MEMOREX

800 Disc Storage Subsystem Tester
Technical Manual

800.20-01

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SECTION 1

THEORY OF OPERATION

1.1 INTRODUCTION

The 800 Disc Storage Subsystem Tester, Figure 1-1, is a portable test unit designed to test the functions of a disc drive and identify failing areas.
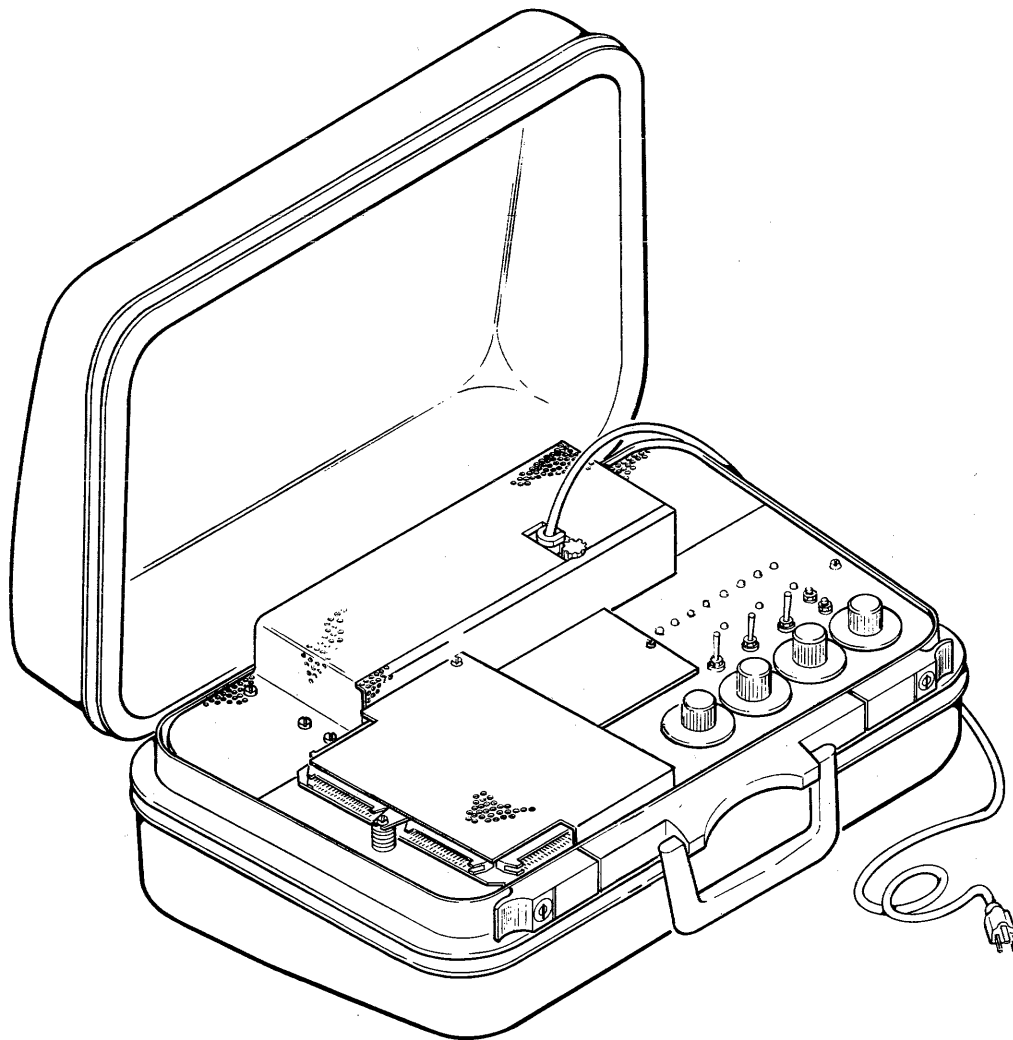
FIGURE 1-1. 800 DISC STORAGE SUBSYSTEM TESTER

The tester is a self-contained unit packaged within a suitcase. The only outside requirement for the tester is access to a 105-125 VAC/210-250 VAC, 40-440 Hz power source in which to plug the tester's power cord. Inside the tester is an operator panel containing all the controls and indicators necessary to conduct a thorough test of a disc drive.

1.2 LOGIC CARDS

All logic functions performed by the tester are provided by six PCBs. Figure 1-2 is a block diagram showing the relationship of the six PCBs. Five PCBs are located in the logic gate and one PCB is located behind the control panel.

PCB Location	PCB Name
A01	I/OP (See Note)
A02	FEP 1
A03	MPUP
A04	PROM 1 (See Note)
A05	Spare
A06	PWRP
Mounted behind the Control Panel	DISP

Note: Subject to change per specified interface.
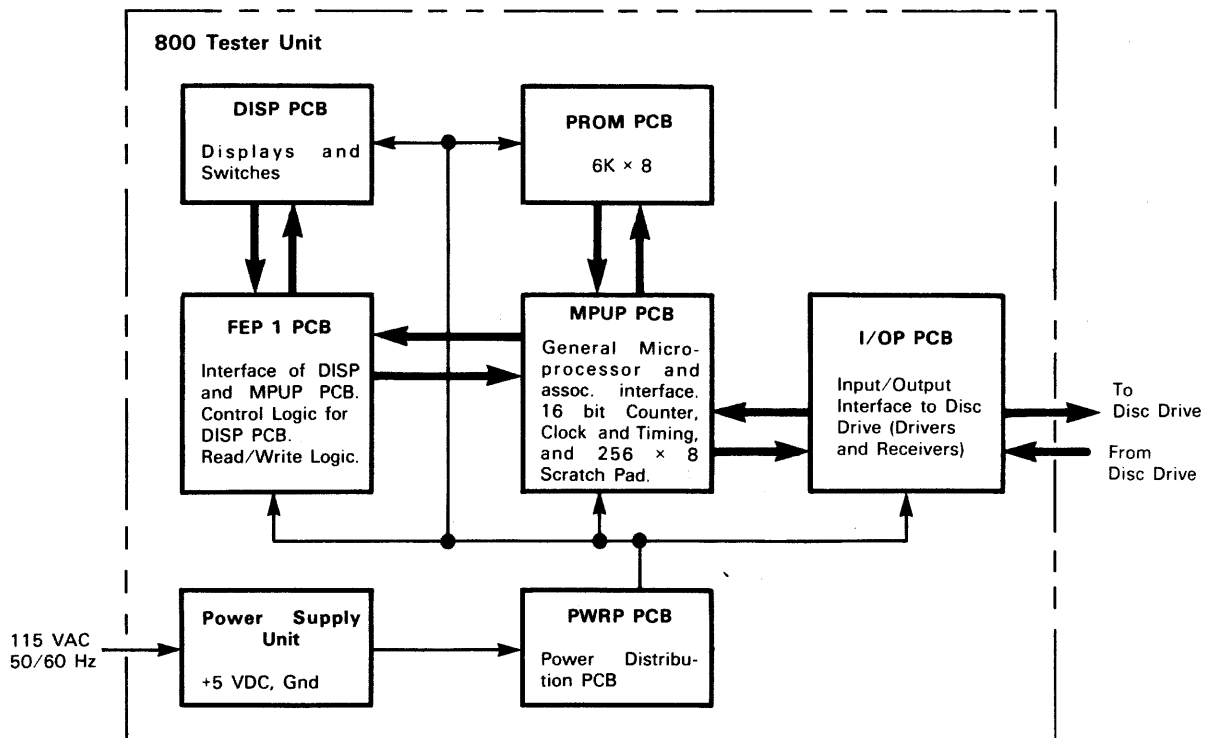
FIGURE 1-2. BLOCK DIAGRAM OF THE TESTER

1.2.1 The MPUP PCB

The MPUP PCB is positioned in card location A03. As indicated in Figure 1-2, this PCB is the central and most fundamental part of the tester. It performs the following functions.

1. Contains the eight-bit microprocessor chip (MPU).

2. Controls the addressing and accessing to all functional interface hardware in the tester.

3. Contains the clock circuitry for generating the microprocessor's one-microsecond cycle time and the Phase 1 and Phase 2 clock pulses.

4. Defines all of the input or output functions of the internal data bus.

5. Generates the error condition for power failure from the disc drive.

6. Contains the Peripheral Interface Adapter (PIA) hardware to communicate and control external functions.

7. Accepts and services interrupts from external inputs.

8. Buffers all address lines for maximum memory addressing.

9. Contains the scratch pad memory of up to 256 words by eight bits of random access memory (RAM).

10. Contains a 16-bit general purpose counter controlled by the microprocessor and clocked at a one-microsecond rate.

11. Executes all program instructions.

1.2.2 The I/OP PCB

The I/OP PCB is positioned in card location A01. Its function is to multiplex the output signals from the disc drive to the interface circuitry of this PCB. Table 1-1 and the I/OP schematics provide definitions of these signals from the disc drive that are multiplexed to Bus In on the I/OP PCB. Table 1-2 provides the definitions for the output signals from the tester to the drive.

The I/OP PCB also transmits the Write Data Strobe and Write Data signals to the disc drive and receives the Read Data Strobe and Read Data signals that are processed by the tester.

TABLE 1-1. DISC DRIVE OUTPUT SIGNALS MULTIPLEXED TO BUS IN OF TESTER

Note: This table is provided as a sample and shows signals and addresses for the 677-01 and 677-51 disc drives only.

BUS IN (BITS 0-7) $\begin{array}{c}S_2\ S_1\ S_0\\ A_4\ A_3\ A_2\end{array}$	DRIVE STATUS 000	001	SERVO SENSE 010	ERROR SUMMARY 011	ABNORMAL STOP (NOT USED) 100	UNSAFE WRITE CONDITION 101	OTHER ERRORS 110	ADDRESS 111
PIA 3A Bit 0 (GND)	Not Used	Not Used	Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
PIA 3A Bit 1	RP06	Servo Data	Off Cylinder	Not Used	Not Used	Write Ready Unsafe	DC Unsafe	Write Protect Level
PIA 3A Bit 2	Sequence Enable	Index Pulse	Not Used	Head Unsafe	Not Used	Current Sink Fail	PLO Unsafe	Plug Enable
PIA 3A Bit 3	On Line	On Track	Reset Register	DC Write Unsafe	Not Used	Write Select Unsafe	35-Volt Regulator Fail	Port B Locked
PIA 3A Bit 4	File Ready Level	Not Used	Difference = Zero	AC Write Unsafe	Not Used	Current Switch Unsafe	No Head Select	Port A Locked
PIA 3A Bit 5	Seek Incomplete	Sign	Velocity Servo Enable	Abnormal Stop	Not Used	Write Current Unsafe	Multi-head Select	Logical Address 1
PIA 3A Bit 6	Offset Ready Level	Difference Less Than 32	Stop Velocity	Not Used	Not Used	Transitions Unsafe	Read and Write	Logical Address 2
PIA 3A Bit 7	Sequence Pick Out	Index Error	Coarse Track	Unsafe	Not Used	Transitions Detector Failure	Write and Offset	Logical Address 4

TABLE 1-2. MPUP PCB TO I/OP PCB INTERFACE

Note: This table is provided as a sample and shows signals and addresses for the 677-01 and 677-51 disc drives only.

PIA / BIT	PIA 1A	PIA 1B	PIA 2A	PIA 2B	PIA 3A	PIA 3B	PIA 4A	PIA 4B
7	HAR 16	Diff 128 Offset Reverse	Port A Lamp	Controller Ground	Bus In Bit 7	High/Low CNT 7	Data Bit 7	Set RUNNING Display
6	HAR 8	Diff 64	Port B Lamp	Recalibrate Pulse	Bus In Bit 6	High/Low CNT 6	Data Bit 6	ERROR CODE Display
5	HAR 4	Diff 32 Offset 800 μins	Sequence Pick In	Device Initial- ize Pulse	Bus In Bit 5	High/Low CNT 5	Data Bit 5	ROUTINE Display
4	HAR 2	Diff 16 Offset 400 μins	CAR 64	Place Device in Standby Pulse	Bus In Bit 4	High/Low CNT 4	Data Bit 4	Read Commands
3	HAR 1	Diff 8 Offset 200 μins	Seek Direction Level	Offset Reset Pulse	Bus In Bit 3	High/Low CNT 3	Data Bit 3	Write Commands
2	CAR 512	Diff 4 Offset 100 μins	Offset Mode Level	Seek/Offset Go Pulse	Bus In Bit 2	High/Low CNT 2	Data Bit 2	MPU Data Mis- compare Latch Reset
1	CAR 256	Diff 2 Offset 50 μins	Read Command Level	Diff 512	Bus In Bit 1	High/Low CNT 1	Data Bit 1	Not Used
0	CAR 128	Diff 1 Offset 25 μins	Write Command Level	Diff 256	Not Used	High/Low CNT 0	Data Bit 0	Sync Data Time
CA1/CB1	Index Pulse	Not Used	Not Used	Not Used	Unsafe	Low CNT = Zero	Execute Int	Read Data Miscompare
CA2/CB2	DC Unsafe	Not Used	Not Used	Enable CNT Reg.	Not Used	High CNT = Zero	Not Used	Not Used

1.2.3 The PROM PCB

The PROM PCB is positioned in card location A04. The main component on this PCB is an integrated circuit providing 256 words by four bits of programmable read only memory (PROM). The total capacity of the PROM PCB is 6K words by eight bits. Thirteen address bits are required to access one of the 6K words by eight bits. Address bits 8-12 are decoded to select and access one of the 24 integrated circuits. Address bits 0-7 are used to select one of 256 words at the chip level. For a detailed description, see the PROM schematics.

