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UPDATE NOTICE**

TSV05 Tape Transport Pocket Service Guide
EK-TSV05-PS-CN1
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Peel the back off this update notice and attach it to the inside front cover of your pocket service guide. Write the changes on the indicated pages in your pocket service guide.

CHANGED INFORMATION

Page ix: Model Variations – TS05-BA, Change TS05-AA + H9642 + 874A to TS05-AA + H9642 + 874D.

Page 6: First bulleted item – Change 874A to 874D.
First entry under Specifications – Change 874A to 874D.
Bottom of page – Change input current from 12 A to 24 A.

Page 7: Top of page – Change NEMA 5-15P to NEMA L5-30P.
Under Output Current – Change both occurrences of 12 A to 24 A.

Page 11: Table 3-2 header should read: LSI-11 Interface Control Module Factory Switchpack Settings (Address E57 = 772520, Vector E58 = 224).

Add an ending sentence to the NOTE that reads: For 22-bit addressing, the extended features switch E58-9 must be ON.

Page 30: Change the NOTE to read as follows:

NOTE

1. With tape placed in the sensor path and no BOT or EOT marker, the reading should be less than .5 volts.
2. With a BOT marker, the reading should be more than 2 volts.
3. Shielding the BOT and EOT sensors from ambient light may be necessary to avoid erroneous indications.

Page 41: Test 23 – Add this ending sentence to the opening statement: "It also may be used to demonstrate the tape drive 100 ips operation to a customer."

Page 83: Section 5.6.9 – Change the Read/Write Assembly part number from 29-24080 to 29-80682.

Page 93: Section 6.2 – Change Head Assembly part number from 29-24080 to 29-80682.

EK-TSV05-PS-004

**TSV05
Tape Transport**

**Pocket
Service
Guide**

Prepared by Computer Special Systems
of
Digital Equipment Corporation

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PREFACE

The *TSV05 Tape Transport Pocket Service Guide* enables field service engineers to troubleshoot and maintain the TSV05 tape transport subsystem to the field replaceable unit (FRU) level.

Additional documents that contain information about the TSV05 tape transport subsystem are:

- *TSV05 Tape Transport Subsystem User's Guide*
(EK-TSV05-UG-001)
- *TSV05 Tape Transport Subsystem Technical Manual*
(EK-TSV05-TM-001)
- *TSV05 Tape Transport Subsystem Installation Guide*
(EK-TSV05-IN-001)

Throughout this pocket service guide, references are made to the TSVO5 and the TS05. The TSV05 is a complete tape transport system that is compatible with the PDP-11/23 by way of the M7196 interface module. The TS05 is the tape transport only and it is an integral part of the TSV05 tape transport subsystem.

Model Variations:

- TS05-AA Tape Transport 120 V, 50/60 Hz
- TS05-AB Tape Transport 240 V, 50/60 Hz
- TS05-AC Tape Transport 100 V, 50/60 Hz
- TS05-AD Tape Transport 220 V, 50/60 Hz
- TS05-BA TS05-AA + H9642 + 874A
- TS05-BB TS05-AB + H9642 + 874B
- TS05-BD TS05-AD + H9642 + 874B
- TSV05-AA TS05-AA + M7196 + cables

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- TSV05-AB TS05-AB + M7196 + cables
- TSV05-AC TS05-AC + M7196 + cables
- TSV05-AD TS05-AD + M7196 + cables
- TSV05-BA TS05-BA + M7196 + cables
- TSV05-BB TS05-BB + M7196 + cables
- TSV05-BD TS05-BD + M7196 + cables

1 INTRODUCTION AND DESCRIPTION

1.1 INTRODUCTION

This chapter gives a general description and a listing of the specifications for the TS05 tape transport. It also includes a feature summary of the TSV05 tape transport subsystem and the controls and indicators of the TS05 tape transport.

1.2 GENERAL DESCRIPTION

The TSV05 tape transport subsystem is a low cost, medium performance, 9-track, magnetic tape storage system designed for computer systems that use the LSI-11 bus, and is compatible with "MS" device driver software. Reading and writing are normally performed at a tape speed of 25 inches per second (in/s). Data is recorded at 1600 bits per inch (bits/in) and is phase encoded (PE) using standard format recording techniques as outlined by ANSI.

The TSV05 consists of a tape transport with an integral formatter and a single, quad-size, LSI-11 bus interface/controller module. This interface/controller module plugs into any quad-sized slot in an LSI-11 bus backplane.

1.3 GENERAL SPECIFICATIONS

(TS05 only)

Height:	22.23 cm (8.75 inches)
Width:	48.26 cm (19.00 inches)
Depth:	61.59 cm (24.25 inches)
Net weight:	36.36 kg (80.00 pounds)
Operating temperature:	15°C to 32°C (59°F to 90°F)
Relative humidity:	20% to 80% non-condensing
AC input power:	100, 120, 220, 240 Vac (+7% to -15%)

Input-line frequency: 49 to 61 Hz

Power consumption: 270 watts (maximum)

(M7196 only)

LSI-11 bus Loading: DC – one load
AC – three loads maximum

Power Consumption: +5 V, 6.5 A maximum

1.4 FEATURE SUMMARY

Tape loading: Automatic self threading

Tape speed: 63.5 cm/s (25 in/s)

NOTE

A tape speed of 254 cm/s (100 in/s) is optionally available with special software.

Rewind speed: 457 cm/s (180 in/s) average
731.52 m (2400 ft) reel

Data density: 1600 bits/in(phase encoded format)
ANSI X3.39 - 1973

Tape specification: Computer grade
(ANSI X3.4 – 1976)

Width: 1.27 cm (0.50 inches)

Thickness: 1.50 mil

Reel sizes: 17.78 cm (7.00 in) 182.88 m
(600 ft) capacity
21.69 cm (8.50 in) 356.76 m
(1200 ft) capacity
26.67 cm (10.50 in) 731.52 m
(2400 ft) capacity

1.5 CONTROLS AND INDICATORS

The TSV05 is easy to maintain and easy to operate. Figure 1-1 shows the control panel of the TSV05 with each switch and indicator identified. Table 1-1 explains the function of each switch and indicator.

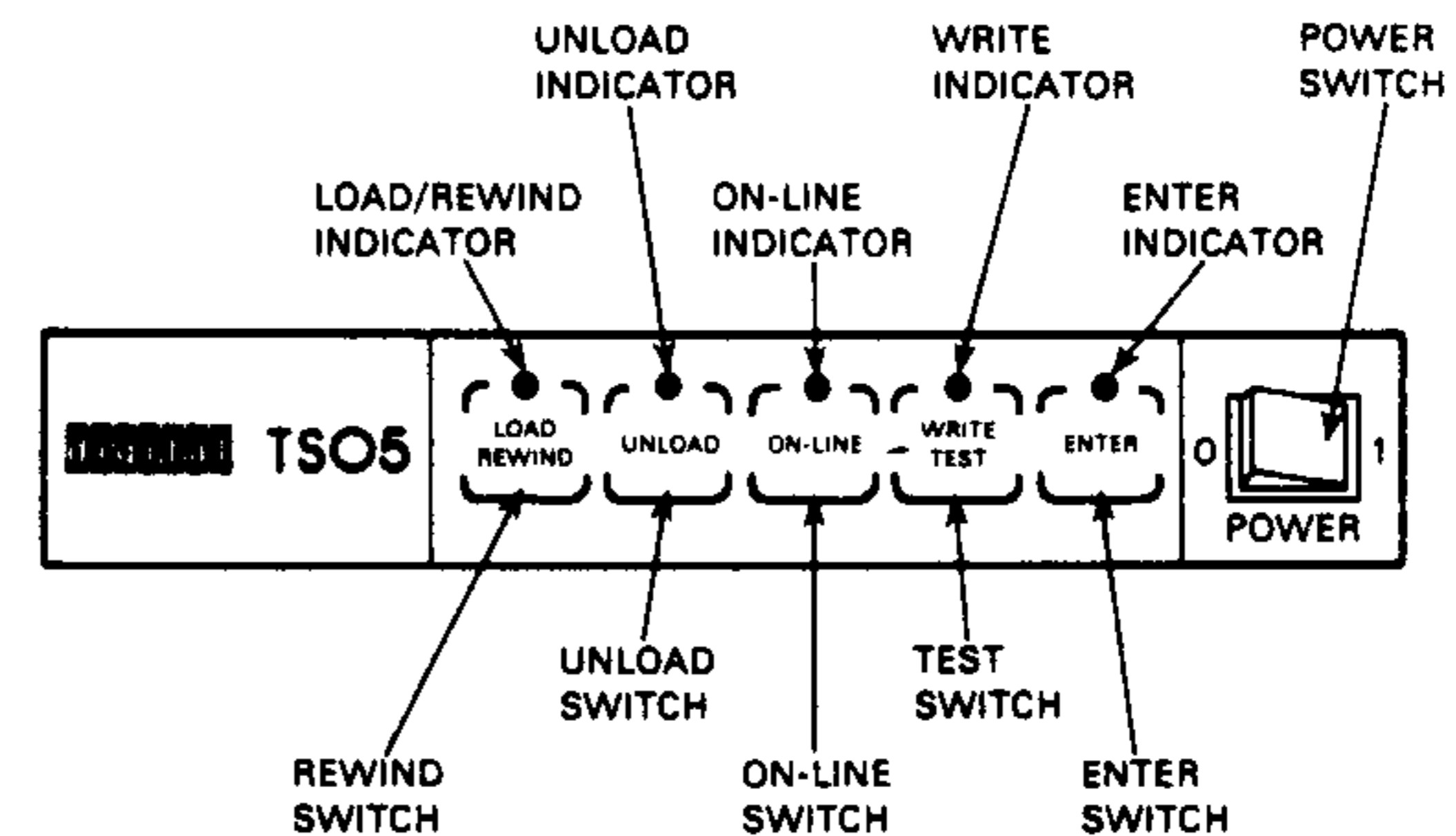


Figure 1-1 TSV05 Controls and Indicators

Table 1-1 TSV05 Controls and Indicators

Item	Function
Load/Rewind Indicator	When on, the beginning of tape (BOT) tab is positioned at the BOT photosensor. When flashing, the TSV05 is executing either a load sequence or a rewind sequence.
Unload Indicator	Flashes during an unload sequence. When the unload sequence is complete, the unload indicator remains on.
On-Line Indicator	When on, the TSV05 is in an operating mode and capable of communicating with the host controller. When off, the TSV05 cannot communicate with the host controller.
Write Indicator	When on, the TSV05 may be placed into the write mode of operation, placing information on the tape that is installed. (Write enable ring is installed on media.)
Enter Indicator	When on, a fault or test condition is present. This indicator, along with the other indicators, gives a faulted condition code.
Power Switch	Turns the TSV05 on or off. If the power switch is pressed to the right, power is applied to the TSV05. If the power switch is pressed to the left, power is removed from the TSV05.
Enter Switch	Used to enter test data.
Test Switch	Used to enter test data.

4 INTRODUCTION

Table 1-1 TSV05 Controls and Indicators (Cont)

Item	Function
On-Line Switch	When pressed for the first time, the TSV05 is placed in an on-line condition and is able to communicate with the host controller. When pressed for the second time, the TSV05 is placed in an off-line condition and is unable to communicate with the host controller.
Unload Switch	When pressed, the tape unloads from any point. The tape rewinds and unloads automatically. When the tape is unloaded, the access door unlocks, allowing access to the tape reel.
Rewind Switch	When pressed, the tape rewinds to the BOT marker on the tape.

2 SYSTEM CONFIGURATION

2.1 INTRODUCTION

The TSV05 tape transport subsystem consists of a tape transport with an integral formatter and a single, quad-size, LSI-11 bus interface/controller module (M7196). The M7196 plugs into any quad-sized slot in an LSI-11 bus backplane and communicates with one tape transport. The M7196 is electrically and functionally compatible with the "Q22" version of the LSI-11 bus (it can generate 22-bit addresses in order to read and write data that is located in the CPU main memory).

The TSV05-A tape transport subsystem is made up of the following components:

- M7196 control module
- TS05-A tape transport
- Two 70-16855-08 cables

The TSV05-B tape system includes the following additional components:

- 874 power controller
- H9642 cabinet

Refer to Figure 2-1 for the TSV05 tape transport subsystem block diagram.

2.2 POWER CONTROLLERS (874A AND 874B)

The 874 power controller serves two basic functions on the TSV05-B system:

- Provides a convenient ac power distribution point, and
- Filters the ac power source for the TSV05.

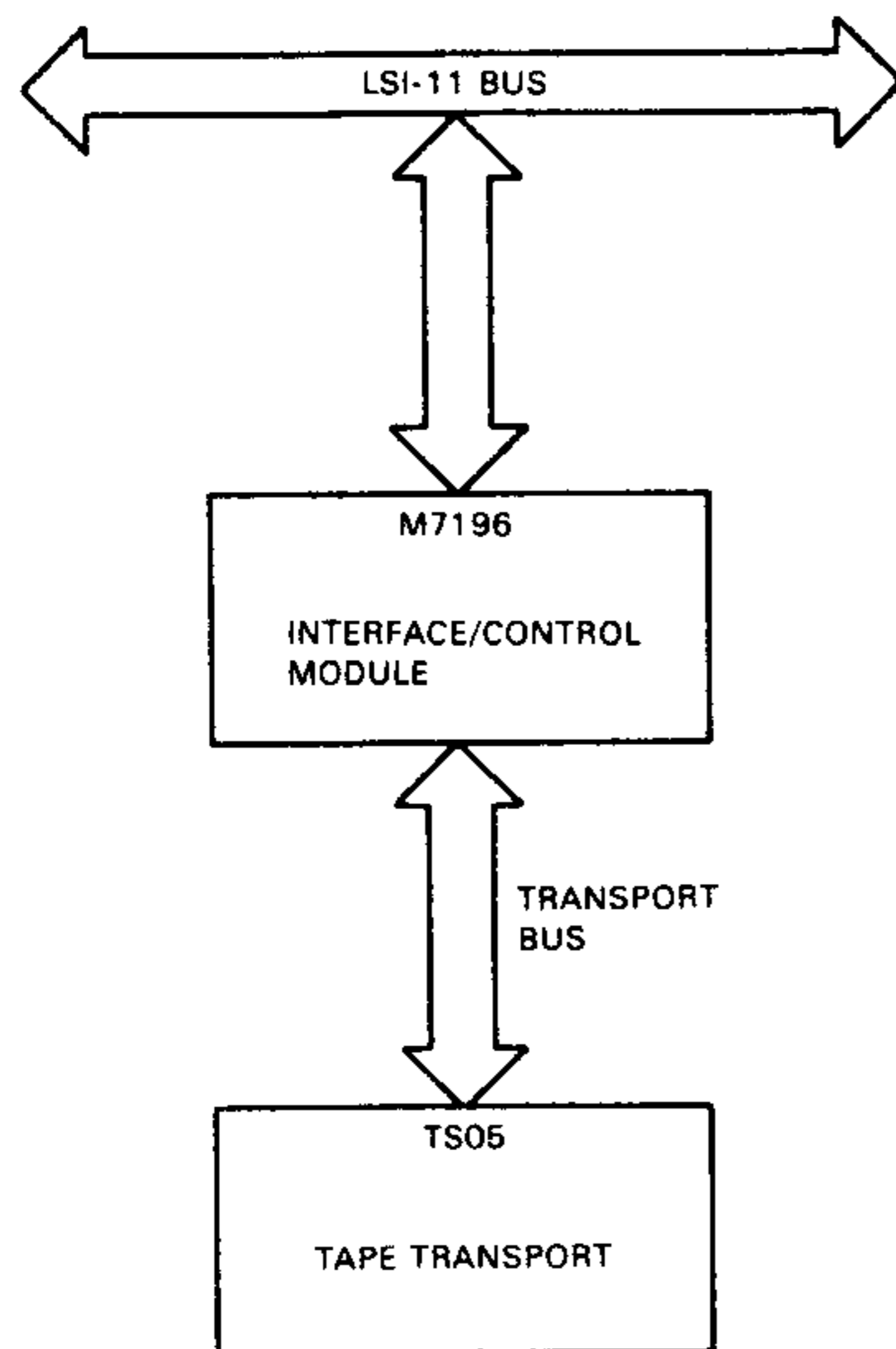


Figure 2-1 TSV05 Tape Transport Subsystem Block Diagram

There are two different 874 power controllers used on the TSV05-B systems:

- 874A – Usually present on units that remain in the United States.
- 874B – Usually present on units that ship outside the United States.

Specifications

874A







Input voltage: 90 to 132 V (single phase) measured phase to neutral.

Input frequency: 47 to 63 Hz

Input current: 12 A at 120 Vac

Power cord and plug:

3-wire #14 A.W.G.
NEMA 5-15P™ (Figure 2-2)

SOURCE	PLUG	RECEPTACLE	USED ON
120V 15A 1-PHASE	 NEMA #5-15P DEC #90-08938	 5-15R 90-08939	874A
120/208V 30A 1-PHASE	 NEMA #L5-30P DEC #12-11193	 L5-30R 12-11194	874D UNITS BUILT PRIOR TO FEB 83
220/240V 15A 1-PHASE	 NEMA #6-15P DEC #90-08863	 6-15R 12-11204	874B

MK-3689

Figure 2-2 874-B and 874-D Plug and Cable Configurations

Output voltage: 90 to 132 V

Output frequency: 47 to 63 Hz

Output Current: 12 A per outlet at 120 V. (Total load current not to exceed 12 A.)

874B

Input voltage: 180 to 264 volts (single phase) measured phase to neutral.

Input frequency: 47 to 63 Hz

Input current: 12 A at 240 Vac

Power cord and plug: 3-wire #14 A.W.G.
NEMA 6-15P™ (Figure 2-2)

Output voltage: 180 to 264 volts

NEMA 5-15P™, 6-15P™, and L5-30P™ are trademarks of the Barber Electric Manufacturing Co.

8 SYSTEM CONFIGURATION

Output frequency: 47 to 63 Hz

Output current: 12 A per outlet at 240 V. (Total load current not to exceed 12 A.)

2.3 TSV05 CABLING AND INTERCONNECTING

Figure 2-3 shows the proper cabling of the TSV05 tape drive to the 874 power controller and to the M7196 control module.

NOTE

The TSV05 tape drive power cord (which is eight feet long), is always connected to a "switched" source on the 874 power controller.

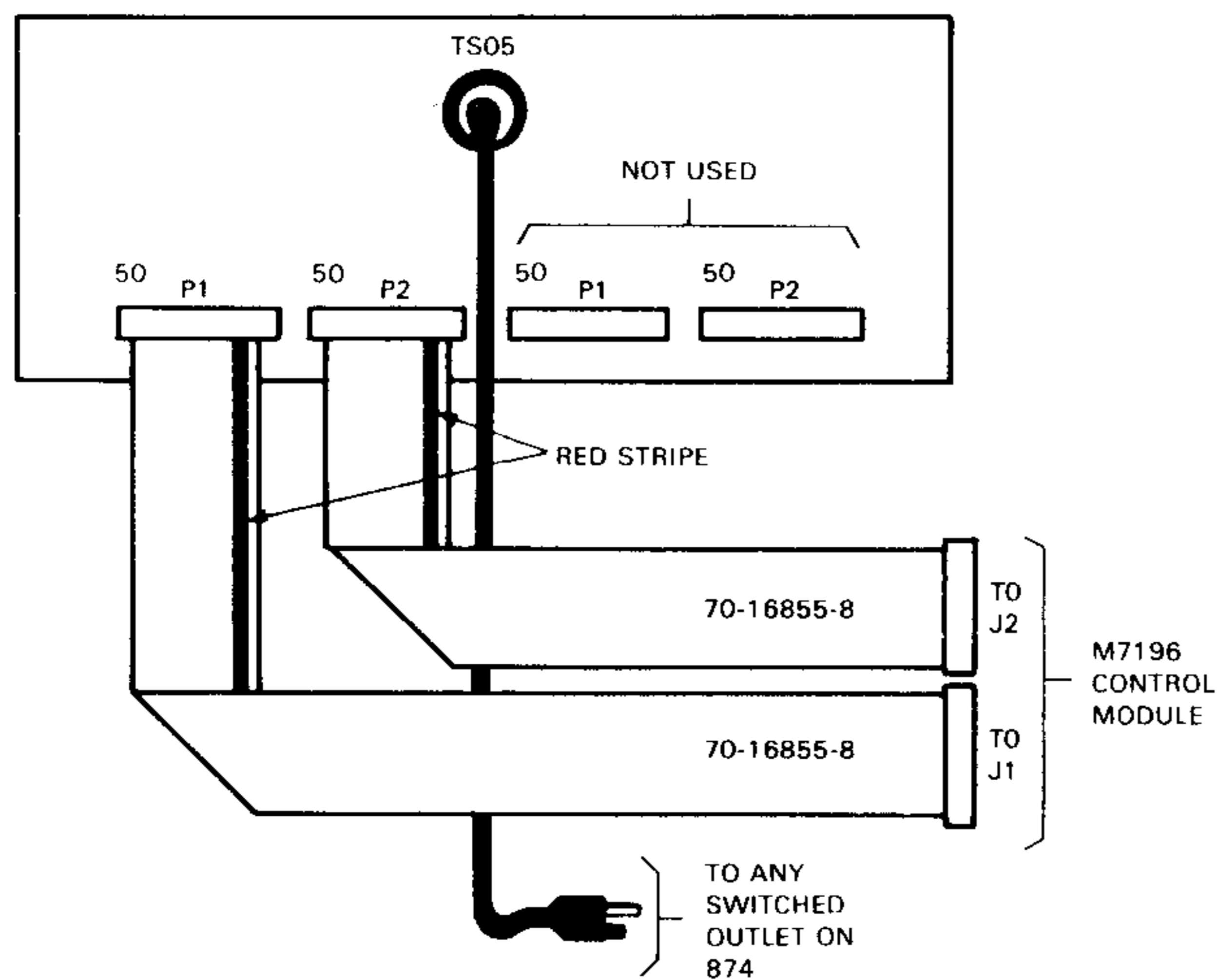


Figure 2-3 TSV05 System Cabling (from the Rear of the TSV05 Tape Transport)

3 BOARD CONFIGURATION

3.1 INTRODUCTION

This chapter contains information about the drive/formatter module and the LSI-11 interface (M7196 control module).

3.2 DRIVE/FORMATTER MODULE [Figure 3-1 (29-24086)]

Refer to Table 3-1 for the factory switchpack settings on the drive/formatter module.

NOTE

The drive/formatter resistor termination packs must be installed for proper operation.

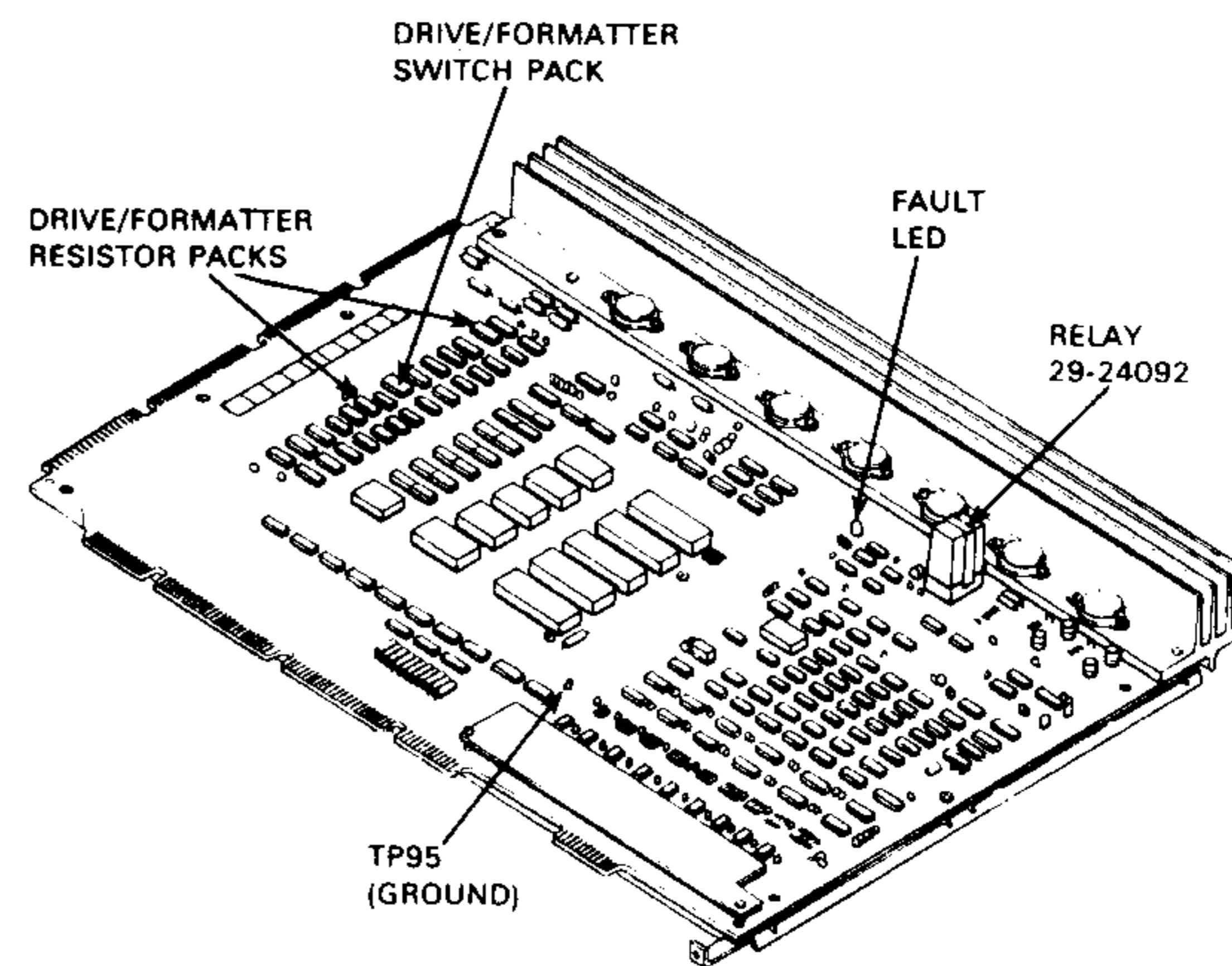


Figure 3-1 Drive/Formatter Module

Table 3-1 Drive/Formatter Module Factory Switchpack Settings

Switch	Setting	Function
S1	On	Unit select 0
S2	On	Unit select 1
S3	Off	Special IRG
S4	On	Unit select 2
S5	On	External parity select
S6	Off	Internal parity generator
S7	Off	Reserved
S8	Off	Reserved

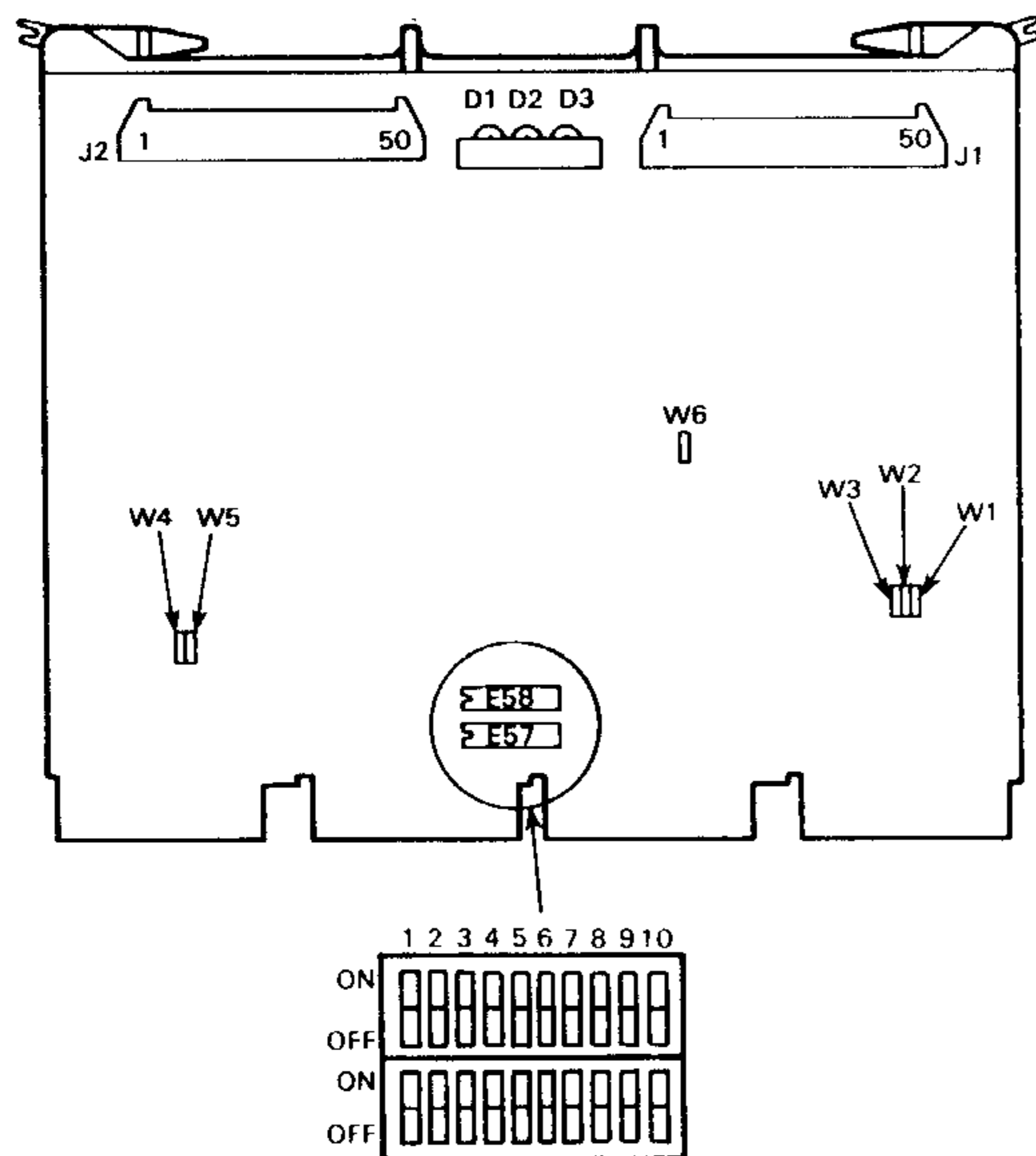
NOTE

Ensure that switch settings of all spare modules are in compliance with Table 3-1 before using.

3.3 LSI-11 INTERFACE CONTROL MODULE

[Figure 3-2 (M7196)]

Refer to Table 3-2 for factory switchpack settings on the LSI-11 interface control module.

**NOTE:**

FACTORY JUMPER CONFIGURATION IS:
W1, W2, AND W3 ARE REMOVED.
W4, W5, AND W6 ARE INSTALLED.

MK4813

Figure 3-2 LSI-11 Interface Control Module (M7196)

Table 3-2 LSI-11 Interface Control Module Factory Switchpack Settings (Address = 772520, Vector = 224)

Switch	Setting	Switch	Setting
E58-1	Off	E57-1	Off
E58-2	On	E57-2	On
E58-3	Off	E57-3	Off
E58-4	OFF	E57-4	ON
E58-5	On	E57-5	Off
E58-6	Off	E57-6	On
E58-7	On	E57-7	Off
E58-8	Off	E57-8	On
E58-9	Off	E57-9	Off
E58-10	On	E57-10	Off

On – Enabled
Off – Disabled

NOTE

E58-1 through 7, vector address (bit 8 through bit 2); E58-8, read/write buffering (normally off); E58-9, extended features (normally off); E58-10, address bit 12; and E57-1 through 10, address bits 11 through 2, respectively.

