

**T2003 SMART EXERCISER  
INSTALLATION AND OPERATION**



**Century Data Systems**  
A Xerox Company

Part Number 76271-201

**T2003 SMART EXERCISER  
INSTALLATION AND OPERATION**

**October 1980**



**WARNING**

This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the technical manuals, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.

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## SECTION 1 INTRODUCTION

### DESCRIPTION

The T2003 Smart Exerciser is a microprocessor controlled portable tester used on Trident and Hunter drives. Stored inside the exerciser are all the cables needed to connect to the drive and power. One of two possible interface boards is attached to the exerciser lid. These interface boards are identified as follows:

- a. Differential Interface board — used to test Trident drives with a differential interface (SMD Interface) and used to test Hunter drives with a differential interface (CMD Interface).
- b. Trident Interface board — used to test Trident and Hunter drives with a TTL interface.

The exerciser interface board is cabled to the drive. The exerciser can operate the drive through the drive exerciser cable or through the drive bus and radial cables. The drive is controlled by commands entered via the exerciser hexadecimal keyboard. The results of these commands are displayed on a four position hexadecimal display. A wide variety of exerciser commands allows the user to perform extensive drive testing.

The exerciser has the capability of writing the cylinder and head address in each sector. The exerciser can also write any two byte pattern in the data field of each sector and repeat this pattern for the desired data field length. The exerciser can format using either the address mark mode or the sector mode.

The T2003 Exerciser part number is 21462-001 (for the Trident interface) or part number 21462-002 (for the differential interface).

### REFERENCE DOCUMENTS

The following manuals may be needed for information about the particular drive being tested:

- a. Models T25/50/80 Installation and Operation P/N 76205-2XX.

- b. Model T82 Installation and Operation P/N 76208-2XX.
- c. Models T200/300 Installation and Operation P/N 76200-2XX.
- d. Models T202/302 Installation and Operation P/N 76206-2XX.
- e. Hunter Disk Drive Installation and Operation P/N 76270-2XX.

### PHYSICAL AND ELECTRICAL CHARACTERISTICS

Table 1-1 provides the environmental, electrical and physical description of the exerciser.

**TABLE 1-1. PHYSICAL AND ELECTRICAL CHARACTERISTICS**

<b>Environmental</b>	
Temperature	50°F to 104°F (10°C to 40°C) Max. temp. gradient 20°F/hr
Humidity	10% to 80% no condensation
Altitude	Sea level to 6000 feet (1.8 kilometers)
<b>Electrical</b>	
Voltage	115 ± 10% VAC using Molex jumper plug P/N 22781-001 230 ± 10% VAC using Molex jumper plug P/N 22781-002
Frequency	47 to 63 Hz
Current	0.8 ampere max.
<b>Physical</b>	
Depth, Length, Width	8½" × 17½" X 13" (21.6cm × 44.5cm × 33cm)
Weight	27 pounds (12.2 kilograms)



## EXERCISER SWITCHES AND INDICATORS

The exerciser has the following switches, indicators, and test points. Figure 1-1 and 1-2 show the exerciser case and control panel.

- a. Four-character exerciser display.
- b. Hexadecimal keyboard.
- c. WRITE Pushbutton.
- d. RESET Pushbutton.
- e. Position Rate (POSRATE) potentiometer.
- f. Power circuit breaker.
- g. LED indicators.
  1. OVERRIDE SER CYL — HUNTER (Override Service Cylinder — Hunter)
  2. CART SELD — HUNTER (Cartridge Selected — Hunter)
  3. +5V (Plus 5 volts)
  4. ADMK MODE (Address Mark Mode)
  5. NO STOP ON ERR (No Stop On Error)
  6. OFFSET ON
  7. STROBE ON
- h. Test points on Differential interface board.
  1. INDEX
  2. SYSCLK (System Clock)
  3. AMDET (Address Mark Detect)
  4. WRITE DATA
  5. READ GATE
  6. READ DATA
  7. SECTOR
  8. WRITE GATE
  9. ERROR

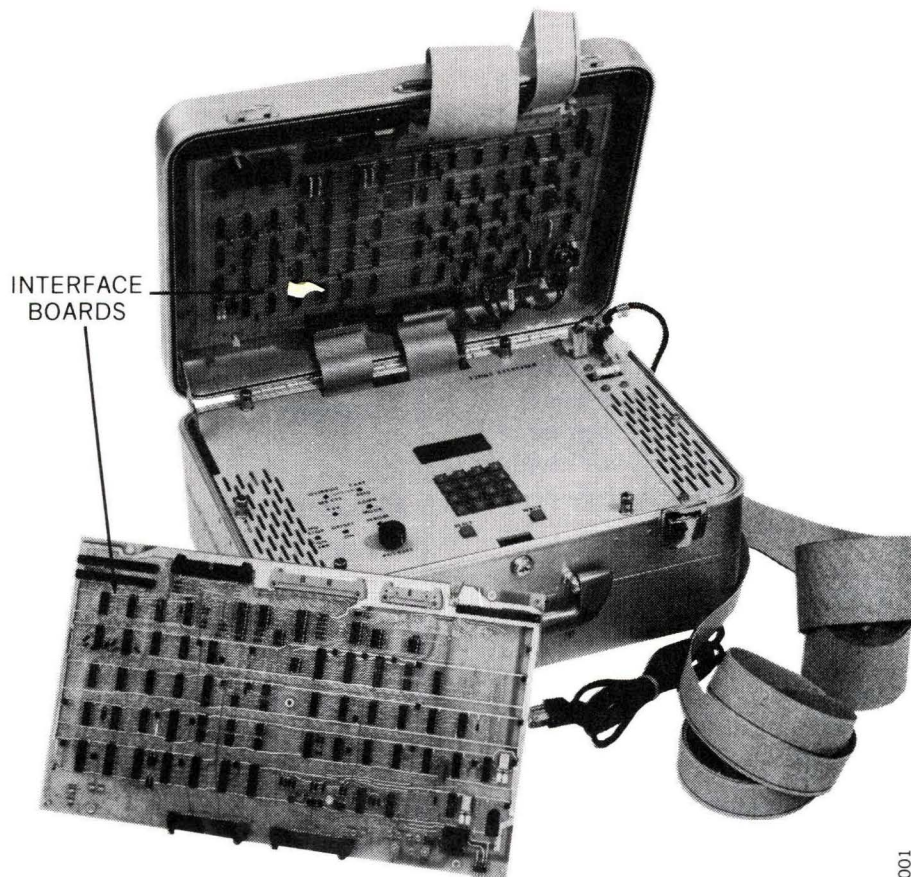


Figure 1-1. T2003 Exerciser

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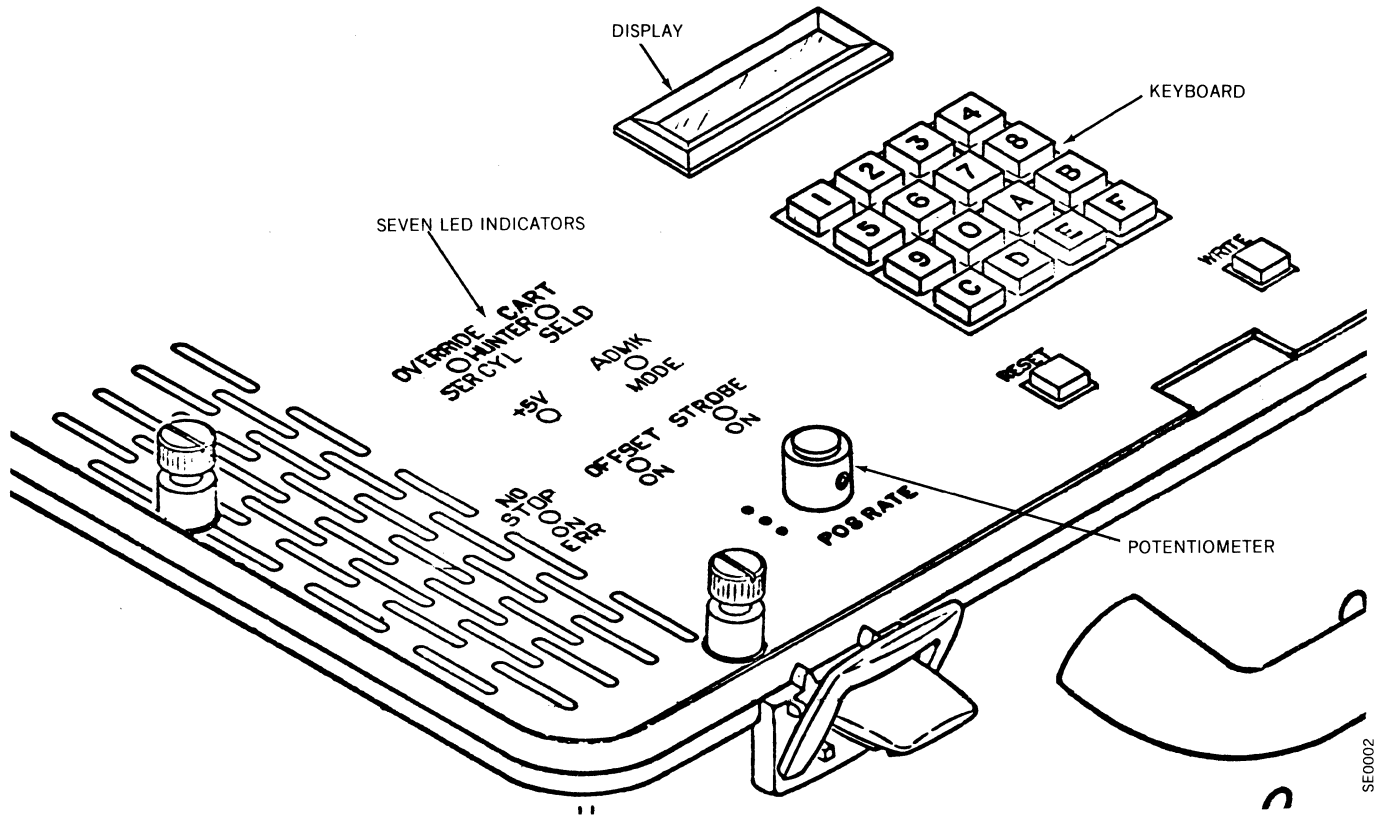


Figure 1-2. Control Panel

j. Test points on Trident interface board.

1. SECTOR/
2. WRITE DATA
3. ERRTP (Error Test Point)
4. GND (Ground)
5. RDGT (Read Gate)
6. AMDT/ (Address Mark Detect)
7. SYSCLK (System Clock)
8. INDEX/
9. READ DATA
10. WGT (Write Gate)

#### Exerciser Hexadecimal Display

The exerciser has a four position hexadecimal display. The user enters commands via the hexadecimal key-

board. These commands are displayed as they are entered and then the result of the command is displayed.

#### Hexadecimal Keyboard

The exerciser keyboard is used to enter all commands and additional information needed to perform an operation.

#### WRITE Pushbutton

After entering any command causing a write operation, the WRITE pushbutton must be momentarily pressed before execution begins. This feature prevents unintentional overwriting of customer data.

#### RESET Pushbutton

The RESET pushbutton stops the execution of any command, clears the display, resets all bus and tag lines, restores detection of servo seek incomplete, and deactivates the position rate (POSRATE) potentiometer.

#### Position Rate (POSRATE) Potentiometer

The position rate potentiometer controls the delay time between seeks for seek commands F232 or F240.

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**Power Circuit Breaker**

All power for the exerciser is controlled by the power circuit breaker which serves as an on/off switch.

**LED Indicator, OVERRIDE SER CYL — HUNTER**

This LED indicator illuminates when format, write, or read operations are permitted on any cylinder including the Hunter service cylinders.

**LED Indicator, CART SELD — HUNTER**

This LED indicator illuminates when a command selects head number 8, the Hunter cartridge.

**LED Indicator, +5V**

This LED indicator illuminates when the exerciser has power.

**LED Indicator, ADMK MODE**

This LED indicator illuminates when the address mark mode command (F411) is executed. The LED is turned off when the sector mode command (F402) is executed.

**LED Indicator, NO STOP ON ERR**

This LED indicator is illuminated whenever any read error will not stop a command execution. The LED is controlled by command F701.

**LED Indicator, OFFSET ON**

This LED is illuminated when the most recent F711 command calls for forward or reverse head offset.

**LED Indicator, STROBE ON**

This LED indicator is illuminated when the most recent F721 command calls for early or late data strobe.

## **SECTION 2 INSTALLATION**

The drive and the exerciser must be made compatible and then the proper cables selected and installed before the testing can begin. These topics are discussed in the following paragraphs:

- a. **Initial Preparation.** The drive is prepared to receive the exerciser with a minimum of customer system interruption.
- b. **Selecting an Exerciser Interface Board.** The user must install the proper interface board in the exerciser to work with his particular drive.
- c. **Selecting a Cable Configuration.** The user determines the extent of testing needed and then selects either the bus and radial cables or the exerciser cable.
- d. **T2003 Exerciser Cables.** The exerciser power cable is installed and the proper interface cables are selected according to Figures 2-1 through 2-4.
- e. **Trident and Hunter Drives.** These paragraphs detail how to connect the cables to the drive and exerciser. Various drive switches or jumpers are positioned to operate with the selected cable configuration.

### **INITIAL PREPARATION**

Before connecting the exerciser to the drive, the following procedure should be carried out:

1. Preserve the customer data by transferring it to another pack.
2. Inform the customer system that the drive is not available.
3. Stop the spindle rotation.
4. Degrade the drive.
5. Turn off the drive main power.

### **SELECTING AN EXERCISER INTERFACE BOARD**

The exerciser can test drives that have either a differential or trident interface (see Appendix B).

Install either the differential or trident interface board in the exerciser lid to match the drive interface. The interface board is held in the exerciser lid by plastic clips at each corner and by a screw in the center of the board. The procedure for removing and replacing an interface board is as follows:

1. Examine the electrical connections at the bottom of the installed interface board. Tag the two ground wires attached to the double slip-on connection. (The single slip-on connection is plus five volts.)
2. Remove all the slip-on wires and cables.
3. Remove the interface board by releasing the plastic clips and removing the screw at the center of the board.
4. Install the other interface board using the plastic clips and center screw.
5. Connect the two ground wires (previously tagged) to the double slip-on connection.
6. Connect the remaining wires and cables.

### **SELECTING A CABLE CONFIGURATION**

Before cabling the drive to the exerciser, the user must become familiar with the cabling configurations. The T2003 Exerciser can be cabled to the drive using one of the three cabling configurations:

- a. Exerciser cable only.
- b. Exerciser and radial cables.
- c. Bus and radial cables.

**Exerciser Cable Only**

The exerciser-cable-only configuration allows the drive to remain cabled to the customer system. The Degate switch on the drive must be set to inhibit the bus and radial interface. In this configuration, all bus/tag, seek, and head commands can be performed by the T2003 Exerciser. A limited read/write through the exerciser port (commands F7B0, F6B1) is available. Certain status functions in the display commands are only available at the exerciser port. See the Appendix A for a summary of exerciser commands.

**Exerciser And Radial Cables**

The exerciser-and-radial-cable configuration is used by CDS manufacturing only and will not be discussed in this manual.

**Bus And Radial Cables**

The bus-and-radial-cable configuration allows the T2003 Exerciser to perform all operations on the drive that would normally be performed by the customer system.

**T2003 EXERCISER CABLES**

The cables for the exerciser are located inside the exerciser carrying case. To remove the cables, loosen the five binding screws on the exerciser control panel and lift the panel. Secure the panel back in place and connect the power cable to the ac input plug next to the circuit breaker. Jumper connectors are used to select either 115 or 230 volts ac. The jumper connector is plugged into the 115/230 vac selector located next to the circuit breaker. Table 2-1 shows how the jumper connectors are wired.

**TABLE 2-1 EXERCISER POWER**

Power Selection		Jumper Connector	
Power	Pins Jumpered		
115 VAC	1-2, 3-4	3	6
230 VAC	2-3	2	5
		1	4

Figures 2-1 through 2-4 show the T2003 Exerciser interface boards. The exerciser, bus, and radial cables are shown connected between the interface board and the drive. The figures show which drive is used with which interface board, which connectors are used at each end of the cable, and the cable part numbers.

**T25/50/80 TRIDENT DRIVES**

Whenever the T25/50/80 Trident drives are tested by the T2003 Exerciser, the following areas in the drive may be modified:

- a. Ground jumper.
- b. Degate/Interface switch.
- c. Cabling.

These drive modifications are summarized in Table 2-2 and are then explained in more detail in the following pages.

**Ground Jumper**

Figure 2-5 shows the T25/50/80 Trident drive. Note the ground jumper location. The ground jumper is configured in the following way:

- 1. Ground jumper short (ac and dc grounds on the drive are connected together). Used when testing with the exerciser or anytime personnel may come in contact with the drive electronics.
- 2. Ground jumper open (ac and dc grounds on the drive are not connected together). Used when the drive is operating with the customer system.

