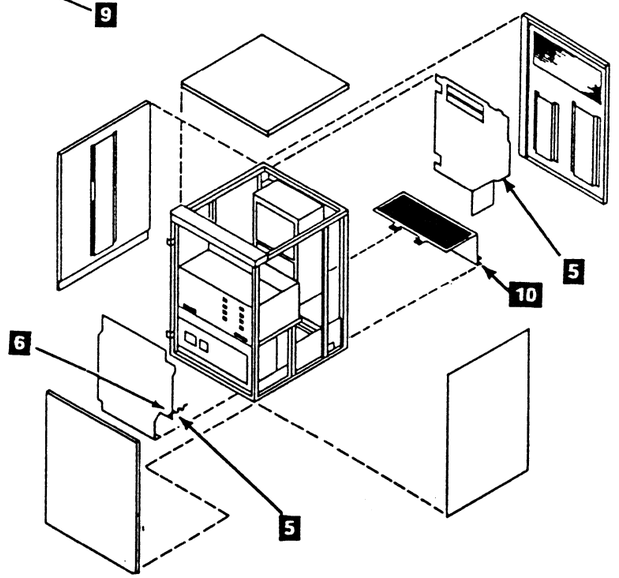
9. That the fan safety screens on the fans on the bottom of the A1 gate are in place 7.

10. That no metal filings, dirt or contaminants, water or other fluids, or marks of earlier smoke or burning are present.

11. If there are marks of earlier smoke or burning, and so on, check the Maintenance Agreement Qualification (MAQ) report for correct procedures for repair action if needed.







This page is for control units with BM 6460460 and tape units with BM 6460006 (See CARR-DR 9)

Note: See INSP 40 and INSP 41 for the following locations.

Control Unit–AC Primary Power

Powered Off with Power Cable and System Attach Cables Disconnected

Check and Correct As Needed

1. That the ac power supply is attached in place tightly. The power supply has two mounting screws **1**.
2. That all ground jumpers (normally green/yellow) are strongly attached by frame ground screws **3**. The system attach ground wires are not present if feature is not installed.

   To check the shield ground of the power cable, you must remove the left side safety cover **4** and the ac input filter cover on the power supply **5**. Leave these covers off, you will need to return to this area later.
3. That all grounded metal has good ground continuity (less than 0.1 ohm) - covers, housings, metal box sides, and so on.
4. That the ac mainline cord has no frayed or damaged wiring at the ac power supply CU-PS-01 **6**.
5. That all ac service outlets are safe **2**. Measure from ground pin to frame. The resistance should not be more than 0.1 ohm.

   Note: That the service outlets are for temporary use of service equipment only.
6. The resistance from the line cord ground pin and housing to all frames and to all power assembly grounds as follows:
   - Line cord ground pin to frame ground.
   - Line cord housing to frame ground.

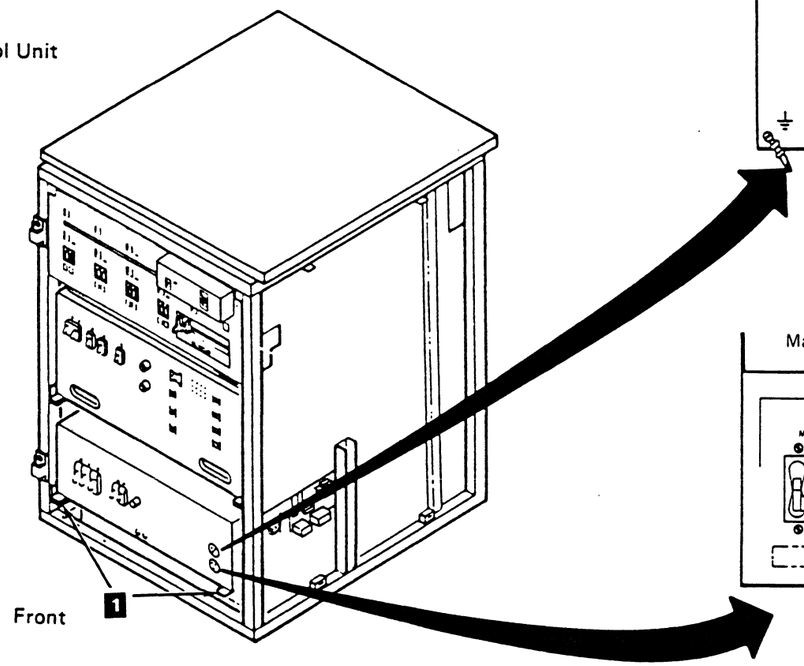
   The resistance should not be more than 0.1 ohm.
7. The resistance from the frame ground to DC ground at:
   - TB1-5
   - TB1-6
   - TB1-7
   - TB1-8
   - TB2-5
   - TB2-6
   - TB2-7
   - TB2-8

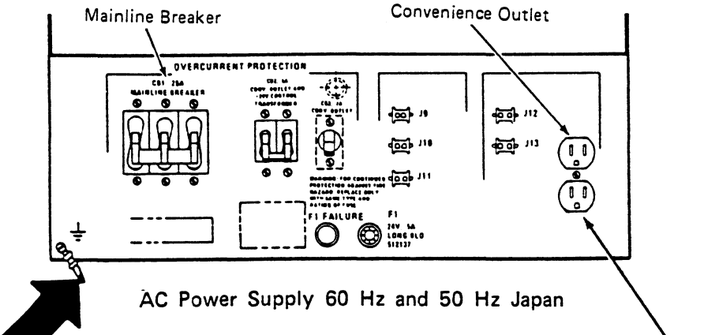
   and to the ground pin on:
   - Logic board 01A-A1D2D08
   - Logic board 01A-A2D2D08

   The resistance should not be more than 0.1 ohm.
8. That all ac/dc CBs and fuses are the correct size:

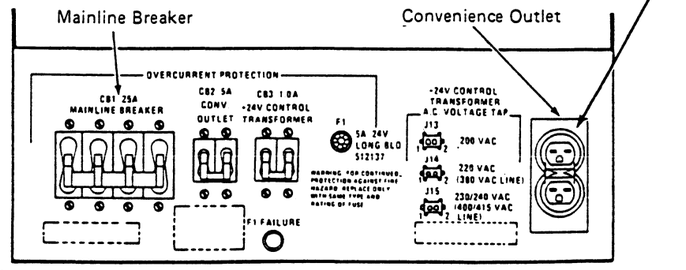
50 Hz	CB1	AC	Main Line	25 A
	CB2	AC	Conv.	5 A
	CB3	AC	24 V	1 A
	F1	DC	24 V	5 A Long Blow
60 Hz	CB1	AC	Main Line	25 A
	CB2	AC	Conv./24 V	5 A
	CB3	AC	Conv	7 A
	F1	DC	24 V	5 A Long Blow

These values can be EC sensitive, so check the fuses and CBs against the machine logic.





AC Power Supply 60 Hz and 50 Hz Japan

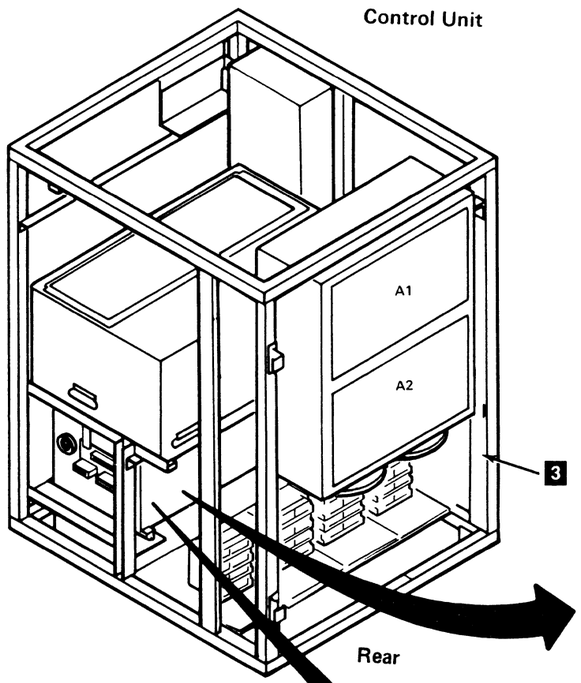


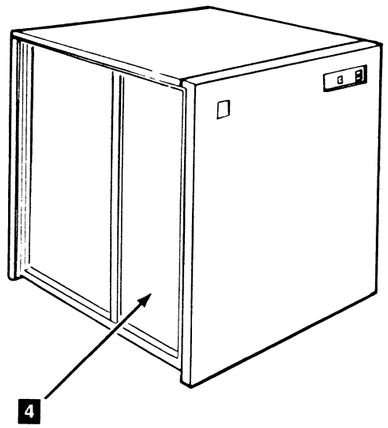
AC Power Supply 50 Hz (Except Japan)

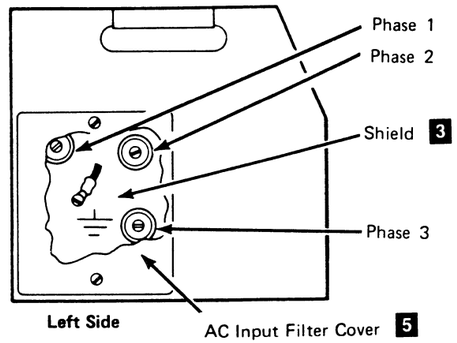
2

Inspection Procedures (Continued)

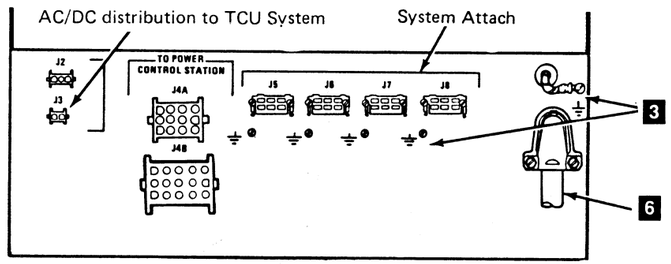
This page is for control units with BM 6460460 and tape units with BM 6460006 (See CARR-DR 9)



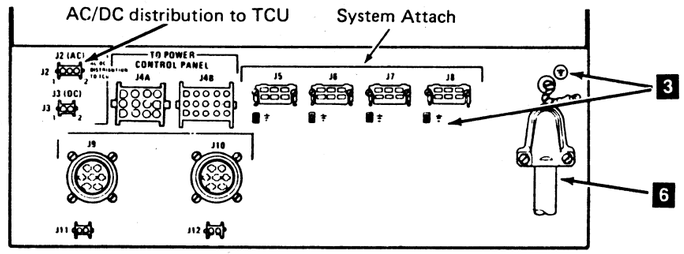




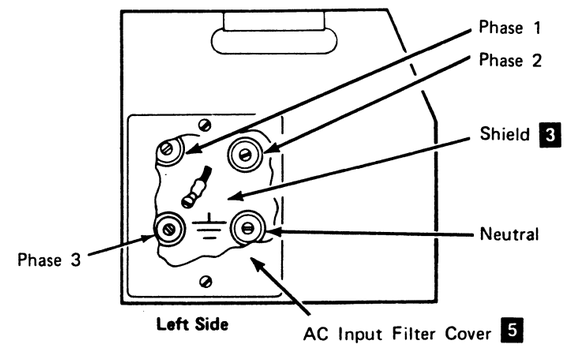
60 Hz, and 50 Hz Japan
Control Unit Left Front with Access to AC Power Supply Left Side



AC Power Supply 60 Hz and 50 Hz Japan



AC Power Supply 50 Hz (Except Japan)



50 Hz, Except Japan
Control Unit Left Front with Access to AC Power Supply Left Side

Inspection Procedures (Continued)

This page is for control units with BM 6460460 and tape units with BM 6460006 (See CARR-DR 9)

Control Unit–DC Power Supplies

Powered Off with Power Cable and System Attach Cables Disconnected

Check and Correct As Needed

1. That all grounded metal has good ground continuity (less than 0.1 ohm) - covers, housings, metal box sides, and so on.