3.4 STANDARD ADDRESS ASSIGNMENTS

The standard addresses used for the LSI-11 interface module are listed below.

1st unit	772520
2nd unit	772524
3rd unit	772530
4th unit	772534

3.5 STANDARD VECTOR ASSIGNMENTS

The standard vectors used for the LSI-11 interface module are listed below.

1st unit	224
2nd unit	*
3rd unit	*
4th unit	*

* Rank of 37 in floating vector area starting at 300.

3.6 DRIVE/FORMATTER AND LSI-11 DIAGNOSTIC LED INDICATORS

Four LED indicators are available to help in fault isolation of errors in the TS05 tape transport. One LED is on the drive/formatter module and three LEDs are on the LSI interface module. The indication given by these LEDs, when used properly, will save time in troubleshooting.

3.6.1 Drive/Formatter Fault LED (Figure 3-1)

The drive/formatter fault LED is located on the right side of the module opposite the third power transistor, as counted from the front of the module, and about 2.54 cm (1 in) behind the module relay, as viewed from the front of the TS05. The following is a listing of the indication.

Off = Normal condition

On = When the fault LED on the drive/formatter module is lit, the following conditions exist:

- Microprocessor problem, or
- Power problems within the TS05. (Refer to Table 4-1)

NOTE

When this LED is lit, the tape will not move.

3.6.2 LSI-11 (M7196) Controller LEDs (Figure 3-2)

The LSI-11 interface controller module has three LEDs located between J1 and J2 of the module. The following is a listing of the indications.

D1

Off = Normal condition

On = Indicates that the subsystem ready bit 7 is a logic zero

D2

Blinking = Normal condition (this exists during self-test diagnostics)

On = Indicates an error in the self-test diagnostics

D3

Off = Normal condition (this indicates that the tape subsystem is idle)

On = Indicates that the TS05 is causing the LSI-11 bus to hang-up



4 TROUBLESHOOTING AND DIAGNOSTICS

4.1 INTRODUCTION

This chapter aids in diagnosing common TS05 tape transport hardware problems.

4.2 SYSTEM TROUBLESHOOTING PRECHECKS

Before using the troubleshooting or diagnostic routines, perform the following:

- Inspect the entire TS05 tape transport for signs of damage or overheated components.
- Check system/module cables for loose connections or damaged cables/wires. (Replace as needed.)
- Verify the symptoms as given by the customer before removal/replacement procedures are performed.
- Listen for unusual noises while the TS05 tape transport is operating. These may indicate mechanical malfunctions.

NOTE

After performing any maintenance procedure, proper system operation must be verified before the TSV05 tape transport subsystem is returned to the customer.

4.3 SYSTEM TROUBLESHOOTING

Table 4-1 lists hardware problems which can be traced to a failing system field replaceable unit (FRU). Table 4-1 lists the symptoms in the following categories:

- Power problems,
- Tape loading problems,
- Tape reading problems,
- Tape writing problems, and
- Tape rewind problems.

The table lists a symptom, a possible cause of the symptom, and the corrective action for the possible cause. The corrective actions are printed in *Italics*.

Table 4-1 TSV05 Tape Transport Troubleshooting Chart

Symptom	Possible Cause/Corrective Action
NOTE If you have an error that cannot be cleared, perform the following:	
<ul style="list-style-type: none"> • Power down the TS05 tape transport, • Press and hold the test button, • Power up the TS05 tape transport, and • Release the test button after five seconds. 	
If the error is not cleared by this procedure, replace the drive/formatter module.	
Power Problems	
TSV05 will not turn on.	Power cord is disconnected from power source or fuse located in the power supply is bad. <i>Connect power cord to power source or replace the bad fuse.</i>
Front panel indicators remain on.	Power supply assembly problem. <i>Replace the TS05 drive/formatter module or power supply assembly.</i>
Front panel indicators remain off.	1. Power supply assembly problem. <i>Replace power supply assembly.</i>
Front panel indicators come on for approximately one second and then go off.	2. AC power switch problem. <i>Replace ac power switch.</i> 3. Front panel switch problem. <i>Replace front panel switch.</i>
Front panel indicators come on for approximately one second then go off briefly, only to come back on and remain on.	Drive/formatter logic problem. <i>Replace the TS05 drive/formatter module.</i>

Table 4-1 TSV05 Tape Transport Troubleshooting Chart (Cont)

Symptom	Possible Cause/Corrective Action
NOTE If you have an error that cannot be cleared, perform the following:	
<ul style="list-style-type: none"> • Power down the TS05 tape transport, • Press and hold the test button, • Power up the TS05 tape transport, and • Release the test button after five seconds. 	
If the error is not cleared by this procedure, replace the drive/formatter module.	
Tape Loading Problems	
CAUTION If for any reason the top cover of the TS05 must be opened when troubleshooting problems dealing with tape loading, the interlock circuits of the TS05 must first be overridden. To override the TS05 interlock circuits, run test 33 (Section 4.8.8).	
All indicators except load are flashing.	BOT marker was not detected within the first 10.67 m (35 ft) of the tape. <i>Check the tape for the BOT marker. Refer to test 22 to check the BOT sensor.</i>
All indicators except unload are flashing.	1. Tape reel inserted upside-down. <i>Insert the reel correctly.</i> 2. Either the tape-in-path sensor or the photo-transistor failed. <i>Refer to test 31 to check the tape-in-path sensor.</i>
All indicators except test are flashing.	Load operation attempted without a reel of tape inserted in the TS05. 1. <i>Open the top cover; verify that the reel is seated on the supply hub. If not, try the load operation again. During load operation, verify supply servo rotates in counterclockwise direction. Refer to test 11 to check the supply servo.</i> 2. <i>If reel is seated and the supply hub is rotating counterclockwise, refer to test 31 to check the reel seat sensor.</i>

Table 4-1 TSV05 Tape Transport Troubleshooting Chart (Cont)

Symptom	Possible Cause/Corrective Action
Load and unload indicators are flashing.	The TS05 has detected more than 1127 m (3500 ft) of tape beyond the BOT marker. <ol style="list-style-type: none"> Usually caused by a long reel of tape. Try a different reel of tape. Refer to test 14 to check the tachometer position logic.
On-line indicator is flashing.	Tension arm movement has exceeded the range of normal operation during the load sequence. <p><i>Only occurs during load operation. Open the top cover and verify that the tape is properly wrapped around the take-up hub. If so, check the compliance arm and run test 24.</i></p>
Unload and on-line indicators are flashing.	The TS05 has received a write command with a write-protected reel of tape loaded on the TS05. <ol style="list-style-type: none"> Reset error code and reload tape. If the write test indicator is off, refer to test 31 to check the file-protect sensor. If the write test indicator is on, run logic diagnostics to check the interface line to the controller.
Unload and test indicators are flashing.	The digital-to-analog converter failed to zero on power up. <p><i>Replace the drive/formatter module.</i></p>
Test indicator is flashing.	Failure of supply hub lock mechanism occurred. <ol style="list-style-type: none"> Failure only occurs during the loading sequence. If the reel appears to lock correctly, refer to test 11 to check the D/A converter. Refer to test 32 to check the hub lock solenoid.
Load, unload, and test indicators are flashing	Take-up servo EMF is not in agreement with the digitally derived velocity reference during tape-load operation

Table 4-1 TSV05 Tape Transport Troubleshooting Chart (Cont)

Symptom	Possible Cause/Corrective Action
	<ol style="list-style-type: none"> Failure only occurs during loading operation. If take-up hub is rotating, failure is in tachometer circuit. If take-up hub is not rotating, refer to test 11 to check the take-up servo. Refer to test 14 to check the tachometer.
Load and enter indicators are flashing.	The servo tension arm has exceeded its free travel limits during any operation except those functions of the load and unload sequence where tape tension is not under arm control. <ol style="list-style-type: none"> If the TS05 missed the BOT or EOT markers, replace the drive/formatter module or sensor. Refer to test 24 to check the compliance arm. Refer to test 11 to check the servos and the D/A converter.
Doors do not lock or unlock. Operator unable to insert tape into the TS05.	Door lock malfunctioning. <p><i>Refer to test 32 to check the door lock.</i></p>
When drive is placed on-line, the tape unloads.	Transport will not operate in an on-line mode. <p><i>Disconnect the cables between the TSV05 and the computer system. If the problem still exists, replace the drive/formatter module.</i></p>
All indicators are flashing.	<ol style="list-style-type: none"> After four automatic retries, the transport cannot successfully complete the load sequence. <p><i>Remove the damaged tape leader and replace the BOT marker.</i></p> Tape leader may be excessively damaged. <p><i>Remove the damaged tape leader and replace the BOT marker.</i></p>
All indicators except	Load operation attempted with the front on-line are flashing. panel door or top cover open. <p><i>Refer to test 32 to check the door lock.</i></p>

Table 4-1 TSV05 Tape Transport Troubleshooting Chart (Cont)

Symptom	Possible Cause/Corrective Action
NOTE If you have an error that cannot be cleared, perform the following:	
<ul style="list-style-type: none"> • Power down the TS05 tape transport, • Press and hold the test button, • Power up the TS05 tape transport, and • Release the test button after five seconds. 	
If the error is not cleared by this procedure, replace the drive/formatter module.	
Tape Reading Problems	
Load and on-line indicators flashing.	TSV05 has received interface commands prior to completion of previous commands. IGO should not go true until IDBSY goes false. <ol style="list-style-type: none"> 1. Usually caused by system failure. 2. Refer to logic diagnostics to check the interface signal IDBSY.
Load, unload, and on-line indicators flashing.	Illegal or undefined command was received by the TSV05. Check cables and interface command lines.
Unload, on-line, and test indicators are flashing.	Because of controller error, tape travel beyond the EOT marker has exceeded 18 feet. Refer to logic diagnostics to check IEOT interface line. This can be caused by faulty software.
Unload and enter indicators are flashing.	Tape speed variations occurred in excess of 10% deviation from normal operating speed. Problem usually caused by a bad tachometer assembly when drive is under system operation. A tachometer test is performed as part of the power-up diagnostic routine and may be bypassed to allow access to other diagnostic tests by pressing the test switch for 5 seconds during power-up. <ol style="list-style-type: none"> 1. If failure occurs during power-up, check that take-up hub moves momentarily counterclockwise during power-up. If not, refer to test 11 to check the take-up servo. 2. Refer to test 14 to check the tachometer.

Table 4-1 TSV05 Tape Transport Troubleshooting Chart (Cont)

Symptom	Possible Cause/Corrective Action
	3. This test will fail if the take-up hub shipping material is not removed.
Read errors during system operation.	System is unable to complete data transfer. To determine if errors are caused by read logic, try to read a known good tape. If errors still occur, replace the control module.
TSV05 "run away" with data busy false.	Transport formatter no longer controlling the tape motion. Refer to test 14 to check the tachometer.
Transport "run away" with data busy true.	Transport formatter no longer controlling tape motion. If transport was executing read operation when run away occurred, check the read formatter. Refer to test 23 to check the read formatter because this indication can be caused by trying to read a blank tape.
NOTE If you have an error that cannot be cleared, perform the following:	
<ul style="list-style-type: none"> • Power down the TS05 tape transport, • Press and hold the test button, • Power up the TS05 tape transport, and • Release the test button after five seconds. 	
If the error is not cleared by this procedure, replace the drive/formatter module.	
Tape Writing Problems	
Transport ignores all commands sent by the controller or transport executes a command other than the command issued by the controller.	System unable to initiate any remote commands. Check interface cable connection between the TSV05 and the controller. Check the command lines.
System is unable to select transport.	Invalid status indications from transport to controller. Check the interface cable connection to the TSV05. Check the transport unit switch settings.

Table 4-1 TSV05 Tape Transport Troubleshooting Chart (Cont)

Symptom	Possible Cause/Corrective Action
Write errors occur during system operation.	System is unable to complete data transfer. <i>To determine if errors are caused by the write logic, try to write on another tape. If able to create on a different tape, replace the defective tape. Refer to the TSV05 Tape Transport Subsystem User's Guide (EK-TSV05-UG) and clean the transport.</i>

NOTE

If you have an error that cannot be cleared, perform the following:

- Power down the TS05 tape transport,
- Press and hold the test button,
- Power up the TS05 tape transport, and
- Release the test button after five seconds.

If the error is not cleared by this procedure, replace the drive/formatter module.

Tape Rewind Problems

Load, on-line, and test indicators are flashing.	Supply reel did not remain locked during tape unload operation. <ol style="list-style-type: none"> 1. If last command sent to the TSV05 was an unload command, refer to tests 22 and 23 to verify that the EOT/BOT sensors are working properly. 2. If drive failed during normal system operation, refer to test 32 to check hub solenoid.
Tape reel cannot be removed from the TS05.	Tape is not wound completely on supply reel of tape reel. <ol style="list-style-type: none"> 1. Following an unload operation, ensure that the tape is wound completely on supply reel. Refer to test 22 and test 23 to check EOT/BOT sensors. 2. Refer to test 11 to check the take up servo circuit. 3. If a power failure has occurred, close the top cover and front door and press unload.

Table 4-1 TSV05 Tape Transport Troubleshooting Chart (Cont)

Symptom	Possible Cause/Corrective Action
	Tape is wound completely on supply reel. <i>If tape is completely wound on supply reel, the tape reel should be unlocked. Refer to test 32 to check hub lock.</i>

NOTE

The supply hub can be manually actuated as follows:

- Power down the TS05 tape transport,
- Open the top cover and front door,
- Press the white button to the left of the tape loading label, and
- Manually turn the tape reel to lock or unlock the three pawls.

4.4 ERROR CONDITIONS

An error condition is indicated by either a steady flashing of the TS05 front panel lights or by a quick, double-pulse flashing of the front panel lights.

Whenever an error condition is present, refer to Table 4-1 for the indication and the corrective action to be performed. If the indication and corrective action cannot be found in Table 4-1, clear the TS05 by performing the following:

1. Power down the TS05,
2. Press and hold the test button on the TS05 front panel,
3. Power up the TS05, and
4. Release the test button after five seconds.

NOTE

If the error condition is not cleared by the above procedure, power down the TS05 and replace the drive/formatter module.

4.5 TSV05 SERVICE AID DIAGNOSTICS

The TSV05 service aid diagnostics are both simple to use and comprehensive. In order to simplify the descriptions of the diagnostics, they are divided into the following:

- Manual service aid diagnostic loading (Section 4.6),

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- TS05 service aid microdiagnostics (Section 4.7),
- TS05 service aid diagnostics run with the tape unloaded (Section 4.8), and
- TS05 service aid diagnostics run with the tape loaded (Section 4.9).

NOTE

Before any diagnostic can be run, the TSV05 must first be placed off-line. (This is for the self-test diagnostics only.) To place the TSV05 off-line, press the on-line indicator switch if it is lit. If it is not lit, the TSV05 is already off-line.

4.6 MANUAL SERVICE AID DIAGNOSTIC LOADING

Before any manual service aid diagnostics can be run on the TS05, they must first be manually loaded into the TS05. The following sequence is used to load all manual service aid diagnostics. (Refer to Figure 4-1 for the different switch locations).

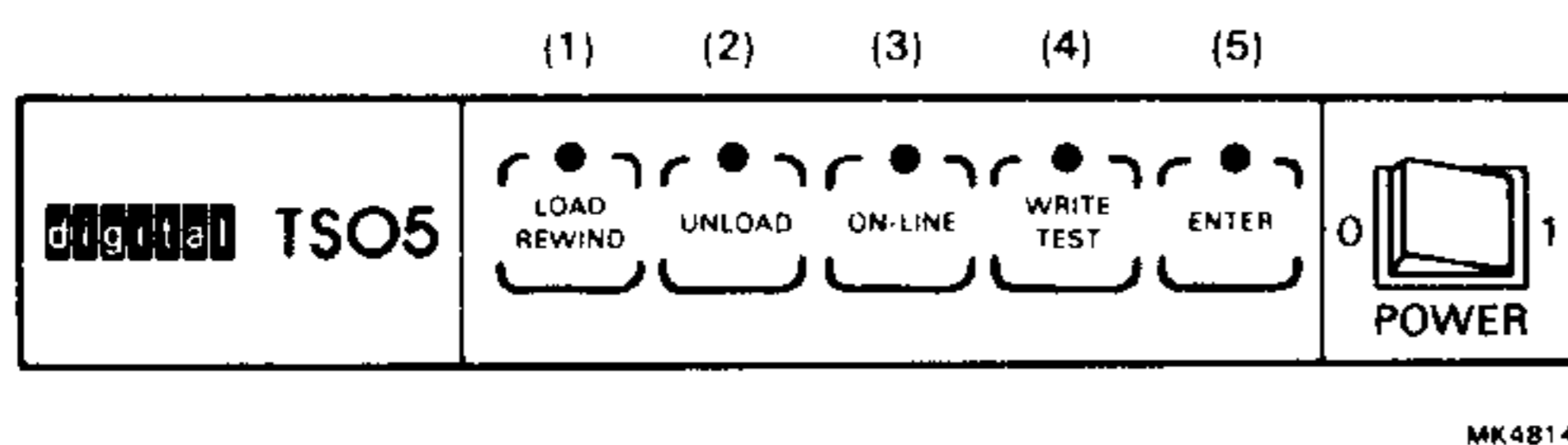


Figure 4-1 TS05 Front Panel Controls and Indicators

1. Turn power on,
2. Press write/test (4),
3. Press enter (5),
4. Press the switch combination(s) that correspond to the test that is to be run,
5. Press enter (5) (this causes the diagnostic to start), and
6. Press write/test (4) (to exit the diagnostic).

NOTE

If while entering the service aid diagnostic you make a mistake, or it takes you longer than 3 seconds to enter a service aid diagnostics, wait for five seconds and then try again.

Example (no tape is loaded)

To manually load test 11 (the supply and take-up servo motor test), which causes the supply hub servo and the take-up hub servo to cycle through forward and reverse movements, proceed as follows:

1. Press test (4),
2. Press enter (5),
3. Press load (1),
4. Press load (1), and
5. Press enter (5).

4.7 TS05 SERVICE AID MICRODIAGNOSTICS

4.7.1 Self-Test

When the TS05 is powered up, a self-test is automatically performed to check the operation of the tape unit. During the power-up sequence, all indicator lights on the front panel remain lit for approximately one second. If after one second all indicators go out, except the unload indicator, the TS05 is operating correctly. If any other indicators remain lit, a failure has been detected by the built-in microdiagnostics. (Refer to Table 4-1 for a description of the error conditions as indicated by the front panel lights.)

4.7.2 Service Aid Diagnostic Mode Operations

The TS05 service aid diagnostics are separated into two groups:

- Diagnostics that run with tape unloaded, and
- Diagnostics that run with tape loaded.

4.8 TS05 SERVICE AID DIAGNOSTICS RUN WITH TAPE UNLOADED**NOTE**

If you must observe mechanical operations while any diagnostic is running, perform the following before loading the diagnostic:

Press write/test, press enter, press on-line, press on-line, press enter, and place the TS05 in the operator maintenance access position (Section 5.2.2).

4.8.1 Test 11 (Supply and Take-up Servo Motor Tests)

This test is used to check the supply servo circuits and the take-up servo circuits.

The servo motors are sequenced to rotate in the forward or clockwise (CW) direction and in the reverse or counter-clockwise (CCW) direction.

To load test 11, perform the following:

1. Press write/test,
2. Press enter,
3. Press load/rewind,
4. Press Load/Rewind, and
5. Press enter.

Corrective Action

1. Replace the drive/formatter module,
2. Replace the supply motor that does not turn, and
3. Replace the take-up motor.

4.8.2 Test 14 (Tachometer Test)

This is an eight-part diagnostic that tests the tachometer assembly in its four quadratures of operation, in both the clockwise (CW) and counterclockwise (CCW) directions. Therefore, only the take-up servo is activated during this diagnostic.

During the first five seconds, all TS05 front panel lights are on. After five seconds, the first part of a four-part diagnostic (CW) starts automatically. After each section of the diagnostic is complete the front panel lights indicate the results of the quadrature test.

To initiate the additional subtests in quadratures 2, 3, and 4 (in both CW and CCW directions), press the load/rewind switch after the panel read-out is read.

NOTE

A good test result is when the front panel lights of the TS05 indicate a decimal value greater than 2. If a decimal value of less than 3 is indicated or if all the front panel lights are flashing, replace the tachometer assembly.

Example

Good Indication

Load

		Write		
Rewind	Unload	On-Line	Test	Enter
(1)	(2)	4)	(8)	16)
*		*		

*

*

NOTE

The binary count value, as indicated by the LEDs in this example, equals 5.

Bad Indication

Load			Write	
Rewind	Unload	On-Line	Test	Enter
(1)	(2)	(4)	(8)	(16)
	*			

*

* Light on

NOTE

The binary count value, as indicated by the LEDs in this example, equals 2.

To load test 14, perform the following:

1. Press write/test,
2. Press enter,
3. Press load/rewind,
4. Press write/test, and
5. Press enter.

Corrective Action

1. Replace the drive/formatter module, and
2. Replace the tachometer.

4.8.3 Test 22 (BOT Sensor Test)

This test is used to display the output voltage of the BOT sensor via the front panel indicators. To avoid erroneous indications, shield the EOT/BOT sensor from all light. The output of the BOT/EOT sensor can be monitored by converting the front panel indication to an voltage level by the following equation:

$$(\text{Binary Count}) \times (.16) = \text{Output Voltage}$$

Example

Load/rewind – off	= 0 binary count
Unload – on	= 2 binary count
On-line – on	= 4 binary count
Write/test – off	= 0 binary count
Enter – on	= 16 binary count

$$22 \times .16 = 3.52 \text{ volts}$$

NOTE

1. With no tape placed in the sensor path, the reading should be above 2 volts.
2. With a BOT marker, the reading should be less than .5 volts.

To load test 22, perform the following:

1. Press write/test,
2. Press enter,
3. Press unload,
4. Press unload, and
5. Press enter.

Corrective Action

1. Replace the EOT/BOT sensor and
2. Replace the drive/formatter module.

4.8.4 Test 23 (EOT Sensor Test)

This test is identical to test 22, except that the EOT circuit is checked for proper operation.

To load test 23, perform the following:

1. Press write/test,
2. Press enter,
3. Press unload,
4. Press on-line, and
5. Press enter.

Corrective Action

1. Replace the EOT/BOT sensor, and
2. Replace the drive/formatter module.

4.8.5 Test 24 (Compliance Arm Tension Test)

This test measures the tension arm transducer voltage and displays a binary code equal to the voltage. This binary code is displayed on the TS05 front panel. The following indicators are used:

1. Load/rewind,
2. Unload,
3. On-line, and
4. Write/test.

In order to properly display the transducer voltage, eight indicators are needed. Since the TS05 only has four indicators that can be used to display the binary code, the eight bit code is broken into high-order and low-order information (the higher order bits are displayed when the enter LED is lit).

To read the transducer output voltage code; perform the following in sequence:

1. Place the TS05 in the operator maintenance access position (Section 5.2.1);
2. Ensure that the compliance arm is at its rest position (back toward the take-up hub, as far as it will go);
3. Press the following in sequence:
 - a. Write/test,
 - b. Enter,
 - c. Unload,
 - d. Write/test, and
 - e. Enter.
4. Read and record the binary code of the front panel indicators (the enter LED should be on);

NOTE

If an indicator is on = 1; if an indicator is off = 0.

Example

Load/rewind – off = 0 (bit 4)
 Unload – on = 1 (bit 5)
 On-line – on = 1 (bit 6)
 Write/test – off = 0 (bit 7)

5. Press load, (the enter indicator goes out);
6. Read and record the binary code of the front panel indicators;

Example

Load/rewind – off = 0 (bit 0)
 Unload – on = 1 (bit 1)
 On-line – off = 0 (bit 2)
 Write/test – off = 0 (bit 3)

7. Combine the readings of the front panel indicators into one binary code that is eight bits long; and

Example

Bit	7	6	5	4	3	2	1	0
	0	1	1	0	0	0	1	0

NOTE

Bit 7 represents a –5 V value, and bits 6 through 0 represent a binary count that is multiplied by +.04 V.

8. Calculate the decimal readout in the following manner:

Decimal							
Value	64	32	16	8	4	2	1
Bits	7	6	5	4	3	2	1 0
(MSB)	0	1	1	0	0	0	1 0 = 98
	98 × .04 = 3.92 volts						

NOTE

When set, bit 7 indicates a value of -5 V. Therefore; if bit 7 is set, the above value is -1.08 V.

(The normal voltage range is between 0.46 and $+4.96$ volts. While holding the compliance arm against the forward stop, the reading will be approximately 3.0 volts less.)

Corrective Action

1. Check to see that the non-metallic dielectric of the capacitor plate assembly moves when the compliance arm is moved. Then, perform the compliance arm adjustment procedure in Appendix B,
2. Replace the drive/formatter module (Section 5.6.5), and
3. Replace the compliance arm assembly (Section 5.6.11).

4.8.6 Test 31 (Tape-In-Path Sensor Test)

The purpose of this test is to check the file-protect/reel-seat sensor and the tape-in-path sensor/phototransistor.

For ease of troubleshooting, test 31 is broken into the following sections:

- Reel-seat/file-protect sensor, and
- Tape-in-path/photo-transistor.

To load test 31, perform the following:

1. Press write/test,
2. Press enter,
3. Press on-line,
4. Press load/rewind, and
5. Press enter.

Reel-Seat/File-Protect Sensor Testing

1. Ensure that the write enable ring is properly installed on the tape being used to run this test,
2. Place the reel of tape onto the supply hub,
3. Load test 31,
4. Observe that the supply hub rotates CCW, and

NOTE

If the supply hub does not rotate properly, run test 11 (Section 4.8.1).

5. Observe that the unload LED flashes twice for every one revolution of the supply hub.

NOTE

If the unload LED flashes once for every revolution of the supply hub, remove the write enable ring from the tape and load test 31 again.

If the same indication occurs again, replace the supply hub assembly (Section 5.4.2).

If the unload LED does not flash, replace the reel-seat/file-protect sensor (Section 5.6.4).

Tape-in-Path Sensor/Photo-Transistor

Observe that the load/rewind LED is on. The load/rewind LED goes off when an object is placed between the tape-in-path sensor and the photo-transistor.

NOTE

If the load/rewind LED is off, replace both the tape-in-path sensor and the photo-transistor (Sections 5.6.2 and 5.6.3).

Corrective Action

1. Replace the tape-in-path sensor (Section 5.6.2) and photo-transistor (Section 5.6.3),
2. Replace the file-protect sensor (Section 5.6.4), and
3. Replace the drive/formatter module (Section 5.6.5).

4.8.7 Test 32 (Interlock Test)

This test causes the supply hub servo to rotate counterclockwise while activating the hub lock solenoid. The hub should come to a stop when the hub tap engages the bellcrank. The reel servo is momentarily reversed and the hub lock solenoid is disengaged. The hub is then positioned past the solenoid latch before it is reactivated and the cycle is repeated. During this test, the door interlocks are also checked. If both the top cover and front panel doors are not closed, the on-line indicator lights.

CAUTION

This test is intended for use by skilled technicians only. If this test is run repeatedly, damage to the door interlocks can result.

To load test 32, perform the following:

1. Press write/test,
2. Press enter,
3. Press on-line,
4. Press unload, and
5. Press enter.

Corrective Action

Replace the bad solenoid.



4.8.8 Test 33 (Interlock Disable Test)

This test disables both the top cover and front panel door interlocks to allow observation of the tape path during operation. Door interlocks are reactivated when the tape is unloaded.

To load test 33, perform the following:

1. Press write/test,
2. Press enter,
3. Press on-line,
4. Press on-line, and
5. Press enter.

Corrective Action

1. Run test 32 (Section 4.8.7) and
2. Replace the drive/formatter module (Section 5.6.5).

CAUTION

This test is to be used during service only.

4.8.9 Test 34 [Air Pump (Blower Motor) Test]

This test is used to check the operation of the air pump (blower motor). The load switch on the front panel controls the operation of the air pump. When the load indicator is on, the blower should be working.

To load test 34, perform the following:

1. Press write/test,
2. Press enter,
3. Press on-line,
4. Press write/test, and
5. Press enter.

Corrective Action

1. Replace the drive/formatter module (Section 5.6.5), and
2. Replace the air pump (Section 5.6.7).

4.9 TS05 SERVICE AID DIAGNOSTICS RUN WITH TAPE LOADED

NOTE

If you must observe mechanical operations while any diagnostic is running, perform the following before loading the diagnostic:

Press write/test, press enter, press on-line, press on-line, press enter, and place the TS05 in the operator maintenance access position (Section 5.2.2).

A rewind is automatically performed when you exit the following tests.

Test 21

This test is used whenever the read threshold is being adjusted and tape 29-11696 is to be used.

To load test 21, perform the following:

1. Press write/test,
2. Press enter,
3. Press unload,
4. Press load, and
5. Press enter.

Test 22

This test exercises the TS05 at both high-speed and low-speed and in both the forward and reverse directions. By cycling the tape in this manner, heavy diagnostic testing is simulated. As the tape approaches the end, the tape rewinds and the test is repeated. (The LEDs indicate the amount of compliance arm movement.)

NOTE

During this test a scratch tape must be used.

To load test 22, perform the following:

1. Press write/test,
2. Press enter,
3. Press unload,
4. Press unload, and
5. Press enter.

Test 23

This test is performed whenever the head adjustment procedure is being performed.

NOTE

Tape 29-19224 should be used during this test.

To load test 23, perform the following:

1. Press write/test,
2. Press enter,
3. Press unload,
4. Press on-line,
5. Press enter, and
6. Press load for 63.5 cm/s (25 in/s) or unload for 254 cm/s (100 in/s) to start tape motion.
7. Press load for 63.5 cm/s (25 in/s) or unload for 254 cm/s (100 in/s), to stop tape motion.

4.10 TSV05 LOGIC DIAGNOSTICS (HOST DIAGNOSTICS)

This section is a reference that should be used when host diagnostics are being run. All commands that must be entered by the operator (that is, system configurations, address locations, and so forth) are given in bold print.

The following is a list of the host diagnostics associated with the TSV05 tape transport subsystem:

- CVTSA,
- CVTSB,
- CVTSC,
- CVTSD, and
- CVTSE.

NOTE

The TSV05 logic diagnostics (host diagnostics) can be obtained through the normal software distribution channels.

4.10.1 Diagnostic Sequence

When an on-site call exists and the symptoms given by the customer are easily understood, run the diagnostics in the following order:

1. CVTSA,
2. CVTSB,
3. CVTSC,
4. CVTSD, and
5. CVTSE.

4.10.2 CVTSA (Test 1)

The following is seen on site when this diagnostic is run:

```
.R VTSA?? <RET>
DRS LOADED
DIAG. RUN-TIME SERVICES REV. D APR-79
CVTSA-A-0
**** TSV05 LOGIC DIAGNOSTIC ****
UNIT IS TSV05
DR>START/FLAG:PNT:HOE <RET>

CHANGE HW (L) ? Y <RET>

# UNITS (D) ? 1 <RET>

UNIT 0
DEVICE ADDRESS (TSBA/TSDB) (0) 172520 ? <RET>
INTERRUPT VECTOR (0) 224 ? <RET>

CHANGE SW (L) ? N <RET>

TST: 001 Initilization Test
TST: 002 Wrap Data -- High Byte Test
TST: 003 Wrap Data -- Low Byte Test
TST: 004 RAM Verification Test
TST: 005 Extended Initialization Test
TST: 006 Command Reject Test
TST: 007 Write Characteristics Test
TST: 008 Volume Check Test
TST: 009 Completion Interrupt Test
TST: 010 Basic Packet Protocol Test
TST: 011 Non-Tape Motion Commands Test
CVTSA EOP 1
0 CUMULATIVE ERRORS CTRL/C
DR>EXIT <RET>
```

NOTE

If any failure is detected during these tests, the corrective action is to replace the M7196 control module. An illegal interrupt to 100 indicates a free running clock. The clock must be disabled.

