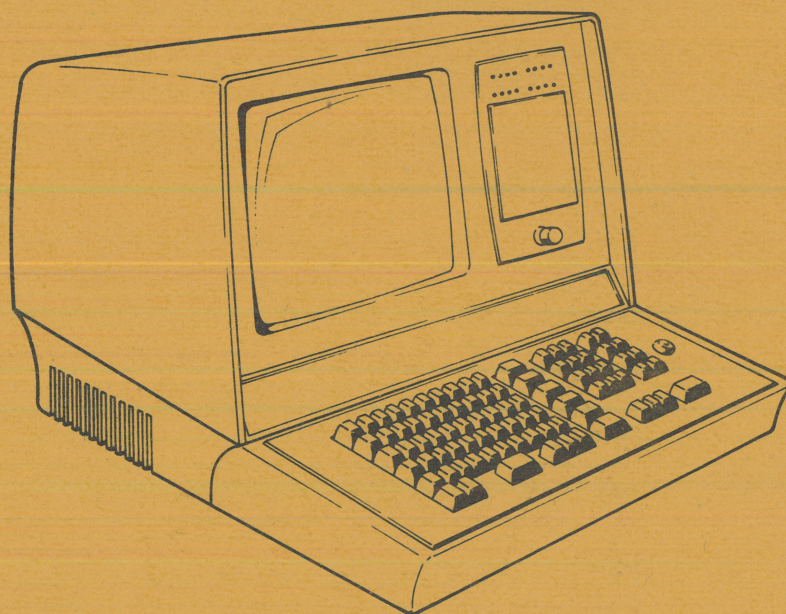
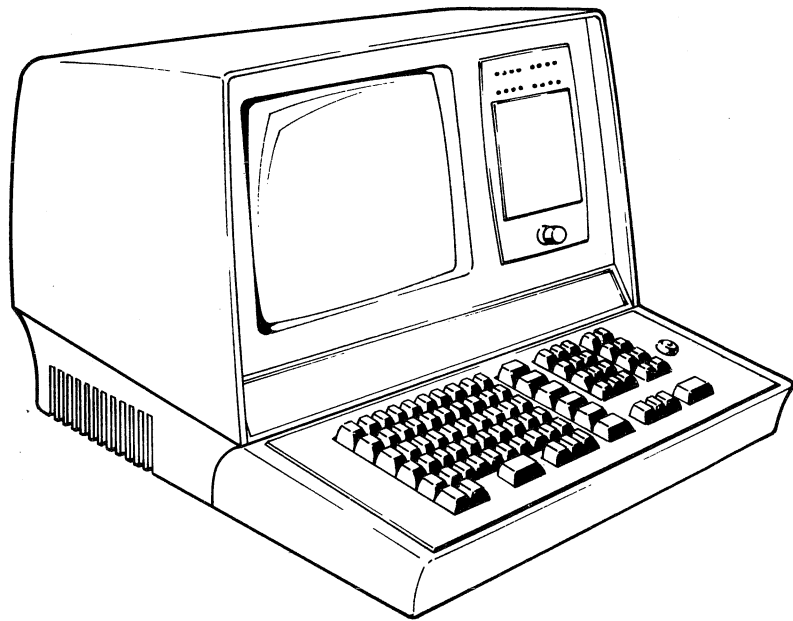


CDC[®] DISPLAY TERMINAL
CC617-A/B



CDC[®] DISPLAY TERMINAL
CC617-A/B



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Dear Mr. [Name],

I have received your letter of the 15th and am sorry that I cannot give you a more definite answer at this time. The matter is still under consideration and I will contact you again as soon as a final decision has been reached.

Very truly yours,

[Signature]

Enclosed for you are the documents mentioned in your letter.

I am sure that you will find them of interest.

Thank you very much for your letter.

I am, Sir, very respectfully,

Your obedient servant,

[Signature]

I am, Sir, very respectfully,

Your obedient servant,

[Signature]

I am, Sir, very respectfully,

Your obedient servant,

[Signature]

I am, Sir, very respectfully,

Your obedient servant,

[Signature]

I am, Sir, very respectfully,

Your obedient servant,

[Signature]

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MANUAL TO EQUIPMENT LEVEL CORRELATION

This manual reflects the equipment configurations listed below.

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

EQUIPMENT TYPE	SERIES	WITH FCO'S	COMMENTS
CC617-A	01	11617	
CC617-A	02	—	Series incremented by ECO 11619
CC617-A	03	—	Series incremented by ECOs 11687 and 11780
CC617-A	04	—	Series incremented by ECO 11858
CC617-A	05	—	Series incremented by ECO 11642
CC617-A	06	11897	Series incremented by ECO 11980
CC617-A	07	12115	Series incremented by ECO 12115
CC617-A	08	12424	Series incremented by ECO 12424
CC617-A	09		
XA175-A	01	11528	
XA175-A	02		

01987-2

MANUAL TO EQUIPMENT LEVEL CORRELATION (CONTD)

EQUIPMENT TYPE	SERIES	WITH FCO'S	COMMENTS
CC617-B	01	—	Series incremented by ECO 11858
CC617-B	02	—	Series incremented by ECO 11642
CC617-B	03	—	Series incremented by ECO 11980
CC617-B	04	12115	Series incremented by ECO 12115
CC617-B	05		

01987-3

PREFACE

This manual contains information to aid in the on-site maintenance of CONTROL DATA® CC617-A/B Display Terminal. The CC617-A Display Terminal, also known as QSE 18330, is part of a remote terminal subsystem configured for use by Ticketron. The CC617-A is an entity, in that it consists of a terminal controller with a fixed firmware program, a cathode-ray tube display, a power supply, and an operator keyboard. The CC617-B Display Terminal offers versatility in its application. For the CC617-B to function as a display terminal, it must be mated with a program memory module containing a firmware program, and an operator keyboard. These aspects of the display terminal are tailored to the application in which the CC617-B is to be used and are considered to be separate equipment. For these reasons, reference in this manual to the overall operating characteristics of the CC617-B are limited in nature. The only specific reference of this type, is to the Ticketron application of the CC617-B in areas where the subject matter pertaining to the exclusively Ticketron-used CC617-A happens to be the same as that of the Ticketron application of CC617-B.

The portion of this manual that is of primary importance during on-site repair is section 6, Maintenance. This section contains diagnostic decision logic tables to aid in isolating a fault, and associated corrective procedures. Generally a modular removal and replacement approach is employed in these procedures which dictates that once a fault is isolated to a module, that module is replaced with a new one. The defective module normally then is sent to a repair center for corrective action.

The corrective procedures also provide information on various component level replacements that may be performed on site. This maintenance approach requires that the site maintain spare modules and certain miscellaneous components to facilitate on-site repair. The suggested on-site spare parts list is contained at the end of section 7, Parts Data.

If the need arises for more detailed information on a basic display terminal module (such as that required for repair center repair work), refer to the applicable hardware maintenance manual. The following list defines their titles and publication numbers.

<u>Title</u>	<u>Publication Number</u>
STIC Module	62961100
+5-volt Regulator	62960700
Processor Module	62960000
Async I/F-2 Module	62960300
Display/Keyboard I/F Module	62969300
Power Supply	62969500
Video Display Module	62961800
Maintenance Panel	62960500
RAM Memory Module (applicable to CC617-A only)	62960100
ROM Memory Module (applicable to CC617-A only)	62960200
RAM/ROM Memory Module (applicable to CC617-B only)	62984900
Keyboard (applicable to CC617-A or Ticketron application of CC617-B only)	62969700

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Additionally, in the case of CC617-B, a manual supporting the on-site maintenance of the keyboard used in the application is initially shipped with the equipment. The same is true if an internal modem module is included in the application. Although not listed, additional copies of these manuals also may be ordered from the preceding address.

CONTENTS

<u>Section</u>		<u>Page</u>
1	— GENERAL DESCRIPTION	
	CC617-A Display Terminal	1-1
	CRT Monitor	1-4
	Power Supply	1-4
	Logic Chassis	1-5
	+5-V dc Regulator Modules	1-6
	2K Read-Only Memory Module (ROM)	1-6
	4K Random-Access Memory Modules (RAM)	1-6
	Processor Module	1-6
	Async I/F-2 Module	1-6
	Special Timing and Interrupt Control (STIC) Module	1-7
	Display/Keyboard Interface Module	1-7
	Sound Alarm	1-7
	Keyboard	1-8
	CC617-B Display Terminal	1-8
	CRT Monitor	1-15
	Power Supply Module	1-15
	Logic Chassis	1-15
	+5-V dc Regulator Module	1-16
	Processor Module	1-16
	Async I/F-2 Module	1-16
	Special Timing and Interrupt Control (STIC) Module	1-17
	Display/Keyboard Interface Module	1-17
	Sound Alarm	1-17
	Physical, Electrical, and Environmental Characteristics	1-17
	Physical Characteristics	1-18
	Electrical Characteristics	1-18
	Environmental Characteristics	1-18
2	— OPERATION	
	Keyboard Module (Ticketron Application Only)	2-1
	Maintenance Panel Status Indicators	2-4
	Display Terminal Initialization (Ticketron Application Only)	2-6

<u>Section</u>	<u>Page</u>
3 —	INSTALLATION AND CHECKOUT
	MOS Circuit Handling Precautions 3-1
	Crating 3-2
	Uncrating 3-2
	Installation 3-4
	Checkout 3-10
4 —	THEORY OF OPERATION
	Video Monitor 4-2
	Cathode-Ray Tube 4-2
	High-Voltage Transformer 4-4
	Video (Monitor) PC Board 4-4
	Vertical Choke 4-4
	Yoke 4-4
	+15-V DC Regulators 4-4
	Logic Chassis Assembly 4-5
	Backplane 4-6
	+5-Volt Regulator(s) 4-7
	ROM Module of the CC617-A Model 4-8
	-9-Volt Regulator 4-9
	Interface Characteristics 4-9
	RAM Module of the CC617-A Model 4-9
	Address Select 4-10
	Memory Request 4-10
	Data Bus Lines 4-10
	Ready 4-12
	Anticipate Ready 4-12
	Write 4-12
	Interface Characteristics 4-12
	Program Memory Module of the CC617-B Model 4-12
	Memory Write and Read 4-13
	Physical Layout 4-14
	Interface Characteristics 4-15
	Processor Module 4-15
	Main Timing 4-17
	Microprocessor 4-17
	Priority Interrupt Decoder 4-17
	Multiplexer 4-17
	Direct Memory Access (DMA) Control 4-18
	Memory and I/O Control 4-18
	Status Latch 4-18
	Line Drivers 4-19
	Processor Module Interface 4-19

Section

Page

STIC Module	4-20
High Core Jump Control	4-23
Interrupt Mask	4-23
Status Encoder	4-24
Site Address Switches	4-24
Timing Control	4-24
Module Control Logic	4-25
Interface Characteristics	4-25
Async I/F-2 Module	4-26
+12-Volt and -12-Volt Regulators	4-29
Interface Characteristics	4-29
Display/Keyboard I/F Module	4-30
Control Logic	4-30
Interface Characteristics	4-32
Optional Internal Modem Module of the CC617-B Model	4-33
Modem Module, CDC Part Number 51912400	4-33
Interface Signals and Definitions	4-34
Switch-Selectable Strapping Options	4-37
Interface Characteristics	4-42
Modem Modules, CDC Part Numbers 51912402 and 51912403	4-42
Receive and Transmit Operation	4-42
Interface Characteristics	4-45
Power Supply Assembly	4-46
Capacitor Board	4-47
-5, +12, -12-V DC Regulator Board	4-47
AC Input Transformer and Resonating Capacitor	4-47
AC Entry Panel	4-47
Rectifier	4-47
Maintenance	4-47
Keyboard Module of the CC617-A Model and Ticketron Application of CC617-B	4-51

5 — DIAGRAMS

DIAGRAMS APPLICABLE TO CC617-A

Module Interconnection Diagram Control Sheet	5-3
Bussed Signal Chart	5-4
+5V Regulator (Slave)	5-5
+5V Regulator (Master)	5-6
Maint Panel I/F Connector	5-7
ROM Memory Module	5-8
RAM Memory (1000 - 1FFF)	5-9

Section

Page

RAM Memory (0000 - 0FFF)	5-10
Processor	5-11
STIC	5-12
Async I/F-2	5-13
Modem Module (Option)	5-14
Display/Kybd I/F Module	5-15
Cable Wiring Diagram	5-16

DIAGRAMS APPLICABLE TO CC617-B

Module Interconnection Diagram Control Sheet	5-21
Bussed Signal Chart	5-22
+5V Regulator (Slave, Option)	5-23
+5V Regulator (Master)	5-24
Maint Panel I/F Connector	5-25
Program Memory Module RAM Address (0000 - 1FFF) ROM Address (E000 - F7FF)	5-26
Processor	5-27
STIC	5-28
Async I/F-2	5-29
Modem Module (Option)	5-30
Display/Kybd I/F Module	5-31
Cable Wiring Diagram	5-32

6

MAINTENANCE

Preventive Maintenance	6-1
General Preventive Maintenance Procedure	6-2
Annual Preventive Maintenance Procedure	6-2
Maintenance Aids	6-2
Maintenance Panel Switches and Indicators	6-3
Upper Eight Indicators	6-3
Lower Eight Indicators	6-4
Switches 0 through 7	6-4
RESET Switch	6-4
EXECUTE Switch	6-5
Printed-Circuit Board Voltage Indicators	6-5
Troubleshooting and Corrective Maintenance	6-5
Conditions	6-6
Situations	6-6
Actions	6-7
Sequence of Actions	6-7
Arrangement of Diagnostic and Corrective Maintenance Information	6-7

CRT DISPLAY/KEYBOARD

Procedure CRT1 — Executing Quicklook Diagnostic (Ticketron Application Only) 6A-7
Maintenance Panel Switch Settings (Ticketron Application Only) 6A-7
Test Execution (Ticketron Application Only) 6A-8
Normal and Error Indications (Ticketron Application Only) 6A-9
Procedure CRT2 — Removing Display Cabinet Hood 6A-12
Procedure CRT3 — Replacing High-Voltage Transformer Assembly 6A-12
Procedure CRT4 — Replacing Video Module + 15-V dc Regulators 6A-14
Procedure CRT5 — Replacing CRT Monitor PC Board 6A-16
Procedure CRT6 — Removing Video Module 6A-17
Procedure CRT7 — Replacing Cathode-Ray Tube 6A-21
Procedure CRT8 — Monitor Adjustments 6A-24
Procedure CRT9 — Replacing Yoke on CRT 6A-33
Procedure CRT10 — Replacing Vertical Choke 6A-37
Procedure CRT11 — High +5-V Voltage Check 6A-39
Procedure CRT12 — +5-V Voltage Regulator Adjustments 6A-40
Procedure CRT13 — Measuring Voltages at CRT Monitor PC Board 6A-40
Procedure CRT14 — Checking and Replacing Intensity Control on Display Panel 6A-43
Procedure CRT15 — Power Supply Voltage Checks 6A-44
Procedure CRT16 — Replacing Display Terminal AC Entry Panel or Input Power Circuit Breaker 6A-45
Procedure CRT17 — Replacing a Fan 6A-47
Procedure CRT18 — Replacing a Logic Card 6A-48
Procedure CRT19 — Replacing Keyboard Assembly 6A-50
Procedure CRT20 — Replacing Keyboard Keyswitches 6A-51
Procedure CRT21 — Replacing Power Supply 6A-51
Procedure CRT22 — Resonating Capacitor Replacement 6A-52

Section

Page

INDEX

6B-1

7 — PARTS DATA

Genealogy Chart (CC617-A)	7-2
Genealogy Chart (CC617-B)	7-3
Hardware Product Configurator (HPC)	7-4
HPC-QSE 18330 Ticketron Term	7-5
Ticketron Display Terminal (15630300)	7-6
Term Ticketron Dspl 60 Hz (TA)	7-9
Ticketron Display Terminal (15630612)	7-11
Term Tkrn Dspl 60 Hz (TA)	7-13
AC Entry Assembly 60 Hz	7-15
Panel Assy (AC Entry) 60 Hz	7-17
SPL Ticketron (CC617A)	7-18
SPL Ticketron (CC617B)	7-20

8 — WIRE LISTS

8-1

APPENDIX

A — INTERFACE CONNECTOR PIN ASSIGNMENTS	A-1
B — DISPLAY CHARACTER REPERTOIRE	B-1
C — TICKETRON DIAGNOSTICS AND AUTOLOAD	C-1
D — CONVERSIONS	D-1

FIGURES

<u>Section</u>	<u>Figure</u>	<u>Page</u>
1	— GENERAL DESCRIPTION	
	1-1 Ticketron Terminal Subsystem Employing CC617-A	1-2
	1-2 CC617-A Display Terminal	1-3
	1-3 Internal Modules of CC617-A	1-5
	1-4 Module Block Diagram of CC617-B Display Terminal	1-9
	1-5 CC617-B Display Terminal	1-11
	1-6 Internal Layout of CC617-B	1-13
2	— OPERATION	
	2-1 Keyboard Layout (Applicable to Ticketron Application Only)	2-1
3	— INSTALLATION AND CHECKOUT	
	3-1 Display Terminal Packaging	3-3
	3-2 Cabinet Hood Removal	3-4
	3-3 CC617-A Display Terminal Card Placement	3-5
	3-4 CC617-B Display Terminal Card Placement	3-5
	3-5 Display Terminal Internal Cabling Diagram	3-7
	3-6 I/O Connector Panel	3-9
4	— THEORY OF OPERATION	
	4-1 Display Terminal Components	4-1
	4-2 Video Monitor Block Diagram	4-3
	4-3 Logic Chassis Assembly	4-5
	4-4 +5-Volt Regulator(s)	4-7
	4-5 Block Diagram of ROM Module Used in CC617-A	4-8
	4-6 RAM Module Used in CC617-A	4-10
	4-7 Functional Diagram of RAM Module Used in CC617-A	4-11
	4-8 Program Memory Module Used in CC617-B	4-14
	4-9 Processor Module	4-15
	4-10 Processor Module Functional Diagram	4-16
	4-11 Processor Module Interface	4-19

<u>Section</u>	<u>Figure</u>	<u>Page</u>
	4-12 STIC Module and Control Switches	4-21
	4-13 STIC Module Functional Diagram	4-22
	4-14 Async I/F-2 Module	4-27
	4-15 Async I/F-2 Functional Diagram	4-28
	4-16 Display/Keyboard Interface Module	4-30
	4-17 Interface Diagram of Modem Module Part Number 51912400 in 2-Wire Configuration	4-35
	4-18 Block Diagram of Modem Module Part Numbers 51912402/51912403	4-43
	4-19 Power Supply Components	4-46
	4-20 Maintenance Panel	4-48
	4-21 Keyboard Module	4-51
5	— DIAGRAMS	
	5-1 Pin Numbering Scheme of Modules in Logic Chassis	5-1
6	— MAINTENANCE	
	6-1 Maintenance Panel	6-3
	6-2 Diagnostic Decision Logic Table Example	6-6
	6-3 Arrangement of Diagnostic and Corrective Maintenance Information	6-7
	CRT DISPLAY/KEYBOARD	
	CRT1 High-Voltage Pin Numbers	6A-13
	CRT2 High-Voltage Transformer Installation	6A-14
	CRT3 15-Volt Regulator Assembly	6A-15
	CRT4 BP5 Connector Pins	6A-16
	CRT5 Video Module's CRT Monitor PC Board Connections	6A-17
	CRT6 Video Module Connector Removal	6A-18
	CRT7 Video Module Mounting Screws	6A-19
	CRT8 Video Module Removal	6A-19
	CRT9 Video Module Installation	6A-20
	CRT10 CRT Socket Removal	6A-21
	CRT11 CRT Yoke Assembly	6A-22
	CRT12 Shielding Sleeve Positioning	6A-25
	CRT13 Monitor PC Board Adjustments	6A-27
	CRT14 Focus Magnet Rings	6A-28
	CRT15 CRT Raster Overlay	6A-29
	CRT16 Applying Plastic Overlay to CRT Screen	6A-31
	CRT17 Identifying Geometric Distortion	6A-31
	CRT18 Typical Positioning of Connection Magnets of Yoke	6A-32

<u>Section</u>	<u>Figure</u>	<u>Page</u>
	CRT19 Removing Flag Terminals	6A-34
	CRT20 CRT Tube-socket Removal	6A-34
	CRT21 Yoke Assembly	6A-35
	CRT22 Positioning Shielding Sleeve	6A-36
	CRT23 Vertical Choke	6A-38
	CRT24 +5-Volt Regulator Test Points	6A-39
	CRT25 Test Points for +465, -190, and +45 V dc	6A-41
	CRT26 Test Pins for +5 and +15 V dc	6A-43
	CRT27 AC Entry Panel Removal	6A-46
	CRT28 Circuit Breaker Connection	6A-47
	CRT29 Logic Module Card Cage and Fan Removal	6A-48
	CRT30 Logic Card Locations	6A-49
	CRT31 Keyboard Cabinet Assembly	6A-50
	CRT32 Resonating Capacitor Mounting	6A-52
B	— DISPLAY CHARACTER REPERTOIRE	
	B-1 Dot Matrix in 80 Character Display Format	B-3
	B-2 Dot Matrix in 40 Character Display Format	B-6
C	— TICKETRON DIAGNOSTICS AND AUTOLOAD	
	C-1 Keyboard Octal Codes	C-7
	C-2 Test Ticket	C-8

TABLES

Section	Table	Page
2	— OPERATION	
	2-1 Keyboard Controls (Ticketron Application Only)	2-2
	2-2 Key Codes and Legends (Ticketron Application Only)	2-4
	2-3 Status Indicators	2-5
4	— THEORY OF OPERATION	
	4-1 Modem Module/Communication Line Signal Definitions	4-36
	4-2 Modem Module/Bell System CBS Definitions	4-36
	4-3 Modem Module/Terminal Interface Signals	4-38
	4-4 Strapping Options of Modem Module	4-40
	4-5 Modem Module/Async I/F-2 Signal Definitions	4-45
6	— MAINTENANCE	
	6-1 Printed-Circuit Card Voltage Indicators	6-5
	CRT DISPLAY/KEYBOARD	
	CRT1 DDLT for Display Terminal	6A-1
	CRT2 Quicklook Tests	6A-9
7	— PARTS DATA	
	7-1 Definition of Column Headings on Assembly Parts Lists	7-1

APPENDIX

A	—	INTERFACE CONNECTOR PIN ASSIGNMENTS	
		A-1 Keyboard Connector Signal Pin Assignments . . .	A-2
		A-2 Modem Connector Signal Pin Assignments	A-3
		A-3 Printer Connector Signal Pin Assignments	A-4
		A-4 Telephone-Line Terminal Block Assignments . . .	A-5
B	—	DISPLAY CHARACTER REPERTOIRE	
		B-1 Displayable Codes	B-2
D	—	CONVERSIONS	
		D-1 Conversion Table	D-1

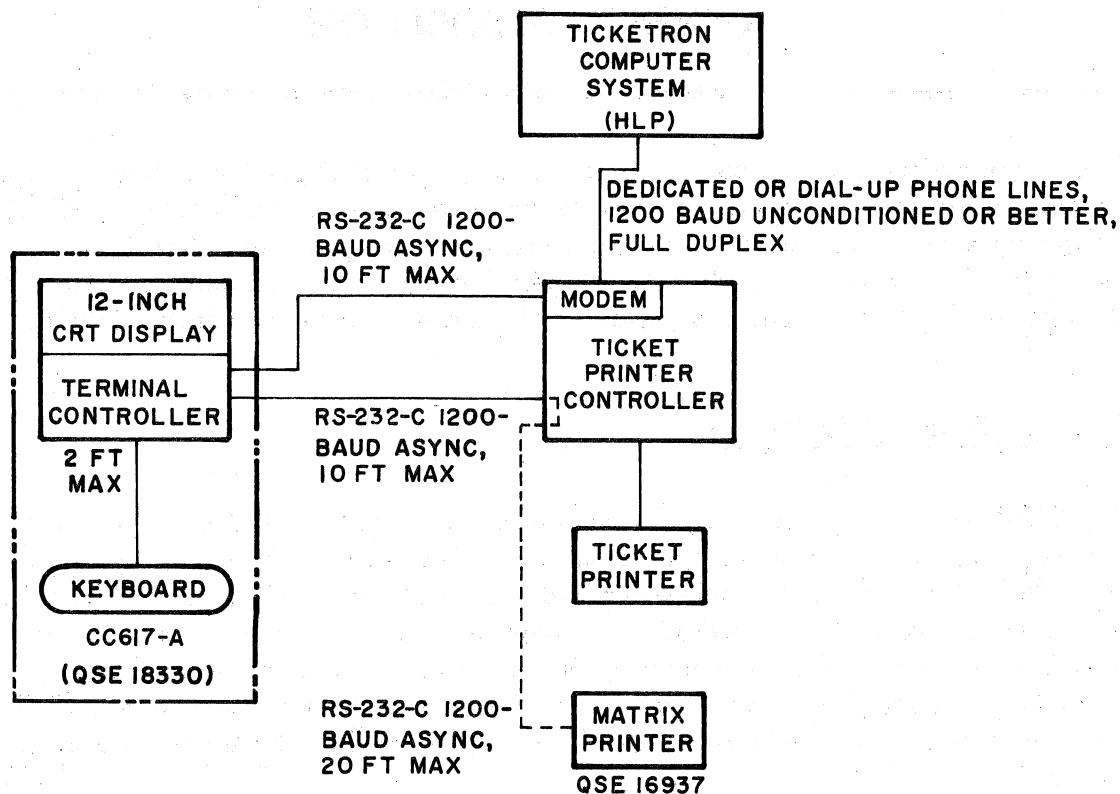
Due to their differences in configuration makeup, the first portion of this section contains a separate overall description for the two models of the display terminal. Following each overall description is a series of paragraphs which describes the major assemblies/modules of that model. At the rear of the section is a listing of data pertaining to their physical, electrical, and environmental characteristics.

CC617-A DISPLAY TERMINAL

The CC617-A Display Terminal, which is also known as QSE 18330, is part of a remote terminal subsystem configured for use by Ticketron. The CC617-A is the main controlling unit of this subsystem and is in itself, an entity, in that it consists of a terminal controller, a cathode-ray tube (crt) display, a power supply, and an operator keyboard. These elements of the subsystem are the only ones that are specifically covered by this manual. The other elements of the subsystem include the units briefly described below. A block diagram of the subsystem is shown in figure 1-1.

- Ticket printer controller — contains power, control logic, and interface electronics for the ticket printer, an optional matrix printer, and a modem.
- Ticket printer — contains the basic printing mechanism for printing tickets.
- Optional matrix printer — contains the basic printing mechanism for printing administrative data.

The subsystem, of which CC617-A is a part, interacts with the higher-level Ticketron processing system via common carrier facilities (telephone lines), and the terminal operator via keyboard input. Ticket information that is displayed on the crt can be printed by the ticket printer under control of the operator. The subsystem also allows for the addition of a matrix printer for printing administrative data. Communications between the subsystem and the higher-level processor are asynchronous and normally are at a data transfer rate of 1200 bits per second (1200 baud rate). The data transfer rate of the CC617-A is from 150 to 9600 bits per second, with the rate being switch-selected to match that used in the communications. The maximum cable lengths of the interface connections between CC617-A and the other units of the subsystem are defined in figure 1-1. As noted in the figure, the modem associated with the subsystem must comply to the requirements of EIA standard RS-232-C. A listing of the interface signals and their pin assignments to the interface connectors of the display terminal are contained in appendix A.



