83324740

CONTROL DATA

CDC® PROGRAMMABLE FIELD TEST UNIT

TB2A3

GENERAL DESCRIPTION
OPERATION
PARTS DATA

Volume 1

HARDWARE MAINTENANCE MANUAL

REVISION RECORD

REVISION	DESCRIPTION
A (09-19-83)	Manual released. Class I ECOs DJ07001, 07002, 07014, 07015, and Class II ECOs DJ07000, 07006, 07011, 07020, 07026 incorporated in this printing.
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REVISION LETTERS I, O, Q AND X ARE NOT USED.

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Minnetonka, MN 55343

or use Comment Sheet in the back of this manual.

MANUAL TO EQUIPMENT LEVEL CORRELATION

This manual reflects the equipment configurations listed below.

EXPLANATION: Locate the equipment type and series code number, as shown on the equipment configuration log, in the list below. Immediately to the right of the series code number is an FCO number. If that number and all of the numbers underneath it match all of the numbers on the equipment configuration log, then this manual accurately reflects the equipment.

This correlation sheet also applies to the following related manuals:

Pub No. 83324750 Rev. D

EQUIPMENT TYPE	SERIES CODE	WITH FCOs	COMMENTS
TB2A3B-F	01 thru 04 05	None	

LIST OF EFFECTIVE PAGES

Sheet 1 of 2

New features, as well as changes, deletions, and additions to information in this manual are indicated by bars in the margins or by a dot near the page number if the entire page is affected. A bar by the page number indicates pagination rather than content has changed.

PAGE	REV	PAGE	REV
Cover	-	1-12	B
Blank	-	1-13	D
Title P	-	1-14	D
ii	D	1-15	D
iii	D	1-16	D
Blank	-	S-2 Div	-
v	D	Blank	-
vi	D	2-1	A
vii	D	2-2	D
Blank	-	2-3	D
ix	D	2-4	D
x	D	2-5	D
xi	D	2-6	D
xii	D	2-7	D
xiii	D	2-8	D
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xv	D	2-10	D
Blank	-	2-11	D
xvii	D	2-12	D
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1-2	A	2-19	D
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1-4	D	2-21	D
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1-8	D	2-25	D
1-9	D	Blank	-
1-10	D	S-3 Div	-
1-11	B	Blank	-

LIST OF EFFECTIVE PAGES (Contd)

Sheet 2 of 2

PAGE	REV	PAGE	REV
3-1	D	S-3B Div	-
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S-3A Div	-	3B-1	B
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3A-1	A	3B-3	D
Blank	-	3B-4	D
3A-3	A	S-3C Div	-
3A-4	D	Blank	-
3A-5	D	3C-1	D
3A-6	A	Blank	-
3A-7	B	S-3D Div	-
3A-8	D	Blank	-
3A-9	D	3D-1	B
3A-10	D	Blank	-
3A-11	D	3D-3	D
3A-12	B	3D-4	D
3A-13	D	3D-5	B
3A-14	A	3D-6	D
3A-15	C	3D-7	B
3A-16	D	3D-8	B
3A-17	D	Cmt Sht	-
3A-18	D	Rtn Env	-
3A-19	D	Blank	-
Blank	-	Cover	-

PREFACE

INTRODUCTION

This manual has been prepared for customer engineers and other technical personnel directly involved with the operation of the TB2A3 Programmable Field Test Unit (PFTU).

It is assumed that customer engineering is familiar with the computer system, drive controller, and the drive logic, as well as system programming techniques for executing I/O operations, including sequencing I/O commands and signal exchange between the drive and controller.

This manual is divided into three sections as follows:

Section 1 - General Description - Contains a functional and physical description of the PFTU.

Section 2 Operation - Provides general information concerning PFTU controls and indicators, equipment set-up, power up procedures, and drive test initiation.

Section 3 Parts Data - Contains an exploded view of the PFTU and a spare parts list.

CONTENTS

2. OPERATION

FIGURES

TABLES

IMPORTANT SAFETY INFORMATION AND PRECAUTIONS

Proper safety and repair is important to the safe, reliable operation of this unit. Service should be done by qualified personnel only. This maintenance manual describes procedures recommended by the manufacturer as effective methods of servicing the unit. Some of these procedures require the use of specially designed tools. For proper maintenance and safety, these specially designed tools should be used as recommended.

The procedures in this maintenance manual and labels on the unit contain warnings and cautions which must be carefully read and observed in order to minimize or eliminate the risk of personal injury. The warnings point out conditions or practices that are potentially hazardous to maintenance personnel. The cautions point out practices which, if disregarded, could damage the unit and make it unsafe for use.

For the safety of maintenance and operating personnel, the following precautions must be observed:

- Perform all maintenance in accordance with the procedures given in this manual.
- Read and observe all cautions and warnings provided in the procedures and labeled on the unit.
- Use the special tools called out in the maintenance procedures.
- Observe sound safety practices when performing maintenance.
- Use caution when troubleshooting a unit that has voltages present. Remove power from unit before servicing or replacing components.
- Wear safety glasses when servicing units.
- Wear safety shoes when removing or replacing heavy components.

It is also important to understand that these warnings and cautions are not exhaustive. The manufacturer could not possibly know, evaluate and advise maintenance personnel of all conceivable ways in which maintenance might be performed or the possible risk of each maintenance technique. Consequently, the manufacturer has not completed any such broad evaluation. Thus, any persons who use any non-approved maintenance procedure or tool must first satisfy themselves that neither their safety nor the unit performance will be jeopardized by the maintenance techniques they select.

CONFIGURATION CHART

EQUIPMENT NUMBER	*INTERFACE	EQUIPMENT PART NUMBER
TB2A3B	ISI	73086303
TB2A3C	ISI/SDI	73086304
TB2A3D	ISI/SDI/SMD-0	73086305
TB2A3E	SMD-0/SDI	73086306
TB2A3F	SMD-0	73086307

*Interface boards and associated controlware may be ordered separately via standard option

STO 69403-1: ISI
STO 69403-2: SDI
STO 69403-3: SMD-0
(refer to section 3C-Accessories)

ABBREVIATIONS

ACIA	Asynchronous Communications Interface Adapter
ALU	Arithmetic/Logic Unit
BPS	Bits Per Second
CM	Control Module
COS	Command Operating System
CRC	Cyclical Redundancy Check
CRT	Cathode Ray Tube
DMA	Direct Memory Access
FCO	Field Change Order
FDD	Flexible Disk Drive
ISI	Intelligent Standard Interface
MPU	Microprocessor Unit
PFTU	Programmable Field Test Unit
RAM	Random Access Memory
ROM	Read Only Memory
SDI	Standard Device Interface
SERDES	Serialize/Deserialize
SMD	Storage Module Drive
STO	Standard Option
UART	Universal Asynchronous Receiver/Transmitter
USART	Universal Synchronous/ Asynchronous Receiver/ Transmitter

SECTION 1

GENERAL DESCRIPTION

GENERAL DESCRIPTION 1

INTRODUCTION

The Control Data TB2A3 Programmable Field Test Unit (PFTU) is a portable self-contained diagnostic tool that simulates the off-line control functions of a disk storage controller. The unit consists of the following major assemblies:

- Keyboard
- Cathode Ray Tube (CRT)
- Power Supply
- Main Control Board
- DMA/SERDES Logic Board
- Interface Board(s)
- Floppy Disk Drive (FDD)

All of the major components are mounted in a light weight aluminum frame which is shock mounted to a suitcase style carrying case (see figure 1-1).

SPECIFICATIONS

Specifications for the PFTU are contained in table 1-1.

FUNCTIONAL DESCRIPTION

The PFTU allows the operator to test a selected interface and drive using diagnostics stored on a flexible disk controlware package. All testing is set up using a displayed set of test parameters. The testing varies depending on the type of interface: non-intelligent (SDI, SMD-0), or intelligent (ISI).

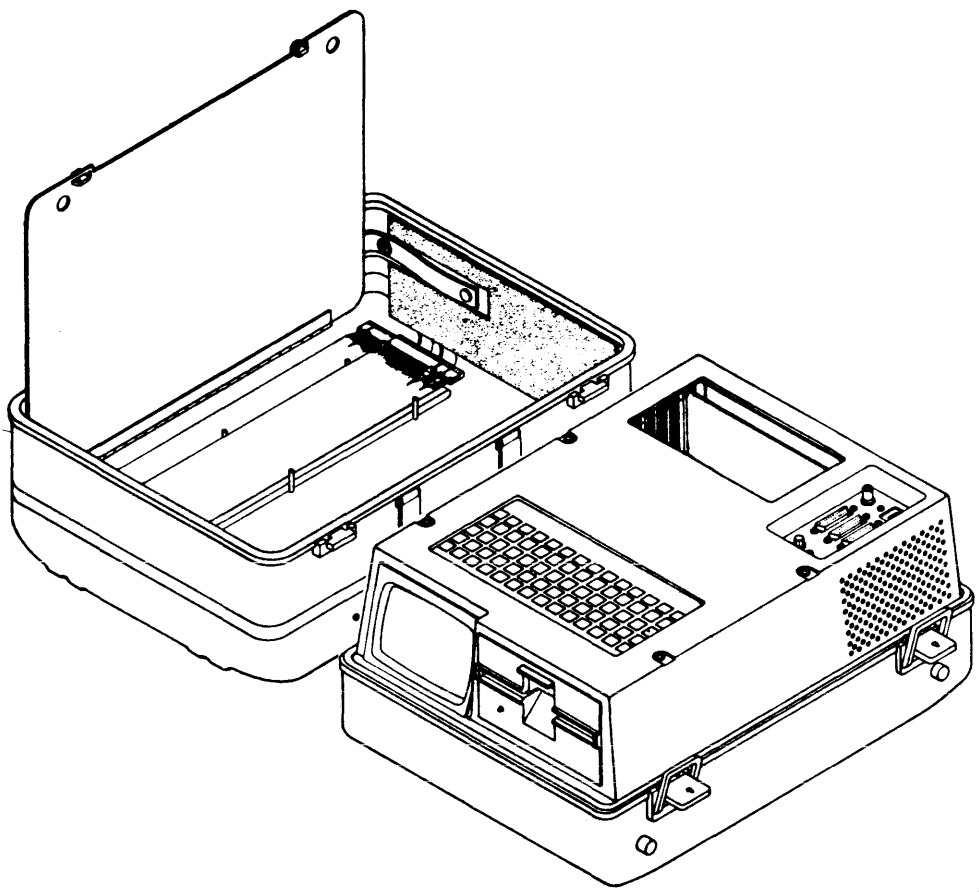

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Figure 1-1. Programmable Field Test Unit

TABLE 1-1. SPECIFICATIONS

CHARACTERISTIC	CONDITION	SPECIFICATION
Size	LXWXH	637 x 319 x 460 mm (18 x 9 x 13 in)
Weight		11.8 kg (26 lb)
Temperature	Operating	10°C to 40°C (50°F to 104°F)
	Gradient	10°C (18°F)
	Non-Operating	-10°C to 50°C (14°F to 122°F)
Relative Humidity (No condensation)	Operating Non-Operating	20° to 80° 10° to 90°
Altitude	Operating	105 kPa to 74 kPa 31 in Hg to 22 in Hg -300 m to 2500 m (-980 ft to 8200 ft)
	Non-Operating	105 kPa to 69 kPa 31 in Hg to 20.3 in Hg -300 m to 3000 m (-980 ft to 10 000 ft)
Input Power	47 to 63 Hz	95 to 130 (±0.2%) V ac at 1.0 A when set to 115 V ac on Voltage Selection Switch. 190 to 260 (±0.2%) V ac at 0.5 A when set to 220 V ac on Voltage Selection Switch
Energy Consumption		85 watts

STANDARD TESTS - NON INTELLIGENT INTERFACES

Standard tests for non-intelligent interfaces must be selected from or entered on a display menu. A set of optional seek and read/write parameters are displayed on two separate menus. A display menu permitting error bypass options is also available.

Bypass Errors Options

The operator may selectively bypass seek errors, header errors, drive faults, data errors, address mark errors, and/or sync errors. Any of these bypasses may be selected individually or collectively to prevent the test from stopping when an error is detected. Bypassed errors are counted and the accumulative count is displayed on the RUN MODE screen during continuous seek and read/write operations.

Seek Mode

The seek mode enables the operator to seek to, or between, cylinder addresses on the disk pack. The operation stops when an error is detected (unless set up to bypass errors), a direct seek is completed or when interrupted by manual intervention.

Direct Seek

This mode performs a seek from a previous (unknown) cylinder location to a cylinder address selected by the operator. The seek is executed once.

Direct Seek - Continuous

The drive performs continuous seeks between the beginning and ending cylinder addresses selected by the operator. Operation stops when an error is detected (unless set up to bypass errors), or when manually interrupted.

Sequential Seek

This mode performs continuous seeks within operator defined low and high cylinder addresses. The operator may change the default value of the seek increment and/or the direction of the increment (forward, reverse, or forward and reverse). Operation stops when an error is detected (unless set up to bypass errors), or when manually interrupted.

X-N Seek

This mode performs alternating forward and reverse seeks within an operator defined range of cylinder addresses. Seek lengths are increased by the operator defined seek increments until both limits of the cylinder range are reached. Then, seeks are performed with decreasing lengths until seeks with a zero length are performed (see figure 1-2). Operation continues until an error is detected (unless set up to bypass errors), or when manually interrupted.

Random Seek

Within an operator selected range of cylinders, this mode performs continuous seeks to a cylinder address generated randomly by the microprocessor. Operation stops when an error is detected (unless set up to bypass errors), or when manually interrupted.

Read/Write Mode

The PFTU is capable of performing the following types of read/write operations:

1. Seek Only
2. Read Data
3. Write/Read Format Data
4. Write/Read Format
5. Write/Read Data
6. Write Format
7. Write Data

Each operation can be performed in any one of three seek modes: Direct, Sequential, and Direct Continuous. Each Read and/or Write operation is completed before the next seek executes.

Except for the Seek Only mode, all testing must begin with a Write Format, Write/Read Format, or Write/Read Format Data operation. A Read Data operation must be preceded by a Write/Read Data or Write Data operation. The operator may format an entire track or write/read data on all sectors or a selected sector on a track.

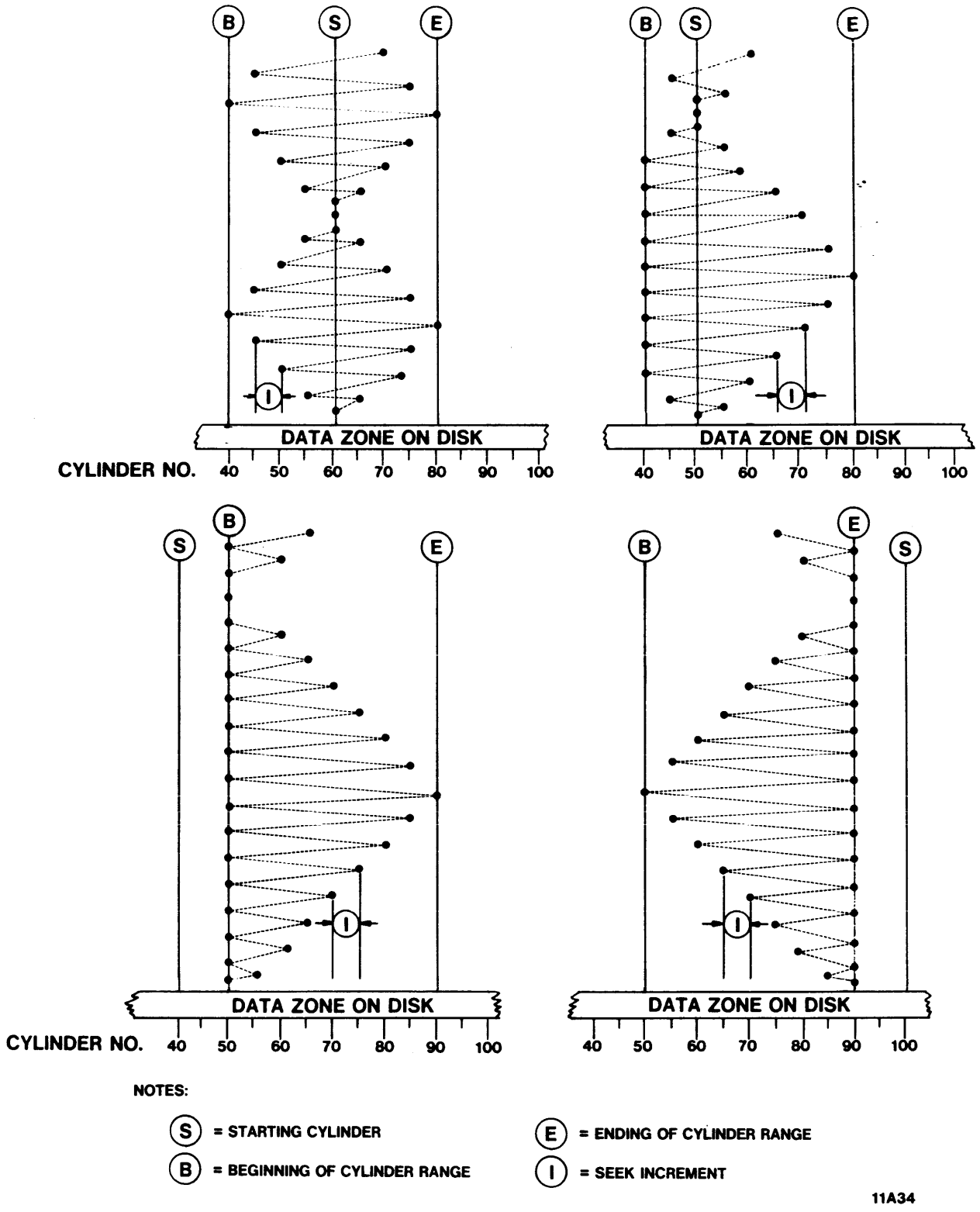

Figure 1-2. Typical X-N Seek Trajectories

Information is transmitted to the drive at a rate determined by the Servo Clock received from the selected drive.

Seek Only

This mode permits operator selection of seek mode functions with no read/write functions active.

Read Data

This mode reads a repeating data pattern, defined by the operator, from selected sector(s) and track(s). A CRC check is performed on the data read from the disk without comparing to data pattern written.

Write/Read Format Data

This mode writes and then reads a pattern consisting of zeros, an address mark, and a header, and also a repeating data pattern, defined by the operator, on selected sector(s) and track(s).

Write/Read Format

This mode writes and then reads a pattern consisting of zeros, an address mark, and a header on selected sector(s) and track(s).

Write/Read Data

This mode writes and then reads a repeating data pattern, defined by the operator, on selected sector(s) and track(s).

Write Format

This mode writes a pattern consisting of zeros, an address mark, and a header on the selected sector(s) and track(s).