4.10.3 CVTSB (Test 2)

The following is seen on site when this diagnostic is run:

```
.R VTSB?? <RET>
DRS LOADED
DIAG. RUN-TIME SERVICES REV. D APR-79
CVTSB-A-0
**** TSV05 LOGIC DIAGNOSTIC ****
UNIT IS TSV05
DR>START/FLAG:PNT:HOE:UAM <RET>

CHANGE HW (L) ? Y <RET>

# UNITS (D) ? 1 <RET>

UNIT 0
DEVICE ADDRESS (TSBA/TSDB) (0) 172520 ? <RET>
INTERRUPT VECTOR (0) 224 ? <RET>

CHANGE SW (L) ? N <RET>

TST: 001 Initialization After WRITE CHARACTERISTICS Test
TST: 002 Basic WRITE SUBSYSTEM MEMORY Command Test
TST: 003 DMA Memory Addressing Test
TST: 004 RAM Exerciser Test
TST: 005 Extended Features Switch and Timers A,B Test
TST: 006 FIFO Exerciser Test
TST: 007 Static Transport Bus Interface Test
TST: 008 Transport Bus Interface Loopback Test
TST: 009 Read/Write Data Parity Test
TST: 010 Manual Intervention Test (Test Not Run)
TST: 011 Configuration Timeout Test (Test Not Run)
TST: 012 Scope Loops Test (Test Not Run)
CVTSA EOP 1
0 CUMULATIVE ERRORS CTRL/C
DR>EXIT <RET>
```

NOTE

If a failure occurs in TST: 001 through 009, the most likely FRU is the M7196 module. However, before replacing the M7196, remove the interconnecting cables and repeat the diagnostic. If the failure recurs, replace the M7196. Otherwise, the interconnecting cables are bad and need replacing.

4.10.4 CVTSC (Test 3)

CAUTION

Before running CVTSC, ensure the following:

The TSV05 is on-line and the tape is properly loaded.

The following is seen on site when this diagnostic is run:

```
.R VTSC?? <RET>
DRS LOADED
DIAG. RUN-TIME SERVICES REV. D APR-79
CVTSC-A-0
**** TSV05 LOGIC DIAGNOSTIC ****
UNIT IS TSV05
DR>START/FLAG:PNT:HOE <RET>

CHANGE HW (L) ? Y <RET>

# UNITS (D) ? 1 <RET>

UNIT 0
DEVICE ADDRESS (TSBA/TSDB) (0) 172520 ? <RET>
INTERRUPT VECTOR (0) 224 ? <RET>

CHANGE SW (L) ? <RET>

TST: 001 Initialization #4 Test
TST: 002 Off-Line And Reject Rewind Test
TST: 003 Basic Write Test
TST: 004 Basic Read Data (Forward and Reverse) Test
TST: 005 Space Records Test
TST: 006 Rereads Test
TST: 007 Write Data Retry Test
TST: 008 Write/Read Tape Mark Test
CVTSA EOP 1
0 CUMULATIVE ERRORS CTRL/C
DR>EXIT <RET>
```

NOTE

If diagnostics CVTSA and CVTSB run without error, 90% of the errors in CVTSC are caused by cable problems or tape transport problems.

1. If TST: 002 fails, check the drive/formatter module switch settings (Section 3.2).
2. If a failure occurs in TST: 003, TST: 007, or TST: 008, perform the following in the sequence given:

Clean the heads, use a new tape, and rerun the diagnostics that have failed.

4.10.5 CVTSD (Test 4)

The following is seen on site when this diagnostic is run:

```
.R VTSD?? <RET>
DRS LOADED
DIAG. RUN-TIME SERVICES REV. D APR-79
CVTSD-A-0
**** TSV05 LOGIC DIAGNOSTIC ****
UNIT IS TSV05
DR>START/FLAG:PNT:HOE <RET>

CHANGE HW (L) ? Y <RET>

# UNITS (D) ? 1 <RET>

UNIT 0
DEVICE ADDRESS (TSBA/TSDB) (0) 172520 ? <RET>
INTERRUPT VECTOR (0) 224 ? <RET>

CHANGE SW (L) ? N <RET>

TST: 001 Write Tape Mark Retry Test
TST: 002 Skip Tape Marks Test
TST: 003 NO-OP ("Clean Tape") and INITIALIZE Test
TST: 004 Erase And Operation Incomplete Test
TST: 005 Data Parity Test
TST: 006 Operations At EOT Test
TST: 007 Extended Mode Functions Test
TST: 008 Record Buffering Test
TST: 009 Function Timing Test
CVTSA EOP 1
0 CUMULATIVE ERRORS CTRL/C
DR>EXIT <RET>
```

NOTE

Ninety percent of all problems that result in errors while CVTSD is run are caused by either cable problems or tape transport problems.

1. If a failure occurs while running TST: 005, check the drive/formatter module switch settings (Section 3.2).
2. If a failure occurs in any of the test, except TST: 005, the most likely failed unit is the drive/formatter module.

4.10.6 CVTSE [Transport Data Reliability Test (Test 5)]

The transport data reliability test diagnostic (CVTSE) tests the functionality of the TSV05 in a "worse case" operating environment. This is accomplished by randomly generating records of random lengths and by generating random data at a random rate.

Example

```
DR>STA/FLA:PNT:HOE <RET>
CHANGE HW (L) ? Y <RET>
# UNITS (D) ? 1 <RET>

UNIT 0
DEVICE ADDRESS (TSBA/TSDB) (0) 172520 ? <RET>
INTERRUPT VECTOR (0) 224 ? <RET>
SELECT DRIVE 0 - 1 (0) ? 0 <RET>
CHANGE SW (L) ? N <RET>

TST: 001
      UNIT 0 TSV05 CODE LEVEL 001
      UNIT 0 TSV05 SWITCH SETTINGS 000
```

NOTE

000 = M7196 extended features and buffering off.

```
TST: 002
      (STATISTICAL TYPEOUT)
TST: 003
TST: 004
TST: 005

CVTSE EOP 1
0 CUMULATIVE ERRORS CTRL/C
DR>EXIT <RET>
```

The length of each diagnostic is determined by the execution time of each test as well as by the length of the tape.

Typical Test Execution Times (first pass)

```
Test 1 - CVTSA - 30 seconds
Test 2 - CVTSB - 45 seconds
Test 3 - CVTSC - 4 minutes
Test 4 - CVTSD - 20 minutes
Test 5 - CVTSE - 30 minutes
```


5 REMOVAL AND REPLACEMENT PROCEDURES

5.1 INTRODUCTION

This chapter contains the removal and replacement procedures for all electrical and mechanical assemblies contained in the control distribution kit (A2-W0560/10).

WARNING

Before performing any removal or replacement procedures, make sure that the TS05 tape transport is turned off and that the power cord is removed from the power source.

5.2 SERVICING PROCEDURES

The TS05 has two different service access positions. These positions must be used when performing the removal and replacement procedures. The different positions are:

- Operator maintenance access position (Section 5.2.1), and
- Service access position (Section 5.2.2).

5.2.1 Operator Maintenance Access Position (Figure 5-1)

The operator maintenance access position is used when the components on the top of the TS05 must be accessed, such as for cleaning.

To place the TS05 in the operator maintenance access position, perform the following:

1. Insert one hand through the front door and push upward on the top cover of the TS05.
2. Lift the top cover up into position (refer to Figure 5-1).
3. Lift, with the right hand, the top cover until the cover retainer (located at the left rear) moves freely.

WARNING

Use extreme care when placing the cover in the upright position. Hand injuries can result if the cover drops while servicing.

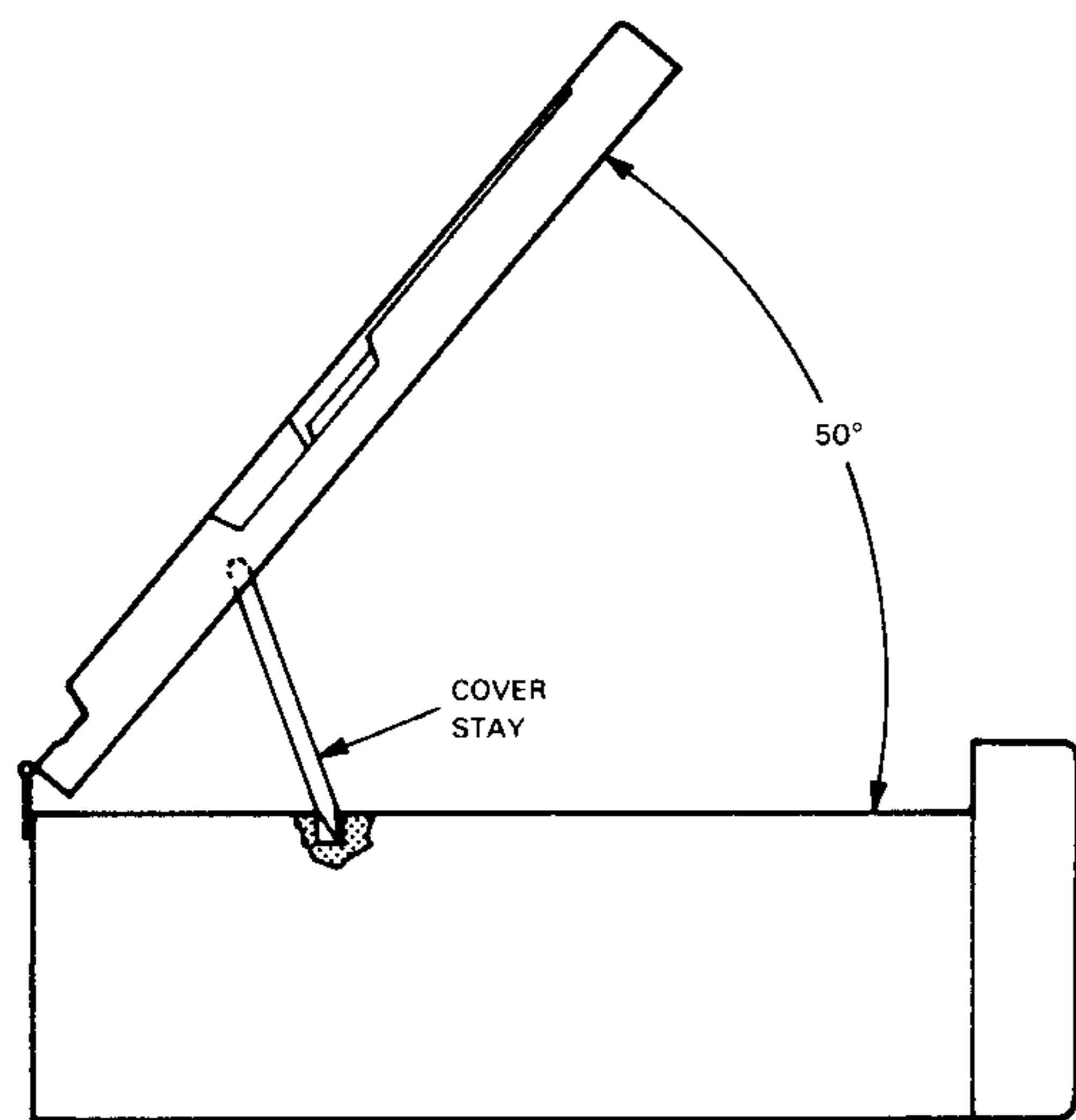


Figure 5-1 Operator Maintenance Access Position

To return the TS05 to the operating position, reverse steps 1 through 3.

5.2.2 Service Access Position (Figures 5-2 and 5-3)

The service access position is used when the control module must be accessed as well as the mechanics associated with the TS05.

To place the TS05 in the service access position, perform the following:

WARNING

The TS05 weighs approximately 36.0 kg (80 lbs). To prevent personal injury, get assistance when lifting the unit.

1. Place the TS05 in the operator maintenance access position (Figure 5-1).
2. Loosen the two spring-loaded captive screws, located on each side (as viewed from the top of the TS05), that secure the TS05 to the top rail assembly.

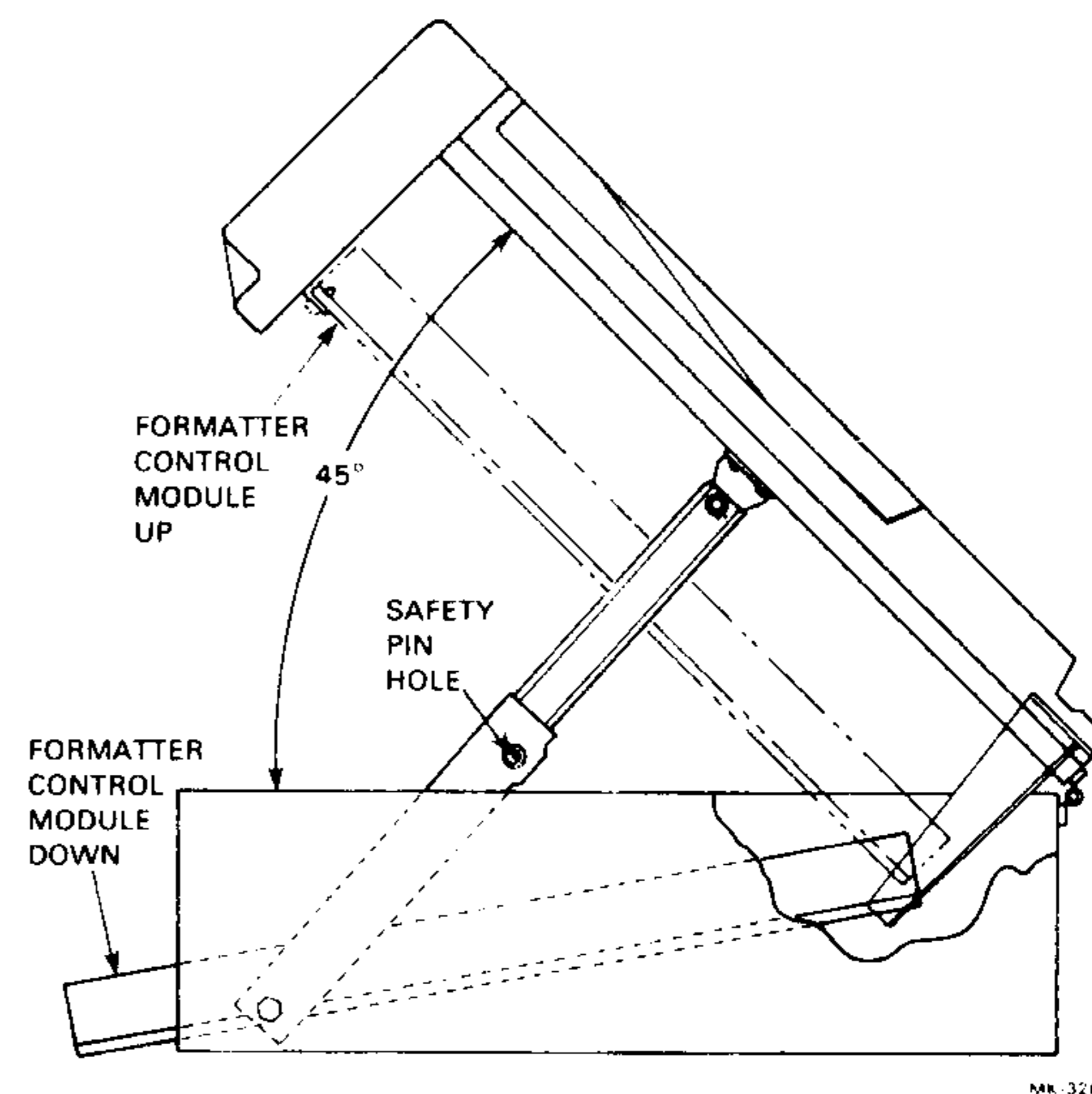


Figure 5-2 Service Access Position (Sandcast Only)

3. Grasp, with both hands, the lower front corners of the TS05 and lift the entire assembly to its maximum upright position. (This will engage the locking mechanism automatically.)
4. Lower the TS05 approximately 2.54 cm (1.00 inch). This will activate the locking mechanism automatically.

NOTE

To eliminate the possibility of the tape unit dropping due to a failure in the locking mechanism, insert the safety pin (or equivalent) into the holes provided 2.54 cm (1.00 in) above the locking mechanism on the top plate supporting slide.

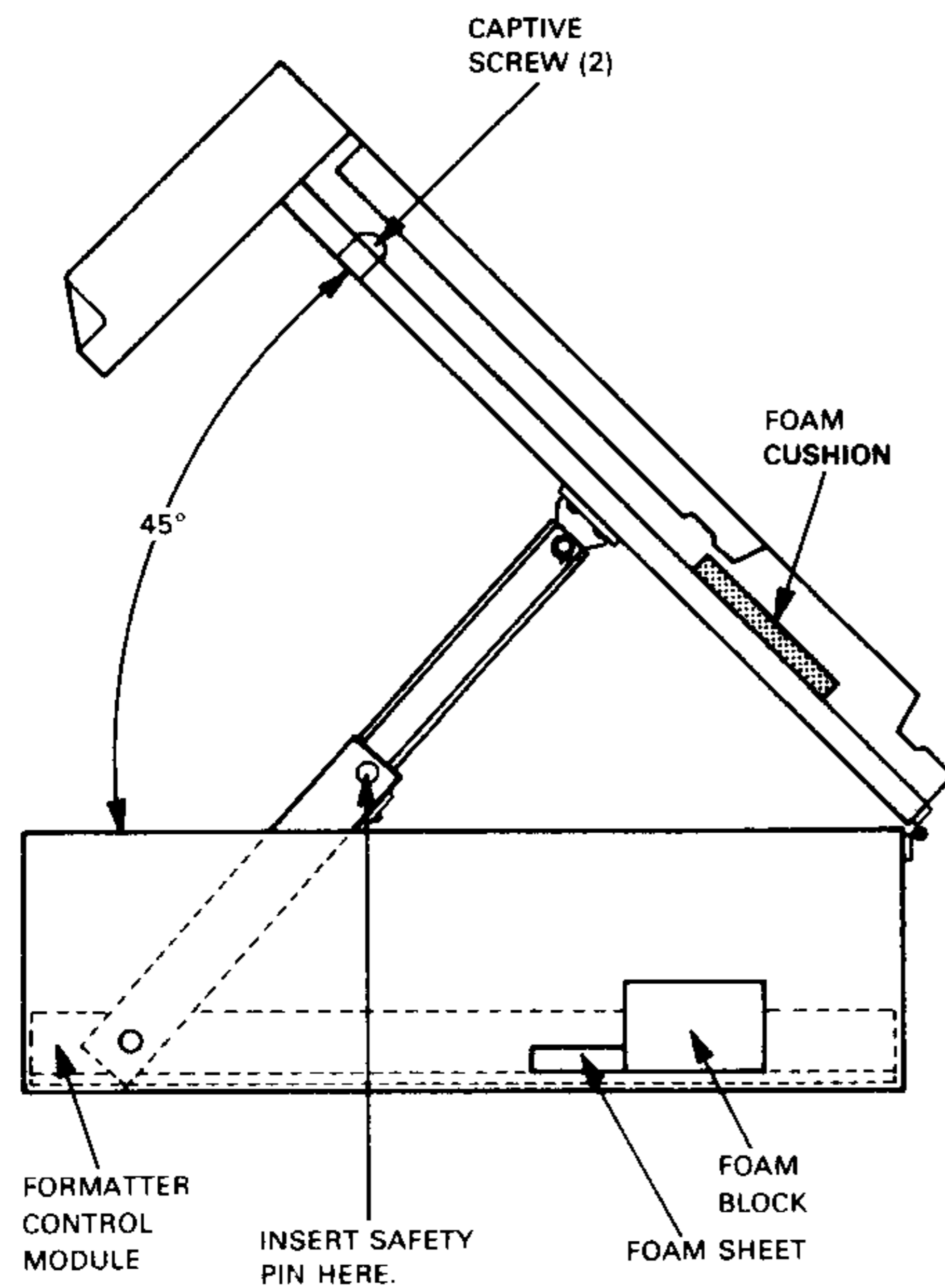
Perform the following step (Step 5) only if it is a sandcast unit. The sandcast unit has a black top plate.

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- Release the drive/formatter module (by pulling down on the two Ny-Lok™ fasteners that secure it to the bottom of the top plate assembly. When the Ny-Lok™ fasteners are released, carefully lower the drive/formatter module down as far as it will go.

To return the TS05 to the operating position, perform the following:

- Sandcast – Reverse steps 1 through 5.
- Diecast – Reverse steps 1 through 4.

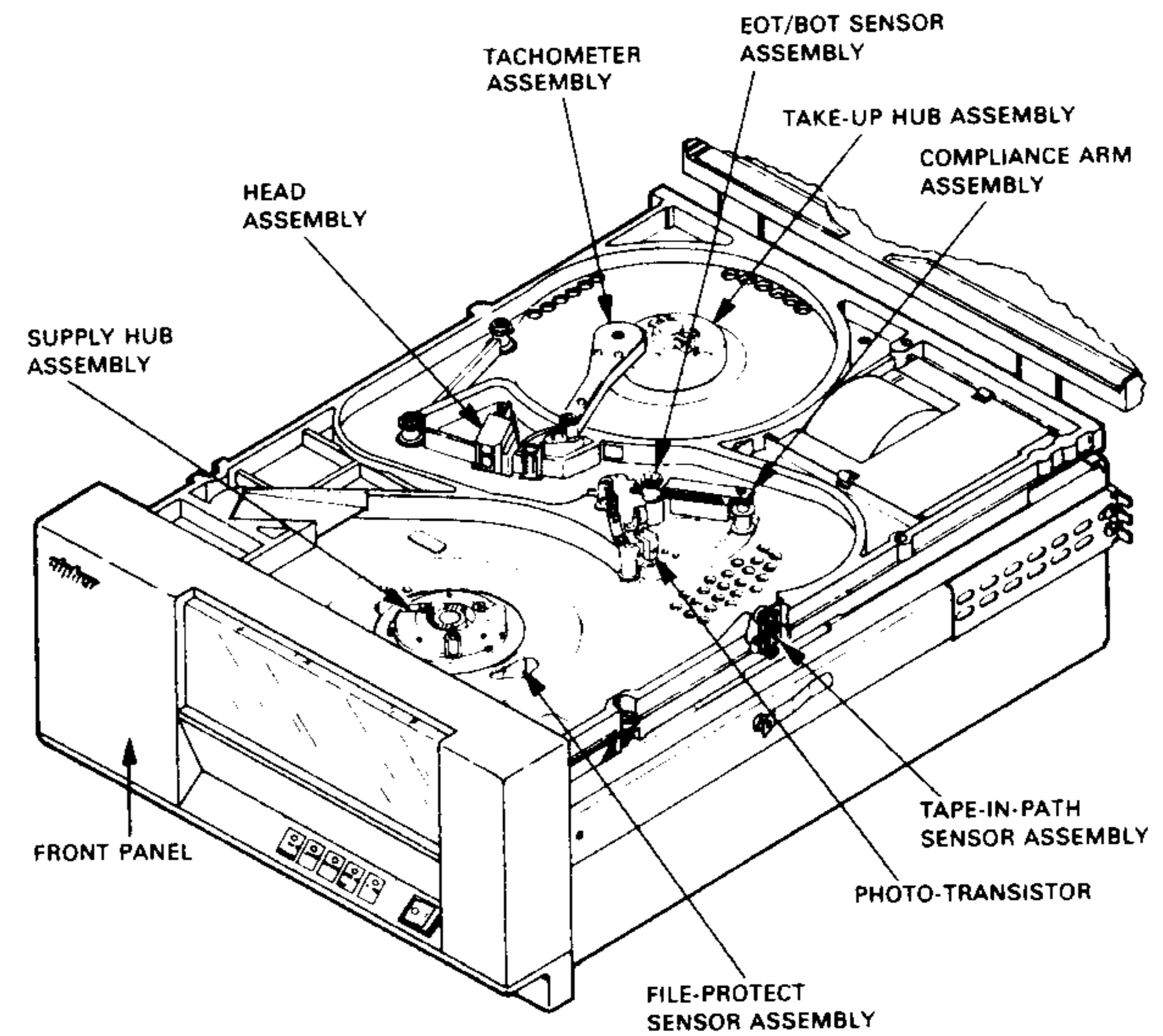


CS-3655

Figure 5-3 Service Access Position
(Diecast Only)

5.3 COMPONENT LOCATION

To help locate the components on the TS05, refer to Figure 5-4, 5-5, and 5-6.



CS-3630

Figure 5-4 Top Plate Assembly (Diecast Unit Only)

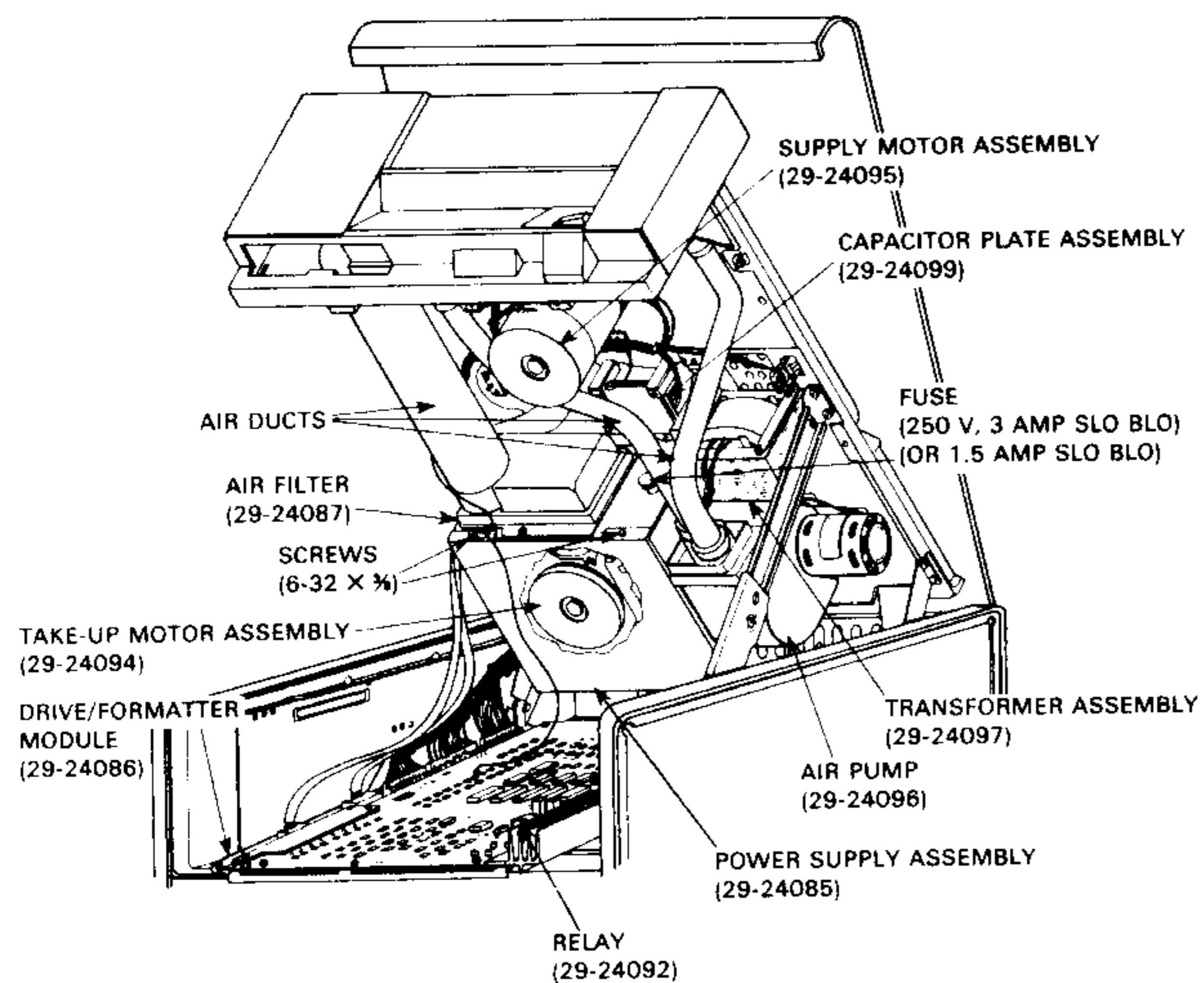


Figure 5-5 Bottom Plate Assembly (Sandcast Unit Only)

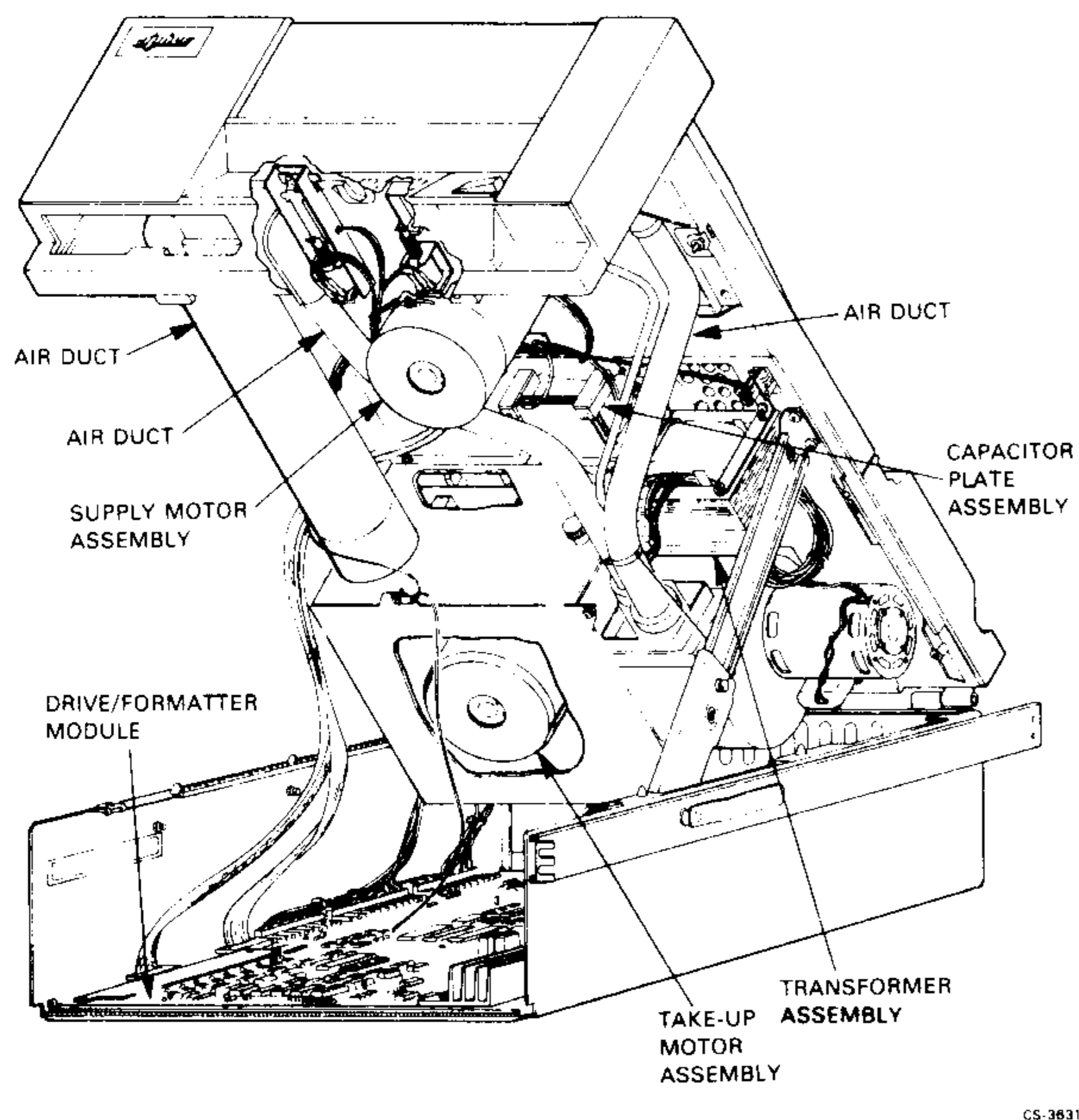


Figure 5-6 Bottom Plate Assembly (Diecast Unit Only)

5.4 REMOVAL/REPLACEMENT FROM THE OPERATOR MAINTENANCE ACCESS POSITION

5.4.1 EOT/BOT Sensor (29-24082)

WARNING

Before performing this procedure, make sure that the TS05 is turned off and that the power cord is removed from the power source.