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Figure 1-1. Ticketron Terminal Subsystem Employing CC617-A

The outward appearance of CC617-A is shown in figure 1-2. Its operator keyboard, which is specifically designed for entering ticket selling data, contains 86 keys with a keylock switch for operational security. Initially, the keylock switch must be unlocked with a key and set to either the ON or MGT (management) position before data can be entered and displayed on the crt, via the keyboard. To the right of the crt screen is a maintenance panel containing 16 indicators that show the operating and communication status of the terminal, along with the INTENSITY control for the crt. Also contained on the maintenance panel are 10 control switches that are hidden from the operator behind a removable cover. These switches are only for use during checkout and maintenance of the terminal. Located at the rear of the display terminal (refer to figure 1-2), is its primary circuit breaker, a 9-foot ac power cord, and connectors for making the interface connections to the subsystem modem and ticket printer controller. The primary circuit breaker provides primary (ac input power) and secondary (power supply) power overload protection for the terminal and also serves as its on/off switch. Amperage rating of the primary circuit breaker is 3.5 amperes.

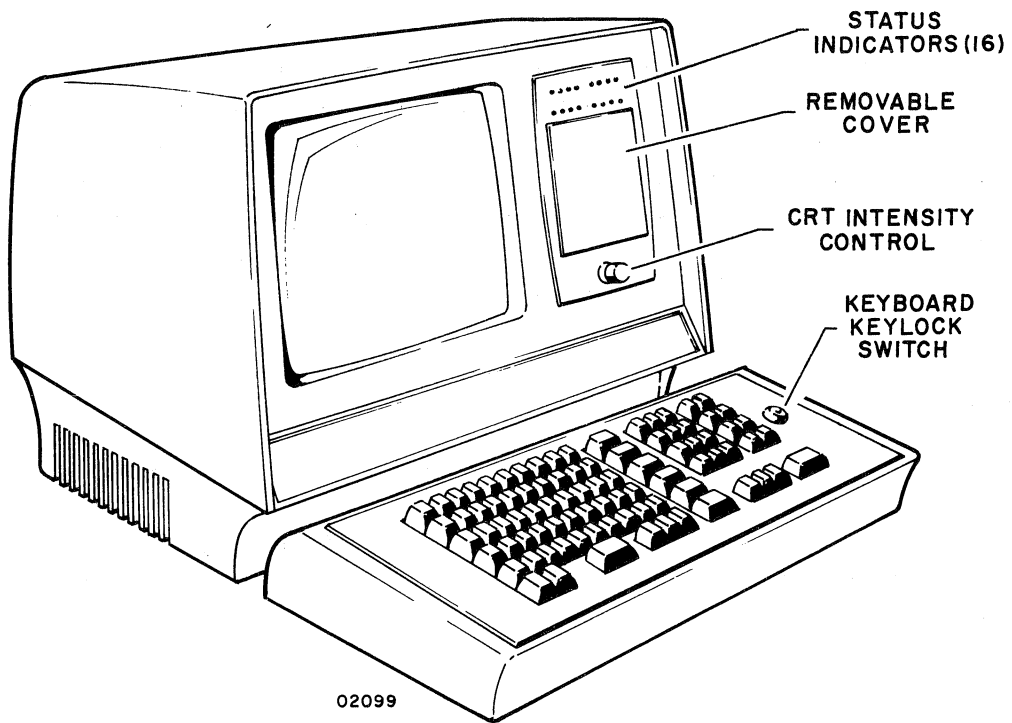
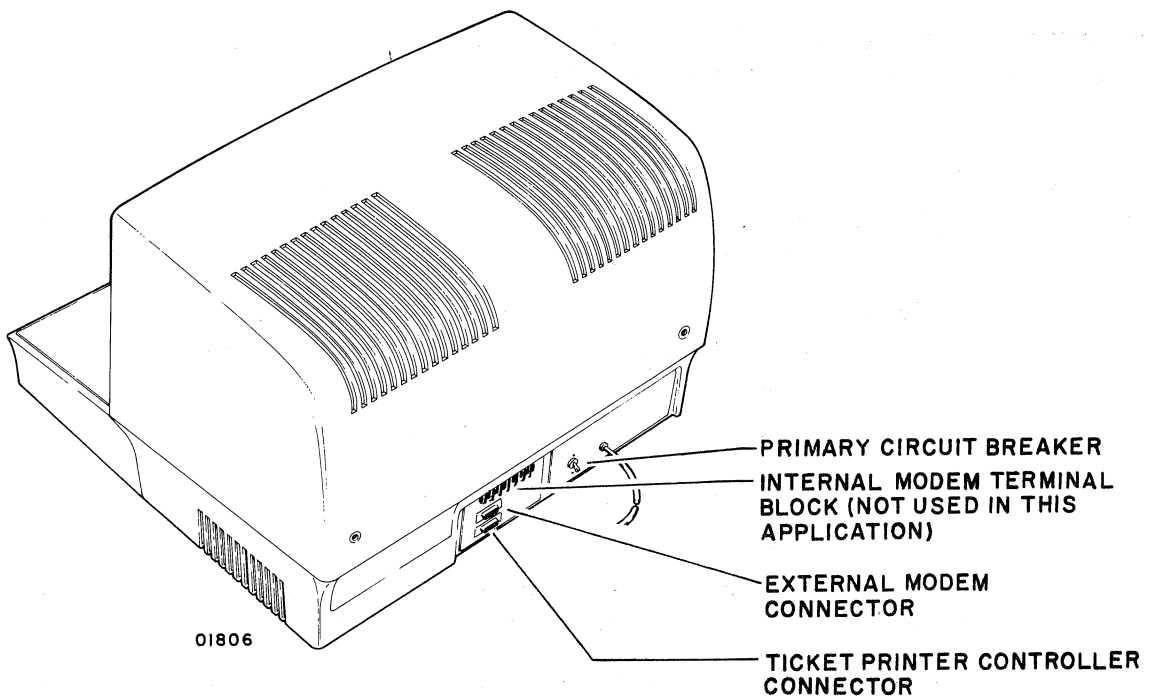


Figure 1-2. CC617-A Display Terminal

The following paragraphs describe the major assemblies/modules of CC617-A. Except for the keyboard these modules are located within the cabinet of CC617-A, as shown in figure 1-3. Major features inherent to these modules include the following:

- A 12-inch (diagonal measurement) crt with video drive circuitry that has a program-generated blinking underline cursor and can show programmable blink, blank, dim, and inverse video fields.
- Symbol generation circuitry that can generate 96 standard ASCII characters and 16 special characters. The dot matrix patterns and associated codes for these characters are contained in appendix B.
- Display refresh memory (random-access memory).
- Memory for applications program storage (random-access memory).
- A fixed firmware program stored in a read-only memory that causes the display terminal to perform an initial self-test, a checksum routine, and an autoload of the applications program.
- Control circuitry for interfacing the display terminal to a modem and to a ticket printer controller.
- Program-generated selection of display format — 40 characters by 6 lines, 40 characters by 12 lines, 80 characters by 12 lines, or 80 characters by 24 lines.

CRT MONITOR

The basic function of the crt monitor is to display alphanumeric video information on the crt screen. It consists of a crt and associated video drive circuits mounted on a printed-circuit (PC) board. This unit interfaces with the display/keyboard logic board which furnishes the video and sweep signals. The vertical sweep frequency is 60 Hz; horizontal sweep frequency is 15.8 kHz. The crt screen is approximately 8 inches high and 10-1/2 inches wide (12 inches diagonal), and uses a nominal raster area of 8 inches wide by 5-1/4 inches high.

POWER SUPPLY

The power supply module is a solid-state supply that uses a transformer output to produce unregulated +20-V dc, -20-V dc, and 20-V ac. Regulated voltages of -5-V dc, +12-V dc, and -12-V dc are also provided. Major physical features of the power supply are a transformer assembly, capacitor board, regulated board, and a bridge rectifier.

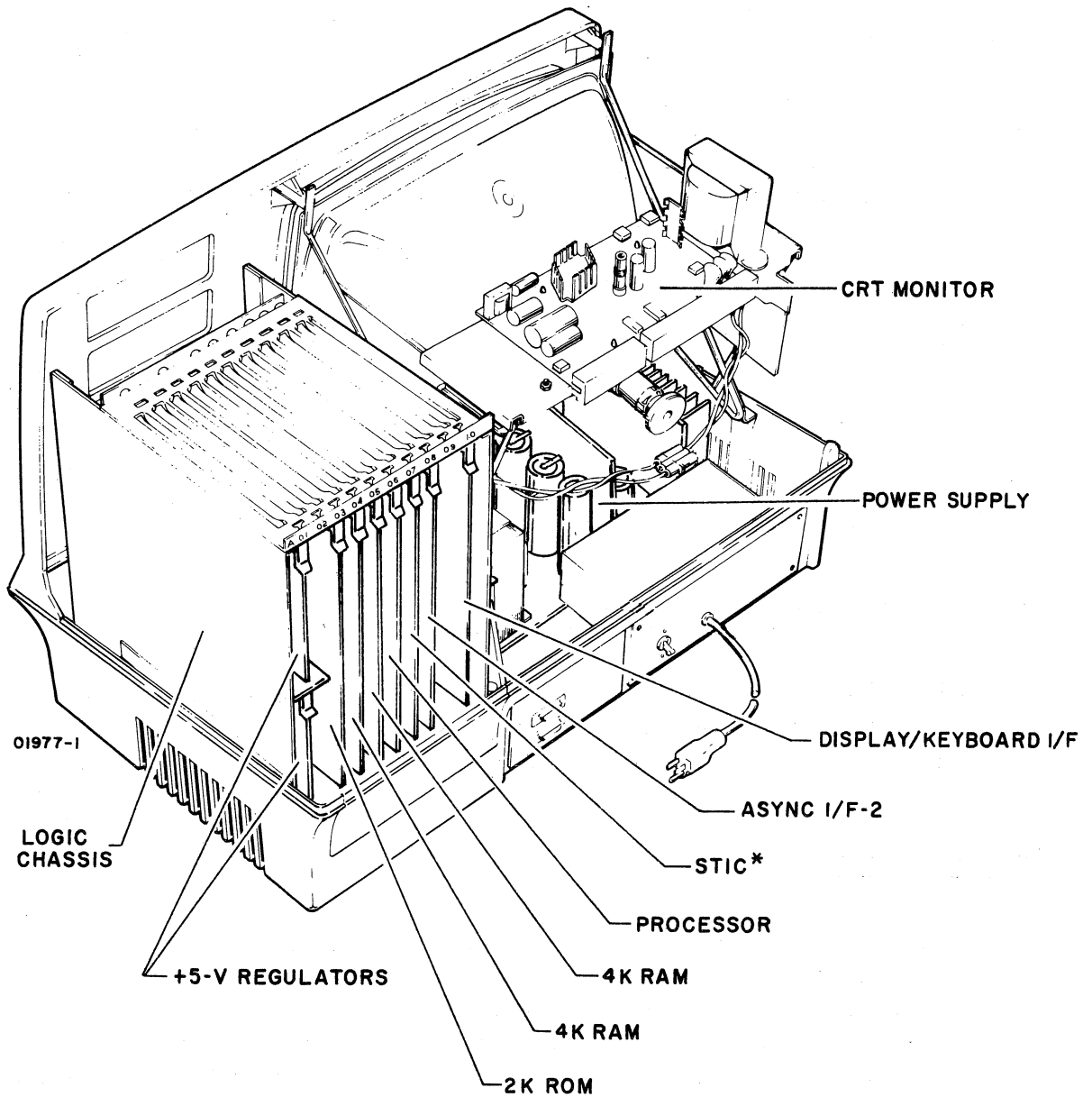


Figure 1-3. Internal Modules of CC617-A

LOGIC CHASSIS

The logic chassis is designed to house eight standard 60-pak PC modules and two voltage regulator modules. It contains a PC backpanel for interconnecting the modules. A total of seven PC logic modules and two 5-volt dc regulators are used in CC617-A. These are described in the following paragraphs.

* Special Timing and Interrupt Control

+5-V dc Regulator Modules

Two regulator modules are used and provide regulated +5-V dc power to the various logic modules contained in the logic chassis. They derive their output from the unregulated +20-V dc produced by the power supply module. Each 5-volt regulator module can provide up to 10 amperes current.

2K Read-Only Memory Module (ROM)

This module contains the firmware program sequences which allow the display terminal to perform an initial self-test (quicklook), RAM checksum, and autoload from the higher-level processor (HLP). These program sequences require 2K bytes of ROM memory.

4K Random-Access Memory Modules (RAM)

Two RAM modules are used and contain the temporary type memory necessary for controlware programs, tables, device buffers, and display refresh of the crt. A total of 8K of RAM is provided for these purposes.

Processor Module

This module is an 8-bit-per-byte microprocessor that interfaces with and controls the functions of all the other logic modules in the logic chassis. It governs the operation of the display terminal by retrieving and executing program instructions stored in the ROM and RAM modules. Included in its responsibilities is the control of access to the RAM for the entry or retrieval of data. Impending communications from other logic modules to the processor module are handled through the use of interrupts.

Async I/F-2 Module

This module allows the processor to communicate with the higher-level processor via an RS-232-C compatible asynchronous communications link. This module has two ports; each port has the following capabilities:

- RS-232-C signal levels
- 8-bit character frame with one start bit and one stop bit

- Half-duplex line control
- Switch-selectable baud rate (150, 300, 600, 1200, 1800, 2400, 4800, and 9600 baud) plus a variable frequency select

This module also transfers parallel data bidirectionally between the processor module and the serial data communication port, generates and checks parity, generates interrupts, and provides status to the processor module.

Special Timing and Interrupt Control (STIC) Module

This module provides the following functions:

- Monitoring of interrupts for the processor module
- Basic timing for the async I/F-2 module
- Monitoring of RAM modules for parity error condition
- Maintenance panel interface
- Sound alarm input
- Switch-selection of the site address of the display terminal
- Master clear/autoload control

Display/Keyboard Interface Module

This module provides a dual interface with the crt display monitor and the keyboard. The display portion of this module obtains data directly from RAM and generates video signals to the crt display. The keyboard portion of the module interfaces the keyboard to the Data bus. Data is received from the keyboard in 8-bit parallel format with a Data Ready signal. The Data Ready causes an interrupt to the processor module to allow the keyboard input to be entered into memory.

Sound Alarm

A sound alarm is located on the bottom of the logic chassis. The alarm is under software (programmable) control via the STIC module. When activated, the alarm generates a frequency of 2900 ± 500 Hz at a sound level of 68 to 80 decibels.

KEYBOARD

The keyboard is a detachable, tabletop data input device containing 86 nonlocking, momentary-contact, magnetic-reed-type key switches. When a key is pressed, it generates an 8-bit code (unique to the key position) and a Data Ready signal. This information is sent to the display/keyboard interface module via a 2-foot cable connecting the keyboard to the keyboard connector of the display terminal. This connector is located at the bottom right front of the display terminal.

The keyboard assembly also contains a three-position keylock switch to indicate OFF, ON, and MGT (management) modes. The switch position cannot be changed without the insertion of a key. Status bits are provided to the keyboard interface logic indicating the position of this switch. The ON and MGT positions control power application to the ticket printer controller.

CC617-B DISPLAY TERMINAL

The module configuration of the CC617-B Display Terminal allows for versatility in its application. Its configuration consists of a terminal controller that contains no memory and consequently no fixed firmware program, along with a crt display and a power supply. It differs from the CC617-A, in that it must be mated with an operator keyboard and a program memory module to function as a display terminal. The program memory module contains both ROM and RAM type memory, with the ROM having a fixed firmware program stored in it. The firmware program dictates the functional characteristics of the host display terminal. For the sake of versatility, the keyboard and the program memory modules are considered separate equipment. For these reasons, reference to them or to the characteristics that they introduce to the display terminal are made in a limited manner in this manual. The only specific reference to the Ticketron application of CC617-B is in areas where the subject matter pertaining to the exclusively-Ticketron-used CC617-A happens to be the same as that of the Ticketron application of CC617-B. In the areas where this condition exists, the fact is noted.

A block diagram of CC617-B is shown in figure 1-4. The CC617-B has provisions for interfacing with a printer (in the case of the Ticketron application, a ticket printer controller), and can either interface with an external modem or host an optional modem module in its logic chassis. The cable lengths for these interface connections and that of the keyboard module used in the application, are as follows:

- Display terminal to printer — 10 feet maximum
- Display terminal to external modem — 50 feet maximum
- Display terminal to keyboard module — 2.5 feet maximum

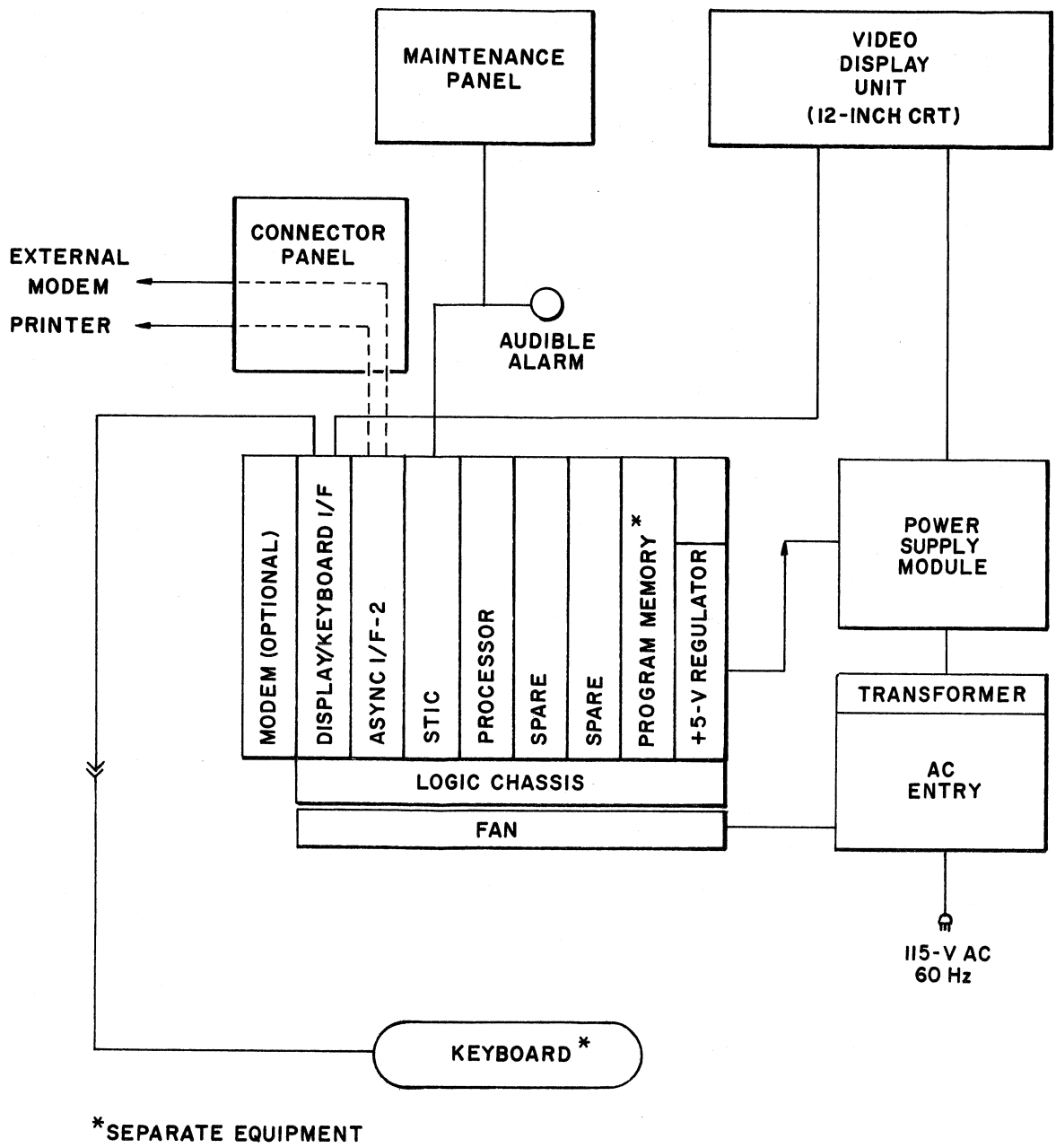


Figure 1-4. Module Block Diagram of CC617-B Display Terminal

The CC617-B interacts with a higher-level processor via common carrier facilities (telephone lines), and a terminal operator via keyboard input. Data received from either of these sources can be displayed on its crt and depending upon the application, may also be printed on an associated printer. Its communications with the higher-level processor are asynchronous and may be in either half-duplex or full-duplex mode. The modem associated with the display terminal must comply to the requirements of EIA standard RS-232-C, and depending upon system requirements, may be either the half-duplex, 2-wire or full-duplex, 4-wire variety.

The printer that may be associated with the display terminal must also be an asynchronous communication device with interface characteristics that meet RS-232-C requirements. In addition, depending upon the application, the printer may have provisions for handling a Keylock In/Keylock Out signal connection to control the application of power to it for security purposes. When used in an application such as Ticketron, the electrical condition of the Keylock In and Keylock Out signal lines from the display terminal are dependent upon what position a keylock switch is in on the keyboard module. When the keylock switch is in the ON or MGT (management) position, these signal lines are electrically connected and a voltage of between +18 to +23 V dc flows through them. When the keylock switch is in the OFF position, these signal lines are electrically disconnected and only the Keylock In signal line has voltage on it. A listing of the interface signals and their pin assignments to the interface connectors of the display terminal are contained in appendix A.

The outward appearance of CC617-B is shown in figure 1-5. The keyboard module used in the application connects to the display terminal via the interface connector located at the bottom right front of the terminal. (In the Ticketron application, the keyboard module is the same as that described in the CC617-A portion of this section.) To the right of the crt screen is a maintenance panel containing 16 indicators that show the operating and communication status of the terminal, along with the INTENSITY control for the crt. Also contained on the maintenance panel are 10 control switches that are hidden from the operator behind a removable cover. These switches are for use only during checkout and maintenance of the terminal.

Located at the rear of the display terminal, refer to figure 1-5, is the primary circuit breaker, 9-foot ac power cord, and connectors for making the interface connections to an associated printer and an external modem. If the optional modem module is employed in the application in lieu of an external modem, the communications telephone cable is connected to the terminal block located above the modem connector. The primary circuit breaker provides primary (ac input power) and secondary (power supply) power overload protection for the terminal and also serves as its on/off switch. Amperage rating of the primary circuit breaker is 3.5 amperes.

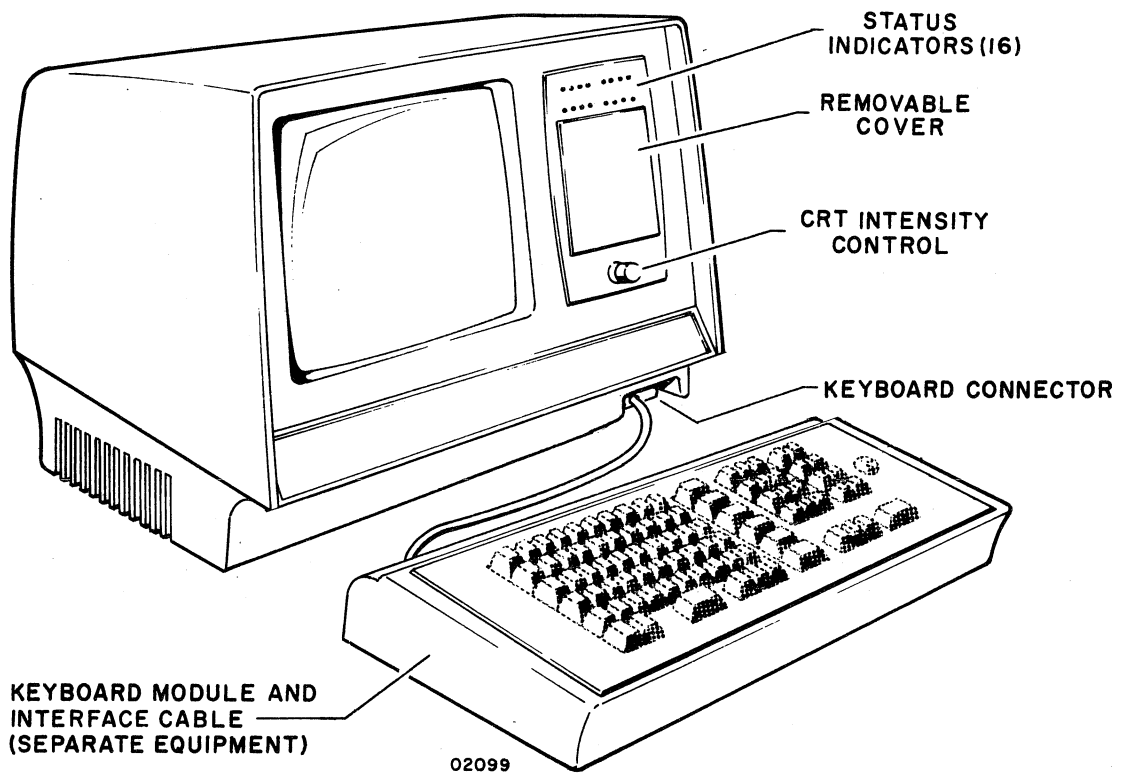
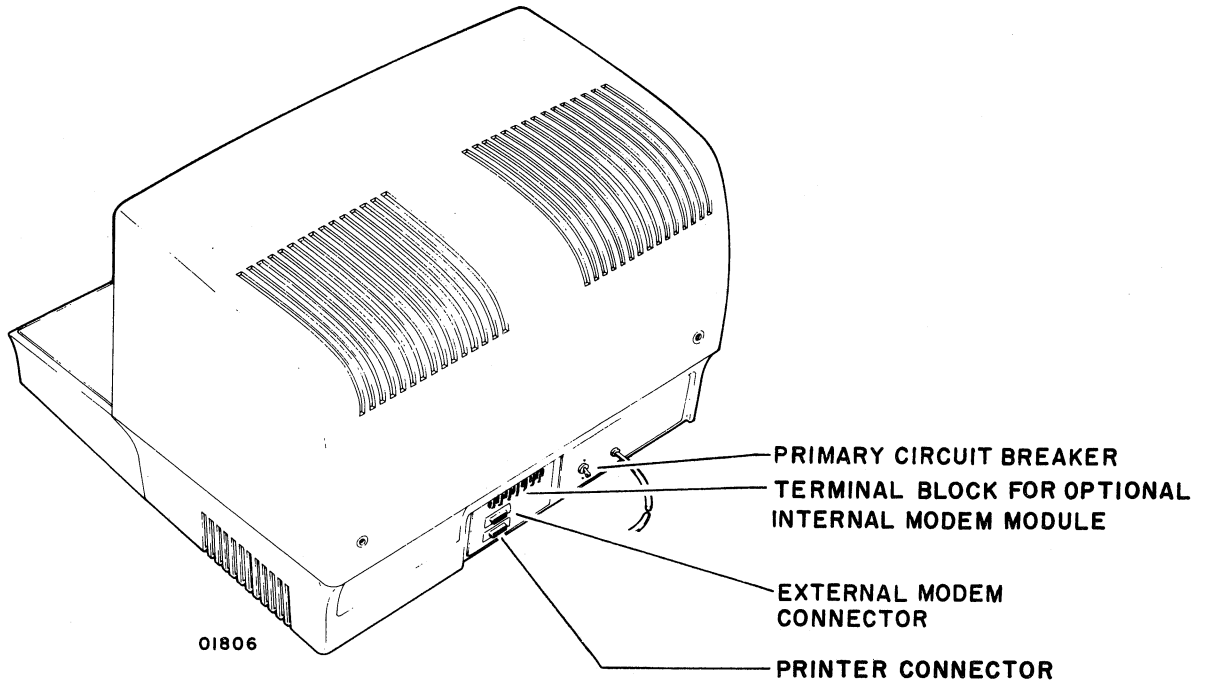


Figure 1-5. CC617-B Display Terminal

The internal layout of CC617-B is shown in figure 1-6. Locations of the major modules are pointed out in the figure along with the location of the program memory module associated with the application, and the location reserved for the optional modem module. Versions of the program memory module designed for use with CC617-B consist of a single PC board that contains both ROM and RAM memory along with circuitry that interfaces the memory with the display terminal shared bus. The two card connectors of card location 03 in the logic chassis, where the program memory module is inserted, provide all the necessary power and signal connections for this interface. Pin assignments of the interface connections pertaining to the program memory module are shown in the interconnection diagrams contained in section 5, Diagrams.