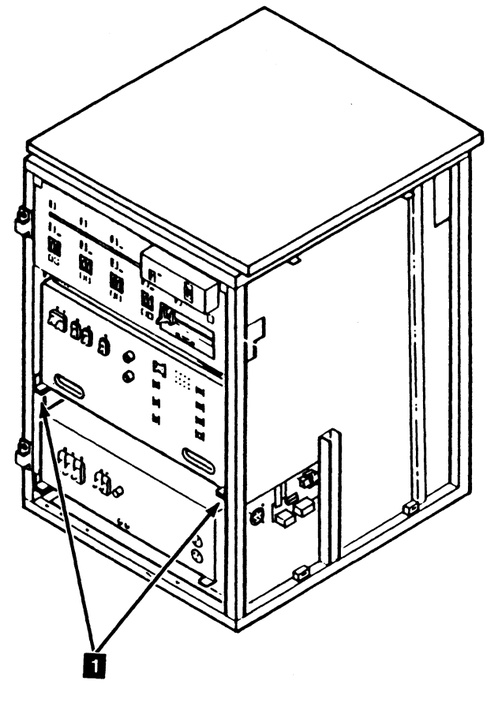
2. All power wiring for frayed or damaged wires.

3. That the dc power supply is attached in place tightly. The power supply has two mounting screws 1.

4. That all ac/dc CBs and fuses are the correct size:

CB1	AC	10 A
CB2	DC +5 v	65 A
CB3	DC +5 v	45 A
CB4	DC -5 v	12 A
F1	+8.5 v	5 A medium blow
F2	+ 24 v	2 A long blow

These values can be EC sensitive, so check the fuses and CBs against the machine logic.



Procedure EC Sensitive (See CARR-DR 9) INSP 45

Inspection Procedures (Continued)

This page is for control units with BM 6460460 and tape units with BM 6460006 (See CARR-DR 9)

Control Unit Inside–Miscellaneous

Powered Off with Power Cable and System Attach Cables Disconnected

Check and Correct As Needed

1. All cables, connections, plugs, and so on for frayed or damaged wiring.
2. All connections, plugs, and so on for damaged latches and/or clamps.

Safety ECs

Powered Off with Power Cable and System Attach Cables Disconnected

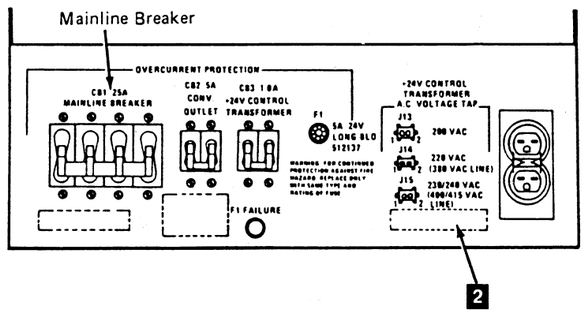
Check and Correct As Needed

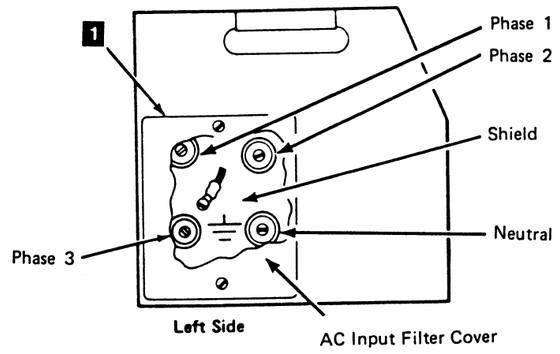
1. That all safety ECs have been installed correctly.
2. The location or list of ECA's.

Power Off and On

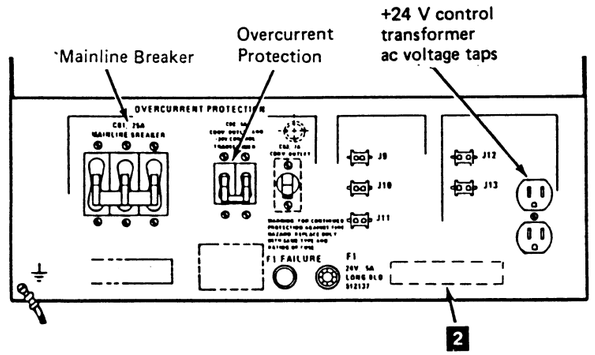
1. Check the customer plug housing to the ground pin. There should be no voltage present and the resistance should be less than 0.1 ohm.
2. Set CB1 off and plug in the power cable.
3. Have the customer close the CB/CP (circuit breaker/circuit panel) that supplies the outlet to which the subsystem is attached.
4. Does machine power label **2** match customer power? Measure with the volt/ohm meter at the ac input filter **1**.
5. Have the customer open the CB/CP that supplies the outlet to which the subsystem is attached and unplug the power cable.
6. Reinstall the covers over the ac input filter.
7. Reinstall all covers and set CB1 off and plug in the power cable.
8. Have the customer close the CB/CP to the outlet that supplies the subsystem.
9. Turn ac CB1 and the Unit Emergency Power Off switch on, and put the Local/Remote switch in the Remote position. Plug in the host system attach cables, if used, one at a time and ensure that the subsystem will power up and down normally.
10. With power up, ensure that the machine will power down with the Unit Emergency switch.
11. Reset the Unit Emergency switch.
12. For control units with Unit Emergency Power Off (UEPO) cables installed; ensure that the control unit (CU) will power on with the host channel (CU Local/Remote switch in the remote position).
13. For control units with EPO cables installed; ensure that the control unit will power off with the host channel (CU Local/Remote switch in the remote position).
14. Repeat the 'POWER ON/OFF' TEST for each host power control cable.

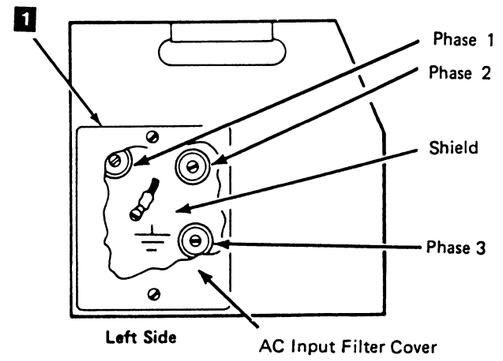
    Power Control 0 J5
    Power Control 1 J6
    Power Control 2 J7
    Power Control 3 J8





Control Unit AC Power Supply 50 Hz (Except Japan)





Control Unit AC Power Supply 60 Hz, and 50 Hz Japan

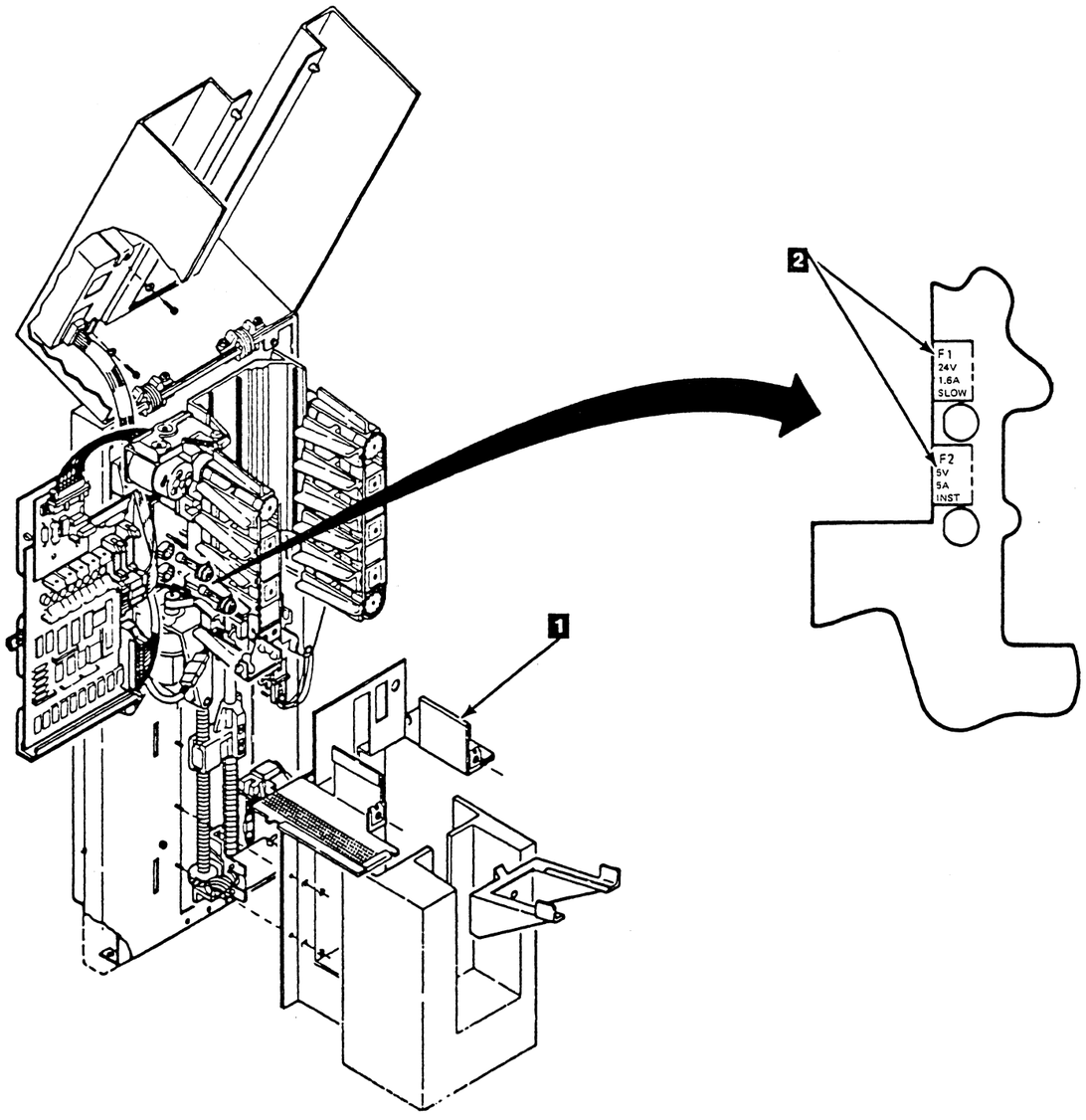
Inspection Procedures (Continued)

This page is for tape units without BM 6460006 (see CARR-DR 9).

Automatic Cartridge Loaders

Check and correct as needed:

- That the lower automatic cartridge loader safety cover is in place 1.
- That all components are mounted correctly and all cable clamps are installed.
- Inspect all cables, connectors, and plugs for frayed or damaged wiring.
- Inspect all connections and plugs for damaged latches and/or clamps.
- Inspect the automatic cartridge loader base plate for correct installation of the fuse labels 2.
- That the two fuses are the correct value as shown on the labels 2 on the automatic cartridge loader base plate.
  - F1 +24 V dc 1.6A Slow Blow
  - F2 +5 V dc 5A Instantaneous Blow.



Completion Report and Signature

This page is for control units with BM 6460460 and tape units with BM 6460006 (See CARR-DR 9)

- SAFETY INSPECTION FOR MACHINE TYPE 3480
- GENERAL SAFETY INSPECTION
- MAINTENANCE AGREEMENT QUALIFICATION (MAQ)

After the inspection, sign and date the checklist and store it with the Maintenance Agreement inspection.