1.2.4 The FEP 1 PCB

The FEP 1 PCB is positioned in card location A02. This PCB provides the interface between the MPUP PCB and the operation control panel (DISP PCB). It performs the following functions.

1. Provides the interface between the operator control panel (DISP PCB) and the MPUP PCB.

2. Manages the repetitive, one-byte fixed pattern, read and write data transfer to the disc drive.

3. Controls the INFORMATION Display area on the operator control panel.

4. Generates the control of the LED displays and the switches on the operator control panel.

5. Generates and controls the Sync Compare address function.

For further detail, see the FEP 1 PCB schematics.

1.2.5 The DISP PCB

This PCB is attached to the back of the operator control panel. The DISP PCB interfaces directly to the FEP 1 PCB and performs the following functions.

1. Displays the eight light emitting diodes (LEDs) in the INFORMATION Display area on the operator control panel.

2. Displays the ERROR CODE LED to indicate that an error has occurred in the executing routine.

3. Displays the RUNNING LED to indicate that the selected routine in the tester is running properly and as specified.

4. Displays the SYNC COMPARE LED to indicate that the microprogram address in the tester compares with the address set in the four 16-position rotary switches labeled SYNC ADDR.

5. Displays the ROUTINE LED to indicate that the INFORMATION Display area contains the number of the routine that is executing.

6. Contains the RESET switch (momentary) for use when resetting and initializing the tester and the input/output interface.

7. Contains the EXECUTE switch for use when entering routine numbers, data, or parameters in the tester's microprocessor.

8. Contains the SDSD/NORMAL toggle switch used to multiplex the 8-bit, bidirectional microprocessor data bus to the INFORMATION Display area of the panel. Set to the SDSD position, the INFORMATION Display area displays the data bus contents when a Sync Address compare occurs (see *Section 1.5.6*). Set to the NORMAL position, the INFORMATION Display area is controlled by the program which displays the data bus as it progresses through the program.

9. Contains the four 16-position rotary switches used for the following:
   a. Routine entry
   b. Data and Parameter entry
   c. Function entry
   d. SYNC ADDR (address) compare entry (see *Section 1.5.4*).

10. Contains the SYNC COMP test point used to synchronize an oscilloscope for address reference (see *Section 1.7.1*).

11. Contains the GND test point used to reference logic ground of the tester.

1.2.6 The PWRP PCB

This PCB distributes the +5 VDC and logic ground to the different PCBs in the 800 Disc Storage Subsystem Tester. When required, the −5.2 VDC can also be distributed.

The PWRP PCB is positioned in card location A06.

Further detail on the PWRP PCB may be obtained from the schematics for this PCB. Figure 1-3 provides a block diagram of the power drawer in the tester.

1.3 PROCESSING SYSTEM

The central processing system in the tester is bus oriented. Eight lines form the data bus and 16 additional lines comprise the address bus. The microprocessor unit (MPU) controls the buses, and all other devices (memory and the PIAs) attached to the buses, and waits for microinstructions from the MPU to send (write) or receive (read) data. Table 1-3 defines the tester's address structure (all devices are addressable).

For additional information on the operation of any device used in the tester, obtain a list of the devices from the PCB schematics and refer to the vendor's Device Specifications.
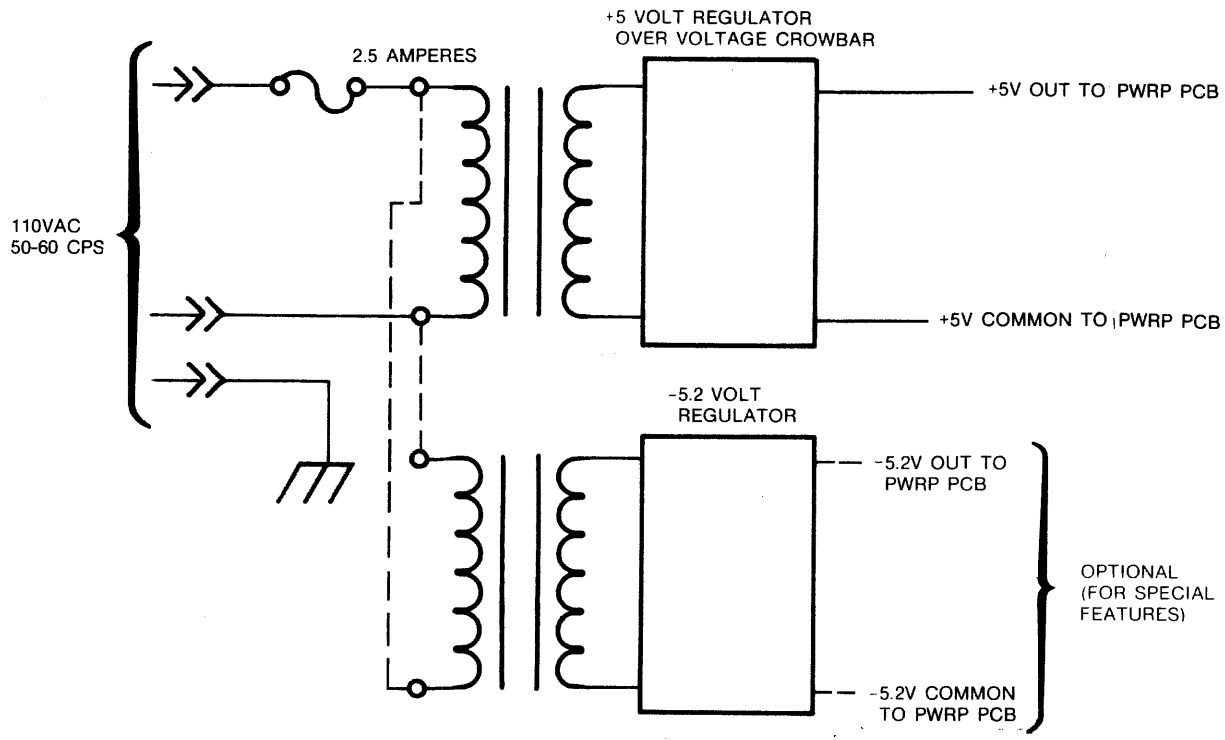
FIGURE 1-3. BLOCK DIAGRAM OF THE POWER DRAWER

TABLE 1-3. 800 TESTER MEMORY PARTITION

A15	A14	A13	A12	A11	A10	A9	A8	A7	A6	A5	A4	A3	A2	A1	A0	SELECTIONS
0	0	X	X	X	X	X	0	0	1	1	0	1	1	RS1	RS0	Select PIA #1
0	0	X	X	X	X	X	0	0	1	1	1	0	1	RS1	RS0	Select PIA #2
0	0	X	X	X	X	X	0	0	1	0	S2	S1	S0	RS1	RS0	Select PIA #3
0	0	X	X	X	X	X	0	0	1	1	1	1	0	RS1	RS0	Select PIA #4
0	0	X	X	X	X	X	0	1	X	X	X	X	X	X	X	Select RAM #1 (128-256)
0	0	X	X	X	X	X	1	0	X	X	X	X	X	X	X	Select RAM #2 (256-383)
0	0	X	X	X	X	X	0	0	1	1	0	0	1	X	0	Load/Read Low CNT
0	0	X	X	X	X	X	0	0	1	1	0	0	1	X	1	Load/Read High CNT
0	0	X	X	X	X	X	0	0	1	1	1	1	1	X	1	Read FE Data Sw.
0	0	X	X	X	X	X	0	0	1	1	1	1	1	1	0	Read/Load Shift Reg.
0	0	X	X	X	X	X	0	0	1	1	1	1	1	0	0	Shift SR (Diagnostic Only)
0	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Select PROM (16K-32K)
1	0	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Select PROM (32K-48K)
1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Select PROM (48K-64K)

NOTE: X = The entry is not significant.

1.4 PHYSICAL CHARACTERISTICS

Each tester is packaged in a suitcase designed for easy portability (weight is less than 30 lbs) and protection of the components. Overall package dimensions are:

Width	14½ inches (hinge-to-handle)
Length	21½ inches
Depth	7¼ inches

The major components packaged in the carrying case are:

Power Supply—The 115 VAC externally supplied power is converted by a self-contained power supply to +5 VDC and ground for use by the tester logic.

Cooling Fan—A 1/250 horsepower fan, which operates from the 115 VAC power, cools the components whenever the tester is powered on by plugging the power supply cord into a 115 VAC power source.

Interface—Communication with the drive is conducted through four I/O cables, labeled A (MDLI-2-J2), B (MDLI-2-J1), C (MDLI-1-J2), and D (MDLI-1-J1), which are semipermanently connected to the I/OP printed circuit board (PCB) in the tester (Figure 1-4). For example, cables A and B of the tester are connected respectively to
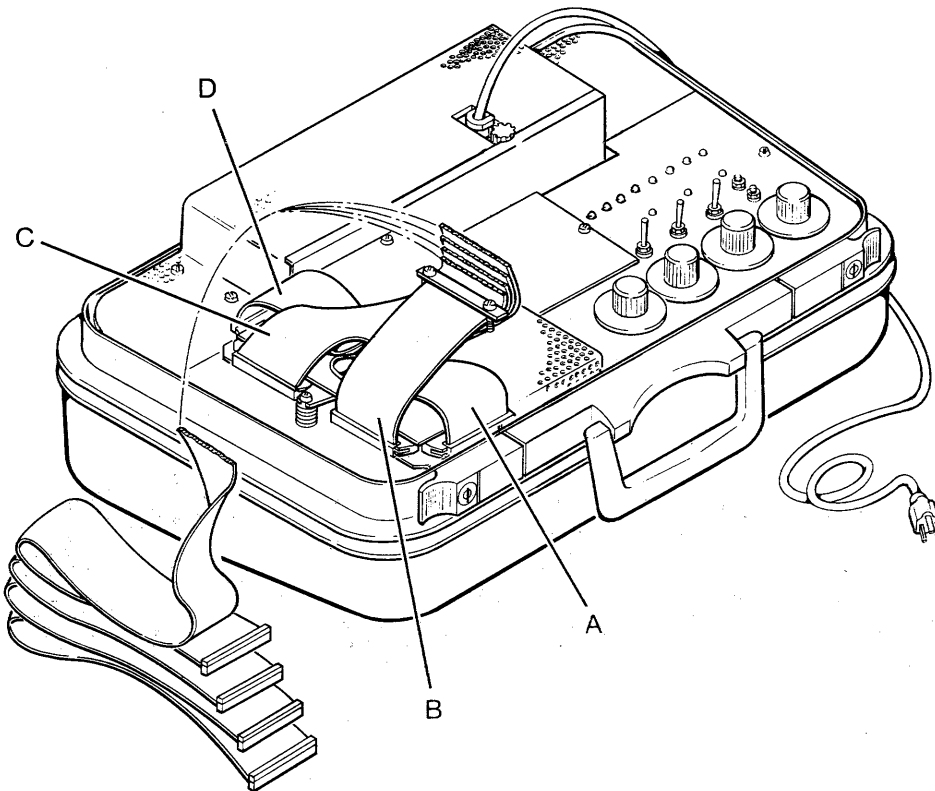
FIGURE 1-4. 800 TESTER WITH INTERFACE CABLES

the A and B edge-connector locations on the IPUT PCB of a 677-01 or 51 OEM Disc Drive. Cables C and D of the tester are connected respectively to the C and D edge-connector locations on the OPUT PCB of a 677-01 or 51 drive. (Note: Methods of interface connection may vary with individual disc drive products depending on their interface requirements.)

1.5 CONTROL PANEL SWITCHES

Figure 1-5 shows an operator's view of the control panel.