Tools Required

- Small phillips screwdriver, and
- Small needlenose pliers.

To remove the EOT/BOT sensor, perform the following:

1. Place the TS05 in the operator maintenance access position (refer to Section 5.2.1.).
2. Remove the two small phillips screws (Figure 5-7, Item 1) that secure the EOT/BOT sensor (Figure 5-7, Item 3), using the small phillips screwdriver.

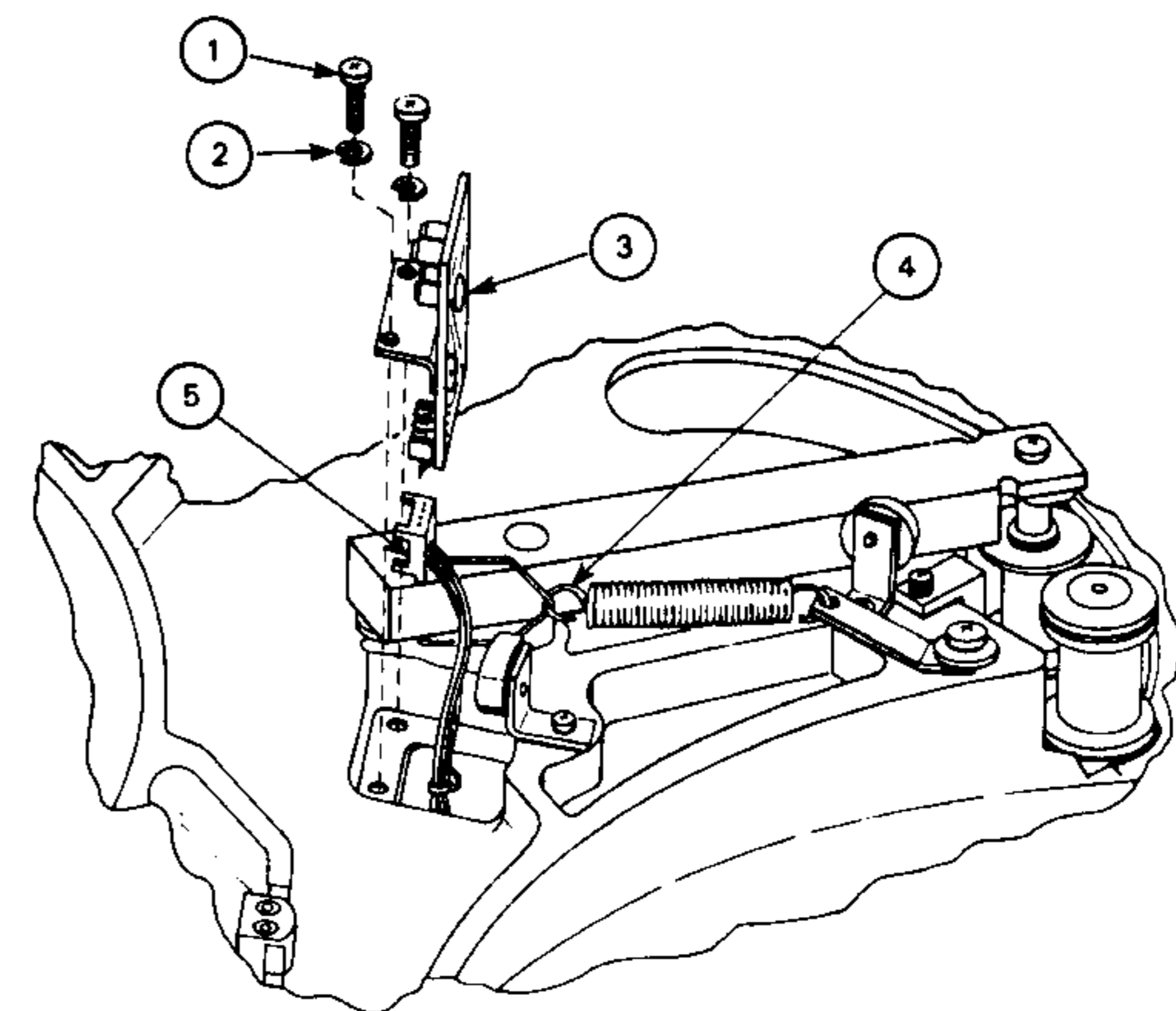


Figure 5-7 EOT/BOT Sensor Assembly

NOTE

Do not drop the screws or the lock washers (Figure 5-5, Item 2).

3. Disconnect the tension spring (Figure 5-7, Item 4) from the compliance arm, using the small needlenose pliers. (This will allow the compliance arm to be moved out of the way while the EOT/BOT sensor is being worked on.)
4. Lift the EOT/BOT sensor up and out of the hole in the top plate assembly. (Do not damage the four wires and connector attached to the bottom of the sensor.)
5. Remove the EOT/BOT sensor by holding the connector (Figure 5-7, Item 5) and gently pulling the sensor.

To replace the EOT/BOT sensor assembly, reverse steps 1 through 5.

5.4.2 Supply Hub Assembly (29-24077)

WARNING

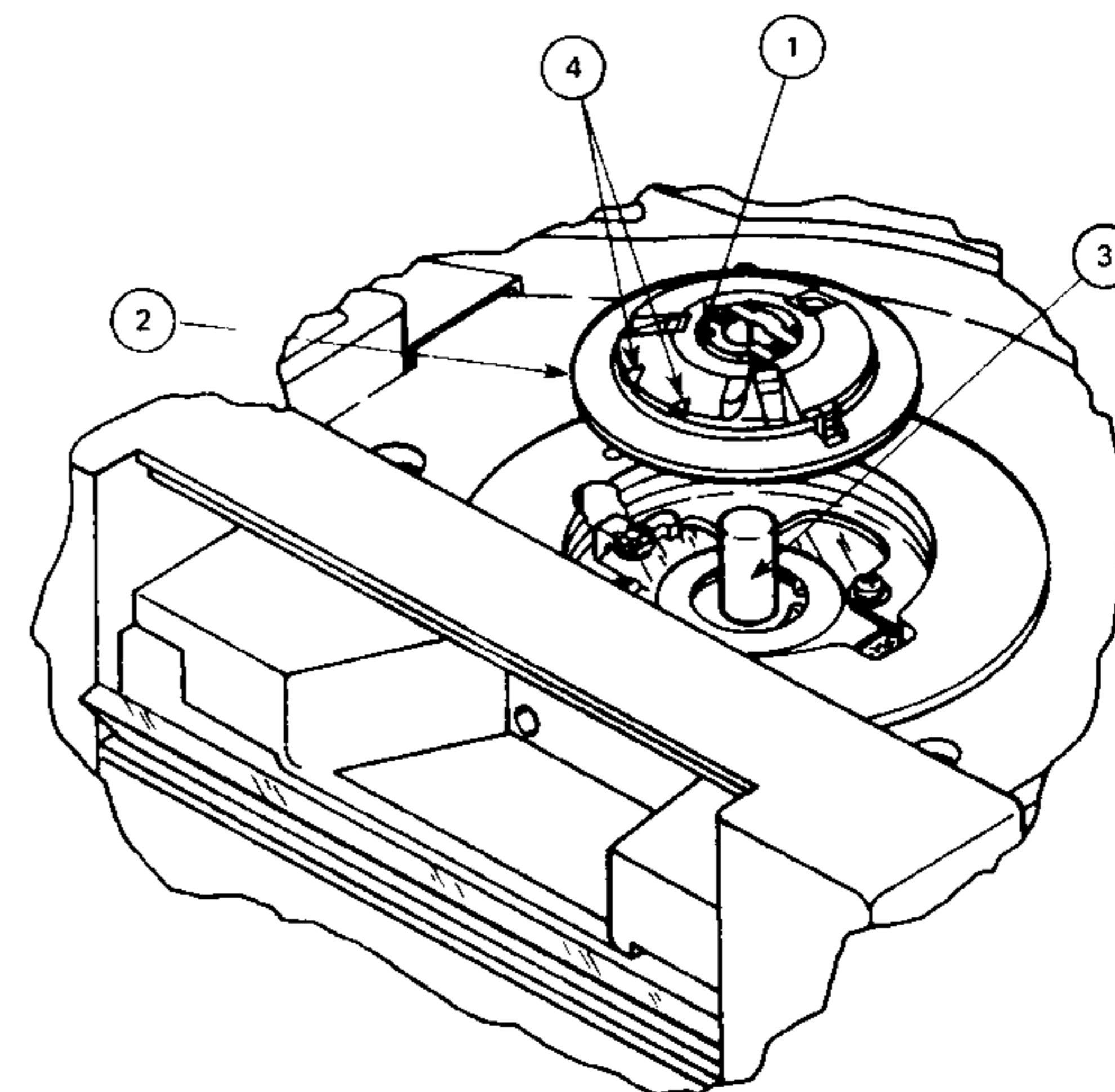
Before performing this procedure, make sure that the TS05 is turned off and that the power cord is removed from the power source.

Tools Required

- 7/64 extended allen wrench (at least 6 inches).

To remove the supply hub assembly, perform the following:

1. Place the TS05 in the operator maintenance access position (Section 5.2.1).
2. Open the door assembly.
3. Manually rotate the supply hub assembly (Figure 5-8, Item 2) until the allen-head screw (Figure 5-8, Item 1) and the access holes (Figure 5-8, Item 4) are facing the open door.



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Figure 5-8 Supply Hub Assembly

NOTE

Before removing the supply hub assembly, note the distance between the supply hub assembly and the top of the shaft (Figure 5-8, Item 3). When the replacement hub assembly is installed, the distance between the shaft and supply hub should be the same.

4. Insert a 7/64 allen wrench through the door assembly and the access holes into one of the 7/64 allen screws holding the supply hub assembly in place. Loosen the allen screw one complete turn. (Repeat this step for the other allen screw.)
5. Remove the hub assembly, when the allen-head screws are loosened and the supply hub can be moved up and down, by lifting it straight up.

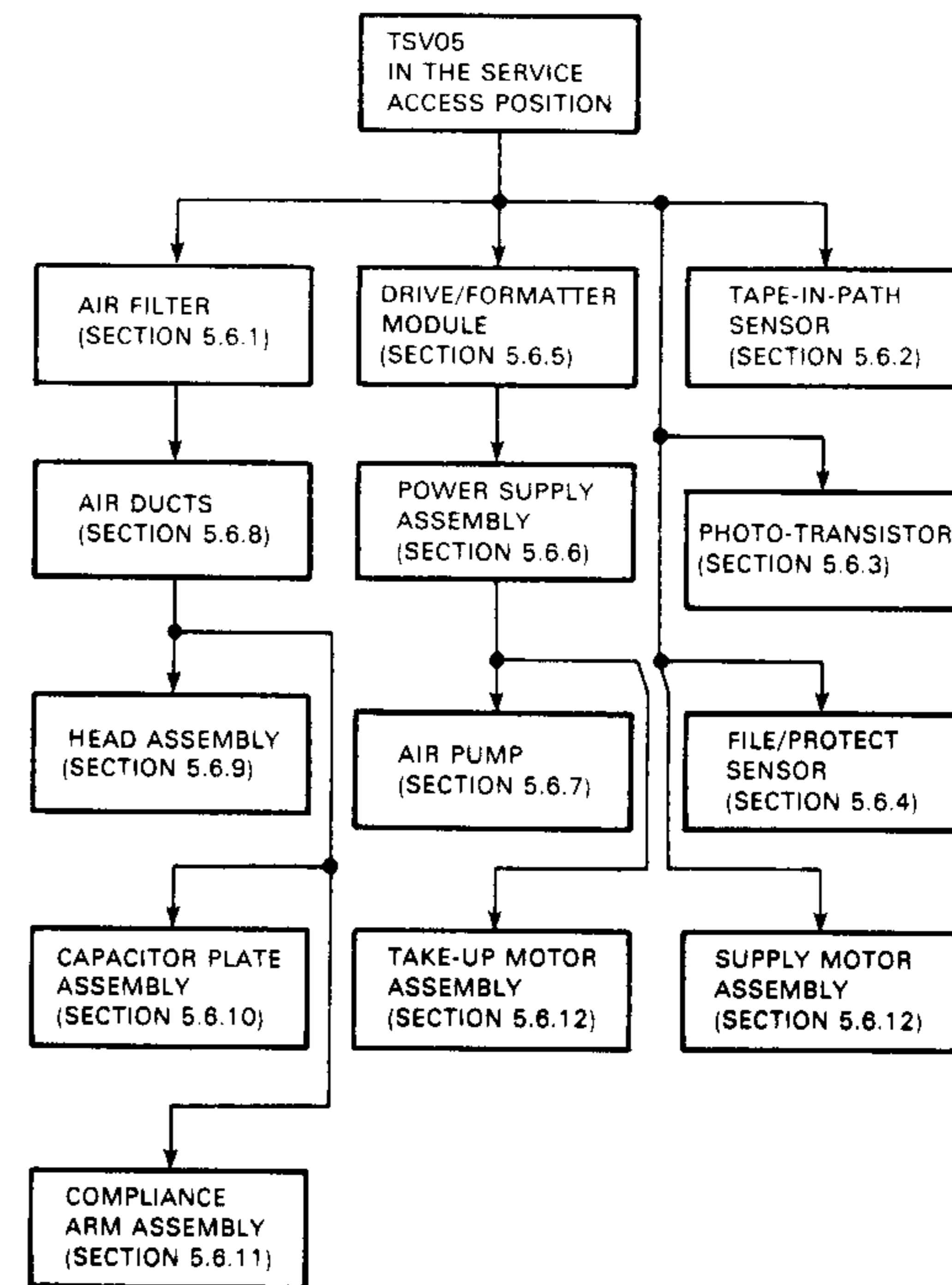
CAUTION

When installing the new supply hub assembly, make sure that the distance between the top of the supply hub and the top of the supply motor shaft is the same as it was originally.

To replace the supply hub assembly, reverse steps 1 through 5. (Refer to Appendix B for the supply hub assembly adjustment procedure.)

5.5 SERVICE ACCESS POSITION REMOVAL SEQUENCE MAP

Some of the Field Replaceable Units (FRUs) on the TS05 cannot be removed without first removing another assembly. Refer to Figure 5-9 for the proper removal sequence.



MK-3888

Figure 5-9 TS05 Service Access Position Removal Sequence

Example

In order to remove the power supply assembly, the drive/formatter module must be removed.

60 REMOVE/REPLACE

5.6 REMOVAL/REPLACEMENT FROM THE SERVICE ACCESS POSITION

5.6.1 Air Filter

WARNING

Before performing this procedure, make sure that the TS05 is turned off and that the power cord is removed from the power source.

Tools Required

- Flat blade screwdriver.

Air Filter (29-24087) Removal/Replacement (Sandcast Unit Only)

To remove the air filter, perform the following:

1. Place the TS05 in the service access position (Section 5.2.2).

CAUTION

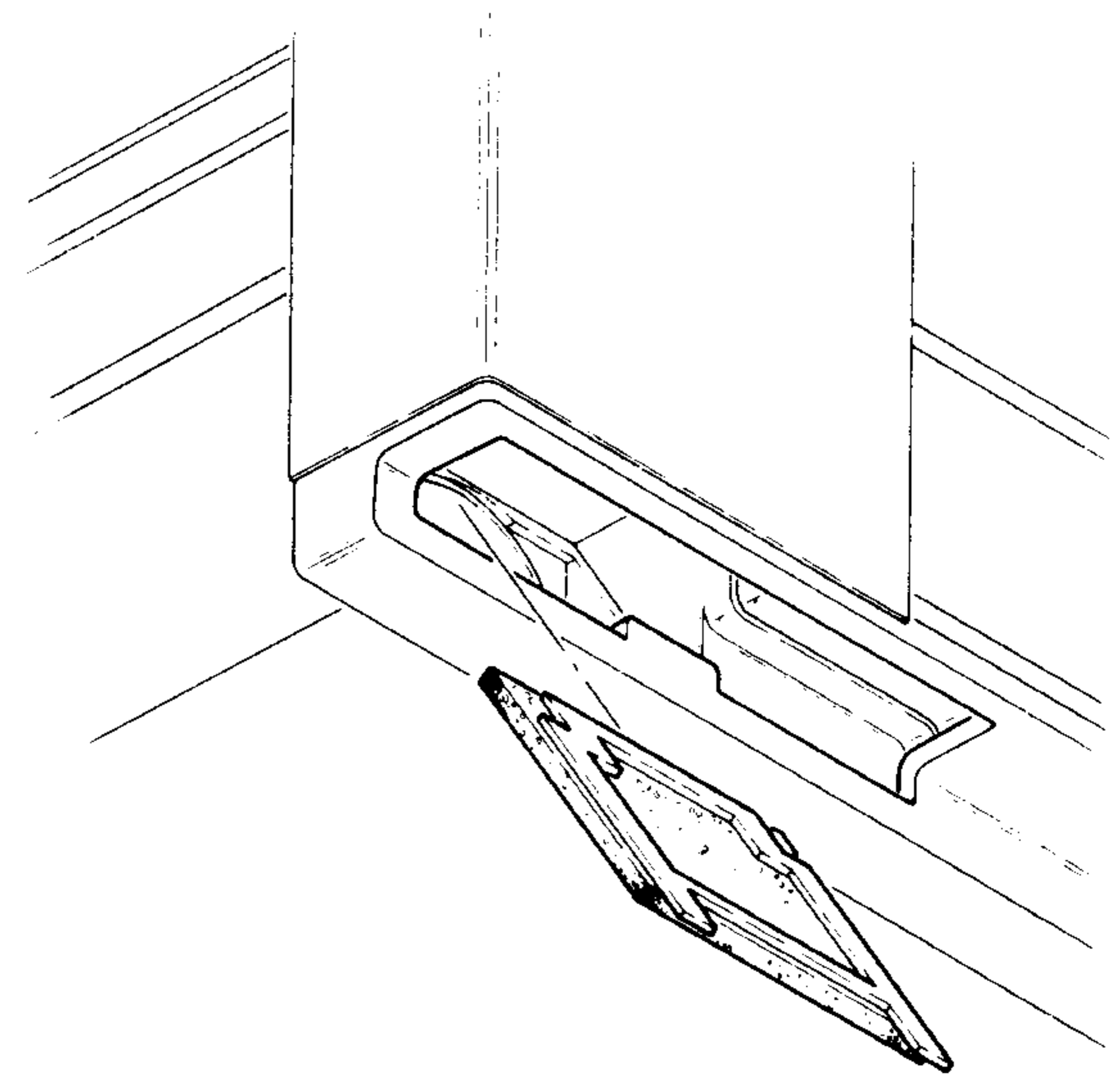
When replacing the air filter, do not damage any wires that may have to be moved out of the way.

2. Remove the air duct that is attached to the air filter.
3. Remove the air filter cover.
4. Grasp the "yellow" tab, which is fastened to the air filter, and carefully pull it to the left until the filter is removed.

To replace the air filter, reverse steps 1 through 4.

Air Filter Removal/Installation (Diecast Unit Only)

1. Remove the filter from inside the air duct opening at the lower left of the front panel (see Figure 5-10.)
2. Clean the filter with low pressure compressed air, or vacuum in the opposite direction of the air flow.



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Figure 5-10 Air Filter Removal (Diecast Unit Only)

3. Install the air filter.

5.6.2 Tape-In-Path Sensor (29-24083)

WARNING

Before performing this procedure, make sure that the TS05 is turned off and that the power cord is removed from the power source.

Tools Required

- Flat blade screwdriver, and
- Small phillips screwdriver.

To remove the tape-in-path sensor (Figure 5-11, Item 3), perform the following:

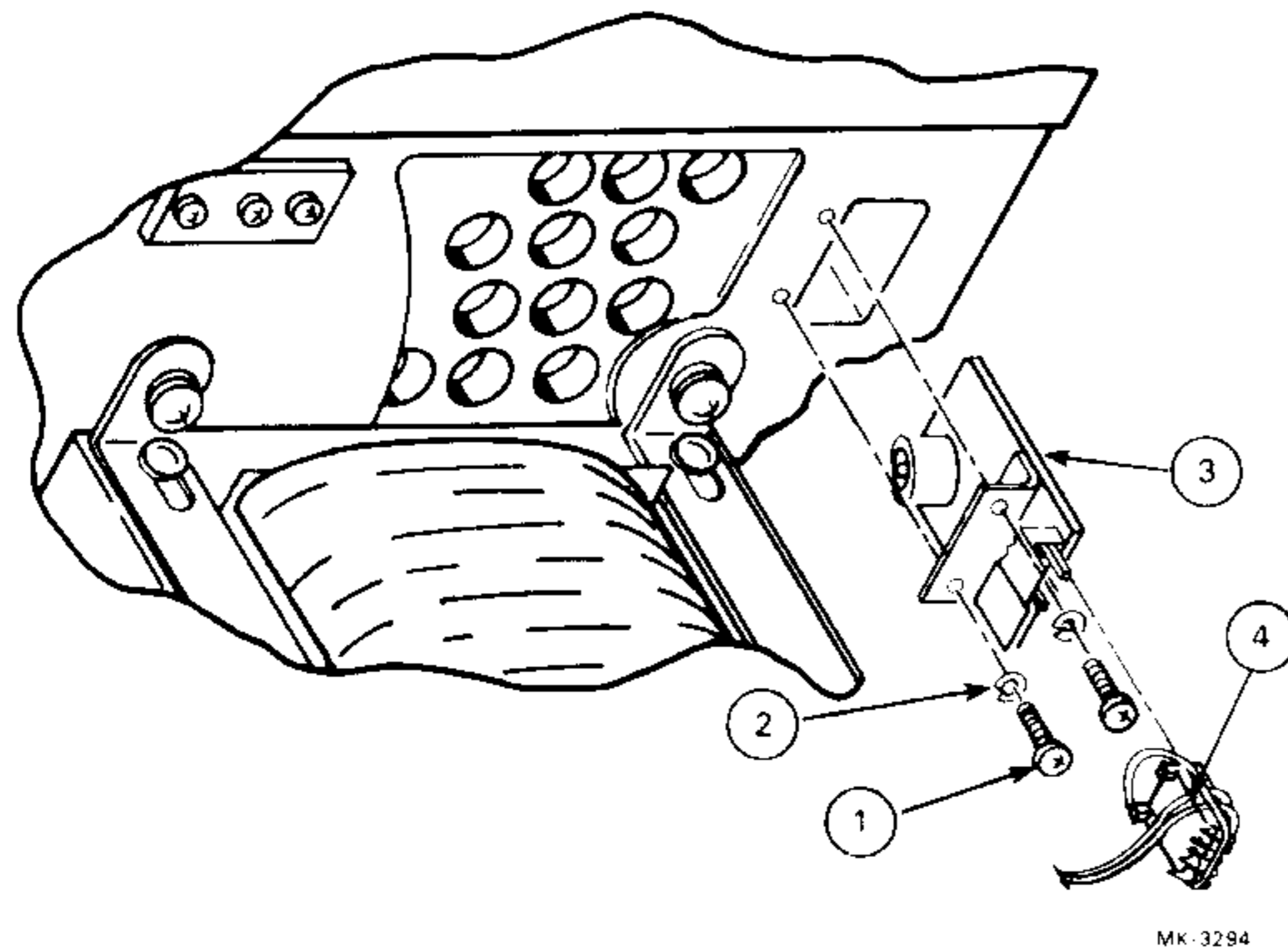


Figure 5-11 Tape-In-Path Sensor

1. Place the TS05 in the service access position (Section 5.2.2).
2. Remove the connector (Figure 5-11, Item 4) by carefully pulling down until it is disconnected.
3. Remove the two phillips screws (Figure 5-11, Item 1) that hold the tape-in-path sensor to the TS05 top plate assembly, using the small phillips screwdriver.

NOTE

Do not drop the phillips screws and their associated lock washers (Figure 5-11, Item 2).

4. Pull the tape-in-path sensor through the top plate assembly after the two phillips screws are removed.

To replace the tape-in-path sensor, reverse steps 1 through 4.

64 REMOVE/REPLACE

5.6.3 Photo-Transistor (29-24093)

WARNING

Before performing this procedure, make sure that the TS05 is turned off and that the power cord is removed from the power source.

Tools Required

- Flat blade screwdriver, and
- Small phillips screwdriver.

To remove the photo-transistor from the TS05, perform the following:

1. Place the TS05 in the service access position (Section 5.2.2).
2. Locate the two blue wires that connect the bottom of the photo-transistor and the point where the wires are attached.
3. Carefully pull the wires apart from the photo-transistor.

NOTE

Note which wire attaches to which photo-transistor connection. This is important because the wires must be reconnected to the same point on the new photo-transistor.

4. Place the TS05 in the operator maintenance access position (Section 5.2.1).
5. Loosen and remove the screw that holds the photo-transistor sensor to the top plate assembly of the TS05.

CAUTION

Do not drop the screw and its associated lock washer into the drive/formatter module.

REMOVE/REPLACE 65

To replace the photo-transistor, reverse steps 1 through 5.

5.6.4 File-Protect Sensor (29-24084)

WARNING

Before performing this procedure, make sure that the TS05 is turned off and that the power cord is removed from the power source.

Tools Required

- Flat blade screwdriver, and
- Small phillips screwdriver.

To remove the file-protect sensor (Figure 5-12, Item 3), perform the following:

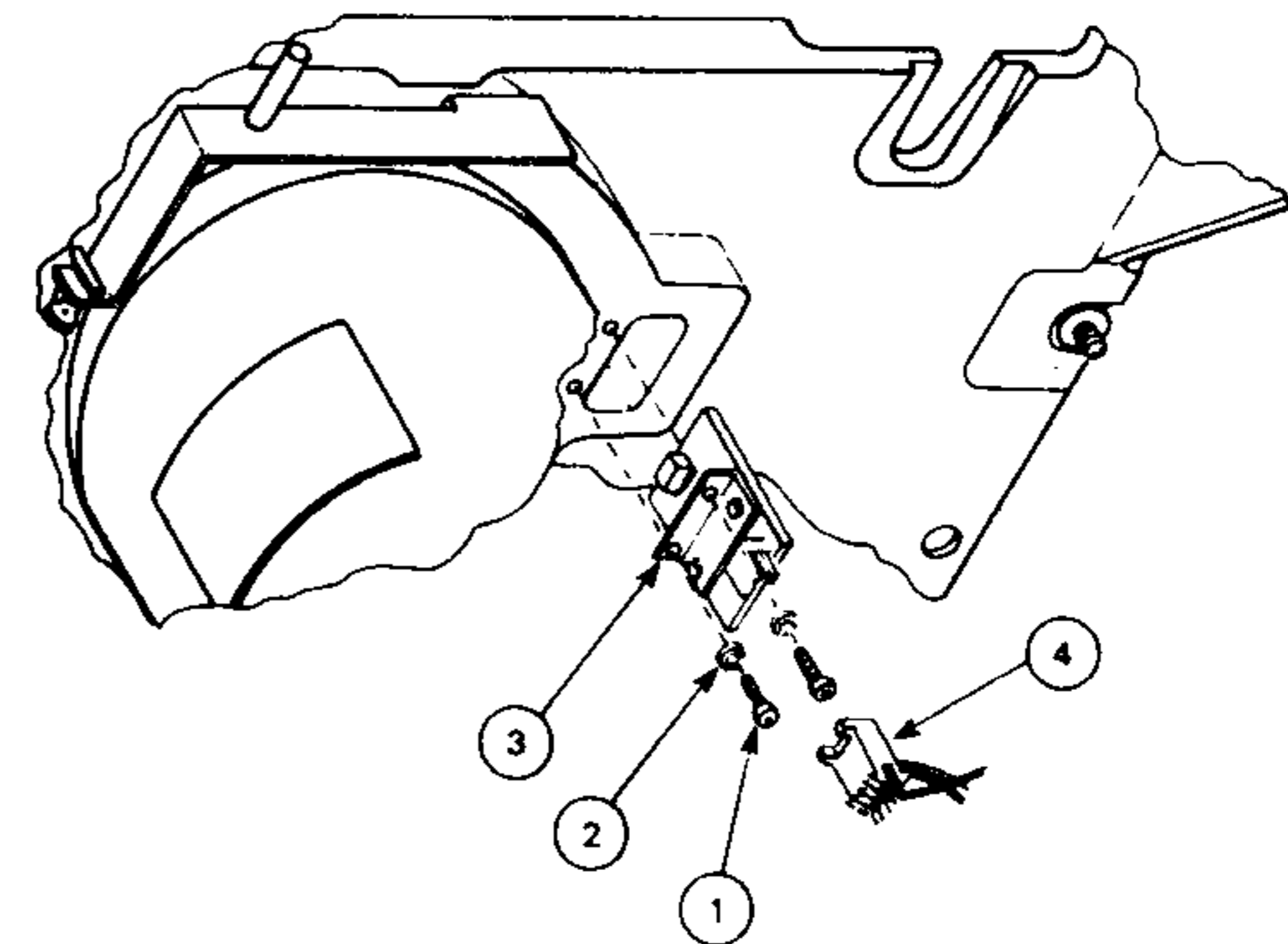


Figure 5-12 File-Protect Sensor

1. Place the TS05 in the service access position (Section 5.2.2).
2. Remove the connector (Figure 5-12, Item 4) by carefully pulling down until it is disconnected.

- Remove the two phillips screws (Figure 5-12, Item 1) that hold the file-protect sensor to the TS05 top plate, using a small phillips screwdriver.

NOTE

Do not drop the phillips screws and their associated lock washers (Figure 5-12, Items 1 and 2).

- Pull the file protect sensor through the top plate assembly.

To replace the file protect sensor, reverse steps 1 through 4.