Stored within the ROM, of the program memory module, is a fixed firmware program that is application oriented and dictates the functional characteristics of the display terminal. The RAM provides the temporary memory necessary for storage of display refresh data and for storage of the applications program that is loaded into the RAM from a higher-level processor during display terminal initialization. Only one program memory module can be used in a display terminal. The storage capacity of the ROM and RAM are as follows:

- ROM — up to 6144 8-bit words made up of 1024 8-bit word increments, with the actual capacity dependent on the requirements of the firmware program used in the application. (In the Ticketron application, 2048 8-bit words of storage are provided for this purpose.)
- RAM — 8192 by 9 bits, with the 9 bits representing 8 bits of data accompanied with an internally generated and internally checked parity bit (8K of 8-bit word storage).

There are three versions of an optional single PC board modem module that can be used in the application of CC617-B. As shown in figure 1-6, the location in the logic chassis reserved for the insertion of a modem module is card location 09. The two card connectors in this location provide all the interface connections that are required between the modem module and the communications telephone line (fastened to the terminal block at the rear of the display terminal) and between the modem module and modem interface and power circuitry of the display terminal. There are provisions for making individual pin connections between the modem module version part number 51912400 and a data coupler with a handset such as the Bell System CBS Data Coupler, via the top card connector. All of the interface connections and pin assignments pertaining to the modem module are shown in the interconnection diagrams contained in section 5.

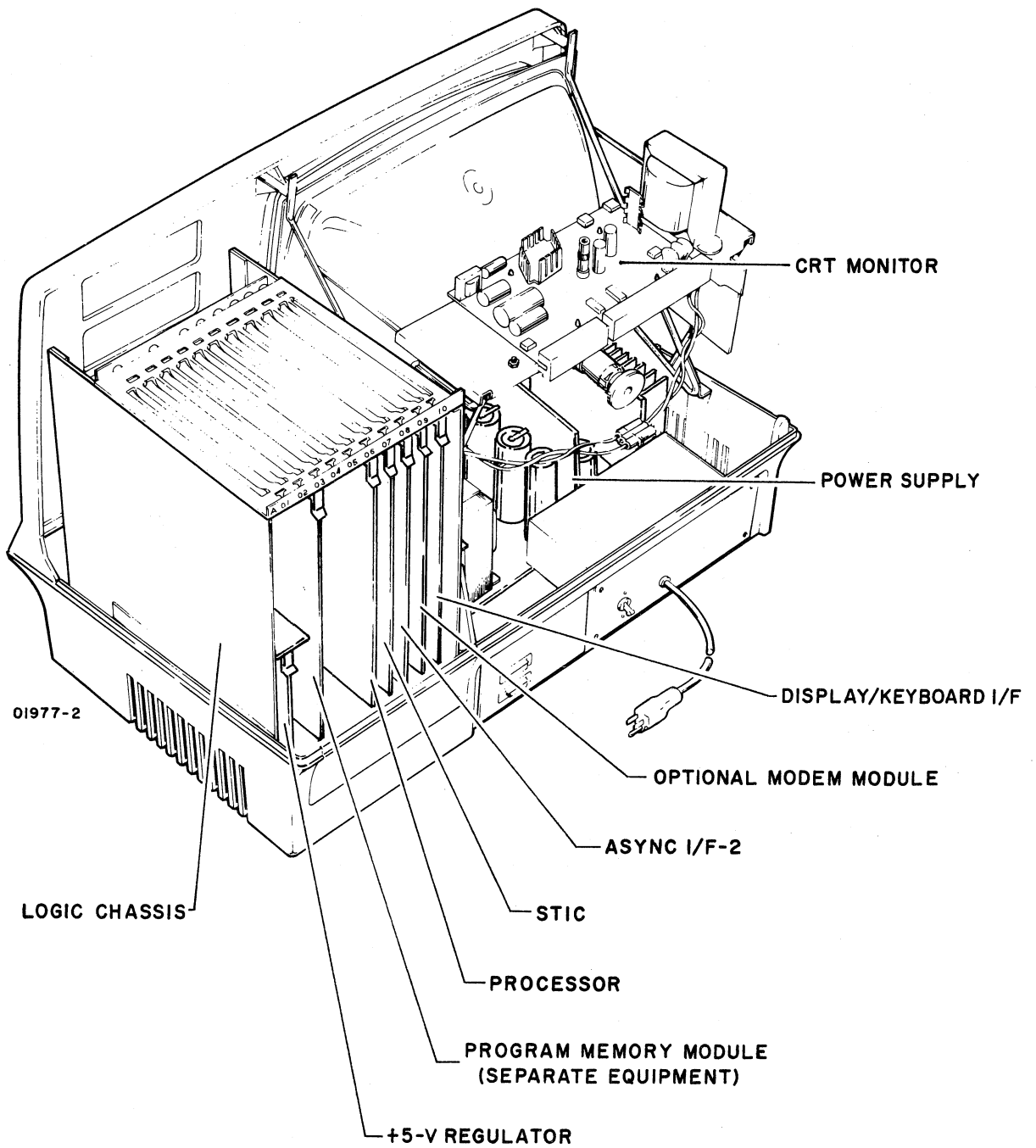


Figure 1-6. Internal Layout of CC617-B

All three versions of the modem module have similarities in that all can operate in either point-to-point or multipoint communication arrangements and each meet the requirements of EIA standard RS-232-C for asynchronous modems. Also, each version employs the phase-coherent frequency shift keying type of modulation/demodulation. Other particulars concerning the three versions of the module are as follows:

- CDC part number 51912400 — has a receive/transmit data transfer rate of from 0 to 1200 bits per second on switched-network communication lines or up to 1800 bits per second on leased communication lines. It can be configured in either full-duplex, 4-wire or half-duplex, 2-wire fashion and can service a data coupler with a handset. The data coupler and handset may be part of either a Bell System CDT or CBS Data Access Arrangement.
- CDC part number 51912402 — has a receive/transmit data transfer rate of from 0 to 1200 bits per second on leased communication lines configured in full-duplex, 4-wire fashion.
- CDC part number 51912403 — has the same capabilities as that given for part number 51912402. The only difference between the two versions is that part number 51912403 can provide its own regulation of power voltage, which in this case is not used.

The major modules within the configuration of CC617-B are described in the text which follows. Many of the features inherent to these modules add to the application versatility of CC617-B in that they are either switch-selectable or firmware/applications program-selectable. Features in this category include the following:

- Switch selectability of communications baud or data transfer rate (150, 300, 600, 1200, 1800, 2400, 4800, or 9600 plus a variable frequency select).
- Firmware program selectability of data character lengths in communications (5, 6, 7, or 8 data bits).
- Firmware program selectability of the number of stop bits that follow a data character in communications (1 or 2 stop bits, or a possible 1.5 stop bits if a 5-bit data character length is being used).
- Firmware program selectability of the type of parity that is used in communications (odd, even, or none).
- Firmware/applications program selectability of the display format that is used by the display terminal (40 characters by 6 lines, 40 characters by 12 lines, 80 characters by 12 lines, or 80 characters by 24 lines).
- Firmware/applications program generation of a blinking underline cursor, with no restriction as to how many can be displayed simultaneously.

Other major features inherent to these modules include the following:

- 12-inch (diagonal measurement) crt with video drive circuitry that can show programmable blink, blank, dim, and inverse video fields.
- Symbol generation circuitry that can generate 96 standard ASCII characters and 16 special characters. The dot matrix patterns and associated codes for these characters are contained in appendix B.
- Control circuitry for interfacing the display terminal to a modem and a printer device with the rate of communications on each interface not necessarily being identical. (This would require that the switch-selected baud rate previously mentioned, which exists on each interface, would be set accordingly.)

CRT MONITOR

The basic function of the crt monitor is to display alphanumeric video information on the crt screen. It consists of a crt and associated video drive circuits mounted on a printed-circuit (PC) board. This unit interfaces with the display/keyboard logic board which furnishes the video and sweep signals. The vertical sweep frequency is 60 Hz; horizontal sweep frequency is 15.8 kHz. The crt screen is approximately 8 inches high and 10-1/2 inches wide (12 inches diagonal), and uses a nominal raster area of 8 inches wide by 5-1/4 inches high.

POWER SUPPLY MODULE

The power supply module is a solid-state supply that uses a transformer output to produce unregulated +20-V dc, -20-V dc and 20-V ac. Regulated voltages of -5-V dc, +12-V dc, and -12-V dc are also provided. Major physical features of the power supply are a transformer assembly, capacitor board, regulator board, and a bridge rectifier.

LOGIC CHASSIS

RED - +5V
YELLOW - +19V
GREEN - -19V

The logic chassis is designed to house eight standard 60-pak PC modules and two voltage regulator modules. It contains a PC backpanel for interconnecting the modules. In its use in CC617-B, a total of six PC modules and one voltage regulator module may be housed. This includes the program memory module used in the application, the optional modem module, and the four PC modules that are part of the CC617-B configuration. A brief description of the latter four PC modules and of the regulator module are contained in the paragraphs that follow.

ROM - QuickLook

+5-Volt dc Regulator Module

This module provides regulated +5-V dc power to the other modules housed in the logic chassis. It derives its output from the unregulated +20-V dc produced by the power supply module. The maximum output current provided is 10 amperes.

Processor Module

This module is an 8-bit-per-byte microprocessor that interfaces with, and controls the functions of all the other PC modules housed in the logic chassis. It governs the operation of the display terminal by retrieving and executing program instructions stored in the ROM and RAM of the applications program memory module. Included in its responsibilities is the control of access to the RAM for the entry or retrieval of data. Impending communications from other PC modules to the processor module are handled through the use of interrupts.

Async I/F-2 Module

As its name implies, this module contains two separate asynchronous communication interfaces or ports. One of its ports is connected to the external or internal modem associated with the display terminal, and the other is connected to the interface connector of the display terminal intended for use by an associated printer. Through these ports it performs all the receive and transmit functions of the display terminal which are under control of the processor module. The switch selectability feature of the baud or data transfer rate of communications is provided by two sets of rocker switches that are located on this module, one set of switches for each port. The functions performed by this module include the following:

- Converts serial data received from the modem or printer to parallel data acceptable for handling by the processor module during receive operations and vice versa during transmit operations.
- Checks received data characters for the type of parity (odd, even, or none) that the firmware program of the application dictates, and adds the appropriate parity bit to data characters that are to be transmitted.
- Checks received serial data for the framing and length that the firmware program of the application dictates, and accordingly generates the framing of data characters to be transmitted. The framing of a data character consists of: a start bit, the data character (5, 6, 7, or 8 data bits in length), the parity bit (if any), and 1 or 2 stop bits (or a possible 1.5 stop bits if a 5-bit data character length is being used).
- Generates interrupts to the processor module when a firmware program preselected interrupt condition occurs.

Special Timing and Interrupt Control (STIC) Module

This module provides the following functions:

- Monitoring of interrupts for the processor module
- Basic timing for the async I/F-2 module
- Monitoring of program memory module for RAM parity errors
- Maintenance panel interface
- Sound alarm input
- Switch-selection of the site address of the display terminal
- Master clear/autoload control for performing display terminal initialization

Display/Keyboard Interface Module

This module provides a dual interface with the crt display monitor and the keyboard module used in the application. The display portion of this module obtains data directly from the RAM of the program memory module and generates video signals to the crt display. The keyboard portion of the module interfaces the keyboard module to the processor module. Data is received from the keyboard in 8-bit parallel form accompanied with a Data Ready signal. The Data Ready causes an interrupt to the processor module to allow the keyboard input to be entered into the RAM of the program memory module.

Sound Alarm

A sound alarm is located on the bottom of the logic chassis. The alarm is under software (programmable) control via the STIC module. When activated, the alarm generates a frequency of 2900 ± 500 Hz at a sound level of 68 to 80 decibels.

PHYSICAL, ELECTRICAL, AND ENVIRONMENTAL CHARACTERISTICS

Following are the physical, electrical, and environmental characteristics for each model of the display terminal.

PHYSICAL CHARACTERISTICS

The dimensions and weight of the display terminal are:

- CC617-A (minus its keyboard)
- CC617-B (in its entirety)
 - Height: 15.7 in
 - Width: 21.4 in
 - Depth: 13.85 in
 - Weight: 60 lb
- Keyboard (applicable to CC617-A only)
 - Height: 4.2 in
 - Width: 21.65 in
 - Depth: 9.25 in
 - Weight: 7.5 lb

ELECTRICAL CHARACTERISTICS

The electrical power requirements for both models are:

Voltage: 115-V ac $\pm 10\%$
Phase: Single
Frequency: 59 - 60.6 Hz, 60 Hz nominal
Current: 1.5 A, nominal

ENVIRONMENTAL CHARACTERISTICS

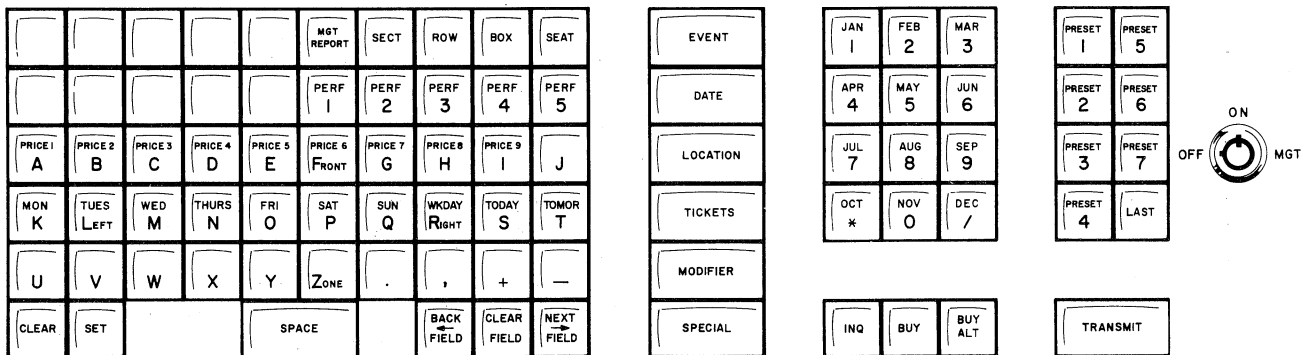
The environmental characteristics for both models are:

Operating Temperature: 50° to 95°F
Operating Maximum Temperature Change: 18°F per hour
Operating Maximum Altitude above Sea Level: 10 000 ft
Storage Temperature: -40° to 158°F
Storage Relative Humidity: 5 to 95% noncondensing
Storage Maximum Altitude above Sea Level: 10 000 ft

This section describes the basic keyboard functions, keyboard data codes, communication status indicators, and the display terminal initialization (firmware) program that applies to the Ticketron application of CC617-B and to the exclusively-Ticketron-used CC617-A. Due to the nearly unlimited variety of applications in which the CC617-B Display Terminal can be used, similar information pertaining to other applications is not provided. The only exception is the description of the status indicators on the display terminal maintenance panel which applies to other applications.

KEYBOARD MODULE (TICKETRON APPLICATION ONLY)

The keyboard module, figure 2-1, provides the means for data entry into the computerized transaction system. The function of the keylock switch and basic functions of the individual keys are listed in table 2-1. Specific software functions of these keys are controlled by Ticketron, and therefore are not described in this manual. The hexadecimal key codes assigned to each of the 86 keys on the keyboard and the keycap colors and legends are listed in table 2-2.



02098

Figure 2-1. Keyboard Layout (Ticketron Application Only)

TABLE 2-1. KEYBOARD CONTROLS (TICKETRON APPLICATION ONLY)

NAME	TYPE	FUNCTION
OFF/ON/MGT	Three-Position Keylock Switch	<p>Controls power application to the ticket printer controller and establishes the operating mode of the terminal.</p> <p>When in OFF position, no power is supplied to the ticket printer electronics. Power to the display logic and memory remains on, keeping programs and stored data intact. Generates Status bits: $2^3 = 0$, $2^2 = 0$.</p> <p>When in ON position, terminal is in normal operating state. Power is supplied to all devices controlled by the keylock switch. Generates Status bits: $2^3 = 0$, $2^2 = 1$.</p> <p>Software-controlled function. Generates Status bits: $2^3 = 1$, $2^2 = 1$.</p>
Data Entry Keys	Pushbutton Keyswitches	<p>Data entry keys are grouped into two clusters which permit operator input of alphabetic and numeric data.</p> <p>The alphabetic keys consist of A through Z, space, and symbols, + and -.</p> <p>Following depression of field key DATE, alphabetic keys K through T translate and enter as MON, TUES, WED, THURS, FRI, SAT, SUN, WKDAY, TODAY, and TOMOR (tomorrow), respectively.</p> <p>The numeric keys consist of 0 through 9 and symbols / and *.</p> <p>Following depression of field key DATE, the numeric keys 1 through 9, *, 0, and / translate and enter as months JAN through DEC respectively.</p>
Field Keys	Pushbutton Keyswitches	<p>The field keys include EVENT, DATE, LOCATION, TICKETS, MODIFIER, SECT (section), ROW, BOX, and SEAT. These keys are used to facilitate the desired ticket transaction.</p>
Control Keys	Pushbutton Keyswitches	<p>Control keys are CLEAR, SET, BACK FIELD, CLEAR FIELD, NEXT FIELD, PRESET 1 through PRESET 7, LAST, and TRANSMIT.</p>

TABLE 2-1. KEYBOARD CONTROLS (TICKETRON APPLICATION ONLY) CONTD

NAME	TYPE	FUNCTION
CLEAR		Pressing CLEAR clears out the present transaction and resets the starting mask on the crt screen.
SET		Pressing SET permits the use of preset keys PRESET 1 through PRESET 7 and LAST to direct the storage of keyboard data.
BACK FIELD		Pressing BACK FIELD repositions the cursor to the beginning of the field. Data within the field is not modified.
CLEAR FIELD		Pressing CLEAR FIELD clears the data in the field at which cursor is positioned. The cursor is returned to the beginning of that field.
NEXT FIELD		Pressing NEXT FIELD positions the cursor to the beginning of the next field on the display screen.
Preset Keys PRESET 1 through PRESET 7 and LAST	Pushbutton Keyswitches	The preset keys, PRESET 1 through PRESET 7 and LAST, are used to direct the storage of transaction data.
TRANSMIT	Pushbutton Keyswitch	Pressing TRANSMIT sends all data previously entered on the current transaction to the central computer.
Self-Defined Field Keys	Pushbutton Keyswitches	The self-defined field keys are grouped into two clusters containing PERF 1 through PERF 5 performance keys and INQ (inquiry), BUY, and BUY ALT (buy alternate) instruction keys.
PERF 1 through PERF 5		These keys are used to select any one of up to five performances on the same date.
INQ BUY BUY ALT		The instruction keys instruct the computer to perform inquiry, buy, or buy alternate actions upon other data in the request.
SPECIAL	Pushbutton Keyswitch	The special function key (SPECIAL) provides for the entry of fields for special types of transactions not defined on the keyboard, but under program control.

TABLE 2-2. KEY CODES AND LEGENDS (TICKETRON APPLICATION ONLY)

CODE (HEX)	LEGEND	COLOR	CODE (HEX)	LEGEND	COLOR	CODE (HEX)	LEGEND	COLOR
01*		Black	29	PRICE 1 A	Gray	51	U	Gray
02*		Black	2A	PRICE 2 B	Gray	52	V	Gray
03*		Black	2B	PRICE 3 C	Gray	53	W	Gray
04*		Black	2C	PRICE 4 D	Gray	54	X	Gray
05*		Black	2D	PRICE 5 E	Gray	55	Y	Gray
06	MGT REPORT	Gray	2E	PRICE 6 FRONT	Gray	56	ZONE	Gray
07	SECT	Blue	2F	PRICE 7 G	Gray	57	.	Gray
08	ROW	Blue	30	PRICE 8 H	Gray	58	,	Gray
09	BOX	Blue	31	PRICE 9 I	Gray	59	+	Gray
0A	SEAT	Blue	32	J	Gray	5A	-	Gray
0B**			33**			5B**		
0C**			34**			5C**		
0D	EVENT	Blue	35	LOCATION	Blue	5D	MODIFIER	Blue
0E**			36**			5E**		
0F	JAN 1	Blue	37	JUL 7	Blue	5F**		
10	FEB 2	Blue	38	AUG 8	Blue	60**		
11	MAR 3	Blue	39	SEP 9	Blue	61**		
12**			3A**			62**		
13	PRESET 1	Light Blue	3B	PRESET 3	Light Blue	63**		
14	PRESET 5	Light Blue	3C	PRESET 7	Light Blue	64**		
15*		Black	3D	MON K	Gray	65	CLEAR SET	Gray
16*		Black	3E	TUES LEFT	Gray	66		Gray
17*		Black	3F	WED M	Gray	67**		
18*		Black	40	THURS N	Gray	68**		
19*		Black	41	FRI O	Gray	69**		
1A	PERF 1	Blue	42	SAT P	Gray	6A	SPACE	Gray
1B	PERF 2	Blue	43	SUN Q	Gray	6B**		
1C	PERF 3	Blue	44	WKDAY RIGHT	Gray	6C	←BACK FIELD	Gray
1D	PERF 4	Blue	45	TODAY S	Gray	6D	CLEAR FIELD	Gray
1E	PERF 5	Blue	46	TOMOR T	Gray	6E	→NEXT FIELD	Gray
1F**			47**			6F**		
20**			48**			70**		
21	DATE	Blue	49	TICKETS	Blue	71	SPECIAL	Blue
22**			4A**			72**		
23	APR 4	Blue	4B	OCT *	Blue	73	INQ	Red
24	MAY 5	Blue	4C	NOV 0	Blue	74	BUY	Red
25	JUN 6	Blue	4D	DEC /	Blue	75	BUY ALT	Red
26**			4E**			76**		
27	PRESET 2	Light Blue	4F	PRESET 4	Light Blue	77**		
28	PRESET 6	Light Blue	50	LAST	Light Blue	78	TRANSMIT	Red

* Black keys are unscrubbed and have no legends.

** These key codes are unassigned and unused.

MAINTENANCE PANEL STATUS INDICATORS

The terminal and communication status indicators located on the maintenance panel of the display are described in table 2-3. All are light-emitting diode (LED) indicators.

TABLE 2-3. STATUS INDICATORS

NAME	FUNCTION
ON } RDY (Ready)	Indicates program execution has started.
ACTV (Active)	Indicates that the terminal has been polled at least once since the start of program execution.
XMT REQ (Transmit Request)	Indicates a transmit request when operator presses TRANSMIT key. Extinguishes immediately before the terminal sends its message to the central computer.
TRAN PROG (Transaction in Progress)	Indicates a transaction in progress immediately after terminal response to a poll. Stays on until terminal completes all of its output response and becomes ready to accept a new request from the keyboard.
COMM ERR (Communication Error)	Indicates a communication error.
CD (Carrier Detect)	Indicates that the modem is receiving a Carrier signal from the central computer.
RD (Receive Data)	Indicates that data signals are being received from the central computer.
MPE (Memory Parity Error)	Indicates detection of a memory (RAM) parity error. It can only be cleared by a power on or manual reset.
RTS (Request to Send)	Indicates that the terminal is about to transmit data.
CTS (Clear to Send)	Indicates that the modem is ready for data transmission.
TD (Transmit Data)	Indicates that the data signals are being transmitted to the central computer.

DISPLAY TERMINAL INITIALIZATION (TICKETRON APPLICATION ONLY)

Display terminal initialization is accomplished through use of a ROM resident firmware program that contains a quicklook diagnostic, a loader (autoload), and a checksum routine. These are described briefly in the following paragraphs. Refer to appendix C of this manual for a detailed description.

The normal sequence for terminal initialization is to apply power to the display terminal with maintenance panel switches 0 through 7 in the logical 0 position (left). It is assumed that the higher-level processor has available all pages of the applications to be loaded into the terminal's RAM memory. Then when power is applied, the quicklook diagnostic will automatically sequence through quicklook tests 001 through 005. These tests check the basic operation of the display terminal hardware before loading the applications program. Tests performed are:

- ROM checksum test (test 001)
- RAM memory test (test 002)
- CPU command test (test 003)
- Asynchronous communications channel test (test 004)
- CRT display test (test 005)

Upon the successful completion of these tests, the autoload program is automatically initiated to load the applications program. The applications program stored in the higher-level processor is divided into pages. The first page is a load page containing a page table that describes each program page available from the higher-level processor. The autoload program requests the load page and loads this page into page 1 of terminal memory. Then, using the load page as a table, the autoload program requests and loads all pages of program 1. When program 1 has been successfully loaded, the autoload jumps to the start of program 1 for execution.

During the quicklook-autoload sequence, the crt provides a visual indication of the tests and load operations being performed. A code is displayed in inverse video at the upper-left corner of the crt. This white block of data is termed a microdisplay. When executing a quicklook test, the microdisplay will contain a T followed by the test number. For example, T001 for quicklook test 1. During autoload the microdisplay will contain an L followed by the reference designation of the program page being loaded. For example, L001 for the loading of a program page having the reference designation of 001.

If a quicklook error occurs, or if the autoload cannot be loaded successfully, the sequence halts and the microdisplay will show an X following the test or reference designation number displayed. For example, T001X or L002X, etc.* Manual intervention is then required to reinitiate the quicklook-autoload sequence, such as reapplying terminal power or toggling the RESET switch. The EXECUTE switch can be used to perform a reload of a program page following an L---X error. Refer to procedure CRT1 contained in section 6, Maintenance, of this manual for additional corrective information.

* An exception is quicklook test 003, in which no X is displayed following the T003. A program load of a nonexistent page will cause a display of P---X.

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This section describes the crating, uncrating, installation, and checkout procedures for the display terminal. For similar information on other equipments that may be contained in the terminal subsystem, refer to the applicable hardware maintenance manual for the equipment. Should any difficulty arise, refer to section 6, Maintenance, of this manual for troubleshooting and corrective maintenance procedures.