1.5.1 RESET—Momentary Switch

This switch causes a re-initialization of the tester; any diagnostic routine in progress will be terminated and forced to the monitor mode. Further use of the tester for diagnostic verification of the disc drive will require operator intervention.
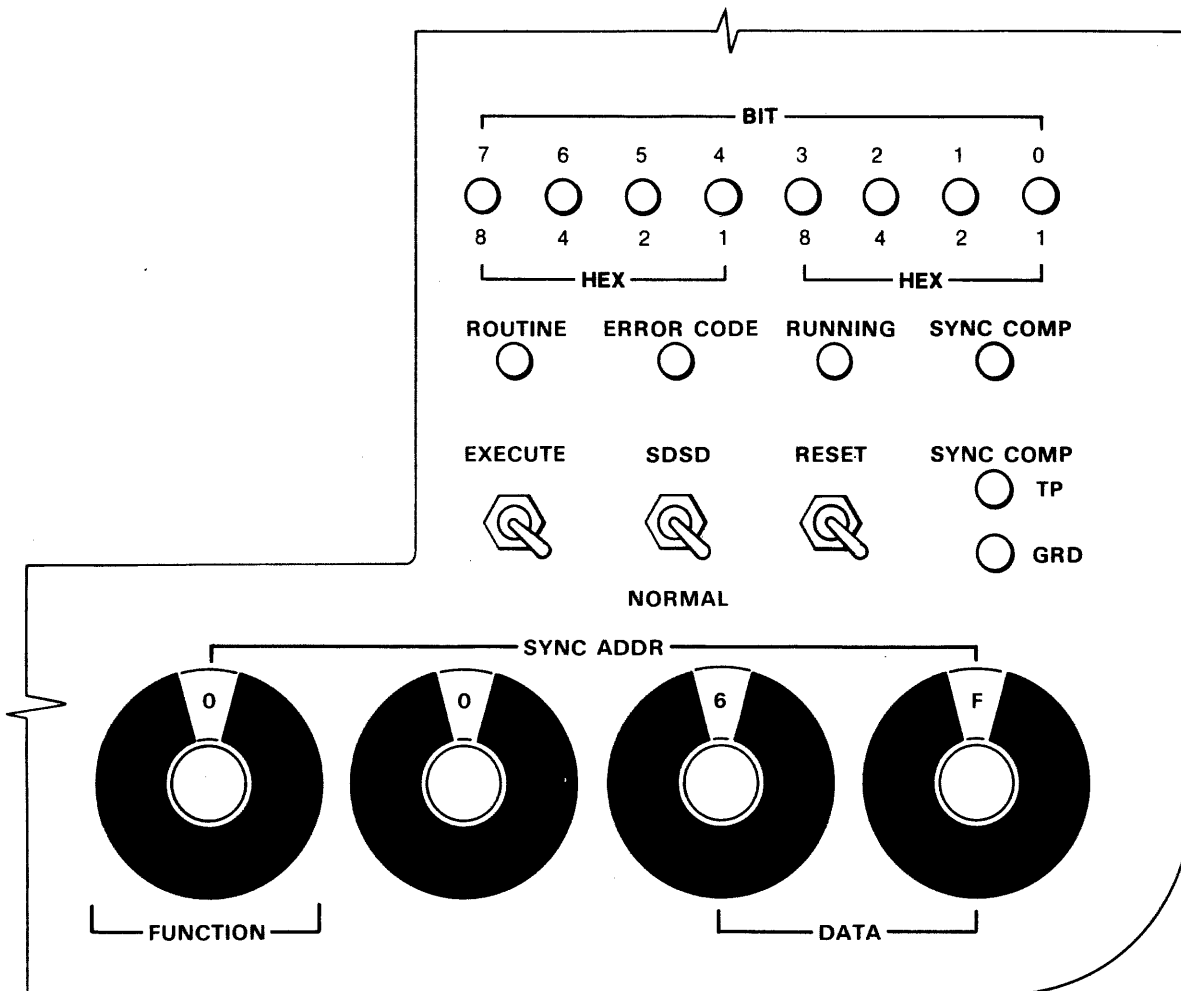
FIGURE 1-5. OPERATOR CONTROL PANEL

1.5.2 DATA Switches

Two 16-position rotary switches labeled DATA provide multiple data entry usage. They are used to enter routine numbers, diagnostic parameters, run options, or write data patterns (also for comparative read data patterns) depending on the function selected with the FUNCTION switch described below.

1.5.3 FUNCTION Switch

The FUNCTION Switch is a 16-position rotary switch which is operated in conjunction with the EXECUTE switch. Selectable functions are defined as follows (see Table 1-4 also):

Position 0   *Run*—Allows running of microdiagnostic routine specified by Position 1.

Position 1   *Routine*—Allows the desired routine number to be selected and set with the DATA switches.

Position 2   *Data*—Allows input parameters to be set with the DATA switches.

Position 3   *Byte*—Allows the parameter byte number to be set with the DATA switches if the byte to be operated on by the diagnostic routine is required.

Position 4   *Display Parameter Byte*—Displays the parameter byte that is defined when the FUNCTION switch is set to position 3. The byte is displayed in the INFORMATION Display area of the control panel. (Automatically increments to the next byte after execution.)

Position 5   *Error Control*—Depending on the option selected with the DATA switches, this function allows the routine to Run Continuously and Stop on Error, or Loop on Error. By default, a routine runs once only.

Position 6   *Advance Head*—May be activated only when the Head Alignment feature is installed in the 800 Tester and the Head Alignment routine is running.

Position F   *Display Routine Number*—Allows the routine number currently stored in the routine number register to be displayed in the INFORMATION Display area of the control panel.

1.5.4 SYNC ADDR (Address) Switches

Four 16-position rotary switches are used to enter the 16-bit Sync Compare address. The Sync Compare address is selected by the operator from the routine's microcode for comparison with the contents of the 16-bit address register in the internal microprocessor as the routine is executed. When the addresses compare, an indicator lights (see SYNC COMP indicator) to signify that the diagnostic is executing correctly. The two rightmost switches are also labeled DATA and are used as described in Section 1.5.2. The leftmost switch is also labeled FUNCTION and serves to define the entry in the DATA switches or the function to be performed by the routine as described in Section 1.5.3.

TABLE 1-4. FUNCTION SWITCH OPERATIONS

FUNCTION POSITION	FUNCTION OPERATION	DATA SWITCH ENTRY	COMMENTS
0	Execute routine	YY (See Note)	The number of the routine to be executed, along with its parameters, is entered prior to this action. Error Control run options are optional.
1	Enter routine to be run	XX	XX = the number of the routine to be run. Example: To run routine 01, XX = 01.
2	Enter parameter data	XX	XX = Parameter data. Byte number automatically increments and points to the next byte number after execution.
3	Enter parameter byte	XX	XX = parameter byte number to be operated on.
4	Display parameter byte	YY (See Note)	Parameter byte to be displayed is defined by setting FUNCTION switch to 3. Automatically increments and points to the next byte number after execution.
5	Error control	XX	XX = 01 Run continuously and stop on error XX = 02 Loop on error XX = 00 Run routine once only Error control default to 00 except where specified.
6	Advance head	YY (See Note)	May be selected only when the Head Alignment feature is installed in the tester and the Head Alignment routine is running.
F	Display routine number	YY (See Note)	Display the number of the routine just executed.

Note: All of the above functions are executed only after the FUNCTION switch is set to the desired position and the EXECUTE switch is pressed.

YY = the DATA switch entry is not significant.

1.5.5 EXECUTE—Momentary Switch

The EXECUTE switch is used in conjunction with the FUNCTION switch or with both the FUNCTION and DATA switches to communicate with the resident Diagnostic Monitor and establish the diagnostic routines for the disc drive.

1.5.6 SDSD/NORMAL—Toggle Switch

When the SDSD/NORMAL switch is in the NORMAL position, the INFORMATION Display area of the control panel displays either the number of the routine entered for execution or the error code if the disc drive fails when running a diagnostic routine.

In the SDSD (Sample Display Sync Data) position, the eight-bit contents of the data destination bus in the internal microprocessor will be displayed whenever the microcode address for the routine that is executing passes through and compares with the Sync Address set in the four SYNC ADDR switches. During this comparison, the data bus is strobed into the INFORMATION Display indicators and the SYNC COMP indicator comes on for approximately 1.5 seconds.

1.6 CONTROL PANEL INDICATORS

1.6.1 INFORMATION Display (8 LEDs)

This eight-bit light emitting diode (LED) display normally shows the routine number entered for execution (the SDSD/NORMAL switch is in the NORMAL position). It also displays the error code generated by the diagnostic routine when an error condition is detected during the execution of the routine.

When the SDSD/NORMAL switch is in the SDSD (Sample Display Sync Data) position, the INFORMATION Display area contains information strobed from the data destination bus of the internal microprocessor at the moment the contents of the internal address bus (16 bits) compare with the contents set in the SYNC ADDR switches (4 hex switches, 16 bits). The SYNC COMP light comes on to indicate that the addresses compared. The SYNC COMP indicator lights for approximately 1.5 seconds each time an address compare occurs.

1.6.2 ROUTINE Indicator

This light is activated by the microcode in the diagnostic routine to indicate that the content of the INFORMATION Display area identifies the number of the diagnostic routine being executed. The SDSD/NORMAL switch must be in the NORMAL position for this indicator to light.

1.6.3 ERROR CODE Indicator

This light is activated by the microcode in the diagnostic routine to indicate that the content of the INFORMATION Display area displays the error code if the SDSD/NORMAL switch is in the NORMAL position.

1.6.4 RUNNING Indicator

This light is activated by the output of a 1.5 second one-shot that is controlled by a microcode control statement. When the light is on it indicates to the operator that the tester is executing a set of diagnostic routine instructions in the sequence defined in the routine. The light goes off whenever a program hangup occurs (indefinite loop), a hardware malfunction (fault) is detected, or there is an unexpected termination of a diagnostic loop. During execution of the Wrap Test—Routine 00—the light remains off. The light comes on and off when the tester is executing the Head Verification Test—Routine 06.

1.6.5 SYNC COMP Indicator

This indicator lights for approximately 1.5 seconds whenever the contents of the SYNC ADDR switches (4 hex switches) compare with the contents of the 16-bit address register in the internal microprocessor. The indicator is activated by the output of the Sync Pulse test point.

1.7 SCOPE TEST POINTS

1.7.1 SYNC COMP Test Point

This test point is a less-than-one-microsecond positive sync pulse which indicates that the contents of the SYNC ADDR switches (4 hex switches) compare with the contents of the 16-bit address register in the microprocessor.

1.7.2 GRD Test Point

This test point is logic ground for the tester unit relative to +5 volts.

1.8 DIAGNOSTIC ROUTINE OPERATION

The 800 Disc Storage Subsystem Tester provides the user with a variety of diagnostic routines to test the disc drives. The Wrap Test—Routine 00—is an internal tester diagnostic used to verify that the tester is in proper operating order.

The purpose of the Wrap routine is to check the I/OP board on the tester and the connector cables from it to the drive. Before running the Wrap Test. a special Wrap plugboard provided with the tester, must be connected to the four I/O cables in the tester (see Figure 1-6). The connector labeled **A** on the Wrap plugboard must be connected to the tester cable labeled **A**. Similarly, B is connected to B, C is connected to C, and D is connected to D. Ensure that the Wrap plugboard is not placed on any metallic surface as it might create shortings of connector pins.
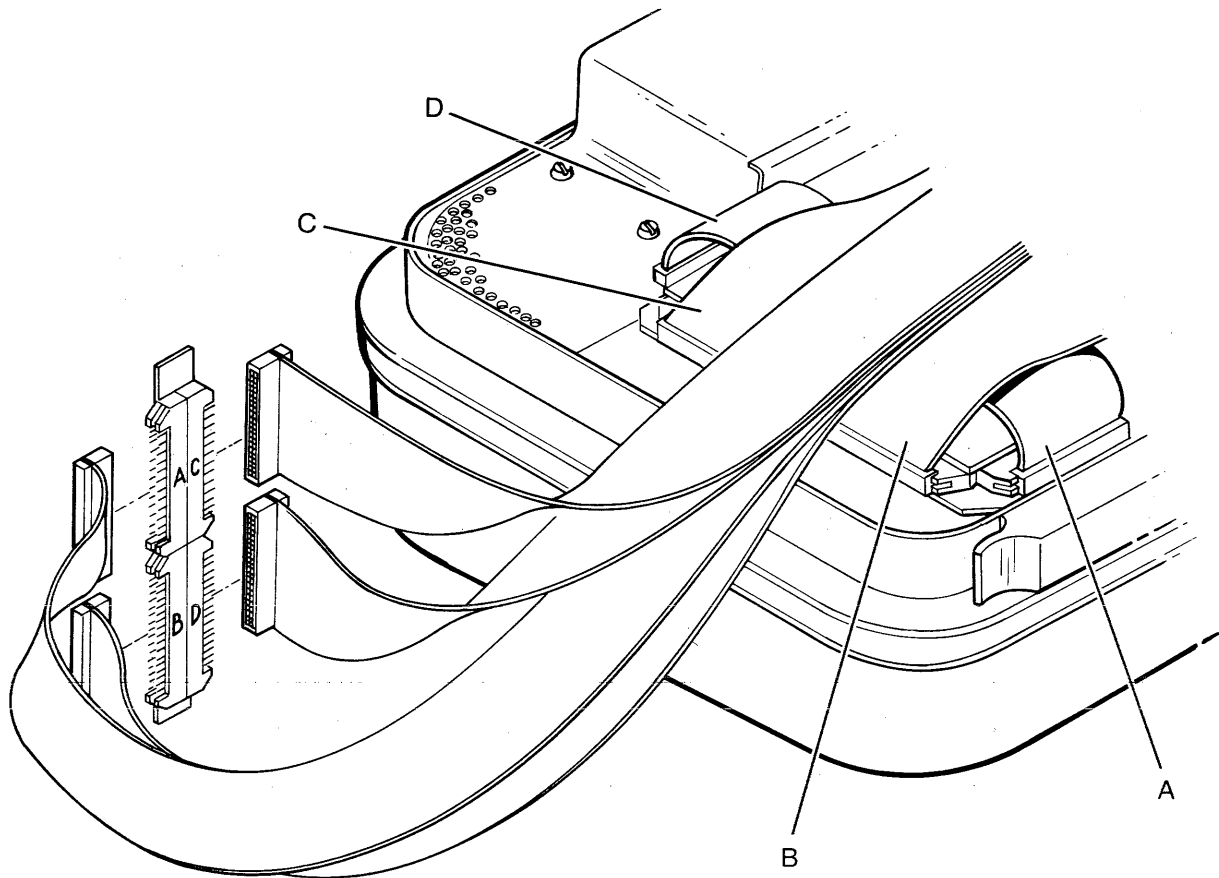
FIGURE 1-6. TESTER WITH WRAP PLUGBOARD

The routine can be run with the following run options.