_____ _____

NAME DATE

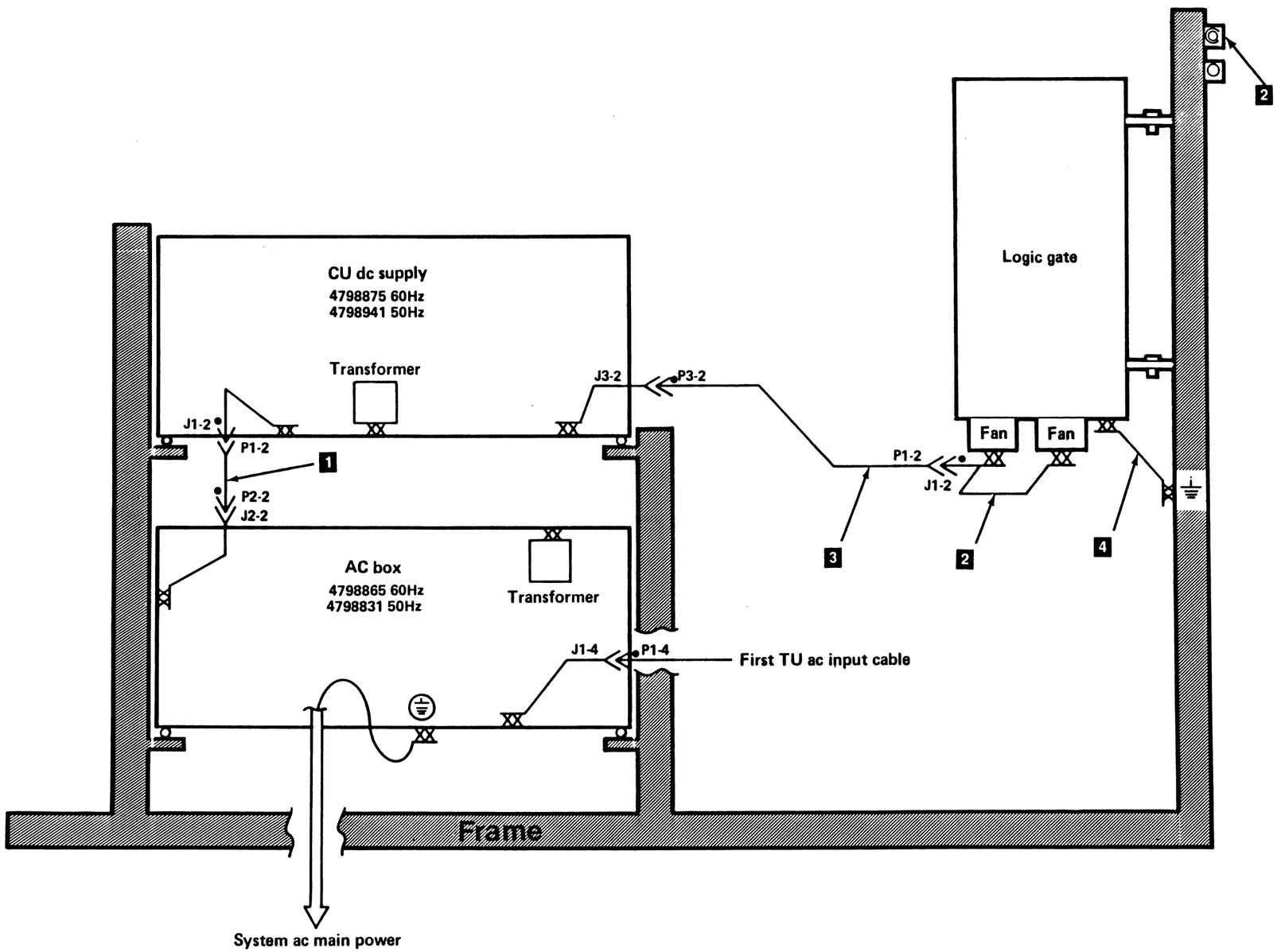
SAFETY HAZARDS

LIST ALL SAFETY HAZARDS, IF NONE SAY NONE.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____

AC Grounding Diagram (Control Unit 50 Hz and 60 Hz)

This page is for control units with BM 6460460 and tape units with BM 6460006 (See CARR-DR 9)



Notes:

1. *All wires shown are green/yellow.*
2. *Blocks are for adjacent frame attachment. They are used for frame ground and stability.*

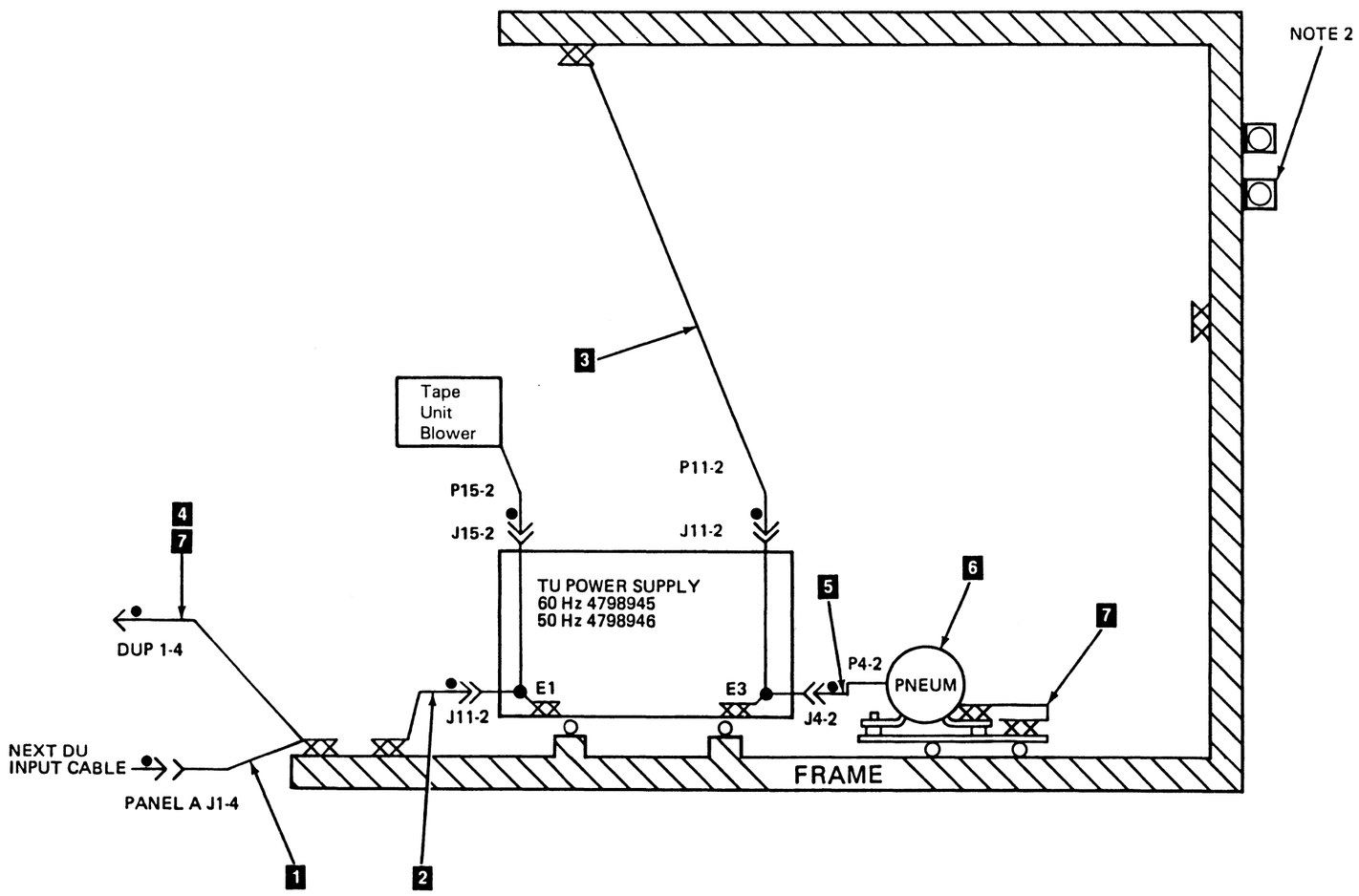
ITEM	PART NO.	DESCRIPTION	AWG
1	4451675	AC-24V DC C/A	14
2	4799041	Cont. gate fan C/A	18
3	4799040	Cont. AC fan C/A	18
4	320638	Jumper	18

Legend

- External tooth lockwasher/starwasher
- Metal to metal with self tapping screws
- Welded connection
- Connector with grounding pin
- Tapped holes for screw attachment

AC Grounding Diagram (Tape Unit and Drive 50 Hz and 60 Hz)

This page is for control units with BM 6460460 and tape units with BM 6460006 (See CARR-DR 9)



Notes:

1. *All wires shown are green/yellow.*
2. *Threaded block for adjacent frame attachment, frame ground and stability.*

ITEM	PART NO.	DESCRIPTION	AWG
1	8576642	A/C Input cable Asm 60 and 50 Hz Japan	12
1	8576643	A/C Input cable Asm 50 Hz WTC	12
2	8576645	Power supply A/C input cable assembly	14
3	8576678	A/C box assembly, 60 and 50 Hz Japan	N/A
3	8577037	A/C box assembly, 50 Hz WTC	N/A
4	4479778	Ground Jumper Asm	16
5	4451691	Cable Asm compressor	16
6	8577023	Pneumatic supply	N/A
7	6390360	Ground jumper Asm	16

Legend

- External tooth lockwasher/starwasher
- Tapped holes for screws attachment
- Metal to metal self tapping screws
- Weld
- Connector with ground pin
- Double crimp
- JX-X Ground pin in connector

Procedure EC Sensitive (See CARR-DR 9) **INSP 70**

General Instructions

This page is for control units without BM 6460460 and tape units without BM 6460006 (See CARR-DR 9)

This safety checklist is to ensure that a machine that has not been under an IBM Maintenance Agreement has the necessary safety items installed and that no other changes were made that would make it unsafe. Each machine, as it was designed and assembled, had needed safety items installed to protect the owners, operators, and service personnel from injury. This checklist verifies only those items.

This checklist should be performed before the normal inspection for maintenance agreement. **The machine should be suspected to be unsafe and you should think it unsafe until you verify that it is safe.** If any unsafe conditions are present, you must decide how serious the hazard could be and whether you can continue without first correcting the problem.

Think about these conditions and the safety hazards they present:

- Electrical, especially primary power, for example: an electrically charged frame can cause serious or lethal electrical shock.
- Explosive, for example: damaged or expanding capacitors can cause serious injury.
- Mechanical hazards, such as a cartridge latch assembly cover missing, can cause injury to the body.

Some of the pages are for features and need not be checked if the features are not installed on the machine.

Needed Materials

The following items are needed or will be useful during the inspection.

- Logic/wiring diagrams
- Copies of safety SMs and ECAs for this machine type
- Parts catalog
- Machine history
- FE Safety Handbook, S229-8124.
- Power and Electrical Safety, ZZ25-7205

Education

Service personnel must be trained on the new general maintenance agreement qualification (MAQ), tailored maintenance agreement qualification, and changed machine safety inspection procedures as part of the electrical safety course.

This page is for control units without BM 6460460 and tape units without BM 6460006 (See CARR-DR 9)

Note: See INSP 115 and INSP 116 for the following locations.

Preparation

CAUTION: TILT HAZARD

Do NOT open both drives of a tape unit that is not bolted on to another tape unit or control unit. With the automatic cartridge loader feature installed and both drive drawers fully extended, a tape unit that is not bolted to another unit will tilt forward with about 20 lbs. of force applied to the top of either automatic cartridge loader.

Start the checklist with the machine powered off and with all electrical power removed from the machine.

1. Power off the subsystem.
2. Have the customer open the CB/CP (circuit breaker/circuit panel) to the outlet supplying power to the subsystem.
3. Check the customer's plug housing to building ground.
   - There should be no voltage present.
   - Resistance should be less than 0.1 ohm.
4. Unplug the power cable.
5. Unplug the system attach cables (if any) from the control unit. They are located at the rear of control unit ac power supply CU-PS-01. See LOC 1.
6. Unplug the channel cables from the control unit. See LOC 1.
7. Disconnect the read/write bus connectors and the thermal connector **1**, and the ac power connector **2**, between the control unit and the first tape unit and between all the tape units.
8. Check that there is no equipment plugged into any of the convenience outlets in the control unit. They are located on the left front of the ac power supply CU-PS-01.
9. Obtain the items that are needed or will be useful before starting the inspection.
   a. Copy of the safety SMs/ECAs for this machine type.
   b. Latest machine history if possible.

Tape Unit and Control Unit Outside

Powered off with power cable and system attach cables disconnected

On the tape unit:

Check and Correct As Needed

1. That the machine is stable, that there are no defective casters or pedestals.
2. That the caster lock thumbscrews are in the two rear casters **7**.
3. That all hinges and latches are in acceptable operating condition, not broken or corroded.
4. That the tape unit displays rotate without binding and the mechanical stops are not broken **3**.

   Note: The displays have detented stop positions.