5.6.5 Drive/Formatter Module (29-24086)

WARNING

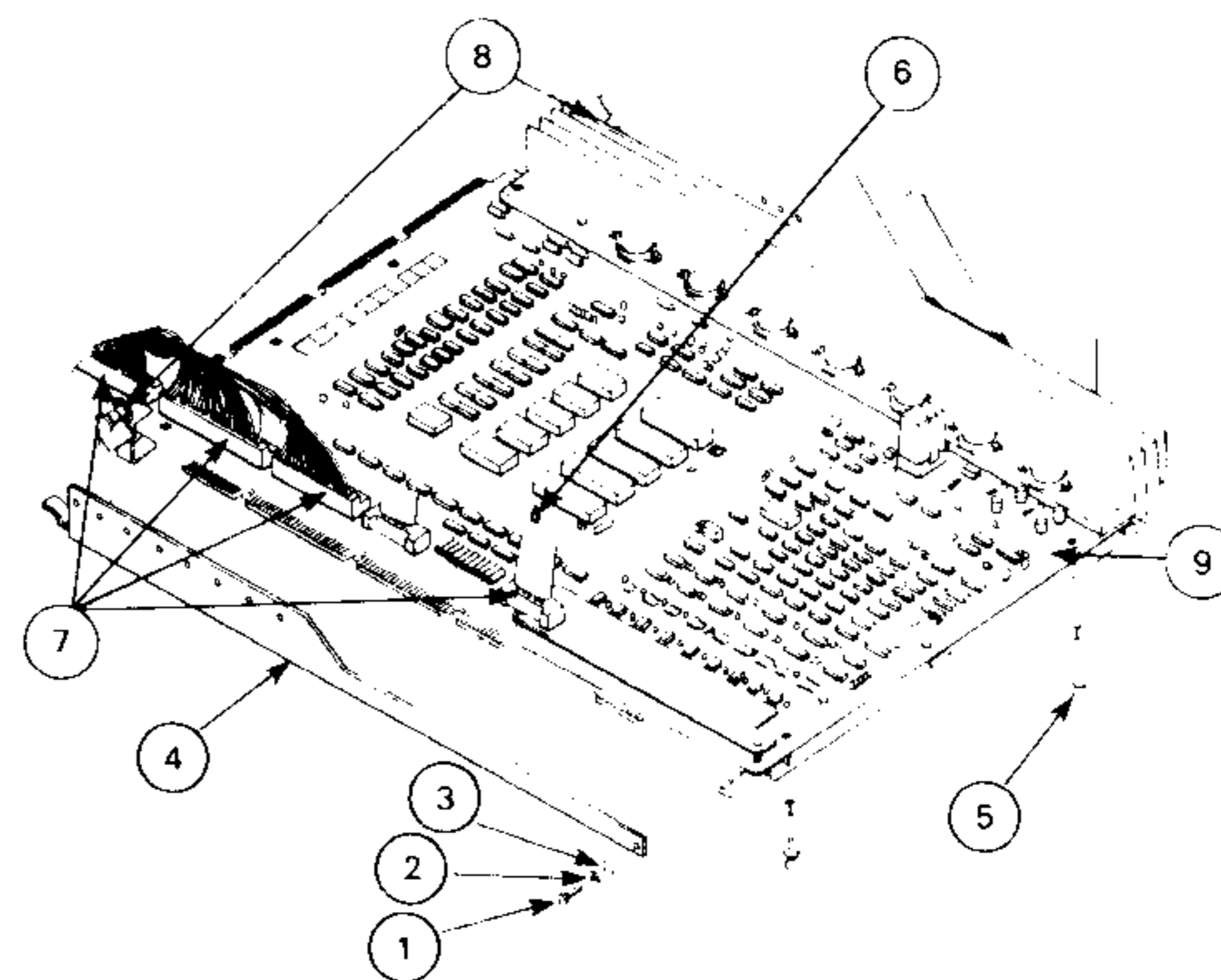
Before performing this procedure, make sure that the TS05 is turned off and that the power cord is removed from the power source.

Tools Required

- Flat blade screwdriver, and
- Small phillips screwdriver.

Drive/Formatter Module Removal/Installation (Sandcast Unit Only)

To remove the drive/formatter module (Figure 5-13, Item 9), perform the following:



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Figure 5-13 Drive/Formatter Module
(Sandcast Unit Only)

- Place the TS05 in the service access position (Section 5.2.2) but do not lower the drive/formatter module.

CAUTION

When the connector retaining bracket screw (Figure 5-13, Item 1) is removed, there is nothing to prevent the bracket from falling. Therefore, support the bracket with your hand before removing the connector retaining bracket screw.

2. Remove the connector retaining bracket screw, lock washer, and washer (Figure 5-13, Items 1, 2, and 3).
3. Lower the connector retaining bracket (Figure 5-13, Item 4) all the way down. Then, pull the connector retaining bracket toward the front of the TS05. This allows the connector retaining bracket to be removed from the drive/formatter module.
4. Release the drive/formatter module by pulling firmly on the two Ny-Lok™ fasteners (Figure 5-13, Item 5) that secure the drive/formatter module to the bottom of the top plate assembly. When released, carefully lower the drive/formatter module down as far as it will go.
5. Disconnect the brown ground wire from TP95 (Figure 5-13, Item 6) by gently pulling the connection up from the drive/formatter module. (Move the brown wire out of the way.)
6. Disconnect the five connectors (Figure 5-13, Item 7) from the left of the drive/formatter module by sliding the connectors toward the left. (Move the connectors out of your way.)

NOTE

The connectors all have a different number of pins and their size is different. Therefore, when reconnecting the connectors, they will only correctly fit on one connector.

7. Lift the front of the drive/formatter module up about 15.24 cm (6.00 inches) and place your arm and hand under the board with your fingers up toward the board. Carefully push up with your fingers on the rear of the board and pull the board toward the front of the TS05. This will remove the drive/formatter module from the pivots (Figure 5-13, Item 8) and allow the board to be removed.

To replace the drive/formatter module, reverse steps 1 through 7.

NOTE

Before replacing the drive/formatter module, check the switch settings (refer to Table 3-1) and perform the read threshold adjustment (Appendix B).

Drive/Formatter Module Removal (Diecast Unit Only)

To remove the drive/formatter module (Figure 5-14), perform the following:

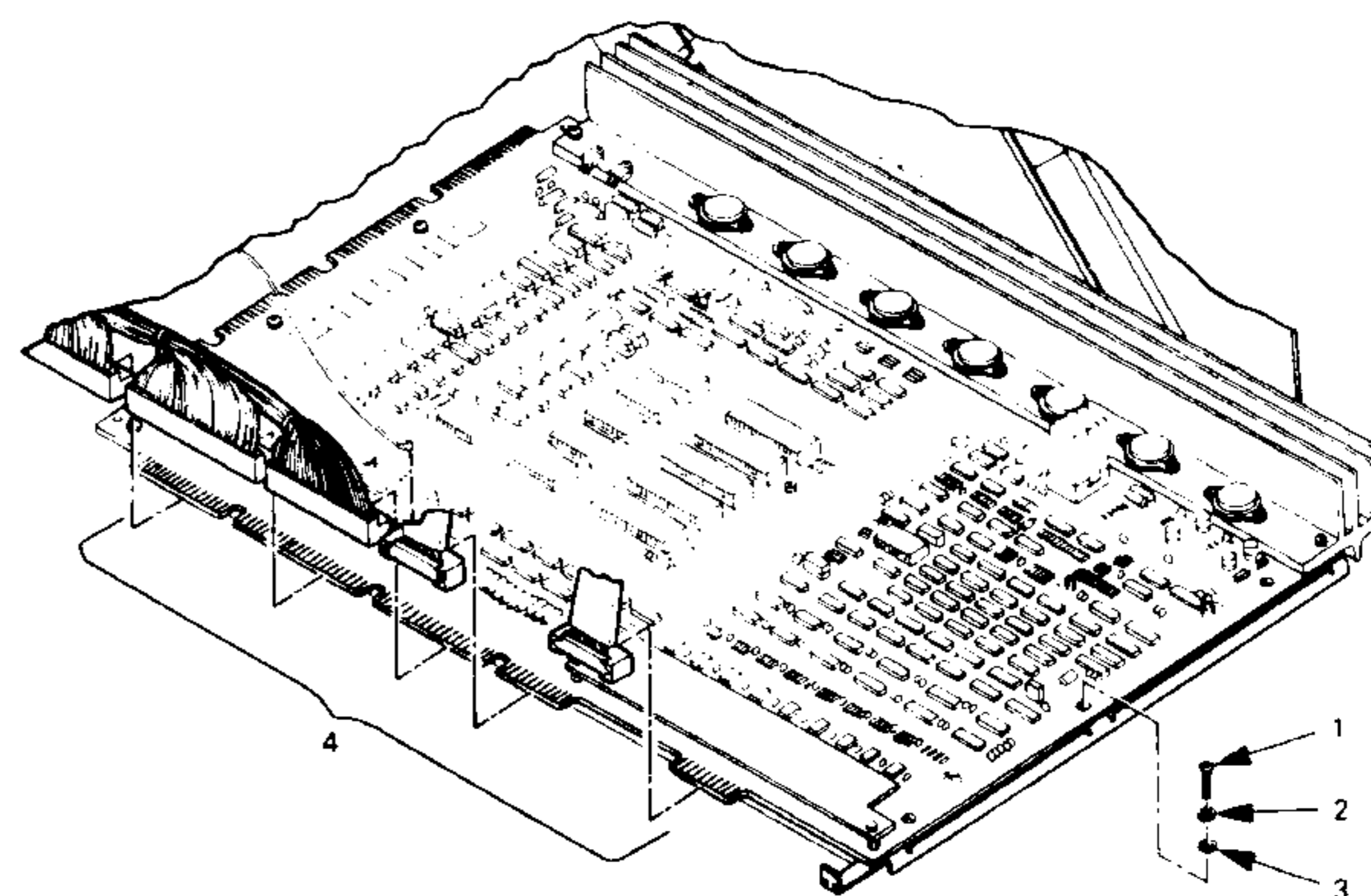


Figure 5-14 Drive/Formatter Module (Diecast Unit Only)

1. Place the TSV05 in the service position (Section 5.2.2).
2. Remove the mounting screw, lockwasher, and flatwasher (Figure 5-14, Items 1, 2, and 3).
3. Disconnect the five connectors (Figure 5-14, Item 4) from the left of the drive/formatter module by sliding the connectors toward the left. Move the connectors out of the way.
4. Lift the front of the drive/formatter module up about 6 cm (2 inches). Carefully slide the board toward the front until it has cleared all obstructions.

To replace the drive/formatter module, reverse steps 1 through 4.

NOTE

Before replacing the drive/formatter module, check the switch settings (refer to Table 3-1) and also perform the read threshold adjustment (Appendix B).

5.6.6 Power Supply Assembly (29-24085)

WARNING

Before performing this procedure, make sure that the TS05 is turned off and that the power cord is removed from the power source.

Tools Required:

- Stubby phillips screwdriver.

Power Supply Assembly (29-24085) Removal/Replace (Sandcast Unit Only)

To remove the power supply assembly, perform the following:

1. Place the TS05 in the service access position (Section 5.2.2).
2. Remove the drive/formatter module (Section 5.6.5).
3. Remove the two phillips screws (Figure 5-4, Item 3) that secure the power supply assembly cover to the power supply, and place them and the cover aside.

NOTE

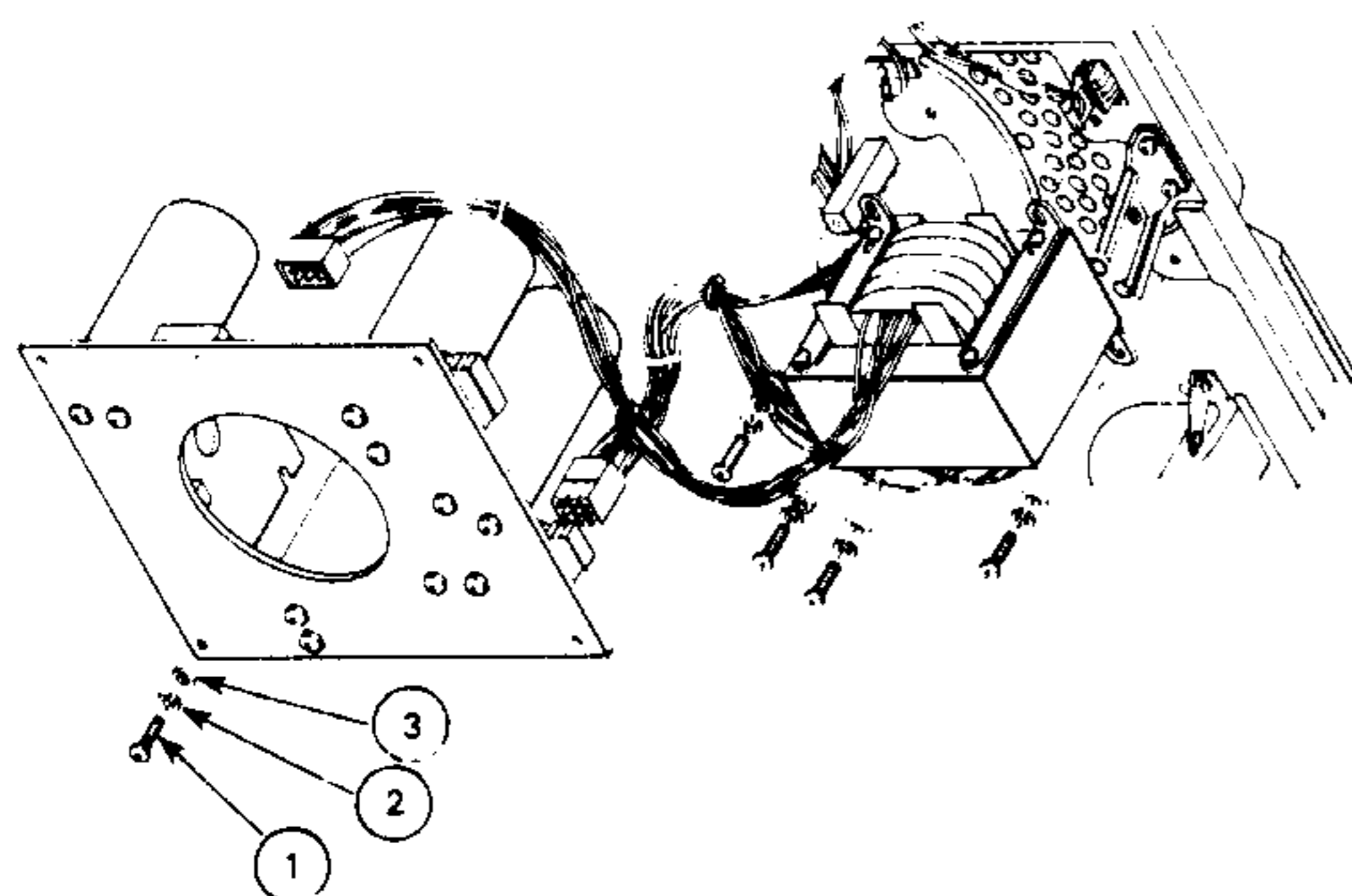
When removing the left-most screw, do not damage the ground wire connected to the screw.

4. Remove the four screws, washers, and lock washers (Figure 5-15, Items 1, 2, and 3) located at the four corners of the power supply printed circuit board (these screws hold the power supply assembly in place).

NOTE

Use your free hand to support the power supply because as the screws are removed, the power supply will move downward.

5. Pull the power supply assembly down until all cables are exposed.



MK-3299

Figure 5-15 Power Supply Assembly

CAUTION

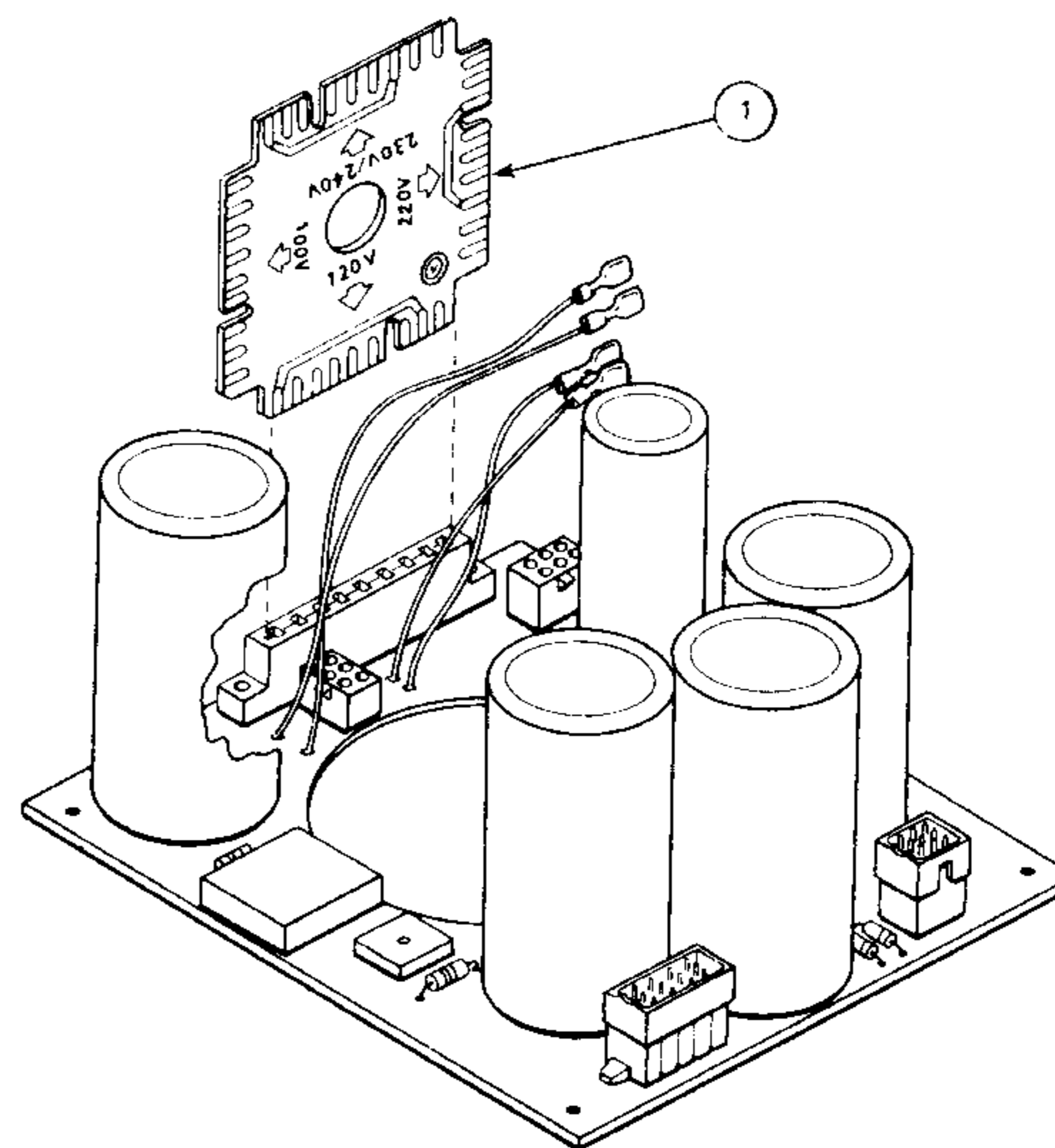
Before disconnecting the cables from the power supply (in the next step), ensure that all cables are identified so that they can be reconnected to the proper connector when replacement is performed.

6. Disconnect all cables from the power supply assembly.

NOTE

If it becomes necessary to remove the voltage selection module (Figure 5-16, Item 1), note the position of the voltage labeling so that the voltage selection module can be installed properly when the power supply is replaced.

To replace the power supply assembly, reverse steps 1 through 5.



MK-3204

Figure 5-16 Voltage Selection Module

Power Supply Assembly Removal/Replace (Diecast Unit Only)

To remove the power supply assembly, perform the following:

1. Turn power off and remove the power cord from the rear of the power supply chassis.
2. Place the unit in the service position in accordance with Section 5.2.2.
3. Remove the drive/formatter module in accordance with the instructions in Section 5.6.5.
4. Remove the front panel air duct by following the instructions in Section 5.6.8, steps 1, 2, 3, 4, and 5 of the Air Intake Tube Removal/Installation (Diecast Unit Only) section.

- Remove the screw (1) (see Figure 5-17), lockwasher (2), and flatwashers (3), which are securing the ground wide terminal.

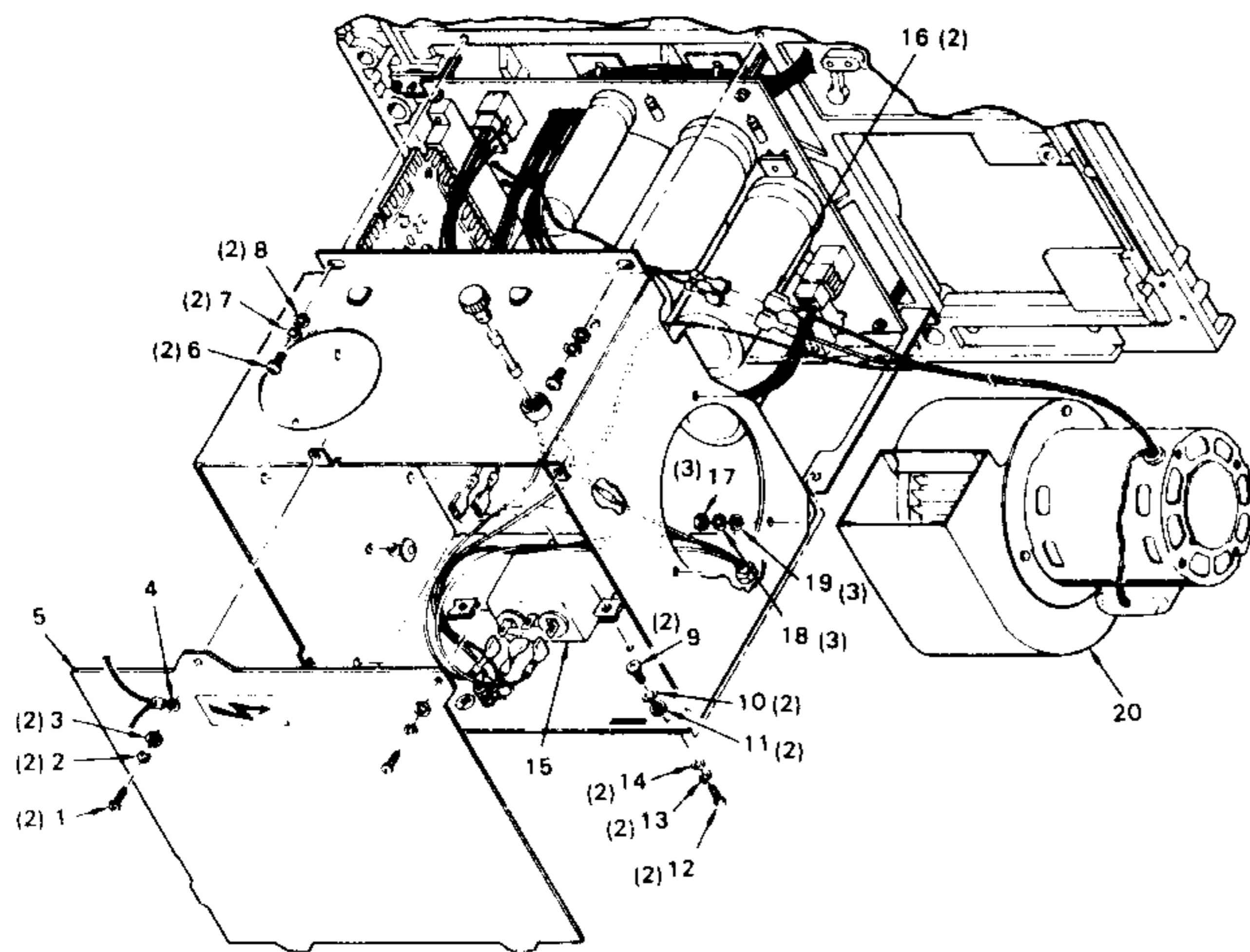


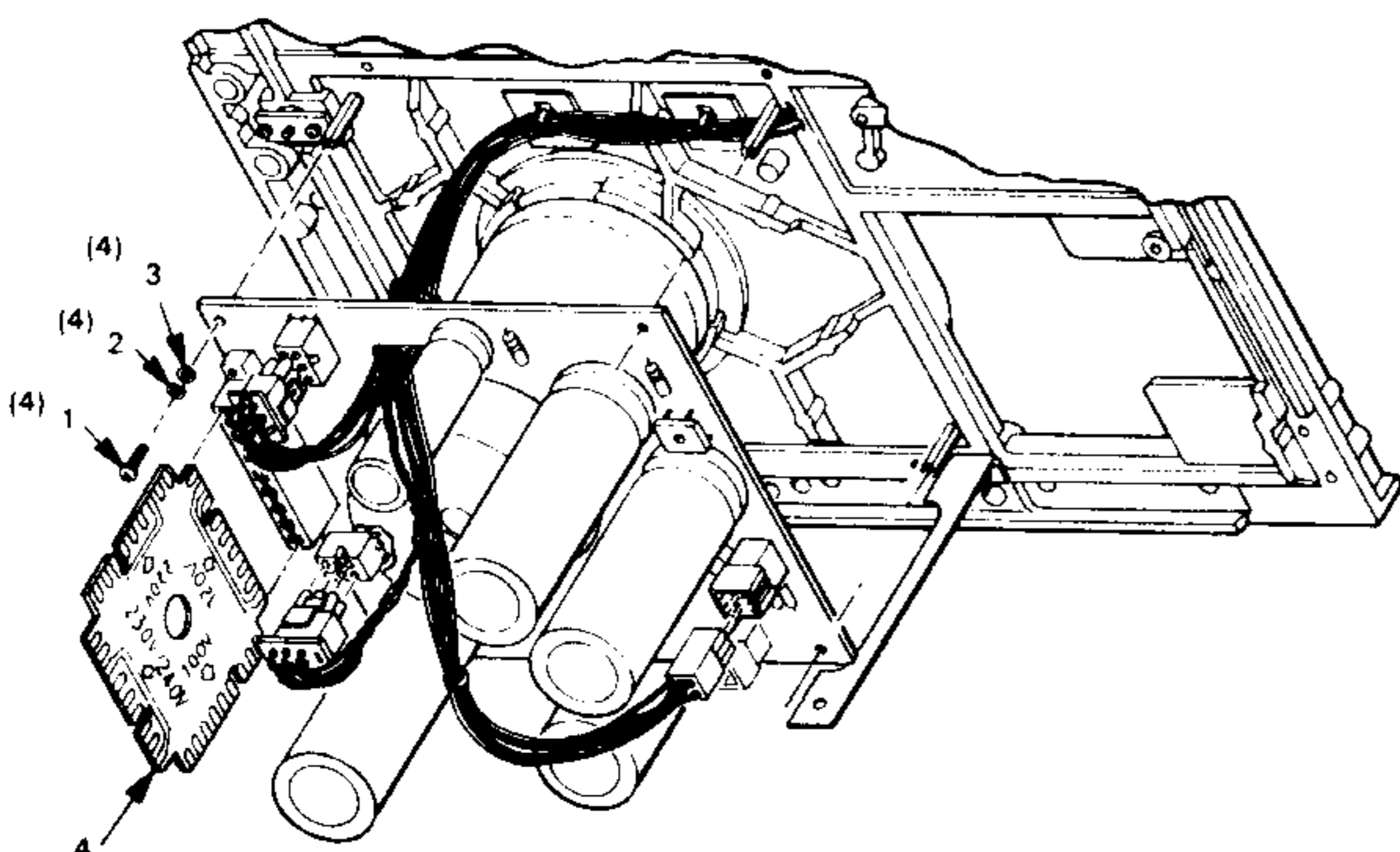
Figure 5-17 Power Supply Assembly (Diecast Unit Only)

- Cut the Ty-raps (five places), securing the wiring harness to the outside of the power supply chassis.
- Disconnect the wiring harness from the power supply PWB.
- Remove the screws (6), lockwashers (7), and flatwashers (8), securing the power supply to the top plate.
- Remove the allen cap screws (9), lockwashers (10), and flatwashers (11) that are securing the chassis to the rear bracket.

- Disconnect the air pump wires (16) and the terminals from the EMI filter (16), noting the position from which they were removed.
- Pull the blower adapter (Figure 5-17) just away from the blower housing.
- If the air pump assembly (20) is to be replaced, remove the nuts (17), lockwasher (18), and flatwasher (19), securing the air pump to the chassis.
- Install the replacement assembly in the reverse order of removal, ensuring that the transformer and the power switch wires are bundled through the housing opening near the top plate.

Power Supply Removal/Replacement (Diecast Unit Only)

- Perform all the removal steps in the Power Supply Removal/Replacement (Diecast Unit Only) section (see Section 5.6.6).
- Disconnect all the wiring from the power supply PWP.
- Remove the four screws (Figure 5-18, Items 1, 2, and 3), carefully lower the power supply PWB, while feeding the cables through the board opening. Remove the voltage selection card (4).
- Reconnect all the connectors to the replacement PWB and replace the voltage selection card (4).
- Hold the power supply PWB in place, and secure with the four screws (Items 1, 2, and 3). See Figure 5-18.
- Replace the power supply assembly in the reverse order (Section 5.6.6).



CS-3835

Figure 5-18 Power Supply PWB (Diecast Units Only)

5.6.7 Air Pump

WARNING

Before performing this procedure, make sure that the TS05 is turned off and that the power cord is removed from the power source.

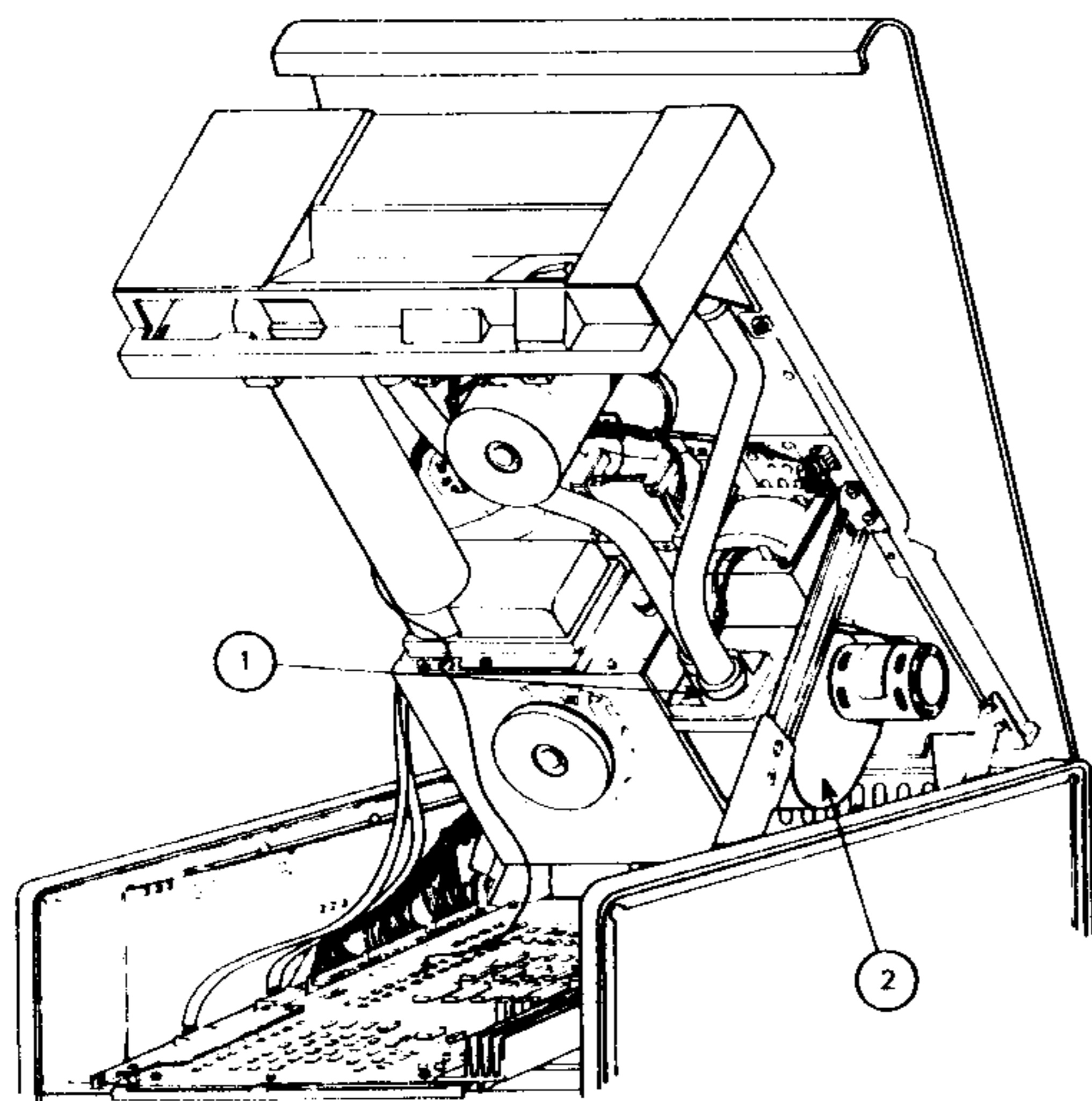
Tools Required

- Stubby phillips screwdriver,
- Phillips screwdriver,
- 1/4 inch drive socket set,
- 11/32 socket, and
- 11/32 open-end/box-end wrench.