Error Control = 01 Loop on pass.

= 02 Loop on error.

1. Set 00 in the DATA switches.

2. Select 1 on the FUNCTION switch.

3. Press the EXECUTE switch. (No LEDs should be on in the INFORMATION Display area of the control panel.)

4. Set the desired run option (01 or 02) in the DATA switches.

5. Select 5 on the FUNCTION switch.

6. Press the EXECUTE switch.

7. Select 0 on the FUNCTION switch.

8. Press the EXECUTE switch.

9. The microdiagnostic routine will now run as specified by the selected run option (step 4).

If no error occurs, the INFORMATION Display area will indicate "FF" (SDSD/NOR-MAL switch must be in the NORMAL position) and the ERROR CODE indicator will come on since "FF" is the error code indicating "test completion". If an error occurs, an error code in the range "10" to "1F" is displayed in the INFORMATION Display area and the ERROR CODE indicator will light.

In order to find the error bit(s), Error Control should be set to Loop on Error (02). With the SYNC ADDR switches set to 0089 and the SDSD/NORMAL switch in the SDSD position, the INFORMATION Display area will indicate the error bit(s). Compare the error bit(s) with those shown in Table 1-5, and either replace the indicated cable or suspect a bad I/OP PCB.

TABLE 1-5. ERROR BITS

ERROR CODE	ERROR BITS	POSSIBLE FAILING CABLE(s)
10 or 18	Bit 2 Bit 3, 5 Bit 4, 6, 7	B A or D A or C
11 or 19	Bits 1-3 Bit 5, 6 Bit 7	B or D A or D A or C
12 or 1A	Bit 1 Bits 3-7	A or D B or D
13 or 1B	Bits 2-5 Bit 7	B or C B or D
15 or 1D	Bits 1-7	A or C
16 or 1E	Bits 2-7	B or C
17 or 1F	Bit 1, 3-5, 7 Bit 2, 6	A or C B or C

1.9 HEAD ALIGNMENT FEATURE (FIGURE 1-7)

The Head Alignment feature (for Memorex 677 Disc Drives only) verifies whether or not the Read/Write heads are properly aligned. In the case of misalignment, it indicates, in microinches, the amount of off-center position from the track centerline.
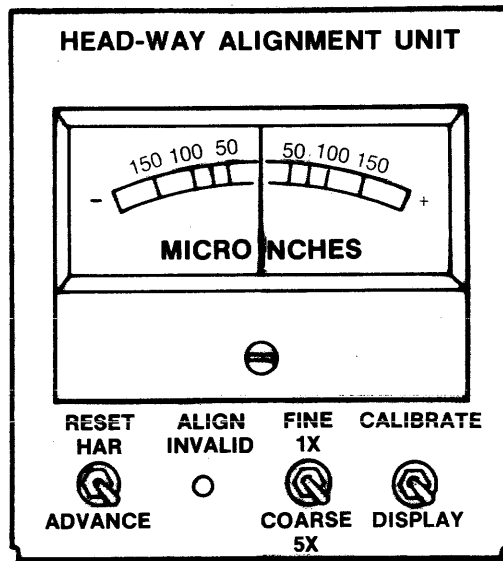
FIGURE 1-7. HEAD-WAY ALIGNMENT UNIT

The feature consists of two PCBs, a meter, and a head alignment cable. The two PCBs are located in the logic gate; the meter is mounted on the control panel; and the head alignment cable, with a paddle board at one end, is plugged into the B04 location in the logic gate of the disc drive.

1.9.1 Head Alignment PCB

The Head Alignment PCB is positioned in card location A10. It performs the following functions:

- Provides a signal to turn the ALIGN INVALID indicator on if servo data is not present.

- Amplifies the Servo Head signal and feeds it to the Position Servo PCB.

- Provides a DC Position Error signal to the meter to indicate, in microinches, the amount of off track.

- Provides a Sign signal to indicate the polarity of the position error of the selected head.

1.9.2 Position Servo PCB

The Position Servo PCB is positioned in card location A09. It performs the following functions:

- Generates a Heads Loaded signal when detecting the presence of servo data.

- Sums the second positive peak and second negative peak of the Servo Head signal to provide a DC Position Error signal to the Head Alignment PCB.

1.9.3 Head Alignment Meter

The Head Alignment Meter indicates, in microinches, the amount of off track. Deflection of the needle to the right indicates that the head is off track toward the spindle; deflection of the needle to the left indicates that the head is off track away from the spindle.

1.9.4 ALIGN INVALID Indicator

This indicator is activated whenever there is an unsafe condition from the drive, or the heads are not loaded or not on track, or any one of the head signals to the Head Alignment feature is invalid.

1.9.5 Reset HAR/ADVANCE—Toggle Switch

This switch is not used.

1.9.6 FINE 1X/COARSE 5X—Toggle Switch

When the FINE 1X switch is used, the reading of the meter reflects the amount of off track in microinches. When the COARSE 5X switch is used, the amount of off track in microinches is five times the reading. For a 100-megabyte disc drive, the actual reading reflects the amount of off track in microinches. For a 200-megabyte drive, the actual reading, divided by two, reflects the amount of off track in microinches.

1.9.7 CALIBRATE/DISPLAY—Toggle Switch

When the CALIBRATE switch is pressed upward, the needle of the meter should be at zero, indicating the unit is correctly calibrated. Otherwise, the discrepancy of the reading must be accounted for in measurement of the head alignment.

SECTION 2

MAINTENANCE

2.1 GENERAL INFORMATION

The 800 Disc Storage Subsystem tester should require minimum maintenance provided it is used and cared for in the same manner as any item of portable test equipment. This section gives procedures to be followed when it is necessary to remove, replace, or service the major components of the tester. Subassemblies and parts with obvious replacement procedures are not discussed. To replace such parts, refer to the following section of this manual where a detailed illustrated parts breakdown of replaceable components is provided.

CAUTION

Before performing any maintenance on the tester, remove the tester's power cord from its source. DC power must be off whenever it is necessary to access the card cage containing the tester's printed circuit boards. The PCBs are susceptible to static charge (possible damage to an integrated circuit on a PCB). Therefore, maintenance personnel should be free of possible static charges before removing or installing any PCB.

2.2 OPERATOR CONTROL PANEL REMOVAL

To access the PCBs and the majority of the tester's replaceable components, the operator control panel must be removed. Refer to Figure 1 in Section 3 of this manual and perform the following.

1. Unplug the tester's power cord.

2. Remove the three screws (Index Number 30 on Figure 1, Section 3) which secure the operator control panel to the tester suitcase. Two of these screws are located at the rear of the tester, one on each end of the power supply unit. The third screw is located in the front center of the unit.

3. When the screws are removed, carefully lift the operator control panel out of the tester suitcase.

CAUTION

When the operator control panel is removed from the carrying case, be careful of the exposed power supply and the cooling-fan blades on the left side of the power supply unit.

2.3 PRINTED CIRCUIT BOARD REMOVAL

The PCB card cage and the DISP PCB are both attached to the operator control panel. Therefore, to replace any of the PCBs in the tester, the operator control panel must be removed first (see 2.2, Operator Control Panel Removal).

2.3.1 Removing and Replacing the PCBs in the Card Cage

1. After removing the operator control panel, locate the two screws securing the PCB Supports. The PCB Supports are located on each end of the tester and must be removed before any PCB in the card cage can be removed.

2. Locate the PCB that is to be removed (see chart below) and carefully disconnect it from its connector.

PCB	GATE AND CARD
I/OP	Gate A, A01
FEP 1	Gate A, A02
MPUP	Gate A, A03
PROM	Gate A, A04
SPARE	Gate A, A05
PWRP	Gate A, A06
SPARE	Gate B, A07
SPARE	Gate B, A08
PSER	Gate B, A09
HD ALIGN	Gate B, A10

3. To replace a PCB, insert it in the appropriate slot and ensure that is properly connected.

4. Align the slots in the left-hand PCB Support with the PCBs in the A Gate and secure the PCB Support.

5. Reinstall the right-hand PCB support.

6. Replace the operator control panel and secure with three screws.

2.3.2 Removing the DISP PCB

The DISP PCB contains the tester's switches and indicators and is attached directly to the operator control panel. To remove this PCB, the control panel must be removed from the tester carrying case first.

1. Using an Allen wrench, remove the screw in each of the four rotary switches on the operator control panel. Remove the knobs.

2. Remove each of the nuts (4) securing these switches to the control panel.

3. Remove the two screws securing the standoffs to the operator control panel and the DISP PCB (see Figure 1, Section 3, Index Numbers 19, 20, and 21).

4. Disconnect the cable to the FEP 1 PCB.

5. To replace the DISP PCB, reverse the above procedure.

2.3.3 Servicing at the PCB Level

To service the tester at the PCB level, knowledge of the integrated circuits (ICs) and their functions is required. Refer to the PCB schematics and to the vendor's Device Specifications for the particular device.

2.4 TESTER DIAGNOSTIC

The Wrap Test, Routine 00, is designed to aid service personnel when a malfunction in the tester, or in the I/O cables to the tester, is suspected. The routine should also be executed before any other routine is run to ensure that the tester is operating correctly.

The Wrap Test must be executed with a Wrap plugboard connected to the disc drive as defined in the Wrap Test procedure (see Section 1.8, Diagnostic Routine Operation).

SECTION 3
ILLUSTRATED PARTS CATALOG

GENERAL

Illustrations always precede their parts list and are on the facing page whenever possible; multi-page illustrations and parts lists are the exception. Blank pages are numbered on the printed side only.

PARTS LIST ORGANIZATION

The following explanatory notes and keyed illustration define all parts list entries:

A The figure number of the associated illustration. It is always the first number on each list; repeated with the first entry on all pages of a multi-page list.

B The index number for each part in the figure.

C Figure number reference for further subassembly breakdown. If the entry is a subassembly and further breakdown is not provided, replacement at the assembly is required.

D Figure number reference to the next higher assembly (NHA).

E Subordination of assemblies, subassemblies and parts within a parts list is shown by indention.

F Attaching parts immediately follow the item they attach and are identified by an asterisk.

G Usable On Codes are explained at the beginning of each list; if a code is not given, the part is common to all codes.

