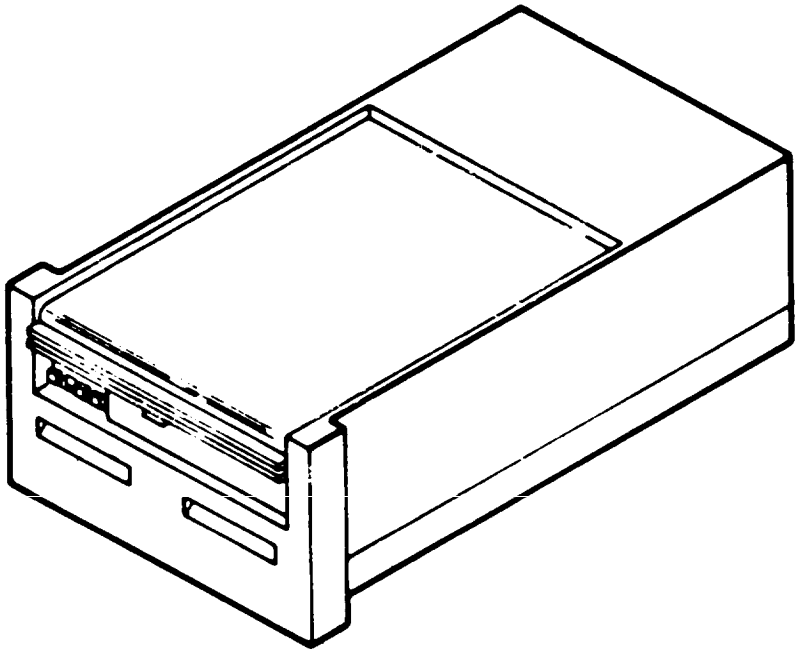
TM 11-7025-208-23

ORGANIZATIONAL AND DIRECT SUPPORT MAINTENANCE MANUAL

DISK MEMORY UNIT
MU-705/MYQ-4



This copy is a reprint which includes current pages from Change 1., 2

(NSN 7025-01-092-2745)

HEADQUARTERS DEPARTMENT OF THE ARMY

MARCH 1984

WARNING

HIGH VOLTAGE

is used in the operation of this equipment

ELECTROCUTION

may result if personnel fail to observe safety precautions.

Never work on electronic equipment unless there is another person nearby. He/she should be familiar with the operation and hazards of the equipment. He/she should also be competent in giving first aid. When you are helped by operators, you must warn them about dangerous areas.

Whenever possible, the power supply to the equipment must be shut off before beginning work on the equipment. If it is necessary to work on the equipment with power on, do not touch anything in the power supply area. Take special care to ground every capacitor likely to hold a dangerous potential. When working inside the equipment after the power has been turned off, always ground every part before, touching it.

Be careful not to contact high-voltage connections when installing or operating this equipment.

Whenever possible, keep one hand away from the equipment to reduce the hazard of current flowing through vital organs of the body.

WARNING

Do not be misled by the term “low voltage”. Voltages as low as 50 volts may cause death.

For artificial respiration, refer to FM 21-11.

WARNING

Remove rings, bracelets, wristwatches, and neck chains before working around electronic equipment. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.

Change
No. 2

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, DC, 15 September 1991

Organizational and Direct Support Maintenance Manual

Disk Memory Unit

MU-705\MYQ-4

(NSN 7025-01-092-2745) (EIC: N/A)

TM 11-7025-208-23, 8 March 1984, is changed as follows:

1. New or changed material is indicated by a vertical bar in the margin of the page. Added or revised illustrations are indicated by a vertical bar in front of the figure captions and by a pointing hand on the illustration pages.

Remove pages	Insert pages
1-5 through 108	1-5 through 1-8
4-1 and 4-2	4-1 and 4-2
4-7 and 4-8	4-7 and 4-8
4-11 through 4-24	4-11 through 4-24
4-27 and 4-28	4-27 and 4-28
4-39 and 4-40	4-39 and 4-40
None	4-42.1/(4-42.2 blank)
4-47 through 4-50	4-47 through 4-50
4-53 and 4-54	4-53 and 4-54
4-79 through 4-82	4-79 through 4-82
4-93 through 4-96	4-93 through 4-96
4-149 and 4-150	4-149 and 4-150
4-159 and 4-160	4-159 and 4-160
4-165 through 4-168	4-165 through 4-168
4-217 and 4-218	4-217 and 4-218
4-227 and 4-228	4-227 and 4-228
4-233 through 4-236	4-233 through 4-236
Index-1 through Index-4	Index-1 through Index-4
FO-l	FO-l
FO-2 (lof 2)	FO-2 (lof 2)
FO-3 (lof 2)	FO-3 (1 of 2)
FO-3 (2 0f 2)	FO-3 (2 0f 2)
FO-4	FO-4
FO-5	FO-5
F0-6	FO-6
FO-7	FO-7
FO-8	FO-8
FO-9	FO-9
None	FO-l0

2. File this change sheet in the front of the publication for reference purposes.

By Order of the Secretary of the Army:

CARL E. VUONO
General, United States Army
Chief *of Staff*

Official:

PATRICIA P. HICKERSON
Colonel, United States Army
The Adjutant General

DISTRIBUTION:

To be distributed in accordance with DA Form 12–36–E, block 5185, Unit and Direct Support/General Support Maintenance requirements for TM 11–’7025-208-23.

TM 11-7025-208-23
cl

CHANGE
NO. 1

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, DC, 2 May 1985

ORGANIZATIONAL AND DIRECT SUPPORT
MAINTENANCE MANUAL

DISK MEMORY UNIT
MU-705/MYQ-4

(NSN 7025-01-092-2745)

TM 11-7025-208-23, 8 March 1984, is changed as follows:

1. New or changed illustrations are indicated by a miniature pointing hand. New or changed text is indicated by a vertical bar in the margin.

2. Remove old pages and insert new pages as indicated below.

Remove	Insert
4-1 and 4-2	4-1 and 4-2
	4-239 thru 4-243/(4-244 blank)
Index-3 and Index-4	Index-3 and Index-4
FO-2 (2 of 2)	FO-2 (2 of 2)

3. File this change sheet in front of the publication for reference purposes.

Change 1 adds a maintenance procedure for the spindle assembly and corrects an error in the power supply schematic diagram.

By Order of the Secretary of the Army:

JOHN A. WICKHAM JR.
General, United States Army
Chief of Staff

Official:

DONALD J. DELANDRO
Brigadier General, United States Army
The Adjutant General

DISTRIBUTION:
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CHAPTER 4
DIRECT SUPPORT MAINTENANCE INSTRUCTIONS

Index of Maintenance Procedures

Section 1. REPAIR PARTS, SPECIAL TOOLS, TMDE AND SUPPORT EQUIPMENT

4-1. COMMON TOOLS AND EQUIPMENT

For authorized common tools and equipment , refer to the Modified Table of Organization and Equipment (MTOE) applicable to your unit.

4-2. SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

Refer to TM 11-701O-2O3-23P for a complete listing and description of special tools, TMDE and support equipment required by organizational maintenance. Also refer to appendix B for a list of tools pertaining to the disk drive assembly.

4-3. SPARES AND REPAIR PARTS

Refer to TM 11-701O-2O3-23P for a complete listing and description of spares and repair parts required for direct support maintenance of this equipment.

Section II. TROUBLESHOOTING

4-4. GENERAL

The most effective way to troubleshoot a fault in this equipment is to follow a routine which guides you through the five phases of troubleshooting (fig. 4-l). By following this routine you assure accurate use of fault isolation and fix procedures. You also improve your troubleshooting skills.

4-5. "[TROUBLESHOOTING PHASES

Each of the five phases in this routine is designed to accomplish a specific goal.

a. Fault Discovery. Usually, the operators or supervisor will notice faulty performance first. They must report the fault on the proper form so you will have the facts you need for the next phase.

b. Failure Confirmation. Based on the facts provided by the operator or supervisor, you must confirm the failure and define the symptom. The symptom is the first clue you will use in the troubleshooting process.

Troubleshooting Entry. Using the symptom defined during phase two, find the troubleshooting flow chart which will help you isolate the fault in the equipment. The checkout and symptom index chart (chart-00) will help you do this.

d. Trouble Isolation. Follow the step-by-step procedures in the flow charts to isolate and correct the cause of the equipment failure.

SUBJECT R (CONT) PARAGRAPH

S

5 SAFETY STEPS TO FOLLOW IF SOMEONE IS THE VICTIM OF ELECTRICAL SHOCK

1 DO NOT TRY TO PULL OR GRAB THE INDIVIDUAL

2 IF POSSIBLE , TURN OFF THE ELECTRICAL POWER

3 IF YOU CANNOT TURN OFF THE ELECTRICAL POWER, PULL, PUSH, OR LIFT THE PERSON TO SAFETY USING A WOODEN POLE OR A ROPE OR SOME OTHER INSULATING MATERIAL

4 SEND FOR HELP AS SOON AS POSSIBLE

5 AFTER THE INJURED PERSON IS FREE OF CONTACT WITH THE SOURCE OF ELECTRICAL SHOCK, MOVE THE PERSON A SHORT DISTANCE AWAY AND IMMEDIATELY START ARTIFICIAL RESUSCITATION

TECHNICAL MANUAL
No. 11-7025-208-23

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, DC, 8 March 1984

ORGANIZATIONAL AND DIRECT SUPPORT MAINTENANCE MANUAL DISK MEMORY UNIT Mu-705/MYQ-4

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in back of this manual, direct to: Commander, US Army Communications and Electronics Command and Fort Monmouth, ATTN: DRSEL-ME-MP, Fort Monmouth, New Jersey 07703. A reply will be furnished to you.

HOW TO USE THIS MANUAL

This manual tells you how to troubleshoot and maintain the Disk Memory Unit MU-705/MYQ-4.

LOCATION OF SUBJECTS IN MANUAL

In this manual, paragraphs are numbered in order by chapter. For example, paragraph 2-3 is the third paragraph in chapter 2. Pages are also numbered this way. Using this numbering system, there are three easy ways to locate the information you need in this manual.

- Front cover locators
- Alphabetical index
- Index of maintenance procedures

Use the front cover locators and marked pages to quickly find the parts of the manual shown on the cover. These locators mark portions of the manual which are used often. If the information you need is not listed on the front cover, use the alphabetical index at the back of this manual. It lists all subjects covered in the manual and directs you to the subject by paragraph number. When you need a specific maintenance procedure, use the index at the start of chapter 3 or 4. This index lists all the maintenance procedures in the chapter and directs you to each procedure by page number.

MAINTENANCE PROCEDURES

Maintenance procedures in this manual have two features which help you perform them more easily:

- initial setup boxes
- First-time performance aids

An initial setup box is used at the start of any procedure which requires setup items before you perform it. This box lists items needed to perform the procedure. If the box does not appear at the start of a procedure, no setup items are needed.

If you are using this manual to perform a procedure for the first time, always read through the entire procedure before you start. Always perform the task steps in the order given. This will help assure correct performance. Use the illustrations beside the tasks steps to find the parts of the equipment called out in the steps. Some steps include a reference to another paragraph. Go to that paragraph if you are not sure how the step is done.

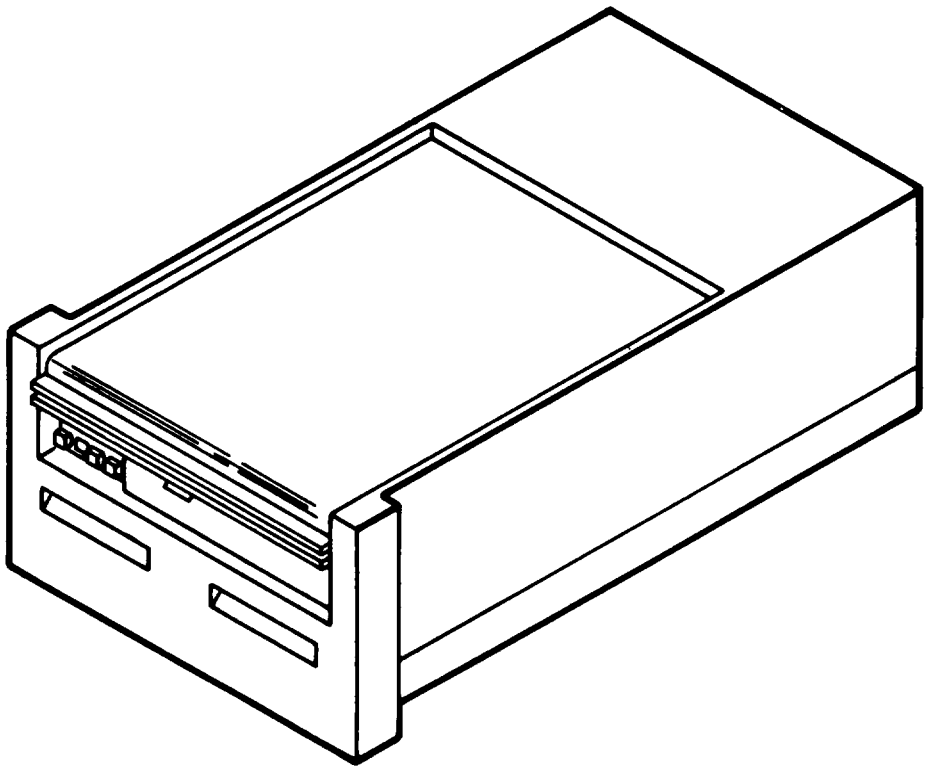


Figure 1-O. Disk Memory Unit MU-705/MYQ-4

CHAPTER 1
INTRODUCTION

Section 1. GENERAL INFORMATION

1-1 SCOPE

Disk Memory Unit MU-705/MYQ-4 (fig. l-O) is an anxiliary memory storage unit used to support a minicomputer. It stores data on interchangeable disk packs. In the rest of this manual it will be called the disk drive. Use this manual for organizational and/or direct support maintenance of the disk drive.

1-2. INDEX OF PUBLICATIONS

Refer to the latest issue of DA Form 310-1 to determine whether there are new editions, changes or additional publications pertaining to the disk drive.

1-3. MAINTENANCE FORMS, RECORDS, AND REPORTS

Department of the Army forms and procedures used for equipment maintenance will be those prescribed by TM 38-750, The Army Maintenance Management System (TAMMS).

1-4. DESTRUCTION OF ARMY ELECTRONICS MATERIEL

Destruction of Army electronics materiel to prevent enemy use shall be in accordance with TM 750-244-2.

1-5. ADMINISTRATIVE STORAGE

Administrative storage of equipment issued to and used by Army activities will have PMCS performed before storing. When removing the equipment from administrative storage, the PMCS checks should be performed to assure operational readiness. Disassembly and repacking of equipment for limited storage are covered in TM 740-90-1.

1-6. Reporting EQUIPMENT Improvement RECOMMENDATIONS (EIR)

If your disk drive needs improvement, let us know. Send us an EIR. you, the user, are the only one who can tell us what you don’t like about your equipment. Let us know why you don’t like the design or performance. Put it on an SF 368 (Quality Deficiency Report). Mail it to us at Commander, U. S. Army Communications and Electronics Command and Fort Monmouth, Attn: DRSEL-ME-MP, Fort Monmouth, NJ 07703. We’ll send you a reply.

1-7. REFERENCE INFORMATION

This listing includes the nomenclature cross reference list, the list of abbreviations and an explanation of terms (glossary) used in this manual.

1-8. NOMENCLATURE CROSS-REFERENCE LIST

Common names are used throughout this manual, but you must use the official nomenclature when filling out report forms, sending an EIR, or finding referenced technical manuals.

Common Name	Official Nomenclature
Disk Drive	Disk Memory MU-705/MYQ-4

1-9. LIST OF ABBREVIATIONS

EDAC	Error detection and correction
MSU	Mass storage unit

1-10. GLOSSARY

A complete glossary of unusual terms is given in the back of this manual. (Glossary-1)

Section Il. EQUIPMENT DESCRIPTION AND DATA

1-11. EQUIPMENT PURPOSE, CAPABILITIES AND FEATURES

The disk drive is a high speed, random access, digital data storage device. The disk drive provides auxiliary memory storage for a central processor. It is connected to the central processor through a memory controller. The capabilities and features are as follows:

- Removable magnetic disk pack for storing and retrieving data. Inside the pack, five disk surfaces are used for reading/writing data. The sixth surface, the servo surface, provides position information and timing signals.
- Write protect circuitry to prevent writing over permanent data that must be saved
- Speed detection circuitry which detects loss of speed or power
- Error detection and correction circuitry for validity check
- Power detection circuitry for ac/dc fault check
- Check indicator circuitry to warn of fault occurance
- Major assemblies are designed for ease of fault isolation and repair

1-12. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS

The disk drive houses all major components within one drawer (fig. l-l). The components are divided into three major assemblies; base assembly (fig. 1-2), deck assembly (fig. 1-5) and logic cage assembly (fig. 1-3).

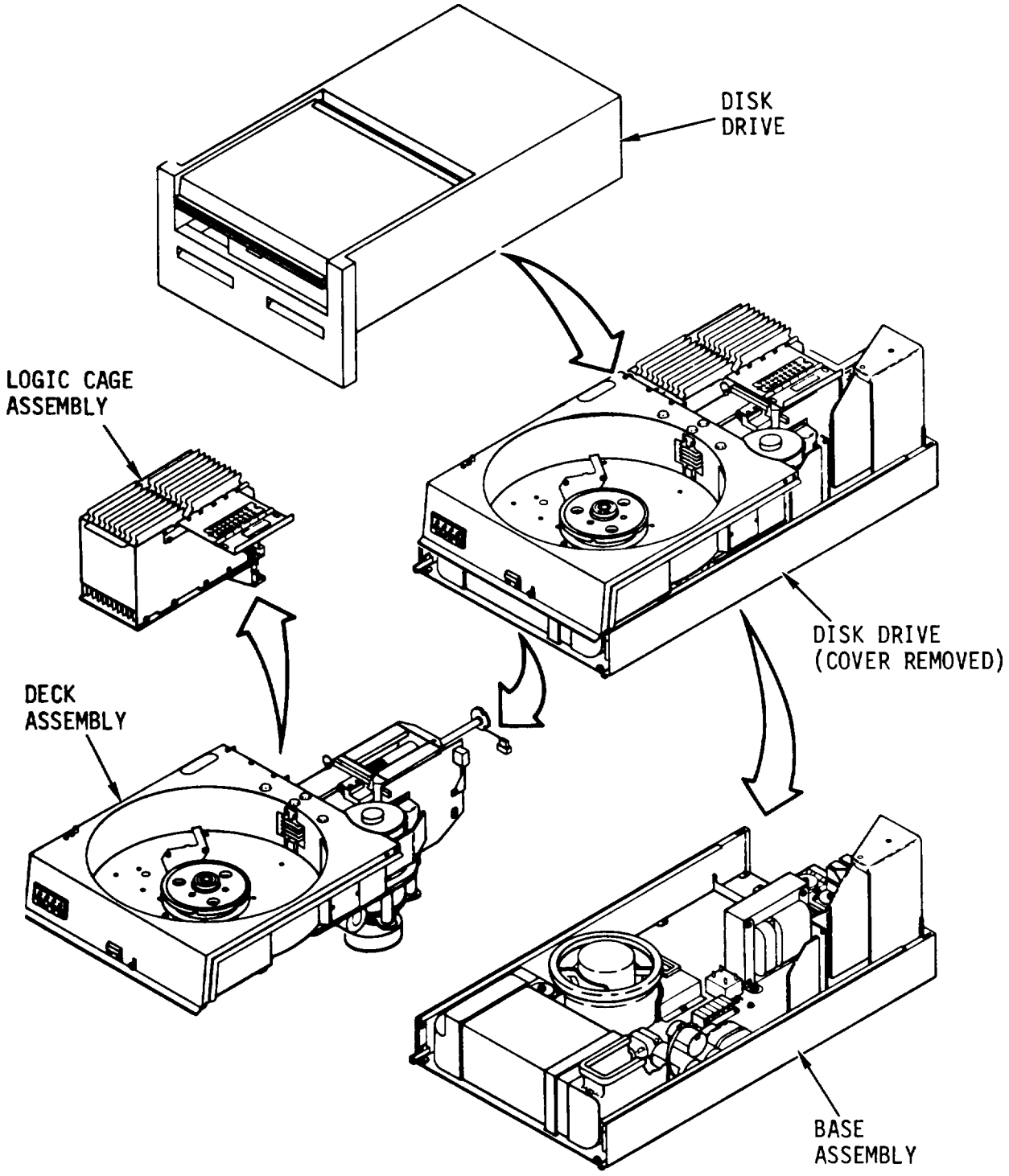
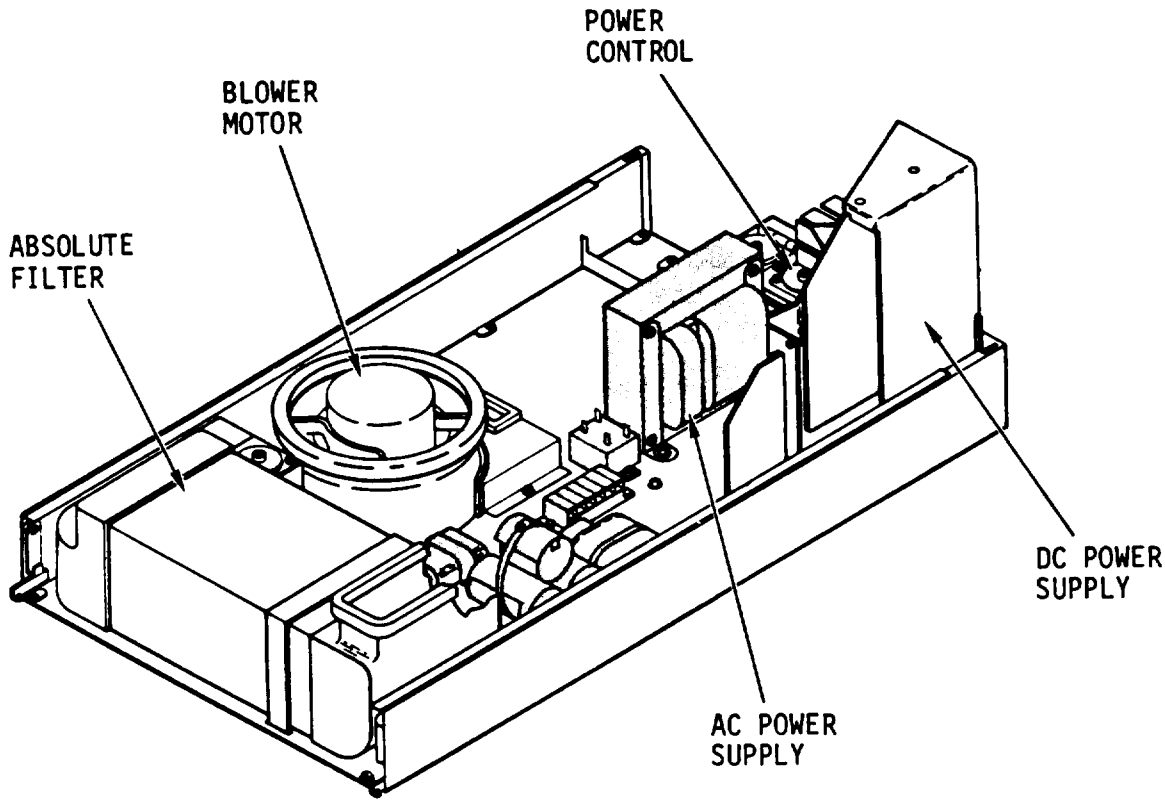


Figure 1-1. Disk Drive Major Components



ABSOLUTE FILTER - Removes dirt from air before air is forced into pack area.

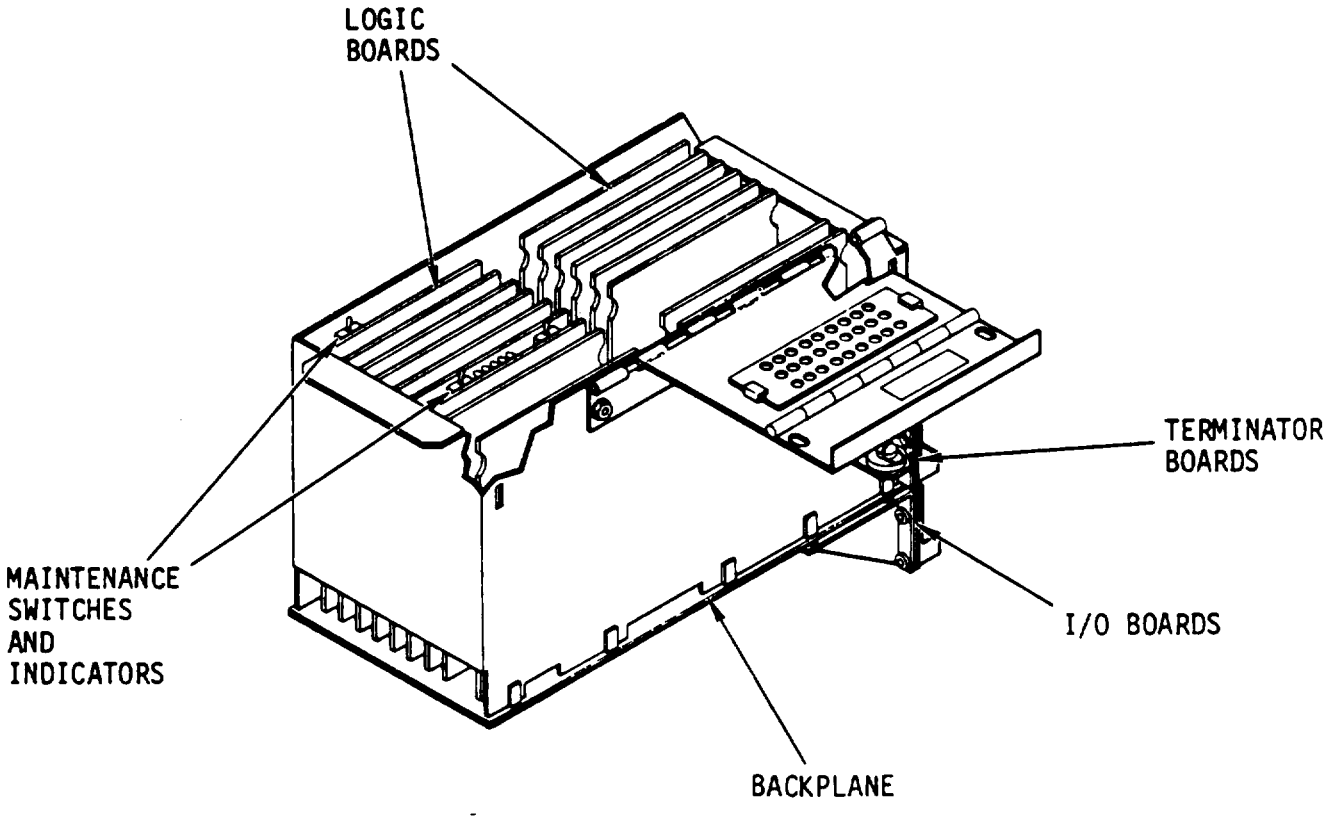
BLOWER MOTOR - Blows clean air into pack area and cooling air into logic chassis.

POWER CONTROL - Controls application of ac and dc power. Panel contains an elapsed time meter and circuit breakers.

DC POWER SUPPLY - Rectifies ac power and provides eight dc output voltages, as well as emergency retract control.

AC POWER SUPPLY - Filters and controls ac power and provides power to drive, blower motors, and to dc power supply. Includes all shaded components in illustration.

Figure 1-2. Base Assembly Components



LOGIC BOARDS - Contain most of the integrated and discrete circuitry which make up the functional logic. (See figure 1-4)

TERMINATOR BOARDS - Contains termination resistors for receivers and transmitters. (Used only on last drive in a daisy chain string.)

1/0 BOARDS - Interface I/0 cable with backpanel.

BACKPLANE - Contains all wiring which interconnects logic boards, 1/0 boards, terminator boards, and other cables attached to logic chassis.

MAINTENANCE SWITCHES AND INDICATORS - Used during test and diagnostic procedures. (See figure 1-6).

Figure 1-3. Logic cage assembly Components

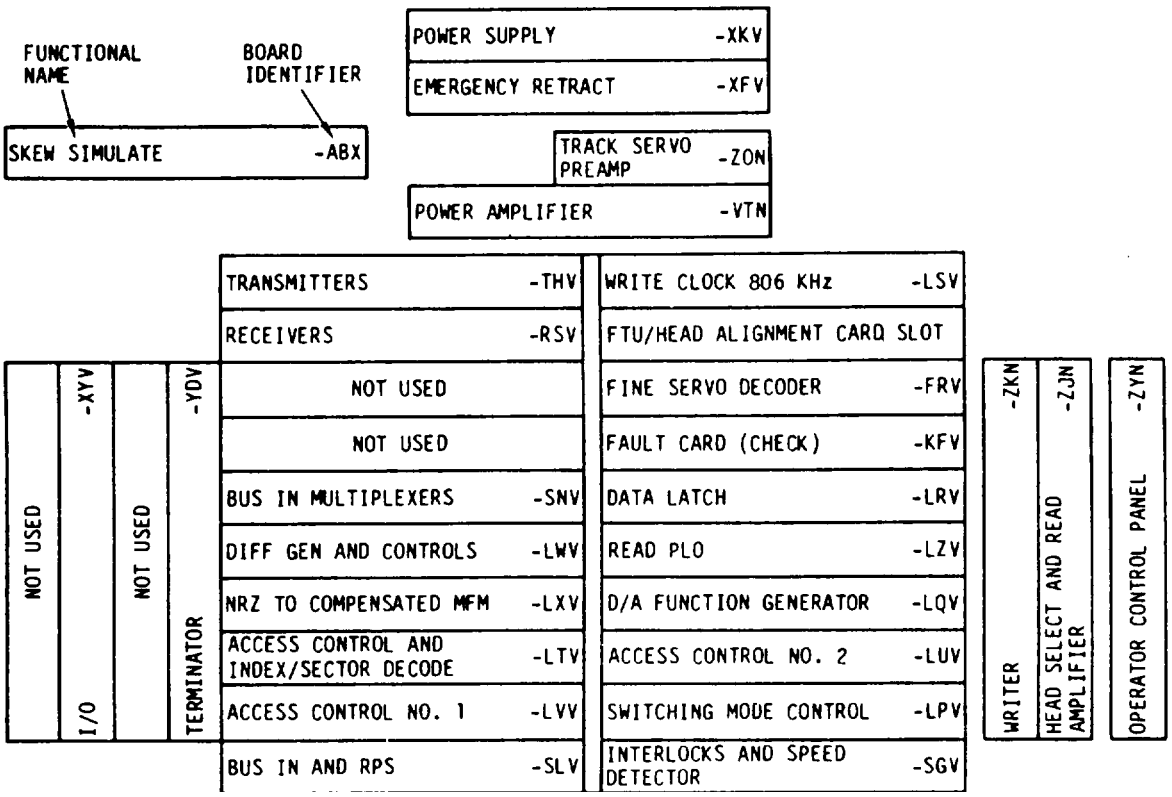


Figure 1-4. Logic Cage Board Locations

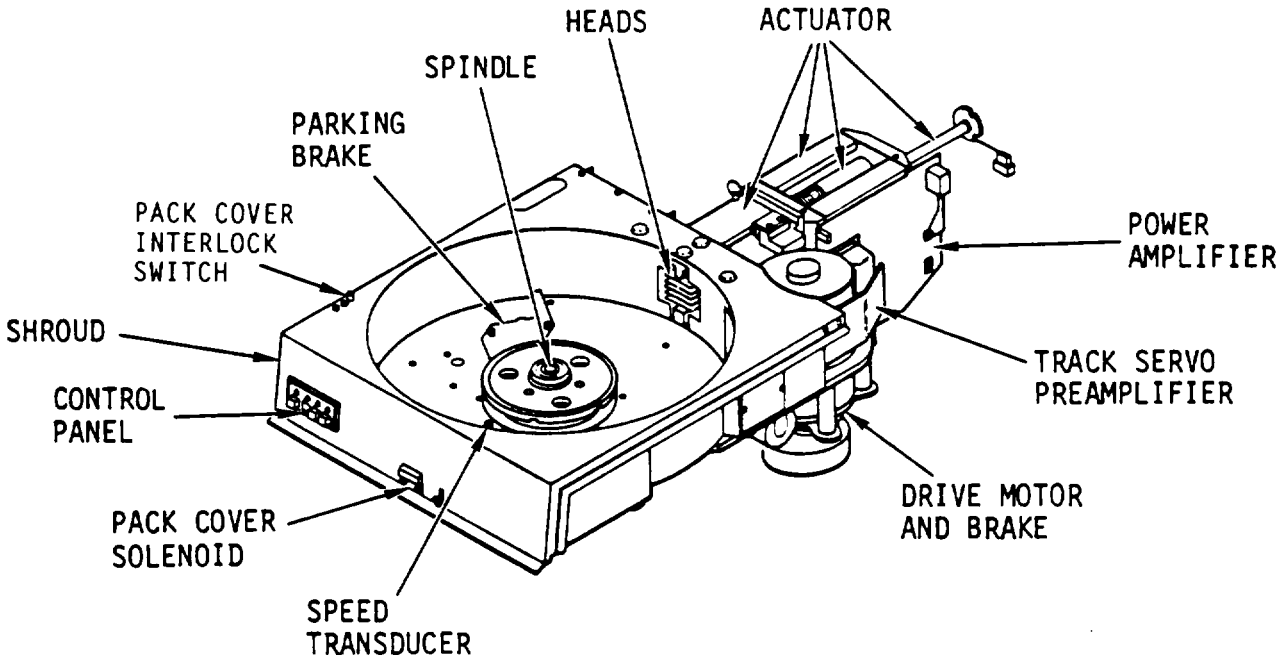


Figure 1-5. Deck Assembly Components (1 of 2)

ACTUATOR - Used to position servo and read/write heads. Made up of rail bracket, rails, carriage coil assembly, magnet assembly; also contains velocity transducer.

POWER AMPLIFIER - Provides final amplifications of servo positioning signal before it is applied to carriage coil.

TRACK SERVO PREAMPLIFIER - Provides first stage of amplification for track servo signal which is read from magnetic disk pack by servo head.

DRIVE MOTOR AND BRAKE - Drive motor drives spindle which in turn drives magnetic disk pack. Brake is used to slow and stop magnetic disk pack after drive motor is turned off.

SPEED TRANSDUCER - Magnetic pickup which provides information to logic on relative speed of magnetic disk pack.

PACK COVER SOLENOID - Locks pack cover on loss of power or when disk pack is spinning. Releases cover 30 seconds after drive motor shuts off.

CONTROL PANEL - Used by operator to control operation of drive. Contains three switches and indicators and the logical address plug.

SHROUD - Provides protection and ventilation for magnetic disk pack.

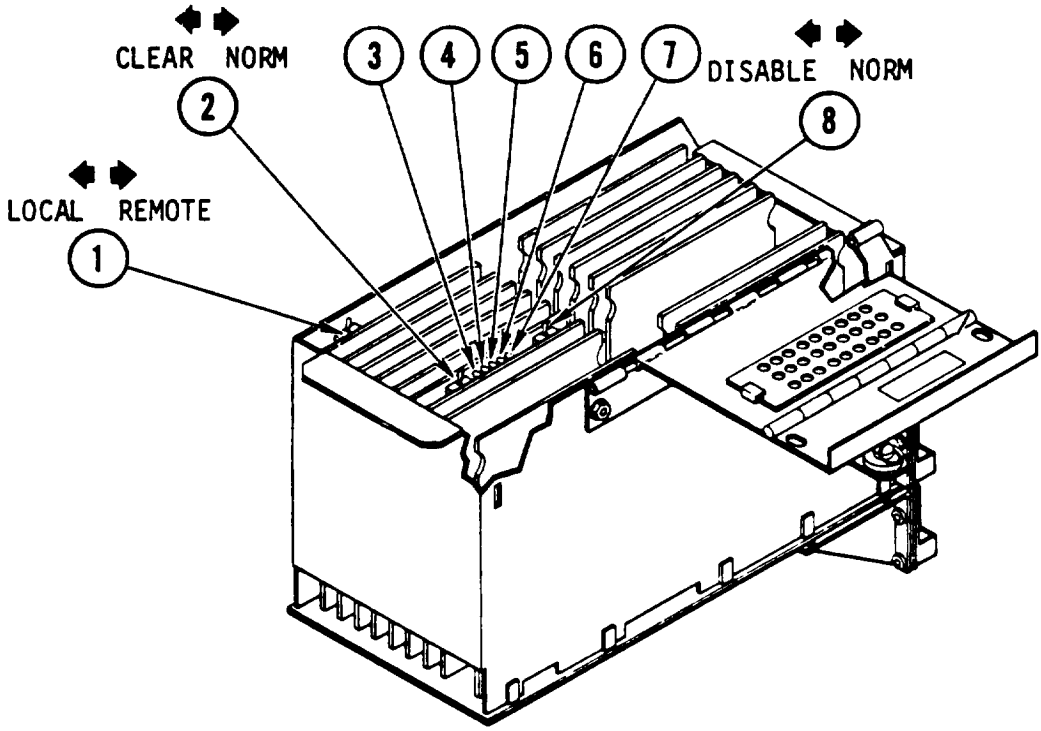
PACK COVER INTERLOCK SWITCH - Prevents drive motor from starting when pack access cover is opened.

PARKING BRAKE - Prevents spindle from turning while magnetic disk pack is being installed or removed.

SPINDLE - Provides surface to secure disk pack and means of transmitting drive motor rotational motion to pack.

HEADS - Servo head reads data from magnetic disk pack servo surface to control actuator positioning. Read/write heads record and read back data on magnetic disk pack data surfaces.

Figure 1-5. Deck Assembly Components (2 of 2)



①	Local/Remote Switch	LOCAL position prevents control of power sequencing by controller. Drive is powered on and off by START switch assuming circuit breakers are set to ON. REMOTE position allows controller to command power sequencing. Drive cannot be started until a ground is applied via subsystem Power Sequence Pick and Hold lines.
②	Fault Clear Switch	CLEAR position clears out Fault Latch and five Fault Status Latches. When switch is actuated, fault indicators on edge of fault beard go out and remain out unless condition causing fault still exists. NORM is normal operating position for switch and position to which it returns when released (spring loaded).
③	Voltage Fault Indicator	Lights to indicate a below normal voltage existed.
④	Write Fault Indicator	Lights to indicate a write fault existed.
⑤	Head Select Indicator	Lights to indicate a multiple head select occurred.
⑥	Read/Write Indicator	Lights to indicate that both write and read were selected simultaneously. .
⑦	$\overline{oc}$ ●(W + R) Indicator	Lights to indicate that a write or read was selected during a seek operation (not on cylinder).
⑧	Disable Switch	DISABLE position prevents Unit Selected from being sent to controller and disables transmitters and receivers. NORM is normal operating position.

Figure 1-6. Maintenance Switches and Indicators

1-13. EQUIPMENT IDENTIFICATION PLATE

An equipment identification plate (fig. 1-7) is installed on the right front of the disk drives located under the pack cover.

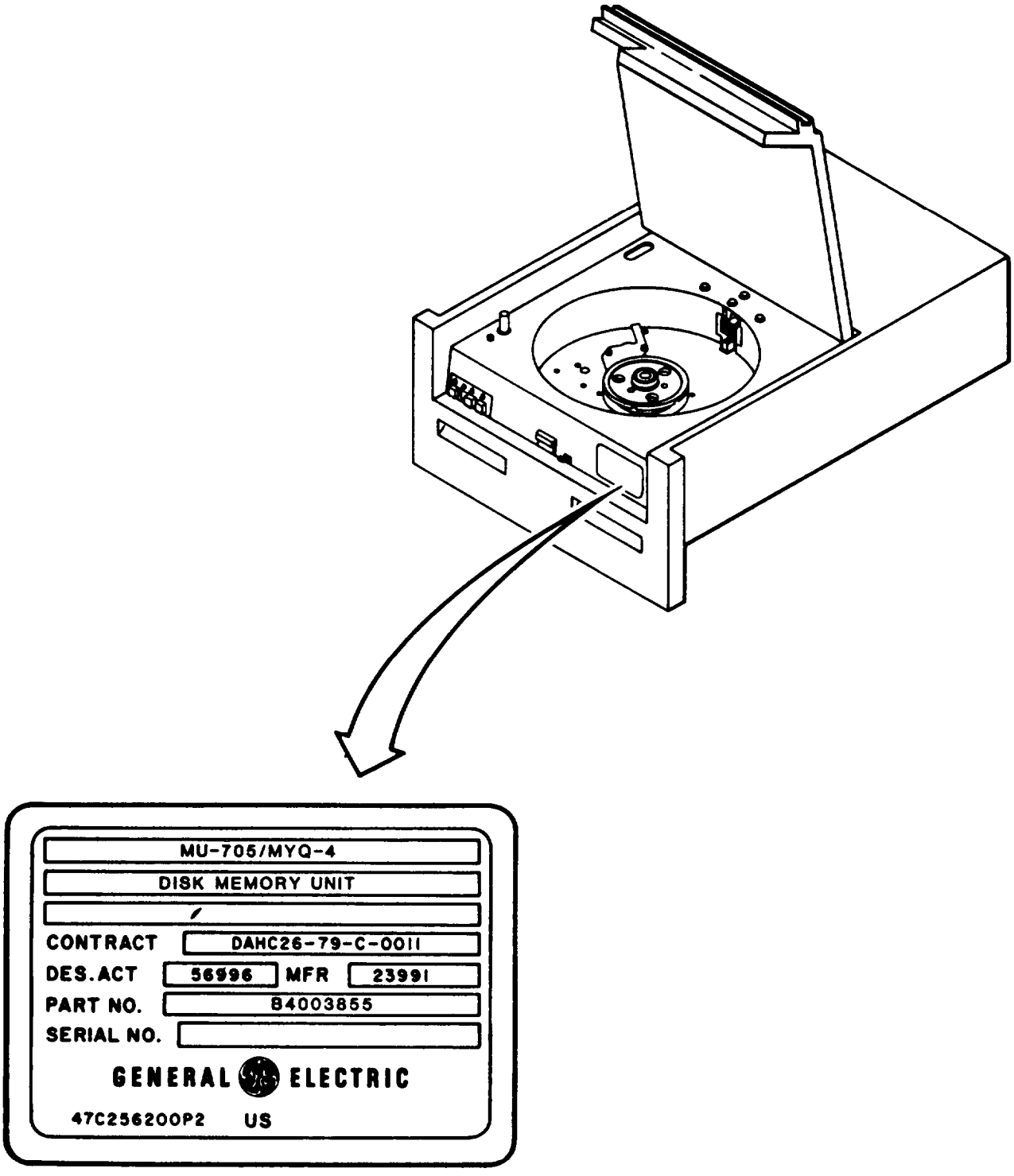
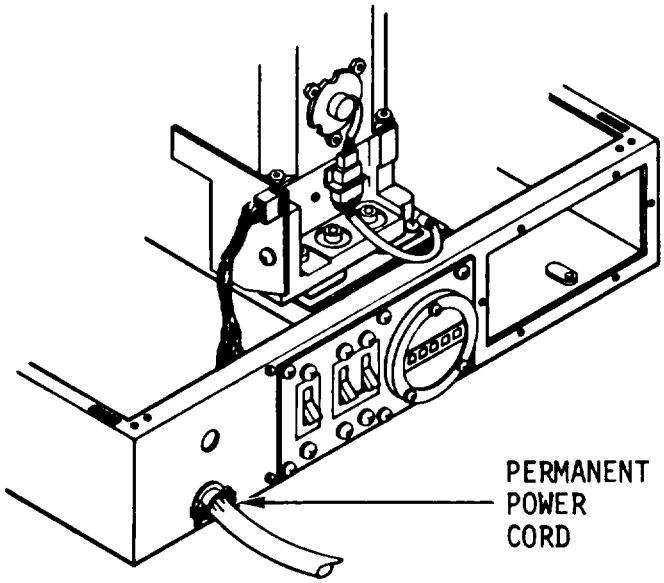


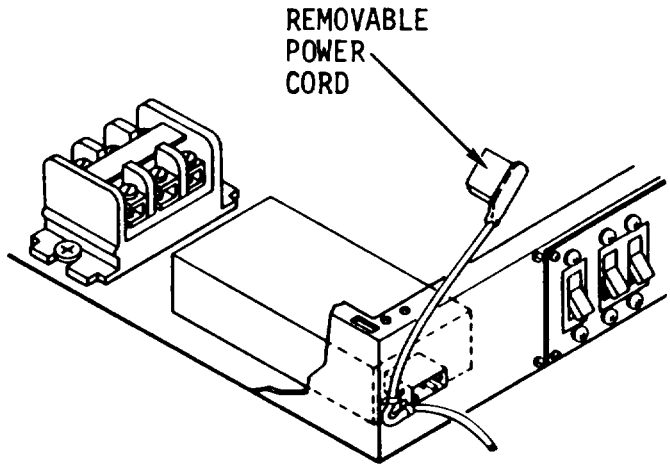
Figure 1-7. Location of Identification Plate

1-14. DIFFERENCES BETWEEN DISK DRIVE MODELS

There are two variations of ac power cord installations (fig. 1-8) a permanent cord mount in serial numbers 25 thru 108 and a removable power cord starting on serial numbers 109 and up.



NOTE:
USED ON EQUIPMENT
SERIAL NO. 25 THRU 108.



NOTE:
USED ON EQUIPMENT STARTING
WITH SERIAL NO. 109.

Figure 1-8. Disk Drive Power Cord Installations

1-15. EQUIPMENT DATA

Weight and dimensions:
- Weight 340.0 lb (154.5 kg)
- Height 36.2 in. (92.0 cm)
- Width 23.0 in. (58.4 cm)
- Depth 36.0 in. (91.4 cm)

Operating environment:
- Temperature 50°F to 100°F" (10°C to 38°C)
- Relative humidity 10% to 90% (noncondensing)

Electrical requirements:
- Voltage 102 V ac to 132 V ac
- Frequency 60 HZ

Altitude:
Operating 1000 ft (305 m) to 6500 ft (2000 m)
Transit (packed for shipment) 1000 ft (305 m) to 15,000 ft (4572 m)

Disk Pack:
Type M4130
Disks/Pack 3 (Top and bottom disks are for protection only.)
Data Surfaces 5
Servo Surfaces 1
Usable Tracks/Surface 823
Tracks/Inch 384
Track Spacing (center to center) 0.0026 (.66 mm)
Coating Magnetic Oxide

Data Capacity:

Bytes/Track	20,160
Bytes/Cylinder	100,800
Bytes/Spindle	82,958,400
Cylinders/Spindle	823

Recording Characteristics:
Mode Modified Frequency Modulation (MFM)
Density (nominal)
Outer Track 4038 bits/in. (1590 bits/cm)
Inner Track 6038 bits/in. (2377 bits/cm)
Rate (nominal) 9.67 MHz (1,209,600 bytes/see)

Heads
Read/write 5
Servo 1
Read/Write Width 0.002 in. (0.051 mm)

Seek Characteristics:
Mechanism Voice Coil, Driven By Servo Loop
Max Seek Time (411 or 823 Tracks) 55 ms
Max Track Seek Time 6 ms
Average Seek Time 30 ms

Latency:
Average 8.33 ms (at 3600 r/rein)
Maximum 17.3 ms (at 3474 r/rein)

Spindle Speed: 3600 r/rein

Drives Per Controller: 4 maximum (O through 3)

CHAPTER 2
TECHNICAL PRINCIPLES OF OPERATION

2-1. GENERAL

This chapter tells you how the disk drive works. This information will help you perform troubleshooting and corrective maintenance procedures.

2-2. FUNCTIONAL DESCRIPTION

The disk drive is an electromechanical device. Operation involves nine interrelated functions:

- Power system functions
- Electromechanical functions
- Interface functions
- Unit selection
- Seek functions
- Track orientation
- Machine clock functions
- Head operation
- Read/write functions
- Fault detection

A functional block diagram (fig. 2-1) shows the interrelationship of these functions which are explained in subsequent paragraphs.

2-3. POWER SYSTEM FUNCTIONS

Power system functions (fig. 2-2) include the power system functional areas; power distribution, power on/off, and emergency heads retract.

a. Power Distribution. Consists of routing primary power to the power supply and other primary power operated components of the disk drive. Power is also applied by the ac power circuit breaker to the blower which provides filtering and ventilation. With the circuit breaker on, power is available to the start and run triacs which will start the drive motor during the power-on sequence. The power supply circuit breaker energizes the power supplies which provide operating voltages for the disk drive circuitry.

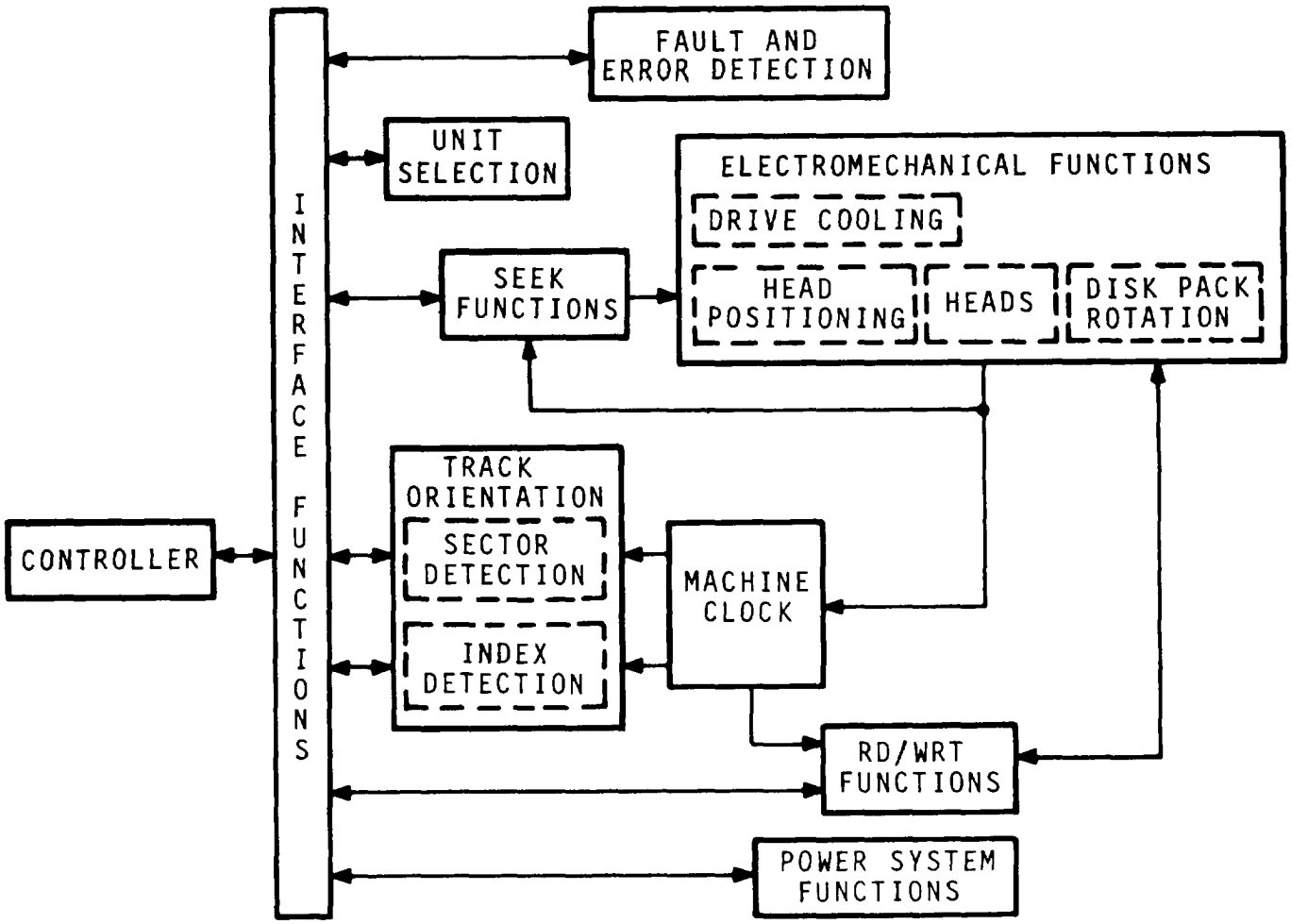


Figure 2-1. Disk Drive Functional Block Diagram

b. Power On Sequence. Starts and runs the drive motor and extends the heads over the disk surface. The drive motor is started by the start triac while the brake is disabled. After initial start, the run triac supplies power to the drive motor. When operating speed is reached, power is applied to the voice coil and the heads extend; the start triac goes off.

c. Power Off Sequence. Unloads the heads, powers off the drive motor and applies the brake.

d. Emergency Retract Relay. Operates automatically during an equipment failure. The heads automatically retract to prevent damage to the heads or the disk pack. When a power failure occurs, the emergency retract relay is deenergized and voltage is applied to the voice coil to retract the heads.

2-4. ELECTROMECHANICAL FUNCTIONS

Electromechanical functions (fig. 2-3) consists of; disk pack rotation, head positioning, filtering and ventilation.

Disk Pack Rotation. The disk pack must be rotated fast enough to create a cushion of air on which the heads will fly. This allows the heads to move over the disk surfaces without touching them. The drive motor provides the rotary motion for the disk pack. A spindle, driven by the motor, is the mechanical mounting for the disk pack. A canister actuated parking brake stops spindle rotation during disk pack loading and unloading. Spindle speed is monitored by a speed transducer. An interlock is provided to ensure that the pack access cover is closed before disk pack rotation can occur.

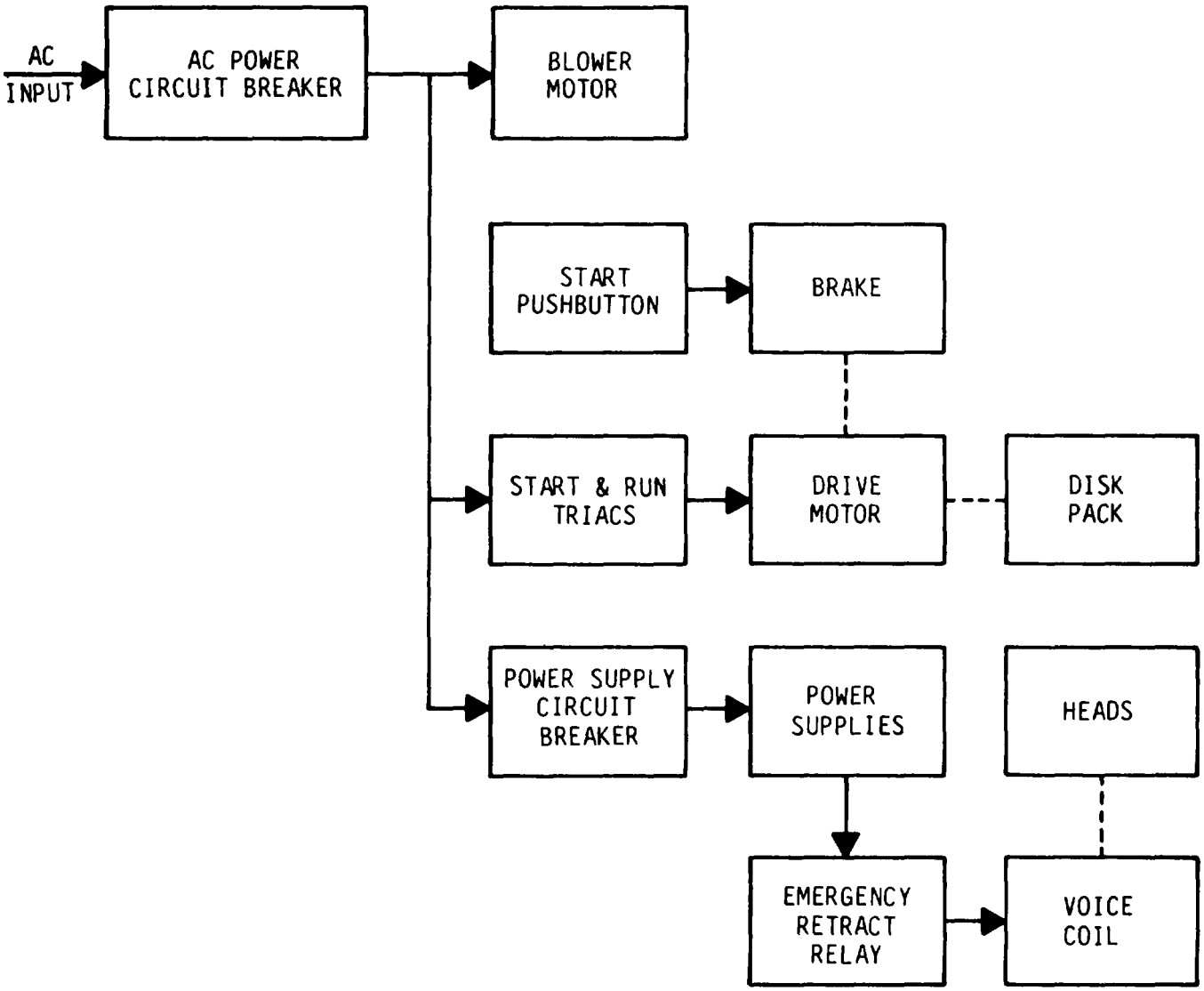


Figure 2-2. Power System Functional Block Diagram

b. Head Positioning. The heads read from and write data on magnetic disks. The heads must be positioned over a specific track on the disk prior to performing the read/write operation. Head positioning is done by a carriage and voice coil assembly which is controlled by servo signals. The carriage and voice coil assembly is mounted on the deck assembly and, extends the head into the disk pack. The heads are electromagnetic devices which perform the read/write functions. There are five read/write heads and a servo head. The servo head provides positioning data to position control circuits.

c. Filtering and Ventilation. The air flow system provides ventilation for the electronic components and filtered air in the disk pack area. A blower assembly, and absolute filter are the main components of the air flow system. Air is drawn through the absolute filter, which removes all particles which might cause damage on the heads or disk pack. The blower pulls the air in and forces it through the disk pack area. Air is also vented into the electronic component area.

2-5. INTERFACE FUNCTIONS

Interface functions (fig. 2-4) include 1/0 signals from the CPU which initiate and control all disk drive operations except power on. All the signal lines are contained in two 1/0 cables, the A cable and the B cable. The A cable carries command and control information to the disk drive and status information to the CPU. Read/write signals and timing information between the disk drive and the CPU are carried on the B cable. Interrupt signals from the disk drive to the CPU are also carried on the B cable.

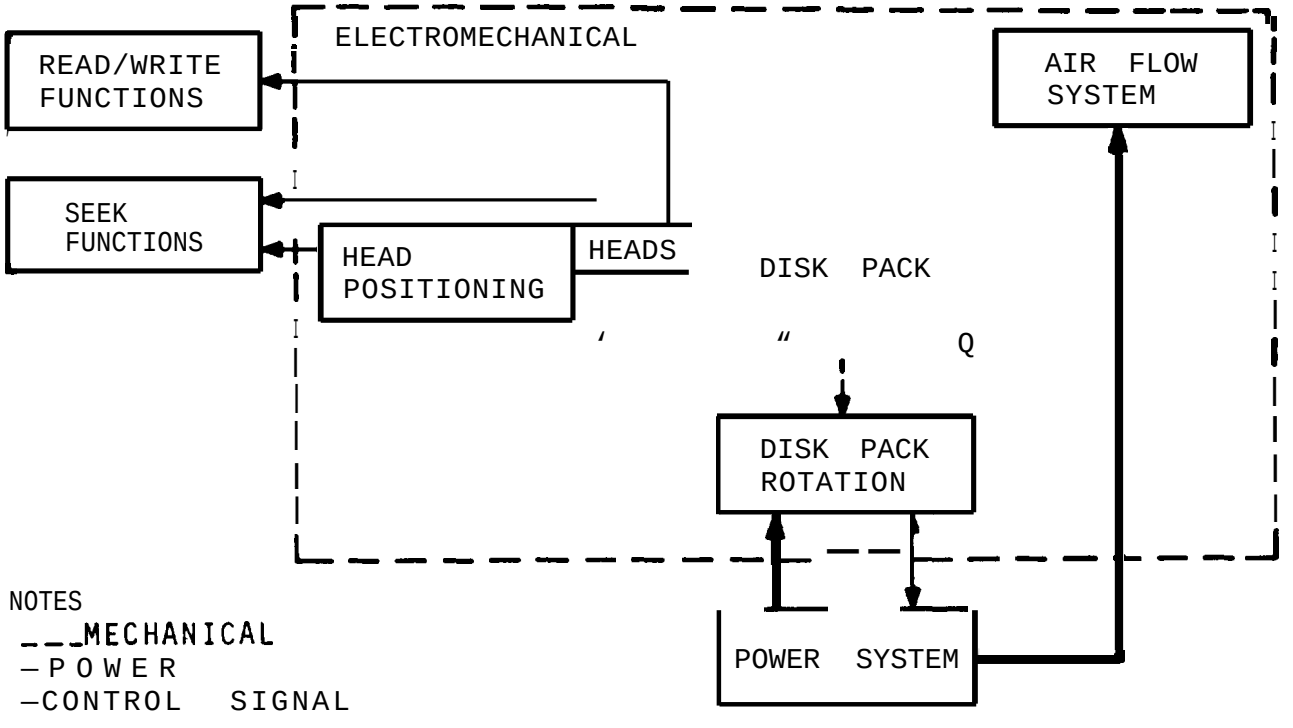


Figure 2-3. Electromechanical Functions Block Diagram

2-6. UNIT SELECTION

The disk drive must be selected before it will respond to commands from the controller or transmit certain 1/0 signals to it. the Tag/Bus Out decode and certain transmitters are not enabled until the Module Addressed signal is active.

The unit select sequence is initiated by a select tag (000) accompanied by an address in its Bus Out bits 24 thru 27. Because the tag and Bus Out receivers are enabled by the Drive Select Hold signal, this signal must be active when the Unit Select tag and logical address are sent.

When the drive recognizes the Unit Select tag, it compares its own logical address to the address sent by the controller. The logical address of the drive is determined by the logical address plug which is installed in the control panel. Depending on the plug used, this address can be any number from 1 thru 15. If no plug is installed the address is 15.

If the address sent by the controller is the same as that of the drive, the drive enables its Module Addressed signal. This signal is sent to the controller and is also used by the drive to enable certain transmitters and the Tag/Bus Out function decode to decode other commands.

2-7. SEEK FUNCTIONS

The seek functions (fig. 2-5) move the heads to the required position over the disk pack. This must be done for any read/write operation.

The basic circuit of the seek functions is the servo loop. This consists of the position control circuits, position signal amplifiers, head positioning mechanism and velocity and position feedback circuits. The position control circuits are return-to-zero/load/unload coarse control, direct seek coarse control and fine control. The circuit used depends on how close the heads are to the desired position and which type of seek is being performed. The position control signal is processed by the position control amplifier and used to generate current for the voice coil. As the heads move, feedback signals indicate head velocity and position. Both velocity and position feedback signals are used to vary the

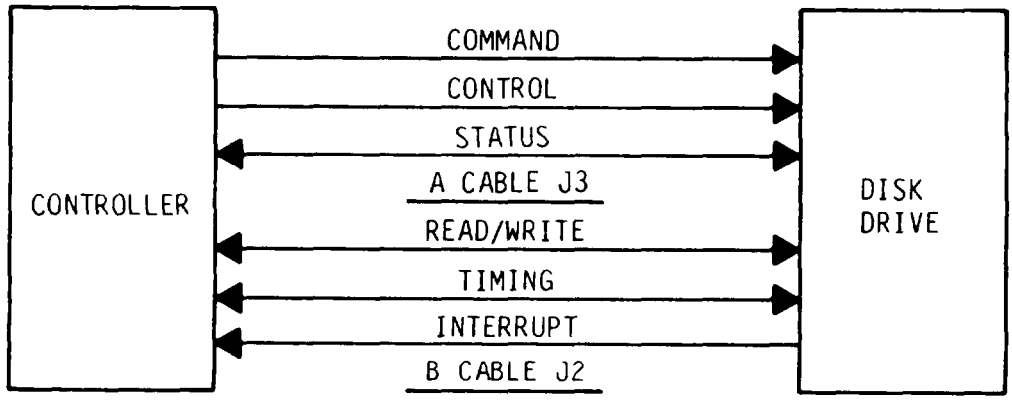


Figure 2-4. Interface Functions Block Diagram

position control signal as the desired head position is reached. The feedback signals also determine when the system switches from coarse to fine control. Fine control accurately positions the heads over the correct track and maintains it during read/write operations. The seek end and seek error detection circuits sense when the seek is complete and whether or not it was successful.

2-8. TRACK ORIENTATION

Before any write or read operation takes place, the CPU must instruct the disk drive to position the heads over the desired track. This is called seek logic. At the same time, the CPU must instruct the disk drive to use the head located over the surface where the operation is to be performed. This is called head selector logic.

After selecting a head and commanding it to seek a specific data track, the CPU must still locate that segment of the track on which the data is to be written or read. This is called track orientation logic. Track orientation is done by using the index signal and the sector siqnals qenerated by the disk drive. The index signal indicates the logical begining oF each track. The sector signals are used by the CPU to determine the position of the head on the track with respect to the index.

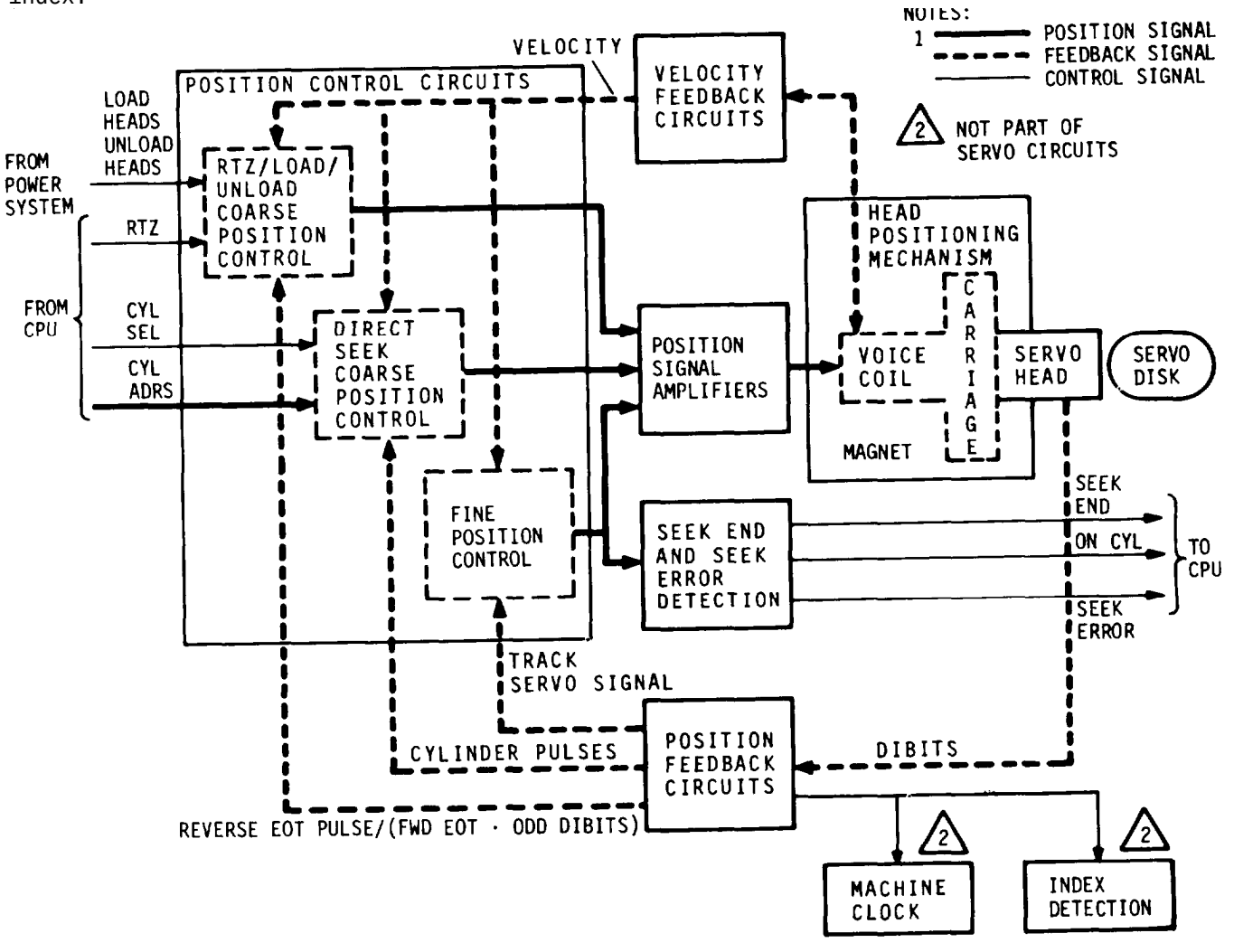


Figure 2-5. Seek Functions Block Diagram

When the desired data track location is found, the CPU commands the disk drive to write or read data. During a write operation, the disk drive receives digital data from the CPU, processes it, and writes it on the magnetic disk pack. During a read operation, the disk drive recovers digital data from the magnetic disk pack and sends it to the CPU.

2-9. MACHINE CLOCK FUNCTIONS

The machine clock circuits generate the clock signals necessary for drive operation. The circuits are the servo clock multiplier and the write clock multiplier.

a. Servo Clock Multiplier. Figure 2-6 is a block diagram of the servo clock multiplier circuit. this circuit generates clock pulses used by the sector

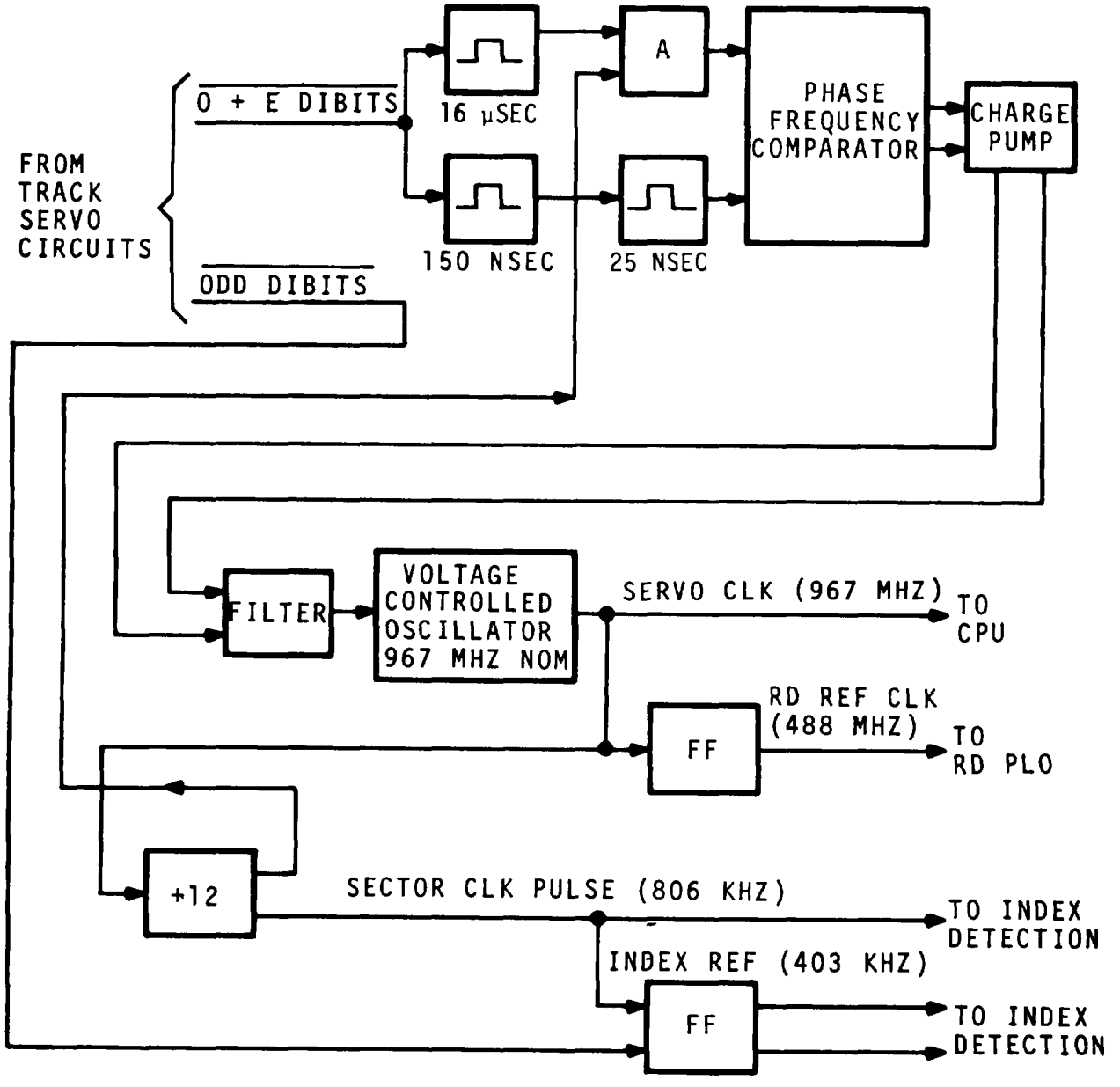


Figure 2-6. Servo Clock Multiplier

detection, index detection and read phase lock oscillator (PLO) circuits. It also generates the 9.67 mHz servo clock signal that is sent to the CPU. The phase lock loop is the main element in the servo clock multiplier circuit. The function of the loop is to adjust itself until its output is identical in phase and frequency to its input. The input consists of the dibit signals from the track servo circuit. The actual frequency is a function of and varies directly with disk pack speed. The output of the loop also varies with disk pack speed. The phase and frequency detection circuit makes the comparison between the input dibits and the output of the loop. The outputs from the detector are fixed amplitude pulses which are a function of the time (phase) difference between the positive going edges of the two inputs. These outputs are applied to the error amplifier which integrates them and generates a voltage proportional to the phase difference between them.

This voltage controls the voltage controlled oscillator. When the VCO output is 9.67 mHz, the feedback will equal the output equivalent to disk pack speeds, and the loop will be synchronized.

b. Write Clock Frequency Multiplier. The write clock frequency multiplier generates the frequencies used during write operations. This circuit consists of a phase lock loop operating in a similar manner to the servo clock loop operating in a similar manner to the servo clock multiplier. The input signal is the write clock signal for the CPU. The phase lock loop synchronizes with these signals and produces outputs used by the write compensation circuits during write operations.

2-10. HEAD OPERATION

Information is recorded on and read from the disk by the read/write heads (fig. 2-7). The disk drive has five read/write heads, one for each recording surface on the disk pack. Data is written by passing a current through a read/write coil within the selected head. A flux field is generated across the gap in the head and magnetizes the iron oxide particles in the disk surface. Erasing old data is done by writing over the data already on the disk. During read operation, disk motion beneath the head causes stored flux to induce a voltage in the head coil. The read circuit analyzes this voltage to define the data written on the disk.

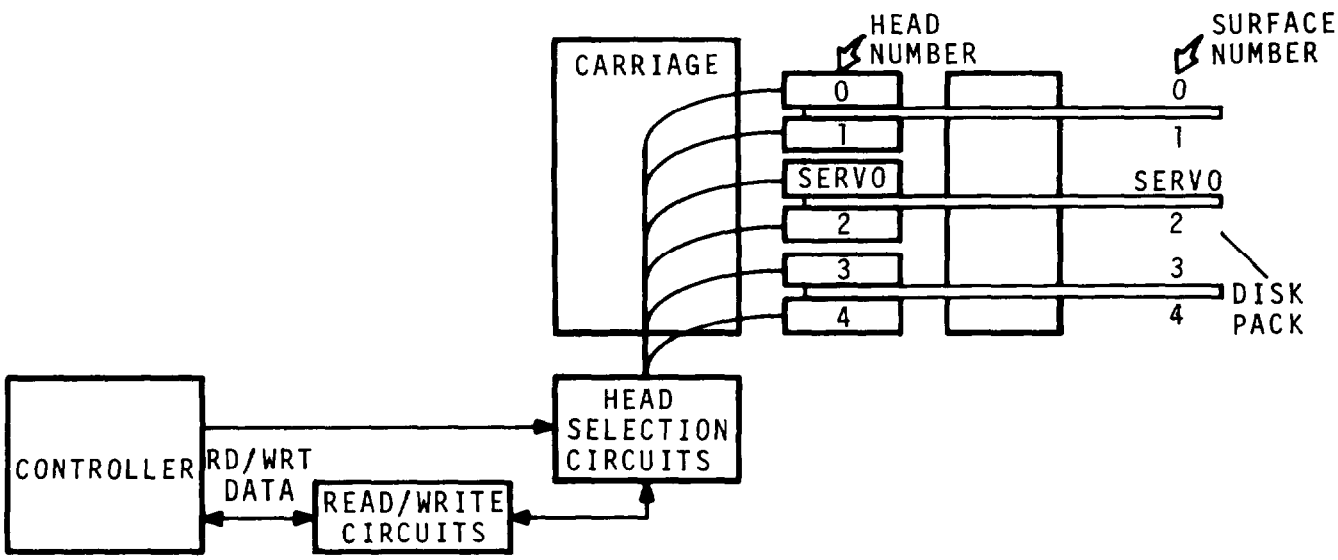


Figure 2-7. Read/Write Heads

2-11. READ/WRITE FUNCTIONS

During a read operation, the disk drive reads data from a disk and transfers it to the CPU. In a write operation, the disk drive receives data from the CPU and writes it on a disk. Figure 2-8 is a block diagram of the read/write circuits.

a. Write Circuits. The write circuits operation is initiated by the proper signal from the CPU. This allows the drive to start processing data. The write data is sent to the converter/write compensation circuits. These circuits convert the data to modified frequency modulation and compensate for variations in data frequency. The compensated data is then processed by the write drive circuit and written on the disk.

b. Read Circuits. When the read operations are initiated, the analog data detection circuits are energized. These circuits sense the data written on the disk and generate analog read data signals. The read data goes to the analog-to-digital converter which converts it into digital modified frequency modulation data. The read circuits also detect the address mark area and send the program signal to the CPU.

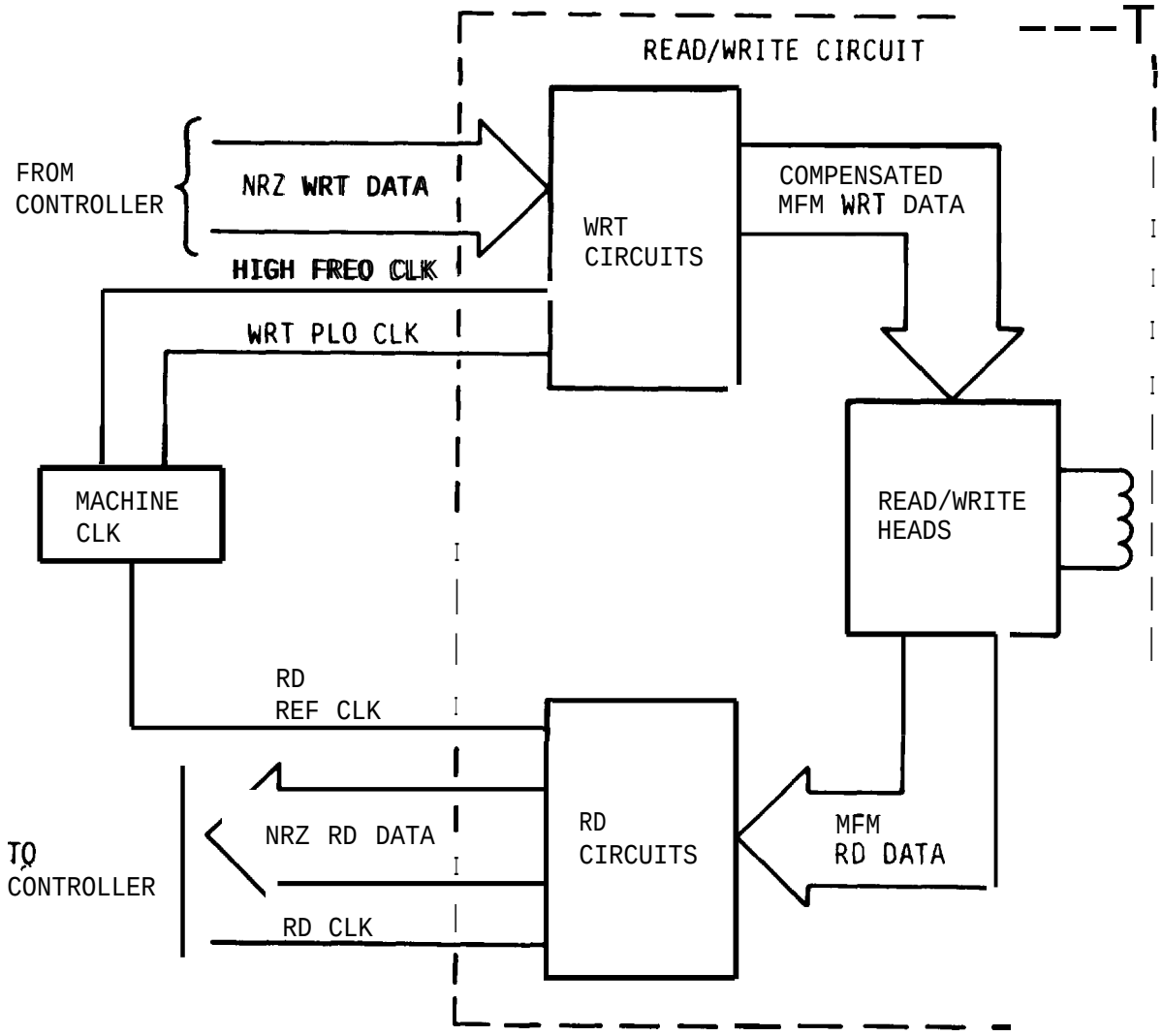


Figure 2-8. Read/Write Circuits Block Diagram

2-12. FAULT DETECTION

The following conditions are interpreted by the fault detection circuit as errors. All of these conditions either light an indicator on the disk drive and/or send a signal to the CPU indicating that an error has occurred. The errors are divided into two categories. Those errors indicated by fault latch and register, and those not indicated by fault latch and register.

a. Errors Indicated by Fault Latch. Certain errors set the disk drive fault latches associated with the error condition. Setting the latches does four things:

- Enables the fault line to the CPU
- Lights the CHECK indicator on the disk drive control panel
- Inhibits the write and load circuitry
- Causes the check diagnostic bit to be true

The errors indicated by fault latch are write fault, head select fault, read and write fault, read or write and off cylinder fault and voltage fault.

b. Errors Not Indicated By Fault Latch. These errors are detected by the disk drive but are not stored in he fault latches. However, they do cause the drive to give other fault indications. The errors are low speed or low voltage, no servo track fault and seek error.

CHAPTER 3
ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

Section 1. REPAIR PARTS, SPECIAL TOOLS, TMDE AND SUPPORT EQUIPMENT

3-1. COMMON TOOLS AND EQUIPMENT

For authorized common tools and equipment refer to the Modified Table of Organization and Equipment (MTOE) applicable to your unit.

3-2. SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

Refer to TM 11-701O-2O3-23P for a complete listing and description of special tools, TMDE and support equipment required by organizational maintenance. Also refer to appendix B for a list of tools pertaining to the disk drive.

3-3. SPARES AND REPAIR PARTS

Refer to TM 11-701O-2O3-23P for a complete listing and description of spares and repair parts required for organizational maintenance of this equipment.

Section II. SERVICE UPON RECEIPT

3-4. UNPACKING

Upon receipt of new equipment, check packing list and instructions for any precautions or specific unpacking procedures.

3-5. CHECKING UNPACKED EQUIPMENT

Inspect the equipment for damage incurred during shipment. If the equipment has been damaged, report the damage on SF 364, Discrepancy in Shipment Report.

Check the equipment against the packing slip to see if the shipment is complete. Report all discrepancies in accordance with the instructions of TM 38-750.

Check the equipment to ensure that required Modification Work Orders have been applied to accordance with DA PAM 310-1.

Section III. PREVENTIVE MAINTENANCE CHECKS AND SERVICES

3-6. GENERAL

Organizational maintenance PMCS is the required inspection and care of the equipment necessary to keep it in good operating condition. Routine checks like equipment inventory, cleaning, dusting, washing, checking for frayed cables, storing items not in use, covering unused receptacles and checking for loose nuts and bolts are not listed in your PMCS. They are things you should do anytime you see they must be done. If you find a routine check like one of these listed in your PMCS, it was listed because operators reported problems with this item.

13-7. PMCS PROCEDURES

PMCS procedures are done at fixed intervals for the following purposes:

- Make sure that the equipment is operable
- Prevert equipment problems in future operation
- Identify and resolve minor problems in the equipment before they become major problems
- Scheduled cleaning of the equipment

3.8. ITEM NUMBER COLUMN

The checks/services in the PMCS table are numbered in order of performance. Use this ITEM number when filling out DA Form 2404 (Equipment Inspection and Maintenance Worksheet).

3-9. ITEM TO BE INSPECTED COLUMN

The items listed in this column are based on the major components of the equipment and use common names of these components.

3-10. PROCEDURE COLUMN

This column gives you the check or service procedure which you must perform on the item.

3-11. EQUIPMENT WILL BE REPORTED NOT READY/AVAILABLE IF COLUMN

This column tells you under what conditions the equipment will be unable to perform its primary mission. When you notice this condition during PMCS you must report it on the proper form and tell your supervisor.

Table 3-1. Organizational Preventive Maintenance Checks and Services

Legend

M - Monthly S - Semiannual

Item No.	Interval M	Interval S	Item To Be Inspected	Procedures	Equipment Will Be Reported Not Ready/ Available If:
				NOTE Before you perform any of the PMCS, look to see if the READY indicator is lit. If it is, press START switch to cycle down disk drive. Wait one minute before you begin any PMCS.	
1	●		Pack area and spindle	Clean pack area and spindle as follows: 1. Slide drawer out. 2. At rear of disk drive set AC POWER switch to OFF. 3. Raise pack access cover. CAUTION Do not bump read/write heads with vacuum nozzle. 4. Carefully vacuum entire pack area. 5. Push in disk drive drawer,	
2	●		Disk drive	Clean disk drive as follows: 1. Slide drawer out. 2. At rear of disk drive, set AC POWER switch to OFF. 3. Raise and remove cover.	

Table 3-1. Organizational Preventive Maintenance Checks and Services -- Centinued

Legend

M - Monthly s - Semiannual

Item No.	Interval M	Interval S	Item To Be Inspected	Procedures	Equipment Will Be Reported Not Ready/ Available If:
				CAUTION Components, wiring, or brackets damage easily. Use vacuum nozzle carefully. 4. Vacuum inside cover. Make sure you get dust out of all corners. 5. Vacuum outside surface of logic cage. 6. Vacuum all flat surfaces. 7. Raise deck to maintenance position. a. On back of drive, locate bolt and use 3/16 in. hex key, remove bolt and spacer from keeper hole. b. Slide spacer under deck and line up with hole. c. Push bolt through spacer and tighten bolt. CAUTION Do not lift drive at pack access cover. d. At front of drive, lift deck until support arm is fully extended. e. Loosen knob and pull it out of storage hole. f. Insert knob in locking hole. Tighten knob.	

Table 3-1. Organizational Preventive Maintenance Checks and Services -- Continued

Legend

M - Monthly s - Semiannual

Item No.	Interval M	Interval S	Item To Be Inspected	Procedures	Equipment Will Be Reported Not Ready/ Available If:
				8. Vacuum underside of deck assembly. 9. Vacuum base assembly 10. Lower deck to normal operating position. a. Loosen knob. Pull it out of locking hole. b. Insert knob in storage hole. Tighten knob. c. With one hand, firmly grasp deck and lift. d. With other hand, grasp arm and push forward towards front of drive, lower deck. 11. Replace cover. 12. Push in disk drive drawer.	
3	●		Lockshaft	Clean and lubricate lockshaft as follows: 1. Slide drawer out. 2. At rear of disk drive, set AC POWER switch to OFF. 3. Raise pack access cover. 4. Use cotton swab to wipe old lubricant from threads of lockshaft. 5. Dampen lint-free gauze with cleaning solution and wipe spindle.	

Table 3-1. Organizational Preventive Maintenance Checks and Services -- Continued

Legend

M - Monthly S - Semiannual

Item No.	Interval M	Interval S	Item To Be Inspected	Procedures	Equipment Will Be Reported Not Ready/ Available If:
				6. Using swab stick, put thin coat of new grease paste on threads. 7. Close pack access *cover.* 8. Push in disk drive drawer.	
4		●	Absolute filter	Remove and replace absolute filter as follows: 1. Slide drawer out. Remove cover. 2. Remove bracket holding filter in place. 3. Slide filter out of slot. 4. Slide in new filter. 5. Insert bracket in slot and position it over filter. 6. Replace bracket screw and washer. . 7. Using small strip of masking tape, note date of installation on filter. 8. Lower deck. 9. Replace cover.	

CHAPTER 4
DIRECT SUPPORT MAINTENANCE INSTRUCTIONS

Index of Maintenance Procedures

Section 1. REPAIR PARTS, SPECIAL TOOLS, TMDE AND SUPPORT EQUIPMENT

4-1. COMMON TOOLS AND EQUIPMENT

For authorized common tools and equipment, refer to the Modified Table of Organization and Equipment (MTOE) applicable to your unit.

4-2. SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

Refer to TM 11-701O-2O3-23P for a complete listing and description of special tools, TMDE and support equipment required by organizational maintenance. Also refer to appendix B for a list of tools pertaining to the disk drive assembly.

4-3. SPARES AND REPAIR PARTS

Refer to TM 11-701O-2O3-23P for a complete listing and description of spares and repair parts required for direct support maintenance of this equipment.

Section Il. TROUBLESHOOTING

4-4. GENERAL

The most effective way to troubleshoot a fault in this equipment is to follow a routine which guides you through the five phases of troubleshooting (fig. 4-l). By following this routine you assure accurate use of fault isolation and fix procedures. You also improve your troubleshooting skills.

4-5. TROUBLESHOOTING PHASES

Each of the five phases in this routine is designed to accomplish a specific goal.

a. Fault Discovery. Usually, the operators or supervisor will notice faulty performance first. They must report the fault on the proper form so you will have the facts you need for the next phase.

b. Failure Confirmation. Based on the facts provided by the operator or supervisor, you must confirm the failure and define the symptom. The symptom is the first clue you will use n the troubleshooting process.

c. Troubleshooting Entry. Usinq the Symptom defined during phase two. find the troubleshooting flow chart which will help you isolate the fault in the equipment. The checkout and symptom index chart (chart-00) will help you do this.

d. Trouble Isolation. Follow the step-by-step procedures in the flow charts to isolate and correct the cause of the equipment failure.

e. After Maintenance. When you have made the fix recommended in the troubleshooting procedure, you must check your work. Use the chart titled After Maintenance Check. It tells you how to test your repair and make sure the equipment now works as it should.

4-6. ALTERNATIVE TROUBLESHOOTING TECHNIQUES

When a failure causes a symptom which is not covered in the symptom index or not corrected by the troubleshooting procedure in the flow chart, you must try alternative techniques.

a. Understand Principles of Operation. Sometimes the symptom may have no specific procedure given to troubleshoot it. When this happens, remember that the equipment always operates the same way. By comparing the faulty operation with expected or normal operation you may find the cause of the failure and be able to fix it.

b. Check the Circuits. All electronic equipment uses circuits to route power through the components. Any break in continuity will cause some type of failure. By running continuity checks on suspect circuits you may find the cause of the failure. Use the schematic diagrams in appendix D to check the circuits in this equipment.

c. Check Past Maintenance Records. If the unusual failure occurred before, it should appear in the maintenance records for the equipment. The records should also tell you how the failure was corrected. Use the same fix this time.

d. Trial and Error Repair. Usually trial and error repairs should be avoided. They are costly and can induce additional symptoms. However, when your experience with the equipment leads you to suspect a definite cause, you should try the repair as a last resort before shipping the equipment to depot for maintenance.

4-7. TROUBLESHOOTING PROCEDURES

The troubleshooting procedures are arranqed as flow charts. The charts consist of background information, specific instructions and decision points. Symbols (table 4-1) are used to organize the charts and guide you through a step-by-step trouble isolation procedure for each known failure symptom.

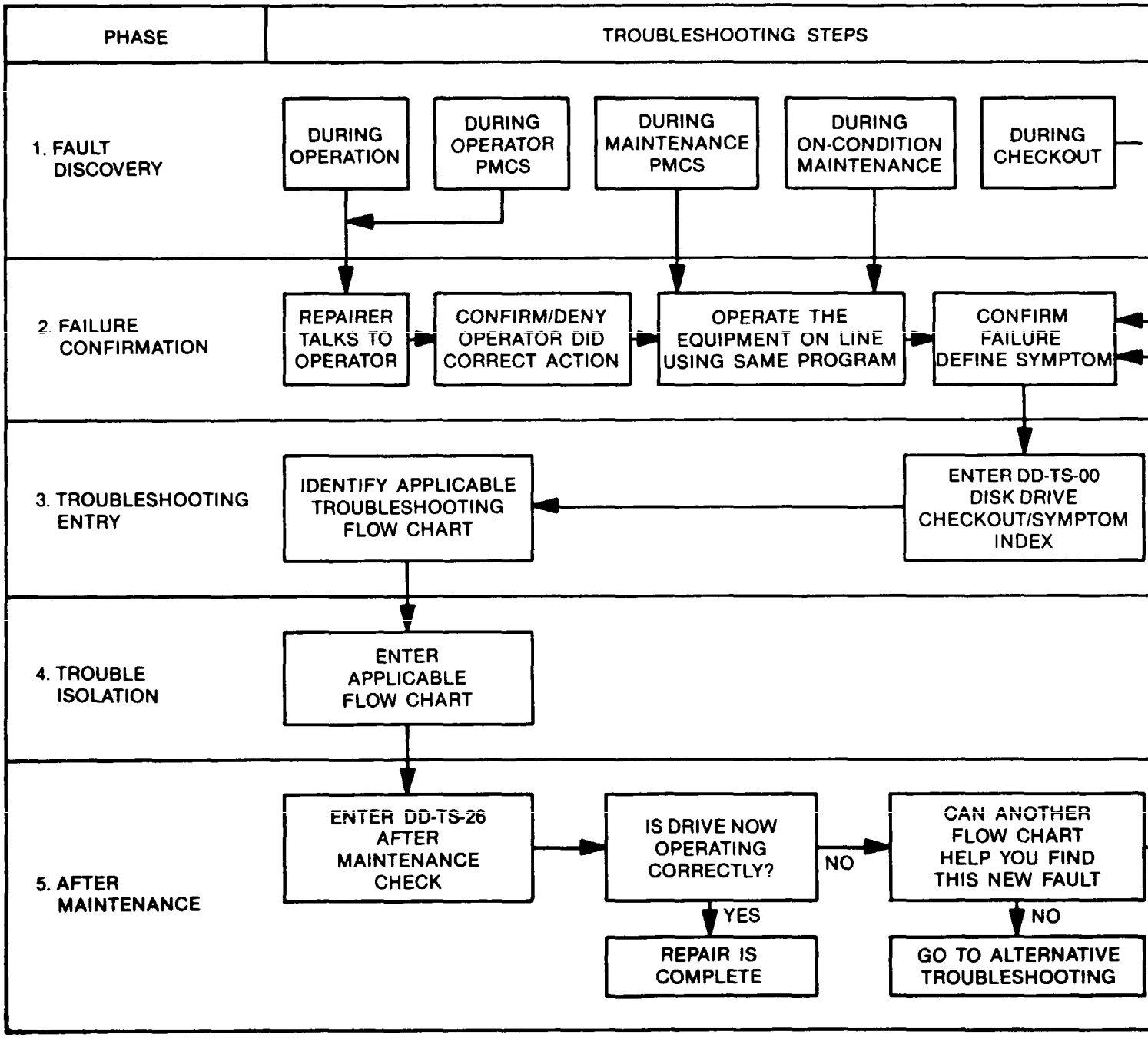


Figure 4-1. Troubleshooting Phases

Table 4-1. Troubleshooting Flow Chart Symbols

SYMBOL	MEANING
START	This is a STARTING POINT symbol. This is where you enter a troubleshooting flow chart.
NOTE	This is a NOTE symbol. It contains information you need to do your work, but which is not a procedural step.
CAUTION	This is a CAUTION symbol. It alerts you to the possible danger of breaking equipment in the steps that follow.
WARNING	This is a WARNING symbol. It alerts you to possible danger in the steps that follow.
INFORMATION	This is an INFORMATION symbol. It contains information that helps you make a test or understand the troubleshooting process.
TEST QUESTION NO YES	This is a TEST/DECISION SYMBOL. It contains a test you must do and a question you must answer. If the results of a test tell you the answer is YES, you will follow the YES arrow to the next symbol. If your answer is NO, you will follow the NO arrow.
A A	These are CONNECTING POINT symbols. They are used in pairs. If the arrow points to the circle, it is the point where you leave a branch of the flow chart. If the arrow points away from the circle, it is the point where you go back into the flow chart. For example, you would go from (A) on one page to (A) on the next page.
INSTALL NEW ITEM (PARA 3-X)	This is a CORRECTIVE ACTION symbol. It tells you what to do to correct the problem. It will also refer you to the paragraph that contains the needed repair or adjustment procedure.
GO TO XX-XX-XX	This is a GO TO symbol. It tells you to go to another flow chart. The X's in the symbol at the left stand for a chart code.
GO TO TM FOR SYSTEM	Other forms for GO TO symbol: This symbol tells you to go to the system Technical Manual for further troubleshooting, such as running a T&V program.
GO TO START	This symbol tells you to go back to the START point of the same flow chart.

DD-TS-00	DISK DRIVE CHECKOUT/SYMPTOM INDEX	1 OF 5

START

1. PULL DRIVE OUT FROM CABINET.
2. AT REAR OF DRIVE. SET AC POWER CIRCUIT BREAKER TO ON.

DID PACK BLOWER TURN ON?

NO → GO TO DD-TS-01 — BLOWER WILL NOT SPIN

YES

SET POWER SUPPLY CIRCUIT BREAKER TO ON.

DID BREAKER TRIP AFTER A FEW SECONDS?

YES → GO TO DD-TS-02 — **POWER SUPPLY** BREAKER TRIPS

NO

DID AC POWER CIRCUIT BREAKER OR DRIVE MOTOR THERMAL BREAKER TRIP WHEN POWER SUPPLY BREAKER WAS CLOSED?

YES → GO TO DD-TS-03 — AC POWER OR DRIVE MOTOR (THERMAL) BREAKER TRIPS

NO

ON FRONT PANEL, IS CHECK INDICATOR LIT?

YES → PUSH **CHECK**. DID CHECK INDICATOR GO OUT?

NO → CAUTION: IF BURNING INSULATION IS SMELLED AT ANY TIME, POWER OFF IMMEDIATELY.

YES

NO

1. MOUNT A WORK PACK.
2. WAIT 2 MINUTES.
3. PRESS **START**.

DID SPINDLE START SPINNING WHEN YOU PRESSED START?