Write Data

This mode writes a repeating data pattern, defined by the operator, on selected sector(s) and track(s).

STANDARD TESTS - INTELLIGENT INTERFACE

General

The ISI Standard Tests allow the user to exercise the logic in the CM and attached devices. Most of these tests require that COS be loaded and functioning in the control module being tested. The tests are selected from a display menu and the sequence of testing assumes satisfactory completion of the previous test. The standard test package consists of the following functions and diagnostics listed in the order of execution:

- PFTU Data RAM Test
- ISI Board Wraparound Test
- Display of Connected Units
- Selection of a Unit
- Function Buffer Test
- Display of Connected Drives
- Selection of a Drive
- Non Read/Write Tests:
    - Power Up Spindle
    - Comprehensive Diagnostic Test
    - Load COS
    - Write COS to Disk
    - Write Diagnostics to Disk
    - Data Buffer Test
- Read/Write Test
- Power Down Spindle

PFTU Data RAM Test

This test writes and then reads a pattern in the data RAM. A comparison is made between the written pattern and the pattern read. If a miscompare occurs, the failing data RAM address and the pattern byte are displayed.

ISI Board Wraparound Test

This test sets the diagnostic bit on the DMA/SERDES board, thereby creating a data path from memory, through the ISI board transmitters and receivers, to the MPU where the data is checked. If the test fails, the expected and received patterns are displayed. The user may loop on the test or skip the test completely.

Display of Connected Units

This test is used to determine the number of CMS attached to each PFTU module. The test issues a broadcast master clear, and the bit significant response is read and decoded as CM addresses 0 through 7. Upon receipt of broadcast master clear request, the CM ceases all ongoing operations, initializes all of its command, status, data, and control memories, and also executes some diagnostic confidence tests. These confidence tests are described in the corresponding control module maintenance manual, volume 2.

Selection of a Unit

The function allows the operator to select a control module. The software checks the operator input against the addresses of all attached units. The test proceeds only if the selected CM is attached to the PFTU.

Function Buffer Test

This test performs a write and read of the function buffer in the CM. A selective reset is issued at the beginning of the test, however, the attention bit is not cleared. An active Attention prevents the CM microprocessor from responding to the command blocks. After the write and read are performed and a comparison made, another selective reset is issued to reinitialize the command block memory. The user may loop on this test.

Display of Connected Drives

This function reads the ISI status. The fifth word of the ISI status block defines the drive addresses attached to the CM.

Selection of a Drive

This function allows the user to input a drive address (0-3). The microprogram compares this input with the addresses of the attached drives. The test proceeds only if the selected drive is attached to the unit.

Non Read/Write Tests

Power Up Spindle

This function selects the drive and powers up the spindle motor. The power up sequence includes a diagnostic self test that verifies that the motor comes up-to-speed within the specified time and also performs an abbreviated R/W check on a reserved cylinder to ensure proper disk operation. These tests are described in the corresponding control module maintenance manual, volume 2.

Comprehensive Diagnostics Test

This test performs a complete appraisal of the CM and specified disk drive hardware. The command executes all of the 7X commands except command code 79 (ISI Interface Test) and command code 77 (Defect Test). The execution order of the subtests performed are defined in the corresponding control module maintenance manual, volume 2.

Load COS

This command causes the CM to bootload the COS program from the selected disk drive or the PFTU.

Write COS to Disk

This command transfers a 16 128 byte field update program from the PFTU flexible disk to the CM which, in turn, writes the program onto the area of the selected disk reserved for COS controlware. The entire program is written at two locations on the system cylinder to ensure that a copy is available if the main program is destroyed. The command is optional and may be skipped by the user.

Write Diagnostics to Disk

This command transfers a 16 128 byte field update program from the PFTU flexible disk to the CM which, in turn, writes the program onto the area of the selected disk reserved for the level II diagnostics controlware. The entire program is written at two locations on the system cylinder to ensure that a copy is available if the main program is destroyed. The command is optional and may be skipped by the user.

Data Buffer Test

This test performs a write and read to the CM data buffer. The Load Buffer From Host command is used to perform a write to the 16K data buffer. The Read Buffer To Host command is utilized to perform a read. If an error occurs, the failing address, expected, and actual patterns are displayed. The user may loop on this test.

Read/Write Test

This test executes a write and then a read on a cylinder, head and sector selected by the user. The Write Specified Data Field and Read Specified Data Field commands are used to implement this test. The user may loop on this test or skip it completely.

Power Down Spindle

This command causes the CM to power down the spindle on the selected disk. The command is optional and may be skipped by the user.

EXTENDED TESTS - INTELLIGENT INTERFACE (ISI)

The ISI extended test package repeats certain of the functions and diagnostics included in the standard test package, and also allows the user to execute the full 1X through 7X command set in the CM. The tests must be selected from a display menu. The extended test package consists of the following functions and diagnostics listed in the order of execution:

- PFTU Data RAM Test
- ISI Board Wraparound Test
- Display of Connected Units
- Selection of a Unit
  - Function Buffer Test
  - Display of Connected Drives
  - Selection of a Drive
  - Execution of ISI Command Set

All of the above functions and tests except the Execution of ISI command set are described under Standard Tests. The ISI command set is described in the corresponding CM maintenance manual, volume 2.

The ISI commands are selected from a display menu and may be executed in any order. After executing a command, the full menu of commands is re-displayed and the same or a different command may be selected. If a different CM and/or drive is selected, the entire extended test program must be restarted via a program provided function key entry. All commands are initiated by loading a command block with user provided information.

PHYSICAL DESCRIPTION

The major component assemblies in the PFTU are shown in figure 1-3. The following paragraphs outline the physical characteristics of these component assemblies.

KEYBOARD

The membrane keyboard enables the operator to select test options and parameters. It contains all of the alphanumeric, grammatical and control keys found on a standard typewriter keyboard. In addition, the keyboard contains twelve special function keys (F1-F12).

CATHODE RAY TUBE (CRT)

The CRT displays instructions and test results. It provides a 5 inch (diagonal) display surface for alphanumeric and graphic information. The screen has an external brightness control adjustment knob on the PFTU operator panel.

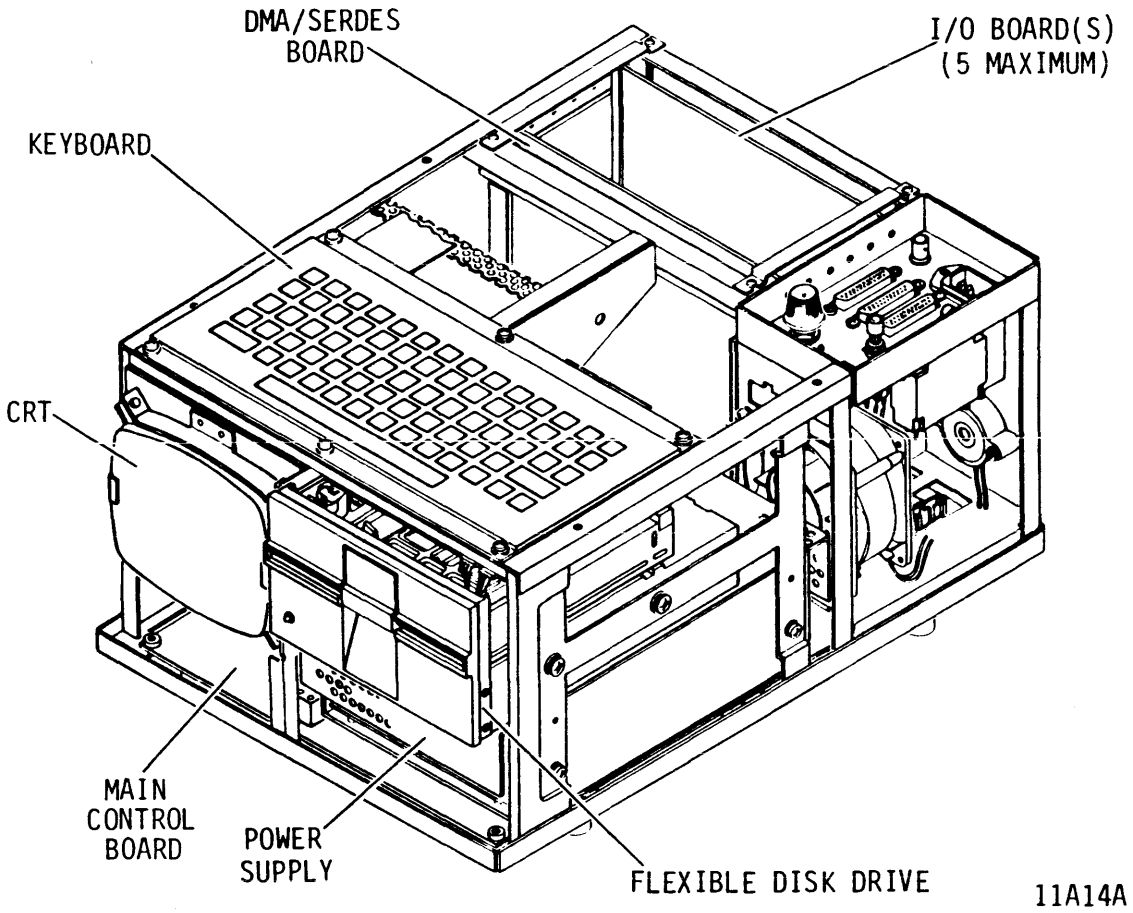

Figure 1-3. Assembly Locator

POWER SUPPLY

The switching power supply generates the ±12 and ±5 V dc voltages required for PFTU operation. It operates from an input source in the range from 95 to 130 V ac or 190 to 260 V ac, and in a frequency range from 47 to 63 Hz. Refer to Voltage Selection in section 2 of this manual.

MAIN CONTROL BOARD

The main control board generates all of the control signals required for tester operation and it also provides a mounting surface for the DMA/SERDES and I/O interface board(s). It consists of a Motorola 6809E Microprocessor and associated peripheral logic.

DMA/SERDES BOARD

The DMA/SERDES board processes read/write data transmitted between the PFTU and the drive being tested. During write operations, it serializes the data (non-intelligent interfaces only), and generates a CRC check character that is appended to the data. During read operations, it deserializes the data (non-intelligent interfaces only) and tests the CRC check character returned with the data for data integrity.

INTERFACE BOARD(s)

The I/O boards interface the data and control information transferred between the PFTU and the drive being tested. A different board is required for each interface protocol.

FLEXIBLE DISK DRIVE (FDD)

The flexible disk drive is used to enter controlware instructions into the PFTU RAM memory. The media is a standard 5.25 inch flexible, removable diskette (two recording surfaces) enclosed in a sealed jacket. An indicator located on the front of the flexible disk drive informs the operator when the unit is selected or in use.

EQUIPMENT CONFIGURATION

GENERAL

The specific configuration of the tester is identified by the equipment identification plate and by the equipment configuration log. It is necessary to correctly identify the equipment's configuration to determine if the manuals being used are applicable to the equipment. The following paragraphs describe the meaning of the equipment identification label, equipment configuration log, and manual to equipment correlation.

EQUIPMENT IDENTIFICATION PLATE

General

This plate is attached to the plastic shroud at the rear of the unit (refer to figure 1-4). This plate identifies the basic mechanical and electrical configuration of the tester at the time it leaves the factory. Certain categories of information contained on this plate are defined in the following paragraphs.

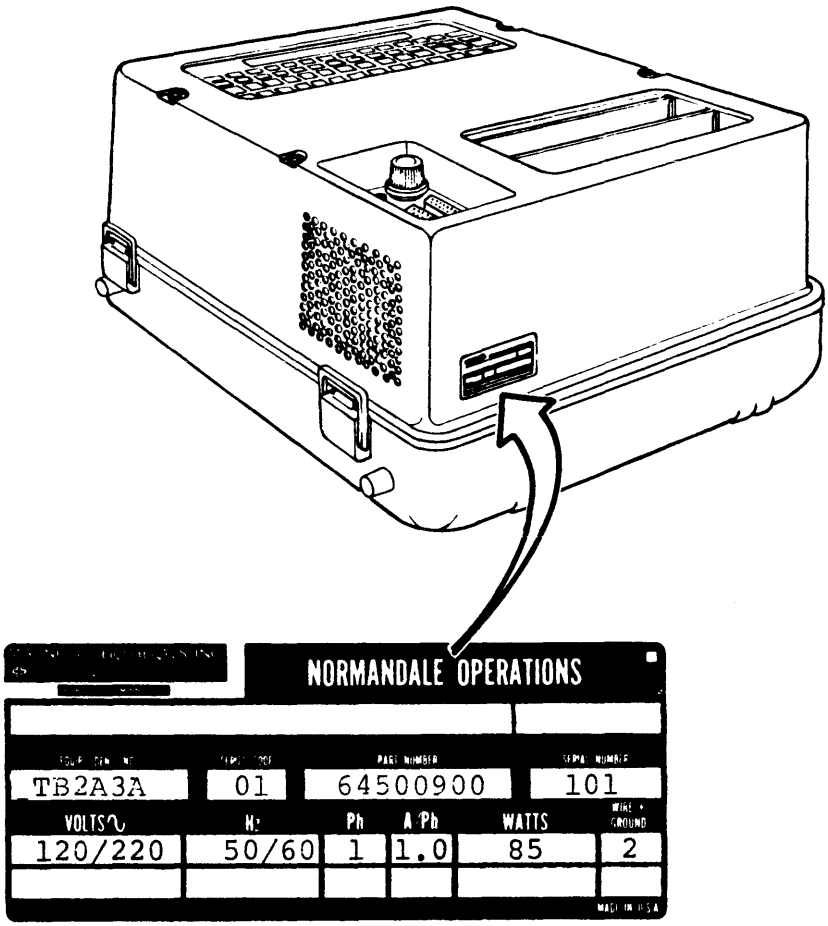

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Figure 1-4. Equipment Identification

Equipment Identification Number

This number is divided into two parts as shown in the example:

EXAMPLE:

Series Code

The series code represents a time period within which a unit is built. While all units are interchangeable at the system level regardless of series code, parts differences may exist within units built in a different series code. When a parts difference exists, that difference is noted in the parts data section of this manual.

Part Number

This number indicates the complete package part number of the equipment. The complete package part number specifies the complete list of parts shipped with the tester, including interconnecting cables, I/O board(s), and flexible disk(s).

Serial Number

Each tester has a unique serial number assigned to it. Serial numbers are assigned sequentially within a family of testers. Therefore, no two equipments will have the same serial number.

EQUIPMENT CONFIGURATION LOG

Engineering Change Orders (ECOs) are electrical or mechanical changes that are performed at the factory and may cause a series code change. When the factory installs an ECO early (prior to a series code change) it is logged on the units configuration log.

Field Change Orders (FCOs) are electrical or mechanical changes that may be performed either at the factory or in the field. FCO changes do not affect the series code but are indicated by an entry on the equipment configuration log that accompanies each machine. The Equipment Configuration log is located on the bottom surface of the CM. The components of a machine with an FCO installed may not be interchangeable with those of a machine without the FCO; therefore, it is important that the Equipment Configuration log be kept current by the person installing the FCO.

MANUAL TO EQUIPMENT CORRELATION

Throughout the life cycle of a machine, changes are made either in the factory build (a series code change) or by ECOs installed in the field. All of these changes are also reflected in changes to the manual package. In order to assure that the manual correlates with the machine, refer to the Manual To Equipment Correlation sheet located in the front matter of this manual. This sheet records all the FCOs which are reflected in the manual. It should correlate with the machine equipment configuration log if all the FCOs have also been installed in the machine.

SECTION 2

OPERATION

OPERATION 2

INTRODUCTION

This section is divided into three parts. The first part contains general information about the PFTU controls and indicators, and also outlines the procedures required to set up the PFTU prior to operation. Part two describes the automatic power up checks. Part three describes the optional procedures used to initiate further testing of the PFTU, and drive testing.

ELECTROSTATIC DISCHARGE PROTECTION

All PFTU electronic assemblies are sensitive to static electricity, due to the electrostatically sensitive devices used within the circuitry. Although some of these devices such as metal-oxide semiconductors are extremely sensitive, all semiconductors as well as some resistors and capacitors may be damaged or degraded by exposure to static electricity.

Electrostatic damage to electronic devices may be caused by a direct discharge of a charged conductor, or by exposure to the static fields which surround charged objects. To avoid damage to PFTU electronic assemblies, service personnel must observe the following precautions when servicing the unit:

- Ground yourself to the PFTU whenever the electronics are or will be exposed. Connect yourself to ground with a wrist strap (refer to Accessories in Section 3 for part numbers). Connection may be made to any metal assembly or to the ground lug on the top center frame member of the PFTU. As a general rule, remember that you, the PFTU, and the circuit cards must all be at ground potential to avoid potentially damaging static discharges.

- Keep boards in conductive bags - when circuit boards are not installed in the PFTU, keep them in conductive static shielding bags (refer to Accessories in Section 3 for part numbers). These bags provide absolute protection from direct static discharge and from static fields surrounding charged objects. Remember that these bags are conductive and should not be placed where they might cause an electrical short circuit.

- Remove boards from bags only when you are grounded - all boards received from the factory are in static shielding bags, and should not be removed unless you are grounded.

- Turn off power to drive before removing or installing any circuit boards.

- Never use an ohmmeter on the _GKN board.

GENERAL OPERATING INFORMATION

GENERAL

The PFTU must be properly configured prior to the start of testing. Items to be considered include:

- Use of Switches/Indicators and Auxiliary I/O Connectors

- Voltage Selection

- Controlware/Interface Selection

- I/O Cabling

SWITCHES AND INDICATORS

Table 2-1 contains a functional description of the switch/indicators and auxiliary I/O connectors located on the PFTU (see figure 2-1). All switch/indicators except the flexible disk drive activity indicator, and the keyboard are located on the operator panel.

VOLTAGE SELECTION

The PFTU can operate in the range from 95 to 130 V ac on the 115 V setting of the Voltage selection switch, or in the range from 190 to 260 V ac on the 220 V ac setting of the Voltage Selection switch. The power supply can accommodate a range of frequency from 47 to 63 Hz.

TABLE 2-1. SWITCH/INDICATORS AND AUXILIARY CONNECTORS

Description	Function
Power On/Off (1/0 Switch) and Circuit Breaker	This switch controls application of power to all circuit components.
RESET Switch	This momentary switch is used to initiate a master clear of all registers and control logic. Pressing the Reset switch following a malfunction causes the microprocessor to over-write the data stored in RAM, and re-initiate the power up self tests. Pressing the RESET switch at other times re-displays the power up menu but does not alter RAM.
BRIGHTNESS Control	This control permits the operator to adjust the brightness of the CRT.
Voltage Selector Switch	This switch allows the operator to select the operating voltage for the PFTU. Refer to Voltage Selection description. NOTE: The PFTU must be connected to source power using the power cord supplied with the unit.
Activity Indicator	Indicates that the flexible disk drive is selected and/or in use.
Keyboard	The keyboard permits the operator to interact with the controlware to select tests and test parameters. The software supports uppercase alpha characters, numerics, control keys, and special function keys.
Audible Indicator	The audible indicator sounds to inform the operator of a problem at such times when the CRT is not functioning or is unreliable. It may also sound at other times to indicate a problem. The indicator also sounds when a key on the keyboard is pressed unless the operator has disabled this feature (refer to Initialization Options).