FIGURE & INDEX NUMBER	PART NUMBER	DESCRIPTION 1 2 3 4	REFERENCE DESIGNATOR	QTY PER ASSY	USABLE ON CODE
3-					
		CODE A - USED ON 210700 ONLY			
		CODE B - USED ON 210701 ONLY			
		CODE C - USED ON 210702 ONLY			
		CODE 1 - ITEMS ARE UNDER EQUIPMENT LEVEL CONTROL OR FEATURE FUNCTIONAL LEVEL CONTROL. PART NUMBERS GIVEN ON THIS LIST MAY NOT BE AT LATEST LEVEL, CHECK APPLICABLE CHART BEFORE MAKING REPLACEMENT.			
-	210700	BASIC DRIVE ASM, 60 HZ, 208/230 VAC (SEE FIG. 1-81 FOR NHA)		REF	A
-	210701	BASIC DRIVE ASM, 50 HZ, 380 VAC (SEE FIG.. 1-81 FOR NHA)		REF	B
-	210702	BASIC DRIVE ASM, 50 HZ, 220 VAC (SEE FIG. 1-81 FOR NHA)		REF	C
-1	211884	. DUCT ASM, AIR		2	
-2	211883	. CLAMP, AIR DUCT		4	
-3	211882	. SHROUD ASM (SEE FIG. 4 FOR BREAKDOWN)		2	
-4*	111159	. SCREW, BUTTON HD, HEX SOCKET, 10-32 × .250		8	
-5*	110043	. SCREW, BH, 4-40 × .375		4	
-6	211389	. LABEL, CAUTION, EXHAUST HOUSING		2	
-7	211546	. AIR EXHAUST ASM, DEFLCT		2	
-8*	111547	. SCREW, PAN HD, 8-32 × .500		4	
-9*	211167	. SPACER, AIR DEFLECT		4	
-10	211169	. CLIP ASM, RETAINING		4	
-11	211647	. AIR DEFLECT		2	
-12*	111547	. SCREW, PAN HD, 8-32 × .500		2	
-13*	110308	. SCREW, CAP, HEX SOCKET, 8-32 × .500		4	
-14	NO NO	. PC BOARD ASM, READ/WRITE MATRIX (PART OF 210923 DECK PLATE PLUG LIST)		4	1
-15	211333	. CLAMP ASM, LEFT		2	
-16	211332	. CLAMP ASM, RIGHT		2	
-17	112361	. CLAMP, CABLE		2	
-18*	110095	. SCREW, 82° FLAT HD, 6-32 × .375		2	
	210628	. CAM TOWER ASM		2	
-19*	110182	.. SCREW, BH, 10-32 × .375		8	
-20	210789	.. COVER-SCREW ASM		2	
-21	210107	.. CAM		2	
-22*	110043	.. SCREW, BH, 4-40 × .375		8	
-23	210165	.. CAM TOWER		2	
-24	210349	. CABLE ASM, READ/WRITE, PRE-AMP "A" (SEE FIG. 25 FOR BREAKDOWN)		REF	
-25	210350	. CABLE ASM, READ/WRITE, PRE-AMP "B" (SEE FIG. 25 FOR BREAKDOWN)		REF	
-26	210970	. STANDOFF, BRACKET		4	
-27	NO NO.	. PC BOARD ASM, SERVO PRE-AMP (PART OF 210923 DECK PLATE PLUG LIST)		2	1
-28	210600	. DECK PLATE ASM, 60 HZ, 208/230 VAC (SEE FIG. 5 FOR BREAKDOWN)		2	A
-28	211500	. DECK PLATE ASM, 50 HZ, 220 VAC, 380 VAC (SEE FIG. 5 FOR BREAKDOWN)		2	B,C
-29*	110580	. NUT, HEX, JAM .250-20		8	
-30*	110374	. WASHER, LOCK, .250		8	
-31	210959	. PLATE, CABLE GUIDE		4	

NUMERICAL INDEX

The numerical index lists all part numbers in numerical order. The part number is cross referenced to each figure and index number where the part can be found in this catalog.
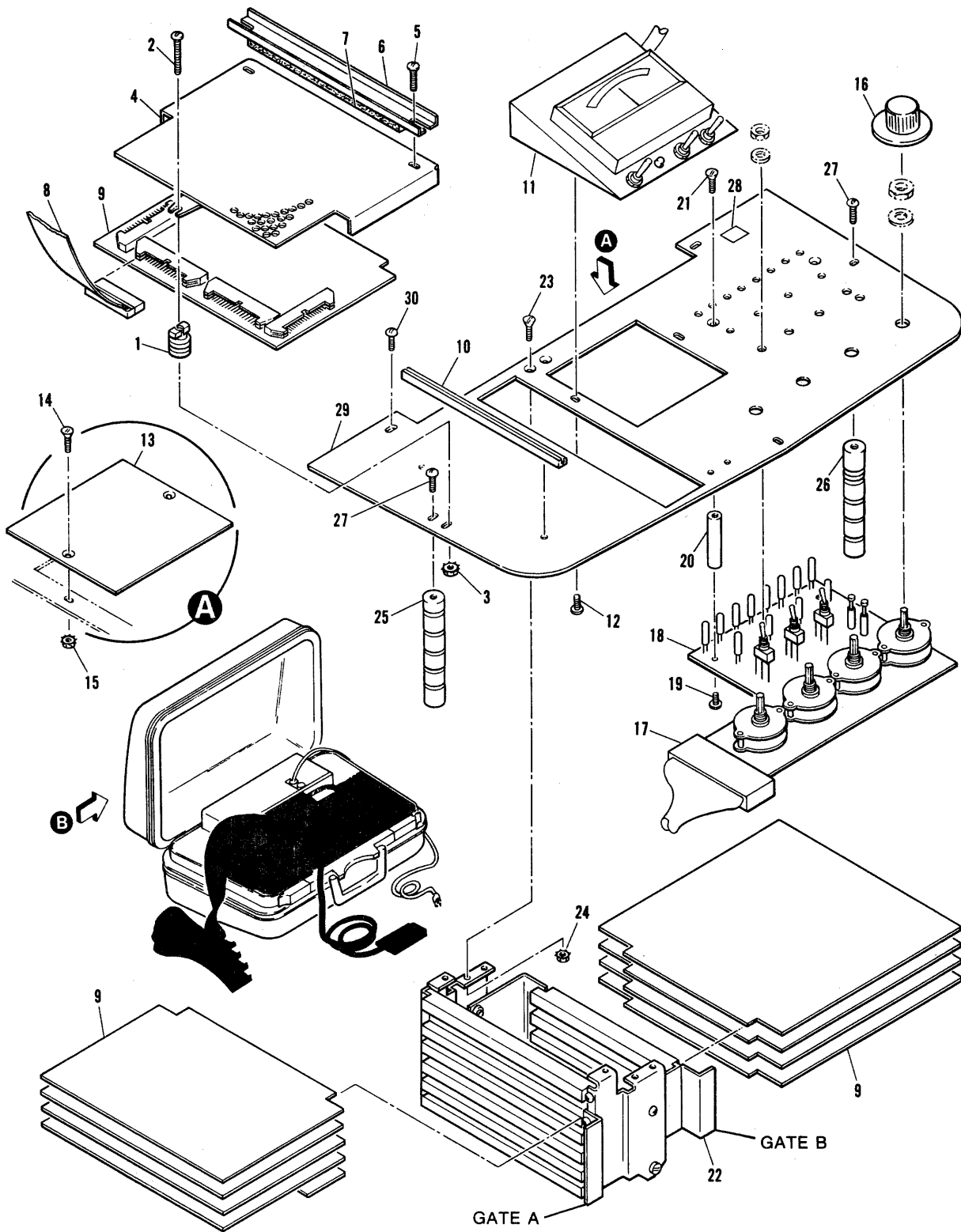
**FIGURE 1. 800 DISC STORAGE SUBSYSTEM TESTER (SHEET 1 OF 3)**

52
TOP COVER
REMOVED FOR
CLARITY
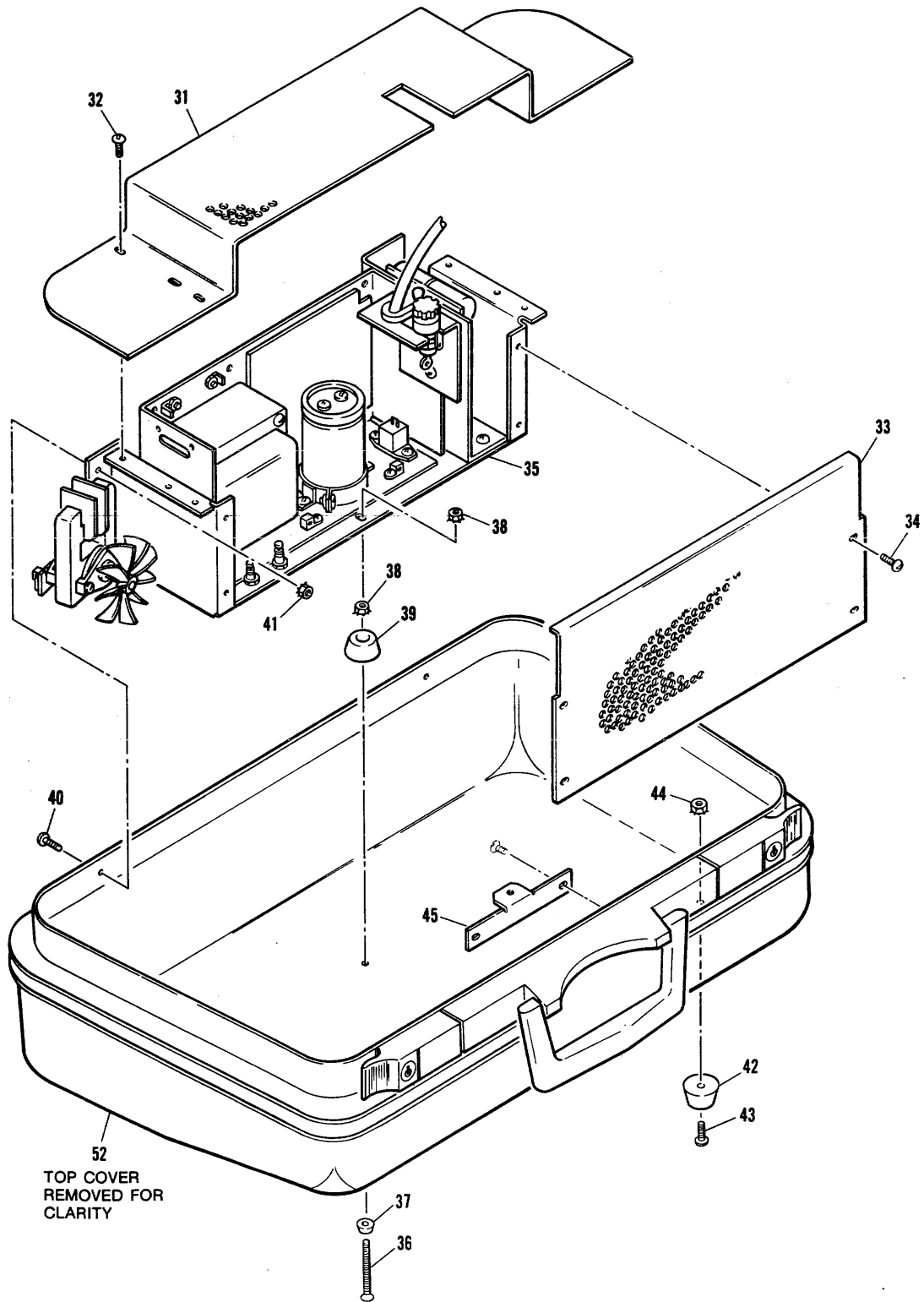
FIGURE 1. 800 DISC STORAGE SUBSYSTEM TESTER (SHEET 2 OF 3)
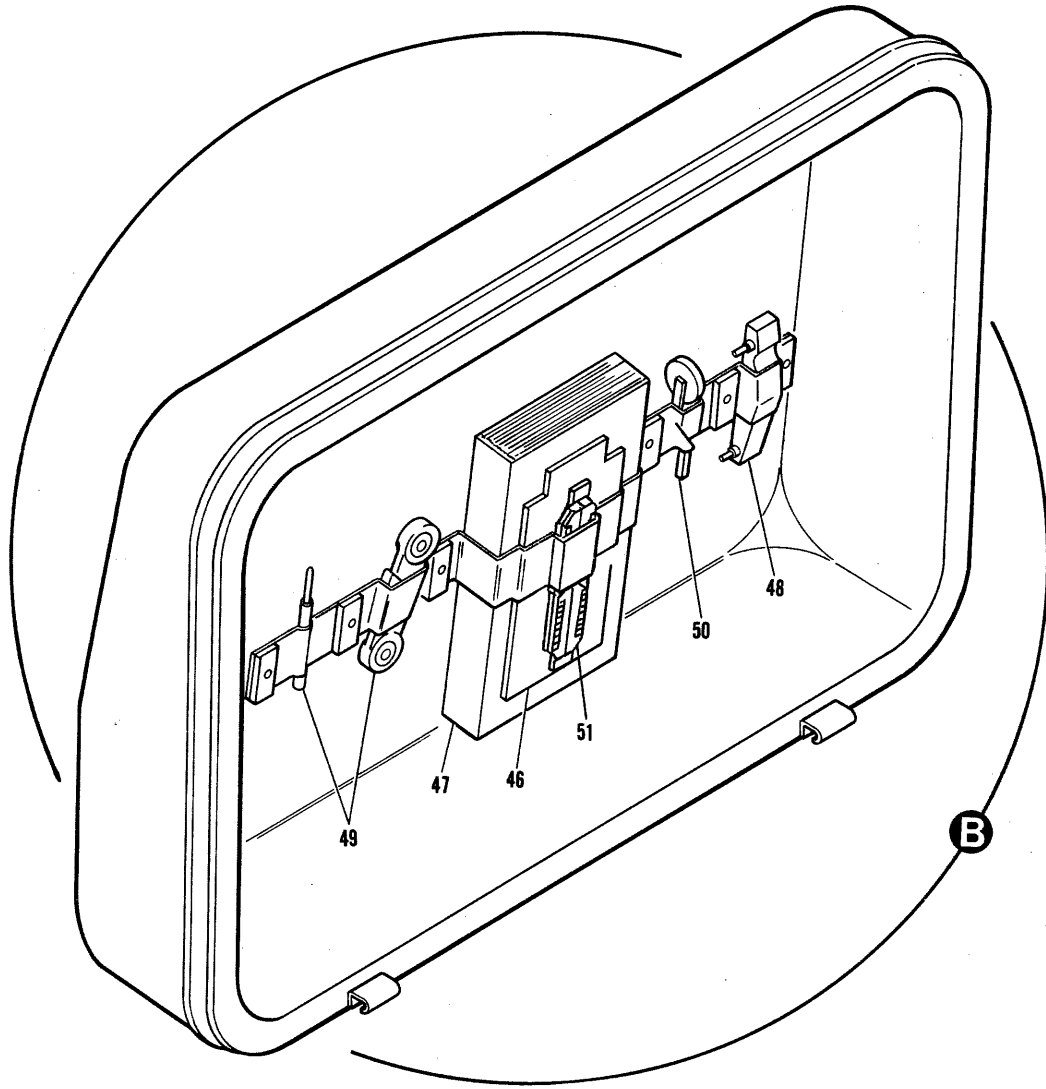
**FIGURE 1. 800 DISC STORAGE SUBSYSTEM TESTER (SHEET 3 OF 3)**