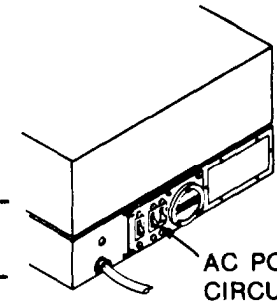
NO → GO TO DD-TS-04 — SPINDLE WILL NOT SPIN

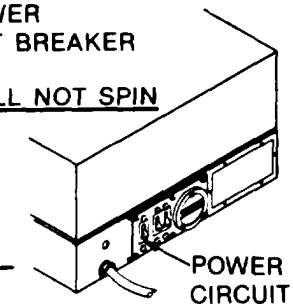
YES

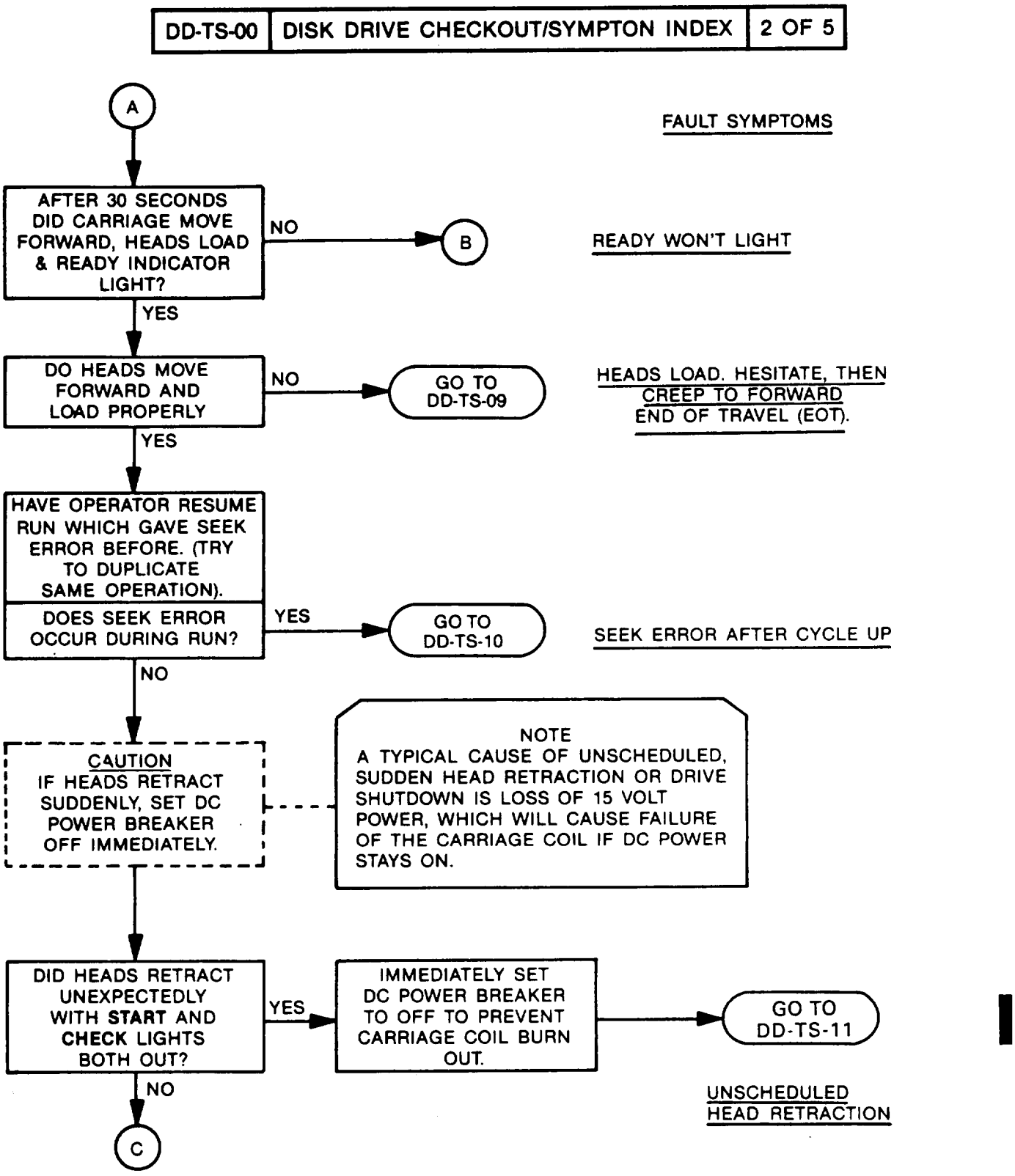
A

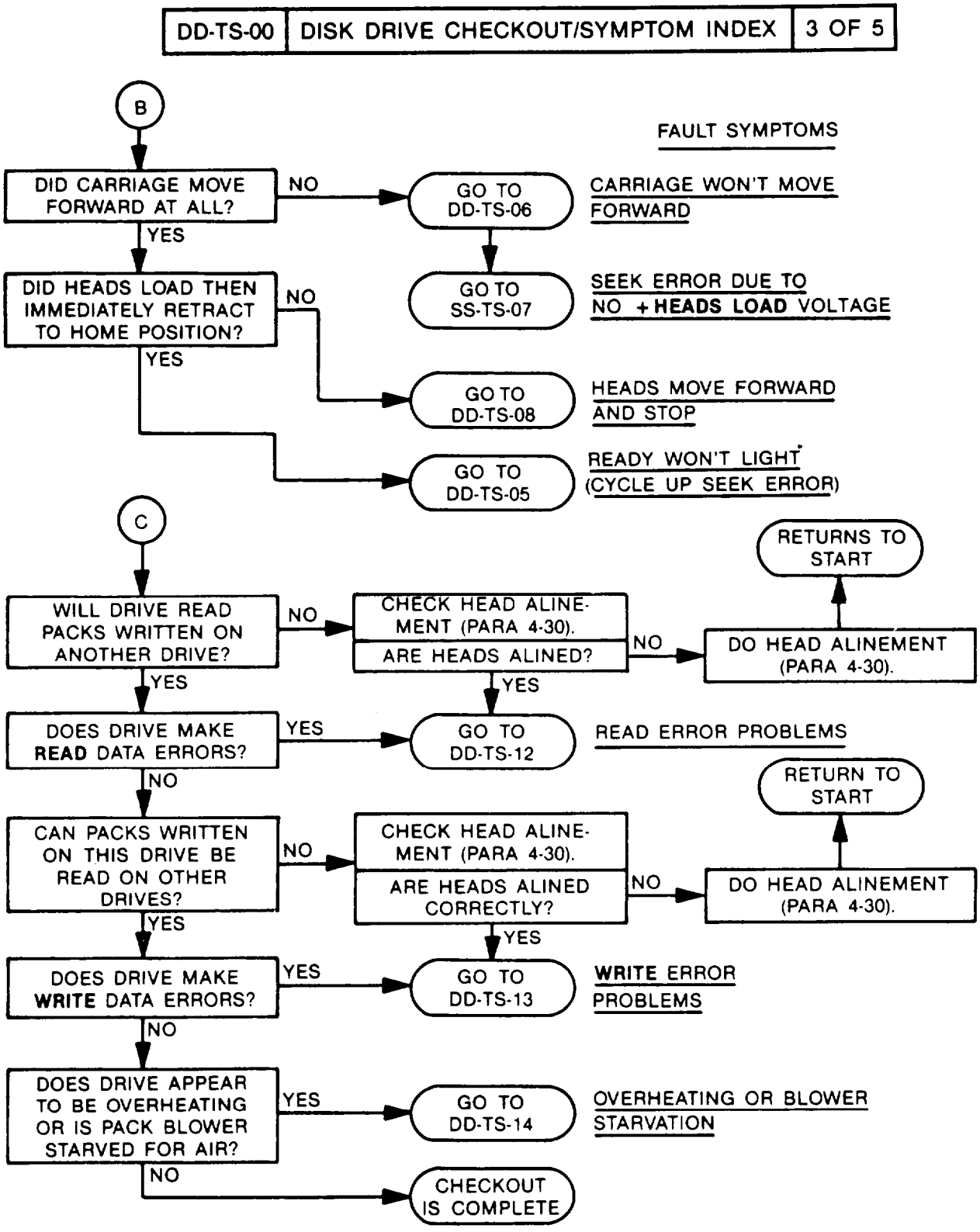
D

FAULT SYMPTOMS

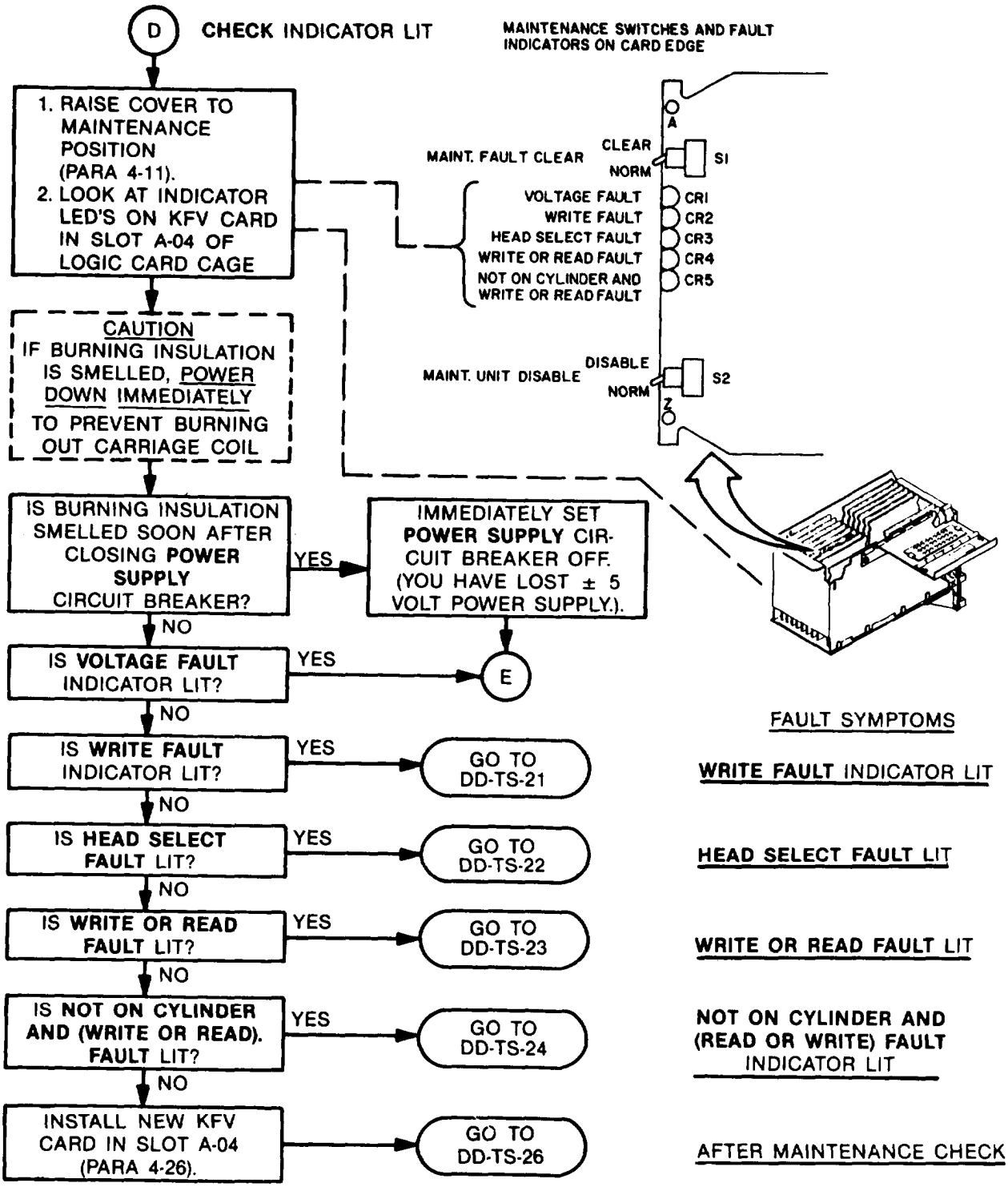


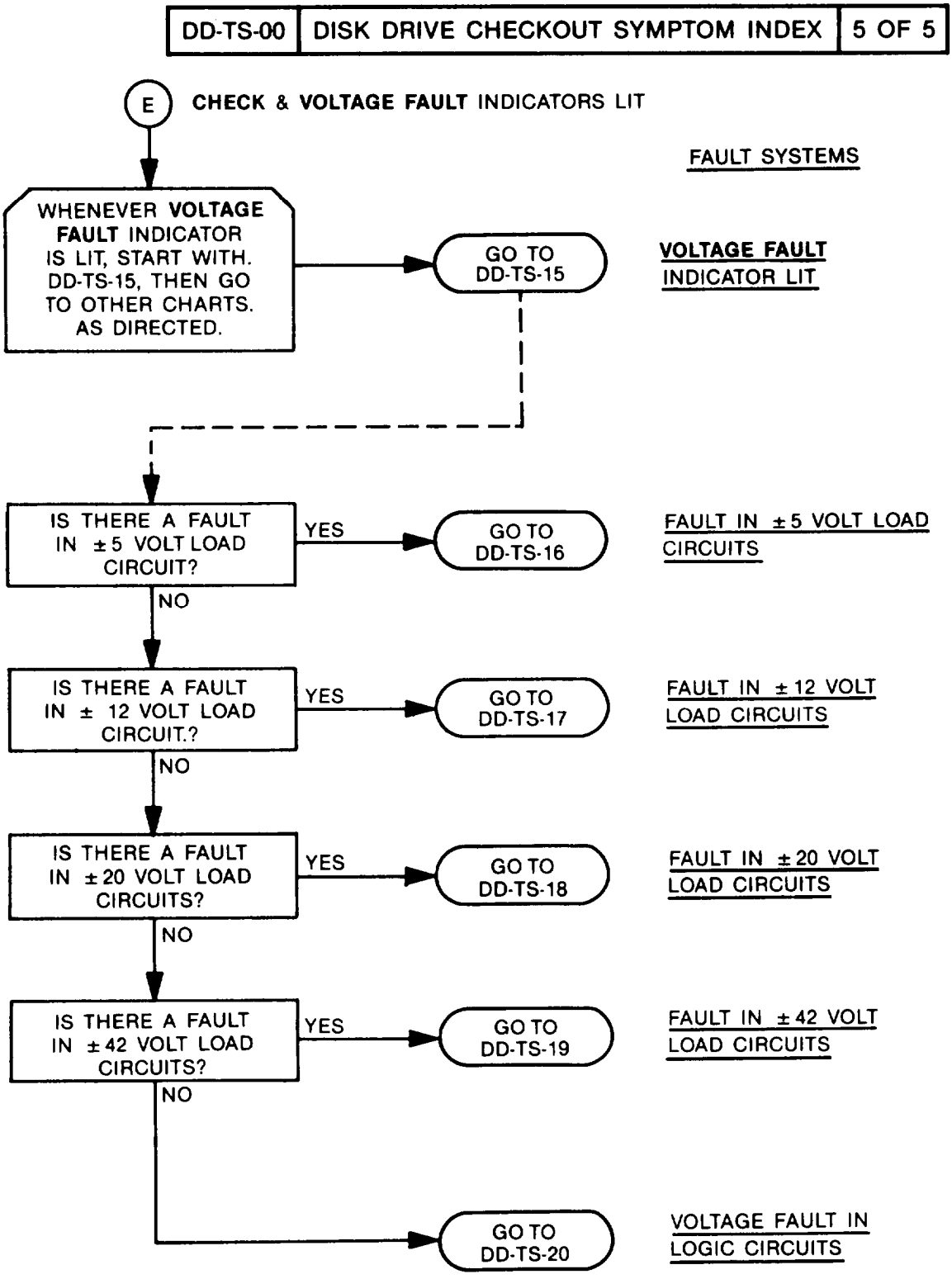



DD-TS-00
DISK DRIVE CHECKOUT/SYMPTON INDEX
2 OF 5
A
FAULT SYMPTOMS
AFTER 30 SECONDS DID CARRIAGE MOVE FORWARD, HEADS LOAD & READY INDICATOR LIGHT?
NO
B
READY WON'T LIGHT
YES
DO HEADS MOVE FORWARD AND LOAD PROPERLY
NO
GO TO DD-TS-09
HEADS LOAD. HESITATE, THEN CREEP TO FORWARD END OF TRAVEL (EOT).
YES
HAVE OPERATOR RESUME RUN WHICH GAVE SEEK ERROR BEFORE. (TRY TO DUPLICATE SAME OPERATION).
DOES SEEK ERROR OCCUR DURING RUN?
YES
GO TO DD-TS-10
SEEK ERROR AFTER CYCLE UP
NO
CAUTION
IF HEADS RETRACT SUDDENLY, SET DC POWER BREAKER OFF IMMEDIATELY.
NOTE
A TYPICAL CAUSE OF UNSCHEDULED, SUDDEN HEAD RETRACTION OR DRIVE SHUTDOWN IS LOSS OF 15 VOLT POWER, WHICH WILL CAUSE FAILURE OF THE CARRIAGE COIL IF DC POWER STAYS ON.
DID HEADS RETRACT UNEXPECTEDLY WITH START AND CHECK LIGHTS BOTH OUT?
YES
IMMEDIATELY SET DC POWER BREAKER TO OFF TO PREVENT CARRIAGE COIL BURN OUT.
GO TO DD-TS-11
UNSCHEDULED HEAD RETRACTION
NO
C


DD-TS-00
DISK DRIVE CHECKOUT/SYMPTOM INDEX
3 OF 5
B
FAULT SYMPTOMS
DID CARRIAGE MOVE FORWARD AT ALL?
NO
GO TO DD-TS-06
CARRIAGE WON'T MOVE FORWARD
YES
DID HEADS LOAD THEN IMMEDIATELY RETRACT TO HOME POSITION?
NO
GO TO SS-TS-07
SEEK ERROR DUE TO NO +HEADS LOAD VOLTAGE
YES
GO TO DD-TS-08
HEADS MOVE FORWARD AND STOP
GO TO DD-TS-05
READY WON'T LIGHT (CYCLE UP SEEK ERROR)
C
RETURNS TO START
WILL DRIVE READ PACKS WRITTEN ON ANOTHER DRIVE?
NO
CHECK HEAD ALINEMENT (PARA 4-30).
ARE HEADS ALINED?
NO
DO HEAD ALINEMENT (PARA 4-30).
YES
YES
DOES DRIVE MAKE READ DATA ERRORS?
YES
GO TO DD-TS-12
READ ERROR PROBLEMS
NO
RETURN TO START
CAN PACKS WRITTEN ON THIS DRIVE BE READ ON OTHER DRIVES?
NO
CHECK HEAD ALINEMENT (PARA 4-30).
ARE HEADS ALINED CORRECTLY?
NO
DO HEAD ALINEMENT (PARA 4-30).
YES
YES
DOES DRIVE MAKE WRITE DATA ERRORS?
YES
GO TO DD-TS-13
WRITE ERROR PROBLEMS
NO
DOES DRIVE APPEAR TO BE OVERHEATING OR IS PACK BLOWER STARVED FOR AIR?
YES
GO TO DD-TS-14
OVERHEATING OR BLOWER STARVATION
NO
CHECKOUT IS COMPLETE

DD-TS-00	DISK DRIVE CHECKOUT/SYMPTOM INDEX	4 OF 5




DD-TS-00
DISK DRIVE CHECKOUT SYMPTOM INDEX
5 OF 5
E
CHECK & VOLTAGE FAULT INDICATORS LIT
FAULT SYSTEMS
WHENEVER VOLTAGE FAULT INDICATOR IS LIT, START WITH. DD-TS-15, THEN GO TO OTHER CHARTS. AS DIRECTED.
GO TO DD-TS-15
VOLTAGE FAULT INDICATOR LIT
IS THERE A FAULT IN ±5 VOLT LOAD CIRCUIT?
YES
GO TO DD-TS-16
FAULT IN ±5 VOLT LOAD CIRCUITS
NO
IS THERE A FAULT IN ± 12 VOLT LOAD CIRCUIT.?
YES
GO TO DD-TS-17
FAULT IN ±12 VOLT LOAD CIRCUITS
NO
IS THERE A FAULT IN ±20 VOLT LOAD CIRCUITS?
YES
GO TO DD-TS-18
FAULT IN ±20 VOLT LOAD CIRCUITS
NO
IS THERE A FAULT IN ±42 VOLT LOAD CIRCUITS?
YES
GO TO DD-TS-19
FAULT IN ±42 VOLT LOAD CIRCUITS
NO
GO TO DD-TS-20
VOLTAGE FAULT IN LOGIC CIRCUITS

DD-TS-01 BLOWER WILL NOT SPIN

START

1. RAISE COVER TO MAINTENANCE POSITION (PARA 4-11).
2. DISCONNECT P301/J301 NEXT TO BLOWER MOTOR (PARA 4-13).
3. SET VOLTMETER TO MEASURE AT LEAST 150 VOLTS AC.
4. MEASURE 120 VAC BETWEEN PINS 2 AND 3 OF FEMALE PLUG.

IS 120 VAC OKAY?

NO → MEASURE 120 VAC AT BOTH SETS OF OUTPUT TERMINALS OF AC POWER CIRCUIT BREAKER (PARA 4-23).

IS 120 VAC PRESENT ON BOTH SETS OF OUTPUT TERMINALS?

YES → INSTALL NEW AC LINE FILTER (PARA 4-24). → GO TO DD-TS-26

NO → IS 120 VAC PRESENT AT INPUT TERMINALS OF **AC POWER** CIRCUIT BREAKER?

NO → TROUBLESHOOT AC POWER DISTRIBUTION CIRCUITS. → GO TO SYSTEM MANUAL

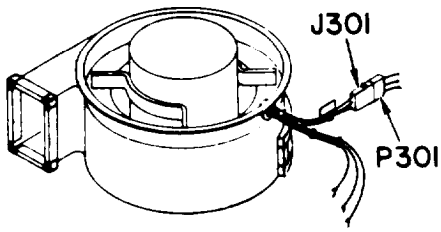
YES → INSTALL NEW **AC POWER** BREAKER (PARA 4-23). → GO TO DD-TS-26

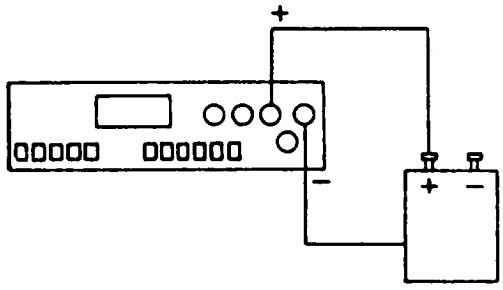
YES → 1. DISCONNECT WIRES ON BLOWER CAPACITOR (PARA 4-21).
2. USING OHMMETER, CHECK CAPACITOR.

DOES CAPACITOR SHOW RESISTANCE

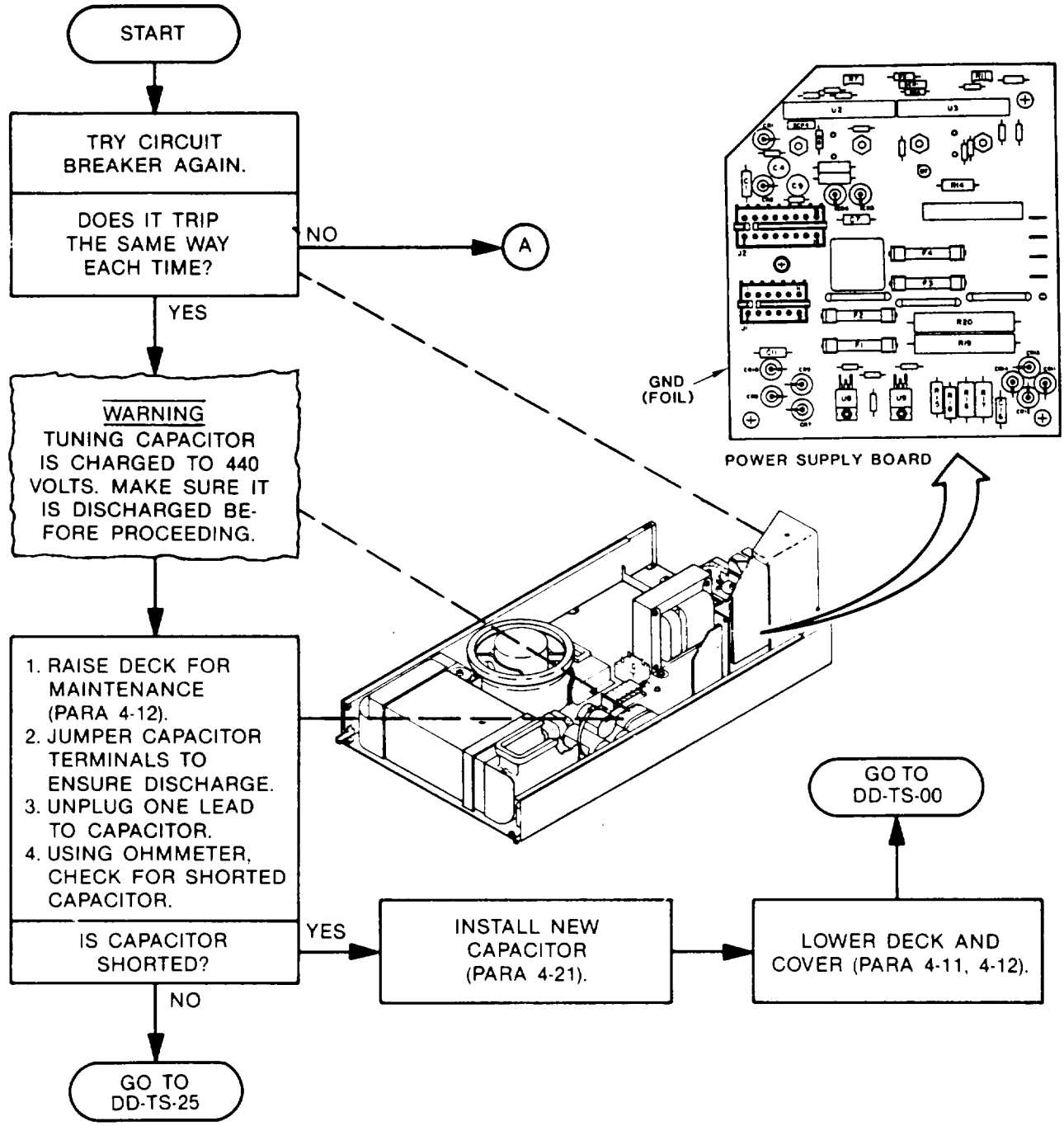
YES → INSTALL NEW BLOWER CAPACITOR (PARA 4-21). → GO TO DD-TS-26

NO → INSTALL NEW BLOWER MOTOR (PARA 4-13). → GO TO DD-TS-26

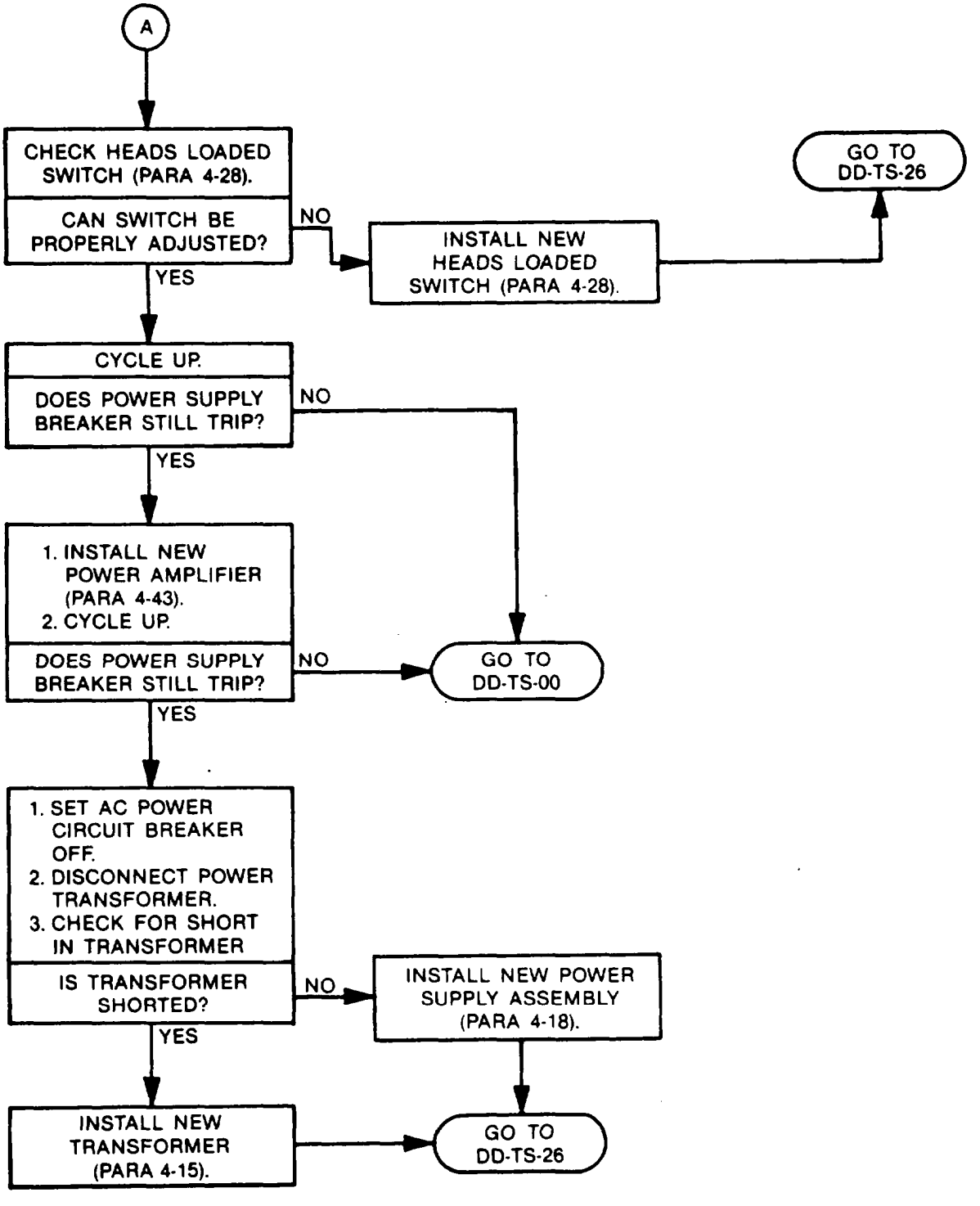




DD-TS-02	POWER SUPPLY CIRCUIT BREAKER TRIPS	1 OF 2



DD-TS-02	POWER SUPPLY CIRCUIT BREAKER TRIPS	2 OF 2



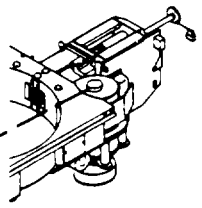
DD-TS-03 | AC POWER OR DRIVE MOTOR (THERMAL) BREAKER TRIPS

START

DID AC POWER BREAKER TRIP?

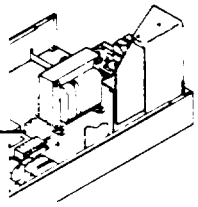
NO

1. PRESS DRIVE MOTOR THERMAL BREAKER.
2. SET **AC POWER** BREAKER TO OFF.



YES

1. UNPLUG WIRES FROM PINS 1 & 2 OF RUN TRIAC.
2. USING OHMMETER, MEASURE FOR SHORT BETWEEN PINS 1 & 2.



ARE CONTACTS SHORTED?

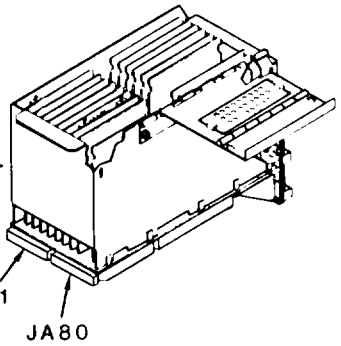
YES

INSTALL NEW RUN TRIAC (PARA 4-16).

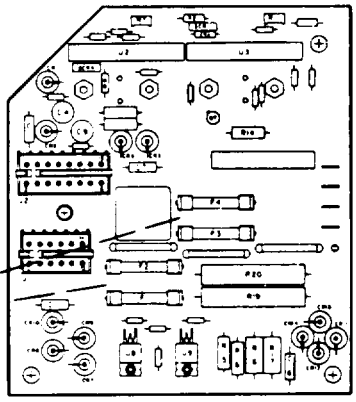
GO TO DD-TS-26

NO

1. RAISE LOGIC CARD CAGE TO MAINTENANCE POSITION (PARA 4-25).
2. UNPLUG PA81/JA81. (MAKE CERTAIN ALL OTHER CONNECTORS ARE MATED.).
3. REMOVE –SGV CARD FROM SLOT A10. (PARA 4-26).
4. MAKE SURE FUSES F1, F2, F3, & F4 ON –XKV CARD ARE GOOD.
5. SET **AC POWER** AND **POWER SUPPLY** BREAKERS TO **ON**.



POWER SUPPLY BOARD



DID **AC POWER** BREAKER TRIP?

YES

USING OHMMETER, CHECK FOR SHORT CIRCUIT.

IS CIRCUIT SHORTED?

YES

CHECK TB1 FOR POSSIBLE DAMAGE OR SHORT. REPAIR BAD WIRE OR INSTALL NEW TB1 (PARA 4-14).

NO

INSTALL NEW -SGV CARD IN SLOT A10 (PARA 4-26).

NO

INSTALL NEW **AC POWER** BREAKER (PARA 4-23).

1. RECONNECT PA80/JA80 AND PA81/JA81.
2. PUT LOGIC CARD CAGE BACK IN (PARA 4-25).
3. CLOSE COVER.

1. RECONNECT PA80/JA80 AND PA81/JA81
2. PUT LOGIC CARD CAGE BACK IN (PARA 4-25).

SET **AC POWER** AND **POWER SUPPLY** BREAKER TO **ON**.

DID AC POWER OR DRIVE MOTOR THERMAL BREAKER TRIP?

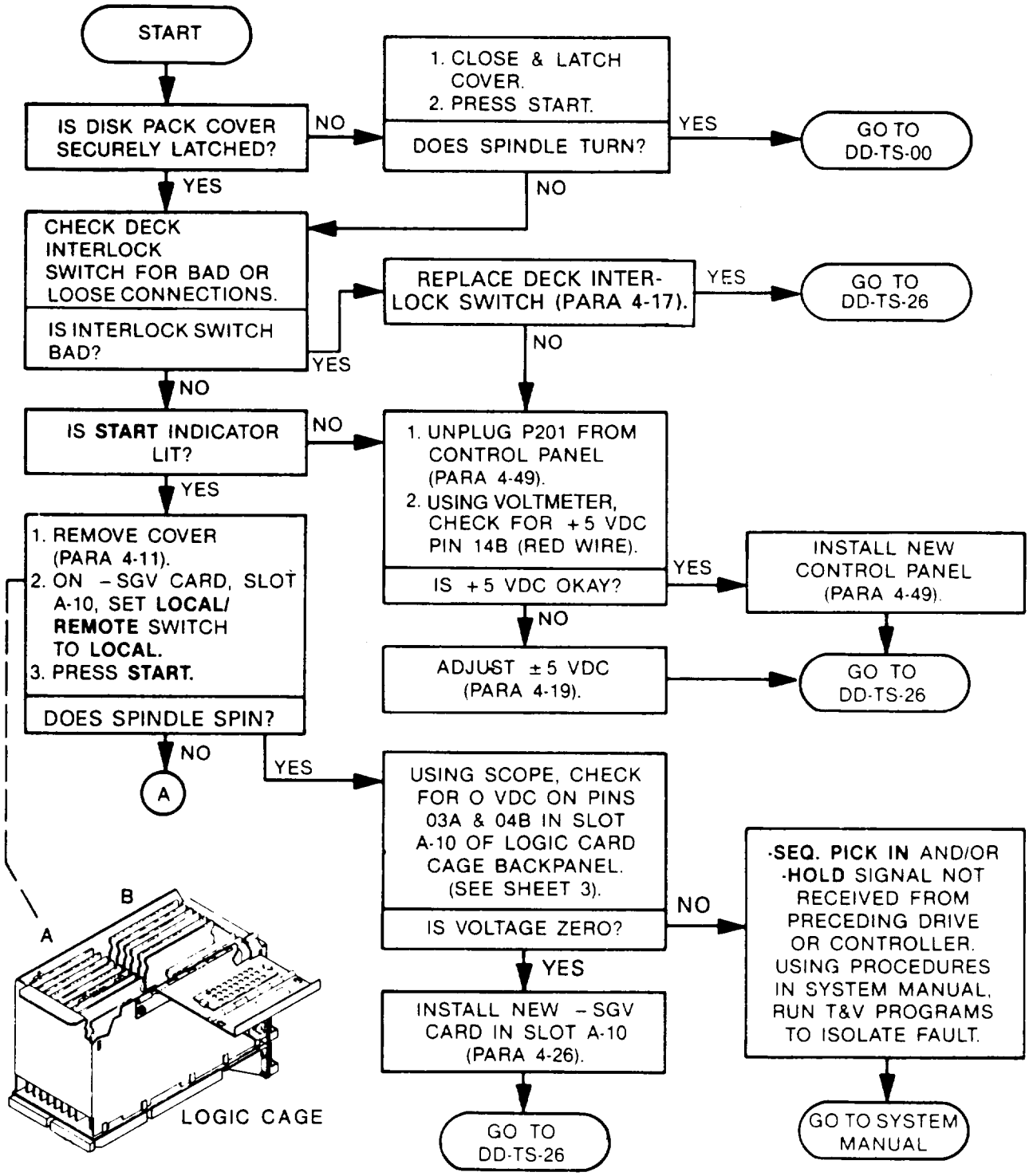
YES

GO TO © ON DD-TS-04

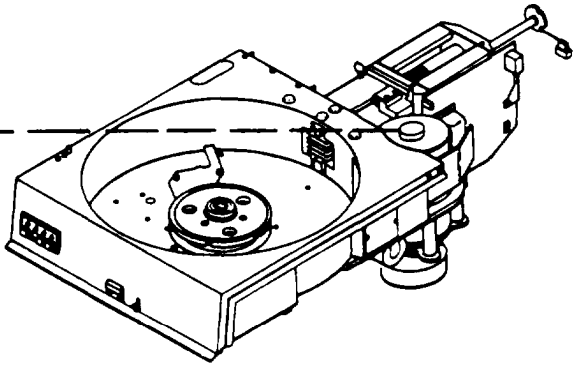
NO

GO TO DD-TS-26

DD-TS-04	SPINDLE WILL NOT SPIN	1 OF 3



DD-TS-04	SPINDLE WILL NOT SPIN	2 OF 3



A

PRESS RED THERMAL RESET BUTTON ON SPINDLE MOTOR.
DOES MOTOR RUN?
YES → GO TO DD-TS-00
NO

USING SCOPE CHECK FOR 0 VDC, SLOT A-10 PIN 26B WHEN **START** IS PRESSED.
IS VOLTAGE ZERO?
NO → CHECK ADJUSTMENT OF PACK COVER INTERLOCK SWITCH.
DOES SWITCH CLOSE AS COVER LATCHES?
YES → USING AN OHMMETER, CHECK PACK COVER SWITCH CONTINUITY.
IS SWITCH OKAY?
YES → INSTALL NEW CONTROL PANEL (PARA 4-49). (START SWITCH IS BAD).
NO → INSTALL NEW PACK COVER INTERLOCK SWITCH (PARA. 4-50).
NO → DD-TS-00
YES

CHECK DRIVE MOTOR CAPACITOR
IS CAPACITOR DEFECTIVE?
YES → B
NO

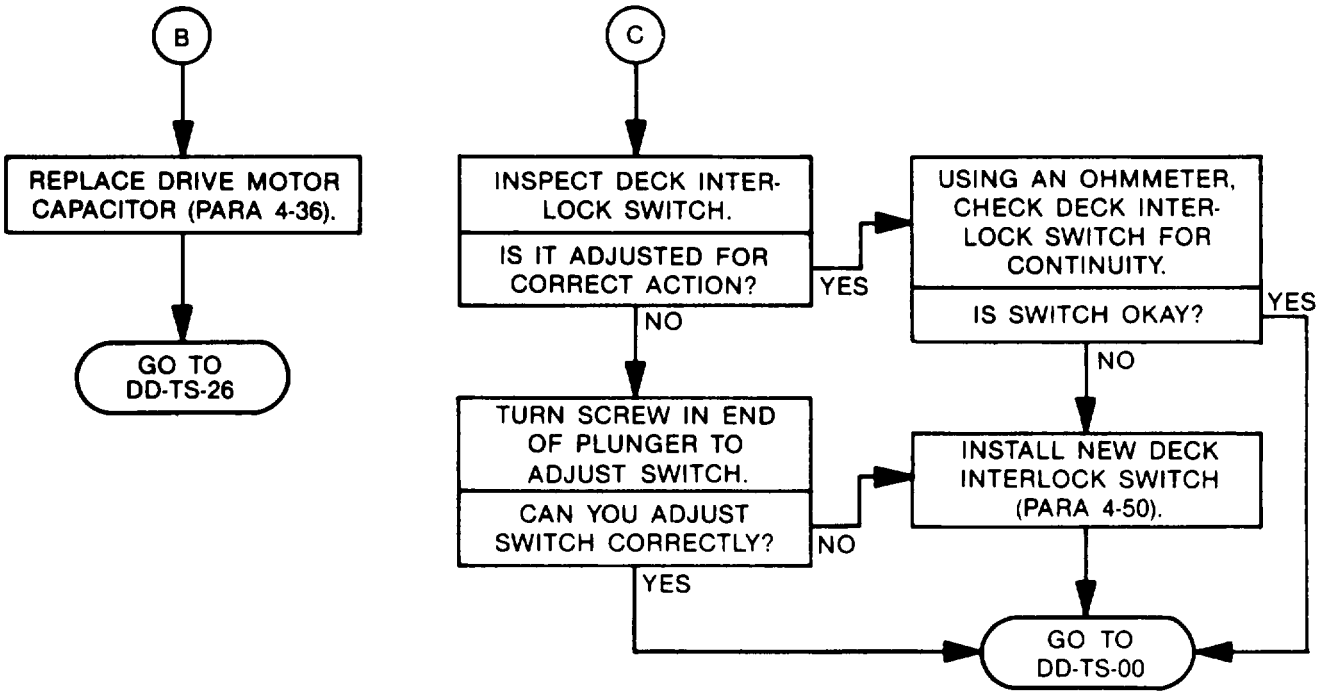
1. INSTALL NEW -SGV CARD IN SLOT A-10 (PARA 4-26).
2. CYCLE UP.
DOES SPINDLE MOTOR RUN?
YES → DD-TS-00
NO

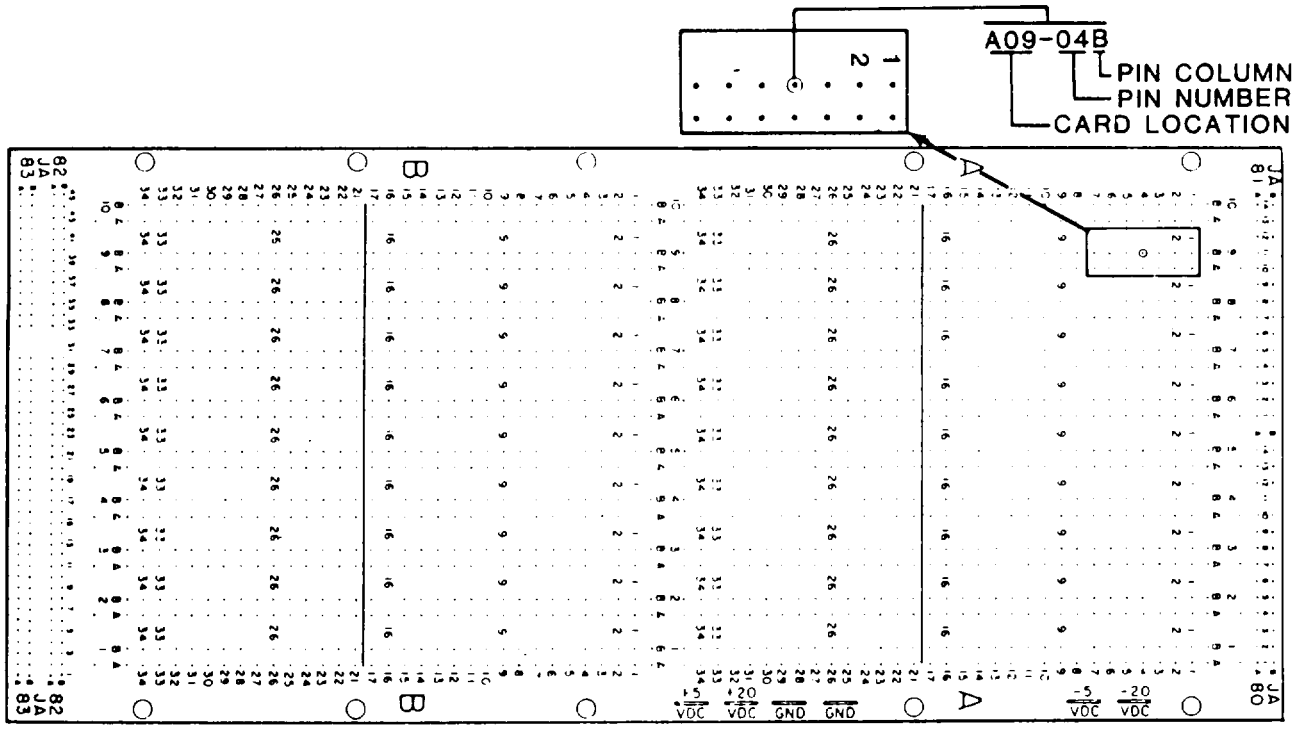
1. UNPLUG P304/J304 ON SPINDLE MOTOR.
2. USING VOLTMETER, CHECK FOR 120 VAC BETWEEN FEMALE PINS 2 & 3.
IS 120 VAC PRESENT?
YES → USING VOLTMETER, CHECK FOR 120 VAC BETWEEN PINS 1 & 3 OF P304 FOR 9 SECONDS AFTER **START** IS PRESSED.
IS 120 VAC PRESENT FOR 9 SECONDS?
NO → INSTALL NEW SOLID STATE (START TRIAC) SWITCH (PARA. 4-35).
YES → INSTALL NEW SPINDLE MOTOR (PARA 4-39).
NO

USING VOLTMETER, CHECK FOR 0 VDC AT PIN 4 OF RUN TRIAC.
IS VOLTAGE ZERO?
YES → INSTALL NEW RUN TRIAC (PARA 4-16).
NO → C

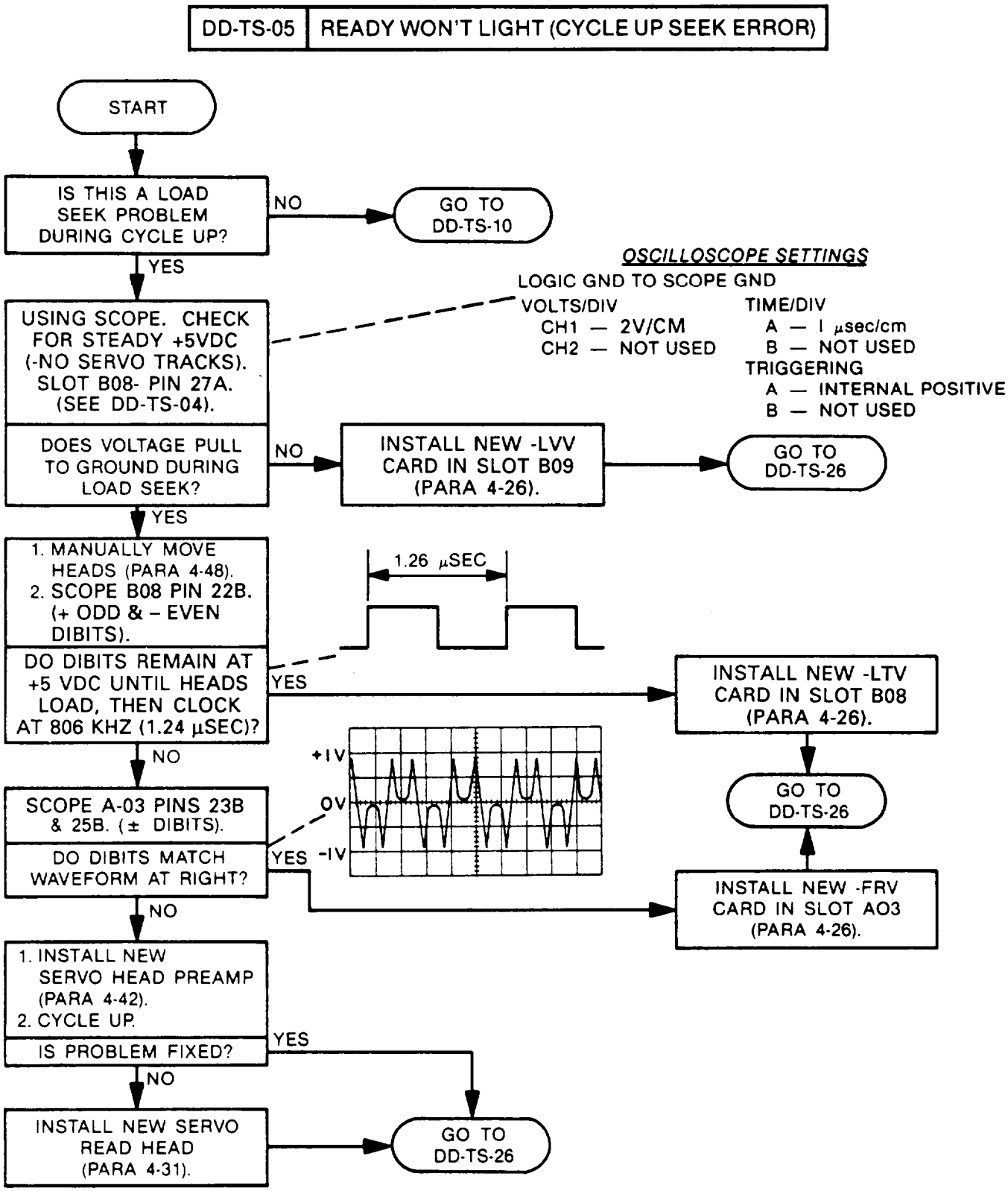
GO TO DD-TS-00

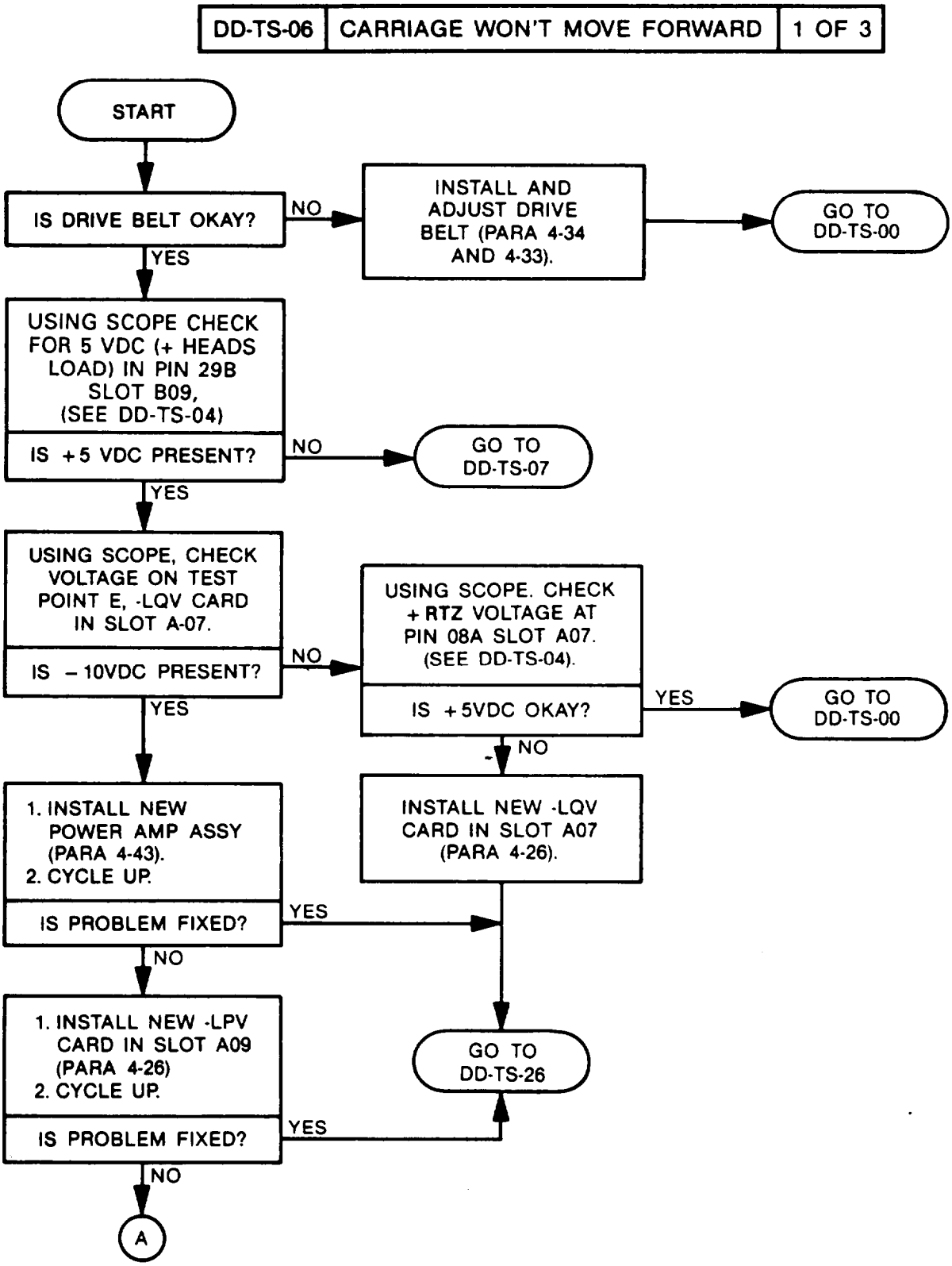
DD-TS-04	SPINDLE WILL NOT SPIN	3 OF 3



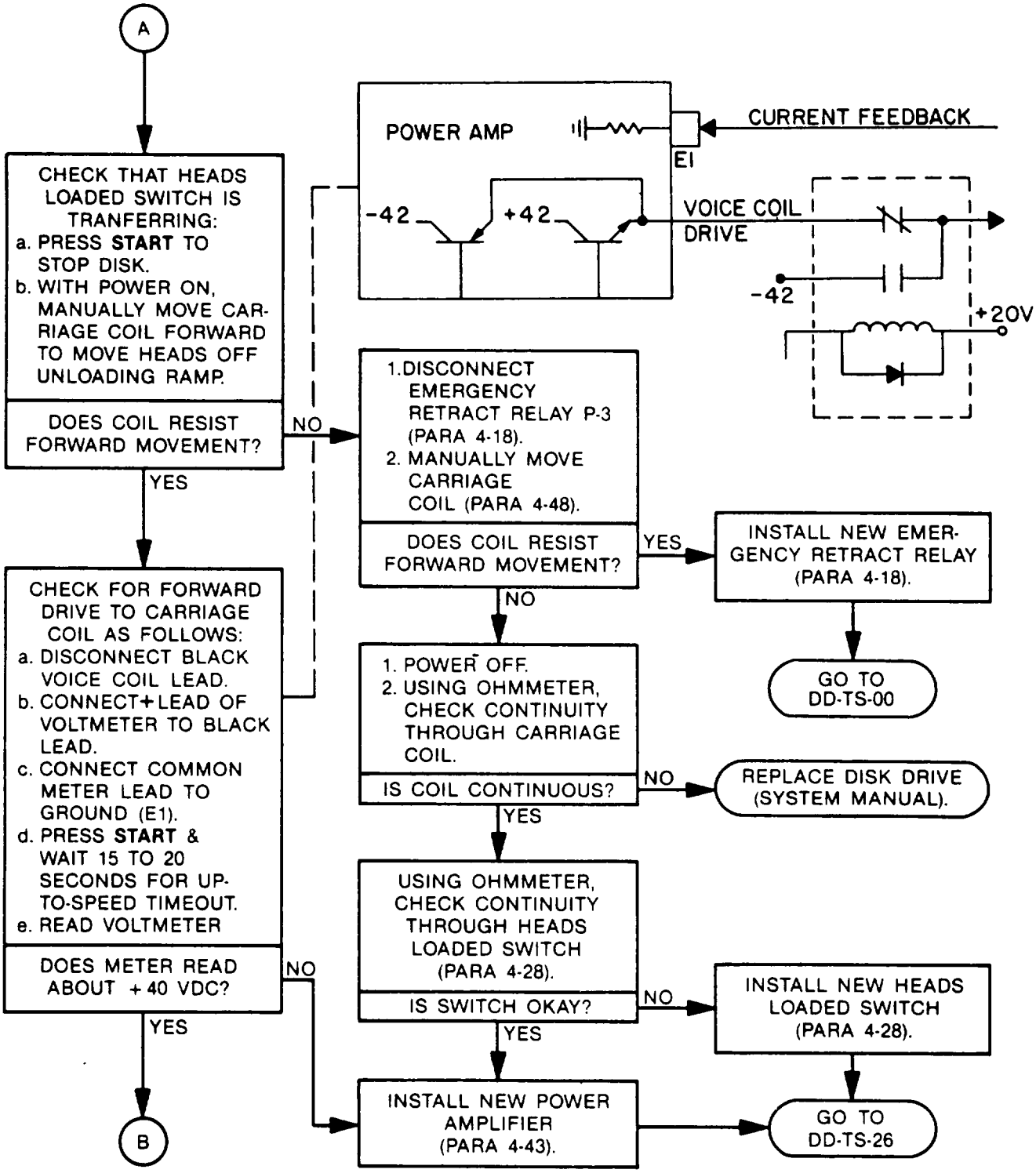


VIEWED FROM WIREWRAP SIDE

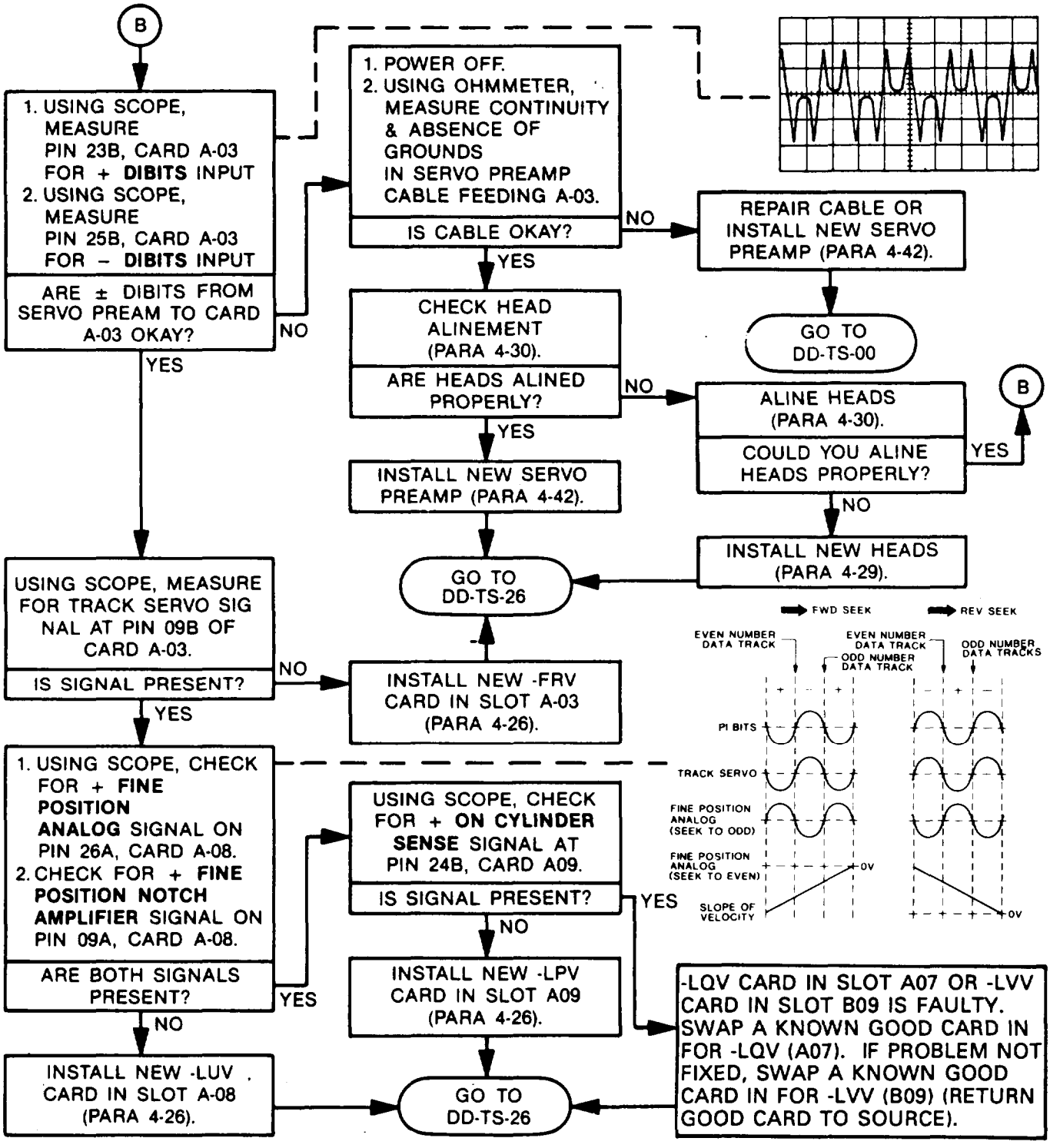

DD-TS-05
READY WON'T LIGHT (CYCLE UP SEEK ERROR)
START
IS THIS A LOAD SEEK PROBLEM DURING CYCLE UP?
NO
GO TO DD-TS-10
YES
OSCILLOSCOPE SETTINGS
LOGIC GND TO SCOPE GND
VOLTS/DIV
CH1 — 2V/CM
CH2 — NOT USED
TIME/DIV
A — 1 µsec/cm
B — NOT USED
TRIGGERING
A — INTERNAL POSITIVE
B — NOT USED
USING SCOPE. CHECK FOR STEADY +5VDC (-NO SERVO TRACKS). SLOT B08- PIN 27A. (SEE DD-TS-04).
DOES VOLTAGE PULL TO GROUND DURING LOAD SEEK?
NO
INSTALL NEW -LVV CARD IN SLOT B09 (PARA 4-26).
GO TO DD-TS-26
YES
1. MANUALLY MOVE HEADS (PARA 4-48).
2. SCOPE B08 PIN 22B. (+ ODD & – EVEN DIBITS).
1.26 µSEC
DO DIBITS REMAIN AT +5 VDC UNTIL HEADS LOAD, THEN CLOCK AT 806 KHZ (1.24 µSEC)?
YES
INSTALL NEW -LTV CARD IN SLOT B08 (PARA 4-26).
GO TO DD-TS-26
NO
SCOPE A-03 PINS 23B & 25B. (± DIBITS).
+1V
0V
-1V
DO DIBITS MATCH WAVEFORM AT RIGHT?
YES
INSTALL NEW -FRV CARD IN SLOT AO3 (PARA 4-26).
NO
1. INSTALL NEW SERVO HEAD PREAMP (PARA 4-42).
2. CYCLE UP.
IS PROBLEM FIXED?
YES
NO
INSTALL NEW SERVO READ HEAD (PARA 4-31).
GO TO DD-TS-26

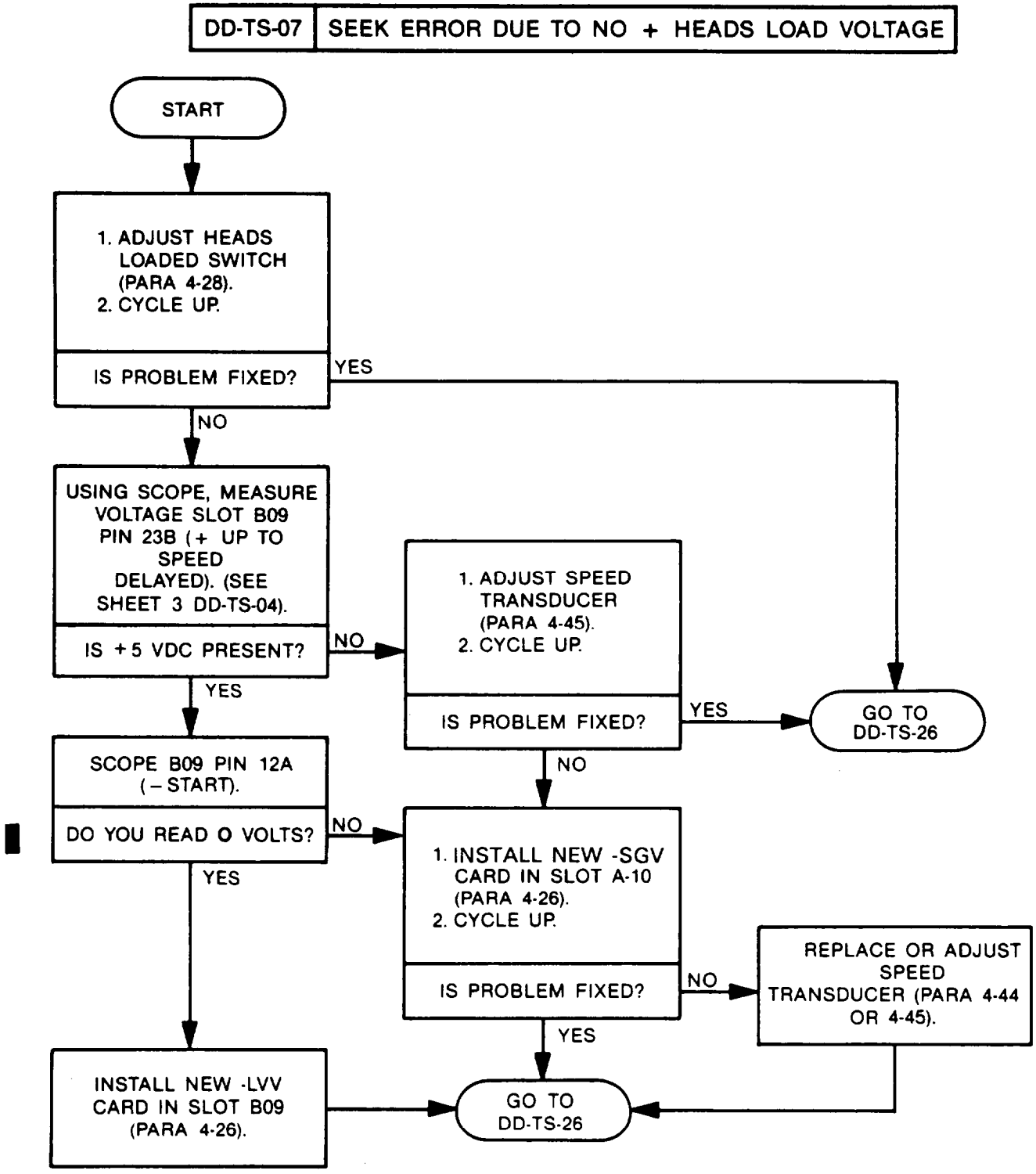

DD-TS-06
CARRIAGE WON'T MOVE FORWARD
1 OF 3
START
IS DRIVE BELT OKAY?
NO
INSTALL AND ADJUST DRIVE BELT (PARA 4-34 AND 4-33).
GO TO DD-TS-00
YES
USING SCOPE CHECK FOR 5 VDC (+ HEADS LOAD) IN PIN 29B SLOT B09, (SEE DD-TS-04)
IS +5 VDC PRESENT?
NO
GO TO DD-TS-07
YES
USING SCOPE, CHECK VOLTAGE ON TEST POINT E, -LQV CARD IN SLOT A-07.
IS -10VDC PRESENT?
NO
USING SCOPE. CHECK +RTZ VOLTAGE AT PIN 08A SLOT A07. (SEE DD-TS-04).
IS +5VDC OKAY?
YES
GO TO DD-TS-00
NO
YES
1. INSTALL NEW POWER AMP ASSY (PARA 4-43).
2. CYCLE UP.
IS PROBLEM FIXED?
YES
INSTALL NEW -LQV CARD IN SLOT A07 (PARA 4-26).
NO
1. INSTALL NEW -LPV CARD IN SLOT A09 (PARA 4-26)
2. CYCLE UP.
IS PROBLEM FIXED?
YES
GO TO DD-TS-26
NO
A

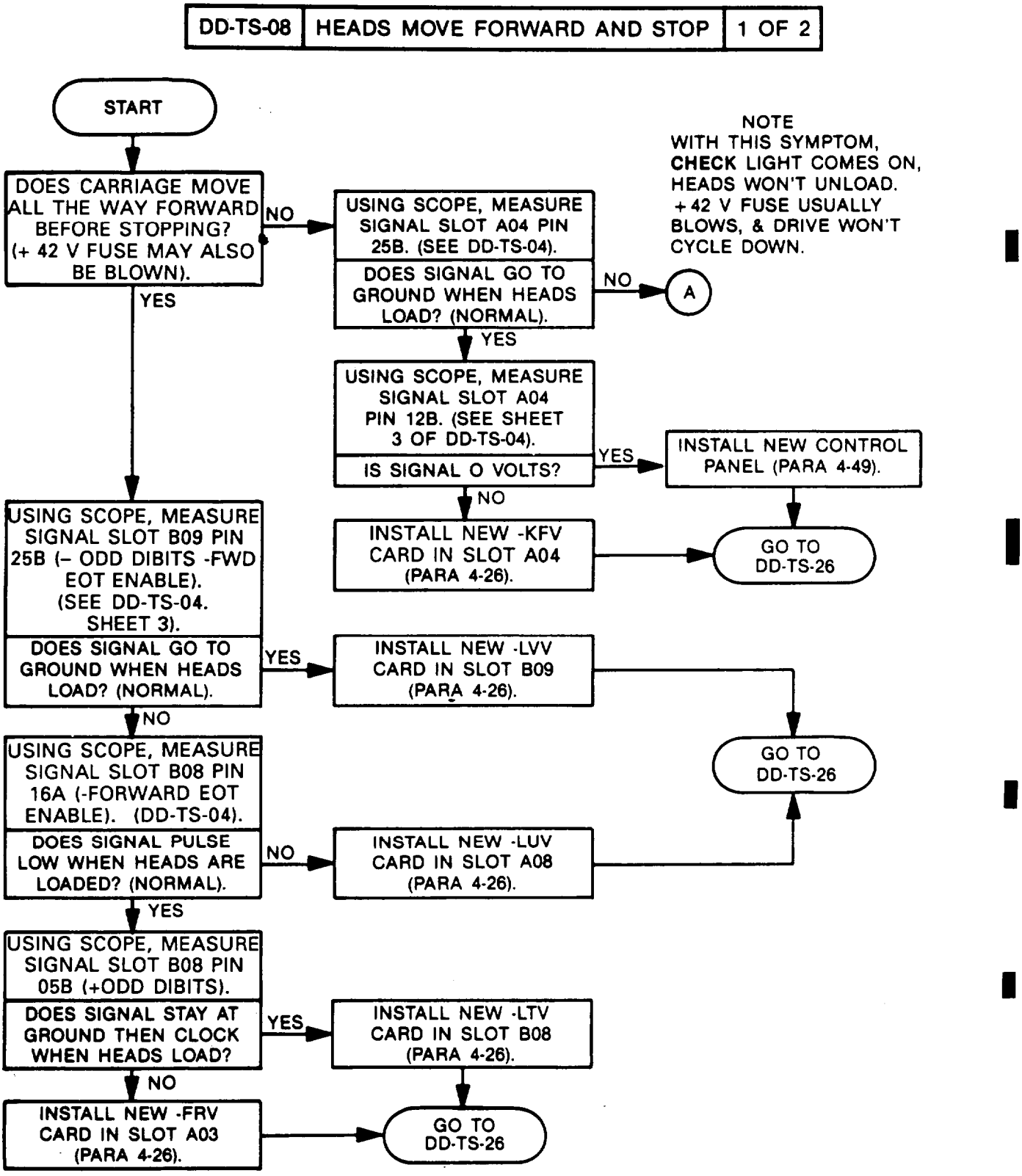
DD-TS-06	CARRIAGE WON'T MOVE FORWARD	2 OF 3

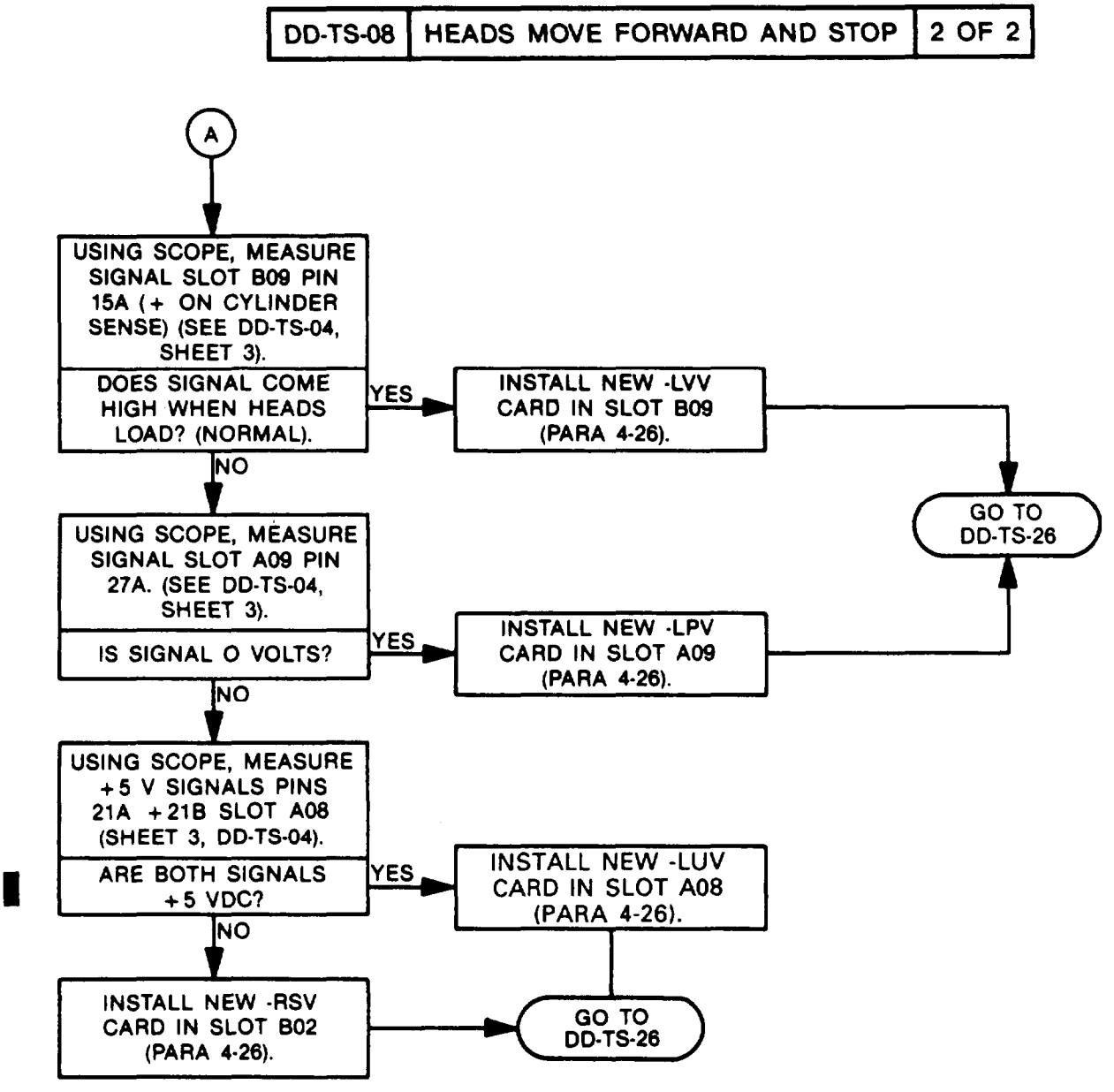


DD-TS-06	CARRIAGE WON'T MOVE FORWARD	3 OF 3

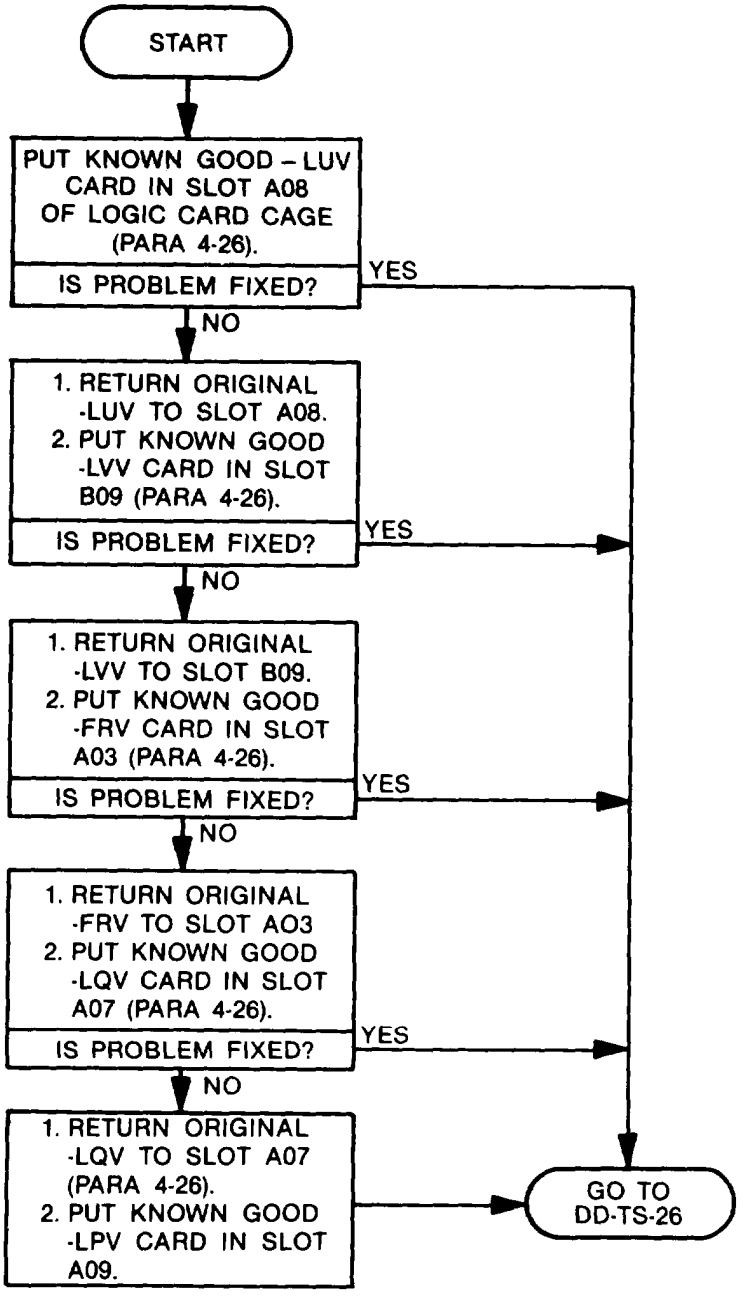


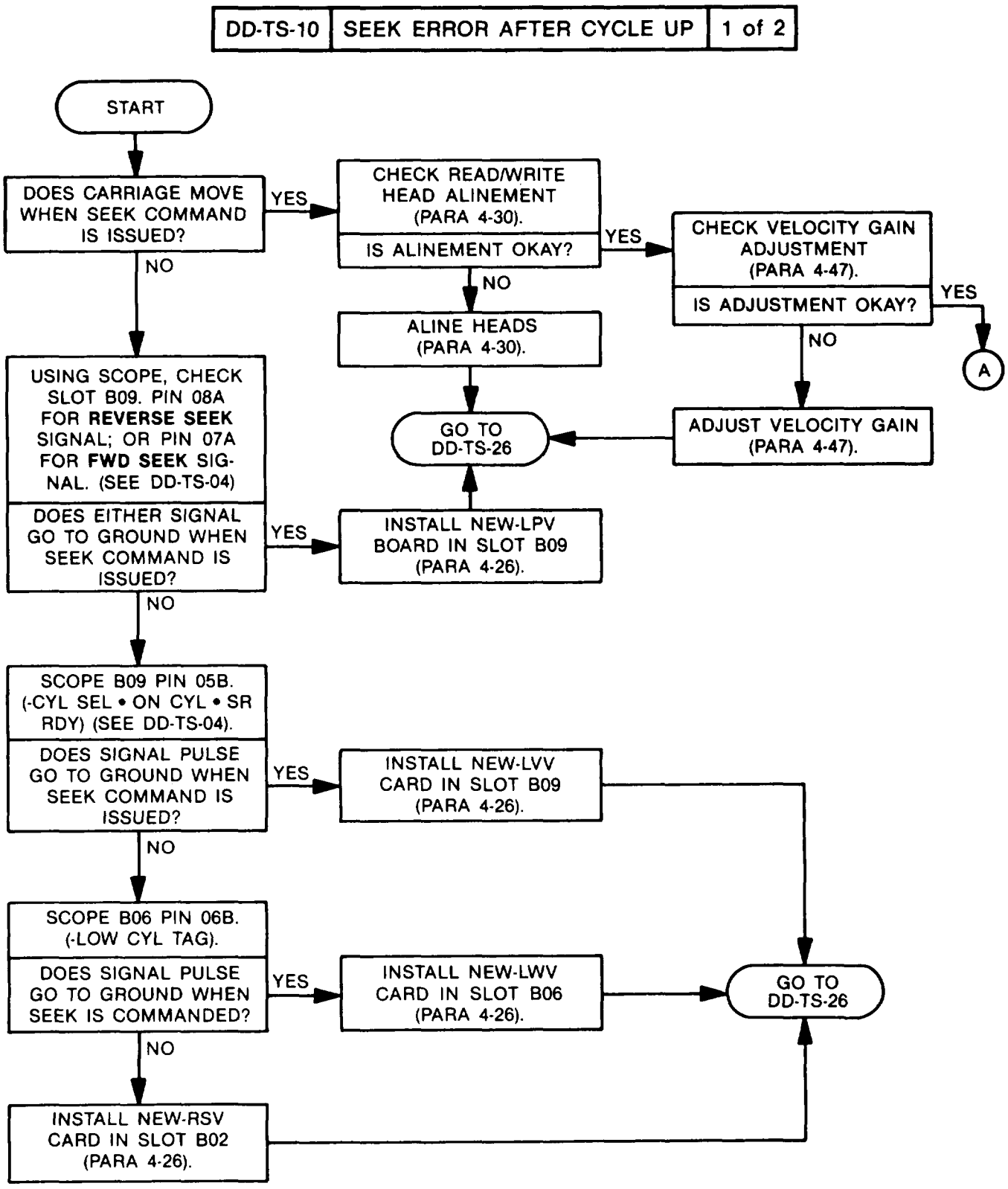

DD-TS-07
SEEK ERROR DUE TO NO + HEADS LOAD VOLTAGE
START
1. ADJUST HEADS LOADED SWITCH (PARA 4-28).
2. CYCLE UP.
IS PROBLEM FIXED?
YES
NO
USING SCOPE, MEASURE VOLTAGE SLOT B09 PIN 23B (+ UP TO SPEED DELAYED). (SEE SHEET 3 DD-TS-04).
IS +5 VDC PRESENT?
NO
YES
1. ADJUST SPEED TRANSDUCER (PARA 4-45).
2. CYCLE UP.
IS PROBLEM FIXED?
YES
GO TO DD-TS-26
NO
SCOPE B09 PIN 12A (– START).
DO YOU READ 0 VOLTS?
NO
YES
1. INSTALL NEW -SGV CARD IN SLOT A-10 (PARA 4-26).
2. CYCLE UP.
IS PROBLEM FIXED?
NO
REPLACE OR ADJUST SPEED TRANSDUCER (PARA 4-44 OR 4-45).
YES
INSTALL NEW -LVV CARD IN SLOT B09 (PARA 4-26).
GO TO DD-TS-26

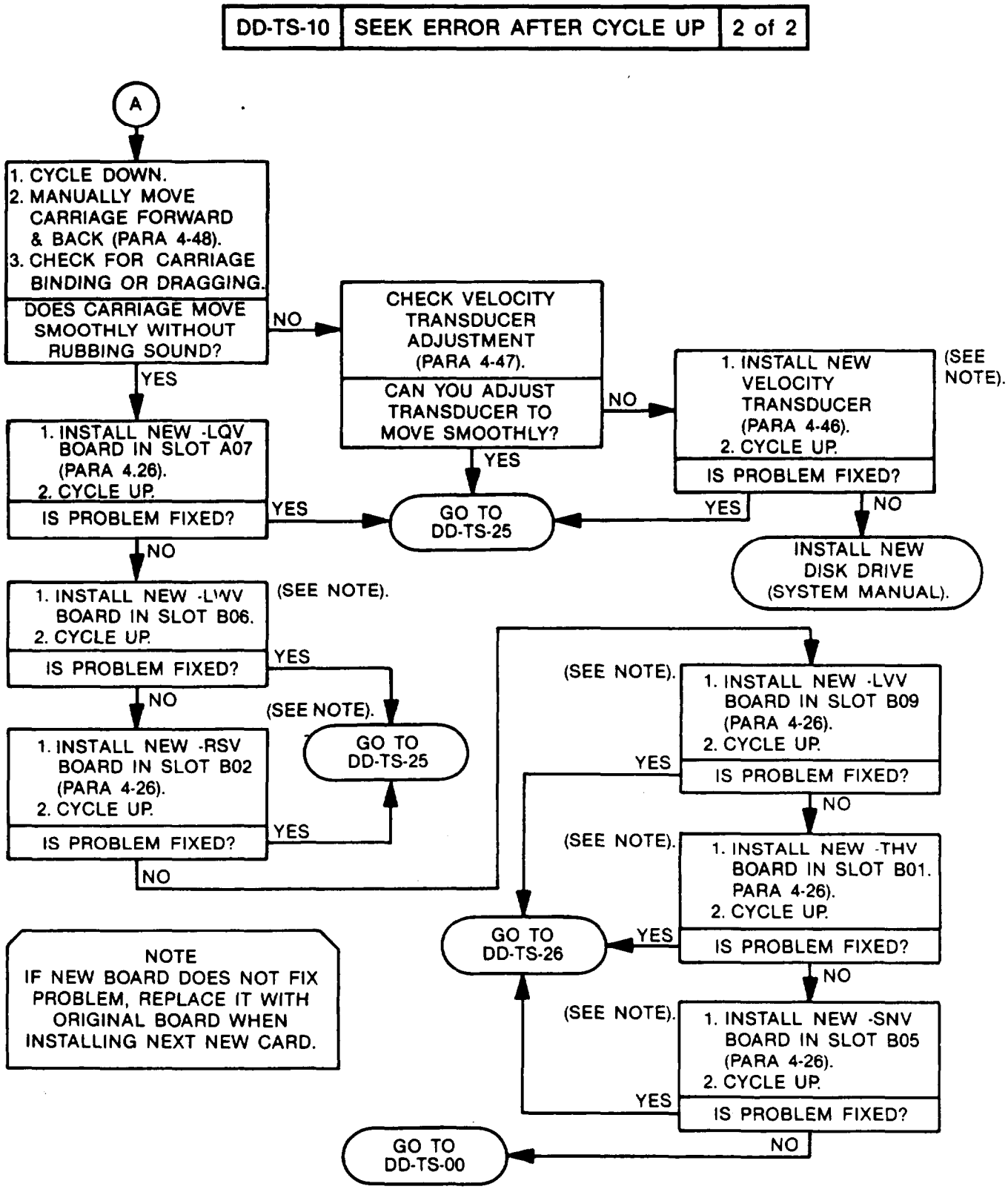

DD-TS-08
HEADS MOVE FORWARD AND STOP
1 OF 2
START
DOES CARRIAGE MOVE ALL THE WAY FORWARD BEFORE STOPPING? (+ 42 V FUSE MAY ALSO BE BLOWN).
NO
YES
USING SCOPE, MEASURE SIGNAL SLOT A04 PIN 25B. (SEE DD-TS-04).
DOES SIGNAL GO TO GROUND WHEN HEADS LOAD? (NORMAL).
NO
A
YES
USING SCOPE, MEASURE SIGNAL SLOT A04 PIN 12B. (SEE SHEET 3 OF DD-TS-04).
IS SIGNAL O VOLTS?
YES
INSTALL NEW CONTROL PANEL (PARA 4-49).
NO
INSTALL NEW -KFV CARD IN SLOT A04 (PARA 4-26).
GO TO DD-TS-26
NOTE
WITH THIS SYMPTOM, CHECK LIGHT COMES ON, HEADS WON'T UNLOAD. +42 V FUSE USUALLY BLOWS, & DRIVE WON'T CYCLE DOWN.
USING SCOPE, MEASURE SIGNAL SLOT B09 PIN 25B (– ODD DIBITS -FWD EOT ENABLE). (SEE DD-TS-04. SHEET 3).
DOES SIGNAL GO TO GROUND WHEN HEADS LOAD? (NORMAL).
YES
INSTALL NEW -LVV CARD IN SLOT B09 (PARA 4-26).
NO
USING SCOPE, MEASURE SIGNAL SLOT B08 PIN 16A (-FORWARD EOT ENABLE). (DD-TS-04).
DOES SIGNAL PULSE LOW WHEN HEADS ARE LOADED? (NORMAL).
NO
INSTALL NEW -LUV CARD IN SLOT A08 (PARA 4-26).
GO TO DD-TS-26
YES
USING SCOPE, MEASURE SIGNAL SLOT B08 PIN 05B (+ODD DIBITS).
DOES SIGNAL STAY AT GROUND THEN CLOCK WHEN HEADS LOAD?
YES
INSTALL NEW -LTV CARD IN SLOT B08 (PARA 4-26).
NO
INSTALL NEW -FRV CARD IN SLOT A03 (PARA 4-26).
GO TO DD-TS-26

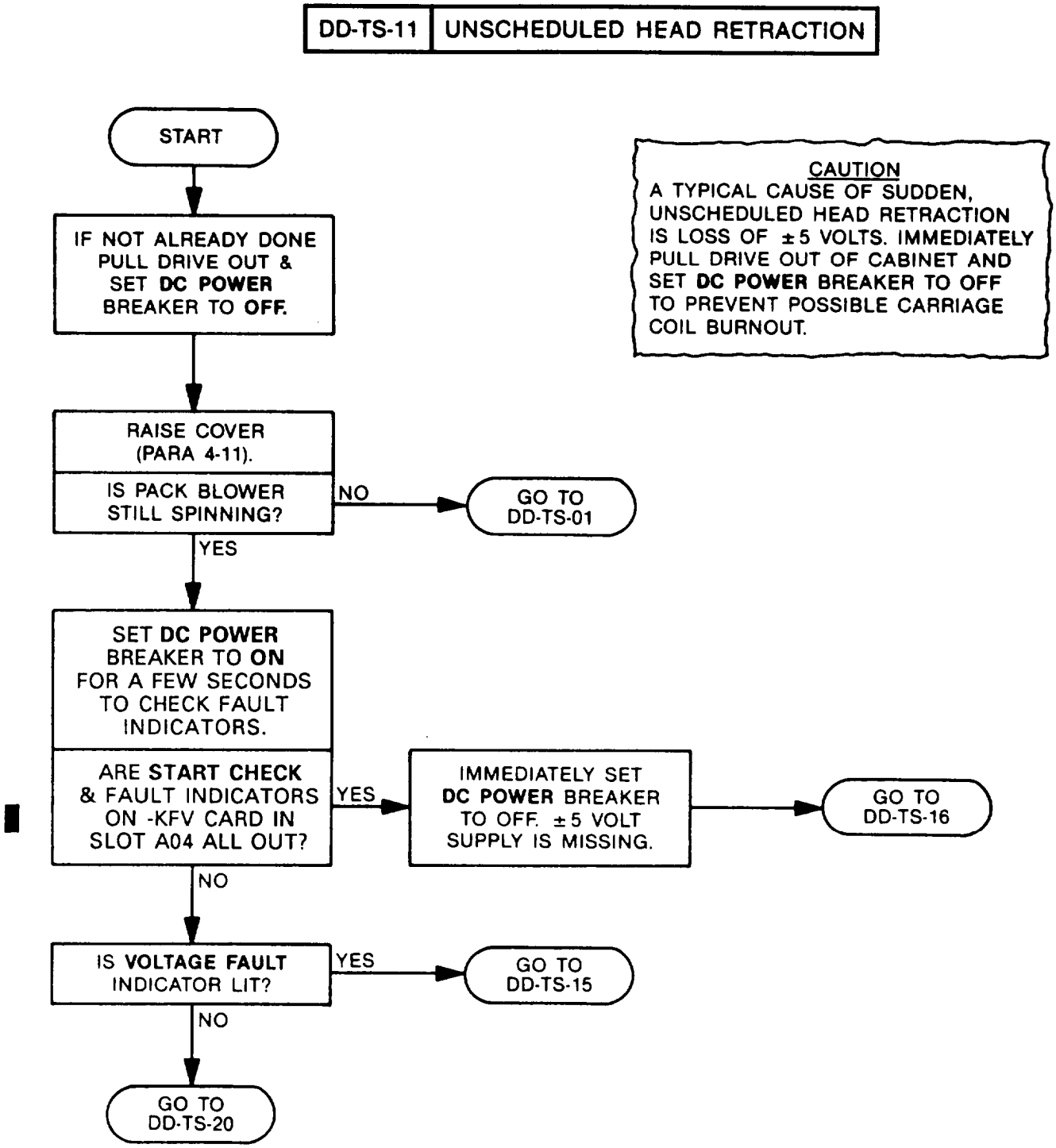

DD-TS-08
HEADS MOVE FORWARD AND STOP
2 OF 2
A
USING SCOPE, MEASURE SIGNAL SLOT B09 PIN 15A (+ ON CYLINDER SENSE) (SEE DD-TS-04, SHEET 3).
DOES SIGNAL COME HIGH WHEN HEADS LOAD? (NORMAL).
YES
INSTALL NEW -LVV CARD IN SLOT B09 (PARA 4-26).
NO
USING SCOPE, MEASURE SIGNAL SLOT A09 PIN 27A. (SEE DD-TS-04, SHEET 3).
IS SIGNAL O VOLTS?
YES
INSTALL NEW -LPV CARD IN SLOT A09 (PARA 4-26).
NO
USING SCOPE, MEASURE +5 V SIGNALS PINS 21A +21B SLOT A08 (SHEET 3, DD-TS-04).
ARE BOTH SIGNALS +5 VDC?
YES
INSTALL NEW -LUV CARD IN SLOT A08 (PARA 4-26).
NO
INSTALL NEW -RSV CARD IN SLOT B02 (PARA 4-26).
GO TO DD-TS-26
GO TO DD-TS-26

DD-TS-09	HEADS LOAD, HESITATE, THEN CREEP TO FORWARD EOT

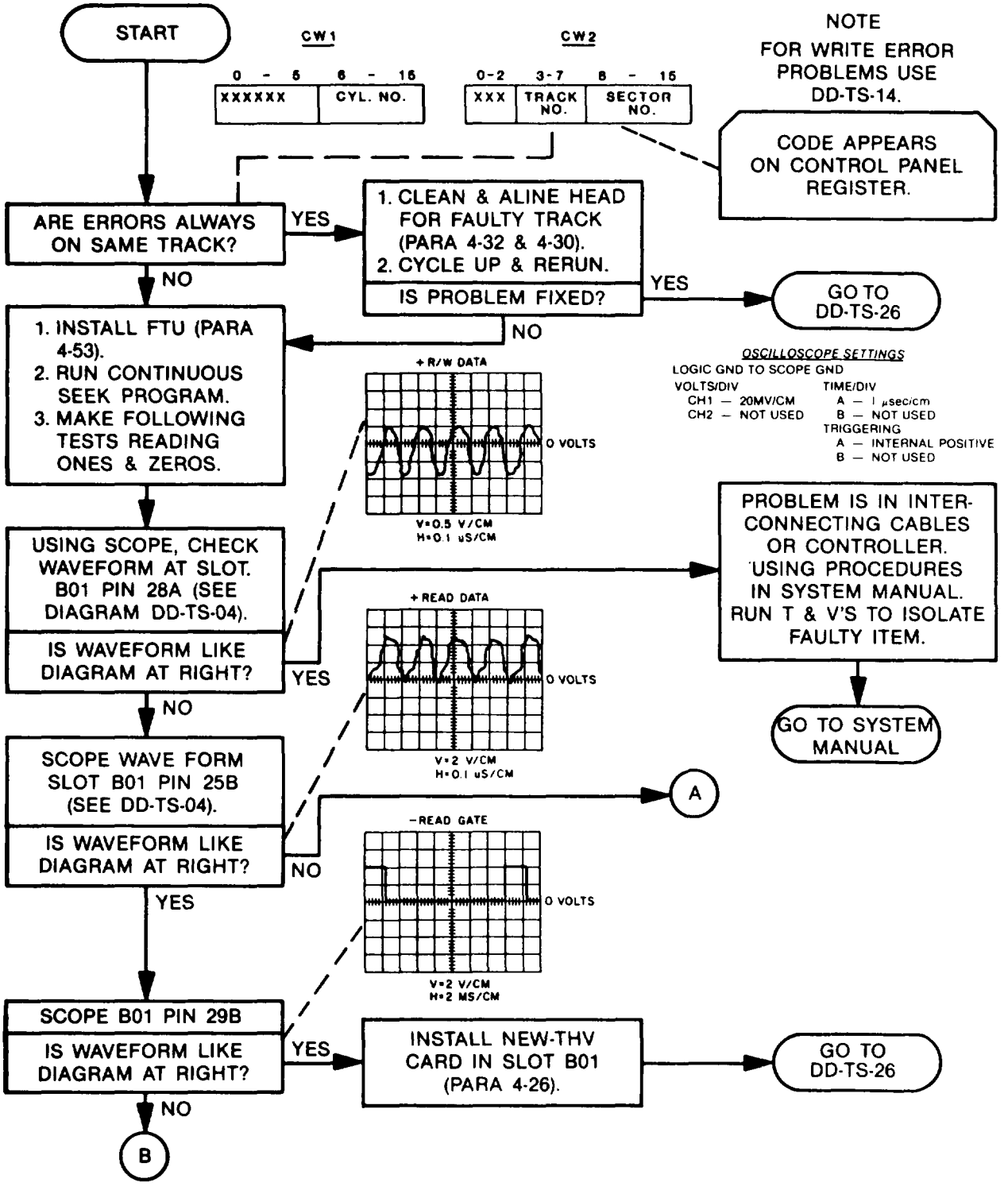



DD-TS-10
SEEK ERROR AFTER CYCLE UP
1 of 2
START
DOES CARRIAGE MOVE WHEN SEEK COMMAND IS ISSUED?
YES
NO
CHECK READ/WRITE HEAD ALINEMENT (PARA 4-30).
IS ALINEMENT OKAY?
YES
NO
ALINE HEADS (PARA 4-30).
CHECK VELOCITY GAIN ADJUSTMENT (PARA 4-47).
IS ADJUSTMENT OKAY?
YES
NO
A
ADJUST VELOCITY GAIN (PARA 4-47).
USING SCOPE, CHECK SLOT B09. PIN 08A FOR **REVERSE SEEK** SIGNAL; OR PIN 07A FOR **FWD SEEK** SIGNAL. (SEE DD-TS-04)
DOES EITHER SIGNAL GO TO GROUND WHEN SEEK COMMAND IS ISSUED?
YES
NO
INSTALL NEW-LPV BOARD IN SLOT B09 (PARA 4-26).
GO TO DD-TS-26
SCOPE B09 PIN 05B. (-CYL SEL • ON CYL • SR RDY) (SEE DD-TS-04).
DOES SIGNAL PULSE GO TO GROUND WHEN SEEK COMMAND IS ISSUED?
YES
NO
INSTALL NEW-LVV CARD IN SLOT B09 (PARA 4-26).
SCOPE B06 PIN 06B. (-LOW CYL TAG).
DOES SIGNAL PULSE GO TO GROUND WHEN SEEK IS COMMANDED?
YES
NO
INSTALL NEW-LWV CARD IN SLOT B06 (PARA 4-26).
INSTALL NEW-RSV CARD IN SLOT B02 (PARA 4-26).
GO TO DD-TS-26

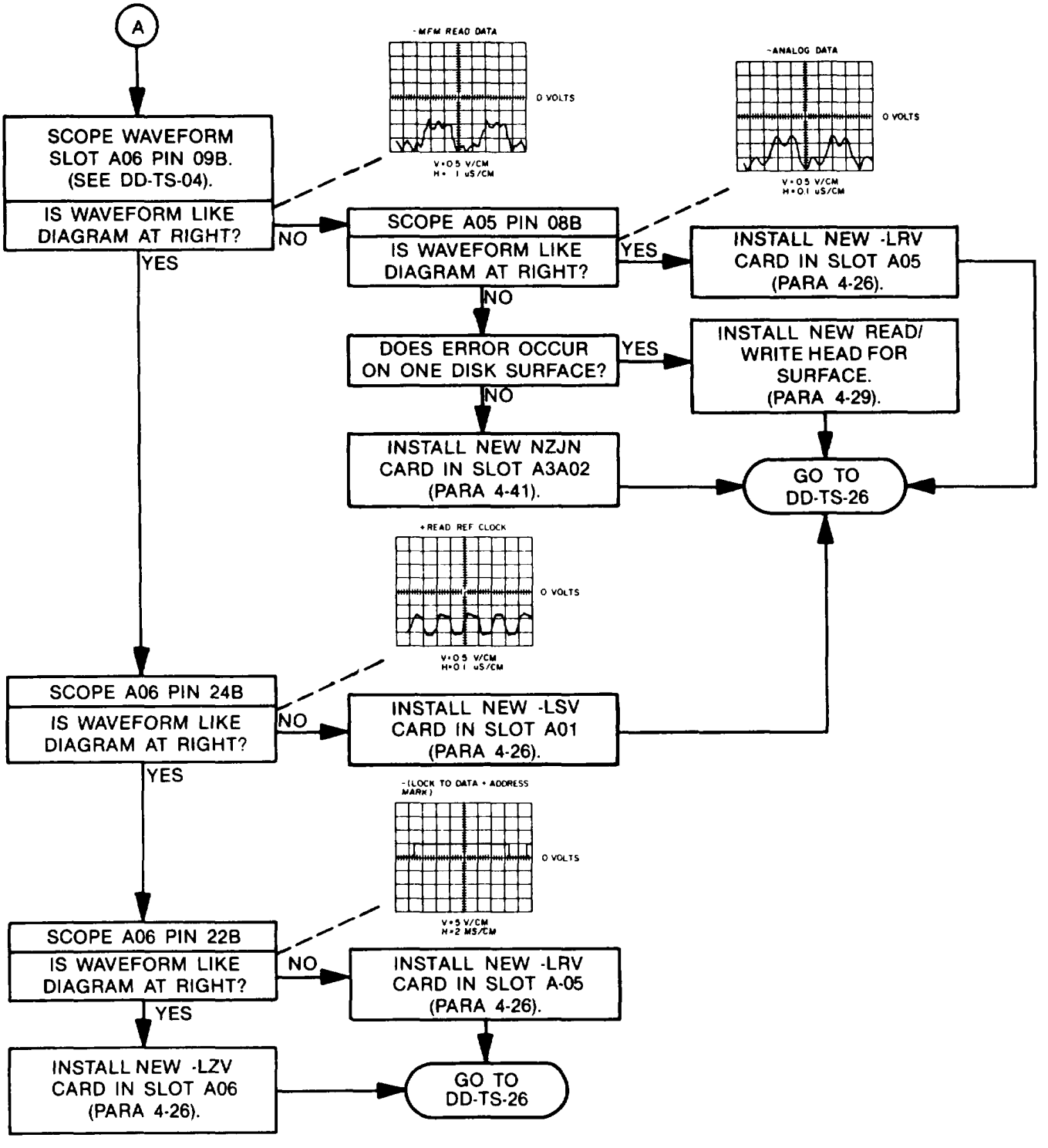

DD-TS-10
SEEK ERROR AFTER CYCLE UP
2 of 2
A
1. CYCLE DOWN.
2. MANUALLY MOVE CARRIAGE FORWARD & BACK (PARA 4-48).
3. CHECK FOR CARRIAGE BINDING OR DRAGGING.
DOES CARRIAGE MOVE SMOOTHLY WITHOUT RUBBING SOUND?
NO
YES
CHECK VELOCITY TRANSDUCER ADJUSTMENT (PARA 4-47).
CAN YOU ADJUST TRANSDUCER TO MOVE SMOOTHLY?
NO
YES
1. INSTALL NEW VELOCITY TRANSDUCER (PARA 4-46).
2. CYCLE UP.
IS PROBLEM FIXED?
(SEE NOTE).
YES
NO
INSTALL NEW DISK DRIVE (SYSTEM MANUAL).
1. INSTALL NEW -LQV BOARD IN SLOT A07 (PARA 4.26).
2. CYCLE UP.
IS PROBLEM FIXED?
YES
NO
GO TO DD-TS-25
1. INSTALL NEW -LWV BOARD IN SLOT B06.
2. CYCLE UP.
IS PROBLEM FIXED?
(SEE NOTE).
YES
NO
(SEE NOTE).
GO TO DD-TS-25
1. INSTALL NEW -RSV BOARD IN SLOT B02 (PARA 4-26).
2. CYCLE UP.
IS PROBLEM FIXED?
YES
NO
(SEE NOTE).
1. INSTALL NEW -LVV BOARD IN SLOT B09 (PARA 4-26).
2. CYCLE UP.
IS PROBLEM FIXED?
YES
NO
(SEE NOTE).
1. INSTALL NEW -THV BOARD IN SLOT B01. PARA 4-26).
2. CYCLE UP.
IS PROBLEM FIXED?
YES
NO
GO TO DD-TS-26
(SEE NOTE).
1. INSTALL NEW -SNV BOARD IN SLOT B05 (PARA 4-26).
2. CYCLE UP.
IS PROBLEM FIXED?
YES
NO
GO TO DD-TS-00
NOTE
IF NEW BOARD DOES NOT FIX PROBLEM, REPLACE IT WITH ORIGINAL BOARD WHEN INSTALLING NEXT NEW CARD.


DD-TS-11
UNSCHEDULED HEAD RETRACTION
START
IF NOT ALREADY DONE PULL DRIVE OUT & SET DC POWER BREAKER TO OFF.
CAUTION
A TYPICAL CAUSE OF SUDDEN, UNSCHEDULED HEAD RETRACTION IS LOSS OF ±5 VOLTS. IMMEDIATELY PULL DRIVE OUT OF CABINET AND SET DC POWER BREAKER TO OFF TO PREVENT POSSIBLE CARRIAGE COIL BURNOUT.
RAISE COVER (PARA 4-11).
IS PACK BLOWER STILL SPINNING?
NO
GO TO DD-TS-01
YES
SET DC POWER BREAKER TO ON FOR A FEW SECONDS TO CHECK FAULT INDICATORS.
ARE START CHECK & FAULT INDICATORS ON -KFV CARD IN SLOT A04 ALL OUT?
YES
IMMEDIATELY SET DC POWER BREAKER TO OFF. ±5 VOLT SUPPLY IS MISSING.
GO TO DD-TS-16
NO
IS VOLTAGE FAULT INDICATOR LIT?
YES
GO TO DD-TS-15
NO
GO TO DD-TS-20

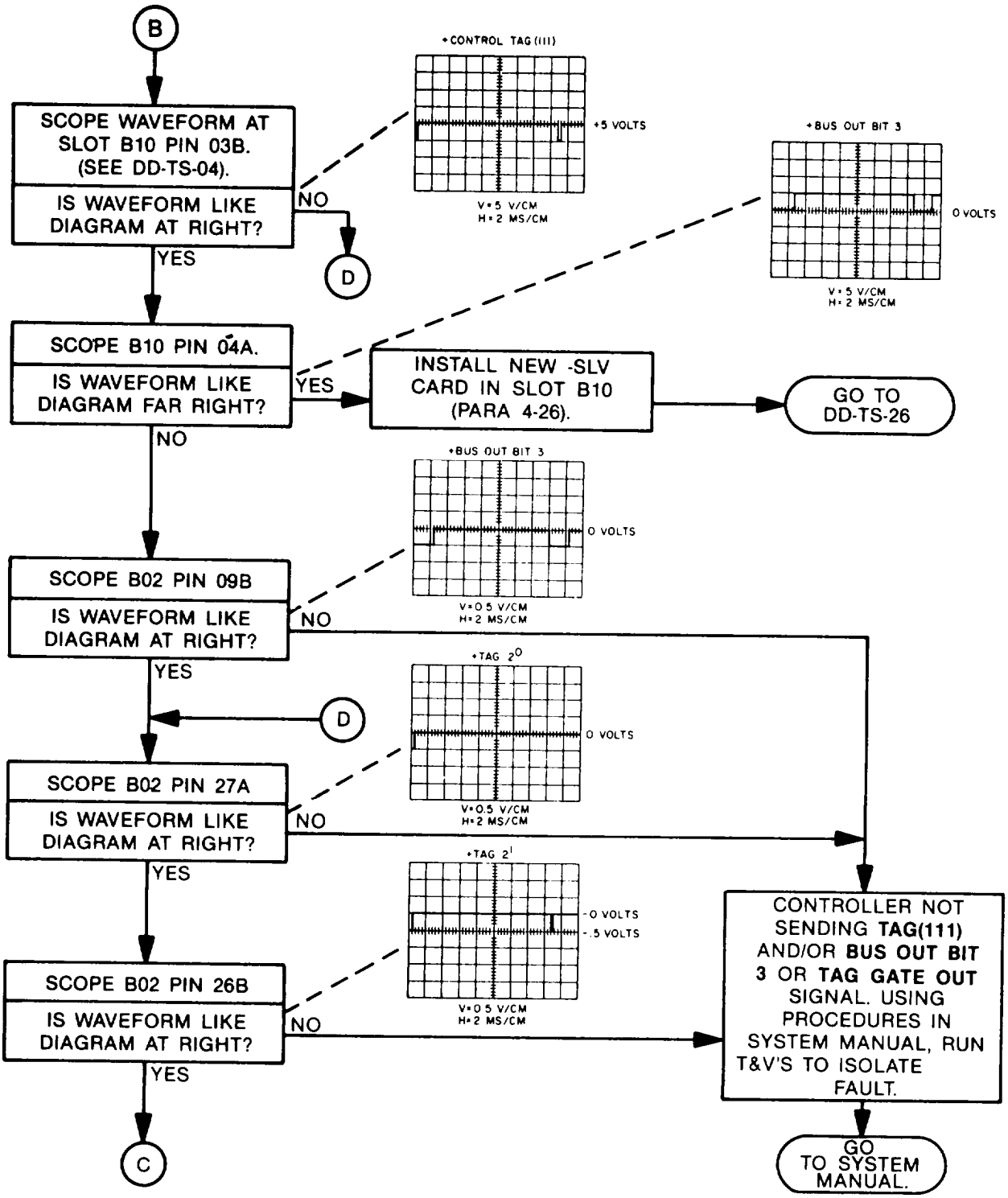
DD-TS-12 | READ ERROR PROBLEMS | 1 of 4



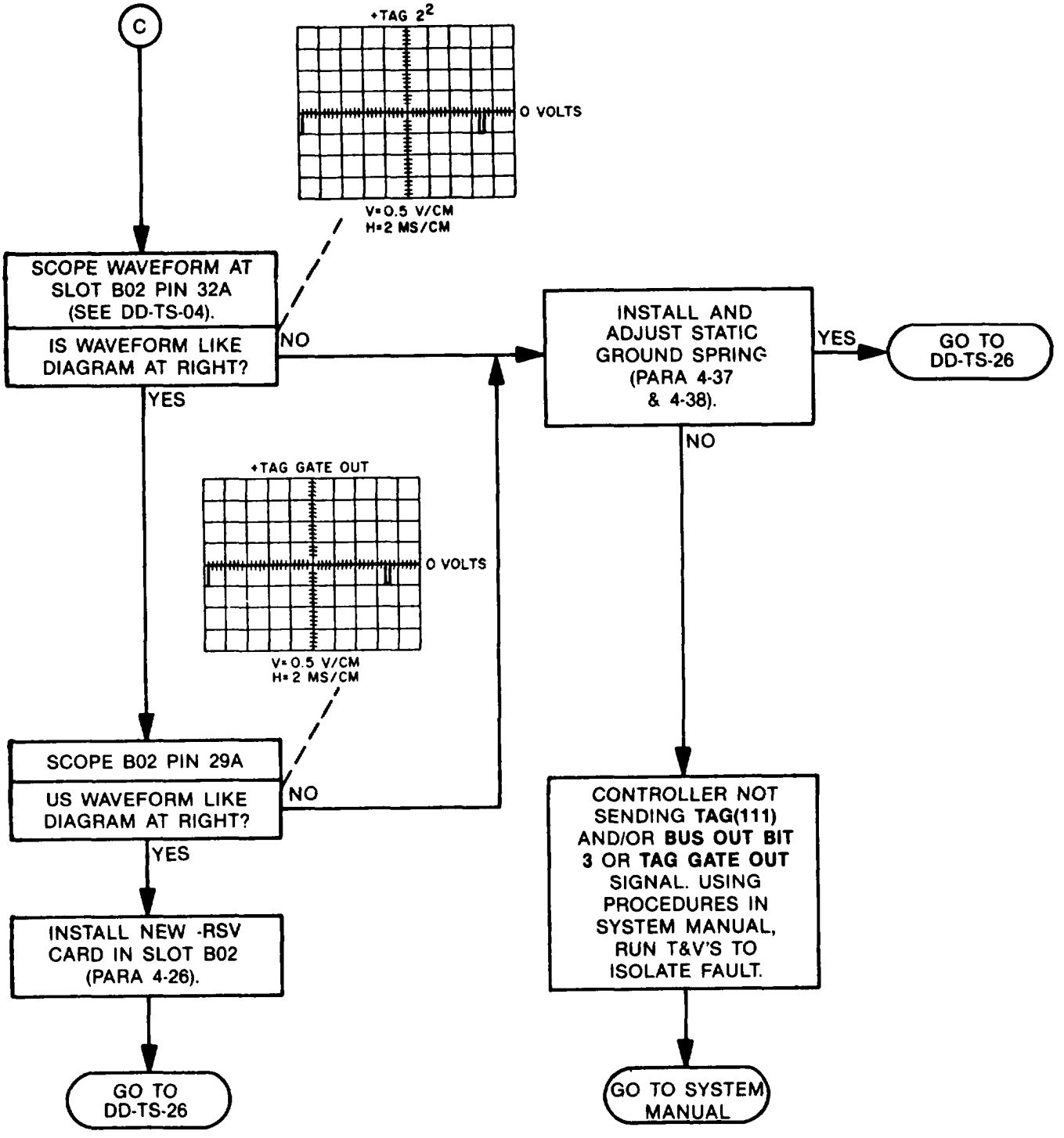
DD-TS-12	READ ERROR PROBLEMS	2 OF 4



DD-TS-12	READ ERROR PROBLEMS	3 OF 4



DD-TS-12	READ ERROR PROBLEMS	4 OF 4



DD-TS-13	WRITE ERROR PROBLEMS	1 OF 5

START

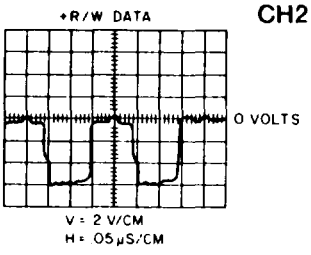
MAKE FOLLOWING TESTS WHILE READING ALTERNATE ONES & ZEROS WITH FIELD TEST UNIT.