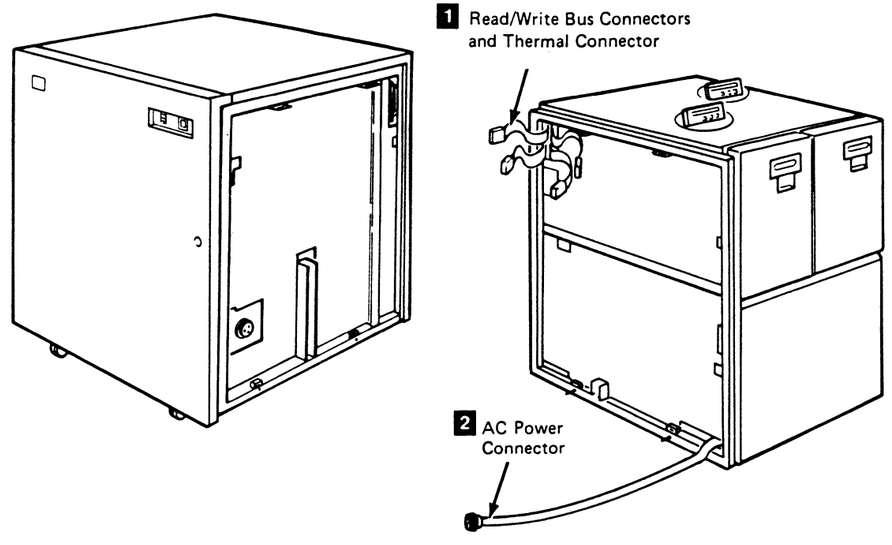
On the control unit:

Check and Correct As Needed

1. That the machine is stable, that there are no defective casters or pedestals.
2. That the caster lock thumbscrews are in the two rear casters **4**.
3. That all hinges and latches are in acceptable operating condition, not broken or corroded.
4. That the ac mainline cord does not have frayed or damaged wiring at the plug end **6**.
5. That the power cable is 10 gauge, 4 wire for 60 Hz and 50 Hz Japan, or 10 gauge 5 wire for 50 Hz World Trade machines.
   - The IBM part number for the correct power cable is 806997. This part number is stamped into the insulation of IBM power cables **5**.
   - If the power cable is not stamped with the IBM part number, see if it is stamped with the wire size and number **5**. A power cable with the correct size wire will be stamped 10/4.
   - If a non-IBM power cable is stamped with a vendor number instead of with the wire size and number, check the vendor number to ensure that the cord contains either four or five 10-gauge wires.
   - If the power cable is not marked, measure the diameter of a wire in the cord with the insulation removed. The diameter of a 10-gauge wire is 2.588 millimeters (0.102 inches).
6. That the power plug type is R&S* 3760 **6**.

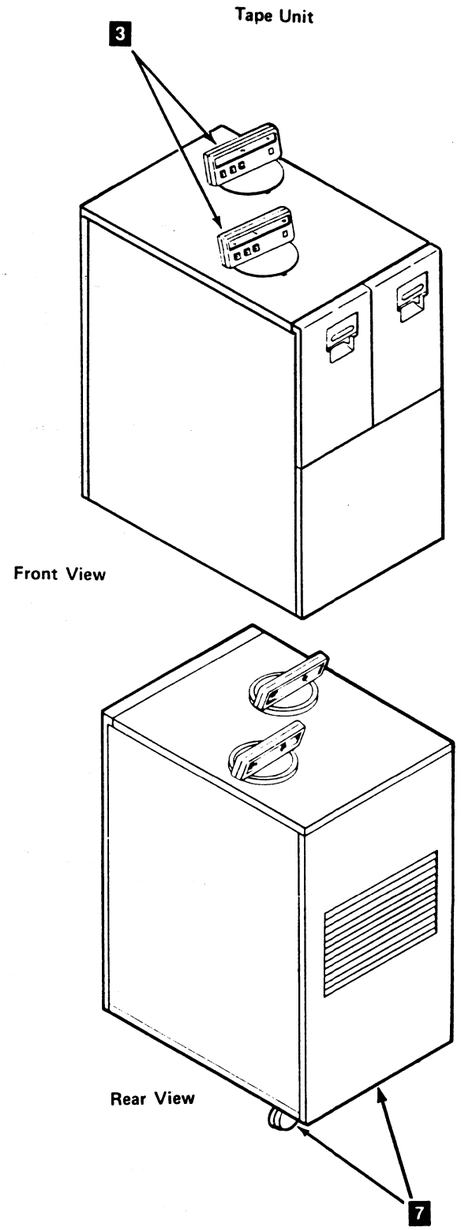
* R&S is Trademark of Russell & Stoll

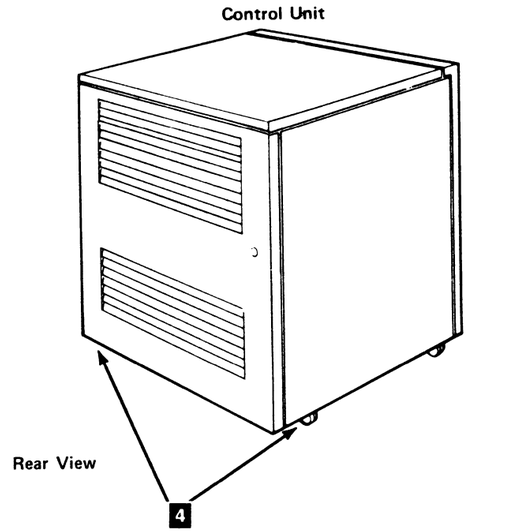
Note: The IBM part number for the EMEA 50 Hz power cable is 4798935. The R&S* 3760 plug is for 60 Hz machines only.

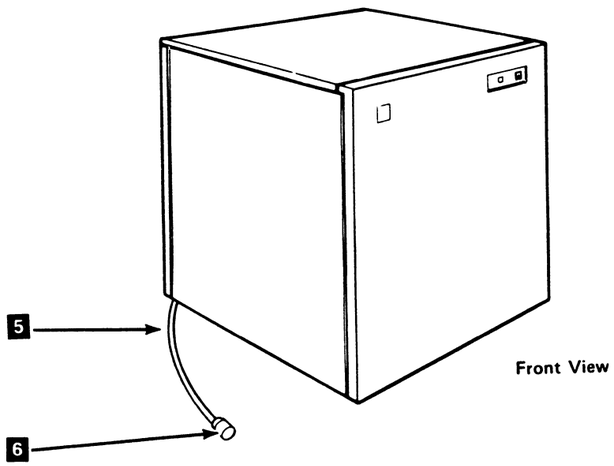


Inspection Procedures (Continued)

This page is for control units without BM 6460460 and tape units without BM 6460006 (See CARR-DR 9)







This page is for control units without BM 6460460 and tape units without BM 6460006 (See CARR-DR 9)

Note: See INSP 121 for the following locations.

Tape Unit Inside

Powered Off with Power Cable and System Attach Cables Disconnected

Check and Correct As Needed

1. That all ground jumpers (normally green/yellow) are tightly attached by frame ground screws 1. See INSP 170 for the ac grounding diagram.

2. That all grounded metal has good ground continuity (less than 0.1 ohm) - covers, housings, metal box sides, and so on.

3. That all hinges and latches are in acceptable operating condition - not broken or corroded.

4. That all normal safety covers (operator and service areas) are in place including those protecting mechanical devices and hot surfaces - no sharp corners or edges should be unprotected.

   a. The ac CB1 safety cover is correctly in place 3.

   b. The ac power cap is present for each tape unit and securely attached to the safety cover 2.

   c. The logic board 02A-A1 covers (pin and card side) are in place 4.

   d. The drive and tape path safety cover is in place 5.

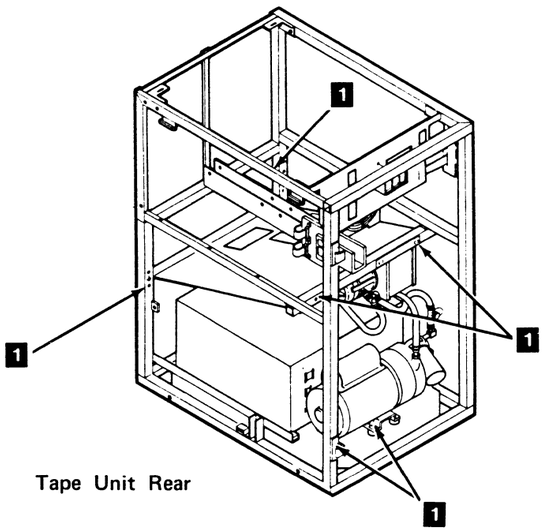
   e. The fan terminal cover is in place 6.

   f. The ac terminal block cover is in place 8.

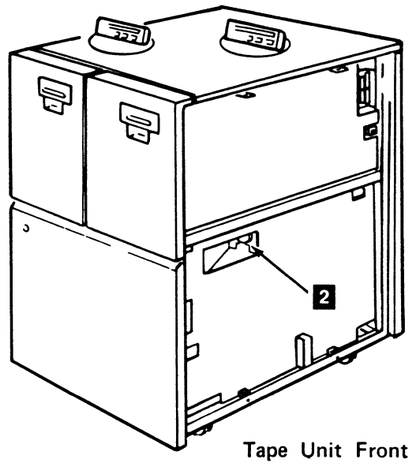
   g. The limited customer access covers are in place 7.

Inspection Procedures (Continued)

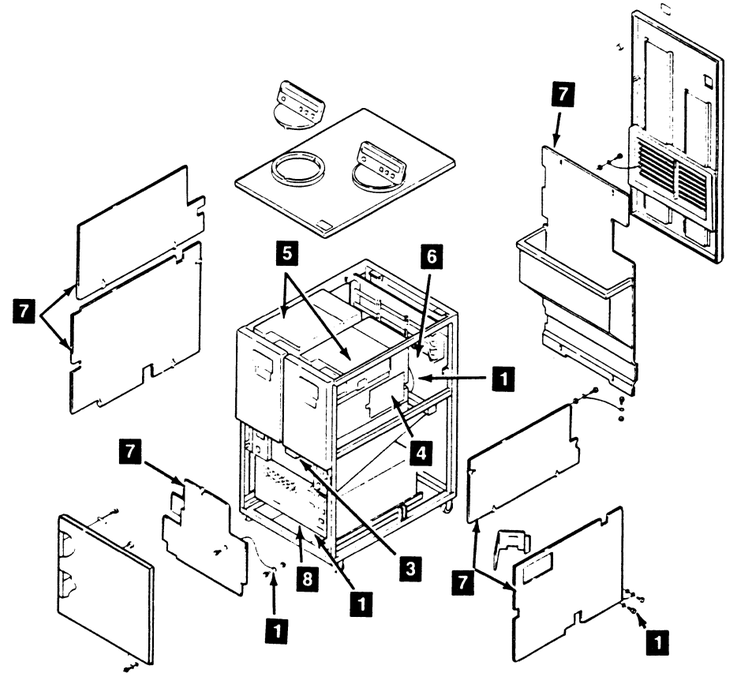
This page is for control units without BM 6460460 and tape units without BM 6460006 (See CARR-DR 9)



Tape Unit Rear



Tape Unit Front



Tape Unit Front with Safety Covers

Notes INSP 124

Notes INSP 124

Inspection Procedures (Continued)

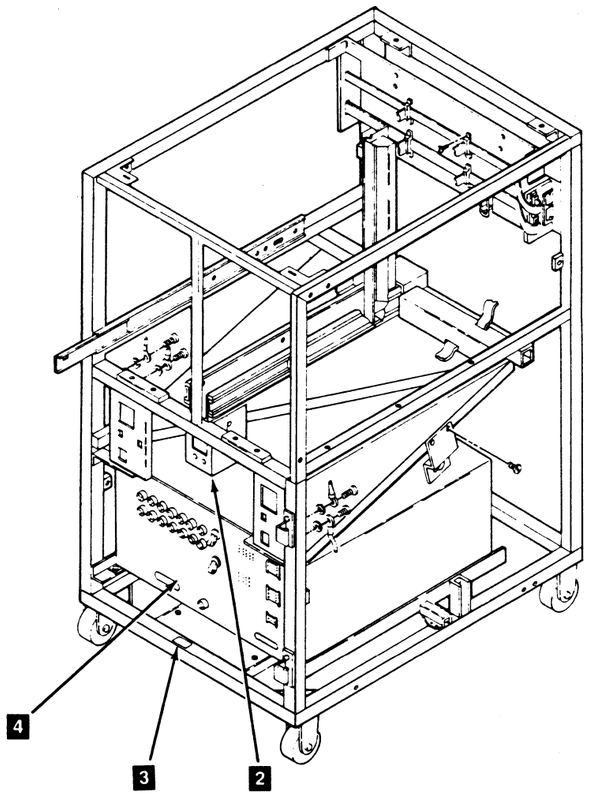
This page is for control units without BM 6460460 and tape units without BM 6460006 (See CARR-DR 9)