Table continued on next page

TABLE 2-1. SWITCH/INDICATORS AND AUXILIARY CONNECTORS (Contd)

Description	Function
J1 Connector	Local Technical Assistance Data Communications Equipment (USART) port: Allows local communication via the RS232 interface. Transmission speeds may be selected from the following baud rates: • 300 bps • 600 bps • 1,200 bps • 2,400 bps • 9,600 bps • 19,200 bps
J2 Connector	Remote Technical Assistance Data Terminal Equipment (USART) port: Allows communication via the RS232 interface to a remote location. Transmission speeds may be selected from the following baud rates: • 300 bps • 1,200 bps
J3 Connector	Software Downloading Data Terminal Equipment (UART) port: Used for software downloading from a modem or other communications device. Transmission speeds may be selected from the following baud rates: • 110 bps • 300 bps • 600 bps • 1,200 bps • 2,400 bps
ANALOG IN Connector	Used for input of an analog voltage in the range from -5 V to +5 V.

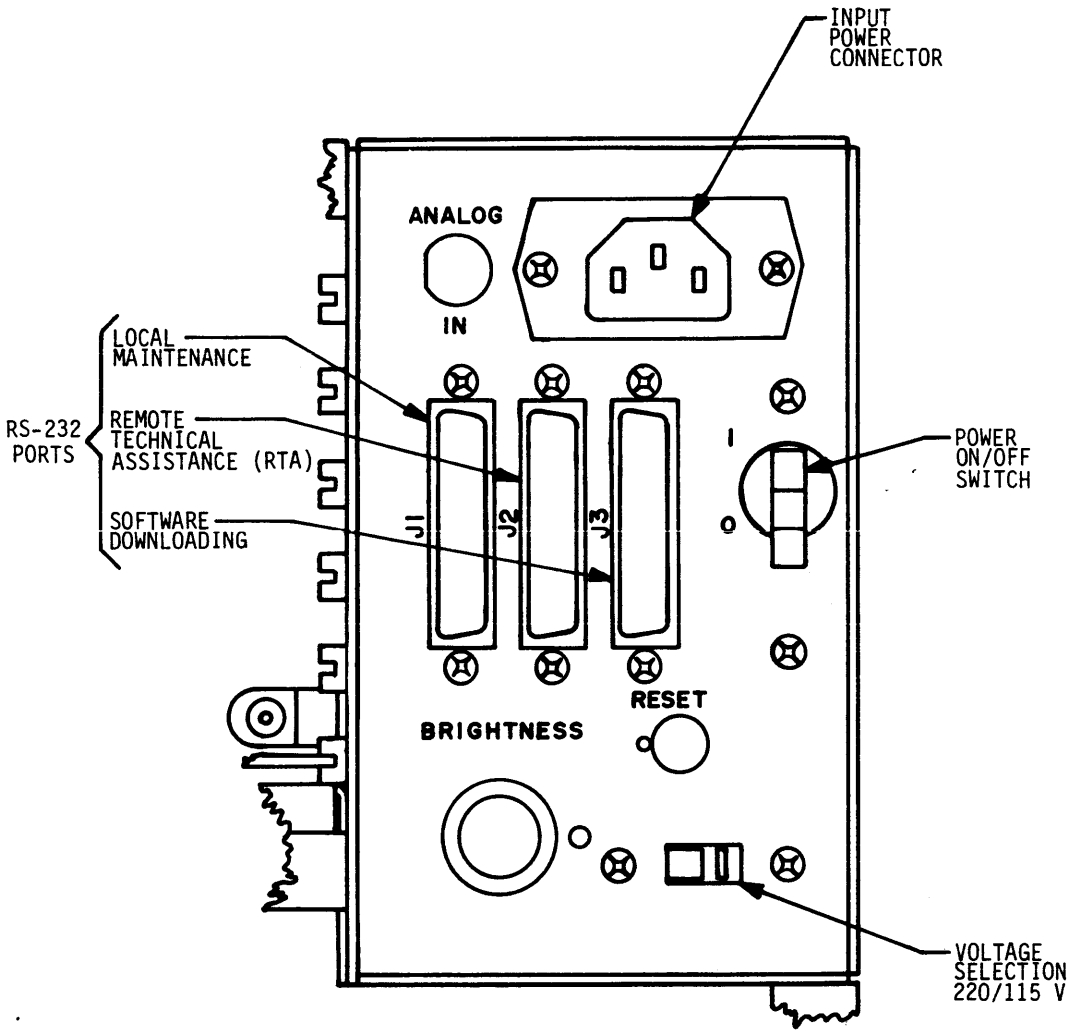


Figure 2-1. Controls and Indicators

CONTROLWARE/INTERFACE SELECTION

NOTE

Only one interface board may be installed in the unit at a time. When switching to another interface, the previous interface board must be removed before installing the new one.

The operator must install the proper interface board (if not already installed) and corresponding flexible disk controlware package in the PFTU to enable testing on a selected drive interface. Refer to Accessories in section 3 for part numbers.

Refer to Electrostatic Discharge Protection heading for precautions to be taken when installing or removing interface cards in the PFTU. Figure 2-2 shows the location of the grounding jack on the PFTU.

I/O CABLING

The cabling configuration for the PFTU varies with the device type and interface type being tested. The cables are shown in figure 2-3. Refer to section 3 for part numbers. For signal information on the cables, refer to the diagrams section in volume 2 of the maintenance manual (Pub. No. 83324750). For information on installing cables and terminators into the drive, refer to the applicable drive manual.

POWER UP CHECKS

On power up, the microprocessor (MPU) in the PFTU automatically executes a series of tests to check on the operations of the logic associated with the MPU.

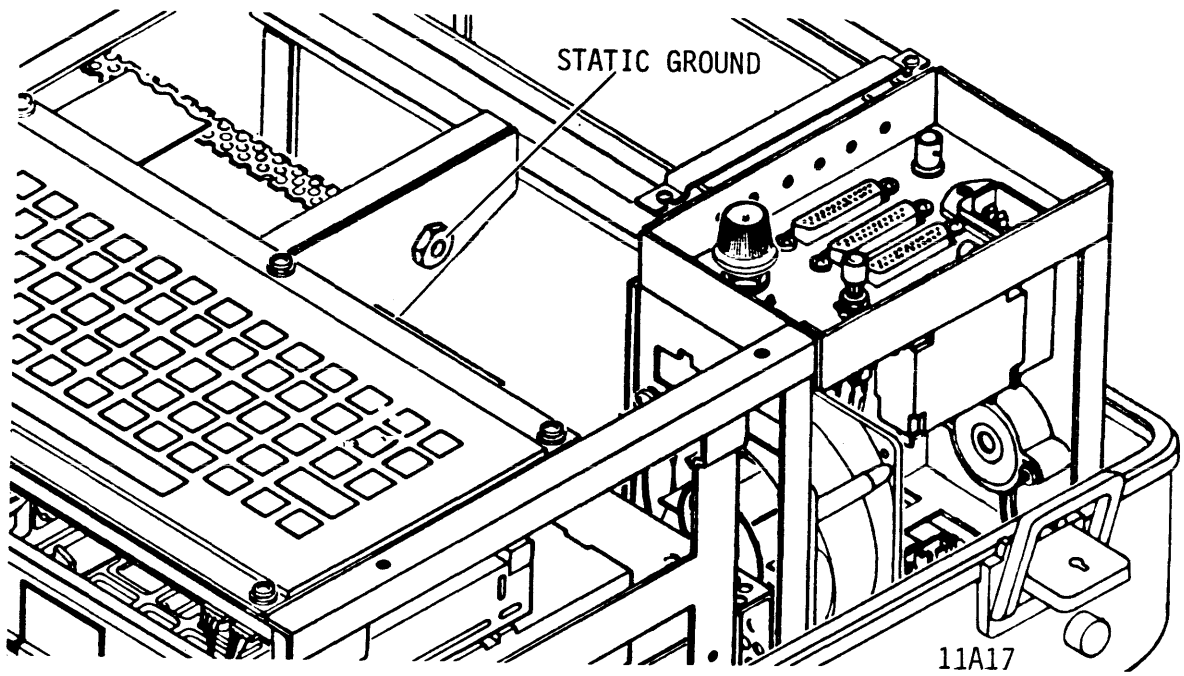


Figure 2-2. Safety Grounding

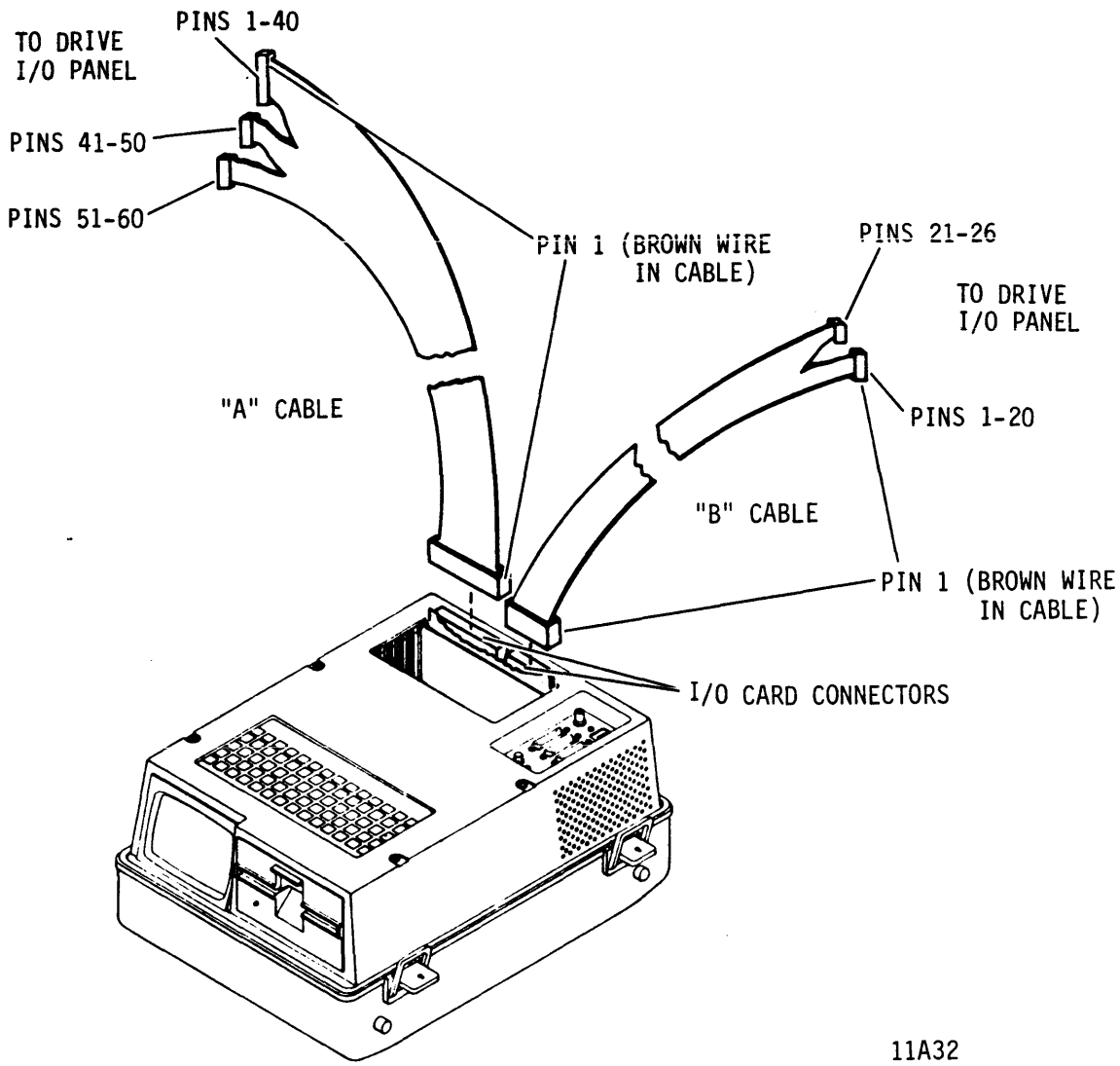


Figure 2-3. I/O Cable Attachment

Testing starts with a check of the ALU and control logic. A failure causes the audible indicator to sound constantly, and PFTU operation stops.

Assuming no failures, the MPU checks static (display) memory by writing and then reading a pattern of all "5"s and all "A"s. A static memory-failure causes the audible indicator to sound at 1/4 second intervals, and PFTU operation stops.

After successful completion, the MPU initializes static memory with control information, initializes all control hardware, and displays the message "Executing Power Up Self Tests" and "Copyright Motorola, Inc. 1981".

The MPU now checks dynamic memory by verifying that the parity generation/checking logic is operating properly. A failure causes the PFTU to stop and display the message "Parity Detection Circuit Failure". The audible indicator sounds constantly until the parity error is cleared. If the test is successful, the MPU initializes dynamic memory. The initialization consists of writing and then reading the following data patterns:

a) Using the 16 bits of all address locations (0000- FFFF) as data, enter the upper 8 bits into successive even memory locations, and the lower 8 bits into successive odd memory locations.

b) Enter all "1"s

c) Enter all "A"s

d) Enter all "5"s

e) Enter all "0"s

All memory locations are written using forced correct parity with no parity checking during read. If a data error is detected, the PFTU stops and displays the message "Memory Failure Detected At Address XXXX YY ZZ".

XXXX = Failing address
YY = Expected value
ZZ = Actual value

TESTING DRIVES USING PFTU

GENERAL

The PFTU is used to set up, execute, and monitor commands that exercise specific drive functions. To maximize tester usefulness as a troubleshooting tool, the following information should be reviewed and understood before conducting tests on a drive:

- Consider the test mode descriptions presented earlier in this manual and how they apply to the drive being tested.
- Examine the descriptions/procedures for available initialization options presented later in this section.
- Refer to the appropriate controlware function chart for the drive interface being tested.

TEST MODE DESCRIPTIONS

Refer to the functional descriptions for the various test modes available for use on the drive being tested. Separate test mode descriptions are presented for either non-intelligent or intelligent interface drives. Determine which of these two categories applies to the drive being tested and decide on the test mode parameters necessary to exercise a function or group of functions within the drive.

INITIALIZATION OPTIONS

Refer to the list of initialization options available as presented later in this section and prepare to load controlware into the tester from the floppy disk. Perform the procedure that loads controlware from floppy disk to initiate testing on the drive being tested.

CONTROLWARE FUNCTION CHART

This chart describes how to move from one display to another and the range of entries available within certain highlighted parameters. Messages displayed on the CRT provide further instructions necessary to set up and run tests. Figure 2-4 is an example of a controlware function chart and explains the format. The following paragraphs explain how to use the controlware function chart (figure 2-5).

Before using the chart, ensure that the controlware loading is completed and an introductory display showing the desired interface name (SMD-O, SDI, or ISI) with a flashing "PFTU" indication appears on the CRT. This introductory display is the normal starting point for all operations performed by the tester.

As shown on the chart, pressing the F6 function key advances to the next display entitled "Device Selection". From this point on, the operator can select and monitor a variety of self tests or drive tests as shown in figure 2-5. After completing selected tests on a drive, the operator can deselect and reinitiate testing on another drive in the string. If more than one type of device is connected in the string, the device type parameter on the "Device Selection" display must be changed to reflect the drive being tested.