NOTE
FOR READ ERROR PROBLEMS USE DD-TS-12

OSCILLOSCOPE SETTINGS
LOGIC GND TO SCOPE GND
VOLTS/DIV
CH1 — 20MV/CM
CH2 — NOT USED
TIME/DIV
A — 1 μsec/cm
B — NOT USED
TRIGGERING
A — INTERNAL POSITIVE
B — NOT USED

USING SCOPE, CHECK WAVEFORM AT SLOT B01 PIN 28A (SEE SHEET 3, DD-TS-04).

IS WAVEFORM LIKE DIAGRAM AT RIGHT?



NO

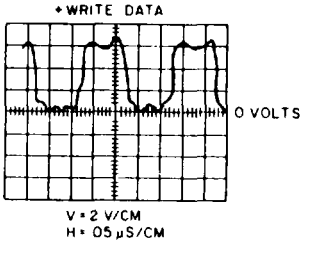
PROBLEM IS IN CABLES OR CONTROLLER. USING PROCEDURES IN SYSTEM MANUAL, RUN T & V'S TO ISOLATE FAULT.

GO TO SYSTEM MANUAL

YES

SCOPE WAVEFORM AT B01, PIN 29A.

IS WAVEFORM LIKE DIAGRAM AT RIGHT?



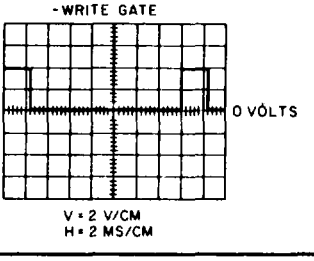
YES

A

NO

SCOPE B01 PIN 26A.

IS WAVEFORM LIKE DIAGRAM AT RIGHT?



NO

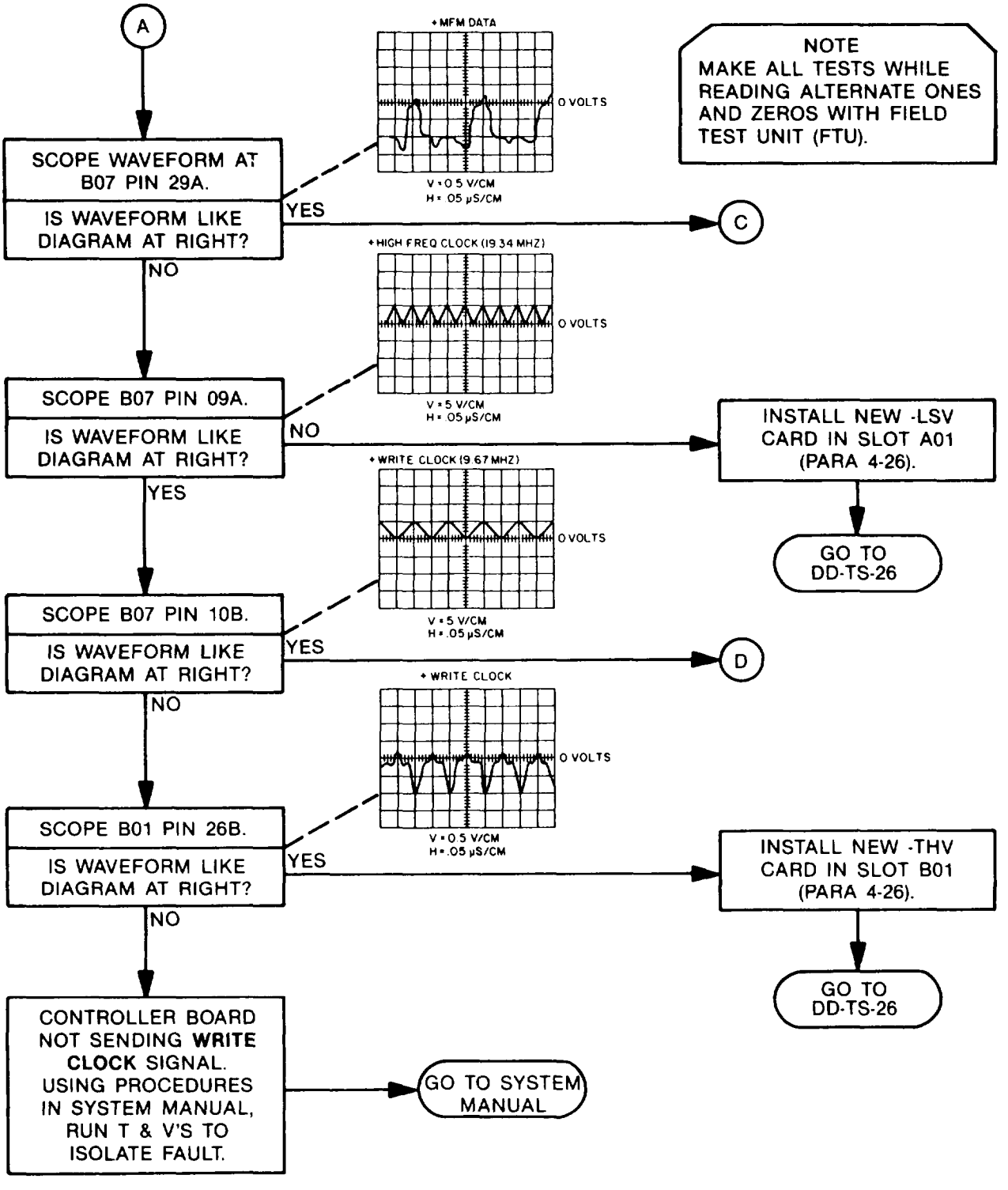
B

YES

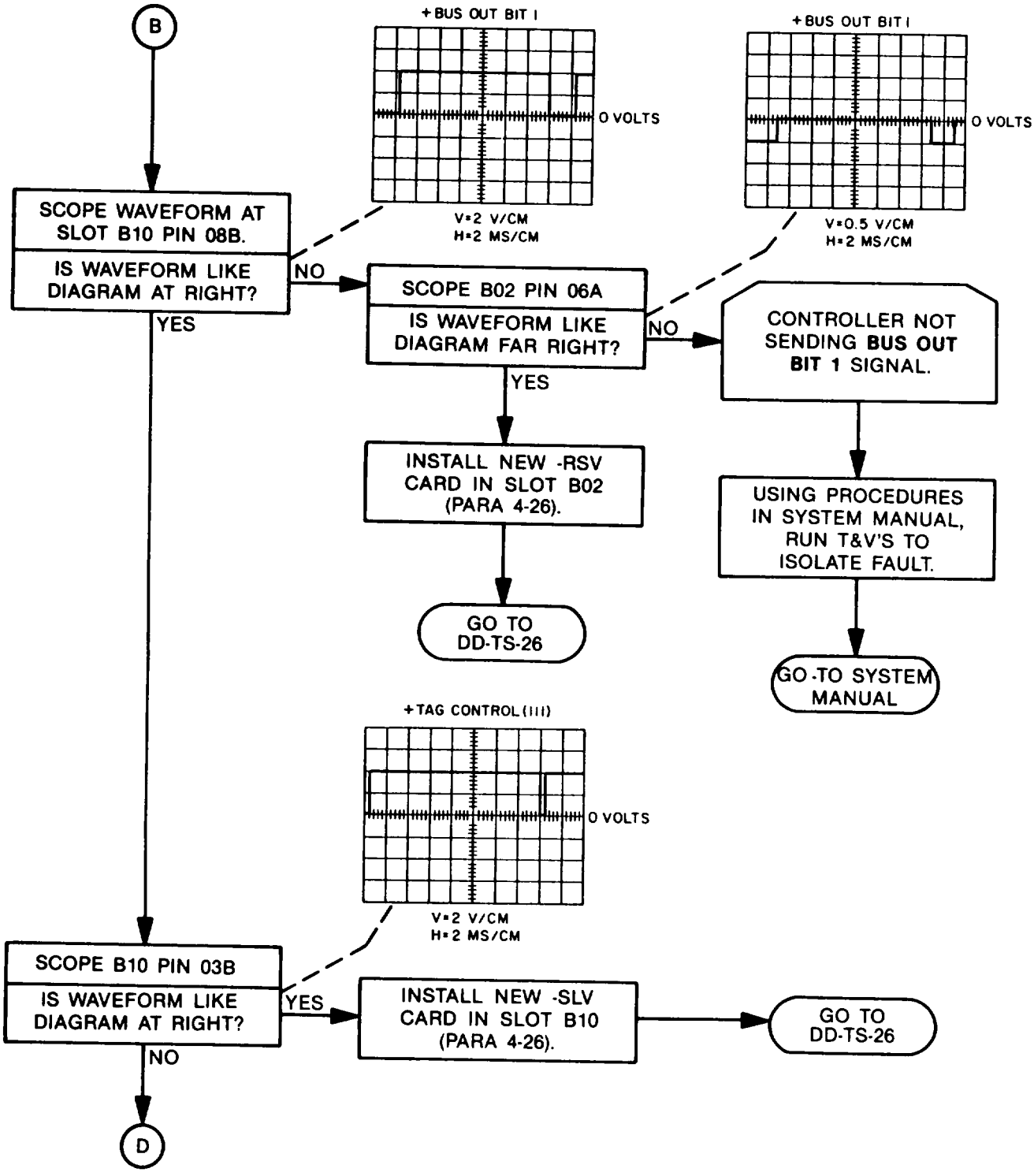
INSTALL NEW -THV CARD IN SLOT B01 (PARA 4-26).

GO TO DD-TS-26

DD-TS-13	WRITE ERROR PROBLEMS	2 of 5



DD-TS-13	WRITE ERROR PROBLEMS	3 OF 5



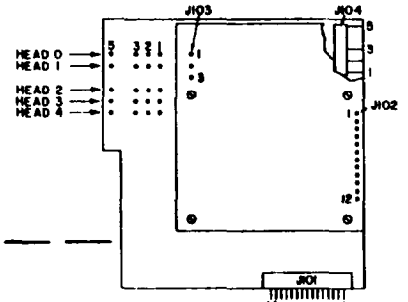
DD-TS-13	WRITE ERROR PROBLEMS	4 OF 5

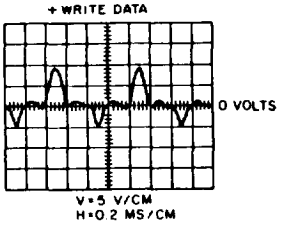
C

(SEE NOTE).

USING SCOPE, CHECK WAVEFORM AT J103 (A3A03) PIN 2.

IS WAVEFORM LIKE DIAGRAM AT RIGHT?





YES

NO

DO ERRORS OCCUR ON ONLY ONE DISK SURFACE?

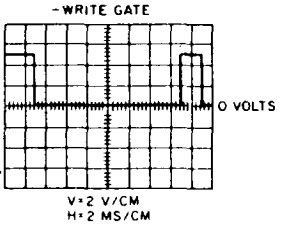
YES

INSTALL NEW READ/ WRITE HEAD FOR DISK WHERE ERRORS OCCUR (PARA 4-29).

NO

INSTALL NEW N2JN CARD IN A3A02 (PARA 4-41).

GO TO DD-TS-26



NOTE

MAKE ALL TESTS WHILE READING ALTERNATE ONES & ZEROS WITH FIELD TEST UNIT.

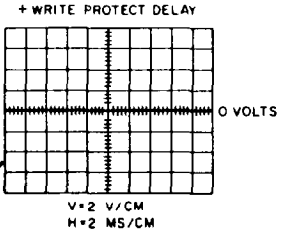
SCOPE J102, PIN 04.

IS WAVEFORM LIKE DIAGRAM AT RIGHT?

NO

B

YES



SCOPE J102, PIN 08.

IS WAVEFORM LIKE DIAGRAM AT RIGHT?

NO

IS WRITE PROTECT SWITCH ON?

YES

SET SWITCH TO OFF.

YES

NO

INSTALL NEW ZKN CARD IN A3A03 (PARA 4-41).

INSTALL NEW -SGV CARD IN SLOT A10 (PARA 4-26).

REPAIR IS COMPLETE

GO TO DD-TS-26

DD-TS-13	WRITE ERROR PROBLEMS	5 OF 5

D

USING SCOPE, CHECK FOR +5 VDC AT SLOT B07 PIN 26B

IS +5 VDC PRESENT?

YES → INSTALL NEW -LXV CARD IN SLOT B07 (PARA 4-26). → GO TO DD-TS-26

NO

NOTE
MAKE ALL TESTS WHILE READING ALTERNATE ONES & ZEROS WITH FIELD TEST UNIT.

USING SCOPE AT SLOT B10, CHECK:
- CHANNEL 1, PIN 03B.
- CHANNEL 2, PIN 05A.

ARE WAVEFORMS LIKE DIAGRAM AT RIGHT?

NO → 1. INSTALL NEW -RSV CARD IN SLOT B02 (PARA 426).
2. CYCLE UP & CHECK WAVEFORMS AGAIN.

ARE WAVEFORMS LIKE DIAGRAM ABOVE?

YES → D

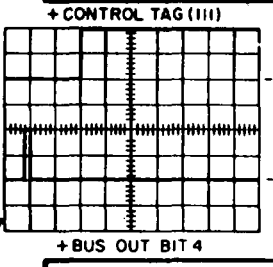
NO → INSTALL & ADJUST GROUND SPRING (PARA 4-37 & 4-38). → GO TO DD-TS-26

YES → INSTALL NEW -SLV CARD IN SLOT B10 (PARA 4-26). → GO TO DD-TS-26

CONTROLLER SENDING **ADDRESS MARK ENABLE** SIGNAL CONTINUOUSLY.

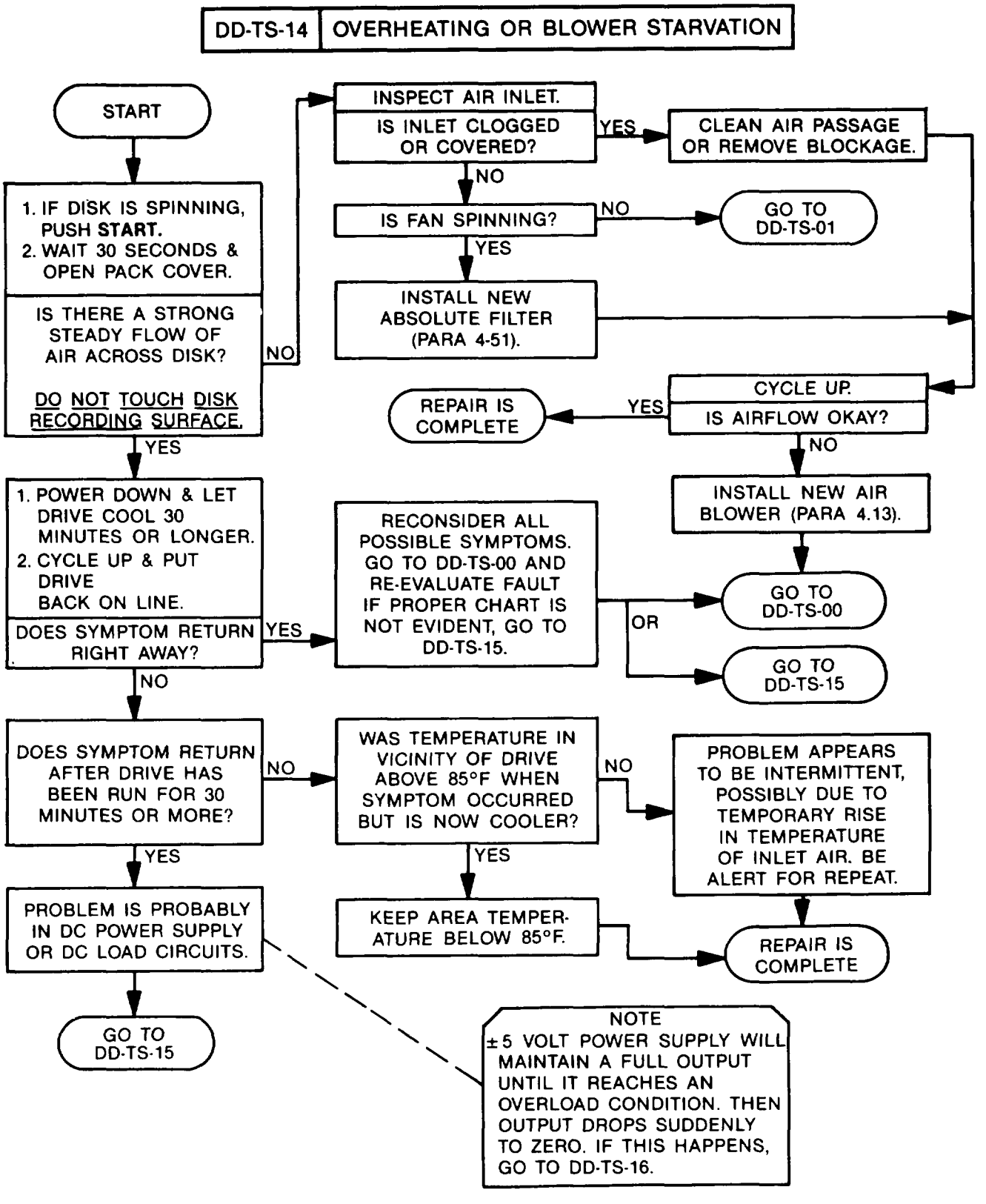
USING PROCEDURES IN SYSTEM MANUAL, RUN T&V'S TO ISOLATE FAULT.

GO TO SYSTEM MANUAL



OSCILLOSCOPE SETTINGS
LOGIC GND TO SCOPE GND

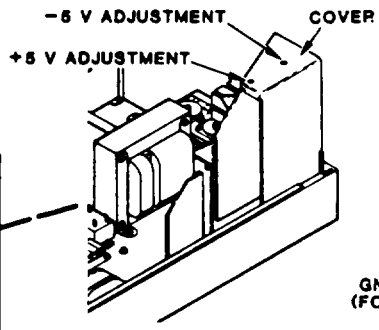
VOLTS/DIV	TIME/DIV
CH1 — 20MV/CM	A — 1 μS/CM
CH2 — 20MV/CM	B — 1μS/CM
VERTICAL	TRIGGERING
MODE — BLT	A — INTERNAL
	B — EXTERNAL

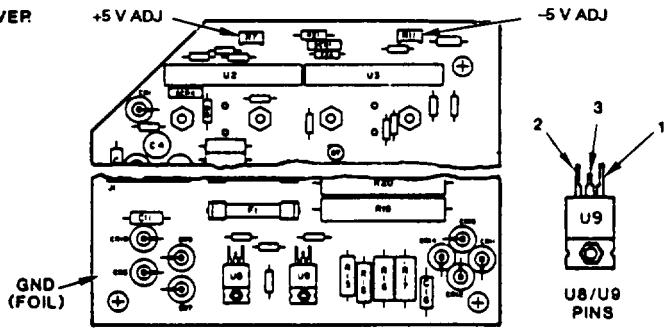

DD-TS-14
OVERHEATING OR BLOWER STARVATION
START
1. IF DISK IS SPINNING, PUSH START.
2. WAIT 30 SECONDS & OPEN PACK COVER.
IS THERE A STRONG STEADY FLOW OF AIR ACROSS DISK?
DO NOT TOUCH DISK RECORDING SURFACE.
NO
YES
INSPECT AIR INLET.
IS INLET CLOGGED OR COVERED?
YES
CLEAN AIR PASSAGE OR REMOVE BLOCKAGE.
NO
IS FAN SPINNING?
NO
GO TO DD-TS-01
YES
INSTALL NEW ABSOLUTE FILTER (PARA 4-51).
CYCLE UP.
IS AIRFLOW OKAY?
YES
REPAIR IS COMPLETE
NO
INSTALL NEW AIR BLOWER (PARA 4.13).
1. POWER DOWN & LET DRIVE COOL 30 MINUTES OR LONGER.
2. CYCLE UP & PUT DRIVE BACK ON LINE.
DOES SYMPTOM RETURN RIGHT AWAY?
YES
RECONSIDER ALL POSSIBLE SYMPTOMS. GO TO DD-TS-00 AND RE-EVALUATE FAULT IF PROPER CHART IS NOT EVIDENT, GO TO DD-TS-15.
GO TO DD-TS-00
OR
GO TO DD-TS-15
NO
DOES SYMPTOM RETURN AFTER DRIVE HAS BEEN RUN FOR 30 MINUTES OR MORE?
NO
WAS TEMPERATURE IN VICINITY OF DRIVE ABOVE 85°F WHEN SYMPTOM OCCURRED BUT IS NOW COOLER?
NO
PROBLEM APPEARS TO BE INTERMITTENT, POSSIBLY DUE TO TEMPORARY RISE IN TEMPERATURE OF INLET AIR. BE ALERT FOR REPEAT.
YES
YES
PROBLEM IS PROBABLY IN DC POWER SUPPLY OR DC LOAD CIRCUITS.
KEEP AREA TEMPERATURE BELOW 85°F.
REPAIR IS COMPLETE
GO TO DD-TS-15
NOTE
±5 VOLT POWER SUPPLY WILL MAINTAIN A FULL OUTPUT UNTIL IT REACHES AN OVERLOAD CONDITION. THEN OUTPUT DROPS SUDDENLY TO ZERO. IF THIS HAPPENS, GO TO DD-TS-16.

DD-TS-15	VOLTAGE FAULT INDICATOR LIT	1 OF 5

START

1. SET POWER SUPPLY BREAKER TO OFF.
2. REMOVE SCREW & PLASTIC COVER.
3. RAISE LOGIC CHASSIS TO MAINTENANCE POSITION (PARA 4-25).
4. MAKE SURE P2/J2 ON LOGIC CHASSIS IS CONNECTED.
5. SET POWER SUPPLY BREAKER TO ON.
6. USING VOLTMETER, MEASURE VOLTAGES (SEE 5V & 20V FASTONS ON LOGIC CHASSIS BACK PANEL IN DD-TS-04).

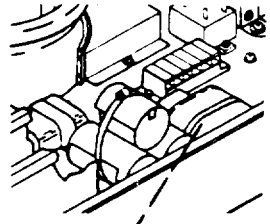




NORMAL LOAD VOLTAGES			
VOLTAGE TO BE CHECKED	VOLT-OHMMETER CONNECTIONS		VOLTAGE READINGS ± (TOLERANCE)
	+ PROBE	– PROBE	
+5	+5 FASTON	EITHER END	+5.1 (±0.05)
–5	–5 FASTON	FASTON ON	–5.1 (±0.05)
+12	U9-PIN 2	LOGIC CHASSIS	+12 (±2)
–12	U8-PIN 2	OR GND (FOIL)	–12 (±2)
+20	+20 FASTON	OF -XKV	+20 (±2)
–20	–20 FASTON	CARD	–20 (±2)
+42	FUSE F3	(FIG. T5-1	+42 (±2)
–42	FUSE F4		–42 (±2)

ARE ±5 VOLTAGES WITHIN TOLERANCE?
- NO → ADJUST +5V & –5V (PARA 4-19).
- YES → ARE ±12 ±20 & ±42 VOLTAGES ALL TOO LOW?

CAN ±5 VOLTAGES BE ADJUSTED WITHIN TOLERANCES?
- NO → B
- YES → RETURN TO START

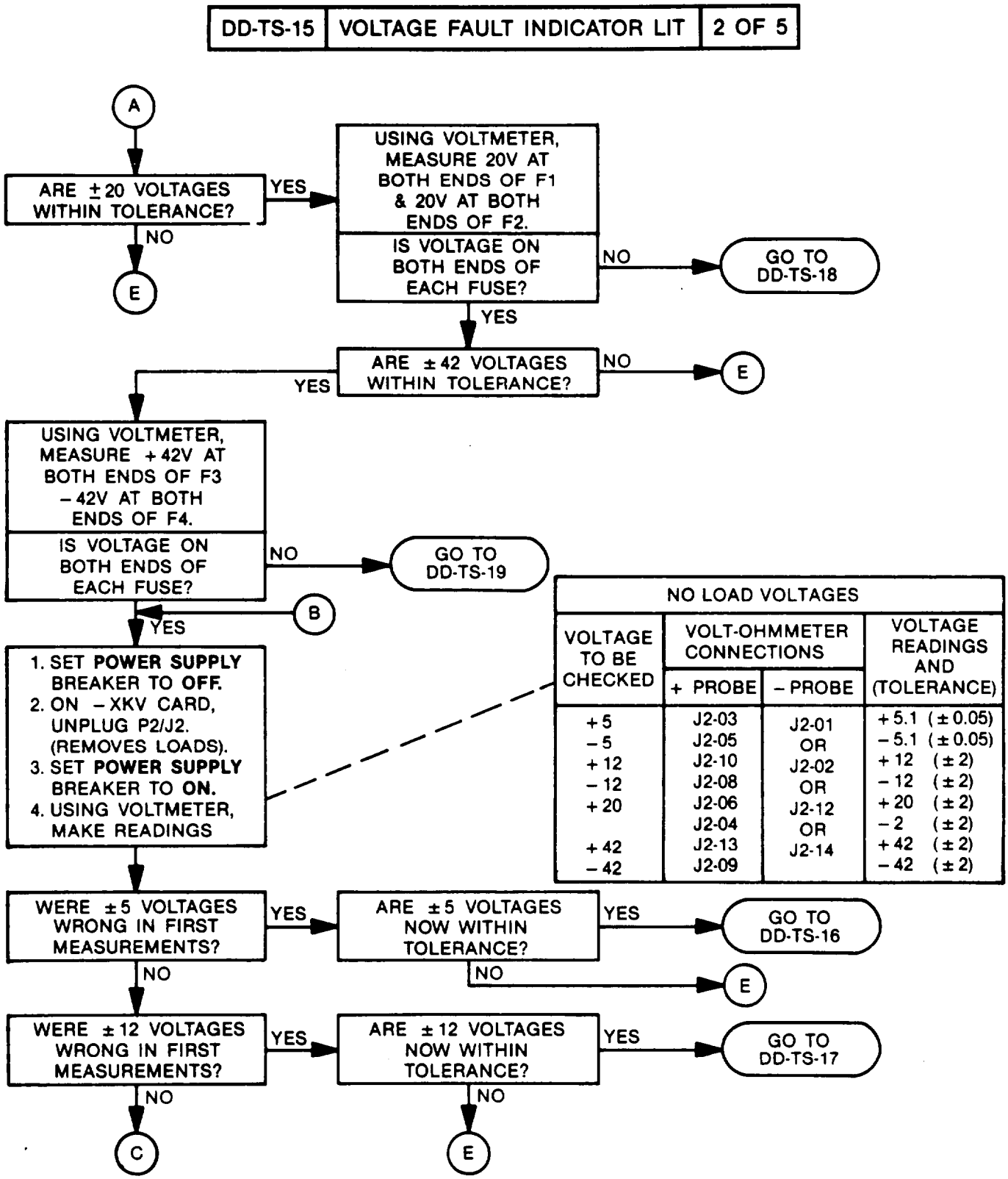


ARE ±12 ±20 & ±42 VOLTAGES ALL TOO LOW?
- YES → WARNING: TRANSFORMER TUNING CAPACITOR IS CHARGED TO 440 VOLTS.
  1. POWER DOWN.
  2. DISCHARGE TRANSFORMER TUNING CAPACITOR.
  3. INSTALL NEW CAPACITOR (PARA 4-21).
  1. SET AC POWER BREAKER TO ON.
  2. RECHECK VOLTAGES.

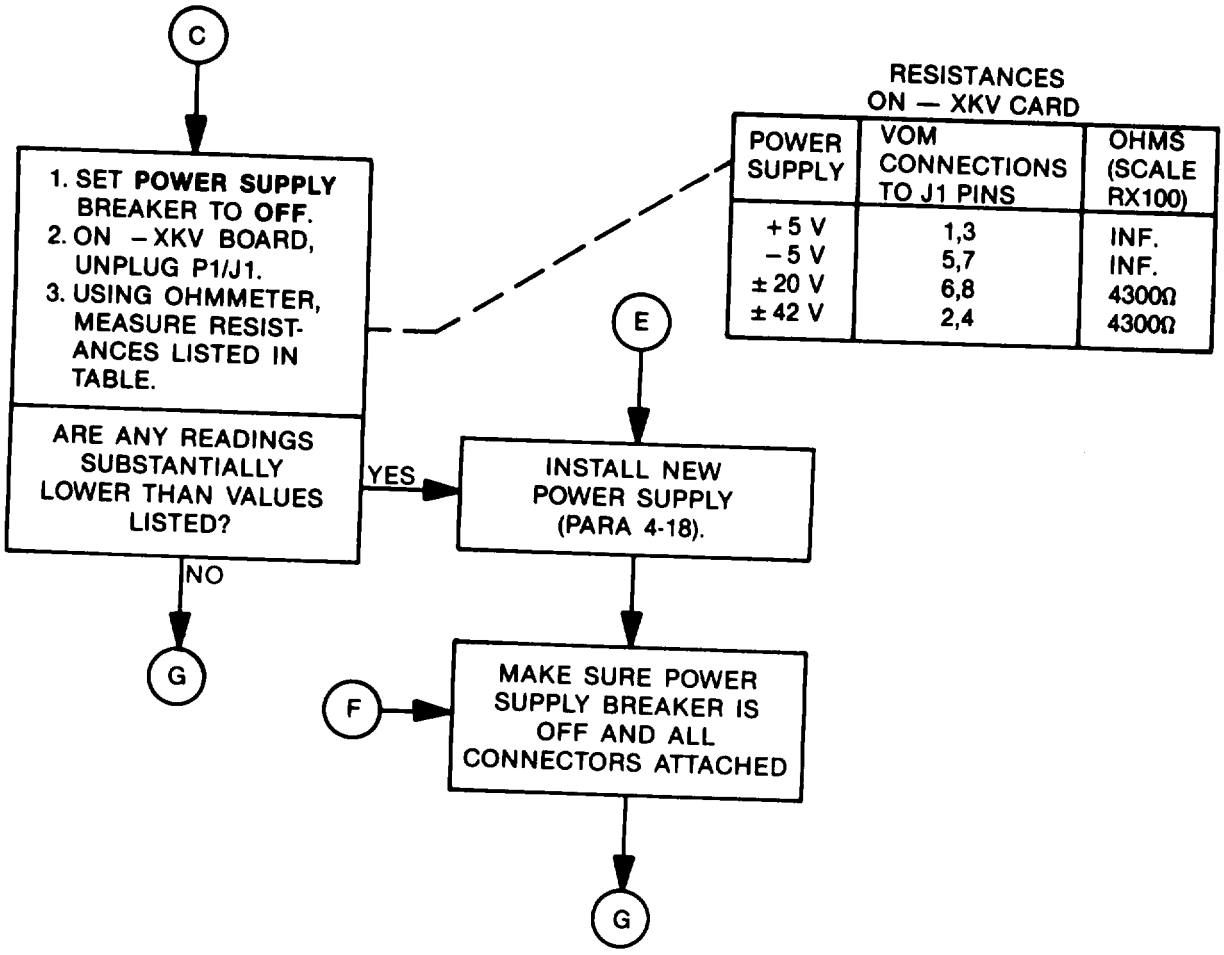
ARE ALL VOLTAGES WITHIN TOLERANCE?
- NO → C
- YES → GO TO DD-TS-26

DID ±12 VOLTAGES READ 7 TO 9 VOLTS OR FLUCTUATE BETWEEN 0V & 12V?
- YES → PROBABLE FAULT, IN DC LOAD CIRCUITRY. → B

ARE ±12 VOLTAGES READING ZERO?
- YES → OVERLOAD CUTOFF DUE TO SHORT IN LOGIC BOARD(S). → B
- NO → A


DD-TS-15
VOLTAGE FAULT INDICATOR LIT
2 OF 5
A
ARE ±20 VOLTAGES WITHIN TOLERANCE?
YES
NO
E
USING VOLTMETER, MEASURE 20V AT BOTH ENDS OF F1 & 20V AT BOTH ENDS OF F2.
IS VOLTAGE ON BOTH ENDS OF EACH FUSE?
NO
GO TO DD-TS-18
YES
ARE ±42 VOLTAGES WITHIN TOLERANCE?
NO
E
YES
USING VOLTMETER, MEASURE +42V AT BOTH ENDS OF F3 −42V AT BOTH ENDS OF F4.
IS VOLTAGE ON BOTH ENDS OF EACH FUSE?
NO
GO TO DD-TS-19
B
YES
1. SET POWER SUPPLY BREAKER TO OFF.
2. ON −XKV CARD, UNPLUG P2/J2. (REMOVES LOADS).
3. SET POWER SUPPLY BREAKER TO ON.
4. USING VOLTMETER, MAKE READINGS
NO LOAD VOLTAGES
VOLTAGE TO BE CHECKED
VOLT-OHMMETER CONNECTIONS
+ PROBE
− PROBE
VOLTAGE READINGS AND (TOLERANCE)
+5 J2-03 J2-01 OR J2-02 +5.1 (±0.05)
−5 J2-05 OR J2-02 −5.1 (±0.05)
+12 J2-10 OR J2-02 +12 (±2)
−12 J2-08 OR J2-02 −12 (±2)
+20 J2-06 OR J2-12 +20 (±2)
J2-04 OR J2-12 −2 (±2)
+42 J2-13 OR J2-14 +42 (±2)
−42 J2-09 −42 (±2)
WERE ±5 VOLTAGES WRONG IN FIRST MEASUREMENTS?
YES
ARE ±5 VOLTAGES NOW WITHIN TOLERANCE?
YES
GO TO DD-TS-16
NO
E
NO
WERE ±12 VOLTAGES WRONG IN FIRST MEASUREMENTS?
YES
ARE ±12 VOLTAGES NOW WITHIN TOLERANCE?
YES
GO TO DD-TS-17
NO
C
NO
E

DD-TS-15	VOLTAGE FAULT INDICATOR LIT	3 OF 5



RESISTANCES ON — XKV CARD

POWER SUPPLY	VOM CONNECTIONS TO J1 PINS	OHMS (SCALE RX100)
+5 V	1,3	INF.
–5 V	5,7	INF.
±20 V	6,8	4300Ω
±42 V	2,4	4300Ω

DD-TS-15	VOLTAGE FAULT INDICATOR LIT	4 OF 5

(G)

FAULT CAN APPEAR TO BE IN TUNING TRANSFORMER, BUT MIGHT BE IN BOARD OF POWER SUPPLY. VERIFY WITH SCOPE.

1. RECONNECT P1/J1. (SEE SHEET 1).
2. SET UP SCOPE
3. SET **POWER SUPPLY** BREAKER TO **ON**.
4. CONNECT PROBE OF SCOPE TO ONE LEAD OF C1
5. SET TIME/DIV CONTROL FOR SQUARE WAVE
6. MEASURE & WRITE DOWN VOLTAGE E FROM SCOPE GROUND REFERENCE LINE TO TOP & BOTTOM PLATEAUS OF SQUARE WAVE. (2 READINGS).
7. MOVE PROBE TO OTHER CAPACITOR LEAD. REPEAT STEP 6.
8. REPEAT STEPS 6 & 7 FOR C7.
9. REPEAT STEPS 6 & 7 FOR C11.
10. REPEAT STEPS 6 & 7 FOR C16.

ARE WAVEFORMS IN STEPS 6 THRU 10 SYMMETRICAL ABOUT GROUND REFERENCE LINE; AND ARE VOLTAGES WITHIN TOLERANCE? (IF IN DOUBT, PROCEED TO (D).)

NO → (D)

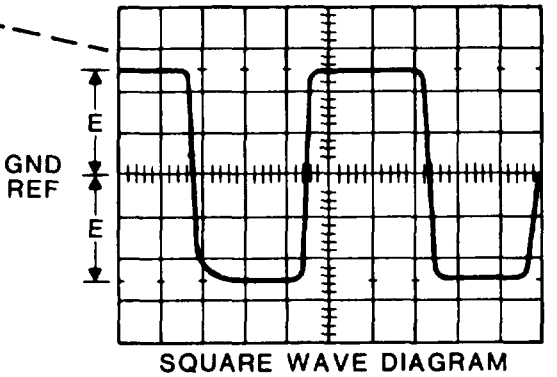
YES → (E)

OSCILLOSCOPE SETTINGS

CM 1 VOLTS/DIV: ±5V E = 11V
±20V E = 2V
±42V E = 44V
SET TIME/DIV FOR BEST TRACE
CM 1 TRIGGERING: (XI PROBE) — LINE

SCOPE CONNECTIONS & READINGS

SUPPLY TO BE CHECKED FOR AC INPUT	SCOPE CONNECTIONS		AC INPUT VOLTAGES (CHECK EACH SIDE OF INPUT CAPACITOR)
	– PROBE (AC INPUT)	– PROBE (GROUND)	
+5V	C1	GROUND-PLANE FOIL OF XKV BOARD	11 V ±1 V
–5V	C7		11 V ±2 V
±20V	C11		22 V ±1 V
±42V	C16		44 V ±2 V



SQUARE WAVE DIAGRAM

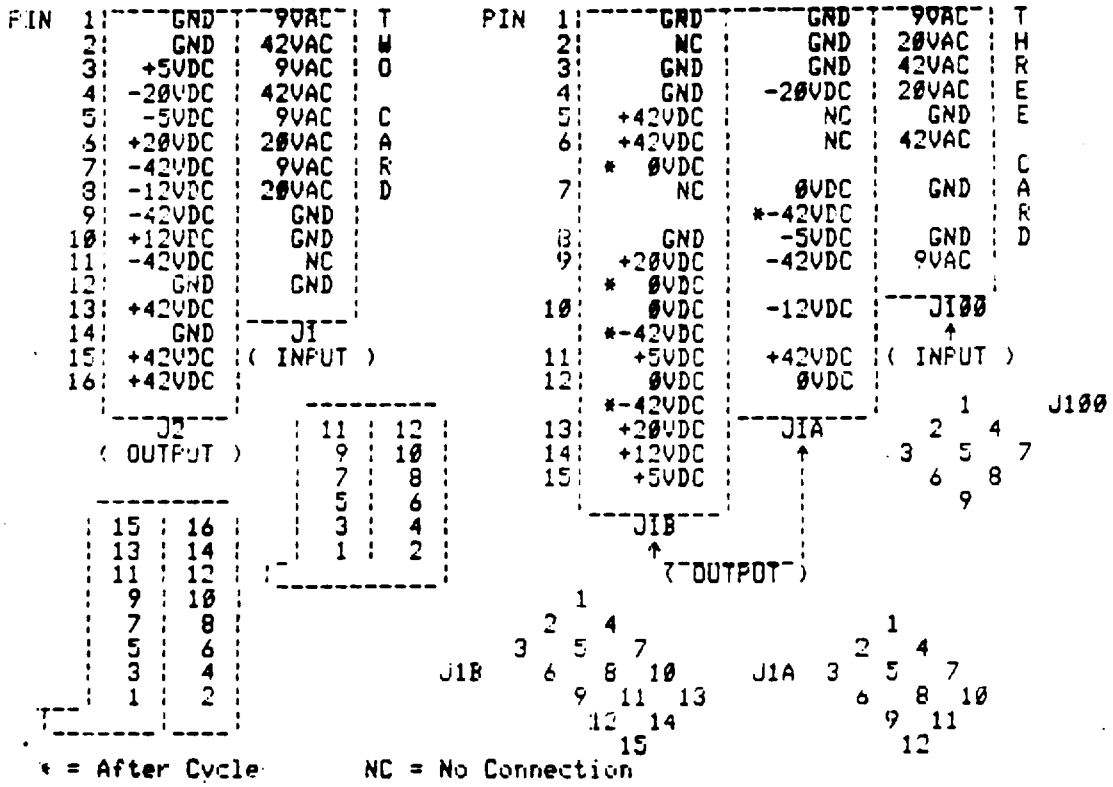


Figure 4-1.1. Power Supply Connection Diagram

DD-TS-15	VOLTAGE FAULT INDICATOR LIT	5 OF 5

D

FOLLOWING STEP MAY BE USED TO CONFIRM IF SCOPE READINGS ARE NOT CLEAR CUT.

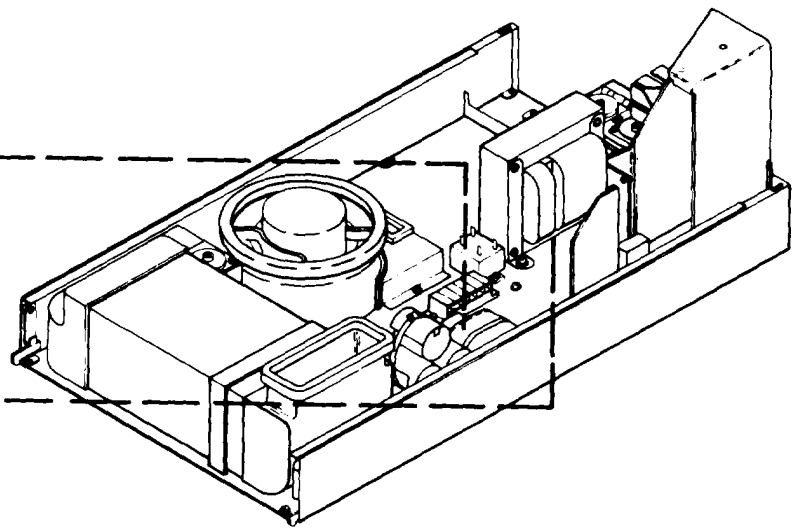
USING A VOLTMETER, RECHECK VOLTAGE READINGS OF STEPS 6 THRU 10. (VOLTAGES WILL BE LOWER RMS VALUES COMPARED WITH PEAK VOLTAGES ON SCOPE.).

ARE VOLTAGES SAME ON BOTH SIDES OF EACH CAPACITOR?

YES → MAKE SURE FUSES ARE GOOD AND CONNECTORS ARE CONNECTED. → GO TO DD-TS-26

NO

WARNING
TUNING CAPACITOR IS CHARGED TO 440 VOLTS. DISCHARGE IT BEFORE YOU DO NEXT STEP.



INSTALL NEW TRANSFORMER (PARA 4-15).

MAKE SURE FUSES ARE GOOD AND ALL CONNECTORS ATTACHED. → G

DD-TS-16	FAULT IN ±5 VOLT LOAD CIRCUITS	1 OF 2

START

CHECK LOGIC CHASSIS:

1. SET **POWER SUPPLY** BREAKER TO **OFF.**
2. UNPLUG WIRE 3 FROM RUN TRIAC (PARA 4-16).
3. UNPLUG WIRE 3 FROM SOLID STATE SWITCH (PARA 4-35).
4. UNPLUG PA80/JA80 AND PA81/JA81.
5. SET **POWER SUPPLY** BREAKER TO **ON.**
6. USING VOLTMETER, MEASURE +5 VOLTS AT LOGIC CHASSIS FASTONS. (SHEET 3, DD-TS-04).

IS +5V PRESENT AT BOTH WIRES?

YES

NO

1. SET **POWER SUPPLY** BREAKER TO **OFF.**
2. CONNECT PA81/JA81.
3. CONNECT PA80/JA80.
4. CONNECT WIRE 3 ON SOLID STATE SWITCH.

GO TO DD-TS-20

ADD CONTROL PANEL TO LOAD CIRCUITRY:

1. SET **POWER SUPPLY** BREAKER TO **OFF.**
2. CONNECT PA80/JA80 ON LOGIC CHASSIS.
3. SET **POWER SUPPLY** BREAKER TO **ON.**
4. MEASURE VOLTAGES AT ±5V FASTONS.

ARE ±5V PRESENT?

NO

INSTALL NEW CONTROL PANEL (PARA 4-49).

GO TO DD-TS-26

YES

1. SET **POWER SUPPLY** BREAKER TO **OFF.**
2. RECONNECT WIRE ON SOLID STATE SWITCH
3. SET **POWER SUPPLY** BREAKER TO **ON.**
4. MEASURE VOLTAGES AT ±5V FASTONS.

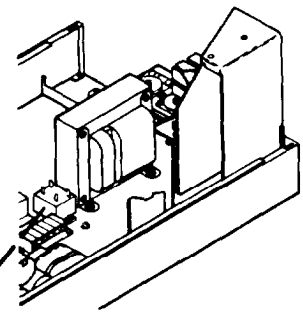
ARE ±5V PRESENT?

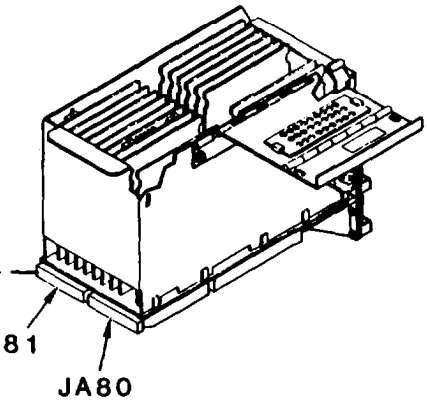
NO

INSTALL NEW RUN TRIAC (PARA 4-16).

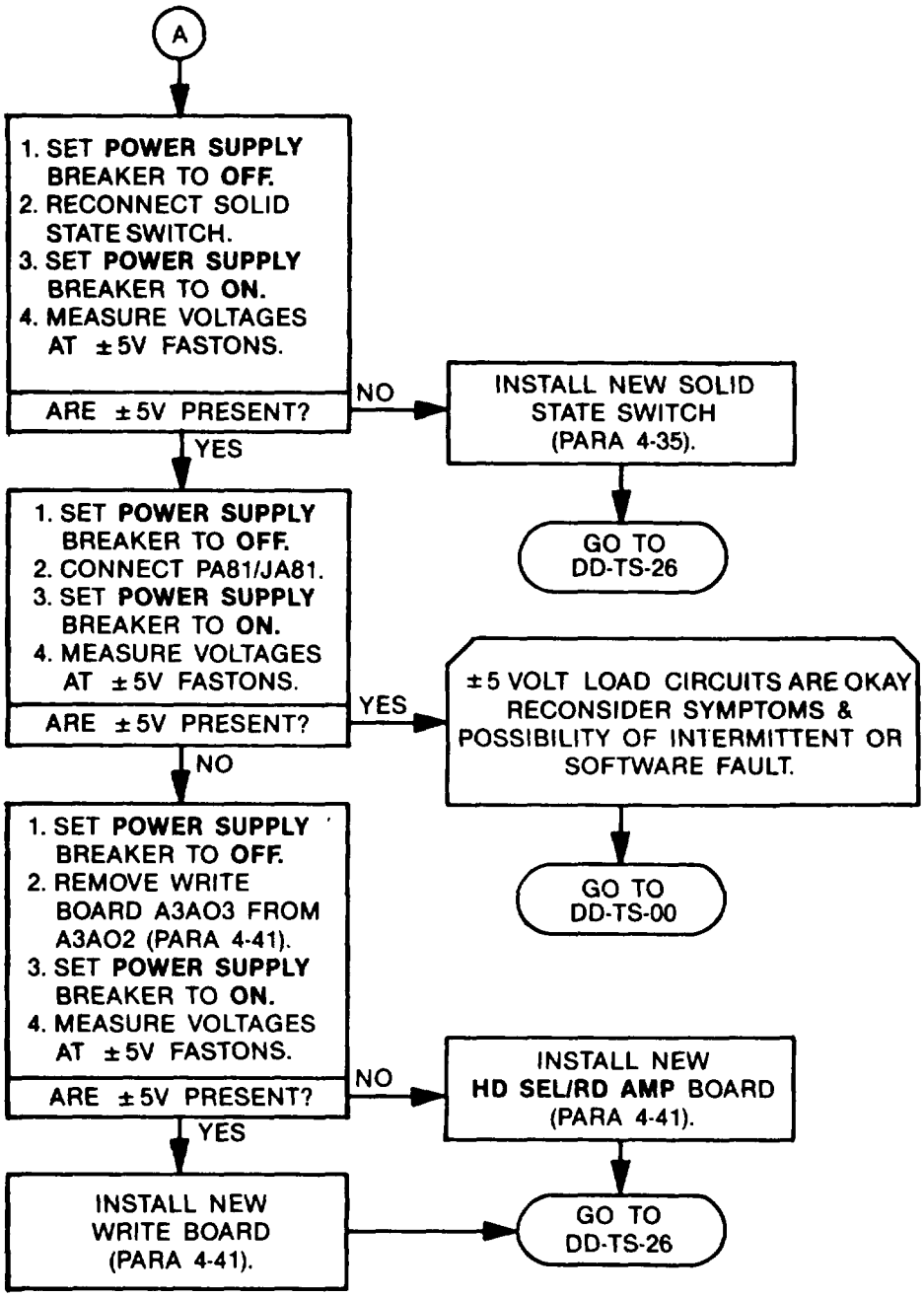
YES

A

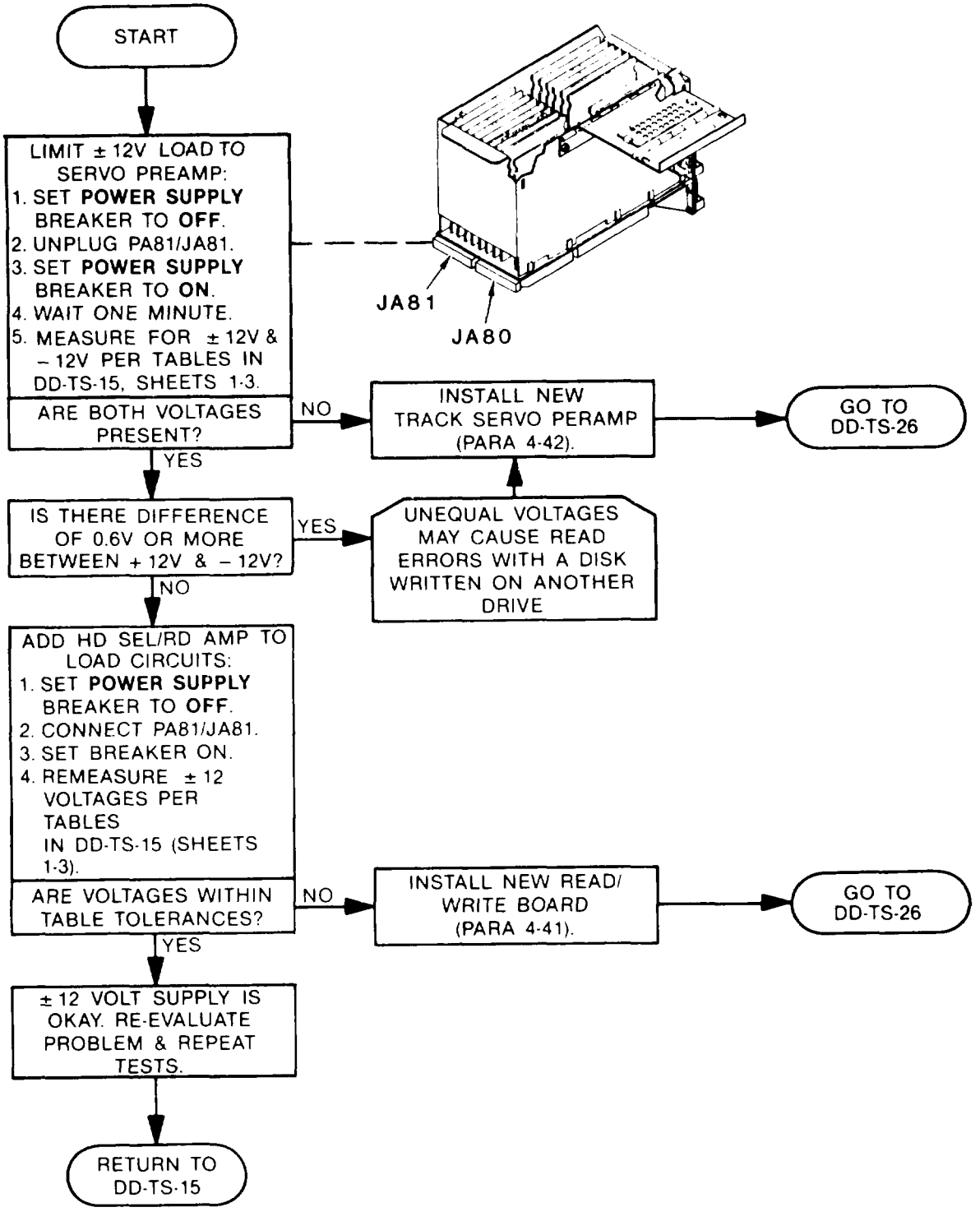




DD-TS-16	FAULT IN ±5 VOLT LOAD CIRCUITS	2 OF 2



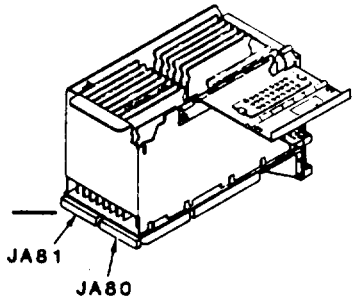
DD-TS-17 | FAULT IN ±12 VOLT LOAD CIRCUITS



DD-TS-18 FAULT IN ±20 VOLT LOAD CIRCUITS

START

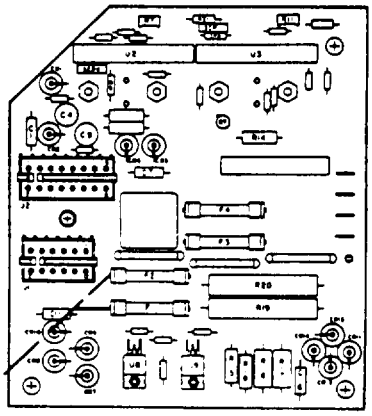
UNPLUG ±20V LOADS EXCEPT LOGIC CHASSIS.
1. SET **POWER SUPPLY** BREAKER TO **OFF.**
2. UNPLUG PA81/JA81.
3. MAKE SURE F1 & F2 ARE BOTH GOOD.
4. SET **POWER SUPPLY** BREAKER TO **ON.**
5. MEASURE FOR +20V AT BOTH ENDS OF F1 & −20V AT BOTH ENDS OF F2.



IS THERE VOLTAGE AT BOTH ENDS OF BOTH FUSES?

NO

1. SET **POWER SUPPLY** BREAKER TO **OFF.**
2. CONNECT PA81/JA81.
3. INSTALL NEW FUSE WHERE VOLTAGE IS NOT PRESENT AT ONE END.



POWER SUPPLY BOARD

GO TO Ⓐ ON DD-TS-16

YES

ADD READ/WRITE LOGIC CARDS TO ±20V LOAD:
1. SET **POWER SUPPLY** BREAKER TO **OFF.**
2. RECONNECT PA81/JA81.
3. SET **POWER SUPPLY** BREAKER TO **ON.**

DID F1 20V BLOW?

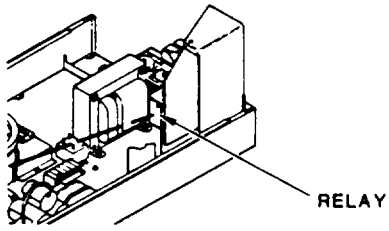
YES

INSTALL NEW READ/ WRITE LOGIC BOARDS (PARA 4-41).

GO TO Ⓕ ON DD-TS-15

NO

1. POWER OFF.
2. USING OHMMETER, MEASURE FOR SHORT OR GROUND FAULT IN COIL OF EMERGENCY RETRACT RELAY BOARD.



IS COIL SHORTED OR GROUNDED?

NO

INSTALL NEW BRAKE ASSEMBLY (PARA 4-40).

GO TO DD-TS-26

YES

INSTALL NEW EMERGENCY RETRACT RELAY (PARA 4-18).

GO TO DD-TS-00

DD-TS-19	FAULT IN ±42 VOLT LOAD CIRCUITS	1 OF 2

START

LIMIT LOADS TO SERVO CAPACITORS
1. SET **POWER SUPPLY** BREAKER TO **OFF.**
2. UNPLUG P200/J200
3. SET **POWER SUPPLY** BREAKER TO **ON.**
4. CHECK F3 & F4 BY MEASURING VOLTAGE AT EACH END.

IS VOLTAGE AT BOTH ENDS OF F3 (+42V)?

NO → INSTALL NEW SERVO CAPACITOR (C1) (PARA 4-29).

YES

IS VOLTAGE AT BOTH ENDS OF F4 (−42V)?

NO → INSTALL NEW SERVO CAPACITOR (C2) (PARA 4-20).

YES

ADD POWER AMP TO ±42V LOADS:
1. SET **POWER SUPPLY** BREAKER TO **OFF.**
2. REMOVE PA09 FROM W/W PINS SLOT A09 ON LOGIC CHASSIS.
3. RECONNECT P200/J200
4. SET **POWER SUPPLY** BREAKER TO **ON.**
5. CHECK F3 & F4 BY MEASURING VOLTAGE AT EACH END.

IS VOLTAGE AT BOTH ENDS OF F3 (+42V). & BOTH ENDS OF F4 (−42V)?

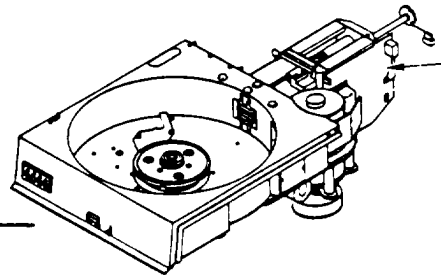
NO → INSTALL NEW A2A04 POWER AMP (PARA 4-43). → GO TO Ⓕ ON DD-TS-15

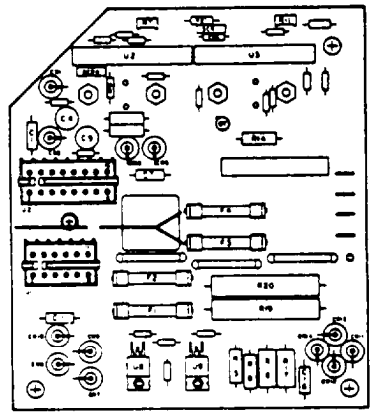
YES

ADD LOGIC CHASSIS TO ±42V LOADS:
1. SET **POWER SUPPLY** BREAKER TO **OFF.**
2. RECONNECT PA09/JA09.
3. UNPLUG PA81/JA81.
4. SET **POWER SUPPLY** BREAKER TO **ON.**

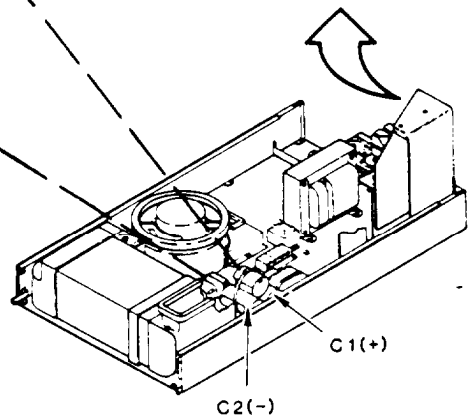
→ (A)

GO TO Ⓕ ON DD-TS-15

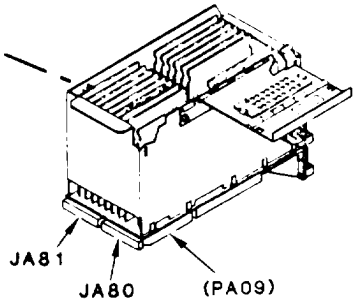


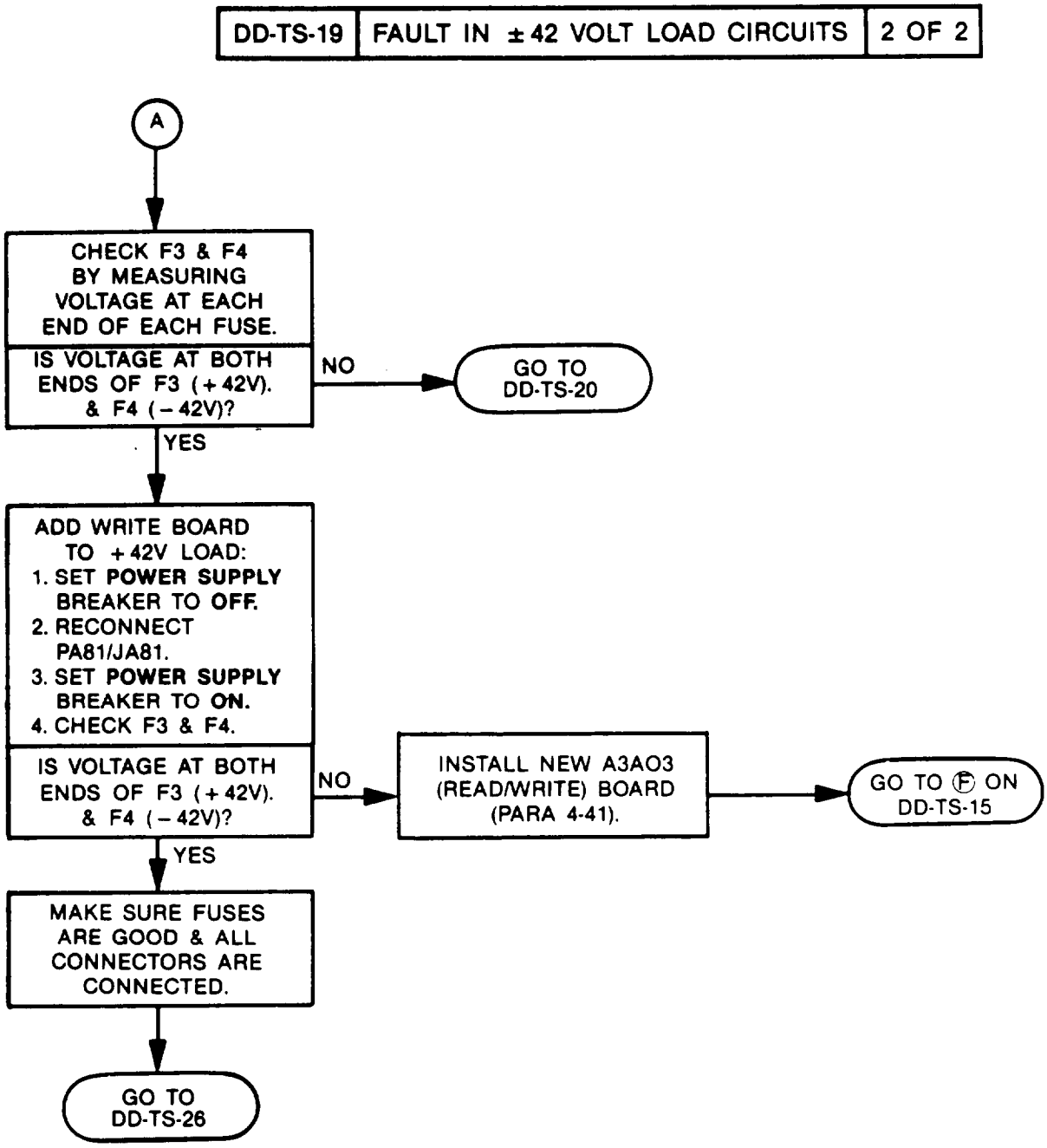


-XXV POWER SUPPLY BOARD



SERVO CAPACITORS




DD-TS-19
FAULT IN ±42 VOLT LOAD CIRCUITS
2 OF 2
A
CHECK F3 & F4 BY MEASURING VOLTAGE AT EACH END OF EACH FUSE.
IS VOLTAGE AT BOTH ENDS OF F3 (+42V). & F4 (−42V)?
NO
GO TO DD-TS-20
YES
ADD WRITE BOARD TO +42V LOAD:
1. SET POWER SUPPLY BREAKER TO OFF.
2. RECONNECT PA81/JA81.
3. SET POWER SUPPLY BREAKER TO ON.
4. CHECK F3 & F4.
IS VOLTAGE AT BOTH ENDS OF F3 (+42V). & F4 (−42V)?
NO
INSTALL NEW A3AO3 (READ/WRITE) BOARD (PARA 4-41).
GO TO (F) ON DD-TS-15
YES
MAKE SURE FUSES ARE GOOD & ALL CONNECTORS ARE CONNECTED.
GO TO DD-TS-26

DD-TS-20	VOLTAGE FAULT IN LOGIC CIRCUITS	1 OF 2

START

1. SET **POWER SUPPLY** BREAKER TO **OFF.**
2. UNPLUG P200/J200.
3. SET **POWER SUPPLY** BREAKER TO **ON.**
4. USING VOLTMETER, MEASURE FOR +42V AT BOTH ENDS OF F3 & −42V AT BOTH ENDS OF F4.

IS +42V AT BOTH ENDS OF F3?

NO → INSTALL NEW SERVO CAPACITOR (C1) (PARA 4-20).

YES

IS 42V AT BOTH ENDS OF F4?

NO → INSTALL NEW SERVO CAPACITOR (C2) (PARA 4-20).

INSTALL NEW SERVO CAPACITOR (C1) (PARA 4-20). → GO TO Ⓕ ON DD-TS-15

YES

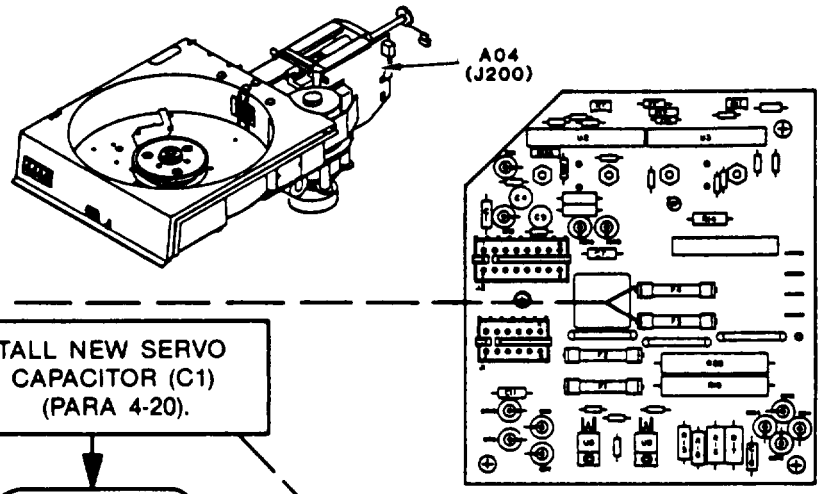
1. SET **POWER SUPPLY** BREAKER TO **OFF.**
2. UNPLUG PA09/JA-9 ON LOGIC CHASSIS
3. CONNECT P200/J200.
4. SET **POWER SUPPLY** BREAKER TO **ON.**
5. MEASURE FOR +42V AT BOTH ENDS OF F3 & −42V AT BOTH ENDS OF F4.

IS VOLTAGE AT BOTH ENDS OF BOTH FUSES

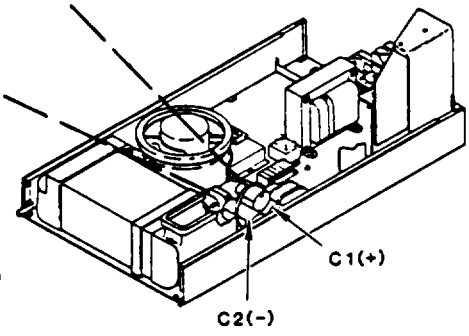
NO → INSTALL NEW A3AO4 POWER AMP (PARA 4-43). → GO TO Ⓕ ON DD-TS-15

YES

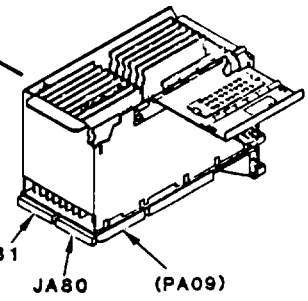
1. SET **POWER SUPPLY** BREAKER TO **OFF.**
2. CONNECT PA09/JA09.
3. UNPLUG PA80/JA80 AND PA81/JA81. (MAKE CERTAIN ALL OTHER CONNECTORS PROPERLY MATED.).
4. REMOVE BOARDS FROM LOGIC CHASSIS FOR VOLTAGE YOU ARE CHECKING (PARA 4-26). → (A)



POWER SUPPLY BOARD

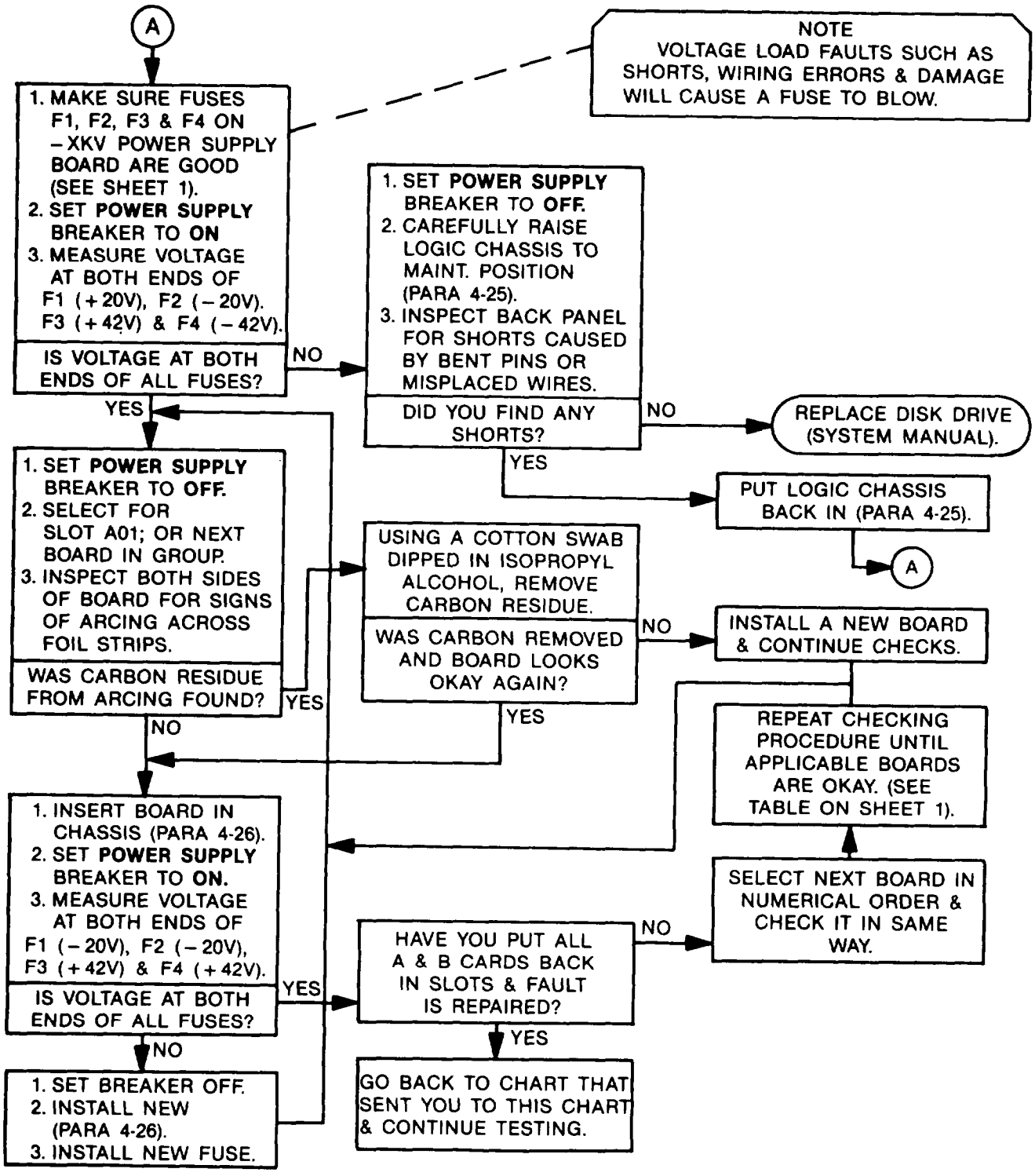


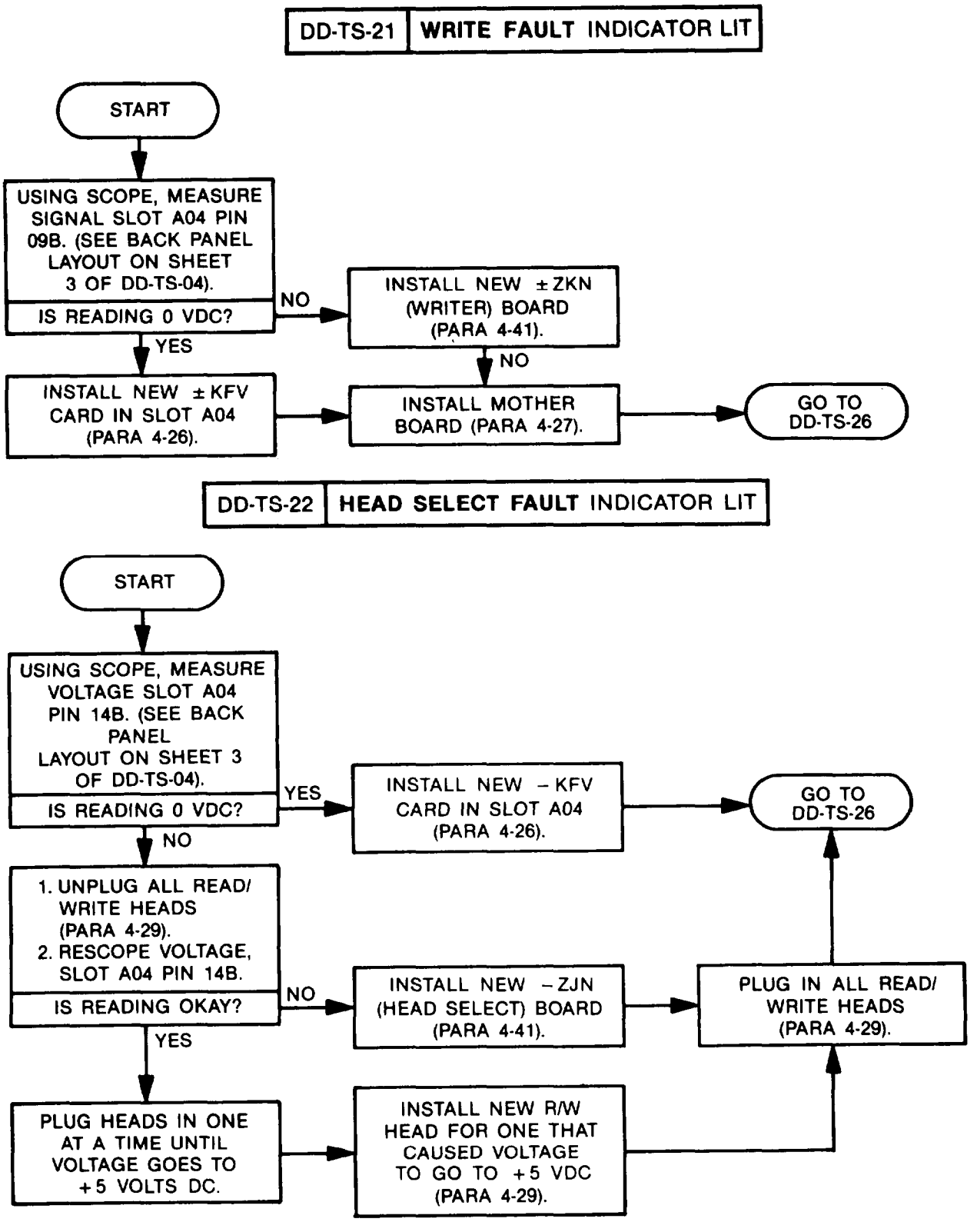
SERVO CAPACITORS

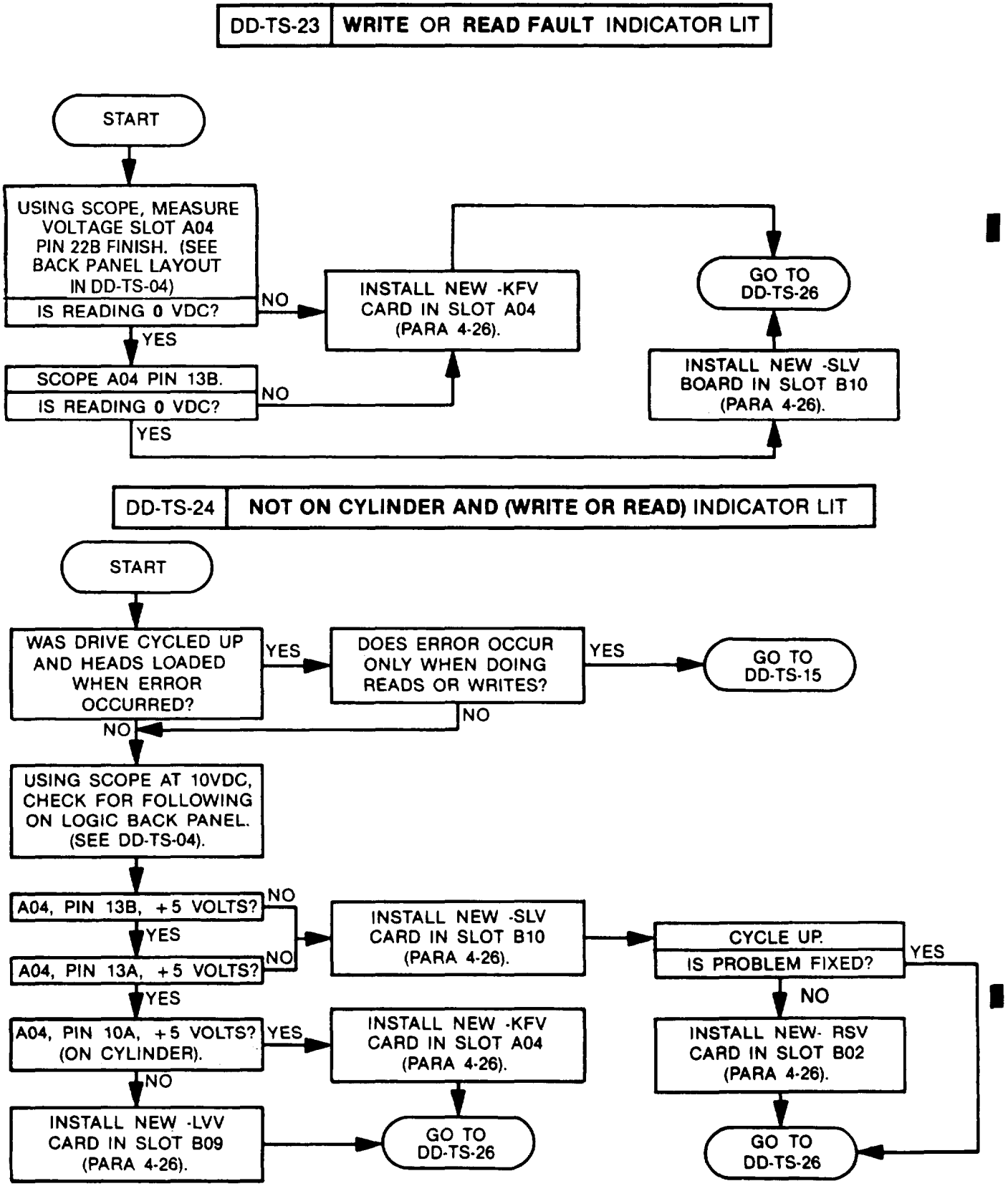


VOLTAGE TO BE CHECKED	REMOVE BOARDS FROM SLOTS	
	A GROUP	B GROUP
±5V	A01 THRU A10	B01 THRU B10
±12V	NONE	NONE
±20V	A01 THRU A10	NONE
±42V	A04, A09, A10	NONE

DD-TS-20	VOLTAGE FAULT IN LOGIC CIRCUITS	2 OF 2




DD-TS-21 WRITE FAULT INDICATOR LIT
START
USING SCOPE, MEASURE SIGNAL SLOT A04 PIN 09B. (SEE BACK PANEL LAYOUT ON SHEET 3 OF DD-TS-04).
IS READING 0 VDC?
NO
INSTALL NEW ±ZKN (WRITER) BOARD (PARA 4-41).
YES
NO
INSTALL NEW ±KFV CARD IN SLOT A04 (PARA 4-26).
INSTALL MOTHER BOARD (PARA 4-27).
GO TO DD-TS-26
DD-TS-22 HEAD SELECT FAULT INDICATOR LIT
START
USING SCOPE, MEASURE VOLTAGE SLOT A04 PIN 14B. (SEE BACK PANEL LAYOUT ON SHEET 3 OF DD-TS-04).
IS READING 0 VDC?
YES
INSTALL NEW −KFV CARD IN SLOT A04 (PARA 4-26).
GO TO DD-TS-26
NO
1. UNPLUG ALL READ/ WRITE HEADS (PARA 4-29).
2. RESCOPE VOLTAGE, SLOT A04 PIN 14B.
IS READING OKAY?
NO
INSTALL NEW −ZJN (HEAD SELECT) BOARD (PARA 4-41).
PLUG IN ALL READ/ WRITE HEADS (PARA 4-29).
YES
PLUG HEADS IN ONE AT A TIME UNTIL VOLTAGE GOES TO +5 VOLTS DC.
INSTALL NEW R/W HEAD FOR ONE THAT CAUSED VOLTAGE TO GO TO +5 VDC (PARA 4-29).


DD-TS-23
WRITE OR READ FAULT INDICATOR LIT
START
USING SCOPE, MEASURE VOLTAGE SLOT A04 PIN 22B FINISH. (SEE BACK PANEL LAYOUT IN DD-TS-04)
IS READING 0 VDC?
NO
YES
INSTALL NEW -KFV CARD IN SLOT A04 (PARA 4-26).
SCOPE A04 PIN 13B.
IS READING 0 VDC?
NO
YES
INSTALL NEW -SLV BOARD IN SLOT B10 (PARA 4-26).
GO TO DD-TS-26
DD-TS-24
NOT ON CYLINDER AND (WRITE OR READ) INDICATOR LIT
START
WAS DRIVE CYCLED UP AND HEADS LOADED WHEN ERROR OCCURRED?
YES
NO
DOES ERROR OCCUR ONLY WHEN DOING READS OR WRITES?
YES
NO
GO TO DD-TS-15
USING SCOPE AT 10VDC, CHECK FOR FOLLOWING ON LOGIC BACK PANEL. (SEE DD-TS-04).
A04, PIN 13B, +5 VOLTS?
NO
YES
A04, PIN 13A, +5 VOLTS?
NO
YES
A04, PIN 10A, +5 VOLTS? (ON CYLINDER).
YES
NO
INSTALL NEW -SLV CARD IN SLOT B10 (PARA 4-26).
INSTALL NEW -KFV CARD IN SLOT A04 (PARA 4-26).
INSTALL NEW -LVV CARD IN SLOT B09 (PARA 4-26).
GO TO DD-TS-26
CYCLE UP.
IS PROBLEM FIXED?
YES
NO
INSTALL NEW- RSV CARD IN SLOT B02 (PARA 4-26).
GO TO DD-TS-26

DD-TS-25 | MISSING AC VOLTAGES

START

1. SET VOLTMETER TO MEASURE AT LEAST 150 VAC.
2. MEASURE OUTPUT VOLTAGES OF THE AC TRANSFORMER AT REAR OF P1.

ARE VOLTAGES OKAY?

YES → ADJUST ±5VDC (PARA 4-19). → GO TO DD-TS-26

NO

1. RAISE DECK (PARA 4-12).
2. CHECK INPUT VOLTAGE TO AC TRANSFORMER AT TB1 FOR 120 VAC.

IS INPUT VOLTAGE OKAY?

YES → INSTALL NEW AC TRANSFORMER (PARA 4-15). → GO TO DD-TS-26

NO

CHECK OUTPUT OF CB2 FOR 120 VAC

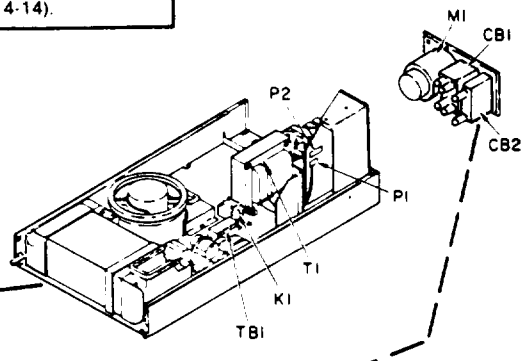
IS OUTPUT VOLTAGE OKAY?

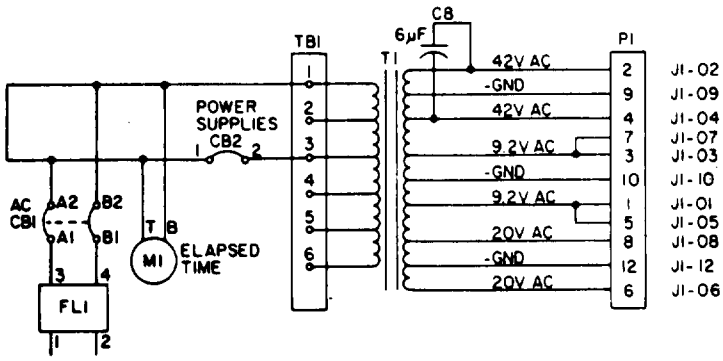
YES → CHECK TB1 AND WIRING FROM CB2 FOR POSSIBLE DAMAGE OR LOOSE CONNECTIONS REPLACE TB1 IF BAD (PARA 4-14). → GO TO DD-TS-26

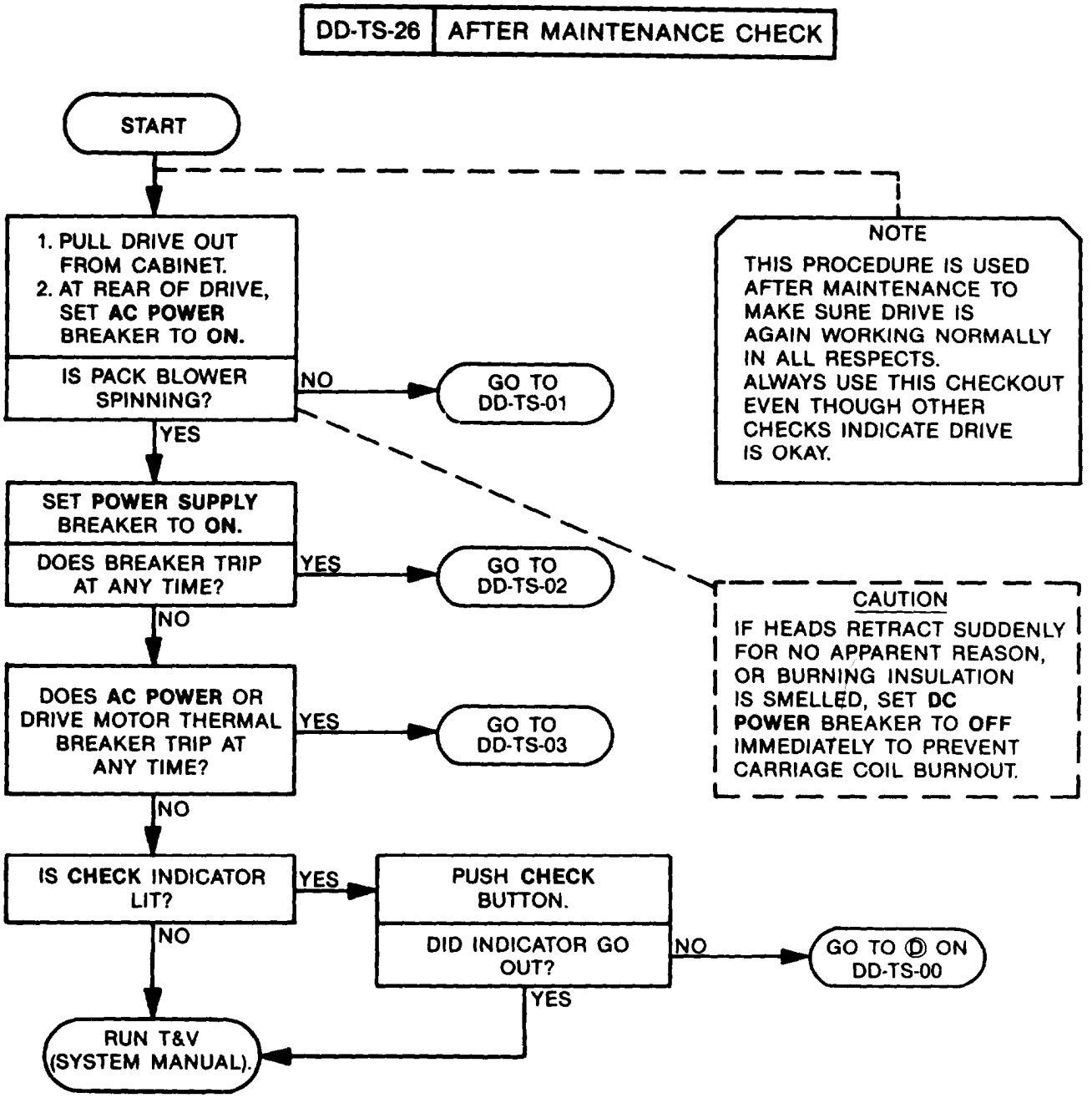
NO

CHECK CB2 AND WIRING FROM CB1 FOR POSSIBLE DAMAGE OR LOOSE CONNECTIONS. REPAIR OR REPLACE (PARA 4-23).

GO TO DD-TS-26






DD-TS-26
AFTER MAINTENANCE CHECK
START
1. PULL DRIVE OUT FROM CABINET.
2. AT REAR OF DRIVE, SET AC POWER BREAKER TO ON.
IS PACK BLOWER SPINNING?
NO
GO TO DD-TS-01
YES
SET POWER SUPPLY BREAKER TO ON.
DOES BREAKER TRIP AT ANY TIME?
YES
GO TO DD-TS-02
NO
DOES AC POWER OR DRIVE MOTOR THERMAL BREAKER TRIP AT ANY TIME?
YES
GO TO DD-TS-03
NO
IS CHECK INDICATOR LIT?
YES
PUSH CHECK BUTTON.
DID INDICATOR GO OUT?
NO
GO TO Ⓓ ON DD-TS-00
YES
NO
RUN T&V (SYSTEM MANUAL).
NOTE
THIS PROCEDURE IS USED AFTER MAINTENANCE TO MAKE SURE DRIVE IS AGAIN WORKING NORMALLY IN ALL RESPECTS.
ALWAYS USE THIS CHECKOUT EVEN THOUGH OTHER CHECKS INDICATE DRIVE IS OKAY.
CAUTION
IF HEADS RETRACT SUDDENLY FOR NO APPARENT REASON, OR BURNING INSULATION IS SMELLED, SET DC POWER BREAKER TO OFF IMMEDIATELY TO PREVENT CARRIAGE COIL BURNOUT.

Section III. MAINTENANCE PROCEDURES

4-8. GENERAL

The individual maintenance procedures in this section contain the corrective actions requied to fix a failure which was isolated during troubleshooting.

4-9. EQUIPMENT HANDLING PRECAUTIONS

As with most data processing equipment, the disk drive is very sensitive to dirt, dust, and even smoke. Follow the rules below to avoid damage to the equipment.

a. Make sure hands, clothing, and shoes are clean before working with the disk drive.

CAUTION

Never touch the recording surface of a magnetic disk pack. Since the head-to-disk flying distance is so small, surface dust, tool nicks, fingerprints, or moisture could cause a head crash. Do not try to clean a magnetic disk pack in any way.

b. Store magnetic disk packs in a closed canister or in a disk drive with the access cover closed. Keep containers closed except when transferring a magnetic disk pack to or from a disk drive.

c. Do not smoke in rooms where magnetic disk packs are handled or stored. Smoke particles are larger than the head-to-disk flying distance (figure 4-2) and may cause a head crash.

d. Do not allow food or beverages on disk drive or near magnetic disk packs. Greasy food residues and finger marks collect dirt, crumbs cause contamination, and fluid spills cause contamination and corrosion.

e. Keep magnetic disk packs away from electric motors, electric solenoids, magnets, and other magnetic fields. Magnetic fields from these devices will erase or distort data recorded on a magnetic disk pack.

NOTE

Motors on disk drives are shielded to prevent magnetic field distortion.

f. Do not drop or bump a magnetic disk pack. Avoid bumping a magnetic disk pack on the spindle of a drive. Avoid bumping magnetic disk packs together. Bump shock can distort recorded magnetic data fields.

g. Do not expose magnetic disk packs to direct sunlight. Oxide separation will result.

CAUTION

In order to avoid a head crash, observe minimum warmup conditions.

h. Magnetic disk packs must be thoroughly dry before you cycle them up on the disk drive. This is most important when the humidifier has been in operation or when the disk packs are cold.

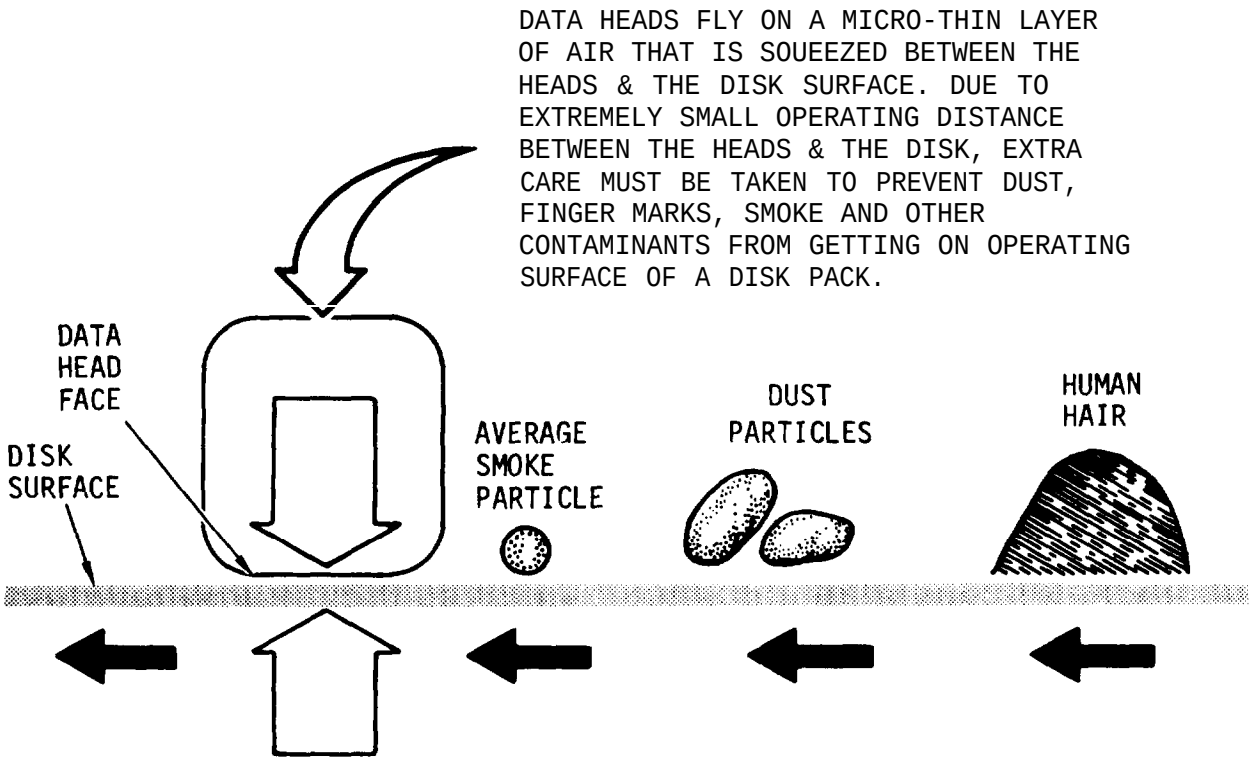


Figure 4-2. Head Flying Distance vs. Contamination Size

i. Do not touch board connector terminals with any tool, bare hands, or a dirty cloth. Tools will physically damage the fragile connector. Dirt or body moisture (which contains salt and other chemicals) will cause destructive corrosion. These problems will result in data processing faults.

j. Hold boards by their edges when they are out of the disk drive and are not in a storage container.

k. If a board is to be transported, place it in a sturdy box to protect it. Pack it carefully with clean packing material that will prevent physical damage and will not cause corrosion on connector terminals.

l. Ground your body to discharge static electricity by touching the metal chassis or cabinet before touching a board. A static discharge from you to a board can destroy integrated circuits on the board.

m. Keep spare boards in antistatic bags in which new boards are shipped from the factory.

n. Keep hands away from actuator during seek operations and when reconnecting leads to the carriage coil. Under certain conditions, emergency retract voltage may be present, causing sudden reverse motion and head unloading.

o. Use caution while working near heads. If the heads are touched, fingerprints can damage them. Clean heads immediately if they are touched.

P. Keep pack access cover closed unless it must be open for maintenance. This prevents entrance of dust into pack area. Do not open pack access cover while disk is spinning or attempt to slow disks by hand.

q. Keep all watches, magnetic disk packs, meters, and other test equipment at least two feet away from the carriage coil magnet.

r. Do not remove or install boards while power is on. Boards are easily damaged by transient voltage spikes which may be generated by removing or installing boards when power is on.

s. Make sure the logic cage is in the normal operating position before raising the deck. Since the logic cage cannot be secured in the maintenance position, it may fall and be damaged as deck is raised.

t. Do not open the acoustic top case when a drawer-mounted drive has the logic cage in the maintenance position. The top case and drawer unit's logic cage will collide and damage will occur.

u. Do not use the CE alinement magnetic disk pack unless specifically directed to do so. These packs contain prerecorded alinement data that can be destroyed if the test procedure requires the disk drive to write. This alinement data cannot be generated in the field.

v. If the disk drive fails to cycle down when the START switch is pressed (to turn off indicator), disconnect the carriage coil leadwire (para. 4-48) and manually retract heads before troubleshooting a malfunction.

w. Make certain that the heads are retracted before turning off power.

x. If power to the drive motor is lost while the heads are loaded and not under servo control (during manual carriage positioning), immediately retract the carriage. Otherwise, the heads will crash when the disk speed is too slow to let the heads fly.

y. Keep all metal tools away from flex leads while power s applied in order to prevent damage to the power amplifier.

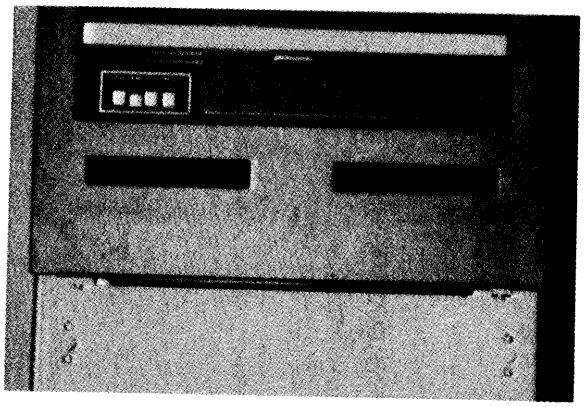
4-10. MAINTENANCE PROCEDURES

Before you start a corrective maintenance procedure, you should gather all the items or help listed in the initial setup box for that procedure. Read the procedure carefully and do only what each step tells you to do. Some steps are followed by a reference. Use the reference any time you are not sure what you must do for that step. Always do the steps in the order they are given unless the procedure requires decision steps. When decision steps are involved, go in the order indicated by the decision.

4-11. REMOVE/REPLACE COVER FOR MAINTENANCE

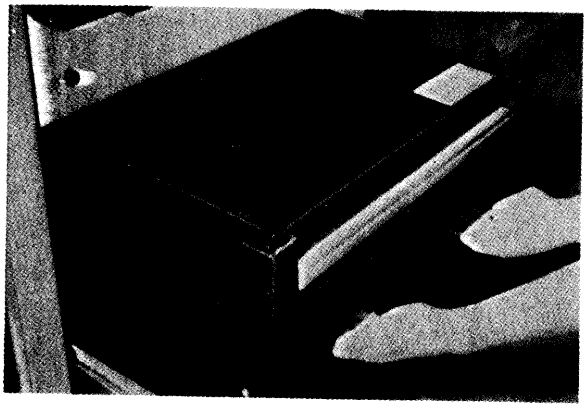
INITIAL SETUP

Common Tools
- Tool kit



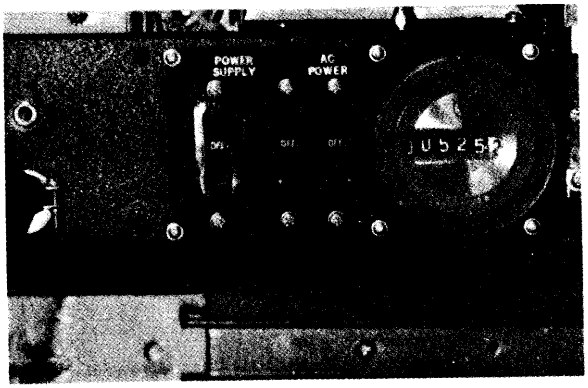
Remove

1. If ready indicator is lit, press START switch to stop drive motor. Wait one minute for disk pack to stop spinning

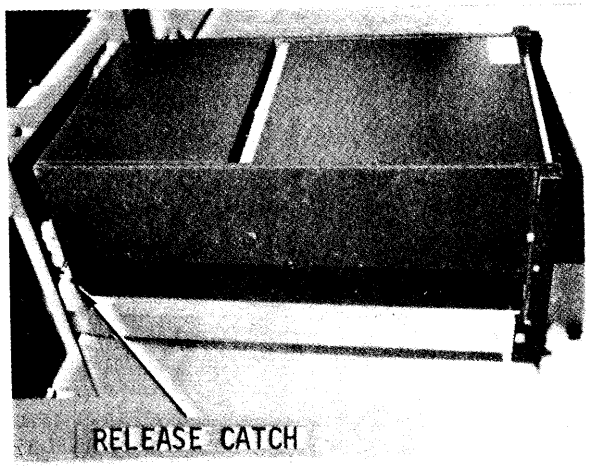


2. Slide drawer out.
3. Remove disk pack.

4-11. REMOVE/REPLACE COVER FOR MAINTENANCE (CONT)



4. At rear of drive, set power to OFF.



5. Find two release latches. There is one on each side of cover.

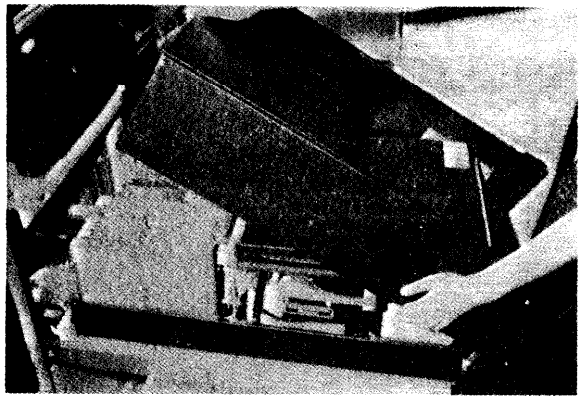
NOTE

Some disk drives have manual release latches. On other disk drives there is a hex socket latch on one side.

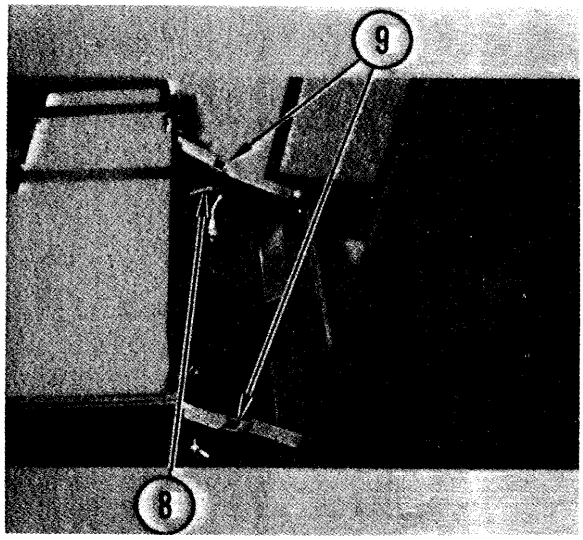
6. Release latches.

- If both latches are like the one shown, press both as you lift cover
- If one latch is the hex socket type, press catch and turn socket with 7/32-inch hex key as you lift cover

4-11. REMOVE/REPLACE COVER FOR MAINTENANCE (CONT)

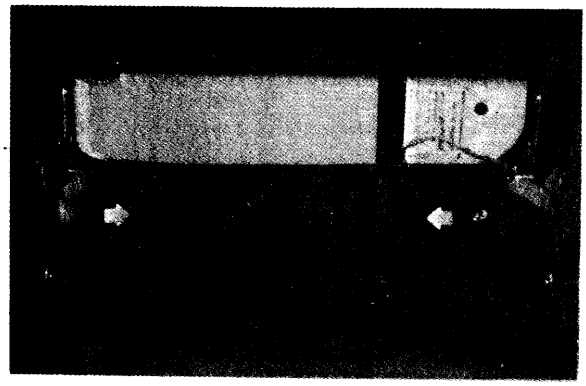


7. Lift cover.



8. Pull ground strap connector from post on cover.

9. Release hinges.

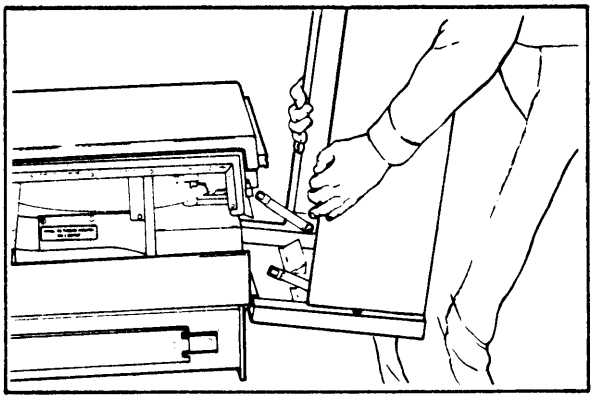


10. Holding cover firmly against you, press in pins as shown.

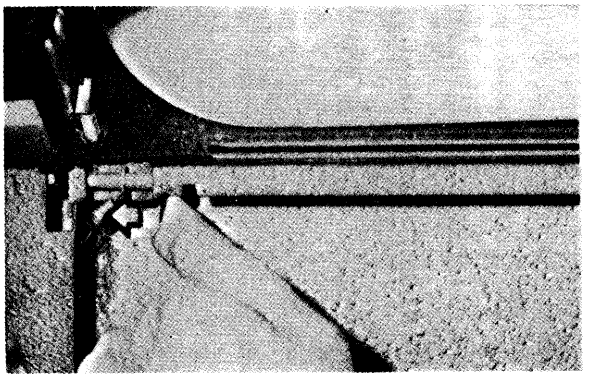
11. Remove cover. Set it aside.