Before proceeding to the procedures in this section, make note of the precautions that follow.

MOS CIRCUIT HANDLING PRECAUTIONS

The display terminal contains a number of PC boards that have MOS (metal-oxide semiconductor) integrated circuits on them. The MOS circuits are susceptible to irreparable damage if they are exposed to excessive static electricity, and thus require special handling. To expedite this, the safest practice to develop is to adhere to the following precautions at all times when handling any of the PC boards.

- Never insert, install, remove, replace, or otherwise connect/disconnect any circuit(s) within the terminal subsystem with primary power applied to any of the cabinets and/or equipments within the subsystem. Power off for the cabinet being worked on is not sufficient. An interface adapter module, powered within another cabinet, may be supplying signals to the logic chassis of the cabinet in which you are installing/removing a MOS circuit. This may be sufficient to damage the MOS circuits upon initial contact with the powered circuit.

WARNING

When observing static grounding precautions, do not touch powered-on electrical equipment and chassis frame at the same time.

- Before touching, grasping, or handling any circuit, connector, cable, or logic chassis backpanel always touch hand(s) to an exposed portion of the associated chassis frame to equalize potentials (bleed off any possible static charge from your hands onto the ground-level chassis).

- Especially in dry ambient air, any movement may cause static electricity buildup due to friction. In the case of shuffling one's feet across a dry carpet, such damage may be quite high and may easily jump from a cable connector being held onto the pins being mated to. This could damage the MOS circuits within the equipment. Thus, the chassis frame must always be touched immediately before connecting any cable to it.
- When removing, replacing, or otherwise handling any assembly/module which contains MOS circuits, do not touch circuit paths or conductors if at all possible. Do not carry a MOS circuit assembly across a room while touching its circuits.
- When a module is out of its chassis, if it is to lay somewhere where it may be touched, if it is to be carried to some other location, or if it is to be shipped, the module should be wrapped in static protective material, such as aluminum foil.

CRATING

The required materials and crating procedures to be followed when preparing the display terminal for shipment are shown in figure 3-1. Use only approved materials to protect against shipping damage. To obtain proper materials, contact the nearest CDC representative or:

Control Data Corporation
Corporate Traffic
8100 34th Avenue South
Minneapolis, Minnesota 55440

If the need arises to ship one of the modules of the display terminal in for repair, use the same packing material and carton that held its replacement. As mentioned under MOS Circuit Handling Precautions, special care must be exercised when packing a module that contains MOS circuits.

UNCRATING

To uncrate the display terminal, refer to figure 3-1 and perform the following:

- 1) Open top of exterior container and lift cables secured in end frame slits of packaging material.
- 2) Lift top flaps of end frames and remove keyboard.
- 3) Remove the two "T" blocks interlocked in the end frames.
- 4) Remove display with end frames attached from the exterior container.
- 5) Remove the end frames and any remaining packaging material from the display.
- 6) Inspect the display and keyboard for any shipping damage.

MATERIALS REQUIRED	QTY	CDC PART NO.
END FRAME CUSHIONING	2	41035801
3" WHITE REINFORCED BOX SEALING TAPE	A/R	-----
EXTERIOR CONTAINER	1	41035802

NOTES:

- 1) INTERLOCK FOAM BASE LEGS WITH END FRAMES
- 2) PLACE END FRAMES WITH BASE LEGS ON DISPLAY
- 3) PLACE DISPLAY WITH END FRAMES INTO CONTAINER
- 4) INTERLOCK "T" BLOCKS WITH END FRAMES
- 5) LIFT TOP FLAPS ON END FRAMES AND INSTALL KEYBOARD WITH KEYS FACING DOWN
- 6) SECURE CABLES IN END FRAME SLITS AS SHOWN
- 7) CLOSE AND SEAL CONTAINER WITH 3" WHITE REINFORCED BOX SEALING TAPE

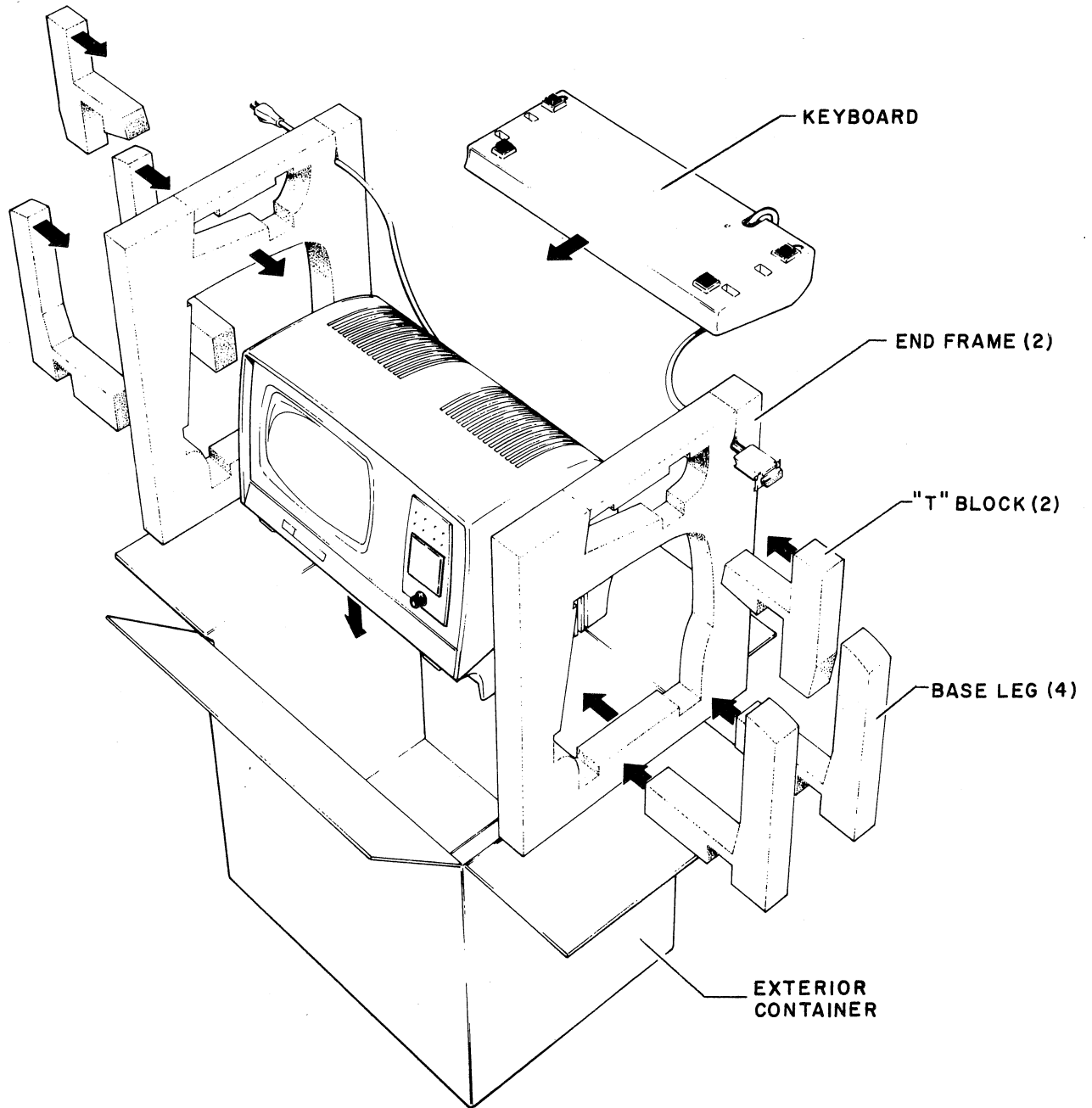


Figure 3-1. Display Terminal Packaging

01945-1

INSTALLATION

The following paragraphs describe the installation instructions for the display terminal. All procedures referenced in the instructions are contained in section 6 of this manual. An index is provided at the end of section 6 which lists the page numbers for the various procedures.

- 1) Move the display terminal to the desired location and make sure there are no obstructions that will interfere with the air intake and exhaust vents of the display terminal cabinet.

CAUTION

Do not lift the unit by the cabinet hood.

- 2) Remove cabinet hood by unscrewing two mounting screws in rear of cabinet hood, see figure 3-2, and sliding hood back and up.
- 3) Check that all PC boards are in their proper chassis location and that they are seated securely. The card placement for the CC617-A is shown in figure 3-3, while the card placement for CC617-B is shown in figure 3-4.

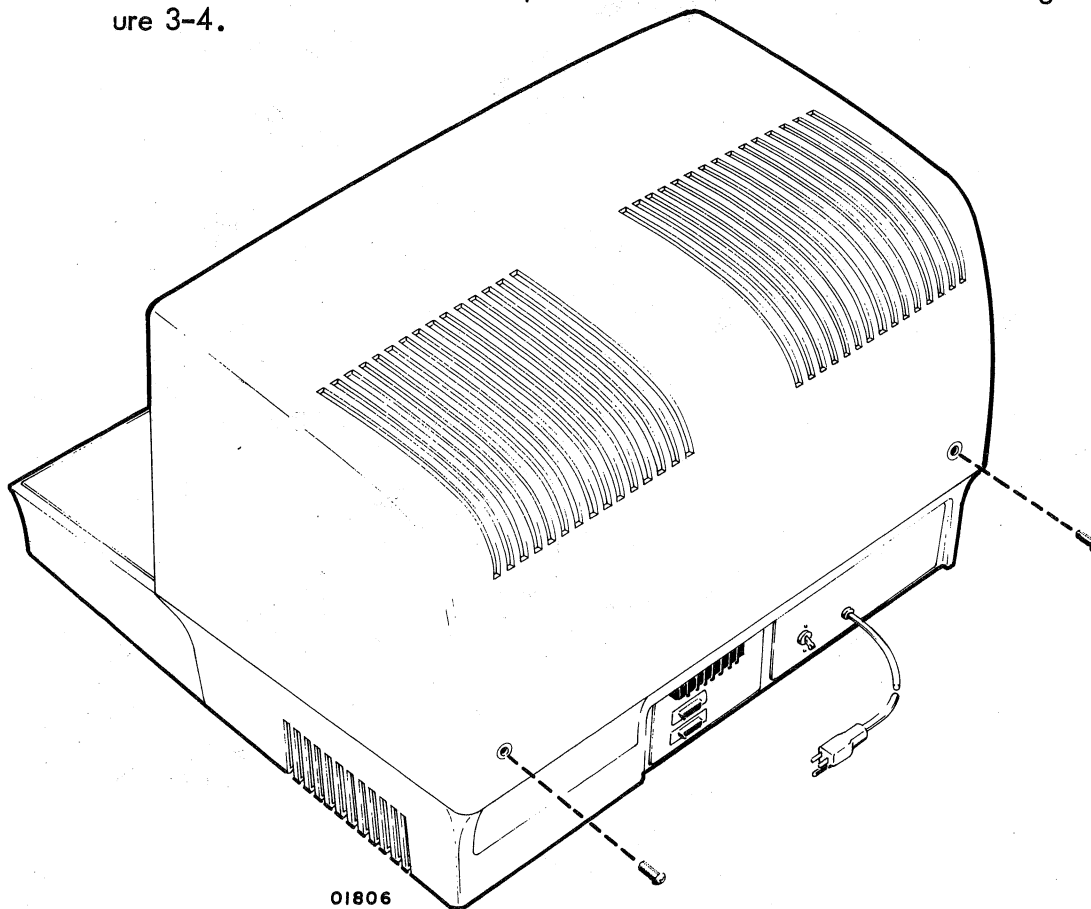


Figure 3-2. Cabinet Hood Removal

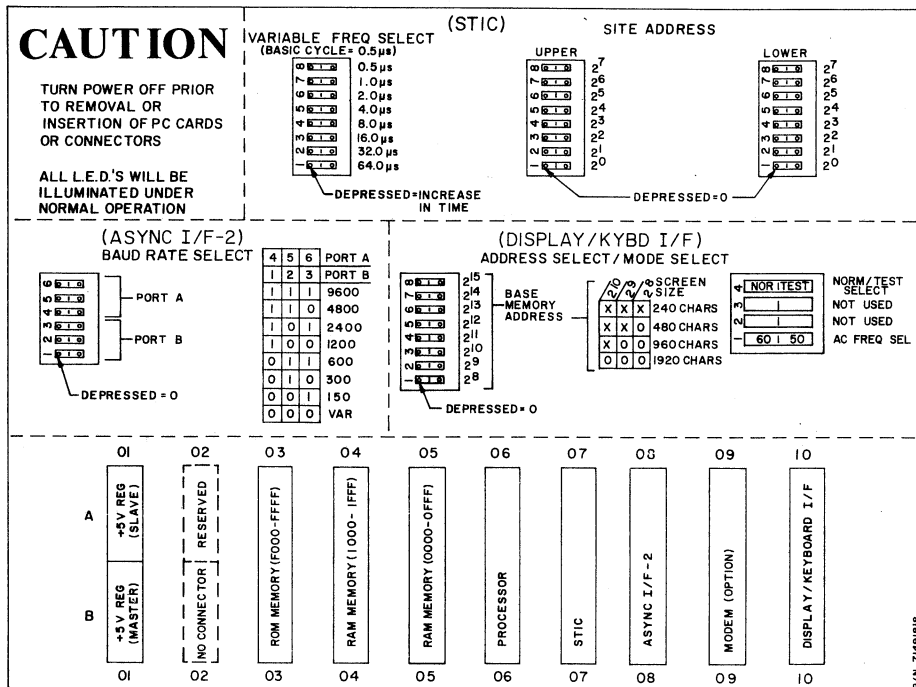


Figure 3-3. CC617-A Display Terminal Card Placement

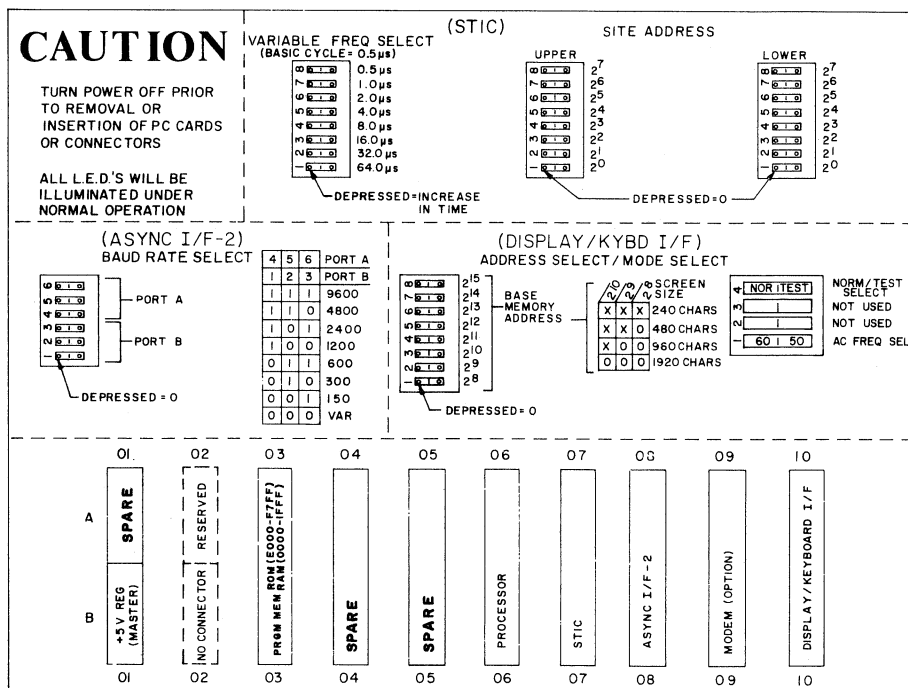


Figure 3-4. CC617-B Display Terminal Card Placement

- 4) Check that all internal cables are connected correctly and seated securely. Refer to figure 3-5.
- 5) Set the internal switches on the display terminal PC boards per the following. Refer to figure 3-3 or 3-4 for switch locations and arrangement. Additional information on switch settings is contained in the PC board descriptions in section 4, Theory of Operation, of this manual.
 - a) STIC module — Chassis location 07. The top eight switches are used to establish a variable baud rate frequency input to the async I/F-2 module. Under most circumstances, communications take place at a rate that can be matched by one of the fixed baud rate switch selections (150, 300, 600, 1200, 2400, 4800, and 9600) available on the async I/F-2 module, thus making the position of these eight variable frequency switches meaningless. If the rate of communications cannot be matched by one of the fixed baud rate settings, refer to section 4 and determine the required setting of the variable frequency switches for your situation.

Site address selection is established by the other 16 switches located on the STIC module. The middle group of switches on the board is for the upper 8 bits of the site address and the bottom group of switches is for the lower 8 bits of the address. The 2^0 bit for each group is the lowest switch position. Pressing a switch down nearest the board edge enables a 0 for that address bit. Obtain the required site address from the customer.

- b) Async I/F-2 module — Chassis location 08. The communication baud rate selection for the modem interface connections (port A) and the ticket printer controller or associated printer (port B) is established by six switches located on the async I/F-2 module. As shown in figure 3-3 or 3-4, the top three-switch segment of the group is for port A and the bottom three-switch segment is for port B. Pressing a switch down nearest the board edge places a 0 in that position of that segment. If the rate of communications for a port cannot be matched by one of the fixed baud rate switch selections, the switches of that segment must be set to the variable frequency selection (all pressed down nearest board edge) with the eight variable frequency switches of the STIC module set appropriately.

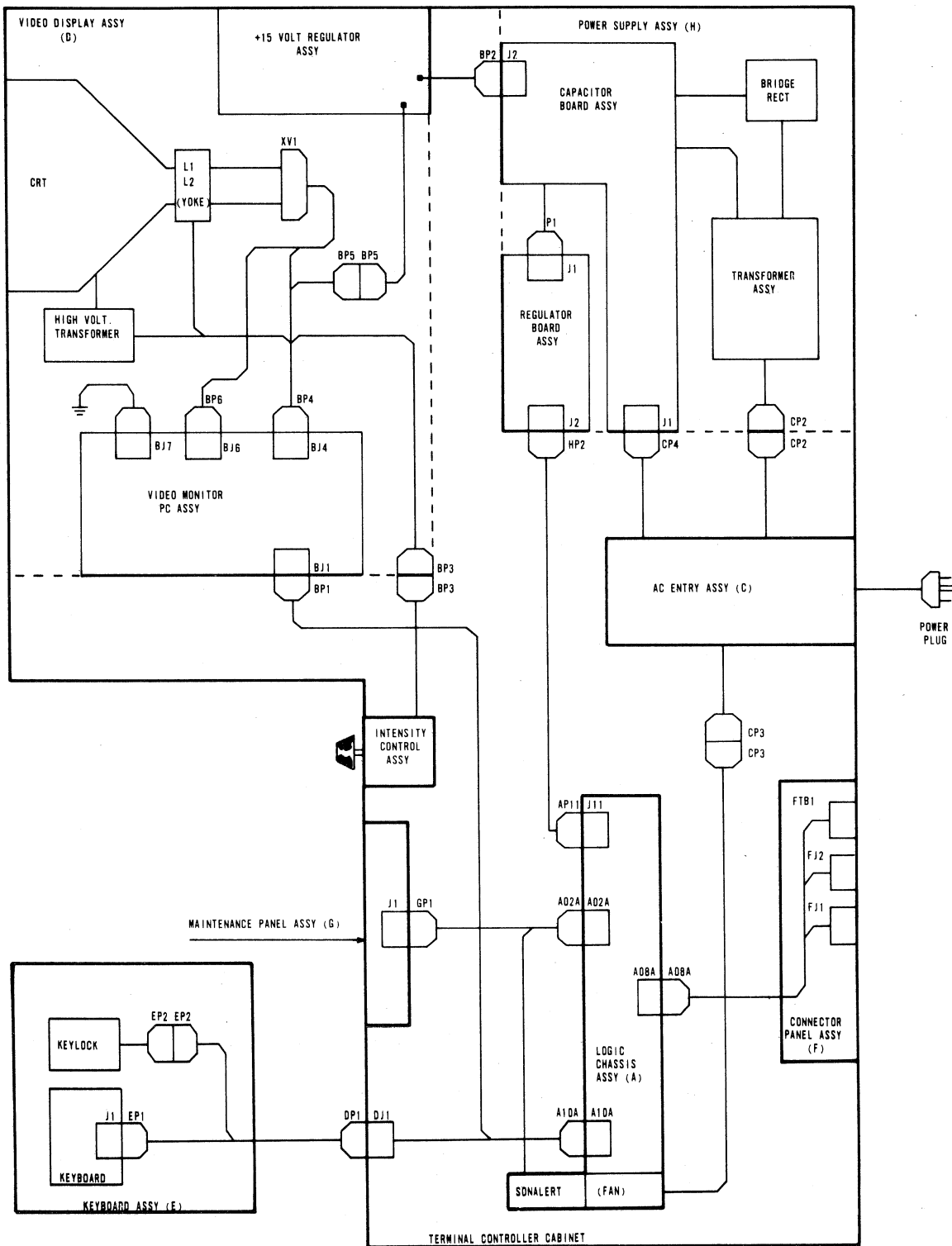


Figure 3-5. Display Terminal Internal Cabling Diagram

- c) Display/Keyboard I/F module — Chassis location 10. Twelve switches are contained on this module. From top to bottom they establish the following selections.

<u>Selection and Switch</u>	<u>Normal Setting Nearest Board Edge</u>
Normal or Test Mode Display Enable	(S2-4) Down (Selects Normal)
Not Used	(S2-3) Meaningless
Not Used	(S2-2) Meaningless
AC Frequency Selection 60/50 Hz	(S2-1) Down (Selects 60 Hz)
Base Memory (RAM) Address of Display Refresh Down Nearest Board Edge = 0	2 ¹⁵ (S1-8) Down
	2 ¹⁴ (S1-7) Down
	2 ¹³ (S1-6) Down
	2 ¹² (S1-5) Up
	2 ¹¹ (S1-4) Up
	2 ¹⁰ (S1-3) Down
	2 ⁹ (S1-2) Down
	2 ⁸ (S1-1) Down

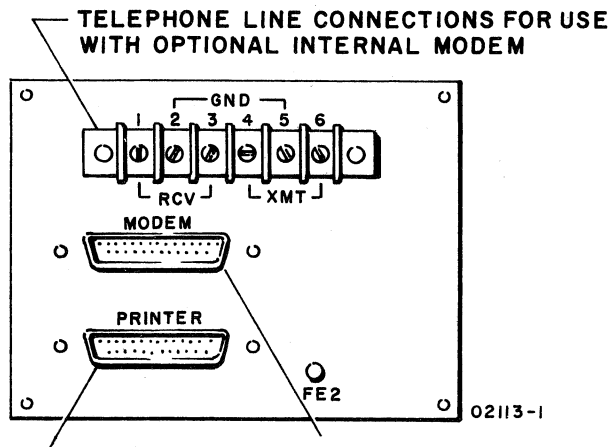
Selects 1800₁₆ for initial starting address. Verify this setting with the customer.

The normal setting for these switches are as indicated in the preceding listing. This establishes a 60-Hz display refresh cycle rate (same as ac power frequency) with the display circuitry enabled under program control. Switches S2-2 and S2-3 are bypassed via backplane wiring to allow program control of odd lines/all lines and 40/80 character display formats. The base memory address for the starting point of display refresh selected by the preceding listed switch settings is 1800₁₆, with the lower 8 bits of the address being all 0's. The selection of the base memory address is dependent upon the firmware program employed in the application with the mentioned 1800₁₆ selection pertaining specifically to the Ticketron application. As noted in the preceding listing, verify the base memory address selection with the customer.

- e) Modem module — Chassis location 09. If a modem module part number 51912400 is being used in the application of CC617-B, refer to the description of switch-selectable strapping options for this module contained in section 4 to determine the required settings for its operating parameter selection switches for your situation.
- 6) Connect the interface cable from the keyboard module to the keyboard connector located at the lower right front of the display terminal cabinet. The pin assignments of this connector are contained in appendix A.

- 7) Connect the applicable interface cables to the connector panel at the rear of the display terminal, see figure 3-6. Refer to appendix A for pin assignments of panel connectors. If the application of the unit being installed is other than that of Ticketron, make sure the interface connections do not exceed the maximum lengths given in the CC617-B portion of section 1, General Description.
- 8) Place the primary circuit breaker located at the rear of the display terminal in the down position and plug the ac power cord into the site power outlet.
- 9) Remove the snap-on cover from the maintenance panel at the front of the display terminal and set the data input switches 0 through 7 to the left (logical 0) position.
- 10) Leave the cabinet hood off and perform the following checkout procedure.

NOTE
 FOR THE PIN ASSIGNMENTS OF THESE CONNECTORS OR ASSIGNMENTS OF THE TERMINAL BLOCK, REFER TO APPENDIX A. A TERMINATOR IS NOT NEEDED IF ONE OF THESE CONNECTORS IS UNUSED.



25-PIN CONNECTOR TO TICKET PRINTER CONTROLLER OR ASSOCIATED PRINTER (IN THE TICKETRON APPLICATION, 10-FT CABLE, CDC PART NO. 61406100)

25-PIN CONNECTOR TO EXTERNAL EXTERNAL MODEM (IN THE TICKETRON APPLICATION, 10-FT CABLE, CDC PART NO. 61406100)

Figure 3-6. I/O Connector Panel

CHECKOUT

The following procedure refers to display terminal characteristics in the area of self-test diagnostics which specifically apply to units containing the fixed firmware program for the Ticketron application. The CC617-B display terminal is unlike the CC617-A in that it may be used in applications other than Ticketron, and thus does not contain a firmware program as an integral part of its configuration. This aspect of CC617-B is application dependent, and if the application of the CC617-B to be checked out is other than that of Ticketron, the characteristics of that unit will probably differ from those referred to in the procedure. Under these circumstances, the customer will have to be conferred with to gain an understanding of the diagnostics employed in that application and any differences between the characteristics of that routine and the one referred to in the procedure, will have to be taken into consideration accordingly.

This procedure only covers the checkout of the display terminal and it assumes that other equipments of the terminal subsystem are installed and operational.

- 1) Place switch 0 on the maintenance panel to the right (logical 1) position. This disables a downline load of the operating program for offline checks of the display terminal.
- 2) Turn the INTENSITY control located on the front panel approximately one-half turn clockwise and apply input power by placing the PRIMARY circuit breaker in the up position.
- 3) Refer to section 6 table titled Printed-Circuit Card Voltage Indicators and verify that all voltage-indicating LEDs located on the PC boards in the logic chassis are lit. Then check the output of the +5-volt regulator at chassis location B01. Refer to procedure CRT12 and measure between the ground and +5-V dc test points at the board edge for a voltage range of +5.0 volts \pm 0.25 volt. Adjust the potentiometer located at the board edge if the voltage is not within tolerance.
- 4) Toggle the RESET switch located on the maintenance panel and observe that the quicklook diagnostic runs to completion. All 1's should be displayed in the upper row of indicators (all upper row indicators lit) on the maintenance panel and the display should be filled with D's, indicating successful completion of quicklook.

NOTE

If a quicklook error occurs, refer to table CRT1 in the maintenance section of this manual for corrective action.