FIGURE & INDEX NUMBER	PART NUMBER	DESCRIPTION 1 2 3 4	QTY PER ASSY	USABLE ON CODE
1-				
		CODE A - USED ON 215900 ONLY		
		CODE B - USED ON 215935 ONLY		
		CODE C - USED ON 215940 ONLY		
		CODE D - USED ON 215945 ONLY		
		CODE E - USED ON 215960 ONLY		
-	215900	800 DISC STORAGE SUBSYSTEM TESTER, 50/60 HZ, 115 VAC, +5 VDC POWER SUPPLY, WITHOUT HEAD ALIGNMENT	REF	A
-	215935	800 DISC STORAGE SUBSYSTEM TESTER, 50/60 HZ, 115 VAC, +5 VDC POWER SUPPLY WITH HEAD ALIGNMENT (SEE NOTE)	REF	B
-	215940	800 DISC STORAGE SUBSYSTEM TESTER, 50/60 HZ, 115 VAC, +5 VDC/–5 VDC POWER SUPPLY, VFO, PRECOMPENSATION, WITHOUT HEAD ALIGNMENT	REF	C
-	215945	800 DISC STORAGE SUBSYSTEM TESTER, 50/60 HZ, 115 VAC, +5 VDC/–5 VDC POWER SUPPLY, VFO, PRECOMPENSATION, WITH HEAD ALIGNMENT (SEE NOTE)	REF	D
-	215960	800 DISC STORAGE SUBSYSTEM TESTER, WITHOUT HEAD ALIGNMENT, 50/60 HZ, 115 VAC, +5 VDC POWER SUPPLY, CUSTOM INPUT/OUTPUT INTERFACE	REF	E
		NOTE: DOES NOT INCLUDE HEAD ALIGNMENT TOOLS. SEE FIGURE 6 FOR HEAD ALIGNMENT TOOL PART NUMBERS.		
-1	215920	. SUPPORT, PCB	1	
-2*	110135	. SCREW, BH, 8-32 X 1.00	1	
-3*	111718	. NUT, HEX, KEPS, 8-32	1	
-4	215905	. COVER, PCBs	1	
-5*	110130	. SCREW, BH, 8-32 X 0.437	2	
-6	215959	. CLAMP, FLAT CABLE	1	
-7	503338	. NEOPRENE, CLOSED CELL	A/R	
-8	215966	. CABLE, INPUT/OUTPUT	4	
-9	215910	. PCB LOCATION	1	A
-9	215934	. PCB LOCATION	1	B
-9	215938	. PCB LOCATION	1	C
-9	215941	. PCB LOCATION	1	D
-9	215961	. PCB LOCATION (SEE FIG. 2 FOR BREAKDOWN)	1	E
-10	701103	. GUIDE, PCB	1	
-11	215923	. HEAD ALIGNMENT ASM (SEE FIG. 3 FOR BREAKDOWN)	1	B,D
-12*	110130	. SCREW, BH, 8-32 X 0.437	2	B,D
-13	215914	. COVER, FEATURE	1	A,C,E
-14*	110146	. SCREW, 82° FLAT HD, 8-32 X 0.375	2	A,C,E
-15*	111718	. NUT, HEX, KEPS, 8-32	2	A,C,E
-16	303065	. KNOB, SWITCH	4	
-17	215913	. CABLE ASM, FEP1 (SEE FIG. 7-1, 7, 8, 9, 10 AND 11 FOR DETAILS)	1	
-18	012961	. PCB ASM, DISPLAY (DISP)	1	
-19*	110127	. SCREW, BH, 8-32 X 0.25	2	
-20	215949	. STANDOFF, 8-32 X 0.875	2	
-21*	110146	. SCREW, 82° FLAT HD, 8-32 X 0.375	2	

FIGURE & INDEX NUMBER	PART NUMBER	DESCRIPTION 1 2 3 4	QTY PER ASSY	USABLE ON CODE
1-22	215906	. PCB GATE ASM	1	A,E
-22	215933	. PCB GATE ASM	1	B
-22	215937	. PCB GATE ASM	1	C
-22	215939	. PCB GATE ASM	1	D
		(SEE FIG. 4 FOR BREAKDOWN)		
-23*	110146	. SCREW, 82° FLAT HD, 8-32 X 0.375	4	
-24*	111718	. NUT, HEX, KEPS, 8-32	4	
-25	215919	. SUPPORT, PCB, LEFT HAND	1	
-26	215915	. SUPPORT, PCB, RIGHT HAND	1	
-27*	110130	. SCREW, BH, 8-32 X 0.437	2	
		ATTACHING PARTS FOR ITEMS 25 AND 26		
-28	201624	. LABEL, UL	1	
-29	215917	. CONTROL PANEL	1	
-30*	110130	. SCREW, BH, 8-32 X 0.437	3	
-31	215904	. COVER, TOP, POWER SUPPLY	1	
-32*	110127	. SCREW, BH, 8-32 X 0.25	4	
-33	215924	. COVER, FRONT, POWER SUPPLY	1	
-34*	110127	. SCREW, BH, 8-32 X 0.25	4	
-35	215922	. POWER SUPPLY, 50/60 HZ, 115 VAC, +5 VDC	1	A,B,E
		(SEE FIG. 5 FOR BREAKDOWN)		
-35	215936	. POWER SUPPLY, 50/60 HZ, 115 VAC, +5 VDC/–5 VDC	1	C,D
		(SEE FIG. 5 FOR BREAKDOWN)		
-36*	110153	. SCREW, 82° FLAT HD, 8-32 X 1.12	1	
-37*	111125	. WASHER, COUNTERSINK, NYLON	1	
-38*	111718	. NUT, HEX, KEPS, 8-32	2	
-39	705458	. BUMPER	1	
-40*	110130	. SCREW, BH, 8-32 X 0.437	2	
-41	111718	. NUT, HEX, KEPS, 8-32	2	
-42	705458	. BUMPER	2	
-43*	110130	. SCREW, BH, 8-32 X 0.437	2	
-44*	111718	. NUT, HEX, KEPS, 8-32	2	
-45	215902	. BRACKET, PANEL MOUNTING	1	
-46	011086	. EXTENDER ASM, PCB	1	B
-47	804115	. MANUAL, TECHNICAL	1	B
-48	210105	. TOOL, HEAD INSTALLATION	1	B
-49	210109	. WRENCH ASM, TORQUE	1	B
-50	211526	. TOOL, ALIGNMENT	1	B
-51	013611	. WRAP PLUGBOARD	1	B
-52	215901	. SUITCASE, MODIFIED	1	

GATE A			
I N D E X N U M B E R	1	I/OP	A01
	2	FEPI	A02
	3	MPUP	A03
	4	PROM	A04
		NOT USED	A05
	5	PWRP	A06

(PCB LOCATION)

GATE B			
I N D E X N U M B E R	6	HD ALIGN	A10
	7	PSER	A09
		NOT USED	A08
		NOT USED	A07

(PCB LOCATION)

FIGURE 2. PCB LOCATION

FIGURE & INDEX NUMBER	PART NUMBER	DESCRIPTION 1 2 3 4	QTY PER ASSY	USABLE ON CODE
2-				
		CODE A - USED ON 215910 ONLY		
		CODE B - USED ON 215934 ONLY		
		CODE C - USED ON 215938 ONLY		
		CODE D - USED ON 215941 ONLY		
		CODE E - USED ON 215961 ONLY		
-	215910	PCB LOCATION (SEE FIG. 1-9 FOR NHA)	REF	A
-	215934	PCB LOCATION (SEE FIG. 1-9 FOR NHA)	REF	B
-	215938	PCB LOCATION (SEE FIG. 1-9 FOR NHA)	REF	C
-	215941	PCB LOCATION (SEE FIG. 1-9 FOR NHA)	REF	D
-	215961	PCB LOCATION (SEE FIG. 1-9 FOR NHA)	REF	E
-1	012946	. PCB ASM, INPUT/OUTPUT (I/OP)	1	A,B, C,D
-2	012951	. PCB ASM, FE PANEL 1 (FEP1)	1	
-3	012941	. PCB ASM, μPROCESSOR UNIT (MPUP)	1	
-4	012956	. PCB ASM, PROGRAMMABLE READ ONLY MEMORY (PROM)	1	
-5	012974	. PCB ASM, POWER (PWRP)	1	
-6	012591	. PCB ASM, HEAD ALIGNMENT (HD ALIGN)	1	B,D
-7	012481	. PCB ASM, POSITION SERVO (PSER)	1	B,D
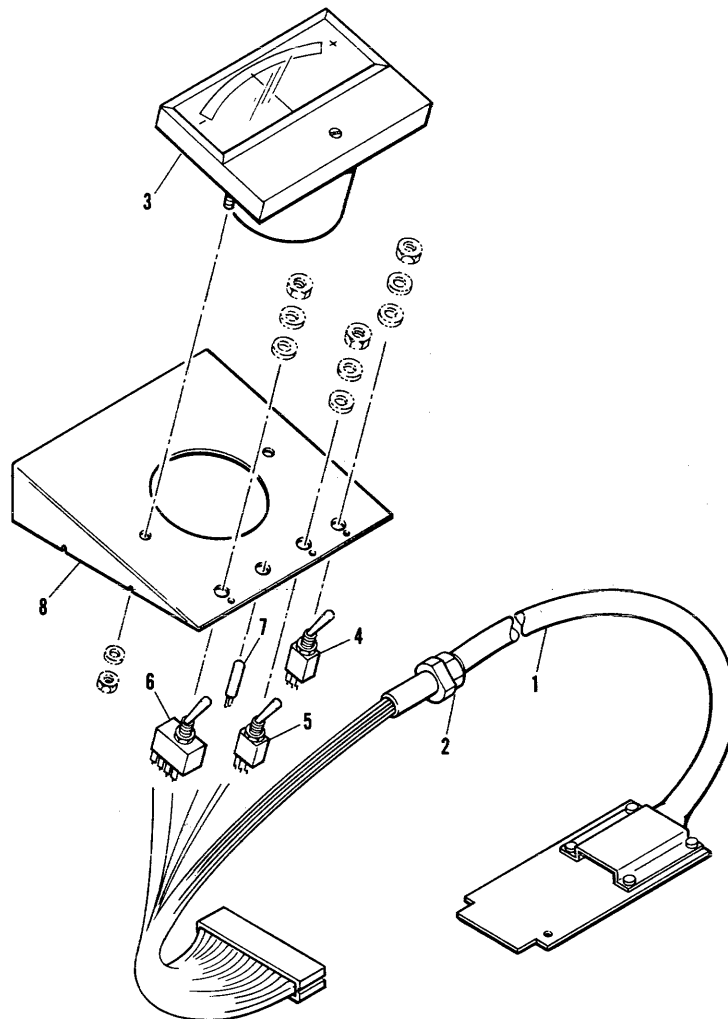
FIGURE 3. HEAD ALIGNMENT ASM