**Degate/Interface Switch**

Figure 2-6 shows the Degate/Interface switch on the edge of a card in the T25/50/80 card cage. The two positions of the switch have the following purpose:

- 1. Interface position. In this position, the drive is connected to its Bus-In connector (J03) and radial con-

**TABLE 2-2. T25/50/80 DRIVE MODIFICATIONS**

Drive Modifications	Using Bus and Radial Cable Between Drive and T2003	Using Exerciser Cable Only Between Drive and T2003
Ground jumper	Short	Short
Degate/Interface switch	Interface	Degate
Cabling	Bus Cable: J3 (drive) to J4 (T2003) Terminator installed: J2 (drive) Radial Cable: J4 (drive) to J3 (T2003)	Exerciser Cable: J1 (drive) to J1 and J7 (T2003)

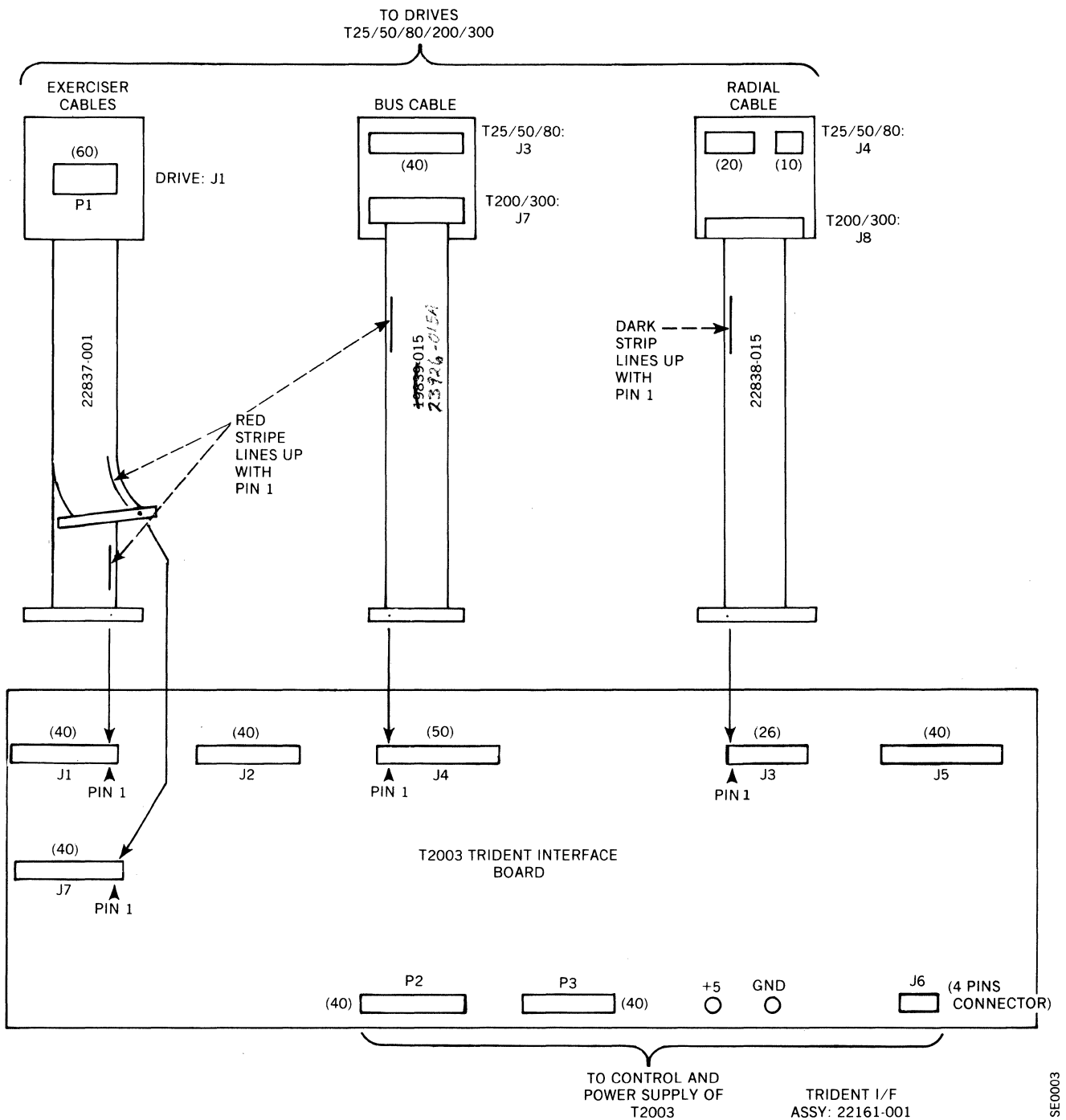
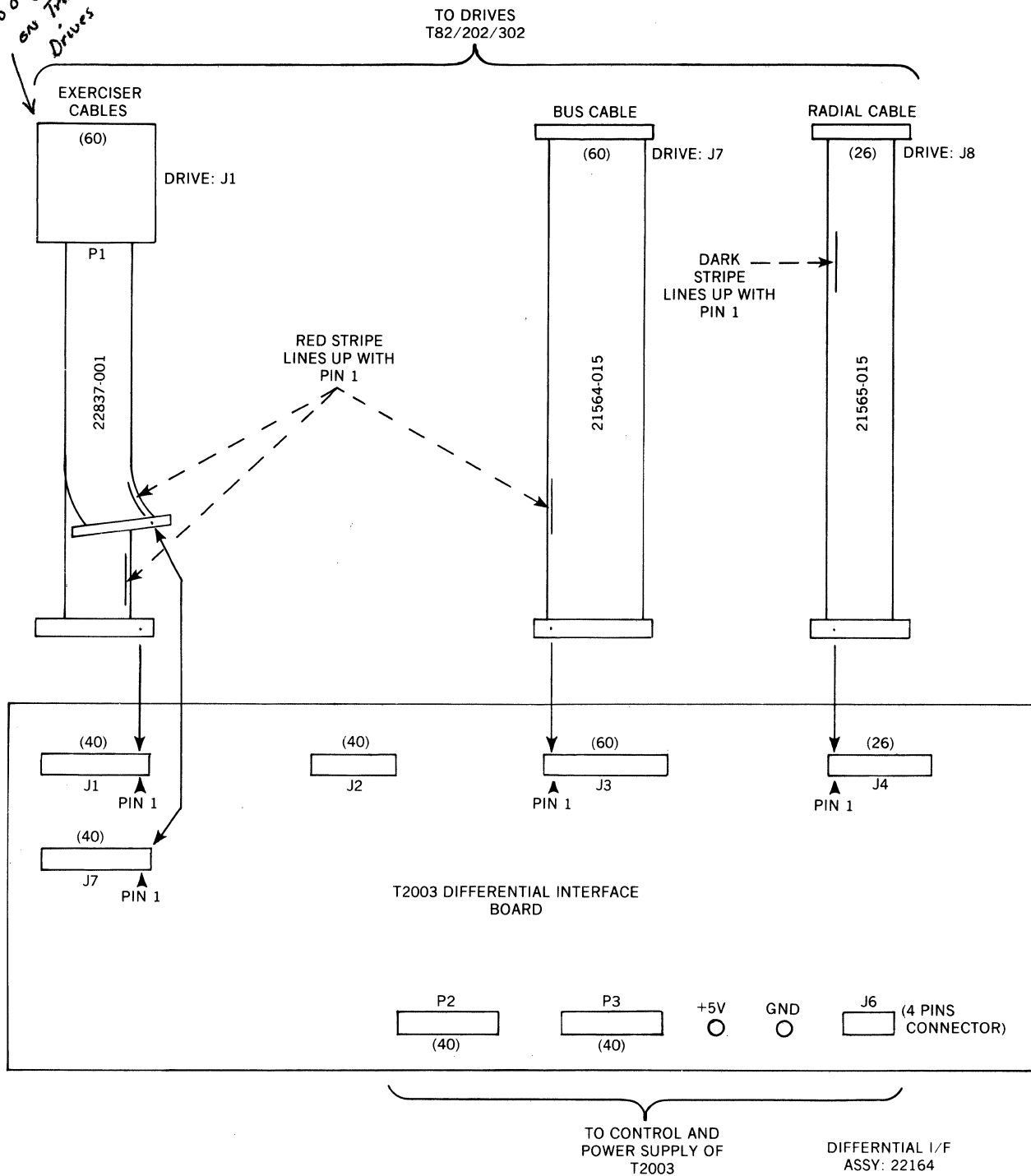


Figure 2-1. Cabling to Trident Interface Board for T25/50/80/200/300 Drives

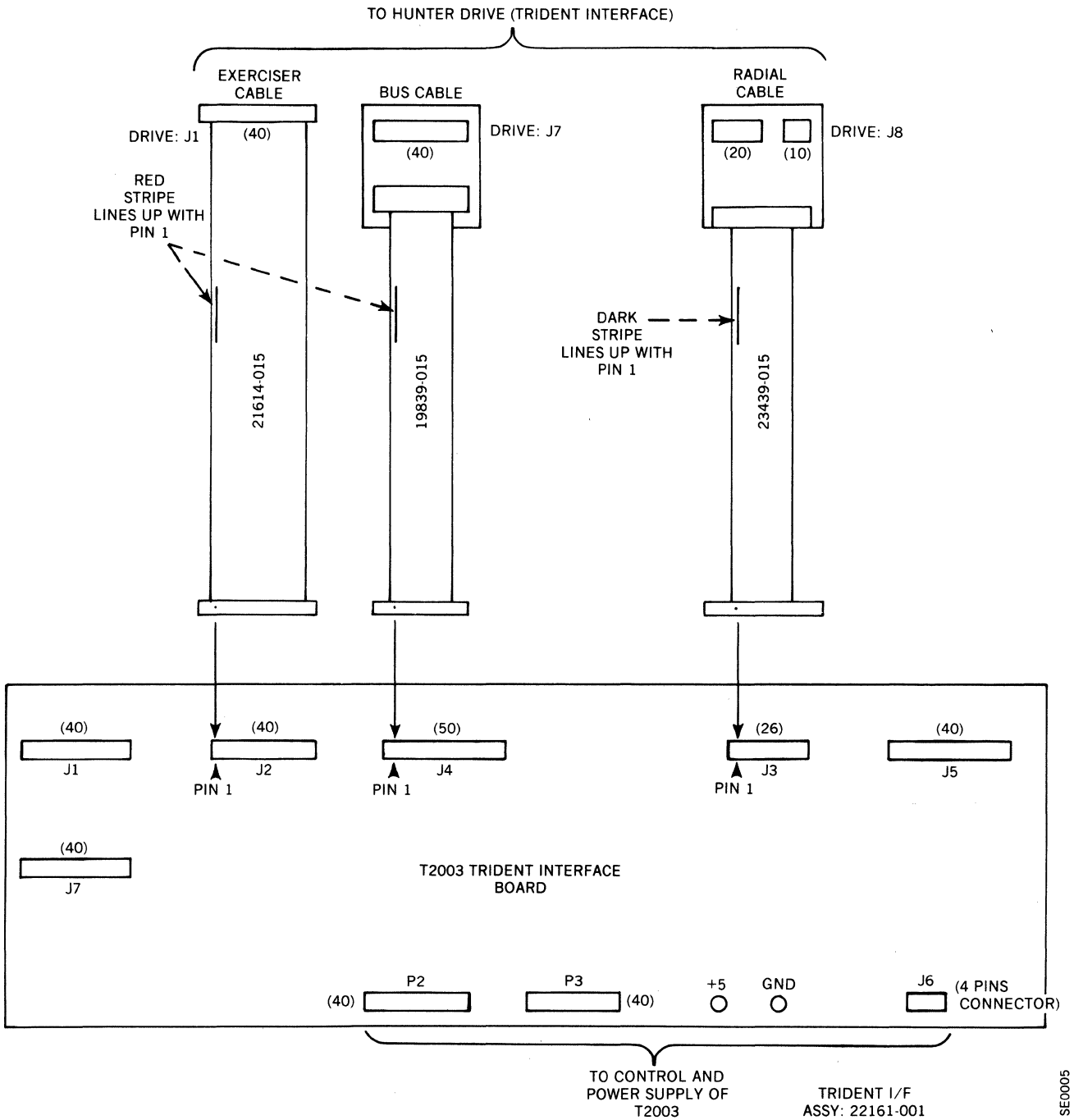
# SMD Interface

*Can only be used on Trident SMD Drives*



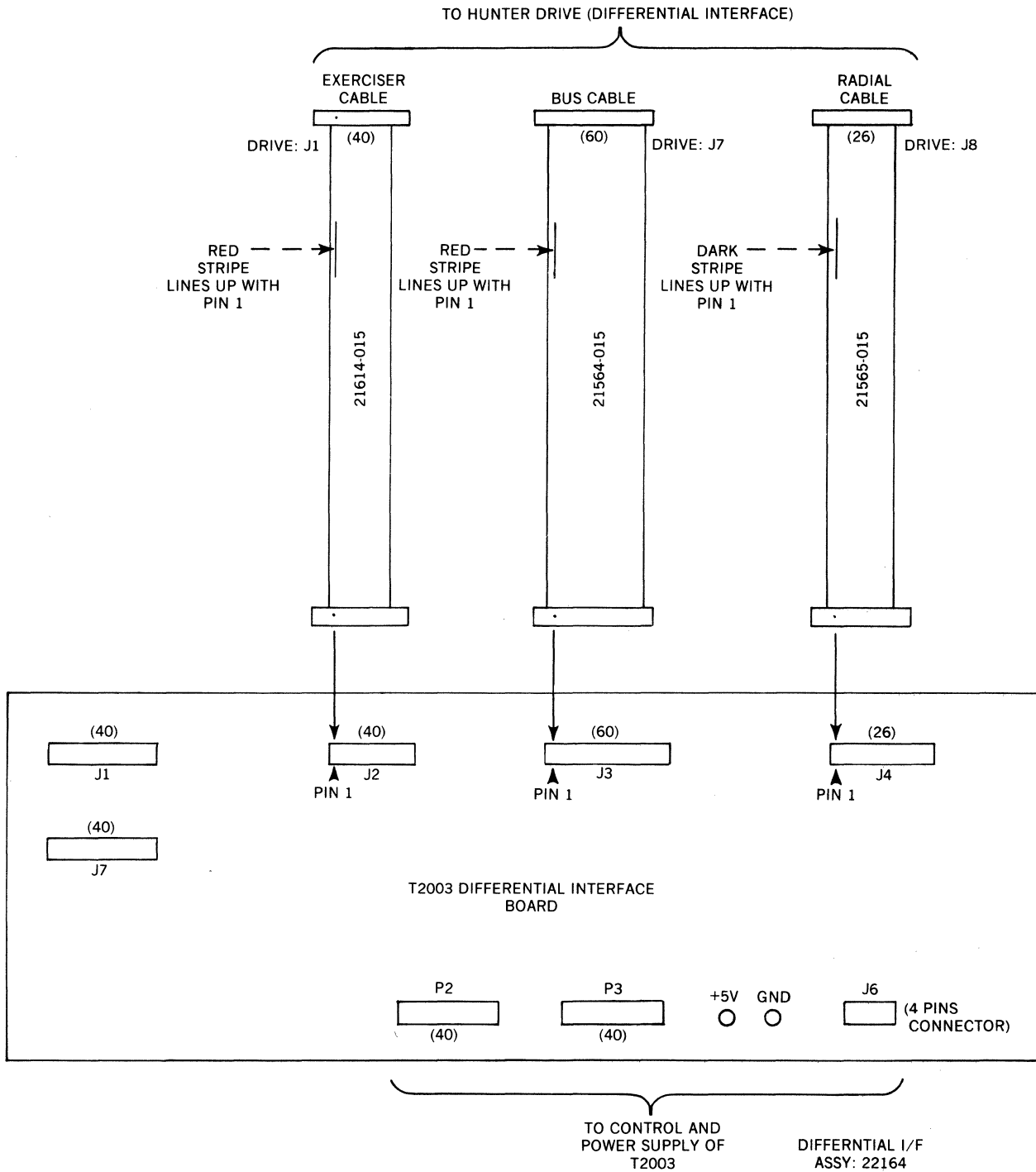
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**Figure 2-2. Cabling to Differential Interface Board for T82/202/302 Drives**



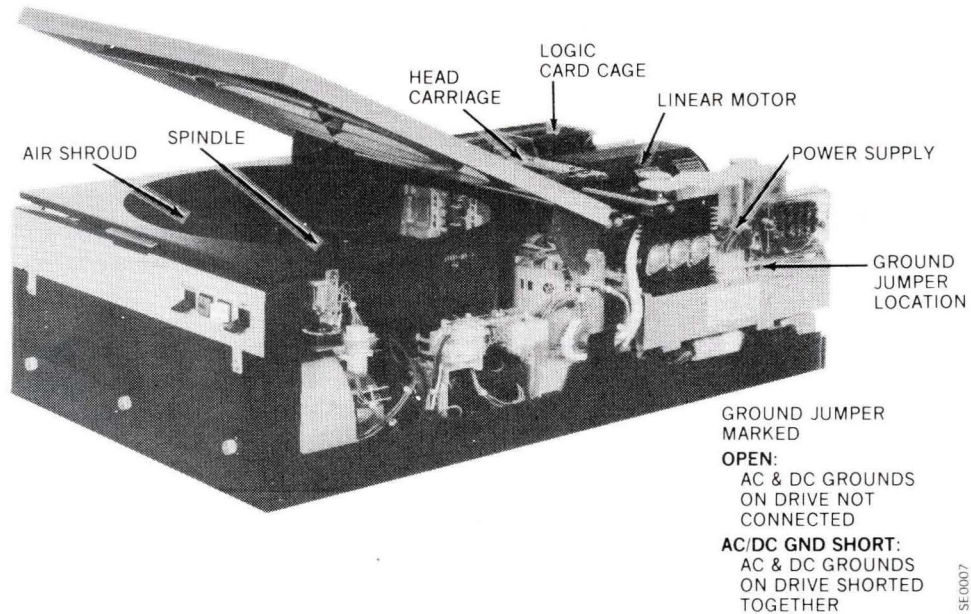
**Figure 2-3. Cabling to Trident Interface Board for Hunter Drive**



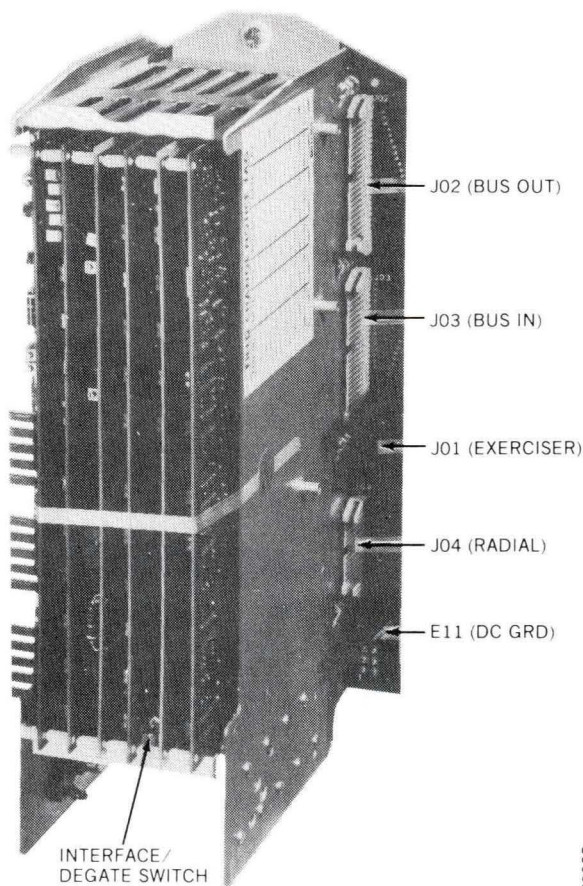


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**Figure 2-4. Cabling to Differential Interface Board for Hunter Drive**



**Figure 2-5. T25/50/80 Trident Drive**



**Figure 2-6. T25/50/80 Cable Connector Locations**

connector (J04). The drive is disconnected from its exerciser connector (J01).

2. Degate position. In this position, the drive is disconnected (degated) from its Bus-In connector (J03) and radial connector (J04). The drive is connected to its exerciser connector (J01).

### Cabling

Figure 2-1 shows the cabling to the trident interface board on the T2003 Exerciser. Figure 2-6 shows the T25/50/80 Trident card cage. The cabling between the T25/50/80 drive and the T2003 Exerciser is as follows:

- a. The exerciser cable (composed of a two-cable paddleboard) connects from J1 of the drive to J1 and J7 of the T2003 Exerciser (trident interface board). The red stripe on the ribbon cable is placed on the right side of the interface board connectors J1 and J7 to line up with pin 1.
- b. The bus cable connects from J3 of the drive to J4 of the T2003 Exerciser (trident interface board). The red stripe on the ribbon cable is placed on the left side of connector J4 to line up with pin 1.
- c. The radial cable connects from J4 of the drive to J3 of the T2003 Exerciser (trident interface board). The red stripe on the ribbon cable is placed on the left side of connector J3 to line up with pin 1.
- d. The drive must be terminated at J2 (bus out).

**T82 TRIDENT DRIVES**

Whenever the T82 Trident drive is tested by the T2003 Exerciser, the following areas in the drive may be modified:

- a. Ground jumper
- b. Degate/Interface switch
- c. Local/Remote switch
- d. Cabling

These drive modifications are summarized in Table 2-3 and are then explained in more detail in the following pages.