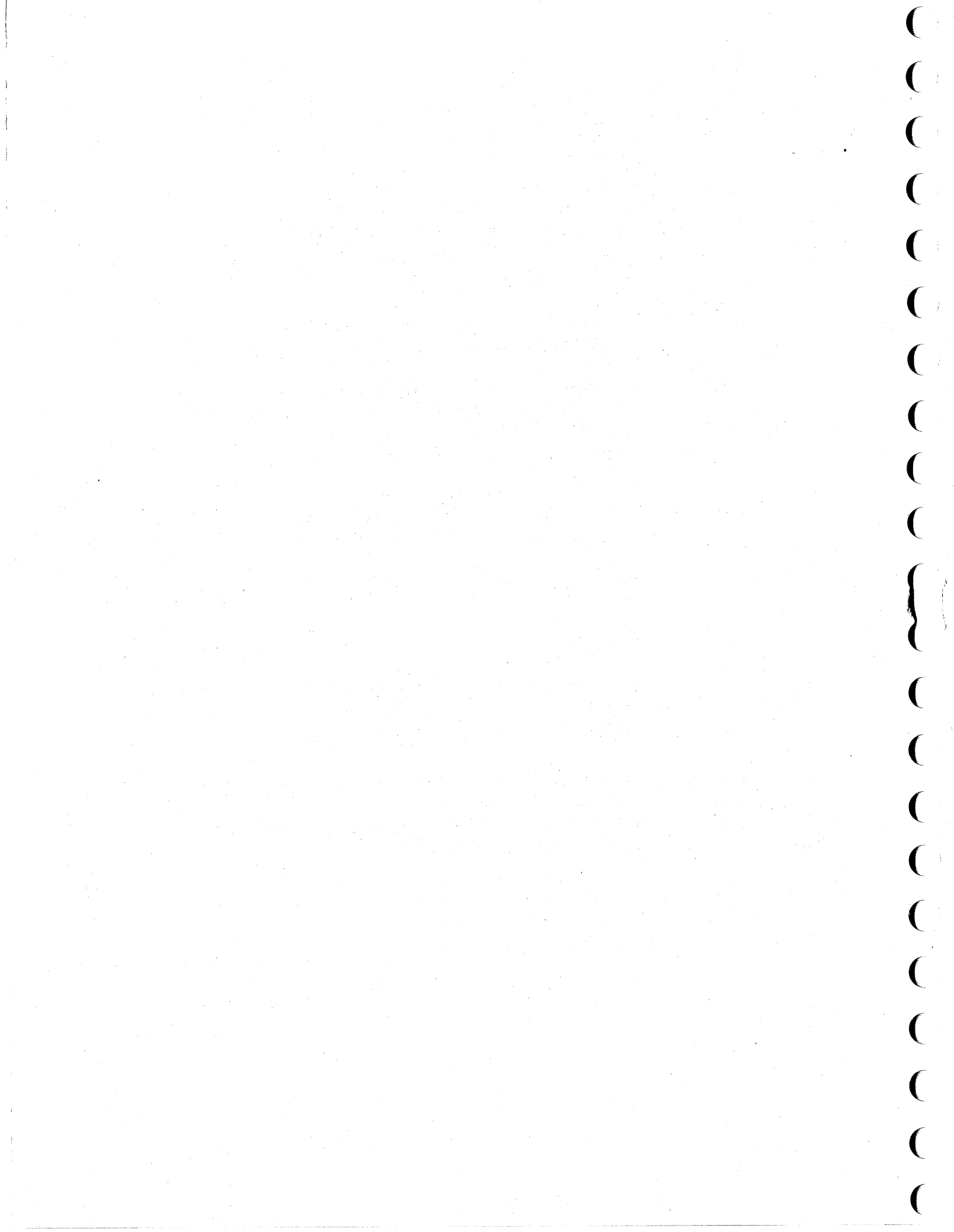
- 5) Adjust the INTENSITY control on the front panel for proper brightness.

NOTE

All procedures are contained in section 6 of this manual. An index at the end of section 6 cross-references the procedure number to the section-6 page number containing that procedure.

- 6) Observe the display of all D's. If raster is tilted or not centered, perform tilt or centering adjustments of procedure CRT8.
- 7) Observe the leftmost and rightmost character columns on the screen for correct alignment and sufficient vertical height (similar to characters in center of screen). If adjustment is required, perform steps 9, 10, and 11 of procedure CRT8.
- 8) Observe that the total display area is approximately 5-1/4 inches high by 8 inches wide and that characters have good contrast. If adjustments are required, refer to procedure CRT8, Monitor Adjustments.
- 9) To perform ticket printer or matrix printer tests, refer to procedure CRT1, quicklook tests 007 and 010.
- 10) Return all maintenance panel switches to the logical 0 (left) position.
- 11) Turn the display terminal input power off (primary circuit breaker down) and replace cabinet hood and maintenance panel cover. This completes the offline checks of the display terminal.

To complete checkout, online system operations should be performed with the aid of the customer to verify that communications and terminal functions are performing correctly. If a malfunction occurs that points to faulty display terminal operation, proceed to section 6 for troubleshooting information.



The maintenance philosophy for the display terminal calls for troubleshooting and parts replacement at the modular level where equipment design permits this approach. Therefore, this section limits itself to the identification and basic functional description of the replaceable modules and subassemblies contained in the display terminal without a detailed analysis of their internal operation. For detailed theory of operation information pertaining to a specific module or assembly, refer to the applicable hardware maintenance manual as listed in the preface of this manual.

The location of the major modules and assemblies within the display terminal are shown in figure 4-1. These are described as to their functional use in the following paragraphs.

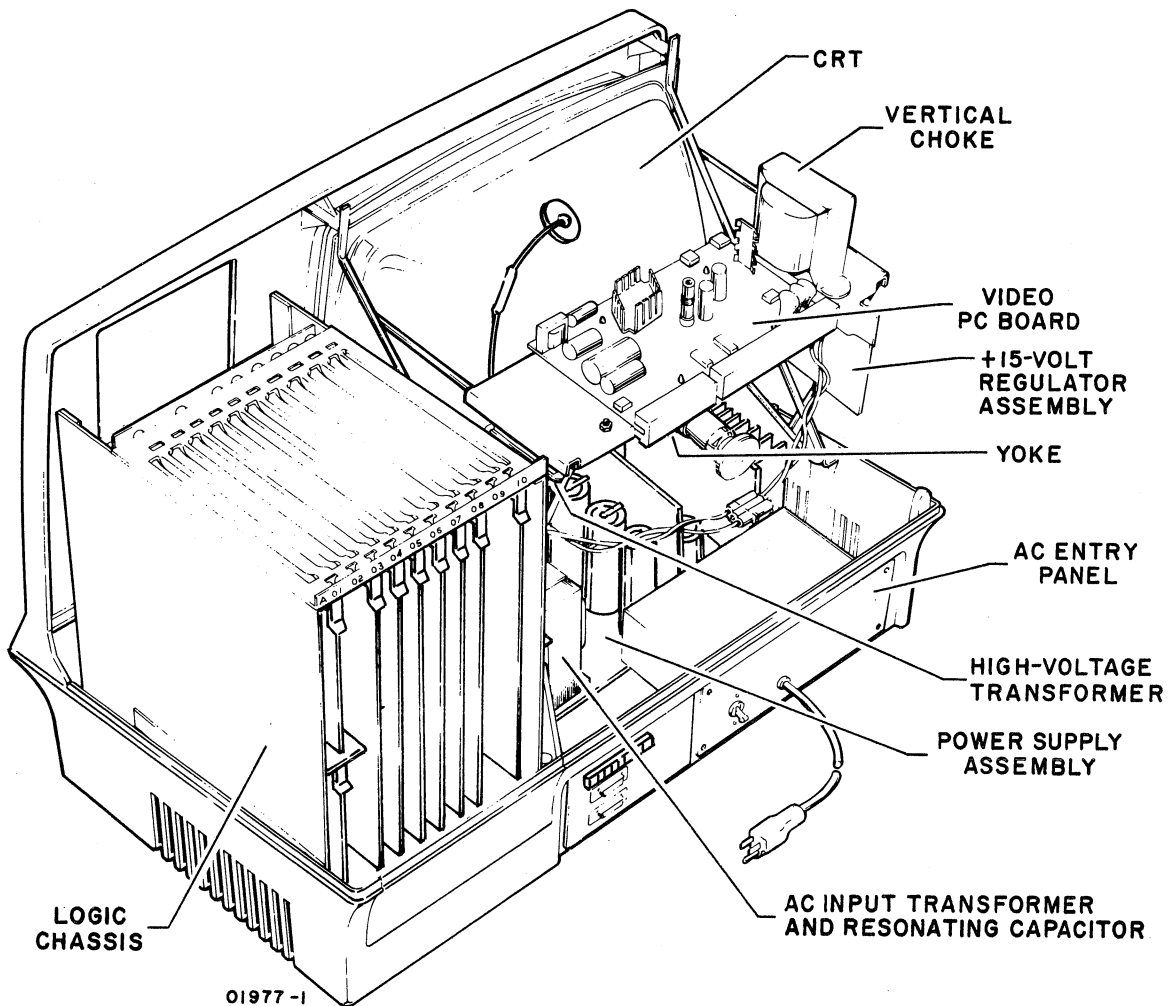


Figure 4-1. Display Terminal Components

VIDEO MONITOR

The video monitor is composed of the following parts:

- CRT
- High-voltage transformer
- Video PC board
- Vertical choke
- Yoke assembly
- +15-V dc regulators

The monitor processes a noncomposite video signal and horizontal sync and vertical sync pulses that are received from the display/keyboard interface PC board contained in the display logic chassis. Refer to the video monitor block diagram shown in figure 4-2.

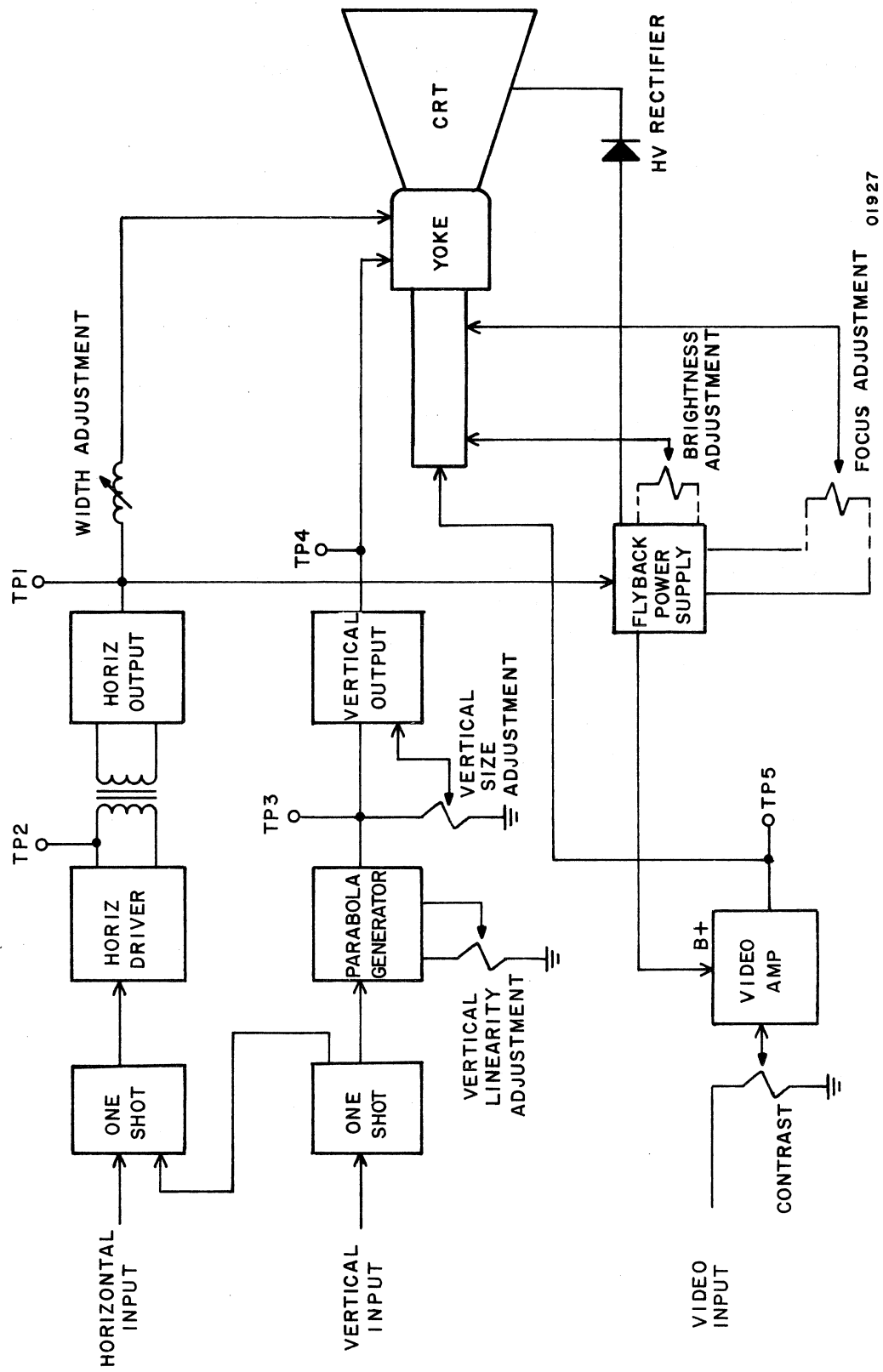
The horizontal section differs from a normal TV set in that no horizontal or vertical oscillator is used. Therefore, with the absence of horizontal input sync pulses no raster will be present. The output stage of the horizontal section provides the yoke with the proper horizontal scanning current, develops the necessary crt support voltages, and provides B+ for the video amplifier through use of the flyback power supply (13-kV high voltage, 450 V G2 voltage, -190 V brightness/focus voltage, and +45 V for the video B+ voltage.) The vertical section incorporates a parabola generator to linearly deflect the beam in the vertical direction. The video preamplifier requires about 0.5 V at its input before the output responds in a linear fashion. Video amplification is then provided by a class C video amplifier stage.

Internal potentiometers provide adjustment capabilities for gain, height, focus, and vertical linearity. Magnets at the rear of the yoke provide for display centering, and a variable coil provides for horizontal width adjustment. A copper sleeve that slides inside the yoke provides for horizontal linearity adjustment.

CATHODE-RAY TUBE

The crt is a standard 12-inch (diagonal) TV tube fitted with a glare-resistant display screen. The usable display area is 5.2 by 8 inches. The raster and character generator characteristics of the display/keyboard interface PC board provide nominal character sizes of either 0.250 inch high by 0.144 inch wide $\pm 10\%$ in 40-character mode or 0.125 inch high by 0.072 inch wide $\pm 10\%$ in 80-character mode.

The crt is a field-replaceable part of the video monitor. Illustrations and procedures for removal are contained in section 6, procedure CRT7.



01927

Figure 4-2. Video Monitor Block Diagram

HIGH-VOLTAGE TRANSFORMER

The high-voltage transformer is a field-replaceable component of the monitor (procedure CRT3, section 6). When the high-voltage transformer is replaced, the anode assembly with the high-voltage diode is also replaced.

VIDEO (MONITOR) PC BOARD

The video PC board is a field-replaceable item. Procedures are described in section 6 (procedure CRT5).

The video PC board contains the circuitry required to generate initial high voltages (-190, +45, and +465) required to drive and control the electron beam. The board also contains a +5-V dc regulator and the monitor adjustments used to create clear and distinct characters on the screen (refer to procedure CRT15 for adjustments).

VERTICAL CHOKE

The vertical choke coil is a replaceable item of the video monitor assembly (procedure CRT10). During refresh, the coil plays an important part in directing sweep voltage through the vertical yoke coil and suppressing unwanted oscillations in the vertical output circuit.

YOKE

The yoke assembly is a replaceable item (procedure CRT9). Current flowing through the yoke is precisely controlled in both axes to regulate the amount of deflection taken by the electron beam on its course to the crt phosphor. Adjustment is always required when a new crt is installed (procedure CRT7).

+15-V DC REGULATORS

There are two +15-V dc regulators mounted on the side of the video monitor chassis on a heat sink, see figure 4-1. The regulators maintain a constant +15-V dc supply to the video (monitor) PC board, which uses the voltage to create the high voltage required to drive and control the electron beam.

The regulators create a regulated voltage from the +20-V dc (nominal) generated by the power supply assembly (discussed later). Procedures are provided for checking and replacing the regulators (transistors) in section 6 (procedure CRT4). The regulators are replaced when the no load output measured from the emitter-to-ground is not 15-V dc with a +17.5 to 29-V dc input voltage applied. The collector is connected to ground.

LOGIC CHASSIS ASSEMBLY

The logic chassis contains a 10-slot card cage with a printed-circuit backplane. It houses the +5-volt power supply regulator(s) and the various control and memory modules of the display terminal. Descriptions of the backplane and logic cards contained in the logic chassis are provided in the following paragraphs. The card placement within the logic chassis of the two display terminal models is shown in figure 4-3.

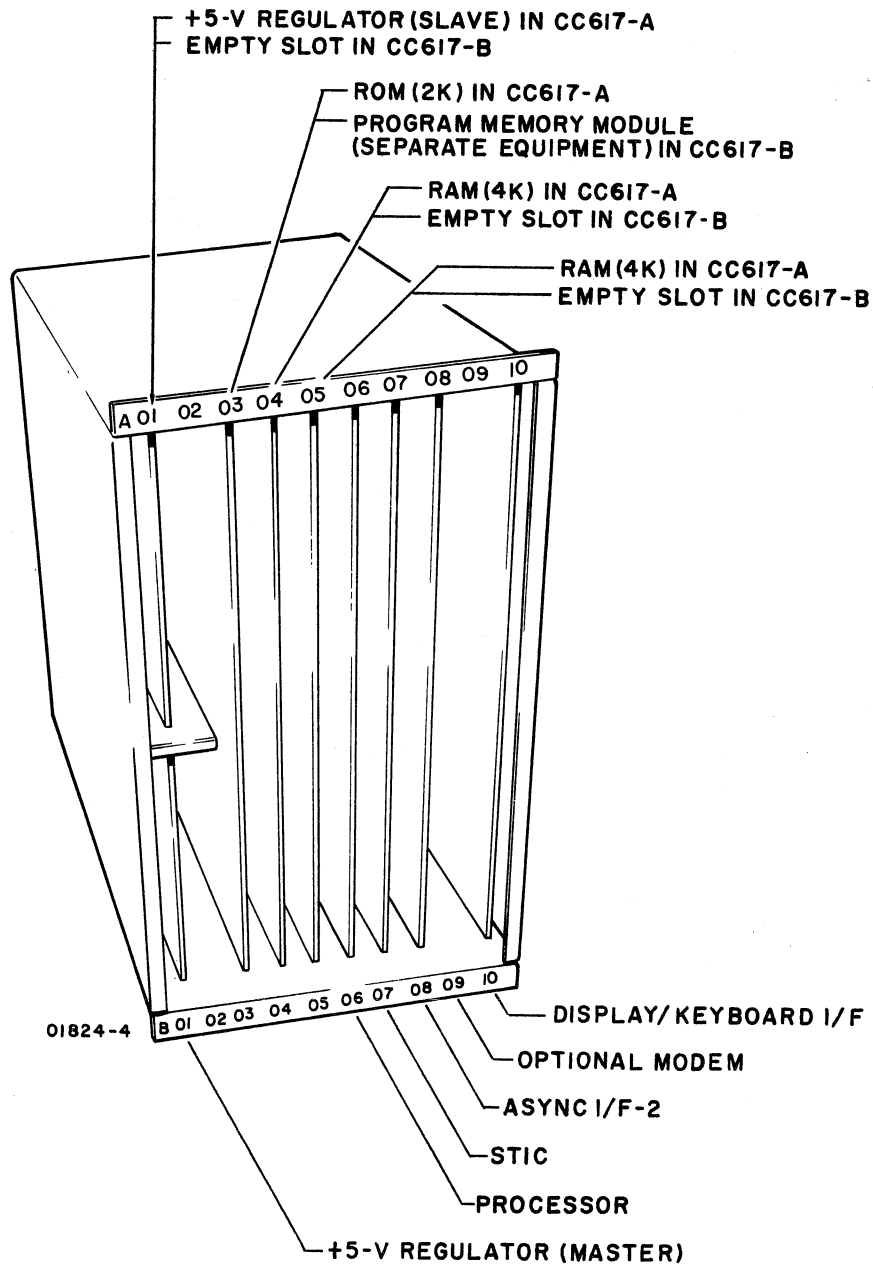


Figure 4-3. Logic Chassis Assembly

BACKPLANE

The backplane is a PC board with connectors for input power and the logic modules. It provides etched signal interconnections between the modules and contains a shared bus for intermodule communication. The signal lines which make up the shared bus are listed on a Bussed Signal Chart contained in section 5. The major signal lines within the shared bus are sixteen Address Bus lines and eight bidirectional Data Bus lines. Because of differences in card placement, the two models of the display terminal use backplanes that have different corresponding interconnection paths.

The shared-bus communications between the processor module and I/O modules (async I/F-2, display/keyboard I/F, and STIC modules) are controlled by the processor module through the use of I/O channels incorporated in the backplane. In this scheme, each I/O module is assigned its own separate channel that carries a unique Channel Strobe signal line which the processor module uses to initiate, address, and provide timing for shared-bus communication transfers. The communication transfers in these situations involve the use of both the Address Bus and Data Bus lines, with the processor module indicating via codes on the lower-order Address Bus lines what type of information (status, function commands, or data) is to be transferred on the Data Bus lines. Also, within each I/O channel is an Interrupt signal line that provides the associated I/O module with the capability of obtaining the attention of the processor module when a program-enabled interrupt condition occurs. The Interrupt signal line of each I/O channel has an assigned priority that determines in what order the processor module recognizes and services them. Monitoring of the interrupts is done by the STIC module.

The selection scheme incorporated in the backplane for shared-bus communications is different between the processor module and memory module(s). Each memory module (or in the case of CC617-B, each memory segment, ROM or RAM) is assigned an address through the use of Module Select lines connected to each module (memory segment). These lines are either tied to ground (low) or left open (high) to form the individual binary address of that memory module (memory segment). When a data bus communication transfer is to occur, the memory module (memory segments) compare the high-order bits of the 16-bit Address Bus word with their backplane-assigned-address to determine to which of them the communication transfer is being directed. The source of the 16-bit Address Bus word depends on the purpose of the communication transfer and is primarily from either the processor module or the display/keyboard I/F module. Communication transfer from the display/keyboard I/F module is for the purpose of obtaining display refresh data from RAM.

In addition to the shared-bus communication connections, common etched interconnections are provided for ground, +5 volts, +20 volts, and -20 volts required for module operation. Power connections are made to the backplane via a 12-pin connector located at the back of the panel.

+5-VOLT REGULATOR(S)

To satisfy the current load requirements of the CC617-A display terminal, two +5-volt regulators, see figure 4-4, and used in the distributive power system. In the CC617-B model, only one +5-volt regulator is used. The regulators convert the unregulated +20-volt output of the power supply assembly to a regulated output of +5-V dc ± 0.5 V at a current rating of up to 10 amperes per regulator. The regulator is a voltage-regulating chopper power supply with current limiting and over-voltage sensing. Its action is controlled by a 20-kHz, oscillator-driven integrated circuit (IC) that functions to alternately pass and block a portion of the input voltage to obtain the required output voltage level. For example, with a +20-V dc input, the active on time of the IC is approximately 1/4 of the duty cycle. Its output is used to control or chop the input voltage down to an average of +5 volts at the output of the regulator. The IC output is amplified and fed to a pass-transistor stage that allows the input power to flow through an inductor and charge a bank of capacitors which supplies the +5-V dc output. A portion of +5-volt output is fed back to the IC which monitors the voltage level. An output of less than +5 volts causes the IC to generate a wider control signal output, and values higher than +5 volts shorten the control signal, thereby controlling the conduction time of the pass-transistor.

A manually adjustable, overcurrent-sensing circuit limits current in the +5-volt output. This circuit is normally set to limit current to 110% of maximum, or 11 amperes per regulator. When an overcurrent condition is sensed, it issues a shutdown signal to the IC which drops back the active duty period and results in reduced current flow in the +5-volt output.

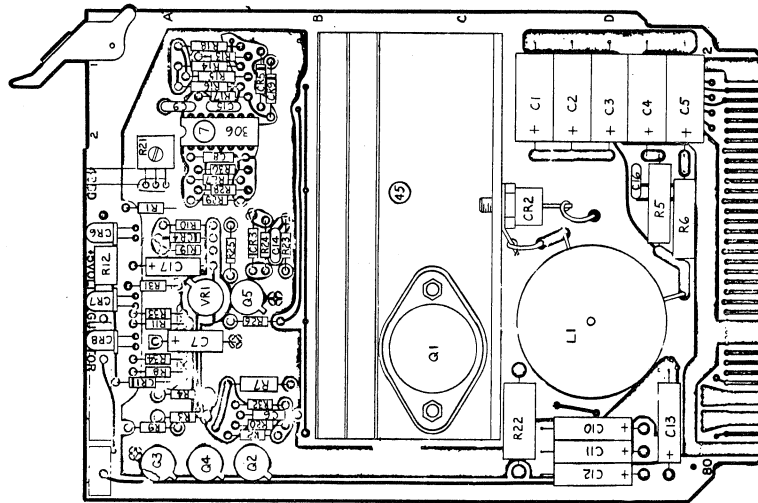


Figure 4-4. +5-Volt Regulator(s)

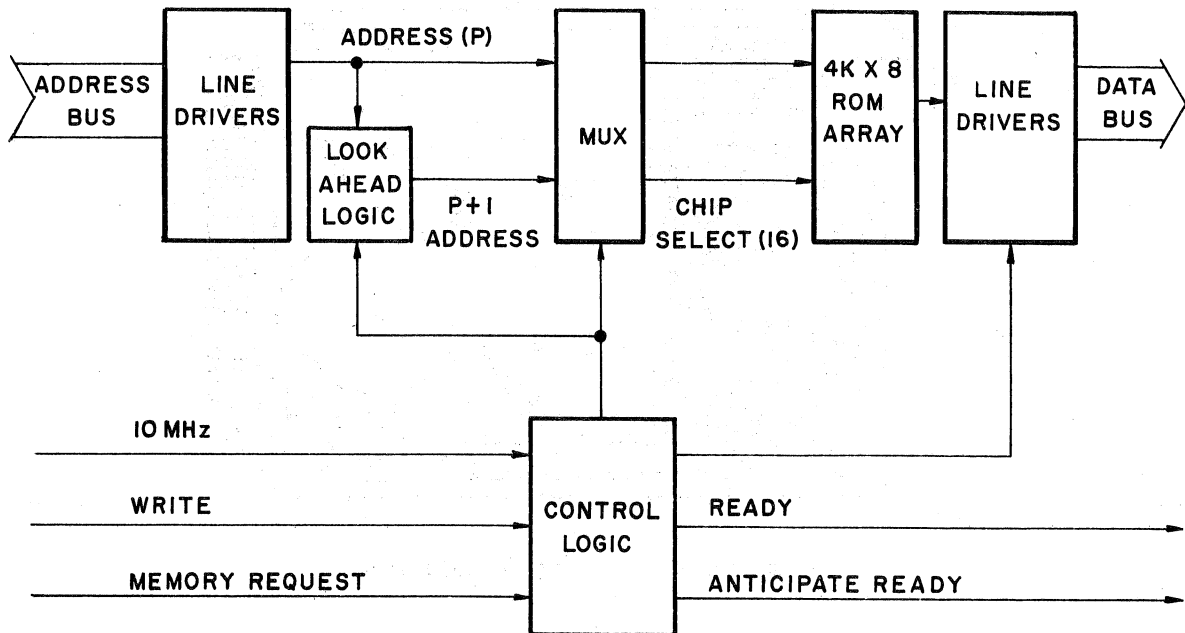
If the +5-volt output rises from between 5.5 to 6.5 volts, a zener diode conducts to issue a signal to the power supply assembly indicating an overvoltage condition. This signal activates a silicon-controlled rectifier (SCR) which trips the primary circuit breaker causing ac input power to the display terminal to be cut off. The +5-volt output of the regulator is manually adjustable to provide approximately $\pm 10\%$ of its nominal value.