Air Pump (29-24096) Removal/Installation (Sandcast Unit Only)

To remove the air pump (blower motor), perform the following:

1. Place the TS05 in the service access position (Section 5.2.2).
2. Remove the drive/formatter module (Section 5.6.5).
3. Remove the power supply assembly (Section 5.6.6).
4. Remove the air duct from the air pump. This can be performed by carefully pulling the duct away from the air pump and removing the multiple coupler (Figure 5-19, Item 1), which is connected to two air ducts.
5. Remove the three nuts, using the 11/32 open-end/box-end wrench, that secure the air pump (Figure 5-19, Item 2) to the power supply assembly cover assembly.



MK-3691

Figure 5-19 Air Pump Assembly

6. Loosen the right-front and right-rear phillips screws, using the phillips screwdriver, that secure the power supply cover assembly to the bottom plate assembly of the TS05.
7. Maneuver the air pump until it can be removed from the power supply cover assembly, and set it on the bottom of the TS05.
8. Loosen and remove the top-most 11/32 inch nut, using the 11/32 open-end/box-end wrench, from the GND terminal inside the power supply assembly. The green ground wire of the air pump is connected to this terminal.
9. Remove the right-front phillips screw that secures the power supply cover assembly to the bottom plate assembly of the TS05.

10. Slide the three wires that are connected to the air pump out through the space between the power supply cover assembly and the top plate assembly of the TS05.
11. Remove the protective screen from the air pump and install it on the replacement air pump.

To replace the air pump, reverse steps 1 through 11.

Air Pump Removal/Installation (Diecast Unit Only)

Refer to the Power Supply Assembly Removable/Replace (Diecast Unit Only) section (see Section 5.6.6).

5.6.8 Air Ducts

WARNING

Before performing this procedure, ensure that the TS05 is turned off and that the power cord is removed from the power source.

Tools Required

- None.

Air Ducts Removal/Installation (Sandcast Unit Only)

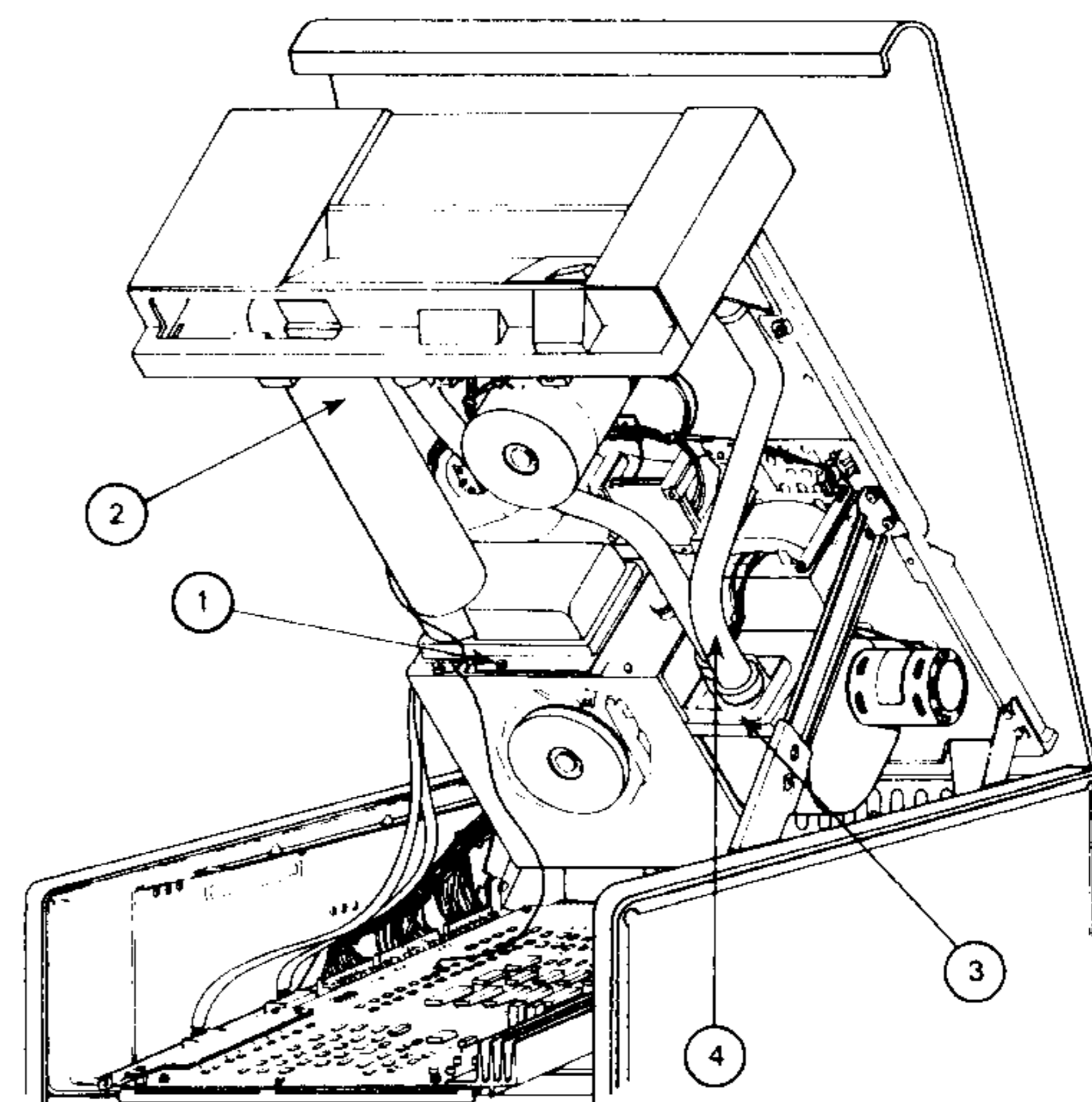
To remove the air ducts from the TS05, perform the following:

1. Place the TS05 in the service access position (Section 5.2.2).
2. Remove the air filter (Section 5.6.1).
3. Pull out on the Ny-Lok™ fastener located at the bottom of the air intake duct going into the power supply case (Figure 5-20, Item 1).
4. Push/pull, using both hands, the air duct (Figure 5-14, Item 2) toward the right side of the TS05. (This frees the air duct from the power supply and the front panel of the TS05 at the same time.)
5. Pull down, using both hands, on the air supply elbow that extends up into the top plate assembly (Figure 5-20, Item 4).

NOTE

Gently pushing on the elbow from the top side of the top plate assembly helps free it.

6. Remove the adapter (Figure 5-20, Item 3) from the air pump.



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Figure 5-20 Air Ducts (Sandcast Unit Only)

NOTE

The right-most air duct, as viewed from the bottom of the TS05 (Figure 5-14, Item 4), does not have to be removed. If the right-most air duct must be removed, for any reason, the front panel of the TS05 must be removed first.

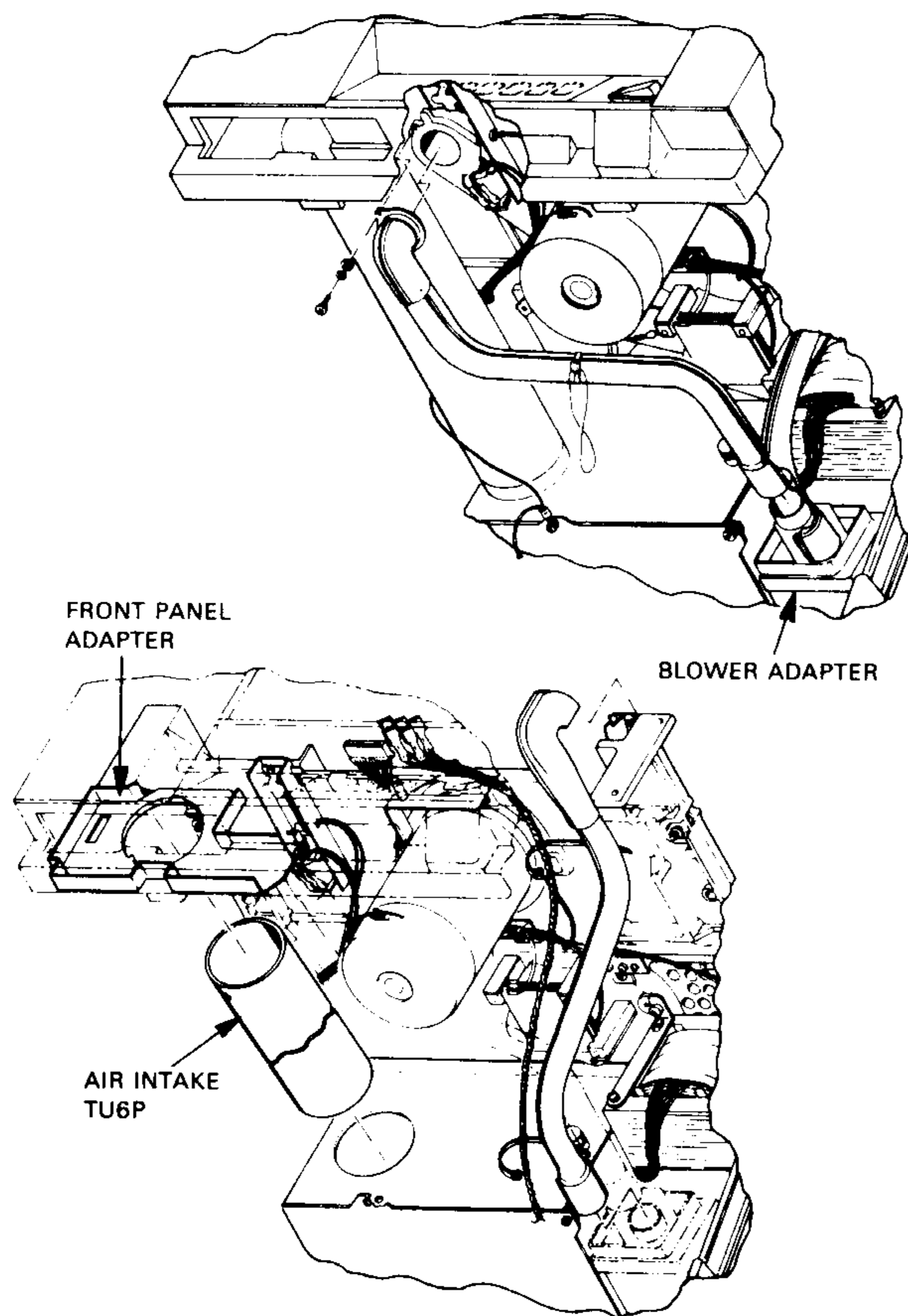
To replace the air ducts, reverse steps 1 through 6.

Air Intake Tube Removal/Installation (Diecast Unit Only Figure 5-21)

1. Remove the filter (see Section 5.6.12).
2. Place the unit in the service access position (see Section 5.2.2).
3. Remove the air intake tube from the power supply case by pressing the tube slightly at the hole (bottom of the tube) to disengage the tooth and slide forward into the front panel adapter.

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4. Remove the front panel by opening the front door and removing the four screws, lockwashers, and flatwashers. Do not remove any Ty-raps, and so forth.
5. Slide the air intake tube out of the front panel.
6. Install the replacement tube in the reverse order of removal.
7. Place the transport in the operating position (see Section 5.2.2).



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Figure 5-21 Air Intake Tube Removal/Installation (Diecast Unit Only)

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5.6.9 Read/Write Head Assembly (29-24080)

WARNING

Before performing this procedure, ensure that the TS05 is turned off and that the power cord is removed from the power source.

Tools Required

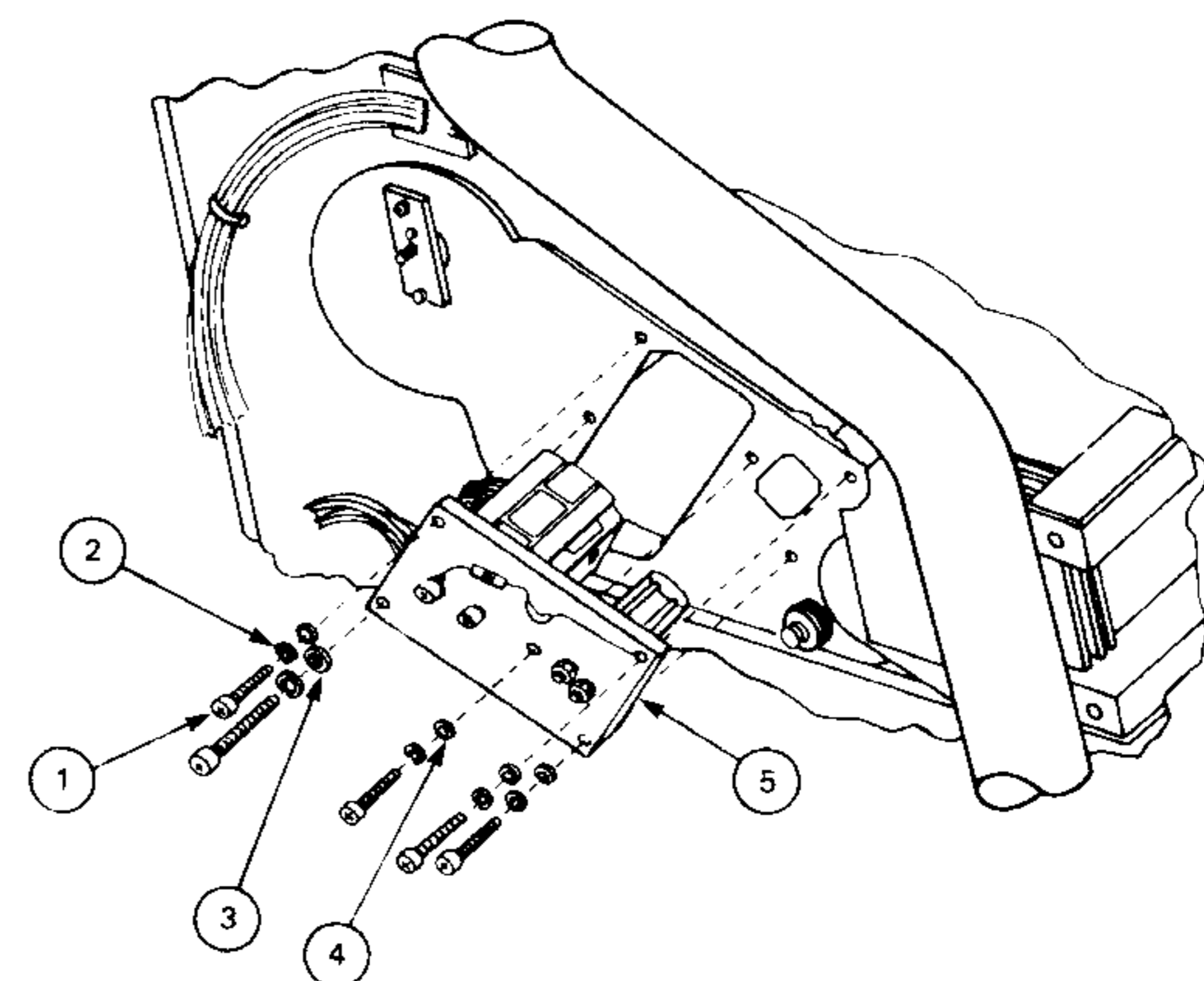
- Small phillips screwdriver, and
- 3/32 allen wrench.

To remove the read/write head assembly, perform the following:

1. Place the TS05 in the service access position (Section 5.2.2).
2. Remove the air filter (Section 5.6.1).
3. Remove the air ducts (Section 5.6.8).

CAUTION

The read/write head assembly (Figure 5-22, Item 5) is delicate. Use extreme care when handling. Do not rub fingers across the head for any reason at any time.



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Figure 5-22 Read/Write Head Assembly

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4. Remove the four phillips screws and the 7/32 allen-head screw which secure the read/write head to the top plate assembly (Figure 5-22, Item 1).

NOTE

Do not lose the washers, lock washers, or shims (Figure 5-22, Items 2, 3, and 4) that are attached to the read/write head assembly.

To replace the read/write head assembly, reverse steps 1 through 4. Perform the head assembly adjustment and read threshold adjustment (Appendix B).

CAUTION

The tape cleaner edges are sharp and can cause injury if improperly handled.

5.6.10 Capacitor Plate Assembly (29-24099)

WARNING

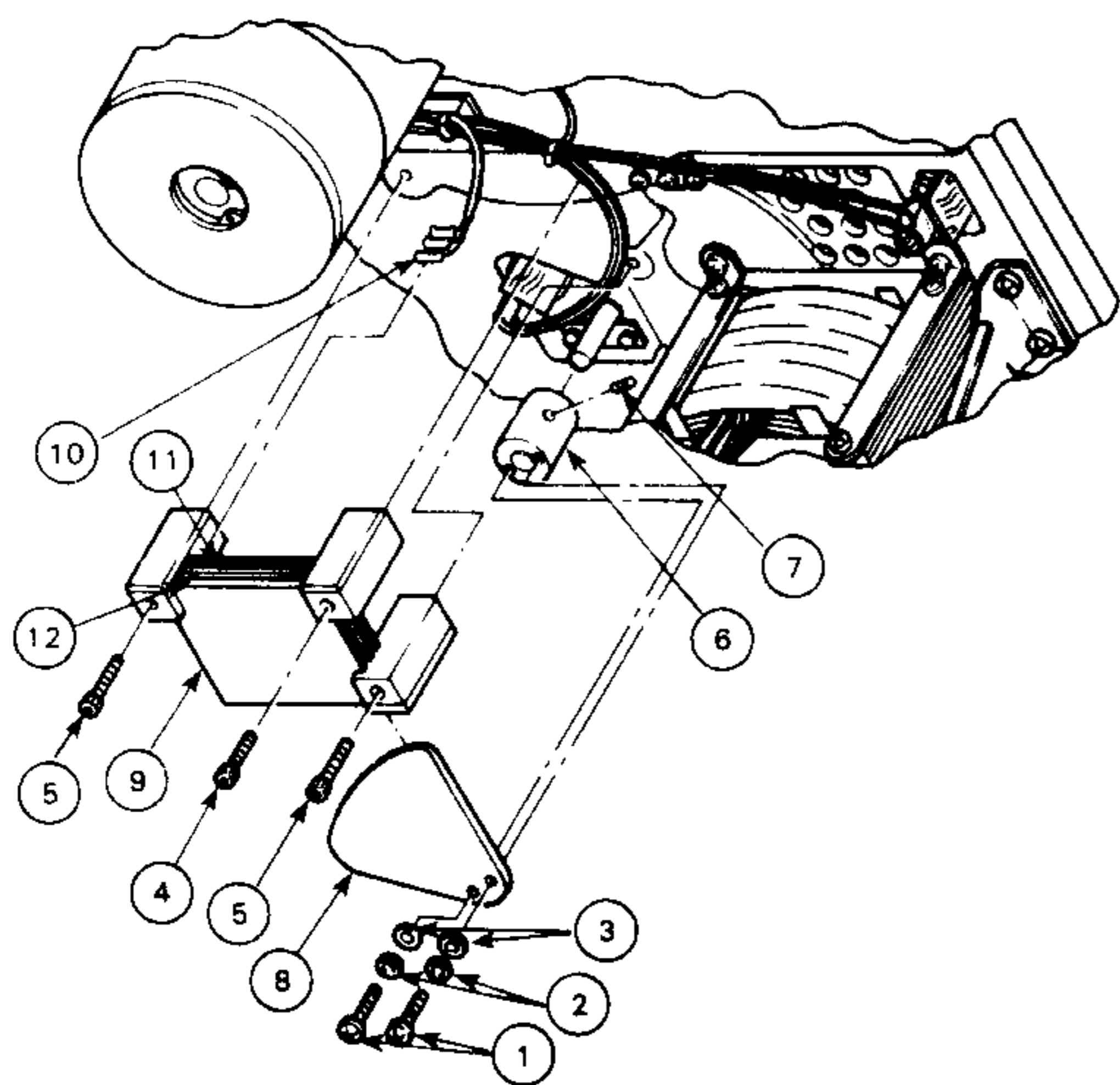
Before performing this procedure, ensure that the TS05 is turned off and that the power cord is removed from the power source.

Tools Required

- 3/32 allen wrench,
- Small phillips screwdriver, and
- Small needlenose pliers.

To remove the capacitor plate assembly, perform the following:

1. Place the TS05 in the service access position (Section 5.2.2).
2. Remove the air filter (Section 5.6.1).
3. Remove the air ducts (Section 5.6.8).
4. Remove the two phillips screws, using a small phillips screwdriver, that secure the non-metallic capacitor dielectric to the compliance arm assembly (Figure 5-23, Items 1, 2, and 3).
5. Remove the non-metallic dielectric (Figure 5-23, Item 8) by sliding it from between the first (Figure 5-23, Item 11) and second (Figure 5-23, Item 12) capacitor plates.
6. Remove the three wires, using needlenose pliers, that are connected to the capacitor plates (Figure 5-23, Item 10). (Make note of which wire is connected to which capacitor plate.)



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Figure 5-23 Capacitor Plate Assembly

NOTE

The larger black wire goes to the bottom capacitor plate, the clear wire goes to the center capacitor plate, and the small black wire goes to the top capacitor plate (the plate closest to the top plate assembly of the TS05).

- Remove the three allen screws, using the 3/32 allen wrench (Figure 5-23, Items 4 and 5) that secures the capacitor plates (Figure 5-23, Item 9) to the top plate assembly of the TS05.

To replace the capacitor plate assembly, reverse steps 1 through 7.

NOTE

After the replacement of the capacitor plate assembly, ensure that the capacitor non-metallic dielectric does not rub on the capacitor plates. If rubbing is present, repeat steps 1 through 7 and adjust the plate assembly (Figure 5-23, Items 6 and 7) until the problem is corrected. Then perform the compliance arm adjustment (Appendix B).

5.6.11 Compliance Arm Assembly (29-24079)

WARNING

Before performing this procedure, ensure that the TS05 is turned off and that the power cord is removed from the power source.

Tools Required

- Needlenose pliers,
- 3/64 allen wrench, and
- Snap-ring (retaining-ring) pliers.

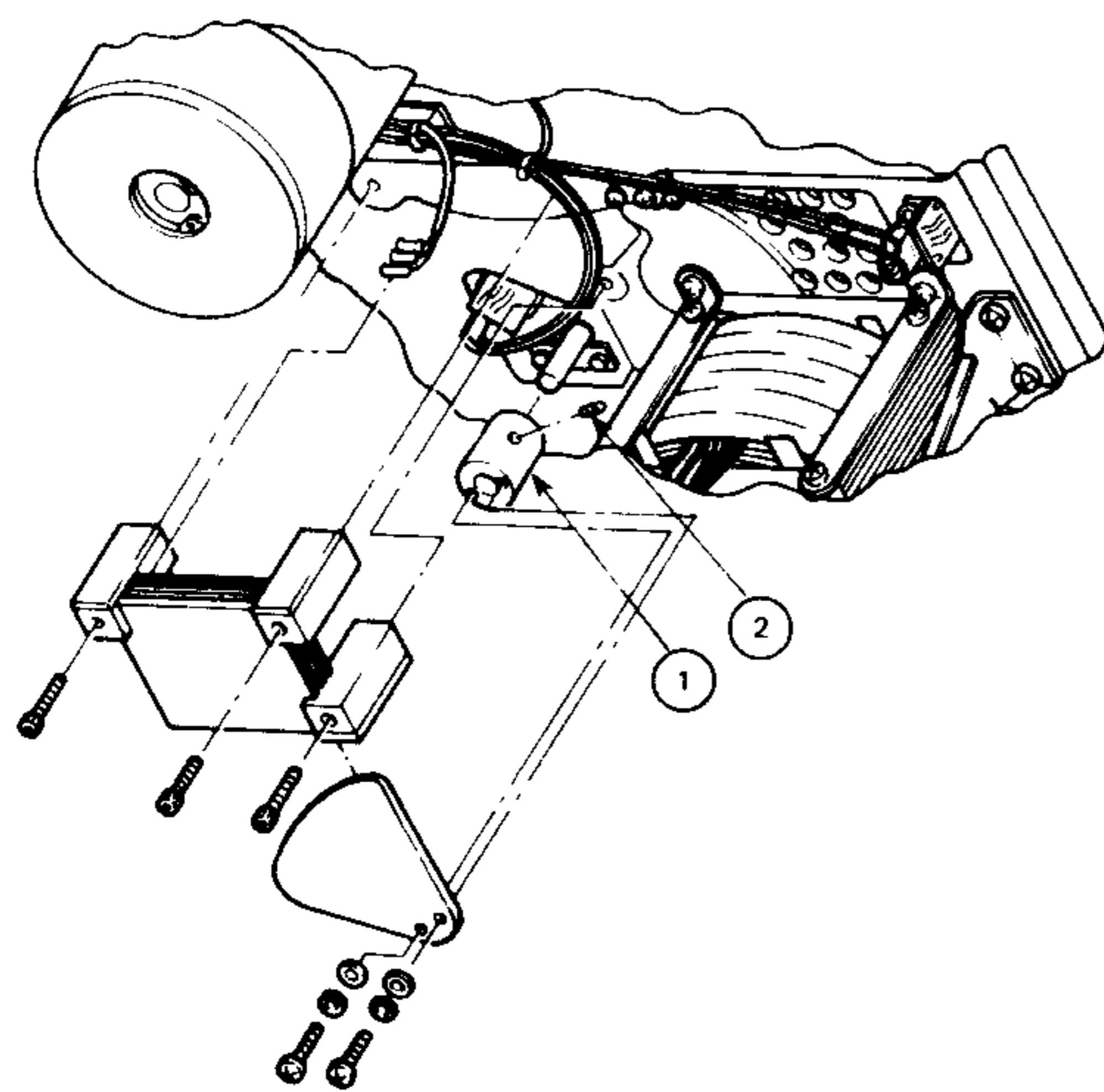
To remove the compliance arm assembly, perform the following:

- Place the TS05 in the service access position (Section 5.2.2).
- Remove the air filter (Section 5.6.1).
- Remove the air ducts (Section 5.6.8).
- Remove the capacitor plate assembly (Section 5.6.10).

NOTE

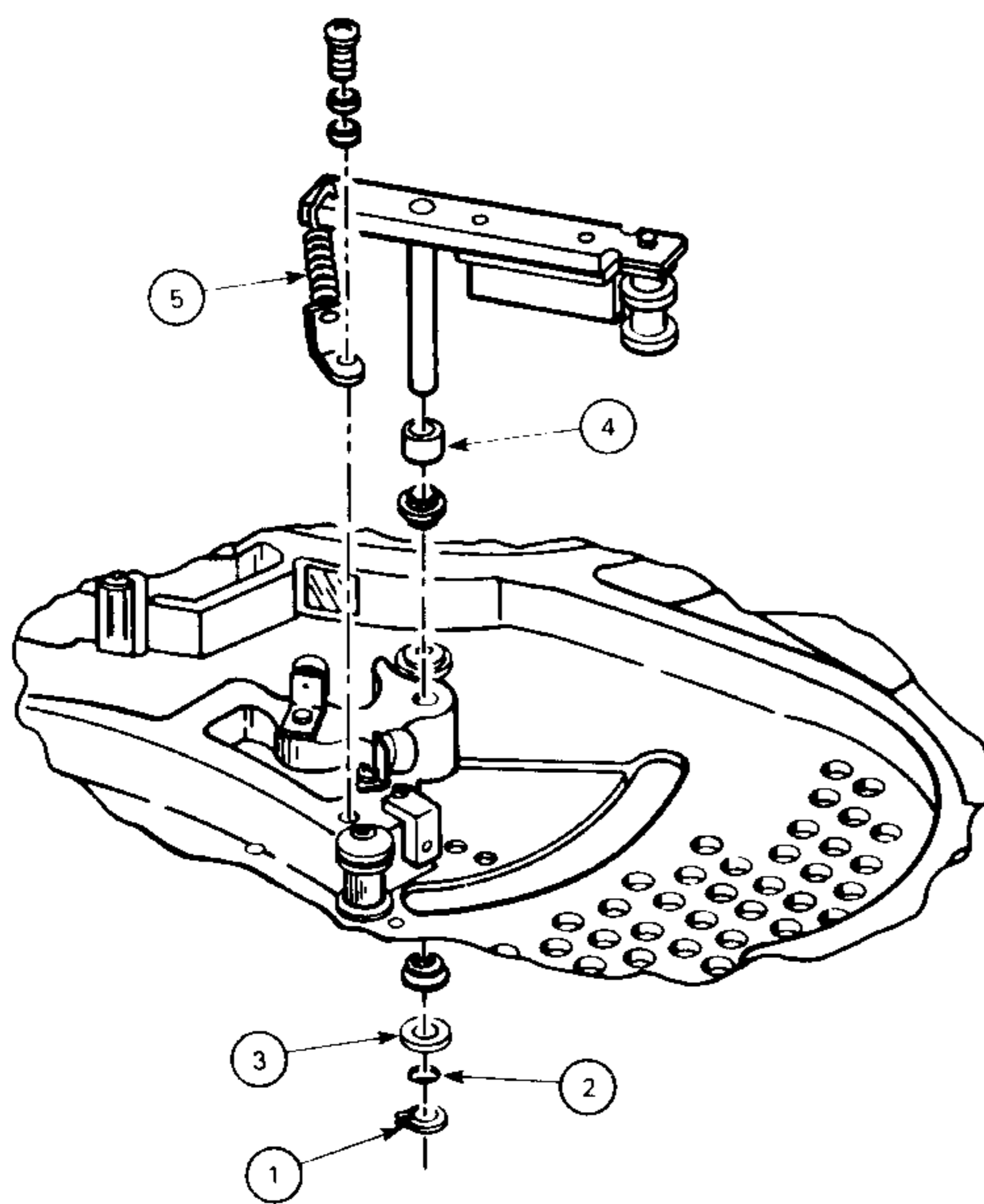
Before removing the collar on the compliance arm shaft (Figure 5-24, Item 1) in step 5, mark the position of the collar on the shaft with a scribe or marker. (This will aid in placing the collar back on the shaft at the correct place.)