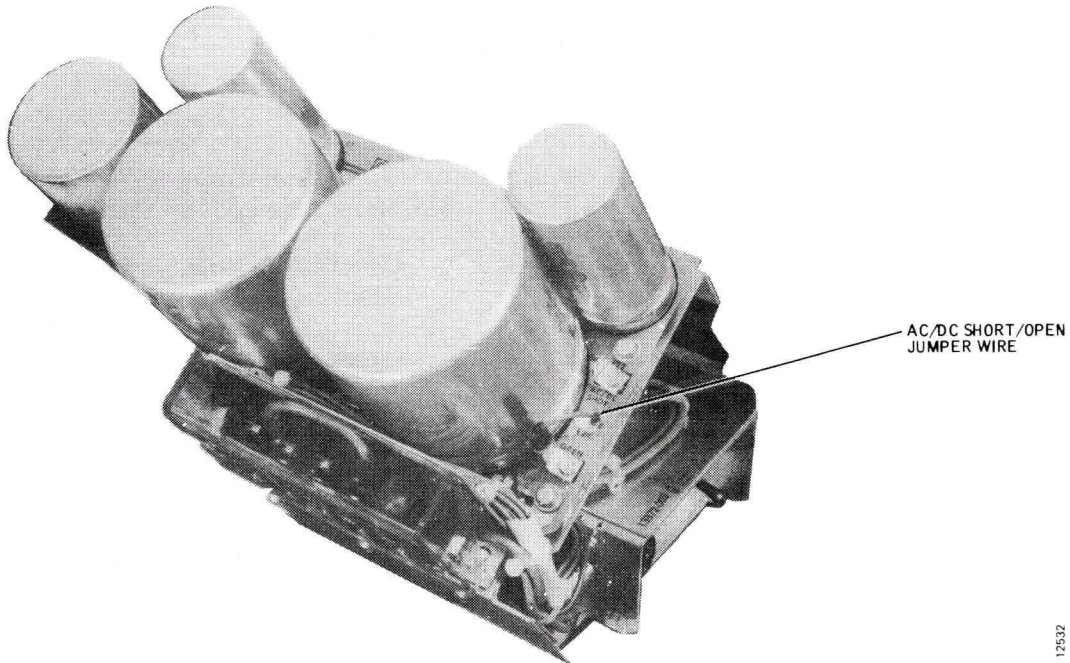
**Ground Jumper**

The ground jumper for the T82 Trident drive is located at the rear of the power supply (see Figure 2-7). The ground jumper is configured in the following way:

1. Ground jumper short (ac and dc grounds on the drive are connected together). Used when testing with the exerciser or anytime personnel may come in contact with the drive electronics.
2. Ground jumper open (ac and dc grounds on the drive are not connected together). Used when the drive is operating with the customer system.

**TABLE 2-3. T82 DRIVE MODIFICATIONS**

Drive Modifications	Using Bus and Radial Cable Between Drive and T2003	Using Exerciser Cable Only Between Drive and T2003
Ground jumper	Short	Short
Degate/Interface switch	Interface	Degate
Local/Remote switch	Remote	Local
Cabling	Bus Cable: J7 (drive) to J3 (T2003) Terminator installed: J6 (drive) Radial Cable: J8 (drive) to J4 (T2003)	Exerciser Cable: J1 (drive) to J1 and J7 (T2003)



**Figure 2-7. Ground Shorting Jumper Location, T82 Power Supply**

### Degate/Interface Switch

Figure 2-8 shows the Degate/Interface switch on the edge of a card in the T82 card cage. The two positions of the switch have the following purpose:

1. Interface position. In this position, the drive is connected to its Bus-In connector (J7) and radial connector (J8). The drive is disconnected from its exerciser connector (J1).
2. Degate position. In this position, the drive is disconnected (degated) from its Bus-In connector (J7) and radial connector (J8). The drive is connected to its exerciser connector (J1).

### Local/Remote Switch

Figure 2-8 shows the Local/Remote switch mounted on the edge of a card in the card cage of the T82 drive. The switch positions have the following meaning:

1. Local. In the Local position, the T82 drive may be powered up/down by using the Start/Stop switch on the front panel.

2. Remote. In the Remote position, the T82 may be powered up/down remotely by the controller or exerciser. The Start/Stop switch must be in the Start position to allow remote powering up/down.

### Cabling

Figure 2-2 shows the differential interface board on the T2003 Exerciser. Figure 2-8 shows the T82 Trident drive card cage. The cabling between the T82 drive and the T2003 Exerciser is as follows:

- a. The exerciser cable (composed of a two-cable paddleboard) connects from J1 of the drive to J1 and J7 of the T2003 Exerciser (differential interface board). The red stripe on the ribbon cable is placed on the right side of the interface board connectors J1 and J7 to line up with pin 1.
- b. The bus cable connects from J7 of the drive to J3 of the T2003 Exerciser (differential interface board). The red stripe on the ribbon cable is placed on the left side of connector J3 to line up with pin 1.
- c. The radial cable connects from J8 of the drive to J4 of the T2003 Exerciser (differential interface board).

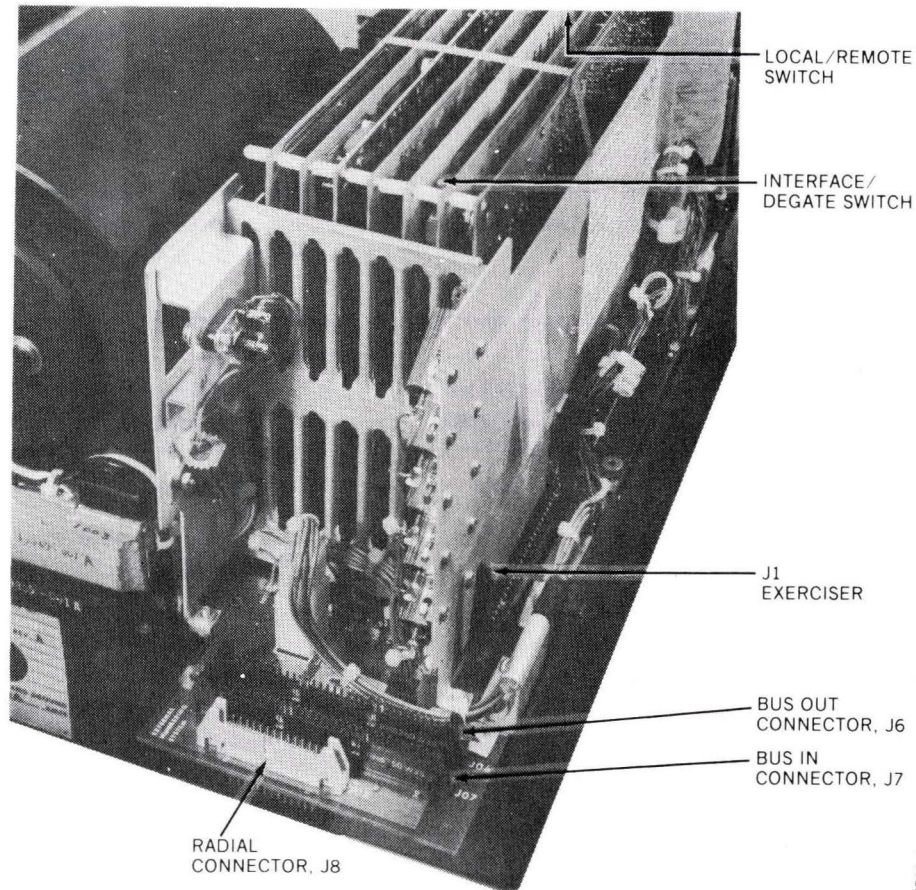


Figure 2-8. Interface Connector Locations, T82

The red stripe on the ribbon cable is placed on the left side of connector J4 to line up with pin 1.

- d. The drive must be terminated at J6 (bus out).

**T200/202/300/302 TRIDENT DRIVES**

Whenever the T200/202/300/302 Trident drives are tested by the T2003 Exerciser, the following areas in the drive may be modified:

- a. Online/Offline (ground) switch (on AC power distribution panel)
- b. Online/Offline (degate) switch (on edge of card in card cage)
- c. Local/Remote switch (T202/302)
- d. Cabling

These drive modifications are summarized in Table 2-4 and are then explained in more detail in the following pages.

**Online/Offline (Ground) Switch**

Figure 2-9 shows the T200/202/300/302 Trident drive. Note the location of the Online/Offline (ground) switch on the AC power distribution panel. The two positions of the switch have the following purpose:

- a. Online/Offline (ground) switch in the Online position. The ac and dc grounds are not shorted together on the drive. This condition is used when the drive is operating with the customer system.

- b. Online/Offline (ground) switch in the Offline position. The ac and dc grounds are shorted together on the drive. This condition is used with the exerciser or anytime personnel may come in contact with the drive electronics.

**Online/Offline (Degate) Switch**

Figure 2-9 shows the T200/202/300/302 Trident drive. Note the location of the Online/Offline (degate) switch on the edge of a card in the card cage. The two positions of the switch have the following purpose:

- a. Online/Offline (degate) switch in the Online position. The drive is connected to its bus-in connectors (J7 and J10) and its radial connector (J8 and J11). The drive is disconnected from its exerciser connector (J1).
- b. Online/Offline (degate) switch in the Offline position. The drive is disconnected (degated) from its bus-in connectors (J7 and J10) and its radial connector (J8 and J11). The drive is connected to its exerciser connector (J1).

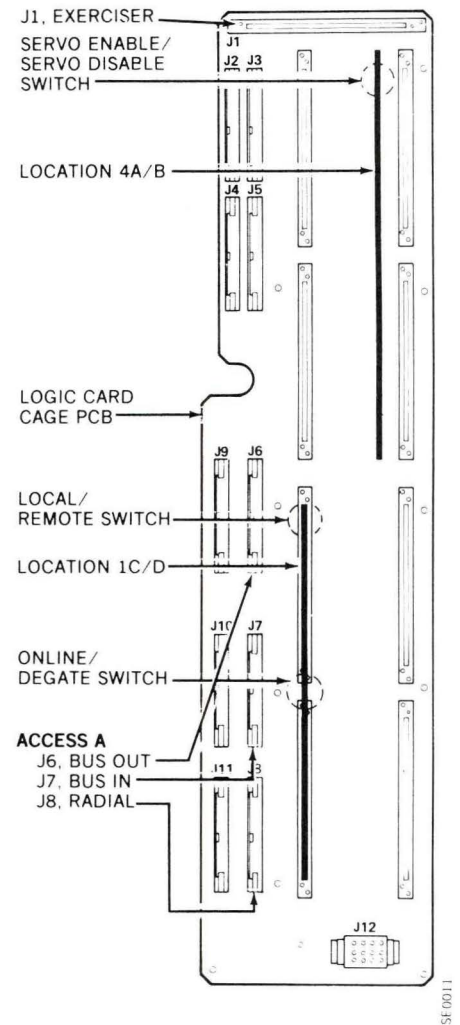
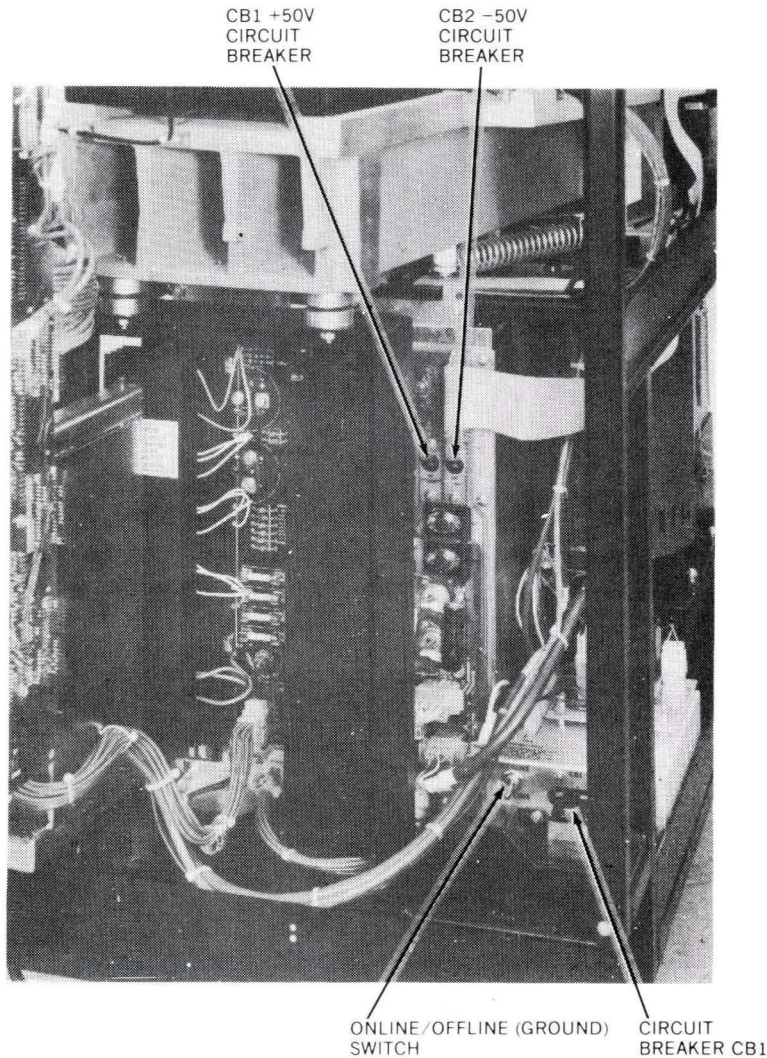
**Local/Remote Switch**

Figure 2-9 shows the Local/Remote switch mounted on the edge of a card in the card cage. This switch is found on the T202/302 drive. The switch positions have the following meaning:

- a. Local. When in the Local position, the T202/302 drive may be powered up/down by using the Start/Stop switch on the front panel.

**TABLE 2-4. T200/202/300/302 DRIVE MODIFICATIONS**

Drive Modifications	Using Bus and Radial Cable Between Drive and T2003	Using Exerciser Cable Only Between Drive and T2003
Online/Offline (ground) switch	Offline (short)	Offline (short)
Online/Offline (degate) switch	Online (interface)	Offline (degate)
Local/Remote switch (T202/302)	Remote	Local
Cabling	<b>T200/300</b>	Exerciser Cable: J1 (drive) to J1 and J7 (T2003)
	Bus Cable: J7 (drive) to J4 (T2003)	
	Radial Cable: J8 (drive) to J3 (T2003)	
	<b>T202/302</b>	
Bus Cable: J7 (drive) to J3 (T2003)	Radial Cable: J8 (drive) to J4 (T2003)	
<b>Terminator</b>	J6 (drive)	



**Figure 2-9. Maintenance Switch Locations, T200/202/300/302**

- b. Remote. When in the Remote position, the T202/302 may be powered up/down remotely by the controller or exerciser. The Start/Stop switch must be in the Start position to allow remote powering up/down.

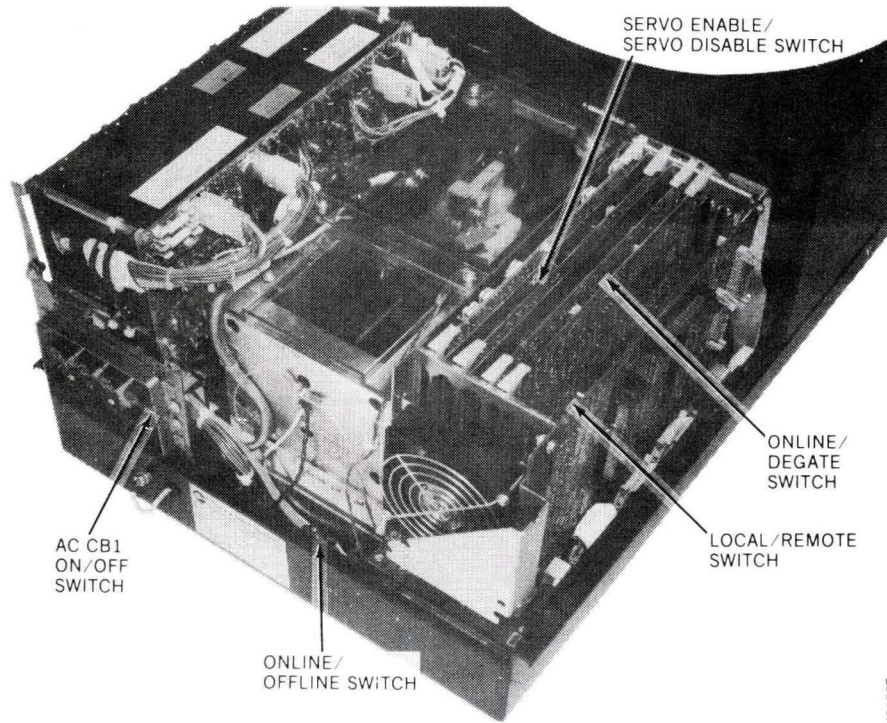
**Cabling**

For the T200/300 drive, refer to Figures 2-1, and 2-9. Figure 2-1 shows the trident interface board on the T2003 Exerciser. Figure 2-9 shows the T200/300 drive card cage. The cabling between the T200/300 drive and the T2003 Exerciser is as follows:

- a. The exerciser cable (composed of a two-cable paddleboard) connects from J1 of the drive to J1 and J7

of the T2003 Exerciser. The red stripe on the ribbon cable is placed on the right side of the interface board connectors J1 and J7 to line up with pin 1.

- b. The bus cable for the T200/300 drive connects from J7 of the drive to J4 of the T2003 Exerciser (trident interface board). The red stripe on the ribbon cable is placed on the left side of connector J4 to line up with pin 1.
- c. The radial cable for the T200/300 drive connects from J8 of the drive to J3 of the T2003 Exerciser (trident interface board). The red stripe on the ribbon cable is placed on the left side of connector J3 to line up with pin 1.
- d. The drive must be terminated at J6 (bus out).



**Figure 2-10. Location of Maintenance Switches, Hunter Drive**

For the T202/302 drive, refer to Figures 2-2 and 2-9. Figure 2-2 shows the differential interface board on the T2003 Exerciser. Figure 2-9 shows the T202/302 drive card cage. The cables between the T202/302 drive and the T2003 Exerciser are as follows:

- a. The exerciser cable (composed of a two-cable paddleboard) connects from J1 of the drive to J1 and J7 of the T2003 Exerciser. The red stripe on the ribbon cable is placed on the right side of connectors J1 and J7 to line up with pin 1.
- b. The bus cable for the T202/302 drive connects from J7 of the drive to J3 of the T2003 Exerciser (differential interface board). The red stripe on the ribbon cable is placed on the left side of connector J3 to line up with pin 1.
- c. The radial cable for the T202/302 connects from J8 of the drive to J4 of the T2003 Exerciser (differential interface board). The red stripe on the ribbon cable is placed on the left side of connector J4 to line up with pin 1.
- d. The drive must be terminated at J6 (bus out).

**Note**

*For dual access configured drives, access A switch must be on.*

**H32/64/96 HUNTER DRIVES**

Whenever the Hunter drive is tested by the T2003 Exerciser, the following areas in the drive may be modified:

- a. Online/Offline (ground) switch.
- b. Online/Offline (degate) switch.
- c. Local/Remote switch (on differential drives).
- d. Cabling.

Table 2-5 summarizes the drive modifications.

**TABLE 2-5. H32/64/96 DRIVE MODIFICATIONS**

Drive Modifications	Using Bus and Radial Cable Between Drive and T2003	Using Exerciser Cable Only Between Drive and T2003
Online/Offline (ground) switch	S1 (Offline or ground)	S1 (Offline or ground)
Online/Offline (degate) switch	Online	Offline (degate)
Local/Remote switch	Remote	Local
Cabling	<b>Trident Interface</b> Bus Cable: J7 (drive) to J4 (T2003) Radial Cable; J8 (drive) to J3 (T2003)	Exerciser Cable: J1 (drive) to J2 (T2003)
	<b>Differential Interface</b> Bus Cable: J7 (drive) to J3 (T2003) Radial Cable: J8 (drive) to J4 (T2003)	
	<b>Terminator</b> J6 (drive)	

**Online/Offline (Ground) Switch**

Figure 2-10 shows the Hunter drive. Note the location of the Online/Offline (ground) switch at the rear of the drive. The two positions of the switch have the following purpose:

- a. Online/Offline (ground) switch in the 'On' position. The ac and dc grounds are not shorted together on the drive. This condition is used when the drive is operating with the customer system.
- b. Online/Offline (ground) switch in the 'S1' position. The ac and dc grounds are shorted together on the drive. This condition is used with the exerciser or anytime personnel may come in contact with the drive electronics.