4-11. REMOVE/REPLACE COVER FOR MAINTENANCE (CONT)

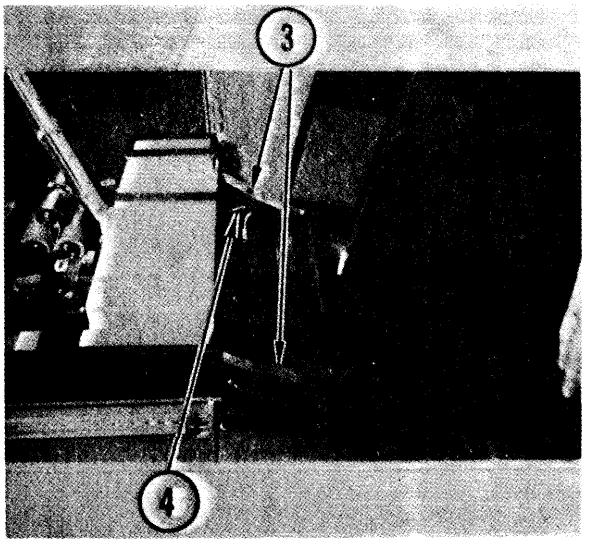
Replace



1. Get cabinet cover. Holding cover against you, line up pins with locking holes.



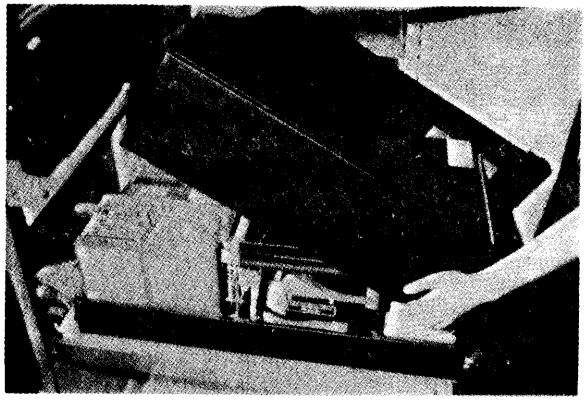
2. To connect cover to drive, press in pins one at a time as shown.



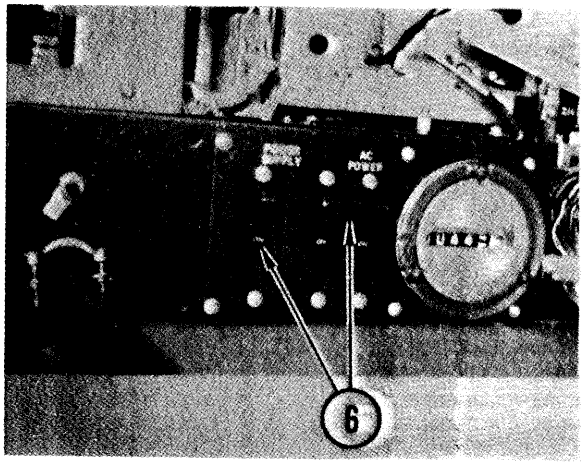
3. Connect hinges.

4. Push ground strap/spade connector on post.

4-11. REMOVE/REPLACE COVER FOR MAINTENANCE (CONT)



5. Lower cover. To make sure release catches lock, press down on cover.

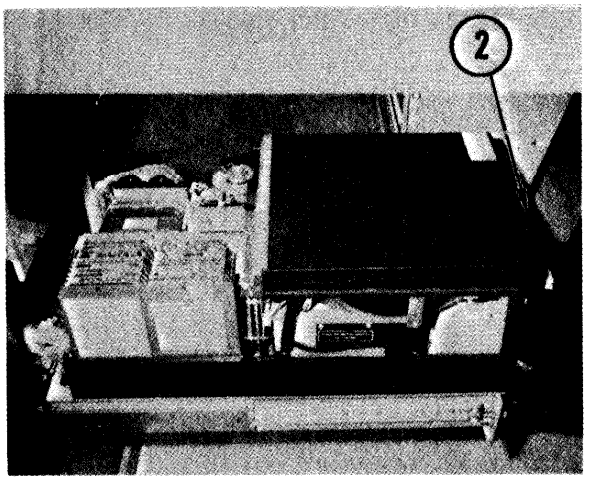


6. From rear of drive, set power to ON.

4-12. RAISE/LOWER DECK FOR MAINTENANCE

INITIAL SETUP

Common Tools
I ● Tool kit

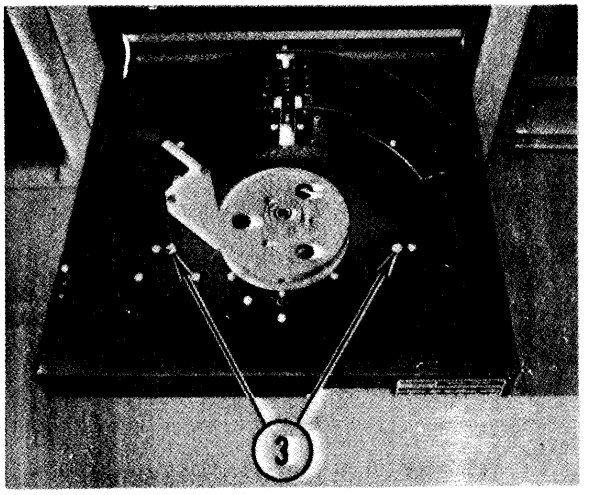


Raise

1. Remove cover (para 4-11).
2. Press release latch and lift pack access cover.

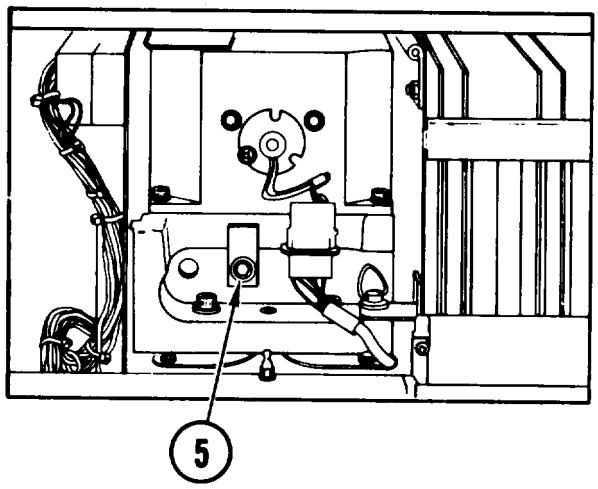
NOTE

Some drives have a pack cover solenoid which ocks latch when power is off to drive. If latch will not release, power on disk drive, lift access cover than power off drive.

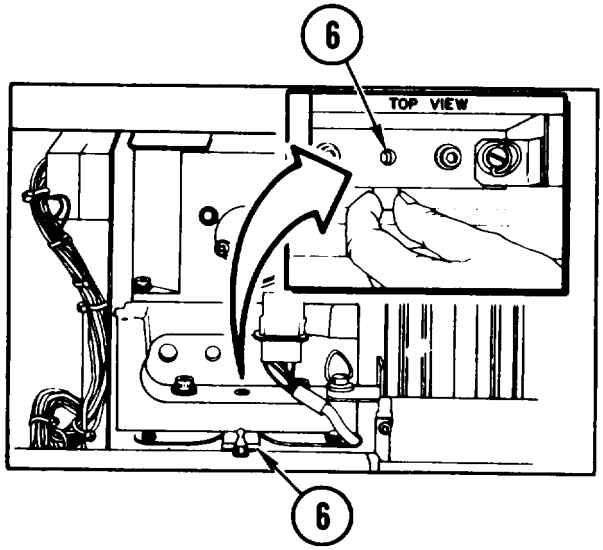


3. Remove deck hold-down screws.
4. Close pack access cover.

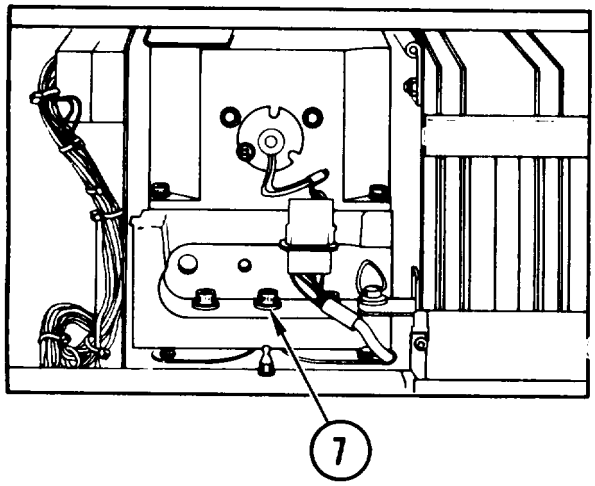
4-12. RAISE/LOWER DECK FOR MAINTENANCE (CONT)



5. On back of drive, locate bolt. Using 3/16-in. hex key, remove bolt and spacer from keeper hole.

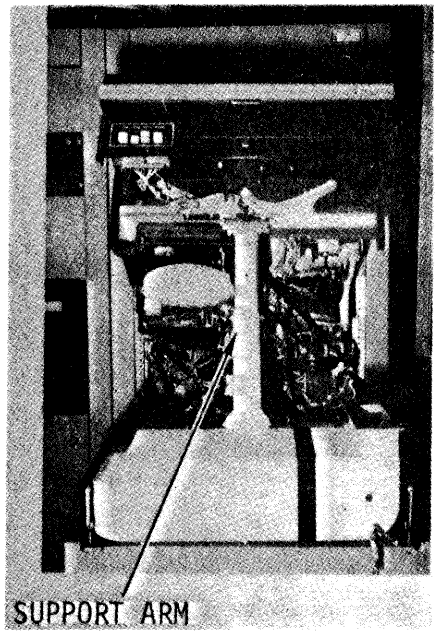


6. Slide spacer under deck as shown. Line up spacer with hole.



7. Push bolt through spacer. Tighten bolt.

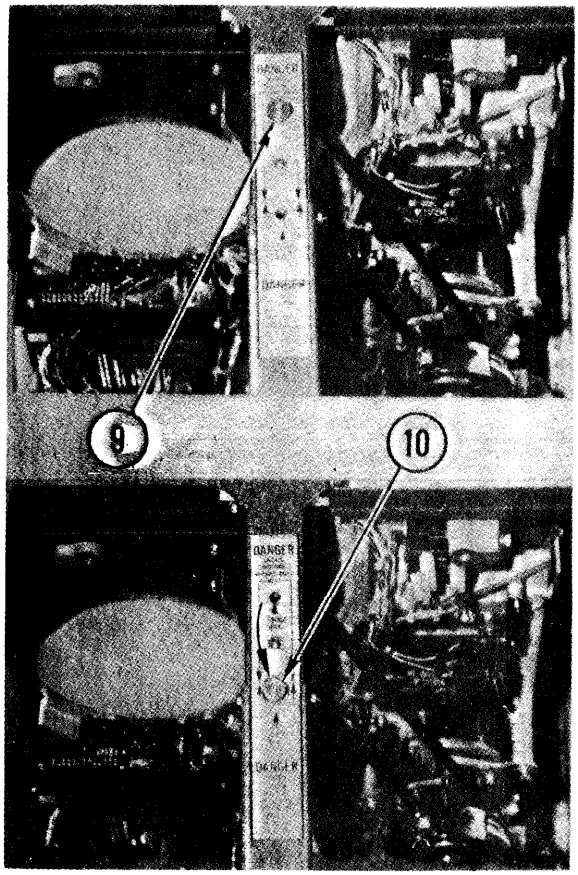
4-12. RAISE/LOWER DECK FOR MAINTENANCE (CONT)



CAUTION

Do not lift drive at pack access cover.

8. From front of drive, lift deck until support arm is fully extended. Lower deck onto arm.

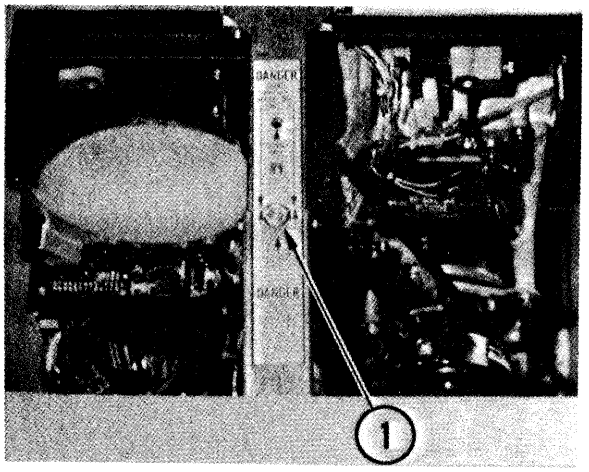


9. Loosen knob and pull it out of storage hole.

10. Insert knob in locking le. Tighten knob.

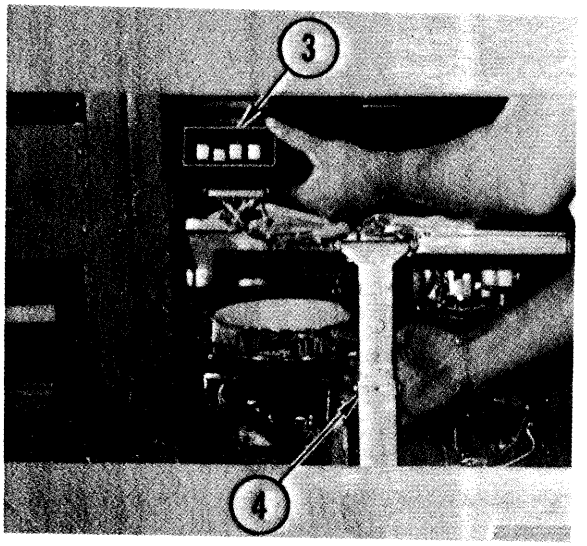
4-12. RAISE/LOWER DECK FOR MAINTENANCE (CONT)

Lower



1. Loosen knob. Pull it out of locking hole.

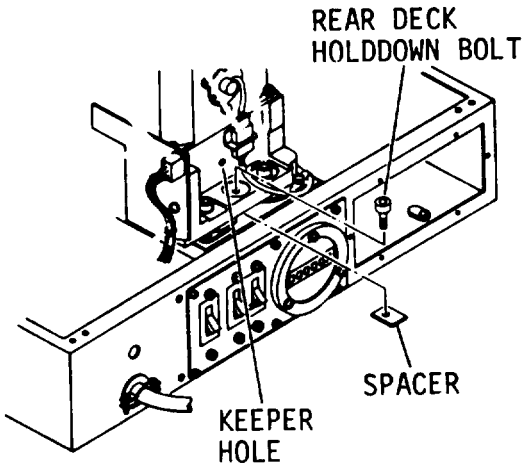
2. Insert knob in storage hole. Tighten knob.



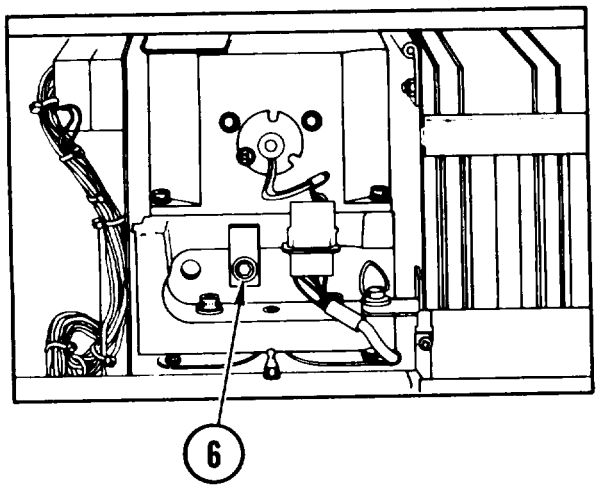
3. With one hand, firmly grasp deck and lift.

4. With other hand, grasp arm and push forward towards front of drive. Lower deck.

4-12. RAISE/LOWER DECK FOR MAINTENANCE (CONT)



5. From rear of drive, locate bolt and spacer. Using 3/16-in. hex key wrench, remove bolt. Pull off spacer.



6. Push bolt through spacer. Tighten bolt in keeper hole.

7. Replace deck hold-down screws.

8. Close pack access cover.

9. Replace cover (para 4-11).

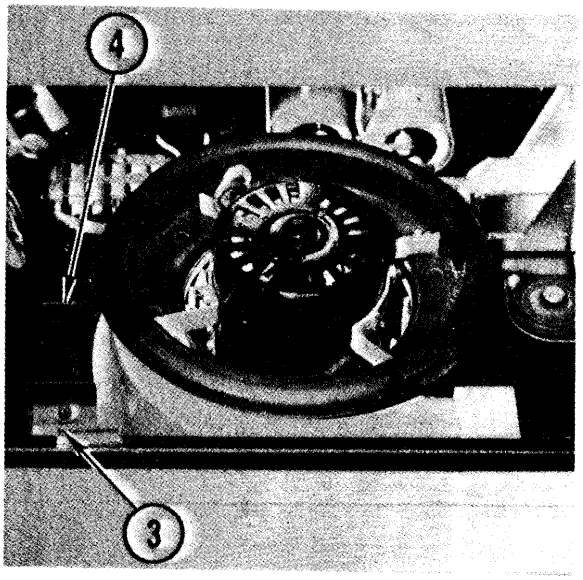
4-13. REMOVE/REPLACE BLOWER MOTOR

INITIAL SETUP

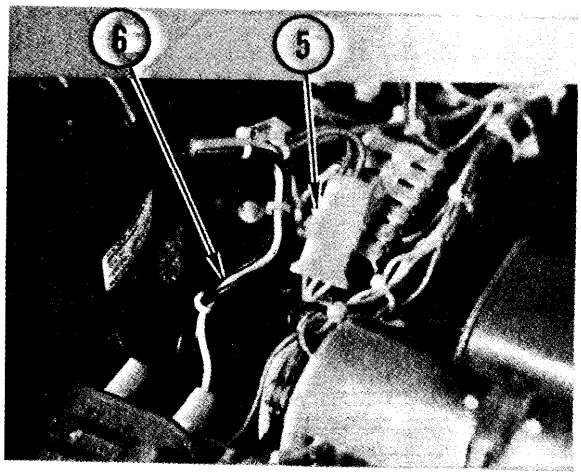
Common Tools
- Tool kit
- Torque screwdriver

Materials/Spare Parts
- Paper
- Pen or pencil

Remove

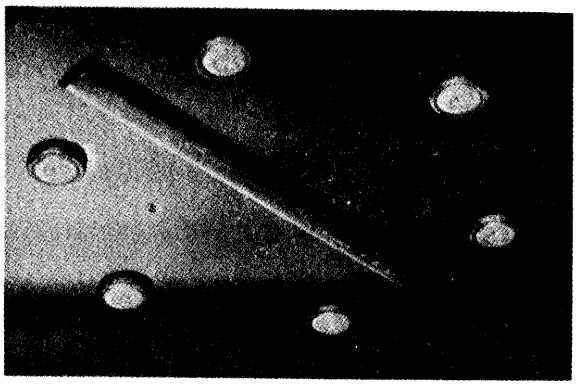


1. Remove disk drive. (See your system manual.)
2. Raise deck (para 4-12).
3. Remove screws.
4. Pull out air plenum.



5. Pull apart P301.
6. On a piece of scratch paper, note position of three capacitor wires. Pull apart connector. Disconnect wires from capacitor.

4-13. REMOVE/REPLACE BLOWER MOTOR (CONT)



7. From underneath assembly, remove six screws and washers.

8. Pull out blower motor.

REPLACE

1. Replace blower motor. Center it over mounting holes.

2. From underneath assembly, insert 1/8 in. hex key up through one mounting hole. This hole should be alined. If key wrench won't go into hole, move blower slightly.

3. When blower is alined, remove hex key.

4. Replace blower screws and washers. Tighten screws to a torque of 9 inch-pounds.

5. Connect P301.

6. Using your notes, connect capacitor wires.

7. Place air plenum snugly against blower.

8. Replace air plenum screws.

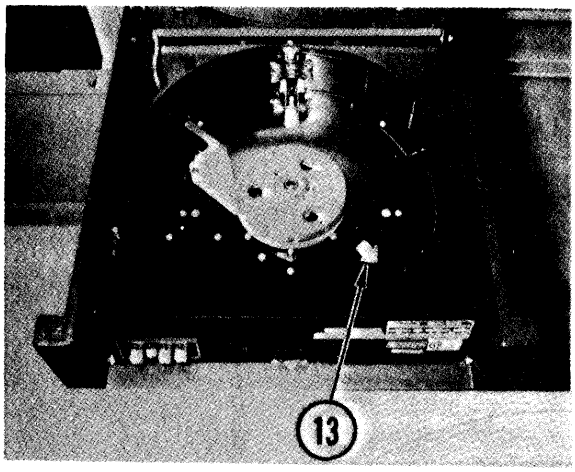
9. Lower deck (para 4-12).

10. Replace disk drive. (See your system manual.)

11. Power on disk drive.

12. Lift pack access cover.

4-13. REMOVE/REPLACE BLOWER MOTOR (CONT)



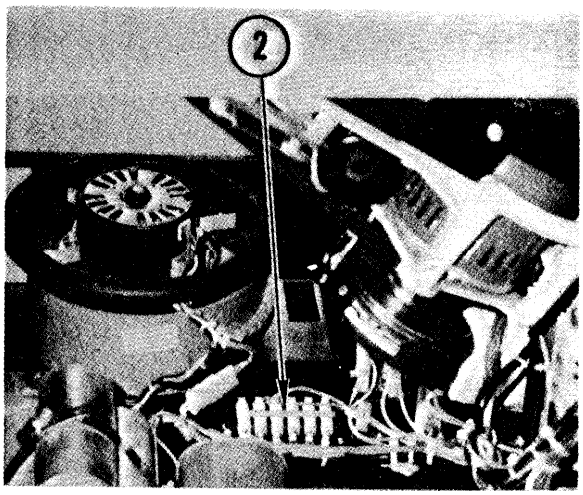
13. Place hand in front of opening to make sure blower is operating.
14. Power off disk drive.
15. Close pack access cover.
16. Slide drawer in.

4-14. REMOVE/REPLACE TERMINAL BOARD

INITIAL SETUP

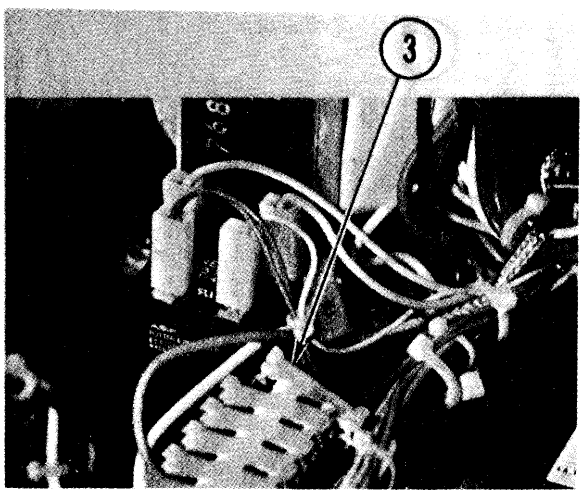
Common Tools
- Tool kit

Materials/Spare Parts
- Tags
- Pen or pencil



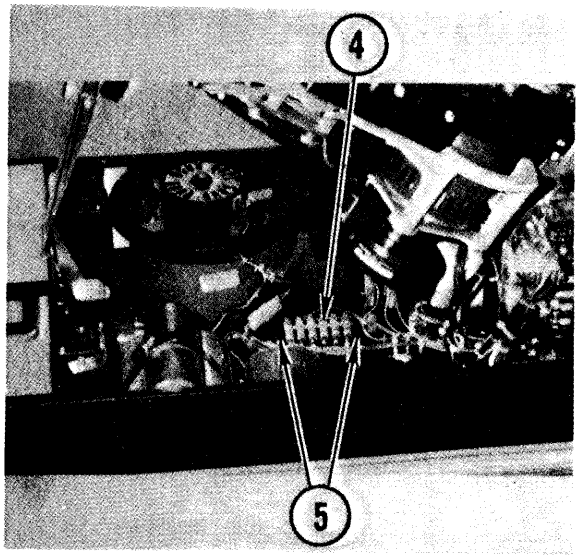
Remove

1. Raise deck (para 4-12).
2. Find terminal board.



3. Remove plastic shields from terminal board.

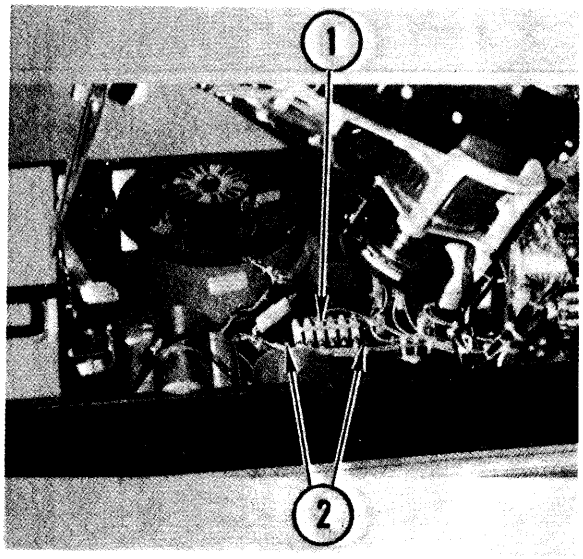
4-14. REMOVE/REPLACE TERMINAL BOARD (CONT)



4. Tag and remove all wires.

5. Remove two screws holding terminal board to bottom of drive.

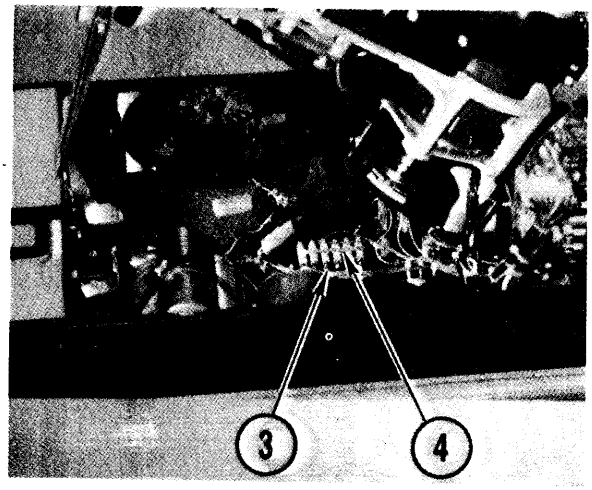
6. Remove terminal board.



Replace

1. Mount terminal board in place.

2. Replace two screws holding terminal board to base assembly.



3. Replace all wires.

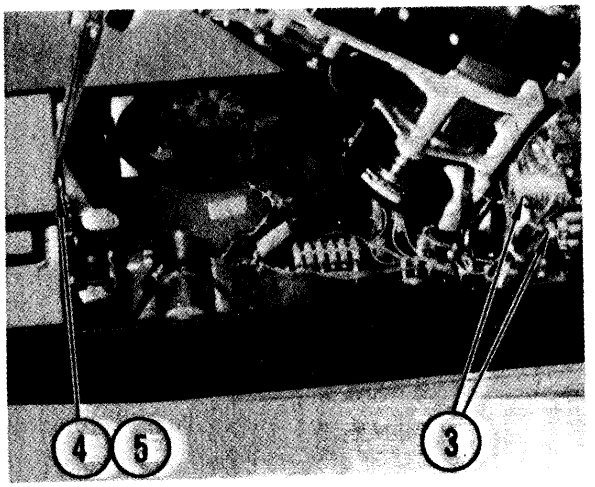
4. Replace plastic shields.

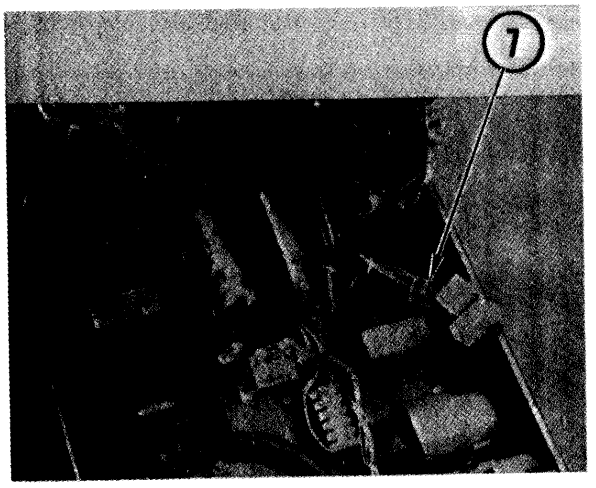
5. Lower deck (para 4-12).

4-15. REMOVE/REPLACE AC TRANSFORMER

INITIAL SETUP

Common Tools	Materials/Spare Parts	Personnel Required
● Tool kit	● Paper ● Pen or pencil ● Tie wraps	● Two

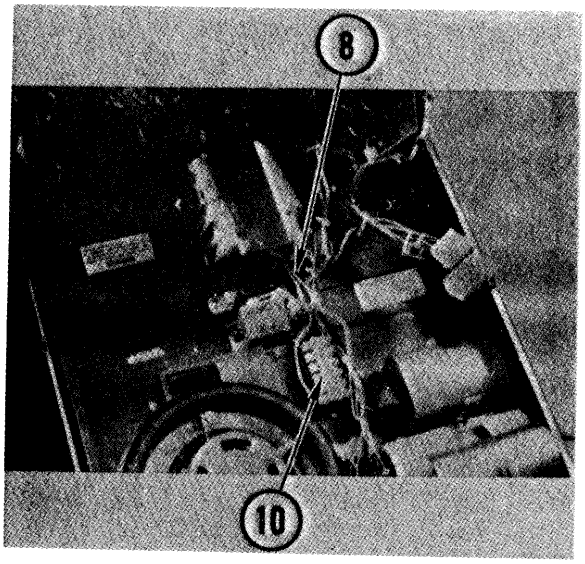




Remove

1. Remove disk drive. (See your system manual.)
2. Raise deck (para 4-12).
3* Disconnect connectors P1 and P2.
4. Pull snap ring from support arm hinge pin.
5. While partner supports weight of deck, pull hinge pin from support arm.
6. Have your partner lift deck to vertical position while you work on transformer.
7. Cut wire ties holding wires to P1 and to P2.

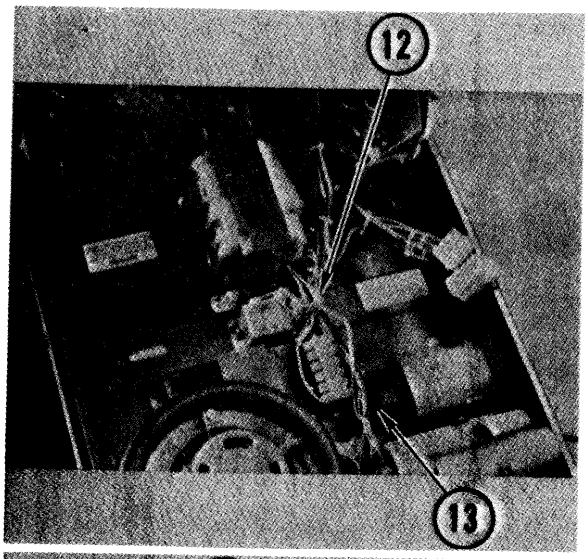
4-15. REMOVE/REPLACE AC TRANSFORMER (CONT)



8. Trace three wires from transformer to terminal block.

9. Note position of three wires on terminal board.

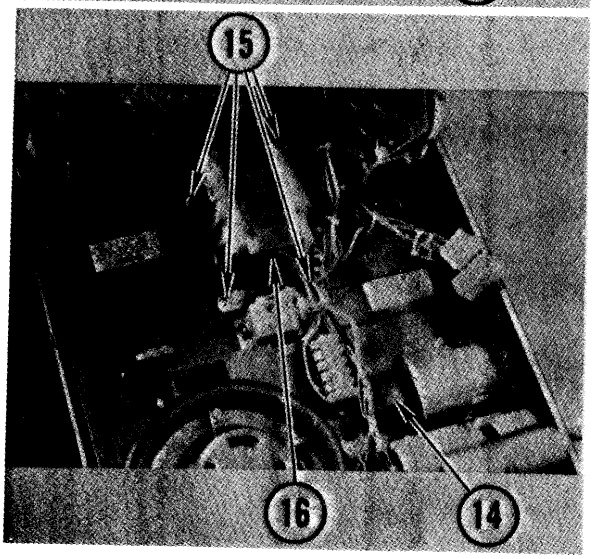
10. Remove plastic covers from terminal board.



11. Loosen the terminal screws, pull the three wires from the terminals.

12. Remove wire ties from bundle on bottom of drive as needed to separate two wires that run from the transformer to transformer tuning capacitor.

13. Tag and disconnect transformer wires from capacitor.

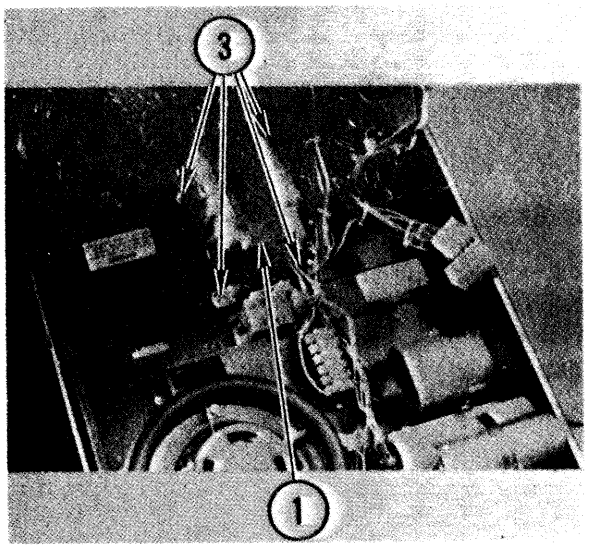


14. Remove rubber terminal cover. Save it for reuse.

15. Remove four mounting screws from transformer base.

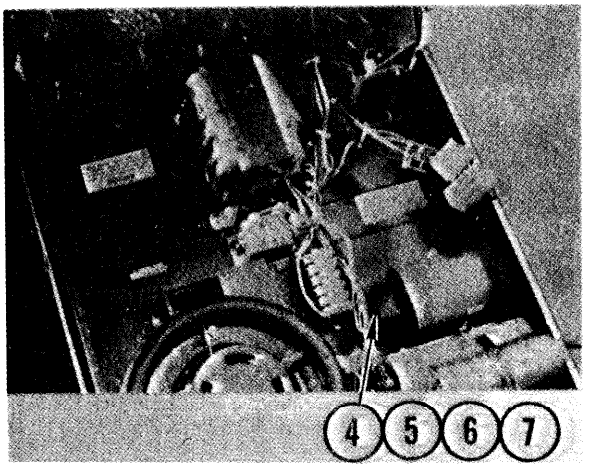
16. Lift transformer from drive.

4-15. REMOVE/REPLACE AC TRANSFORMER (CONT)

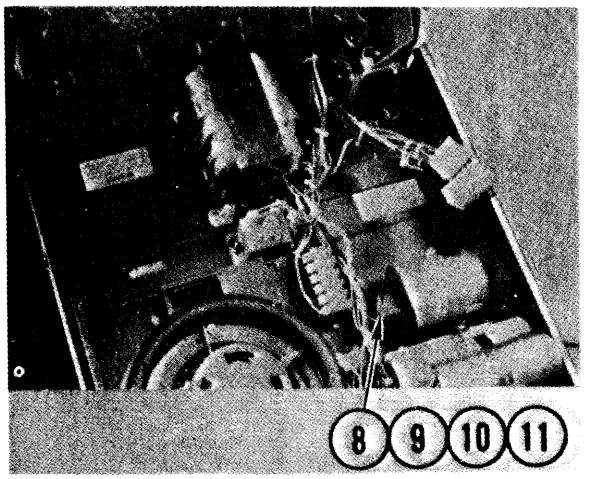


Replace

1. Place transformer in drive.
2. Aline mounting holes in transformer base with holes in bottom of drive.
3. Install four mounting screws.



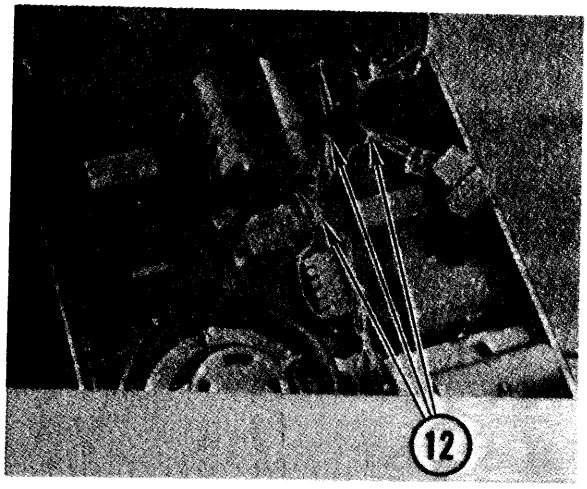
4. Route two transformer wires with slide connectors to the tuning capacitor.
5. Push wires through holes in the rubber capacitor terminal cover.
6. Push slide connectors onto capacitor terminals.
7. Position rubber terminal cover over terminals.



8. Route three colored transformer wires with stripped ends to terminal block.
9. Using notes made during removal, match each wire with its terminal number.
10. Insert each wire into its terminal and, while holding the wire in place, tighten the terminal screw.

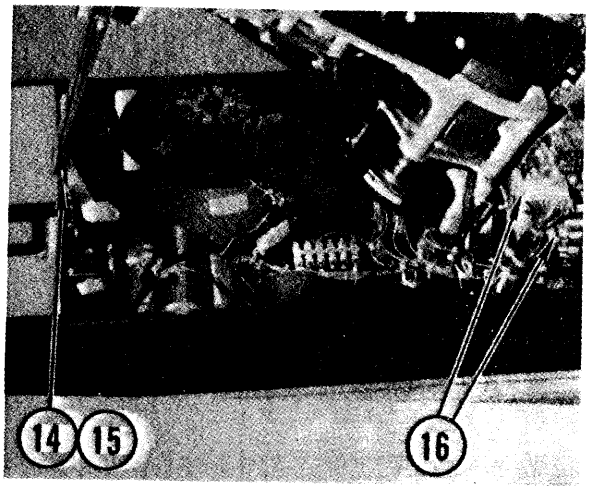
110 Install plastic cover over each of the terminals.

4-15. REMOVE/REPLACE AC TRANSFORMER (CONT)



12. Put tie wraps on three wire bundles.

13. While your partner lowers the deck and supports its weight, aline the support arm hinge with the hinge on the drive.



14. Insert the hinge pin.

15. Install the snap ring. Be sure it snaps into the hinge pin groove.

16. Plug connectors P1 and P2 into jacks J1 and J2.

17. Lower deck (para 4-12).

18. Replace disk drive. (See system manual.)

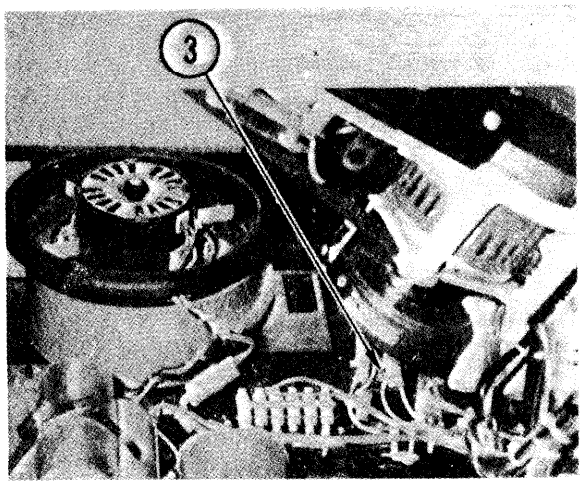
4-16. REMOVE/REPLACE RUN TRIAC

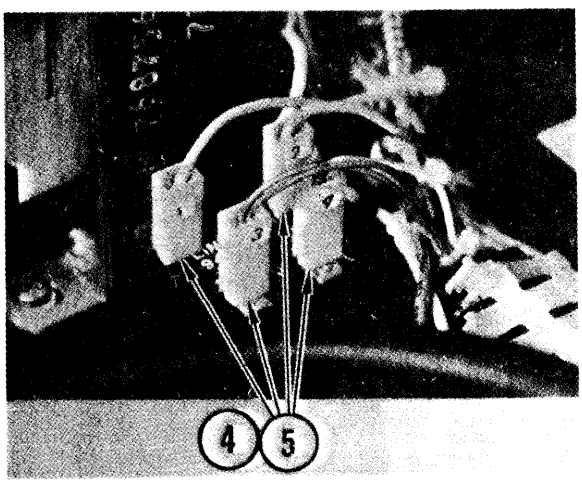
INITIAL SETUP

Common Tools	Materials/Spare Parts
● Tool kit	● Dielectric grease ● lags ● Pen or pencil

Remove

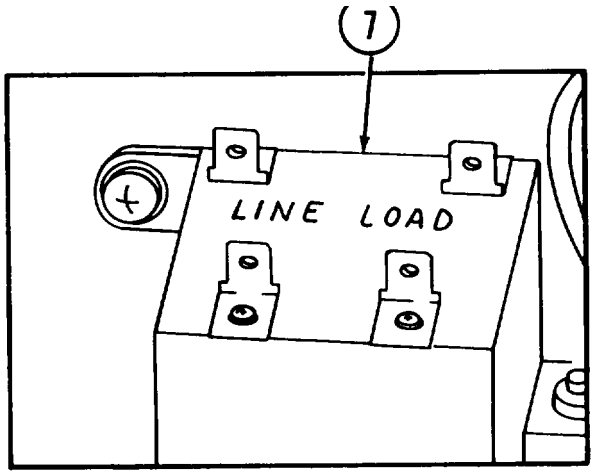
1. Remove disk drive. (See your system manual.)
2. Raise deck (para 4-12).
3. Locate run triac.





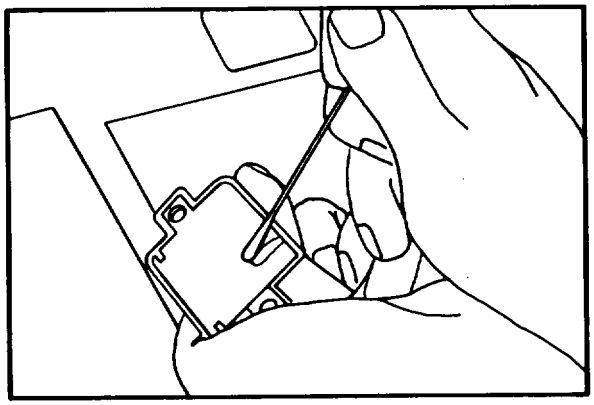
4. Tag wires as shown.
5. Pull off wires.
6. From underneath disk drive, remove two screws holding triac to bottom of drive.

4-16. REMOVE/REPLACE RUN TRIAC (CONT)

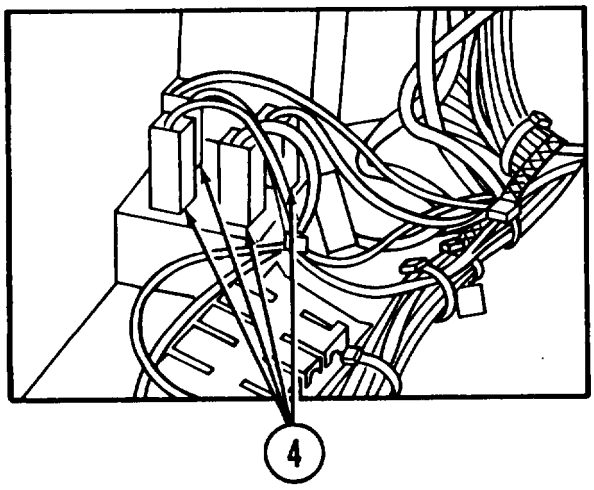


7. Pull out triac.

Replace



1. With swab, apply light coat of dielectric grease to triac base.
2. Mount triac in place.
3. From underneath disk drive, replace two screws securing triac to bottom of drive.



4. Push on wires.
5. Remove tags.
6. Lower deck (para 4-12).
7. Replace disk drive. (See your system manual.)

4-17. REMOVE/REPLACE DECK INTERLOCK SWITCH

INITIAL SETUP

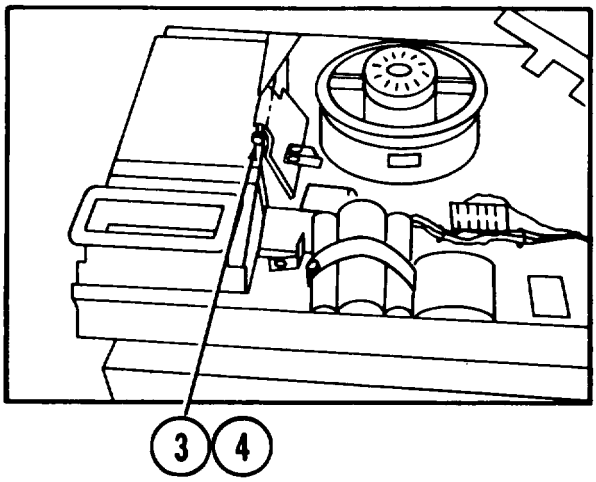
Common Tools
- Tool kit

Materials/Spare Parts
- Tags
- Pen or pencil
- Tie wraps

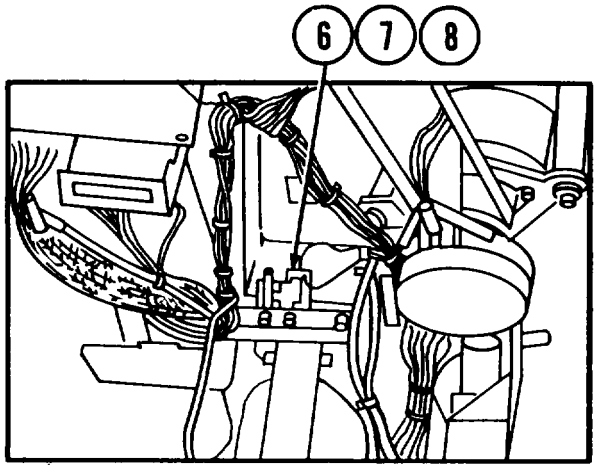
Personnel Required
- Two

Remove

1. Remove disk drive. (See your system .
2. Raise deck (para 4-12).

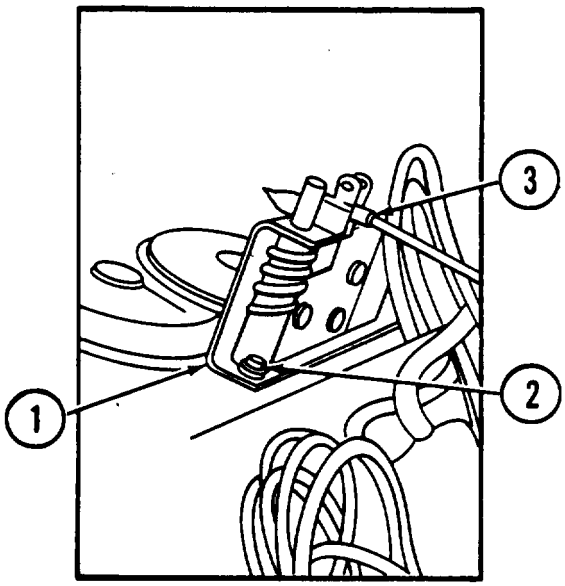


3. Pull snap ring from support arm hinge pin.
4. While partner supports weight of deck, pull hinge pin from support arm.



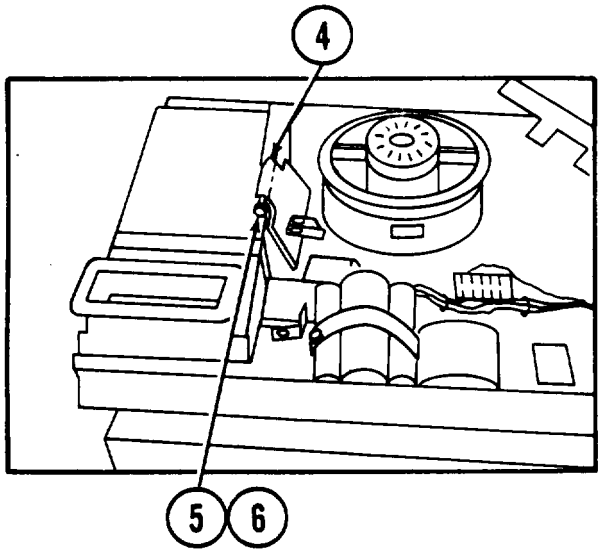
5. Have your partner lift deck to vertical position and hold it in that position while you work on interlock switch.
6. Find interlock switch.
7. Tag and disconnect the wires from switch.
8. Remove two switch mounting screws from the hinge plate.
9. Lift switch from drive.

4-17. REMOVE/REPLACE DECK INTERLOCK SWITCH (CONT)



Replace

1. Place switch on the back side of hinge plate so that plunger is to the left and side terminal is to the right.
2. Aline mounting holes and install screws.
3. Attach both wires.



4. While your partner lowers deck and supports its weight, aline support arm hinge with hinge on drive.
5. Insert hinge pin.
6. Install snap ring. (Be sure it snaps into the hinge pin groove.)
7. Lower deck (para 4-12).
8. Replace disk drive. (See your system manual.)

4-18. REMOVE/REPLACE POWER SUPPLY ASSEMBLY

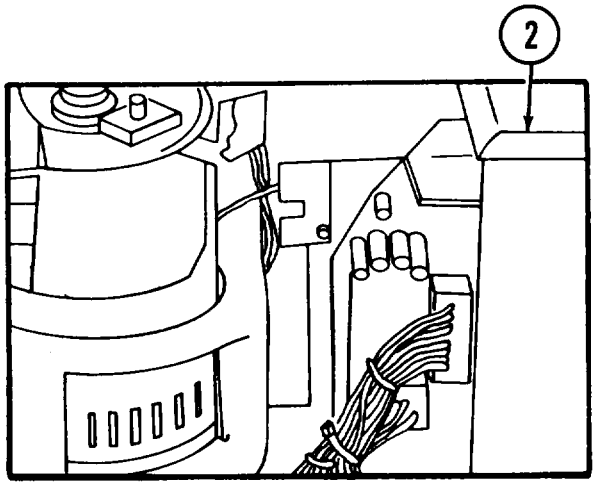
INITIAL SETUP

Common Tools
- Tool kit

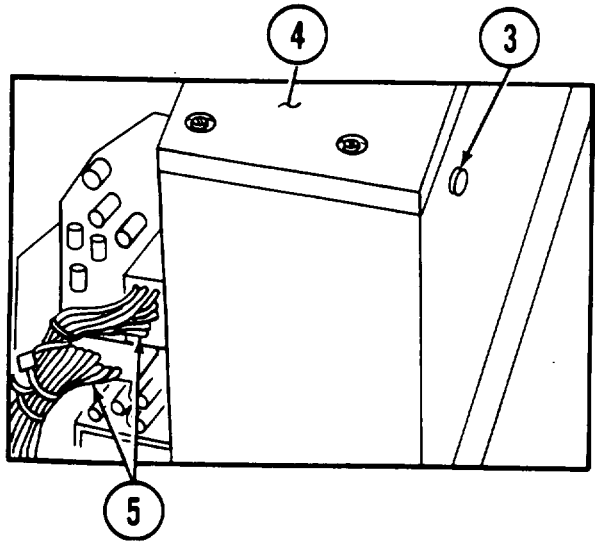
WARNING

Electrocution may result if this procedure is done with power ON.

Remove

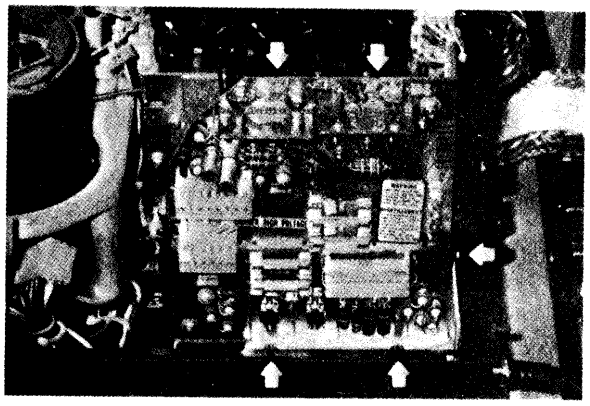


1. Remove cover (para 4-11).
2. At side of drive, find power supply.

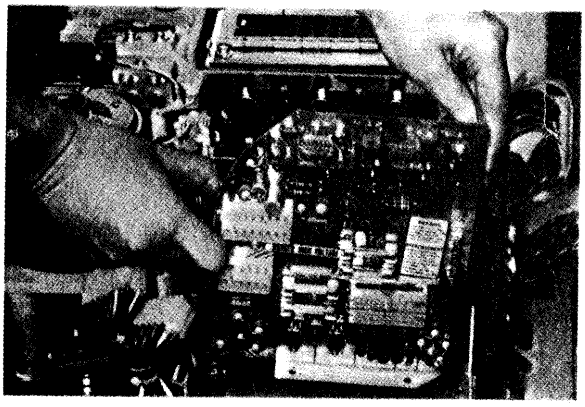


3. Remove screw and washer.
4. Pull off cover.
5. Pry off J1 and J2.

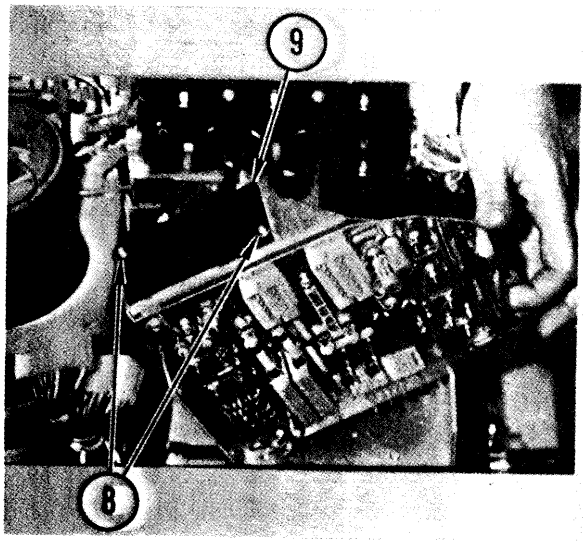
4-18. REMOVE/REPLACE POWER SUPPLY ASSEMBLY (CONT)



6. Remove five screws securing power supply to base. There are two on each side and one in back.



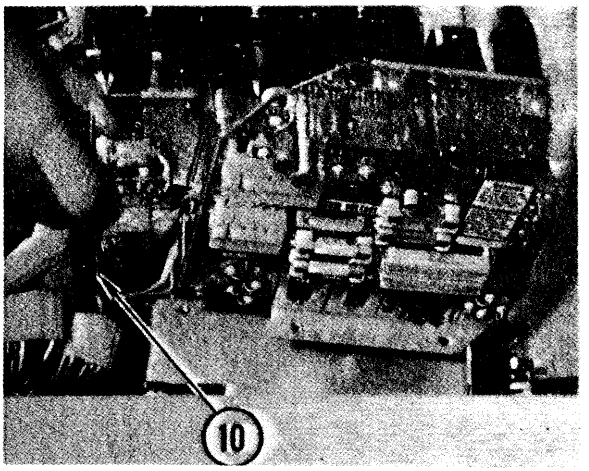
7. Grasp power supply at corners of board and lift half way up.



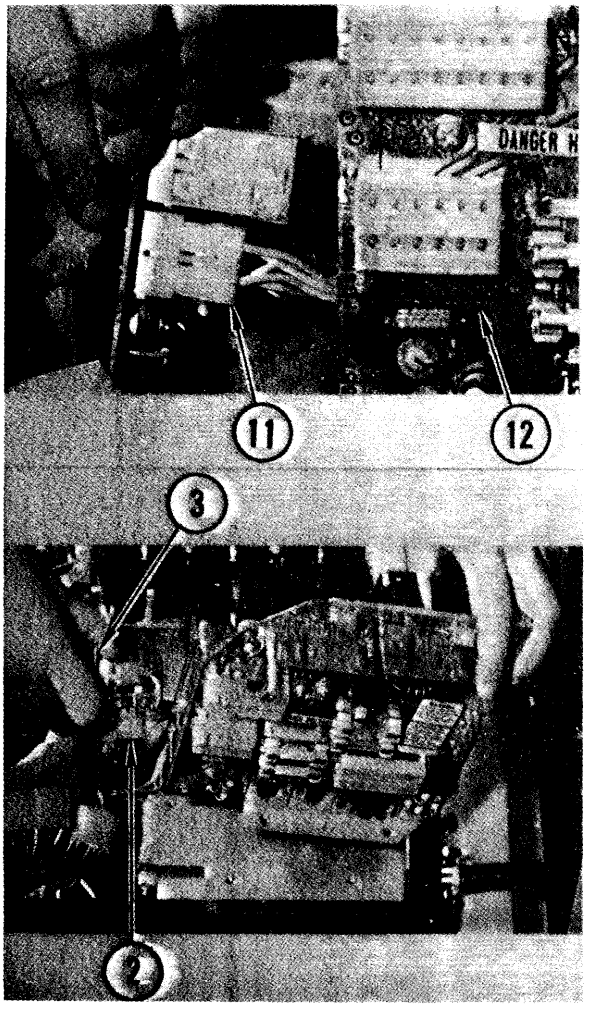
8. Remove bolts and nuts.

9. Pull off panel.

4-18. REMOVE/REPLACE POWER SUPPLY ASSEMBLY (CONT)



10. Pull out emergency retract relay.



11. Pull off P-3 and free emergency retract relay from power supply assembly.

12. Remove power supply board.

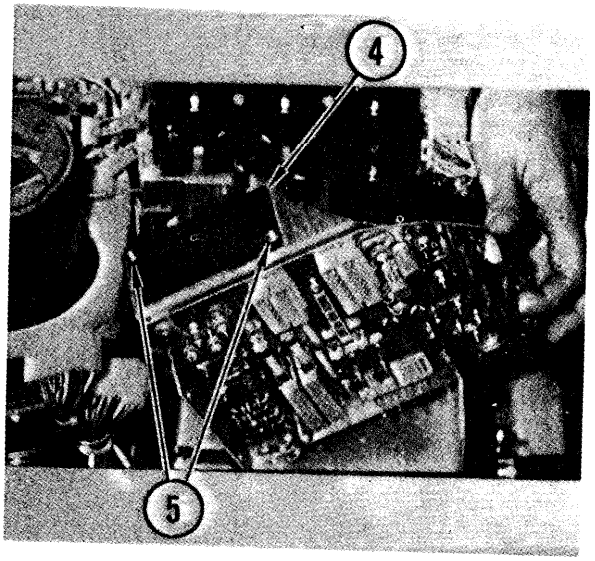
Replace

1. Set power supply assembly in position.

2. Push on P-3.

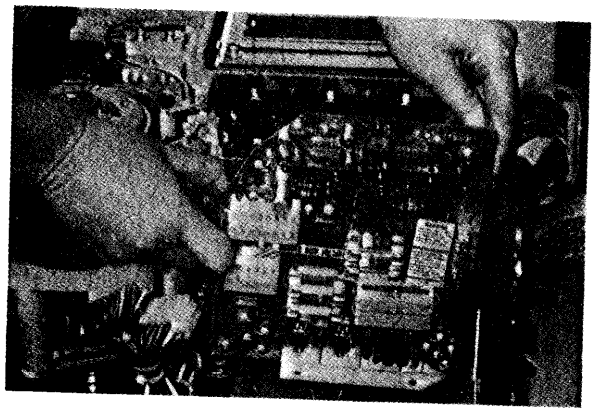
3. Push emergency retract relay into power supply assembly.

4-18. REMOVE/REPLACE POWER SUPPLY ASSEMBLY (CONT)

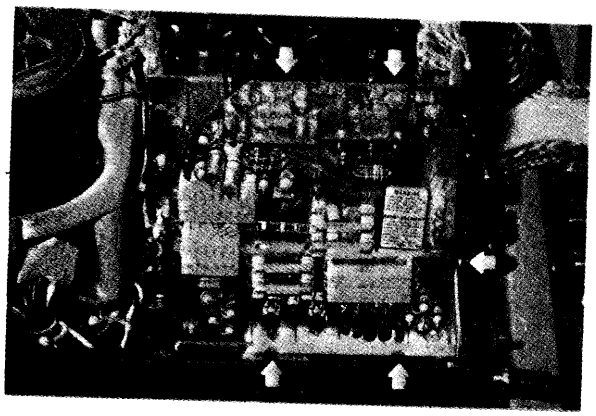


4. Replace panel.

5. Replace bolts and nuts.

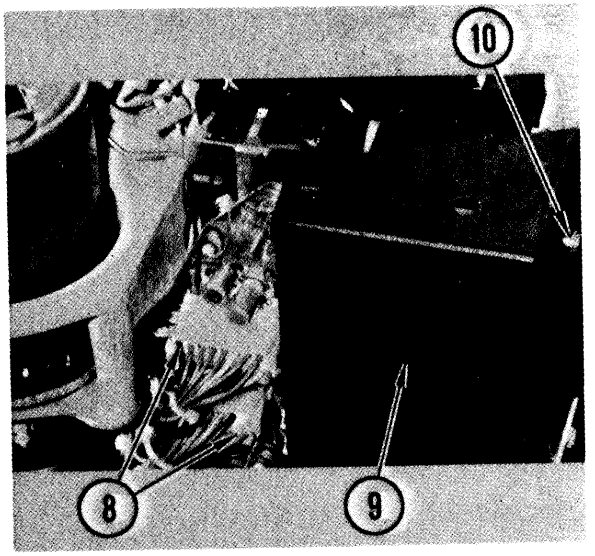


6. Lower power supply assembly in place. Line up holes in base with holes in power supply assembly.



7. Using long screwdriver and wand magnet, replace five screws securing power supply to base.

4-18. REMOVE/REPLACE POWER SUPPLY ASSEMBLY (CONT)



8. Push on J1 and J2.

NOTE

If you are installing a new power supply you must adjust plus/minus 5 volts (para 4-19) before you do steps 9-11 below.

9. Push on cover.

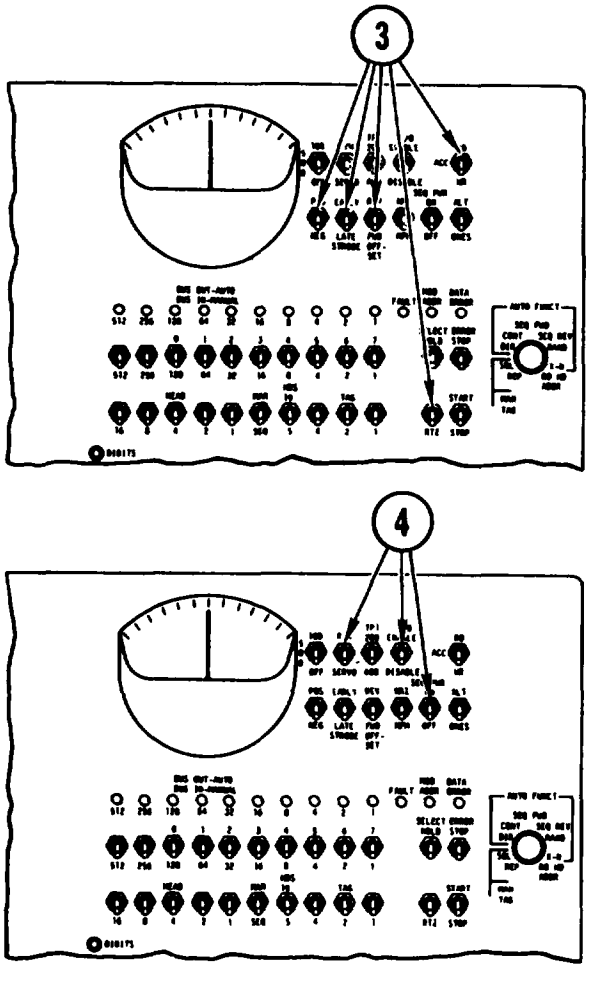
10. Replace screw and washer.

11. Close cover (para 4-11).

4-19. ADJUST PLUS/MINUS 5 VOLTS

INITIAL SETUP

Common Tools	Test, Measurement and Diagnostic Equipment	Supplies
● Tool kit	● Multimeter ● Field test unit (FTU)	● Scratch pack



CAUTION

Loss of cooling air causes drive to overheat. When logic cage is in maintenance position, do not operate drive for more than 20 minutes at a time.

NOTE

Your field test unit (FTU) may be model TB216 or TB303. This procedure covers each model under its respective heading.

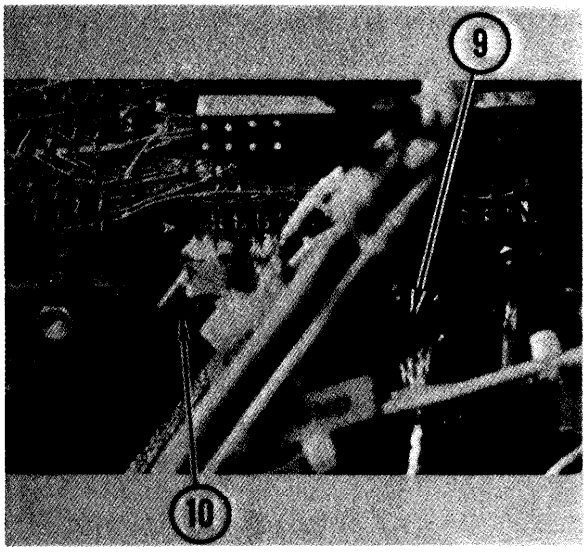
MODEL TB303

1. Remove cover (para 4-11).
2. Install FTU (para 4-53).
3. Set these toggle switches in center position.
   - ● ACC/RD/WR
   - ● POS/NEG
   - ● EARLY/LATE STROBE
   - ● REV/FWD/OFF-SET
   - ● RTZ
4. Set these toggle switches in up position.
   - ● R/W SERVO
   - ● I/0 ENABLE-DISABLE
   - ● SEQ PWR ON/OFF

5* Set all remaining switches in down position.

6. Install scratch pack.
7. .Raise logic cage (para 4-25).
8. Set up multimeter to measure dc voltage.

4-19. ADJUST PLUS/MINUS 5 VOLTS (CONT)



9. At bottom of caqe. connect black lead to ground faston as shown.

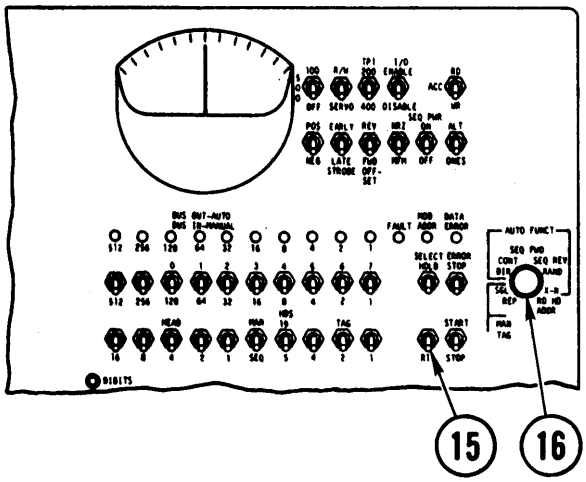
10. Connect red lead to + 5 V faston. l

11. From rear of drive, set ac circuit breaker ON.

12. Power ON drive.

13. Make sure PROTECT light is on.

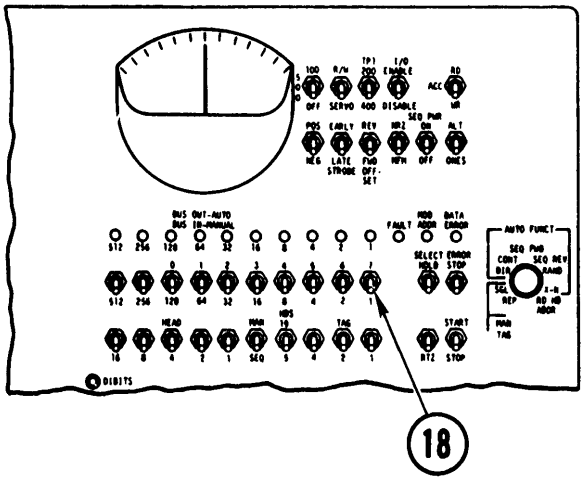
14. Cycle up drive.



15. On FTU push down then release RTZ.

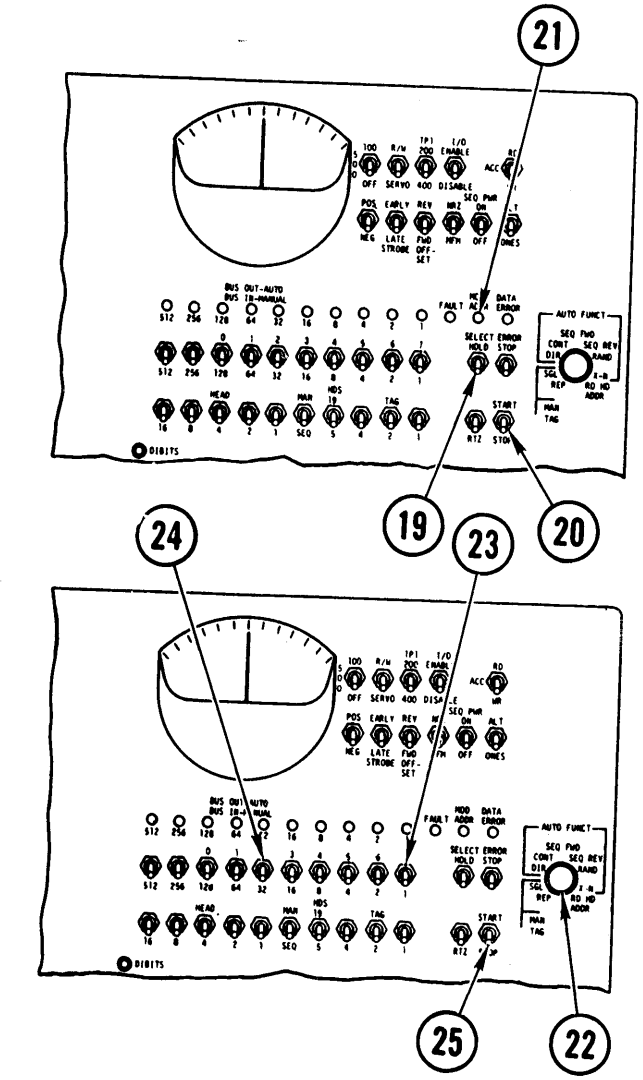
16. Turn AUTO FUNC selector to SGL.

17. If at disk drive 0400 or 0600 start at step 19. If at drive 0680 start at step 18.



18. Set BUS OUT switch 1 up.

4-19. ADJUST PLUS/MINUS 5 VOLTS (CONT)



19. Set SELECT HOLD up.

20. Set START/STOP up and then down.

21. Push down then release RTZ. Only MOD ADDR should be lit.

22. Turn AUTO FUNC selector to CONT.

23. Set BUS OUT switch 1 down.

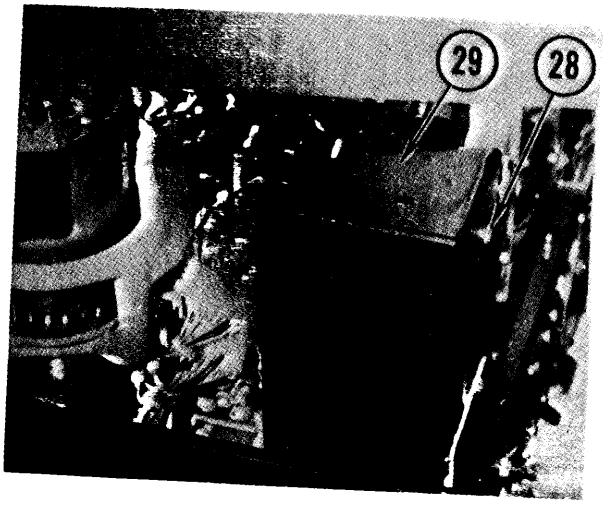
24. Set BUS OUT switch 32 up. All remaining BUS OUT switches should be down.

25. Set START/STOP down then up-.

26. Set multimeter to ON.

27. Look at multimeter. +5 V output should be +5.10 +/- 0.05 volts.

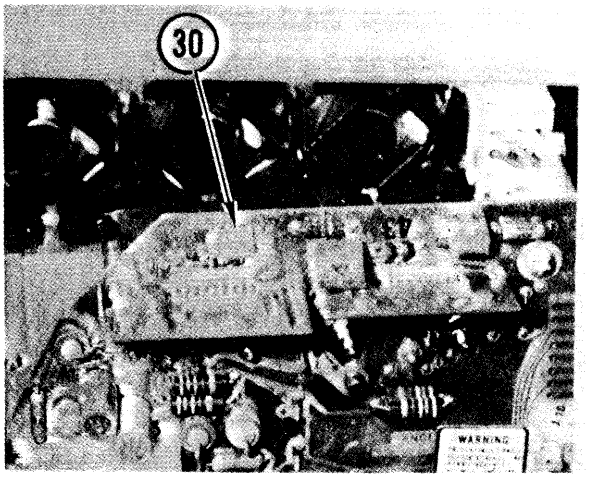
- If it is, go to step 31
- If not, go to step 28



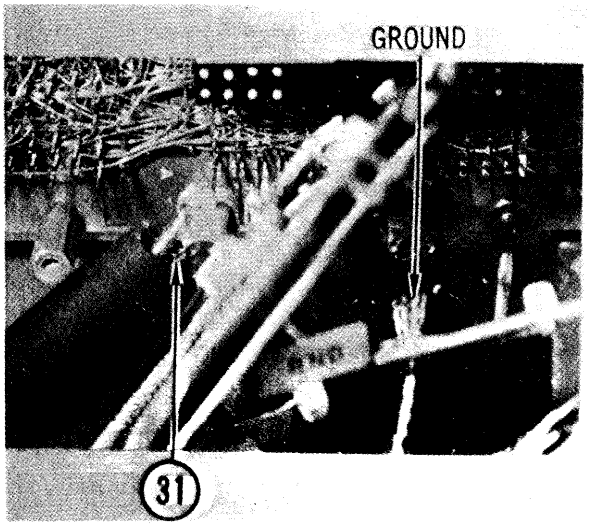
28. From side of drive, locate power supply. Remove screw.

29. Pull off cover.

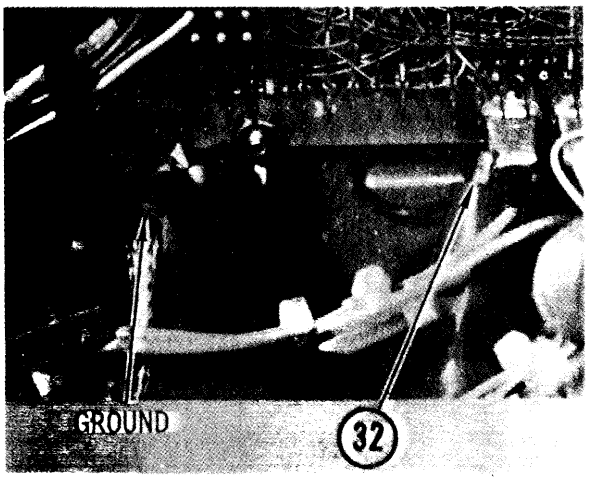
4-19. ADJUST PLUS/MINUS 5 VOLTS (CONT)



30. On power supply unit, locate +5 V potentiometer. Using potentiometer adjustment tool, turn potentiometer until output is +5.10 +/- 0.05 volts.



31. Disconnect red lead from plus +5 V faston.

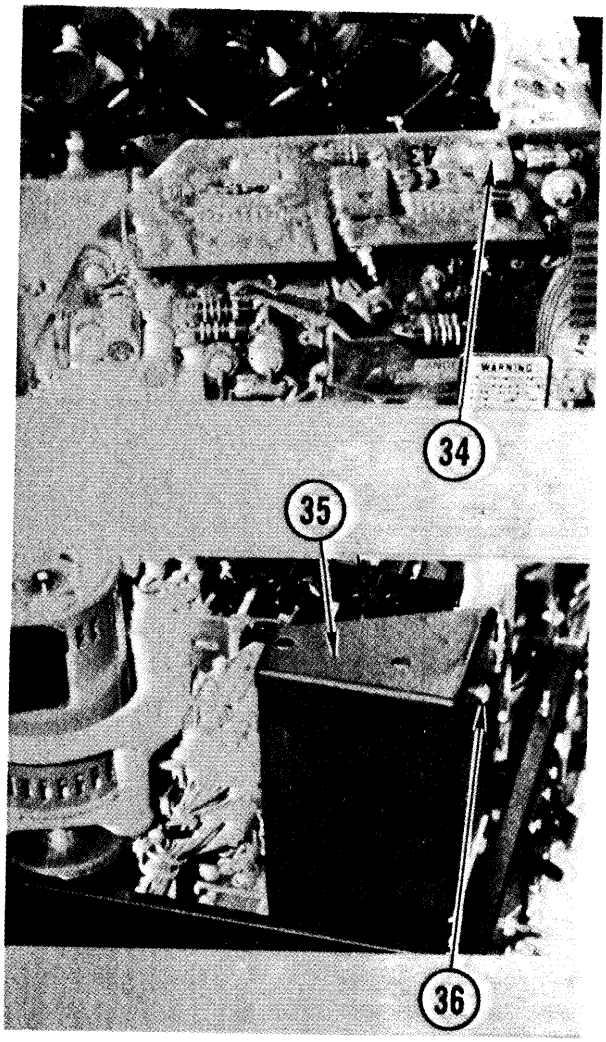


32. Connect red lead to -5 V faston.

33. Look at multimeter. -5 v output should be -5.10 +/- 0.05 volts.

o If it is, go to step 37
0 If not, go to step 34

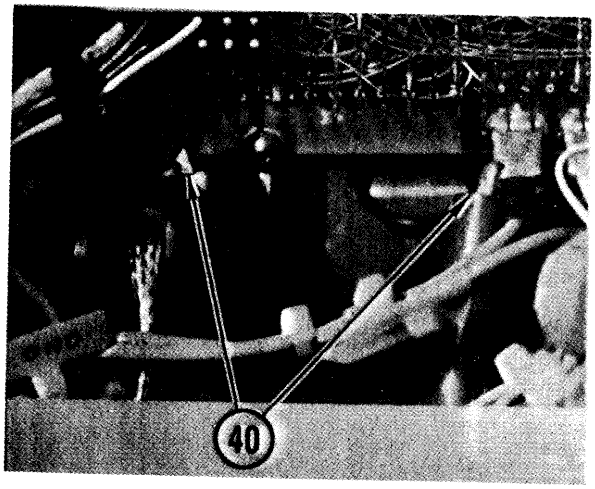
4-19. ADJUST PLUS/MINUS 5 VOLTS (CONT)



34. On power supply unit, locate -5 V potentiometer. Using potentiometer adjustment tool, turn potentiometer until output is -5.10 +/- 0.05 volts.

35. Put on cover.

36. Replace screw.



37. Set FTU to stop continuous seeks.

38. Cycle down drive.

39. Power OFF drive.

40. Disconnect red and black leads.

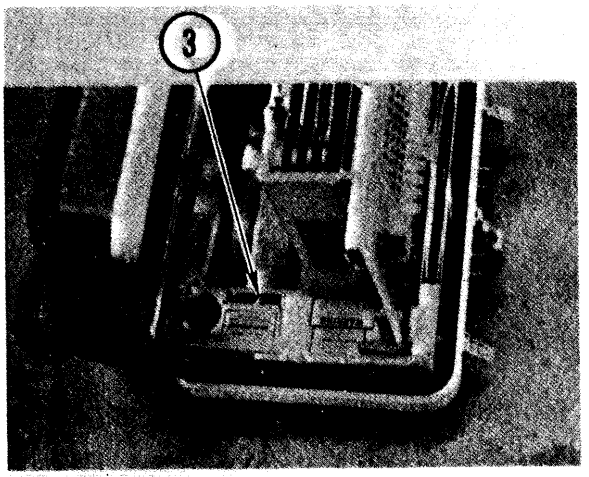
41. Lower logic cage (para 4-25).

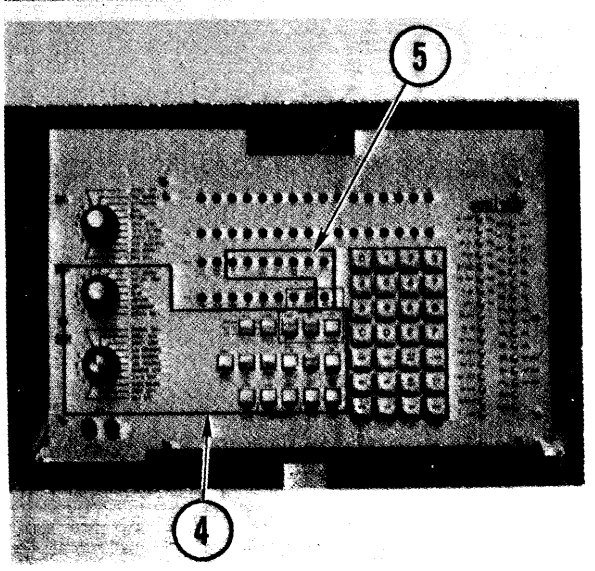
42. Remove FTU. Replace communication cables on disk drive.

43. Remove magnetic disk pack.

44. Replace cover (para 4-11).

4-19. ADJUST PLUS/MINUS 5 VOLTS (CONT)





MODEL TB216

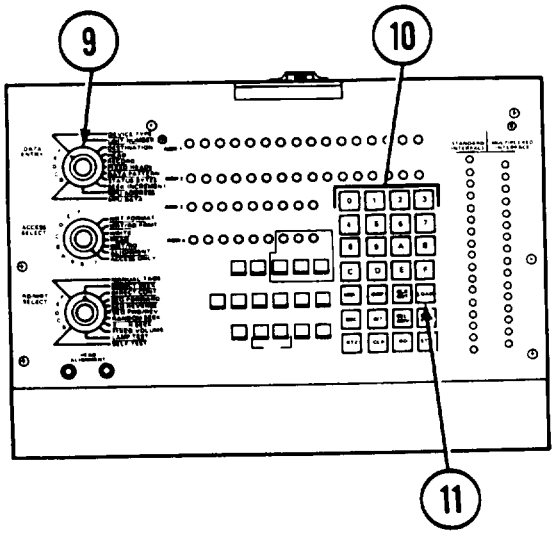
1. Remove cover (para 4-11).
2. Install and test FTU (para 4-53).
3. Power on FTU circuit breaker.
4. In sequence, set FTU switches listed to postions shown:

SWITCH	POSITION
PROCESSOR START/RESET	RESET
PROCESSOR RUN/HALT	HALT
SINGLE/CONT	CONT
-/+ OFFSET	CENTER (OFF)
LATE/EARLY	CENTER (NORMAL)
WRT FLAG	OFF
WRT PROT	ON
AM/SECTOR	EITHER
EOT STOP	OFF
ERROR OVERRIDES:	
DATA-OFF	OFF
ADDR-OFF	OFF
SHIFT PATT/DATA PATT	DATA PATT
RD/WRT SELECT	ACCESS ONLY
ACCESS SELECT	DIRECT SEEK
PROCESSOR START/RESET	START
PROCESSOR RUN/HALT	RUN
SEQ PWR/OFF	SEQ PWR

5. Look to see that the following FTU indicators light:

ON CYCL	SEEK ERRO
RDY	FLT
WT PROT	BUSY
SELD	RUN
+5	-5

4-19. ADJUST PLUS/MINUS 5 VOLTS (CONT)



6. Power ON disk drive.

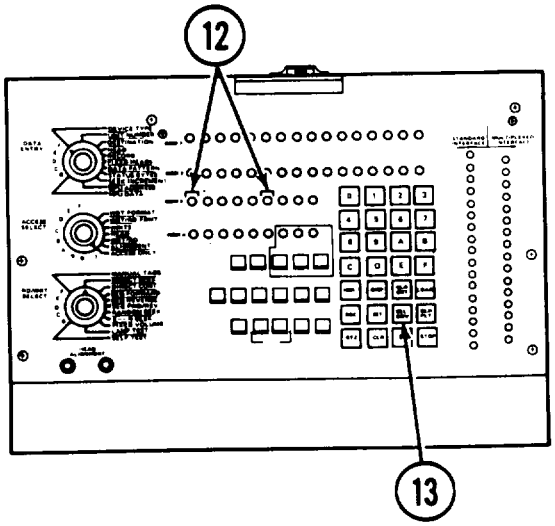
7. Load scratch disk pack.

8. Cycle up disk drive.

9. Turn DATA ENTRY switch to DEVICE TYPE.

10. Enter device code 3105 at keyboard.

- Corresponding ROW 2 indicators will light.
- If you key incorrectly, press CLR ENT, then enter code again.

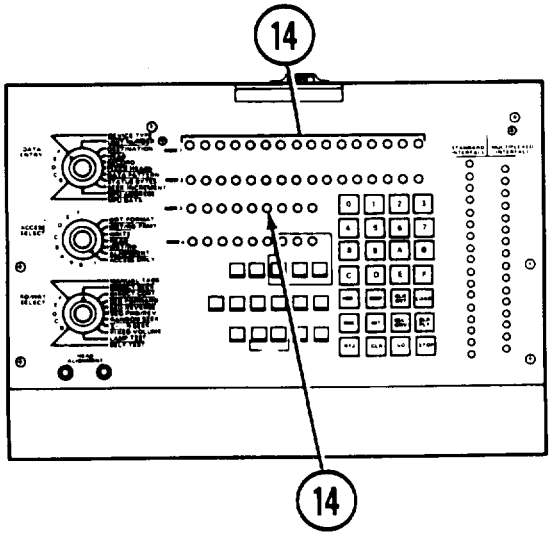


11. Press LOAD key.

- Code will transfer to ROW 1 indicators.
- If code does not transfer press CLR ENT, then repeat step 10.

12. Be sure that ROW 3 indicators 1/0 RDY are lit.

13. Press SEL DRV key.



14. Look to see that SELD indicator lights and that logical address for selected disk drive appears in row 1.

- If SELD is flashing or incorrect logical address lights, selection was unsuccessful.
- Press CLR and repeat from step 10.

4-19. ADJUST PLUS/MINUS 5 VOLTS (CONT)

15. Raise logic cage (para 4-25).

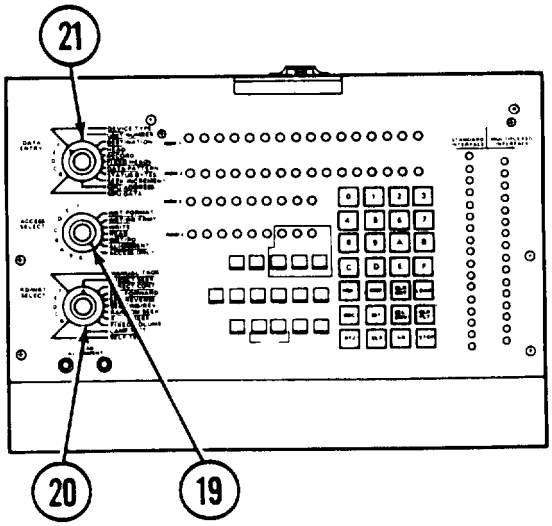
16. Set up multimeter to read dc voltage.

17. At bottom of logic cage, connect black lead to ground terminal.

CAUTION

Do not touch multimeter lead across + 5V and + 20V or damage to board will result. Connect lead carefully.

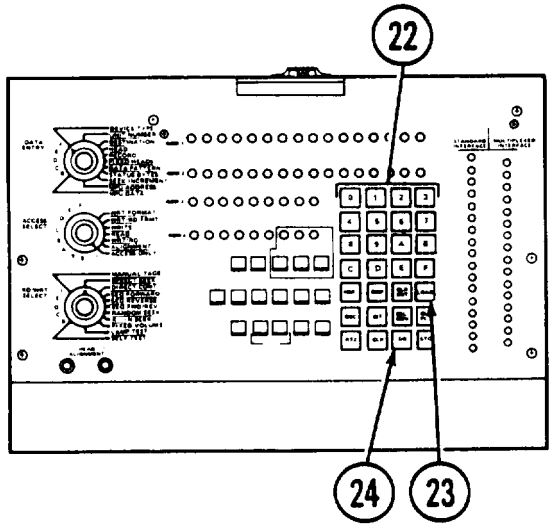
18. Connect red lead to +5V terminal.



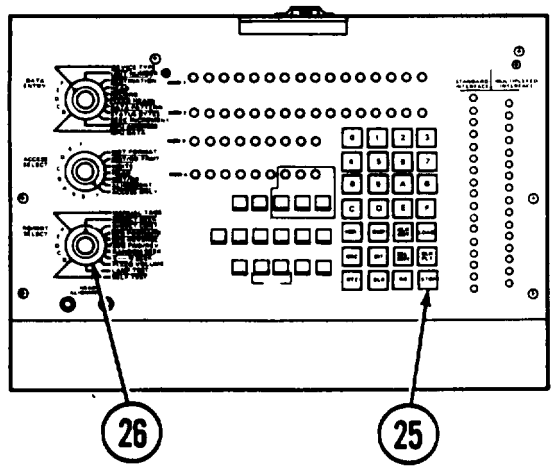
19. Turn RD/WRT SELECT switch to ACCESS ONLY.

20. Turn ACCESS SELECT switch to DIRECT SEEK.

21. Turn DATA ENTRY switch to DESTINATION.

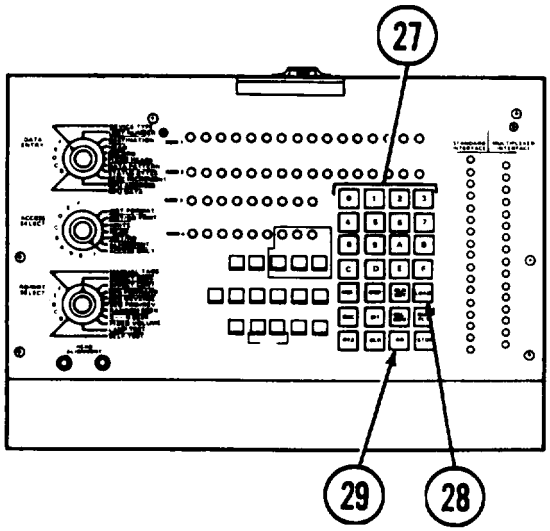


4-19. ADJUST PLUS/MINUS 5 VOLTS (CONT)



25. Press STOP key.

26. Turn ACCESS SELECT switch to DIRECT CONT.



27. Key in 32.

28. Press LOAD key.

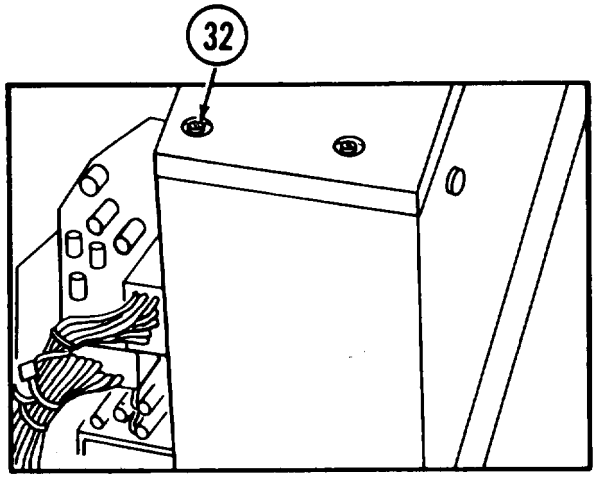
29. Press GO key.

30. Set multimeter to ON.

31. Look at multimeter. +5 volt output must be -5.10 ± 0.05V.

- If it is, go to step 37.
- If it is not, go to step 32.

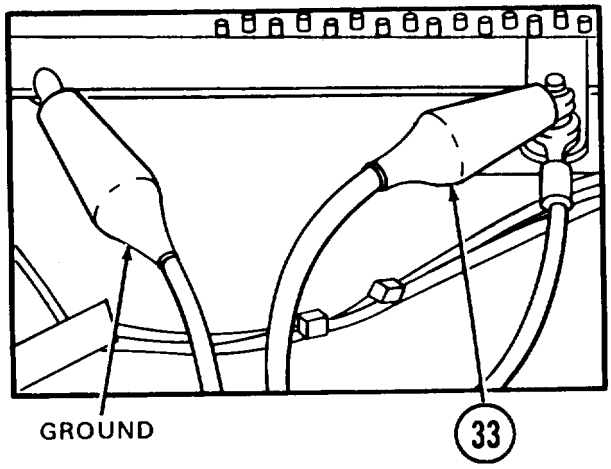
4-190 ADJUST PLUS/MINUS 5 VOLTS (CONT)



32. On power supply, locate +5V adjustment. Use potentiometer adjustment tool to bring output to +5.10 + 0.05V on the multimeter.

CAUTION

Do not touch multimeter lead across -5V and -25V or damage to board will result. Connect lead carefully.

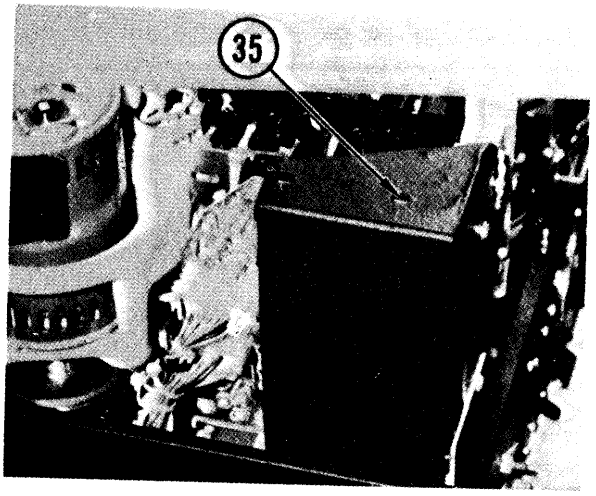


33. On bottom of logic cage, move red multimeter lead to -5V terminal.

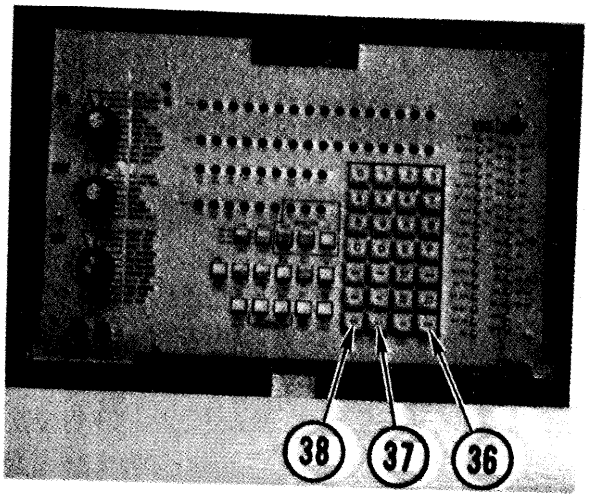
34. Look at multimeter. -5 volts output must be -5.10 ± 0.05 V.

- If it is, go to step 36.
- If it is, not go to step 35.

4-19. ADJUST PLUS/MINUS 5 VOLTS (CONT)



35. On power supply, locate -5 v adjustment. Use potentiometer adjustment tool to bring output to -5.10 ± 0.05 V on the multimeter.



36. On FTU, press STOP key.

37. Press CLR key.

38. Press RTZ key.

39, Set multimeter to OFF.

40• Remove meter leads.

41. Lower logic cage (para 4-25).

42. Cycle down disk drive. Set processor switches START RUN to RESET HALT.

43. Power OFF drive.

44. Power OFF FTU circuit breaker.

45. Remove FTU cables.

46. Reconnect disk drive cables at rear of logic cage.

47. Remove disk pack.

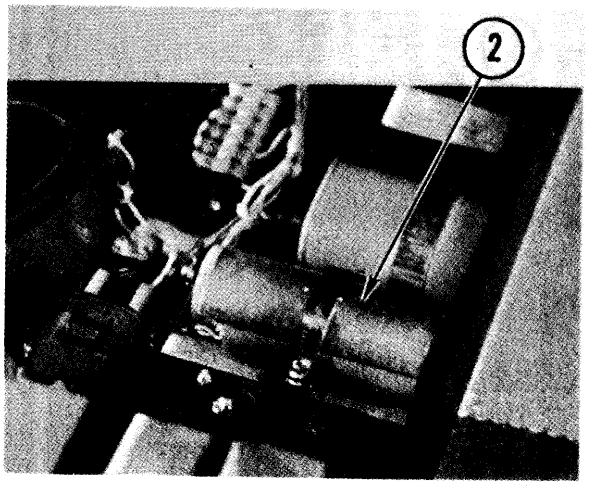
48. Replace drive cover (para. 4-11).

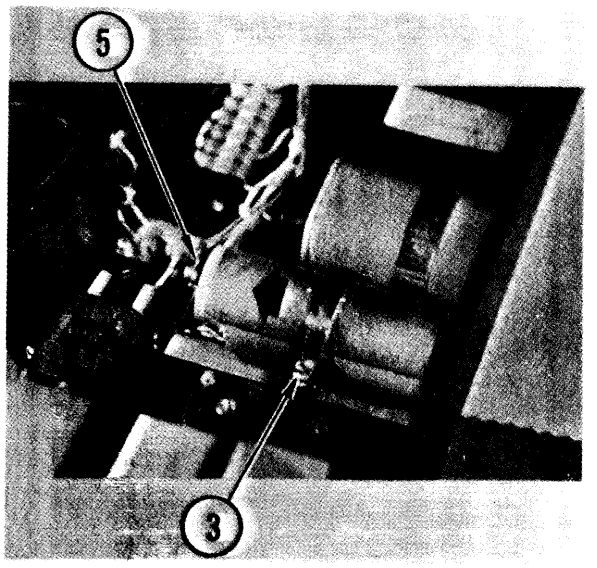
4-20. REMOVE/REPLACE SERVO STARTING CAPACITORS

INITIAL SETUP

Common Tools
- Tool kit

Materials/Spare Parts
- Tags (for wires)
- Pen or pencil





Remove

1. Raise deck (para 4-12)

NOTE

There are three servo starting capacitors. If you are removing top capacitor, do steps 2-5. If you are removing bottom capacitor, do steps 2-9 l

2. Find capacitor you will remove.

WARNING

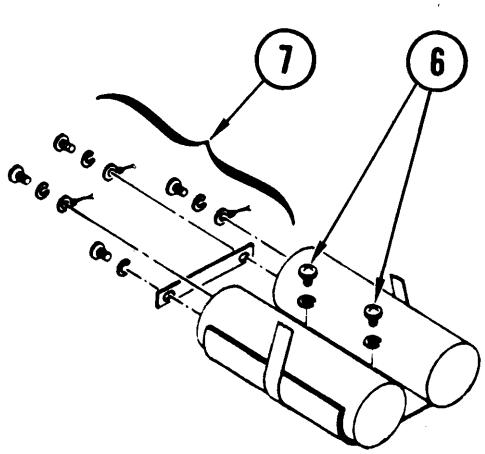
Capacitors may hold high voltage charge. Test with voltmeter before handling.

3. Loosen clamp.

4. Slide out top capacitor. Remove and retain metal shield.

5. Tag and remove wires from top capacitor. Lift out top capacitor.

4-20. REMOVE/REPLACE SERVO STARTING CAPACITORS (CONT)



6. Remove two screws and washers holding bracket to base assembly.

7. Note positions of wires and buss bar on bottom capacitors.

8. Raise capacitors. Remove wires and buss bar from bottom capacitor.

NOTE

If you are removing both bottom capacitors, retain buss bar.

Replace

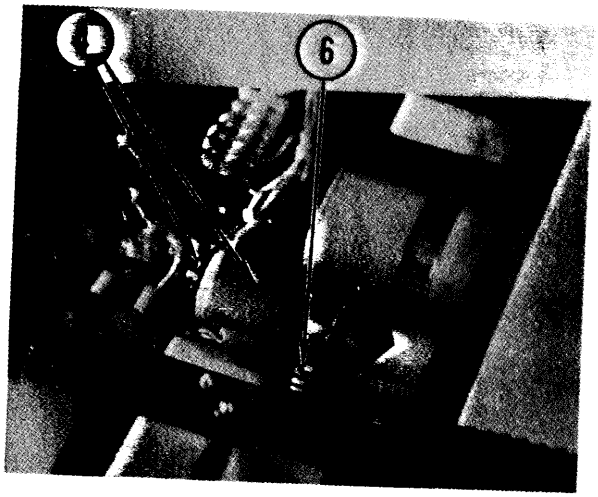
NOTE

If you are replacing a bottom capacitor, do steps 1-7. If you are replacing the top capacitor, do steps 4-7.

1. Using your notes attach wires and buss bar to capacitor.

2. Set capacitor in place on brackets and aline holes in bracket with holes in base assembly.

3. Replace screws and washers which hold capacitor bracket on base assembly. Tighten screws.



4. Attach wires to top capacitor. Set sheild in place on capacitor.

5. Slide capacitor into position under clamp.

6. Tighten clamp.

7. Lower deck (para 4-12).

4-21. REMOVE/REPLACE BLOWER OR TRANSFORMER TUNING CAPACITOR

INITIAL SETUP

Common Tools
- Tool kit

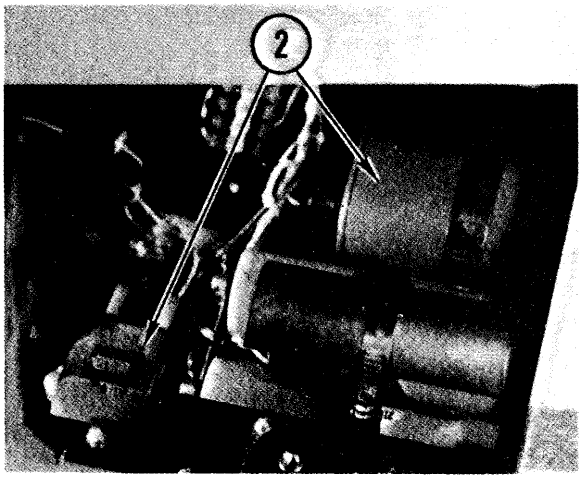
Materials/Spare Parts
- Tags (for wires)
- Pen or pencil

NOTE

This procedure may be used for either capacitor.

Remove

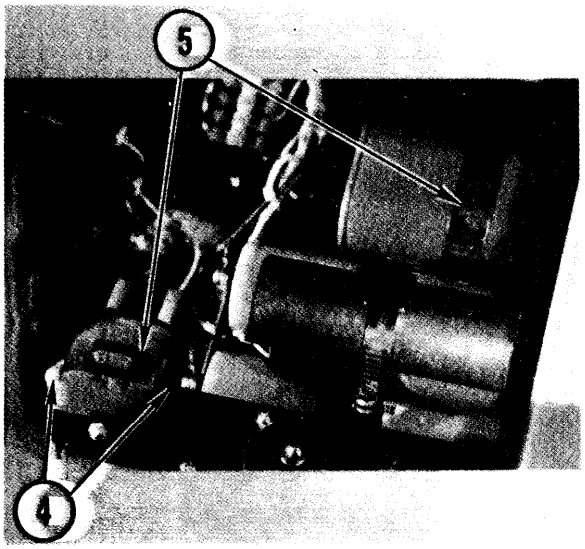
1. Raise deck (para 4-12).



WARNING

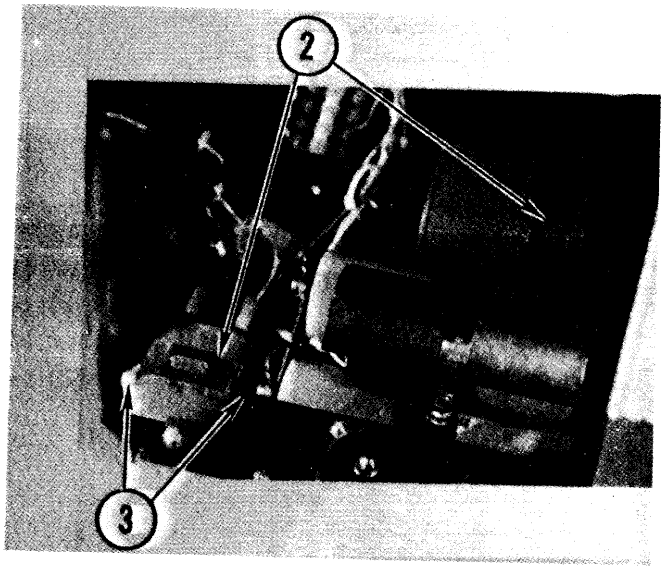
Capacitors may hold high voltage charge. Test with voltmeter before handling.

2. Find defective capacitor.
3. Tag and remove wires from capacitor.



4. Remove two screws from holding clamp.
5. Remove holding clamp.
6. Lift capacitor from disk drive.

4-21. REMOVE/REPLACE BLOWER OR TRANSFORMER TUNING CAPACITOR (CONT)



Replace

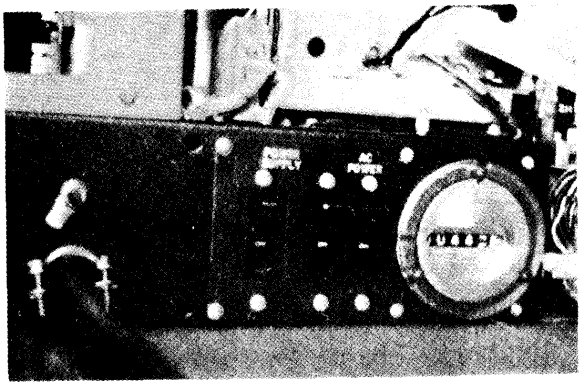
1. Place capacitor on disk drive.
2. Place clamp over capacitor.
3. Replace two screws holding clamp.
4. Replace wires on capacitors.
5. Lower deck (para 4-12).

4-22. REMOVE/REPLACE ELAPSED TIME METER

INITIAL SETUP

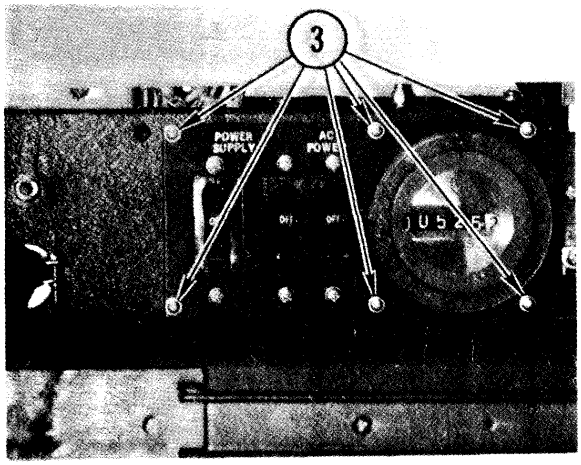
Common Tools
- Tool kit

Materials/Spare Parts
- Tags (for wires)
- Pen or pencil



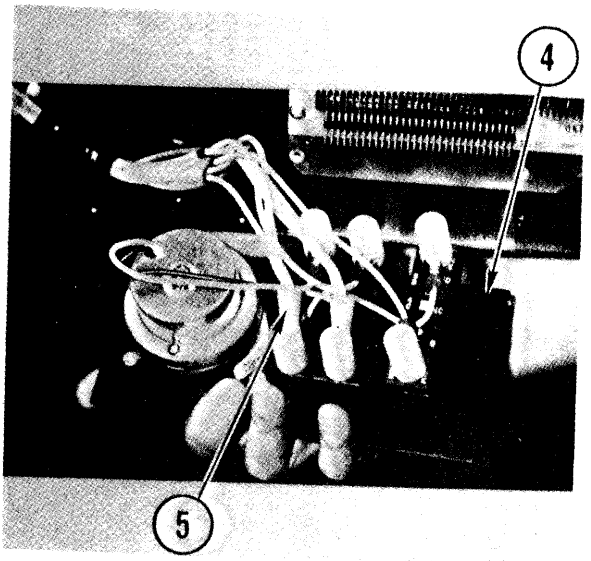
Remove

1. Remove disk drive. (See your system manual.)
2. Set disk drive on work table with access to rear.



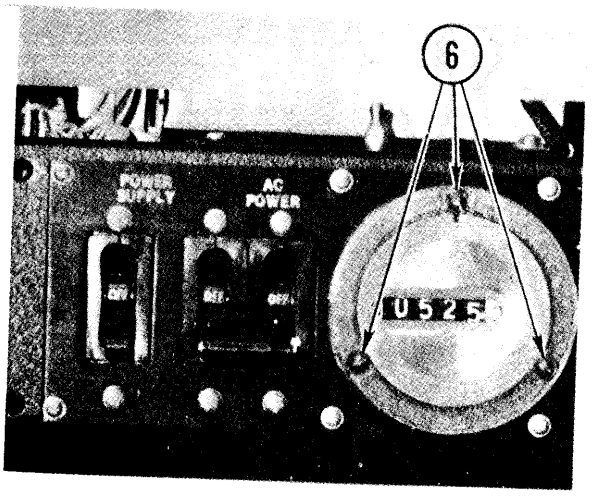
3. Remove six screws. Carefully pull plate out of mounting.