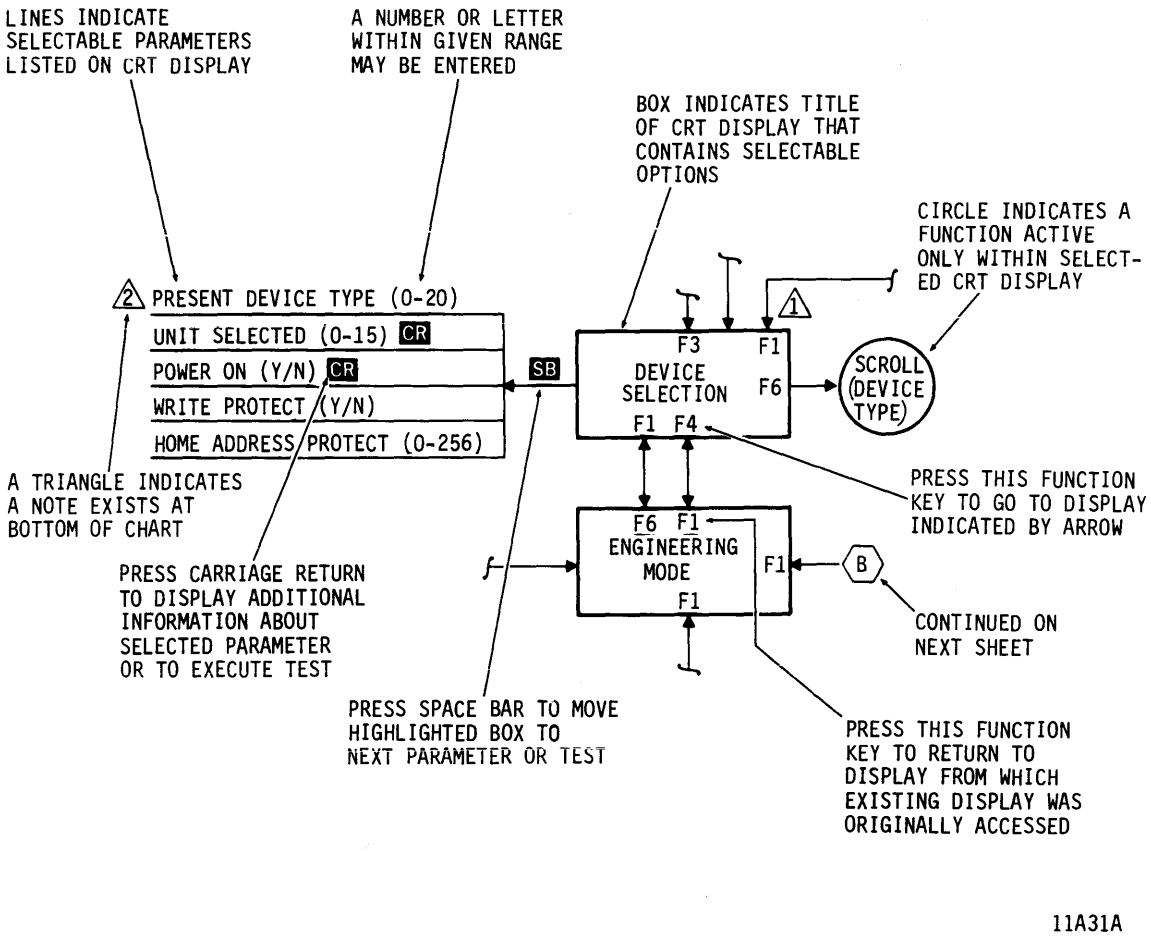


Figure 2-4. Example of Controlware Function Chart

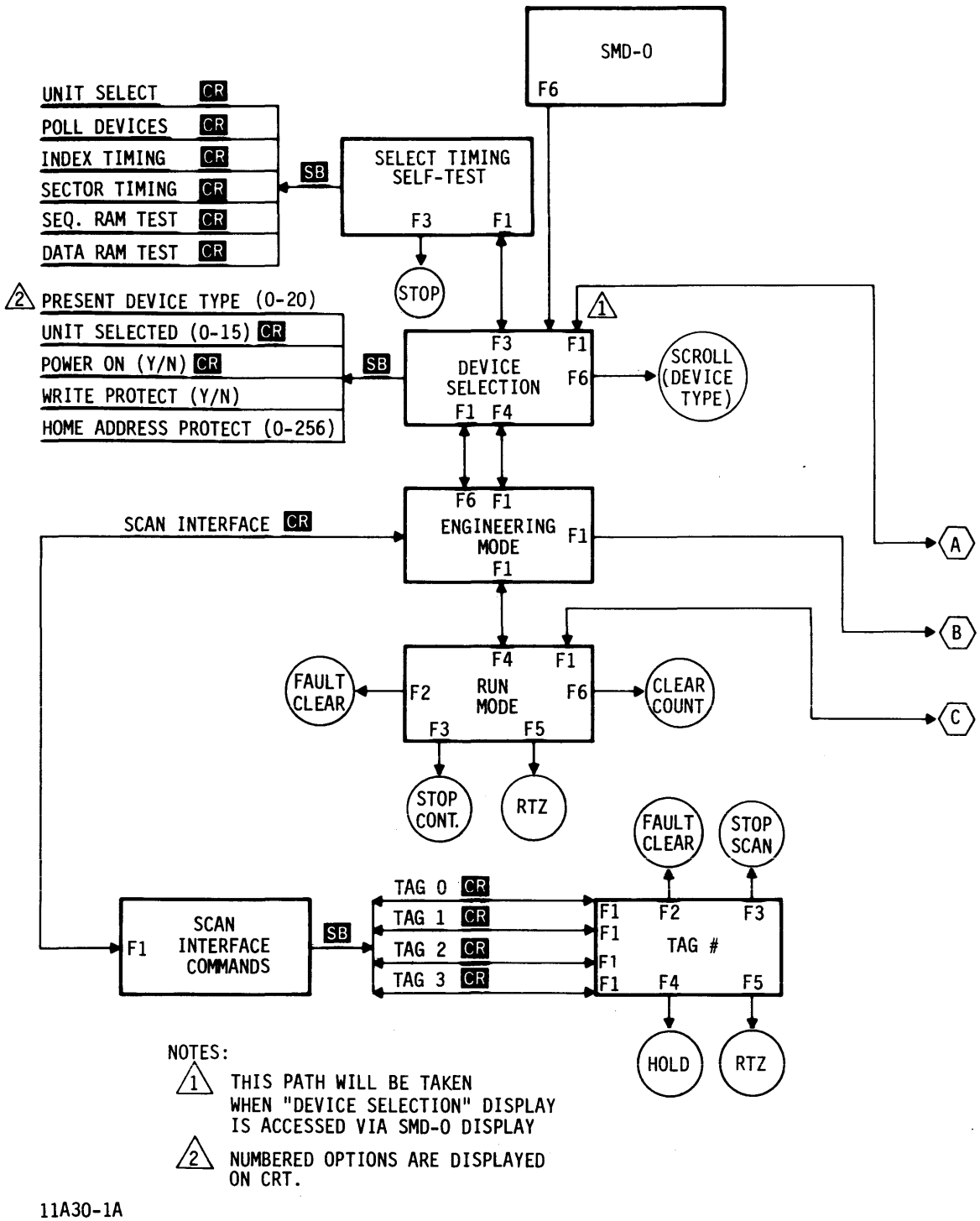


Figure 2-5. SMD-O Interface Controlware Function (Sheet 1 of 2)

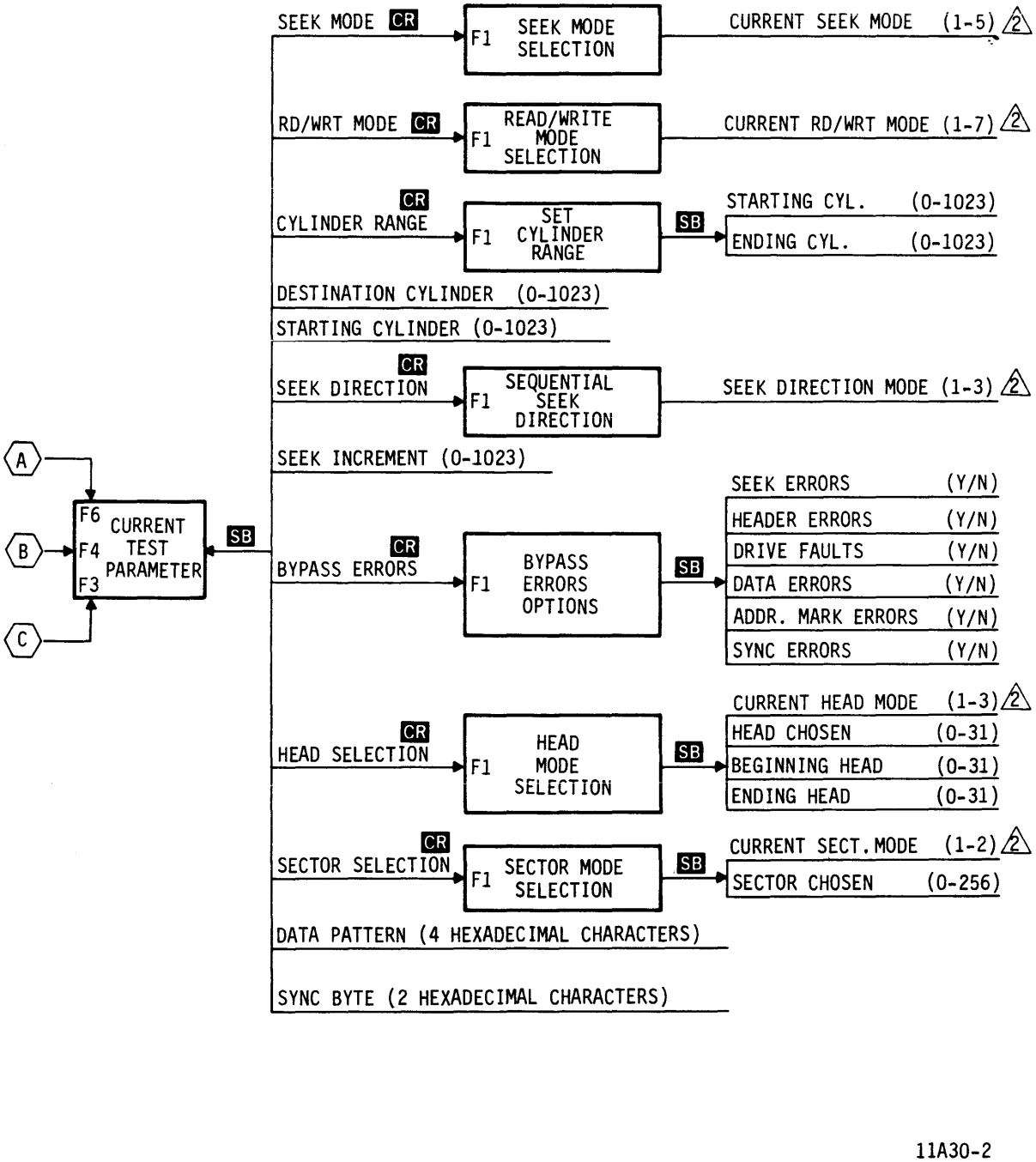


Figure 2-5. SMD-O Interface Controlware Function (Sheet 2)

The "Current Test Parameters" display shows the current parameters for the main driving routine from which all other displayed test routines are accessed. During typical tester operations, this display is accessed immediately after completing entries on the "Device Selection" display. By moving the highlighting box to any current test parameter, changes may be made to the selected parameter as required to accomplish the desired test function(s).

When the "Run Mode" display is accessed, it immediately attempts to perform the test(s) defined by the information contained on the "Current Test Parameters" display. The active seek mode and read/write mode are reported on the "Run Mode" display. Variable counts of "Seeks Attempted", "Rd/Wrt Attempted", "Cyl" (cylinder number), "Head" (head number), and "Errors" are also shown on the "Run Mode" display and are updated as they occur. A flashing "Running" message will appear on the display when continuous tests are being performed. Test execution will stop or continue to run when an error is encountered depending on "Bypass Error Options" selected. Test execution may also be stopped by pressing any of the function keys listed on the bottom of the CRT display. A flashing "Stopped" message will appear on the display when one of the listed function keys are pressed. When this happens, the F3 function key is automatically redefined as the "Cont" (continue) key. Pressing the F3 key while a test is stopped will cause testing to resume.

The "Engineering Mode" display allows the operator to monitor interface status by enabling "Scan Interface Commands". Any of the various tags listed on this CRT display may be selected and the status lines scanned to display the results of the tags issued.

INITIALIZATION OPTIONS

GENERAL

Upon successful completion of the power up checks, the parity detection circuit is enabled and the message "Select Initialization Option" is displayed with the following menu:

"1) Match Line Frequency (50/60 Hz)"

"2) Run Self Test Diagnostics"

"3) Load Controlware From Floppy Disk"

"4) Clean Floppy Disk Heads"

"5) Toggle Keystroke Entry Acknowledge"

MATCH LINE FREQUENCY

This option is provided to permit the user to match the CRT refresh rate to the frequency of the room lighting. The following message is displayed "Do you Want to Change To XX Hz". XX = "50" on 60 Hz unit or "60" on 50 Hz unit. Reply "Y" or "N". After the reply, the display returns to the menu. The unit is configured at the factory to default to 60 Hz operation.

RUN SELF TEST DIAGNOSTICS

General

NOTE

When running the self test diagnostics, the I/O Card installed in the unit must be switched off.

If menu option 2 is selected, the following menu is displayed:

"A) ACIA Check"

"B) Burn-In Check"

"C) CRC Check"

"D) Disk Check"

"K) Keyboard Check"

"M) RAM Check"

"U) USART Check"

"V) CRT Check"

"X) Exit Self Tests"

ACIA Check

This diagnostic checks the data transfer on the Asynchronous Communications Interface Adapter (ACIA) chip. Prior to running the test, pins 2 and 3 on RS-232C port J3 must be jumpered using the single channel RS-232 jumper. Refer to Section 3 for part number. The check has four possible responses as follows:

1. On successful completion, an asterisk is displayed to prompt the user to select the same or another menu option. If unsure of the menu choices, pressing RETURN will display the menu.

2. If a transmitter error occurs, the message "ACIA-TX-TIME-OUT" is displayed.

3. If a receiver error occurs, or the jumper is not installed, the message "ACIA-RX-TIMEOUT" is displayed.

4. If the transmitted data does not match the received data, the message "XX YY" is displayed where XX = the expected data, and YY = the actual data.

All data transmission is performed at 2400 BAUD.

Burn-In Check

This diagnostic combines the RAM check (except Walking Bit Test) and the Disk Check. This test requires a formatted scratch diskette due to the destructive nature of some of the tests. Refer to description of these tests for operating instructions and displays. The addresses of the failing memory locations and the disk errors are dynamically displayed. Counts are accumulated and displayed. Testing is continuous. To exit, press RESET.

CRC Check

This diagnostic performs a cyclical redundancy check (CRC) over a user specified memory range using the polynomial $X^{16} + X^{12} + X^5 + 1$. The check starts with the ending address specified by the user, and finishes with the beginning address specified by the user. When finished, the test displays the following message "CRC XXXX" where XXXX = result of CRC computation. This code is provided for reference only and is useful only to factory personnel, or other persons seeking to analyze or alter the contents of memory.

Disk Check

General

This checks to ensure that the diskette reader is functioning. The test requires a formatted scratch diskette due to the destructive nature of some of the tests. A utility routine is provided on the controlware package to allow the operator to format a scratch floppy disk. Refer to Accessories in section 3 for part number of blank flexible disk. The Disk Check menu is as follows:

"1- Wrt/Rd Test (Destructive)"

"2- Read for CRC (Non-Destructive)"

"3- Worst Case Trk/Sctr Access (Non-Dst)"

"4- Worst Case Data Pattern (Destructive)"

"5- Sctr/Drive Uniqueness (Destructive)"

The operator must respond first to the question "WHICH DRIVE (0, 1, B)?". The response must be "0". The operator must then respond to the question "ALL THE TESTS (Y/N)?" A "Y" response will cause all five tests to be executed. An "N" response will display "TEST #", where # = a number from 1 to 5 that must be entered by the operator. If the "Y" response is chosen, the tests loop indefinitely. To exit, press RESET. Disk errors are dynamically displayed. Error counts are accumulated, and displayed.

Test Descriptions

Write/Read test (destructive): Beginning with track 0, sector 1, pseudo-random data is written/read one sector at a time until all the sectors have been tested. If a verify error occurs, an error code will be displayed along with drive (drive 0), track, and sector number.

Read for CRC (non-destructive): Starting with track 0, sector 1, all the sectors are read for CRC only. If an error occurs, the drive (drive 0), track, and sector numbers are displayed.

Worst case track/sector access (non-destructive): This test is used to ensure track position reliability under worst case application. Beginning at track 0 sector 1, 10 sectors are read for CRC. Then the last 10 sectors of the last track are read for CRC. This process is repeated for the next 10 sectors in both directions, until all the sectors have been tested. Ten sectors are read to ensure track overflow. Any error will be displayed as drive (drive 0), track, and sector number.

Worst case data pattern (destructive): Beginning with track 0, sector 1, all the sectors are written with a worst case bit pattern (4DB2). They are then read back to check their CRC. Any error will be displayed as drive (drive 0), track, and sector number.

Sector/drive uniqueness (destructive): Each contiguous sector is written with its own sector and drive unit number (drive 0). The head is returned to track zero and each sector is read to ensure uniqueness.

Error Messages

Table 2-2 lists and describes the error codes that can occur during disk check.

TABLE 2-2. DISK CHECK ERROR CODES

Error Code	Description
EO	No Errors - This status indication is returned when no errors have occurred in the disk operation.
E1	Data CRC Error - This status is returned when the CRC following the data is in error. This error would occur after the sector has been read, and if appropriate, written into memory. Possible causes of this error include miswriting and misreading the data and/or CRC. The operating system will attempt to read the sector five times before returning this error.
E2	Disk Write Protected - This status is returned whenever an attempt is made to write to a diskette that is write protected (the diskette has the write protection tab).
E3	Disk Not Ready - This status is returned when an operation is attempted with a disk that is not ready. Possible causes of the not ready status include the flexible disk drive door is not closed, the diskette is not up to speed, or the diskette has been inserted into the flexible disk drive with the wrong orientation. Refer to Load Controlware From Floppy Disk heading in this section.
E4	Read Deleted Data Mark - This status is returned when an attempt is made to read a sector that is prefaced by a deleted data mark. The sector will not be read into memory or written onto another area on the diskette. A possible cause of this status is that a deleted data mark was intentionally written to the sector without properly updating data mark directory.

Table Continued on Next Page

TABLE 2-2. DISK CHECK ERROR CODES (Contd)

Error Code	Description
E5	Timeout - This status is returned when the track address has not been found after five attempts. Possible causes of this error include attempting to read or write a bad track or sector or an unformatted disk. Reformatting the disk may eliminate this error. This error may also occur as a result of bad head alignment.
E6	Invalid Disk Address - The operating system requests to read or write information that is outside the range of the media.
E7	Seek Error - This error occurs if a return to zero is completed incorrectly or track zero is found before a seek operation is completed.
E8	Data Mark Error - This error occurs if a valid data mark for the sector being read has not been found. This error message occurs before the sector is read and prevents the sector from being read. The operating system will attempt to read the sector in error five times before returning this error message. Possible causes of this error include misreading or miswriting the disk.
E9	Address Mark CRC Error - This error occurs when the CRC of an address mark is incorrect. This error occurs before the sector is read or written, and stops the operation in progress. Possible causes of this error include miswriting the address mark or its CRC when formatting the disk, or misreading the address mark or its CRC. The operating system will attempt to read the sector in error five times before returning this error message.

Table Continued on Next Page

TABLE 2-2. DISK CHECK ERROR CODES (Contd)

Error Code	Description
EA	Partial Sector Uniqueness Error - This error indicates that the same data information has appeared in the first eight bytes of two or more sectors. This error can occur only during self testing.
EB	Full Sector Uniqueness Error - This error indicates that the same data information has appeared throughout two or more sectors. This error can occur only during self testing.
E@	Verify Error - This error indicates that the information read from the flexible disk did not match the information written on the disk. In addition to the error code, the drive (drive 0), track, and sector number are also displayed. This error can occur only during self testing.

Keyboard Check

The keyboard check is used to test the ability of the keyboard to erase a string of characters displayed on the CRT.

After selection, the CRT displays the message "Keyboard Check" and asks the question "Keyboard With Lower Case Keys?". The operator must respond with N (upper case alpha, numeric, and grammatical keys). If by accident, the operator responds with Y, the test will not complete. To abort the test, the operator must press RESET.

Two tests are executed. The first test requires the operator to hold the CTRL key down continuously while typing each char- acter displayed on the screen. The display for each character disappears from the screen as the corresponding key is struck. All characters must be erased to continue. Afterward all characters reappear on the screen. The second test requires only that the operator press the key corresponding to the display character to cause it to disappear from the screen.

At the conclusion of the keyboard check an asterisk is displayed to indicate that the operator is free to select the same or another menu choice (A-D, K, M, U, V, X). If unsure of the choices, press RETURN to display the menu.

RAM Check

General

This diagnostic writes and then reads three test patterns in RAM memory to ensure proper operation. The operator can select the beginning and ending locations for testing; however, locations 0000-0100 and E000-FFFF are forbidden and cannot be checked. The test patterns are as follows:

"1- Walking Address Test"

"2- Bit Pattern Test"

"3- Walking Bit Test"

Test Descriptions

Walking Address Test: This test uses the 16-bits of the selected address locations as data. The upper 8-bits of the address are entered into successive even memory locations. The lower 8-bits of the address are entered into successive odd memory locations.