**Online/Offline (Degate) Switch**

Figure 2-10 shows the Hunter drive. Note the location of the Online/Offline (degate) switch on the edge of a card in the card cage. The two positions of the switch have the following purpose:

- a. Online/Offline (degate) switch in the Online position. The drive is connected to its bus-in connector (J7) and its radial connector (J8). The drive is disconnected from its exerciser connector (J1).
- b. Online/Offline (degate) switch in the Offline (degate) position. The drive is disconnected (de-gated) from its bus-in connector (J7) and its radial connector (J8). The drive is connected to its exerciser connector (J1).

**Local/Remote Switch (Differential Drives)**

Figure 2-10 shows the Local/Remote switch mounted on the edge of a card in the card cage. This switch is found on the differential Hunter drive. The switch positions have the following meaning:

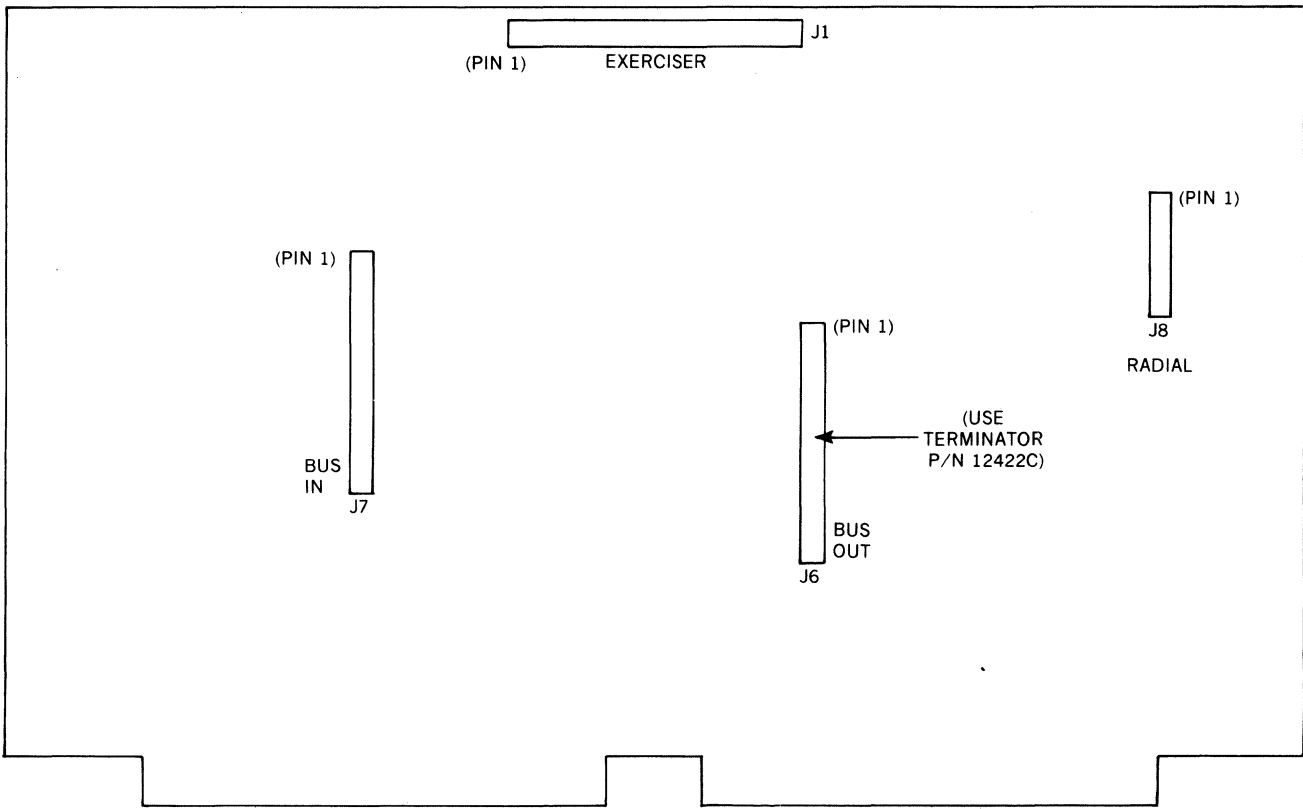
- a. Local. When in the Local position, the differential Hunter drive may be powered up/down by using the Start/Stop switch on the front panel.
- b. Remote. When in the Remote position, the differential Hunter may be powered up/down remotely by the controller or exerciser. The Start/Stop switch must be in the Start position to allow remote powering up/down.

**Cabling**

For the Hunter (trident interface), refer to Figures 2-3 and 2-11. Figure 2-3 shows the trident interface board on the T2003 Exerciser. Figure 2-11 shows the Hunter I/O board (trident interface). The cables between the Hunter (trident interface) and the T2003 Exerciser are as follows:

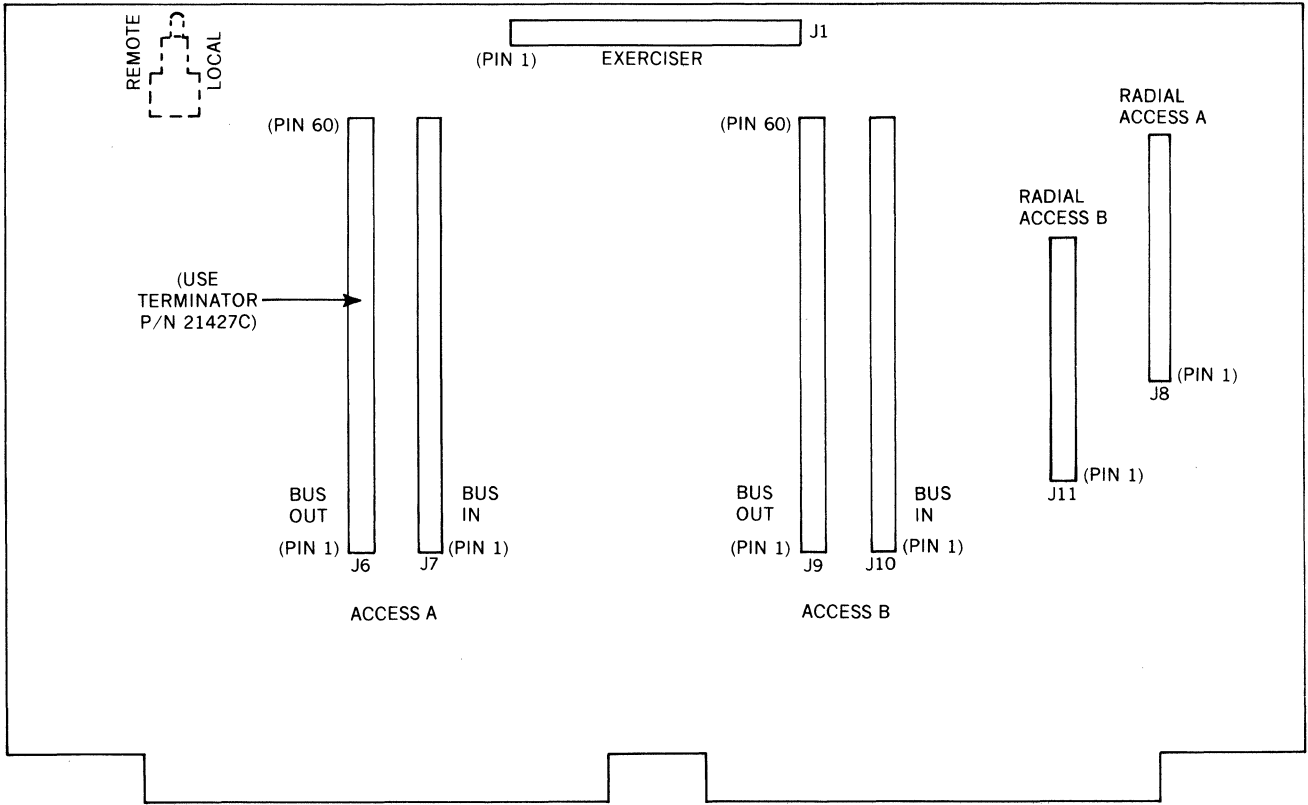
- a. The exerciser cable connects from J1 of the drive to J2 of the T2003 Exerciser. The red stripe on the ribbon cable is placed on the left side of the connectors J1 and J2 to line up with pin 1.
- b. The bus cable connects from J7 (bus in) of the drive to J4 of the T2003 Exerciser. The red stripe on the ribbon cable is placed at the top of J7 and to the left of J4 to line up with pin 1.





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Figure 2-11. Trident I/O Board on Hunter



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Figure 2-12. Differential I/O Board on Hunter

- c. The radial cable connects from J8 of the drive to J3 of the T2003 Exerciser. The red stripe on the ribbon cable is placed at the top of J8 and to the left of J3 to line up with pin 1.
- d. The drive must be terminated at J6 (bus out).

For the Hunter (differential interface), refer to Figures 2-4 and 2-12. Figure 2-4 shows the differential interface board on the T2003 Exerciser. Figure 2-12 shows the Hunter I/O board (differential interface). The cables between the Hunter (differential interface) and the T2003 Exerciser are as follows:

- a. The exerciser cable connects from J1 of the drive to J2 of the T2003 Exerciser. The red stripe on the rib-

bon cable is placed on the left side of the connectors J1 and J2 to line up with pin 1.

- b. The bus cable connects from J7 (bus in) of the drive to J3 of the T2003 Exerciser. The red stripe on the ribbon cable is placed on the bottom of J7 and to the left of J3 to line up with pin 1.

- c. The radial cable connects from J8 of the drive to J4 of the T2003 Exerciser. The red stripe on the ribbon cable is placed at the bottom of J8 and to the left of J4 to line up with pin 1.

- d. The drive must be terminated at J6 (bus out).

## SECTION 3 OPERATION

### EXERCISER DISPLAY

Once the drive and exerciser are cabled together and power applied, the user may enter commands through the keyboard and observe the display. The exerciser display is composed of four hexadecimal positions. The display can indicate the following:

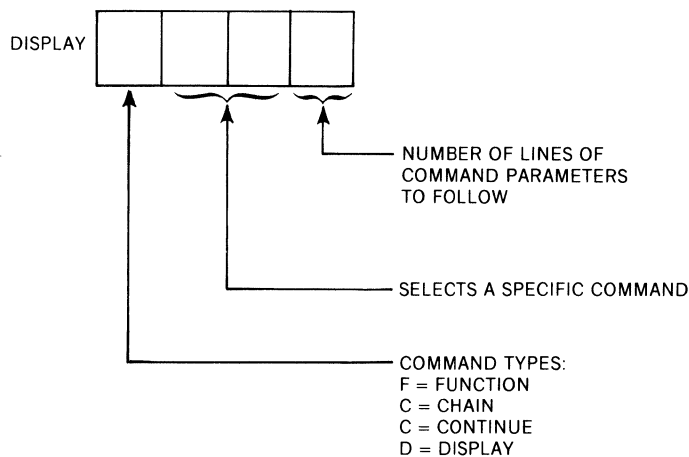
- a. Ready-for-command. A period at the far left of the display with all four hexadecimal positions blank, indicates the exerciser is ready for a command.
- b. Hexadecimal characters entered from the keyboard. The last four characters entered from the keyboard are displayed.
- c. An error code. An 'E' in the left hand position with the other positions displaying numbers is used to indicate an error code.
- d. A busy indicator. A 'B' in the left hand position indicates the exerciser is busy executing a command.
- e. Results of the executed command. The interpretation of the results depends on the particular command executed.

### COMMAND STRUCTURE AND TYPE

The commands are entered from the keyboard and displayed four characters at a time. Each four character display is called a line. The first line of a command specifies the operation. Any additional lines of the command are called parameters and provide information to carry out the operation. Figure 3-1 shows the structure for the first line of a command. The left-most position identifies the command type:

1. Function
2. Chain
3. Continue
4. Display

The next two positions identify the specific operation. The right-most position indicates how many lines of parameters must be entered from the keyboard to carry out the operation. A brief discussion of the command types is presented in the following paragraphs. Appendix A gives a detailed discussion of the commands.



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Figure 3-1. Structure for the First Line of a Command

## FUNCTION COMMANDS

The function commands are subdivided into types of function commands:

- F0XX — Basic
- F1XX — Bus/Tag
- F2XX — Seek
- F3XX — Head
- F4XX — Read/Write/Format Set-up
- F5XX — Format
- F6XX — Write
- F7XX — Read

The following paragraphs describe the types of function commands.

### Function Commands, Basic

Before the exerciser can test a drive, basic commands must be entered identifying the drive type and the cabling configuration between the drive and the exerciser. Other basic commands sequence the drive up or down. The command summary in Table A-1 of Appendix A gives the complete list of the 10 basic commands.

### Function Commands, Bus And Tag

The four bus and tag commands cause selected bits to be placed on the bus lines. A cylinder, head, or control tag is then activated to simulate commands from the host CPU. In this manner, the interface to the host CPU can be tested. See Table A-1 of Appendix A.

### Function Commands, Seek

Seek commands cause head positioning. There are eight commands including single, alternate, and random cylinder positioning as well as seek time calculations.

### Function Commands, Head

Head commands cause head selection, head advancing, or head resetting. There are four head commands listed in Table A-1 of Appendix A.

### Function Commands, Read/Write/Format Set-up

Set-up commands are used to provide the exerciser with necessary information before a read/write/format command can be executed. For example, before executing a format command, either the sector mode or address mark mode command must be executed. Another example, before executing a write command, the data pattern command must be executed. Seven set-up commands are given in Table A-1 of Appendix A.

## Function Commands, Format

The five format commands cause the exerciser to write the preamble, the cylinder/head address, and a filler of zero bits for each record of a track. The various format commands cause formatting of a single track, a single cylinder, one surface of the pack, or the entire pack. Appendix C shows the fields written by a sector mode or by an address mark mode format. Table A-1 of Appendix A lists the format commands.

## Function Commands, Write

The nine write commands (except F6B1) can only write on a previously formatted track. The write commands (except F6B1) write a two-byte data pattern. The commands write on a single track, a single cylinder, one surface of the pack, or the entire pack. Other write commands cause random seek-write and alternate cylinder seek-write operations. The F6B1 command is a special write-through-the-exerciser-port command. The F6B1 command writes a low or high frequency data pattern on the entire selected track. See Table A-1 of Appendix A for a list of write commands.

### Note

*All write commands (except F6B1) write only in the zero bit filler area produced by a format command. See Appendix C for a description of the fields written during a write command.*

## Function Commands, Read

This group has fourteen commands. Certain of these commands read the two-byte data pattern in the data field and compare this pattern with the data pattern written by the last write command. These commands can read a single track, a single cylinder, one surface of the pack, or the entire pack. Other read commands cause random seek-read and alternate cylinder seek-read operations. Recovery from read errors may be possible by using the offset or strobe commands. The F7B0 command is a special read-through-the-exerciser-port command. It is used with the write-through-the-exerciser-port command. See Appendix A for a complete list of the commands.

## CHAIN COMMANDS

The chain commands are used to link function commands together to form a customized routine. Table A-1 of Appendix A lists the three chain commands. An example of a routine formed by chain commands is as follows:

C002 Chain command indicating two function commands are in the chain.

F221 Function command causing a seek to a cylinder. The right-most position is a one indicating one parameter needed by the command.

0100 The parameter for command F221. The parameter indicates the seek is to cylinder 100 (decimal).

F200 Function command causing a rezero operation.

C200 Chain command indicating the end of the chain. C200 indicates the chain is performed repeatedly. The Reset pushbutton terminates the chain immediately. Pressing a key on the hexadecimal keyboard terminates the chain after the command in process is finished.

#### Note

*Not all function commands can be chained. Appendix A provides a summary of the commands with an asterisk (\*) to indicate those commands that can be chained.*

## CONTINUE COMMAND

The continue command is a single command (C300) used to start execution of a command which was halted by a read error. See Appendix A for details.

## DISPLAY COMMANDS

The 25 display commands are used to monitor the operation of the drive or the exerciser. Drive or exerciser status can be displayed on the four position readout. Other commands can display the Cylinder Address Register, the Difference Counter, the Head Address Register, the Remaining Byte Count, Bit Error Count, any RAM or PROM location, and other useful information. In addition, the RAM contents can be altered by the DB01 display command. Appendix A has a complete list of the commands.

## USING THE EXERCISER COMMANDS TO TEST THE DRIVE

Once the drive is cabled to the exerciser, a series of tests are performed. These tests start with informing the exerciser of the drive type and cabling. The tests then progress from simple operations to extensive reading/writing. These tests are presented here as a general guideline. Many variations are possible. The exerciser commands are detailed in Appendix A.

A brief check on the operational condition of the exerciser can be made with or without the drive connected. This test command is as follows:

\* F091, 0000 Exerciser diagnostics. An error code 'AN<sub>1</sub>N<sub>2</sub>N<sub>3</sub>' is displayed if the test fails. See Appendix A Table A-5 for the meaning of N<sub>1</sub>N<sub>2</sub>N<sub>3</sub>.

### Test Number 1, Drive Type and Cabling

In test number 1, the exerciser is informed of the drive type and cabling. The drive is sequenced up and selected. Verify the drive sequences up.

*T<sub>200</sub> = 0005*

F001, 00N<sub>1</sub>N<sub>2</sub> Drive type command. N<sub>1</sub>N<sub>2</sub> specifies drive type. See Appendix A, Table A-2.

*+ 0007*

\* F011, 0003 Cable hook-up command. 0003 specifies bus and radial cables used between drive and exerciser. See Appendix A, Table A-3.

The drive can now be sequenced up. The trident interface drives and the differential interface drives have a different sequence up command. Use one of the following commands:

F020 Sequence-up the trident interface drive.

\* F031, 000F Sequence-up the differential interface drive. Drive unit F is selected and sequenced-up. Removing the logical address plug from the drive front panel causes a drive unit address to be F. Verify that the Ready indicator (behind the logical address plug) comes on.

### Test Number 2, Basic Drive Operations

In test number 2, some simple operations are performed to verify the basic drive operation. Such operations as count sectors, check RPM, rezero, and check seek times for forward and reverse. The commands are as follows:

F060	Check RPM
F070	Count sectors
F200	Rezero
F250	Seek time forward (milliseconds)
F260	Seek time reverse (milliseconds)

### Test Number 3, Basic Read/Write, Sector Mode

In test number 3, a basic read/write operation is performed in the sector mode. The user enters commands which will format a single track, write a data pattern on this track, and read the data pattern from this track.

The sequence of commands is as follows:

- F402, 00XX, 0000** Set sector mode command. The decimal number of sectors per track obtained from command F070 is entered for XX in the first parameter. Zeros are entered for the second parameter.
- For Hunter drive only: **F212, 0100, 0008** Seek to cylinder 100 (decimal), head 8 (cartridge). The 'CART SELD' LED comes on.
- For Hunter drive only: **F441, 0001** Enable reading and writing on all cylinders. The 'OVERRIDE CYL' LED comes on.
- For Trident drive only: **F212, 0100, 0004** Seek to cylinder 100 (decimal), head 4.
- F501, 0000** Format one revolution on cylinder 100 and head 8 (Hunter cartridge) or head 4 (Trident drive).
- F431, FFFF** Set a data pattern of FFFF before writing in the data field.
- F631, 0000** Write the data pattern in the data field for one revolution on cylinder 100, head 8 (Hunter cartridge) or head 4 (Trident drive).

#### Note

*A read header error may result when the write data pattern command (F631) is executed.*

If a read header error occurs, the overhead and data fields per sector may be too long and extend into the next sector. The length of the overhead and data fields is determined by the F402 command. Return to the beginning of this sequence of commands. The overhead and data field length can be reduced by entering the F402 command again with the first parameter (sector number) increased by one or two. The second parameter is entered as 0000. See Appendix A for F402 command details. The commands following the F402 are repeated and the testing continued.