4-22. REMOVE/REPLACE ELAPSED TIME METER (CONT)



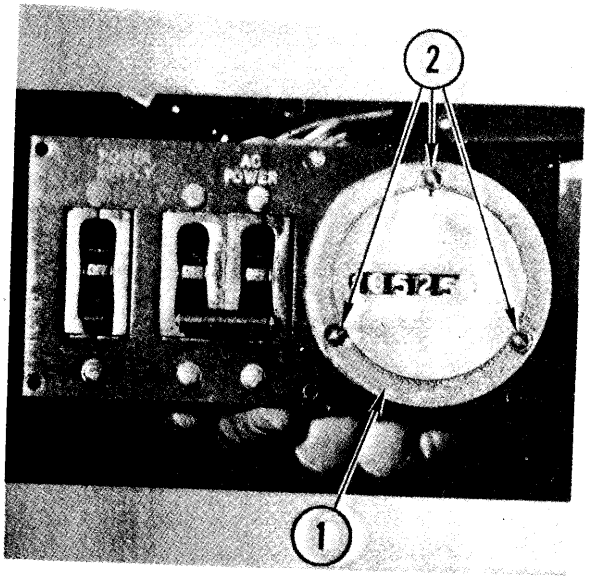
4. Turn plate around.

5. Tag and remove wires from meter to breakers.



6. Remove three screws holding meter to plate.

7. Lift meter from plate.

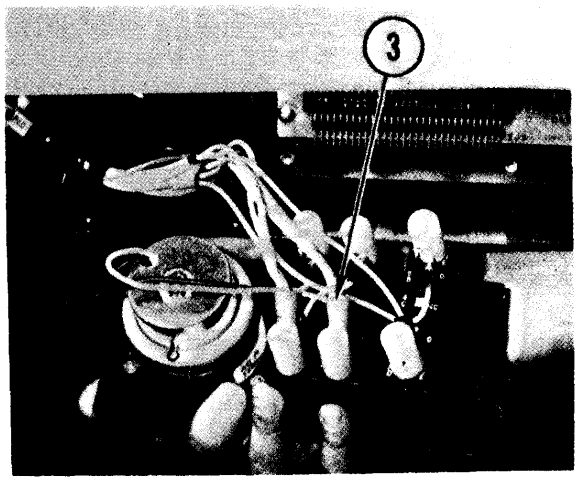


Replace

1. Set meter into position on plate.

2. Replace screws holding meter to plate.

4-22. REMOVE/REPLACE ELAPSED TIME METER (CONT)



3. Connect wires to plate.

4. Set plate into position on disk drive.

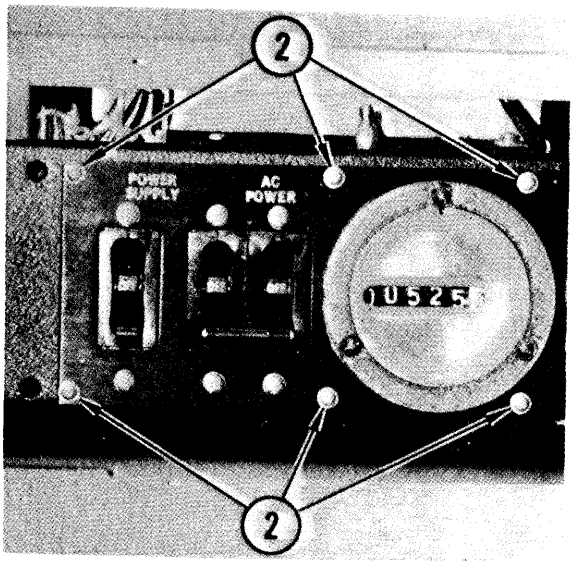
5. Replace screws holding plate to disk drive.

6. Replace disk drive. (See your system manual.)

4-23. REMOVE/REPLACE AC OR DC CIRCUIT BREAKER

INITIAL SETUP

Common Tools
- Tool kit



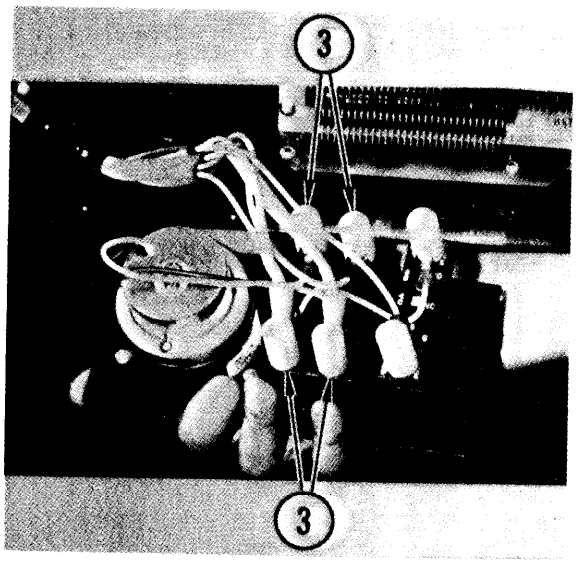
Remove

1. Remove disk drive. (See your system manual).

2. Remove six screws. Carefully pull plate out of mounting.

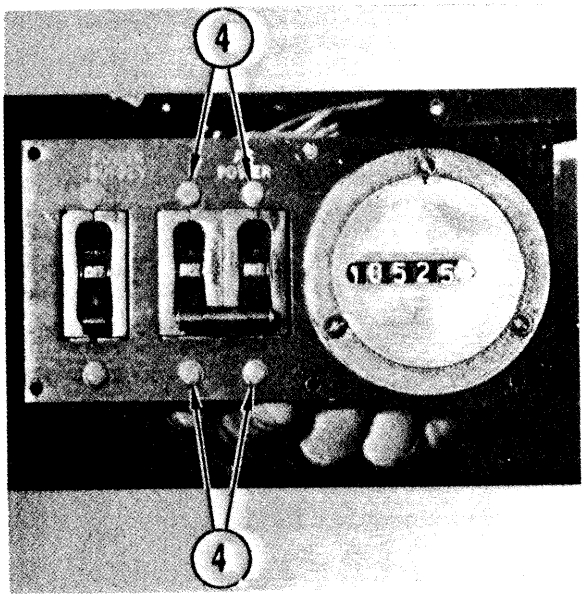
NOTE

Illustration shows removal of ac circuit breaker. Use same procedure for dc circuit breaker.

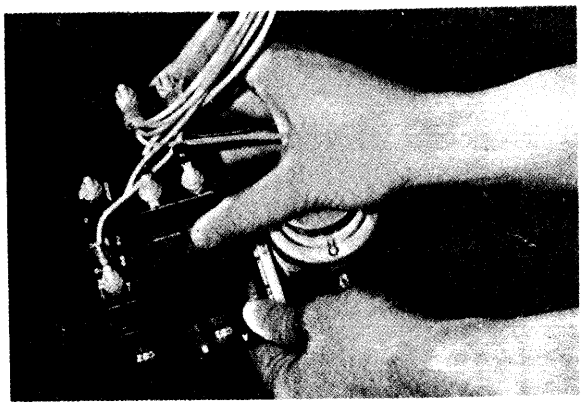


3. Pull off insulation caps. You may need to pry them off with needle nose pliers.

4-23. REMOVE/REPLACE AC OR DC CIRCUIT BREAKER (CONT)



4. Remove screws holding circuit breaker to plate.

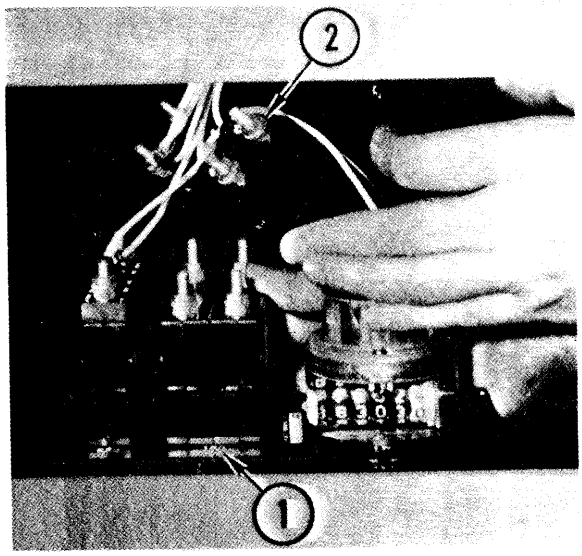


5. Lift out old circuit breaker.

Replace

NOTE

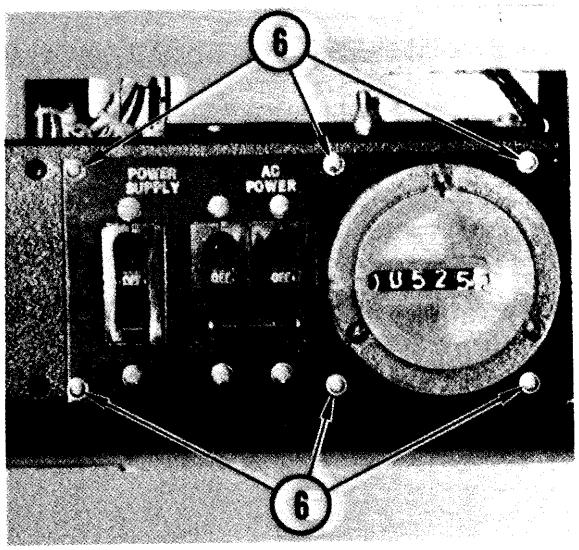
Illustration shows replacement of ac circuit breaker. Use same procedure for dc circuit breaker.



1. Insert new circuit breaker.

2. Using 5/16-in. wrench, loosen nuts on old circuit breaker.

4-23. REMOVE/REPLACE AC OR DC CIRCUIT BREAKER (CONT)



6. Carefully push circuit breaker into mounting. Replace screws.

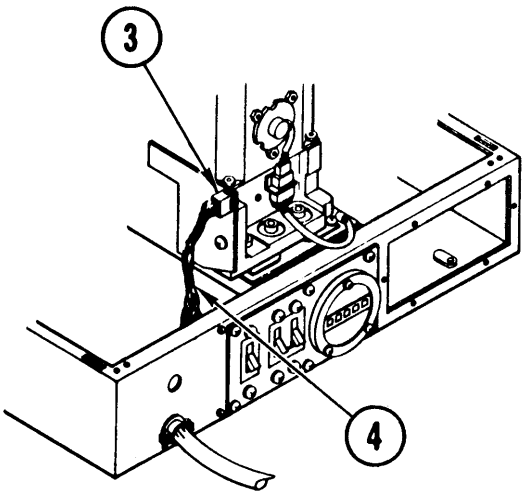
7. Replace disk drive. (See your system manual.)

4-24. REMOVE/REPLACE LINE FILTER

INITIAL SETUP

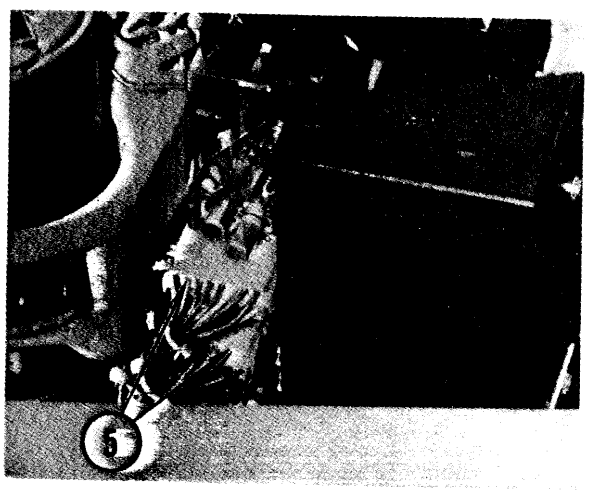
Common Tools
- Tool kit

Materials/Spare Parts
- Tie wraps
- Tags
- Paper
- Pen or pencil



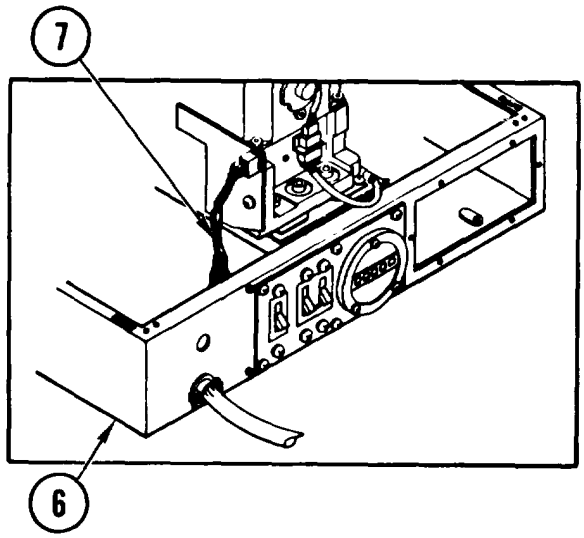
Remove

1. Remove disk drive. (See your system manual).
2. Remove cover (para 4-11).
3. Find plug P200 and disconnect it from power amplifer board.
4. Cut two tie wraps holding P200 to power amplifier.



5. Disconnect P1 and P2 from side of power supply.

4-24. REMOVE/REPLACE LINE FILTER (CONT)

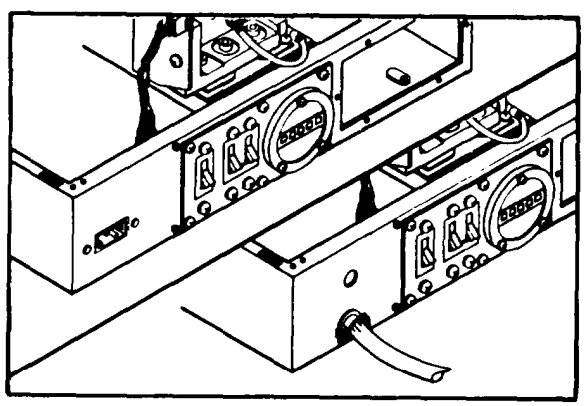


6. From bottom of drive, remove four screws holding power supply mounting bracket to bottom.

7. Cut tie wrap. Remove screw holding wiring harness to power supply bracket.

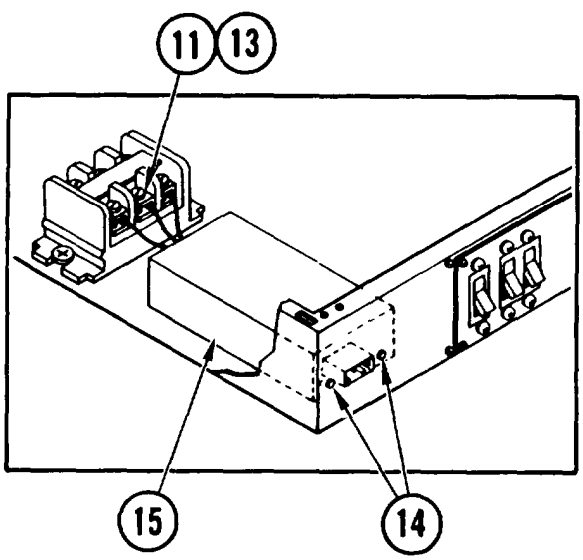
8. Moving wiring harnesses as needed, lift power supply from the drive base.

9. Lay power supply aside carefully without disconnecting more wires.



10. On back face of drive base. Look at line filter power connection.

- If it is a jack for a plug, use steps 11 thru 15
- If there is no jack and the power cord is present, use steps 16 thru 21



11. Note position of line filter wires on terminal board.

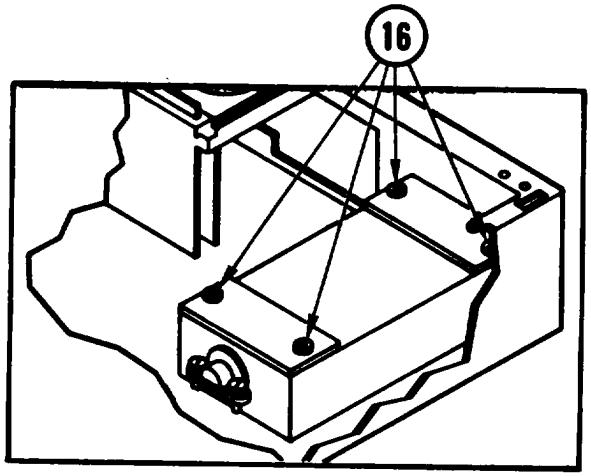
12. Remove plastic shields from terminals.

13. Loosen terminal screws and pull line filter wires out of terminals. (Do not disturb wires on other side of terminal board.)

14. Remove two screws holding line filter to back of drive.

15. Lift line filter from drive base.

4-24. REMOVE/REPLACE LINE FILTER (CONT)



16. Remove screws holding both covers to line filter. Remove both covers.

17. On note paper, identify each wire and terminal to which it connects. Record connections for both ends.

18. Disconnect wires from terminals in both ends.

19. At both ends, loosen and remove nut holding connector to line filter.

20. Pull filter away from connectors.

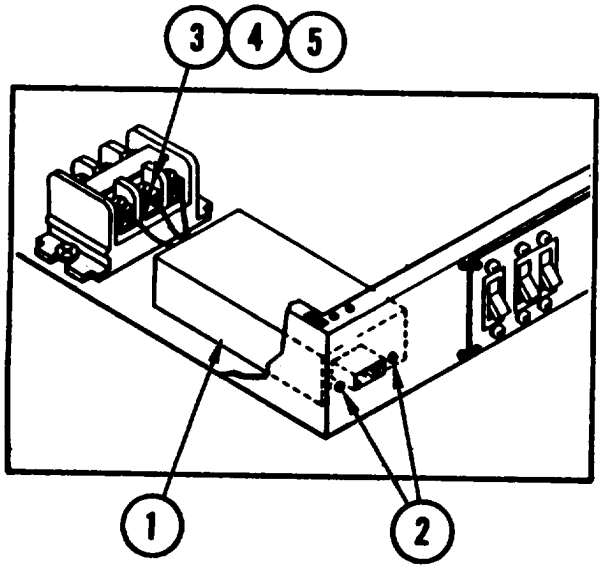
21. Pass wires though connector holes in filter.

Replace

NOTE

If line filter has jack for a removable power cord, use steps 1 thru 6.

If line filter does not have jack, use steps 7 thru 12.



1. Place line filter in drive base.

2. Aline filter mounting holes with holes in rear of drive base. Install mounting screws.

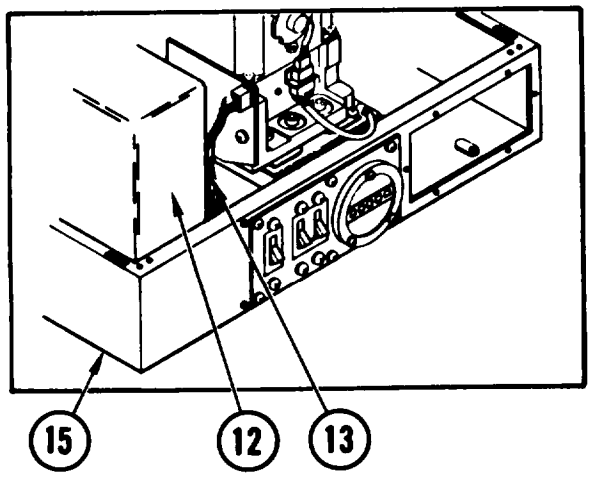
3. Using notes made during removal, match each filter wire with its terminal number.

4. Insert each wire into its terminal and, while holding wire in place, tighten terminal screw.

5. Install plastic covers over terminals.

6. Go to steps 13-22.

4-24. REMOVE/REPLACE LINE FILTER (CONT)



7. Look at line filter to see which end is line side and which is load side.
8. Insert power cord wires into connector hole on line side.
9. Insert wires from drive terminal load into connector hole on load side.
10. On each end, pass connector nut over wires, seat connector, then tighten nut.
11. Using notes made during removal, connect wires to terminals.
12. Position covers and insert screws.
13. Moving wiring harnesses as needed, place power supply in position on drive base.
14. Replace tie wrap.
15. Aline power supply mounting holes with holes in drive base.
16. From below, install power supply mounting screws.
17. Reconnect plug P200.
18. Secure wiring harness P200 to two harness clamps with new tie wraps.
19. Reconnect plugs P1 and P2 to jacks J1 and J2.
20. If removed, replace ac power cord.
21. Replace cover (para 4-11).
22. Replace disk drive (See system manual.)

4-25. RAISE/LOWER LOGIC CAGE FOR MAINTENANCE

INITIAL SETUP

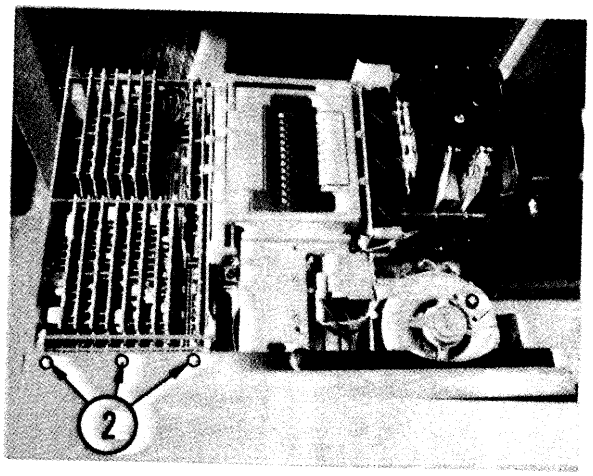
Common Tools
- Tool kit

Raise

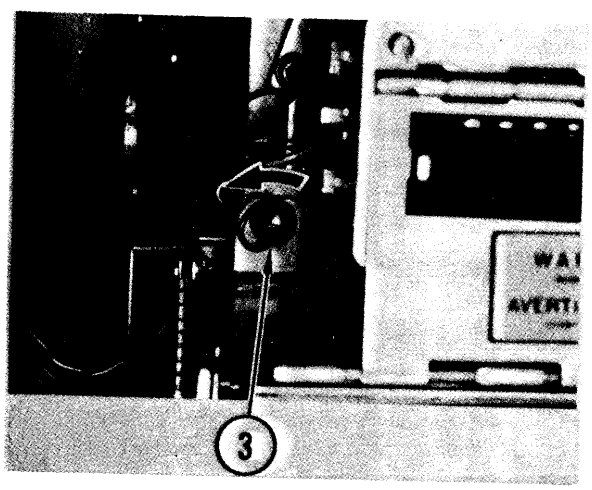
1. Remove cover (para 4-11).

NOTE

On some units, bracket may have only two screws.

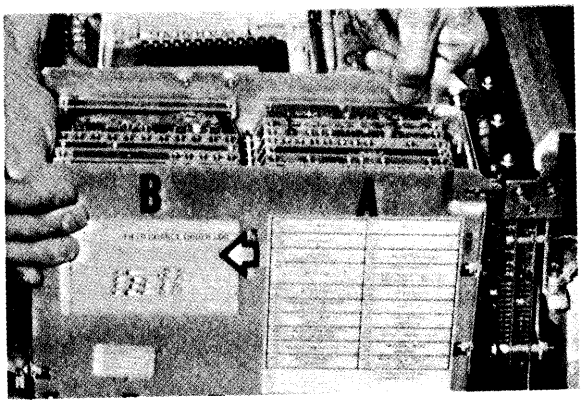


2. Loosen screws enough to free cage.



3. From rear of drive, loosen fastener as shown.

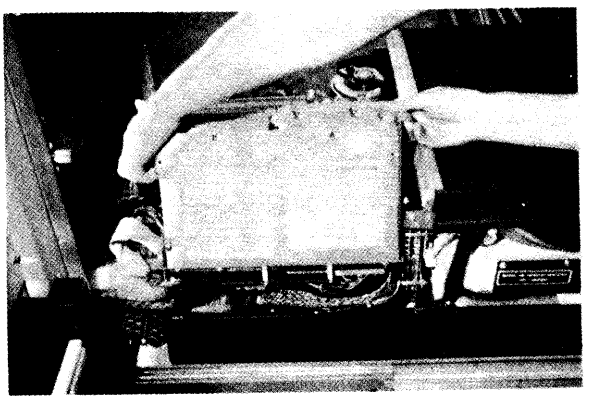
4-25. RAISE/LOWER LOGIC CAGE FOR MAINTENANCE (CONT)



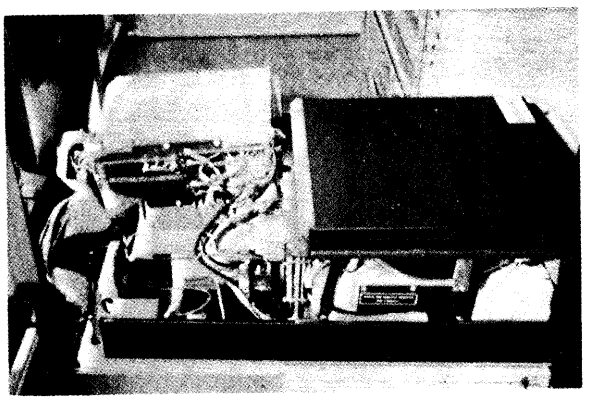
4. Carefully pull logic cage out of mount.

CAUTION

Logic cage can fall if not secured.



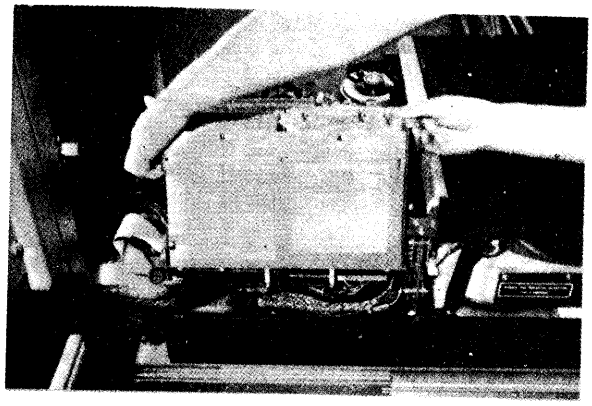
5. Swing up cage.



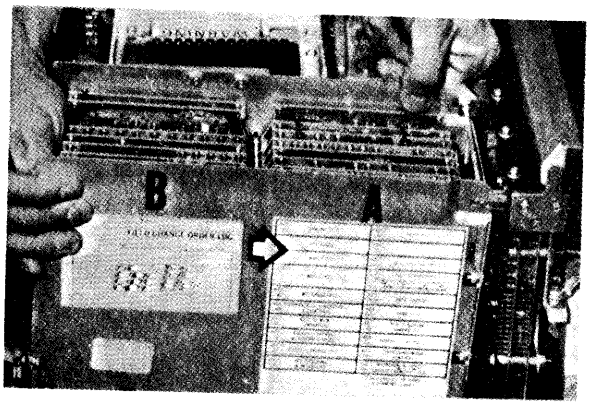
6. Lay cage on its side as shown.

4-25. RAISE/LOWER LOGIC CAGE FOR MAINTENANCE (CONT)

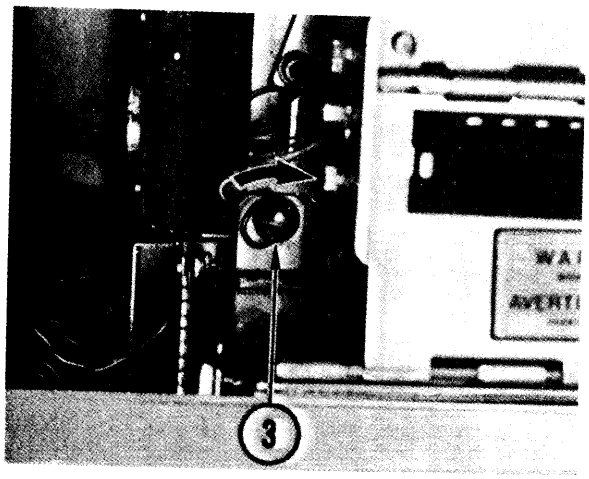
Lower



1. Swing cage down as shown.

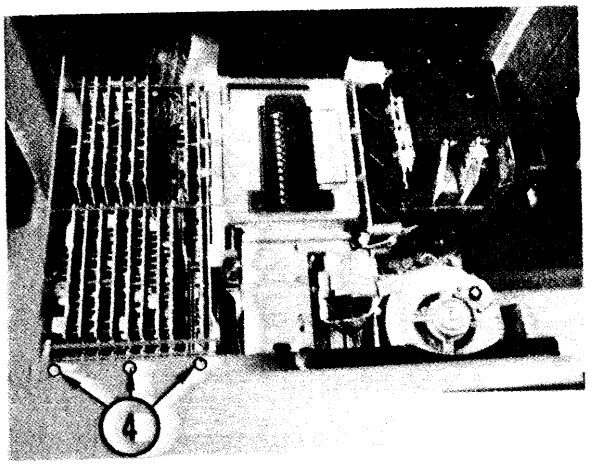


2. Slide cage into mount.



3. From rear of drive, tighten fastener as shown.

4-25. RAISE/LOWER LOGIC CAGE FOR MAINTENANCE (CONT)



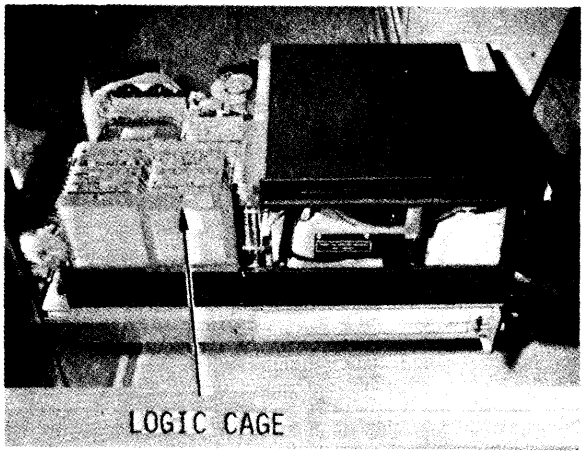
4. Tighten screws.

5. Replace cover (para 4-11).

4-26. REMOVE/REPLACE LOGIC CAGE BOARDS

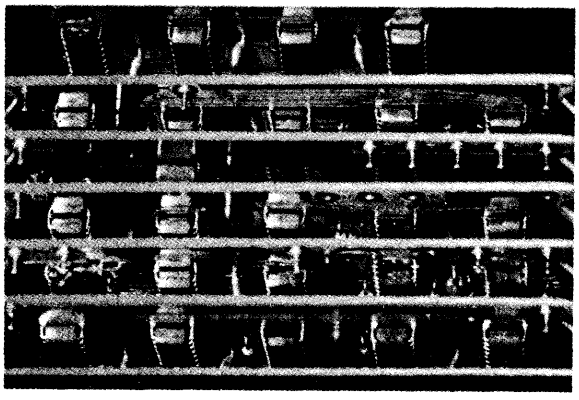
INITIAL SETUP

Special Tools
Card extraction tool



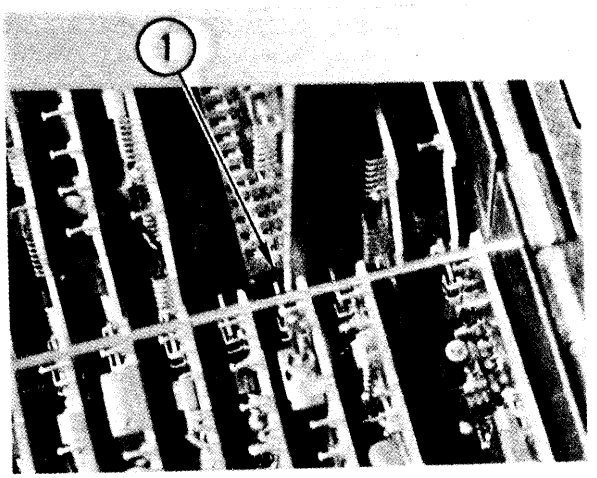
Remove

1. Remove cover (para 4-11).



2. Using card extraction tool, pull board straight up. If board does not slide out, wiggle it loose.

4-26. REMOVE/REPLACE LOGIC CAGE BOARDS (CONT)



Replace

1. Using side guides, carefully slide board back into slot. Make sure it is seated evenly in cage.

2. Replace cover (para 4-11).

4-27. REMOVE/REPLACE BACKPLANE

INITIAL SETUP

Common Tools
- Tool kit

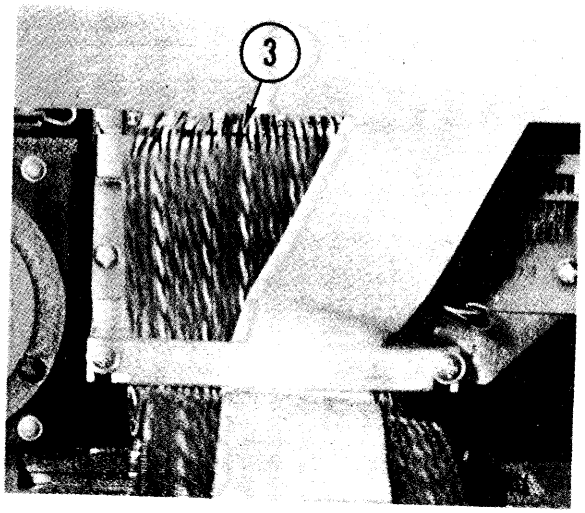
Materials/Spare Parts
- Tags
- Pen or pencil

NOTE

The backplane and logic cage are removed and replaced as one assembly.

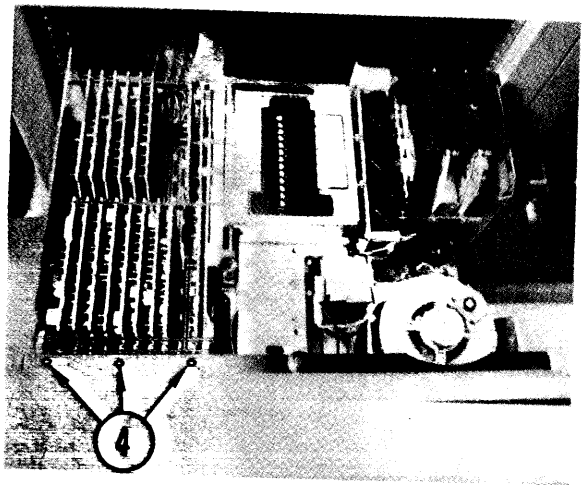
Remove

1. Remove cover (para 4-11).



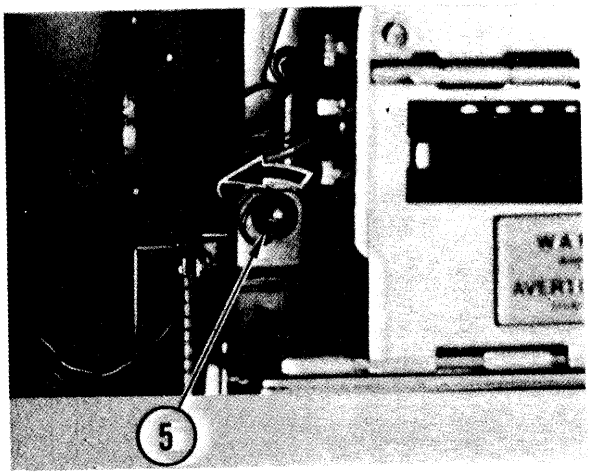
2. Remove all boards from logic cage (para 4-26).

3. Tag, then remove all cables from rear of cage.



4. Loosen screws enough to free cage.

1-27. REMOVE/REPLACE BACKPLANE (CONT)



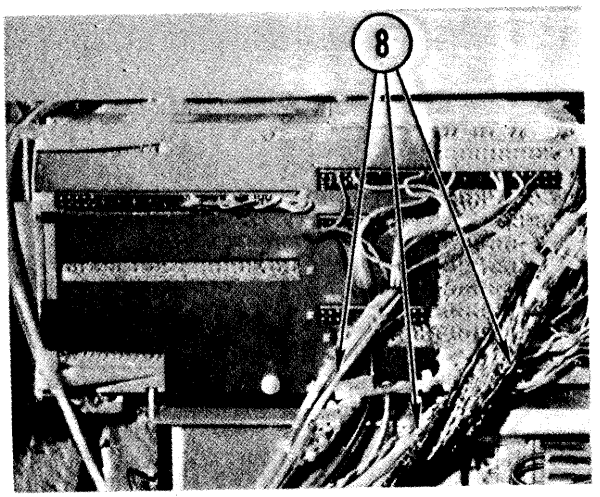
5. From rear of drive, loosen fastener as shown.

6. Carefully pull logic cage out of mount.

CAUTION

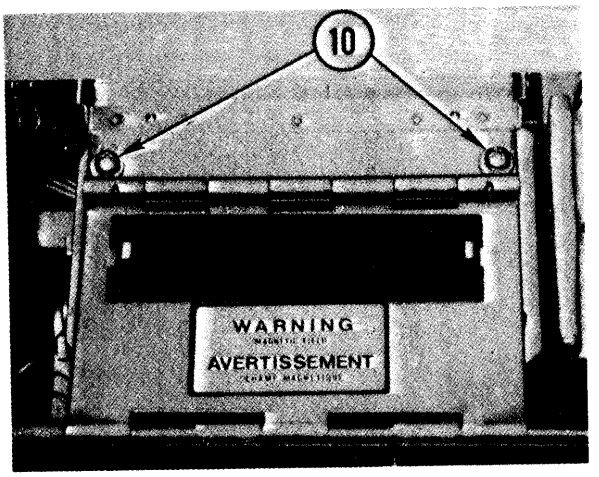
Logic cage can fall if not secured.

7. Swing up cage.



8. Tag, then remove all cables and wires from bottom of cage.

9. Lower cage.



10. Remove two screws holding logic cage to carriage coil assembly.

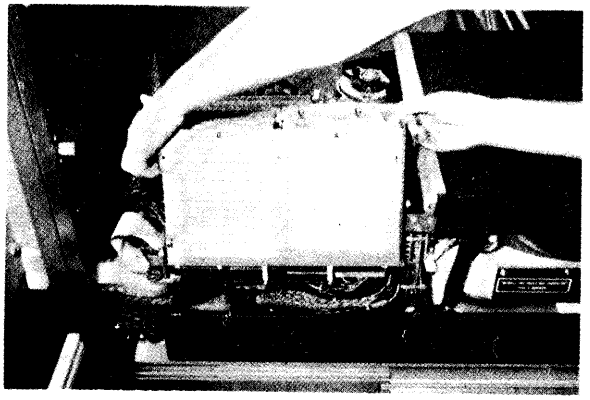
11. Lift backplane and logic cage from drive.

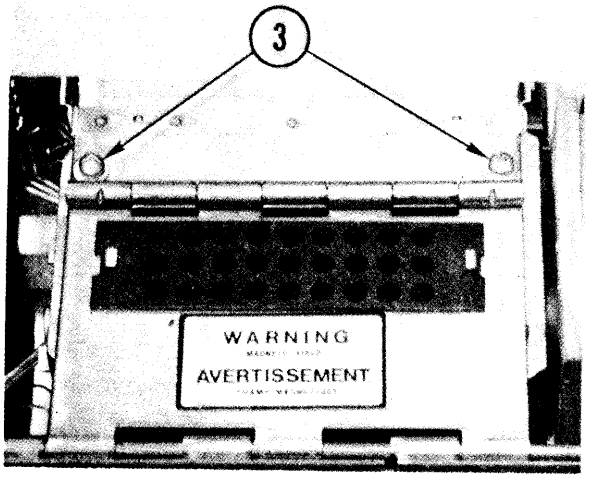
4-27. REMOVE/REPLACE BACKPLANE (CONT)

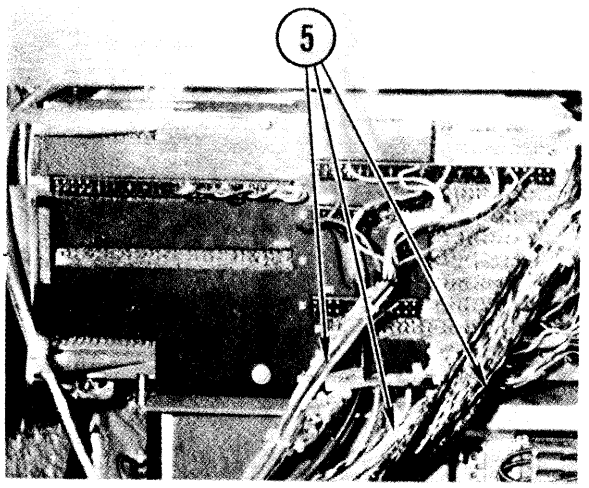
Replace

1. Replace all logic boards (para 4-26).

2. Mount logic cage into position on drive.



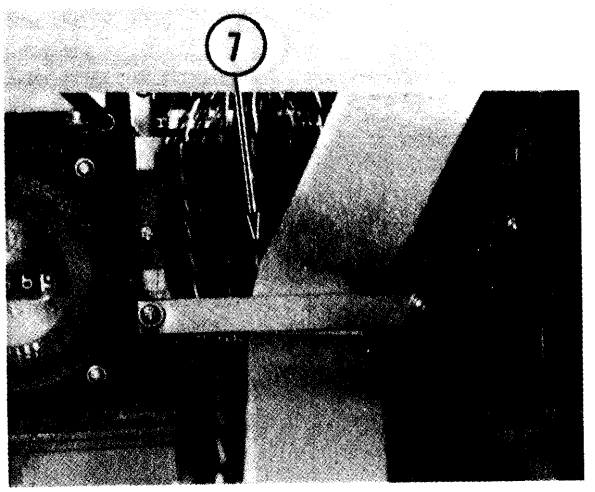




5. Replace all cables and wires to bottom of cage.

6. Lower cage (para 4-25).

4-27. REMOVE/REPLACE BACKPLANE (CONT)



7. Replace all cables on rear of drive.
8. Replace cover (para 4-11).

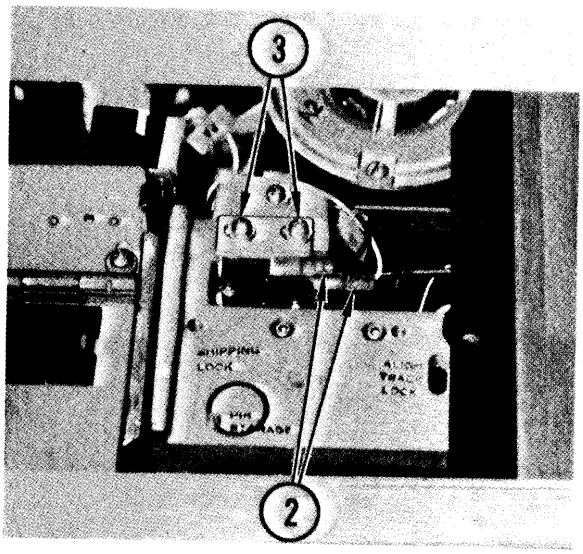
4-28. REMOVE/REPLACE/ADJUST HEADS LOADED SWITCH

INITIAL SETUP

Common Tools
- Tool kit

Materials/Spare Parts
- Paper
- Pen or pencil

TMDE
- Multimeter



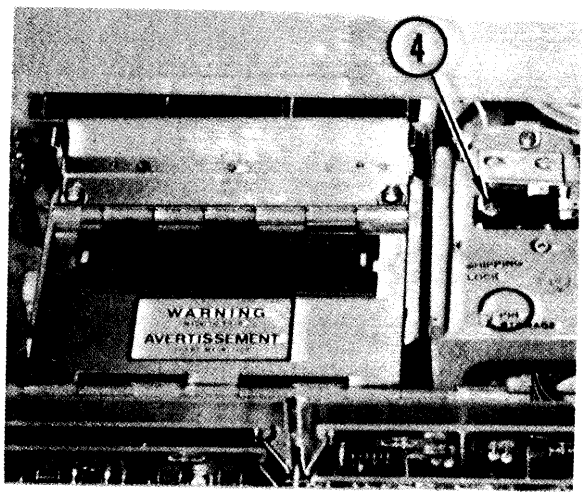
Remove

1. Raise cover (para 4-11).
2. On piece of paper, note position of wires. Using needle nose pliers, pull off wires.

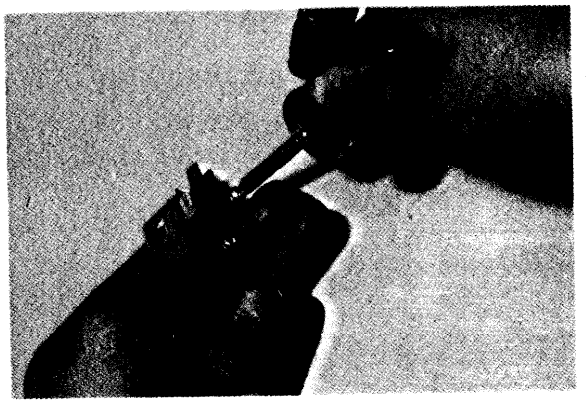
NOTE

Some disk drives may have a protective shield over the heads loaded switch. If your drive has one, discard it. It cannot be used once switch has been readjusted.

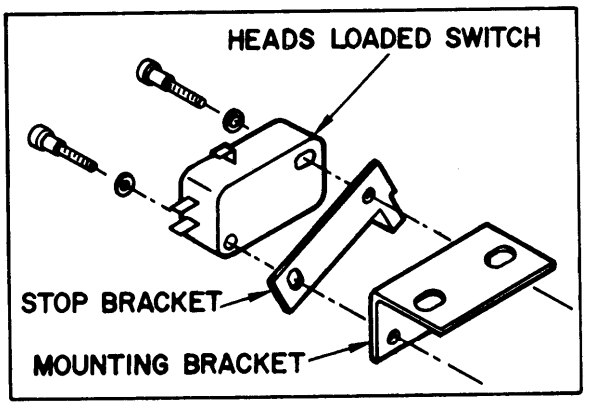
3. Remove screws and washers.



4-28. REMOVE/REPLACE/ADJUST HEADS LOADED SWITCH (CONT)



5. Remove screws and nuts.



6. Remove switch and stop bracket from mounting bracket.

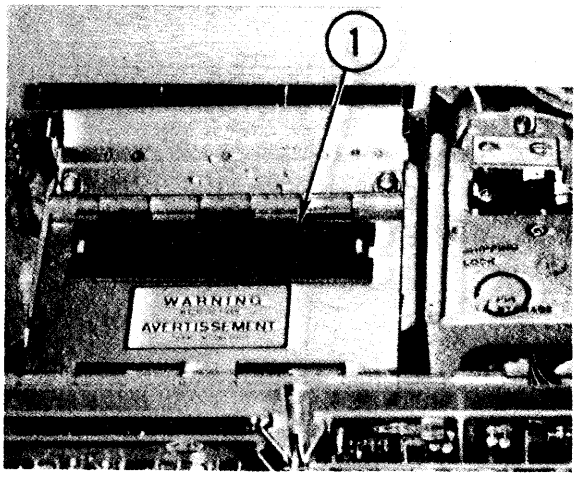
Replace

1. Assemble switch and stop bracket to mounting bracket. Replace switch screws.

2. Put switch back in drive. Replace mounting bracket screws.

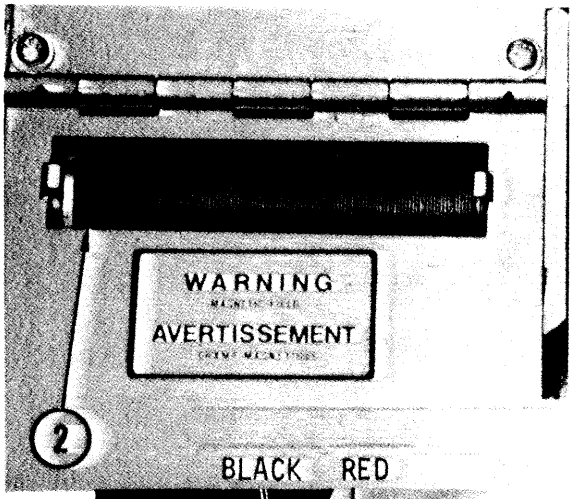
3. Go to Adjust step 1.

4-28. REMOVE/REPLACE/ADJUST HEADS LOADED SWITCH (CONT)



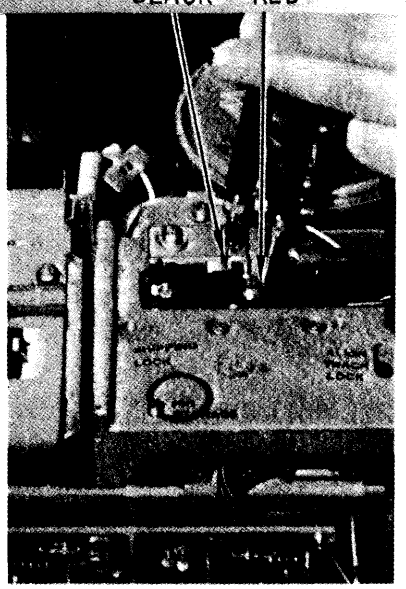
Adjust

1. Pull cover off actuator assembly.



2. Make sure carriage is fully retracted.

3. Set up multimeter to measure resistance.

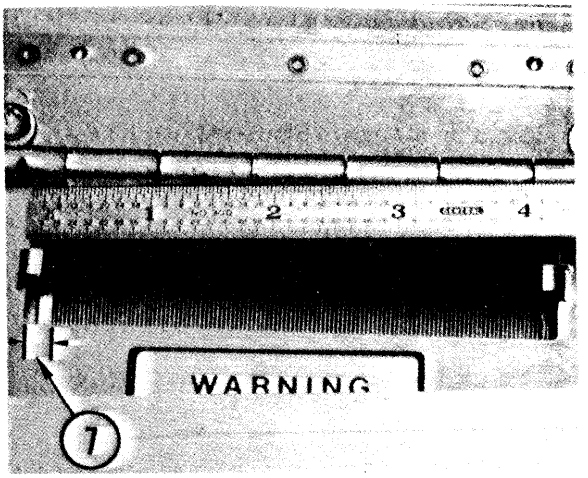


4. Connect leads as shown.

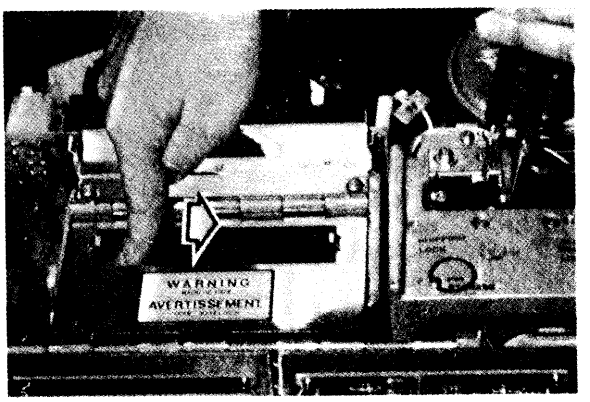
5. Set multimeter to read 2 ohms.

6. Check meter. It should read zero ohms.

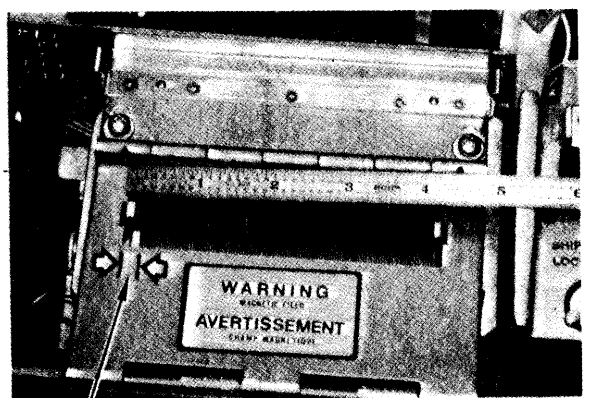
4-28. REMOVE/REPLACE/ADJUST HEADS LOADED SWITCH (CONT)



7. Using machinist's rule, measure distances between rear of coil and edge of assembly, as shown. On piece of paper, write down the distance.



8. Move coil forward until meter switches from zero ohms to one ohm.



9. Again, measure distance between coil and edge of assembly, as shown. Write it down.

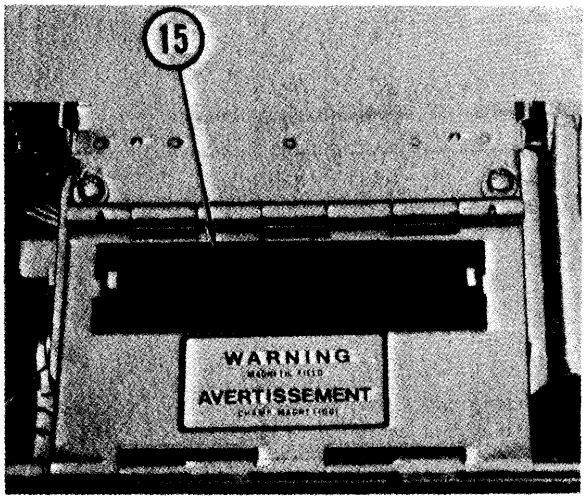
4-28. REMOVE/REPLACE/ADJUST HEADS LOADED SWITCH (CONT)

10. The difference between distance measured in step 7 and step 9 must be 1/16 to 1/8 inch. If measurement is off, go to step 11. If measurement is correct, go to step 12.

11. Loosen mounting bracket screws enough to slide heads loaded switch forward or backward. Move switch and repeat steps 8 thru 10 until distance is correct.

12. Tighten mounting bracket screws.

13. Using your notes, reconnect red wires to switch.



14. Manually move carriage to fully retracted position.

15. Replace coil cover.

16. Replace cover (para 4-11).

4-29. REMOVE/REPLACE READ/WRITE HEADS

INITIAL SETUP

Common Tools
- Tool kit
- Torque screwdriver

Remove

NOTE

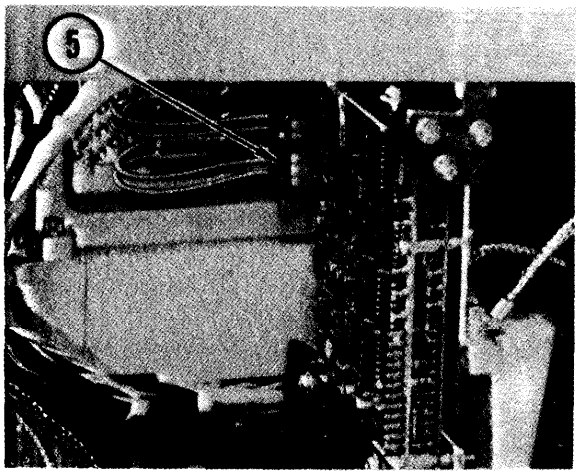
There are five read/write heads. Follow the same steps for each head. This task shows read/write head number zero.

1. Remove cover (para 4-11).
2. Press release latch and lift pack access cover.

NOTE

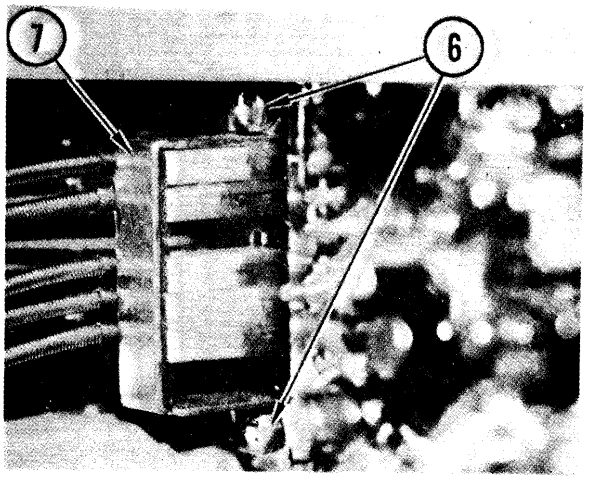
Some disk drives have a pack cover solenoid which will not release latch when power is off. If latch will not release, power on drive, open pack access-cover and power off.

3. If installed, remove disk pack.
4. Raise logic cage (para 4-25).



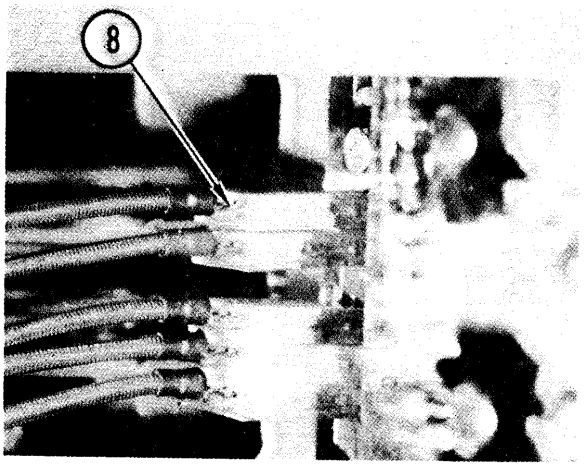
5. Locate head connectors.

4-29. REMOVE/REPLACE READ/WRITE HEADS (CONT)

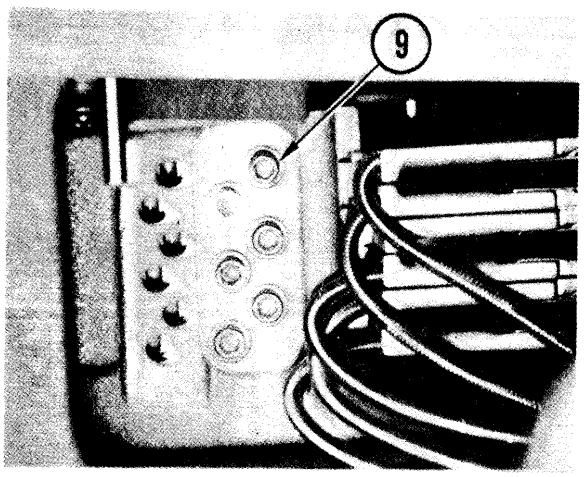


6. Take out screws.

7. Pull off bracket.

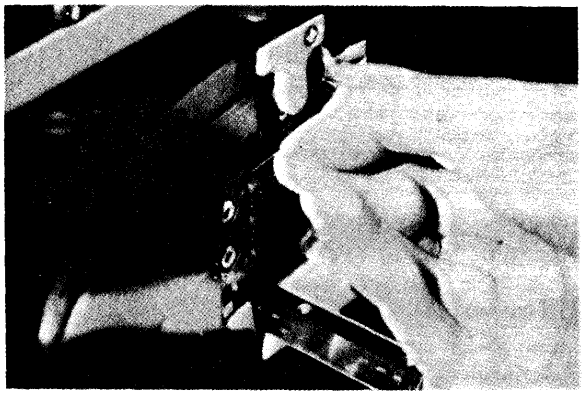


8. Unplug connector.



9. Remove screw.

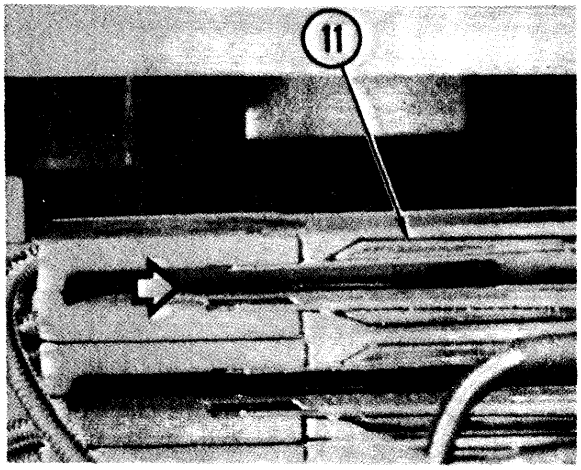
4-29. REMOVE/REPLACE READ/WRITE HEADS (CONT)



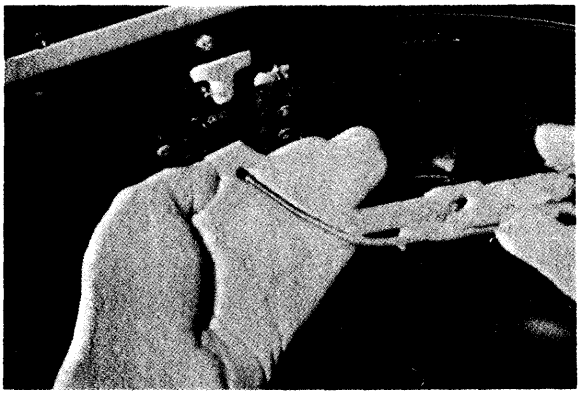
CAUTION

Heads scratch easily. Pull head out carefully. Don't let one head rub another. another.

10. From inside pack area, find head. Grasp edge of arm only. Gently pull out head about 1/4 inch.



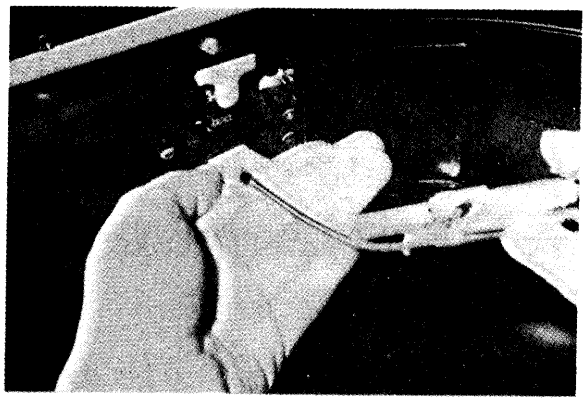
11. Go to rear. Make sure connector isn't caught on anything. Push head forward another 1/2 inch as shown.



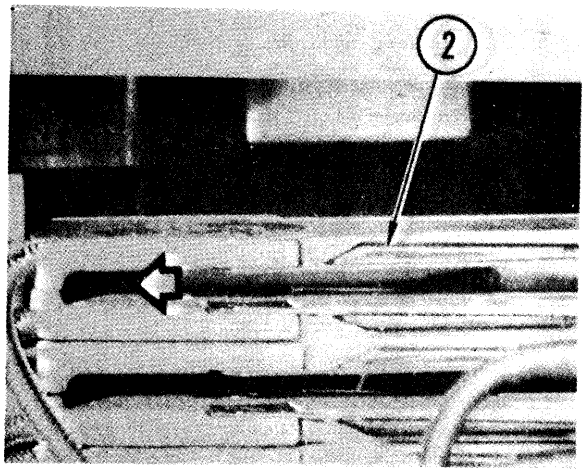
12. From pack area, pull head and connector out all the way.

4-29. REMOVE/REPLACE READ/WRITE HEADS (CONT)

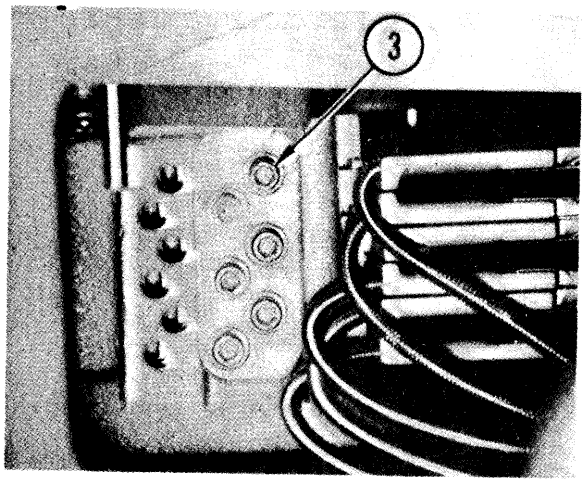
Replace



1. Hold head arm by edge as shown. From pack area, slide connector and head in slot as shown.

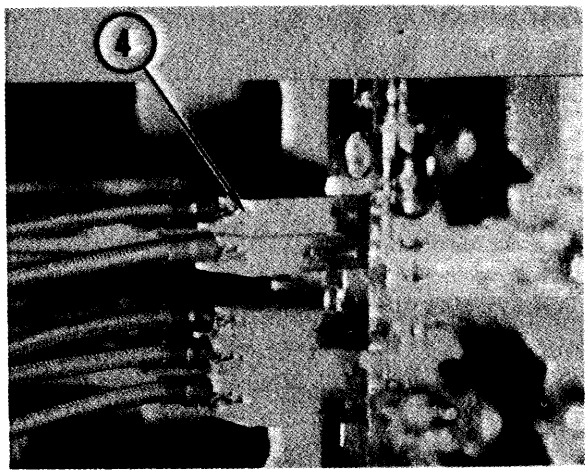


2. From rear, grasp head and slide it back until it lines up with other heads.



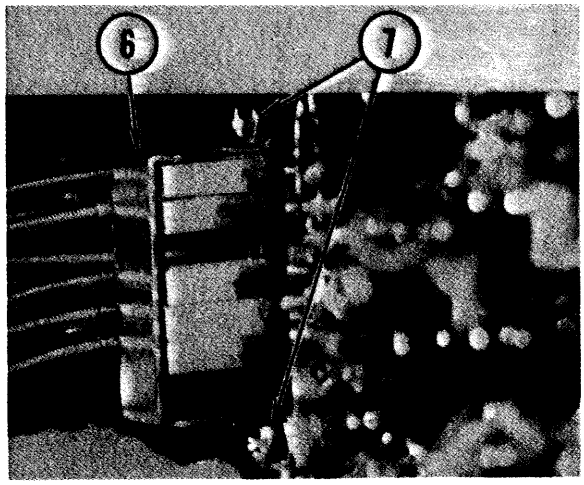
3. Replace screw. Using torque screwdriver, tighten to a torque of 4 to 8 inch-pounds.

4-29. REMOVE/REPLACE READ/WRITE HEADS (CONT)



4. Plug in connector.

5. Aline heads (para 4-30).



6. Replace bracket.

7. Replace screws.

8. Lower logic cage (para 4-25).

9. Replace cover (para 4-11).

4-30. CHECK/ALINE READ/WRITE HEADS

INITIAL SETUP

Common Tools	Special Tools	Test, Measurement and Diagnostic Equipment	Materials/ Spare Parts
● Tool kit ● Torque screwdriver	● Head alinement tool	● Field test unit ● Oscilloscope ● CE alinement pack	● Paper ● Pen or pencil

Check

1. Remove cover (para 4-11).

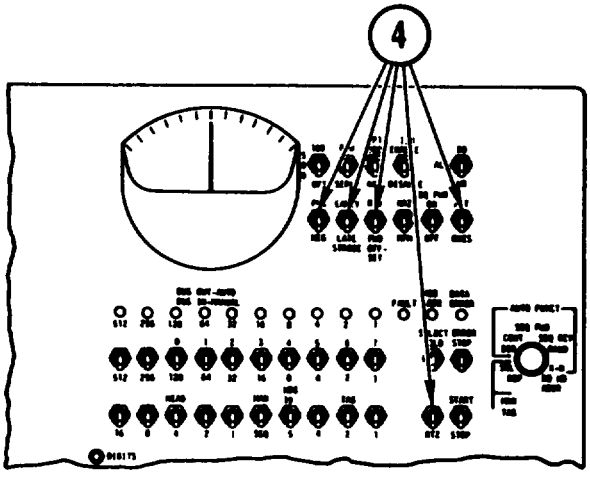
2. Raise logic cage. Check servo head alinement (para 4-31, Replace steps 4-5) l

NOTE

Your field test unit (FTU) may be model TB216 or TB303. This procedure covers each model under its respective heading. Continue with step 3 under correct model heading.

MODEL TB303

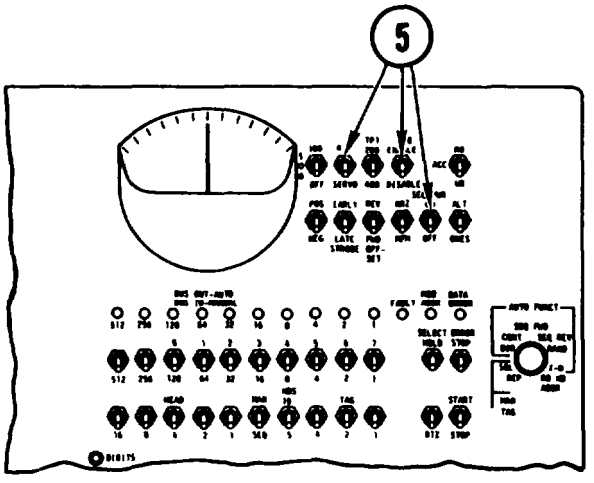
3. Install FTU (para 4-53).



4. Set these toggle switches in center position.

- ACC/RD/WR
- POS/NEG
- EARLY/LATE STROBE
- REV/FWD/OFF-SET
- RTZ

4-30. CHECK/ALINE READ/WRITE HEADS (CONT)



5. Set these toggle switches in up position.

   l R/W SERVO
   l 1/0 ENABLE-DISABLE
   l SEQ PWR ON/OFF

6. Set all remaining switches in down position.

7. Set up oscilloscope. Use these settings for X10 probe:

   VOLTS/DIV

   CH 1 - 0.1 v
   CH 2 - not used

   TIME/DIV

   1 usec.

   TRIGGERING

   CH 1 - INTERNAL POSITIVE

8. Attach channel 1 probe to red dibits jack of FTU.

9. Attach, probe ground lead to the black dibits jack of FTU.

10. Power on drive.

11. Load CE alinement pack.

   CAUTION

   Make sure PROTECT indicator is lit.

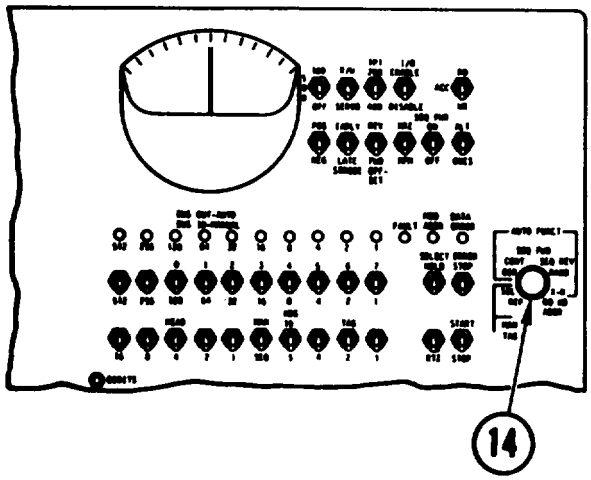
12. Cycle up disk drive.

13. On FTU push down then release RTZ.

   CAUTION

   Wait 30 minutes before doing step 15. This will ensure stabilization of disk drive temperatures.

4-30. CHECK/ALINE READ/WRITE HEADS (CONT)



14. Turn AUTO FUNCT selector to SGL.

NOTE

When there are two disk drives per channel, use step 15 for second drive. For all other disk drives, start at step 16. See your system manual to determine disk drives per channel.

15. Set BUS OUT switch 1 up to address second drive.

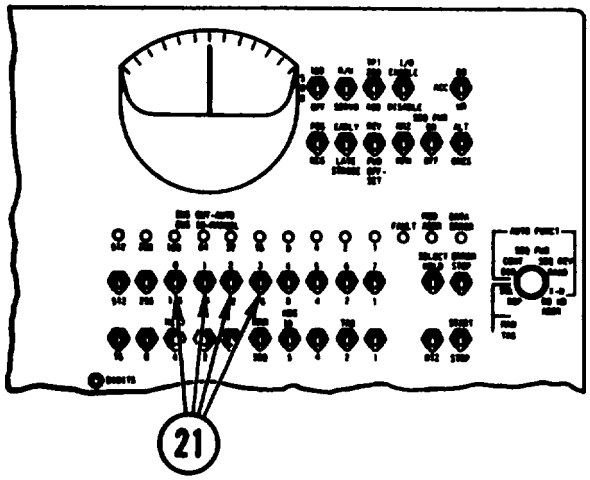
16. Set SELECT/HOLD up.

17. Set START/STOP up then down.

18. Push down then release RTZ. Only MOD ADDR indicator should be lit.

19. Set AUTO FUNCT selector to DIR.

20. If up, set BUS OUT switch 1 down.

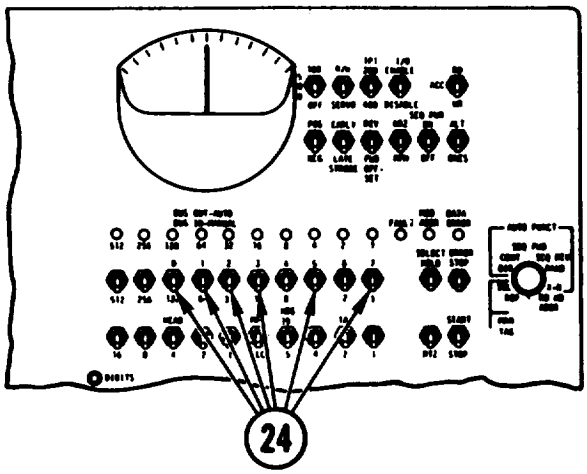


21. Set BUS OUT switches 128, 64, 32, and 16 up. All remaining BUS OUT switches must be down.

22. Set START/STOP switch up then down. BUS IN light will display the switches in step 21.

23. Turn AUTO FUNCT selector to CONT.

4-30. CHECK/ALINE READ/WRITE HEADS (CONT)



24. Set BUS OUT switches 128, 64, 32, 16, 4, and 1 up. All remaining BUS OUT switches must be down.

25. Set START/STOP switch up. Leave switch in the up position for at least 30 seconds.

26. Set START/STOP switch down.

27. Push down then release RTZ.

28. Turn AUTO FUNCT selector to DIR.

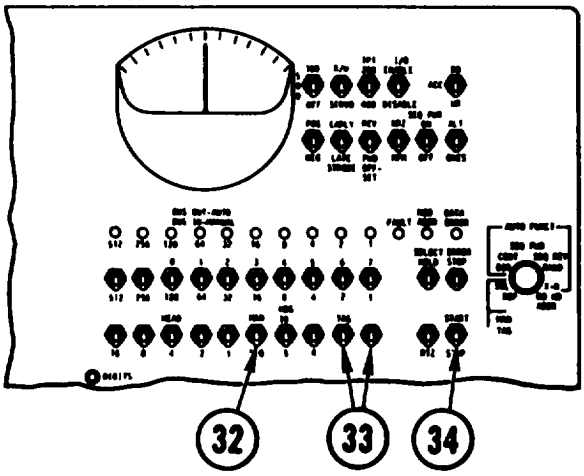
29. Set START/STOP switch up then down.

30. Turn AUTO FUNCT selector switch to SGL .

31. Set all BUS OUT switches down.

NOTE .

Set meter sensitivity switch to center position (500).

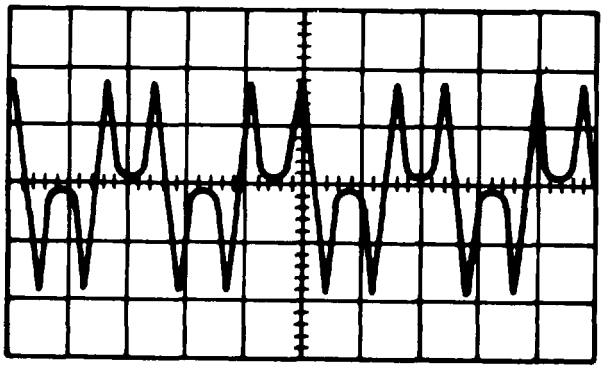


32. Set MAN/SEQ up.

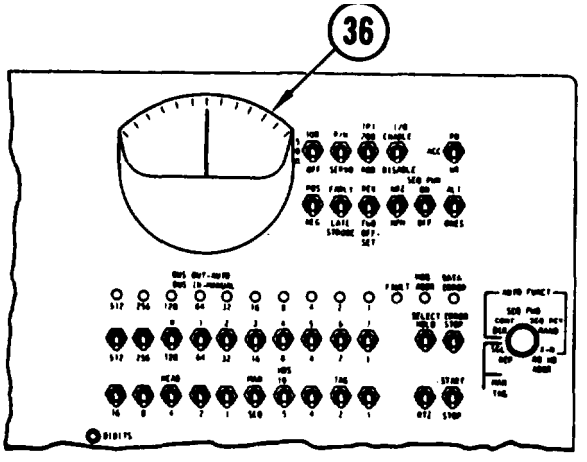
33. Set TAG switches 1 and 2 up.

34. Set START/STOP switch up then down. (Head zero is selected.)

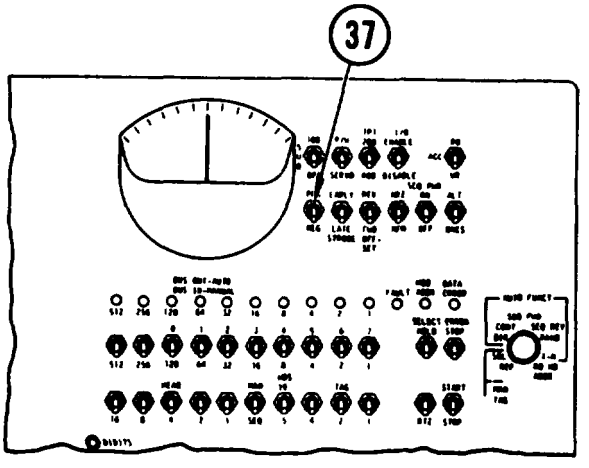
4-30. CHECK/ALINE READ/WRITE HEADS (CONT)



35. Look at scope. Dibit pattern will be similar to that shown.



36. Look at head alinement meter. It is now showing the positive dibit reading. Since meter sensitivity is set at 500, count 10 mV for each scale marker on the plus or minus side from zero. Write down the amount.



37. Press down and hold the POS/NEG switch. Observe head alinement meter. It is now showing the negative dibit reading. Make the same calculation as done in step 36. Write down the amount.

4-30. CHECK/ALINE READ/WRITE HEADS (CONT)

Example: P = +20 N = +15
(P) - (N) = (+20) - (+15) = +5
Example: P = +20 N = -15
(P) - (N) = (+20) - (-15) = +35
Example: P = =20 N = +15
(P) - (N) = (-20) - (+15) = -35

38. Using the formula below, calculate offset.

    OFFSET = (P) - (N)

    where: P = positive dibit reading (step 36)
    N = negative dibit reading (step 37)

39. Write down the result of OFFSET calculation.

40. If OFFSET calculation is:

    l Equal to or greater than 300 mV, you must locate all packs written by the drive. The data on those packs must be saved to another disk or to tapes before head can be alined. Check SOP

    l Greater than 150 mV but less than 300 mV, head must be alined

    l Less than 150 mV, head is within specification. No alinement is required

41. Set START/STOP down.

    NOTE

    You have just finished check read/write head zero. Now, you will check the remaining heads (1, 2, 3, 4) by following the steps below, observing the scope dibit pattern, and calculating OFFSET. (See steps 35 thru 39.) DO NOT go on to the aline part of mask until you find out which, if any, heads must be alined.

42. Set all BUS OUT switches down.

4-30. CHECK/ALINE READ/WRITE HEADS (CONT)

43. Check remaining heads one at a time by selecting BUS OUT switches as follows:

    - Head 1: set BUS out switch 1 up, then do steps 44 and 45.
    - Head 2: set BUS OUT switch 2 up, then do steps 44 and 45.
    - Head 3: set BUS OUT switches 1 and 2 up, then do steps 44 and 45.
    - Head 4: set BUS OUT switch 4 up, then do step 45.

44. Set START/STOP up.

45. Repeat steps 35 thru 43 until heads 1, 2, 3 and 4 have been checked.

46. If any head is out of the specification described in step 40, perform the Aline part of this task. If all heads are within specification, do step 47.

47. Push down then release RTZ.

48. Set START/STOP down.

49. Cycle down disk drive.

50. Unload CE alinement pack.

51. Power off drive.

52. Unplug FTU.

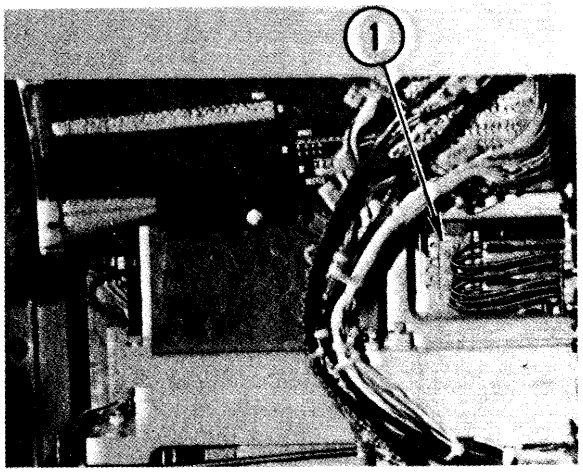
53. Remove head alinement board and cable.

54. Remove field test unit 1/0 cables.

55. Install disk drive 1/0 cables.

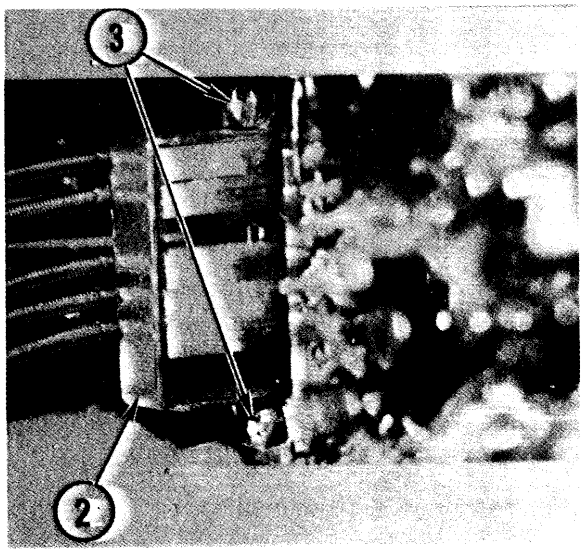
56. Replace cover (para 4-11).

4-30. CHECK/ALINE READ/WRITE HEADS (CONT)



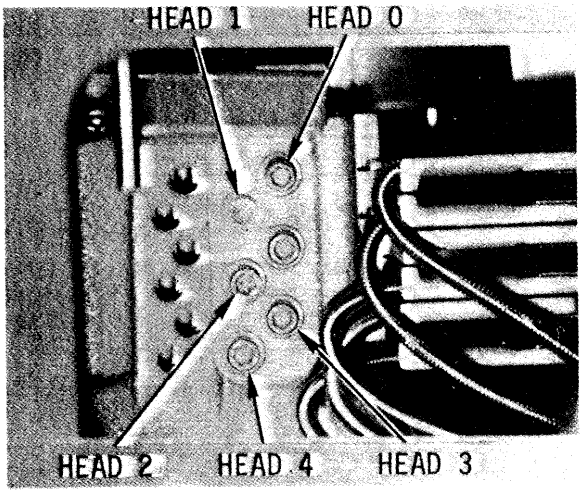
Aline

1. From logic chassis side of drive, find head carriage.



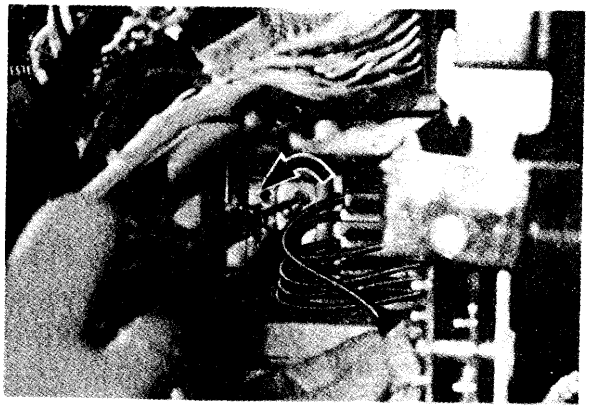
2. Find head connector holddown bracket.

3. Remove screws. Pull off bracket.

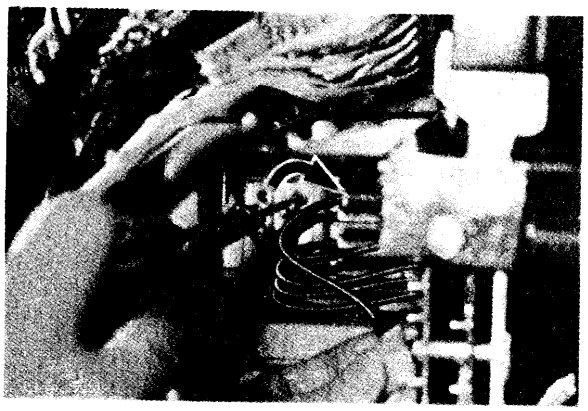


4. Find lock screw for the head to be alined.

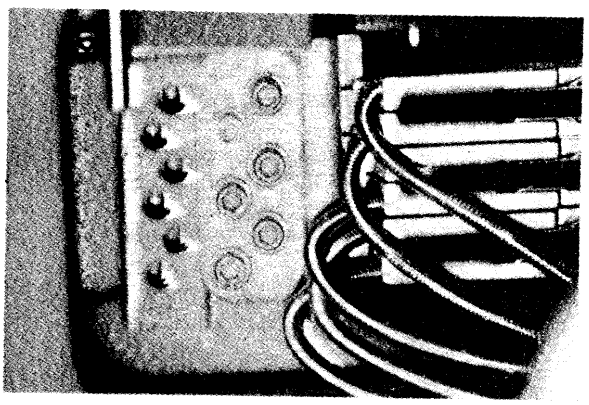
4-30. CHECK/ALINE READ/WRITE HEADS (CONT)



5. Set torque screwdriver at 10 inch-pounds. Turn counter-clockwise enough to break loose lock screw (1/8 to 1/4 turn).



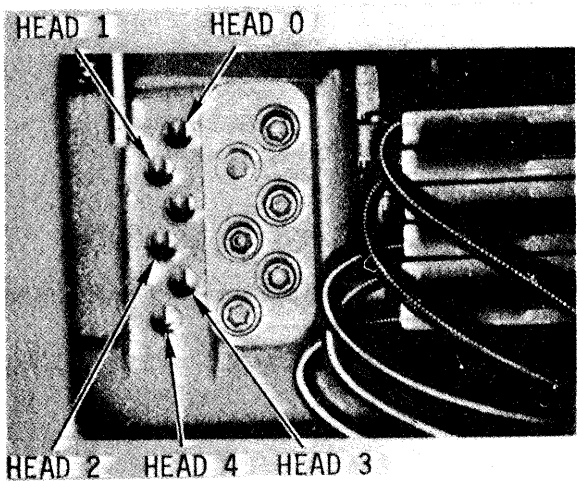
6. Retighten screw, as shown.



7. On FTU, select head to be alined by using BUS OUT switches as follows:

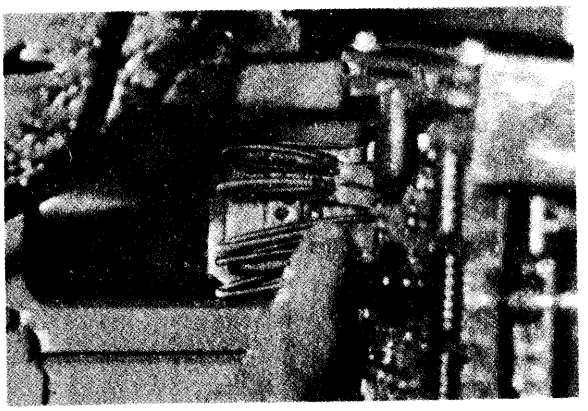
- Head 0: set all BUS OUT switches down, then do step 8
- Head 1: set BUS CUT switch 1 up, then do step 8
- Head 2: set BUS OUT switch 2 up, then do step 8
- Head 3: set BUS OUT switches 1 and 2 up, then do step 8
- Head 4: set BUS OUT switch 4 up, then do step 8

4-30. CHECK/ALINE READ/WRITE HEADS (CONT)



8. Set START/STOP UP.

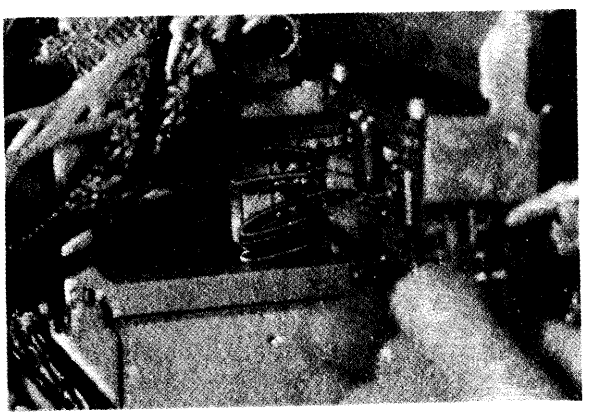
9. Find access slot for head you will aline.



10. If head connector cables are in the way, bend them up or down so alinement tool can be inserted.

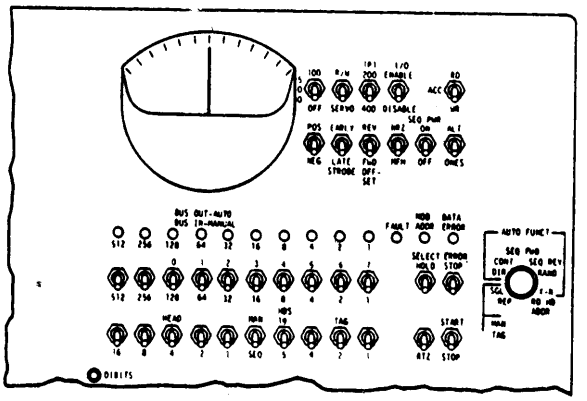
CAUTION

Alinement tool must be seated. Failure to do so will damage head slot*



11. Carefully insert alinement tool. Make sure it is seated.

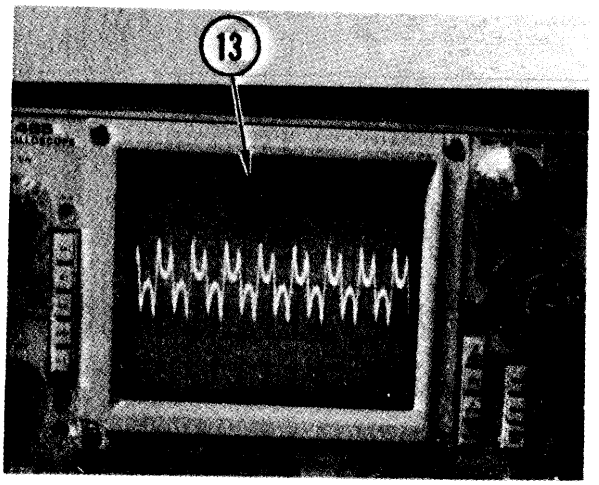
4-30. CHECK/ALINE READ/WRITE HEADS (CONT)



NOTE

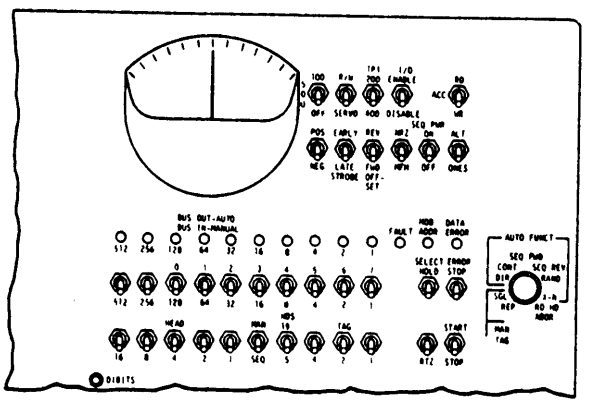
Very small movements of alinement tool are required. Make sure movements are slight.

12. While looking at FTU meter, carefully move tool until needle is within 100 mV of zero.



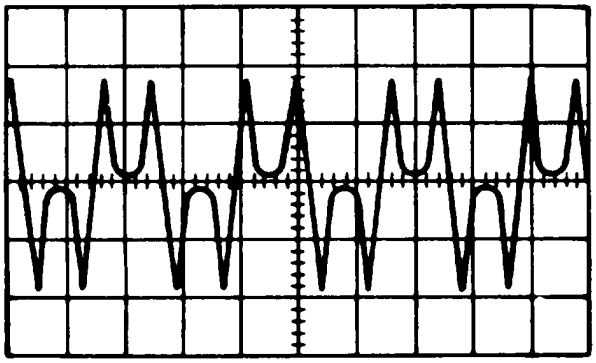
13. Look at scope. Waveform will be similar to this.

14. On FTU, set meter sensitivity switch to the up position (100).



15. While looking at FTU meter, carefully move tool until needle is within 10 mV of zero.

4-30. CHECK/ALINE READ/WRITE HEADS (CONT)



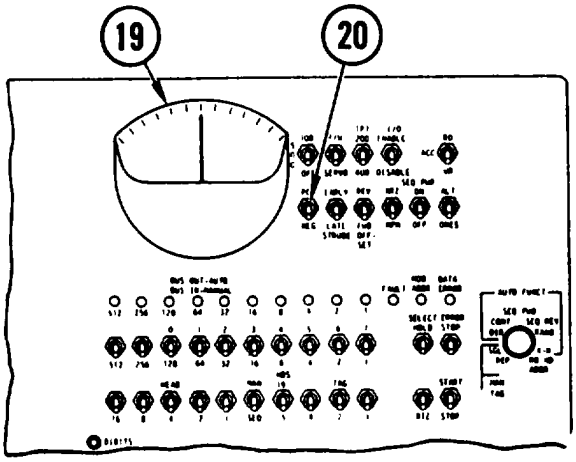
16. Look at scope. Waveform will be similar to this.

17. On FTU, press down and hold POS/NEG switch. Look at meter. Needle should be in same range as in step 15.

    - If in 10 mV range, release POS/NEG and go to step 18
    - If not, release POS/NEG and repeat steps 15 thru 17

NOTE

Head alinement tool must be removed carefully. Failure to do so will disturb alinement.



18. Remove head alinement tool.

19. Look at FTU meter

    - If in 10 mV range, go to step 20
    - If not, insert alinement tool and repeat steps 15 thru 19

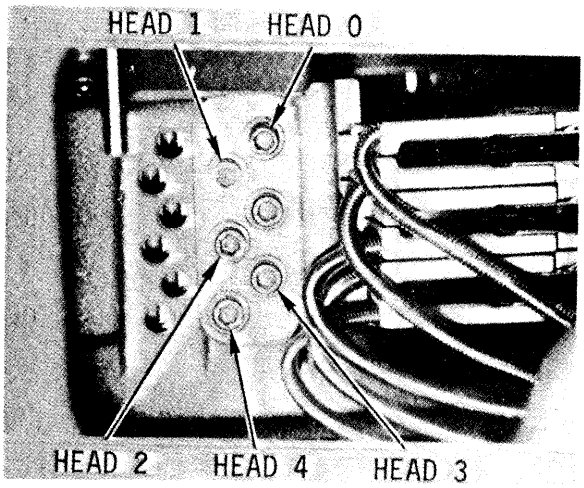
20. Press down and hold POS/NEG switch.

    - If in 10 mV range, go to step 21
    - If not, insert alinement tool and repeat steps 15 thru 19

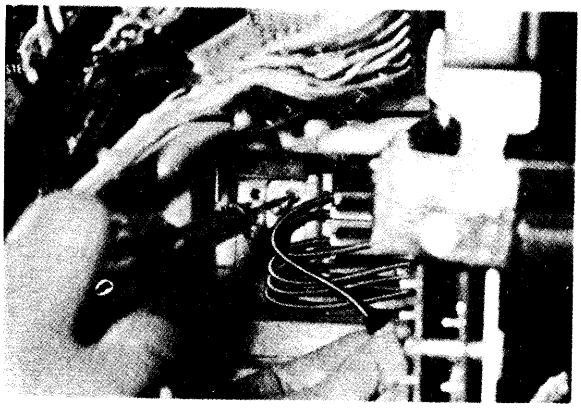
21. If other heads are to be alined, set 500/100 switch to center position (500). Start at step 4 for each . If all heads are alined, set START/STOP=down.

22. Set torque screwdriver at 12 inch-pounds.

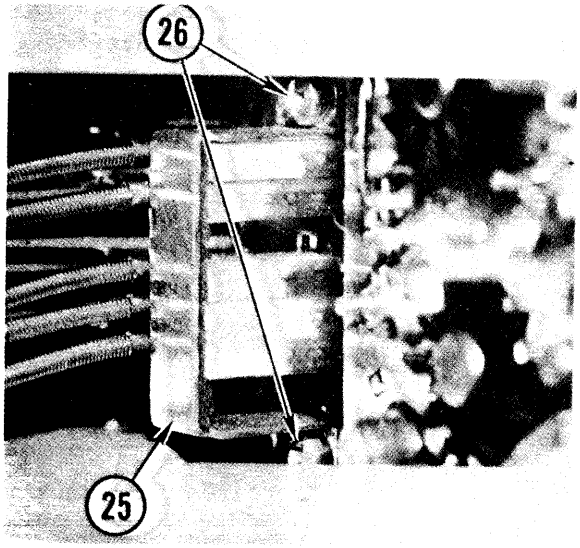
4-30. CHECK/ALINE READ/WRITE HEADS (CONT)



23. Find lock screw(s) of head(s) just alined.



24. Tighten each lock screw as shown.

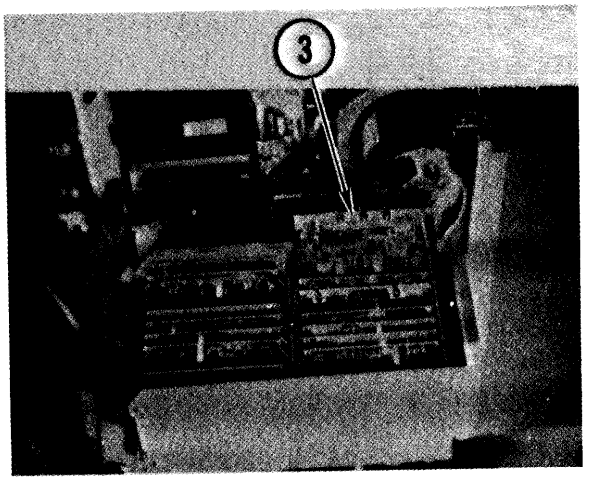


25. Replace head connector holddown bracket.

26. Replace screws.

27. Check head alinement (steps 36 thru 44).

4-30. CHECK/ALINE READ/WRITE HEADS (Cont)



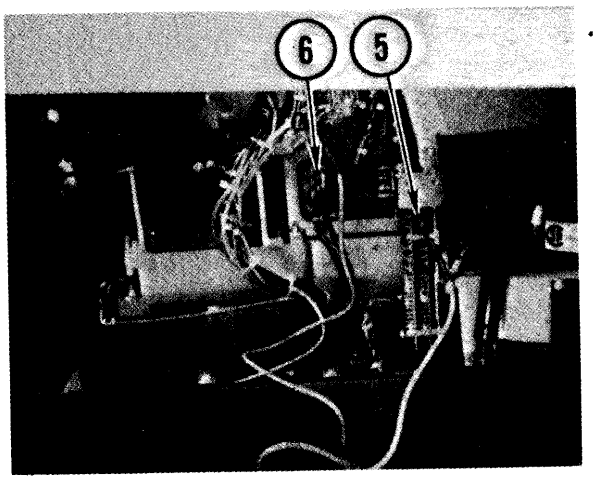
MODEL TB216

3. Install and test FTU (para 4-53).

CAUTION

I/O Connectors from FTU must be installed correctly. If installed in wrong location damage to pins or connectors may result.

4. Make sure I/O connectors from FTU are properly installed on logic cage.



5. Connect plug P104 of FTU head alinement cable to 3-pin connector on second read/write board.

6. Connect plug P8P2 to pins 8-11 on slot A02 on underside of logic cage.

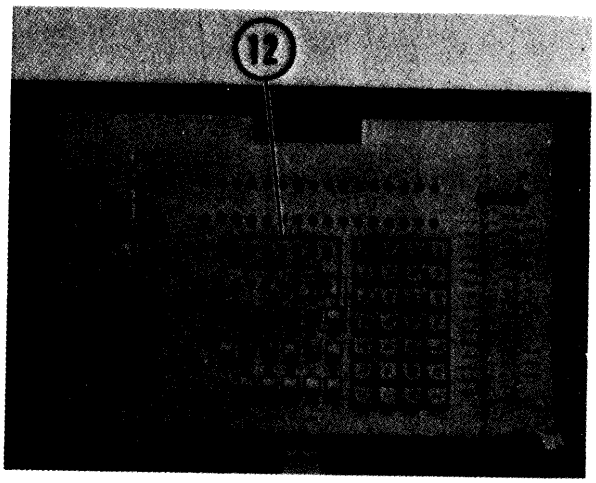
7. Lower logic cage.

8. Make sure head alinement board is correctly installed in logic cage.

9. On back of disk drive, power ON circuit breakers.

10. Power ON FTU circuit breaker. Check that +5 and -5 indicators light.

4-30. CHECK/ALINE READ/WRITE HEADS (CONT)



11. Set FTU switch listed to positions shown:

SWITCH	POSITION
PROCESSOR START/RESET	RESET
PROCESSOR RUN/HALT	HALT
SINGLE/CONT	CONT
-/+ OFFSET	CENTER (OFF)
LATE/EARLY	CENTER (NORMAL)
WRT FLAG	OFF
WRT PROT	ON
AM/SECTOR	EITHER
EOT STOP	OFF
ERROR OVERRIDES:	
DATA-OFF	OFF
ADDR-OFF	OFF
SHIFT PATT/DATA PATT	DATA PATT
RD/WRT SELECT	ACCESS ONLY
ACCESS SELECT	DIRECT SEEK
PROCESSOR START/RESET	START
PROCESSOR RUN/HALT	RUN
SEQ PWR/OFF	SEQ PWR

12. Look to see that the following FTU indicators light:

ON CYCL	SEEK ERR
RDY	FLT
WT PROT	BUSY
SELD	RUN

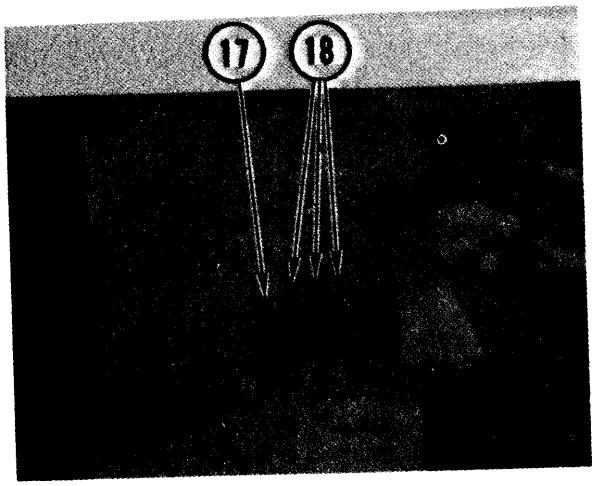
13. Power ON disk drive.

14. Load CE alinement pack.

15. Cycle up disk drive.

4-30. CHECK/ALINE READ/WRITE HEADS (CONT)

16. Allow drive to stablize for at least 30 minutes before accessing cylinder (steps 28-32).



NOTE

Steps 17-26 may be done while you are waiting for disk drive to stablize.

17. Connect head alinement test leads between FTU head alinement panel jacks and head alinement board jacks. Connect (+) to (+) and (-) to (-).

18. On head alinement board, set toggle switches as follows:

SWITCH	POSITION
xl/x.l	xl
RW/S	RW
N/P	N

19. set up oscilloscope. Use these settings for X10 probe.

VOLTS/DIV

CH 1 - O.lV
CH 2 - not used

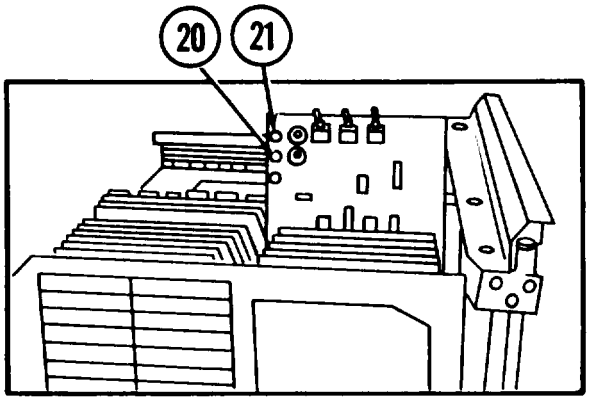
TIME/DIV

1 usec.

TRIGGERING

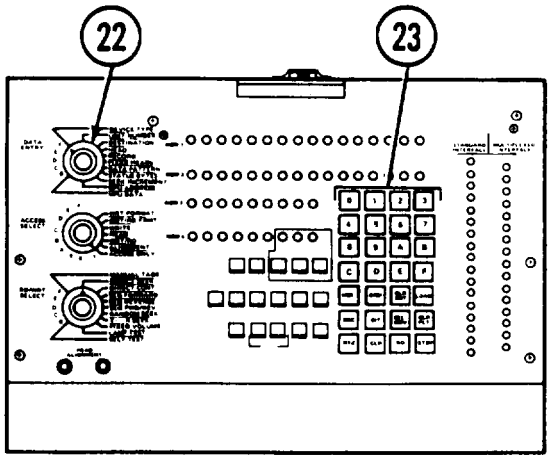
CH l- INTERNAL POSITIVE

4-30. CHECK/ALINE READ/WRITE HEADS (CONT)



20. Connect X1O probe to head alinement board test point READ SIG (Y).

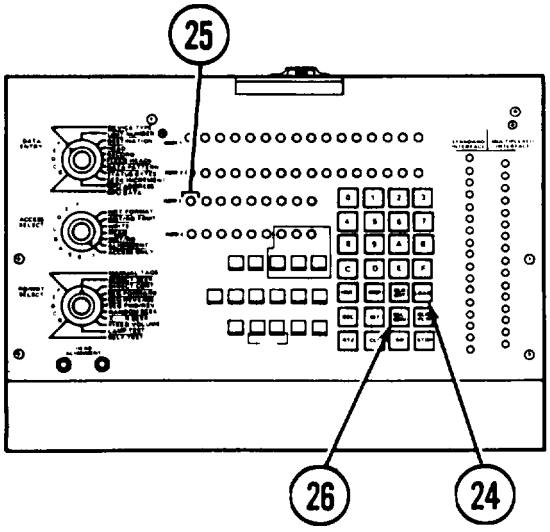
21. connect X1O ground probe to head alinement board test point METER (-z).