- Loosen the allen-head screw on the compliance arm shaft (Figure 5-24, Item 2) using a 3/64 allen wrench.
- Remove the snap ring (Figure 5-25, Item 1) from the compliance arm shaft, using the snap-ring pliers.



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Figure 5-24 Compliance Arm Assembly
(Bottom View)



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Figure 5-25 Compliance Arm Assembly
(Top View)

7. Remove the washer and spacer (Figure 5-25, Items 2 and 3) from the compliance arm shaft.
8. Remove one end of the tension spring from the compliance arm, using the needlenose pliers (Figure 5-25, Item 5).

NOTE

Be careful not to lose the spacer (Figure 5-25, Item 4) on the compliance arm.

9. Lift the compliance arm from the top plate assembly.

To replace the compliance arm assembly, reverse steps 1 through 9. Perform the compliance arm adjustment (Appendix B).

5.6.12 Take-Up Motor/Supply Motor Assemblies

WARNING

Before performing this procedure, ensure that the TS05 is turned off and that the power cord is removed from the power source.

Tools Required

- Allen wrench set, and
- Phillips screwdriver.

To remove either the take-up motor assembly or the supply motor assembly, perform the following:

1. Place the TS05 in the operator maintenance access position (Section 5.2.1).
2. Remove the hub assembly (Section 5.4.2).
3. Loosen, but do not remove, the three screws holding the motor to the base plate.
4. Place the TS05 in the service access position (Section 5.2.2).
5. Remove the power supply assembly (Section 5.6.6) if the take-up motor assembly is being removed.
6. Disconnect the two in-line spade connectors attached to the motor.
7. Remove the three screws that secure the motor to the base plate assembly of the TS05, while supporting the motor that is being removed.
8. Remove the motor (carefully).

To replace the take-up motor or supply motor assembly, reverse steps 1 through 8.

NOTE

After replacing a motor, perform the hub height adjustment procedure (Appendix B).

6 FIELD REPLACEABLE UNITS

6.1 INTRODUCTION

This chapter lists the Digital Equipment Corporation part numbers for the major Field Replaceable Units (FRUs) of the TSV05 tape transport subsystem.

The parts listing is divided into the following sections:

- FRU electrical components of the TSV05 tape transport subsystem (Section 6.2),
- FRU mechanical components of the TSV05 tape transport subsystem (Section 6.3),
- FRU cables for the TSV05 tape transport subsystem (Section 6.4), and
- Test tape to be used on the TSV05 tape transport subsystem (Section 6.5).

6.2 FRU ELECTRICAL COMPONENTS

Part Description	Part Number
Capacitor plate assembly*	29-24099
Drive/formatter module*	29-24086S (Sandcast Only)
Drive/formatter module*	29-24086D (Diecast Only)
EOT/BOT sensor*	29-24082
File-protect sensor*	29-24084
Control module*	M7196
Head assembly*	29-24080
Photo-transistor*	29-24093
Power supply*	29-24085
Tape-in-path sensor*	29-24083
Transformer assembly	29-24097

* These parts are included in the control distribution kit (A2-W0560/10).

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Part Description	Part Number
Relay	29-24092
Take-up motor assembly	29-24094
Supply motor assembly	29-24095
Power switch	29-24088
Front panel switch	29-24090

6.3 FRU MECHANICAL COMPONENTS

Part Description	Part Number
Air filter*	29-24087
Air pump (blower motor)*	29-24096
Compliance arm assembly*	29-24079
Compliance arm bump assembly	29-24098
Supply hub*	29-24077
Tachometer assembly	29-24078
Roller tape guide assembly	29-24081
Compliance arm tape guide*	29-24089
Front panel	29-24100
Roller guide	29-24101
Take-up hub	29-24091

6.4 FRU CABLES

Part Description	Part Number
I/O cables*	70-16855-8

6.5 TEST TAPE

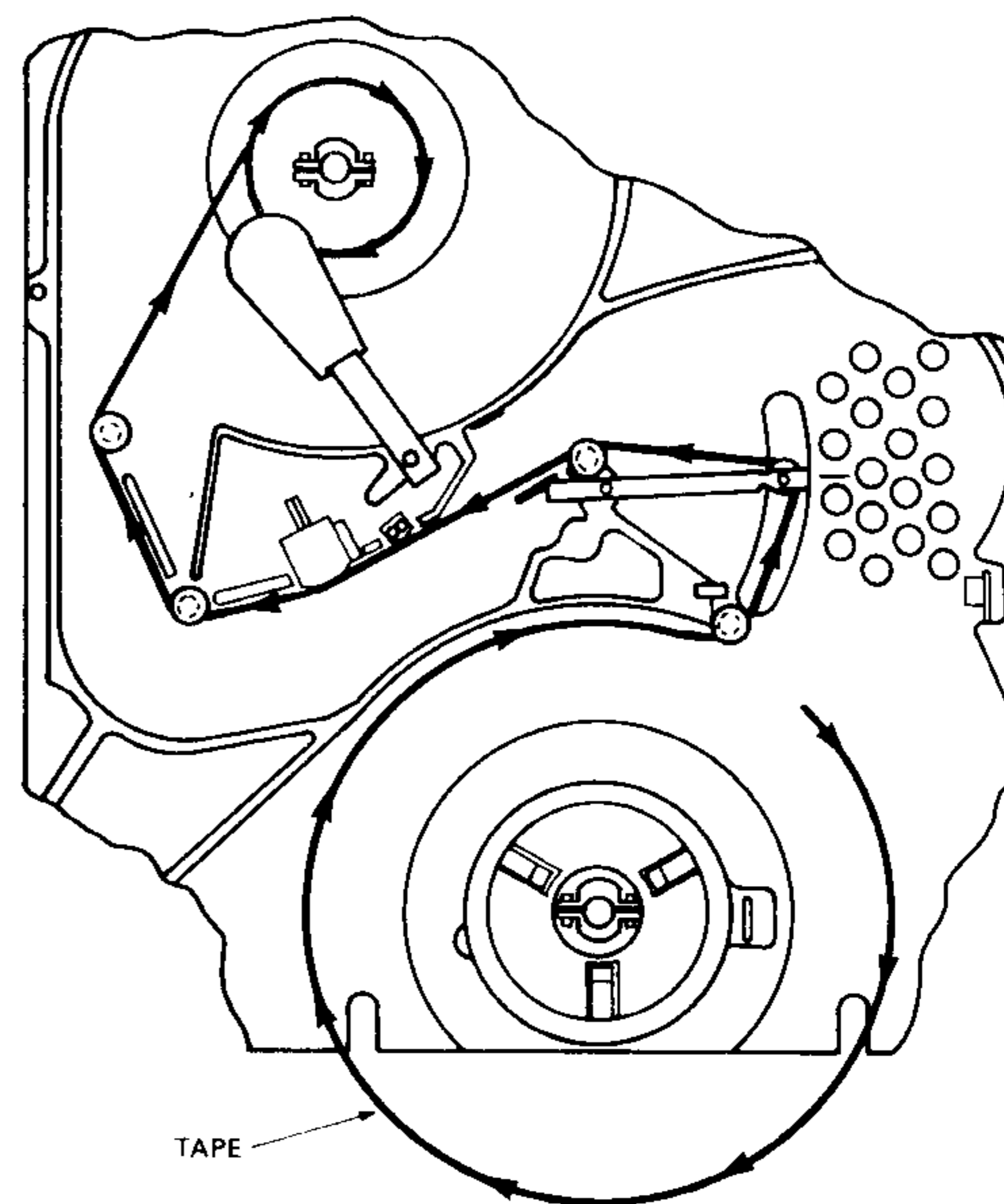
Part Description	Part Number
Amplitude test tape*	29-11696-00
800 bits/in skew tape	29-19224-00
Scratch Tape	30-18709-08

* These parts are included in the control distribution kit (A2-W0560/10).

A MANUAL LOAD

To load tape after a failure of the autoloading routine, proceed as follows:

1. Turn the power switch on the TS05 to off, (0 position).
2. Place the TS05 in the operator maintenance access position (refer to Section 5.2.1).
3. Place the reel of tape on the supply hub. Ensure that the reel is evenly seated on the hub.
4. Thread the tape along the path shown in Figure A-1. Carefully move the tachometer assembly away from the take-up hub and wrap the tape, clockwise, around the take-up hub. Check to make sure the tape is seated correctly on the tape guides and threaded properly over the head assembly.



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Figure A-1 Tape Threading Path

NOTE

Ensure that the tape BOT marker is not loaded beyond the BOT sensor on the tape drive. [There should be approximately 3.66 m (12 ft) of tape before the sensor. However, if this procedure does not work, check the amount of tape before the BOT sensor. It may be necessary to obtain another tape.]

5. Close the top cover and place the TS05 in its normal operating position.
6. Press the power switch to the 1 position.
7. Press and hold enter.
8. Press load.
9. Release enter and load.

The tape should gain tension and advance forward until the BOT marker is positioned at the photosensor. The load indicator should light, indicating that the transport is ready for use.

NOTE

The TS05 will not autoload tape when in the operator maintenance position or in the service access position.

B ADJUSTMENTS

This appendix gives the adjustment procedures that should be followed after the following have been replaced:

- Compliance arm assembly,
- Head assembly,
- Drive/formatter module, and
- Take-up or supply hub assemblies.

B.1 COMPLIANCE ARM ADJUSTMENT

This procedure must be performed after the following:

- Compliance arm removal/replacement (Section 5.6.11), and
- Capacitor plate assembly removal/replacement (Section 5.6.10).

Tools Required

- Spring scale (0 to 36 oz),
- Phillips screwdriver, and
- 30.48 cm (1 ft) of string (optional).

To perform the compliance arm adjustment, perform the following:

1. Turn the TS05 off and remove the tape.
2. Place the TS05 in the operator maintenance access position (Section 5.2.1).

- Place the hook of the spring scale (Figure B-1, Item 1) into the slot provided on the compliance arm (Figure B-1, Item 2), about 1.9 cm (3/4 in) from the compliance arm pivot point. (In some instances it is easier to loop a string around the compliance arm and hook the spring scale to the loop rather than trying to hook it to the compliance arm.)

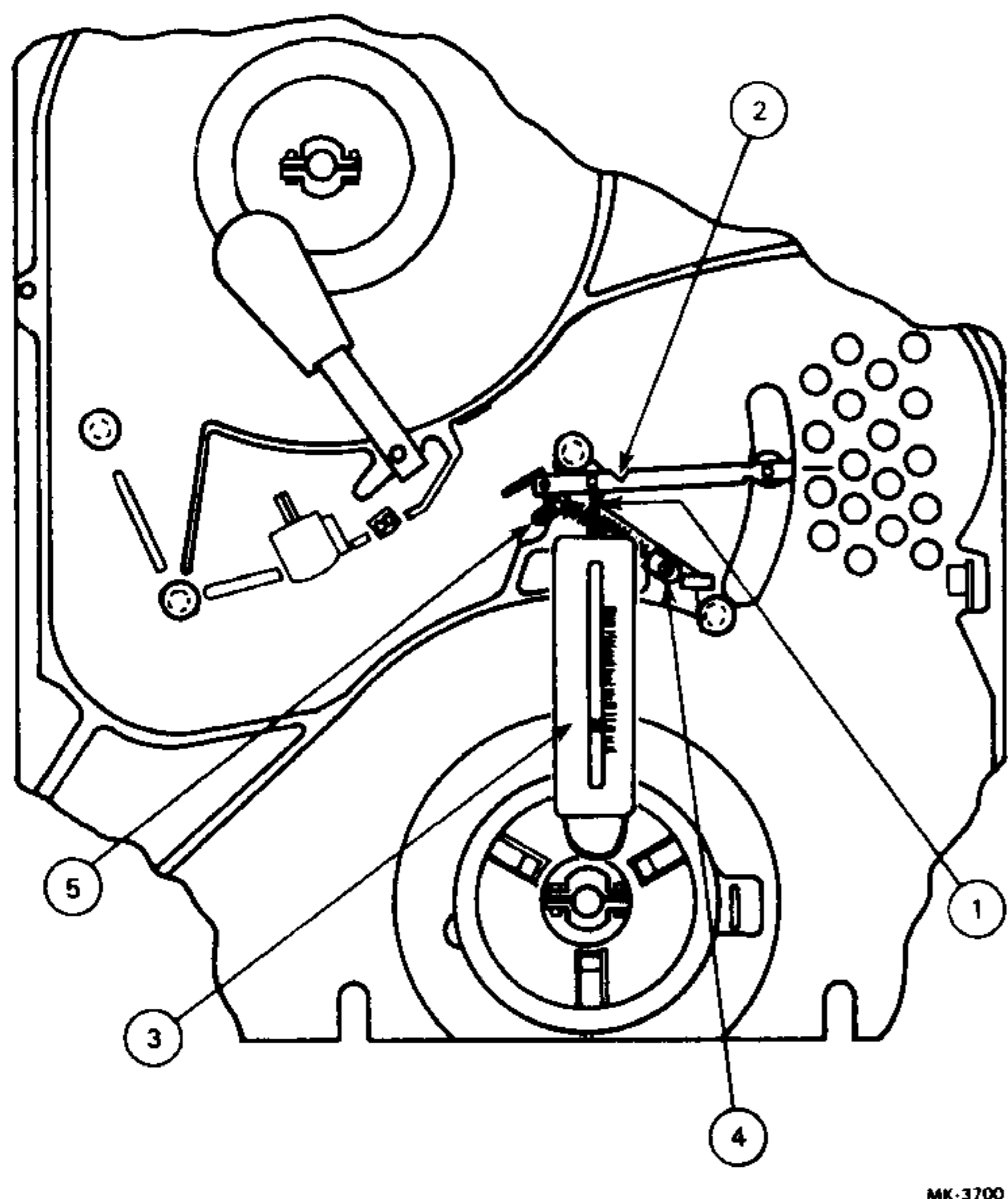


Figure B-1 Compliance Arm Adjustment

- Pull the spring scale (Figure B-1, Item 3) directly toward the front of the TS05 until the compliance arm points between the 4th and 5th row of holes on the top plate assembly (the holes are counted from the front of the TS05).

NOTE

Hold the spring scale perpendicular to the compliance arm when checking the tension.

When the compliance arm points between the 4th and 5th holes, the spring scale should indicate 28.5 ounces \pm 3.0 ounces.

If the reading is not within tolerance, the spring mechanical tie point (Figure B-1, Item 4) must be rotated until the reading is correct.

NOTE

To increase the spring tension, loosen the Phillips screw (this is the mechanical tie point) and rotate the spring tie counterclockwise.

- Verify the minimum spring tension required to move the arm from the rest position (after the spring tension is within tolerance).
- Position the hook of the spring scale at the same point used in step 3 and pull at a perpendicular angle, to the compliance arm, until the compliance arm is just pulled off the rest (Figure B-1, Item 5).

The spring scale should indicate 14 ounces \pm 2.0 ounces. If out of tolerance, repeat steps 1 through 6 until the compliance arm tension is correct.

B.2 HEAD ASSEMBLY ADJUSTMENT

This procedure must be performed after the head assembly (29-24080) has been replaced.

Tools Required

- Dual-trace oscilloscope;
- 800 bits/in skew tape (29-19224);
- Phillips screwdriver (6 inches in length – minimum), or a 3/32 allen wrench (6 inches in length – minimum); and
- Glyptal™

To perform the head assembly adjustment, perform the following:

- Load the 800 bits/in skew tape into the TS05.

Glyptal™ is a trademark of Alkyd-Resin Products

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- Place the TS05 in the service access position (Section 5.2.2).
- Connect the oscilloscope channel one scope probe to TP 55 (Figure B-2).

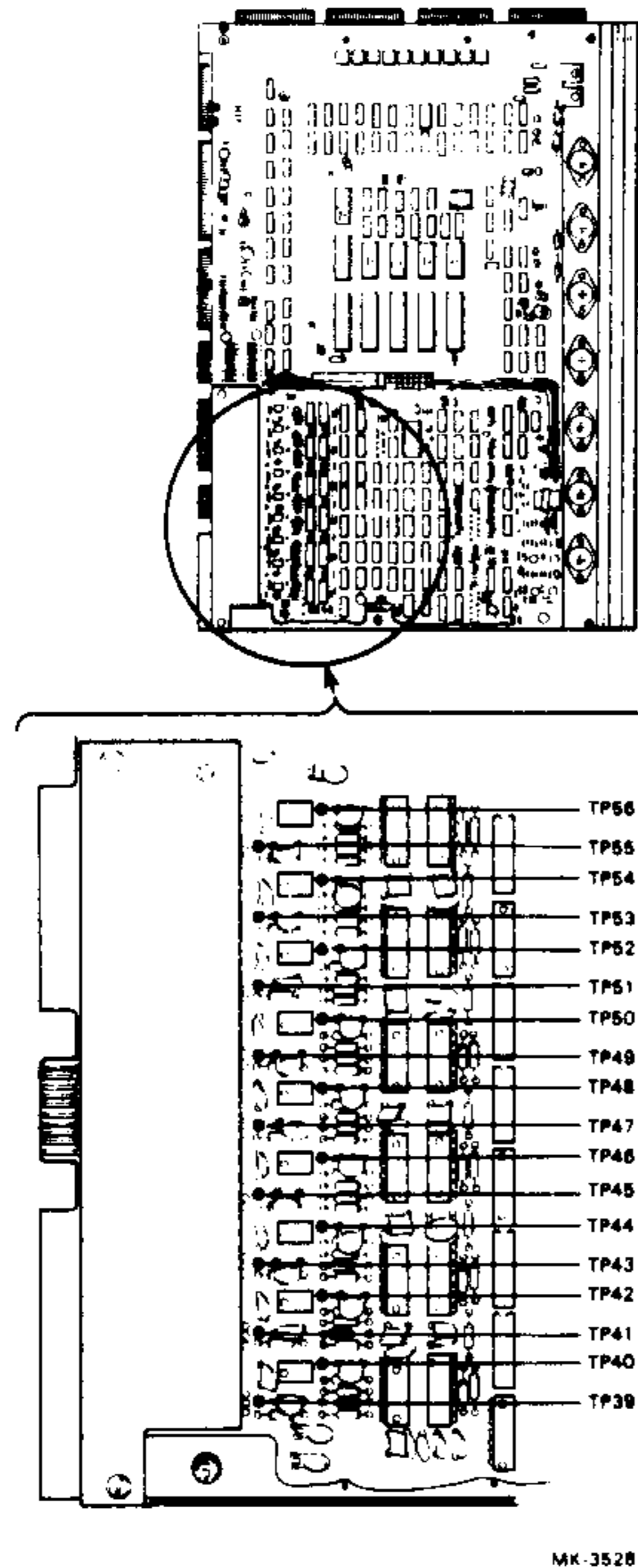


Figure B-2 Drive/Formatter Module

- Connect the oscilloscope channel two scope probe to TP 39 (Figure B-2).
- Set the dual-trace oscilloscope as follows:
 - Horizontal sweep
 - Calibrated position
 - 10 μ sec

- Vertical deflection
 - Calibrated position
 - .2 volts/div

- Loosen the adjustment screw (Figure B-3.).

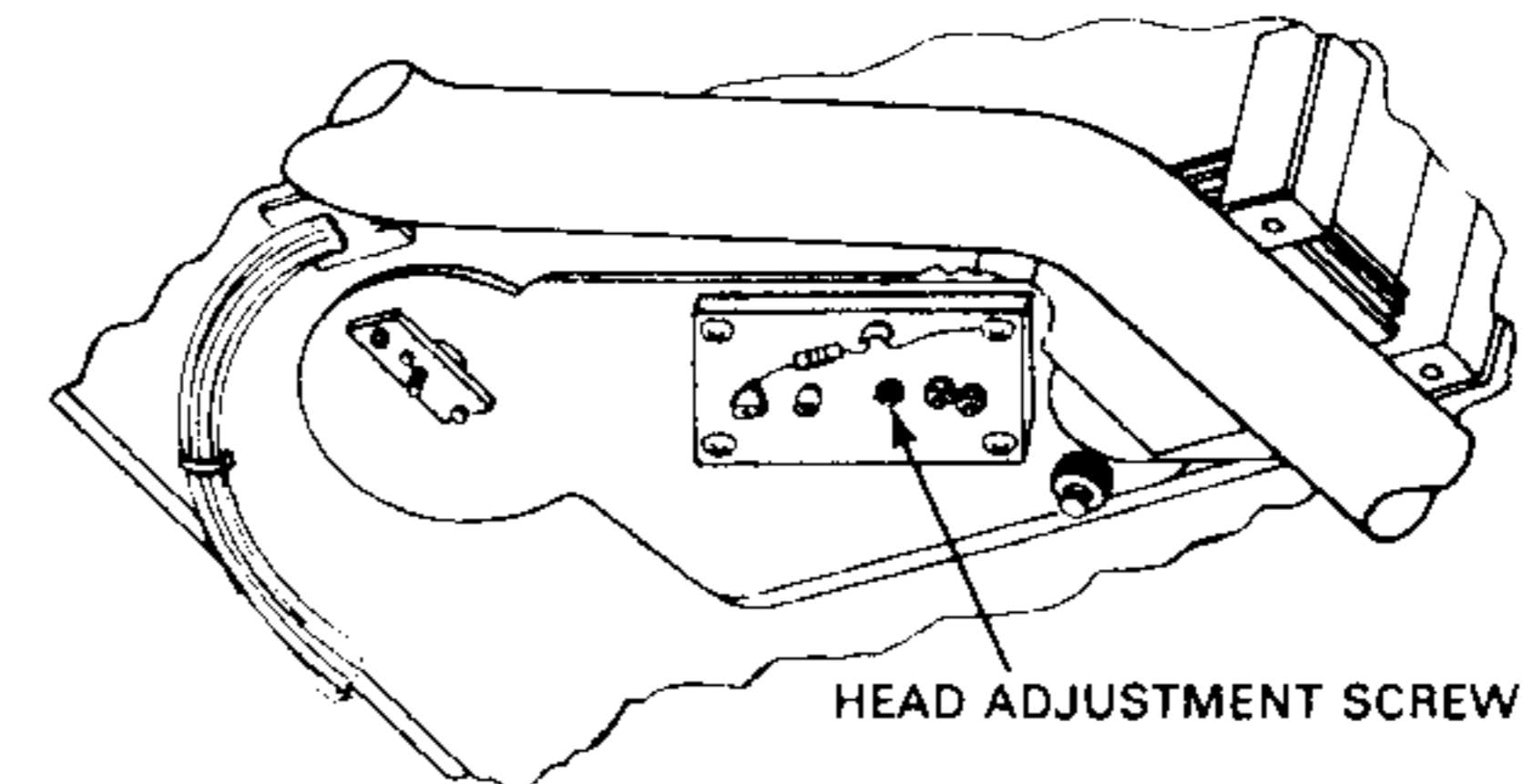


Figure B-3 Head Assembly (Bottom View)

- Run test 23 (Section 4.9) – 63.5 cm/s (25 in/s).
- Set the sync on the oscilloscope to INT and adjust the level control on the oscilloscope until a presentation, similar to Figure B-4, is present.

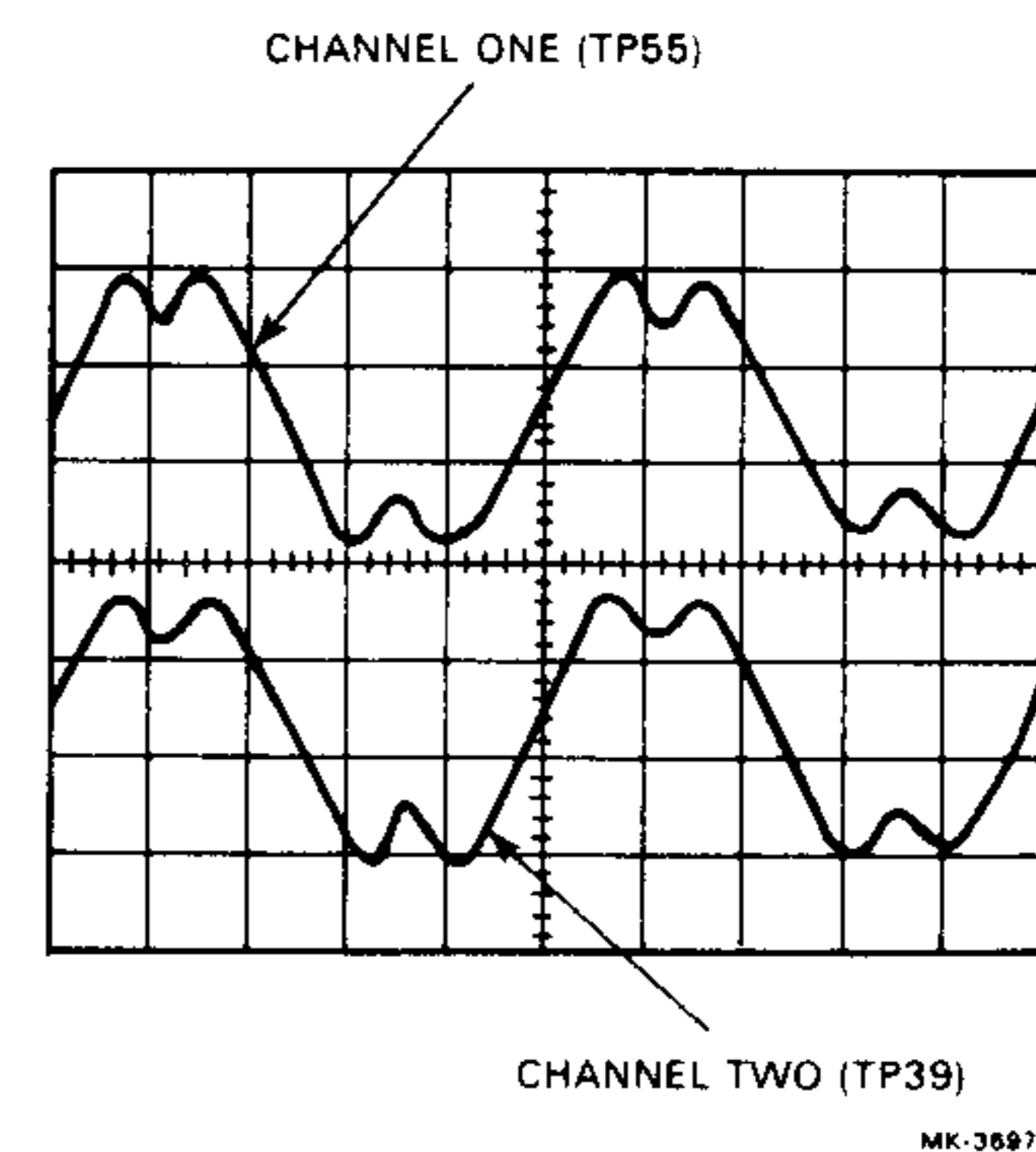


Figure B-4 Oscilloscope Presentation

9. Position the waveform from channel two over the waveform for channel one using the vertical positioning of channel two (Figure B-5).

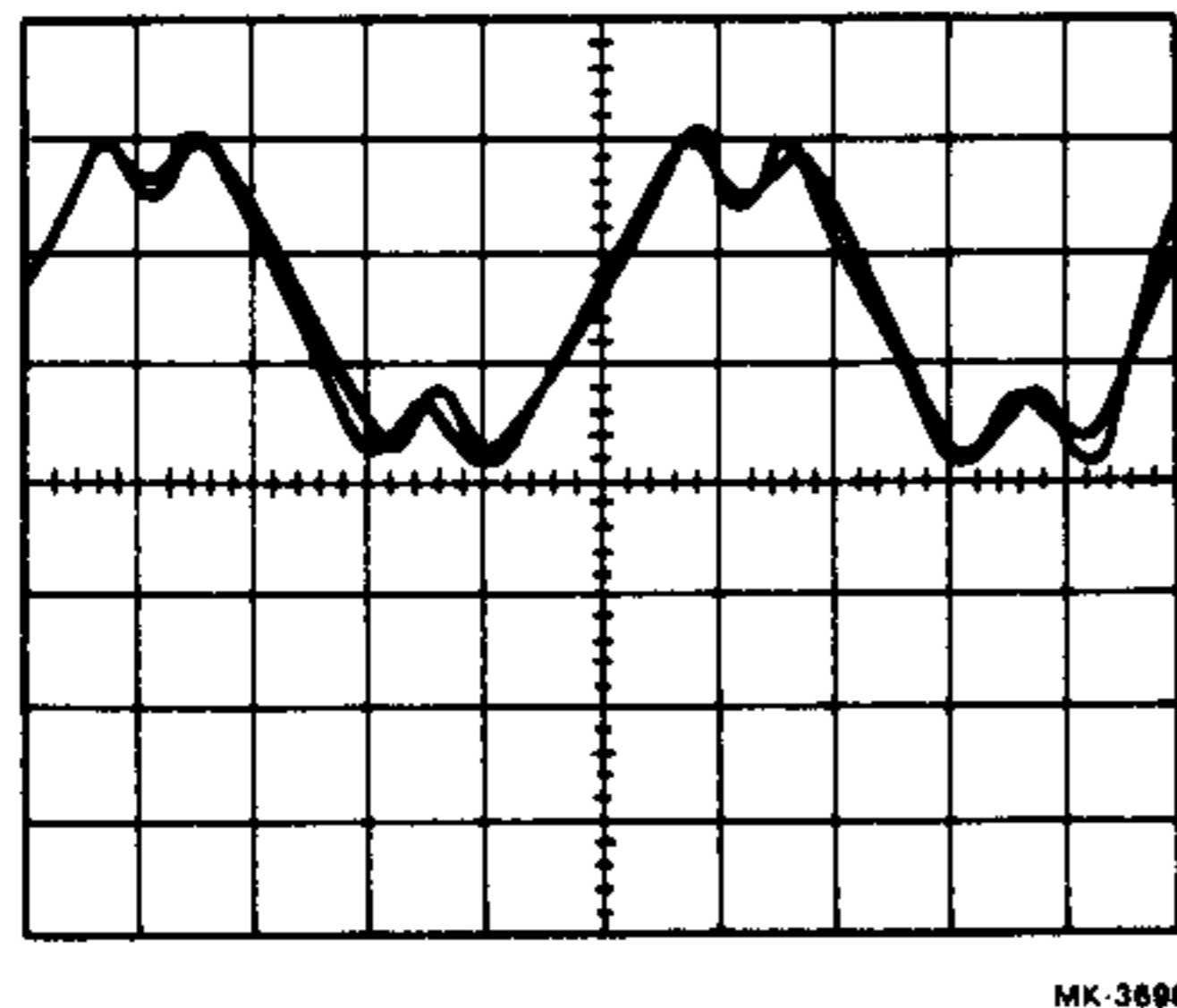


Figure B-5 Oscilloscope Presentation (Combined)

10. Rotate the adjustment screw on the bottom of the head assembly until the phase and voltage relation of both waveforms is as close to being in phase and the same peak-to-peak voltage as possible.
11. Ensure that the phase and voltage relationship at each of the following test points is within 10% of the voltage and phase of the signal at TP 55:
- TP 41,
 - TP 43,
 - TP 45,
 - TP 47,
 - TP 49,
 - TP 51, and
 - TP 53.

12. Remove the scope probes from the drive/formatter module.
13. Unload the skew tape by pressing unload.
14. Turn the TS05 off.
15. Apply Glyptal™ to the head adjustment screw. (This will keep the screw from loosening).
16. Return the TS05 to the normal operating position.
17. Turn the TS05 on.

B.3 READ THRESHOLD ADJUSTMENT

This procedure must be performed after the following:

- Head assembly replacement, and
- Drive/formatter module replacement.