- F731, 0000** Read one revolution in the data field at cylinder 100, head 8 (Hunter cartridge) or head 4 (Trident drive). If incorrectly read, error code E014 is displayed.
- D903** Displays the last two bytes in the data field from the last read command entered (should be FFFF).

#### Test Number 4, Extensive Read/Write, Sector Mode

In this test number 4, an extensive read/write operation is performed using the sector mode (test 3 establishes the sector mode). All cylinders and all heads are formatted.

#### CAUTION

*For the Hunter drive, check the head alignment before formatting on the fixed disk. The alignment track on the fixed disk could otherwise be damaged.*

After the format operation, a data pattern is set and a write all cylinders and all heads is followed by a read all cylinders and heads. A new data pattern is entered and the write and read operation performed. For each pass through the command sequence, change the data pattern to one of the following: 0000, FFFF, 0F0F, 0101, FEFE, AAAD, 6DB6, DB0F, DADA, CA58, and C3FE. The command sequence is as follows:

- F520** Format all cylinders and heads (Cartridge LED will blink as Hunter head 8 is periodically selected)
- F431, XXXX** Set data pattern
- F660** Write all cylinders and heads
- F760** Read all cylinders and heads (Repeat the last three commands and change data pattern (XXXX) for each repeat.)

#### Test Number 5, Random Operation (Sector Mode)

In test number 5, the drive is given continuous read, random cylinder, random head operations. A write once random cylinder, random head is then performed. The commands are as follows (test numbers 3 and 4 must have been performed to ensure some data pattern on all cylinders and heads).

- F7D0** Read continuous on random cylinder, and random head. Press RESET to stop continuous read.
- F680** Write once data pattern on random cylinder and random head.

#### Test Number 6, Basic Read/Write (Address Mark Mode)

In test number 6, a basic read/write operation is performed using the address mark mode (only test number 1 is necessary before test number 6). The user enters commands which will format (in address mark mode) a single track, write a data pattern on this track, and then read the data pattern from this track. The command sequence is as follows:

- For Hunter drive Seek to cylinder 100 (decimal), head only: **F212, 0100, 8 (cartridge). 0008**

For Trident drive only: F212, 0100, 0004 Seek to cylinder 100 (decimal), head 4.

For Hunter drive only: F441, 0001 Enable reading and writing on all cylinders. The 'OVERRIDE SER CYL' LED comes on.

F411, 00XX Set address mark mode. Enter the number of address marks desired in XX.

F501, 0000 Format one revolution on cylinder 100 (decimal), head 8 (Hunter cartridge) or head 4 (Trident drive).

F431, FFFF Set data pattern of FFFF before writing in the data field.

F631, 0000 Write the data pattern in the data field for one revolution on cylinder 100 (decimal), head 8 (Hunter cartridge) or head 4 (Trident drive).

F731, 0000 Read one revolution in the data field on cylinder 100 (decimal), head 8 (Hunter cartridge) or head 4 (Trident drive). If incorrectly read, error code E014 is displayed.

D930 Displays the last two bytes in the data field from the last read command entered (should be FFFF).

#### **Test Number 7, Extensive Read/Write (Address Mark Mode)**

In this test number 7, an extensive read/write operation is performed using address mark mode (test 6 establishes the address mark mode). All cylinders and all heads are formatted.

#### **CAUTION**

*For the Hunter drive, check the head alignment before formatting on the fixed disk. The alignment track on the fixed disk could otherwise be damaged.*

After the format operation, a data pattern is set and a write all cylinders and heads is followed by a read all cylinders and heads. A new data pattern is entered and the

write and read operation performed. For each pass through the command sequence, change the data pattern to one of the following: 0000, FFFF, 0F0F, 0101, FEFE, AAAD, 6DB6, DB0F, DADA, CA58, and C2FE. The command sequence is as follows:

F520	Format all cylinders and heads (Cartridge LED will blink as Hunter head 8 is periodically selected)
F431, XXXX	Set data pattern
F660	Write all cylinders and heads
F760	Read all cylinders and heads

Repeat the last three commands and change data pattern (XXXX) for each repeat.

#### **RETURNING THE DRIVE TO THE SYSTEM**

Once the testing is finished, the drive is returned to the customer system by using the following procedure:

1. Stop the spindle rotation.
2. Degate the drive.
3. Turn off the drive main power.
4. Disconnect the exerciser.
5. Reconnect any system cables.
6. Position the Ground switch to Online or jumper to OPEN.
7. Turn on the drive main power.
8. Position the Degate switch to Online.
9. Position Local/Remote switch to Remote.
10. Start the spindle rotation.
11. Return control back to the customer system.

## **APPENDIX A DESCRIPTION OF EXERCISER COMMANDS**

The exerciser command consists of a four digit hexadecimal number. Some commands require additional four digit hexadecimal numbers to specify parameters or addresses. The following paragraphs describe the commands in detail. Table A-1 summarizes these exerciser commands.



**TABLE A-1. SUMMARY OF EXERCISER COMMANDS**

Command (* indicates valid chain commands)	Cable Hook-up†	Function
<b>Basic Functions</b>		
F001 00N <sub>1</sub> N <sub>2</sub>	1, 3	Drive Type
F011 000N	1, 3	Cable Hook-up
F020	3	Sequence up and select — Trident Interface
F031 000N <sub>1</sub>	3	Sequence up and select — Differential Interface
F040	3	Sequence down and deselect
F050	1, 3	Device check reset (fault clear)
F060	1, 3	RPM
F070	3	Count sector pulses
F080	3	Deselect drive
F091	1, 3	Exerciser diagnostics
<b>Bus/Tag Functions</b>		
F101 0B <sub>1</sub> B <sub>2</sub> B <sub>3</sub>	1, 3	Raise selected bus lines
F111 000N	1, 3	Set cylinder tag
F121 000N	1, 3	Set head tag
F131 000N	1, 3	Set control tag
<b>Seek</b>		
*F200	1, 3	Rezero
*F212 C <sub>1</sub> C <sub>2</sub> C <sub>3</sub> C <sub>4</sub> 00H <sub>1</sub> H <sub>2</sub>	1, 3	Seek to Cylinder and head
*F221 C <sub>1</sub> C <sub>2</sub> C <sub>3</sub> C <sub>4</sub>	1, 3	Seek to cylinder (single)
F232 C <sub>1</sub> C <sub>2</sub> C <sub>3</sub> C <sub>4</sub> C <sub>5</sub> C <sub>6</sub> C <sub>7</sub> C <sub>8</sub>	1, 3	Alternate seek (continuous)
F240	1, 3	Random seek (continuous)
F250	1, 3	Seek time — forward
F260	1, 3	Seek time — reverse
F270	1	Servo seek incomplete disable
<b>Head Functions</b>		
*F301 00H <sub>1</sub> H <sub>2</sub>	1, 3	Set head address register
*F310	1, 3	Advance head address (Trident Interface)
*F320	1, 3	Reset head address (Trident Interface)
F330	1, 3	Head select (Trident Interface)
<b>Read/Write/Format Set-up Functions</b>		
*F402 0S <sub>1</sub> S <sub>2</sub> S <sub>3</sub> B <sub>1</sub> B <sub>2</sub> B <sub>3</sub> B <sub>4</sub>	3	Sector mode
*F411 0A <sub>1</sub> A <sub>2</sub> A <sub>3</sub>	3	Address mark mode
F421 L <sub>1</sub> L <sub>2</sub> L <sub>3</sub> L <sub>4</sub>	3	Set data length
*F431 H <sub>1</sub> H <sub>2</sub> H <sub>3</sub> H <sub>4</sub>	3	Set data pattern
F441 000N	3	Working cylinders (Hunter only)
*F450	3	Reset read error latches
*F460	3	Reset bit error counter

**TABLE A-1. SUMMARY OF EXERCISER COMMANDS (Continued)**

Command (* indicates valid chain commands)	Cable Hook-up†	Function
<b>Format</b>		
*F501 000N	3	Format specified cylinder and head
*F511 C <sub>1</sub> C <sub>2</sub> C <sub>3</sub> C <sub>4</sub>	3	Format one cylinder, all heads (once)
*F520	3	Format all cylinders and heads
*F531 00H <sub>1</sub> H <sub>2</sub>	3	Format all cylinders, specified head
*F542 C <sub>1</sub> C <sub>2</sub> C <sub>3</sub> C <sub>4</sub> 00H <sub>1</sub> H <sub>2</sub>	3	Format/write/read all cylinders and heads
<b>Write</b>		
*F631 000N	3	Write on specified cylinder, head
*F641 C <sub>1</sub> C <sub>2</sub> C <sub>3</sub> C <sub>4</sub>	3	Write all heads, specified cylinder (once)
*F651 00H <sub>1</sub> H <sub>2</sub>	3	Write all cylinders, specified head (once)
*F660	3	Write all cylinders, all heads (once)
*F671, 00H <sub>1</sub> H <sub>2</sub>	3	Write random cylinder, specified head (once)
*F680	3	Write random cylinder, random head (once)
F693 C <sub>1</sub> C <sub>2</sub> C <sub>3</sub> C <sub>4</sub> C <sub>5</sub> C <sub>6</sub> C <sub>7</sub> C <sub>8</sub> 00H <sub>1</sub> H <sub>2</sub>	3	Write, alternate seek (continuous)
F6A1 00H <sub>1</sub> H <sub>2</sub>	3	Random seek-write (continuous)
F6B1 000N	1	Write through exerciser port
<b>Read</b>		
F701 000N	1, 3	Stop/no stop on error
*F711 000N	3	Offset
*F721 000N	3	Data strobe
*F731 000N	3	Read specified cylinder and head
*F741 C <sub>1</sub> C <sub>2</sub> C <sub>3</sub> C <sub>4</sub>	3	Read all heads, specified cylinder (once)
*F751 00H <sub>1</sub> H <sub>2</sub>	3	Read all cylinders, specified head (once)
*F760	3	Read all cylinders, all heads (once)
*F771 00H <sub>1</sub> H <sub>2</sub>	3	Read random cylinder, specified head (once)
*F780	3	Read random cylinder, random head (once)
F793 C <sub>1</sub> C <sub>2</sub> C <sub>3</sub> C <sub>4</sub> C <sub>5</sub> C <sub>6</sub> C <sub>7</sub> C <sub>8</sub> 00H <sub>1</sub> H <sub>2</sub>	3	Read, alternate seek (continuous)
F7A1 00H <sub>1</sub> H <sub>2</sub>	3	Random seek-read, specified head (continuous)
F7B0	1	Read through exerciser port
F7C2 C <sub>1</sub> C <sub>2</sub> C <sub>3</sub> C <sub>4</sub> 00H <sub>1</sub> H <sub>2</sub>	3	Count address marks
F7D0	3	Read continuous-random cylinder and random head

**TABLE A-1. SUMMARY OF EXERCISER COMMANDS (Continued)**

Command (* indicates valid chain commands)	Cable Hook-up†	Function
<b>Chain</b>		
*C0N <sub>1</sub> N <sub>2</sub>	1, 3	Chain command
*C100	1, 3	Execute chain command (once)
*C200	1, 3	Execute chain command (continuously)
<b>Continue</b>		
C300	3	Continue after data error of E014
<b>Display</b>		
D001 000N	1	T200/300/302 } Cylinder
D011 000N	1	Hunter } Address
D101 000N	1	T200/300/302 } Difference
D111 000N	1	Hunter } Count
D200	1	T25/50/80 } Head
D211 000N	1	T200/300/302 } Address
D220	1	Hunter } Control
D300	1	T25/50/80/82 } Status
D310	1	T200/300/302 } Error/
D400	1	T25/50/80/82 } Control
		T200/300/302 } Status
D500	1	Hunter, Misc. Status #1
D520	1	Hunter, Misc. Status #2
D600	3	All drives } Major Drive
D610	1	Hunter } Status
D700	3	All drives, Rd/Wrt Error
D710	3	All drives, Remaining Byte Count
D720	3	All drives, Error Count
D800	3	All drives } Bus/Tag
D810	1	Hunter } Lines
D820	1	All Trident drives } Status
D900	1, 3	Mode inst } Exerciser Status
D920	1, 3	Write data Ram } Status
D930	1, 3	Read data from RAM } Status
DA01, 00N <sub>1</sub> N <sub>2</sub>	1, 3	Misc data
DB01 A <sub>1</sub> A <sub>2</sub> A <sub>3</sub> A <sub>4</sub>	1, 3	Memory display/Change

†Cable hook-up

1 = exerciser cable only

3 = bus and radial cables only

**BASIC FUNCTIONS**

**F001 00N<sub>1</sub>N<sub>2</sub>, Drive Type**

The drive type command defines the model number of the drive connected to the exerciser. See Appendix B for

drive models showing interface type, head and cylinder numbers, and bytes/track. The Table A-2 defines N<sub>1</sub>N<sub>2</sub> for the drive type.

**TABLE A-2. DRIVE TYPE COMMAND**

N <sub>1</sub> N <sub>2</sub>	Drive Type
01	T-25
02	T-50
03	T-80
04	T-82
05	T-200
06	T-300
07	T-302
08	Hunter-Trident, 32 megabytes
09	Hunter-Trident, 64 megabytes
0A	Hunter-Trident, 96 megabytes
0B	Hunter-Diff, 32 megabytes
0C	Hunter-Diff, 64 megabytes
0D	Hunter-Diff, 96 megabytes
0E	T-202
0F	T-202RM
10	T-302RM
11	T-82RM
12	T-600
13	T-602

**F011 000N, Cable Hook-Up**

The cable hook-up command tells the exerciser which cables are connected between the drive and the exerciser. Table A-3 defines N for the cable hook-up.

**TABLE A-3. CABLE HOOK-UP**

N	Cables Used
1	Drive exerciser port only
2	Drive exerciser and radial cable ports (manufacturing use only)
3	Drive bus and radial cable ports

**F020 Sequence Up and Select (Trident Interface)**

The F020 command works on the T-25, T-50, T-80, T-200, T-300, and Hunter (Trident interface) when the drive exerciser port is not used. When the drive exerciser port is used, the DEGATE switch automatically sequences and selects the drive.

The F020 command turns on the sequence and select bit to the drive through the radial cable.

### F031 000N<sub>1</sub>, Sequence Up and Select (Differential Interface)

The F031 command works on the T-82, T-302 and Hunter differential interface when the drive exerciser port is not used. When the drive exerciser port is used, the DEGATE switch automatically sequences and selects the drive.

The F031 command turns on PICK, HOLD, and UNIT SELECT TAG. The unit select number 'N<sub>1</sub>' (in the second line of the F031 command) is compared with the drive unit select plug decode. If 'N<sub>1</sub>' and the drive select plug are equal, the F031 command sequences up and selects the drive. The 'N<sub>1</sub>' equals the drive unit number (0 to E Hex). F is used when no plug is installed. Error code E018 indicates if drive failed to sequence up within 40 seconds.

### F040, Sequence Down and Deselect

On T-25, T-50, T-80, T-200, T-300, and Hunter (Trident interface), this command drops Sequence and Select. On T-82, T-302 and Hunter differential interface, this command drops PICK, HOLD, and Unit Select Tag.

### F050, Device Check Reset (Fault Clear)

This command issues a device check reset (Fault Clear) to the drive.

### F060, RPM

This command will cause the readouts to display the RPM of the disk in revolutions per minute. A continuous 'B' readout may indicate that no index pulses are occurring. INDEX is ANDed with COMP SEC IND (Compare Sector/Index) in the exerciser on Trident interface drives.

### F070, Count/Display Number of Sector Pulses

This command counts and displays the number of sector pulses between index pulses. A continuous 'B' readout may indicate that no index pulses are occurring. INDEX and SECTOR are ANDed with COMP SEC IND (compare Sector/Index) in the exerciser on Trident interface drives.

### F080, Deselect Drive

The F080 command is used only when the Bus and Radial ports are used. This command issues a rezero, then drops the select bit (it does not sequence the drive down). The exerciser tests the SELECTED line to ensure the drive did deselect. If not deselected, an error code E028 is displayed. To reselect the drive, use the F020 or F031 command.

### F091 000N, Exerciser Diagnostics

This command executes a series of self diagnostic routines. Table A-4 shows the values for 'N' used in the second line of the F091 command. The test box referred to in the table is for in-house unit testing only.

TABLE A-4. EXERCISER DIAGNOSTICS

N	Test Description
0	Run diagnostics on exerciser with no test box or drive connected.  <b>Note</b>  <i>For N = 0, a test procedure is given. For N = 1 thru 5, refer to test specification 23483.</i>
1	Run diagnostics with test box connected and the 0/1 switch set to 0.
2	Run diagnostics with test box connected and the 0/1 switch set to 1.
3	Run diagnostics with T-300 or T-302 drives OFF-LINE on exerciser port.
4	Run diagnostics with T-300 or T-302 drives OFF-LINE on bus/radial ports.
5	Run burn-in test on Hunter drive.

To run exerciser diagnostics for N = 0, use the following test procedure:

1. Install the correct interface board in the lid.
2. *Do not* connect any cables between the drive and exerciser.
3. Enter 'F091, 0000'.

Steps 4-6 test each key, readouts and LEDs which are optional. Proceed to step 7 if it is desired not to test these functions.

4. Verify a decimal point only in the left hand digit.  
  
Verify that all other digits are blank.
5. Press each key (0-F) (order not important). Its number or letter should be displayed on all four readouts.

6. Pressing key '0' should turn off all LEDs (except "+5V").

Pressing key 1 should turn on all LEDs.

7. Press the 'WRITE' key. This will start the diagnostic test routine indicated by a 'B' in the left hand digit and the test number incrementing on the other three digits. If an error occurs 'An<sub>1</sub>n<sub>2</sub>n<sub>3</sub>' will be displayed where n<sub>1</sub>n<sub>2</sub>n<sub>3</sub> indicates the test step number of the failing test. Table A-5 lists the test numbers and the area tested.

**TABLE A-5. EXERCISER DIAGNOSTICS TEST F091 0000**

N <sub>1</sub> N <sub>2</sub> N <sub>3</sub> Test Numbers	Area Tested
001 — 006	MPU Module
007 — 011	Drive Status
012 — 025	Bus/ Tag Lines
026 — 02B	Index/Sect/Amdet Sense latches
02C — 034	Enable/Done
035 — 038	R/W Instruction Latch
039 — 044	Format Sector Mode
045 — 05D	Write Sector Mode
05E — 07A	Read Sector Mode
07B — 086	Write Addmk Mode
087 — 08F	Read Addmk Mode

### BUS/TAG FUNCTIONS

#### F101 0B<sub>1</sub>B<sub>2</sub>B<sub>3</sub>, Raise Selected Bus Line

The B<sub>1</sub>, B<sub>2</sub>, and B<sub>3</sub> hex bits in the F101 command raise selected bus lines according to Table A-6. The RESET key resets all bus/tag lines. Use command D800, D810 or D820 to display bus.