Three LED indicators are provided on the regulator card to indicate presence of the following voltages. The LEDs, however, do not indicate that correct voltages are present, only that a voltage of the proper polarity sufficient to light the LED is available.

- Red — +5-V dc
- Yellow — +20-V dc
- Green — -20-V dc

ROM MODULE OF THE CC617-A MODEL

The read-only memory (ROM) module, figure 4-5, uses erasable, reprogrammable integrated circuits for storage of the firmware program. The basic circuit chip is a 256 8-bit erasable read-only memory (EROM). The ROM module contains eight EROM chips which provide a storage capacity of 2048 8-bit words. The maximum storage capacity of the ROM module is 4096 8-bit words when 16 EROM chips are used.



02186

Figure 4-5. Block Diagram of ROM Module Used in CC617-A

When accompanied by a correct 16-bit Address Bus word and a Memory Request, a high logic level on the Write line selects a read from the ROM module. If the Write line is low during such an instance, the module operates the same as if a memory read was occurring, except the Data Bus tristate line drivers are not enabled. Thus, if a module accidentally tries to write to a memory address, the ROM module would respond with a Ready signal but would not store any data, and would not overdrive the bus by activating the Data Bus drivers.

-9-Volt Regulator

The ROM module contains a -9-volt regulator circuit that converts the -20-volt unregulated voltage from the power supply assembly to $-9\text{ V} \pm 5\%$. The -9 volts from this regulator are connected to a backpanel pin and jumpered to other backpanel pins feeding the EROM chips on the module. An LED indicator located at the edge of the module indicates the presence of the -9 V regulated voltage.

Interface Characteristics

Signal interchange occurs via the shared bus. All interface signals are TTL compatible. The signal voltage levels are defined as follows:

0.0 V to 0.8 V = logical 0 input
2.0 V to 5.0 V = logical 1 input
0.0 V to 0.4 V = logical 0 output
2.4 V to 5.0 V = logical 1 output

RAM MODULE OF THE CC617-A MODEL

The RAM module, figure 4-6, provides random-access, read/write storage for up to 4096 8-bit data words plus parity. Two identical modules are used in CC617-A to provide a total storage capacity of 8192 words. The memory access time is 850 nanoseconds and memory cycle time is 950 nanoseconds. The RAM module automatically generates and stores an odd parity bit (2^8) when data is written into memory. A parity error signal occurs if the character parity is even on a memory read.

A functional diagram of the RAM module is shown in figure 4-7. The RAM modules are used by the processor module for read/write storage, and the display/keyboard I/F module for the reading of display refresh data. Each RAM module contains 36 RAM chips. Each chip provides 1024 1-bit storage locations. During read/write operations, the chips are selected in groups of nine.

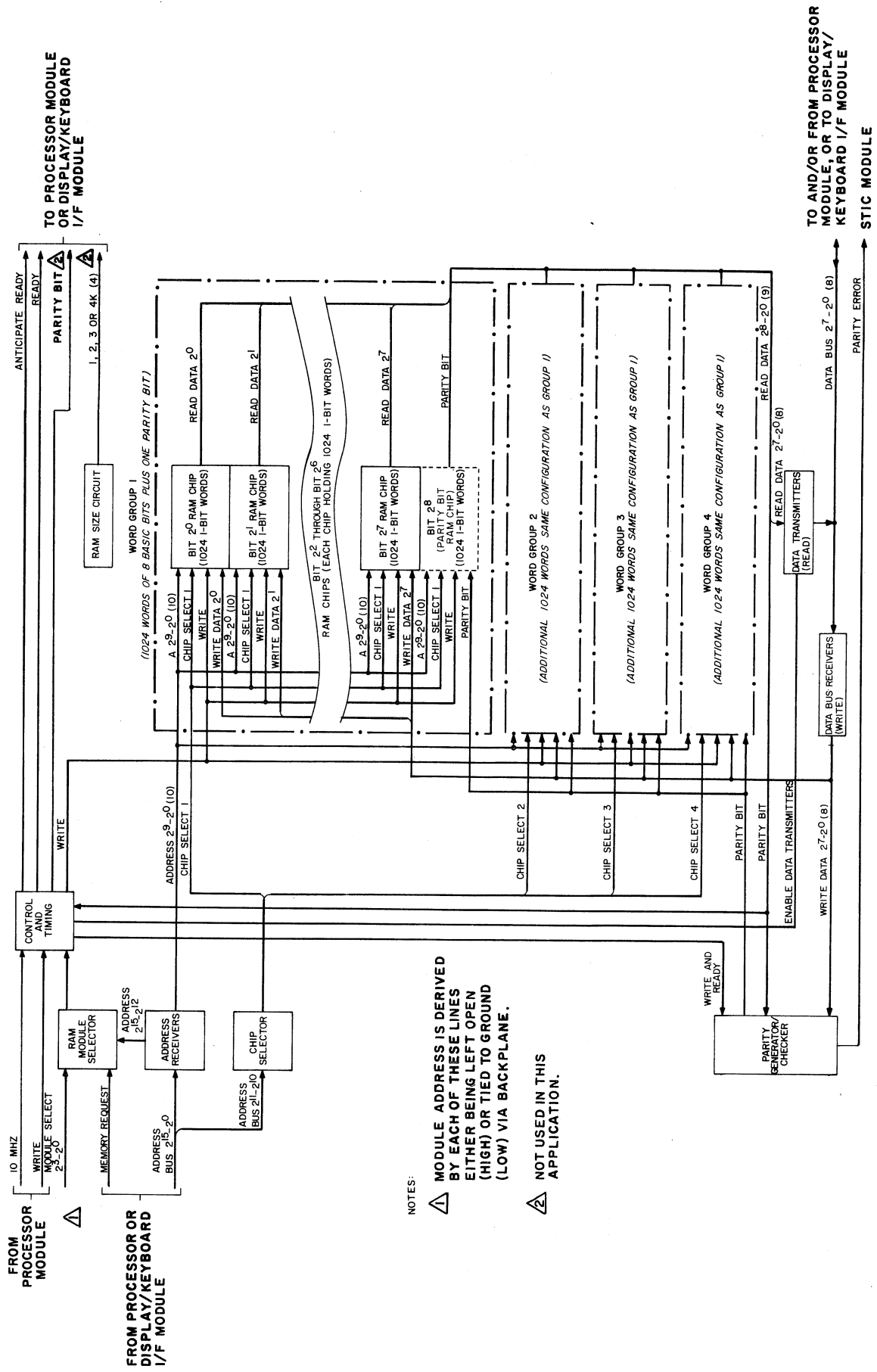


Figure 4-7. Functional Diagram of RAM Module Used in CC617-A

Ready

The Ready signal, in write mode, indicates that the 8-bit word on the Data Bus has been stored in memory. In read mode, it indicates that the contents of the addressed word is stable on the Data Bus.

Anticipate Ready

The Anticipate Ready signal, in write mode, indicates that the write memory cycle will be finished within 200 nanoseconds. In read mode, it indicates that read data will be stable on the Data Bus within 200 nanoseconds.

Write

The write signal selects either a read or write operation. A low logic level indicates a write to memory; a high logic level indicates a read from memory.

Interface Characteristics

All RAM module interface signals are TTL compatible and occur via the shared bus. The signal voltage levels are defined as follows:

- 0.0 V to 0.8 V = logical 0 input
- 2.0 V to 5.0 V = logical 1 input
- 0.0 V to 0.4 V = logical 0 output
- 2.4 V to 5.0 V = logical 1 output

PROGRAM MEMORY MODULE OF THE CC617-B MODEL

The program memory module mated with the CC617-B display terminal is a separate piece of equipment. The memory module consists of a single logic card containing both ROM and RAM memory with circuitry that interfaces the memory with the processor module and the shared bus. Stored within the ROM is a fixed firmware program for the application that dictates the functional characteristics of the host display terminal. The RAM provides the temporary memory necessary for storage of the applications program loaded into RAM during display terminal initialization and for storage of display refresh data. The storage capacity of the ROM and RAM are as follows:

- ROM — up to 6144 8-bit words made up of 1024 8-bit word increments, with the actual capacity dependent on the requirements of the firmware program used in the application.
- RAM — 8192 9-bit words (8 data bits plus a parity bit).

The parity bit employed by the RAM is self-generated and self checked. Each time a word is written into the RAM, the program memory module automatically generates and stores an even parity bit (2^8) with the data word. When a word is read from RAM, the module performs a parity check and if the parity is not correct, a Parity Error signal is issued to the STIC module causing the MPE (memory parity error) indicator on the maintenance panel to light. This condition is cleared by program intervention via the processor module or by the performance of either a power-on master clear or manual reset.

Selection of the ROM or RAM by the processor module is accomplished through use of the 16-bit Address Bus word. The $2^{13} - 2^{15}$ bits of the address word select the memory segment, ROM and RAM, and the low-order bits of the word select the specific word location within the segment. The address assigned to the ROM, by way of the logic chassis backplane, is through the use of Module ROM Select lines $2^1 - 2^3$ which are connected to the program memory module. These lines are left open on the backplane, resulting in a high or logical 1 being reflected on each of them. The $2^1 - 2^3$ Module ROM Select lines correspond to the $2^{13} - 2^{15}$ bits of the Address Bus word, making the ROM address from $E000_{16}$ to $F7FF_{16}$. Likewise the address assigned to the RAM is derived from the Module Ram Select lines $2^1 - 2^3$ connected to the program memory module. In this case, these lines are all tied to ground (low or logical 0) by the backplane, thus making the RAM address from 0000_{16} to $1FFF_{16}$. In addition to its use by the processor module, this memory select scheme is also used by the display/keyboard I/F module for obtaining display refresh data from the RAM.

Memory Write and Read

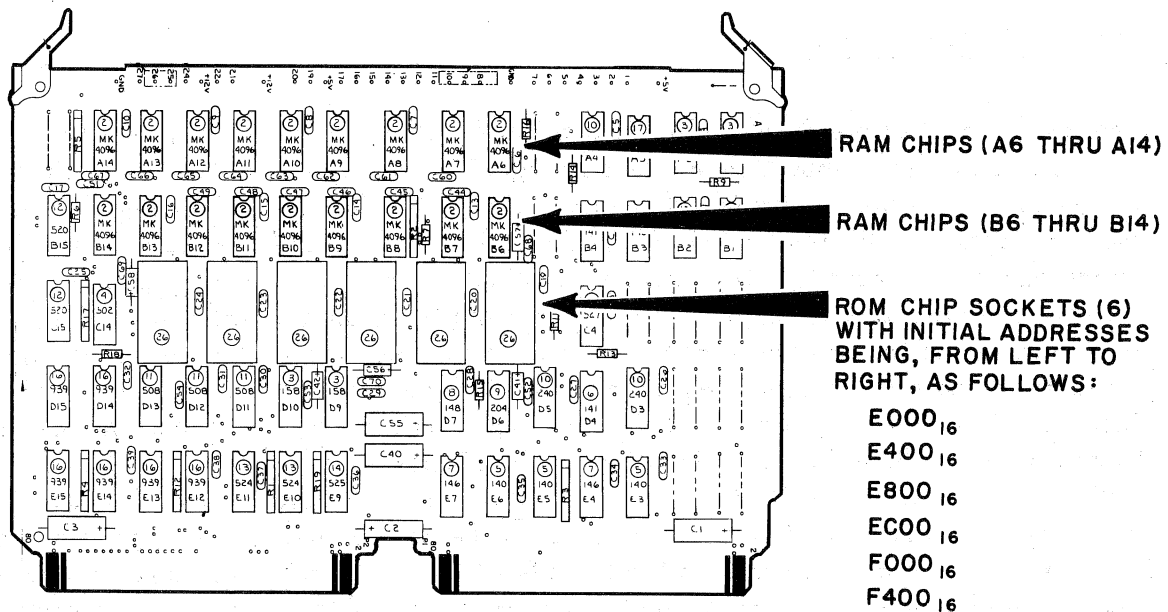
The employment of the ROM and RAM addresses by the program memory module occurs when a shared-bus Memory Request signal is received. This causes the program memory module to compare the fixed value of the Module Select lines for each memory segment with the $2^{13} - 2^{15}$ bits of the 16-bit Address Bus word to determine which memory segment is being addressed. Next the program memory module samples the shared-bus Write signal line to determine if the subsequent operation is to be a read or, as in the case of RAM, a write (a low level on the Write signal line indicates a write to memory, and a high level indicates a read from memory). If the operation is to be a memory read, the program memory module places the 8-bit word from the selected memory location on the bidirectional Data Bus lines and activates the shared-bus Ready signal to indicate that the word is ready for sampling. If the operation is to be a memory write, as in the case of RAM, the program memory module stores the 8-bit word from the Data Bus lines in the selected memory location and activates the Ready signal to indicate that storage of the word has been completed.

All ROM read operations are done by the processor module, with several instances where the STIC module is involved. These instances occur at the start of display terminal initialization, when the origin of the 2¹² - 2¹⁵ bits of the Address Bus word is from the high core jump control circuit of the STIC module instead of from the processor module. The operation of this STIC module circuit is discussed later in the section.

RAM read operations are done by both the processor module and the display/keyboard I/F module. In the case of the display/keyboard I/F module, the read operations from the RAM are under control of the processor module, and are only for the purpose of obtaining display-refresh data. The 16-bit Address Bus word used in reading display-refresh data, originates from the display/keyboard I/F module, as does the Memory Request signal. The Write signal has no provisions provided for its activation/deactivation by the display/keyboard I/F module. This signal originates only from the processor module and since the idle state of the line is a high level (indicating a memory read), it is impossible for the display/keyboard I/F module to accidentally write to a RAM address. All RAM write operations are done exclusively by the processor module.

Physical Layout

The physical layout of the program memory module is shown in figure 4-8. Pointed out in the figure are the locations of the RAM integrated-circuit chips and the locations of the sockets where the ROM integrated-circuit chip(s) of the application are inserted. There is a total of 18 RAM chips on the module. Each RAM chip provides 4096 1-bit storage locations. In read/write operations, the chips are selected in groups of none. Each ROM chip, plugged into the module, has a storage capacity of 1024 8-bit words. As previously mentioned, the size of ROM storage or number of ROM chips contained on the module is dependent on the requirements of the firmware program used in the application.



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Figure 4-8. Program Memory Module Used in CC617-B

Interface Characteristics

Signal interchange occurs via the shared bus. All interface signals are TTL compatible. The signal voltage levels are defined as follows:

- 0.0 V to 0.8 V = logical 0 input
- 2.0 V to 5.0 V = logical 1 input
- 0.0 V to 0.4 V = logical 0 output
- 2.4 V to 5.0 V = logical 1 output

PROCESSOR MODULE

The processor module, see figure 4-9, is an 8-bit-per-byte parallel microprocessor that governs the control of the display terminal by retrieving and executing program instructions stored in the ROM and RAM. Responsibilities for the module include access control to the RAM for the entry and retrieval of data, and control over the shared bus that carries all intermodule communication transfers. Its communications with the higher-level processor of the system and with an associated printer device in the application, is through the asynchronous interface module. Its communications input from the display terminal keyboard is through the display/keyboard I/F module, while its communications with the maintenance panel, is through the STIC module. Once the processor module circuits are initiated to perform an operation, they are the controlling entity for sequences (such as, communications, calculations, etc.), that are necessary to complete the particular operation. The processor module circuits secure any needed information from the associated program — store memory and execute such information, utilize RAM as required (for temporary storage), and request/accept/transmit I/O communications associated with the operation.

The processor module has no operating controls or switches. Located at the outer edge of the board are two LEDs that indicate the presence of two internally regulated voltages. These voltages are derived from the +20 and -20 voltage outputs of the power supply assembly. A yellow LED glows when +12 V is present and a green LED glows when -5 V is present.

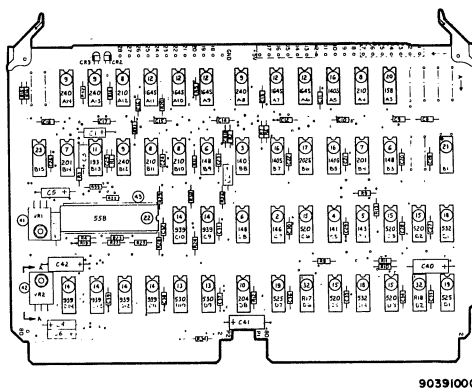
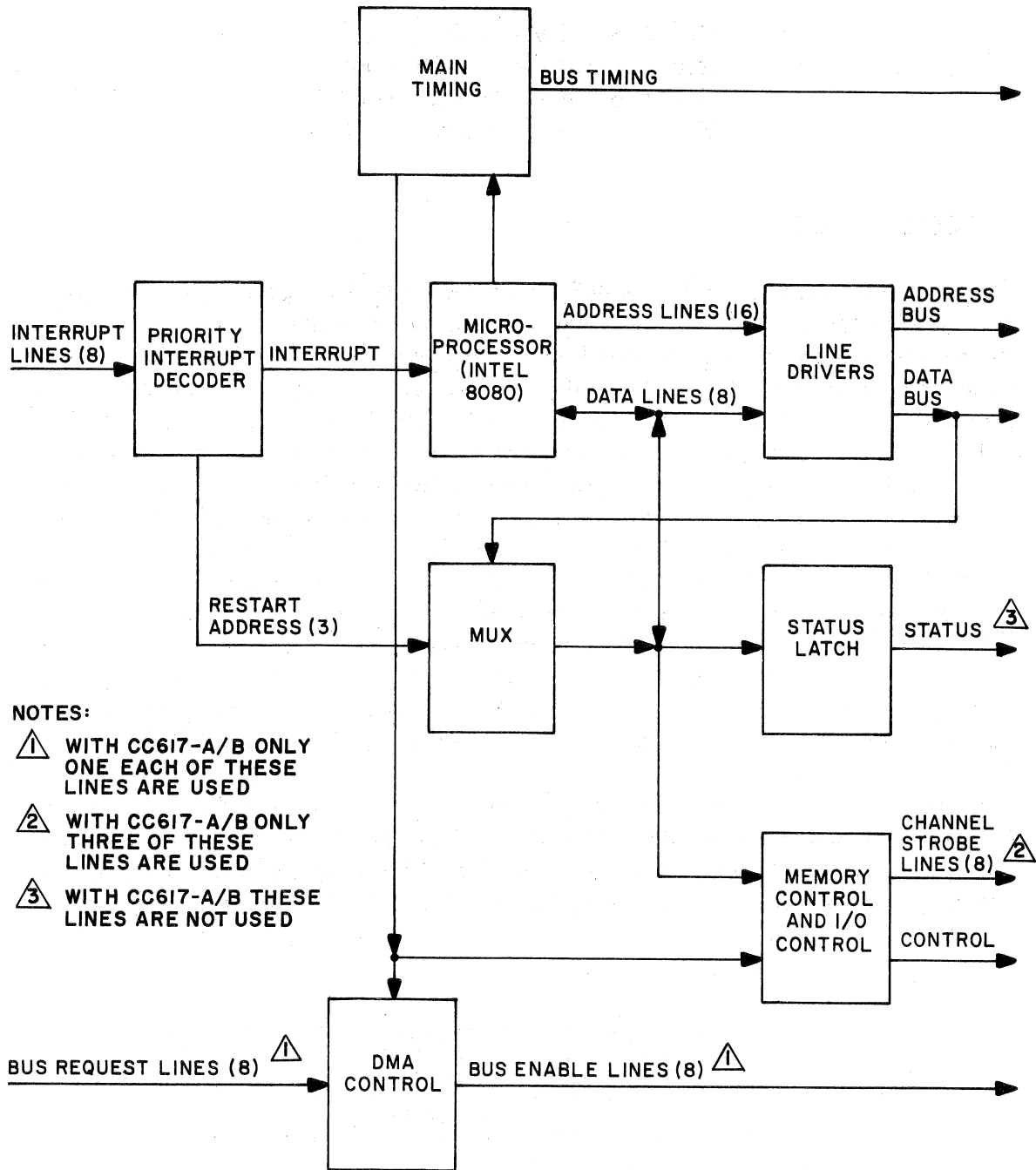


Figure 4-9. Processor Module

The major functional areas of the processor module are shown in figure 4-10. Their primary functions are described in the following paragraphs.



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Figure 4-10. Processor Module Functional Diagram

Main Timing

These circuits generate the master timing required for all processor module operations. Timing is initiated by a 20-MHz oscillator which drives a 5-bit ring counter and various other timing pulse generation circuits. The resulting outputs govern not only internal module operations but also supply timing to the other modules on the shared bus to synchronize their operation with that of the processor module.

Microprocessor

The microprocessor functional area of the module consists of a single integrated circuit chip (Intel 8080 or equivalent) which recognizes and executes approximately 100 instructions. The means by which it obtains program instructions from memory and performs its duties in their execution, is through the receipt and issuance of communication transfers via the shared bus. The microprocessor sends/receives 8-bit word transfers via the bidirectional Data Bus lines and generates the proper Address Bus signals for these transfers to be performed. Included in its duties is the processing of interrupts in coordination with the priority interrupt decoder circuits of the module, shared bus control, and the governing of Channel Strobe/Memory Request signal generation by the memory and I/O control circuits of the module.

Priority Interrupt Decoder

These circuits recognize the various interrupts which are received through the STIC module. They receive up to eight interrupts, store their presence, generate a Restart Address (Trap Address in RAM from which the processor module obtains information to process the unique interrupt) corresponding to the highest priority interrupt stored, and notify the microprocessor that an interrupt is waiting to be processed. The interrupt conditions are sampled once every 50 nanoseconds if no interrupt is currently being processed by the processor module.

Multiplexer

The multiplexer (mux) selects either an 8-bit Data Bus word or a Restart Address (for interrupt processing only) for input to the microprocessor.

Direct Memory Access (DMA) Control

These circuits control the display/keyboard I/F modules use of the shared bus for access to the RAM. Each time a data character is to be read from the RAM for display refresh, the display/keyboard I/F module issues a Bus Request signal. If no communication transfer on the shared bus is in process, these circuits receive and store the request and respond with a Bus Enable signal to allow access to the RAM. The sampling of the Bus Request line under these conditions occurs once every 250 nanoseconds.

Memory and I/O Control

These circuits generate the signals that accompany a shared-bus communication transfer. With exception of the display/keyboard I/F module's use of the shared bus in obtaining display refresh data from the Ram, all shared-bus communication transfers are initiated by the processor module and require some of the signals which these circuits generate. In the case of a shared-bus transfer with an I/O module, these circuit generate the unique Channel Strobe signal for the I/O channel in which the I/O module is connected to via the logic chassis backplane. This action serves to initiate the transfer, address the transfer, and provides the timing for the transfer. Included with this action and with all processor module-initiated shared-bus transfers, is the setting of the shared-bus Write signal line by these circuits to denote in which direction the information flow is to occur. A high level on the Write line indicates that the information transfer will be from the addressed I/O module to the processor module, and a low level on the Write line indicates the opposite. The type of information (status, function commands, or data) which is to be transferred on the bidirectional Data Bus lines, is specified via a code placed on the Address Bus lines by the microprocessor. Also handled by these circuits, is the receipt of the corresponding response from the addressed I/O module to the Channel Strobe signal. Depending upon the state of the Write signal line, receipt of the response indicates that the information either is being received or is being placed on the Data Bus.

In the case of a shared-bus communication transfer with ROM or RAM, the operation of these circuits is much the same as previously described with the only major difference being the circuits generate a shared-bus Memory Request signal instead of a unique Channel Strobe signal. In this case, the selection of a memory module (with CC617-B, a memory segment, ROM or RAM) is accomplished through the 16-bit Address Bus word that is generated by the microprocessor, with its high-order bits signifying the address of the memory module or segment.

Status Latch

The outputs of this circuit are not used in CC617-A/B.

Line Drivers

These circuits consist of three-state buffer/drivers which transmit Address Bus and Data Bus signals to the shared bus. The three states possible on the output lines are high, low, or floating.

Interface Characteristics

The general interface between the processor module and the other logic modules of the display terminal is shown in figure 4-11.