FIGURE & INDEX NUMBER	PART NUMBER	DESCRIPTION 1 2 3 4	QTY PER ASSY	USABLE ON CODE
3-	215923	HEAD ALIGNMENT ASM (SEE FIG. 1-11 FOR NHA)	REF	
-1	215982	. CABLE ASM, HEAD ALIGNMENT (SEE FIG. 7-3, 7, 10, 11, 12, 13, 14, 15 AND 16 FOR DETAILS)	1	
-2	111713	. BUSHING CLAMP	1	
-3	158852	. METER, DC	1	
-4	605093	. SWITCH, TOGGLE	1	
-5	601369	. SWITCH, TOGGLE	1	
-6	504574	. SWITCH, TOGGLE	1	
-7	157346	. LIGHT EMITTING DIODE (LED)	1	
-8	215912	. BRACKET, HEAD ALIGNMENT ASM	1	
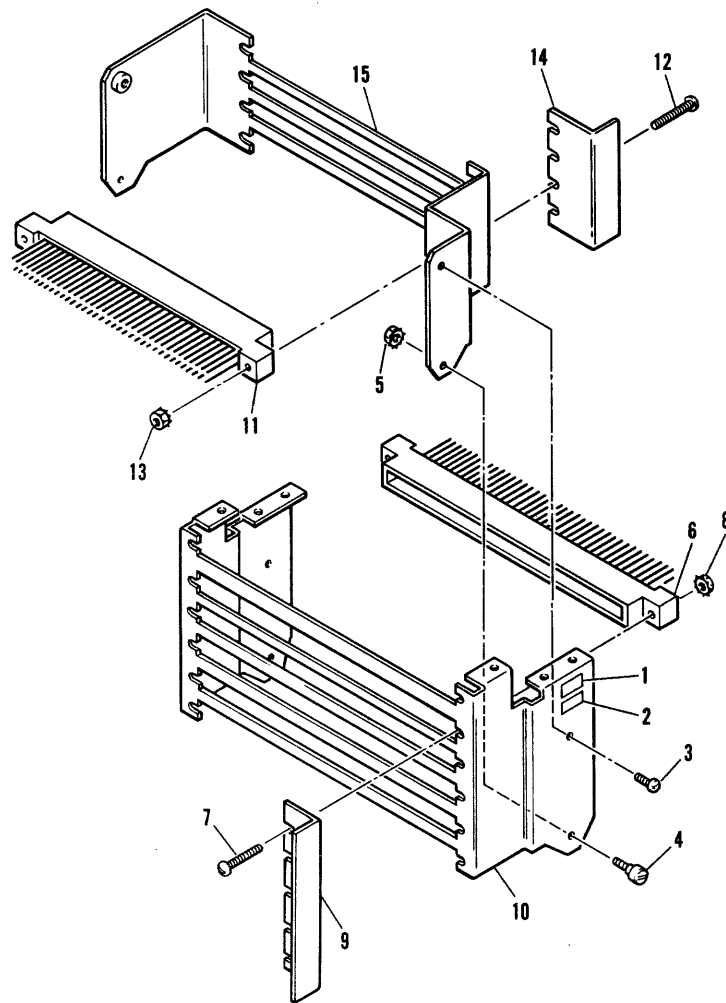
FIGURE 4. PCB GATE ASM

FIGURE & INDEX NUMBER	PART NUMBER	DESCRIPTION 1 2 3 4	QTY PER ASSY	USABLE ON CODE
4-				
		CODE A - USED ON 215933 ONLY		
		CODE B - USED ON 215937 ONLY		
		CODE C - USED ON 215939 ONLY		
		CODE D - USED ON 215906 ONLY		
		CODE E - USED ON 215942 ONLY		
		CODE F - USED ON 215943 ONLY		
		CODE G - USED ON 215944 ONLY		
-	215933	PCB GATE ASM, A/B (SEE FIG. 1-22 FOR NHA)	REF	A
-	215937	PCB GATE ASM, A/B (SEE FIG. 1-22 FOR NHA)	REF	B
-	215939	PCB GATE ASM, A/B (SEE FIG. 1-22 FOR NHA)	REF	C
-1	201416	. MARKER, EC LEVEL	1	A,B,C
-2	211411	. LABEL, P/N MARKER	1	A,B,C
-	215906	. PCB GATE ASM, A (SEE FIG. 1-22 FOR NHA)	1	D
-3*	110127	. SCREW, BH, 8-32 X 0.25	2	A,B,C
-4*	700651	. SCREW, SHOULDER	2	A,B,C
-5*	111718	. NUT, HEX, KEPS, 8-32	2	A,B,C
-6	158809	. . CONNECTOR, PCB (A01, A02, A03, A04, A06)	5	A,B, C,D
-7	110045	. . SCREW BH, 4-40 X 0.5	10	A,B, C,D
-8	110840	. . NUT, HEX, KEPS, 4-40	10	A,B, C,D
-9	215953	. . GUIDE, PCB	1	A,B, C,D
-10	215918	. . BRACKET, CONNECTOR MOUNTING	1	A,B, C,D
-	215942	. PCB GATE ASM, B	1	A,E
-	215943	. PCB GATE ASM, B	1	B,F
-	215944	. PCB GATE ASM, B	1	C,G
-11	158810	. . CONNECTOR, PCB (A09/A10)	2	A,E
-11	158810	. . CONNECTOR, PCB (A07/A08)	2	B,F
-11	158810	. . CONNECTOR, PCB (A07, A08, A09, A10)	4	C,G
-12*	110046	. . SCREW, BH, 4-40 X 0.5	4	A,B, E,F
-12*	110046	. . SCREW, BH, 4-40 X 0.5	8	C,G
-13*	110840	. . NUT, HEX, KEPS, 4-40	4	A,B, E,F
-13*	110840	. . NUT, HEX, KEPS, 4-40	8	C,G
-14	215954	. . GUIDE, PCB	1	A,B,C, E,F,G
-15	215925	. . BRACKET, CONNECTOR MOUNTING	1	A,B,C, E,F,G
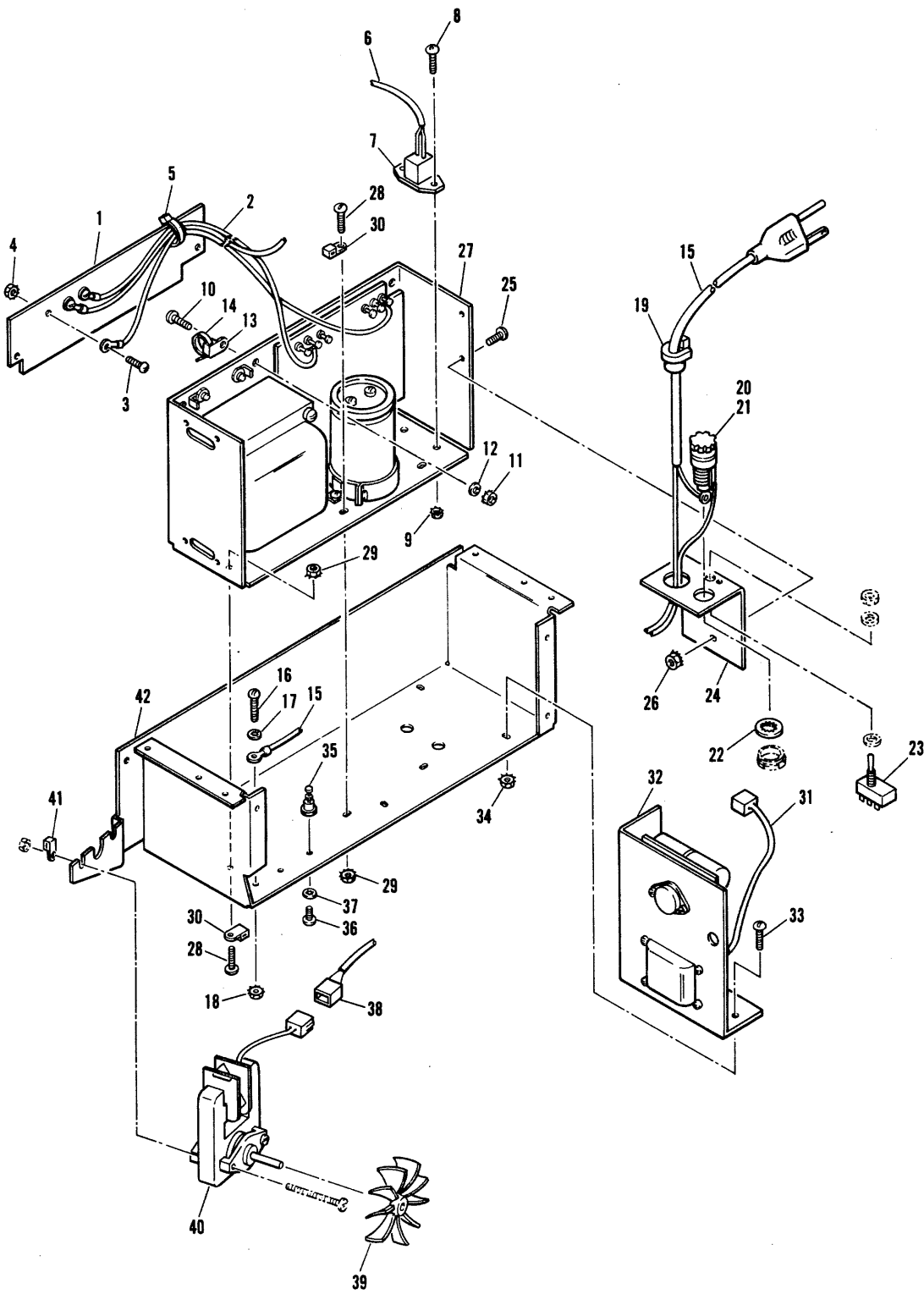
FIGURE 5. POWER SUPPLY ASM

FIGURE & INDEX NUMBER	PART NUMBER	DESCRIPTION 1 2 3 4	QTY PER ASSY	USABLE ON CODE
5-		CODE A - USED ON 215922 ONLY		
		CODE B - USED ON 215936 ONLY		
-	215922	POWER SUPPLY ASM, 50/60 HZ, 115 VAC, +5 VDC	REF	A
		(SEE FIG. 1-35 FOR NHA)		
-	215936	POWER SUPPLY ASM, 50/60 HZ, 115 VAC, +5 VDC/-5 VDC		
		(SEE FIG. 1-35 FOR NHA)	REF	B
-1	012974	. PCB ASM, POWER (PWRP)		
		(SEE FIG. 2 FOR LOCATION)	1	
-2	215911	. CABLE ASM, DC		
		(SEE FIG. 7-1, 4 AND 7 FOR DETAILS)	1	A
-2	215947	. CABLE ASM, DC		
		(SEE FIG. 7-1, 2, 4, AND 7 FOR DETAILS)	1	B
-3*	110129	. SCREW, BH, 8-32 X 0.375	2	A
-3*	110129	. SCREW, BH, 8-32 X 0.375	3	B
-4*	111718	. NUT, HEX, KEPS, 8-32	2	A
-4*	111718	. NUT, HEX, KEPS, 8-32	3	B
-5	005046	. CABLE TIE	1	
-6	215932	. CABLE ASM, 0.V PROTECT		
		(SEE FIG. 7-1 AND 7 FOR DETAILS)	1	
-7	215927	. OVERVOLTAGE PROTECTOR	1	
-8*	110081	. SCREW, BH, 6-32 X 0.375	2	
-9*	110849	. NUT, HEX, KEPS, 6-32	2	
-10	110130	. SCREW, BH, 8-32 × 0.438	1	
-11	111718	. NUT, HEX, KEPS, 8-32	1	
-12	110926	. WASHER, FLAT, 0.460	1	
-13	701721	. MOUNT, CABLE TIE, NYLON	1	
-14	005046	. CABLE TIE	1	
-15	215955	. HARNESS ASM, AC		
		(SEE FIG. 7-1, 2 AND 7 FOR DETAILS)	1	A
-15	215956	. HARNESS ASM, AC		
		(SEE FIG. 7-1, 2 AND 7 FOR DETAILS)	1	B
-16*	110130	. SCREW, BH, 8-32 X 0.437	1	
-17*	110386	. WASHER, LOCK, INTERNAL TOOTH, NO. 6	1	
-18*	111718	. NUT, HEX, KEPS, 8-32	1	
-19	200573	. BUSHING, CLAMP	1	
-20	150481	. FUSE HOLDER, PANEL MOUNT	1	
-21	150457	. FUSE, 125 VAC, 2.5 A	1	
-22	111114	. WASHER, LOCK, INTERNAL TOOTH, 0.510	1	
-23	300099	. SWITCH, TOGGLE, SPDT	1	
-24	215921	. BRACKET, FUSE MOUNTING	1	
-25*	110130	. SCREW, BH, 8-32 X 0.437	2	
-26*	111718	. NUT, HEX, KEPS, 8-32	2	
-27	215928	. POWER SUPPLY, +5 VDC	1	
-28*	110131	. SCREW, BH, 8-32 X 0.5	3	
-29*	111718	. NUT, HEX, KEPS, 8-32	3	
-30	701721	. BASE, TIE WRAP	3	
-31	215946	. CABLE ASM, AC		
		(SEE FIG. 7-1, 5, 6 AND 7 FOR DETAILS)	1	B
-32	215929	. POWER SUPPLY ASM, -5 VAC	1	B
-33*	110130	. SCREW, BH, 8-32 X 0.437	2	
-34*	111718	. NUT, HEX, KEPS, 8-32	2	
-35	200541	. STANDOFF, INSULATED	2	
-36*	110079	. SCREW, BH, 6-32 X 0.25	2	
-37*	110386	. WASHER, LOCK, INTERNAL TOOTH, NO. 6	2	
-38	215908	. CABLE ASM, AC		
		(SEE FIG. 7-1, 5, 6 AND 7 FOR DETAILS)	1	