Bit Pattern Test: This Test writes and then reads memory using the following data patterns:

- Enter all "F"s
- Enter all "A"s
- Enter all "5"s
- Enter all "0"s

NOTE

The Walking Bit Test can take up to 29 hours to complete depending on the amount of memory tested.

Walking Bit Test: This test starts by erasing a section of memory. Afterward one bit in one memory location is turned on followed by a check to ensure that all remaining bit locations remain at "0". The entire process is repeated after moving the logic "1" to a different location in the same word. Testing continues until all bit locations in all memory locations have been tested.

Test Parameters

After selection the diagnostic displays the message "RAM Check" followed by "BEG XXXX" where XXXX= the last value entered for beginning address. If a new beginning address is desired the operator can select a new address by entering a four digit number after the displayed address. Pressing RETURN causes the MPU to advance to the "END ZZZZ" display where ZZZZ = last value entered for ending address. Here again the operator may enter a new ending address.

If any attempt is made to write into the forbidden memory area the CRT displays the message "Don't Overwrite Program Stack" and then gives the operator another chance to choose valid memory addresses.

Test Execution

Assuming all valid entries, the PFTU asks the question "Include Walking Bit Test" (Y or N). Afterward, testing begins. If any test fails, the CRT displays the failing address, what should have been in memory at this address, and the actual contents of the memory address.

USART Check

The USART Check tests the operation of the Universal Synchronous/Asynchronous Receiver/Transmitter chips. Prior to running the test, the operator must connect a jumper between RS-232 ports J1 and J2. Refer to Section 3 for part number of jumper cable. The check has four possible responses as follows:

1. On successful completion, an asterisk is displayed to prompt the user to select the same or another menu option. If unsure of the menu choices, pressing RETURN will display the menu.

2. If a transmitter error occurs on port J1 the message "LTADCE-USART-TX-TIMEOUT" is displayed. The same error on port J2 will display "RTADTE-USART-TX-TIMEOUT".

3. If a receiver error occurs on port J1, the message "LTADCE-USART-RX-TIMEOUT" is displayed. The same error on port J2 will display "RTADTE-USART-RX-TIMEOUT".

4. If the transmitted data does not match the received data, the message "XX YY" is displayed where XX= the expected data and YY= the actual data.

All data transmission is performed at 9600 BAUD.

CRT Check

This diagnostic displays three patterns on the CRT screen to ensure that the full area is available for use.

The first display is a checkerboard pattern followed by a checker board pattern with overlaid cross-hatches (#). The checkerboard background then drops out leaving only the cross-hatch pattern.

The second display consists of the ASCII character set displayed in high resolution in a marching line pattern where each line consists of one character repeated 80 times (white on black). The entire character set is then repeated at 40 characters to a line in low resolution using inverted video (black on white).

The third display consists of cursor movement in a clockwise direction (first in high resolution and then in low resolution) around the perimeter of the screen.

Exit Self Tests

This menu option returns the display to the five menu options described under MPU Initialization Options.

LOAD CONTROLWARE FROM FLOPPY DISK

The following procedure describes the steps that must be performed to initiate testing on a selected drive using the normal drive interface. It is assumed that the operator is thoroughly familiar with the information on cabling, voltage selection, use of switches and indicators, and controlware selection presented at the beginning of this section. The proper interface board must be installed and the I/O cables must be connected to the PFTU and the drive prior to applying power. Apply power to the PFTU and to the drive(s) being tested, then proceed as follows:

1. Set the power switch on the interface board to on.

2. Set the LOCAL/REMOTE switch on the drive to REMOTE and set the start switch to the ON position.

3. Select menu option number 3 on "Select Initialization Options" display. In response to the resulting message on the CRT display, insert the proper flexible disk package, close the door on the flexible disk drive, and press RETURN (see figure 2-6). At this time the microprocessor loads the disk operating system and displays the description of controlware programming parameters.

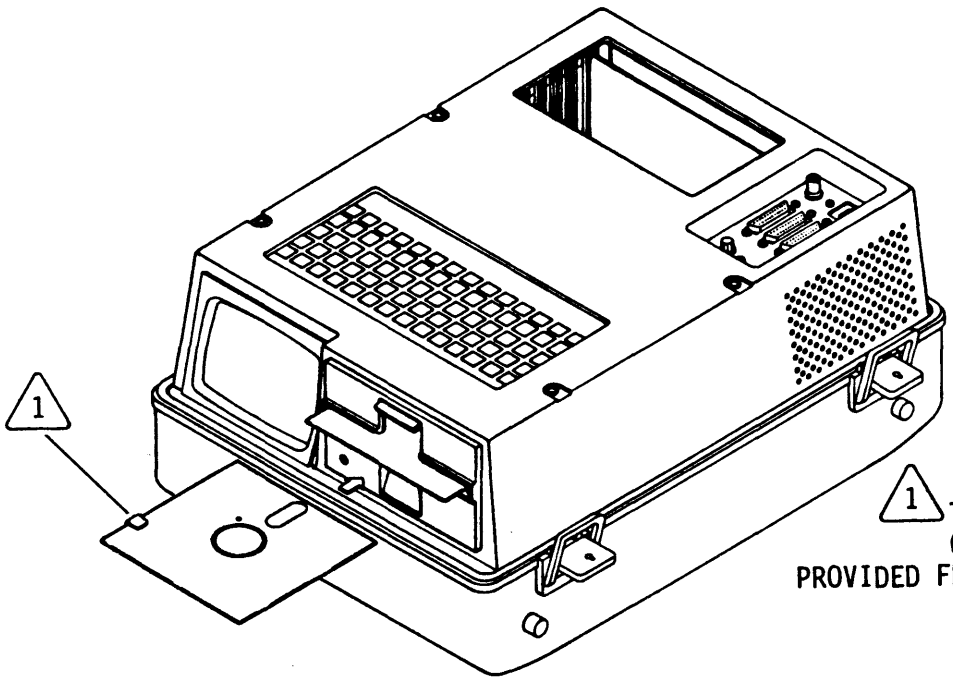


Figure 2-6. Floppy Disk Orientation

4. To complete controlware loading and proceed with program execution, enter the alphanumeric program name listed on the flexible disk I.D. label. When entered the name will appear after the equal (=) sign located at the bottom of the display (see figure 2-7). An introductory display showing the interface name (SMD-0, SDI, or ISI) with a flashing "PFTU" indication appears when controlware loading is successfully completed.

CLEAN FLOPPY DISK HEADS

NOTE

Head cleaning is not a required procedure on the PFTU. It is included here only for use on units that have been subjected to unusual environmental conditions.

The head cleaning procedure requires the use of a head cleaning kit. Refer to Accessories in section 3 for part number of head cleaning kit. Instruction for using the head cleaning kit are included with the kit. After inserting the disk in the flexible disk drive, the head cleaning routine performs a load operation and then retracts the heads after 20 seconds.

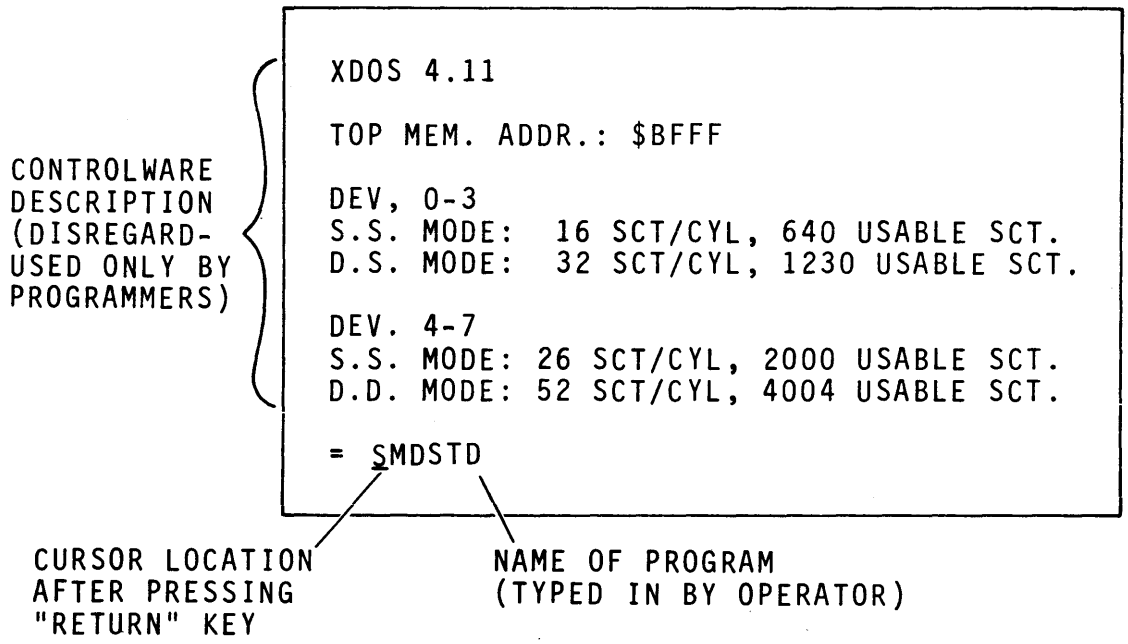


Figure 2-7. Controlware Initialization Display

TOGGLE KEYSTROKE ENTRY ACKNOWLEDGE

Menu option 5 permits the user to disable the audible indicator from sounding during key entry. Selecting the option a second time reactivates the indicator.

SECTION 3

PARTS DATA

PARTS DATA 3

INTRODUCTION

This section provides replaceable part information for the TB2A3 Programmable Field Test Unit (PFTU).

Information in this section falls into four categories:

Illustrated Parts Breakdown - This breakdown provides part number information for all field replaceable items.

Spare Parts List - This is a list of recommended spare parts.

NOTE

Parts listed in the illustrated parts breakdown, but not in the spare parts list, may be long lead time items subject to significant delays.

Accessories - This section provides part number and description for all accessories shipped with the PFTU.

Card Interchangeability Charts - This section provides location, part number, and revision information for all field replaceable cards. All cards shown are also Engineering Recommended Spare Parts.

SECTION 3A

ILLUSTRATED PARTS BREAKDOWN

GENERAL

The Illustrated Parts Breakdown provides the information needed to order field replaceable parts. This information is presented in assembly illustrations and parts lists.

The symbols used in this section are explained in the following paragraphs along with a definition of some of the abbreviations used. Refer to the front of this manual for a complete list of abbreviations.

The illustrated parts breakdown is structured as follows. Each major assembly is shown in an exploded view and assigned a figure number. More than one illustration per figure number may be required for a complex assembly. In this case, the illustrations are titled figure X (sheet 1); figure X (sheet 2), etc. The parts shown on the illustrations are numbered. A parts list for each illustration begins on the page facing the illustration. The numbers on the figure correspond to the index numbers on the associated part lists. In some cases, the parts list will have more than one page for the corresponding sheet of figure.

The Illustrated Parts Breakdown is divided into four columns:

Index Number Column - The numbers given in this column correspond to the numbers shown on the illustration. When more than one entry is given for a particular index number, the use of each part is defined in the Notes column. Items may be listed without index numbers, and are mentioned for reference only. These items do not appear on the illustration.

Part Number Column - This column provides the eight digit number by which a part may be ordered. There are several conditions when there will be an incomplete number or no number at all.

The symbol ## in the part number column indicates that the item is a recommended spare part, and that the part number is located in the Spare Parts List section. To find the part number refer to the instructions for using the Spare Parts List (section 3B).

Description Column - This column gives the name and a brief description of each part and assembly. The relationship of parts and assemblies is shown within the column by means of indentation. When an item is indented more than the previous item, it is part of the previous item.

The abbreviation CIC refers to Card Interchangeability Chart. The CIC in this manual is located in section 3D.

When necessary, items are identified as being right side or left side. Right and left are determined by facing the front of the PFTU.

Notes Column - This column defines multiple part number entries for a single index number. Multiple entries may be necessary to identify differences such as machine configuration (for example, whether the part issued on a series code XX unit with the Engineering Change Order (ECO) XXXX installed). Information that is unique to one particular equipment or application will also be noted in this column.

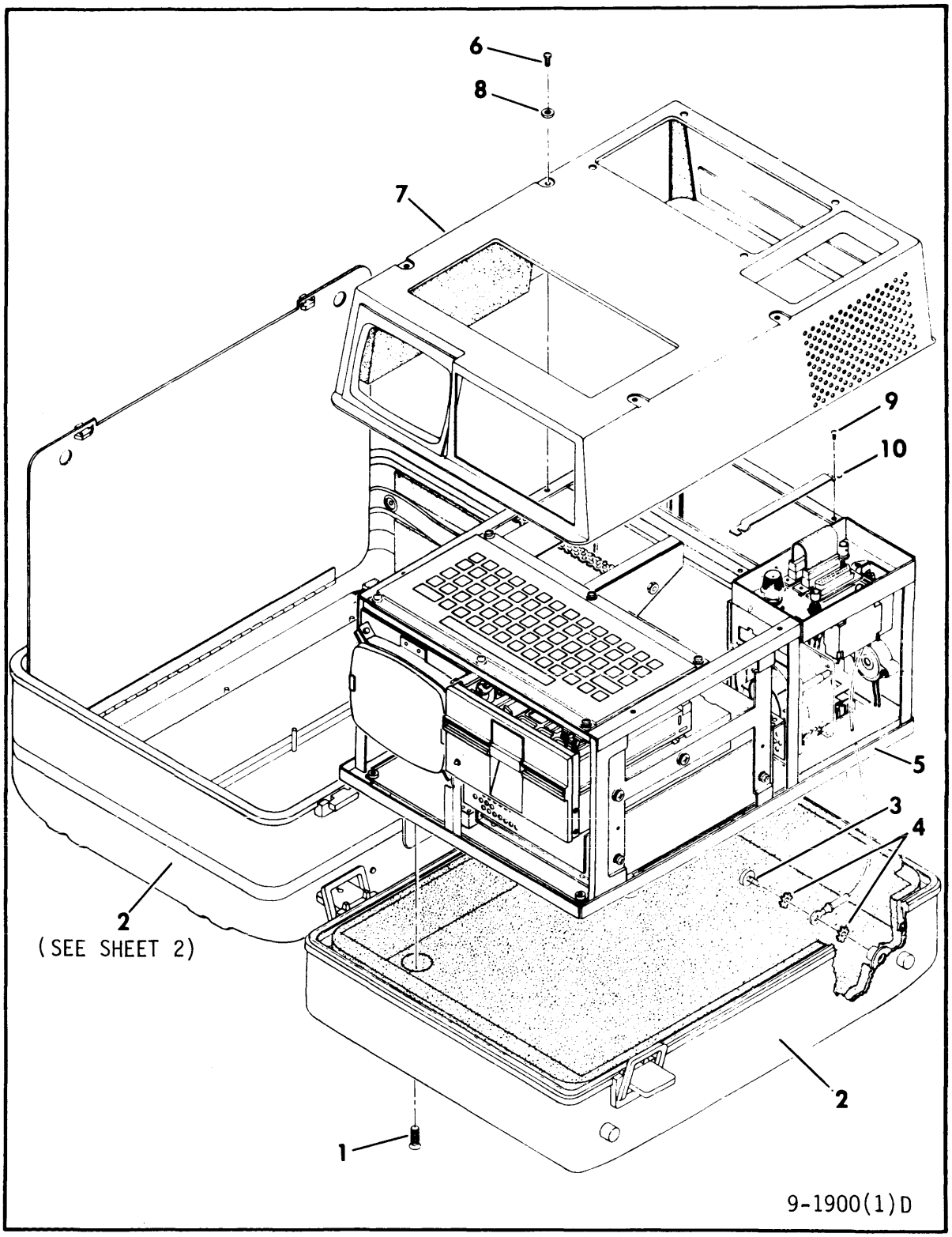


Figure 3A-1. Final Assembly (Sheet 1 of 2)

INDEX NO	PART NO	PART DESCRIPTION	NOTE
3A-1	73086303	FINAL ASSEMBLY (Sheet 1 of 2)	TB2A3B (ISI)
3A-1	73086304	FINAL ASSEMBLY	TB2A3C (ISI/SDI)
3A-1	73086305	FINAL ASSEMBLY	TB2A3D (ISI/SDI SMD-0)
3A-1	73086306	FINAL ASSEMBLY	TB2A3E (SMD-0/ SDI)
3A-1	73086307	FINAL ASSEMBLY	TB2A3F (SMD-0)
1	92956326	SCREW, Phillips, 1/4-20 x 7/16	
2	73086401	CASE ASSEMBLY	
3	10126243	SCREW, Hex Socket, 10-32 x 3/8	
4	10126403	WASHER, Lock, Ext Tooth, 10	
5		CHASSIS ASSEMBLY (See Figure 3A-2)	
6	10127111	SCREW, Phillips, 6-32 x 1/4	
7	81417001	COVER, Chassis	S/C 03 W/O 07115 & Blw
7	81417002	COVER, Chassis	S/C 03 W/07115 & Abv
8	10125605	WASHER, Flat, 6	
9	10127320	SCREW, Slotted, 4-40 x 1/4	
10	93913897	RETAINER, Card	