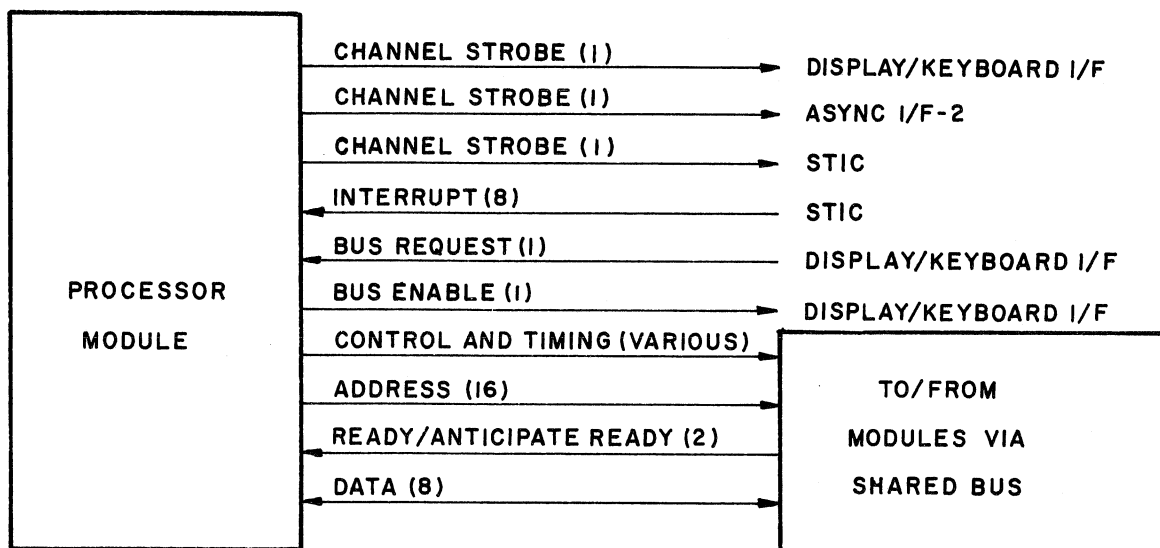


Figure 4-11. Processor Module Interface

The interface signals are either TTL two-state (high or low) or TTL three-state (high, low, or floating). Those signals which may be in the floating condition are placed in such condition when the processor module requests that one of the other modules on the shared bus place logic high/low information on the signal lines. Interface signal logic levels are defined as follows:

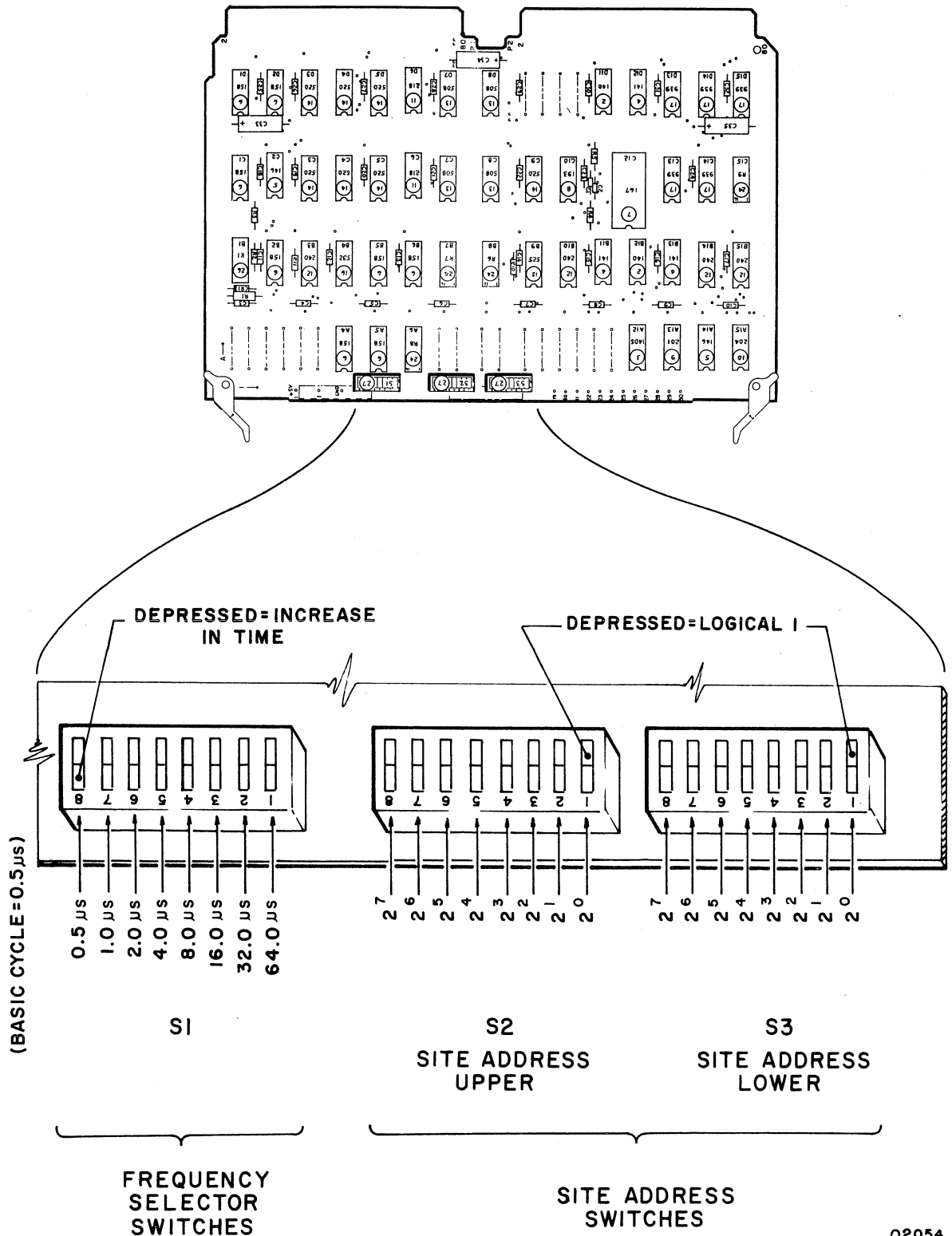
- Inputs: 0.0 V to 0.8 V = logical 0
2.0 V to 5.0 V = logical 1
- Outputs: 0.0 V to 0.4 V = logical 0
2.4 V to 5.0 V = logical 1

STIC MODULE

Basically, the STIC module, see figure 4-12, preprocesses I/O information for the processor module. It connects, to the processor module via the shared-bus eight dedicated Interrupt lines and an I/O channel. All interface operations are under processor module control. The STIC module provides the following functional features:

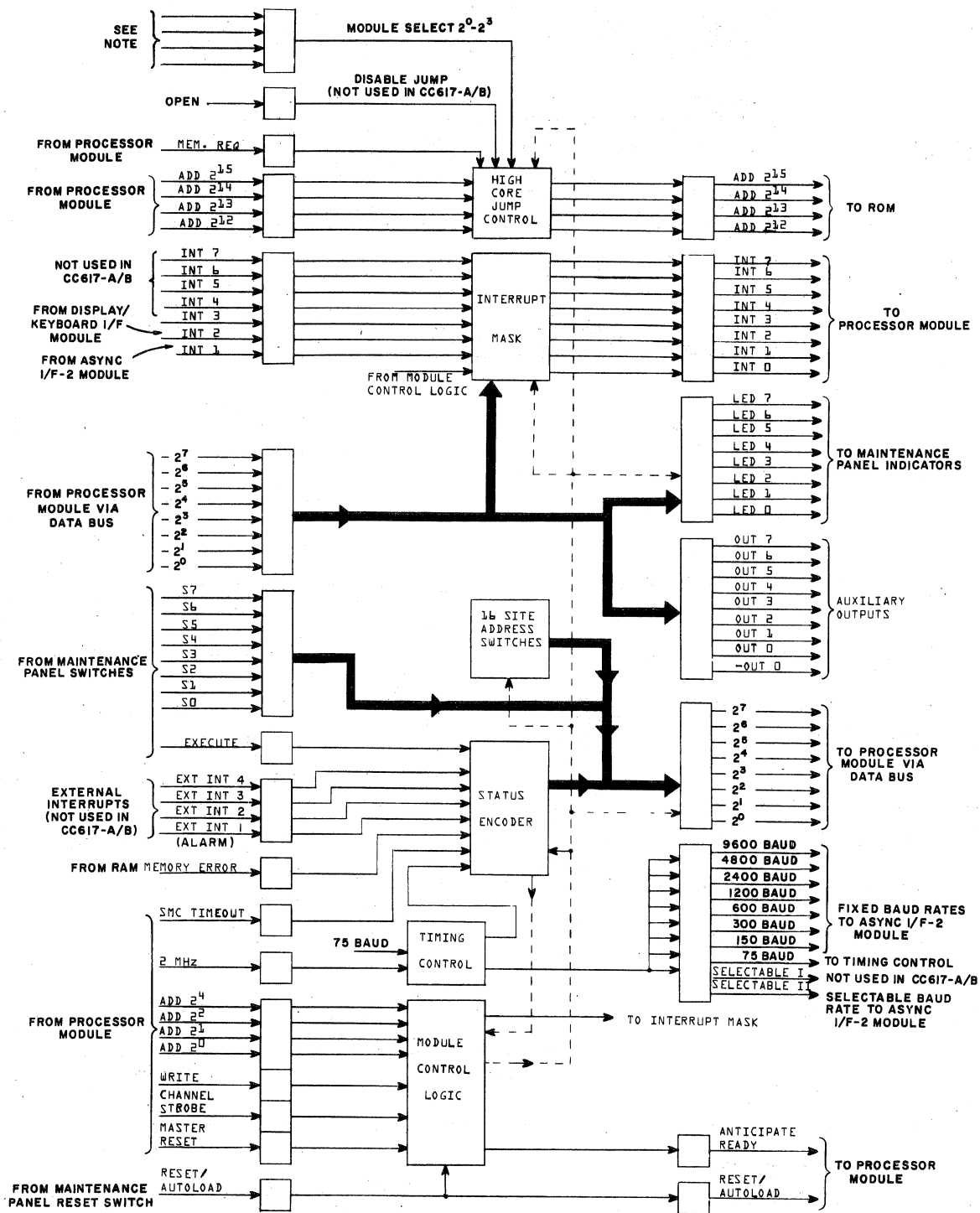
- Processor module interface with the maintenance panel
- Monitoring of other I/O module interrupts
- Interrupt mask that allows the processor module to control which interrupts it will receive through the STIC module
- Special timing for use by the async I/F-2 module
- Interval timer with a 212.2 millisecond cycle time for generation of interval timer interrupts to the processor module for real time program applications
- Display terminal site address switches
- RAM parity error monitoring for the purpose of generating a parity error interrupt to the processor module and for energizing the MPE indicator on the maintenance panel
- Auxiliary output register for storage by the processor of program selections such as that of the display format

A functional diagram of the STIC module circuits is shown in figure 4-13. All functional blocks shown on the left-hand side of the figure are receiving circuits for the particular input signals entering from I/O channels, maintenance panel, memory, etc. All functional blocks shown on the right-hand side are transmitting circuits that issue the particular output signals identified in the figure. The following paragraphs describe those functions identified at the center of figure 4-13.



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Figure 4-12. STIC Module and Control Switches



NOTE: HIGH CORE JUMP ADDRESS IS DERIVED BY EACH OF THESE LINES EITHER BEING LEFT OPEN (HIGH) OR TIED TO GROUND (LOW) VIA BACKPLANE. IN CC617-A/B THEY ARE ALL LEFT OPEN TO REPRESENT AN ADDRESS OF FXXX₁₆.

Figure 4-13. STIC Module Functional Diagram

High Core Jump Control

The purpose of this circuit is to provide a set high core address to the ROM during the first three memory read operations of display terminal initialization. In effect, this action leads the processor module into the firmware program. The circuit begins its operation following a power-up or manual reset, and ends after the third initial memory read operation has been performed by the processor module. During these initial memory read operations, the circuit places the content of the STIC module's Module Select lines 2⁰ - 2³ on the 2¹² - 2¹⁵ bit lines of the 16-bit Address Bus word. In doing this, the 2¹² - 2¹⁵ bits of the 16-bit Address Bus word originated by the processor module are overridden. All of the STIC module's Module Select lines are left open (high) on the backplane, so the resulting ROM address is FXXX₁₆.

Interrupt Mask

The interrupt mask circuit allows the processor to control which interrupts it will receive through the STIC module via the individual Interrupt 0-7 lines. In the case of CC617-A/B, only the Interrupt 0, Interrupt 1, and Interrupt 2 lines of this group have any significance. As can be seen in figure 4-13, the Interrupt 1 line from the STIC module to the processor module, corresponds to the Interrupt line that originates from the asynchronous I/F-2 module. In the same manner, the Interrupt 2 line corresponds to the Interrupt line that originates from the display/keyboard I/F module. In each instance, an interrupt condition occurring in either of these I/O modules will cause a corresponding interrupt to be issued to the processor module if they are not masked. In the case of the Interrupt 0 line, the source is the STIC module itself, and when an interrupt condition occurs in the STIC module, this Interrupt line is activated if it is not masked.

The interrupt conditions of the STIC module differ from those of the other I/O modules in that they are extremely varied in nature. They are briefly described as follows:

- Activation of the EXECUTE switch on the maintenance panel
- Occurrence of a RAM parity error
- Occurrence of an internal timeout condition within the processor module when the processor module is waiting for a response from a memory or I/O module during an attempted shared-bus communication transfer
- Occurrence of the end of the cycle time of the STIC module's 212.2-milli-second interval timer

The means by which the processor module can differentiate between these STIC interrupt conditions is through the use of the status encoder.

Status Encoder

This circuit constantly monitors the conditions that represent an interrupt condition in the STIC module so that this information can be transferred to the processor module via the Data Bus lines during a status function. Because of the great possibility that more than one STIC module interrupt condition may exist at the time when this information is transferred, a priority is assigned to each interrupt condition and the highest priority interrupt condition present is the one that is conveyed to the processor module. The priority of the STIC module interrupt conditions are as follows:

- 1) RAM parity error (highest priority)
- 2) processor timeout
- 3) interval timer
- 4) EXECUTE switch (lowest priority)

Site Address Switches

These two-position toggle switches, see figure 4-12, allow manually setting a 16-bit site address for the terminal. The switches are set to a logical 0 by pressing the rocker switch so it toggles down toward the circuit card edge.

Timing Control

The major circuits in this category are the 212.2-millisecond interval timer, which has been previously mentioned; the fixed-frequency generation circuits that provide the async I/F-2 module with the fixed 150, 300, 600, 1200, 2400, 4800, and 9600 baud rate timing signals; and the variable frequency generation circuit (controlled by the eight frequency selector switches) that provides the async I/F-2 module with an alternative baud rate timing signal when the rate of communications is not at the same rate as one of the fixed baud rate timing signals. The frequency selector switches, see figure 4-12, are provided to establish variable selectable baud rates for the async I/F-2 module. These two-position switches, when toggled down towards the edge of the circuit card, increase the frequency being issued. The basic time period is 0.5 microsecond, and each switch enabled provides an additional time increase as follows:

Basic period	0.5 microsecond
Switch 8	0.5 microsecond
Switch 7	1.0 microsecond
Switch 6	2.0 microseconds
Switch 5	4.0 microseconds
Switch 4	8.0 microseconds
Switch 3	16.0 microseconds
Switch 2	32.0 microseconds
Switch 1	64.0 microseconds

For example, if a frequency for 2400 baud is desired, then:

Baud rate = 2400 bits per second
 Frequency required = $2400 \times 16 = 38,400$ Hz
 (where 16 is a multiplier inherent in the asynchronous logic circuit)

$$\text{Period} = \frac{1}{38,400} = 26.0 \text{ microseconds}$$

Therefore, switches 3, 4, 7, and 8 are used to select a total time period of 25.5 microseconds plus the basic time period of 0.5 microsecond = 26.0 microseconds for the desired 2400 baud rate.

Module Control Logic

Basically, the STIC module control logic consists of circuits which recognize when a shared-bus communication transfer is directed to the STIC module and determine the action that should be taken by the module in the transfer.

Interface Characteristics

The signal interchange between the processor module and STIC module occurs via the shared bus, the dedicated Interrupt 0-7 lines, and an I/O channel assigned to the STIC module through the logic chassis backplane. The few signals that occur between the STIC module and the ROM and RAM are also via the shared bus. Interrupts from each of the other I/O modules of the logic chassis are carried to the STIC module on the Interrupt line of their I/O channel. All other signal interchange, such as between the STIC module and maintenance panel or STIC module and async I/F-2 module, is via dedicated signal lines in the backplane. Most of the shared-bus

interface signals are TTL three-state (high, low, or floating), with the remaining shared bus signals and all of the other interface signals being TTL two-state (high or low). The TTL two-state signals are defined as follows:

Inputs: 0.0 V to 0.8 V = logical 0
2.0 V to 5.0 V = logical 1

Outputs: 0.0 V to 0.4 V = logical 0
2.4 V to 5.0 V = logical 1

The TTL three-state signals have the following characteristics:

- Logical 1 = low impedance to +5 V.
- Logical 0 = low impedance to ground.
- Floating (indeterminate) = high impedance to both +5 V and ground.

ASYNC I/F-2 MODULE

The asynchronous interface module, see figure 4-14, contains two switch-selectable baud-rate communication ports that act to interface the processor module with the higher-level processor of the system via the modem and communications telephone line, and with the printer device, which may be associated with the display terminal via the interface cable leading to the printer. Through these two ports, the async I/F-2 module performs all the external receive and transmit of the display terminal, all of which are under control of the processor module. Although the async I/F-2 module has the capability of handling either TTL level or RS-232-C compatible level signals on its two ports, only the RS-232-C level signals are used in its application in CC617-A/B.

The async I/F-2 module connects with the processor module via the shared bus and an I/O channel. It also has dedicated backplane connections leading to the maintenance panel from its port A which is connected to the modem. These lines are used to show the status of communications on this port by causing the appropriate indicators to be lit. Its other intermodule connections are with the STIC module for the purpose of receiving the fixed 150, 300, 600, 1200, 2400, 4800, and 9600 baud rate and variable frequency baud rate timing signals from the STIC module. These baud rate signals from the STIC module correspond to the selections that are available for each port by the setting of the six switches shown in figure 4-14. These switches are divided into two segments, one for each port. During installation, each of the switch segments is set to match the rate of external communications that are to occur on the port. If the rate of communications for a port cannot be matched by one of the fixed baud rate switch selections, the switches of that segment are set to the variable frequency selection (all pressed down nearest board edge) and the frequency selector switches on the STIC module are set appropriately to match that particular communication rate.

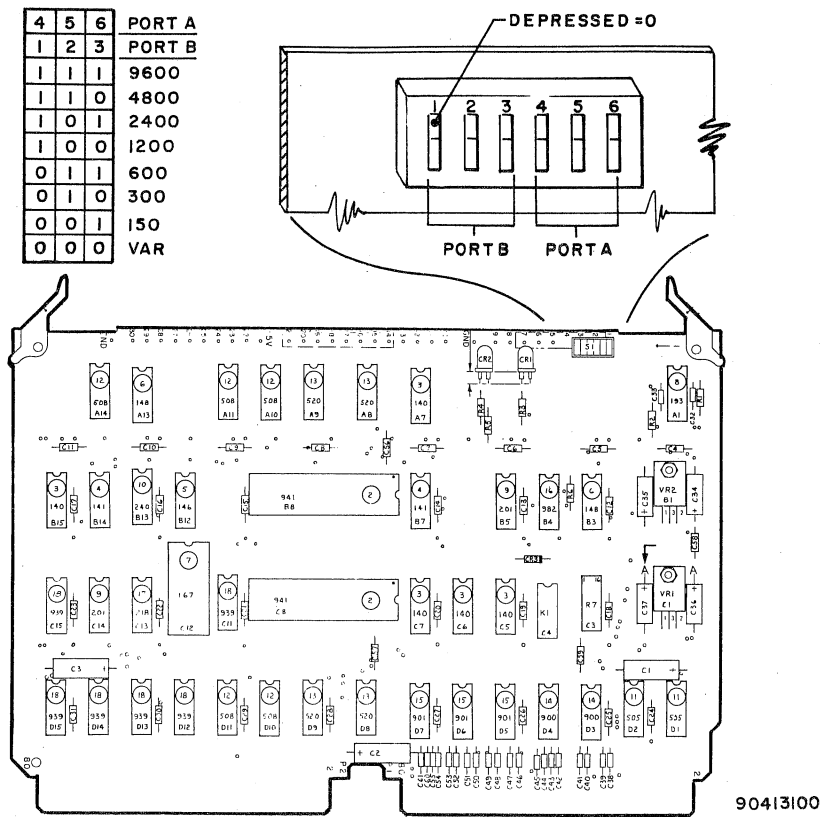
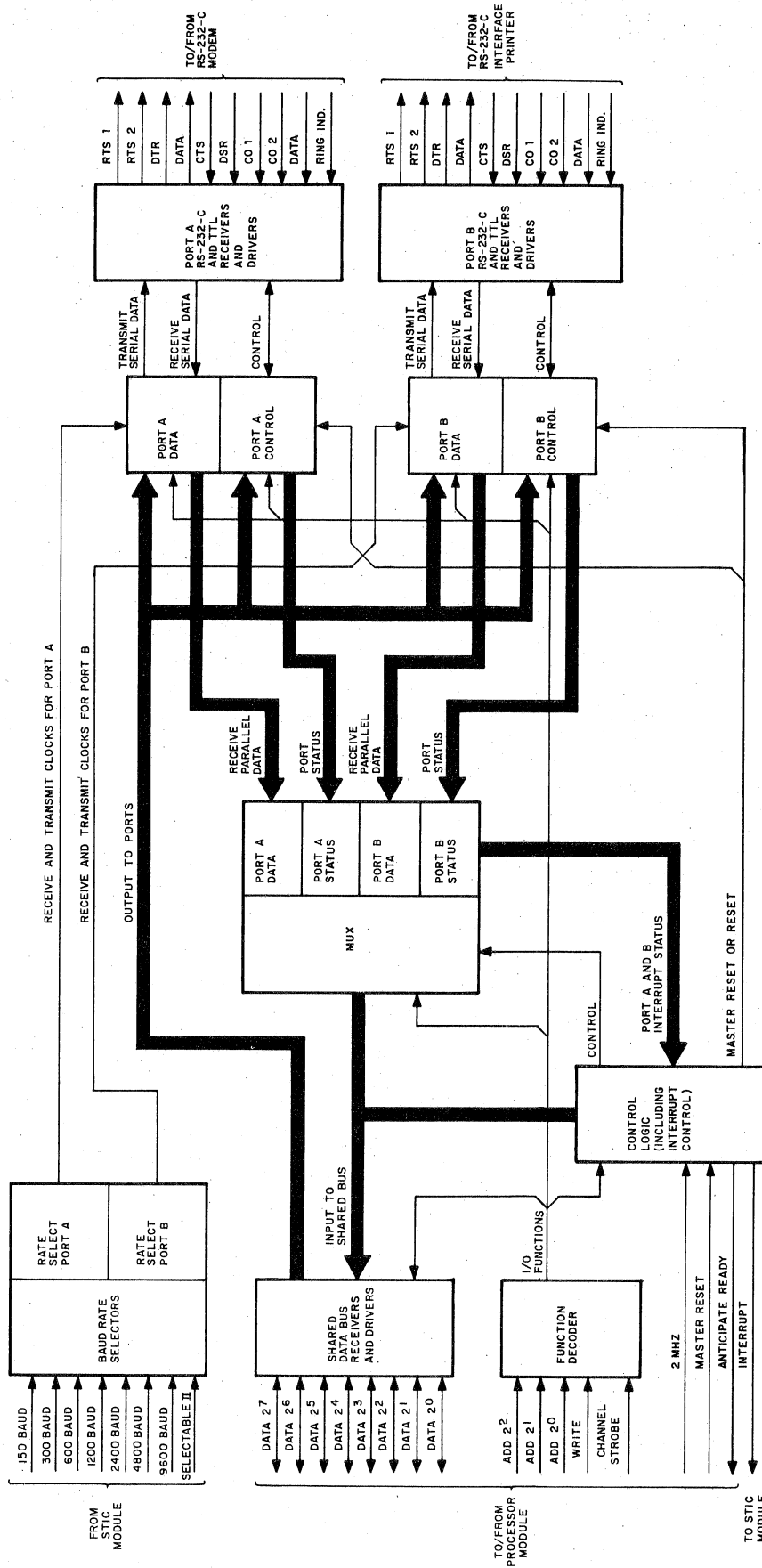


Figure 4-14. Async I/F-2 Module

For the purpose of reference, a block diagram of the async I/F-2 module is shown in figure 4-15. The major functions that are performed by the module include the following:

- Converts serial, RS-232-C level data received from the modem or printer to parallel TTL level data acceptable for handling by the processor module during receive operations and vice versa during transmit operations.
- Checks received data characters for the type of parity (odd, even, or none) that the firmware program of the application dictates through the processor module, and adds the appropriate parity bit to data characters that are to be transmitted.
- Checks received serial data for the framing and length that the firmware program of the application dictates through the processor module, and generates the framing of data characters to be transmitted. (The framing of a data character consists of: a start bit; the data character, which can be 5, 6, 7, or 8 data bits in length; the parity bit, if any; followed by 1 or 2 stop bits, or a possible 1.5 stop bit if a 5 data bit character length is being used.)
- Generates interrupts to the processor module, via the STIC module, when a firmware program (processor commanded) preselected interrupt condition occurs.



NOTE: THE SIGNAL CONNECTIONS LEADING FROM THE ASYNC I/F-2 MODULE TO THE MAINTENANCE PANEL ARE NOT SHOWN.

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Figure 4-15. Async I/F-2 Functional Diagram

The transfer between the processor module and async I/F-2 module of a data character that is to be transmitted or that has been received, is via the bidirectional Data Bus lines during a shared bus communication transfer. The same is true for the transfer of status information from the async I/F-2 module to the processor module, and for the transfer of function commands from the processor module to the async I/F-2 module. Directions as to the type of information to be transferred in these cases is provided by the code placed on the Address Bus lines by the processor module.

+12-Volt and -12-Volt Regulators

The async I/F-2 module has two voltage regulators that provide regulated +12 V and -12 V $\pm 5\%$. Input power is from the power supply assembly +20 V and -20 V unregulated outputs. Provided at the edge of the module are two LED indicators to indicate presence of the regulated voltages. The yellow LED indicates +12 V, and the green LED indicates -12 V.

Interface Characteristics

All signal interchange between the async I/F-2 module and the processor module, STIC module, and maintenance panel are TTL level signals with the majority of them being two-state (high or low). The signals within this group which are TTL three-state (high, low or floating), involve most of the shared bus interface signals that are with the processor module. The TTL two-state signals are defined as follows:

Inputs: 0.0 V to 0.8 V = logical 0
2.0 V to 5.0 V = logical 1

Outputs: 0.0 V to 0.4 V = logical 0
2.4 V to 5.0 V = logical 1

The TTL three-state signals have the following characteristics:

- Logical 1 = low impedance to +5 V.
- Logical 0 = low impedance to ground.
- Floating (indeterminate) = high impedance to both +5 V and ground.

All signal interchange between the two communications ports of the async I/F-2 module and the modem (internal or external) and the associated printer device, is at voltage levels which meet the requirements of RS-232-C. These signal levels are as follows:

Inputs: -25.0 V to +0.8 V = mark or inactive
+2.0 V to +25.0 V = space or active

Outputs: -12.0 V to 3.0 V = mark or inactive
+3.0 V to +12.0 V = space or active

DISPLAY/KEYBOARD I/F MODULE

This module, see figure 4-16, contains interface and control logic for the video monitor and the keyboard module.

Control Logic

The display/keyboard I/F module has two primary functions. In its operations with the keyboard module, it serves as an interim input data collector for the processor module. In its operations with the video monitor, it serves as an independent collector/video-generator of display refresh data in that it obtains the data that is to be displayed through performance of memory-read operations to the RAM, serializes the data, and converts the data to a video signal, all under its own control. Its keyboard circuitry provides an 8-bit parallel interface to the keyboard that generates an interrupt for each key depression. Depending upon the application, it also generates a status indication for each of the three positions (ON/OFF/MGT) of a keylock switch which may be located on the keyboard module. The video logic portion of the module contains 12 two-position rocker switches which select the following control and address functions for the display. To allow program control of their operations, two switches are bypassed.