22. Turn DATA ENTRY switch to DEVICE TYPE.

23. Enter device code 3105 at keyboard.

- Corresponding ROW 2 indicators will light.
- If you key incorrectly, press CLR ENT, then enter code again.



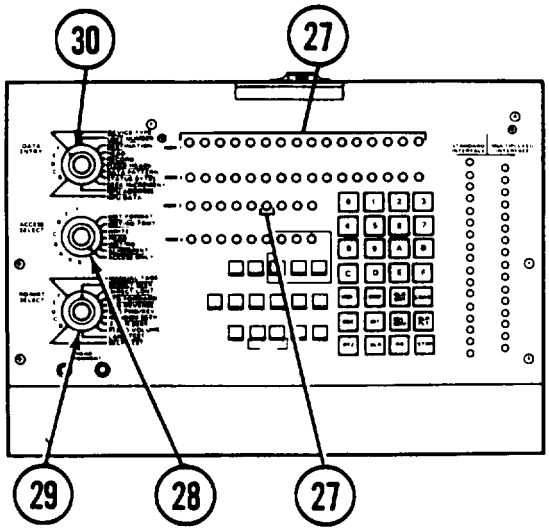
24. Press LOAD key.

- Code will transfer to ROW 1 indicators.
- If code does not transfer, press CLR ENT then repeat step 23.

25. Be sure that ROW 3 indicator 1/0 RDY is lit.

26. Press SEL DRV key.

4-30. CHECK/ALINE READ/WRITE HEADS (CONT)



27. Make sure SELD indicator lights and that logical address for selected disk drive lights in ROW 1.

- If SELD is flashing or incorrect logical address lights, selection was unsuccessful.
- Press CLR ENT, then repeat from step 23.
- If second attempt to select is unsuccessful, troubleshoot the disk drive.

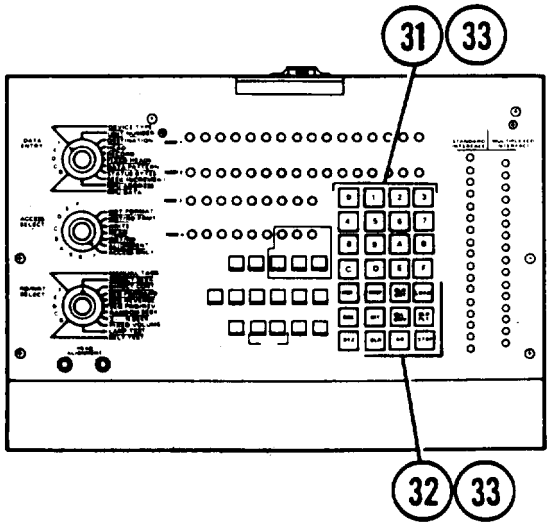
NOTE

Before performing step 28, one hour must have passed since step 15 was performed.

28. Set RD/WRT SELECT switch to ACCESS ONLY.

29. Set ACCESS SELECT switch to DIRECT SEEK.

30. Set DATA ENTRY switch to DESTINATION.

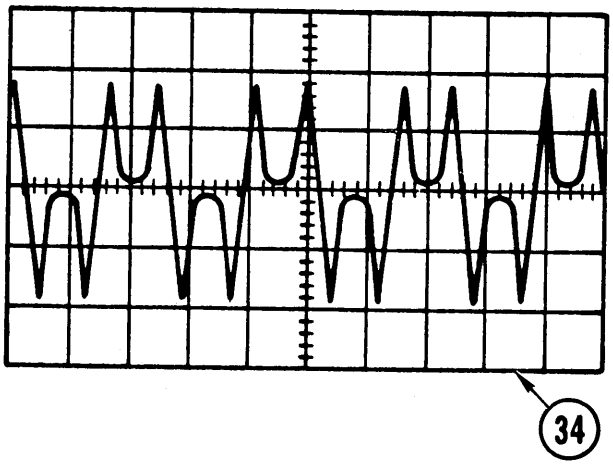


31. Key in cylinder address 240 and press LOAD key.

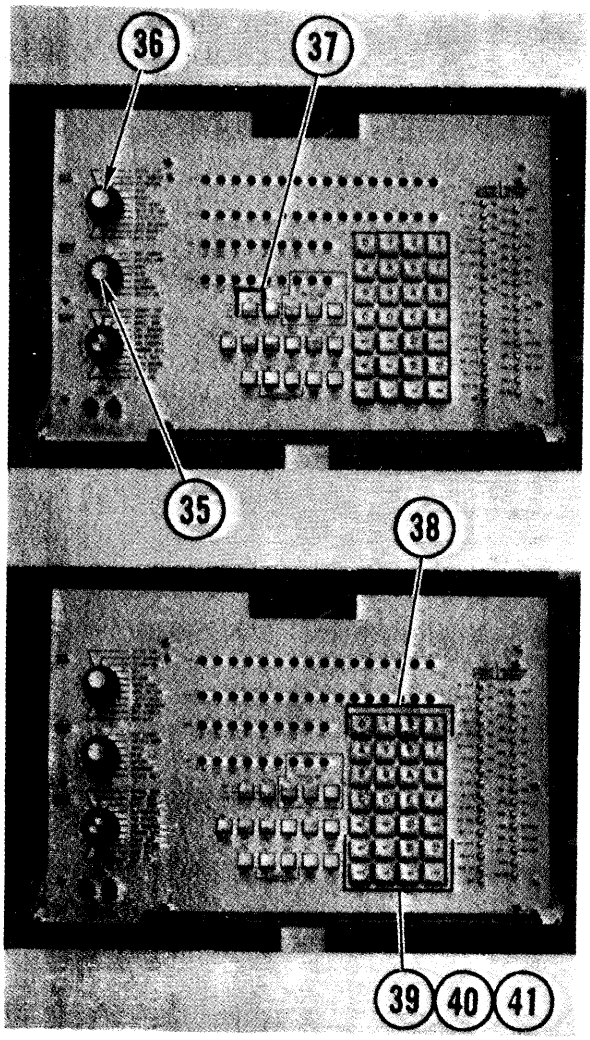
32. Press GO, STOP, and CLR keys.

33. Key in cylinder address 245. Press LOAD and GO keys.

4-30. CHECK/ALINE READ/WRITE HEADS (CONT)



34. Look at oscilloscope. Waveform will be as shown.



35. Set RD/WRT SELECT switch to ALIGNMENT.

36. Set DATA ENTRY switch to HEAD.

37. Set HEAD toggle switch to MAN.

38. Key in number of head to be checked and alined. Head numbers, from top to bottom, are:

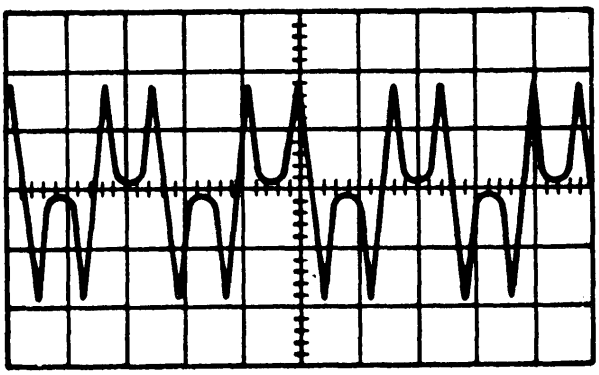
    0
    1
    SERVO
    2
    3
    4

39. Press LOAD key.

40. Press one key (BIT, HEX, or DEC) to select the type of display desired.

41. Press GO key.

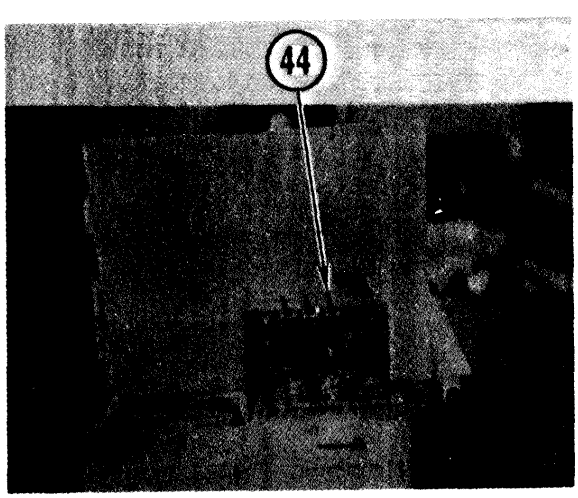
4-30. CHECK/ALINE READ/WRITE HEADS (CONT)



42. Look at the oscilloscope. Waveform should be as shown.

LED Designation	Representation (In mV)		
	HEX Mode	DEC Mode	BIT Mode
0	1	1	10
1	2	2	20
2	4	4	30
3	8	8	40
4	16	10	50
5	32	20	60
6	64	60	70
7	128	80	80
8	256	100	90
9	512	200	100
A	1024	400	200
B	Not Used	800	300
C	Not Used	1000	400
D	Not Used	Not Used	500
E	Not Used	Not Used	600 And Above
F	- Sign	- Sign	- Sign

43. Use head alinement chart to interpret and record indication of ROW 2 lights (negative dibit side in mV).



44. On head alinement board, set N/P toggle switch to P.

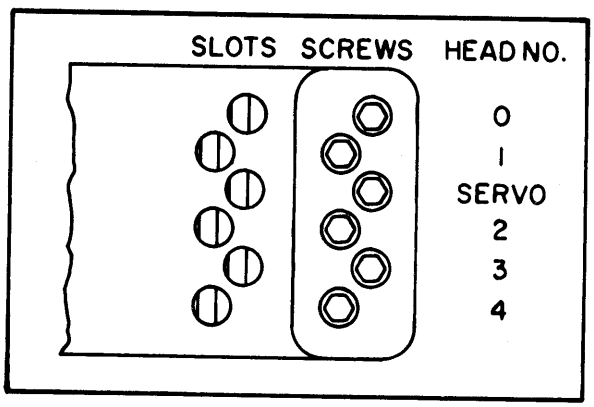
45. Use head alinement chart to interpret and record indication of ROW 2 lights (positive dibit side in mV).

4-30. CHECK/ALINE READ/WRITE HEADS (CONT)

46. Look at (-) and (+) dibit readings taken in steps 43 and 45 for the following conditions:
    - Each reading must be less than 75 mV (total dibit offset less than 150 mV)
    - Both readings must be within 5 mV of each other
    - If both conditions above are met, alinement of this head is not needed. Go to step 51
    - If only one or none of the conditions are met, go to step 47

CAUTION

Alinement tool must seat in slot. Failure to seat will damage slot.

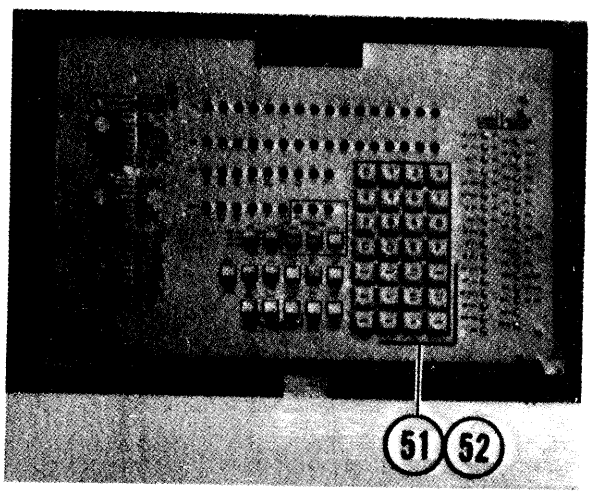


47. Remove head connector hold-down bracket. Loosen locking screws. Aline heads to 10 in/lb torque (with heads retracted).

48. Insert alinement tool in head slot. Using very small movements, turn tool small amounts and watch scope for pattern movement.

49. With heads retracted, tighten screw to 11.5 - 12.5 in/lb.

50. Repeat steps 35 thru 49 for each head alinement.



51. Press STOP key.

52. Press CLR key.

4-30. CHECK/ALINE READ/WRITE HEADS (CONT)

53. Cycle down disk drive.

54. Unload CE disk pack.

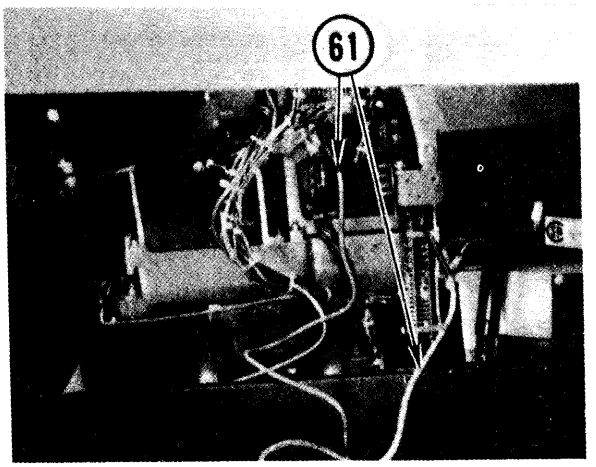
55. Pull out disk drive drawer.

56. On back of disk drive, power OFF circuit breakers.

57. Power OFF FTU circuit breaker.

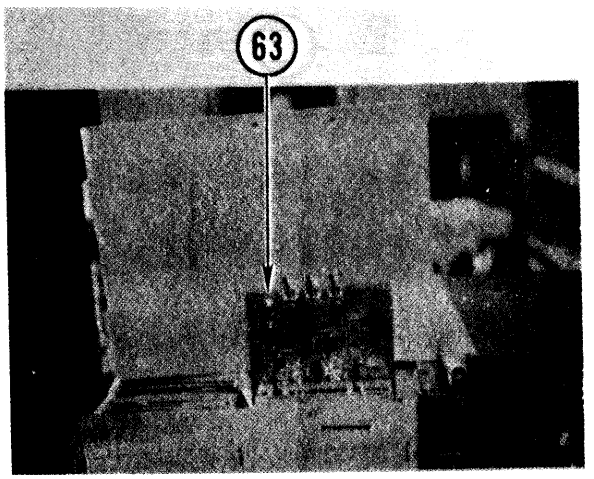
58. Remove and stow FTU test leads.

59. Power OFF oscilloscope. Remove and stow its test leads.



60. Unplug and stow oscilloscope.

61. Remove and stow FTU head alinement cable.



62. Lower logic cage (para 4-25).

63. Remove FTU head alinement board from logic cage slot A02. Stow it.

64. Stow FTU.

65. Reconnect drive cables at rear of logic cage.

66. Replace disk drive cover (4-11).

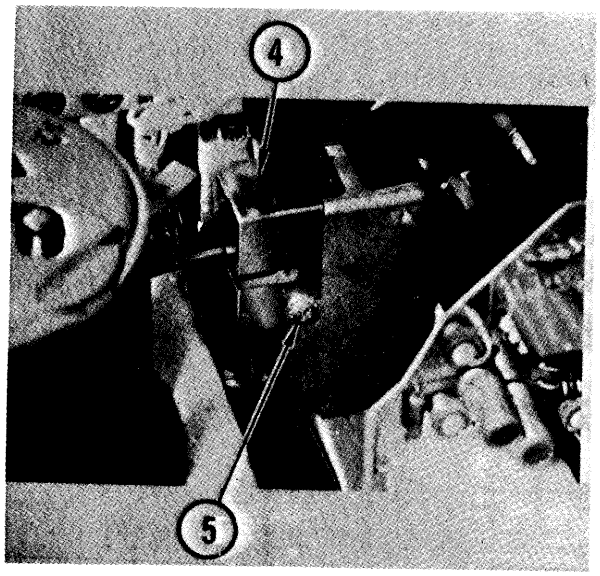
4-31. REMOVE/REPLACE SERVO HEAD

INITIAL SETUP

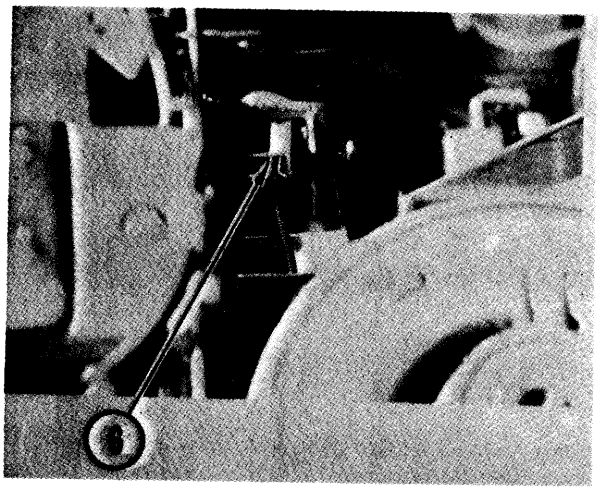
Common Tools
- Tool kit
- Torque screwdriver

Special Tools
- Head adjustment tool

Remove

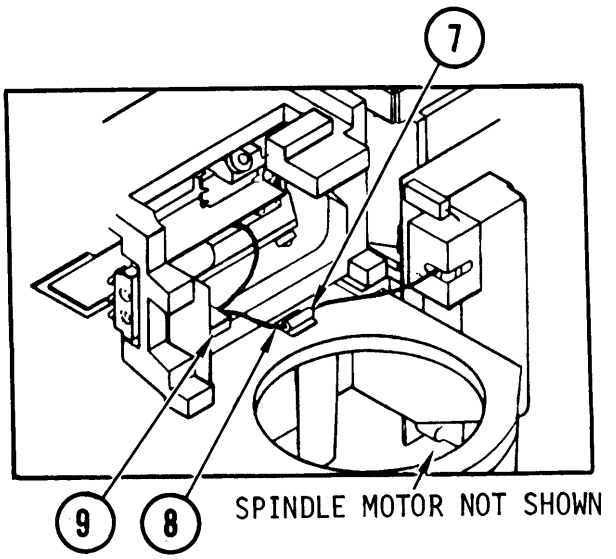


1. Remove cover (para 4-11).
2. Press release catch and lift pack access cover.
3. If installed, remove disk pack.
4. From side of deck, locate servo preamp cover.
5. Loosen screw enough to free cover. Pull off cover. It should rest on connecting wires.



6. Find and unplug servo head connector.

4-31. REMOVE/REPLACE SERVO HEAD (CONT)

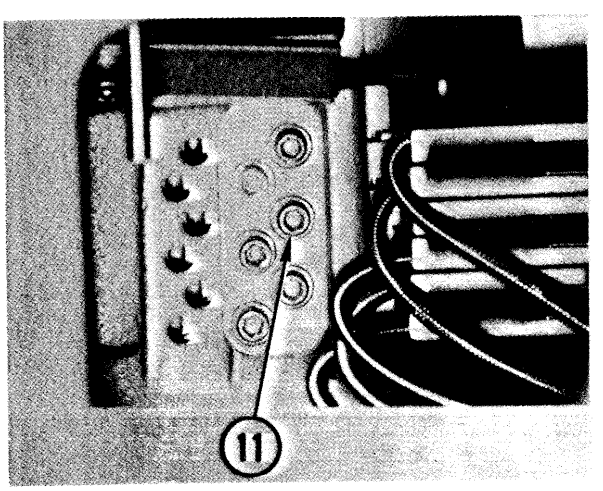


7. Next to spindle motor, find cable clip.

8. Pull out head cable.

9. Pull out PA connector.

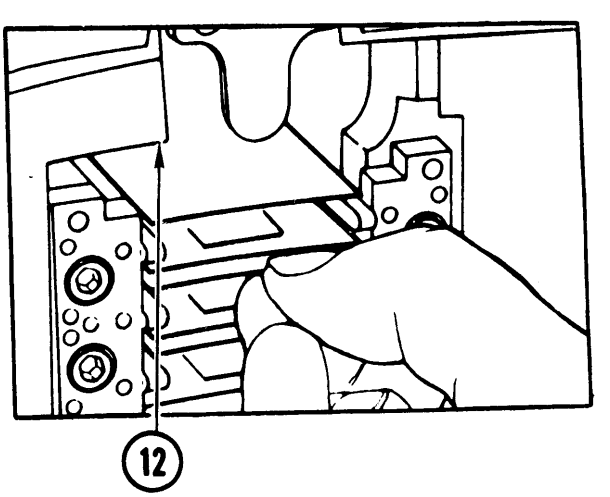
10. Raise logic cage (para 4-25).



11. Remove servo head screw.

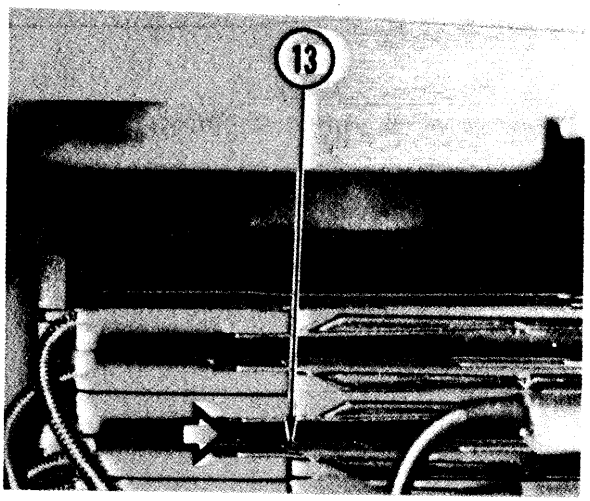
CAUTION

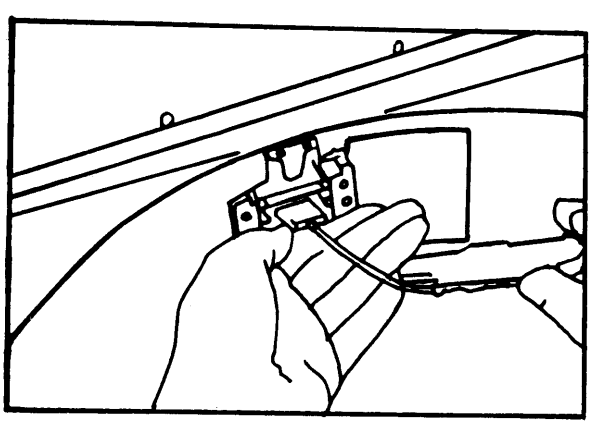
Servo head is fragile. Pull head out carefully. Don't let head touch other heads.



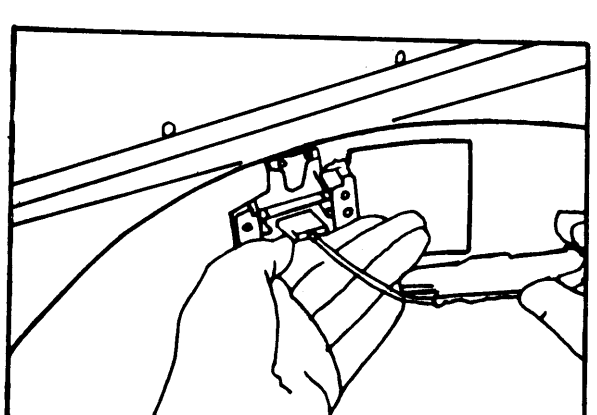
12. From inside pack area, find servo head. Grasp outer edge of arm as shown. Gently pull out head about 1/4 inch.

4-31. REMOVE/REPLACE SERVO HEAD (CONT)





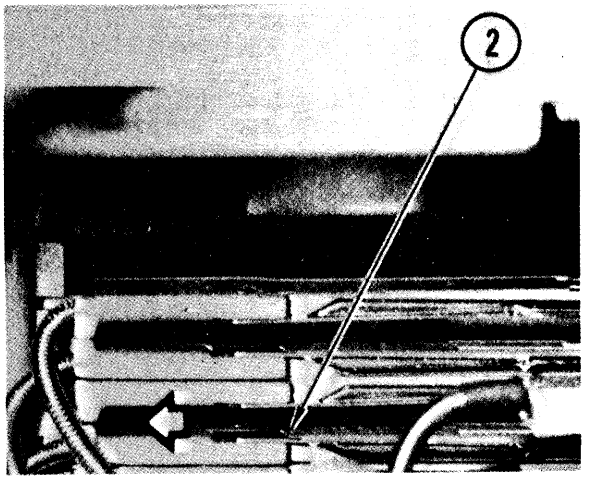
14. From pack area, grasp edge of head arm as shown. Pull head and connector out all the way.



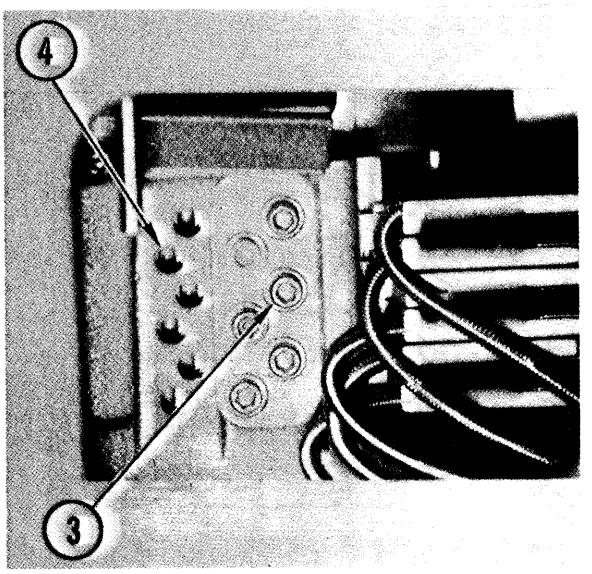
Replace

1. Hold arm by edge as shown. From pack area, slide connector and head in slot as shown.

4-31. REMOVE/REPLACE SERVO HEAD (CONT)

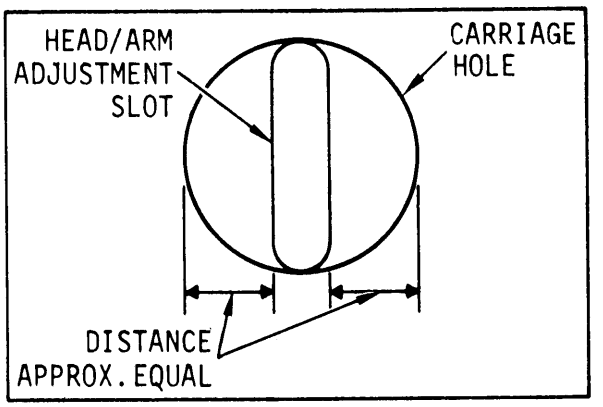


2. From rear, grasp head and slide it back until it lines up with other heads.



3. Replace screw. Using torque screwdriver, tighten to a torque of 4 to 8 inch-pounds.

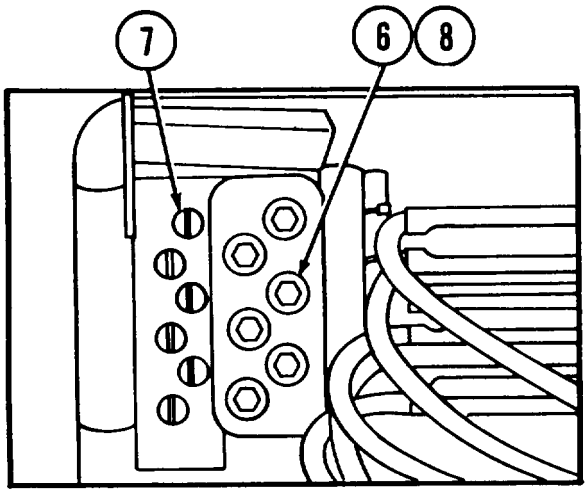
4. Look through servo head adjustment slot.

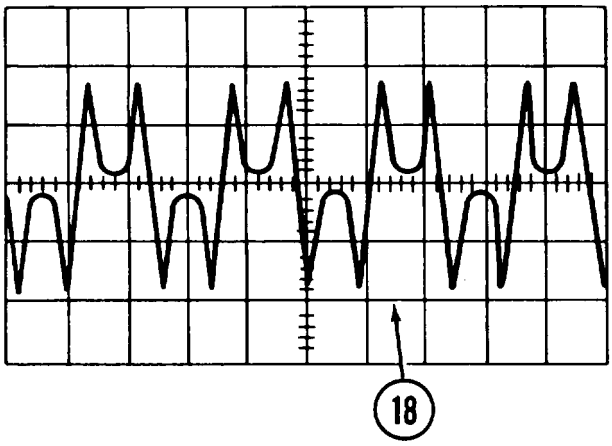


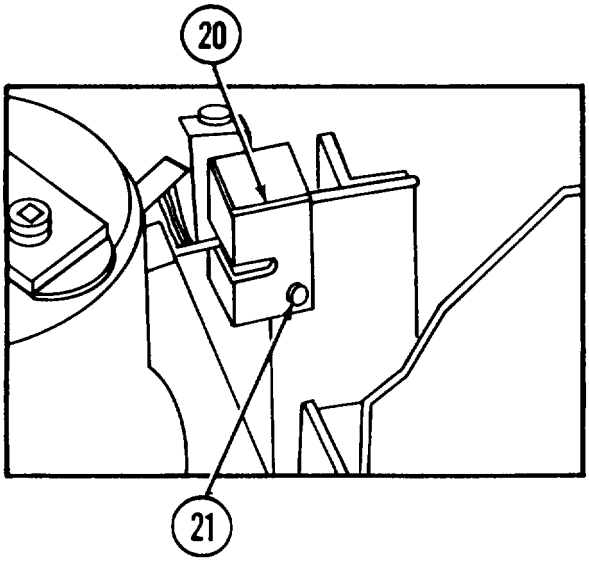
5. Compare servo head adjustment slot with Illustration. Slot should be centered in carriage alinement hole as shown.

- If it is, go to step 8
- If it isn't, go to step 6

4-31. REMOVE/REPLACE SERVO HEAD (CONT)







6. With torque screwdriver, loosen screw.
7. With head adjustment tool, center slot as shown in step 5.
8. Tighten screw to a torque of 12 inch-pounds.
9. Push in PA connector.
10. Connect head cable to cable clip.
11. Push in servo head connector.
12. With CE pack installed and oscilloscope connected to the read and ground jacks, load heads to cylinder 000 (00) and perform thermal stabilization.
13. When thermal stabilization is completed command continuous seek between cylinder 240 and 245 for 30 seconds minimum. This allows head gimbal springs to settle.
14. Stop continuous seek.
15. Loosen servo-head to 6 inch pound torque.
16. Command a direct seek to cylinder 245.
17. Set servo - R/W switch to servo position.
18. Balanced dibit pattern should be observed on oscilloscope.
19. If balanced dibits pattern was observed in previous steps, calculate head offset for servo head. Servo head offset must be 0 ±30mv. If offset is greater than 30 mv. terminate procedure and troubleshoot servo system.
20. Replace shield.
21. Tighten screw.
22. Aline read/write heads (para. 4-30).

4-32. CLEAN HEADS

INITIAL SETUP

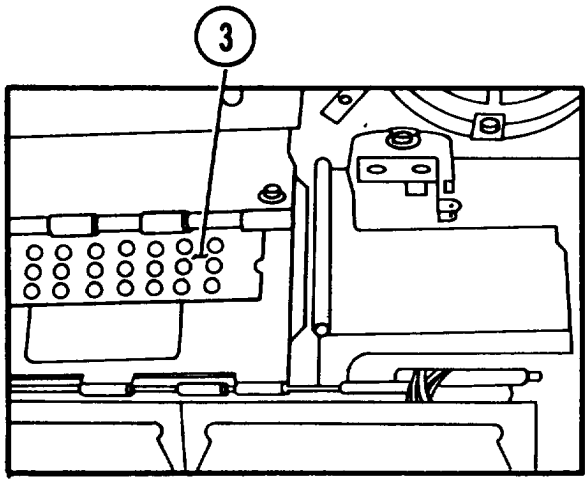
Materials/Spare Parts
- Isopropyl alcohol
- Gauze or lint-free cloth

CAUTION

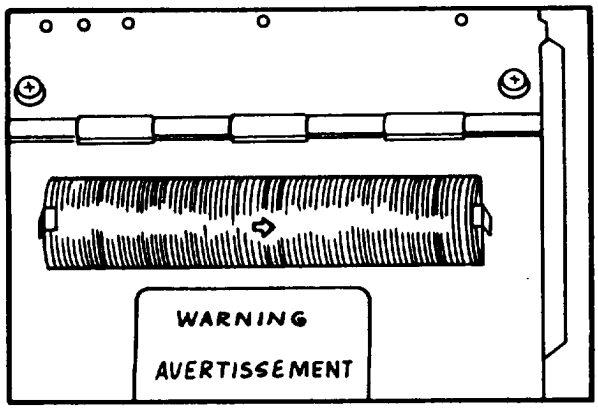
Head cleaning is a delicate procedure. Clean a head only when absolutely necessary.

NOTE

There are six heads. Follow these steps for any head.

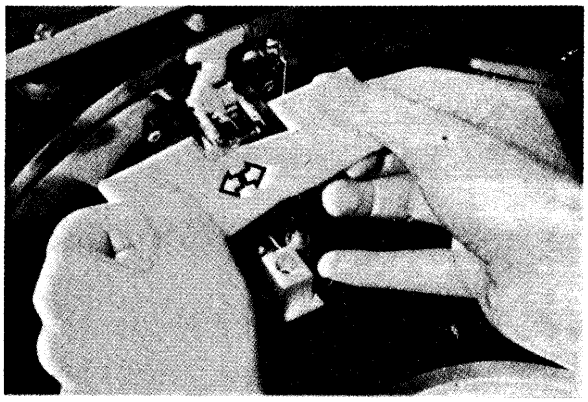


1. Remove disk pack.
2. Raise deck (para 4-12.
3. Pull off coil cover

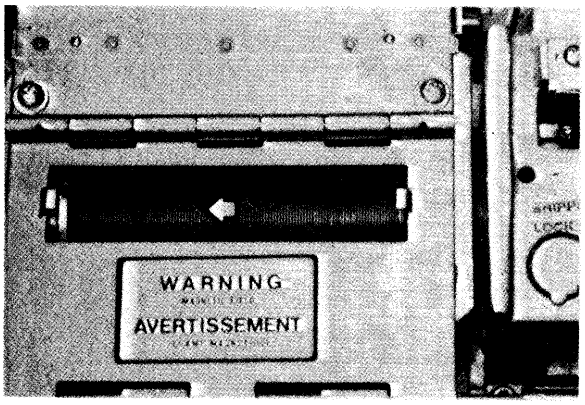


4. Slowly push carriage as shown until you feel a slight release in pressure.
5. Open pack access cover.

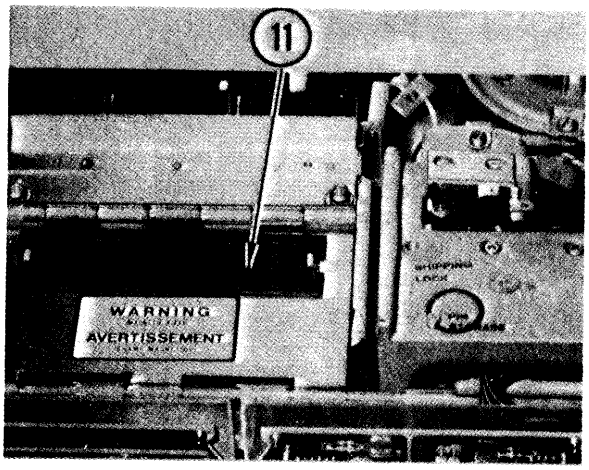
4-32. CLEAN HEADS (CONT)



6. Moisten strip of gauze with isopropyl alcohol.
7. Insert gauze strip beneath bottom head as shown.
8. Gently slide cloth back and forth.
9. Repeat steps 6 thru 8 for each of the remaining heads.



10. Push carriage back all the way.



11. Push on coil cover.
12. Lower deck (para 4-12).
13. Power on.

NOTE

The next step is used to purge the pack area of lint and dust.

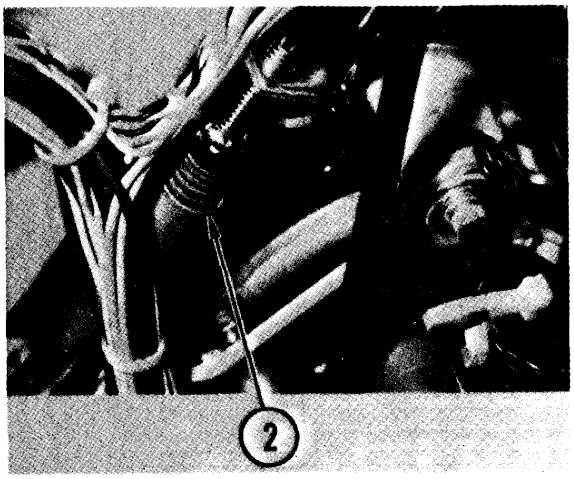
14. Allow drive to run for 1 to 3 minutes without disk pack installed.

4-33. REMOVE/REPLACE DRIVE BELT

INITIAL SETUP

Common ToolS
- Tool kit

Materials/Spare Parts
- Drive belt

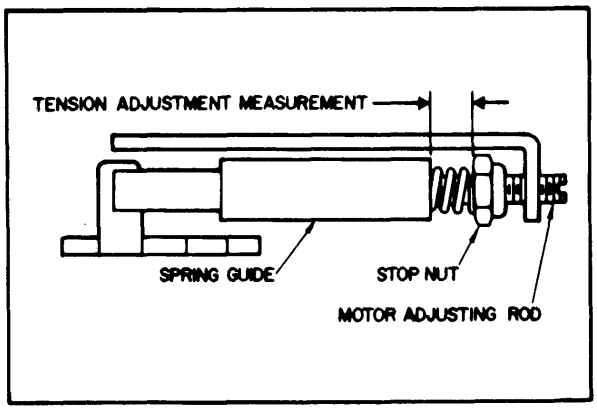


Remove

1. Raise deck (para 4-12).
2. From underneath deck, locate spring guide.

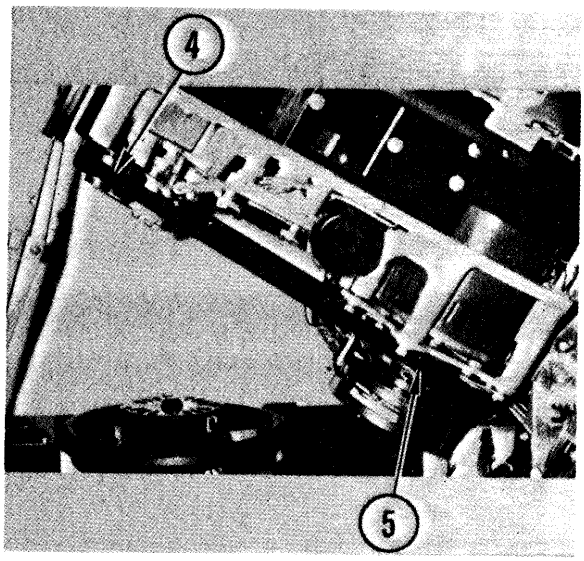
CAUTION

You must let tension off spring or motor shaft can bend.



3. With screwdriver, hold motor adjusting rod in place. With 7/16-inch open end wrench, loosen nut all the way to take tension off spring.

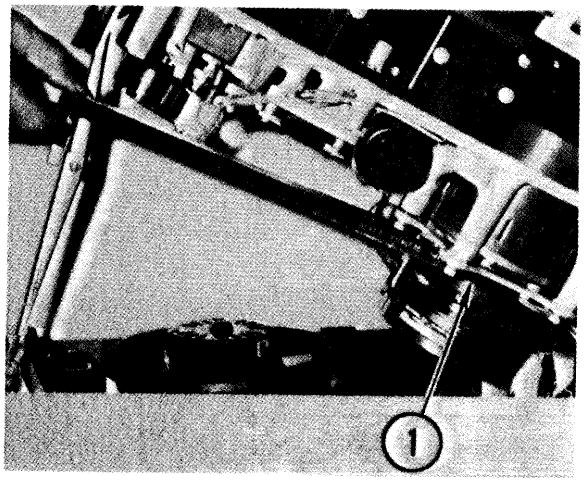
4-33. REMOVE/REPLACE DRIVE BELT (CONT)



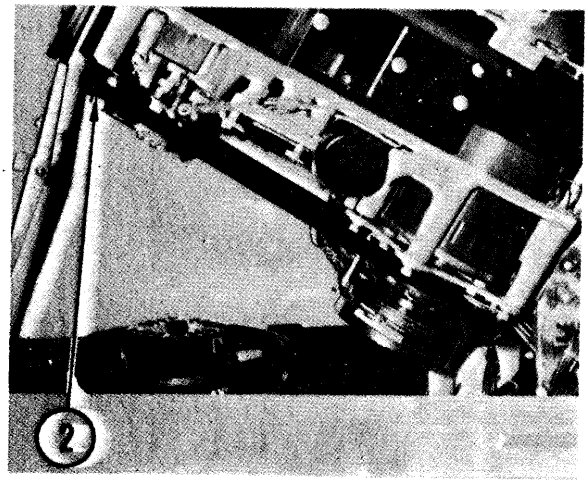
4. While turning motor pulley by hand, slip belt off.

5. Pull other end of belt off pulley. Slip it out from around brake.

Replace



1. Slip belt onto pulley.



2. While turning spindle pulley by hand, slip belt onto pulley.

3. To make sure drive belt is centered on pulley, turn pulley by hand several times.

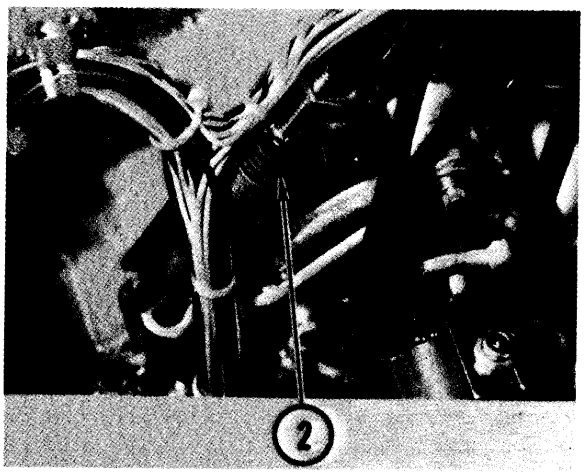
4. Adjust drive belt (para 4-34, steps 2-13).

4-34. ADJUST DRIVE BELT

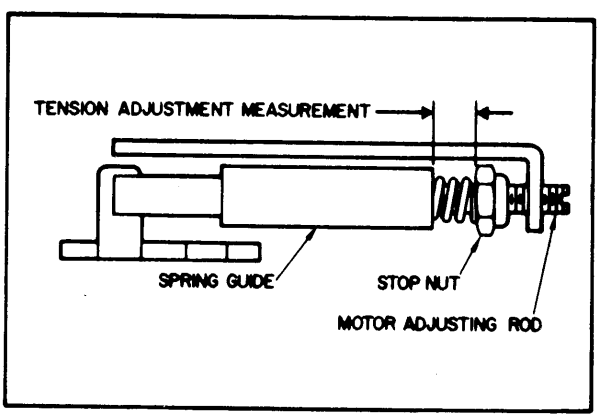
INITIAL SETUP

Common Tools
- Tool kit

Supplies
- Scratch pack



1. Raise deck (para 4-12).
2. From underneath deck, locate spring guide.



3. Using machinist's rule, measure gap between spring guide and stop nut. Gap must be:

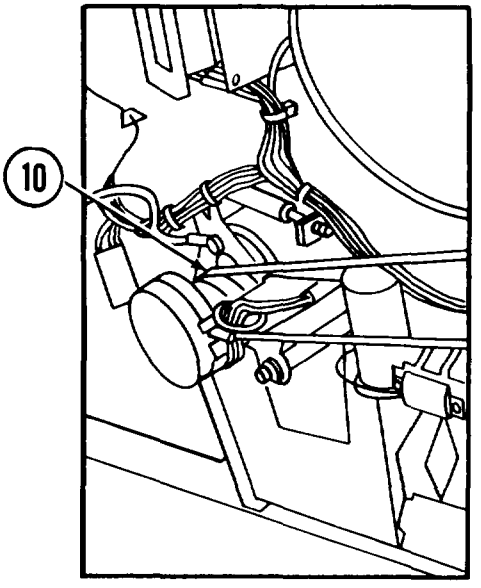
   0.25 +/- 0.05 in. 6.35 +/- 1.27 mm)

4. Using screwdriver, hold motor adjusting rod in place. Using 7/16-inch open end wrench, adjust nut until gap is correct.

50 Lower deck (para 4-12).

6. Install scratch pack.
7. Power on drive.

4-34. ADJUST DRIVE BELT (CONT)



8. Cycle up drive. When READY indicator lights, cycle down drive.

9. Raise deck (para 4-12).

10. From side of deck, check belt to make sure it is in center of motor pulley.

    - If belt is centered, go to step 14,
    - If belt is not centered, go to step 11.

11. Remove brake assembly (para 4-40, Remove steps 2-5).

12. Using machinist's rule, adjust pulley alinement gap. Gap should be 13/16 ± 1/32 inch (para 4-39, Replace step 13).

13. Replace brake assembly (para 4-40, Replace steps 2-6.

14. Power off drive. Lower deck.

15. Remove scratch pack.

16. Slide drawer in.

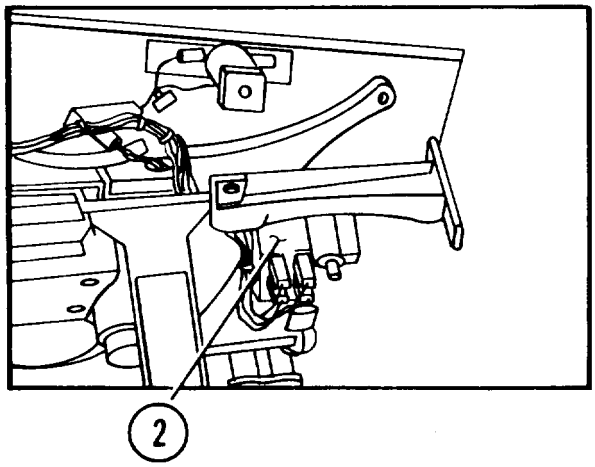
4-35. REMOVE/REPLACE SOLID STATE SWITCH (START TRIAC)

INITIAL SETUP

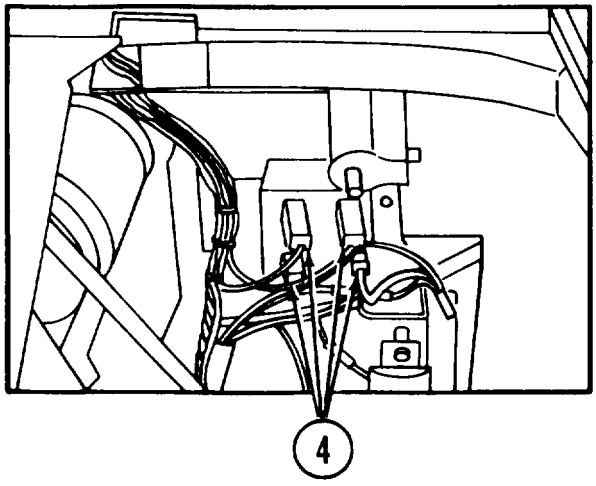
Common Tools	Materials/Spare Parts
● Tool kit	● Dielectric grease
	● Tags (for wires)
	● Swab
	● Pen or pencil

Remove

1. Raise deck (para 4-12).



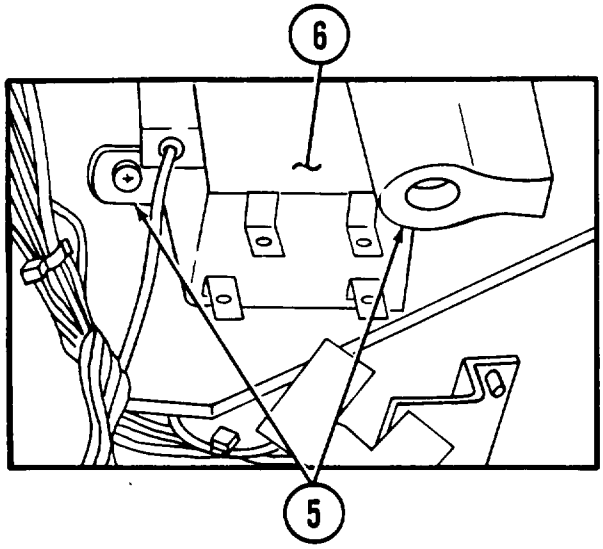
2. Find solid state switch.



3. Tag wires.

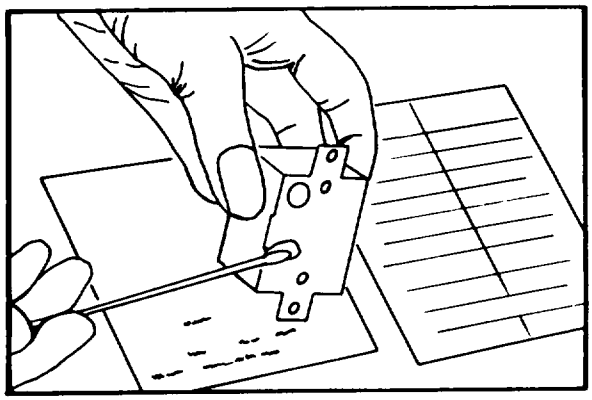
4. Pull off wires.

4-35. REMOVE/REPLACE SOLIDSTATE SWITCH (START TRIAC) (CONT)

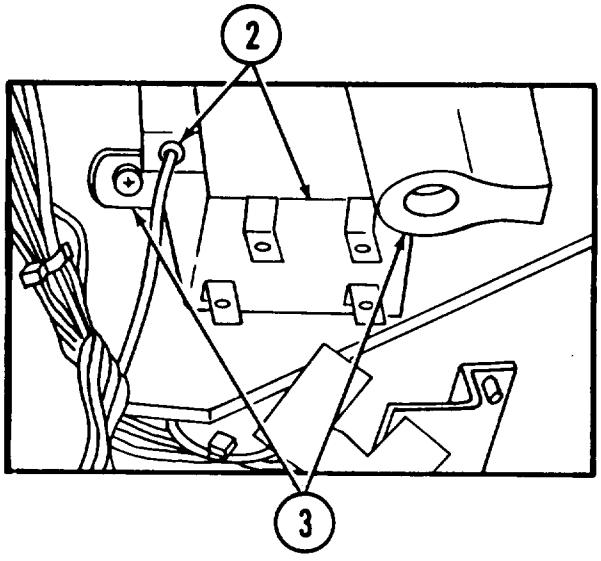


5. Remove two screws securing switch and ground wire to deck.
6. Remove switch.

Replace

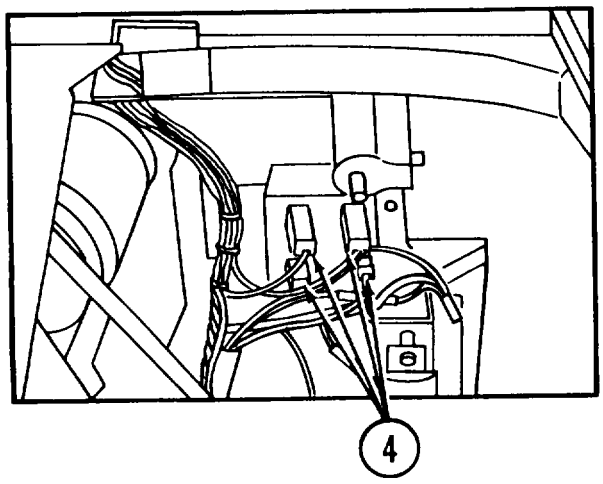


1. With swab, apply light coat of dielectric grease to switch base.



2. Mount switch and ground wire.
3. Replace two screws.

4-35. REMOVE/REPLACE SOLIDSTATE SWITCH (START TRIAC) (CONT)



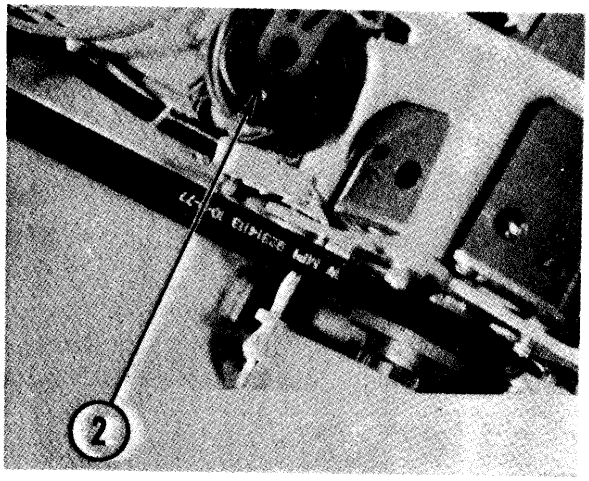
4. Push on wires. Remove tags.

5. Lower deck (para 4-12).

4-36. REMOVE/REPLACE DRIVE MOTOR CAPACITOR

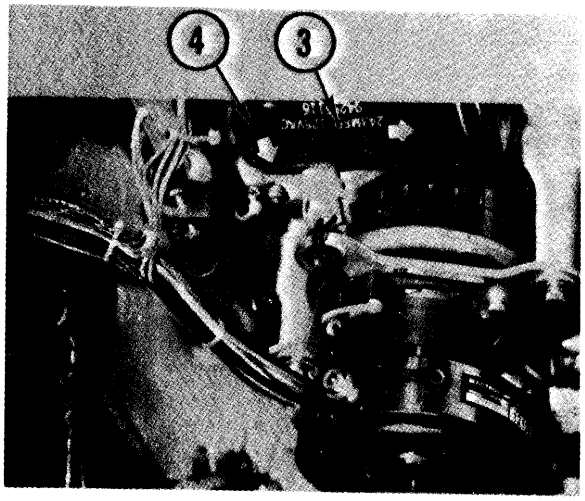
INITIAL SETUP

Common Tools
- Tool kit



Remove

1. Raise deck for maintenance (para 4-12).
2. Find drive motor capacitor.

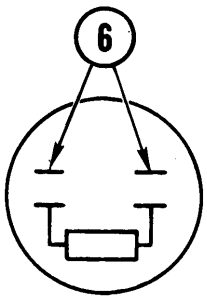


NOTE

You may have to pry retaining clamp away from capacitor with screwdriver.

3. Push capacitor in direction shown to free bottom from retaining clamp.
4. Pull bottom as shown and free top from retaining clamp.
5. Remove cap from capacitor.

4-36. REMOVE/REPLACE DRIVE MOTOR CAPACITOR (CONT)

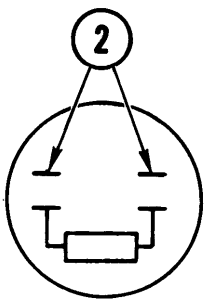


WARNING

Capacitor may hold high voltage charge. Test with voltmeter before removing connectors.

6. Remove wire connectors.

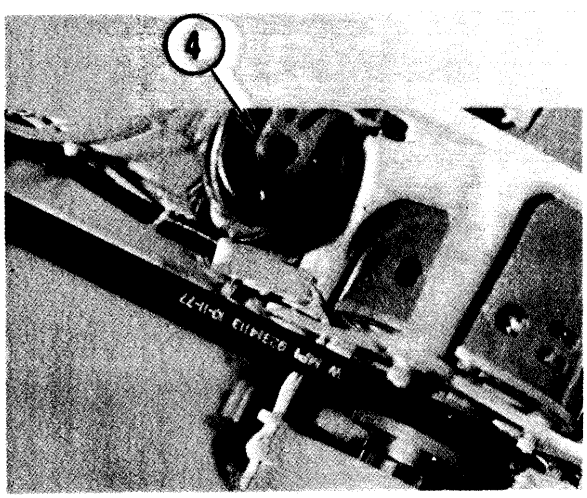
Replace



1. Remove cap from capacitor.
2. Push on wire connectors.
3. Replace cap on capacitor.

CAUTION

Do not pinch capacitor wires in cap or retaining clamp.



4. Insert top of capacitor into retaining clamp.
5. Push bottom of capacitor into retaining clamp. Make sure capacitor is secured on top and bottom. If necessary, use screwdriver to pry open retaining clamp and seat capacitor.
6. Lower deck (para 4-12).

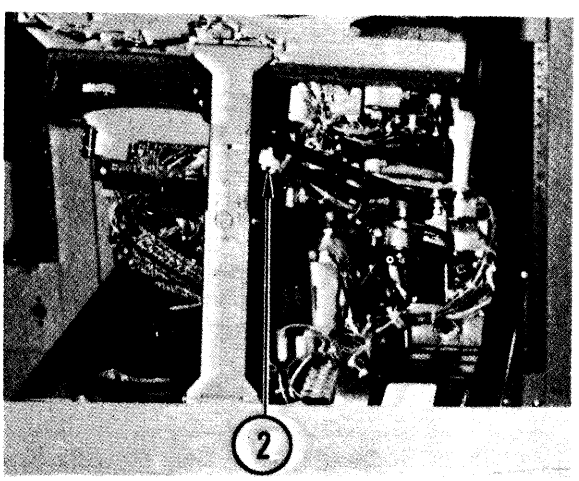
4-37. REMOVE/REPLACE STATIC GROUND SPRING

INITIAL SETUP

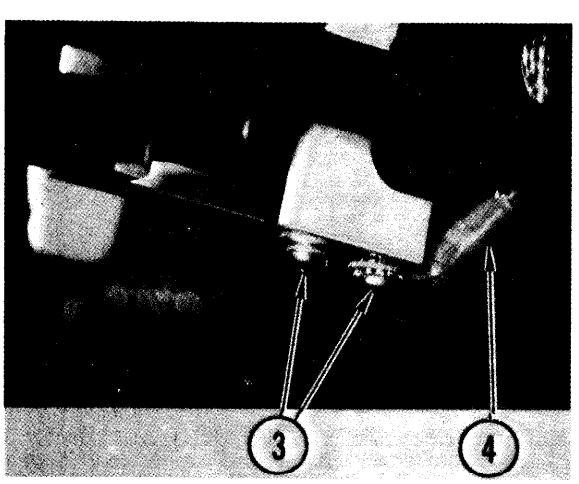
Common Tools
- Tool kit

Remove

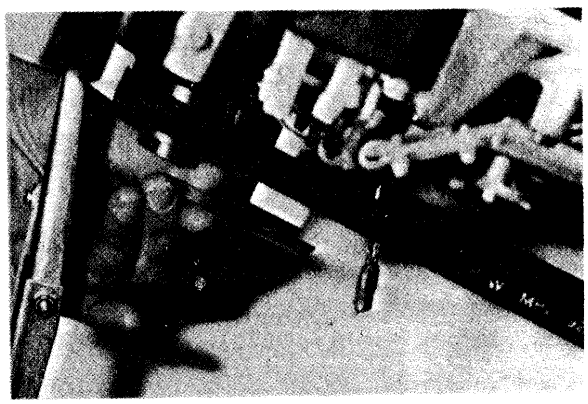
1. Raise deck (para 4-12).
2. Find spring.



3. Remove screws and washers.
4. Pull ground strap aside.

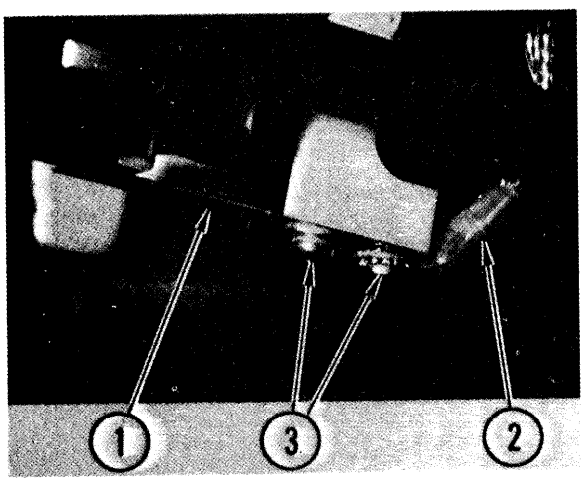


4-37. REMOVE/REPLACE STATIC GROUND SPRING (CONT)



5. Remove spring.

Replace



1. Set static ground spring in place.
2. Hold ground strap and spring in place.
3. Replace screws and washers.
4. Adjust static ground spring (para 4-38, steps 2-10).

4-38. ADJUST STATIC GROUND SPRING

INITIAL SETUP

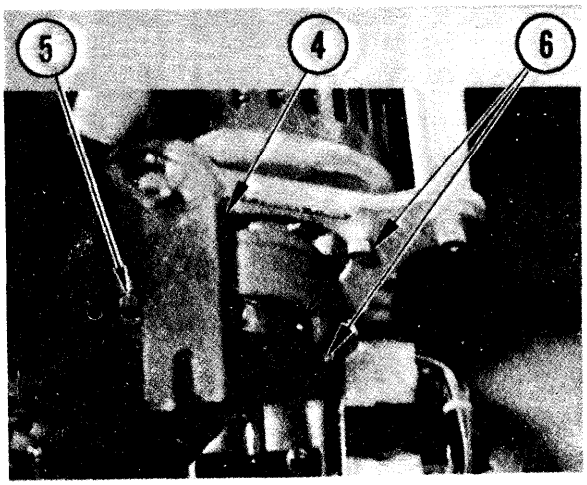
Common Tools
- Tool kit
- Belt tension gauge

1. Raise deck (para 4-12).
2. Hook gage to end of spring as shown.
3. Pull down on gage until spring is free of spindle end.
4. Look at gauge. Force measurement must be 80 to 100 grams to free spring from spindle.
   - If it is, go to step 10
   - If it is not, go to step 5
5. Loosen screws enough to free mounting block.
6. To increase tension, slide block up as shown.
7. To decrease tension, slide block down as shown.
8. Tighten screws.
9. Repeat until force measurement is 90 +/- 10 grams. If after several tries you don't get correct measurement, replace static ground spring (para 4-37).
10. Lower deck (para 4-12).

4-39. REMOVE/REPLACE SPINDLE MOTOR

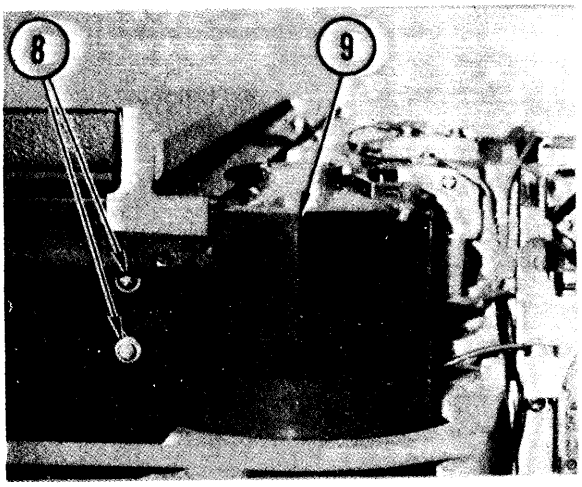
INITIAL SETUP

Common Tools
- Tool kit



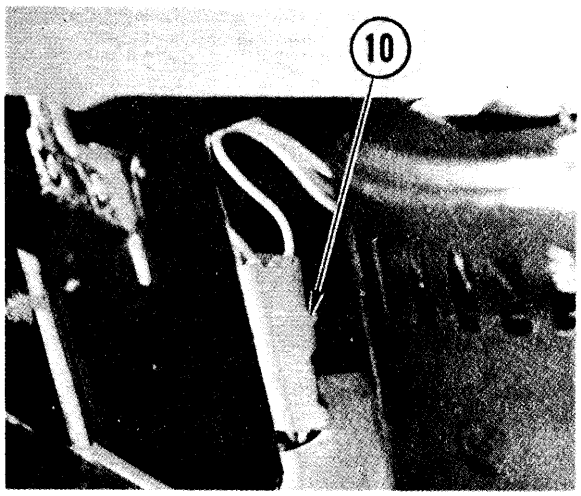
Remove

1. Raise deck (para 4-12).
2. Remove drive belt (para 4-33).
3. Remove brake assembly (para 4-40).
4. Remove screw, bracket.
5. Remove screw and ground strap.
6. Remove screws and wire.

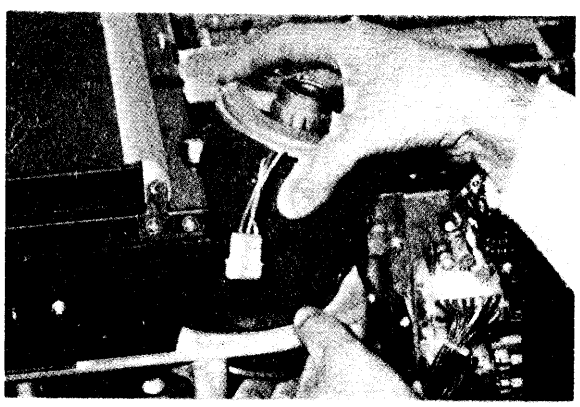


7. Lower deck (para 4-12).
8. From side of deck, remove screws.
9. Remove plate.

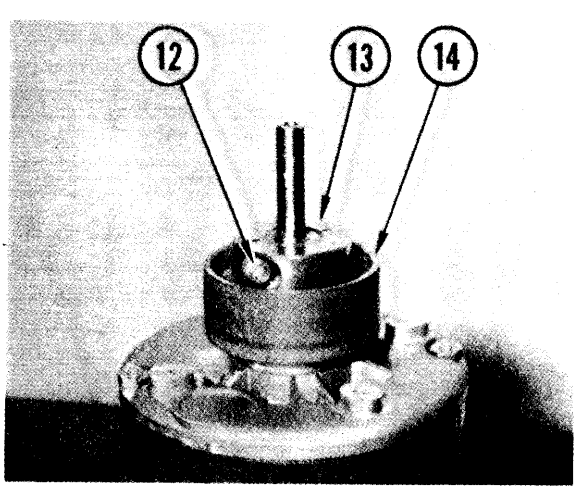
4-39. REMOVE/REPLACE SPINDLE MOTOR (CONT)



10. Pull apart P304.



11. Lift out motor.



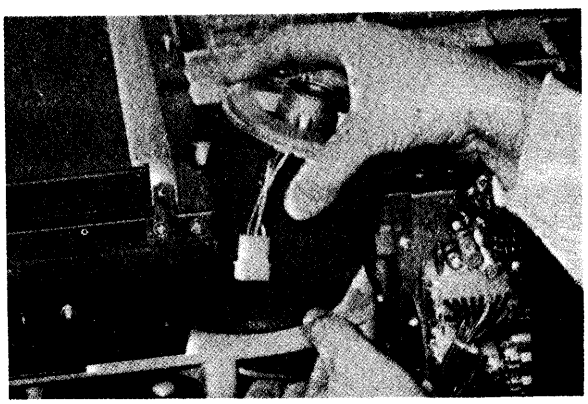
12. Using hex key, loosen screw enough to free collar and pulley.

13. Pull off collar.

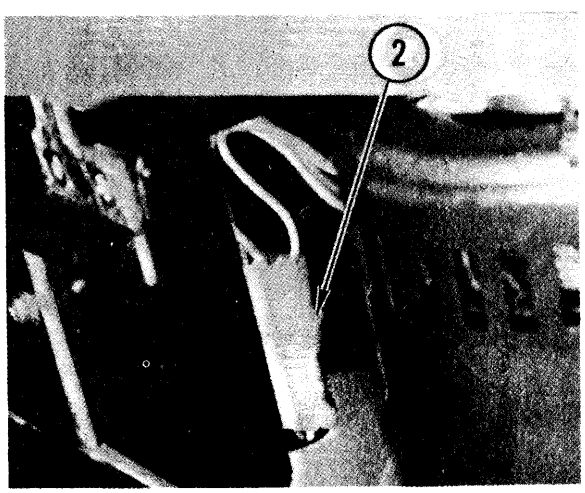
14. Pull off pulley.

4-39. REMOVE/REPLACE SPINDLE MOTOR (CONT)

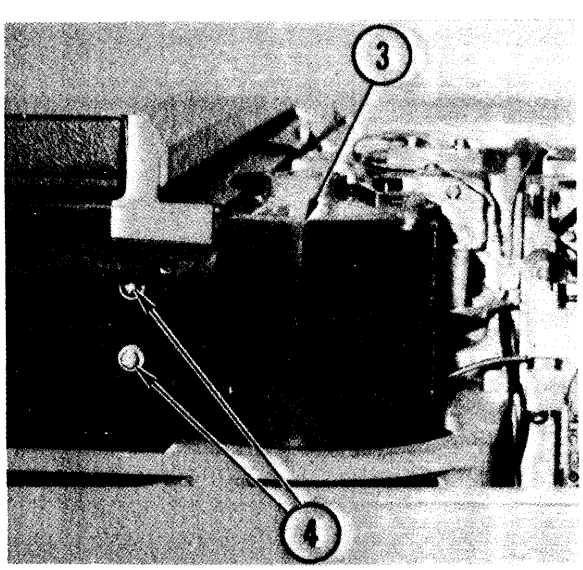
Replace



1. Replace motor.



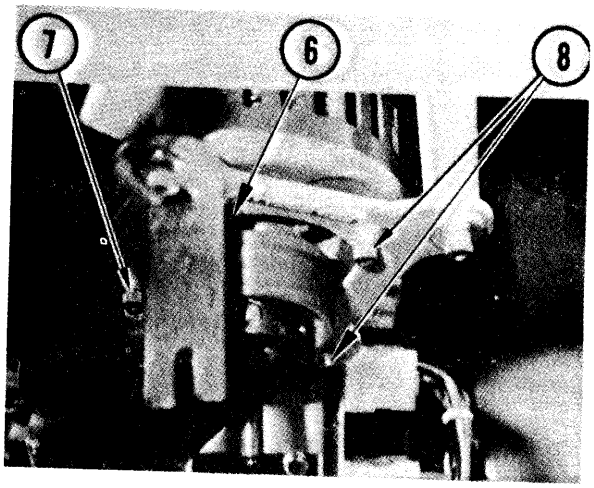
2. Connect P304.



3. Replace plate.

4. Replace screws.

4-39. REMOVE/REPLACE SPINDLE MOTOR (CONT)



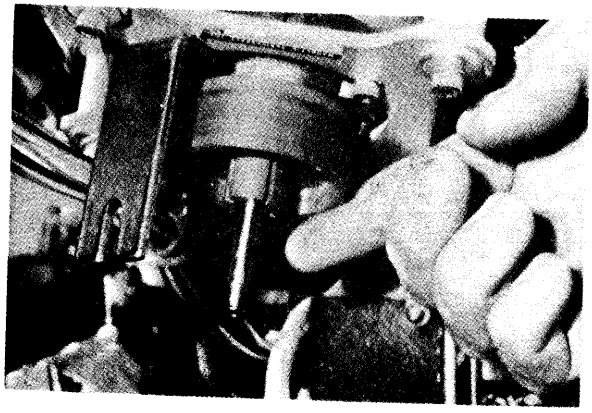
5. Raise deck (para 4-12).

6. Install screw and bracket. Tighten screw just enough to hold bracket in place.

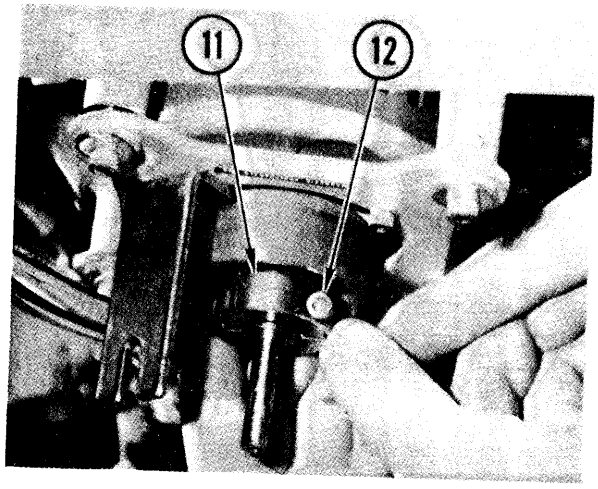
7. Install screw and ground strap. Hand-tighten screw.

8. Install screws and wire.

9. Tighten all four screws.



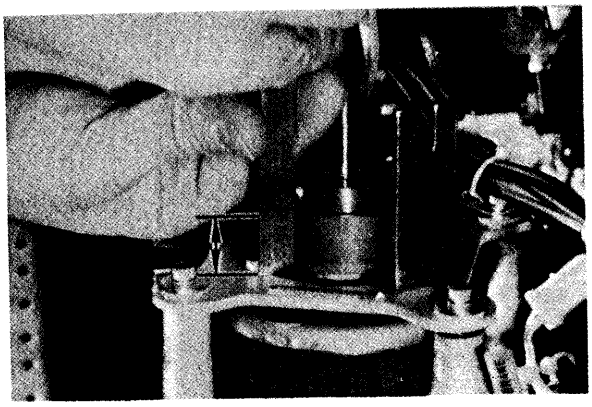
10. Slide on pulley.



11. Slide on collar as shown.

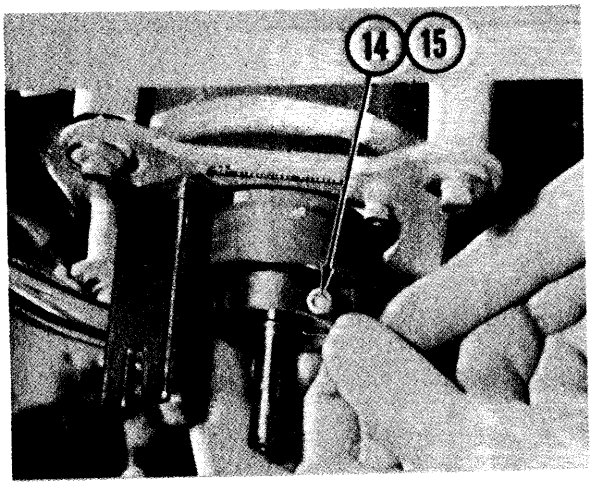
12. Tighten screw just enough to hold collar and pulley in place.

4-39. REMOVE/REPLACE SPINDLE MOTOR (CONT)



13. Using machinist's rule, measure alinement gap. Gap must be 13/16 + 1/32 inch.

    - If gap is correct, go to step 15
    - If gap is not correct, go to step 14



14. Loosen screw enough to move collar and pulley. Position pulley until gap is correct.

15. Tighten screw.

16. Install brake assembly (para 4-40, Replace steps 1-5).

17. Install drive belt (para 4-33, Replace steps 1-4).

4-400 REMOVE/REPLACE BRAKE ASSEMBLY

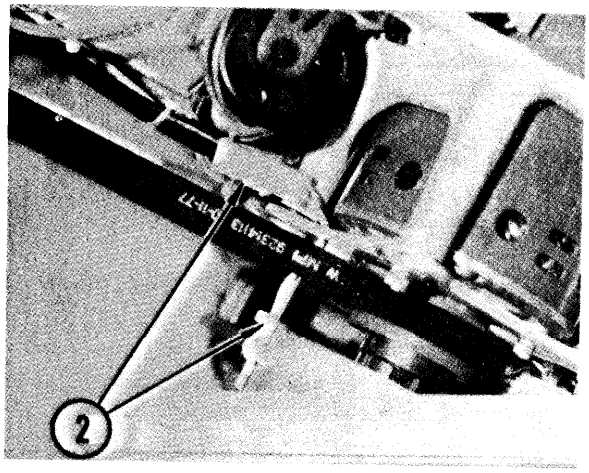
INITIAL SETUP

Common Tools
- Tool kit
- Torque screwdriver

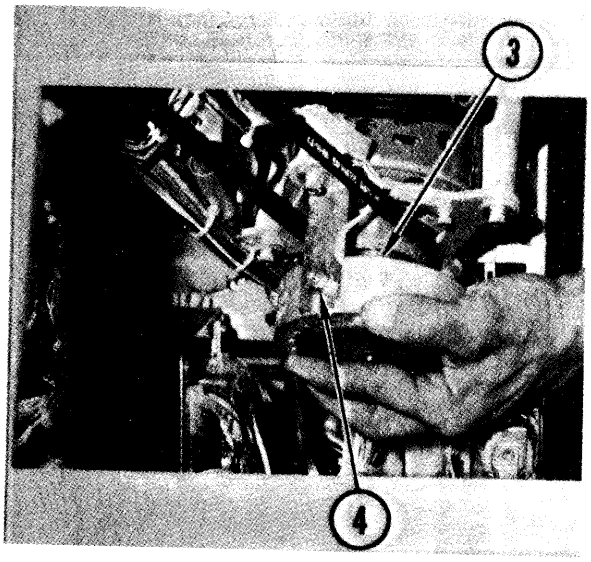
Materials/Spare Parts
- Tie wraps

Remove

1. Raise deck (para 4-12).



2. Unplug connector on brake. Cut tie wraps.

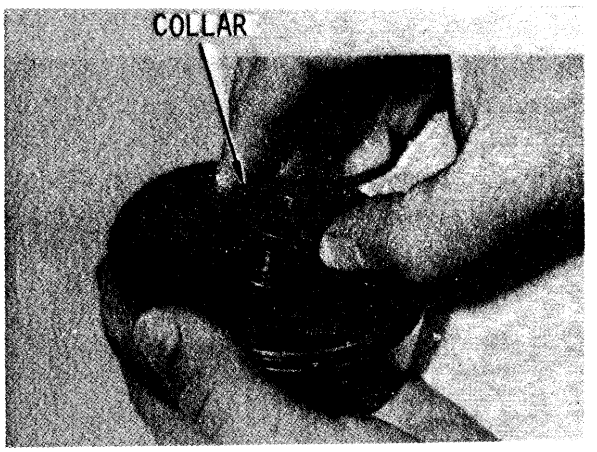


Using hex key loosen setscrew.

With one hand, hold brake from underneath. Remove screw holding wire lead to brake assembly. Remove wire lead.

Slide brake off motor shaft.

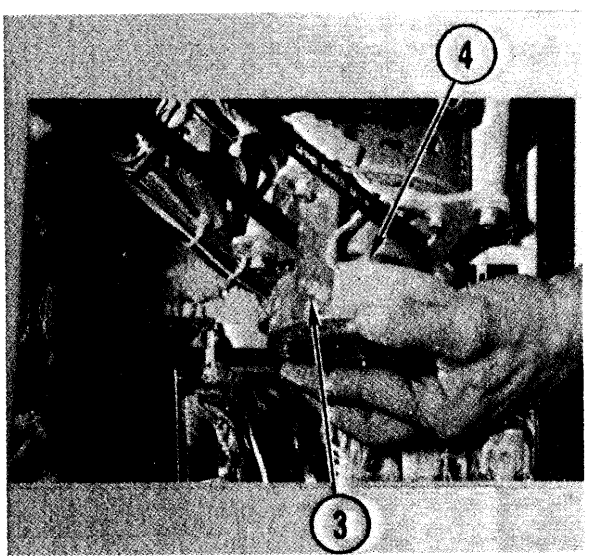
4-40. REMOVE/REPLACE BRAKE ASSEMBLY (CONT)

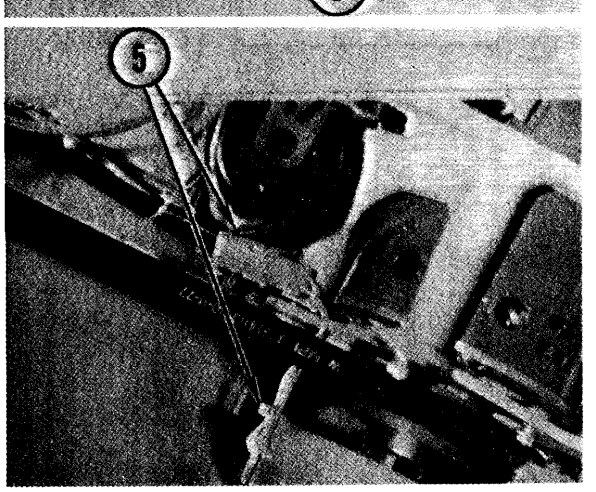


6. Lift off collar.

Replace

1. Put collar on new brake.
2. Slide brake onto motor shaft.
3. Replace wire lead and screw.
4. Tighten screw. Using torque screwdriver, tighten to 30'+/- 2 inch-pounds.





5. Push connectors together. Install tie wraps.
6. Lower deck (para 4-12).

4-41. REMOVE/REPLACE READ/WRITE BOARD ASSEMBLY

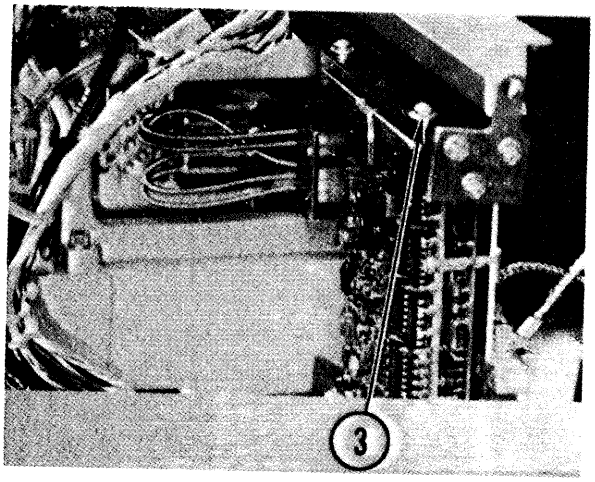
INITIAL SETUP

Common Tools
- Tool kit

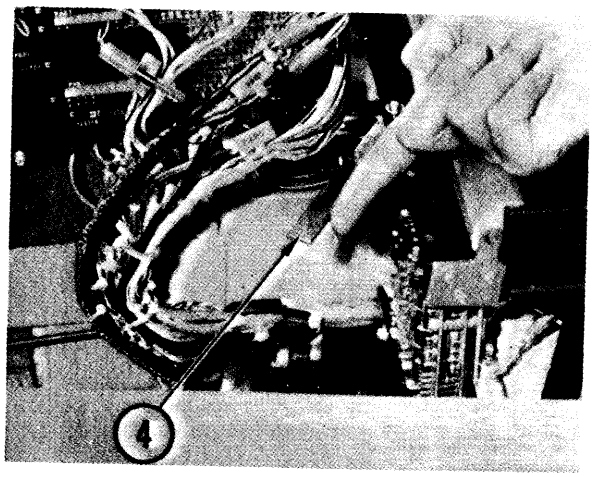
Materials/Spare Parts
- Paper
- Pen or pencil

Remove

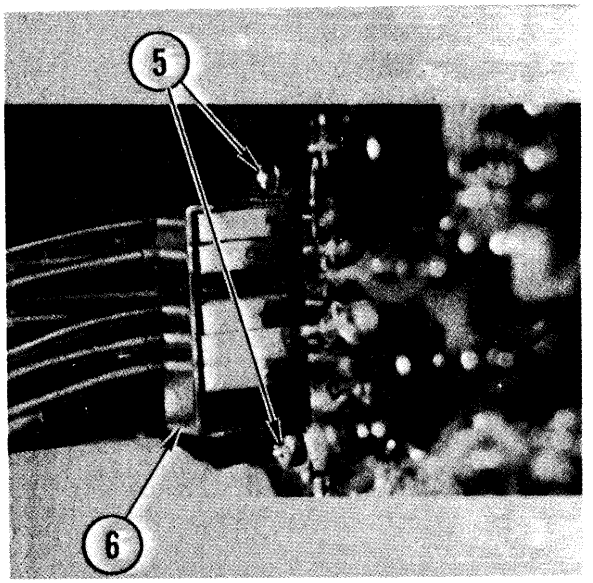
1. Remove cover (para 4-11).
2. Raise logic cage (para 4-25, Raise, steps 2-6).
3. Remove screw.



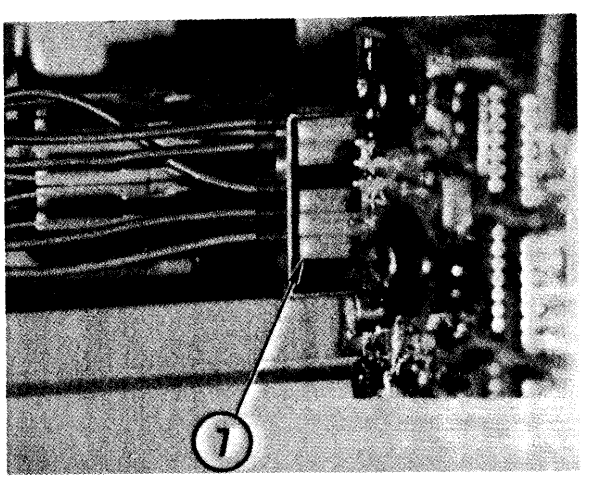
4. Pu1l out plate. Push to side.



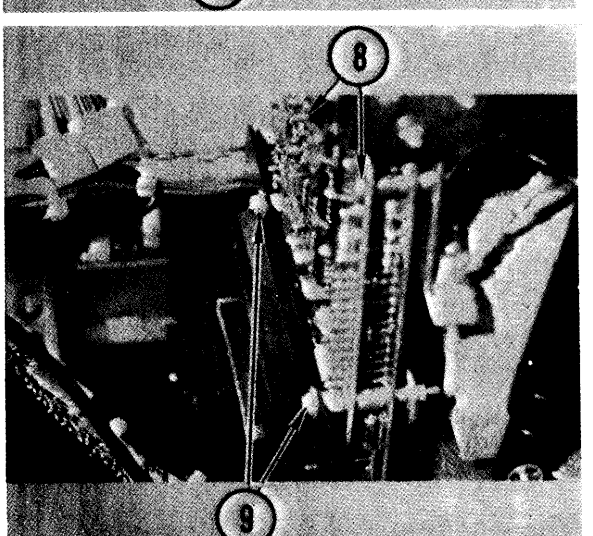
4-41. REMOVE/REPLACE READ/WRITE BOARD ASSEMBLY (CONT)



5. Remove screws.
6. Remove bracket.

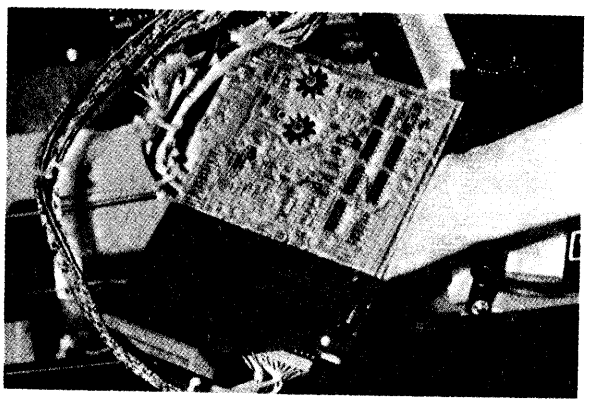


7. Unplug cables one at a time.

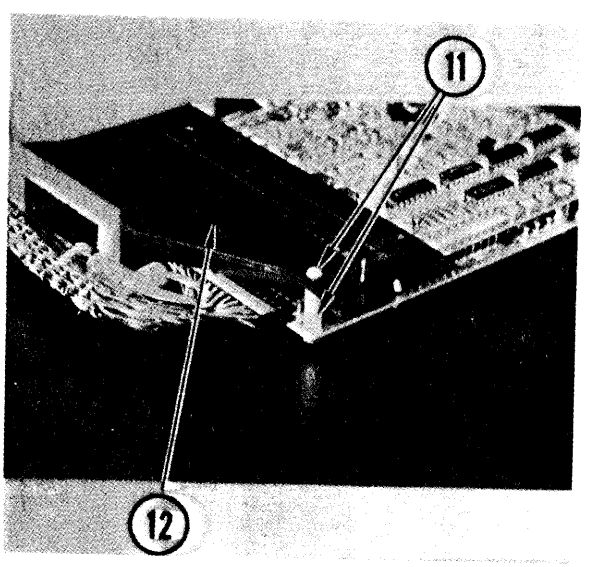


8. Remove screws and plate.
9. Remove screws, spacers, and nuts.

4-41. REMOVE/REPLACE READ/WRITE BOARD ASSEMBLY (CONT)

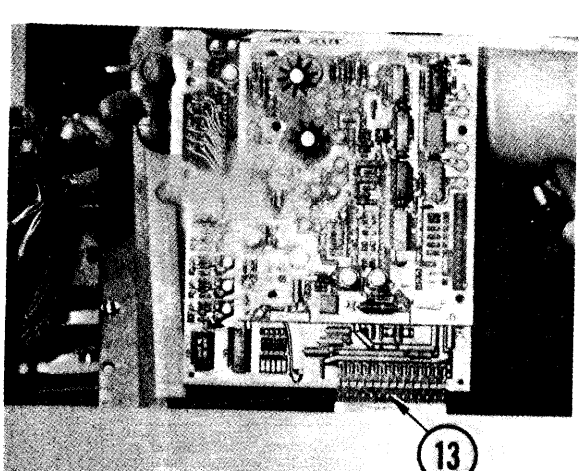


10. Pull out assembly.



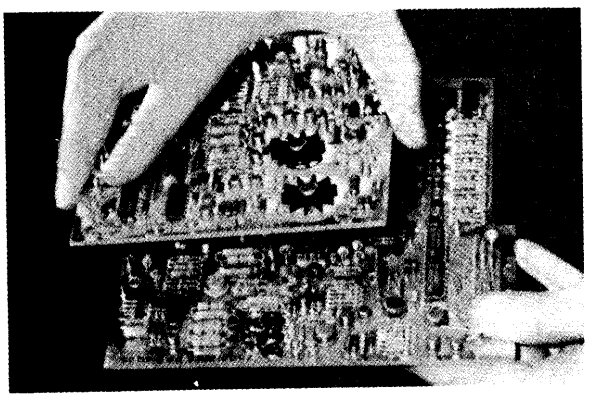
11. Remove nylon screw and spacer.

12. Pull off air plenum.



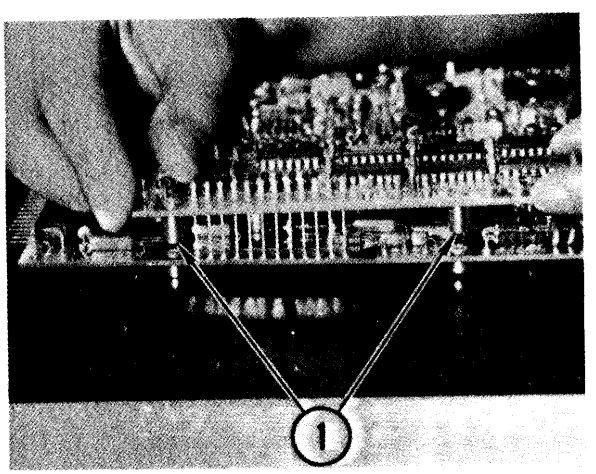
13. On scratch paper, note how P101 is installed. Pull P101 from board.

4-41. REMOVE/REPLACE READ/WRITE BOARD ASSEMBLY (CONT)



14. Pull boards apart.

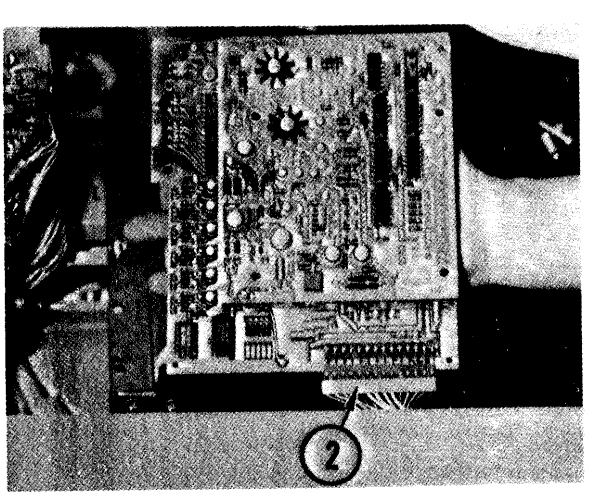
Replace



1. Line up spacers. Mount boards together.

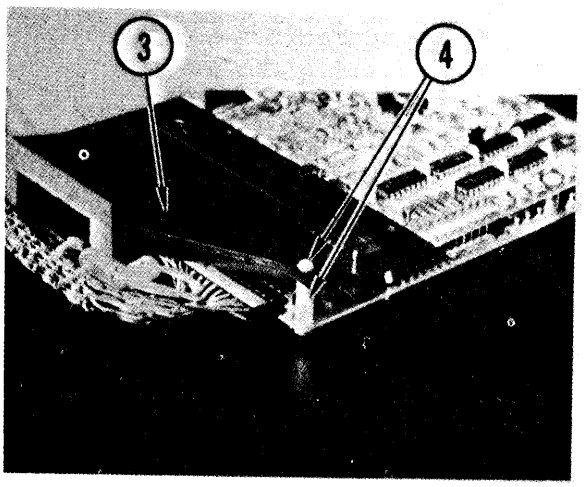
CAUTION

Incorrect installation of P101 will cause damage to boards.



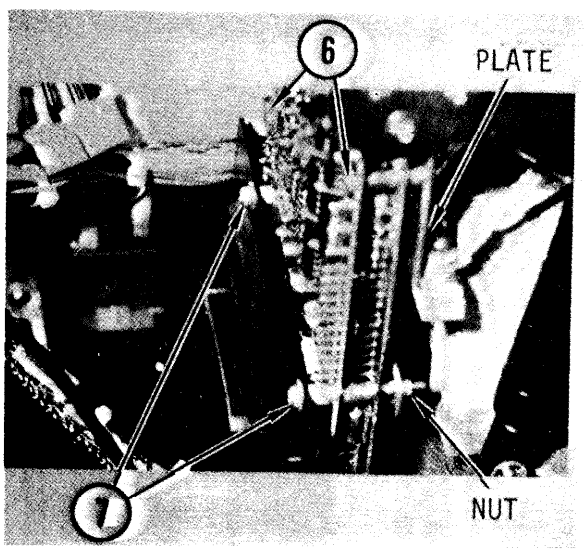
2. Connect P101 using notes made during removal.

4-41. REMOVE/REPLACE READ/WRITE BOARD ASSEMBLY (CONT)



3. Replace air plenum.

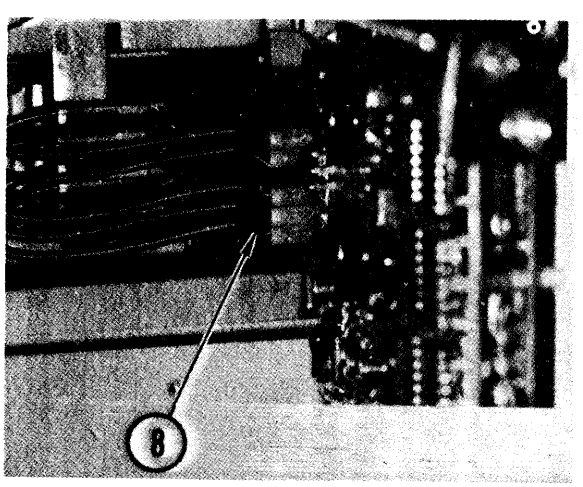
4. Replace spacer and nylon screw.



5. Gently push assembly back in place.

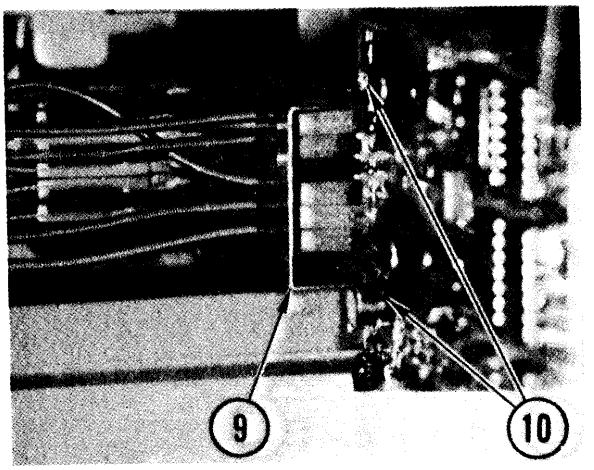
6. Replace screws and plate.

7. Replace screws, spacers, and nut. Do not tighten screws until you have completed step 11.

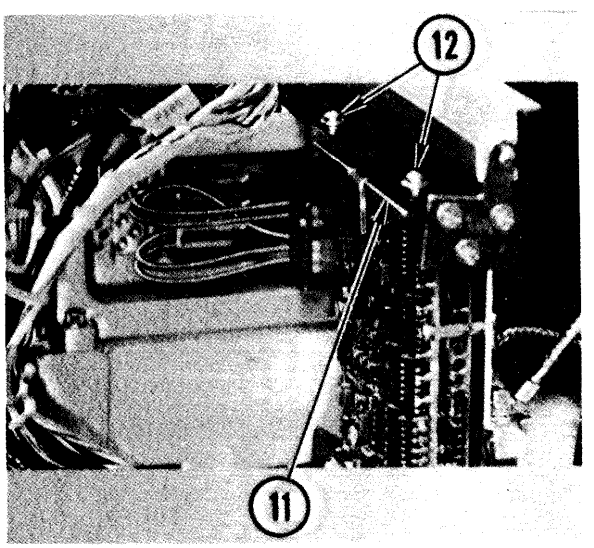


8. Carefully plug in cables one at a time.

4-41. REMOVE/REPLACE READ/WRITE BOARD ASSEMBLY (CONT)



9. Replace bracket.
10. Replace screws.



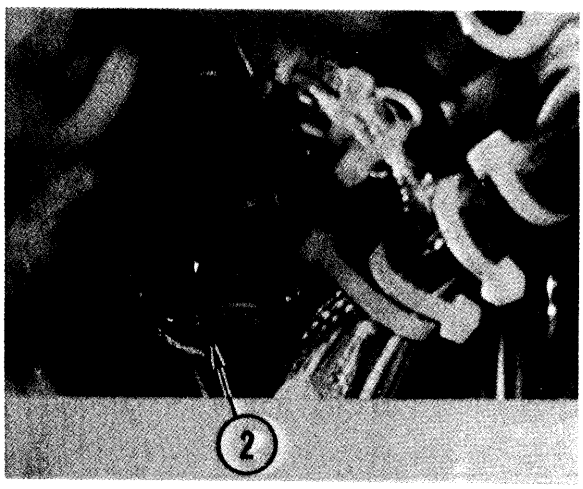
11. Push plate in place.
12. Replace screw. Tighten all screws.
13. Lower logic cage (para 4-25).
14. Replace cover (para 4-11).

4-42. REMOVE/REPLACE TRACK SERVO PREAMP

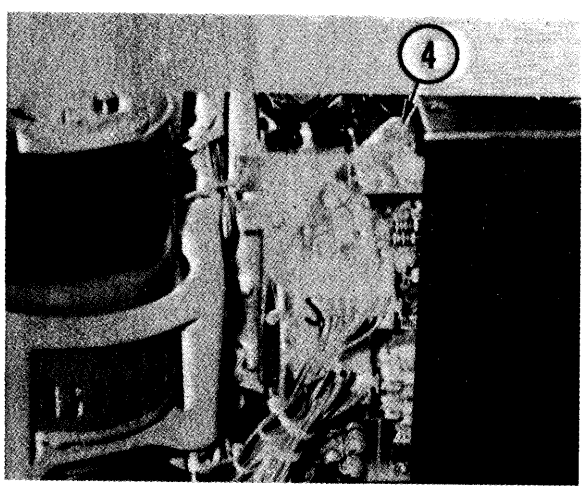
INITIAL SETUP

Common Tools	Materials/Spare parts
● Tool kit	● Tie wraps

Remove

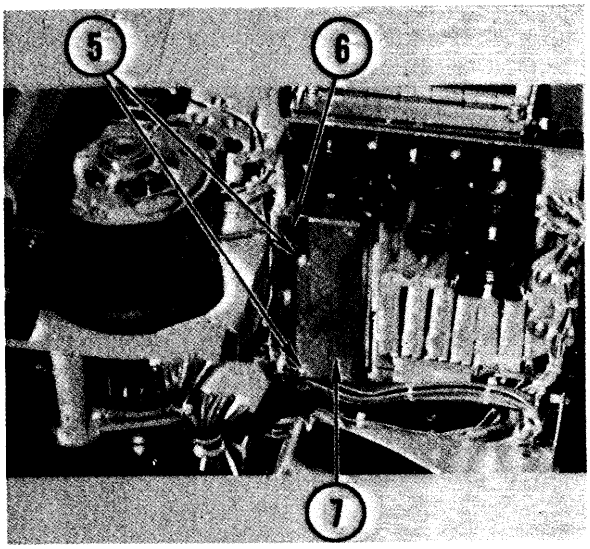


1. Raise deck (para 4-12).
2. From underneath deck, reach behind servo preamp and find P8. Cut tie wraps and pull off P8.

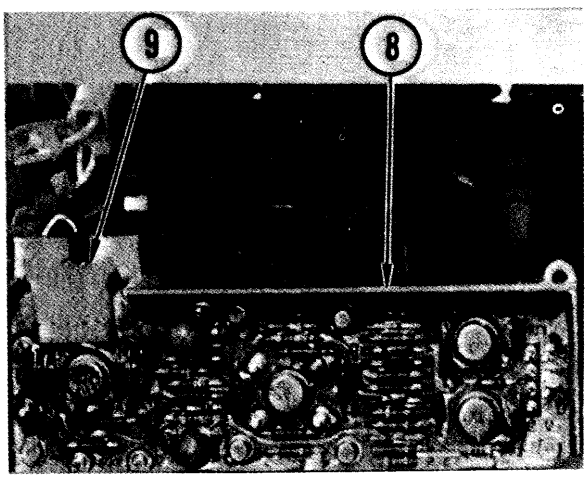


3. Lower deck (para 4-12 Lower steps 1-7).
4. Remove power supply (para 4-18).

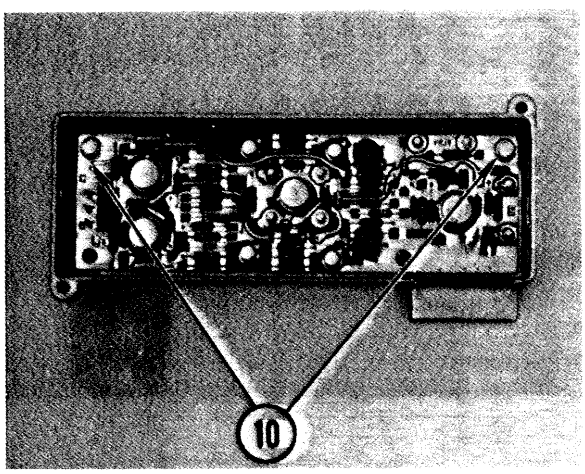
4-42. REMOVE/REPLACE TRACK SERVO PREAMP (CONT)



5. Remove screws.
6. Slide cover off shield and let it hang on cable.
7. Pull off shield.



8. Turn shield around as shown.
9. Pull off head connector.



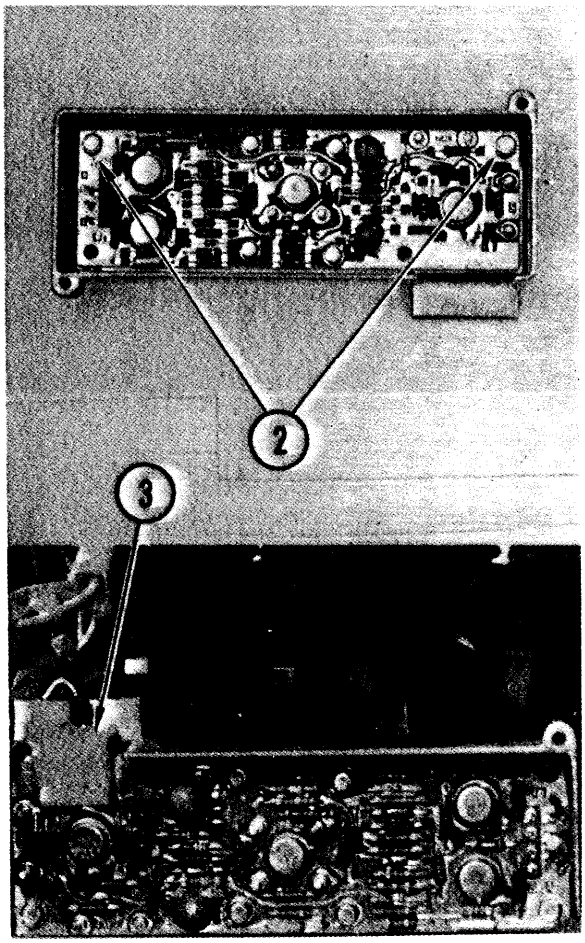
10. Using 3/16-in. nut driver, remove screws.
11. Lift out board.

4-42. REMOVE/REPLACE TRACK SERVO PREAMP (CONT)

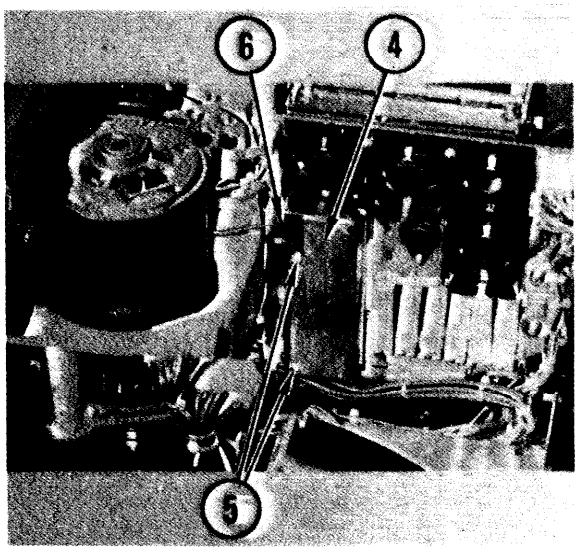
Replace

1. Set board into shield as shown.

2. Using 3/16-in. nut driver, replace screws.



3. Push in head connector. Push on P8.

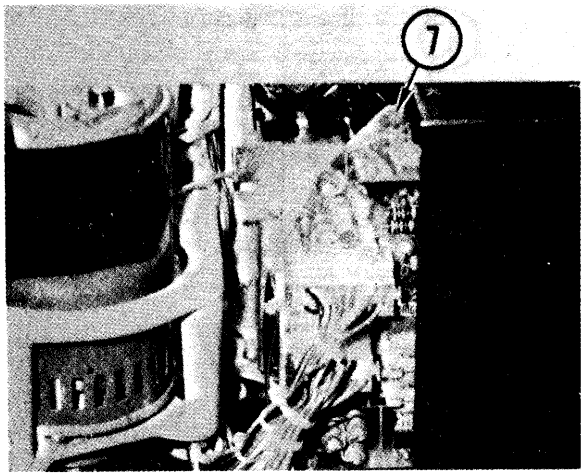


4. Put shield in place.

5. Insert screws. Tighten bottom screw only.

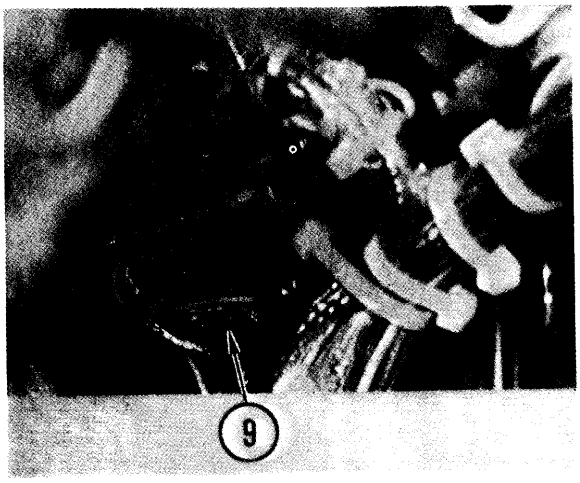
6. Slide cover under top screw as shown. Tighten top screw.