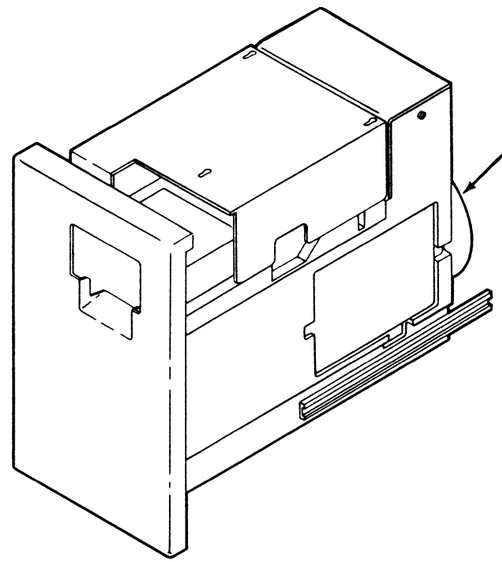
Tape Unit Inside (Continued)

Check and Correct As Needed

1. That all safety labels are located where indicated:
   a. That all labels reading "LINE VOLTAGE PRESENT WITH POWER OFF" are attached in the following locations:
      - Terminal strip at lower rear **3**.
      - Main tape unit circuit breaker **2**.
   b. That a label reading "Unit Weight 101 LB (46 KG)" is located on the dc power supply TU-PS-01 **4**.
2. That the thermal switches are not bypassed. See CARR-DR 1100 and CARR-DR 820 for a procedure to get access to the thermal switches.
3. No obvious non-IBM changes.
4. That both fan safety screens are in place on the drive assembly **1**.
5. That (on 50 Hz machines only) the safety screen is in place on the power supply cooling fan. The fan is located at the rear of the tape unit, above the power supply.
6. No metal filings, dirt or contaminants, water or other fluids, or marks of earlier smoke or burning are present.

   If there are any marks of earlier smoke or burning, and so on, check the Maintenance Agreement Qualification (MAQ) report for correct procedures for repair action if needed.





Inspection Procedures (Continued)

This page is for control units without BM 6460460 and tape units without BM 6460006 (See CARR-DR 9)

Tape Unit-DC Power Supplies

Powered Off with Power Cable and System Attach Cables Disconnected

Check and Correct As Needed

1. That all power supplies are attached tightly. The dc power supply TU-PS-01 has two screws **1**.
2. That all grounded metal has good ground continuity (less than 0.1 ohm) - covers, housings, metal box sides, and so on.
3. The power wiring for frayed or damaged wiring.
4. That the following ac/dc CBs and fuses are the correct size:

CB1	AC	Drive frame	10 A	
CB1	DC	Drive 0	20 A	
CB2	DC	Drive 1	20 A	
F1/2		Drive 0/1	12 A	Medium blow
F3/4		Drive 0/1	5 A	Long blow
F5/6		Drive 0/1	1 A	Long blow
F7/8		Drive 0/1	3 A	Long blow
F9/10		Drive 0/1	8 A	Medium blow
F11/12		Drive 0/1	.75 A	Immediate blow
F13			2 A	Long blow

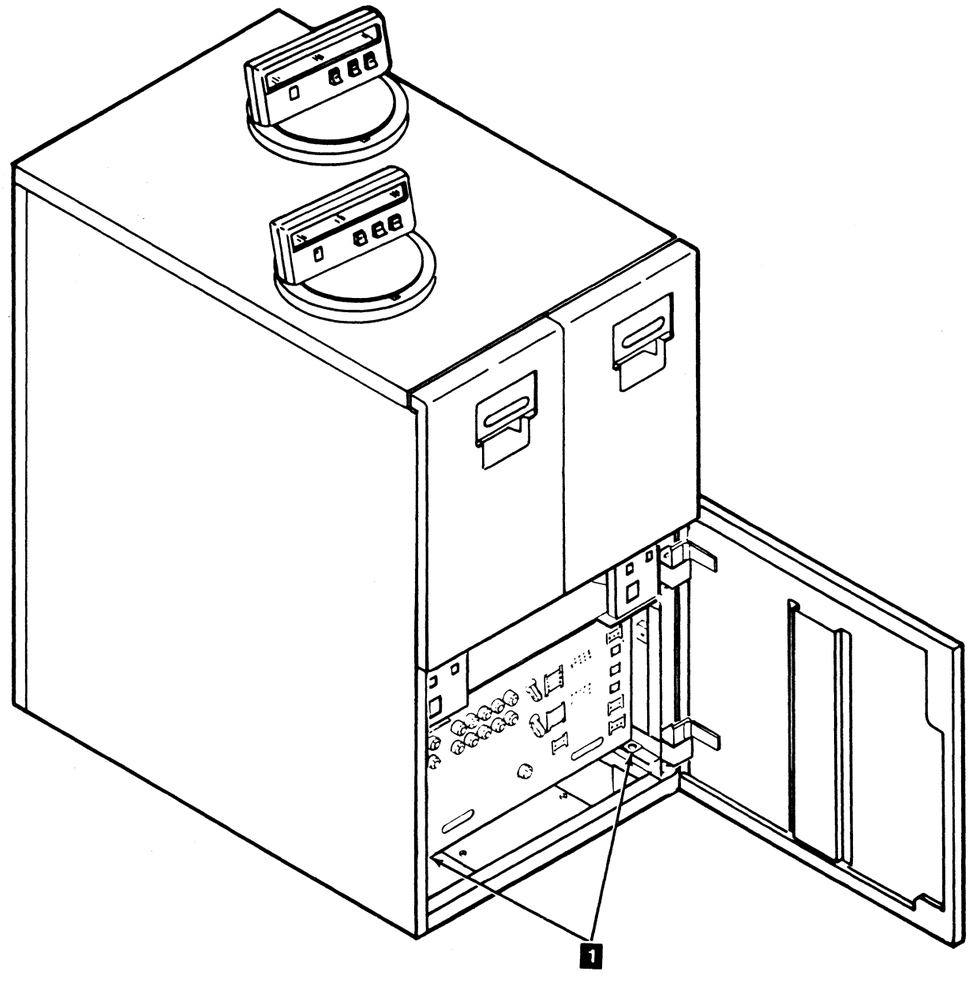
These values can be EC sensitive, so check the fuses and CBs against the machine logic.

Tape Unit Inside-Miscellaneous

Powered Off with Power Cable and System Attach Cables Disconnected

Check and Correct As Needed

1. All cables, connections, plugs, and so on for frayed or damaged wiring.
2. All connections, plugs and so on for damaged latches and/or clamps.



Procedure EC Sensitive (See CARR-DR 9) **INSP 132**

Inspection Procedures (Continued)

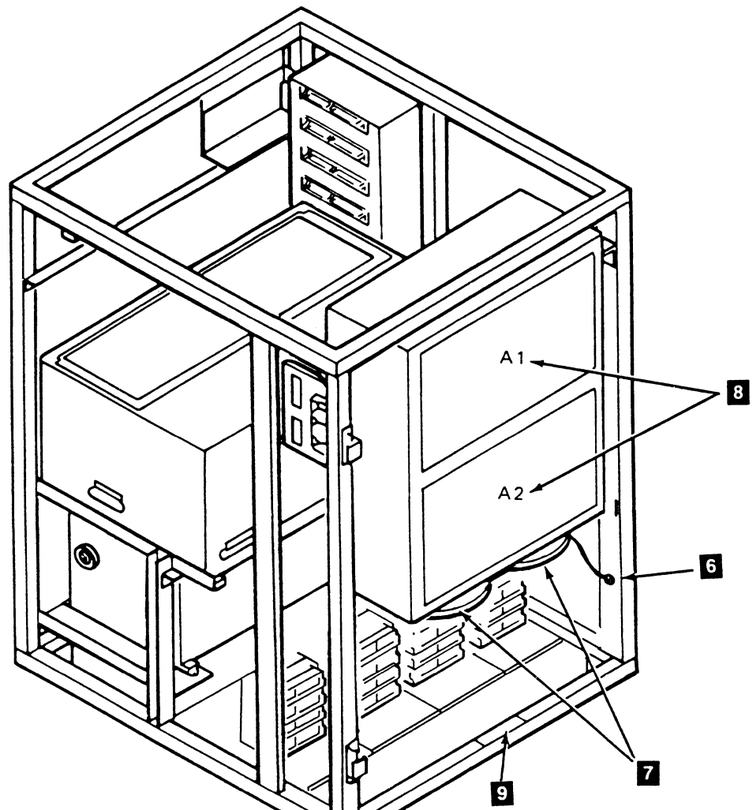
This page is for control units without BM 6460460 and tape units without BM 6460006 (See CARR-DR 9)

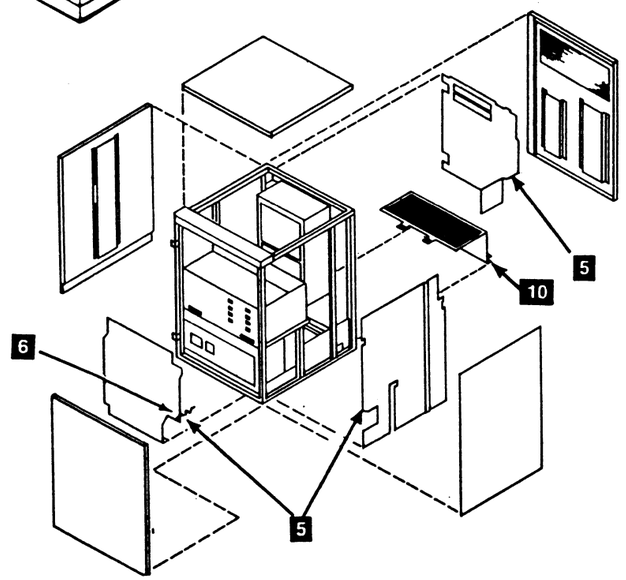
Control Unit Inside

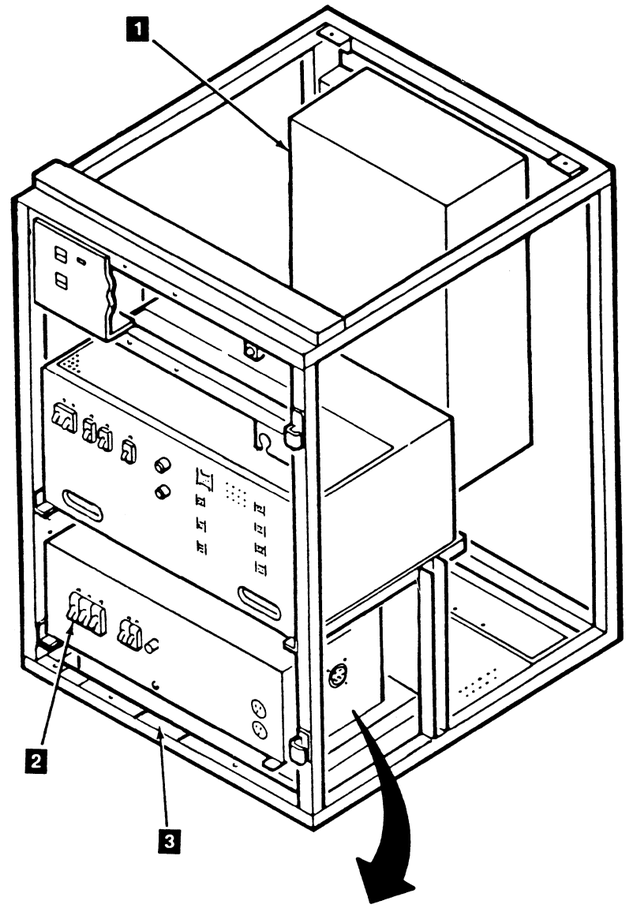
Powered Off with Power Cable and System Attach Cables Disconnected