**TABLE A-6. BUS LINE BINARY VALUES DETERMINED BY B<sub>1</sub>B<sub>2</sub>B<sub>3</sub>**

B <sub>1</sub>		B <sub>2</sub>		B <sub>3</sub>	
Bus Lines	Binary Weight	Bus Lines	Binary Weight	Bus Lines	Binary Weight
10	4	2	8	6	8
0	2	3	4	7	4
1	1	4	2	8	2
		5	1	9	1

For example, command F101, 026A results in the following bus line binary values:

B <sub>1</sub> = 2	B <sub>2</sub> = 6	B <sub>3</sub> = A
BUS <sub>10</sub> = 0	BUS <sub>2</sub> = 0	BUS <sub>6</sub> = 1
BUS <sub>0</sub> = 1	BUS <sub>3</sub> = 1	BUS <sub>7</sub> = 0
BUS <sub>1</sub> = 0	BUS <sub>4</sub> = 1	BUS <sub>8</sub> = 1
	BUS <sub>5</sub> = 0	BUS <sub>9</sub> = 0

#### F111 000N, Set Cylinder Tag

This command allows exercising the cylinder tag. The particular bus line configuration can be set by using the F101 command. The values for 'N' used in the F111 command are given in Table A-7. Use command D800, D810, or D820 to display tag when N = 0002.

**TABLE A-7. N VALUES FOR TAG COMMANDS**

N*	Command Description
0	Pulse tag line once
1	Pulse tag line continuously
2	Raise tag line indefinitely

\*The RESET key will reset all bus/tag lines.

#### F121 000N, Set Head Tag

This command allows exercising the head tag. The particular bus line configuration can be set by using the F101 command. The values for 'N' used in the F121 command are given in Table A-7. Use command D800, D810, or D820 to display tag when N = 0002.

#### F131 000N, Control Tag

This command allows exercising the control tag. The particular bus line configuration can be set by using the F101 command. The values for 'N' used in the F131 command are given in Table A-7. Use command D800, D810, or D820 to display tag with N = 0002.

### SEEK FUNCTIONS

#### F200 Rezero

This command causes the drive to seek to cylinder zero, head zero, and other functions defined in the drive specification.

### **F212 C<sub>1</sub>C<sub>2</sub>C<sub>3</sub>C<sub>4</sub> 00H<sub>1</sub>H<sub>2</sub>, Seek to Cylinder and Head (Single)**

This command causes the drive to do a single seek to a specified cylinder and head. The values C<sub>1</sub>C<sub>2</sub>C<sub>3</sub>C<sub>4</sub> and H<sub>1</sub>H<sub>2</sub> in the command specify the following:

C<sub>1</sub>C<sub>2</sub>C<sub>3</sub>C<sub>4</sub> = cylinder number in decimal where C<sub>4</sub> is the units position

H<sub>1</sub>H<sub>2</sub> = head number in decimal where H<sub>2</sub> is the units position

### **F221 C<sub>1</sub>C<sub>2</sub>C<sub>3</sub>C<sub>4</sub>, Seek to Cylinder (Single)**

This command causes the drive to do a single seek to a specified cylinder. The values C<sub>1</sub>C<sub>2</sub>C<sub>3</sub>C<sub>4</sub> in the command specify the cylinder number in decimal. C<sub>4</sub> is the units position.

### **F232 C<sub>1</sub>C<sub>2</sub>C<sub>3</sub>C<sub>4</sub> C<sub>5</sub>C<sub>6</sub>C<sub>7</sub>C<sub>8</sub>, Alternate Seek (Continuous)**

This command causes the drive to do a continuous seek between two specified cylinders. The front panel Position Rate potentiometer is now enabled to control the time between seeks. Fully clockwise gives the maximum seek rate. Pressing RESET halts the process. In the F232 command, the values C<sub>1</sub>C<sub>2</sub>C<sub>3</sub>C<sub>4</sub> and C<sub>5</sub>C<sub>6</sub>C<sub>7</sub>C<sub>8</sub> are the specified cylinder numbers in decimal. C<sub>4</sub> and C<sub>8</sub> are the units positions.

### **F240 Random Seek (Continuous)**

This command causes the drive to do continuous random seeks. The software controls the cylinder number. The front panel Position Rate potentiometer is now enabled to control the time between seeks. Fully clockwise gives maximum seek rate. Pressing RESET, will halt the process.

### **F250 Seek Time — Forward**

This command will display the maximum time in milliseconds to complete a seek from cylinder zero to the highest cylinder number (not to Hunter service cylinders). The process is continuous and will continuously display the average time for each 8 seeks. If a Seek Incomplete occurs, an error code E003 will be displayed. Pressing RESET, will halt the process.

### **F260 Seek Time — Reverse**

This command will display the maximum time in milliseconds to complete a seek from the highest cylinder number (not Hunter service cylinders) to cylinder zero. The process is continuous and will continuously display the average time for each 8 seeks and up-date the reading for each reverse seek. If a Seek Incomplete occurs, an error code E003 will be displayed. Pressing RESET will halt the process.

### **F270 Servo Seek Incomplete Disable**

The F270 command requires the use of the exerciser port and tests all drives except the Hunter. The command disables the servo seek incomplete control by dropping EX SKINC ENS/. Pressing RESET enables the servo seek incomplete control.

## **HEAD FUNCTIONS**

### **Note**

*Head number 8 on Hunter drives is the cartridge.*

### **F301 00H<sub>1</sub>H<sub>2</sub>, Set Head Address Register**

This command sets the head address register (HAR) to a specified head number. The value of H<sub>1</sub>H<sub>2</sub> in the command is the specified head number in decimal with H<sub>2</sub> the units position. If the head number is outside the allowable range, an error code E000 is displayed. (Check head address with commands D200, D211, or D220 using exerciser port.)

### **F310 Advance Head Address (Trident Interface)**

The F310 command is used on the T-25, T-50, T-80, T-200, T-300, and Hunter (Trident interface) only. This command advances the head address register by one.

### **Note**

*The F310 command may allow setting the HAR to an illegal address.*

### **F320 Reset Head Address (Trident Interface)**

This command resets the head address register to zero for T-25, T-50, T-80, T-200, T-300, and Hunter (Trident interface). On the Hunter, the command also resets the cartridge select bit to zero.

### **F330 Head Select (Trident Interface)**

This command continuously selects a head by raising bus 7 and control tag lines. Pressing RESET will drop the bus and tag lines.

## **READ/WRITE/FORMAT SET-UP FUNCTIONS**

These set-up commands must be entered before any format, read or write commands are entered. When the exerciser performs format, read or write commands on the Trident or Hunter drives, the Bus and Radial cables are used.

**Note**

*Hunter drives with serial numbers greater than a specific number can use the exerciser port and radial port for format, read, or write commands. At the release of this manual, this specific serial number is not available.*

**F402 0S<sub>1</sub>S<sub>2</sub>S<sub>3</sub> B<sub>1</sub>B<sub>2</sub>B<sub>3</sub>B<sub>4</sub>, Sector Mode**

This command tells the exerciser that the pack is to be formatted using sector pulses. The command specifies the number of sectors, (S<sub>1</sub>S<sub>2</sub>S<sub>3</sub>) and number of bytes in the overhead and data fields in each sector (B<sub>1</sub>B<sub>2</sub>B<sub>3</sub>B<sub>4</sub>).

The actual number of sector pulses that are generated for each disk rotation is determined by strapping in the drive (for details, see the drive Installation And Operation manual). The number of sectors per track entered in S<sub>1</sub>S<sub>2</sub>S<sub>3</sub> is used by the exerciser for making calculations. In one such calculation, the exerciser divides the bytes per track (either 13,440 or 20,160) by S<sub>1</sub>S<sub>2</sub>S<sub>3</sub> to get the maximum number of bytes per sector in the overhead and data fields (see Figure A-1). If the user enters 0000 for the B<sub>1</sub>B<sub>2</sub>B<sub>3</sub>B<sub>4</sub> parameter, the exerciser uses this calculated overhead and data field length when writing. If the user enters a value greater than zero for the B<sub>1</sub>B<sub>2</sub>B<sub>3</sub>B<sub>4</sub> parameter, the exerciser uses B<sub>1</sub>B<sub>2</sub>B<sub>3</sub>B<sub>4</sub> as the overhead and data field length. The B<sub>1</sub>B<sub>2</sub>B<sub>3</sub>B<sub>4</sub> parameter must not be greater than the calculated value.

The F402 parameters are summarized as follows:

S<sub>1</sub>S<sub>2</sub>S<sub>3</sub> Number of sectors per track (1-255 decimal) used to calculate the maximum length of the overhead and data fields in each sector. S<sub>1</sub>S<sub>2</sub>S<sub>3</sub> must be equal to or greater than the number displayed in the F070 command.

B<sub>1</sub>B<sub>2</sub>B<sub>3</sub>B<sub>4</sub> = 0000 The exerciser calculated value of the overhead and data field length in each sector is used.

This calculated decimal value is displayed by the DA01, 0007 command. The value must be less than the bytes per sector strapped in the drive.

B<sub>1</sub>B<sub>2</sub>B<sub>3</sub>B<sub>4</sub> ≠ 0000 This decimal value is used as the length of the overhead and data fields. This value must be less than or equal to the exerciser calculated value.

**F411 0A<sub>1</sub>A<sub>2</sub>A<sub>3</sub>, Address Mark Mode**

This command tells the exerciser that the pack will be formatted using address marks. The command specifies the number of address marks. The exerciser calculates the number of bytes per record which may be displayed by the DA01 0007 command. A<sub>1</sub>A<sub>2</sub>A<sub>3</sub> equals the number of address marks in decimal (between 1 and 255).

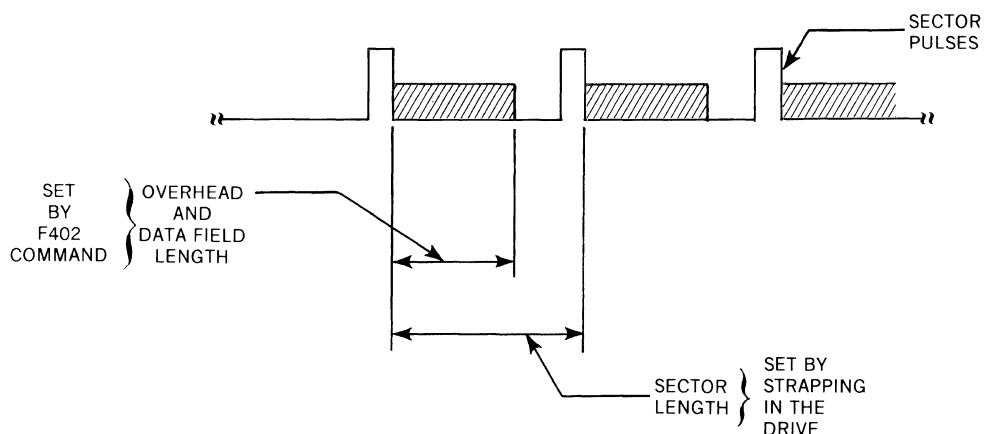
After a track is formatted, entering the F7C2 command will cause the exerciser to verify that A<sub>1</sub>A<sub>2</sub>A<sub>3</sub> marks are read. The AD-MK Mode LED will be on.

**F421 L<sub>1</sub>L<sub>2</sub>L<sub>3</sub>L<sub>4</sub>, Set Data Length**

The exerciser calculates a data field length in commands F402 or F411. This length may be displayed by the DA01 0008 command. If the desired data length is less than the exerciser calculated value, this F421 command sets the desired data length. Error code E006 is displayed if the desired value entered by the F421 command is larger than the exerciser calculated value. L<sub>1</sub>L<sub>2</sub>L<sub>3</sub>L<sub>4</sub> equals the desired data length in HEX and should be multiples of 2.

**F431 H<sub>1</sub>H<sub>2</sub>H<sub>3</sub>H<sub>4</sub>, Set Data Pattern**

This command defines the data pattern to be written in the data field during a write command. During a read command, the data read from the disk is compared with this data pattern. H<sub>1</sub>H<sub>2</sub>H<sub>3</sub>H<sub>4</sub> equals the four HEX character data pattern. Command D920 displays this data pattern.



**Figure A-1. Overhead and Data Field Set by Command F402**

SE0016

#### **F441 000N, Working Cylinders (Hunter only)**

This command defines which cylinders can be formatted, written or read. The value of N in the command is as follows:

N = 0: Only the service cylinders (833 thru 836) on the non-removable platters or removal cartridge may be used.

N = 1: Any cylinder (including service cylinders) on the non-removable platters or removable cartridge may be used. Customer data can be destroyed if a non-service cylinder is used.

#### **F450 Reset Read Error Latches**

This command resets the header error and data error latches. These latches are set by errors during a read or write operation. Every read or write command automatically resets these latches before starting the operation except when the commands are in a chain command.

#### **F460 Reset Bit Error Counter**

This command resets the error counter which counts the number of bit errors during any read operation. This command must be entered prior to a read operation where the bit errors are to be counted.

### **FORMAT COMMANDS**

On Trident drives, any cylinder may be formatted. On Hunter drives, any cylinder or just the service cylinders may be formatted depending upon command F441. Error code E007 is displayed when using cylinders forbidden by command F441. After entering any format command, the Write key must be pressed to start the operation. Head 8 selects the Hunter cartridge.

#### **F501 000N, Format Specified Cylinder and Head (once or continuous)**

This command formats the cylinder and head specified by the F212 seek command which must be executed first. The values for N are as follows:

N = 0: Format one revolution

N = 1: Format continuously until RESET is pressed. Pressing RESET may destroy data. To preserve data, press the 'E' key to stop operation.

#### **F511 C<sub>1</sub>C<sub>2</sub>C<sub>3</sub>C<sub>4</sub>, Format One Cylinder, All Heads (once)**

This command formats all heads (including the Hunter cartridge) on the specified cylinder. The C<sub>1</sub>C<sub>2</sub>C<sub>3</sub>C<sub>4</sub> equals the cylinder number in decimal.

#### **F520 Format All Cylinders and Heads**

This command formats all cylinders and heads on Trident drives. On Hunter drives, this command formats only those cylinders which were defined by the F441 command.

#### **F531 00H<sub>1</sub>H<sub>2</sub>, Format All Cylinders, Specified Head**

This command formats the specified head on all cylinders on Trident drives. On Hunter drives, this command formats the specified head only on those cylinders which were defined by the F441 command.

#### **F542 C<sub>1</sub>C<sub>2</sub>C<sub>3</sub>C<sub>4</sub> 00H<sub>1</sub>H<sub>2</sub>, Format/Write/Read All Cylinders and Heads**

This command starts executing by formatting, writing, and reading at the specified cylinder and head. The execution continues for the remaining heads on the cylinder and then increments to the next cylinder where the execution is done on all the heads. The process continues until the maximum cylinder and head is executed. The values for C<sub>1</sub>C<sub>2</sub>C<sub>3</sub>C<sub>4</sub> and H<sub>1</sub>H<sub>2</sub> are as follows:

C<sub>1</sub>C<sub>2</sub>C<sub>3</sub>C<sub>4</sub>: Starting cylinder number in decimal

H<sub>1</sub>H<sub>2</sub>: Starting head number in decimal

### **WRITE COMMANDS**

On Trident drives, any cylinder and head may be written. On Hunter drives, command F441 determines whether writing is allowed on all cylinders or restricted to the service cylinders (833 thru 836). An error code E007 is displayed if command F441 is violated. The WRITE key must be pressed after entering a write command before execution starts. A write continuous command can be stopped without destroying data by pressing the 'E' key rather than the RESET key. Head 8 selects the Hunter cartridge.

#### **Note**

*The drive radial cable must be connected to the exerciser before any read/write commands are entered.*

### **F631 000N, Write On Specified Cylinder and Head**

The F212 seek command must be issued first to select the desired cylinder and head. Then the F631 command writes in the data field on the desired head the pattern last defined by the F431 command. The values for N are as follows:

N = 0: Write one revolution

N = 1: Write continuously until the RESET key or 'E' key is pressed. Data may be destroyed by the RESET key but not destroyed by the 'E' key.

### **F641 C<sub>1</sub>C<sub>2</sub>C<sub>3</sub>C<sub>4</sub>, Write Once — All Heads, Specified Cylinder**

This command causes the drive to seek to a specified cylinder. At the completion of the seek, the pattern last defined by the F431 command is written in the data field on all heads. The value C<sub>1</sub>C<sub>2</sub>C<sub>3</sub>C<sub>4</sub> is the cylinder number in decimal.

### **F651 00H<sub>1</sub>H<sub>2</sub>, Write Once — All Cylinders, Specified Head**

This command causes the drive to seek to each cylinder in sequence. At the completion of each seek, the pattern last defined by the F431 command is written in the data field on the specified head. The value H<sub>1</sub>H<sub>2</sub> is the head number in decimal.

### **F660 Write Once — All Cylinders, All Heads**

This command causes the drive to seek to each cylinder in sequence. At the completion of each seek, the pattern last defined by the F431 command is written in the data field on all heads.

### **F671 00H<sub>1</sub>H<sub>2</sub>, Write Once — Random Cylinder, Specified Head**

This command causes the drive to seek to a random cylinder. At the completion of the seek, the pattern last defined by the F431 command is written in the data field on the specified head. The value H<sub>1</sub>H<sub>2</sub> is the head number in decimal.

### **F680, Write Once — Random Cylinder, Random Head**

This command will cause the drive to seek to a random cylinder. At the completion of the seek, the pattern last defined by the F431 command is written in the data field on a random head.

### **F693 C<sub>1</sub>C<sub>2</sub>C<sub>3</sub>C<sub>4</sub> C<sub>5</sub>C<sub>6</sub>C<sub>7</sub>C<sub>8</sub> 00H<sub>1</sub>H<sub>2</sub>, Alternate Seek-Write**

This command will cause the drive to continuously seek between the two specified cylinders. At the completion of

each seek, the pattern last defined by the F431 command is written in the data field on the specified head. Pressing the 'E' key will halt the operation without destroying data.

C<sub>1</sub>C<sub>2</sub>C<sub>3</sub>C<sub>4</sub>: One cylinder number in decimal

C<sub>5</sub>C<sub>6</sub>C<sub>7</sub>C<sub>8</sub>: Other cylinder number in decimal

H<sub>1</sub>H<sub>2</sub>: Head number in decimal

### **F6A1 00H<sub>1</sub>H<sub>2</sub>, Random Seek-Write (continuous)**

This command will cause the drive to continuously random seek. At the completion of each seek, the pattern last defined by the F431 command will be written in the data field on the specified head. Pressing the 'E' key will halt the operation without destroying data.

H<sub>1</sub>H<sub>2</sub> = Head number in decimal

### **F6B1 000N, Write Through Exerciser Port (all drive types)**

This command applies either low or high frequency pulses to the write data input of the exerciser port. The DEGATE switch must be on. These pulses are not synced to index or R/W clock. The command also raises control tag, write and head select. The cylinder and head are specified by the previously issued F212 command. Pressing RESET will stop the operation and reset the bus and tag lines.

N = 0: Low frequency (3.2 MHz on T-25, T-50, T-200; 4.8 MHz on T-80, T-300, T-82, T-302, Hunter)

N = 1: High frequency (6.4 MHz on T-25, T-50, T-200; 9.6 MHz on T-80, T-300, T-82, T-302, Hunter)

## **READ COMMANDS**

On Trident drives, any cylinder and head may be read. On Hunter drives, command F441 determines whether reading is allowed on all cylinders or restricted to the service cylinders (833 thru 836). An error code E007 is displayed if command F441 is violated. The cylinders and heads to be read must first be formatted and then the data field written. To stop continuous read operations, press the RESET key. Head 8 selects the Hunter cartridge.

### **Note**

*The drive radial cable must be connected to the exerciser before any read/write commands are entered.*



### **F701 000N, Stop/No-Stop On Error**

This command allows the operator to either stop the data field byte counter on the first data error or to allow the exerciser to flag the first data error and continue to read the rest of the data field without stopping. The entire header field is always read whether an error occurred or not.

N = 0: Stop on read error ('No Stop On Error' LED off)

N = 1: Do not stop on read error ('No Stop On Error' LED on)

### **F711 000N, Offset**

This command allows off-setting the heads when attempting to read.