FIGURE & INDEX NUMBER	PART NUMBER	DESCRIPTION 1 2 3 4	QTY PER ASSY	USABLE ON CODE
5-39	200385	. BLADE, FAN	1	A
-39	200385	. BLADE, FAN	2	B
-40	705686	. FAN	1	A
-40	705686	. FAN	2	B
-41	701721	. MOUNT, CABLE TIE, NYLON	1	A
-41	701721	. MOUNT, CABLE TIE, NYLON	2	B
-42	215903	. BRACKET, POWER SUPPLY	1	
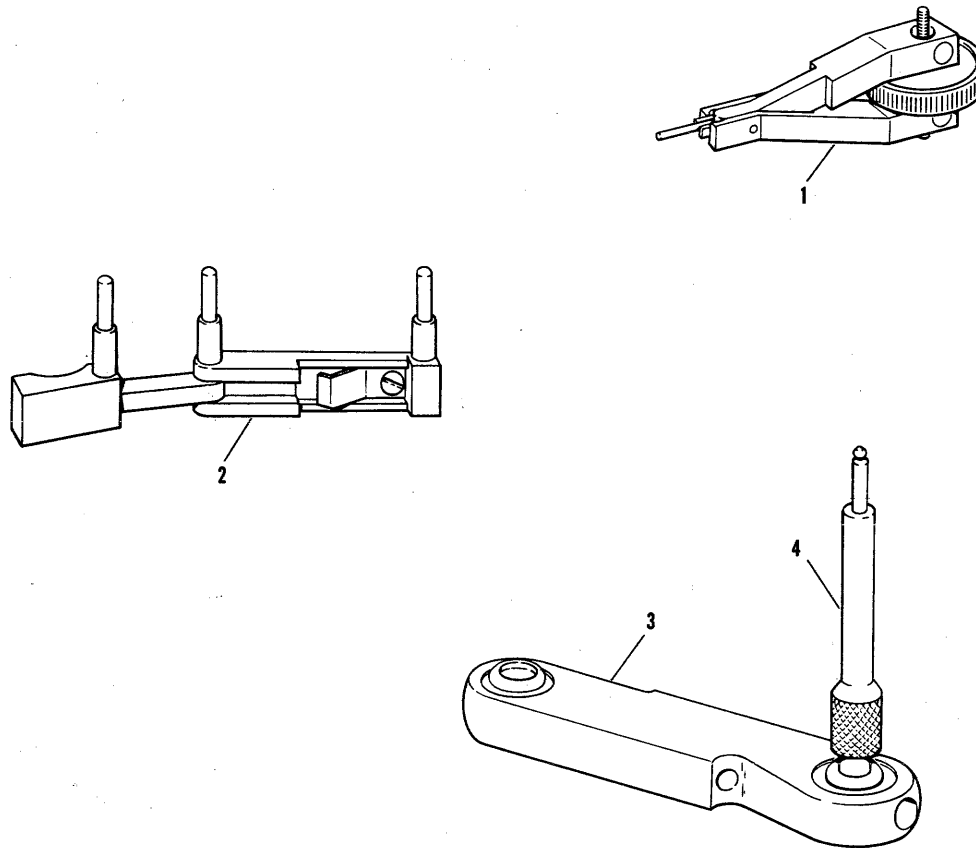
FIGURE 6. HEAD ALIGNMENT TOOLS

FIGURE & INDEX NUMBER	PART NUMBER	DESCRIPTION 1 2 3 4	QTY PER ASSY	USABLE ON CODE
6-	NO NO.	HEAD ALIGNMENT TOOLS	REF	
-1	211526	. HEAD ALIGNMENT TOOL	1	
-2	210105	. HEAD INSTALLATION TOOL	1	
-3	210109	. HEAD TORQUE TOOL	1	
-4	211516	. TORQUE SHAFT, REPLACEMENT	1	
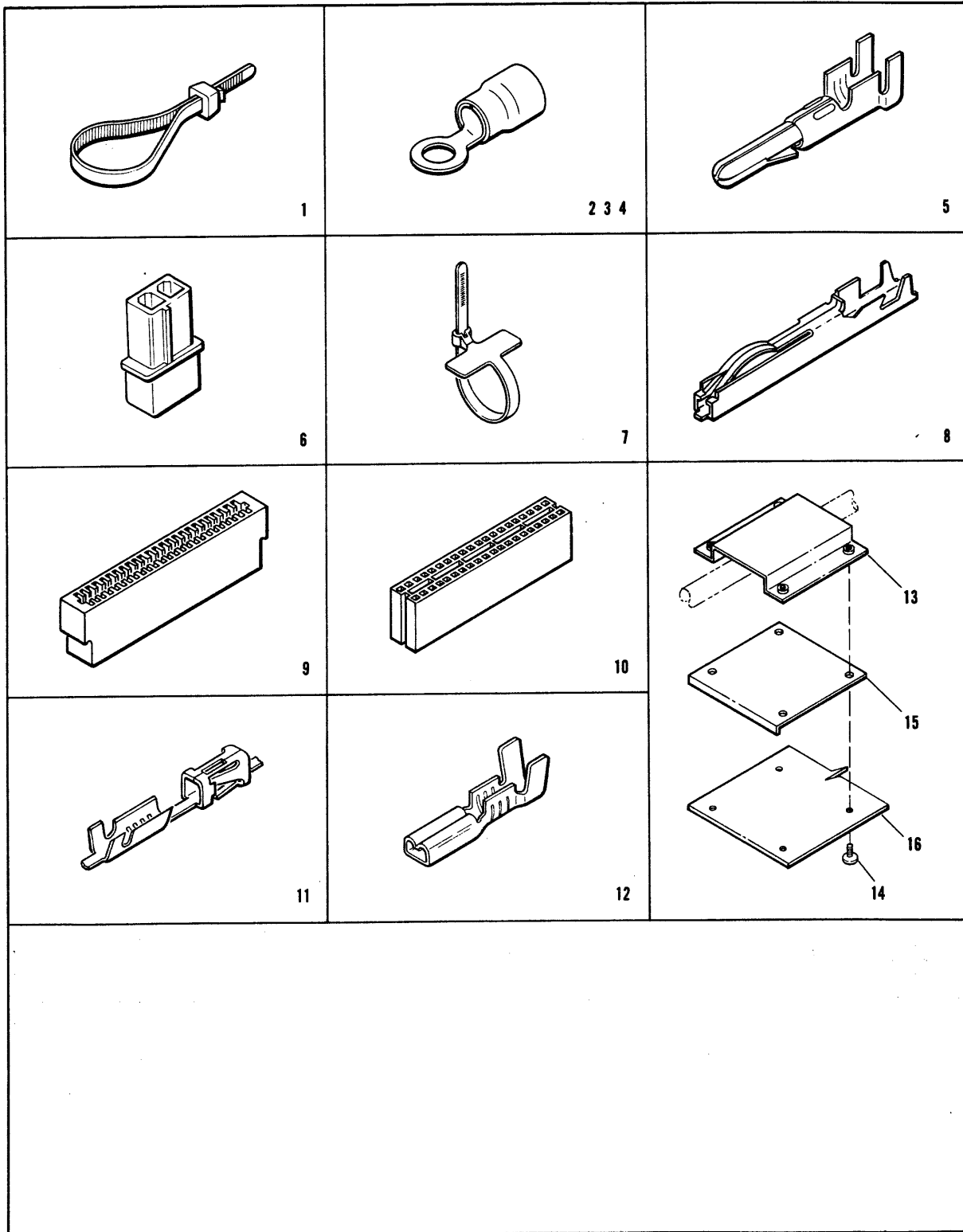
FIGURE 7. HARNESS AND CABLE COMPONENTS

FIGURE & INDEX NUMBER	PART NUMBER	DESCRIPTION 1 2 3 4	QTY PER ASSY	USABLE ON CODE
7-	NO NO.	HARNESS AND CABLE COMPONENT ASM	REF	
-1	005046	. TIE, STRAP	A/R	
-2	150103	. TERMINAL, LUG, RING TONGUE, 22-16, NO. 6	A/R	
-3	150104	. TERMINAL, LUG, RING TONGUE, 22-16, NO. 10	A/R	
-4	150109	. TERMINAL, LUG, RING TONGUE, 16-14, NO. 8	A/R	
-5	150200	. CONTACT, PIN, 22-18	A/R	
-6	150262	. HOUSING, CONNECTOR	A/R	
-7	154319	. MARKER, CABLE	A/R	
-8	158645	. CONTACT, LEAF, 28-24	A/R	
-9	158812	. HOUSING 25/50, PC BOARD	A/R	
-10	158853	. CONNECTOR, 40 POSITION	A/R	
-11	158856	. CONNECTOR, CONTACT, SOCKET	A/R	
-12	605103	. TERMINAL, FASTON	A/R	
	NO NO.	. PART OF HEAD ALIGNMENT UNIT CABLE ASM 211450	REF	
-13	210885	. . CLAMP, CABLE, PADDLE	1	
-14	110040	. . SCREW, BH 4-40 X 0.188	4	
-15	210884	. . BASE, CABLE, PADDLE	1	
-16	011841	. . PC BOARD ASM, LOGIC GATE PADDLE BOARD	1	

PART NUMBER	FIGURE & INDEX NUMBER	PART NUMBER	FIGURE & INDEX NUMBER	PART NUMBER	FIGURE & INDEX NUMBER	PART NUMBER	FIGURE & INDEX NUMBER
005046	5-14	125982	3-1	215933	1-22		
005046	5-5	150103	7-2	215933	4-REF		
005046	7-1	150104	7-3	215934	2-REF		
011086	1-46	150109	7-4	215934	1-9		
011841	7-16	150200	7-5	215935	1-REF		
012481	2-7	150262	7-6	215936	1-35		
012591	2-6	150457	5-21	215936	5-REF		
012941	2-3	150481	5-20	215937	4-REF		
012946	2-1	154319	7-7	215937	1-22		
012951	2-2	157346	3-7	215938	1-9		
012956	2-4	158645	7-8	215938	2-REF		
012961	1-18	158809	4-6	215939	4-REF		
012974	2-5	158810	4-11	215939	1-22		
012974	5-1	158812	7-9	215940	1-REF		
013611	1-51	158852	3-3	215941	1-9		
110040	7-14	158853	7-10	215941	2-REF		
110045	4-7	158856	7-11	215942	4-10		
110046	4-12	200385	5-39	215943	4-10		
110079	5-36	200541	5-35	215944	4-10		
110081	5-8	200573	5-19	215945	1-REF		
110127	1-19	201416	4-1	215946	5-31		
110127	1-34	201624	1-28	215947	5-2		
110127	1-32	210105	6-2	215949	1-20		
110127	4-3	210105	1-48	215953	4-9		
110129	5-3	210109	1-49	215954	4-14		
110130	5-10	210109	6-3	215955	5-15		
110130	5-25	210884	7-15	215956	5-15		
110130	5-16	210885	7-13	215959	1-6		
110130	1-5	211411	4-2	215960	1-REF		
110130	1-30	211516	6-4	215961	1-9		
110130	1-27	211526	6-1	215961	2-REF		
110130	1-12	211526	1-50	215966	1-8		
110130	5-33	215900	1-REF	300099	5-23		
110130	1-43	215901	1-52	303065	1-16		
110130	1-40	215902	1-45	503338	1-7		
110131	5-28	215903	5-42	504574	3-6		
110135	1-2	215904	1-31	601369	3-5		
110146	1-14	215905	1-4	605093	3-4		
110146	1-21	215906	1-22	605103	7-12		
110146	1-23	215906	4-1	700651	4-4		
110153	1-36	215908	5-38	701103	1-10		
110386	5-17	215910	2-REF	701721	5-13		
110386	5-37	215910	1-9	701721	5-41		
110840	4-13	215911	5-2	701721	5-30		
110840	4-8	215912	3-8	705458	1-39		
110849	8-9	215913	1-17	705458	1-42		
110926	5-12	215914	1-13	705686	5-40		
111114	5-22	215915	1-26	804115	1-47		
111125	1-37	215917	1-29				
111713	3-2	215918	4-10				
111718	5-29	215919	1-25				
111718	5-34	215920	1-1				
111718	1-44	215921	5-24				
111718	1-41	215922	1-35				
111718	4-5	215922	5-REF				
111718	1-38	215923	3-REF				
111718	1-24	215923	1-11				
111718	1-15	215924	1-33				
111718	5-18	215925	4-15				
111718	5-11	215927	5-7				
111718	5-26	215928	5-27				
111718	5-4	215929	5-32				
111718	1-3	215932	5-6				

COMMENTS FORM

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