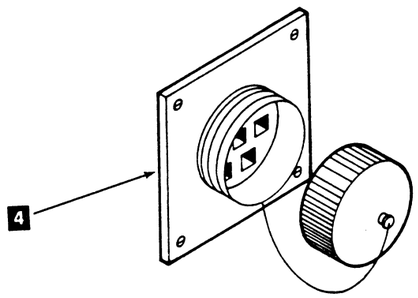
Check and Correct As Needed

1. That all ground jumpers (normally green/yellow) are tightly attached by frame ground screws 6. See INSP 165 for the ac grounding diagram.
2. That all grounded metal has good ground continuity (less than 0.1 ohm) - covers, housings, metal box sides, and so on.
3. That all hinges and latches are in acceptable operating condition - not broken or corroded.
4. That all normal safety covers (operator and service areas) are in place including those protecting mechanical devices and hot surfaces - no sharp corners or edges should be unprotected.
   - The logic gate card covers (A1,A2) are in place 8.
   - All three gate dc voltage strip (TB) covers are in place 1.
   - The ac safety cover is in place 4.
   - All four limited customer access covers are in place 5.
   - Machines with vertical style I/O connectors have the drip-screen guard in place 10.
5. That all safety labels are located where indicated.
   - Labels reading, "Hazardous Area, etc..." must be located on the frame members at 3 and 9.
6. Mark the customer's circuit breaker/circuit panel (CB/CP) number for the circuit controlling ac power to subsystem at CB1 (main line CB) 2 and on the main line power cable plug.
7. That the thermal switches are not bypassed. These are located at the top and the bottom of 01-A gate. See CARR-CU 1430 for a procedure to get access to the thermal switch.
8. That no obvious non-IBM changes have been made.
9. That the fan safety screens on the fans on the bottom of the A1 gate are in place 7.
10. That no metal filings, dirt or contaminants, water or other fluids, or marks of earlier smoke or burning are present.
11. If there are marks of earlier smoke or burning, and so on, check the Maintenance Agreement Qualification (MAQ) report for correct procedures for repair action if needed.









Inspection Procedures (Continued)

This page is for control units without BM 6460460 and tape units without BM 6460006 (See CARR-DR 9)

Note: See INSP 140 and INSP 141 for the following locations.

Control Unit–AC Primary Power

Powered Off with Power Cable and System Attach Cables Disconnected

Check and Correct As Needed

1. That the ac power supply is attached in place tightly. The power supply has two mounting screws **1**.

2. That all ground jumpers (normally green/yellow) are strongly attached by frame ground screws **3**. The system attach ground wires are not present if feature is not installed.

   To check the shield ground of the power cable, you must remove the left side safety cover **4** and the ac input filter cover on the power supply **5**. Leave these covers off, you will need to return to this area later.

3. That all grounded metal has good ground continuity (less than 0.1 ohm) - covers, housings, metal box sides, and so on.

4. That the ac mainline cord has no frayed or damaged wiring at the ac power supply CU-PS-01 **6**.

5. That all ac service outlets are safe **2**. Measure from ground pin to frame. The resistance should not be more than 0.1 ohm.

   Note: That the service outlets are for temporary use of service equipment only.

6. The resistance from the line cord ground pin and housing to all frames and to all power assembly grounds as follows:

   - Line cord ground pin to frame ground.
   - Line cord housing to frame ground.

   The resistance should not be more than 0.1 ohm.

7. The resistance from the frame ground to DC ground at:

   - TB1-5
   - TB1-6
   - TB1-7
   - TB1-8
   - TB2-5
   - TB2-6
   - TB2-7
   - TB2-8

   and to the ground pin on:

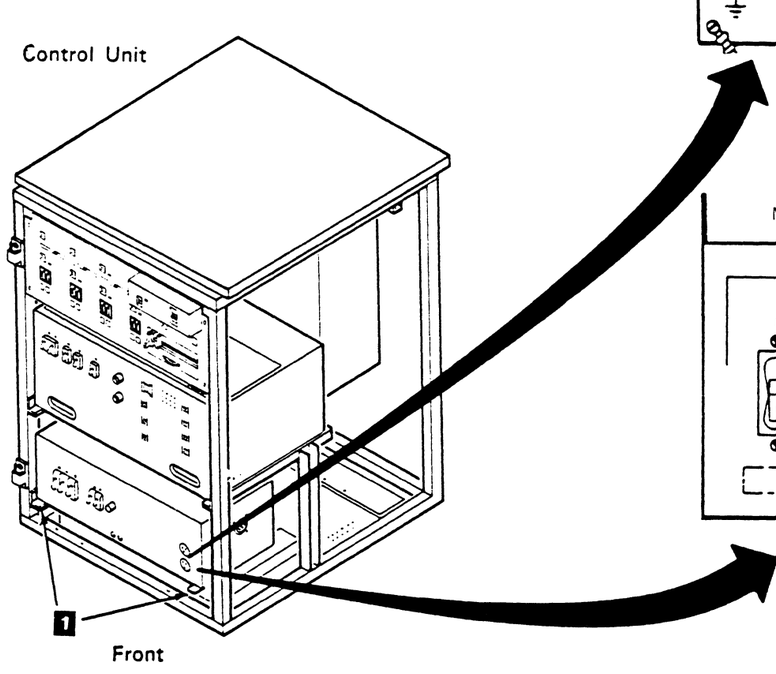
   - Logic board 01A-A1D2D08
   - Logic board 01A-A2D2D08

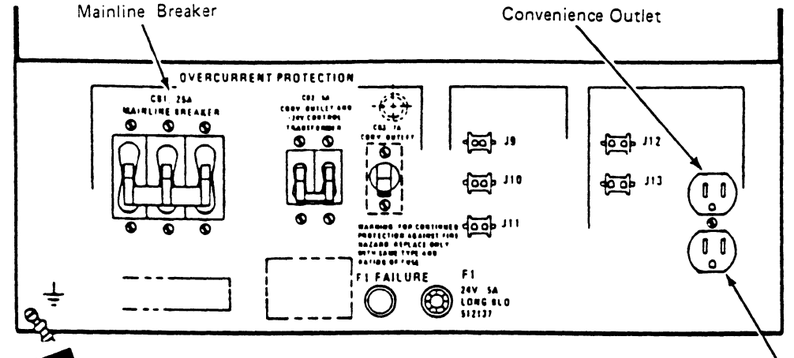
   The resistance should not be more than 0.1 ohm.

8. That all ac/dc CBs and fuses are the correct size:

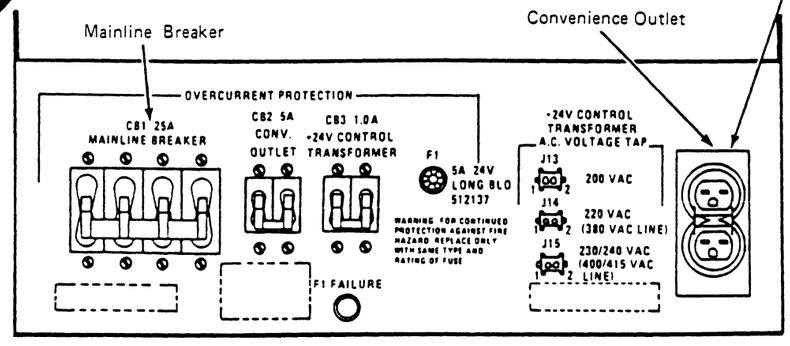
50 Hz	CB1	AC	Main Line	25 A
	CB2	AC	Conv.	5 A
	CB3	AC	24 V	1 A
	F1	DC	24 V	5 A Long Blow
60 Hz	CB1	AC	Main Line	25 A
	CB2	AC	Conv./24 V	5 A
	CB3	AC	Conv	7 A
	F1	DC	24 V	5 A Long Blow

These values can be EC sensitive, so check the fuses and CBs against the machine logic.





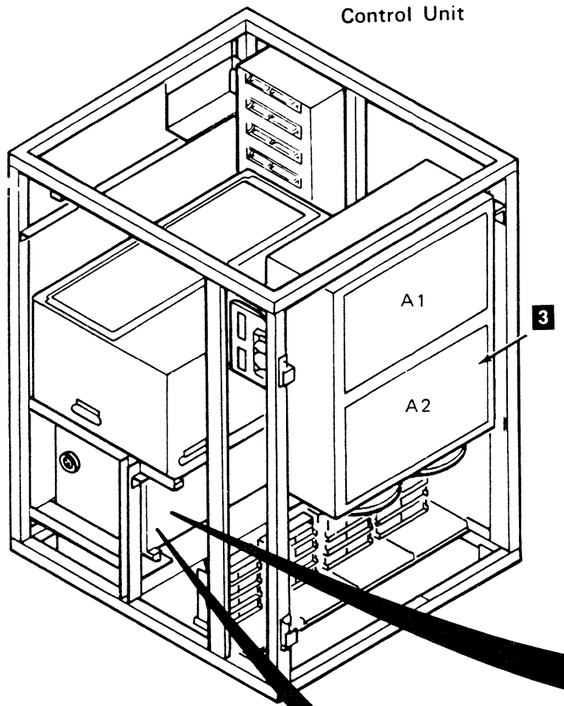
AC Power Supply 60 Hz and 50 Hz Japan

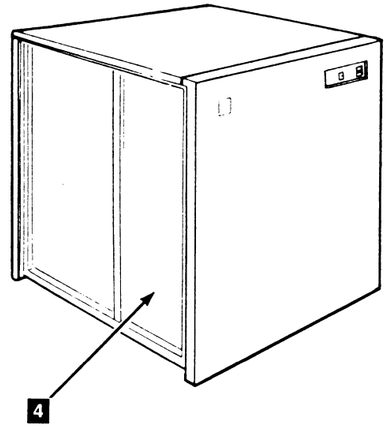


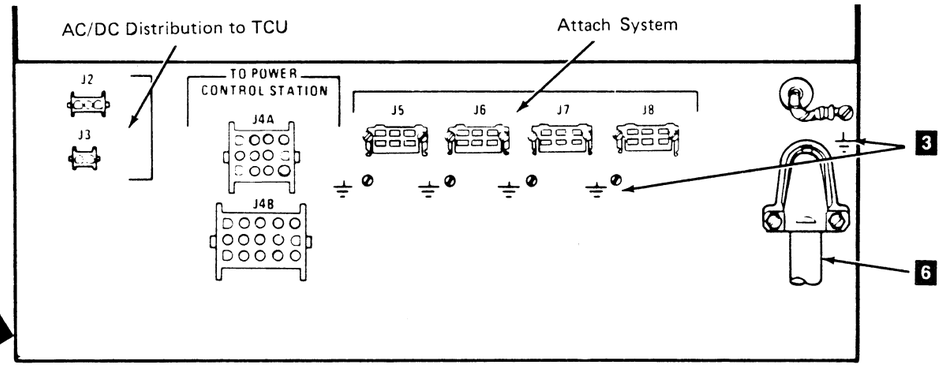
AC Power Supply 50 Hz (Except Japan)

Inspection Procedures (Continued)

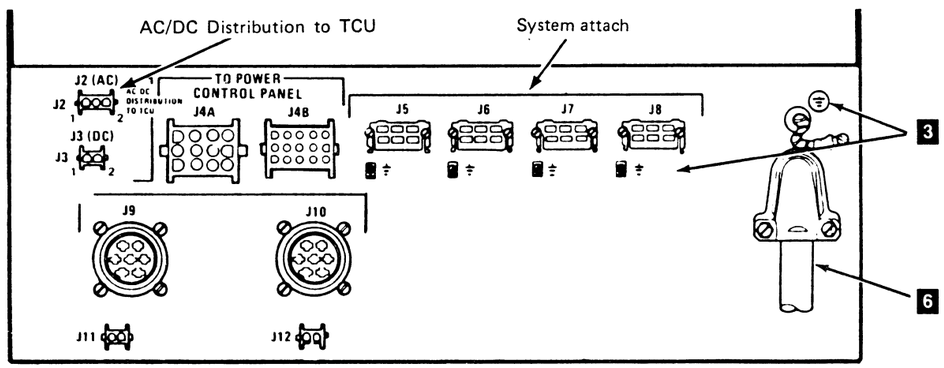
This page is for control units without BM 6460460 and tape units without BM 6460006 (See CARR-DR 9)

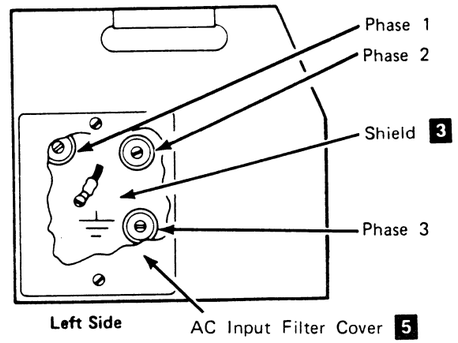




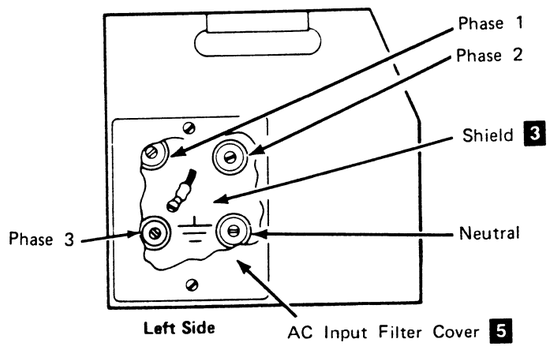


AC Power Supply 60 Hz and 50 Hz Japan





60 Hz, and 50 Hz Japan
Control Unit Left Front with Access to AC Power Supply Left Side



50 Hz, Except Japan
Control Unit Left Front with Access to AC Power Supply Left Side

This page is for control units without BM 6460460 and tape units without BM 6460006 (See CARR-DR 9)

Control Unit–DC Power Supplies

Powered Off with Power Cable and System Attach Cables Disconnected

Check and Correct As Needed

1. That all grounded metal has good ground continuity (less than 0.1 ohm) - covers, housings, metal box sides, and so on.