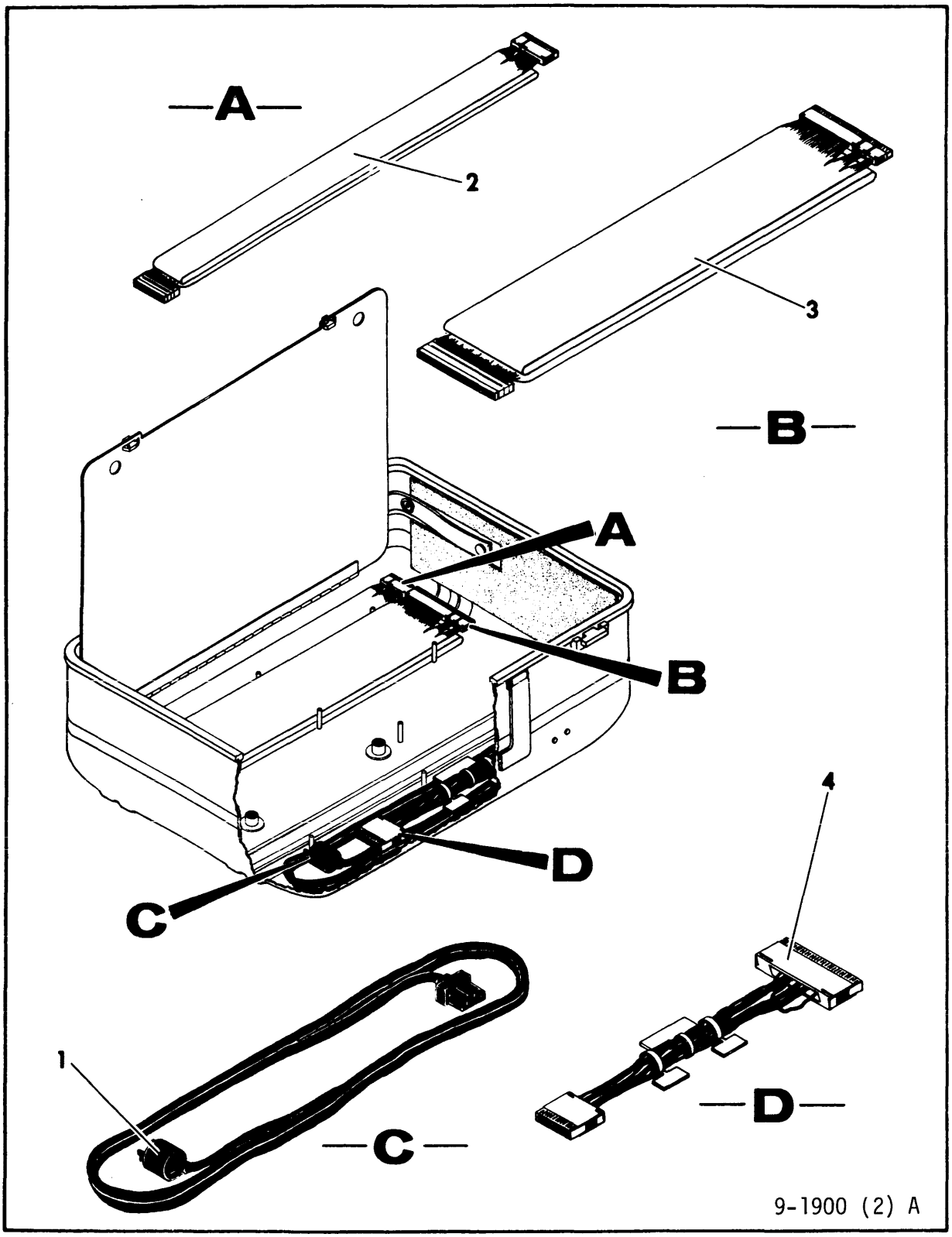


Figure 3A-1. Final Assembly (Sheet 2)

INDEX NO	PART NO	PART DESCRIPTION	NOTE
3A-1		FINAL ASSEMBLY (Sheet 2)	
1	75778702	CORD, Power	
2	##	CABLE ASSEMBLY, Universal Step Down	
3	##	CABLE ASSEMBLY, Universal Step Down	
4	##	CABLE ASSEMBLY, Wraparound	

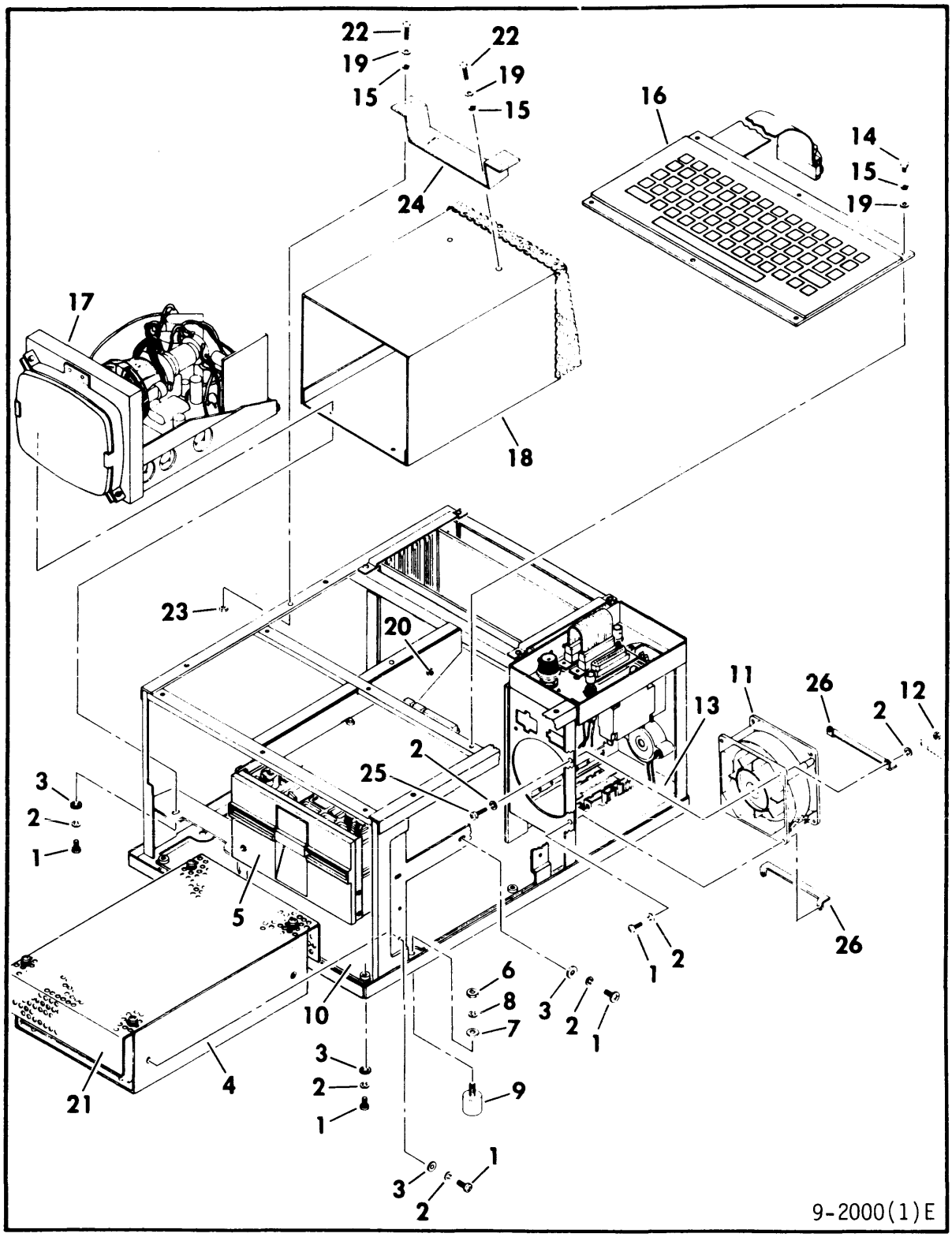


Figure 3A-2. Chassis Assembly (Sheet 1 of 5)

INDEX NO	PART NO	PART DESCRIPTION	NOTE
3A-2	81997001	CHASSIS ASSEMBLY (Sheet 1 of 6)	
1	10127113	SCREW, Phillips, 6-32 x 3/8	
2	10125803	WASHER, Spring Lock, 6	
3	10125605	WASHER, Flat, 6	
4	##	POWER SUPPLY ASSEMBLY	
		CABLE & FDD ASSEMBLY	
5	##	FLOPPY DISK DRIVE, Model 9409	
6	10125301	NUT, Hex, 1/4-20	
7	10125608	WASHER, Flat, 1/4	
8	10125806	WASHER, Spring Lock, 1/4	
9	77610165	MOUNT, Shock	
10	CIC	_GKN COMPONENT ASSEMBLY	
11	##	FAN, DC Brushless	
12	10125105	NUT, Hex, 6-32	
13	80456310	WALL, Left, Plenum	
14	10127320	SCREW, Slotted, 4-40 x 1/4	
15	10125801	WASHER, Spring Lock, 4	
16	##	KEYBOARD ASSEMBLY	
17	##	CRT ASSEMBLY	
18	93263475	COVER, Display	S/C 07 & Blw
18	93263476	COVER, Display	S/C 08 & Abv
19	10125603	WASHER, Flat, 4	
20	93879001	JACK, Banana	
21	45071500	COVER ASSEMBLY, Power Supply	
	81595051	COVER, Power Supply	
	94385500	GROMMET, Extruded	
	94277400	STRAP, Cable Tie	
22	10127103	SCREW, Phillips, 4-40 x 5/16	S/C 08 & Abv
23	10125103	NUT, Hex, 4-40	S/C 08 & Abv
24	93148618	BRACKET, Display	S/C 08 & Abv
25	10127114	SCREW, Phillips 6-32 x 1/2	S/C 08 & Abv
26	93148619	BRACKET, Fan	S/C 08 & Abv

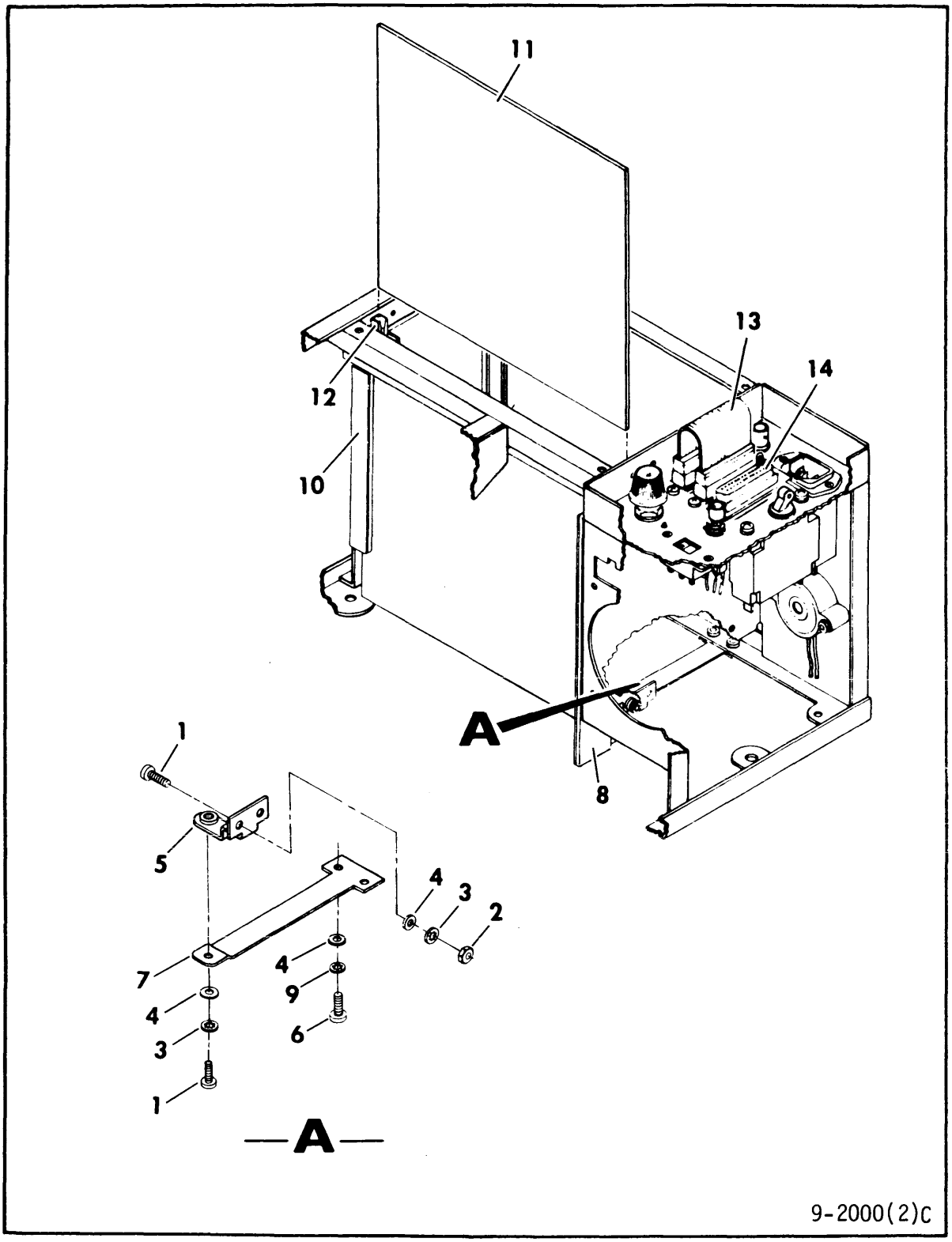


Figure 3A-2. Chassis Assembly (Sheet 2)

INDEX NO	PART NO	PART DESCRIPTION	NOTE
3A-2		CHASSIS ASSEMBLY (Sheet 2)	
1	10125703	SCREW, Phillips, 4-40 x 5/16	
2	10125103	NUT, Hex, 4-40	
3	10125801	WASHER, Spring Lock, 4	
4	10125603	WASHER, Flat, 4	
5	92777170	BRACKET, Upper	
6	10127112	SCREW, Phillips, 6-32 x 5/16	
7	93913898	BRACKET, Lower	
8	80456320	WALL, Front, Plenum	
9	10125803	WASHER, Spring Lock, 6	
10	80456310	WALL, Left, Plenum	
11	CIC	_GJN COMPONENT ASSEMBLY	
12	93593500	GUIDE, Card	
13	93681500	CABLE ASSEMBLY, RS232 Wrap Around	
14	93680000	CABLE ASSEMBLY, RS232 Wrap Around	

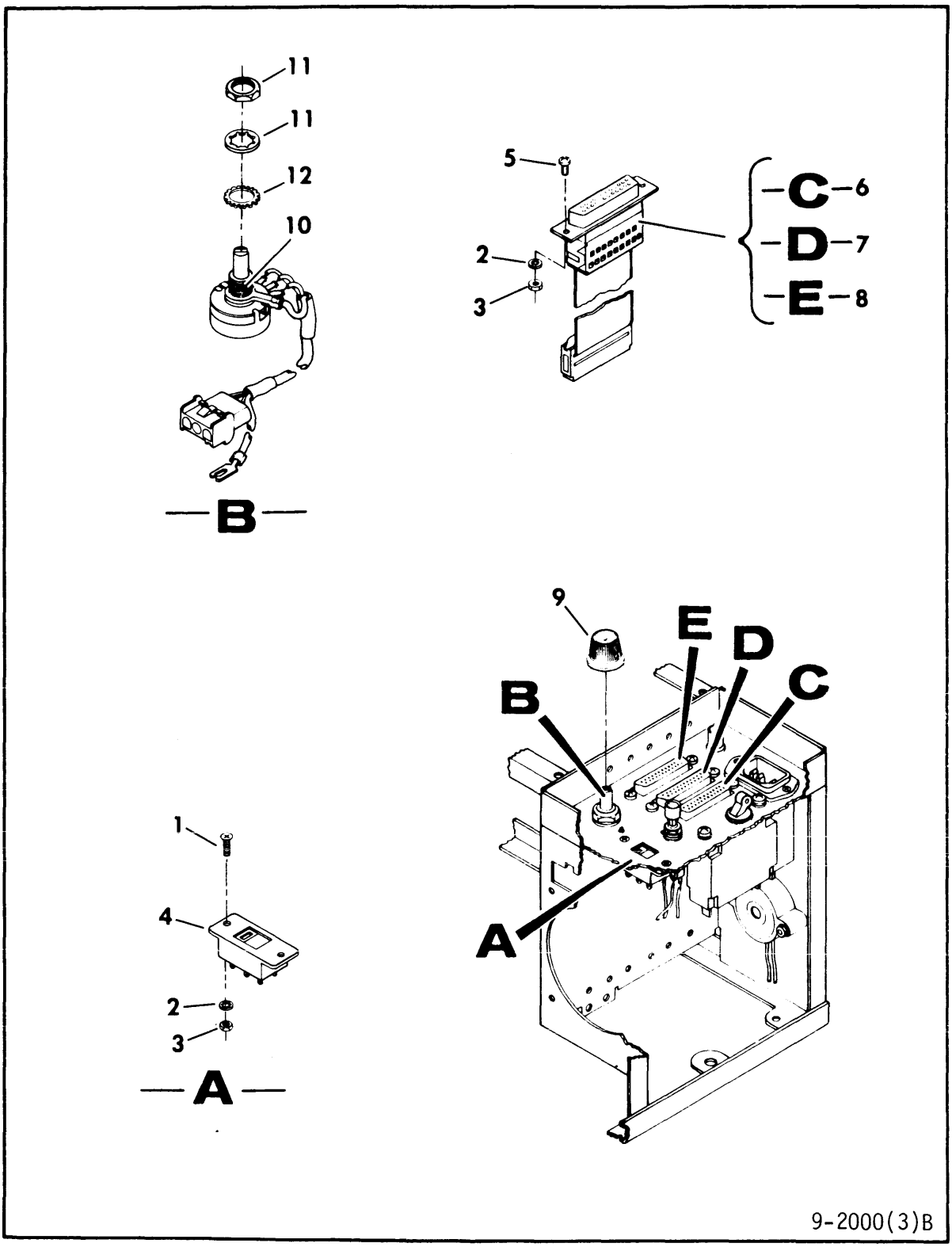


Figure 3A-2. Chassis Assembly (Sheet 3)

INDEX NO	PART NO	PART DESCRIPTION	NOTE
3A-2		CHASSIS ASSEMBLY (Sheet 3)	
1	10125703	SCREW, Phillips, 4-40 x 5/16	
2	10125801	WASHER, Spring Lock, 4	
3	10125103	NUT, Hex, 4-40	
4	15002347	SWITCH, Volt, Selector	
5	10127320	SCREW, Slotted, 4-40 x 1/4	
6	93180000	CABLE ASSEMBLY (J3)	
7	95077901	CABLE ASSEMBLY (J2)	
8	93681500	CABLE ASSEMBLY (J1)	
9	93152002	KNOB, Skirted	
10	94436801	RESISTOR, Variable	
11		HARDWARE, Attaching	Supplied with Resistor
12	10126406	WASHER, Lock, Ext Tooth, 3/8	