To perform the read threshold adjustment perform the following:

1. Load the amplitude test tape (29-11696-00).
2. Place the TS05 in the service access position (Section 5.2.2).
3. Run test 21 (Section 4.9).
4. Adjust the read threshold adjustment (Figure B-6) until the load and unload LEDs (Figure B-7) both begin to flash on and off.
5. Apply Glyptal™ to the read threshold adjustment to prevent the new setting from changing.
6. Return the TS05 to the normal operating position.

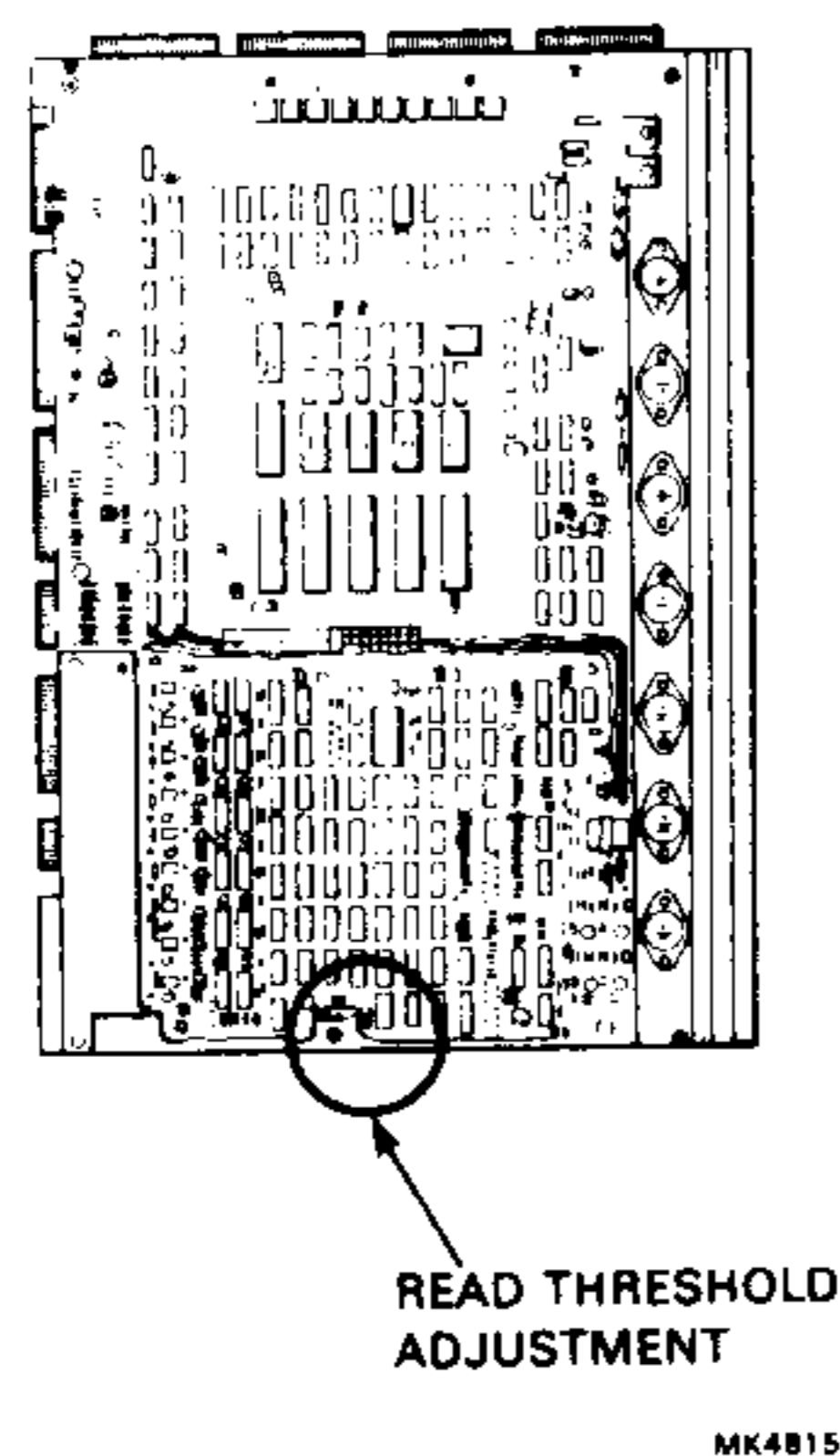


Figure B-6 Drive/Formatter Module
Read Threshold
Adjustment

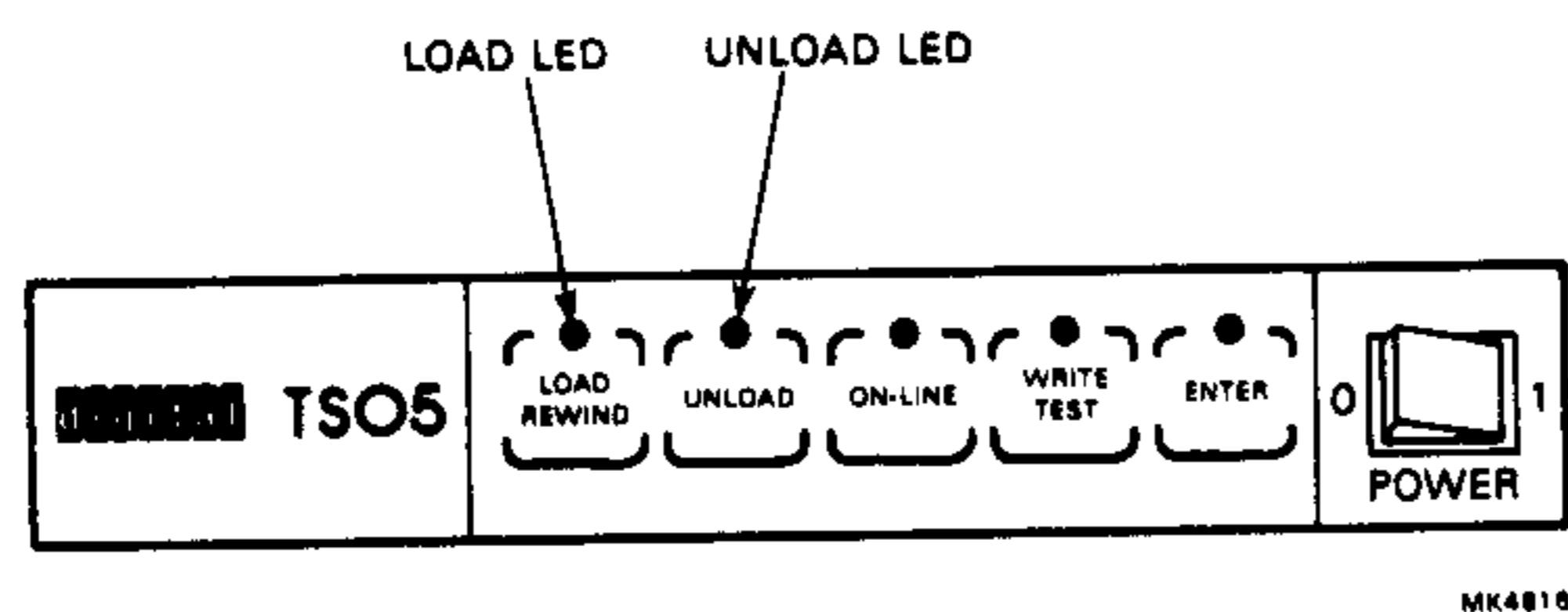


Figure B-7 Load and Unload LEDs

B.4 HUB HEIGHT ADJUSTMENT

This procedure must be performed every time either the take-up or supply hubs are removed.

Tools Required

- 7/64 extended allen wrench,
- 6-inch machinest scale, and
- Scratch tape.

Refer to supply hub assembly procedure (Section 5.4.2) for the assembly removal procedure, (this procedure generally applies to the take-up hub removal and replacement also).

The supply hub is adjusted so that the top of the base ridge is $1 \frac{1}{64}$ inches above the base of the motor. This can be measured by inserting a 6 inch machinest scale (perpendicular to the top plate assembly), between the supply hub pawl and the top plate assembly of the TS05 (refer to Figure B-8). To verify that the hub height is proper, run test 22 (Section 4.9) and observe the tape during the test. The tape should not rub against the top or bottom of the tape reel flange as the tape exists the reel.

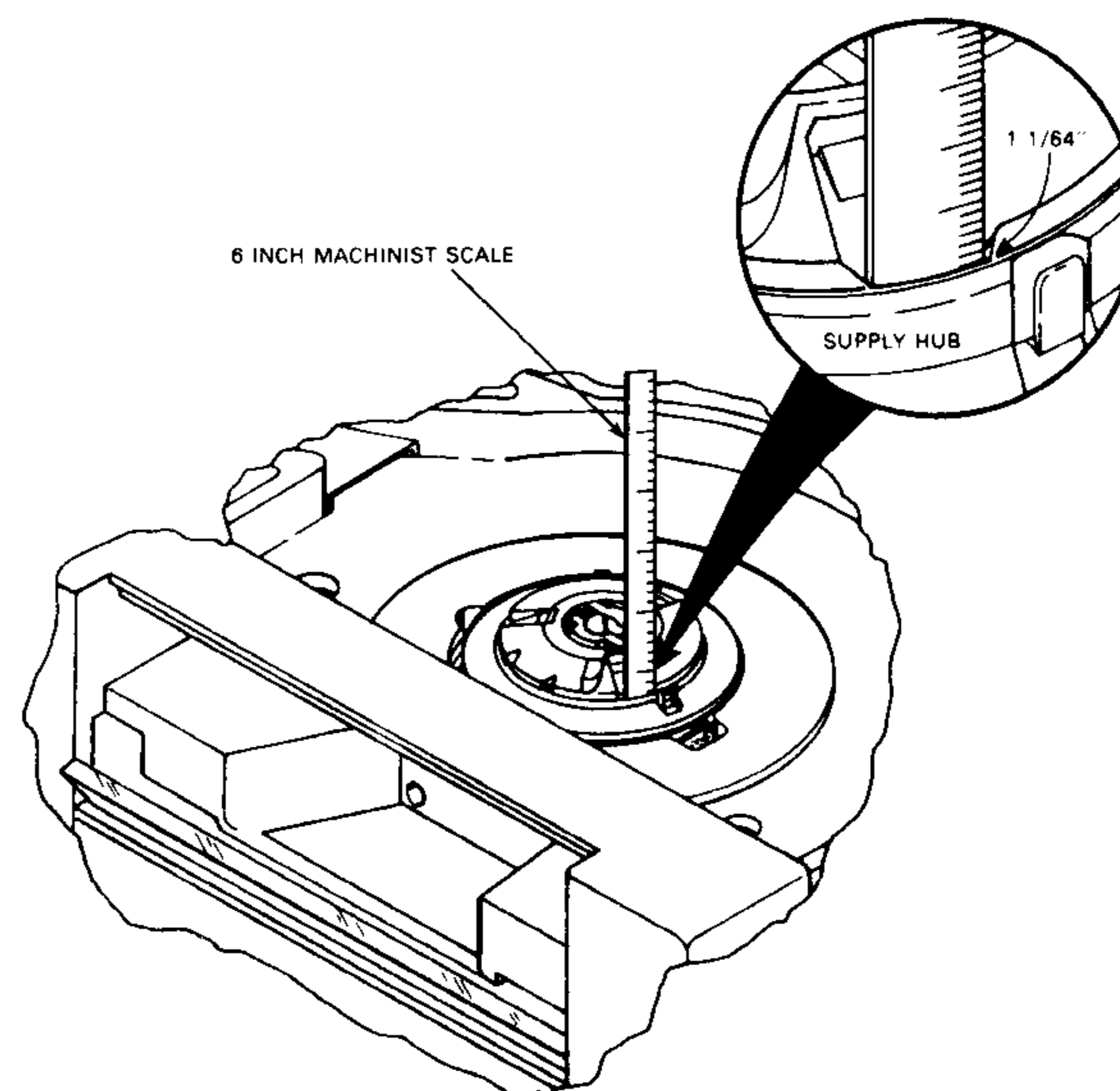


Figure B-8 Supply Hub Height Measuring

Corrective Action

If the tape rubs against the tape reel flange, the height is not set properly. Perform the hub height procedure again making allowances to correct for the improper height adjustment.

The take-up hub is adjusted so that the top of the hub is $1 \frac{17}{32}$ inches above the base of the motor. This can be measured by inserting a 6 inch machinest scale (perpendicular to the top plate assembly), between the take-up hub and the

top plate assembly of the TS05 (refer to Figure B-9). To verify that the hub height is proper, run test 22 (Section 4.9) and observe the tape during the test. The tape should not touch the bottom of the hub or ride up over the top edge of the hub assembly.

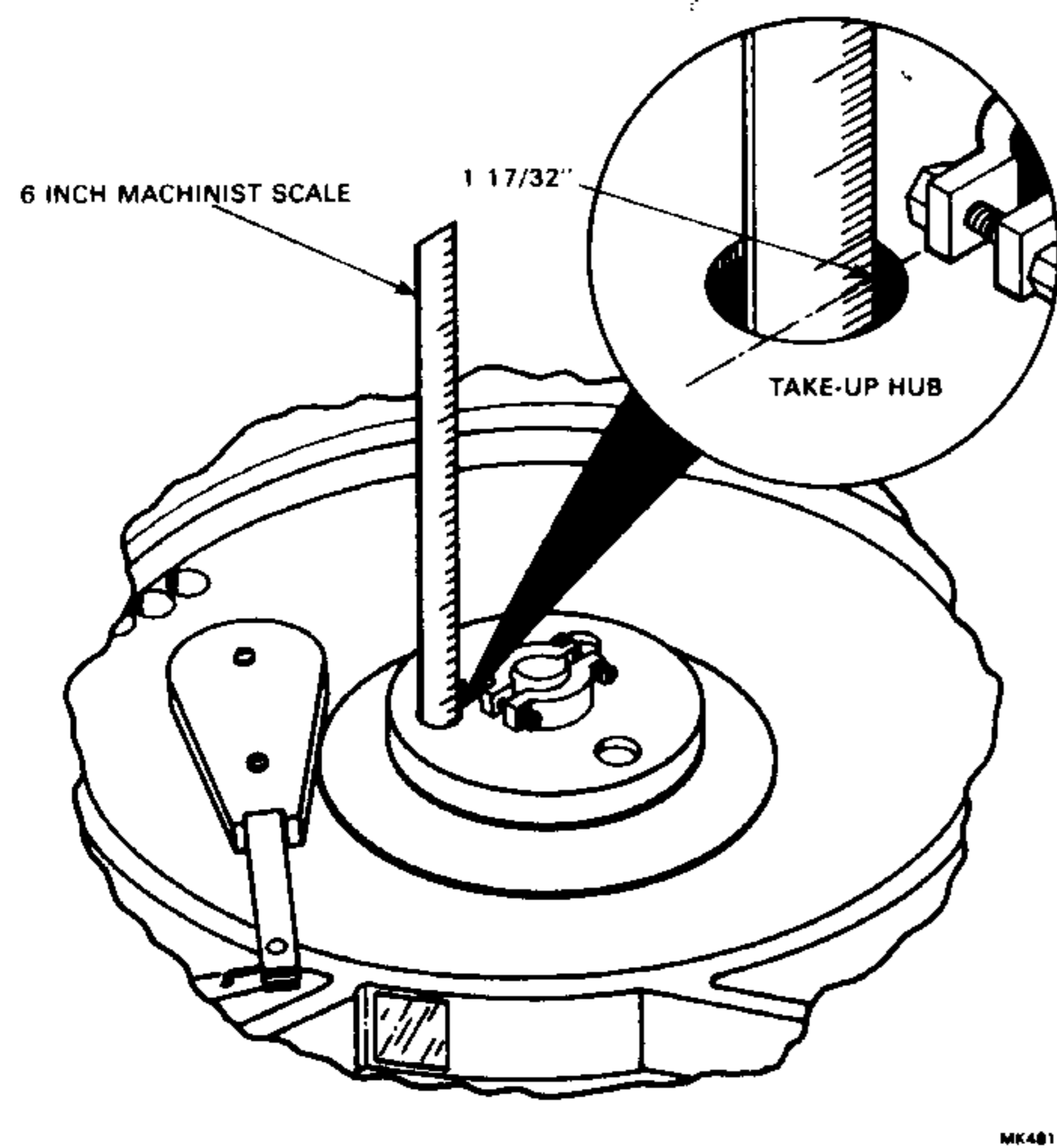


Figure B-9 Take-Up Hub Height Measuring

Corrective Action

If the tape touches the bottom of the hub or rides up over the top edge of the hub assembly, the height is not set properly. Perform the hub height procedure again making allowances to correct for the improper height.

C REGISTER SUMMARY

This appendix contains a summary of the device registers on the M7196 controller module, and the different "remote" device registers that the controller maintains in a message buffer area located in main memory.

C.1 BUS ADDRESS REGISTER (TSBA)
Refer to Figure C-1 for the TSBA bit map.

C.2 DATA BUFFER REGISTER (TSDB)
Refer to Figure C-2 for the TSDB bit map.

C.3 STATUS REGISTER (TSSR)
Refer to Figure C-3 for the TSSR bit map.

C.4 EXTENDED DATA BUFFER REGISTER (TSDBX)
Refer to Figure C-4 for the TSDBX bit map.

C.5 EXTENDED STATUS REGISTER 0 (XST0)
Refer to Figure C-5 for the XST0 bit map.

C.6 EXTENDED STATUS REGISTER 1 (XST1)
Refer to Figure C-6 for the XST1 bit map.

C.7 EXTENDED STATUS REGISTER 2 (XST2)
Refer to Figure C-7 for the XST2 bit map.

C.8 EXTENDED STATUS REGISTER 3 (XST3)
Refer to Figure C-8 for the XST3 bit map.

C.9 EXTENDED STATUS REGISTER 4 (XST4)

This register exists only if extended features are enabled. If the extended features are enabled, the data field length word will equal 14. Refer to Figure C-9 for the XST4 bit map.

BUS ADDRESS 772520 FIRST UNIT - (READ ONLY - TSBA)

A15	A14	A13	A12	A11	A10	A09	A08	A07	A06	A05	A04	A03	A02	A01	A00
15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00

BIT	NAME	OCTAL WEIGHT	DEFINITION
15	A15	100000	BUS ADDRESS BIT 15
14	A14	40000	BUS ADDRESS BIT 14
13	A13	20000	BUS ADDRESS BIT 13
12	A12	10000	BUS ADDRESS BIT 12
11	A11	4000	BUS ADDRESS BIT 11
10	A10	2000	BUS ADDRESS BIT 10
09	A09	1000	BUS ADDRESS BIT 09
08	A08	400	BUS ADDRESS BIT 08
07	A07	200	BUS ADDRESS BIT 07
06	A06	100	BUS ADDRESS BIT 06
05	A05	40	BUS ADDRESS BIT 05
04	A04	20	BUS ADDRESS BIT 04
03	A03	10	BUS ADDRESS BIT 03
02	A02	4	BUS ADDRESS BIT 02
01	A01	2	BUS ADDRESS BIT 01
00	A00	1	BUS ADDRESS BIT 00

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Figure C-1 TSBA Register Summary



BUS ADDRESS 772520 FIRST UNIT - (WRITE ONLY - TSDB)

P15	P14	P13	P12	P11	P10	P09	P08	P07	P06	P05	P04	P03	P02	P01	P00
15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00

BIT	NAME	OCTAL WEIGHT	DEFINITION
15	P15	100000	COMMAND POINTER BIT 15
14	P14	40000	COMMAND POINTER BIT 14
13	P13	20000	COMMAND POINTER BIT 13
12	P12	10000	COMMAND POINTER BIT 12
11	P11	4000	COMMAND POINTER BIT 11
10	P10	2000	COMMAND POINTER BIT 10
09	P09	1000	COMMAND POINTER BIT 09
08	P08	400	COMMAND POINTER BIT 08
07	P07	200	COMMAND POINTER BIT 07
06	P06	100	COMMAND POINTER BIT 06
05	P05	40	COMMAND POINTER BIT 05
04	P04	20	COMMAND POINTER BIT 04
03	P03	10	COMMAND POINTER BIT 03
02	P02	4	COMMAND POINTER BIT 02
01	P01	2	COMMAND POINTER BIT 01
00	P00	1	COMMAND POINTER BIT 00

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Figure C-2 TSDB Register Summary

(BUS ADDRESS 772522 FIRST UNIT (READ ONLY - TSSR))

SC	N/U	SCE	RMR	NXM	NBA	A17	A16	SSR	OFL	FC1	FC0	TC2	TC1	TC0	N/U
15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00

BIT	NAME	OCTAL WEIGHT	DEFINITION
15	SC	100000	SPECIAL CONDITION
14	N/U	40000	- NOT USED -
13	SCE	20000	SANITY CHECK ERROR
12	RMR	10000	REGISTER MODIFICATION REFUSED
11	NXM	4000	NON-EXISTENT MEMORY
10	NBA	2000	NEED BUFFER ADDRESS
09	A17	1000	BUS ADDRESS BIT 17
08	A16	400	BUS ADDRESS BIT 16
07	SSR	200	SUBSYSTEM READY
06	OFL	100	OFF-LINE
05	FC1	40	FATAL TERMINATION CLASS 01
04	FC0	20	FATAL TERMINATION CLASS 00
03	TC2	10	TERMINATION CLASS BIT 02
02	TC1	4	TERMINATION CLASS BIT 01
01	TC0	2	TERMINATION CLASS BIT 00
00	N/U	1	- NOT USED -

BUS ADDRESS 772523 FIRST UNIT (WRITE WORD CAUSES RESET)

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Figure C-3 TSSR Register Summary



BUS ADDRESS 772523 FIRST UNIT (WRITE HIGH BYTE ONLY - TSDBX)

BT				P21	P20	P19	P18								
15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00

BIT	NAME	OCTAL WEIGHT	DEFINITION
15	BT	100000	BOOT COMMAND BIT
14	N/U	40000	- NOT USED -
13	N/U	20000	- NOT USED -
12	N/U	10000	- NOT USED -
11	P21	4000	COMMAND POINTER BIT 21
10	P20	2000	COMMAND POINTER BIT 20
09	P19	1000	COMMAND POINTER BIT 19
08	P18	400	COMMAND POINTER BIT 18
07	N/U	200	- NOT USED -
06	N/U	100	- NOT USED -
05	N/U	40	- NOT USED -
04	N/U	20	- NOT USED -
03	N/U	10	- NOT USED -
02	N/U	4	- NOT USED -
01	N/U	2	- NOT USED -
00	N/U	1	- NOT USED -

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Figure C-4 TSDBX Register Summary

TMK	RLS	LET	RLI	WLE	NEF	IILC	ILA	MOT	ONL	IE	VCK	PED	WLK	BOT	EOT
15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
BIT	NAME	OCTAL WEIGHT	DEFINITION												
15	TMK	100000	TAPE MARK (READ SPACE/WRITE/SKIP/OTHER)												
14	RLS	40000	RECORD LENGTH SHORT												
13	LET	20000	LOGICAL END OF TAPE												
12	RLI	10000	RECORD LENGTH LONG												
11	WLE	4000	WRITE LOCK ERROR												
10	NEF	2000	NON-EXECUTABLE FUNCTION												
09	IILC	1000	ILLEGAL COMMAND												
08	ILA	400	ILLEGAL ADDRESS												
07	MOT	200	TAPE MOVING												
06	ONL	100	ON-LINE												
05	IE	40	INTERRUPT ENABLE												
04	VCK	20	VOLUME CHECK												
03	PED	10	PE DRIVE												
02	WLK	4	WRITE LOCK												
01	BOT	2	BEGINNING OF TAPE												
00	EOT	1	END OF TAPE												

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Figure C-5 XST0 Register Summary

DLT	N/U	COR	N/U	N/U	N/U	N/U	N/U	N/U	N/U	N/U	N/U	N/U	N/U	N/U	N/U
15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00

BIT	NAME	OCTAL WEIGHT	DEFINITION
15	DTL	100000	DATA LATE ERROR
14	N/U	40000	- NOT USED -
13	COR	20000	CORRECTABLE DATA
12	N/U	10000	- NOT USED -
11	N/U	4000	- NOT USED -
10	N/U	2000	- NOT USED -
09	N/U	1000	- NOT USED -
08	RBP	400	READ BUS PARITY ERROR
07	N/U	200	- NOT USED -
06	N/U	100	- NOT USED -
05	N/U	40	- NOT USED -
04	N/U	20	- NOT USED -
03	N/U	10	- NOT USED -
02	N/U	4	- NOT USED -
01	UNC	2	UNCORRECTABLE DATA
00	N/U	1	- NOT USED -

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Figure C-6 XST1 Register Summary

15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
OPM	RCE	N/U	N/U	N/U	WCF	N/U	N/U	RL7	RL6	RL5	RL4	RL3	RL2	RL1	RL0
BIT	NAME	OCTAL WEIGHT		DEFINITION											
15	OPM	1000000		OPERATION IN PROGRESS (TAPE MOVING)											
14	RCE	400000		RAM CHECKSUM ERROR											
13	N/U	200000		-- NOT USED --											
12	N/U	100000		-- NOT USED --											
11	N/U	40000		-- NOT USED --											
10	WCF	20000		WRITE CLOCK FAILURE											
09	N/U	10000		-- NOT USED --											
08	N/U	4000		-- NOT USED --											
07	RL7	200		REVISION LEVEL BIT 7											
06	RL6	100		REVISION LEVEL BIT 6											
05	RL5	40		REVISION LEVEL BIT 5											
04	RL4	20		REVISION LEVEL BIT 4											
03	RL3	10		REVISION LEVEL BIT 3											
02	RL2	4		REVISION LEVEL BIT 2											
01	RL1	2		REVISION LEVEL BIT 1											
00	RL0	1		REVISION LEVEL BIT 0											

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Figure C-7 XST2 Register Summary

15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
		MICRODIAGNOSTIC ERROR CODE													
BIT	NAME	OCTAL WEIGHT		DEFINITION											
15	MDE	1000000		MICRODIAGNOSTIC ERROR CODE											
14	MDE	400000		MICRODIAGNOSTIC ERROR CODE											
13	MDE	200000		MICRODIAGNOSTIC ERROR CODE											
12	MDE	100000		MICRODIAGNOSTIC ERROR CODE											
11	MDE	40000		MICRODIAGNOSTIC ERROR CODE											
10	MDE	20000		MICRODIAGNOSTIC ERROR CODE											
09	MDE	10000		MICRODIAGNOSTIC ERROR CODE											
08	MDE	4000		MICRODIAGNOSTIC ERROR CODE											
07	N/U	200		-- NOT USED --											
06	OPI	100		OPERATION INCOMPLETE											
05	REV	40		TAPE MOTION REVERSE: IF MULTIPLE RETRY AT LEAST 1 WAS REVERSE											
04	N/U	20		-- NOT USED --											
03	DCK	10		DENSITY CHECK											
02	N/U	4		-- NOT USED --											
01	N/U	2		-- NOT USED --											
00	RIB	1		REVERSE INTO BOT											

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Figure C-8 XST3 Register Summary

BIT	NAME	OCTAL WEIGHT	DEFINITION
15	HSP		
14	RXC		
13	N/U		
12	N/U		
11	N/U		
10	N/U		
09	N/U		
08	N/U		
07	WR7		
06	WR6		
05	WR5		
04	WR4		
03	WR3		
02	WR2		
01	WR1		
00	WRO		

BIT	NAME	OCTAL WEIGHT	DEFINITION
15	HSP	100000	HIGH SPEED 100 IPS MODE
14	RXC	40000	RETRY COUNT EXCEEDED
13	N/U	20000	- NOT USED -
12	N/U	10000	- NOT USED -
11	N/U	4000	- NOT USED -
10	N/U	2000	- NOT USED -
09	N/U	1000	- NOT USED -
08	N/U	400	- NOT USED -
07	WR7	200	WRITE ENTRY COUNT BIT 7
06	WR6	100	WRITE ENTRY COUNT BIT 6
05	WR5	40	WRITE ENTRY COUNT BIT 5
04	WR4	20	WRITE ENTRY COUNT BIT 4
03	WR3	10	WRITE ENTRY COUNT BIT 3
02	WR2	4	WRITE ENTRY COUNT BIT 2
01	WR1	2	WRITE ENTRY COUNT BIT 1
00	WRO	1	WRITE ENTRY COUNT BIT 0

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Figure C-9 XST4 Register Summary

D MESSAGE BUFFER EXAMINATION

This appendix gives the assumptions that must be made, the conditions that must exist, and the proper procedure that must be followed in order to properly examine the message buffer in the TSV05 diagnostics.

Assumptions

In order to check the TSV05 message buffer, the following assumptions must be made:

- The TSV05 diagnostics being used are CVTSA, CVTSB, CVTSC, CVTSD, and CVTSE.
- The TSV05 diagnostics listed above are being run with a LSI-11/23 processor.
- The user must be familiar with console ODT on the LSI-11/23 processor.

Conditions

The following conditions are needed in order to successfully examine the TSV05 message buffer.

- The diagnostics being run must be run with the halt on error (HOE) flag.
- The need buffer address (NBA) in the TSSR must not be set. (If the NBA is set, the message buffer does not exist and therefore cannot be examined.)

Message Buffer Examination Procedure

The following is the procedure that is to be followed when an examination of the message buffer is desired.

1. Press the break key on the terminal to get into console ODT.
2. Examine the TSBA of the TSV05 (772520). This points to the next address beyond the message buffer.

3. Subtract an octal 20 from the contents of the TSBA.
4. Examine the new calculated address as well as the next 7 word addresses.

NOTE

The second or third word has a value of 12 or 14. If the word value is 14, all five extended status registers exist. If the word has a value of 12, only four extended status registers exist.

The next word is the residual byte count (RBPCR). (Subsequent words will be XST0, XST1, XST2, XST3, and XST4. Refer to Appendix C.)

5. Type P followed by a CTRL/C to get to get back to the diagnostics and the diagnostics prompt DR>.

E BOOT CODE

This appendix contains the TS05 boot code that accomplishes everything the MS boot code will. Error handling is accomplished by retrying.

In order for the boot code to work, it is assumed that an MS boot block exists on tape and all hardware is operating properly. If this is true, the following code will boot RT11, RSX11, RSTS, and XXDP + tapes.

NOTE

Upon exit from this boot code, registers R0-R4 will contain the following:

- R0 = 0 unit number
- R1 = 172522 TSSR address
- R2 = 172520 TSBA/TSDB address
- R3 = 010016 PC of "SM" + 20

Refer to Figure E-1 for an example of the TS05 boot code.


```

007776 046523      .=7776      DEVICE ID BACKWARD
010000 012701      .WORD "SM"  R1=TSRR
010004 010102      MOV TS0DB+2,R1 R2=TSRR
010006 005000      CLR R0      CLEAR R0

010010 105711      TSTB (R1)   WAIT FOR SSR
010012 100376      BPL -1
010014 010704      MOV PC,R4   R4=PC OF "SM"+20
010016 112737      MOVB #200,0#TS05DB+3 WRITE BYTE BIT 15

010024 005242      INC -(R2)   WRITE INTO TSDB

010026 105711      TSTB (R1)   WAIT FOR SSR
010030 100376      BPL -1

010032 005711      TST (R1)   TEST FOR ERROR
010034 100761      BMI START  IF SC=1 RETRY
010036 005007      CLR PC     JUMP TO ZERO
                .END

STARTING ADDRESS 10000.

```

Figure E-1 TS05 Boot Code Example

READER'S COMMENTS

TSV05 Tape Transport

Pocket Service Guide

EK-TSV05-PS-004

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