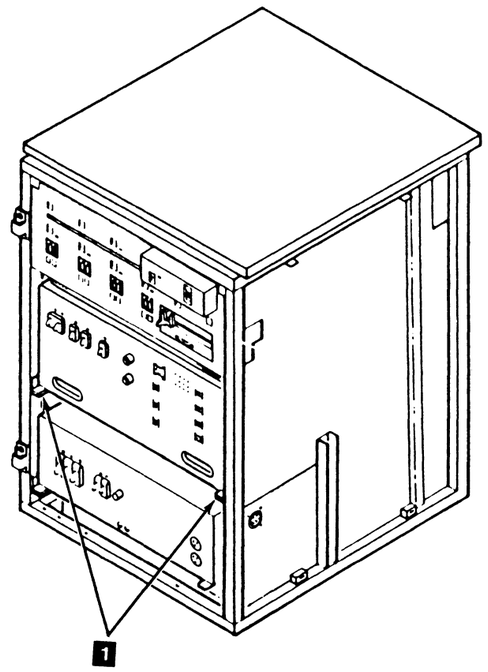
2. All power wiring for frayed or damaged wires.

3. That the dc power supply is attached in place tightly. The power supply has two mounting screws **1**.

4. That all ac/dc CBs and fuses are the correct size:

CB1	AC	10 A	
CB2	DC +5 v	65 A	
CB3	DC +5 v	45 A	
CB4	DC -5 v	12 A	
F1	+8.5 v	5 A	medium blow
F2	+ 24 v	2 A	long blow

These values can be EC sensitive, so check the fuses and CBs against the machine logic.



Inspection Procedures (Continued)

This page is for control units without BM 6460460 and tape units without BM 6460006 (See CARR-DR 9)

Control Unit Inside–Miscellaneous

Powered Off with Power Cable and System Attach Cables Disconnected

Check and Correct As Needed

1. All cables, connections, plugs, and so on for frayed or damaged wiring.
2. All connections, plugs, and so on for damaged latches and/or clamps.

Safety ECs

Powered Off with Power Cable and System Attach Cables Disconnected

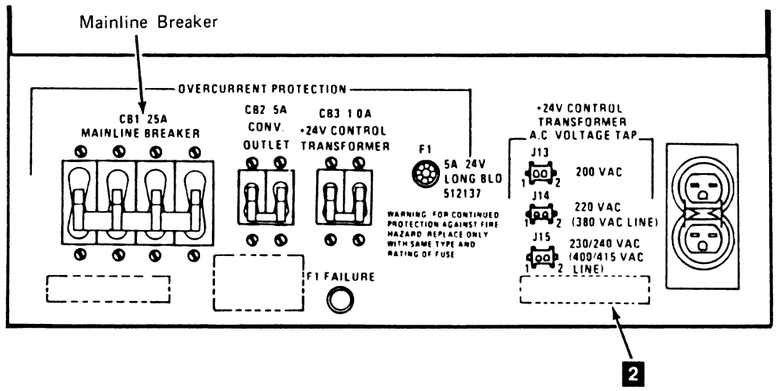
Check and Correct As Needed

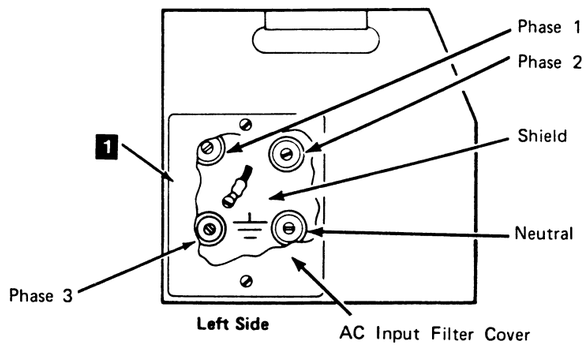
1. That all safety ECs have been installed correctly.
2. The location or list of ECA's.

Power Off and On

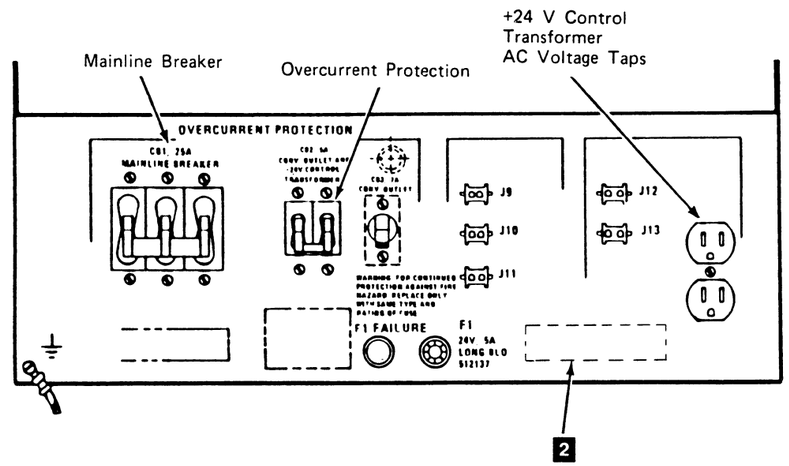
1. Check the customer plug housing to the ground pin. There should be no voltage present and the resistance should be less than 0.1 ohm.
2. Set CB1 off and plug in the power cable.
3. Have the customer close the CB/CP (circuit breaker/circuit panel) that supplies the outlet to which the subsystem is attached.
4. Does machine power label **2** match customer power? Measure with the volt/ohm meter at the ac input filter **1**.
5. Have the customer open the CB/CP that supplies the outlet to which the subsystem is attached and unplug the power cable.
6. Reinstall the covers over the ac input filter.
7. Reinstall all covers and set CB1 off and plug in the power cable.
8. Have the customer close the CB/CP to the outlet that supplies the subsystem.
9. Turn ac CB1 and the Unit Emergency Power Off switch on, and put the Local/Remote switch in the Remote position. Plug in the host system attach cables, if used, one at a time and ensure that the subsystem will power up and down normally.
10. With power up, ensure that the machine will power down with the Unit Emergency switch.
11. Reset the Unit Emergency switch.
12. For control units with Unit Emergency Power Off (UEPO) cables installed; ensure that the control unit (CU) will power on with the host channel (CU Local/Remote switch in the remote position).
13. For control units with EPO cables installed; ensure that the control unit will power off with the host channel (CU Local/Remote switch in the remote position).
14. Repeat the 'POWER ON/OFF' TEST for each host power control cable.

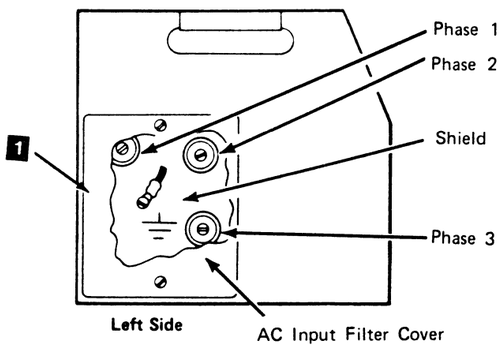
    Power Control 0 J5
    Power Control 1 J6
    Power Control 2 J7
    Power Control 3 J8





Control Unit AC Power Supply 50Hz, Except Japan





Control Unit AC Power Supply 60 Hz, and 50 Hz Japan

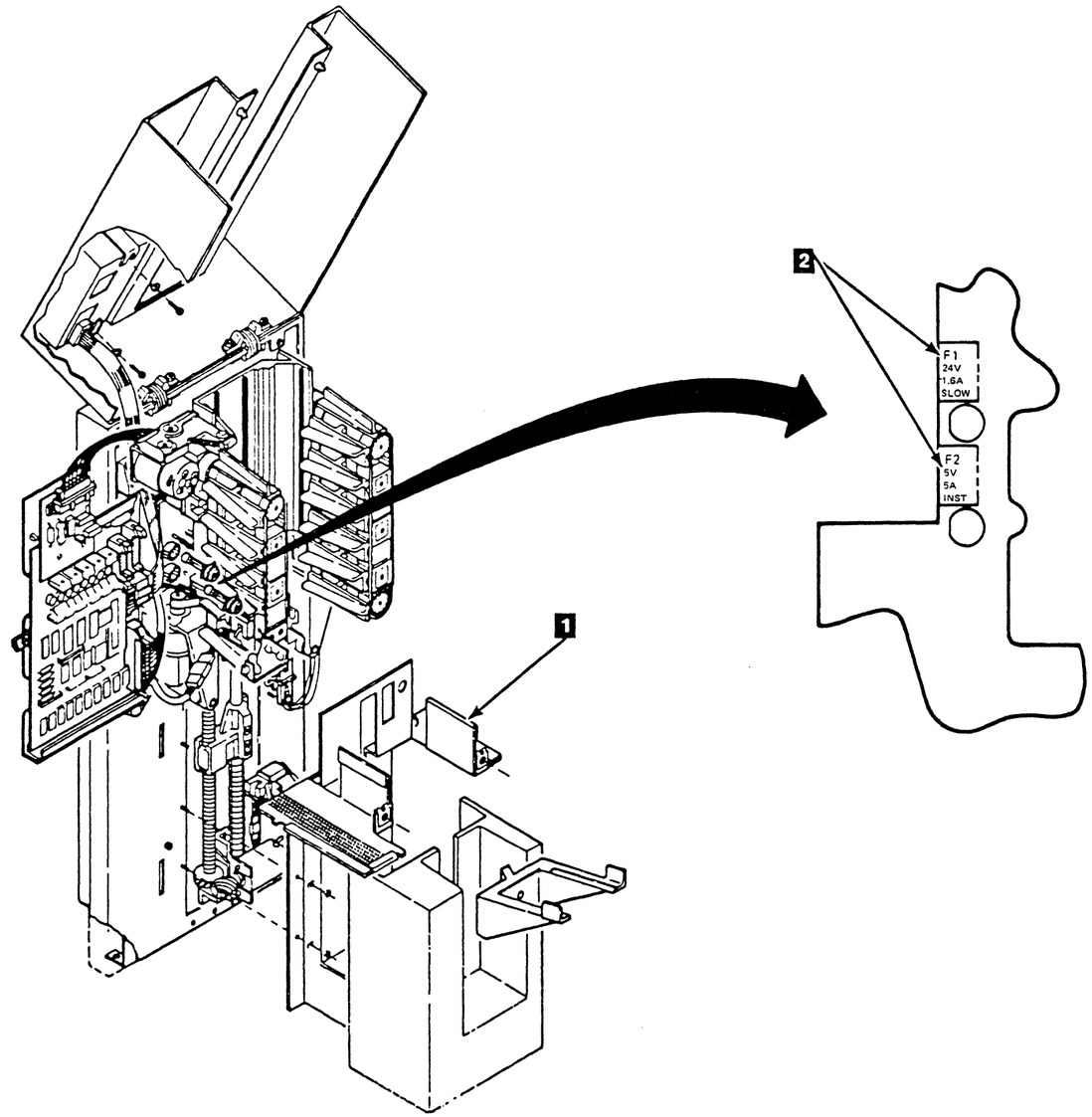
Inspection Procedures (Continued)

This page is for tape units without BM 6460006 (see CARR-DR 9).