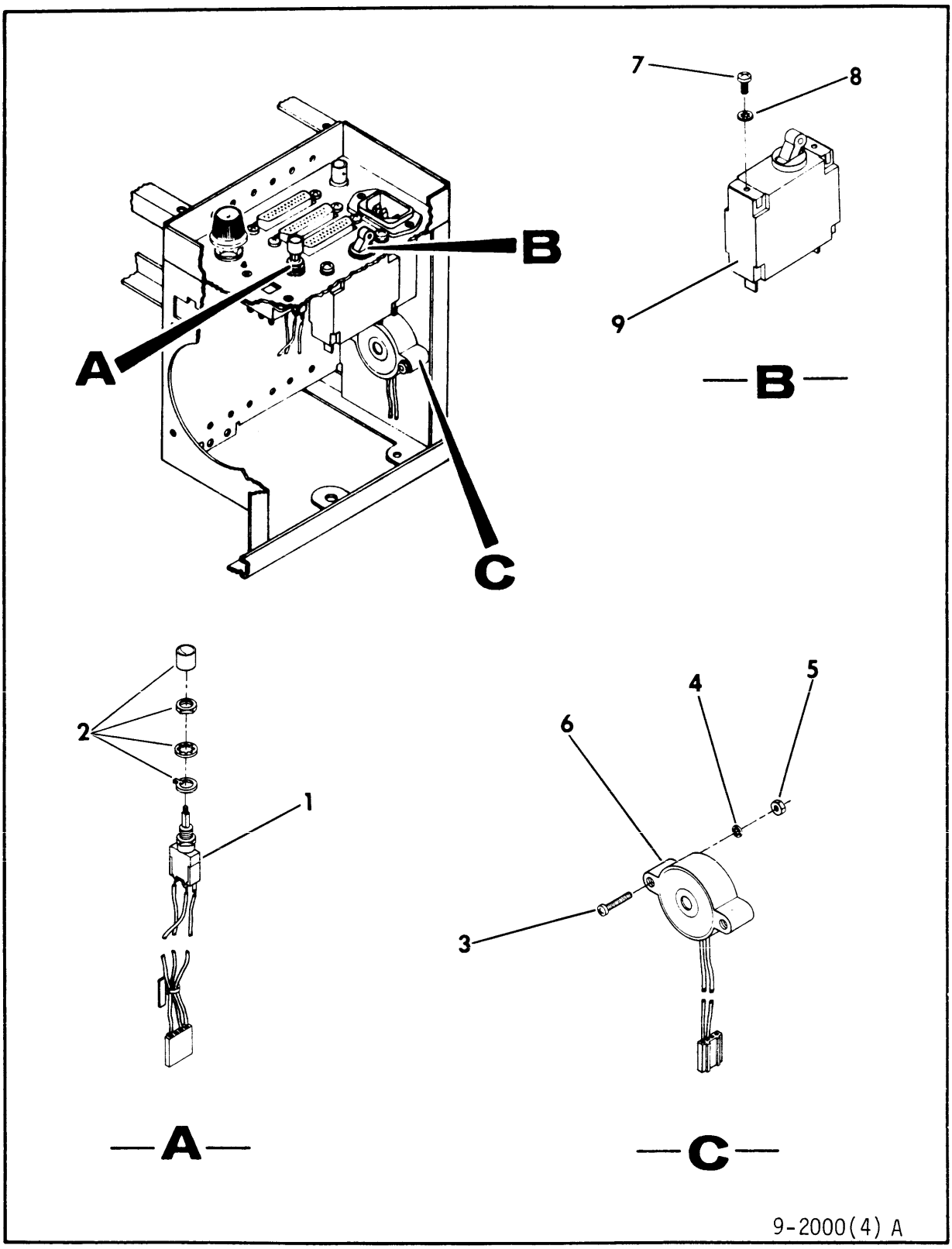


Figure 3A-2. Chassis Assembly (Sheet 4)

INDEX NO	PART NO	PART DESCRIPTION	NOTE
3A-2		CHASSIS ASSEMBLY (Sheet 4)	
1	##	SWITCH, Reset	
2		HARDWARE, Attaching	Supplied with switch
3	10127106	SCREW, Phillips, 4-40 x 5/8	
4	10125801	WASHER, Spring Lock, 4	
5	10125103	NUT, Hex, 4-40	
6	81227000	INDICATOR, Audio	
7	10127111	SCREW, Phillips, 6-32 x 1/4	
8	10125803	WASHER, Spring Lock, 6	
9	95587002	CIRCUIT BREAKER, Single Pole	S/C 01
9	95587003	CIRCUIT BREAKER, Single Pole	S/C 02 & Abv

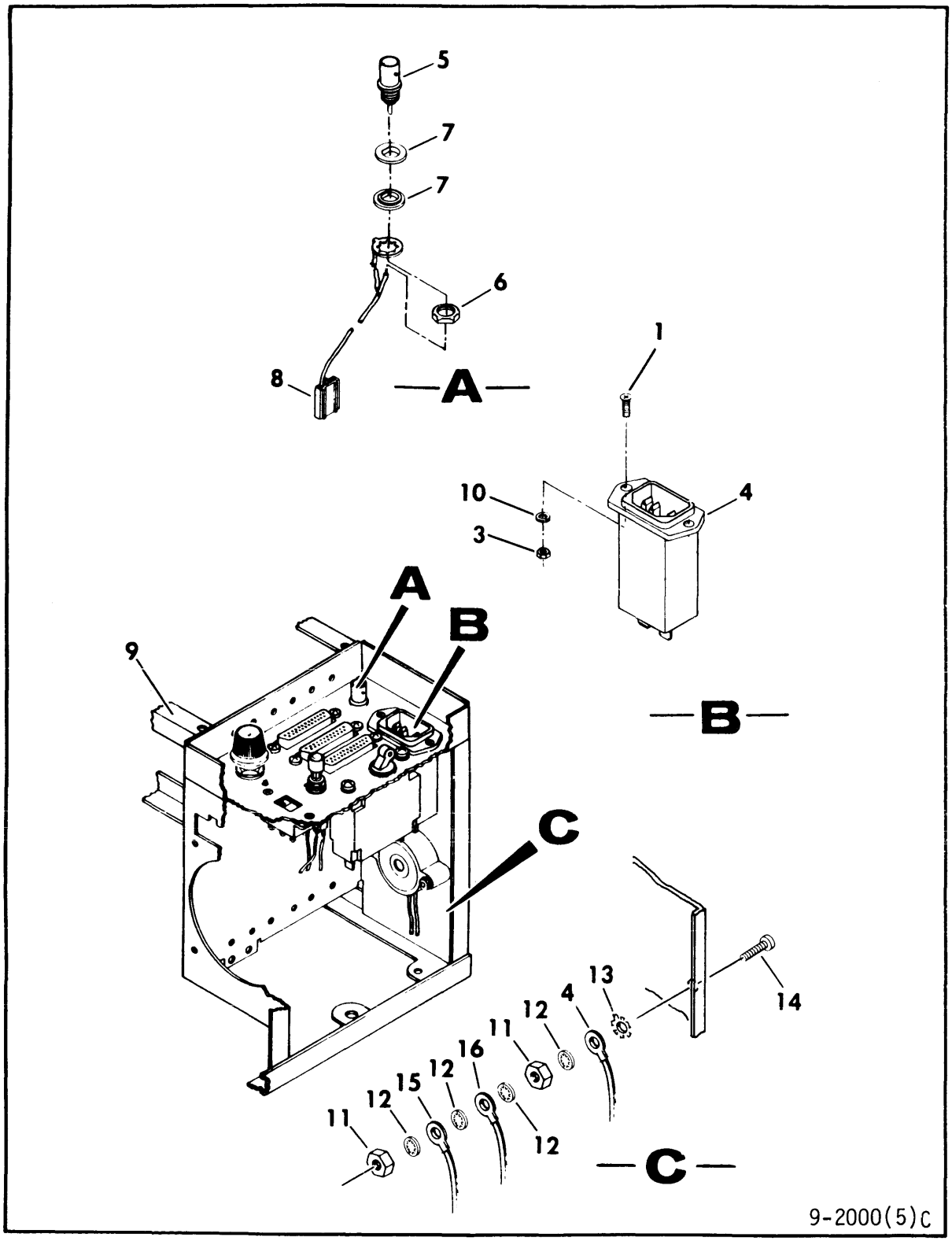


Figure 3A-2. Chassis Assembly (Sheet 5)

INDEX NO	PART NO	PART DESCRIPTION	NOTE
3A-2		CHASSIS ASSEMBLY (Sheet 5)	
1	10125703	SCREW, Phillips, 4-40 x 5/16	
2	10126400	WASHER, Lock, 4	
3	10125103	NUT, Hex, 4-40	
4	15002320	FILTER, Line	S/C 07 W/O 07143 & Blw
4	45439200	FILTER, Line	S/C 07 W/ 07143 & Abv
		FRAME & CONNECTOR ASSEMBLY	
5	15185830	RECEPTACLE	
6		HARDWARE, Attaching	Supplied with Receptacle
7	15185831	BUSHING, Insulated	
8	95256700	CABLE ASSEMBLY (A2J14)	
9	93263470	FRAME, Chassis	
10	10125801	WASHER, Lock, 4	
11	10125106	NUT, Hexagon, 8-32	
12	10126104	WASHER, Lock, 8	
13	10126402	WASHER, Lock, 8	
14	10127124	SCREW, Phillips, 8-32	
15	93150105	CABLE, Ground	Case Ground
16		CABLE, Ground	From AC cable (see Figure 3A-3)

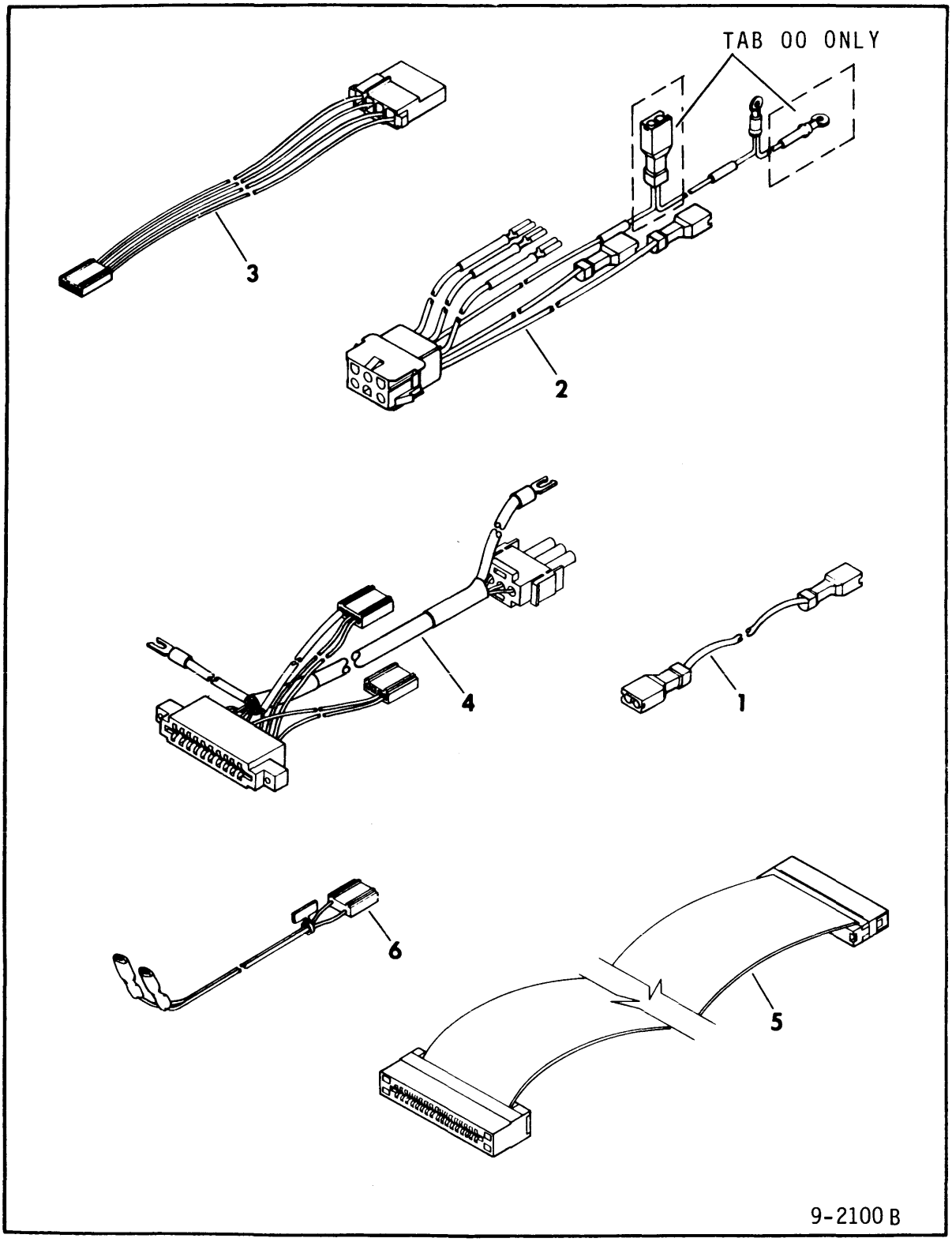


Figure 3A-3. Internal Cable Assemblies

INDEX NO	PART NO	PART DESCRIPTION	NOTE
3A-3		INTERNAL CABLE ASSEMBLIES	
1	81557400	CABLE ASSEMBLY (CB1-LF3)	
2	81914700	AC CABLE ASSEMBLY	S/C 07 W/O 07143 & Blw
2	81914701	AC CABLE ASSEMBLY	S/C 07 W/ 07143 & Abv
3	92162100	DRIVE POWER CABLE ASSEMBLY	
4	81263601	CRT INPUT CABLE ASSEMBLY	
5	81971100	DRIVE DATA INTERFACE CABLE ASSEMBLY	
6	##	FAN CABLE ASSEMBLY	

SECTION 3B

SPARE PARTS LIST

GENERAL

The Spare Parts List serves as an aid in determining the interchangeability of assemblies and parts to be spared. An example of the columns used in the Spare Parts List is shown on the next page.

NOTE

The spare parts list establishes the support service level of the unit. Individual parts, assemblies, or components not on this list may be long lead time items subject to significant delays.

The Spare Parts List is divided into four columns:

Items Appear On - This column cross-references the part number in the spare parts list to the associated figure number, page number, and index number in the illustrated parts breakdown.

Description - This column gives the name and a brief description of the part or assembly. This column also tracks series code history information.

Part Number - The Part Number column gives the part number of the part when the unit was manufactured or as a result of the latest FCO. This part can be used as a replacement on the type and series code units indicated in the Description and Notes columns. However, always use the Replacement Part Number when ordering new parts or spares.

Replacement Part Number - Contains the interchangeable replacement part number. Use this number when ordering replacement parts or spares.

Notes - This column provides additional information such as Field Change Order (FCO), Special Purchase Order (SPO), serial number, and machine configuration.

EXAMPLE OF SPARE PARTS LIST

ENGINEERING RECOMMENDED SPARE PARTS LIST						
ITEMS APPEAR ON			DESCRIPTION	PART NUMBER	REPLACE-MENT PART NUMBER	NOTES
Fig. No.	Page No.	Index No.				
3-11	3-37	25	CONTROL PANEL ASSEMBLY			
			Used S/C 14 and above	WWWWW	XXXXX	Single Channel
			Used S/C 14 and above	YYYYY	ZZZZZ	Dual Channel

In the example above, the control panel assembly is referenced as index 25 on figure 3-11, which appears on page 3-37. The original part number for single-channel units was WWWWW; order part number XXXXX if it must be replaced. WWWWW cannot be ordered from the factory but field spares can still be used on S/C 14 and above single-channel units.

ENGINEERING RECOMMENDED SPARE PARTS LIST

ITEMS APPEAR ON Fig. No.	Page No.	Index No.	DESCRIPTION	PART NUMBER	REPLACEMENT PART NUMBER	NOTES
3A-1	3A-7	2	CABLE ASSEMBLY, Universal Step Down			
			Used S/C 01 and above	95247801	95247801	
3A-1	3A-7	3	CABLE ASSEMBLY, Universal Step Down			
			Used S/C 01 and above	95527901	95527901	
3A-1	3A-7	4	CABLE ASSEMBLY, Wraparound			
			Used S/C 01 and above	92639100	92639100	
3A-2	3A-9	4	POWER SUPPLY ASSEMBLY			
			Used S/C 01 - 06	81703901	81703901	
			Used S/C 07 and above	81703902	81703902	
3A-2	3A-9	5	FLOPPY DISK DRIVE, Model 9409			
			Used S/C 01 and above	77680001	77680001	
3A-2	3A-9	11	FAN DC Brushless			
			Used S/C 01 and above	15005646	15005646	
3A-2	3A-9	16	KEYBOARD ASSEMBLY			
			Used S/C 01 and above	92266200	92266200	

ENGINEERING RECOMMENDED SPARE PARTS LIST

ITEMS APPEAR ON Fig. No.	Page No.	Index No.	DESCRIPTION	PART NUMBER	REPLACEMENT PART NUMBER	NOTES
3A-2	3A-9	17	CRT ASSEMBLY			
			Used S/C 01 - 07	95131761	95131761	
			Used S/C 08 and above	95131762	95131762	
3A-2	3A-15	1	SWITCH, RESET			
			Used S/C 01 and above	93181800	93181800	
3A-2	3A-19	6	FAN CABLE ASSEMBLY			
			Used S/C 01 and above	93418500	93418500	

SECTION 3C

ACCESSORIES

GENERAL

Table 3C-1 is a list of accessories that are shipped with the PFTU. Cables not listed are located in section 3A of this manual.

TABLE 3C-1. ACCESSORIES

PART NUMBER	DESCRIPTION
12263496	Static Ground Strap, Large (6 1/2 x 8 in wrist)
12263623	Static Ground Strap, Small (up to 6 in wrist)
12263625	Static Shielding Bag (8 x 12 in)
54034100	ISI Interface Board (STO 69403-1)
54034500	SDI Interface Board (STO 69403-2)
54035300	SMD-0 Interface Board (STO 69403-3)
77425241	Head Cleaning Kit
92735700	ISI Interface Controlware
92735701	SDI Interface Controlware
92735703	SMD-0 Interface Controlware
70462700	Blank Flexible disk (for use during self test)

SECTION 3D

CARD INTERCHANGEABILITY CHARTS

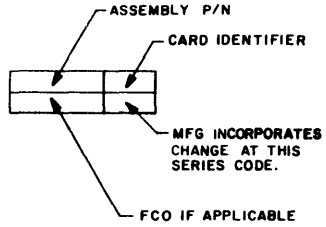
CARD INTERCHANGEABILITY CHART 3D

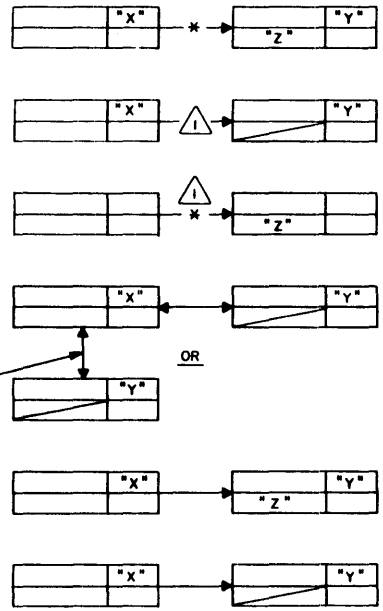
GENERAL

The card interchangeability chart (CIC) provides the latest revision level of a card, its title, and its part number for ordering purposes.

Prior to attempting to use the charts, be sure to read and understand the rules for interpreting the CIC as given on page 3D-3.