N = 0: Offset off (OFFSET ON indicator is off)

N = 1: Offset forward, plus (OFFSET ON indicator is on)

N = 2: Offset reverse, minus (OFFSET ON indicator is on)

### **F721 000N, Data Strobe**

This command allows strobing the data early or late when attempting to read.

N = 0: Strobe normal (STROBE ON indicator is off)

N = 1: Strobe late (STROBE ON indicator is on)

N = 2: Strobe early (STROBE ON indicator is on)

### **F731 000N, Read Specified Cylinder and Head (once or continuous)**

This command reads the data on the cylinder and head specified by a previously issued F212 seek command. The data is bit by bit compared with the data pattern last defined by the F431 command.

N = 0: Read one revolution

N = 1: Read continuously until the RESET key is pressed. The command will not stop on error.

### **F741 $C_1C_2C_3C_4$ , Read Once — All Heads, Specified Cylinder**

This command reads the data on the specified cylinder and all heads in sequence. The data read is bit by bit

compared with the data pattern last defined by the F431 command.

$C_1C_2C_3C_4$  = Cylinder number in decimal.

### **F751 $00H_1H_2$ , Read Once — All Cylinders, Specified Head**

This command reads the data on the specified head and all cylinders in sequence. The data read is bit by bit compared with the data pattern last defined by the F431 command.

$H_1H_2$  = Head number in decimal

### **F760 Read Once — All Cylinders, All Heads**

This command reads the data on all cylinders and all heads in sequence. The data read is bit by bit compared with the data pattern last defined by the F431 command.

### **F771 $00H_1H_2$ , Read Once — Random Cylinder, Specified Head**

This command reads the data on the specified head on a random cylinder defined by the software. The data read is bit by bit compared with the data pattern last defined by the F431 command.

$H_1H_2$  = Head number in decimal

### **F780 Read Once — Random Cylinder, Random Head**

This command reads the data on a random cylinder and random head defined by the software. The data read is bit by bit compared with the data pattern last defined by the F431 command.

### **F793 $C_1C_2C_3C_4 C_5C_6C_7C_8$ $00H_1H_2$ , Alternate Seek-Read (continuous)**

This command will cause the drive to continuously seek between the two specified cylinders. At the completion of each seek, the data read on the specified head will be bit by bit compared with the pattern last defined by the F431 command. Pressing the RESET key will halt the operation.

CCCC = Cylinder numbers in decimal

$H_1H_2$  = Head number in decimal

**F7A1 00H<sub>1</sub>H<sub>2</sub>, Random Seek-Read (continuous)**

This command will cause the drive to continuously random seek. At the completion of each seek, the data read on the specified head will be bit by bit compared with the pattern last defined by the F431 command. Pressing the RESET key will halt the operation.

H<sub>1</sub>H<sub>2</sub> = Head number in decimal

**F7B0 Set Read Gate Continuous (all drive types)**

This command allows scoping the drive read data line to observe the read data. 'Control Tag', 'Read' and head select are raised continuously. Pressing RESET will stop the operation and reset the bus/tag lines.

**F7C2 C<sub>1</sub>C<sub>2</sub>C<sub>3</sub>C<sub>4</sub> 00H<sub>1</sub>H<sub>2</sub>, Count Address Marks**

If in the address mark mode (F411 command entered), the exerciser will read the specified track, count the number of 'address marks detected' and compare this count to the number of address marks entered in the F411 command. If they agree, number counted will be displayed. If they disagree, an error code E009 will be displayed. The actual number of address marks detected can be displayed by entering the DA01, 0006 command.

This track must be formatted and written on before attempting this command. Address mark mode must be set. 'No Stop On Error' mode will be set.

C<sub>1</sub>C<sub>2</sub>C<sub>3</sub>C<sub>4</sub> = Cylinder number in decimal

H<sub>1</sub>H<sub>2</sub> = Head number in decimal

**F7D0 Read Continuous — Random Cylinder, Random Head**

This command reads the data on a random cylinder and random head defined by the firmware. After each read, a new random cylinder and head are chosen. This process is repeated continuously until the RESET key is pressed.

**CHAIN COMMANDS**

Chain commands allow linking certain 'F' commands together. The commands will be executed in the same sequence they are entered. If in the read stop-on-error mode, the first data error will halt the execution of any additional commands. The last 'F' command and its parameters that was executed can be displayed by entering the display command DA01, 0000. Table A-8 lists the 'F' commands that can be used in chaining.

**TABLE A-8. 'F' COMMANDS ALLOWED IN CHAINING**

'F' Command	Description
F200	Rezero
F212	Seek to cylinder and head
F221	Seek to cylinder
F301	Set HAR
F310	Advance HAR
F320	Reset HAR
F402	Sector Mode
F411	Address Mark Mode
F431	Set data pattern
F450	Reset read error latches
F460	Reset bit error counter
F501	Format cylinder and head once (N = 0 only)
F511	Format one cylinder, all heads
F520	Format all cylinders and heads
F531	Format all cylinders, specified head
F542	Format/Write/Read all cylinders and heads
F631	Write cylinder and head once (N = 0 only)
F641	Write all heads, specified cylinder
F651	Write all cylinders, specified head
F660	Write all cylinders, all heads
F671	Write random cylinder, specified head
F680	Write random cylinder, random head
F711	Offset
F721	Data strobe
F731	Read cylinder and head once (N = 0 only)
F741	Read all heads, specified cylinder
F751	Read all cylinders, specified head
F760	Read all cylinders, all heads
F771	Read random cylinder, specified head
F780	Read random cylinder, random head

**CON<sub>1</sub>N<sub>2</sub>, Chain Commands**

This command allows a maximum of 21 hexadecimal chainable 'F' commands to be chained together.

N<sub>1</sub>N<sub>2</sub> = Hexadecimal number of 'F' commands to be entered (does not include command parameter lines)

**C100 Execute Chain Command Once**

This command executes all commands entered in the CONN command one time through. The read error latch and bit error counter are reset before executing the first command. The WRITE key must be pressed if any format or write command is part of the chain.

### C200 Execute Chain Command Continuously

This command executes all commands entered in the CONN command continuously. The read error latch and bit error counter are reset before executing the first command. The process is terminated at the completion of the current command by pressing the 'E' key. (Pressing RESET will stop the operation immediately but could destroy data being written if caught during a format or write command.)

The WRITE key must be pressed if any format or write command is part of the chain.

### CONTINUE COMMAND, C300

The exerciser can be set to stop executing on error (command F701, 0000). The C300 command can then be issued to continue an error interrupted command under the following conditions:

The error causing the interrupted command resulted in error code E014 being displayed.

The error is 'soft' and can be overcome by reading the track again.

The interrupted command was one of the following:

1. F542, Format/Write/Read all cylinders and heads
2. F651, Write all cylinders, specified head
3. F660, Write all cylinders, all heads
4. F751, Read all cylinders, specified head
5. F760, Read all cylinders, all heads

If one of the above 'F' commands is executing without error and the C300 command is issued, error code E029 will be displayed.

### DISPLAY COMMANDS

The display commands will cause the four position hexadecimal display to show information whose interpretation is determined by the particular display command.

#### D001 00N, Cylinder Address Register on T-200/300/302

The Cylinder Address Register on the T-200/300/302 is displayed. The exerciser port is used and the display is in decimal or hexadecimal.

N = 0: CAR in decimal

N = 1: CAR in hexadecimal shown in the following way:

HEX READOUT	0	0	0	0	0	0	CAR 512	CAR 256	CAR 128	CAR 64	CAR 32	CAR 16	CAR 8	CAR 4	CAR 2	CAR 1
HEX	8	4	2	1	8	4	2	1	8	4	2	1	8	4	2	1

#### D011 000N, Cylinder Address Register on Hunter

The Cylinder Address Register on the Hunter is displayed. The exerciser port is used and the display is in decimal or hexadecimal.

N = 0: CAR in decimal

N = 1: CAR in hexadecimal shown in the following way:

HEX READOUT	0	0	0	0	0	0	CAR 512	CAR 256	CAR 128	CAR 64	CAR 32	CAR 16	CAR 8	CAR 4	CAR 2	CAR 1
HEX	8	4	2	1	8	4	2	1	8	4	2	1	8	4	2	1
BUS	X	X	X	X	X	X	0	1	2	3	4	5	6	7	8	9

#### D101 000N, Difference Counter on T-200/300/302

The Difference Counter (DIFF) on the T-200/300/302 is displayed. The exerciser port is used and the display is in decimal or hexadecimal.

N = 0: DIFF in decimal

N = 1: DIFF in hexadecimal shown in the following way:

HEX READOUT	0	0	0	0	0	0	DIFF 512	DIFF 256	DIFF 128	DIFF 64	DIFF 32	DIFF 16	DIFF 8	DIFF 4	DIFF 2	DIFF 1
HEX	8	4	2	1	8	4	2	1	8	4	2	1	8	4	2	1

#### D111 000N, Difference Counter on Hunter

The Difference Counter (DIFF) on the Hunter is displayed. The exerciser port is used and the display is in decimal or hexadecimal.

N = 0: DIFF in decimal

N = 1: DIFF in hexadecimal shown in the following way:

HEX READOUT	0	0	0	0	0	0	DIFF 512	DIFF 256	DIFF 128	DIFF 64	DIFF 32	DIFF 16	DIFF 8	DIFF 4	DIFF 2	DIFF 1
HEX	8	4	2	1	8	4	2	1	8	4	2	1	8	4	2	1
BUS	X	X	X	X	X	X	0	1	2	3	4	5	6	7	8	9

**D200 Head Address Register on T-25/50/80/82**

The Head Address Register (HAR) on the T-25/50/80/82 is displayed. The exerciser port is used and the display is in hexadecimal as follows:

HEX READOUT	0	0	0	0	0	0	0	0	0	0	0	0	0	HAR 4	HAR 2	HAR 1
HEX	8	4	2	1	8	4	2	1	8	4	2	1	8	4	2	1

**D211 000N, Head Address Register on T-200/300/302**

The Head Address Register (HAR) on the T-200/300/302 is displayed. The exerciser port is used and the display is in decimal or hexadecimal.

N = 0: HAR in decimal

N = 1: HAR in hexadecimal shown in the following way:

HEX READOUT	0	0	0	0	0	0	0	0	0	0	0	HAR 16	HAR 8	HAR 4	HAR 2	HAR 1
HEX	8	4	2	1	8	4	2	1	8	4	2	1	8	4	2	1

**D220 Head Address Register on Hunter**

The Head Address Register (HAR) on the Hunter is displayed. The exerciser port is used and the display is in hexadecimal as follows:

HEX READOUT	0	0	0	0	0	0	0	0	0	0	0	0	CART. SELECTED	HAR 4	HAR 2	HAR 1
HEX	8	4	2	1	8	4	2	1	8	4	2	1	8	4	2	1
BUS	X	X	X	X	X	X	X	X	X	X	X	X	1	5	6	7

**D300 Control Status on the T-25/50/80/82**

The control status on the T-25/50/80/82 is displayed. The exerciser port is used.

HEX READOUT	LIDCLSD/ (0)	BRUSHEXT/ (0)	0	0	0	0	RETHD	LDSP	FWD	HDEXT	HDL	TRKFL	RDY (ONCYL)	SKENA	OFFSET	SKINC
HEX	8	4	2	1	8	4	2	1	8	4	2	1	8	4	2	1
OK	0	X	0	0	0	0	0	0	X	1	1	1	1	0	X	0

T-82 Differences in '( )'

**D310 Control Status on the T-200/300/302**

The control status on the T-200/300/302 is displayed. The exerciser port is used.

HEX READOUT	0	0	0	0	0	0	RETHD	LOADSP	FWD	HDEXT	HDLDDL	TRKFL	READY (ONCYL)	SKENA	OFFSET	SKINC
HEX	8	4	2	1	8	4	2	1	8	4	2	1	8	4	2	1
OK	0	0	0	0	0	0	0	0	X	1	1	1	1	0	X	0

T-302 Differences in '( )'

**D400 Error/Control Status on T-25/50/80/82 and T-200/300/302**

The drive control/error status on the T-25/50/80/82 is displayed. The exerciser port is used and the display is as follows:

HEX READOUT	DEGATE/	READ	WRT	DRMOT	BRAKE	SPEED	SCRDY (RDRDY/)	SCILLOS	OSERR (RDWRT)	WRTRDY	WRTOS	WRDONLY	WRTUTH	DEVCHKR/W	EMRET	DCUSF
HEX	8	4	2	1	8	4	2	1	8	4	2	1	8	4	2	1
OK	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0

T-82 Differences in '( )'

The drive control/error status on the T-200/300/302 is displayed. The exerciser port is used and the display is as follows:

HEX READOUT	DEGATE/	RDGATE	WRENA	DRMOT	BRAKE	SPEED	SCRDY (RDRDY/)	SCILLOS	SHRDY (RDWRT)	WRTRDY	WRTOS	WRDONLY	WRTUTH	RWUSF	EMRET	EMRET
HEX	8	4	2	1	8	4	2	1	8	4	2	1	8	4	2	1
OK	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0

T-302 Differences in '( )'

### D500 Hunter Extended Status — Miscellaneous #1

The miscellaneous #1 Hunter extended status is displayed. The exerciser port is used.

HEX READOUT	0	0	0	0
HEX	8	4	2	1
BUS	X	X	X	X
OK	0	0	0	0

HEX READOUT	0	0	0	CARTR. SELD.
HEX	8	4	2	1
BUS	X	X	0	1
OK	0	0	0	X

HEX READOUT	SPEEDLOSS	READ	WRITE	HD 4
HEX	8	4	2	1
BUS	2	3	4	5
OK	0	0	0	X

HEX READOUT	HD 2	HD 1	RUN	EMRET/
HEX	8	4	2	1
BUS	6	7	8	9
OK	X	X	1	1

### D520 Hunter Extended Status — Miscellaneous #2

The miscellaneous #2 Hunter extended status is displayed. The exerciser port is used.

HEX READOUT	0	0	0	0
HEX	8	4	2	1
BUS	X	X	X	X
OK	0	0	0	0

HEX READOUT	0	0	MOD0**	MOD1**
HEX	8	4	2	1
BUS	X	X	0	1
OK	0	0	X	X

HEX READOUT	FWD	0	0	HDEXTENDED
HEX	8	4	2	1
BUS	2	3	4	5
OK	X	0	0	1

HEX READOUT	OFFSET ACTIVE/ VELENA/ TRKFL/ STAT. IND. ERROR*
HEX	8 4 2 1
BUS	6 7 8 9
OK	X 1 0 0

\*STAT. IND. ERROR — Indicates that the Hunter error indicator is displaying a number other than '0'.  
\*\*MOD0 and MOD1 are decoded as follows:

DECODE	MOD1	MOD0	MBYTE
0	0	0	32
2	0	1	64
1	1	0	96

### D600 Major Drive Status for all Drive Types

The major drive status for all drive types is displayed. The Bus and Radial ports are used.

Trident interface drives have the following display:

HEX READOUT	RDY/ DEV. CHK. SK. INC. END OF CYL
HEX	8 4 2 1
OK	0 0 0 0

HEX READOUT	OFFSET ON ON LINE/ NO CLOCK READ ONLY
HEX	8 4 2 1
OK	X 0 0 X

HEX READOUT	ATTN 0 0 0
HEX	8 4 2 1
OK	X 0 0 0

HEX READOUT	0 0 0 0
HEX	8 4 2 1
OK	0 0 0 0

Differential interface drives have the following display:

HEX READOUT	ON CYL/ FAULT SK. ERR SELD/
HEX	8 4 2 1
OK	0 0 0 0

HEX READOUT	SKEND READY/ NO CLOCK WRT PROT
HEX	8 4 2 1
OK	X 0 0 X

HEX READOUT	0 0 0 0
HEX	8 4 2 1
OK	0 0 0 0

HEX READOUT	0 0 0 0
HEX	8 4 2 1
OK	0 0 0 0

### D610 Major Hunter Drive Status

The major drive status for Hunter drives is displayed. The exerciser port is used.

Trident interface drives have the following display:

HEX READOUT	READY/ DEV. CHK. SK. INC ON LINE/
HEX	8 4 2 1
OK	0 0 0 0

HEX READOUT	ATTN DEGATE/ 0 READ ONLY
HEX	8 4 2 1
OK	X 0 0 X

HEX READOUT	0 0 0 0
HEX	8 4 2 1
OK	0 0 0 0

HEX READOUT	0 0 0 0
HEX	8 4 2 1
OK	0 0 0 0

Differential interface drives have the following display:

HEX READOUT	ON CYL/ FAULT SK. ERR READY/
HEX	8 4 2 1
OK	0 0 0 0

HEX READOUT	SK END DEGATE/ 0 READ ONLY
HEX	8 4 2 1
OK	X 0 0 X

HEX READOUT	0 0 0 0
HEX	8 4 2 1
OK	0 0 0 0

HEX READOUT	0 0 0 0
HEX	8 4 2 1
OK	0 0 0 0

### D700 Read/Write Error Status

This command displays the Read/Write Error status. The bus and radial port is used on all drive types. The status is reset by the F450 command. The display is as follows:

HEX READOUT	0 0 0 0
HEX	8 4 2 1
OK	0 0 0 0

HEX READOUT	0 0 0 0
HEX	8 4 2 1
OK	0 0 0 0

HEX READOUT	NO CLOCK
HEX	8 4 2 1
OK	0 0 0 0

HEX READOUT	HEADER ERR. DATA FIELD ERR. IST BY DATA ERR. NO SYNC BIT*
HEX	8 4 2 1
OK	0 0 0 0

\*NO SYNC BIT — During a write or read operation, it may indicate no sync bit or 'AMDETD' was found to enter into a header mode. Also during a read operation, it may indicate no sync bit was found to enter into a data mode.

### D710 Remaining Byte Count in Data Field

The command displays in hexadecimal the remaining byte count in the data field. The bus and radial port is used on all drive types.

HEX READOUT	BYTE 32768	BYTE 16384	BYTE 8192	BYTE 4096	BYTE 2048	BYTE 1024	BYTE 512	BYTE 256	BYTE 128	BYTE 64	BYTE 32	BYTE 16	BYTE 8	BYTE 4	BYTE 2	BYTE 1
HEX	8	4	2	1	8	4	2	1	8	4	2	1	8	4	2	1

### D720 Bit Error Count in Data Field

The command displays the Bit Error Counter which counts the number of bit errors in the data fields read. The bus and radial port is used on all drive types. The Bit Error Counter is reset by the F460 command. This count is only valid in the no-stop-on-error mode, because in the stop-on-error mode the first byte in error is latched and can be read using the D940 command. The display is in hexadecimal as follows:

HEX READOUT	0	0	0	0	0	0	0	0	BIT ERR > 127	BIT ERR 64	BIT ERR 32	BIT ERR 16	BIT ERR 8	BIT ERR 4	BIT ERR 2	BIT ERR 1
HEX	8	4	2	1	8	4	2	1	8	4	2	1	8	4	2	1

**Note:** The data read back can be displayed by entering the D930 command.

### D800 Bus/Tag Display Using Bus Port (All Drives)

This command displays the Bus and Tag for all drive types using the bus port. This display is as follows:

HEX READOUT	EN. BUS IN	0	CONTR. TAG	HEAD TAG	CYL. TAG	BUS 10	BUS 0	BUS 1	BUS 2	BUS 3	BUS 4	BUS 5	BUS 6	BUS 7	BUS 8	BUS 9
HEX	8	4	2	1	8	4	2	1	8	4	2	1	8	4	2	1

### D810 Bus/Tag Display Using Exerciser Port (Hunter Drive)

This command displays the Bus and Tag for the Hunter drive using the exerciser port. The display is as follows:

HEX READOUT	EN. BUS IN	SERV. TAG	CONTR. TAG	HEAD TAG	CYL. TAG	0	BUS 0	BUS 1	BUS 2	BUS 3	BUS 4	BUS 5	BUS 6	BUS 7	BUS 8	BUS 9
HEX	8	4	2	1	8	4	2	1	8	4	2	1	8	4	2	1

### D820 Bus/Tag Display Using Exerciser Port (All Trident Drives)

This command displays the Bus and Tag for the Trident drives using the exerciser port. The display is as follows:

HEX READOUT	0	0	CONTR. TAG	HEAD TAG	CYL. TAG	BUS 10	BUS 0	BUS 1	BUS 2	BUS 3	BUS 4	BUS 5	BUS 6	BUS 7	BUS 8	BUS 9
HEX	8	4	2	1	8	4	2	1	8	4	2	1	8	4	2	1

### D900 Exerciser Status — Modes/Instructions

This command, used for exerciser diagnostics, displays various exerciser bits.