4-42. REMOVE/REPLACE TRACK SERVO PREAMP (CONT)



7. Replace power supply (para 4-18, Replace steps 1-10).

8. Raise deck (para 4-12).



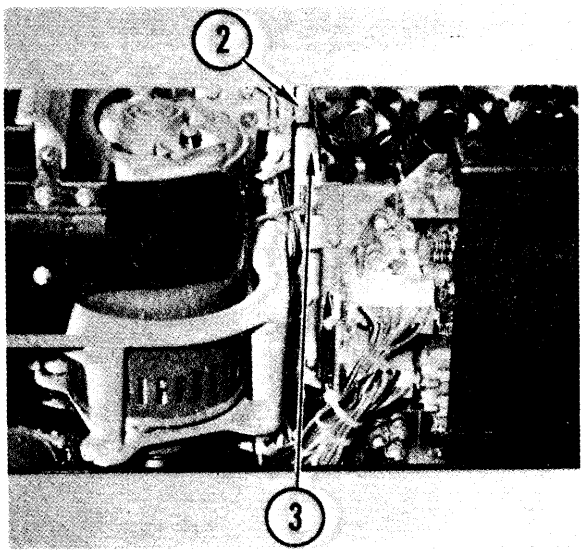
9. From underneath deck, push in J8. Replace tie wraps.

10. Lower deck (para 4-12).

4-43. REMOVE/REPLACE POWER AMPLIFIER ASSEMBLY

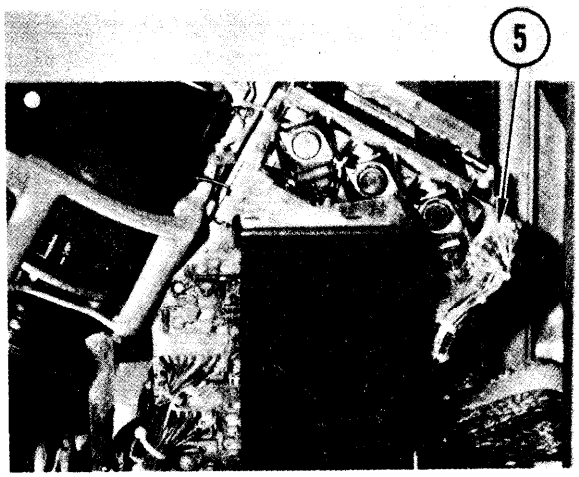
INITIAL SETUP

Common Tools
- Tool kit



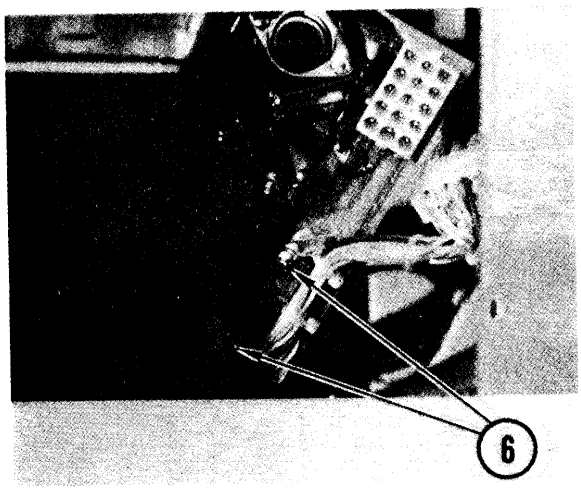
Remove

1. Raise cover (para 4-11).
2. Pull apart PA connector.
3. Loosen screw enough to free assembly.
4. Raise deck (para 4-12).

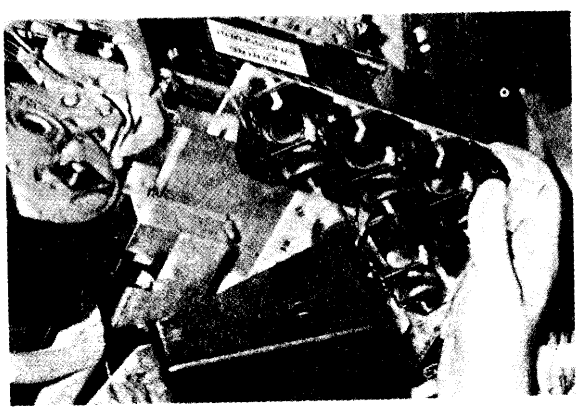


5. Disconnect P200. If necessary, use small screwdriver to pry plug apart.

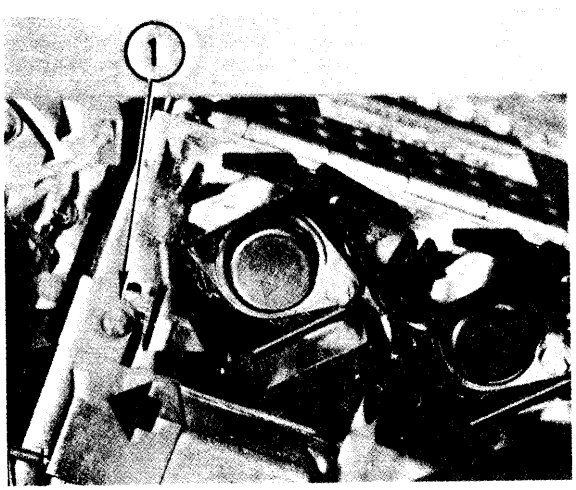
4-43. REMOVE/REPLACE POWER AMPLIFIER ASSEMBLY (CONT)



6. Remove screws.



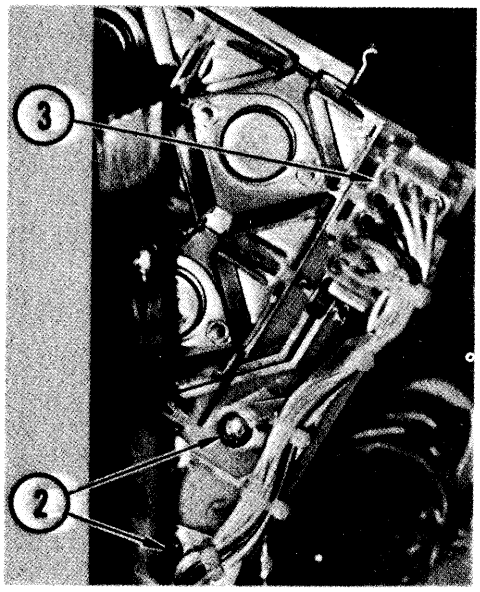
7. Slide power amplifier out of mounting.



Replace

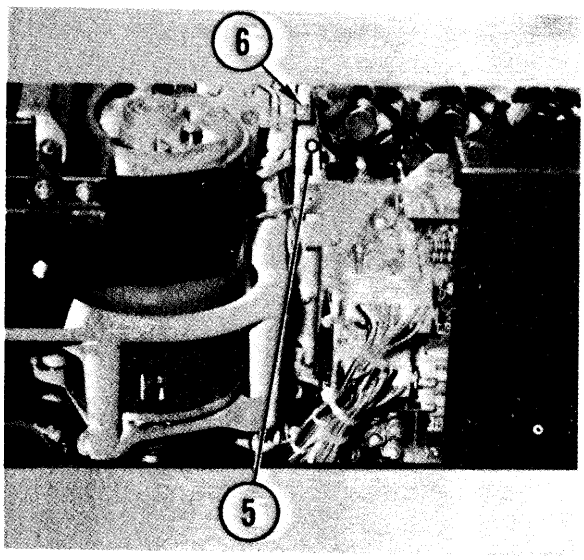
1. With deck in raised position, slide power amplifier back in place. Line it up under screw.

4-43. REMOVE/REPLACE POWER AMPLIFIER ASSEMBLY (CONT)



2. Replace screws.

3. Connect P200.



4. Lower deck (para 4-12).

5. Tighten screw.

6. Connect PA connector.

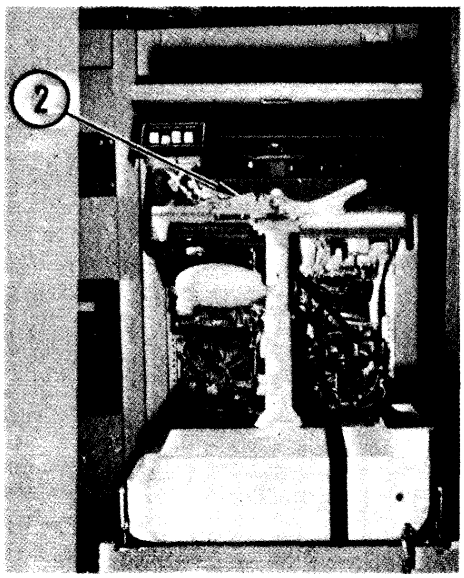
4-44. REMOVE/REPLACE SPEED TRANSDUCER

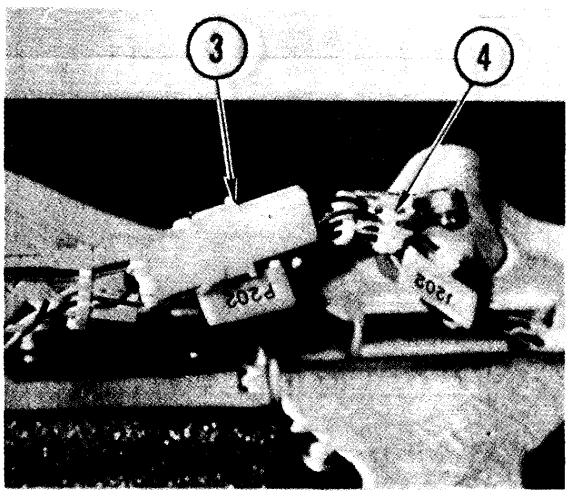
INITIAL SETUP

Common Tools	Materials/Spare Parts	Supplies
● Tool kit	● Tie wraps	● Scratch pack

Remove

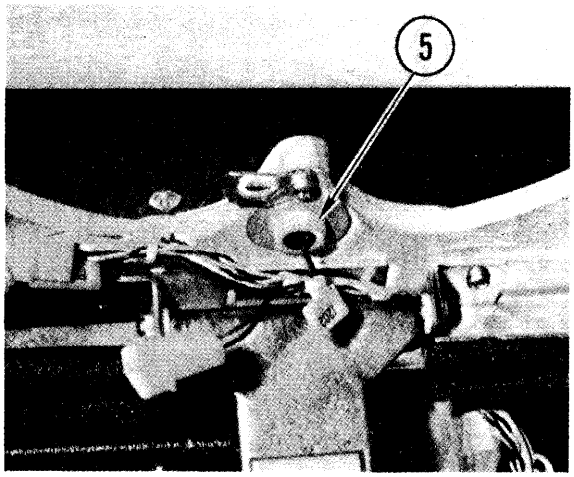
1. Raise deck (para 4-12).
2. Locate P202.



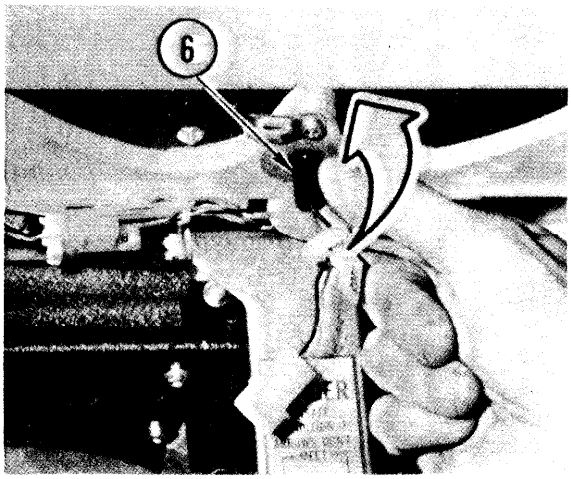


3. Unplug P202.
4. Cut tie wrap to free J202 wires.

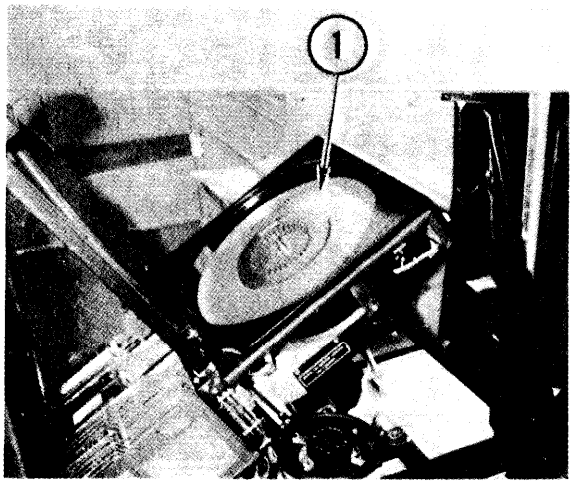
4-44. REMOVE/REPLACE SPEED TRANSDUCER (CONT)



5. Using a 9/16-inch open-end wrench, loosen nylon lock nut. Slip nut off transducer. (It should rest on connecting wires.)



6. Unscrew and remove speed transducer as shown.

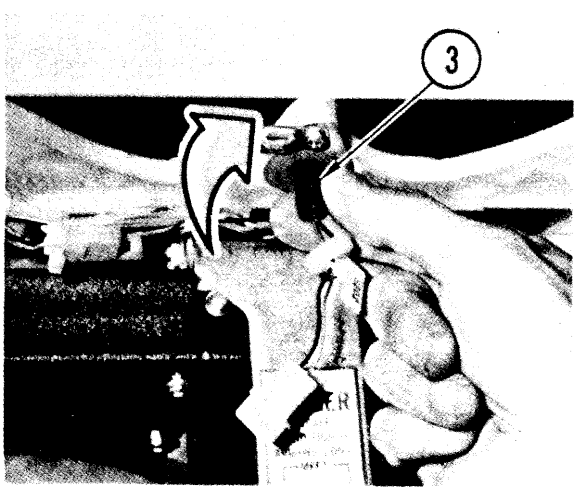


Replace

1. With deck raised, install scratch pack.

4-44. REMOVE/REPLACE SPEED TRANSDUCER (CONT)

2. Loosen nylon nut. Slip nut off new transducer as shown.



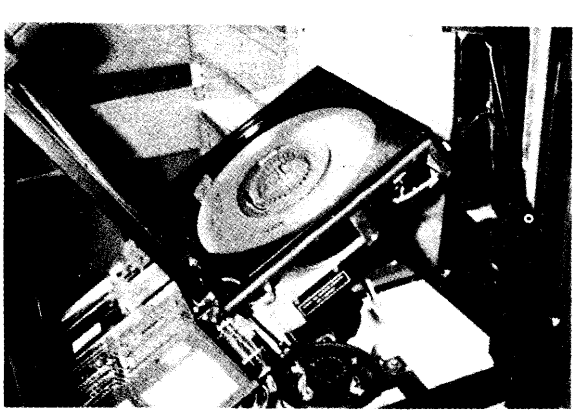
3. Slowly screw transducer up through bottom of deck. Turn until transducer stops.

4. Unscrew transducer one full turn.

5. Replace nylon nut. Turn until it stops . Do not over-tighten.

CAUTION

Do not touch recording surface of disk pack.



6. Turn pack by hand. Listen for scraping sound. This indicates transducer is hitting bottom of pack.

- If scraping sound, go to step 7
- If no scraping sound, go to step 9

7. Loosen nylon lock nut. Slide nut over wires. Unscrew transducer half turn.

8. Turn nylon lock nut back on transducer. Do not over-tighten lock nut.

4-44. REMOVE/REPLACE SPEED TRANSDUCER (CONT)

9. Connect P202.
10. Tie J202 wires with new tie wrap.
11. Lower deck (para 4-12).

NOTE

If seek errors occur during operation, finer adjustment of speed transducer is required (para 4-45, steps 2-10).

4-45. CHECK AND ADJUST SPEED TRANSDUCER

INITIAL SETUP

Common Tools	Test, Measurement and Diagnostic Equipment
● Tool kit	● Oscilloscope

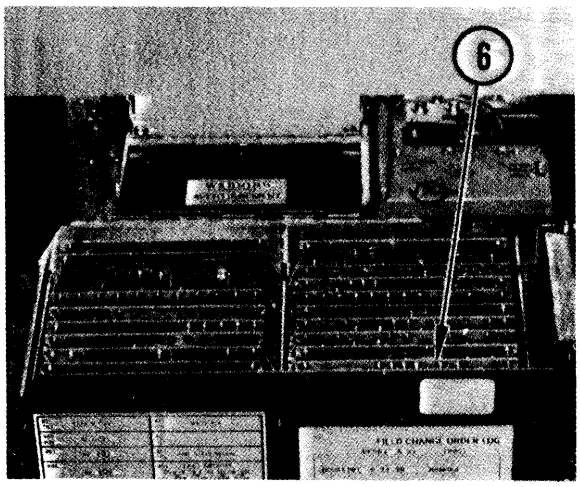
1. Remove cover (para 4-11).
2. Install scratch pack.
3. Power on drive.
4. Cycle up drive.
5. Set up oscilloscope. Use standard probe. Settings should be:

   VOLTS/DIV

   CH 1 - 5 V
   CH 2 - NOT USED

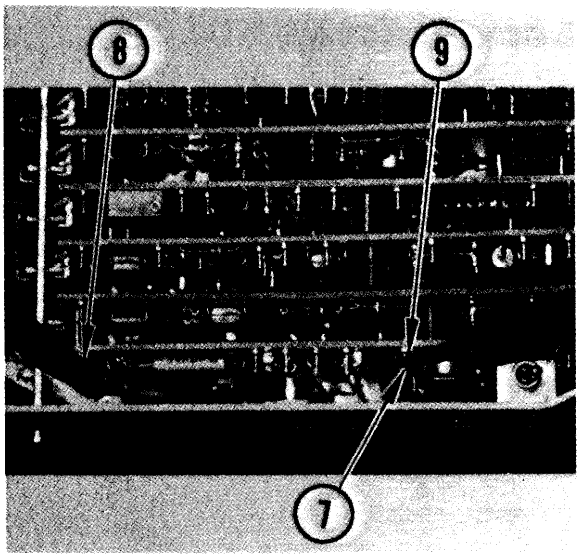
   TIME DIV

   1 ms

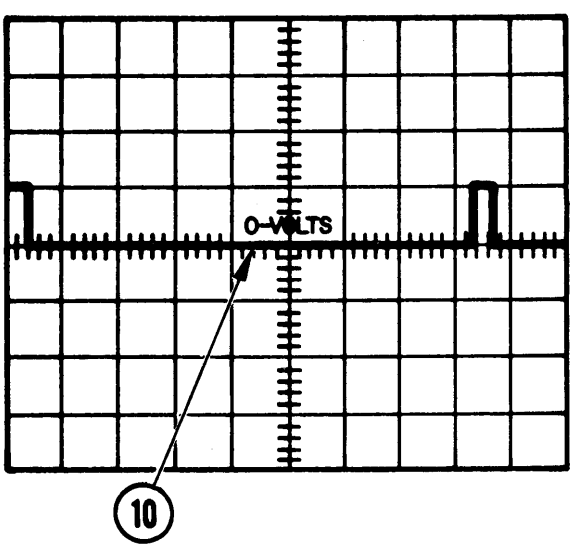


6. Locate board in slot A-10.

4-450 CHECK AND ADJUST SPEED TRANSDUCER (CONT)



7. Find test point B.
8. Find cage connection closest to test point. Attach ground clamp.
9. Attach probe to test point B.



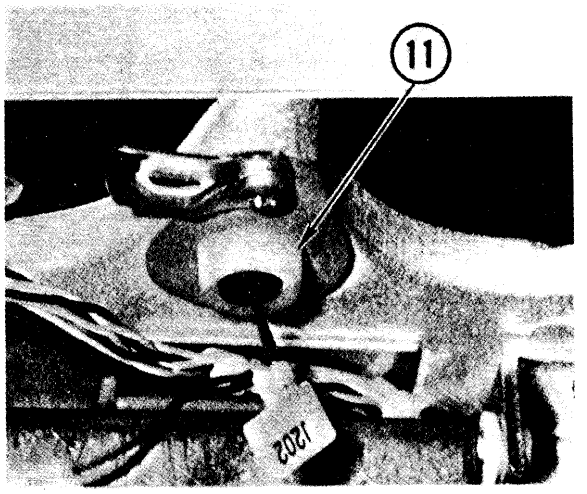
10. Look at oscilloscope. Waveform should look like this.

- If it does, go to step 21.
- If waveform pulses are dropping out, or there are no pulses, or if waveform noise pulses are in between speed pulses, go to step 11

NOTE

If adjustment is required, perform steps 11 through 19. If waveform pulses are dropping out or there are no pulses, then do adjustments as indicated in step 17. If waveform noise pulses are in between speed pulses, do adjustment as indicated in step 18.

4-450 CHECK AND ADJUST SPEED TRANSDUCER (CONT)



11. Raise deck (para 4-12).

12. Find speed transducer.

NOTE

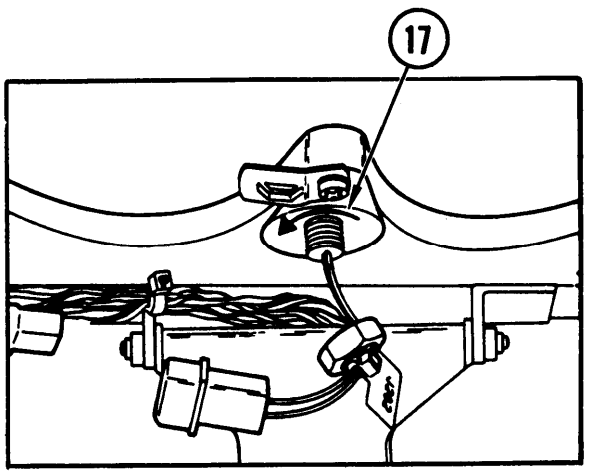
To perform this task you will lower deck and cycle up drive repeatedly. It is not necessary to install hex head bolts in deck until task is completed.

130 Using a 9/16-inch open-end wrench, loosen nylon nut.

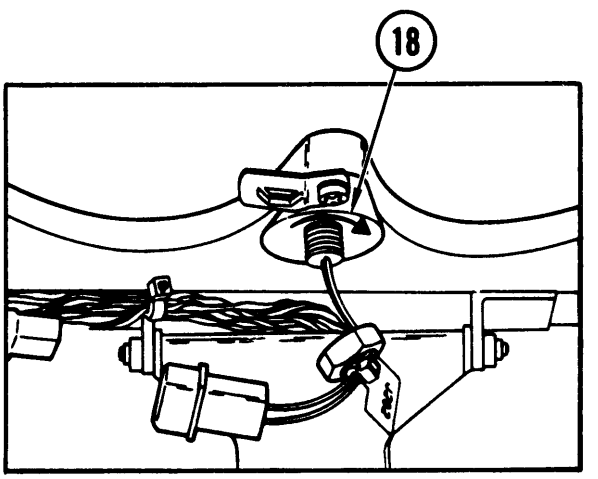
14. Lower deck (para 4-12).

15. Cycle up drive.

16. Observe scope.



17. If waveform pulses are dropping out or there are no pulses, turn speed transducer 1/2 turn as shown. Repeat adjustment as required. Go to step 19 after adjustment is completed.



18. If waveform noise pulses are in between speed pulses, turn speed transducer 1/2 turn as shown.

19. Tighten nylon lock nut. Turn until it stops. Do not over-tighten.

20• Go back to step 10.

21. Disconnect scope.

22. Press start to cycle down drive.

23. Power off drive.

24. Remove scratch pack.

25. Replace cover (para 4-11).

4-46. REMOVE/REPLACE VELOCITY TRANSDUCER

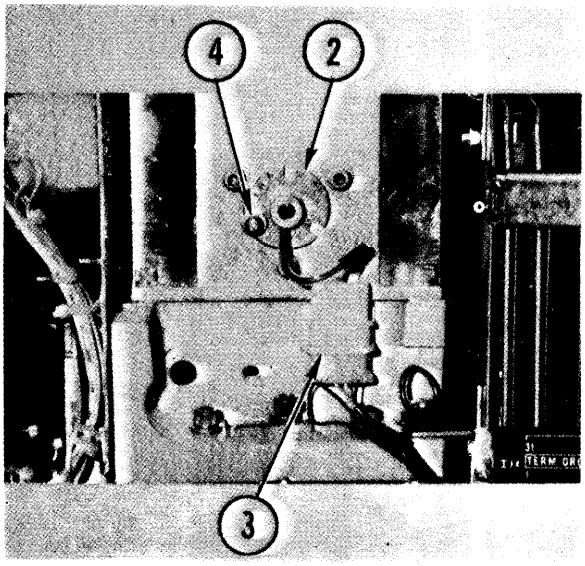
INITIAL SETUP

Common Tools
- Tool kit

Materials/Spare Parts
- Screw-thread locking compound

NOTE

Velocity transducer assembly consists of transducer coil, transducer core and extension rod. You must replace all parts at same time.

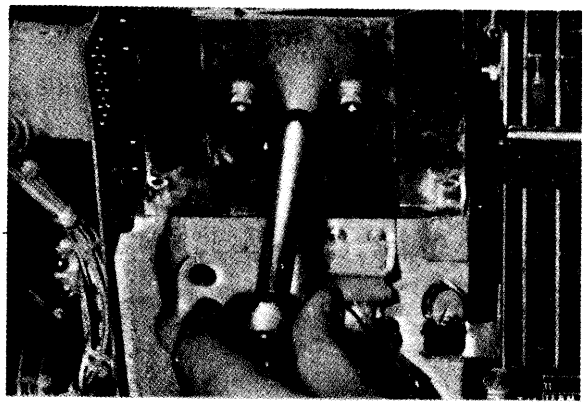


1. Remove cover (para 4-11).
2. At rear of drive, find magnet assembly.

CAUTION

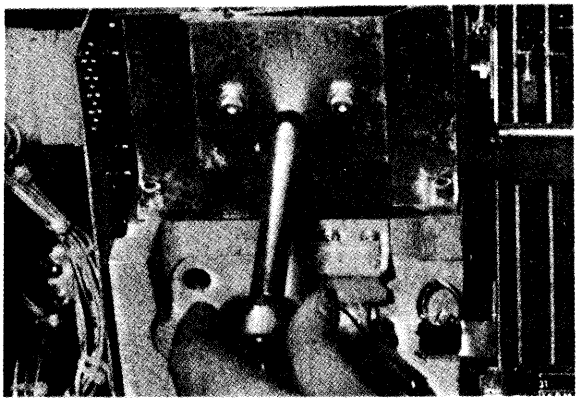
Wires to P-22 break off easily. Handle connector carefully.

3. Disconnect P-22.
4. Remove screw and washer.



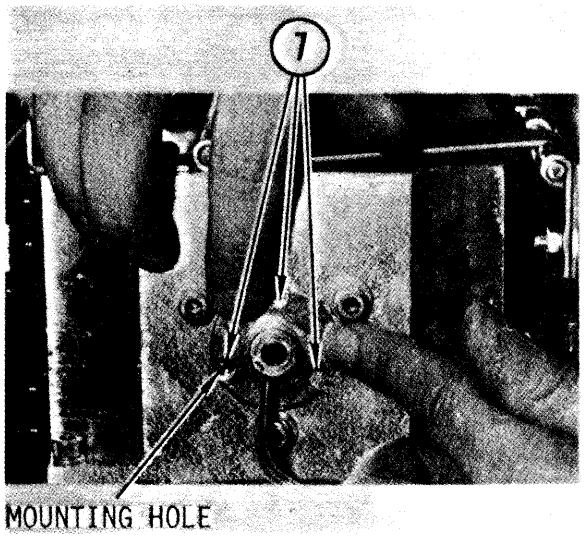
5. Slowly pull out coil.

4-46. REMOVE/REPLACE VELOCITY TRANSDUCER (CONT)

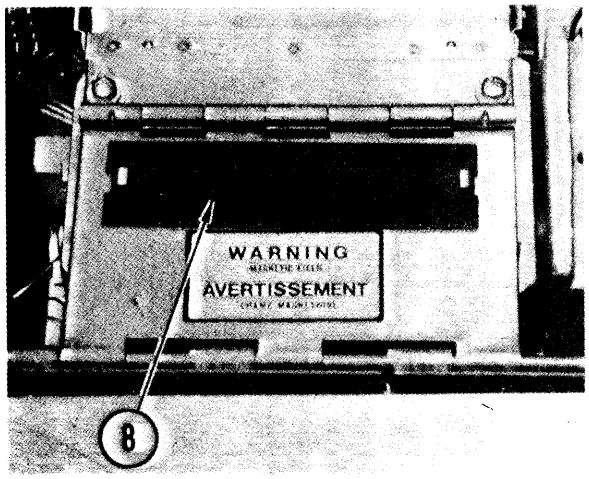


6. Slowly push in new transducer coil.

I



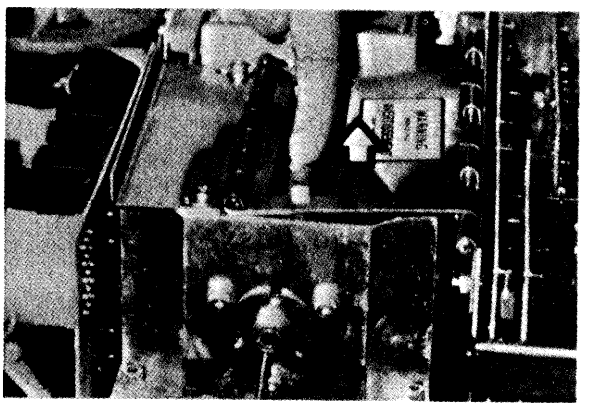
7. Choose one of these three slots. Line up slot with mounting hole.



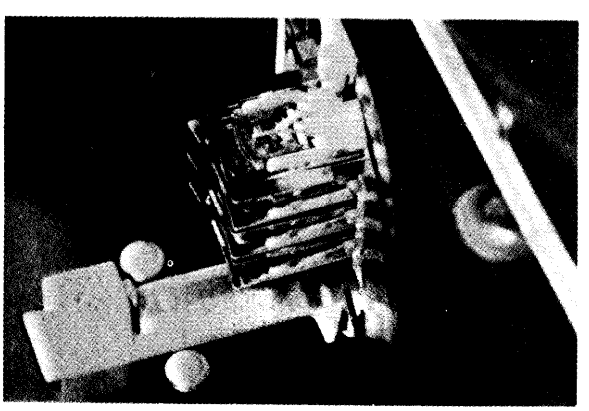
8. Pull off coil cover.

!

4-46. REMOVE/REPLACE VELOCITY TRANSDUCER (CONT)



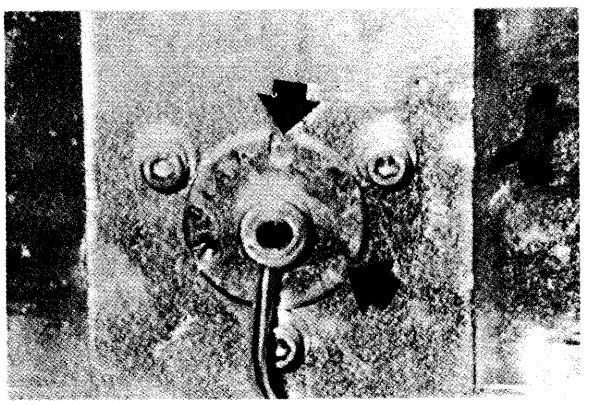
9. Slowly push carriage coil as shown until you feel slight release in pressure.



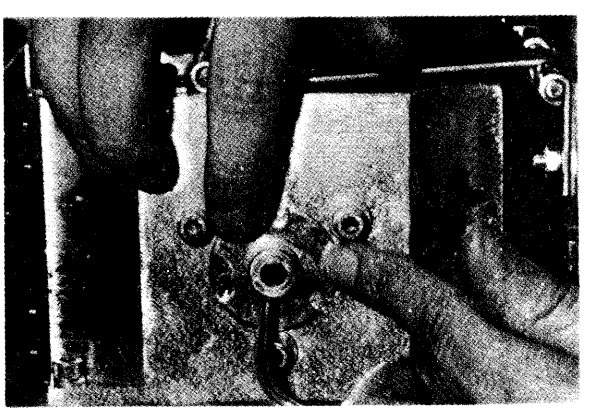
10. At same time, look inside pack area. Make sure heads do not extend more than 1 1/2 inches. If they do, move carriage coil back until you feel pressure on carriage coil.

11. Gently slide carriage coil back and forth. Listen for rubbing sound.

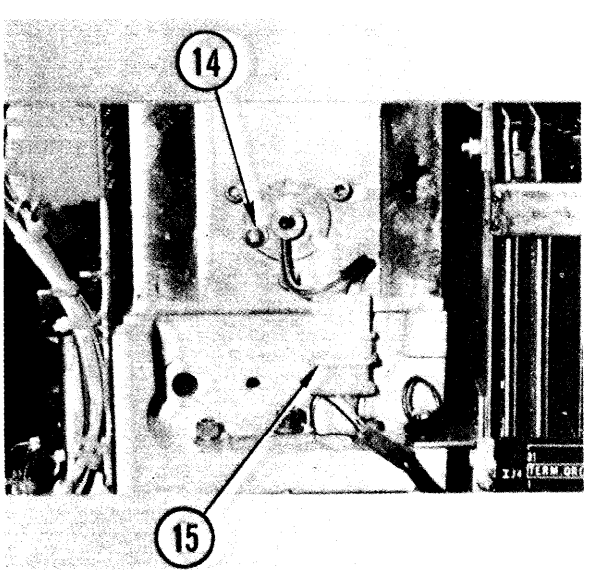
4-46. REMOVE/REPLACE VELOCITY TRANSDUCER (CONT)



12. For each remaining slot, repeat steps 9 and 13.



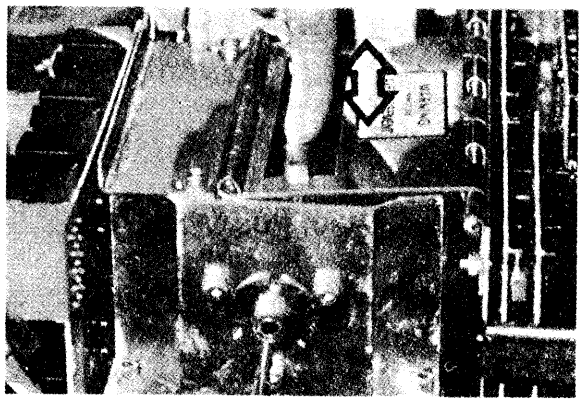
13. Choose slot which produced the least amount of rubbing. Line up that slot with mounting hole.



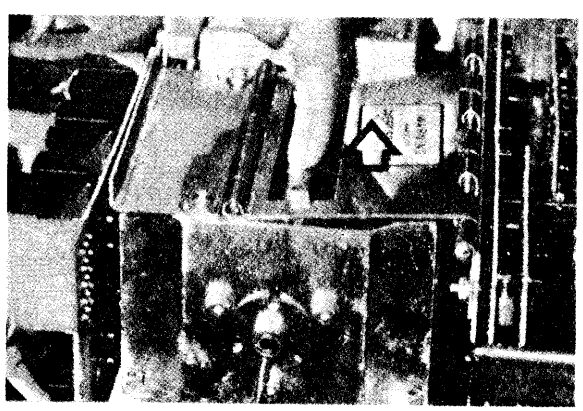
14. Replace screw and washer.

15. Connect P-22.

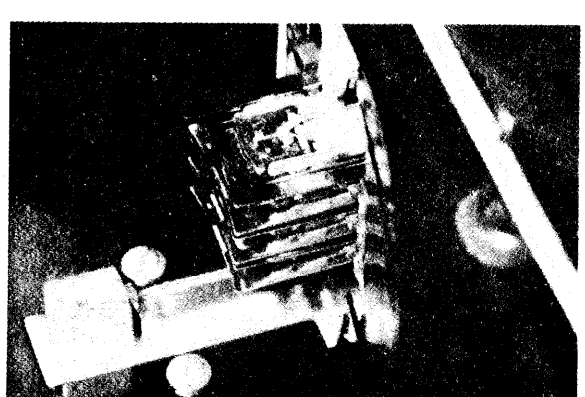
4-46. REMOVE/REPLACE VELOCITY TRANSDUCER (CONT)



16. Gently slide carriage coil back and forth. Listen for rubbing sound. If sound is about the same, go to step 17. If you feel carriage dragging, select another mounting slot for the transducer coil and check again. Use slot which produces least drag and rubbing.



17. Slowly push carriage coil as shown until you feel slight, release in pressure.

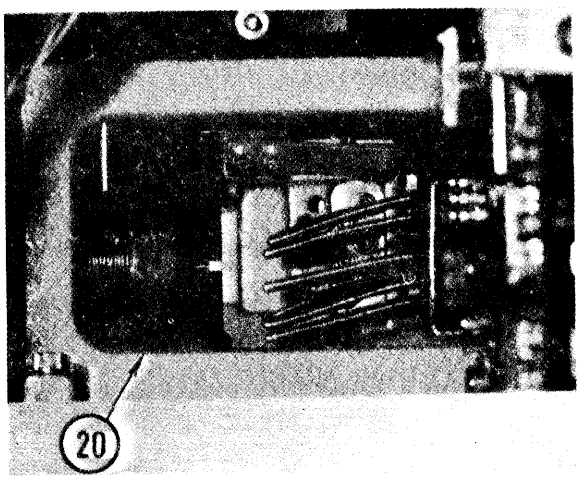


18. At the same time, look inside pack area. Make sure heads do not extend more than 1 1/2 inches. If they do move carriage coil back until you feel pressure on carriage coil.

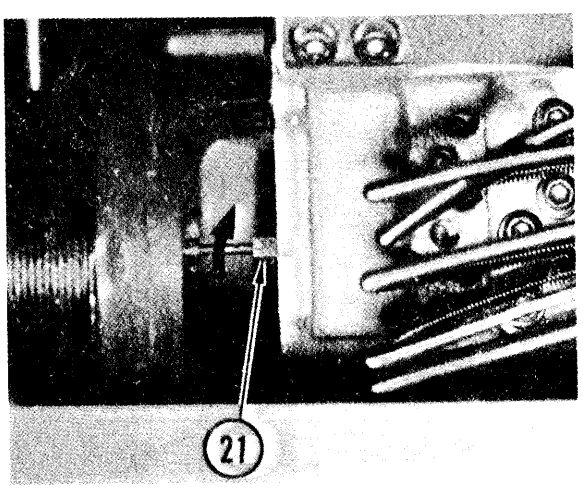
4-46. REMOVE/REPLACE VELOCITY TRANSDUCER (CONT)

19. Raise logic cage (para 4-25).

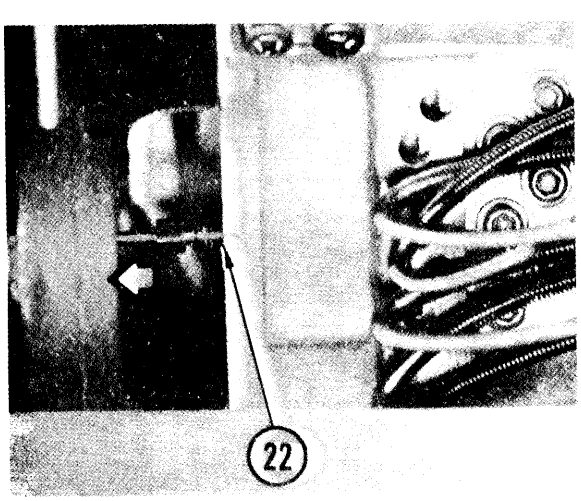
20. From logic cage side of drive, locate carriage assembly.



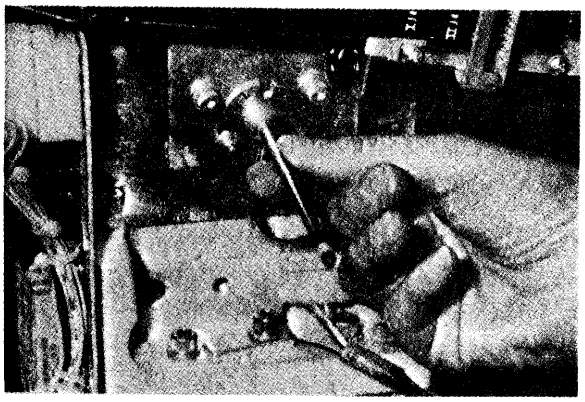
21. Using l/8-inch open-end wrench, turn rod as shown, until rod is off threads.



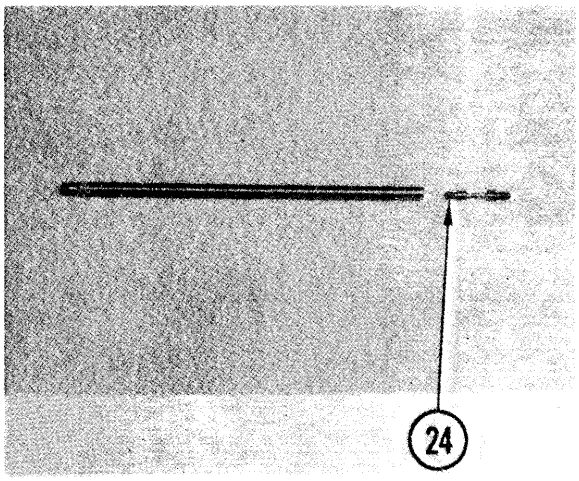
22. Using your finger, push core through coil.



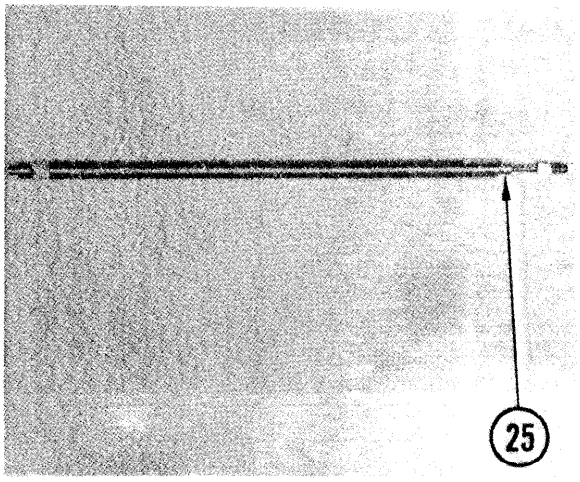
4-46. REMOVE/REPLACE VELOCITY TRANSDUCER" (CONT)



23. Go to rear of assembly. Pull out core.

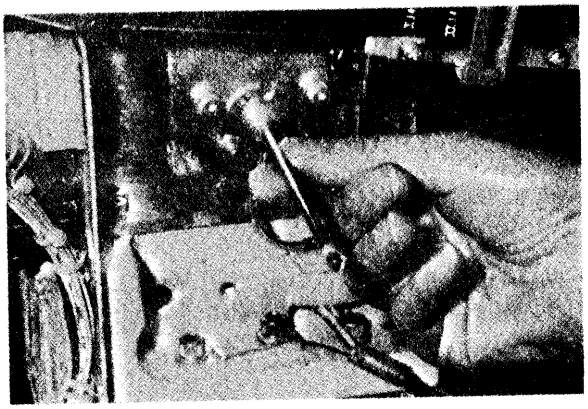


24. On replacement rod, put light coat of screw thread locking compound on these threads only.



25. Screw rod into end of replacement core. Wipe off leftover locking compound.

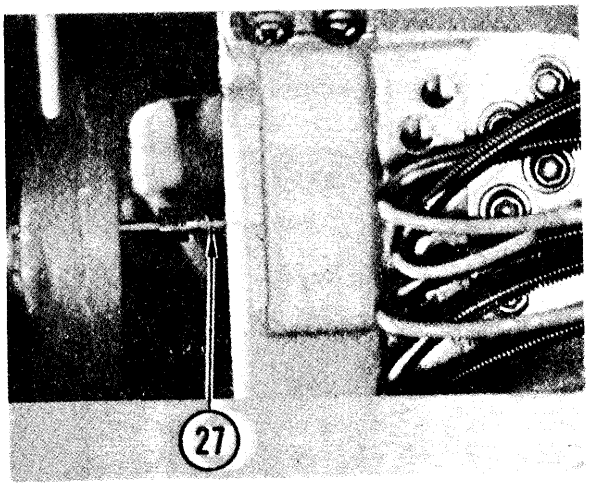
4-46. REMOVE/REPLACE VELOCITY TRANSDUCER (CONT)



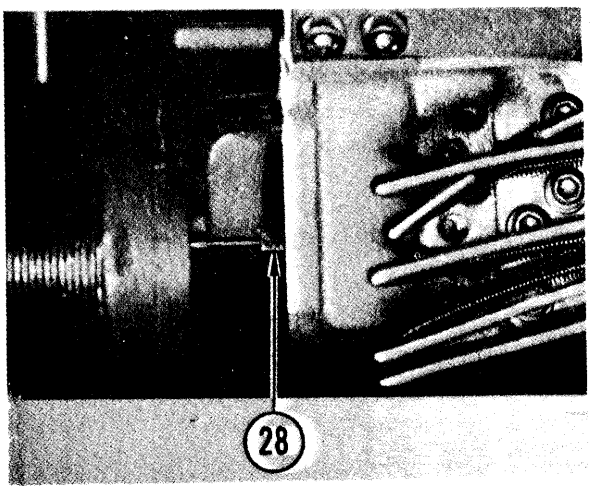
26. Slide core back through coil.

CAUTION

Do not get locking compound on bearings.



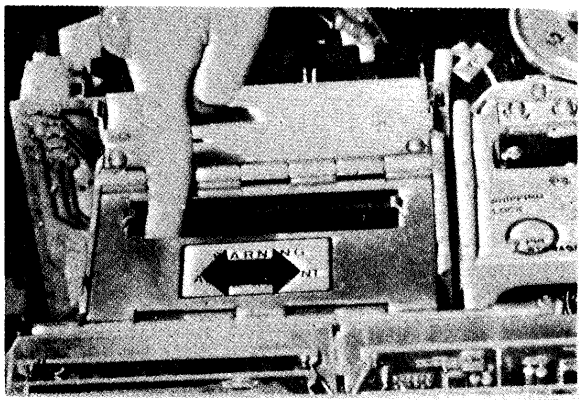
27. Carefully put light coat of locking compound on threads.



28. Using l/8-in. open-end wrench, turn rod until it’s back in place. Do not overtighten.

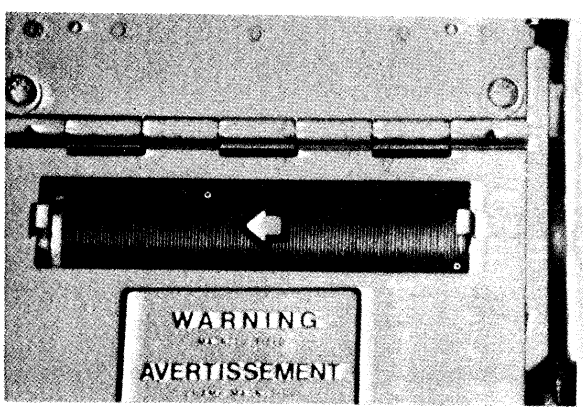
29. Wipe away leftover locking compound.

4-46. REMOVE/REPLACE VELOCITY TRANSDUCER (CONT)



30. Lower logic cage (para 4-25).

31. Slowly move carriage back and forth. If carriage moves freely, go to step 32. If you feel carriage dragging, select another mounting slot for the transducer coil and check again. Use slot which produces least drag and rubbing.



32. Slide carriage back to retracted position.

33. Replace coil cover.

34. Lower deck (para 4-12).

4-47. ADJUST VELOCITY GAIN

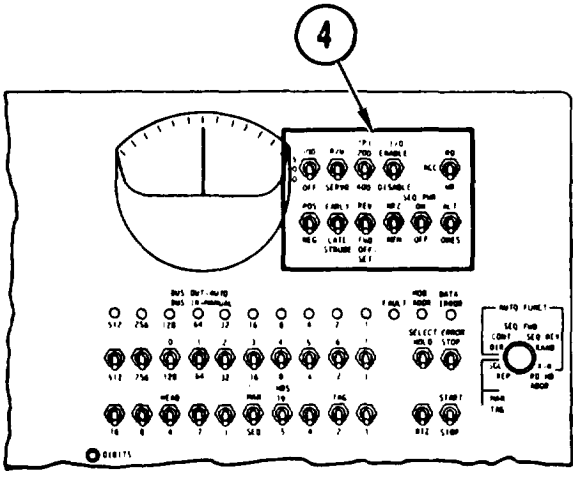
INITIAL SETUP

Common Tools	Test, Measurement and Diagnostic Equipment	Supplies
● Tool kit	● Oscilloscope ● Field test unit (FTU)	● Scratch pack

1. Remove cover (para 4-11).
2. Remove disk drive communication cables.

NOTE

Your field test unit (FTU) may be model TB216 or TB303. This procedure covers each model under its respective heading. Continue with step 3 under correct model heading.



MODEL TB303

3. Install FTU 1/0 cables (para 4-53).
4. Set FTU toggle switches as follows:

Center position

- ACC/RD/WR
- POS/NEG
- EARLY/LATE STROBE
- REV/FWD/OFF-SET

Up position

- R/W SERVO
- 1/0 ENABLE-DISABLE
- SEQ PWR ON/OFF

Down position

- All other switches on panel

4-47. ADJUST VELOCITY GAIN (CONT)

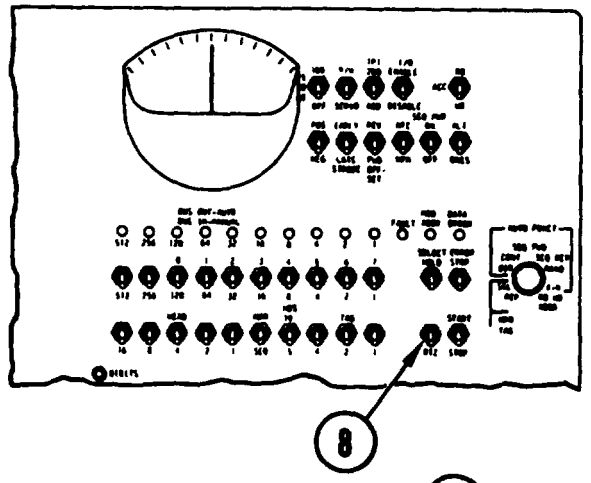
5. Load scratch pack.

NOTE

The LOCAL/REMOTE switch on board A10 in logic cage must be set to REMOTE for this procedure.

6. Power on disk drive.

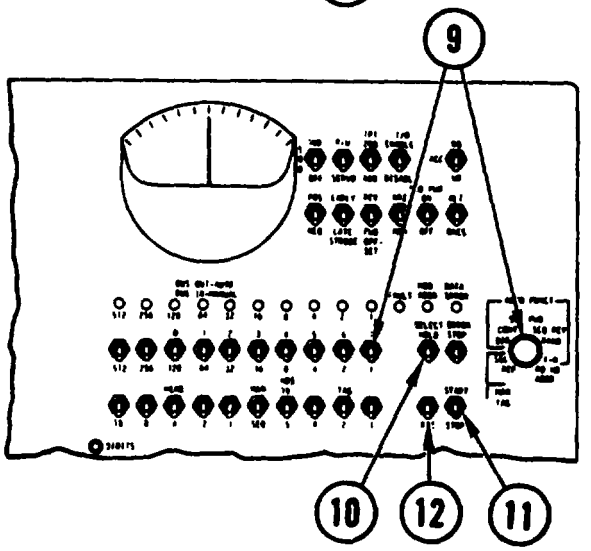
7. Cycle up disk drive. Make sure PROTECT light is on.



8. On the FTU, push down then release RTZ .

NOTE

When there are two disk drives per channel, use step 9 for second drive. For all other disk drives, start at step 10. See your system manual to determine disk drives per channel.



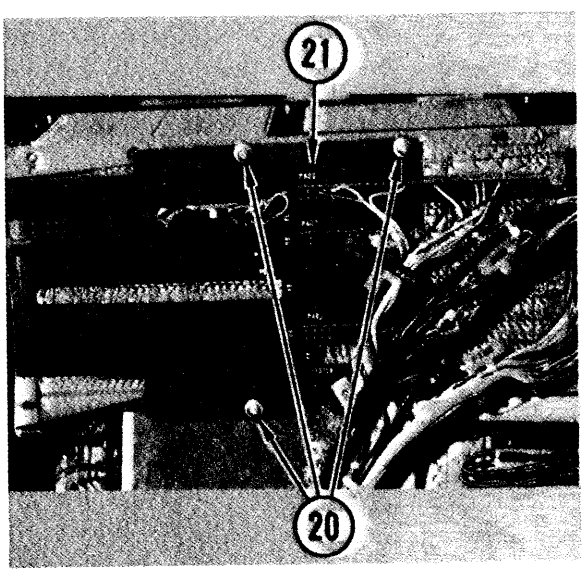
9. Set AUTO FUNCT selector to SGL. Set BUS OUT switch 1 up to address second drive.

10. Set SELECT HOLD up.

11. Set START/STOP up.

12. Push down then release RTZ. Only MOD ADDR should be lit.

4-47. ADJUST VELOCITY GAIN (CONT)



13. Turn AUTO FUNCT selector to RAND.

14. Set START/STOP down, then up.

NOTE

Drive will perform random seeks. Wait 10 minutes before doing step 15 to allow the heads to stabilize You may set up oscilloscope (step 22) while you are waiting.

15. Set START/STOP down.

16. Push down, then release RTZ.

17. Cycle down disk drive.

18. At rear of drive, set power off.

19. Raise logic cage (para 4-25).

20. Remove screws.

21. Pull off cover.

22. Set up oscilloscope:

VOLT/DIV

CH 1 - 0.2 V (use X 10 probe)
CH 2 - not used

TRIGGER

A - EXTERNAL POSITIVE
B - not used

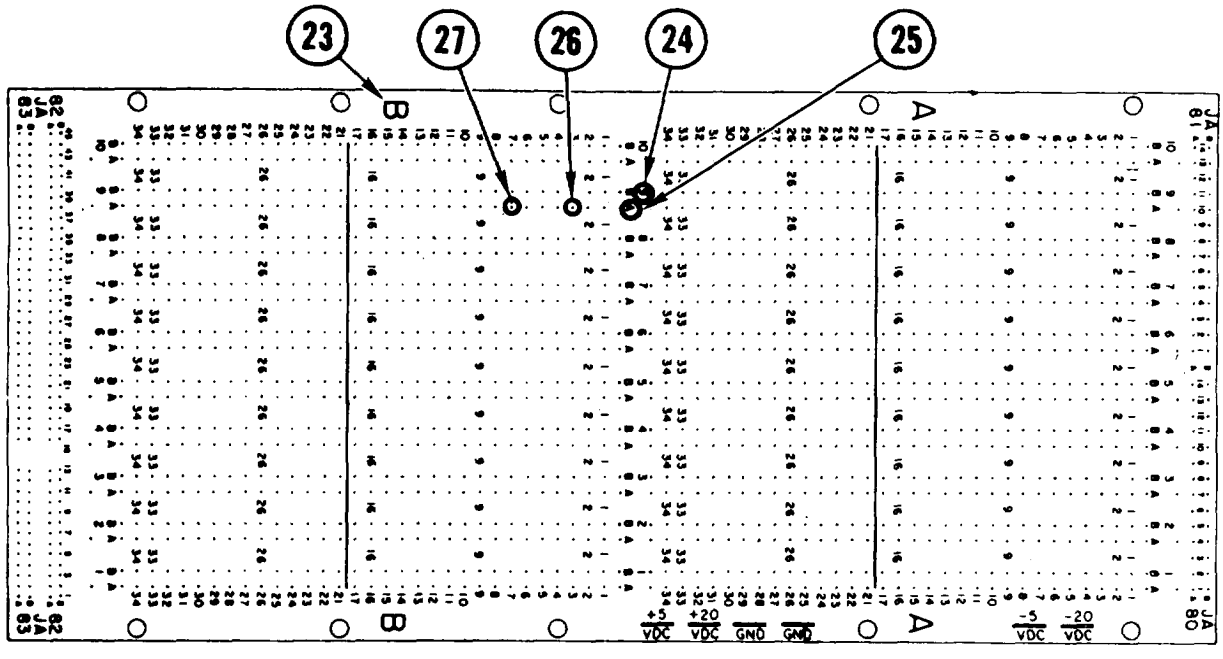
TIME/DIV

10 ms

MODE TRIGGER

CH 1

4-47. ADJUST VELOCITY GAIN (CONT)



23. Locate B side of logic cage.

NOTE

You may have to move wire to the side in order to see row numbers.

24. Find row 9.

25. Find column A.

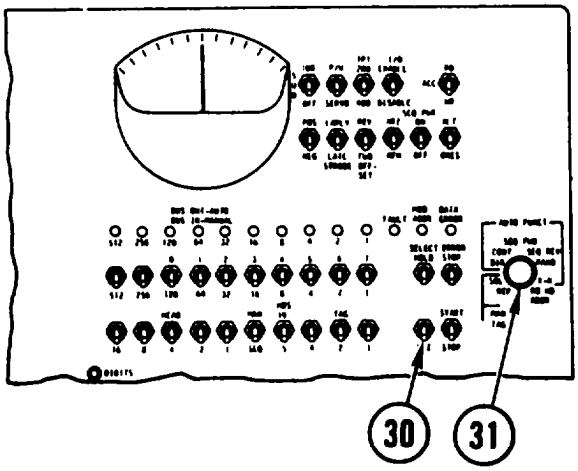
26. In column A, find the 3rd pin. Attach CH 1 oscilloscope probe to this pin point.

27. In column A, find the 7th pin. Attach trigger probe to this pin point.

28. At rear of drive, set power to ON.

29. Cycle up drive.

4-47. ADJUST VELOCITY GAIN (CONT)



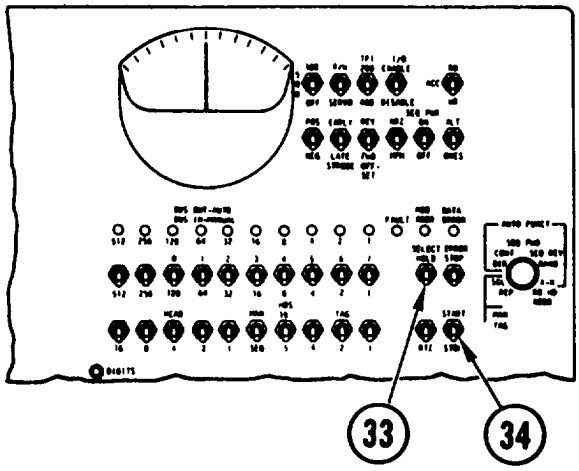
30. On FTU, push down, then release RTZ.

31. Turn AUTO FUNCT selector to SGL.

NOTE

When there are two disk drives per channel, use step 32 for second drive. For all other disk drives, start at step 33. See your system manual to determine disk drives per channel.

32. Set BUS OUT switch 1 up to address second drive.



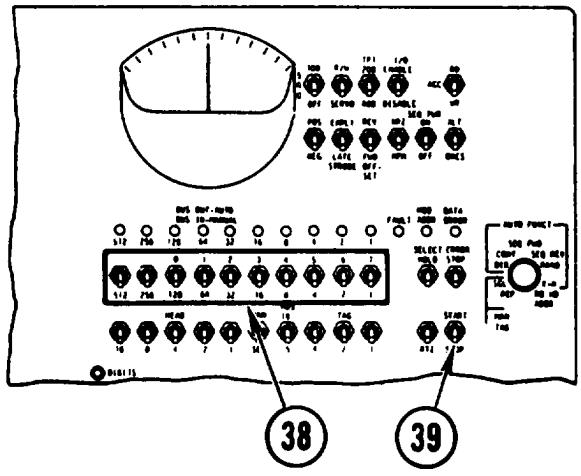
33. Set SELECT HOLD up.

34. Set START/STOP up.

35. Push down, then release RTZ. Only MOD ADDR light should be lit.

36. Turn AUTO FUNCT selector to CONT.

37. If up, set BUS OUT switch 1 down.

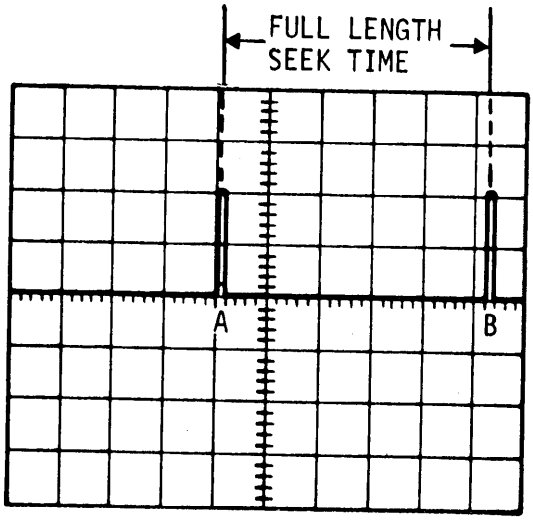


38. Set BUS OUT switches up as follows:

512, 256, 32 16, 4 and 2. Make sure remaining BUS OUT switches are down.

39. Set START/STOP down, then up.

4-47. ADJUST VELOCITY GAIN (CONT)



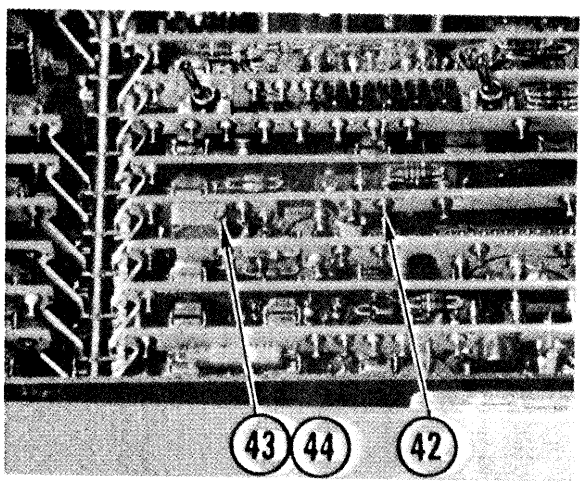
40. Adjust oscilloscope trigger level until you see these pulses.

NOTE

Measurement is from trailing edge of pulse A to leading edge of pulse B.

41. Between pulses, measure full length seek time. Time between On Cylinder pulses should be 52 to 54 milliseconds.

- If it is, go to step 45
- If not, go to step 42



42. With logic cage on its side, locate board A2A07.

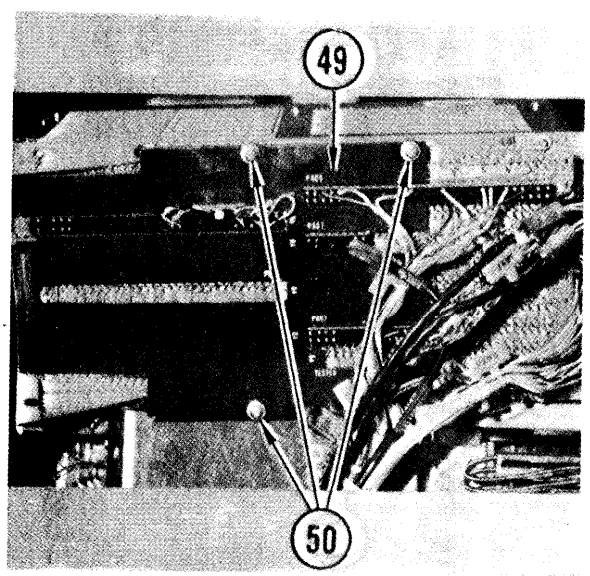
43. Find velocity gain potentiometer E2R6 .

44." Using potentiometer adjustment tool, slowly turn potentiometer until time between On Cylinder pulses is 52 to 54 milliseconds.

45. On FTU, set START/STOP down. Push down, then release RTZ.

46. Cycle down drive.

47. Power off drive.



48. Remove oscilloscope probes from logic chassis.

49. Replace protective cover on underside of logic cage.

50. Replace screws.

51. Lower logic cage (para 4-25).

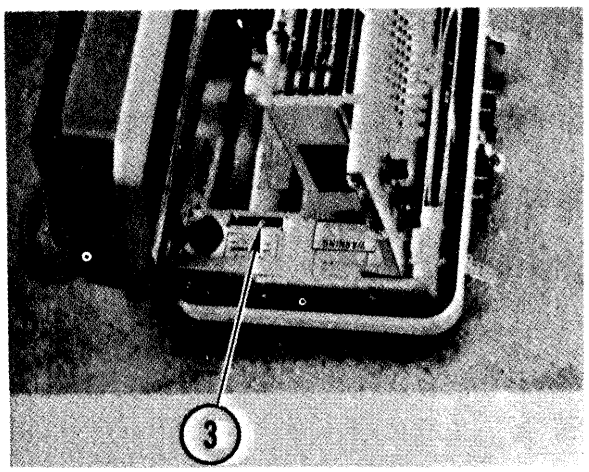
52. Remove FTU cables. Replace disk drive 1/0 cables.

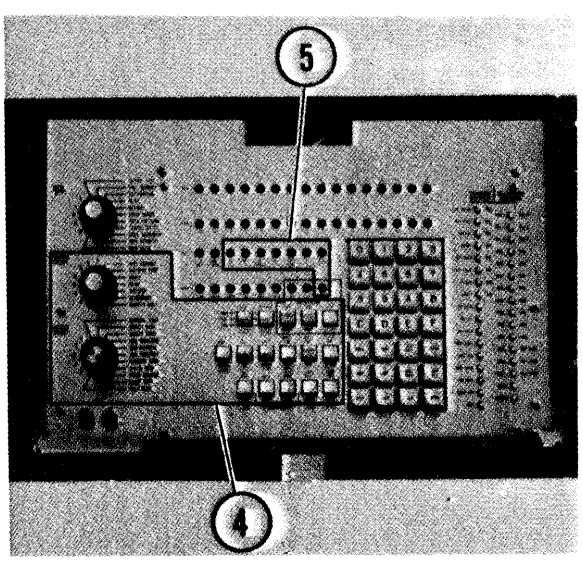
53. Remove scratch pack.

54. Replace cover (para 4-11).

4-47. ADJUST VELOCITY GAIN (CONT)

MODEL TB216





3. Install and test FTU (para 4-53). Power ON FTU circuit breaker. Check that +5 and -5 indicators light.

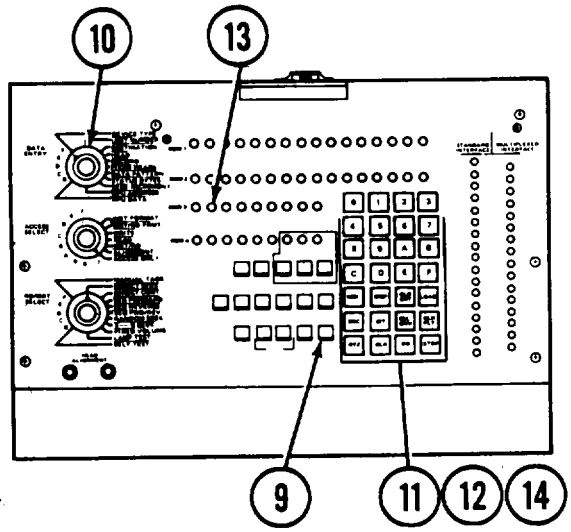
4. In sequence, set FTU switches listed to positions shown:

SWITCH	POSITION
PROCESSOR START/RESET	RESET
PROCESSOR RUN/HALT	HALT
SINGLE/CONT	CONT
-/+ OFFSET	CENTER (OFF)
LATE/EARLY	CENTER (NORMAL)
WRT FLAG	OFF
WRT PROT	ON
AM/SECTOR	EITHER
EOT STOP	OFF
ERROR OVERRIDES:	
DATA-OFF	OFF
ADDR-OFF	OFF
SHIFT PATT/DATA PATT	DATA PATT
RD/WRT SELECT	ACCESS ONLY
ACCESS SELECT	DIRECT SEEK
PROCESSOR START/RESET	START
PROCESSOR RUN/HALT	RUN
SEQ PWR/OFF	OFF

5. Look to see that the following FTU indicators light:

ON CYCL	SEEK ERR
RDY	FLT
WT PROT	BUSY
SELD	RUN

4-47. ADJUST VELOCITY GAIN (CONT)



6. Power ON disk drive.

7. Place A10 board LOCAL/REMOTE switch in REMOTE.

8. Load scratch disk pack.

9. Place SEQ PWR/OFF switch in SEQ/PWR and cycle up disk drive.

10. Turn DATA ENTRY switch to DEVICE TYPE .

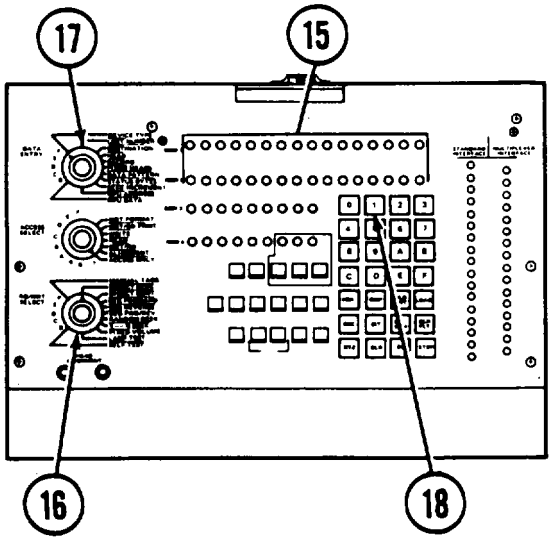
11. Enter device code 3105 at keyboard.

- Corresponding ROW 2 indicators will light.
- If you key incorrectly, press CLR ENT, then enter code again.

12. Press LOAD key.

- Code will transfer to ROW 1 indicators.
- If code does not transfer press CLR ENT, then repeat step 11.

13. Be sure that ROW 3 indicators 1/0 RDY is lit.



14. Press SEL DRV key.

15. Look to see that SELD indicator lights and that logical address for selected disk drive appears in ROW 1.

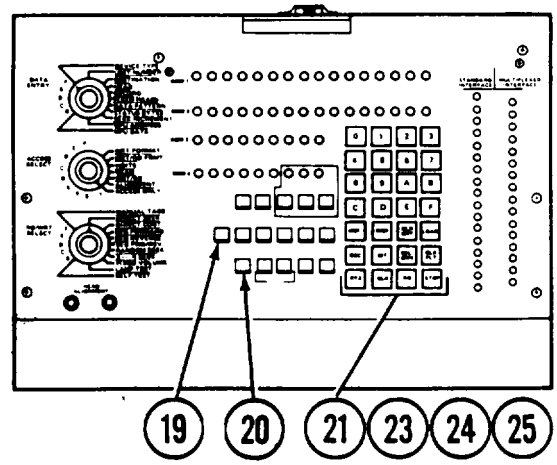
- If SELD is flashing or incorrect logical address lights, selection was unsuccessful.
- Press CLR and repeat from step 11.

16. Turn ACCESS SELECT switch to RANDOM SEEK.

17. Turn DATA/ENTRY switch to STATUS BYTES .

18. Press key 1.

4-47. ADJUST VELOCITY GAIN (CONT)



19. Set SINGLE/CONT switch to CONT.

20. Set EOT STOP/OFF switch to OFF.

21. Press GO key.

NOTE

Drive will perform random seeks. Wait 10 minutes before doing step 23 to allow heads to stablize. You may set up oscilloscope (step 31) while you wait.

22. Allow drive to cycle for at least 10 minutes.

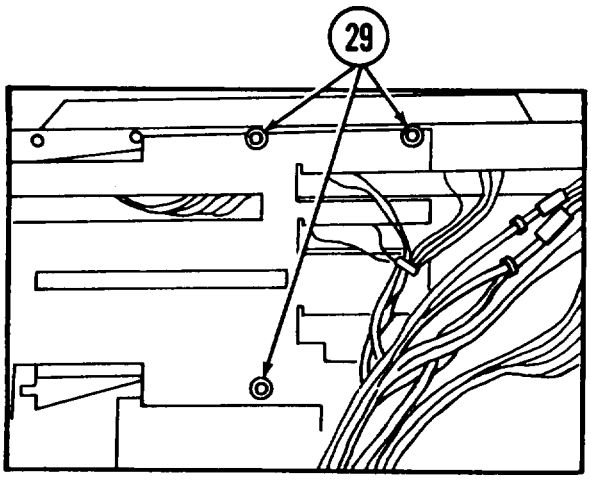
23. Press STOP key.

24. Press CLR key.

25. Press RTZ key.

26. Cycle down disk drive.

27. At rear of drive, power OFF circuit breakers.



28. Raise logic cage (para 4-25).

29. Remove screws.

30. Remove cover.

31. Set up oscilloscope. Use these settings for normal probe:

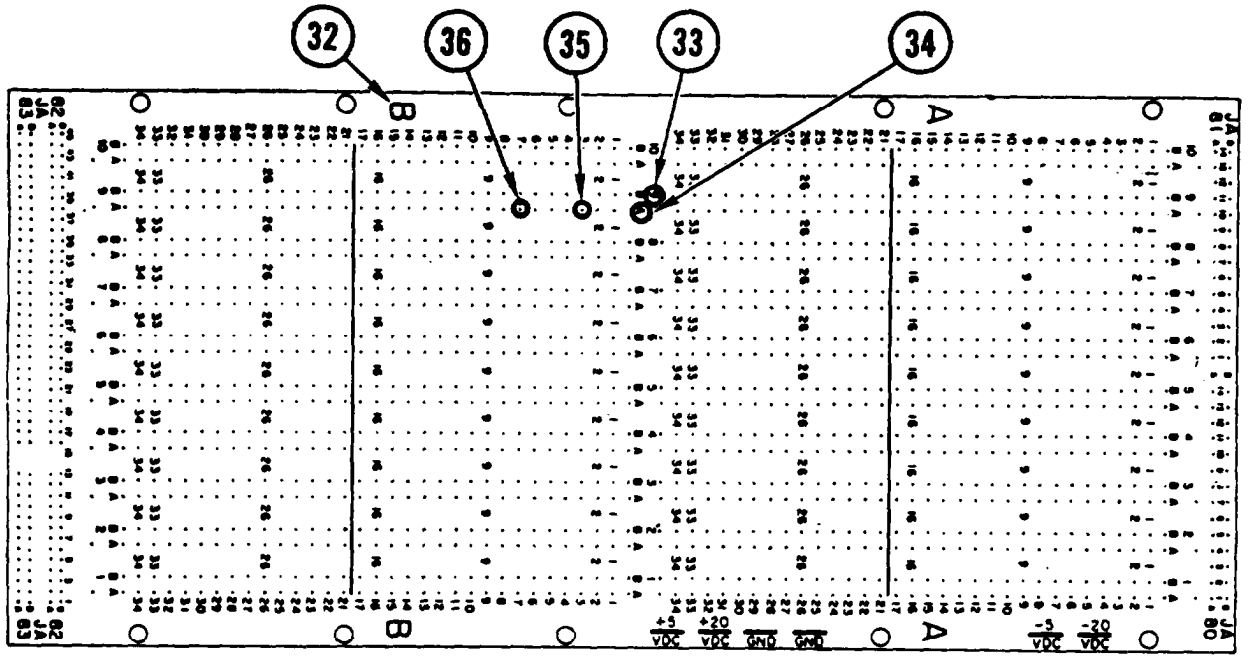
A TRIGGER	VOLTS/DIV
A +/EXTERNAL	CH 2- 2V (X10 probes)
B not used	CH 1 - not used
TRIG MODE - NORM	Push INVERT BUTTON

TIME/DIV

HORZ DISPLAY - A LOCK KNOBS

10 ms

4-47. ADJUST VELOCITY GAIN (CONT)



32. Locate B side of logic cage.

NOTE

You may have to move wire to the side in order to see row numbers.

33. Find row 9.

34. Find column A.

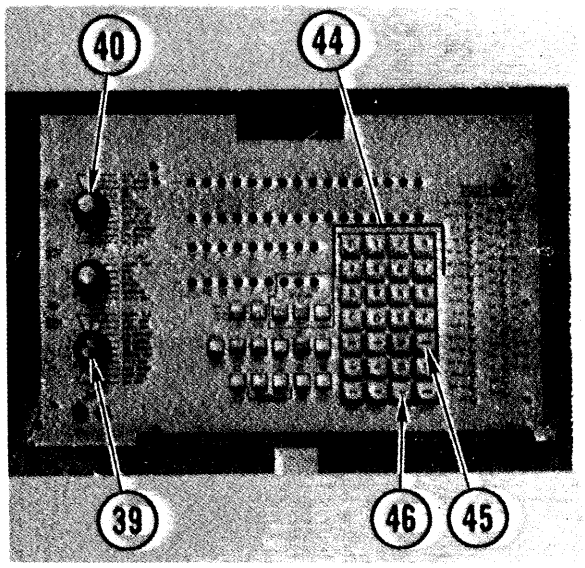
35. In column A, find the 3rd pin. Attach CH 2 oscilloscope probe to this pin point (position B09-03A).

36. In column A, find 7th pin. (B09-07A). Attach trigger probe to this pin point.

37. At rear of drive, set power to ON.

38. Cycle up drive.

4-470 ADJUST VELOCITY GAIN (CONT)



39. Turn ACCESS SELECT switch to DIRECT SEEK . 0

40. Turn DATA ENTRY switch to DESTINATION.

41. Key in 0.

42. Press LOAD. Press GO.

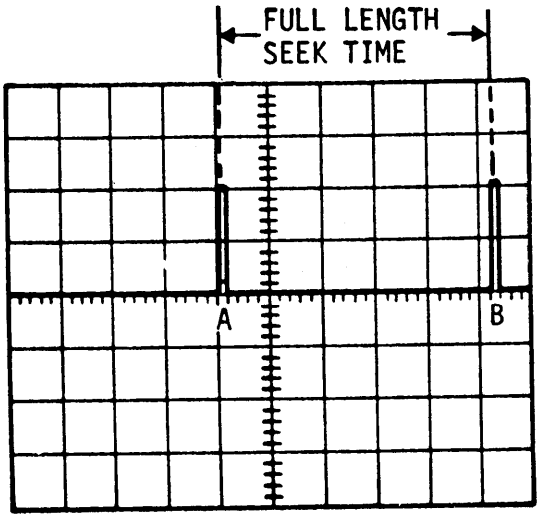
43. Turn ACCESS SELECT to DIRECT CONT.

44. Key in 822.

45. Press LOAD key.

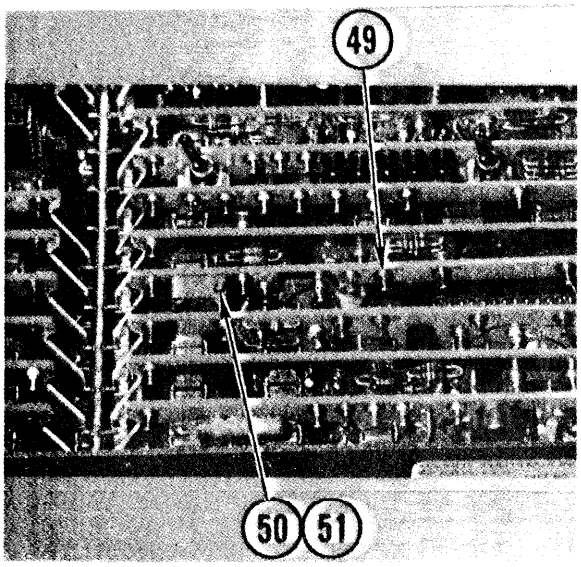
46. Press GO key.

47. Adjust oscilloscope trigger lever until you see these pulses.



48. Between pulses, measure full length seek time. Time between On Cylinder pulses should be 52 to 54 milliseconds.

- If it is, go to step 52
- If not, go to step 49

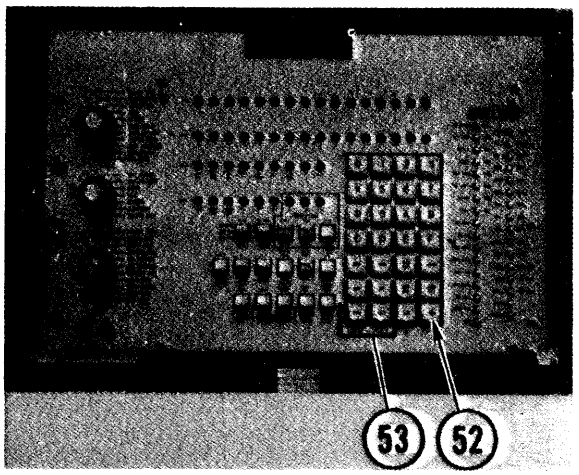


49. With logic cage on its side, locate card A2A07.

50. Find velocity gain potentiometer E2R6 .

51. Using potentiometer adjustment tool, solwly turn Potentiometer until time between On Cylinder pulses is 52 to 54 milliseconds.

4-47. ADJUST VELOCITY GAIN (CONT)



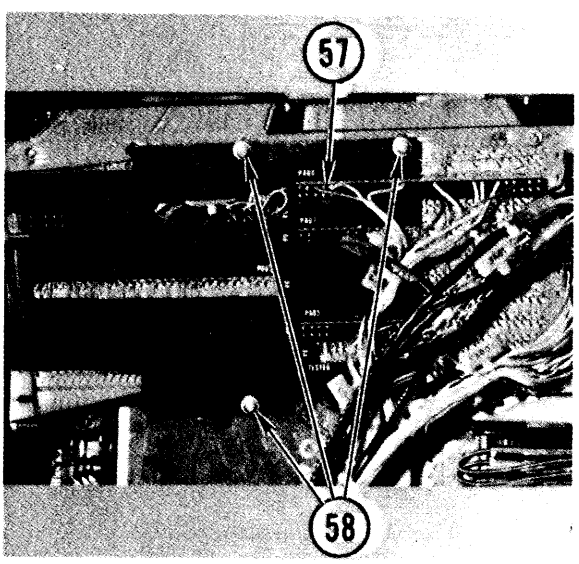
52. Press STOP key.

53. Press CLR key, then RTZ key.

54. Cycle down drive. Unload disk pack.

55. Power OFF drive.

56. Power OFF oscilloscope. Remove and stow test leads.



57. Replace logic cage bottom cover.

58. Replace screws.

59. Lower logic cage (para 4-25). On board A10, set LOCAL/REMOTE switch to LOCAL.

60. Power OFF FTU.

61. Remove and stow FTU cables.

62. Stow FTU.

63. Reconnect disk drive cables at rear of logic cage.

64. Replace disk drive cover (4-11).

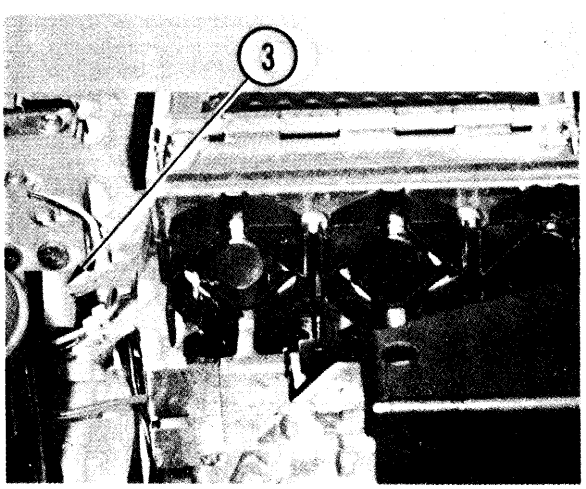
4-48. MANUALLY POSITION CARRIAGE COIL

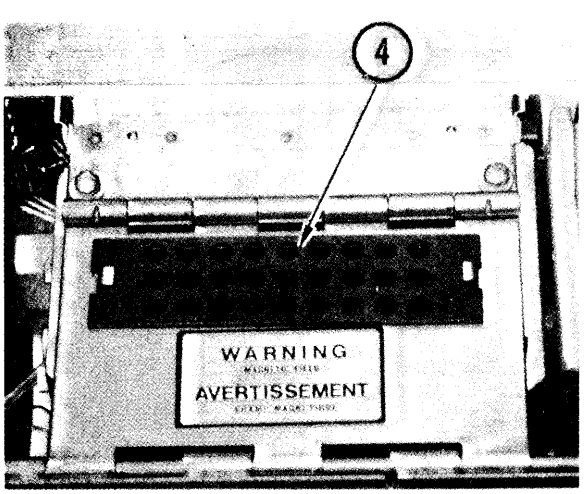
INITIAL SETUP

Supplies
- Scratch pack

NOTE

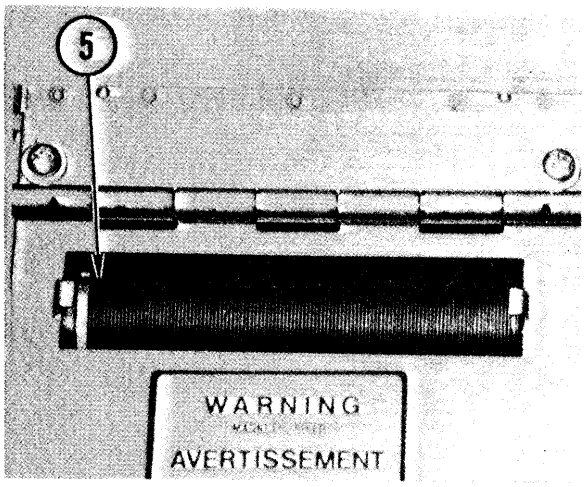
Certain troubleshooting tests require moving carriage coil assembly by hand. Do this only when a specific test directs you to.



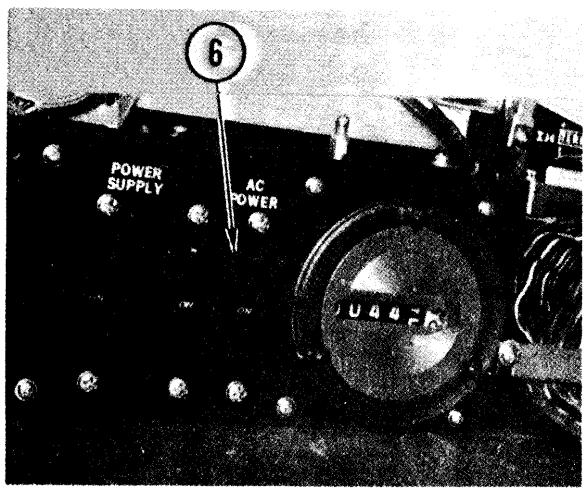


1. Remove cover for maintenance (para 4-11).
2. Load scratch pack.
3. Pull connector PA from power supply board.

4-48. MANUALLY POSITION CARRIAGE COIL (CONT)



5. Make sure carriage coil is in retracted position as shown.



6. From rear of drive, set ac power to ON. Power ON drive.

7. Cycle up drive. Wait 30 seconds for drive motor to come up to speed.

CAUTION

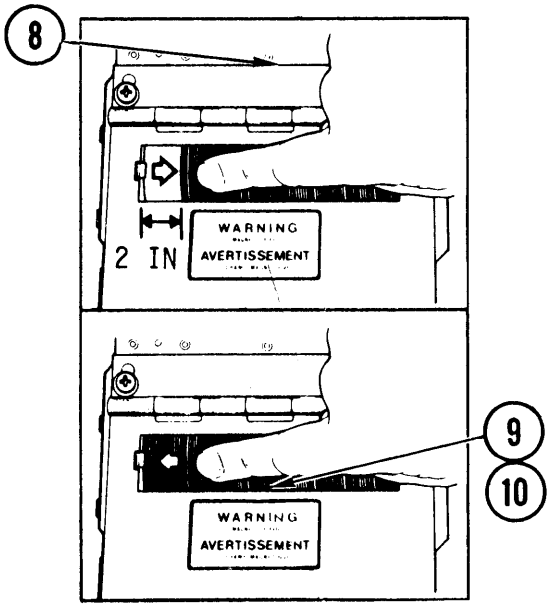
Heads damage easily. Use extreme care when moving carriage coil.

a. Move coil at about same speed it moves under drive control.

b. Do not push down on carriage.

c. Do not allow coil to contact FORWARD STOP when moving forward.

4-48. MANUALLY POSITION CARRIAGE COIL (CONT)



8. Carefully press coil as shown. Move coil forward about 2 inches. It should release and move back and forth freely.

9. Push coil back as shown.

NOTE

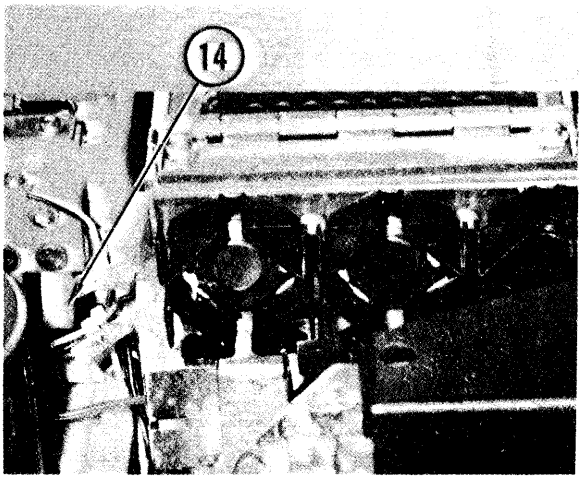
Move carriage coil back and forth as required until test is completed.

10. After you complete test, push coil back to retracted position.

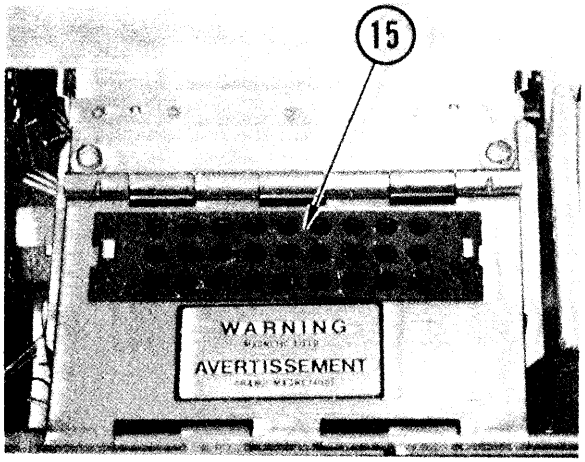
11. Cycle down drive.

12. Power OFF drive.

13. Unload scratch pack.



14. Push connector PA on power supply board.

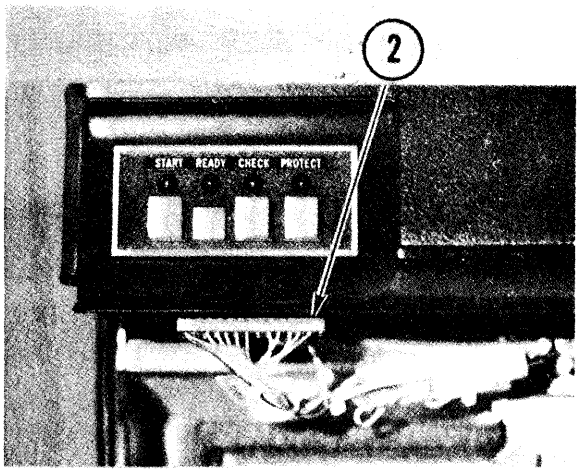


15. Push on coil cover.

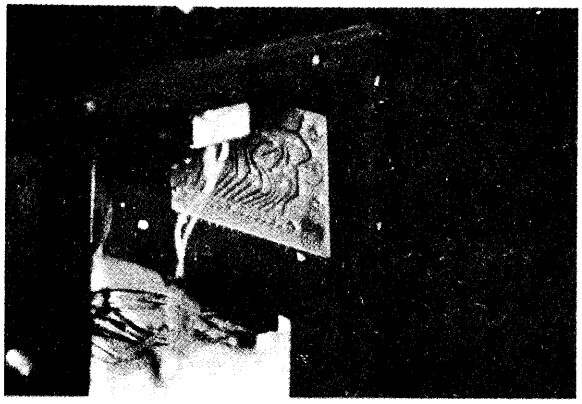
16. Replace cover (para 4-11).

4-49. REMOVE/REPLACE CONTROL PANEL

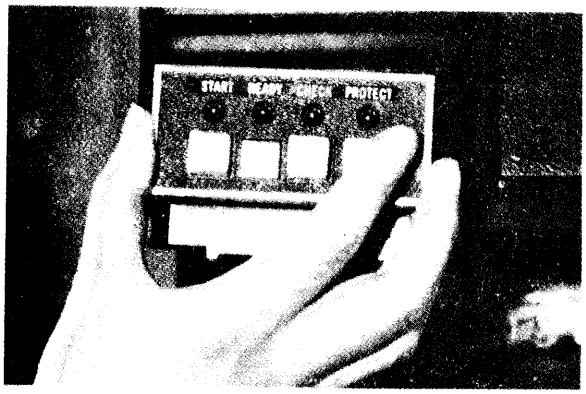
Remove



1. Raise deck (para 4-12).
2. Pull connector P201 from control panel.

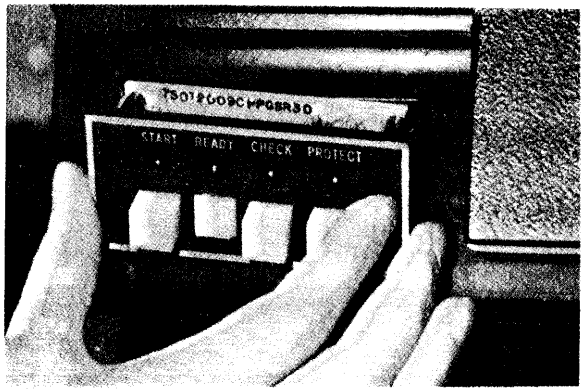


3. Press in on each side of panel to release tabs. Gently push panel forward.



4. Pull panel out of mounting cutout as shown.

4-49. REMOVE/REPLACE CONTROL PANEL (CONT)



Replace

1. Insert control panel into mounting cutout as shown. Press panel to lock in place.

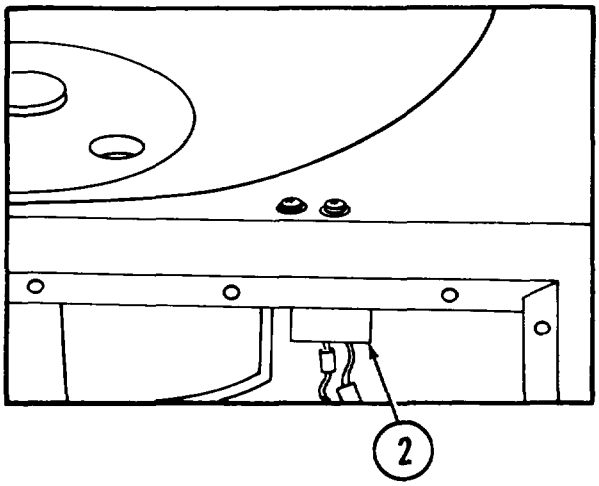
2. Push connector P201 on control panel.

3. Lower deck (para 4-12).

4-50. REMOVE/REPLACE PACK COVER INTERLOCK WITCH

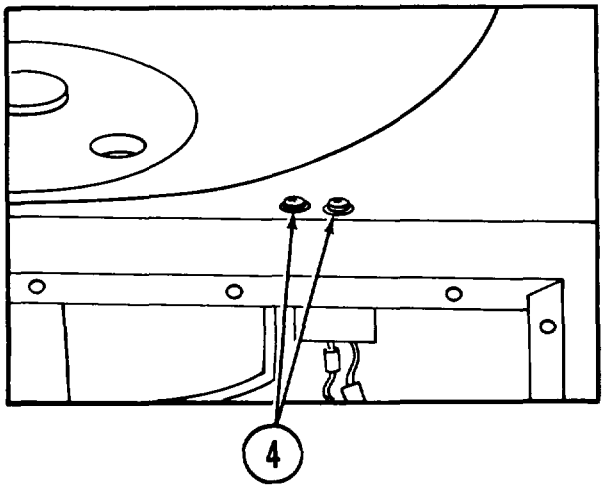
INITIAL SETUP

Common Tools
l Tool kit



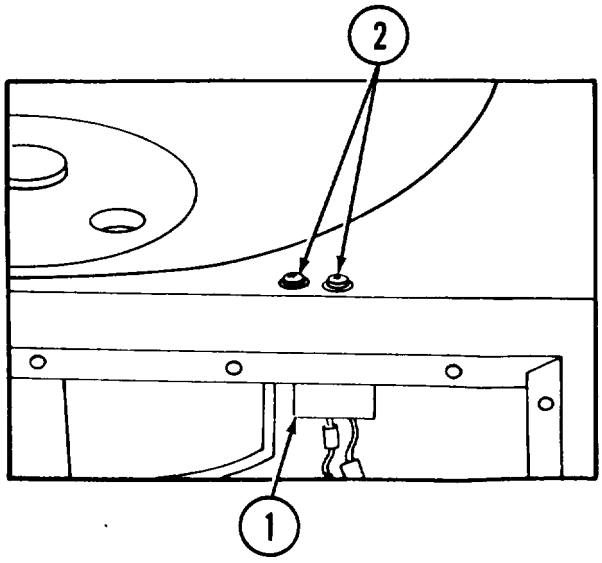
Remove

1. Raise deck (para 4-12).
2. Find the deck interlock switch.
3. Note position and disconnect wires. Raise pack access cover.



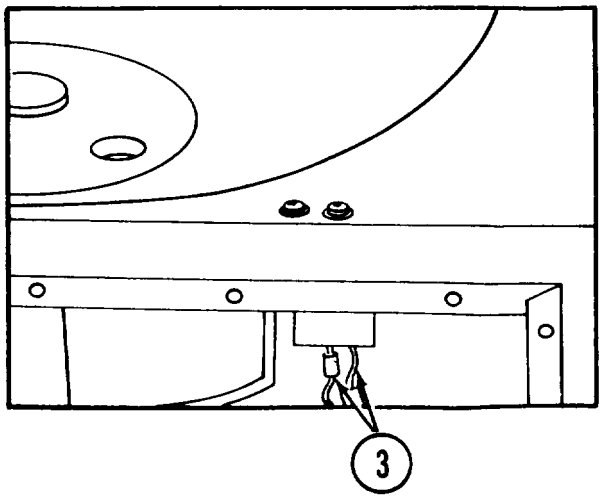
4. Remove screws holding deck interlock switch to deck.
5. Pull out deck interlock switch.

4-50. REMOVE/REPLACE PACK COVER INTERLOCK SWITCH (CONT)



Replace

1. Mount switch into position.
2. Replace screws holding switch on deck assembly.

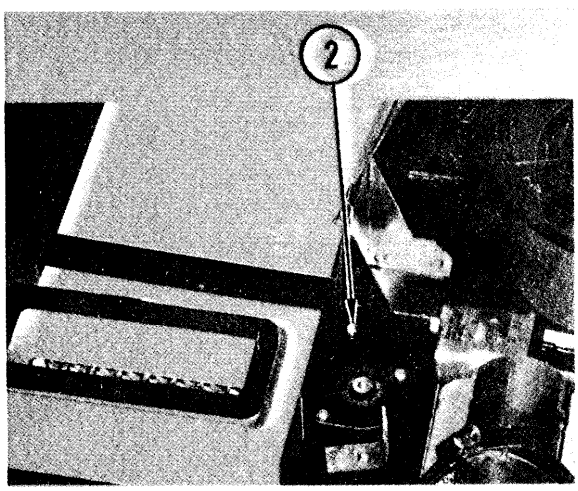


3. Replace wires.
4. Close pack access cover.
5. Lower deck (para 4-12).

4-51. REMOVE/REPLACE ABSOLUTE FILTER

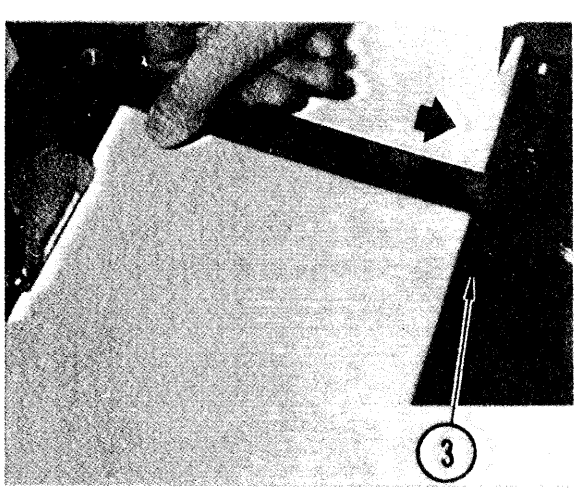
INITIAL SETUP

Common Tools
- Tool kit



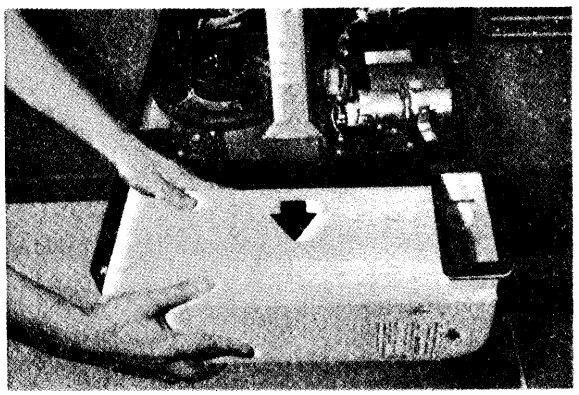
Remove

1. Raise deck (para 4-12).
2. Remove bracket screw and washer.



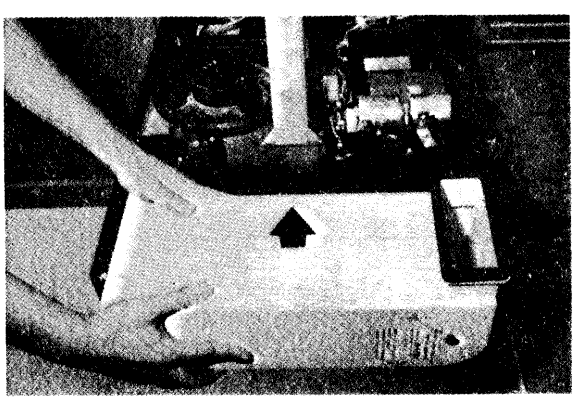
3. To remove bracket, pivot it toward front of drive until bracket end lifts out of slot.

4-51. REMOVE/REPLACE ABSOLUTE FILTER (CONT)

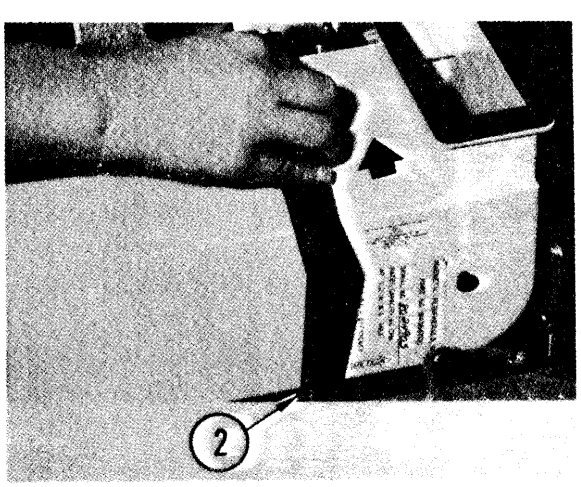


4. Slide filter out.

Replace



1. Slide filter in.



2. Insert bracket in slot, then position it.

3. Replace bracket screw and washer.

4. Lower deck (para 4-12).

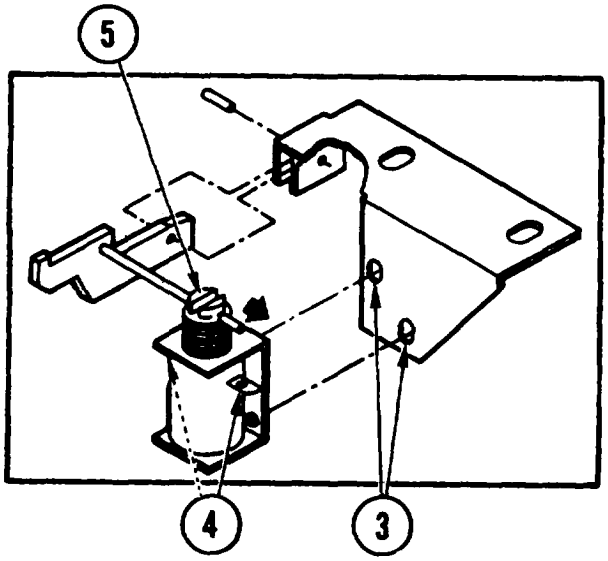
4-52. REMOVE/REPLACE/ADJUST PACK COVER SOLENOID

INITIAL SETUP

Common Tools	Materials/Spare parts
● Tool kit	● Tags
	● Pen or pencil

NOTE

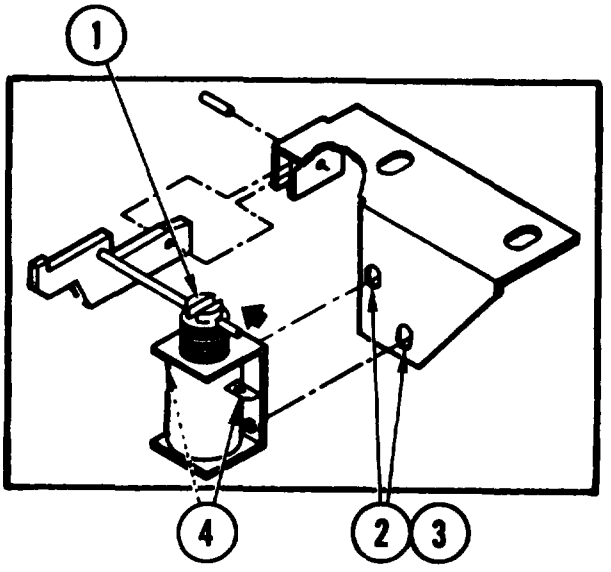
The pack cover solenoid is an optional item which may be installed on some disk drives. Its purpose is to lock pack access cover for 30 seconds after spindle motor is shut off or when power is off to drive. It is basically a safety device. Use this procedure to remove/ replace/adjust the pack cover solenoid.



Remove

1. Raise deck (para 4-12).
2. Find solenoid.
3. Remove two screws holding solenoid to mounting bracket.
4. Tag and remove wires from solenoid.
5. Carefully work solenoid away from interlock latch.

4-52. REMOVE/REPLACE/ADJUST PACK COVER SOLENOID (CONT)



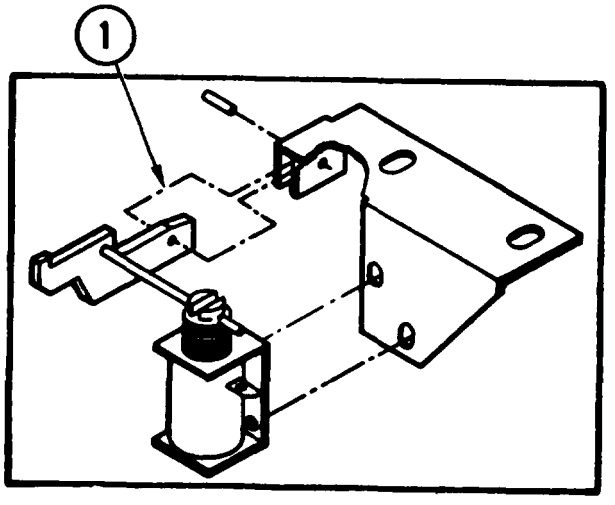
~~Replace~~

1. Carefully work solenoid into interlock latch.
2. Aline holes in solenoid with holes in mounting bracket.
3. Install and hand tighten screws.
4. Push on wires.
5. Adjust solenoid position. (Go to Adjust.)