Automatic Cartridge Loaders

Check and correct as needed:

- That the lower automatic cartridge loader safety cover is in place **1**.
- That all components are mounted correctly and all cable clamps are installed.
- Inspect all cables, connectors, and plugs for frayed or damaged wiring.
- Inspect all connections and plugs for damaged latches and/or clamps.
- Inspect the automatic cartridge loader base plate for correct installation of the fuse labels **2**.
- That the two fuses are the correct value as shown on the labels **2** on the automatic cartridge loader base plate.
  - F1 +24 V dc 1.6A Slow Blow
  - F2 +5 V dc 5A Instantaneous Blow.



Notes

Completion Report and Signature

This page is for control units without BM 6460460 and tape units without BM 6460006 (See CARR-DR 9)

- SAFETY INSPECTION FOR MACHINE TYPE 3480
- GENERAL SAFETY INSPECTION
- MAINTENANCE AGREEMENT QUALIFICATION (MAQ)

After the inspection, sign and date the checklist and store it with the Maintenance Agreement inspection.

_____ _____

NAME DATE

SAFETY HAZARDS

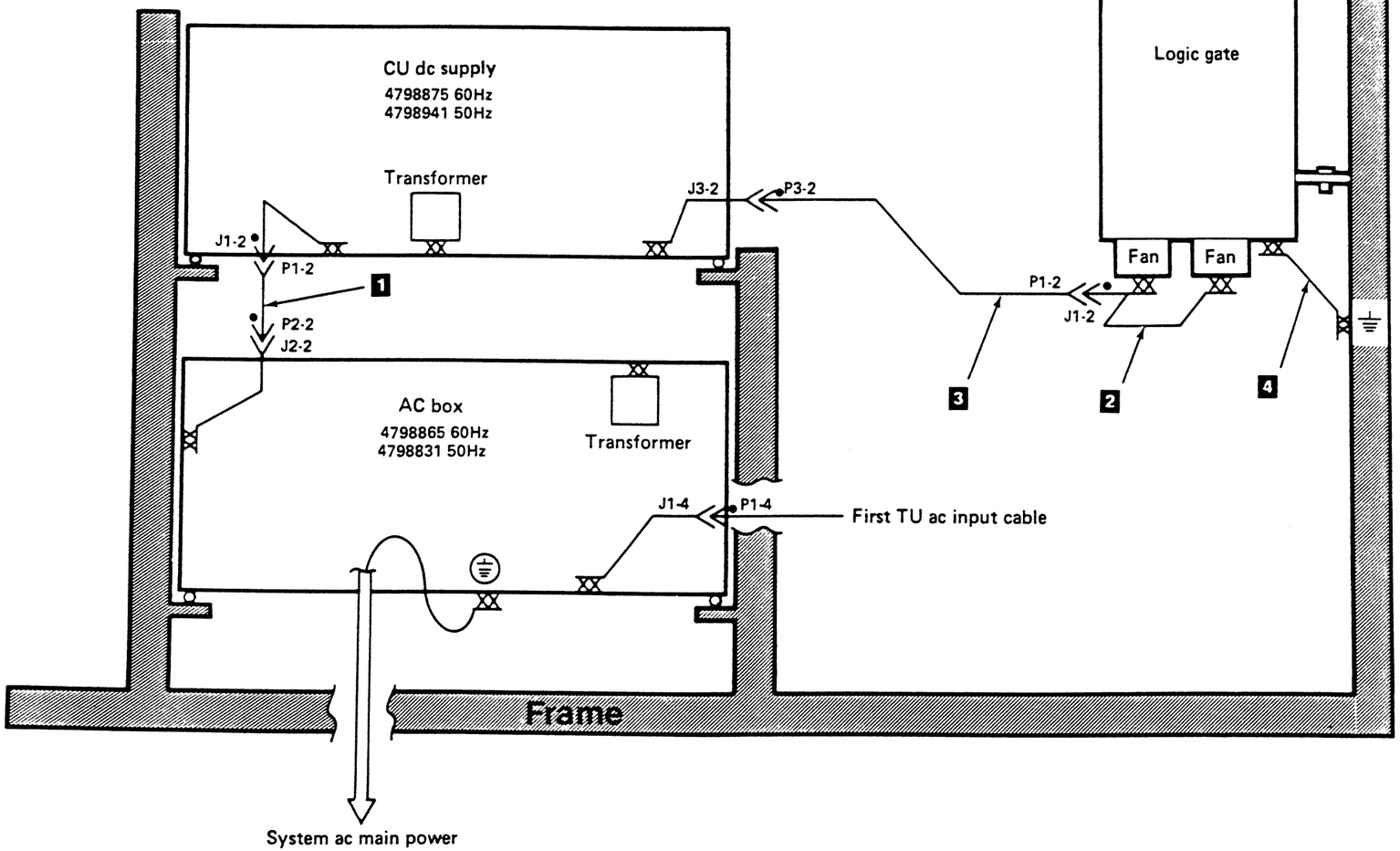
LIST ALL SAFETY HAZARDS, IF NONE SAY NONE.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____

Procedure EC Sensitive (See CARR-DR 9) INSP 160

AC Grounding Diagram (Control Unit 50 Hz and 60 Hz)

This page is for control units without BM 6460460 and tape units without BM 6460006 (See CARR-DR 9)



Notes:

1. *All wires shown are green/yellow.*
2. *Blocks are for adjacent frame attachment. They are used for frame ground and stability.*

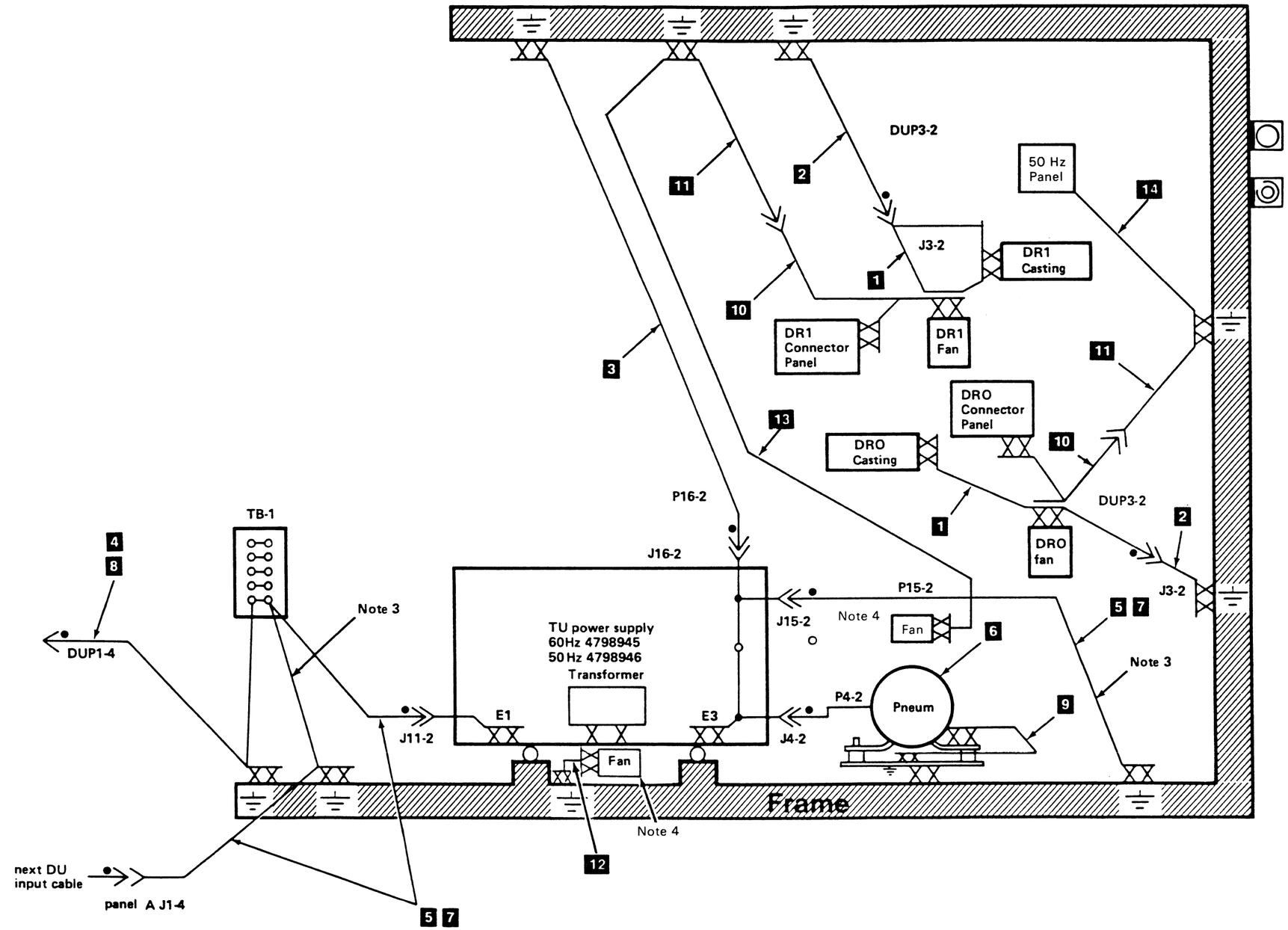
ITEM	PART NO.	DESCRIPTION	AWG
1	4451675	AC-24V DC C/A	14
2	4799041	Cont. gate fan C/A	18
3	4799040	Cont. AC fan C/A	18
4	320638	Jumper	18

Legend

- External tooth lockwasher/starwasher
- Metal to metal with self tapping screws
- Welded connection
- Connector with grounding pin
- Tapped holes for screw attachment

AC Grounding Diagram (Tape Unit and Drive 50 Hz and 60 Hz)

This page is for tape units without BM 6460006
(See CARR-DR 9)



Notes:

1. *All wires shown are green/yellow.*
2. *Threaded block for adjacent frame attachment, frame ground and stability.*
3. *Part number 4799073 from TB 1-8 and J 15-2 to tape unit frame is AWG14.*
4. *The 60 Hz fan is below the power supply and the 50 Hz fan is above the Pneumatic assembly.*

ITEM	PART NO.	DESCRIPTION	AWG
1	4451674	Device fan and ground	18
2	4451673	DR0 or 1 TU fan C/A	16
3	4451671	AC fan SW DR1 C/A	16
4	4451669	TU 60HZ AC input C/A	12
5	4451670	60HZ AC dist DR0 C/A	12
6	4479774	Pneumatic assembly	
7	4799073	50HZ AC dist DR0 C/A	12
8	4451672	TU 50HZ AC input C/A	12
9	4479778	Ground jumper	16
10	4799064	Fan to TU jumper asm	16
11	4799065	TU to fan jumper asm	16
12	6857785	Fan to TU C/A 60 Hz	18
13	82X5458	Fan to TU jumper asm 50 Hz	16
14	5712793	50 Hz fan panel to TU jumper asm	12

Legend

- XX — External tooth lockwasher/starwasher
- ◎ — Tapped holes for screws attachment
- ⊙ — Metal to metal self tapping screws
- — — Weld
- ← — Connector with ground pin
- > — Double crimp
- JX-X — Ground pin in connector

Procedure EC Sensitive (See CARR-DR 9) **INSP 170**

Special Characters

A

B

C

0 0 0 0 0 0 0 0 0 0

0 0 0 0 0 0 0 0 0 0

D

0 0 0 0 0 0 0 0 0 0

0 0 0 0 0 0 0 0 0 0

E

0 0 0 0 0 0 0 0 0 0

N

O

P

0 0 0 0 0 0 0 0 0

Q

R

0 0 0 0 0 0 0 0 0 0

0 0 0 0 0 0 0 0 0 0

U

V

W

X

Y

0 0 0 0 0 0 0 0 0 0

Z

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