HEX READOUT	BUSY	AMPRMD	PRMD	HDRMD	RLKMD	DAMD	PADMD	ENABLE	CONT = 1	READ	WRITE	FORMAT	SELF TEST	NO ST. ON ERR	AD MK MD	0
HEX	8	4	2	1	8	4	2	1	8	4	2	1	8	4	2	1

### D920 Exerciser Status — Contents of Write Data RAM

This command will display the contents of the write data RAM as shown below. Press the 'A' key to advance the display. See Figure A-2.

The first two displays, contain the data pattern which was entered in the 'F431' command. This pattern is written in the data field during a write operation, and is used to compare the data read back from the data field during a read operation.

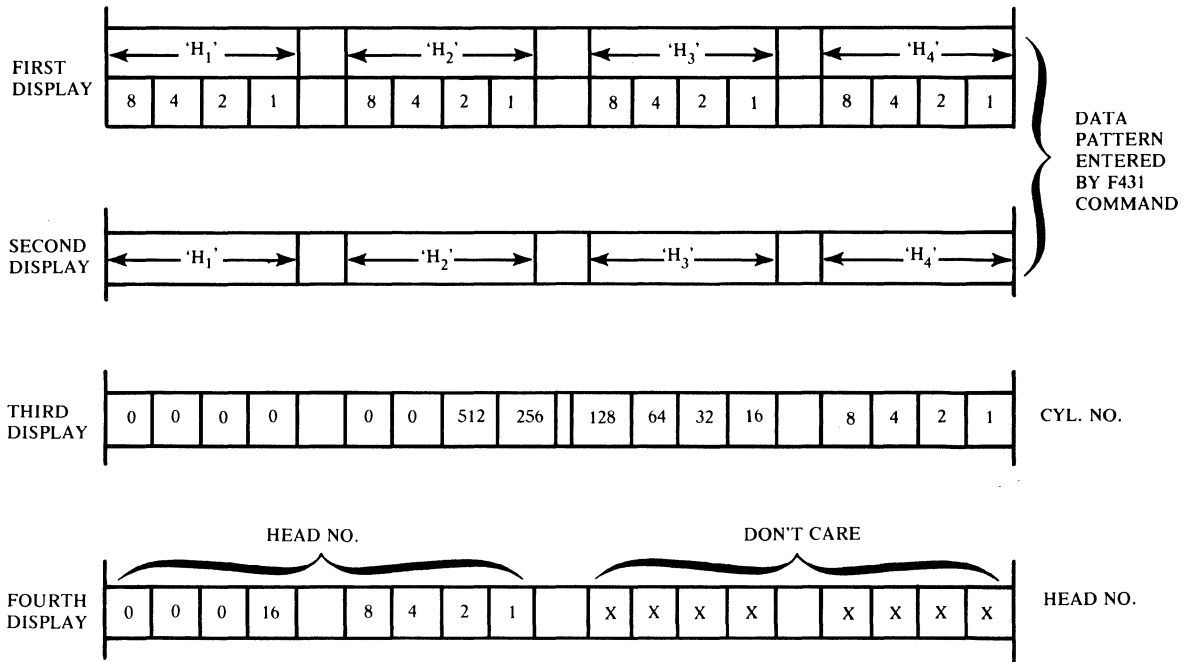
The next two displays contain the cylinder and head no.'s in binary which are written in the header field during a format operation, and is used to compare the data read back from the header field during a write or read operation.

### D930 Exerciser Status — Contents of Read Data RAM

This command will display the contents of the read data RAM as shown below. Press the 'A' key to advance the display. See Figure A-3.

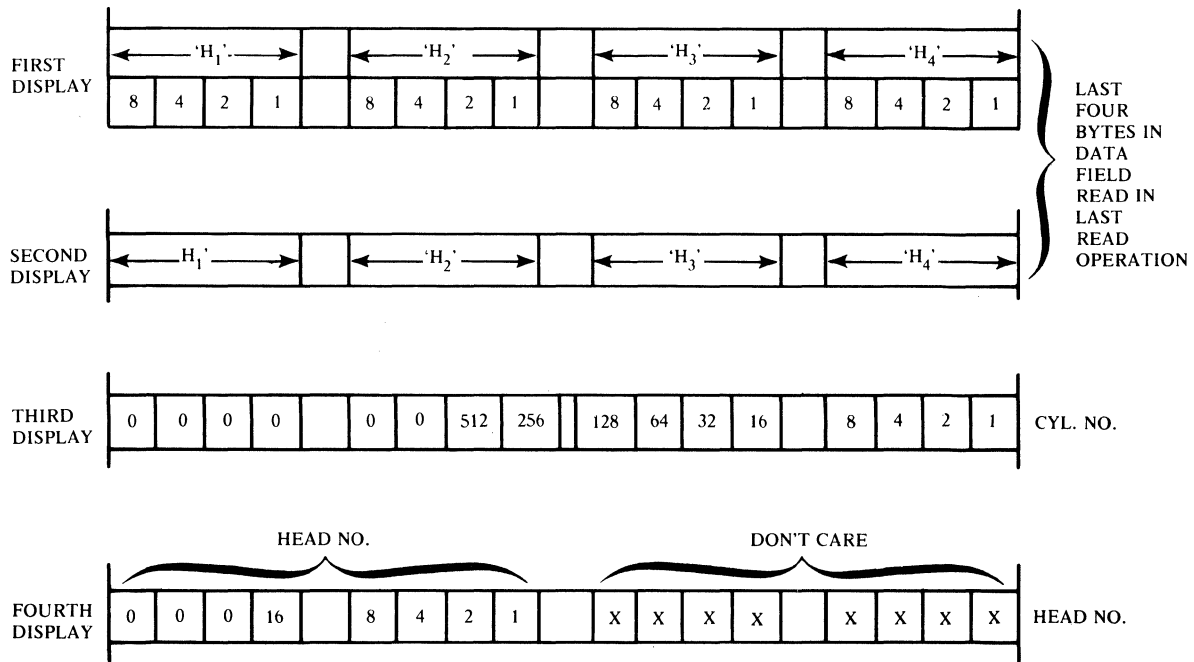
The first two displays contain the last four bytes read from the data field from the last READ operation.

The next two displays contain the last cylinder and head in binary read from the header field during a WRITE or READ operation. The commands DA01, 0002 and DA01, 0004 provide the cylinder and head in decimal.



SE0019

Figure A-2. D920 Display



SE0020

Figure A-3. D930 Display

### DA01, 00N<sub>1</sub>N<sub>2</sub>, Miscellaneous Data

The command displays miscellaneous data. To advance to the next sequential parameter, press the 'A' key.

N<sub>1</sub>N<sub>2</sub> = 00: Last command entered or present command being executed during a chain operation.

N<sub>1</sub>N<sub>2</sub> = 01: Last cylinder number outputted to drive in decimal.

N<sub>1</sub>N<sub>2</sub> = 02: Last cylinder number read during a write or read operation in decimal. (See D930 command for this number in binary.)

N<sub>1</sub>N<sub>2</sub> = 03: Last head number outputted to drive in decimal.

N<sub>1</sub>N<sub>2</sub> = 04: Last head number read during a write or read operation in decimal. (See D930 command for this number in binary.)

N<sub>1</sub>N<sub>2</sub> = 05: Last data pattern entered in the F431 command. (To display the last four bytes of data, read back during a read operation, see D930 command.)

N<sub>1</sub>N<sub>2</sub> = 06: Number of address marks counted during an F7C2 command.

N<sub>1</sub>N<sub>2</sub> = 07: Number of bytes used in each sector (in decimal) calculated in the F402 or F411 commands or number entered in the F402 command. This value must be less than the bytes per sector strapped in the drive.

N<sub>1</sub>N<sub>2</sub> = 08: Data mode length (in HEX) calculated in the F402 or F411 commands or number entered in F421 command.

### DB01 A<sub>1</sub>A<sub>2</sub>A<sub>3</sub>A<sub>4</sub>, Memory Display/Change

This command will display the contents of any RAM or PROM location. No drive is necessary.

Press 'A' key — Displays the contents of the next location.

Press 'B' key — Displays the contents of the previous location.

Press C0N<sub>1</sub>N<sub>2</sub> — Changes the contents of the present RAM location to 'N<sub>1</sub>N<sub>2</sub>'. The RAM addresses are from 0000 to 017F.

Press 'F' key — Starts executing instructions at location 0100. Locations 0100 to 017F can be used to enter and execute machine language instructions.



**APPENDIX B  
DRIVE SPECIFICATIONS**

Table B-1 shows selected drive specifications for the various drive models.

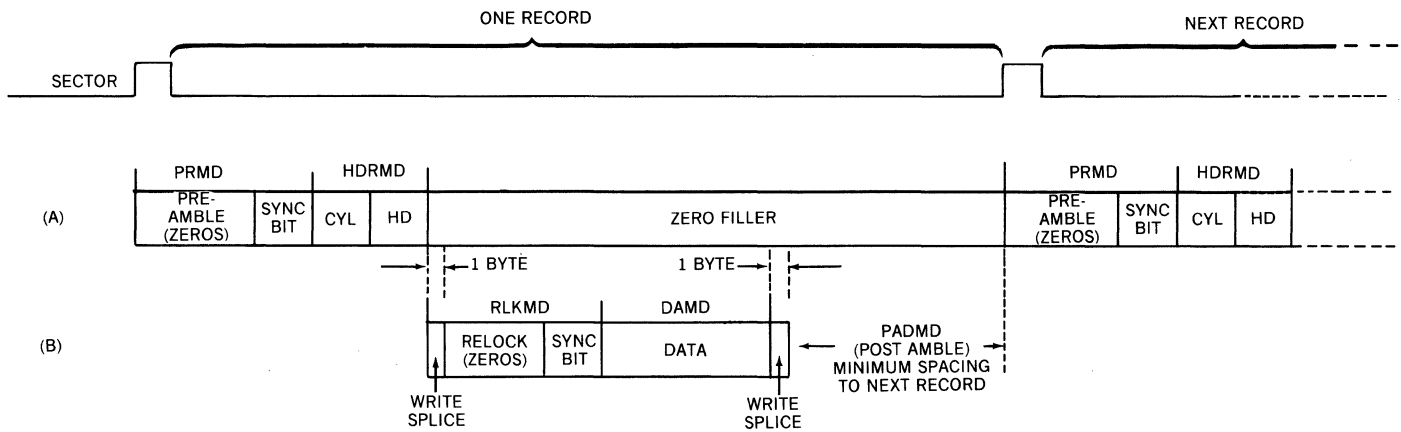
**TABLE B-1. DRIVE SPECIFICATIONS**

Drive Model	(Interface: T = Trident D = Differential)	Range of Head Addresses			Range of Cylinder Addresses	Service Cylinder	Bytes/Track Unformatted
		Remove-able Packs*	Non-Remove-able Packs*	Remove-able Cartridge			
T-25	T	0-4			0-407	None	13,440
T-50	T	0-4			0-814	None	13,440
T-80	T	0-4			0-814	None	20,160
T-82 (882)	D	0-4			0-814/822	None	20,160
T-200	T	0-18			0-814	None	13,440
T-202	D	0-18			0-814/822	None	13,440
T-300	T	0-18			0-814	None	20,160
T-302 (832/833)	D	0-18			0-814	None	20,160
Hntr-Tri H-32	T		Hd. No. 0	Hd. No. 8	0-836	833-836	20,160
Hntr-Tri H-64	T		0-2	Hd. No. 8	0-383	833-836	20,160
Hntr-Tri H-96	T		0-4	Hd. No. 8	0-836	833-836	20,160
Hntr-Diff H-32	D		Hd. No. 0	Hd. No. 8	0-836	833-836	20,160
Hntr-Diff H-64	D		0-2	Hd. No. 8	0-836	833-836	20,160
Hntr-Diff H-96	D		0-4	Hd. No. 8	0-836	833-836	20,160
T-602	D	0-18			0-1348	None	20,160

\*Not including servo head

**APPENDIX C**  
**FORMATTED TRACK USING SECTOR OR ADDRESS MARKS**

Figure C-1 and Table C-1 provide information on the fields written during a format command and during a write command for sector mode operation. Figure C-2 and Table C-2 provide similar information for address mark mode operation.



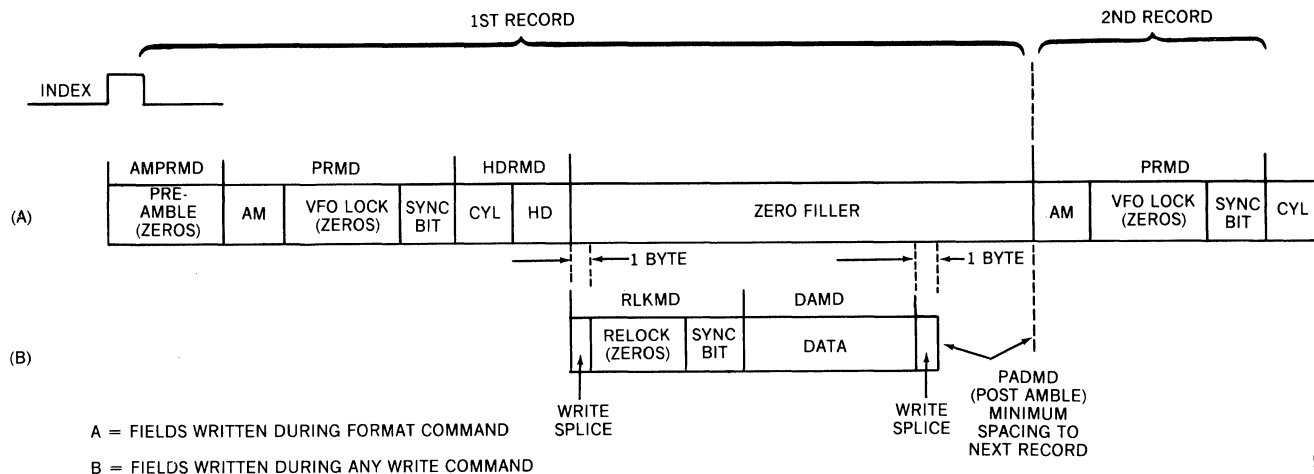
A = FIELDS WRITTEN DURING FORMAT COMMAND  
 B = FIELDS WRITTEN DURING ANY WRITE COMMAND

SEC0017

**Figure C-1. Fields for Sector Mode**

**TABLE C-1. FIELDS FOR SECTOR MODE**

Field	Description	Length in Bytes		
		T-25/50/200	T-80/300	T-82/302/ Hunter
PRMD	Preamble Mode, all zeros Sync byt, a '1' bit	36	48	27
HDRMD	Header Mode, CYL HD	2 1	2 1	2 1
RLKMD	Relock Mode, all zeros Sync bit, a '1' bit	10	15	12
DAMD	Data Mode	VARIABLE	VARIABLE	VARIABLE
PADMD	Pad Mode, all zeroes	14	21	9



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**Figure C-2. Fields for Address Mark Mode**

**TABLE C-2. FIELDS FOR ADDRESS MARK MODE**

Field	Description	Length in Bytes		
		T-25/50/200	T-80/300	T-82/302/ Hunter
AMPRMD	Address Mark Preamble Mode (Initial zeros only on 1st record after index.)	22	34	16
PRMD	Preamble Mode			
	AM (Address Mark) of no transition	3	3	3
	VFO = field, all zeroes	5	8	16
HDRMD	Header Mode, CYL	2	2	2
	HD	1	1	1
RLKMD	Relock Mode, all zeroes SYNC = sync bit, a '1' bit	10	15	12
DAMD	Data Mode	VARIABLE	VARIABLE	VARIABLE
PADMD	Pad Mode, all zeros	27	28	16

## **APPENDIX D ERROR CODES**

The Table D-1 gives the error codes which appear in the exerciser display.

**TABLE D-1. ERROR CODES**

<b>Codes</b>	<b>Description</b>
E000	Illegal command
E001	Wrong interface board installed for drive type entered in 'F001'.
E002	Cylinder or head entered was outside of range of drive type entered.
E003	Seek incomplete (seek error) occurred during an 'F250' or 'F260' command.
E004	Spare
E005	Too many address marks or sectors for the record length; not allowing at least 2 bytes of data field.
E006	Data length entered in 'F421' too long for record size. (Enter DA01, 0008 for calculated maximum data length.
E007	Attempted to format, write or read on a non-service cylinder without overriding using the 'F441' command.
E008	Attempted to format, write or read without the radial and bus cables connected. Enter 'F011 0003' when using the bus and radial cables.
E009	Address marks counted in 'F7C2' command didn't agree with the count entered in 'F411' command. Use DA01, 0006 to display number of address marks counted.
E00A	Spare
E00B	Spare
E00C	Exerciser port (T-25/50/80/200/300/82/302) <b>Error/Control Status</b> error. Enter 'D400' to read status.
E00D	Exerciser port (T-25/50/80/200/300/82/302) <b>Control Status</b> error. Enter 'D300' or 'D310' to read status.
E00E	Bus/Radial port <b>major status</b> drive error. Enter 'D600' to read status.
E00F	Hunter <b>Misc. #1 status</b> error. Enter 'D500' to read status.
E010	Hunter <b>Misc. #2 status</b> error. Enter 'D520' to read status.
E011	Spare
E012	<b>Hunter Exerciser port major status</b> drive error. Enter 'D610' to read status.
E014	Read error (all drive types). Enter 'D700' to read status.
E015	Spare
E016	No index pulse detected.
E017	Working cylinder not defined in the 'F441' command.
E018	Drive didn't sequence up within 40 seconds.
E019	Drive not selected.
E01A	Drive not ready.
E01B	Spare
E01C	Cylinder must be a Hunter service cylinder (833-836) with F441 = 0. (Ser. cyl. only).
E01D	Spare
E01E	Cable hook-up command, 'F011' not defined.
E01F	Drive not sequenced down.
E020	Illegal drive type. See 'F001' for drive type.
E021	Illegal D command type (in software).
E022	Illegal chain command.
E023	Spare
E024	Can't seek to Hunter serv. cyl. without cable on exerciser port.
E025	Drive type and cable hook-up wrong for command entered.
E026	Cable hook-up (F011) must be for exerciser cable (0001) and Degate switch must be active to do 'F6B1' or F7B0 commands.
E027	F080 command requires bus and radial cables connected and comand 'F011 0003' entered.
E028	Drive did not deselect after an F080 command — see D600 command for state of 'SELD/'.
E029	Commands F651, or F660, or F751, or F760, or F542, did not stop on error.

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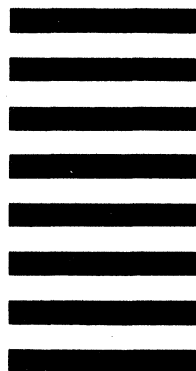
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