~~Adjust~~

NOTE

The pack cover solenoid adjustment is required whenever the solenoid is changed or if the pack access cover does not lock when power is removed from drive.



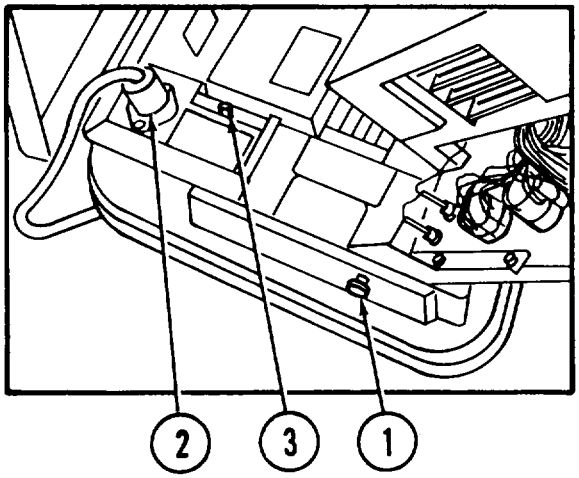
1. Slip a 0.035 inch feeler gauge between the pack cover latch and the solenoid latch.
2. Tighten screws to solenoid.
3. Test adjustment by trying to open pack cover with power off.

   l If it opens, repeat steps 1-3

   l If it does not open, go to step 4

4. Lower deck (para 4-12).

4-53. INSTALL/TEST FIELD TEST UNIT



NOTE

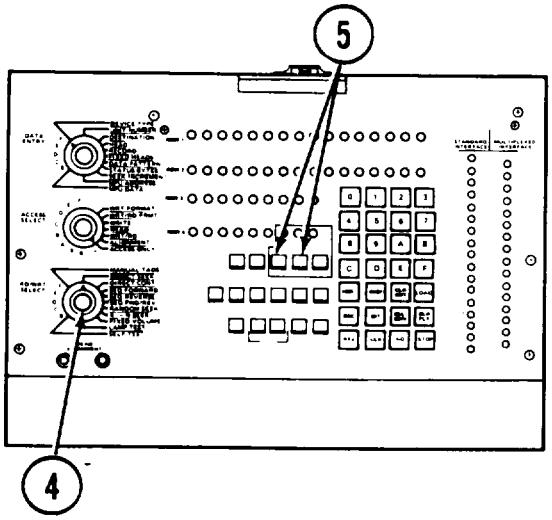
Your field test unit FTU) may be model TB216 or TB303. This procedure covers each model under its respective heading.

MODEL TB216

1, Open FTU carrying case, release catch on left side of chassis, raise front panel and lock in place.

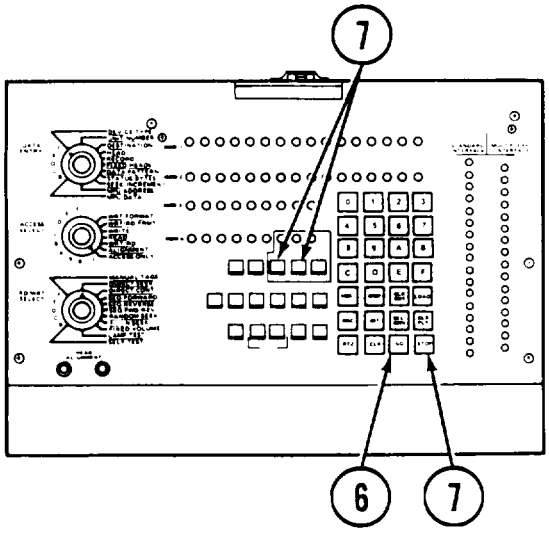
2. Connect power cord to FTU and ac power outlet.

3. Set circuit breaker ON. +5 and -5 LED indicators should be lit.



4. Set ACCESS SELECT switch to LAMP TEST position.

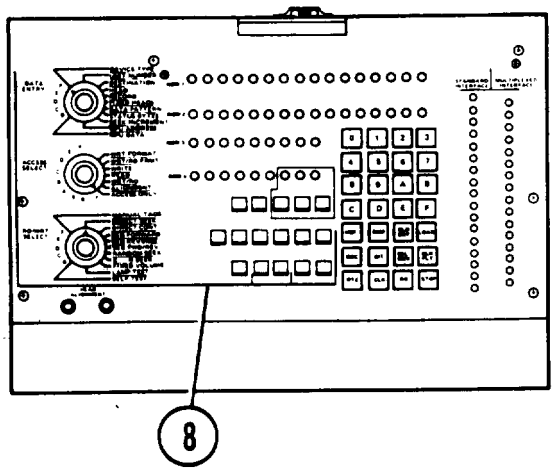
5. Set PROCESSOR switches to START and RUN positions. All LED indicators in row 3 will light except for 1/0 RDY and UNIT RUN.



6. Press GO key. All LED indicators should blink and continue to blink except for PROCESSOR LEDs which should stay lit. If any LED does not light, the FTU is not working properly.

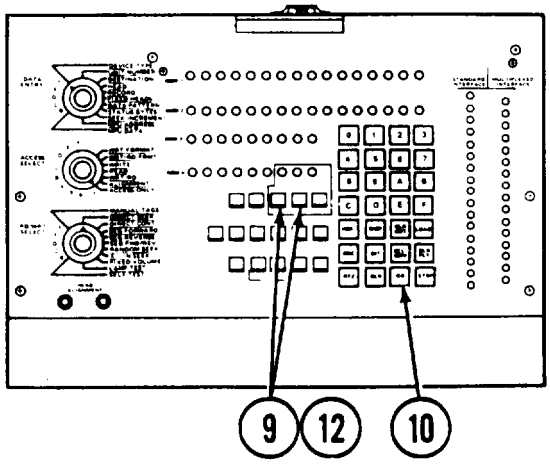
7. Press STOP key and PROCESSOR switches to RESET and HALT position.

4-53. INSTALL/TEST FIELD TEST UNIT (CONT)



8. Set following switches:

SWITCH	POSITION
ACCESS SELECT	SELF TEST
ERROR OVERRIDE	
DATA/OFF	OFF
ADDR/OFF	OFF
DATA ENTRY	DEVICE TYPE
RD/WRT SELECT	WRT FORMAT
HEAD SEQ	SEQ
RECORD	SEQ
SINGLE/CONT	CONT
-/+ OFFSET	CENTER (OFF)
EARLY/LATE	CENTER (OFF)
WRT FLAG	OFF
WRT PROT	ON
AM/SECTOR	SECTOR
EOT STOP	OFF
SHIFT PATT	DATA PATT
SEQ PWR	OFF



9. Set processor START and RUN switches to START and RUN position.

10. Press GO key. If LED indicators RUN, +5, -5, RD and in row 2, 29 and 211 are all lit, FTU is operating properly. If any of these do not light, FTU is not working properly.

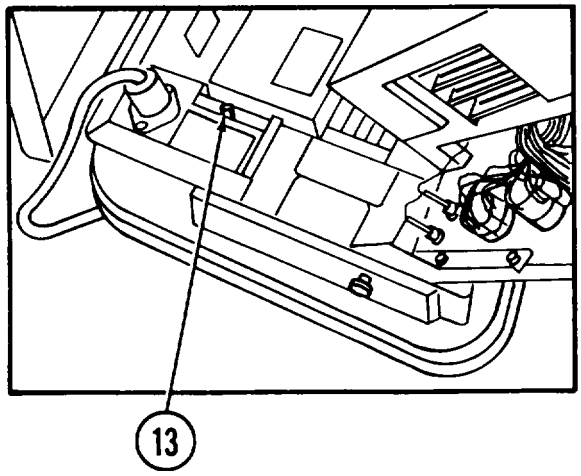
11. Test all keys and switches. Each should show a lit LED when pressed.

NOTE

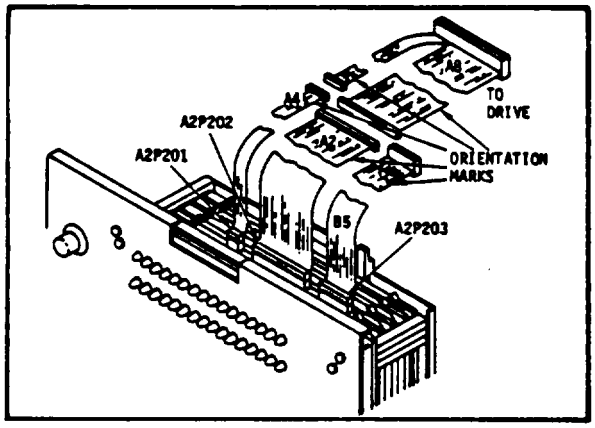
Rows 1 and 3 LEDs do not light during this test.

12. Set PROCESSOR switches START and RUN to RESET and HALT positions.

4-53. INSTALL/TEST FIELD TEST UNIT (CONT)



13. Set FTU circuit breaker OFF.



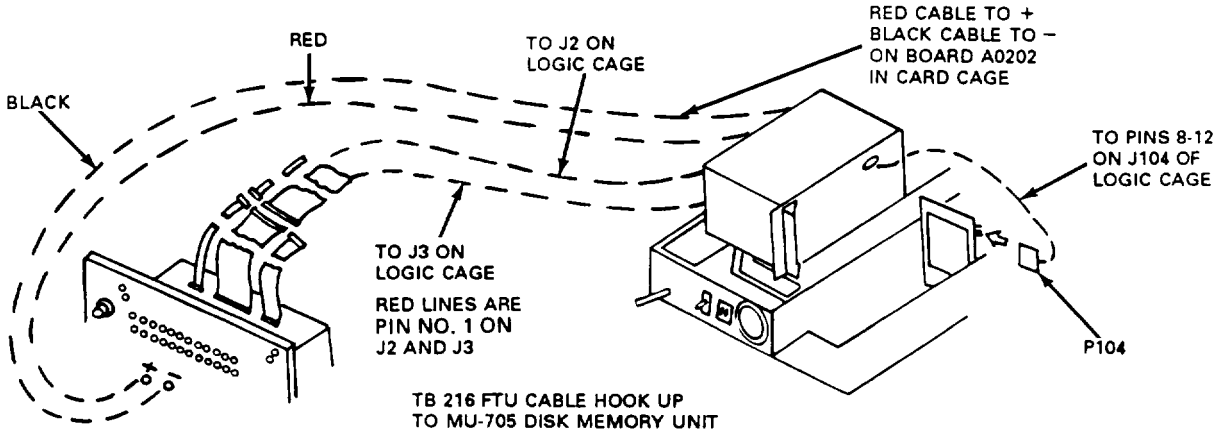
14. Connect FTU cable assemblies A2, A4, B5 and A8 cable assembly.

NOTE

All cable assemblies are keyed and have a colored orientation strip on right hand side of cable.

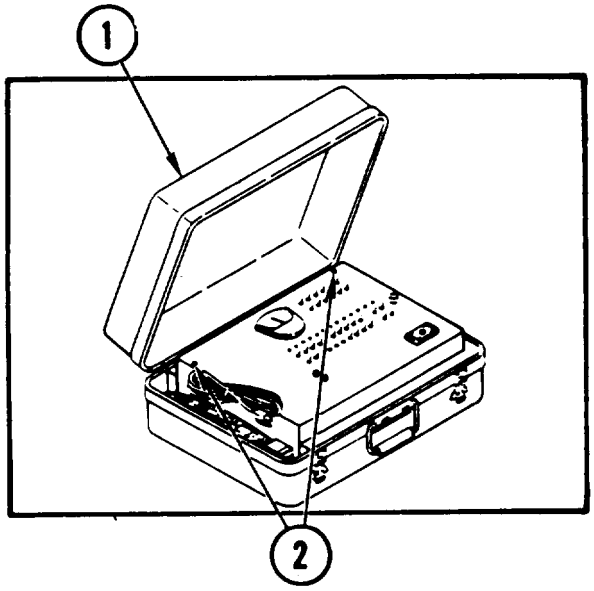
15. Disconnect top disk drive cable assemblies at rear of logic cage assembly.

16. Plus cable assemblies A8 and B5 to connector at rear of logic cage assembly. Check pin location and orientation (colored orientation strip is pin 1) to make sure cable assemblies are properly connected.



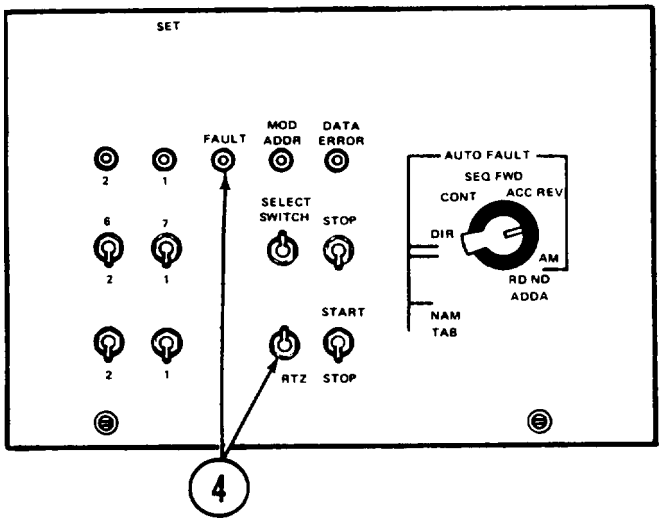
TB 216 FTU CABLE HOOK UP TO MU-705 DISK MEMORY UNIT

4-53. INSTALL/TEST FIELD TEST UNIT (CONT)

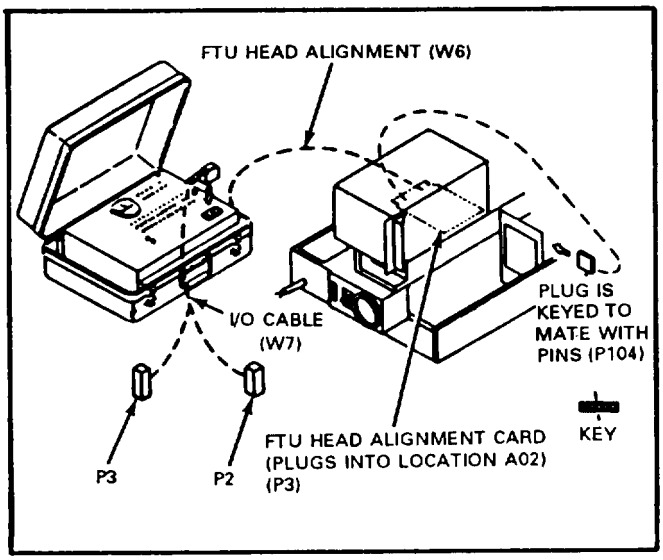


MODEL TB303

1. Open FTU carrying case.
2. Loosen tie-down screws. Raise front panel and lock in place.



3. Plug in ac power cord.
4. Check FAULT indicator:
   - If lit, push down RTZ switch. If FAULT indicator stays lit, the FTU is defective.
   - If not lit, FTU is okay.

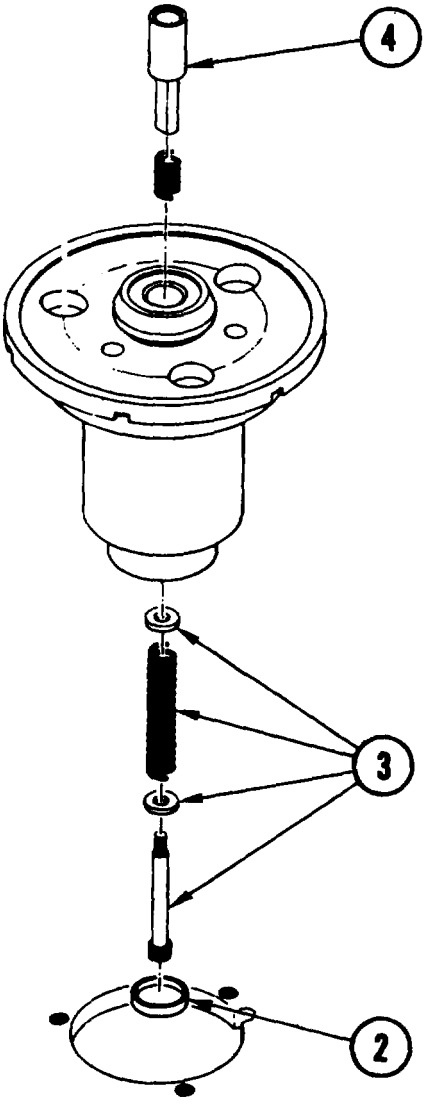


5. Install FTU cables to disk drive.
   - If you will aline heads, install head alinement board in slot A02 and 1/0 cable.
   - If you will adjust drive, install 1/0 cable only.

4-54. REMOVE/REPLACE SPINDLE LOCKSHAFT

INITIAL SETUP

Common Tools	Materials/Spare parts
● Tool kit	● Screw-thread locking compound



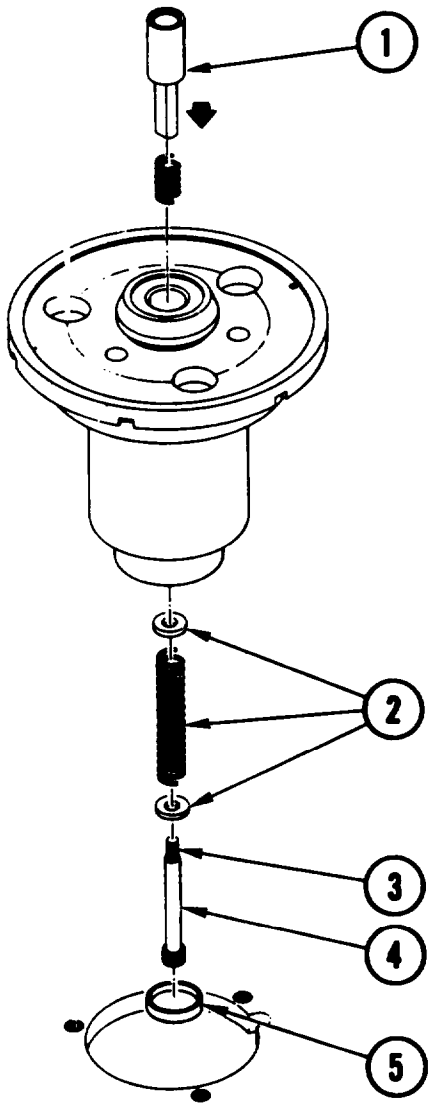
Remove

1. Remove static ground spring (para 4-37).
2. Using two screw drivers, pry shaft end seal from shaft.
3. Reach in from bottom of spindle and remove shoulder screw, washers and spring. Lock spindle by pressing end of brake plate.
4. Lift lockshaft out from top of spindle.

NOTE

If smaller compression spring came out of spindle with lockshaft, retain it for use on new lockshaft.

4-54. REMOVE/REPLACE SPINDLE LOCKSHAFT (CONT)



Replace

NOTE

If smaller compression spring came out with old lockshaft, you must assemble it on new lockshaft before replacement.

1. Slide lockshaft in from top of spindle.
2. Place two washers and larger compression spring on screw as shown.

CAUTION

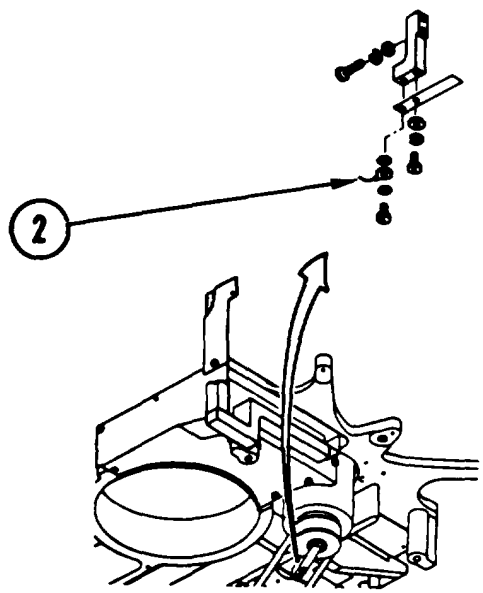
Do not apply any screw-thread locking compound to spring or washers.

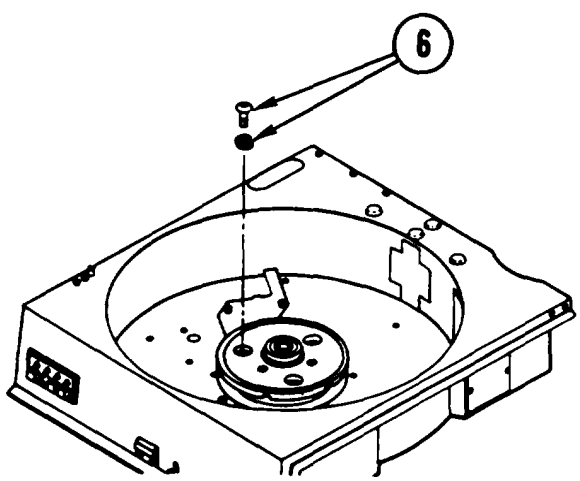
3. Apply thin coat of screw-thread locking compound to last four threads of screw.
4. Install screw into bottom of lockshaft and tighten to a torque of 40 ± 5 lb/in.
5. Press shaft end seal into position on bottom of spindle.
6. Allow screw-thread locking compound to cure for at least three hours.
7. Replace static ground spring (para 4-37).

4-55. REMOVE/REPLACE/ADJUST SPINDLE ASSEMBLY

INITIAL SETUP

Common Tools	Special Tools
● Tool kit	● Spindle alinement kit





CAUTION

When spindle assembly is removed from drive or shipping container, do not allow it to rest on pulley end of assembly. When it must be set down, lay it on its side or on spindle face plate. Improper handling of spindle assembly may cause damage to spindle bearings which could result in premature failure of spindle or even damage to disks and heads.

Remove

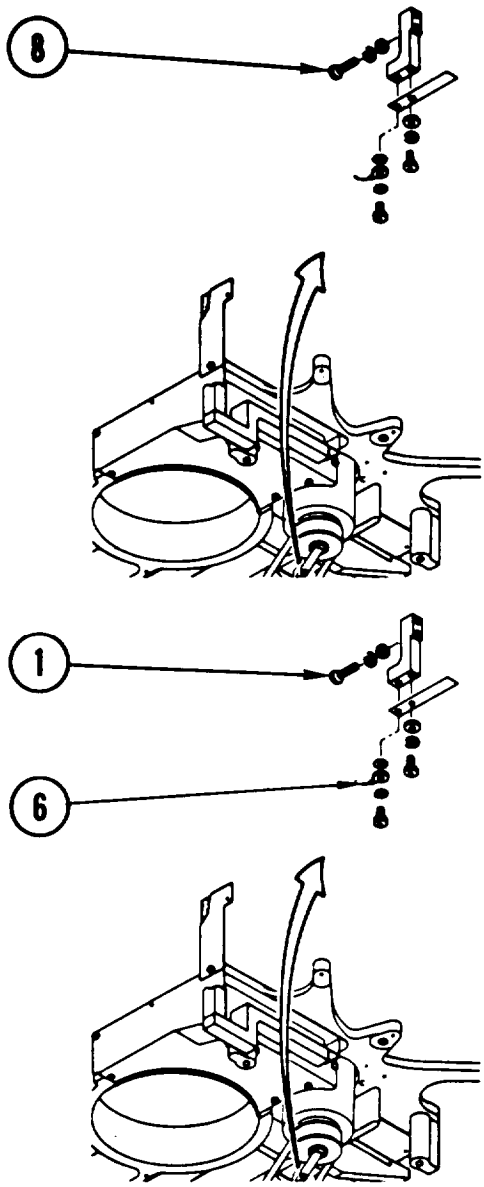
1. Raise deck (para 4-12).
2. Remove screw and lockwashers securing ground cable to static ground spring block.
3. Remove drive belt (para 4-33, Remove, steps 2-5).
4. Lower deck (para 4-12, Lower, steps 1-4).
5. Rotate spindle to aline holes in top of spindle with mounting hardware.
6. Remove screws and lockwashers securing spindle assembly to deck.

CAUTION

Take care not to damage static ground spring when removing spindle assembly.

7. Lift spindle assembly from deck.

4-55 REM0VE/REPLACE/ADJUST SPINDLE ASSEMBLY (CONT)

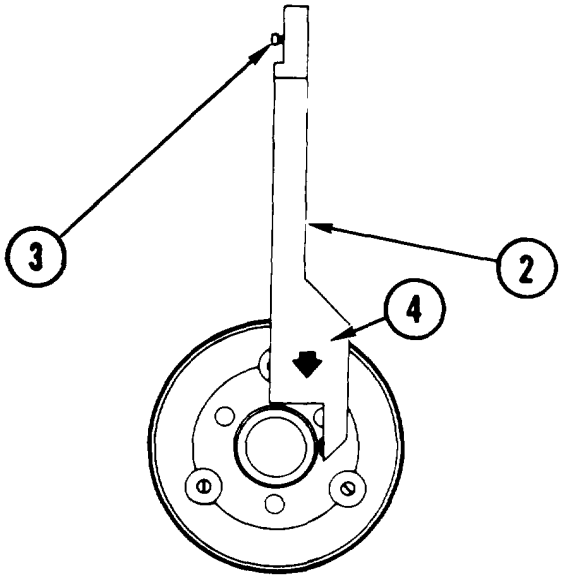


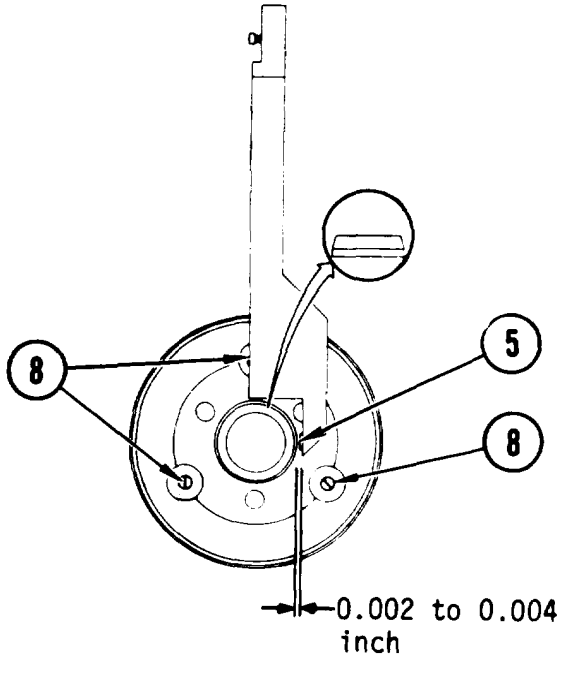
8. Remove screws and washers securing static ground block to spindle assembly, and remove static ground spring assembly.

REPLACE

1. Install static ground spring assembly on spindle assembly, and secure in place with screw and washers.
2. Lower spindle assembly through deck opening in shroud, passing static ground spring through slot.
3. Orient spindle assembly so that static ground spring block faces drive motor.
4. Using screws without lockwashers, secure spindle assembly to deck. Turn screws in fully, but do not tighten.
5. Raise deck (para 4-12, Raise, steps *8-10).*
6. Replace ground cable on static ground spring block, and secure in place with screw and washers.
7. Replace drive belt (para 4-33. Replace, steps 1-4).

4-55. REMOVE/REPLACE/ADJUST SPINDLE ASSEMBLY (CONT)





Adjust

1. Remove head arm number 3, second from bottom (para 4-29).

2. Install spindle alinement tool in slot on carriage from which head arm number 3 was removed.

3. Secure alinement tool to carriage with screw; using torque screwdriver, tighten to a torque of 4 ± 1/2 inch pounds.

CAUTION

When extending carriage, move it slowly to avoid damage to heads.

4. Extend carriage to position alinement tool as shown.

NOTE

Two feeler gauges are provided. One gauge is 0.002 inch and the other is 0.004 inch. Use each as required to adjust the spindle.

5. Insert either feeler gauge between alinement arm and spindle as shown.

6. Check if dimension between alinement arm and spindle is not less than 0.002 or not more than 0.004 each.

- If it is, go to step 15
- If adjustment is required, qo to step 7

NOTE

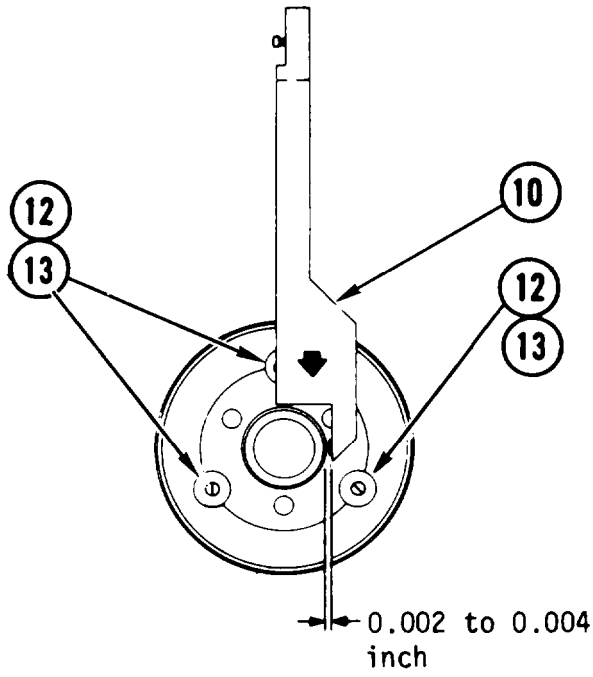
If screws were previously replaced without lockwashers, go to step 11.

7. Retract carriage sufficently to aline holes in-spindle with mounting screws.

8. Remove screws and lockwashers securing spindle to deck.

9. Replace screws without lockwashers and tighten screws slightly.

4-55. REMOVE/REPLACE/ADJUST SPINDLE ASSEMBLY (CONT)



CAUTION

When extending carriage, move slowly to avoid damage to heads.

10. Extend carriage to position alinement tool as shown. Check alinement with feeler gauge to determine degree of adjustment necessary.

11. Using end of hammer handle, gently tap spindle until dimension between alinement tool and spindle meets the 0.003 ± 0.001 specification (step 6).

12. Tighten one screw at a time and check dimension between alinement tool and spindle after tightening each screw.

13. Remove first screw tightened and replace washer. Replace screw and washer in spindle, tighten it, and recheck dimensional specification after tightening.

14. Repeat procedure in step 13 for second and third screws.

15. Remove screw securing alinement tool (step 3); remove alinement tool.

16. Replace head arm number 3 (para. 4-29, Replace, steps 1-4).

17. Adjust static ground spring (para. 4-38).

18. Check and adjust speed transducer (paa 4-45, steps 2-10).

4-55. REMOVE/REPLACE/ADJUST SPINDLE ASSEMBLY (CONT)

19. Check and aline head number 3 (para. 4-30) .

- If using FTU TB 303 do steps 3 thru 56 (Check) and steps 1 thru 27 (Aline)
- If using FTU TB 216 do steps 3 thru 61 (Check) and 63 thru 65 (Aline)

20. Replace bracket (para. 4-29, Replace, steps 6-9)

APPENDIX A

REFERENCES

A-1. INTRODUCTION

This appendix lists all forms, field manuals and technical manuals referenced in, or required for use with, this technical manual.

A-2. FORMS

Equipment Inspection and Maintenance Worksheet . . . . . DA Form 2404
Quality Deficiency Report . . . . . Form SF 368
Discrepancy in Shipment Report . . . . . Form SF 364
Recommended Changes to Equipment Technical Manuals . . . . . DA Form 2028-2
Recommended Changes to Publications and Blank Forms . . . . . DA Form 2028
Maintenance Request . . . . . DA Form2407

A-3. TECHNICAL MANUALS

Operator's Manual: Disk Memory Unit MU-705/MYQ-4 . . . . . TM 11-7025-208-10"
Procedures for Destruction of Electronic Materiel to Prevent Enemy Use (Electronics Command) . . . . . TM 750-244-2
The Army Maintenance Management System (TAMMS) . . . . . TM 38-750
Administrative Storage of Equipment . . . . . TM 740-90-1

A-4. MISCELLANEOUS PUBLICATIONS

Consolidated Index of Army Publications and Blank Forms . . . . . DA PAM 310-1

APPENDIX B

MAINTENANCE ALLOCATION CHART

Section 1. INTRODUCTION

B-1. GENERAL

This Maintenance Allocation Chart (MAC) provides a summary of maintenance operations for the disk drive. This document assigns categories of maintenance for specific maintenance functions on repairable items and identifies tools and equipment required to perform each function. Each maintenance function is assigned to the lowest level of maintenance prepared to perform that function for the disk drive. It should be understood that each maintenance function can also be performed at all higher levels of maintenance. The higher levels of maintenance will have tools and test equipment to perform the maintenance functions assigned to and normally performed by lower levels of maintenance.

The following paragraphs of Section I present maintenance function definitions, explanation of MAC column entries, and explanation of column entries of the tool and test equipment requirements section. Section 11 presents the MAC for the disk drive and Section III presents the tool and test equipment requirements.

B-2. MAINTENANCE FUNCTION DEFINITIONS.

Maintenance Functions are limited to and defined as follows:

a. Inspect. Determination of the serviceability of an item by comparing its physical, mechanical, and/or electrical characteristics with established standards through examination.

b. Test. Verification of serviceability and detection of beginning failure by measuring the mechanical or electrical characteristics of an item and comparing those characteristics with prescribed standards.

c. Service. Performance of operations required periodically to keep an item in proper operating condition. Such operations would include cleaning, preservation, draining, painting, or replenishment of fuel/lubricants/hydraulic fluids or compressed air supplies.

d. Adjust. Maintenance within prescribed limits by bringing into proper or exact position, or by setting the operating characteristics to the specified parameters.

e. Aline. Adjustment of specified variable elements of an item to the maximum or desired performance.

f. Calibrate. Determination and cause corrections to or adjustments to instruments or test measuring and diagnostic equipment used in precision measurement. Consists of comparing two instruments, one a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

g. Install. Emplacement, seating, or fixing into position an item, part, or module (component or assembly) in a manner to allow proper functioning of the equipment/system.

h. Replace. Substitution of a serviceable like-type part, subassembly, or module (component or assembly) for an unserviceable counterpart.

i. Repair. Application of maintenance services (inspect, test, service, adjust, aline, calibrate, replace) or other maintenance actions (welding, grinding, riveting, straightening, facing, remaching, or resurfacing) to restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module/component/assembly, and item or system. This function does not include trial and error replacement of consumable spare type items such as fuses, lamps, or electronic tubes.

j. Overhaul. Periodic maintenance effort (service/action) necessary to restore an item to a completely serviceable/operational condition as prescribed by maintenance standards (e.g., DWR) in appropriate technical publications. Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like-new condition.

k. Rebuild. Restoration of unserviceable equipment to a like-new condition in accordance with original manufacturing standards. Rebuild is the highest degree of material maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (hour, miles etc.) considered in classifying Army equipment/components.

B-3. EXPLANATION OF MAC COLUMN ENTRIES.

a. Group Number. This column lists group numbers, the purpose of which is to identify components, assemblies, subassemblies and modules with the next highest assembly.

b. Component/Assembly. This column contains the noun names of components, assemblies, subassemblies, and modules for which maintenance is authorized.

c. Maintenance Function. This column lists the functions to be performed on the item listed in the Component/Assembly column.

d. Maintenance Category. This column specifies, by the listing of a “worktime” figure in the appropriate subcolumn(s), the lowest level of maintenance authorized to perform the function listed in the Maintenance Function column. This figure represents the active time required to perform that maintenance function at the indicated category of maintenance. If the number or complexity of the tasks within the listed maintenance function varies at different maintenance categories, appropriate “worktime” figures will be shown for each category. The number of man-hours specified by the “worktime” figure represents the average time equired to restore an item (assembly, subassembly, component, module, end item, or system) to a serviceable condition under typical field operating conditions. This time includes preparation time, troubleshooting time, and quality assurance/quality control time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the MAC.

Subcolumns of the Maintenance category Column are:

C -- Operation/Crew
O -- Organizational
F -- Direct Support
H -- General Support
D -- Depot

e. Tools and Equipment. This column specifies by code those comnon tool sets (not individual tools) and special tools, test, and supporting equipment required to perform the designated function.

Explanation of Column Entries of Tool and Test Equipment Requirements Table.

a. Tool or Test Equipment Reference Code. The numbers in this column coincide with the numbers used in the tools and equipment column of the MAC. The numbers indicate the applicable tool or test equipment for the maintenance functions.

b. Maintenance Category. The codes in this column indicate the maintenance category allocated the tool or test equipment.

c. Nomenclature. This column lists the noun name and nomenclature of tools and test equipment required to perform the maintenance functions.

d. National/NATO Stock Number. This column presents the National/NATO Stock number of the specific tool or test equipment when these numbers are assigned.

e. Tool Number. This column lists the manufacturer's part number of the tool, followed by the Federal supply code for the manufacturer (5 digit) in parentheses, when these numbers are fully identified.

SECTION II MAINTENANCE ALLOCATION CHART
FOR DISK MEMORY UNIT MU-705/MYQ-4

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY					(5) TOOLS AND EQUIP.	(6) REMARKS
			C	O	F	H	D		
02	Disk Memory Unit (MU-705/MYQ-4)	Service		1.5				1,15,16,18, 21	F
		Test			0.2			1,2,4,5,6, 7,10	
		Replace			0.5			1,3,4,5,6, 7,10,17	
		Repair			0.7			1,3,4,5,6, 7,8,9,10, 19,20,22	
		Overhaul					80.O		A
0201	Base Assy. (A1XX)	Test			0.2			4,5	
		Repair			0.3			1,5,10,200	
020101	Power Supply PWB (AXKV)	Test			0.2			4,5	
		Adjust			0.2			1,5,10	
		Replace			0.3			1	
		Repair					0.8		A
0202	Logic Chassis Assy. (A2XX)	Test			0.2			4,5,6,7, 10	
		Repair			0. 1			1,6	
020201	Circuit Cara Assy. Write Clock (CLSV)	Test			0.2			4,5,6,7, 10	
		Replace			0.1			1,5	
		Repair					0.3		A
020202	Circuit Card Assy. Fine Servo Decoder (HFRV)	Test			0.2			4,5,6,7	
		Replace			0.1			1,6	
		Repair					0.3		A
020203	Circuit Card Assy. Fault Card (HKFV)	Test			0.2			4,5,6,7	
		Replace			0.1				
		Repair					0.3		A
020204	Circuit Card Assy. Read PLO (BLZV)	Test			0.2			4,5,6,7	
		Replace			0.1			l,6	
		Repair					0.3		A
0202U5	Circuit Card Assy. Data Latch (KLRV)	Test			0.2			4,5,6,7	
		Rep 1 ace			0.1			l,6	
		Repair					0.1		A
020206	Circuit Lard Assy. D/A Functional Generator (JLQV)	Test			0.2			4,5,6,7	
		Adjust			0.5			1,4,6,10	
		Replace			0.7			1,6	
		Repair					0.8		A

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SECTION II MAINTENANCE ALLOCATION CHART
FOR DISK MEMORY UNIT MU-705/MYQ-4

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY C	O	F	H	D	(5) TOOLS AND EQUIP.	(6) REMARKS
020207	Circuit Card Assy. Access Control #2 (ELUV)	Test Replace Repair			0.2 0.1		 0.3	4,5,6,7 1,6	 A
020208	Circuit Card Assy. Switching Mode Control (FLPV)	Test Replace Repair			0.2 0.1		 0.3	4,5,6,7 1,6	 A
020209	Circuit Card Assy. Interlocks and Speed Detector (6SGV)	Test Replace Repair			0.1 0.2		 0.3	4,5,6,7 1,6	 A
020210	Circuit Card Assy. Transmitter (BTHV)	Test Replace Repair			0.,2 0.1		 0.3	4,5,6,7 1,6	 A
020211	Circuit Card Assy. Receiver (BRSV)	Test Replace Repair			0.2 0.1		 0.3	4,5,6,7 1,6	 A
020212	Circuit Card Assy. Bus-In-Multiplexer (6SNV)	Test Replace Repair			0.2 0.1		 0.3	4,5,6,7 1,6	 A
020213	Circuit Card Assy. DIFF Generator and Controls (FLWV)	Test Replace Repair			0..2 0.1		 0.3	4,5,6,7 1,6	 A
020214	Circuit Card Assy. NRZ to Compensated MFM PWB (ELXV)	Test Replace Repair			0.2 0.1		 0.3	4,5,6,7 1,6	 A
020215	Circuit Card Assy. Access Control and Index/Spector Decode (ELTV)	Test Replace Repair			0.2 0.1		 0.3	4,5,6,7 1,6	 A
020216	Circuit Card Assy. Access Control #1 (PLVV)	Test Replace Repair			0.2 0.1		 0.3	4,5,6,7 1,6	 A
020217	Circuit Card Assy. Bus-In & RPS (6SLV)	Test Replace Repair			0.2 0.1		 0.3	4,5,6,7 1,6	 A
020218	Circuit Card Assy. Comp. Assy. (AXYV)	Test Replace Repair			0.2 0.1		 0.3	4,5,6,7 1,6	 A

DRSEL-MA Form 6031-1. (1 Mar 77) HISA-F.M 526-77

SECTION II MAINTENANCE ALLOCATION CHART
FOR DISK MEMORY UNIT MU-705/MYQ-4

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY C	O	F	H	D	(5) TOOLS AND EQUIP.	(6) REMARKS
020219	Logic Chassis W/ Backplane	Test			1.0			1,2,10	
		Replace			1.0			1	
		Repair					3.0		A
0203	Deck Assy. (A3XX)	Test			0.2			4,5,8,10	
		Adjust			0.2			8,9,10	
		Repair			0.5			1,8,9,11	
020301	Circuit Cart Assy. Writer (EZKN)	Test			0.2			4,5	
		Replace			0.5			1	
		Repair					0.3		A
020302	Circuit Card Assy. Head Select & Read Amplifier (NZJN)	Test			0.2			4,5	
		Replace			0.1			1	
		Repair					0.3		A
020303	Amplifier Power Bd. (5VTN)	Test			0.2			4,5	
		Rep 1 ace			0.5			1	
		Repair					0.3		A
020304	Circuit Card Assy. Pre-Amp, Track Servo (EZON)	Test			0.2			4,5	
		Replace			0.5			1	
		Repair					0.3		A
020305	Coil Carriage	Test			0.3			4,10	
		Replace					2.0		A
		Repair			3.0			1,5,8,9, 10,11	
		Align					2.0		A
		Repair					2.0		A
020306	Spindle, Wheel	Test			1.0				
		Replace			2.0			1,12	
		Repair			3.0			1,13	
		Repair					2.0		A
		Align			2.0			1,12	
0204	Cable Assy.	Replace			0.1			1	
		Repair					0.3		A
0205	Cable Assy.	Replace			0.1			1	
		Repair					0.3		A
0206	Cable Assy.	Replace			0.1			1	
		Repair					0.3		A

SECTION III TOOL AND TEST EOUIPMENT REQUIREMENTS
FOR DISK MEMORY UNIT MU-705/MYQ-4

TOOL OR TEST EQUIPMENT REF CODE	MAINTENANCE CATEGORY	NOMENCLATURE	NATIONAL/NATO STOCK NUMBER	TOOL NUMBER
1	O,F	Tool Kit Electronic Equipment TK17	5180-01-023-4982	
2	O,F	T & V Pack (Standard Part of DAS3 System)	TBD	HIS SHU 152J (33322)
3	F	Oecimal Socket Set	5120-00-247-0748	
4	F	Oscilloscope, OS-261/C	6625-00-127-0079	
5	F	Multimeter, Digital AN/USM-451	6625-01-060-6804	
6	F	MSU Card Extraction Tool	7010-01-101-6680	
7	F	MSU Card Extender	7010-01-101-6679	
8	F	MSU Head Alignment Pack	7010-01-101-6681	
9	F	MSU Head Adjustment Tool	5120-01-059-6860	
10	F	MSU Field Test Unit, TB216A	7010-01-103-7623	
11	F	MSU Torque Screwdriver Kit	5180-01-007-8999	
12	F	Alignment Tool	TBD	MPI75018400 (33322)
13	F	Hex Key Allen Set - Decimal	5120-00-529-1475	
14	F	Shim Stock, Plastic	TBD	PSS5A (07631)
15	F	Magnetic Pickup	5120-00-545-4268	
16	F	Mirror, Ball Joint	5120-00-448-2455	
17	F	Screwdriver, Stubby, Phillips		HIS 97017133-001 (33322)
18	F	Vacuum Cleaner	TBD	S1015O3OW (29335)
19	F	Phillips Screwdriver, No. 1x10"	5120-00-580-2361	
20	F	Phillips Screwdriver, Offset	5120-00-256-9014	

DRSEL-MA Form 6013-1. (1 Mar 77) HISA-FM 411-77

SECTION III TOOL AND TEST EQUIPMENT REQUIREMENTS
FOR DISK MEMORY UNIT MU-705/MYQ-4

TOOL OR TEST EQUIPMENT REF CODE	MAINTENANCE CATEGORY	NOMENCLATURE	NATIONAL/NATO STOCK NUMBER	TOOL NUMBER
21	F	Lubricant	TBD	TBD
22	F	Shim Stock, Plastic		PSS5A (07631)

SECTION IV MAINTENANCE ALLOCATION CHART
FOR DISK MEMORY UNIT MU-705/MYQ-4

Reference Code	Remarks
A.	Repair by contractor.
B.	DS repair of 0107 Power Supply limited to replacement of fan aria/or fuses.
C.	DS repair of 0125 Power Distribution Unit limited to replacement of fuses.
D.	DS repair of 070501 XPS/4 Board limited to replacement of fuses.
E.	DS repair of 0706 Universal Wire Harness limited to replacement of connectors and limit switch.
F.	See Technical System Manual for Complete Group Coding.

APPENDIX C

EXPENDABLE SUPPLIES AND MATERIALS LIST

Section 1. INTRODUCTION

C-l. SCOPE

This appendix lists expendable supplies and materials you are authorized for the support of DAS3.

C-2. GENERAL

This list identifies items that do hot have to accompany DAS3 and that do not have to be turned in with it.

C-3. EXPLANATION OF LISTING

National stock numbers, descriptions, and quantities are provided to help you identify and request the additional items you require to support this equipment.

Section Il. EXPENDABLE SUPPLIES AND MATERIALS

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description	(5) U/M
		7530-00-285-5836	Paper, Writing UU-P-121	PG
		7510-00-281-5254	Pencil, General Writing SS-P-166	DZ
		7520-00-904-1265	Marker, Tube Type, Fine Tip	DZ
		8030-00-058-5398	Sealing Compound (Loctite) MIL-S-22473	EA
		8035-00-222-2423	Cloth, lintfree	YD
		6810-00-753-4993	Alcohol, Isopropyl 81348 TTI-735 Dielectric Grease	CN
		6515-00-303-8250	Applicator, Disposable 81348 GG-A-616	PG
		7510-00-551-9823	Tape, Transparent 3“ Core	RO
		6850-00-105-3084	Trichlorotrifluoroethane Freon TF	CN

APPENDIX D
SCHEMATIC DIAGRAMS

Index of Diagrams

D-1. GENERAL

Appendix D illustrates the power circuits required to operate the disk drive. Other special circuits and functional diagrams are also included. This information will be helpful if the troubleshooting procedures within this manual fail to help you isolate a fault. You can use common test procedures to check the circuits.

D-2. DIAGRAMS

Figures D-1 and FO-1 illustrate the input power requirements and the ac power system. Figures FO-2 and FO-3 illustrate the dc power requirements which supply the voltages necessary for operation of the logic boards. Figures FO-4 and FO-5 illustrate special functional circuits.

Figure FO-6 is used for alternate troubleshooting of cycle up faults. Figure FO-7 is used for alternate troubleshootiing of initial seek errors. Figure FO-8 is used for alternate troubleshooting of such erros which occur during operation.

Figure FO-9 is used for alternate troubleshooting when there is a data transfer fault.

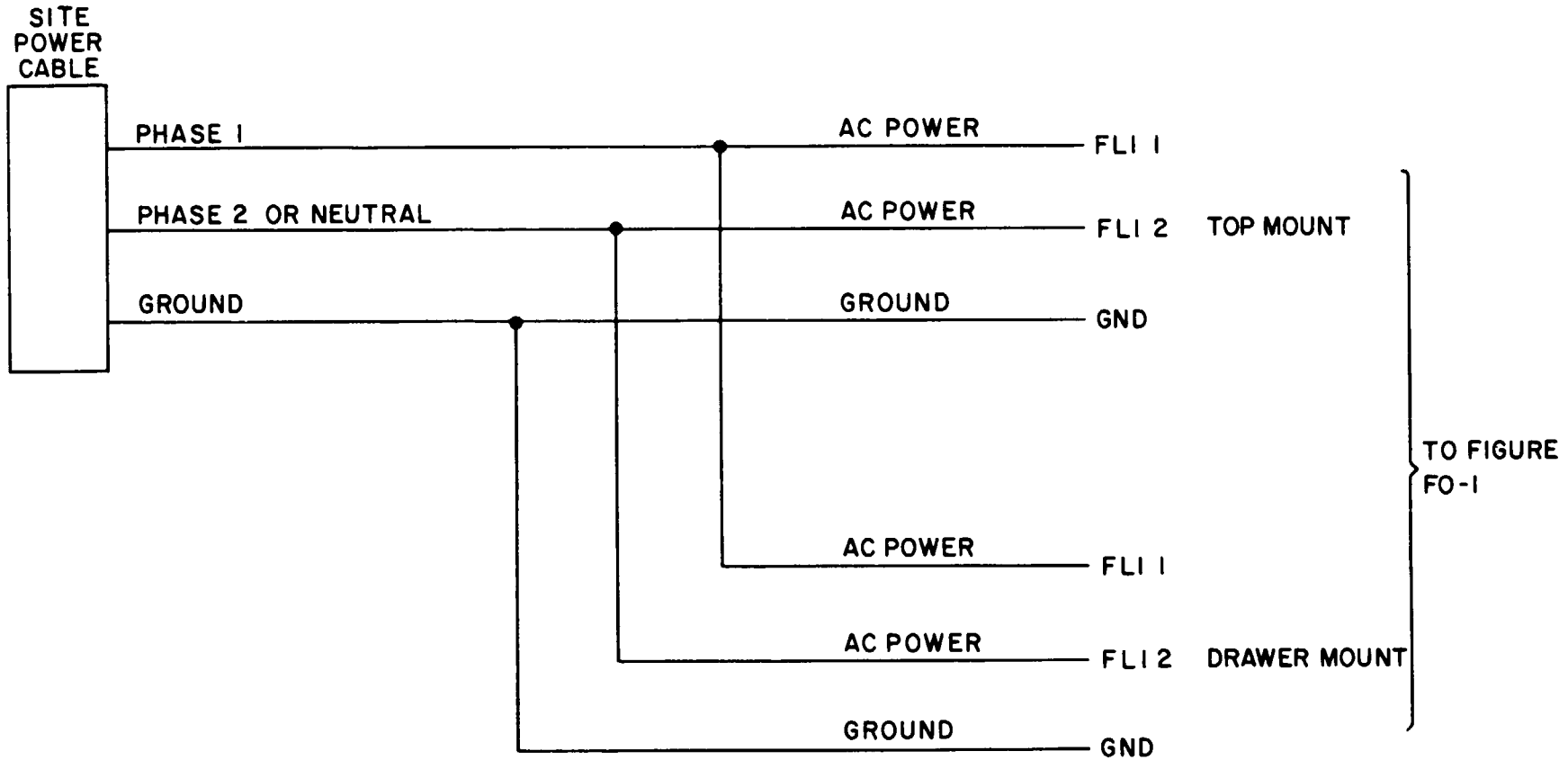

Figure D-1. Site Power Circuit

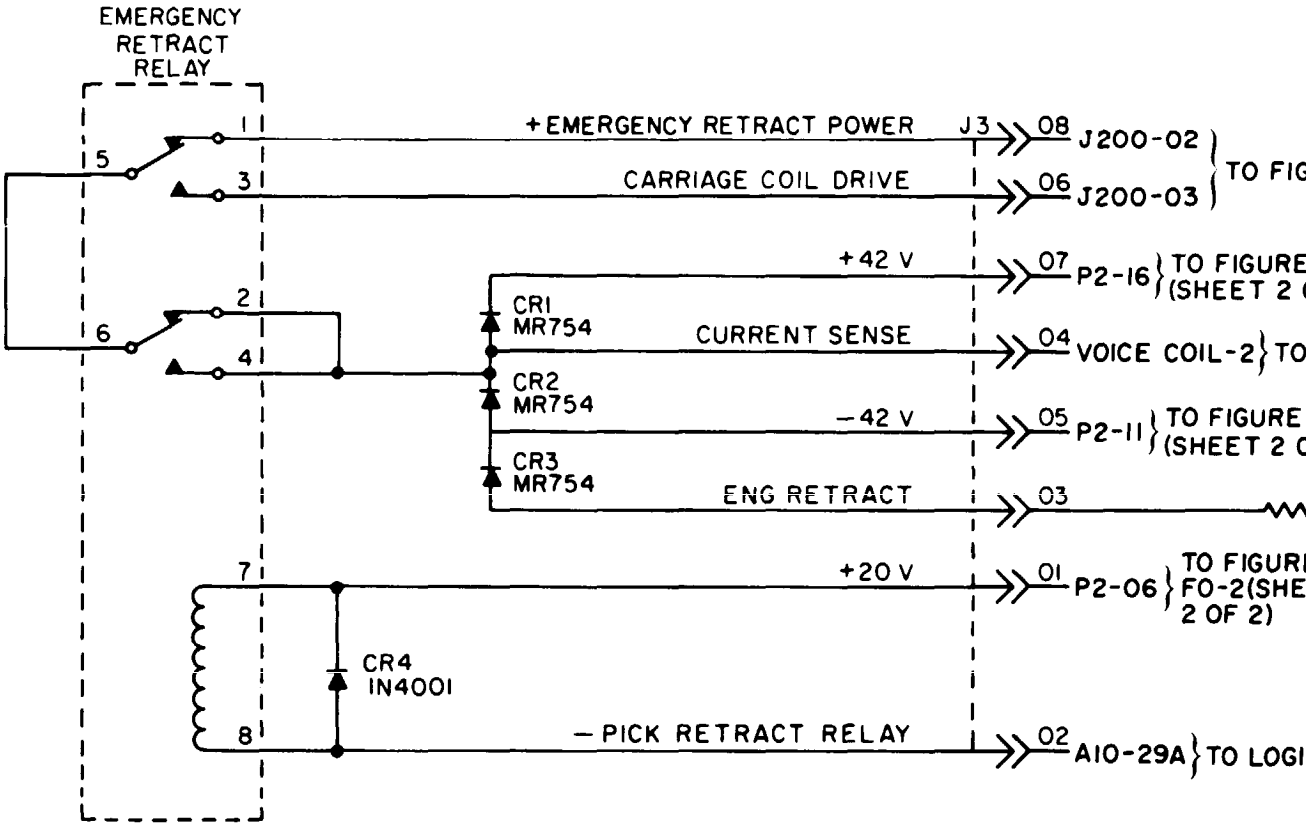

Figure D-2. Emergency Retract Circuit

GLOSSARY

ANALOG SIGNALS. A continuous electrical signal that varies in frequency or amplitude in relation to a digital input.

BACKPLANE (Backpanel). An assembly used to join several circuit boards or mother boards into a working unit.

CLOCK CIRCUITS. Generate clock signals to control the clock related processing tasks.

CENTRAL PROCESSOR UNIT. Transmits data and control signals to other units.

DIBIT. A group of two bits. In four phase modulation each dibit is encoded as one of four unique carrier phase shifts.

DISK. A generic name for mass storage devices such as diskette, cartridge disk or storage module.

END OF TRAVEL. Heads move over a disk surface between two borders. The outermost border is called the end of travel.

FEEDBACK SIGNAL. A signal which returns a portion of the output to its input circuit.

INPUT/OUTPUT SIGNALS. Signals transmitted from the CPU which control input or output data.

MOTHER BOARD. An assembly used to join several logic boards into one working component.

READ/WRITE HEAD. Electromagnetic devices which perform read/write functions.

SERVO HEAD. Electromagnetic device which provides positioning data for read/write functions.

INDEX

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS

SOMETHING WRONG WITH THIS PUBLICATION?

Stateside Army Depot
ATTN : AMSTA -US
Stateside, N.J. 07703

DATE S
10 July 1975

PUBLICATION NUMBER
TM 11-5840-340-12

PUBLICATION DATE
23 Jan 74

Radar Set AN/PRC-76

BE EXACT PIN-POINT WHERE IT IS

PAGE NO	PAR GRAI	FIGU NO	TABLE NO
2-25	2-28		
0	5-3		3-1
5-6	·8		
		'03	

IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD **BE DONE** ABOUT IT:

Recommend that the installation antenna alignment procedure be changed throughout to specify a 2° antenna lag rather than 1°.

REASON : Experience has shown that with only a 1° lag the antenna servo system is too sensitive to wind gusting in excess of 25 knots, and has a tendency to rapidly accelerate and decelerate as it hunts, causing strain to the drive train. Hunting is minimized by adjusting the lag to 2° without degradation of operation.

Item 5, Function column. Change "2 db" to "3db."

REASON : The adjustment procedure for the TRANS POWER FAULT indicator calls for a 3 db (500 watts) adjustment to light the TRANS POWER FAULT indicator.

Add new step f.1 to read, "Replace cover plate removed in step e.1, above."

REASON: To replace the cover plate.

Zone C 3. On J1-2, change "+24 VDC to "+5 VDC."

REASON : This is the output line of the 5 VDC power supply. +24 VDC is the input voltage.

ED NAME GRADE OR TITLE AND TELEPHONE NUMBER
SSG I. 6

SIGN HERE

DA, FORM JUL 79 2028-2

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Major General, United States Army
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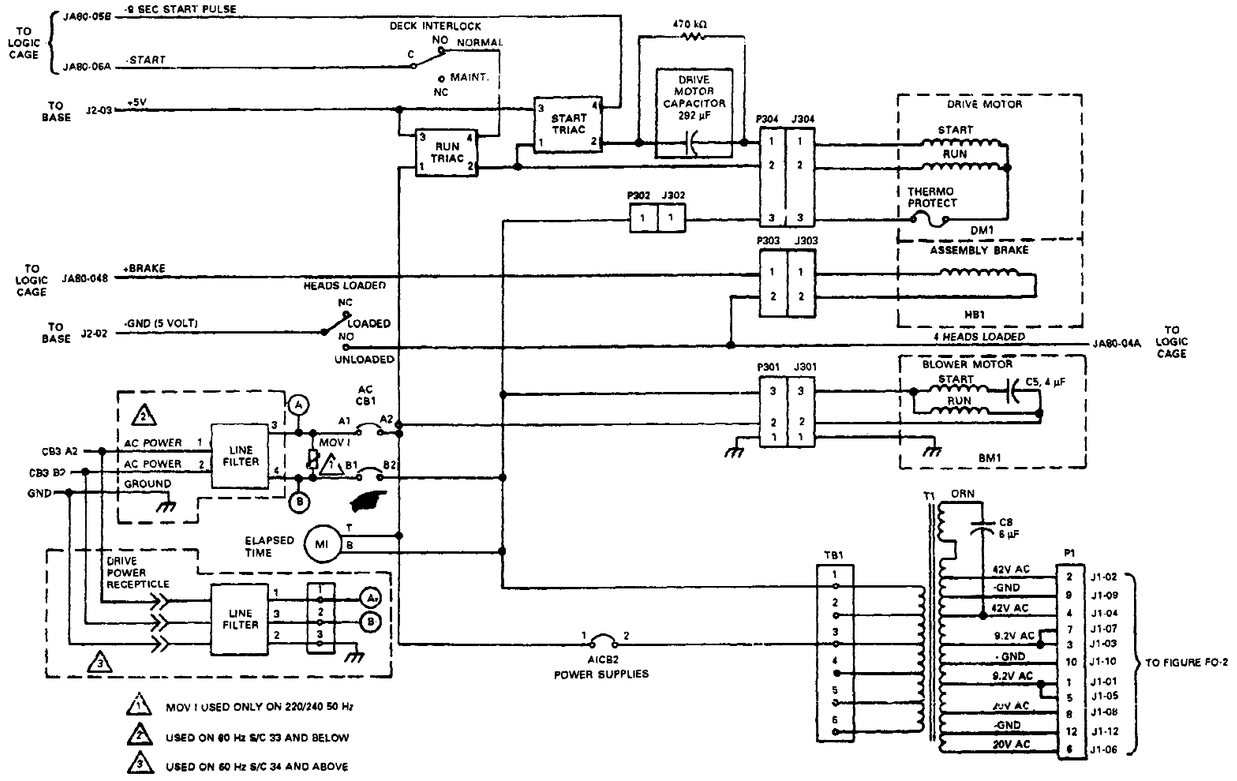
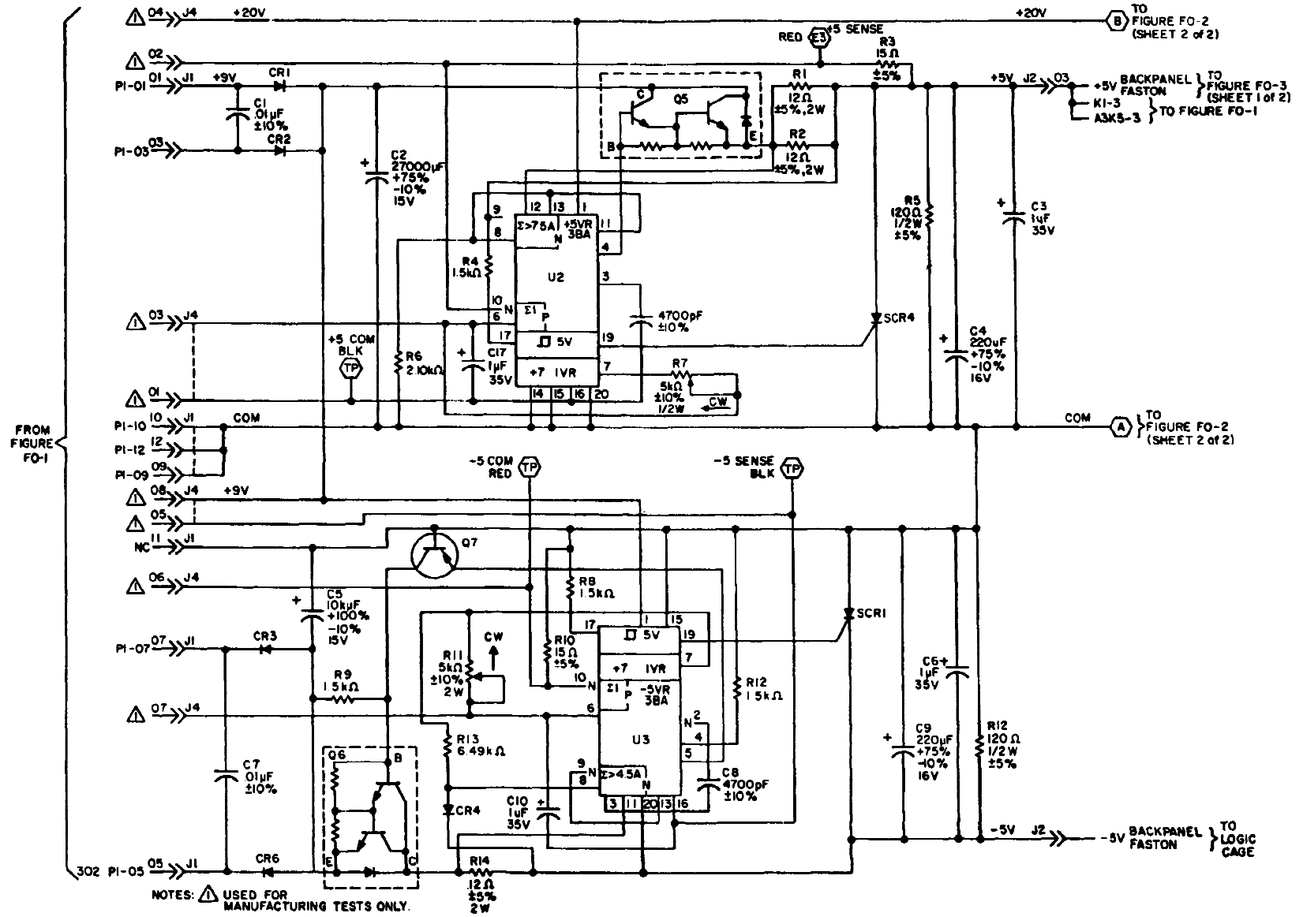
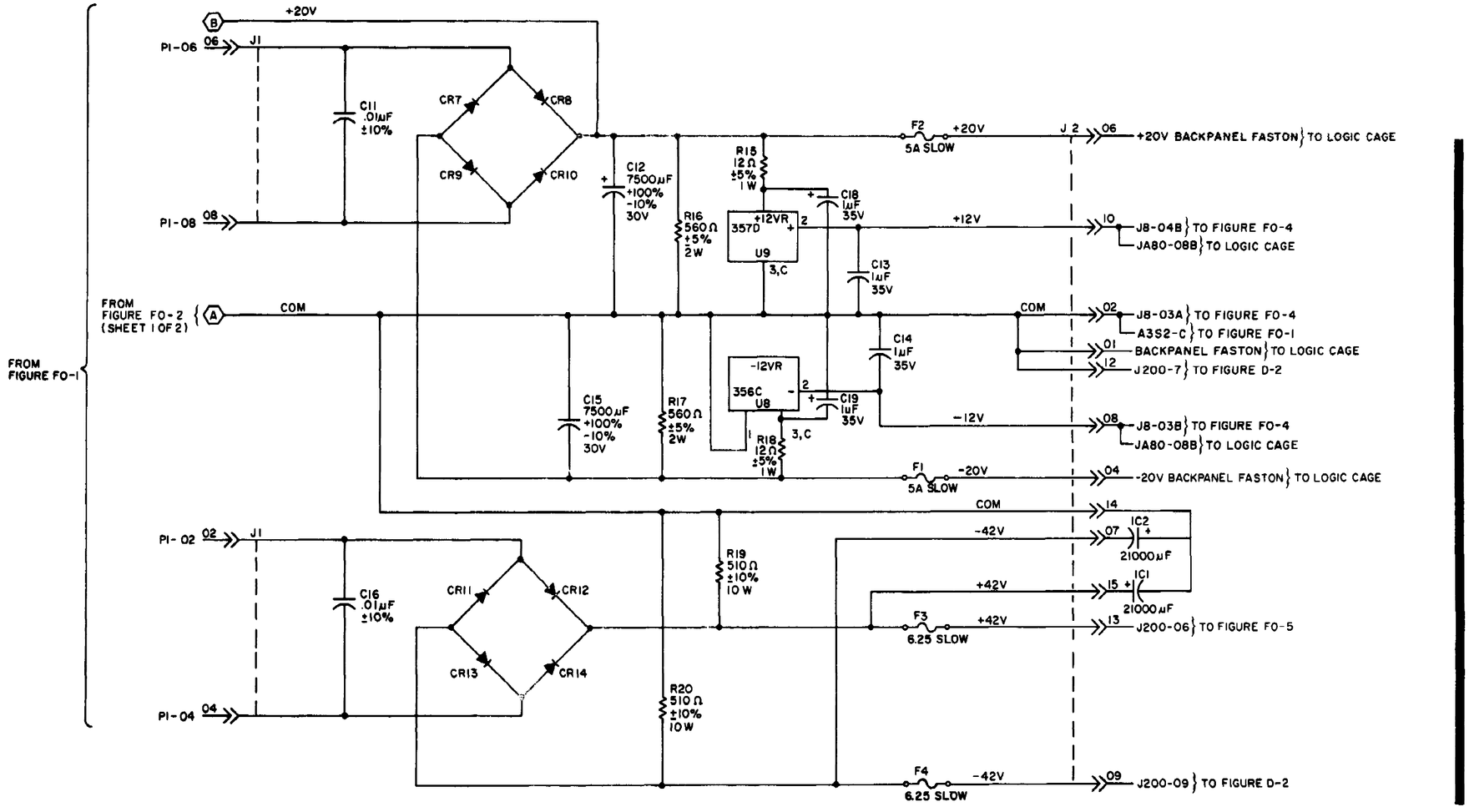
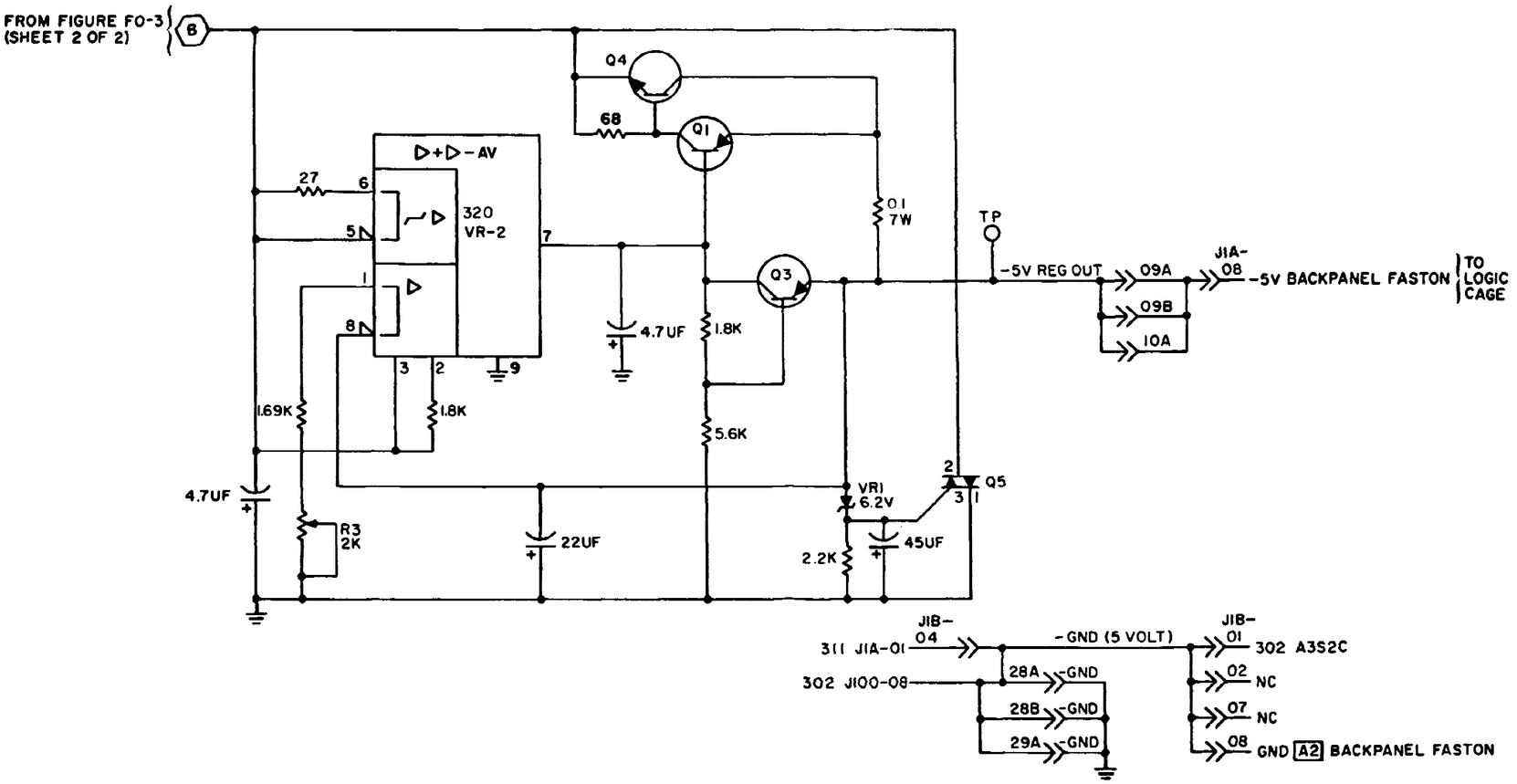

TO LOGIC CAGE
JA80-05B
-9 SEC START PULSE
JA80-06A
-START
DECK INTERLOCK
NO NORMAL
C
MAINT.
NC
TO BASE J2-03
+5V
RUN TRIAC
START TRIAC
470 kΩ
DRIVE MOTOR CAPACITOR 292 µF
P304 J304
DRIVE MOTOR
START
RUN
THERMO PROTECT
DM1
P302 J302
P303 J303
ASSEMBLY BRAKE
HB1
TO LOGIC CAGE JA80-04B
+BRAKE
HEADS LOADED
NC
LOADED
NO
UNLOADED
TO BASE J2-02
-GND (5 VOLT)
4 HEADS LOADED
TO LOGIC CAGE JA80-04A
P301 J301
BLOWER MOTOR
START
C5, 4 µF
RUN
BM1
AC CB1
A1
A2
MOV I
B1
B2
CB3 A2
CB3 B2
GND
AC POWER 1
AC POWER 2
GROUND
LINE FILTER
ELAPSED TIME
MI
DRIVE POWER RECEPTICLE
T1
ORN
C8 6 µF
TB1
P1
42V AC
-GND
42V AC
9.2V AC
-GND
9.2V AC
20V AC
-GND
20V AC
J1-02
J1-09
J1-04
J1-07
J1-03
J1-10
J1-01
J1-05
J1-08
J1-12
J1-06
TO FIGURE FO-2
AICB2
POWER SUPPLIES
1 MOV I USED ONLY ON 220/240 50 Hz
2 USED ON 60 Hz S/C 33 AND BELOW
3 USED ON 60 Hz S/C 34 AND ABOVE

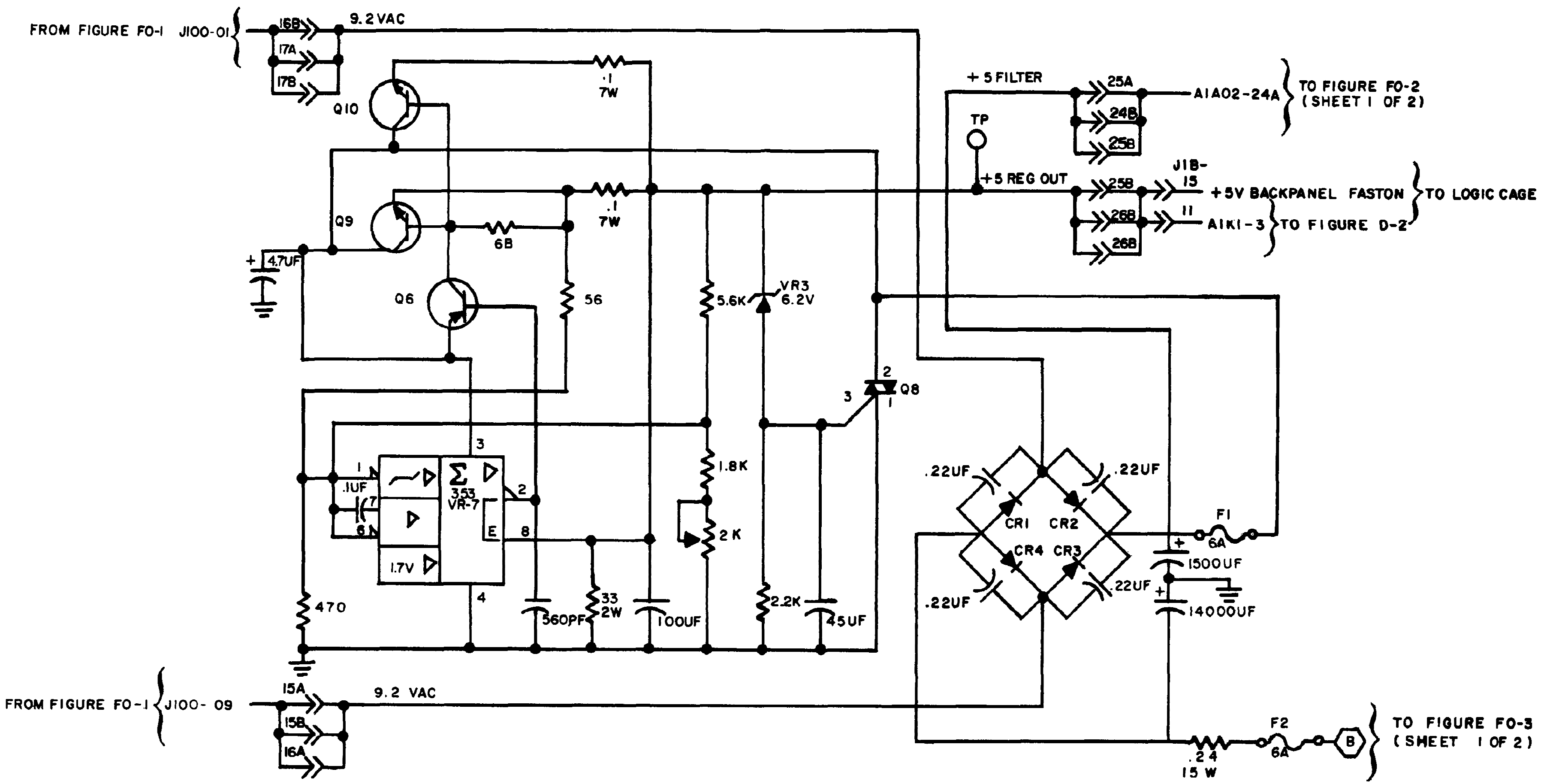

FROM FIGURE FO-1
+20V
+9V
+5V
-5V
COM
+5 SENSE
-5 SENSE
+5 COM BLK
-5 COM RED
TO FIGURE FO-2 (SHEET 2 of 2)
TO FIGURE FO-3 (SHEET 1 of 2)
TO FIGURE FO-1
BACKPANEL FASTON
K1-3
A3K5-3
TO LOGIC CAGE
U2
U3
SCR1
SCR4
CR1
CR2
CR3
CR4
CR6
Q5
Q6
Q7
NOTES: ⚠ USED FOR MANUFACTURING TESTS ONLY.



FO-2: Power Supply (2 of 2)

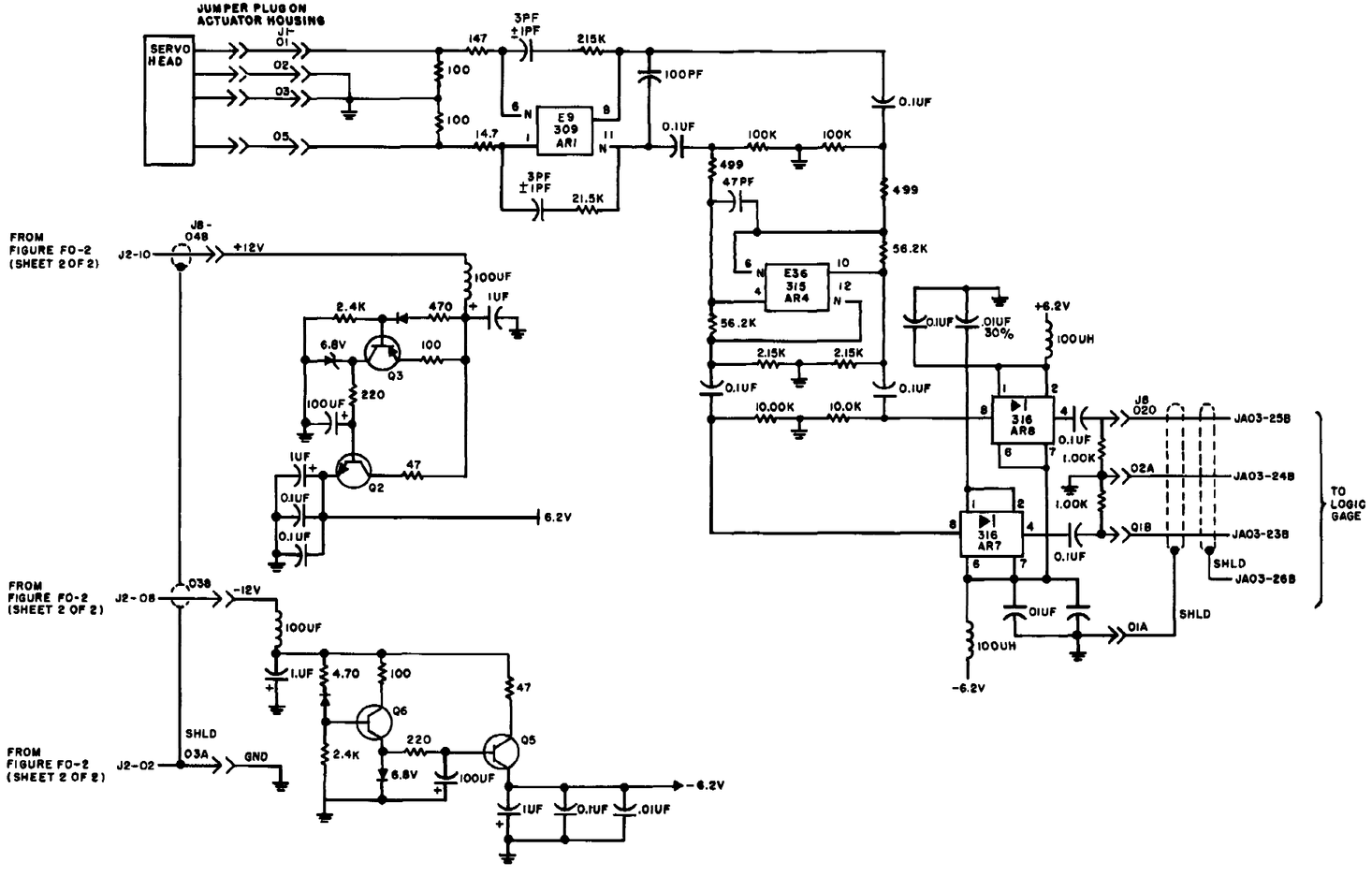


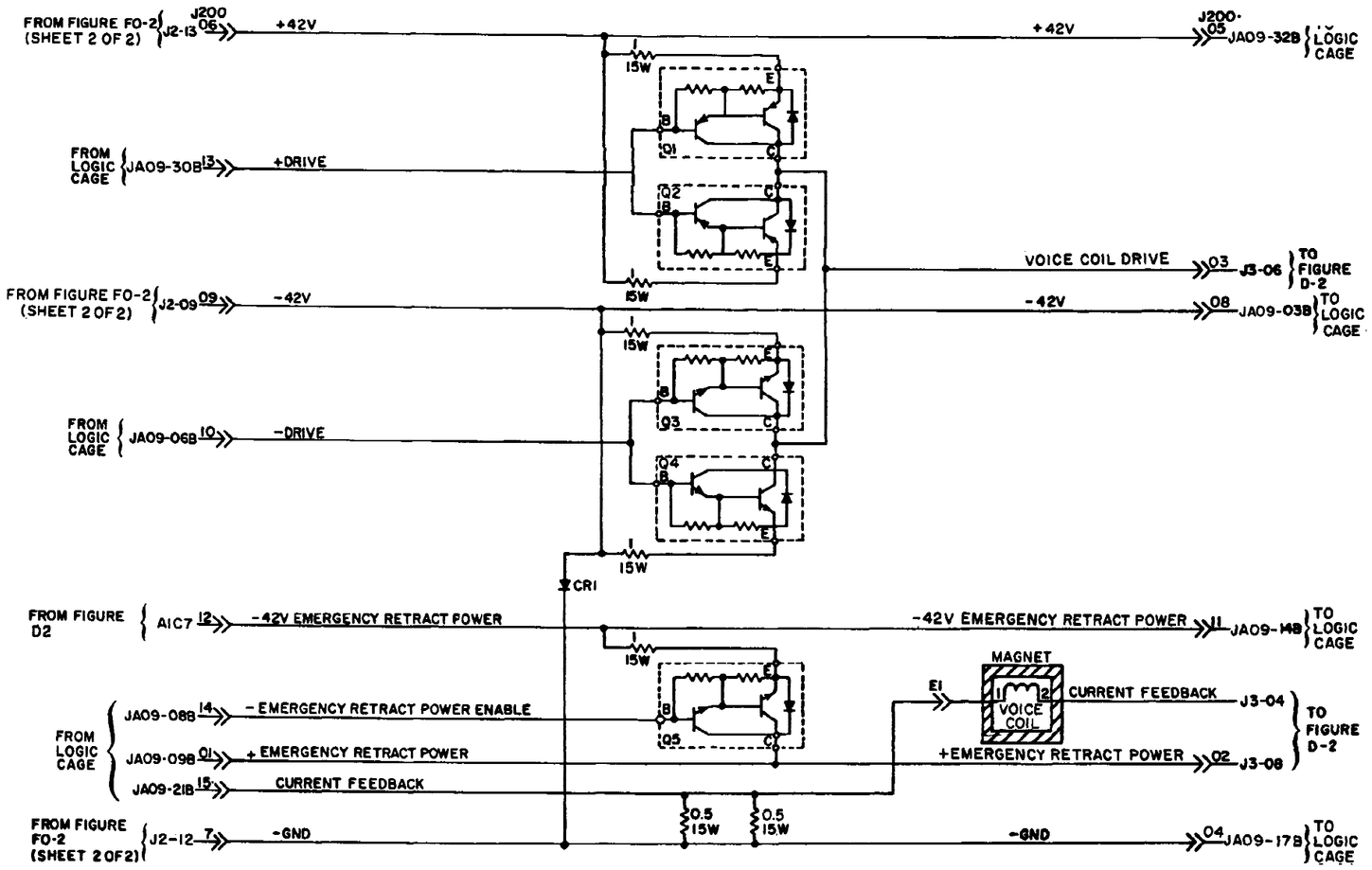
Change 2 FO-3: Plus and Minus 5 V Power Supply (1 of 2)

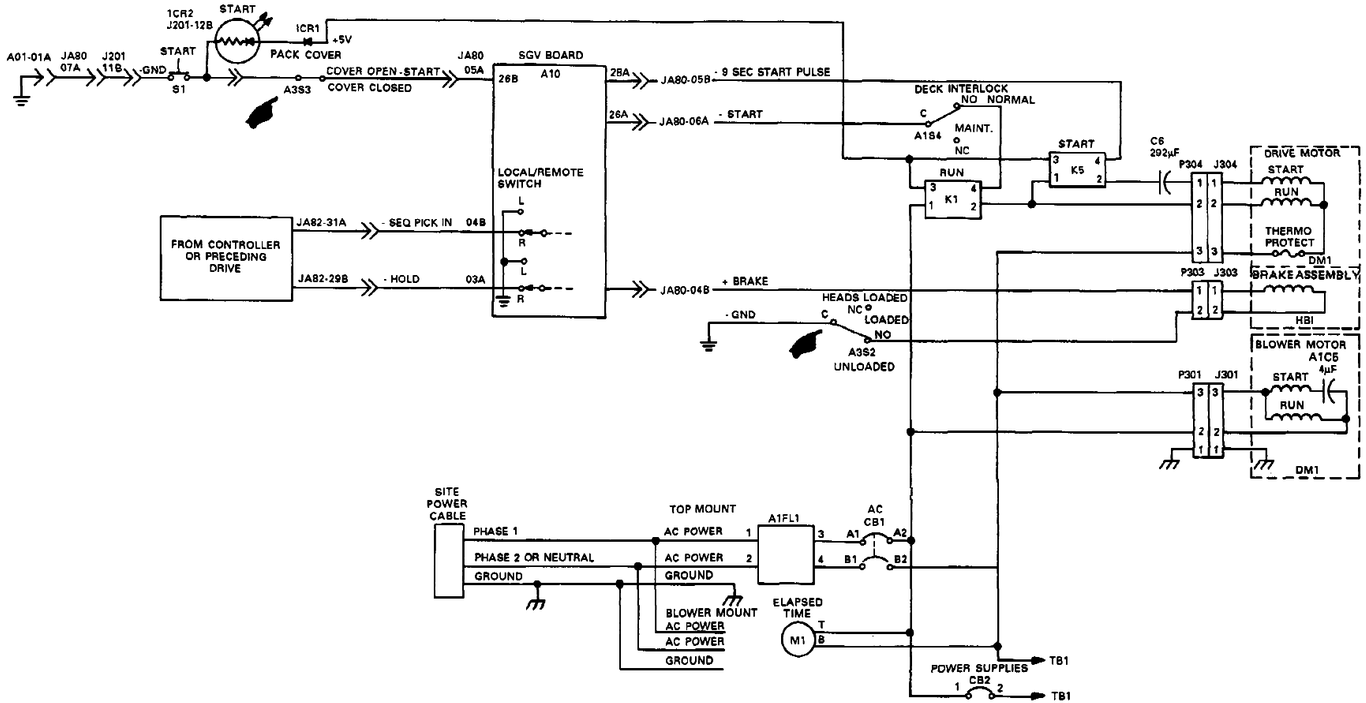


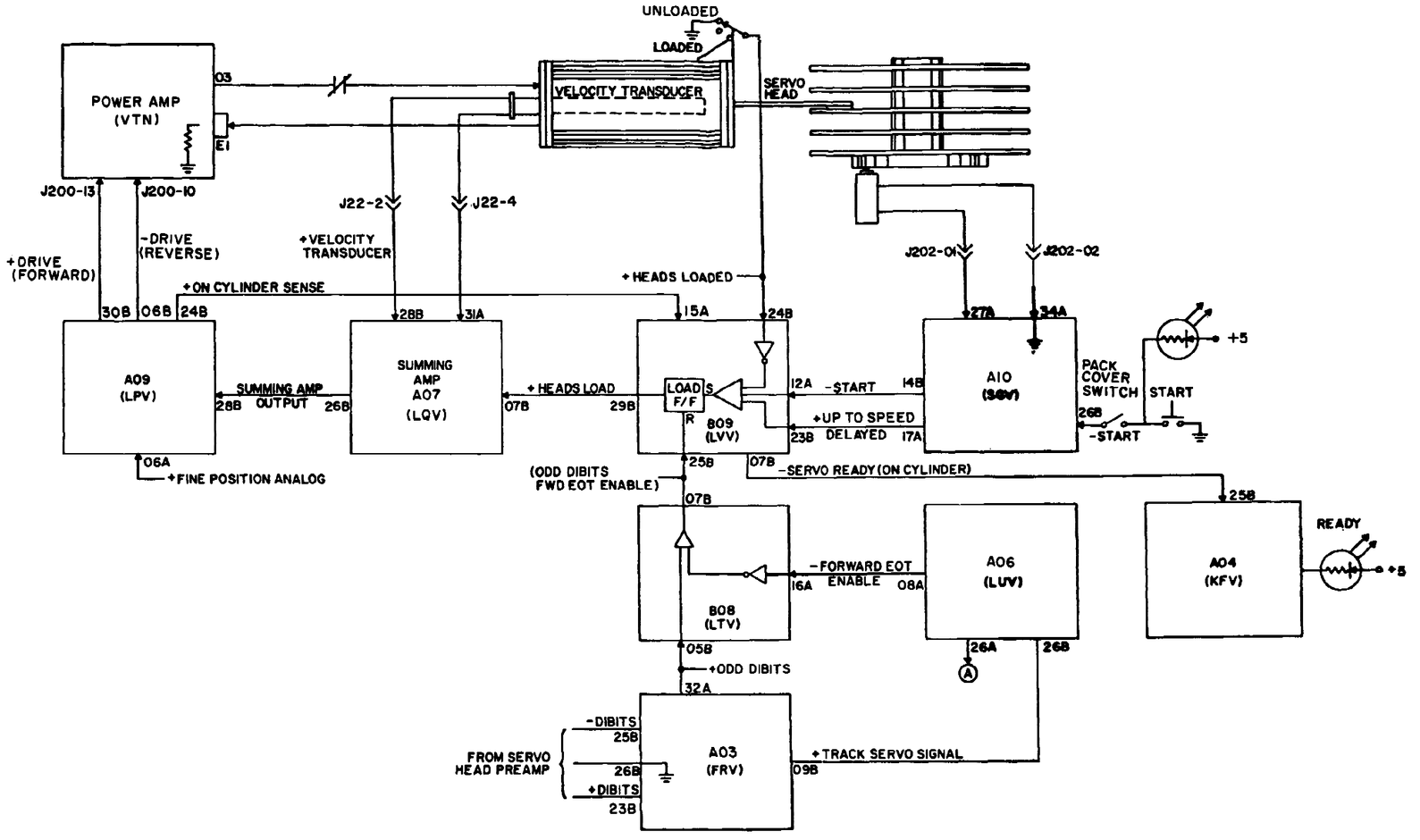
Change 2

FO-3: Plus and Minus 5 V Power Supply (2 of 2)

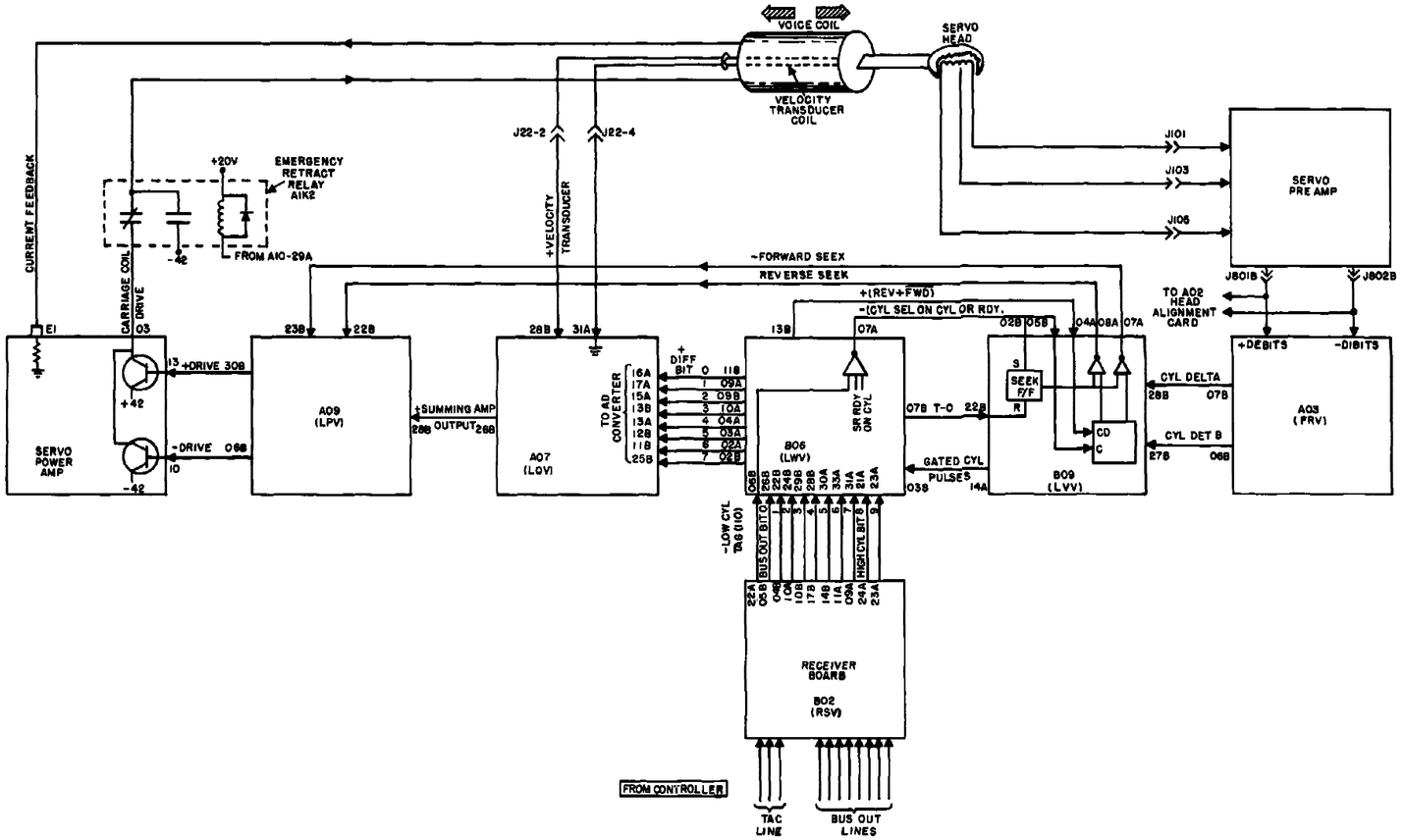

JUMPER PLUG ON ACTUATOR HOUSING
SERVO HEAD
J1
01
02
03
05
147
100
100
14.7
3PF ±1PF
215K
E9 309 AR1
100PF
0.1UF
100K
100K
499
47PF
499
56.2K
E36 315 AR4
56.2K
2.15K
2.15K
0.1UF
0.1UF
10.00K
10.0K
3PF ±1PF
21.5K
FROM FIGURE FO-2 (SHEET 2 OF 2)
J8-048
J2-10
+12V
100UF
1UF
2.4K
470
6.8V
Q3
100
220
100UF
1UF
Q2
47
0.1UF
0.1UF
6.2V
FROM FIGURE FO-2 (SHEET 2 OF 2)
038
J2-08
-12V
100UF
1.UF
4.70
100
47
Q6
220
Q5
2.4K
6.8V
100UF
-6.2V
1UF
0.1UF
.01UF
FROM FIGURE FO-2 (SHEET 2 OF 2)
SHLD
03A
J2-02
GND
0.1UF
.01UF 30%
+6.2V
100UH
316 AR8
316 AR7
J8 020
02A
01B
01A
0.1UF
1.00K
1.00K
0.1UF
.01UF
100UH
-6.2V
SHLD
SHLD
JA03-25B
JA03-24B
JA03-23B
JA03-26B
TO LOGIC GAGE


FROM FIGURE FO-2 (SHEET 2 OF 2)
J2-13
J200 06
+42V
+42V
J200-05
JA09-32B
TO LOGIC CAGE
FROM LOGIC CAGE
JA09-30B 13
+DRIVE
15W
Q1
Q2
VOICE COIL DRIVE
03
J3-06
TO FIGURE D-2
FROM FIGURE FO-2 (SHEET 2 OF 2)
J2-09 09
-42V
-42V
08
JA09-03B
TO LOGIC CAGE
FROM LOGIC CAGE
JA09-06B 10
-DRIVE
Q3
Q4
CR1
FROM FIGURE D2
AIC7 12
-42V EMERGENCY RETRACT POWER
-42V EMERGENCY RETRACT POWER
11
JA09-14B
TO LOGIC CAGE
MAGNET
VOICE COIL
E1
CURRENT FEEDBACK
J3-04
Q5
FROM LOGIC CAGE
JA09-06B 14
- EMERGENCY RETRACT POWER ENABLE
JA09-09B 01
+ EMERGENCY RETRACT POWER
+EMERGENCY RETRACT POWER
02
J3-08
TO FIGURE D-2
JA09-21B 15
CURRENT FEEDBACK
0.5 15W
0.5 15W
FROM FIGURE FO-2 (SHEET 2 OF 2)
J2-12 7
-GND
-GND
04
JA09-17B
TO LOGIC CAGE

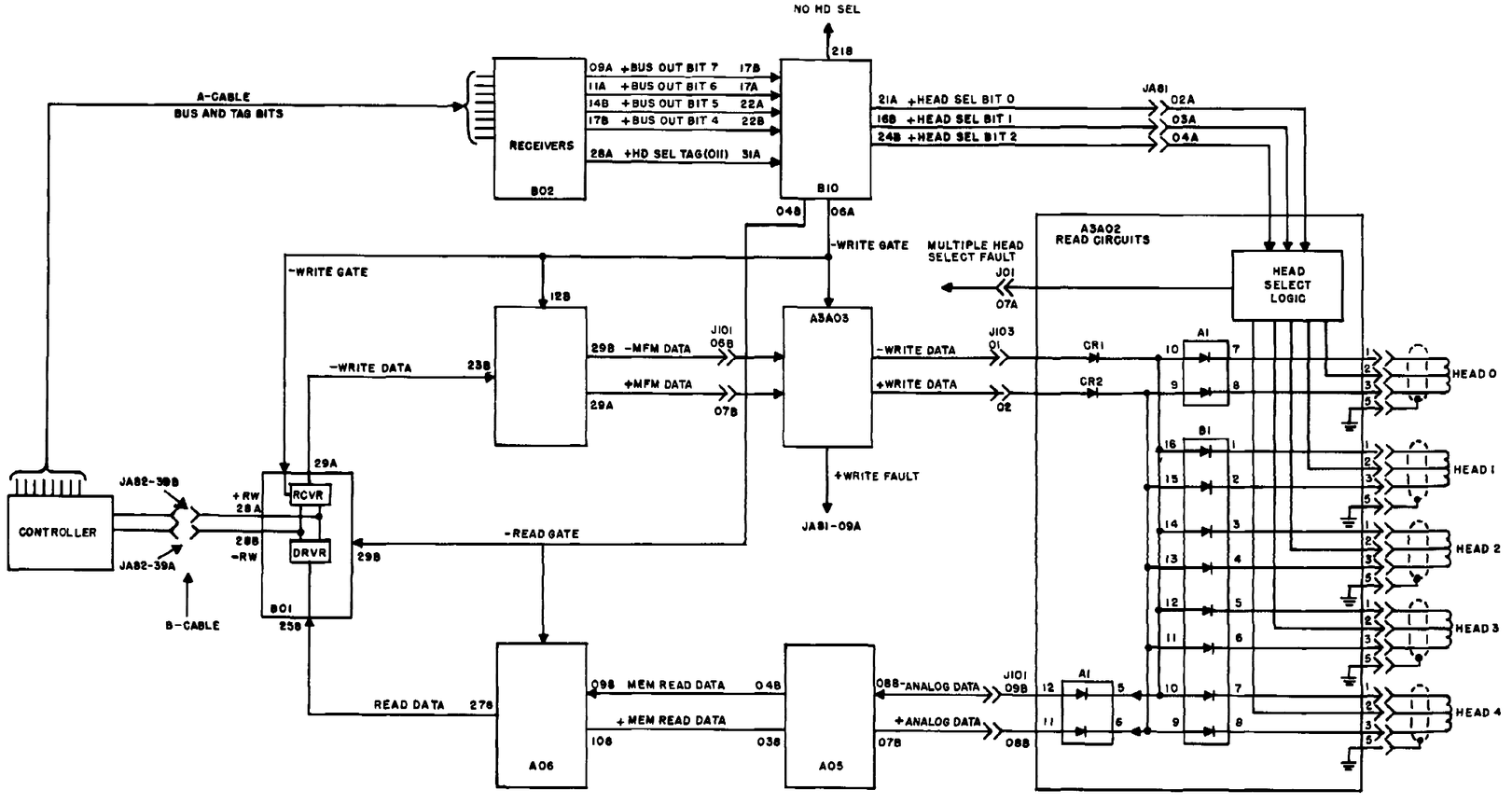

1CR2
J201-12B
START
1CR1
+5V
A01-01A
JA80
07A
J201
11B
START
GND
S1
PACK COVER
A3S3
COVER OPEN-START
COVER CLOSED
JA80
05A
SGV BOARD
26B
A10
28A
JA80-05B
- 9 SEC START PULSE
26A
JA80-06A
- START
DECK INTERLOCK
NO NORMAL
C
A1S4
MAINT.
NC
START
K5
RUN
K1
C6
292µF
P304
J304
DRIVE MOTOR
START
RUN
THERMO
PROTECT
DM1
LOCAL/REMOTE
SWITCH
L
R
L
R
FROM CONTROLLER
OR PRECEDING
DRIVE
JA82-31A
- SEQ PICK IN
04B
JA82-29B
- HOLD
03A
P303
J303
BRAKE ASSEMBLY
HB1
JA80-04B
+ BRAKE
- GND
HEADS LOADED
NC
C
LOADED
NO
A3S2
UNLOADED
BLOWER MOTOR
A1C5
4µF
P301
J301
START
RUN
DM1
SITE
POWER
CABLE
PHASE 1
PHASE 2 OR NEUTRAL
GROUND
TOP MOUNT
AC POWER 1
AC POWER 2
GROUND
A1FL1
3
4
AC
CB1
A1
A2
B1
B2
BLOWER MOUNT
AC POWER
AC POWER
GROUND
ELAPSED
TIME
M1
T
B
POWER SUPPLIES
CB2
1
2
TB1
TB1



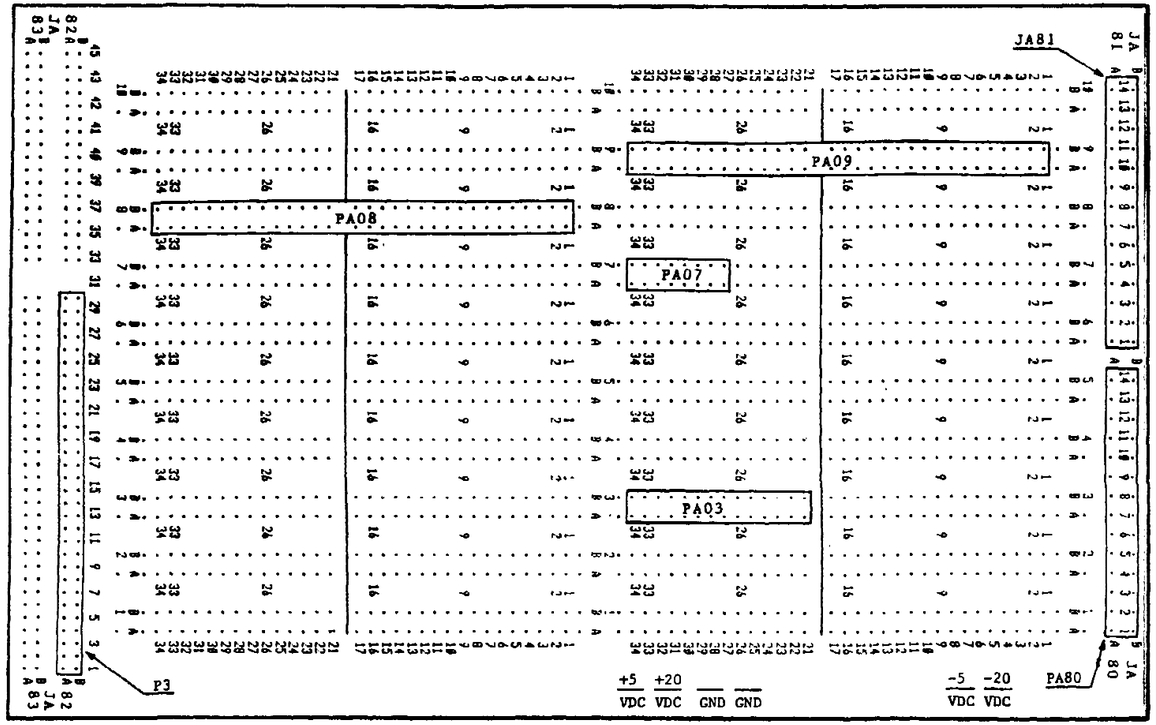
Change 2 FO-7: Cycle Up Seek Error Diagram



Change 2 FO-8: Normal Seek Function Diagram.



Change 2 FO-9: Disk Drive Data Flow Diagram


JA81
PA09
PA08
PA07
PA03
PA80
P3
+5 VDC
+20 VDC
GND
GND
-5 VDC
-20 VDC

PIN: 054938-000