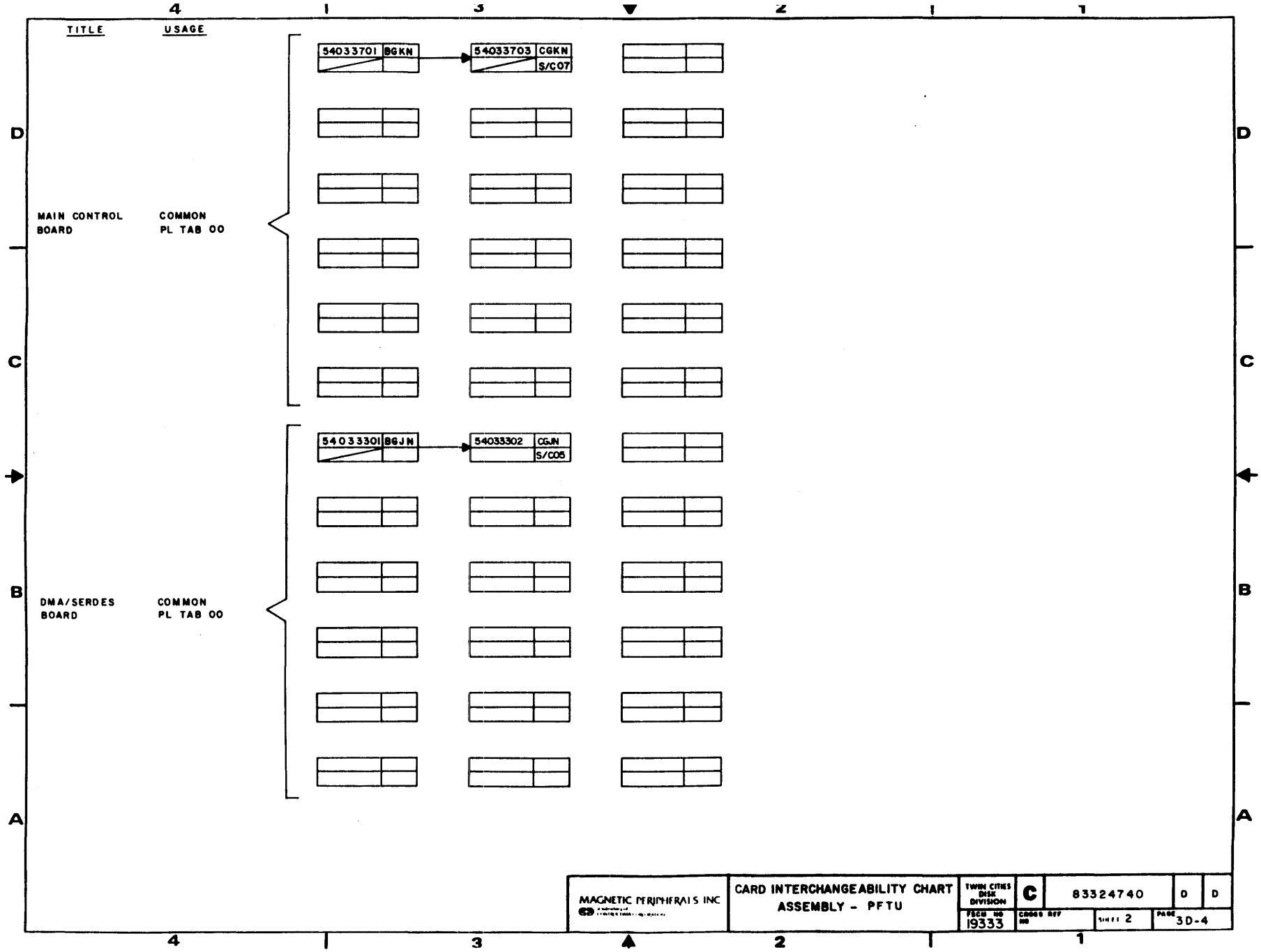
REVISION RECORD						
REV	ECO	DESCRIPTION	DRFT	DATE	CHKD	APP
A	DJ23000	CLASS A RELEASE		11-2-83		
B		NO CHANGE	JL	10-16-84		
C	DJ07127	BGJN TO CGJN	JL	10-16-84		
D	DJ07126	BGLN TO CGLN	BJP	3-27-85		
E	DJ07133	BGKN TO CGKN	BJP	3-27-85		
F	DJ07142	CGLN TO DGLN	BJP	3-27-85		





REFERENCE DRAWING	MAGNETIC PERIPHERALS INC. a Control Data Company	TITLE	CARD INTERCHANGEABILITY CHART ASSEMBLY - PFTU
	FIRST USED ON / NEXT ASSEMBLY		
COMPONENTS EXCEPT AS NOTED: TOLERANCE / VALUE / RATING; RES; CAP	DWN Tammy Paulson 11-2-83; CHKD; ENGR; MFG; QA	TWIN CITIES DISK DIVISION	C 83324740 D F
		FSCM NO. 19333	CROSS REF NO / SHEET 1 OF 6 / PAGE 3D-3

REF: 81676400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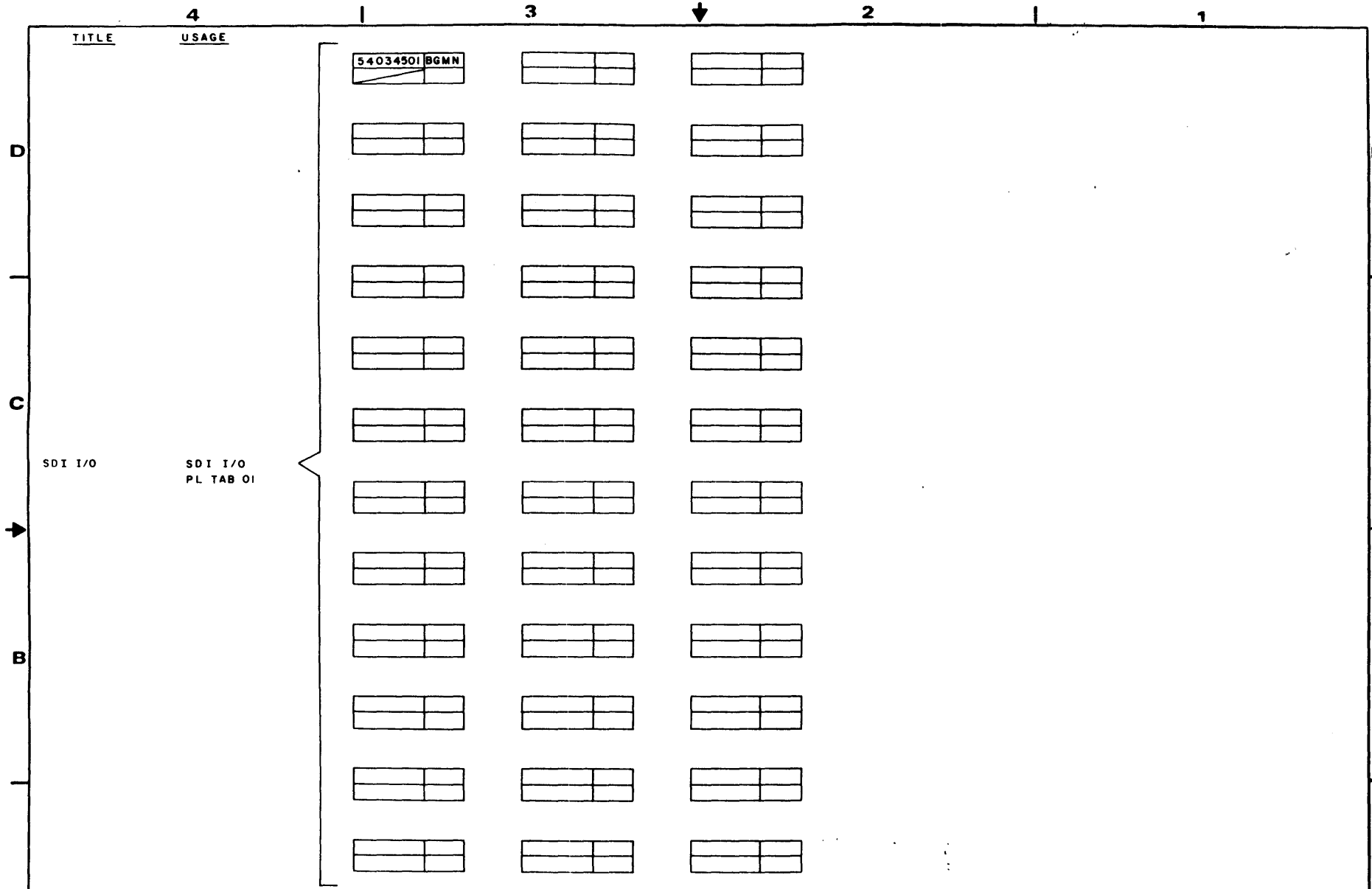
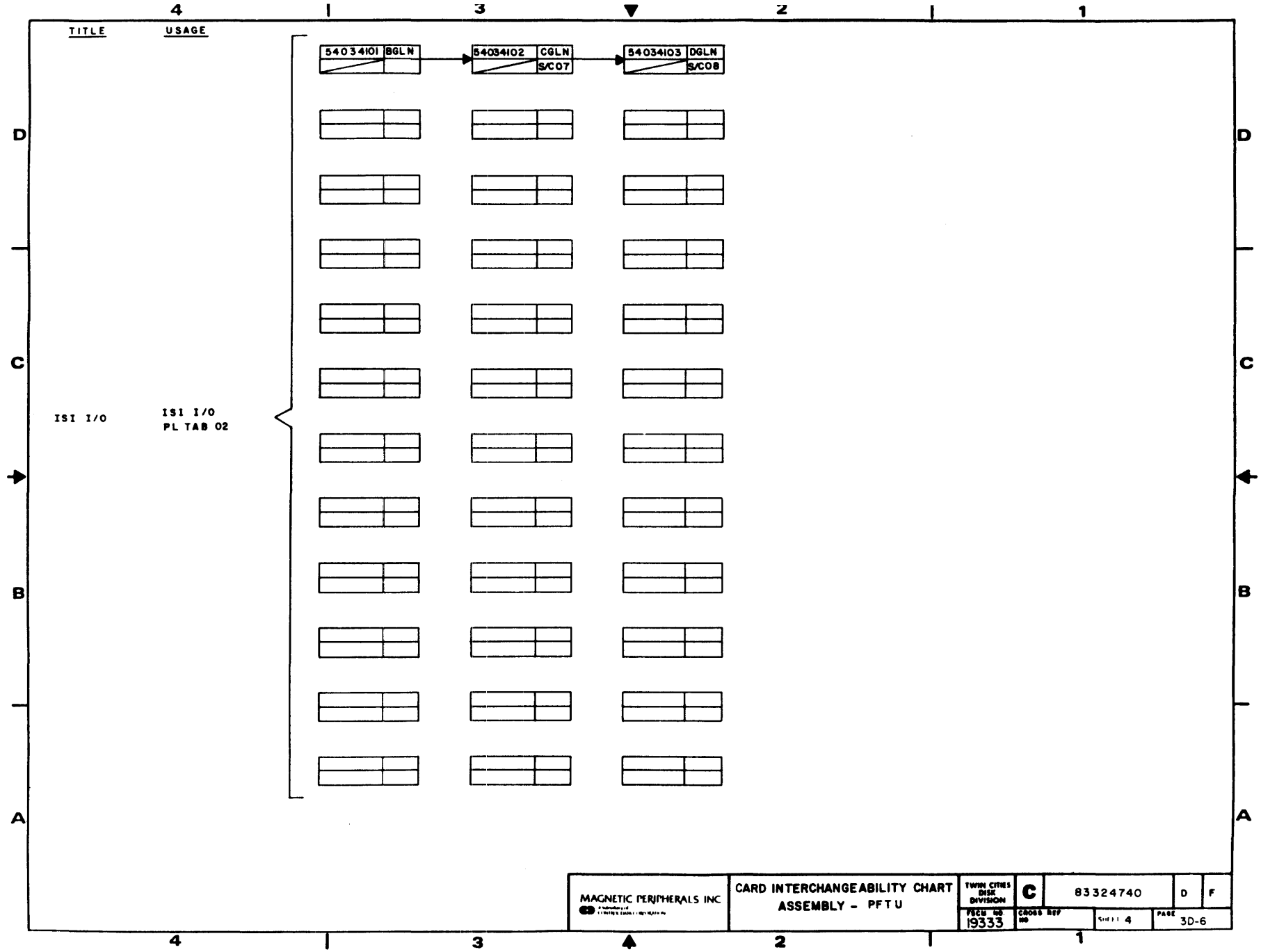
MAIN CONTROL BOARD
COMMON PL TAB 00
54033701 BGKN
54033703 CGKN S/C07
DMA/SERDES BOARD
COMMON PL TAB 00
54033301 BGJN
54033302 CGJN S/C05
MAGNETIC PERIPHERALS INC
CARD INTERCHANGEABILITY CHART ASSEMBLY - PFTU
TWIN CITIES DISK DIVISION
C
83324740
D
D
FSCM NO 19333
SHEET 2
PAGE 3D-4



MAGNETIC PERIPHERALS INC.	CARD INTERCHANGEABILITY CHART ASSEMBLY - PFTU	TWIN CITIES DISK DIVISION	C	83324740	B	A
		PSCM NO. 10333	CROSS REF NO	SHEET 3	PAGE 3D-5	



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		FECN NO. 19333	CROSS REF NO.	SHEET 4	PAGE 3D-6

TITLE	USAGE
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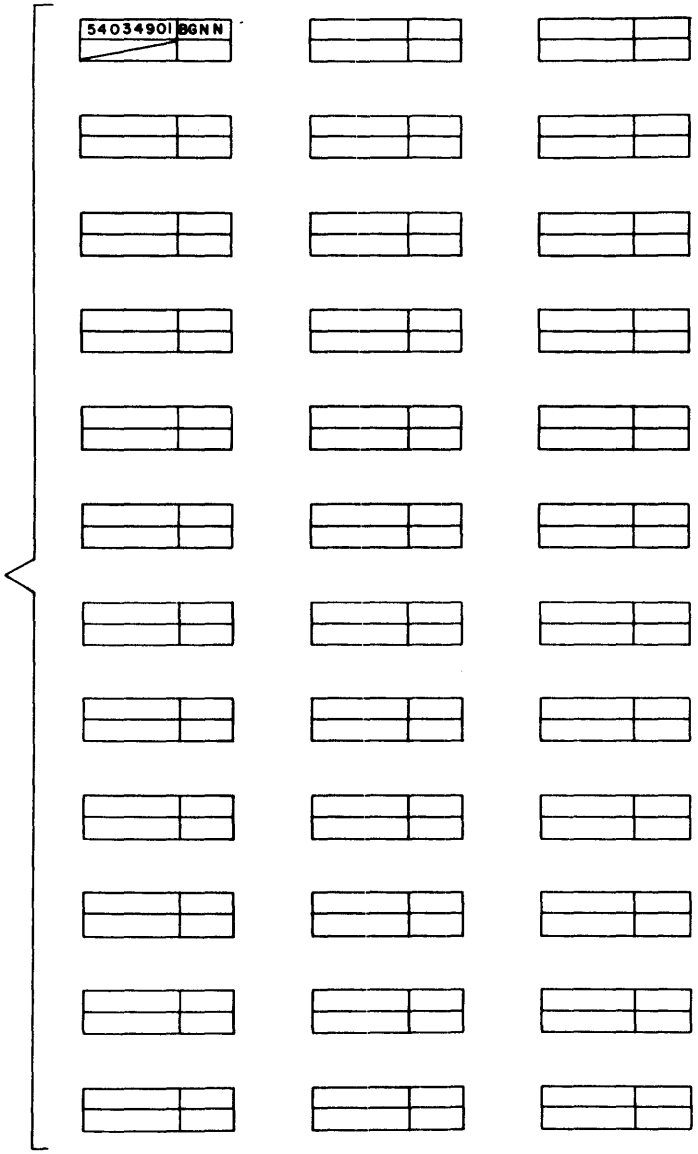

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TITLE	USAGE
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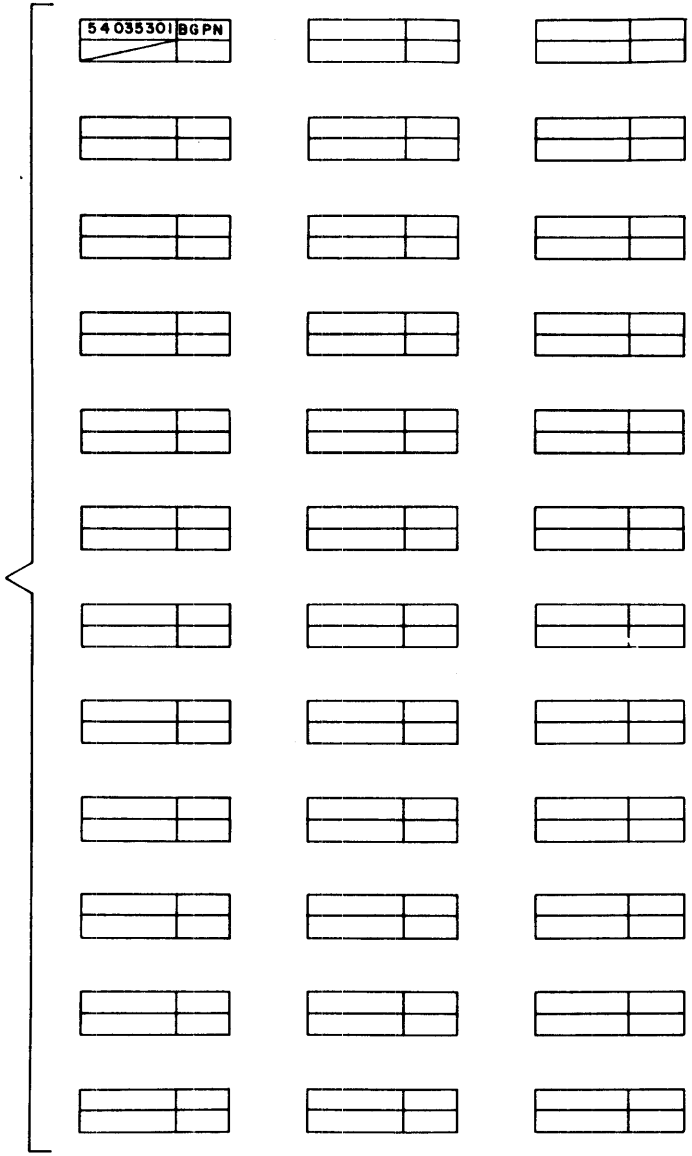

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		FSCM NO 19333	CROSS REF NO	SHEET 6	PAGE 3D-8

COMMENT SHEET

MANUAL TITLE:

PUBLICATION NO.: **REVISION:**

NAME: _____

COMPANY: _____

STREET ADDRESS: _____

CITY: _____ **STATE:** _____ **ZIP CODE:** _____

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