- Display of 6 or 12 lines at 40 characters per line
 - Display of 12 or 24 lines at 80 characters per line
 - Display operation at 50 or 60 Hz
 - Display Enable switch to manually turn on the display for test purposes
 - Eight address switches to establish the initial RAM address for display refresh
- } Under program control;
not switch-selectable

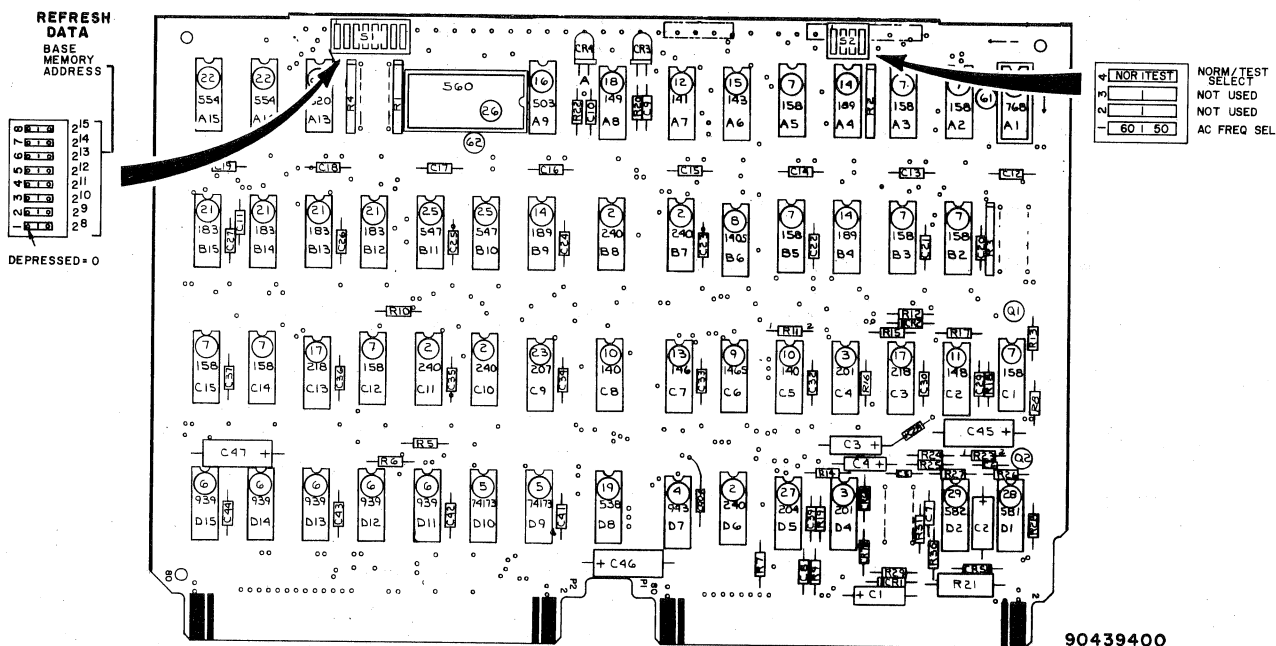


Figure 4-16. Display/Keyboard Interface Module

Information to be displayed is stored in the RAM by the processor module under program control. The initial memory block address is determined by the settings of the eight address switches which establish the upper 8 bits of the 16-bit memory Address Bus word. The lower 8 bits of the 16-bit Address Bus word which is controlled by the module's video control circuitry, reflect all zeros during the initial address. Each memory location within the memory block is uniquely related to a specific character position on the crt screen, with the initial address corresponding to the top left displayable portion of the screen. As the scanning cycle of the crt beam progresses from the initial position toward the right of the screen, the memory addresses that are generated for these positions by the module's video control circuitry increment accordingly. The actual relationship between the scanning of a display line and the reading from memory of its corresponding characters, is that the reading takes place one display line time before they are scanned. The incrementation of the lower 8 bits of the 16-bit Address Bus word continues until the last displayable character position on the screen has been reached in the current scanning cycle, at which time they are cleared to all zeros again in preparation for the next scanning cycle.

The 8-bit data character read from the addressed memory location is interpreted as either a displayable symbol or a video control code. Each video control code occupies one character position on the screen, but a blank is displayed in its place. Once a control code is detected in the data stream, the video option selected (blink, blank, inverse, or dim) becomes active until a new control code is detected or the end of the display line is reached, whichever occurs first. A blinking underline cursor may be program-generated by setting bit 2⁷ in the character frame corresponding to the location on the screen where a cursor is to be displayed. There is no restriction as to how many cursors can be displayed simultaneously.

A character generator provides the dot-matrix pattern for each of the displayed characters and symbols. Video serializer and driver circuits convert the TTL signal level parallel data bits of each scan line into a serially-generated, noncomposite, video signal required by the video monitor. The horizontal and vertical sync pulses supplied to the video monitor by the module are via separate signal lines.

A phase lock loop circuit on the module is used to eliminate any "swim" effect on the screen caused by a difference between the ac power frequency and the internal refresh timing. It consists of a phase detector that compares two signals and generates an output which is a dc voltage proportional to the difference in phase between them. This voltage controls the frequency of a voltage-controlled oscillator. This frequency, divided by the correct number, is fed back to the phase detector to compare it with the ac input frequency. Upon power on, the circuit will start running at a certain frequency which will be varied by the phase detector output until they are in phase. Two indicators are provided at the board edge of the module which indicate the presence of +12-V dc and -12-V dc from the power supply (yellow indicates +12-V dc; green indicates -12-V dc).

Interface Characteristics

All signal interchange between the display/keyboard I/F module and the processor module is via the shared bus and an I/O channel assigned to the display/keyboard I/F module through the logic chassis backplane. The memory-read operations between the display/keyboard I/F module and RAM are also via the shared bus. The access to memory and to the shared bus during a memory-read operation is obtained from the processor module by the display/keyboard I/F module issuing a Bus Request signal on its I/O channel. If no shared-bus communication transfer is in process, the processor module responds to the request with a Bus Enable signal on the I/O channel which allows the memory-read operation to occur. All signal inputs from the keyboard module to the display/keyboard I/F module and from the display/keyboard to the video monitor, are via dedicated signal lines in the backplane. Nearly all of the shared-bus interface signals are TTL three-state (high, low, or floating), with the remaining shared-bus signals and all of the other interface signals, except that of the serial noncomposite video signal to the video monitor, being TTL two-state (high or low). The TTL two-state signals are defined as follows:

Inputs: 0.0 V to 0.8 V = logical 0
2.0 V to 5.0 V = logical 1

Outputs: 0.0 V to 0.4 V = logical 0
2.4 V to 5.0 V = logical 1

The TTL three-state signals have the following characteristics:

- Logical 1 = low impedance to +5 V
- Logical 0 = low impedance to ground
- Floating (indeterminate) = high impedance to both +5 V and ground

The amplitude of the serial noncomposite video signal to the video monitor from the display/keyboard I/F module has the following ranges:

- 1.0 to 2.0 V = white level
- 60 to 90% of white level = gray or dim level
- 0.3 to 0.7 V = black level

OPTIONAL INTERNAL MODEM MODULE OF THE CC617-B MODEL

There are three versions of an optional logic card modem module that can be used in the application of CC617-B. The card location in the logic chassis reserved for the modem module is card location 09. The two card connectors at this location provide all the interface connections that are required between the modem module and the communications telephone line fastened to the terminal block at the rear of the display terminal, port A of the async I/F-2 module, and power distribution system of the display terminal. There also are provisions for making individual pin connections between the modem module version part number 51912400 and a data coupler with a handset such as the Bell System CBS Data Coupler, via the top card connector. All of the interface connections and pin assignments pertaining to the modem module are shown in the interconnection diagrams contained in section 5.

All three versions of the modem module have similarities, in that all can operate in either point-to-point or multipoint communication arrangements, and each meets the requirements of EIA standard RS-232-C for asynchronous modems. Also, each version employs the phase-coherent frequency shift keying (FSK) type of modulation/demodulation. Other particulars concerning the three versions of the module are described in the following paragraphs.

Modem Module, CDC Part Number 51912400

This version is capable of handling a receive/transmit data transfer rate of from 0 to 1200 bits per second on switched-network communication lines or up to 1800 bits per second on leased communication lines. It can be configured in either full-duplex 4-wire or half-duplex 2-wire fashion and has the capability of servicing a data coupler with a handset. The data coupler and handset may be part of either a Bell Systems CDT or CBS Data Access Arrangement. When a Bell CDT Data Coupler and a standard telephone handset with exclusion (data) key is employed, it provides the site of the display terminal with the capability of manual originating or answering. When a Bell CBS Data Coupler and a standard handset with exclusion (data) key is employed, it provides the site with not only manual originating and answering capabilities, but also automatic answering.

Major modulation/demodulation characteristics of the module are as follows:

- The analog receiving circuits recognize an incoming phone line signal with a power level of from -50 dBm (minimum) to 0 dBm (maximum with a frequency of either a mark or a space as being a carrier signal). A selection switch is provided on the module to decrease this minimum power level sensitivity from -50 dBm to -35 dBm.
- The FSK demodulation circuits consider the incoming phone line signal to be a mark (equivalent to logical 1) when its frequency is 1200 Hz nominal and a space (equivalent to logical 0) when its frequency is 2200 Hz nominal, with the center point between a mark and a space being at a frequency of 1700 Hz.

- The frequencies transmitted on an outgoing phone line signal by the FSK modulation circuits are:

Mark (equivalent to logical 1), 1200 Hz
Space (equivalent to logical 0), 2200 Hz
Soft carrier — if enabled, 900 Hz
Answer tone — if used with a Bell System
CBS Data Coupler, 2012 to 2240 Hz

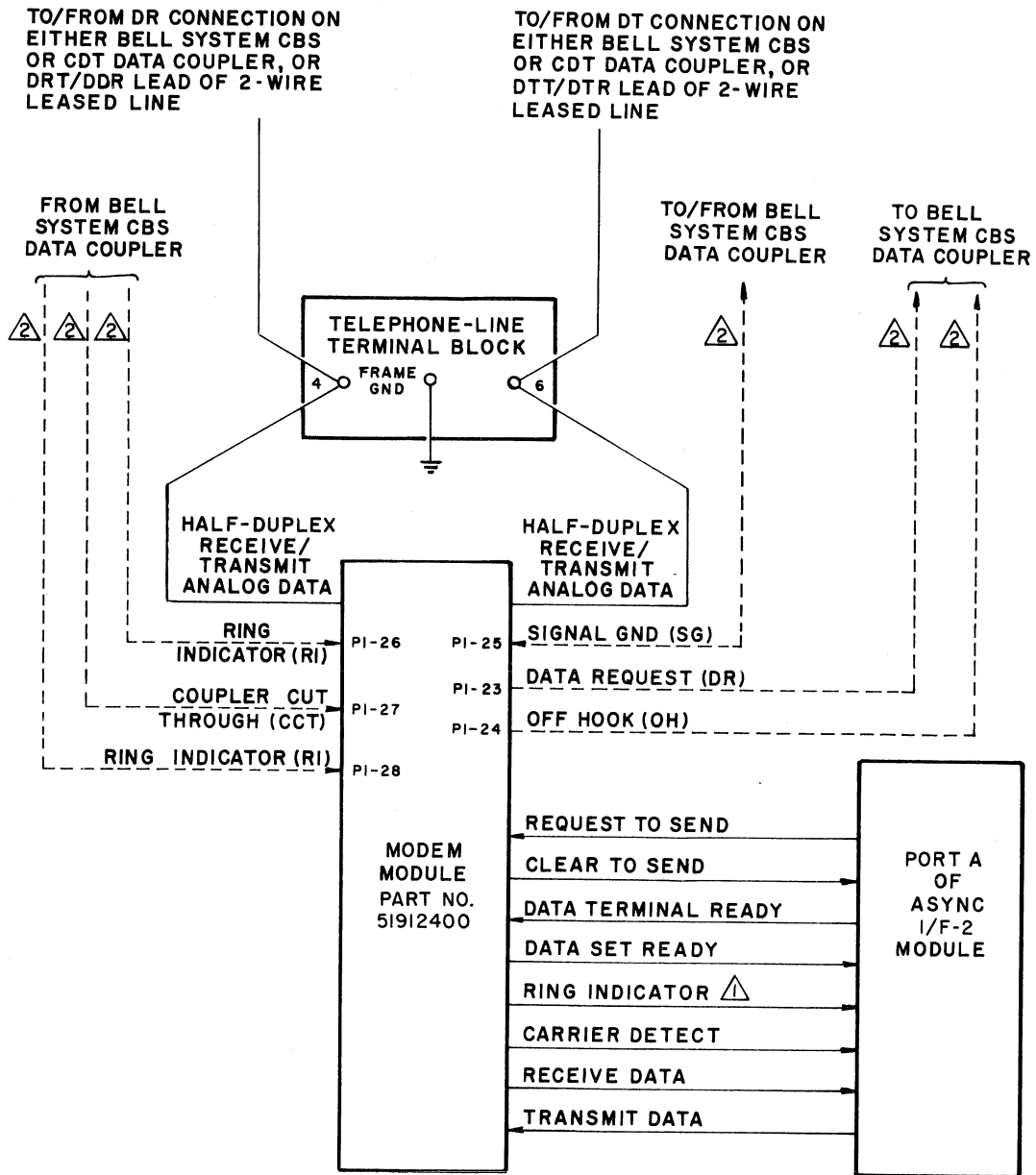
To govern the transmission of the soft carrier, two selection switches are provided on the module. One switch enables/disables the transmission of a soft carrier; while the other selects the length of the time period in which, if enabled, the soft carrier is transmitted following the drop of the later discussed Request to Send signal from the async I/F-2 module, signifying the end of data transmission. The power level used by the module in the transmission of the mark, space, soft carrier, and answer tone frequencies is switch-selectable from 0 dBm (maximum) to -14 dBm (minimum), in decrements of 2 dBm. A mark or a space in the transmission represents a carrier signal.

- The analog receiving circuits employ an amplitude limiter type of equalization that is switch-selectable to match the basic distance in which communications are to occur.

Interface Signals and Definitions

The interface connections of the modem module in a half-duplex, 2-wire communication line configuration, along with its signal interface with the display terminal via the async I/F-2 module is shown in figure 4-17. This configuration would be used in a switched-network or 2-wire leased communication line application. As shown in the figure, the two wire connection made at the telephone-line terminal block, of the half-duplex transmit/receive analog data leads of the communication line, provide all the interface connections that are necessary for either of these methods of application. In the case of the switched-network application, these leads would be via a data coupler such as the Bell System CDT or CBS Data Coupler. If the latter data coupler is used in the application, the six additional interface connections shown in figure 4-17 as dashed-lines, would also be required to be made. The signal designations that are shown in the figure within parentheses are the abbreviated designations that actually appear on the interconnection panel of the coupler itself. In the case of a full-duplex, 4-wire leased communication line application, the connections made at the telephone-line terminal block would differ from those shown, and they would cause a separate set of receive and transmit analog data leads to be interconnected between the modem module and terminal block. The interface assignments of the terminal block for both 2-wire and 4-wire configurations are provided in a table contained in appendix A.

The definition of the telecommunication interface signals between the modem module and the communication line, via the interconnection paths provided by the telephone-line terminal block, is listed in table 4-1.



NOTES:

- Δ 1 SIGNAL ONLY HAS SIGNIFICANCE WHEN A BELL SYSTEM CBS DATA COUPLER IS USED IN APPLICATION.
- Δ 2 THESE LEADS WOULD HAVE TO BE TO THE MODEM MODULE VIA THE BACK OF THE TOP CARD CONNECTOR (PI) IN CARD LOCATION O9 OF LOGIC CHASSIS. THE PIN NUMBERING SCHEME OF THE CARD CONNECTORS IS SHOWN IN SECTION 5.

Figure 4-17. Interface Diagram of Modem Module Part Number 51912400 in 2-Wire Configuration

TABLE 4-1. MODEM MODULE/COMMUNICATION LINE SIGNAL DEFINITIONS

MODULE PIN NUMBER	SIGNAL	DEFINITION
P1-51/P1-52	Data Tip and Data Ring Transmit/Receive — in half-duplex 2-wire configuration	These lines carry the half-duplex outgoing transmit analog data from the modem module and the half-duplex incoming receive analog data to the modem module.
P1-51/P1-52	Data Tip Transmit/Data Ring Transmit — in full-duplex 4-wire configuration	These lines carry the full-duplex outgoing transmit analog data from the modem module.
P1-54/P1-55	Data Tip Receive/Data Ring Receive	These lines carry the full-duplex incoming receive analog data to the modem module.

The definitions of the telecommunication interface signals that are used between the modem module and a Bell System CBS Data Coupler, which provide the site with automatic answering in a switched-network application, are listed in table 4-2.

TABLE 4-2. MODEM MODULE/BELL SYSTEM CBS DEFINITIONS

MODULE PIN NUMBER	SIGNALS	DEFINITION
P1-23/P1-24	Data Request/Off Hook	These two lines from the modem module are activated in conjunction to cause the receive/transmit analog data lines leading to the modem module to be connected through the coupler to the telephone line. This takes place whenever an automatic answer or data transmission on the telephone line is to occur. The Data Request/Off Hook signals are activated when the Data Terminal Ready signal from the async I/F-2 module is present and either the coupler has received a ring on the telephone line (Ring Indicator signal from coupler active) requiring that a subsequent automatic answer be made by the modem or a manual origination or answer has been completed by the indication of the Switch Hook signal from the coupler becoming inactive (until this occurs the operation is inhibited). The Data Request/Off Hook signals remain active in these circumstances until the Data Terminal Ready signal is dropped.
P1-25	Signal Ground	This line provides the common reference for all of the control interface signals between the modem module and coupler.
P1-26	Ring Indicator	The coupler activates this line when it receives a ring on the telephone line. Activation of the Data Request/Off Hook signals by the modem module inactivates it.
P1-27	Coupler Cut Through	The coupler activates this line to indicate to the modem module that its receive/transmit analog data lines are connected through the coupler to the telephone line. This follows the activation of the Data Request/Off Hook signals by the modem module.
P1-28	Switch Hook	The coupler activates this line when it senses a contact closure of whichever handset indicator is connected to it, which in this particular arrangement should be the exclusion key. Under these circumstances the contact closure of the exclusion key would occur either during a manual origination or manual answer so as to allow the telephone line to be transferred to the handset. Upon completion of the manual origination or answer, the control of the telephone line is transferred back to the modem module by the exclusion key being lifted, causing the Switch Hook signal to be inactivated. During the period in which the Switch Hook signal is active, the Data Request/Off Hook signals to the coupler are inhibited.

The signal interface between the modem module and the display terminal, by way of port A of the async I/F-2 module, is defined in table 4-3. As can be seen from the table, the significance of some of these signals differ with the communication type application in which the modem module is used. A visual indication of the state of these signal lines during operation is provided by eight red LEDs (one for each signal line) that are located on the outer board edge of the modem module. Each of the eight LEDs are labeled in an abbreviated fashion (such as, DTR for Data Terminal Ready) as to the signal line it represents. When an LED is lit, it indicates that the corresponding signal line is active. In regard to the Receive Data (RD) and Transmit Data (TD) LEDs, this means when they are lit (intermittently), that the corresponding signal line is not in an idle marking state and that data is being carried on it. Also contained on the outer board edge of the modem module are two LEDs which indicate the presence of +12 V and -12 V from the power supply assembly. The green LED glows when +12 V is present and the yellow LED glows when -12 V is present.

Switch-Selectable Strapping Options

In order to meet the requirements of all the communication line applications in which modem module part number 51912400 may be used, a total of thirteen switch-selectable strapping options are incorporated in the module as listed in table 4-4. The selection of the strapping options is governed by the setting of 21 two-position slide or rocker switches that are located on the component side of the module. To avoid inadvertent movement of the setting of these switches during handling once they have been set, each switch or group of switches has a slide-off cover installed over them. As can be seen from table 4-4, each of the switches is labeled as to what option its setting affects. During installation of the host display terminal, the modem module must be removed from the logic chassis and the covers removed to gain access to the switches so they can be set appropriately for the particular application in which the modem module is to be used. To facilitate this, the selection subcolumns of table 4-4, specify the option selection appropriate for each type of application when no particular circumstances have to be taken into consideration. When particular circumstances pertaining to an application do affect the selection of an option, the selection subcolumn for that application refers to the note contained in the table. In all cases, the pushing of a switch toward a labeled selection causes that option selection to be set or selected.

Not to be mistaken for any option selection switches are the three switches located along the outer board edge of the modem module that are labeled LOCAL LOOP BACK, REMOTE LOOP BACK, and MARK/SPACE TEST. These three switches are contained on the module for the purpose of performing tests on the module at a repair center facility. They are mentioned here because of their affect on the operation of the module if their normal operating settings should be inadvertently changed during the handling of the module or the shipment of the display terminal. Both the LOCAL LOOP BACK and REMOTE LOOP BACK switches must be set away from their corresponding labels and the 3-position MARK/SPACE TEST switch must be in its center position in order for normal operation to occur.

TABLE 4-3. MODEM MODULE/TERMINAL INTERFACE SIGNALS

SIGNAL	ORIGIN	ACTIVE STATE	HALF-DUPLEX/2-WIRE CONFIGURATION		FULL-DUPLEX/4-WIRE CONFIGURATION
			SWITCHED-NETWORK BELL CDT DATA COUPLER	SWITCHED-NETWORK BELL CBS DATA COUPLER	
Request to Send	Async 1/F-2	Spacing	Turns modem transmitter carrier on if Data Terminal Ready from async 1/F-2 is active and Data Set Ready from modem is active. Carrier is turned off when Request to Send is inactivated.	Same	Same
Clear to Send	Modem	Spacing	Indicates modem transmitter carrier is on and data may be transmitted.	Same	Same
Data Terminal Ready	Async 1/F-2	Spacing	Indicates the terminal is ready to receive or transmit data.	Same except in this case, it is an enabling condition that allows the modem to connect to the telephone line when an automatic answer, manual answer, or manual origination occurs.	Same as first description
Data Set Ready	Modem	Spacing	This response is given for Data Terminal Ready.	Same except in this case, it includes indication that the modem is connected to the telephone line.	Same as first description
Ring Indicator	Modem	Spacing	No significance always inactive.	Indicates that the coupler is receiving a ring on the telephone line.	No significance, always inactive

TABLE 4-3. MODEM MODULE/TERMINAL INTERFACE SIGNALS (CONTD)

SIGNAL	ORIGIN	ACTIVE STATE	HALF-DUPLEX/2-WIRE CONFIGURATION			FULL-DUPLEX/4-WIRE CONFIGURATION LEASED
			SWITCHED-NETWORK BELL CDT DATA COUPLER	SWITCHED-NETWORK BELL CBS DATA COUPLER	LEASED	
Carrier Detect	Modem	Spacing	Indicates a carrier is being received on the telephone line by the modem or the modem itself is transmitting a carrier on the telephone line.	Same as first description	Same as first description	Indicates that a carrier is being received on the telephone line by the modem.
Receive Data	Modem	Logical 1 equivalent to a mark and logical 0 equivalent to a space	This signal line carries the demodulated data that the modem has received from the telephone line during receive operations. When the modem is not performing receive operations (Data Terminal Ready or Carrier Detect inactive) it holds the Receive Data line at a constant marking state.	Same	Same	Same
Transmit Data	Async I/F-2	Logical 1 equivalent to a mark and logical 0 equivalent to a space	This signal line carries the data that the modem is to modulate and transmit on the telephone line during transmit operations. When transmit operations are not being performed (Request to Send or Clear to Send inactive) the async I/F-2 holds the Transmit Data line in a constant marking state.	Same	Same	Same

TABLE 4-4. STRAPPING OPTIONS OF MODEM MODULE

MODEM MODULE APPLICATION			
<p>FULL-DUPLEX, 4-WIRE, LEASED LINE: POINT-TO-POINT COMMUNICATION ARRANGEMENT MULTIPOINT COMMUNICATION ARRANGEMENT</p> <p>HALF-DUPLEX, 2-WIRE, LEASED LINE SWITCHED-NETWORK COMMUNICATION LINE: AUTOMATIC ANSWERING MANUAL ANSWERING</p>			
STRAPPING OPTIONS	SELECTION SWITCHES	SELECTION	NOTES
Transmit power level which is selectable from 0 dbm maximum to -14 dbm minimum in 2 dbm decrements	Three switches labeled XMT LEV -2, -4, -8. Pressing one of these switches toward its label selects that much of a decrease from the 0 dbm maximum (all three switches pressed away from their labels).	0 dbm 0 dbm 0 dbm See note	On switched-network applications, these switches are to be set so the power level selected is the same as the maximum transmit level marked on the data coupler. If this is not possible, then set the switches to the next lower 2 dbm decrement (such as, -5 dbm marked on data coupler: -5 dbm selection not possible so -4 and -2 switches are set toward their labels to select a -6 dbm transmit power level).
Half-duplex, 2-wire or full-duplex, 4-wire operation	One switch labeled 2W on one side and 4W on the other.	4W 2W 2W See note	
Automatic or manual answer	One switch labeled AUTO on one side and MAN on the other.	MAN MAN MAN See note	
Receiving equalization that is selectable to match the basic distance communications that are to occur	Three switches labeled RCV EQ NEAR, NORM, and FAR.	See note See note See note See note	The selection made by these switches is to correspond to the distance in which communications are to occur as follows: NEAR selection for distances, if phoned would be a local call; or FAR selection for distances, if phoned would be a long-distance call; or NORM selection for cases where the distance of communications may be a combination of both.
Transmitter preemphasis	Two switches labeled XMT EQ IN, and XMT EQ OUT.	XMT EQ OUT See note See note See note	The selection of these switches for 4-wire, leased, multipoint application depends upon the distance between the site and that of the higher processor. If this distance were phoned and had to be carried as a long-distance phone call, the XMT EQ IN switch would be set. If this is not the case, then the XMT EQ OUT switch would be set.
Carrier detect minimum power level which can be either -50 dbm or -35 dbm	One switch labeled CD LEV -50, CD LEV -35.	See note See note See note See note	The selection made by the setting of this switch depends upon the distance in which communications are to occur. Using the definitions given previously in this column for local and long-distance, set the switch as follows: for local communications, set the switch to -35; for long-distance communications, or a combination of both local and long-distance, set the switch to -50.

TABLE 4-4. STRAPPING OPTIONS OF MODEM MODULE (CONTD)

	RCV TERM IN	See note	RCV TERM OUT	RCV TERM IN	RCV TERM OUT	RCV TERM IN	RCV TERM OUT	
Receiver Termination	RCV TERM IN	See note	RCV TERM OUT	RCV TERM IN	RCV TERM OUT	RCV TERM IN	RCV TERM OUT	The selection of this switch for a 4-wire, leased, multipoint application depends on whether the site is at the end of the multipoint network or not. If the site is at the end of the network, the switch should be set to RCV TERM IN; otherwise it should be set to RCV TERM OUT. The conditions for the selection of the setting of this corresponds to that given in this column for receiver termination.
Transmitter Termination	XMT TERM IN	See note	XMT TERM IN	XMT TERM IN	XMT TERM IN	XMT TERM IN	XMT TERM IN	The selection made by the setting of these two switches for a leased line application depends upon what length delay period is used by other sites of the communication system and namely the higher-level processor. The selection made should then match or be as close as possible to that delay period.
Request to Send/Clear to Send delay which provides a selection of a 200, 60, or 10-millisecond delay period between RTS going active, and the issuance of CTS	See note	See note	See note	See note	See note	See note	See note	The condition for the selection of the setting of this switch corresponds to that given in this column for Request to Send/Clear to Send delay.
Carrier detector-on delay which determines if the delay period between the actual detection of a carrier and the indication of its detection via Carrier Detect, is to be 40 or 6 milliseconds in length	See note	See note	See note	See note	See note	See note	See note	The conditions for the selection of the setting of this switch corresponds to that given in this column for Request to Send/Clear to Send delay.
Carrier detector-off delay which determines if the delay period between the actual detection of the drop of a carrier and the indication of it doing so by dropping Carrier Detect, is to be 15 or 6 milliseconds in length	See note	See note	See note	See note	See note	See note	See note	The conditions for the selection of the setting of this switch corresponds to that given in this column for Request to Send/Clear to Send delay.
Transmit soft carrier selection which either enables or disables it from being transmitted, and if enabled, determines the length of the time period it is transmitted following the drop of RTS	SC OFF	See note	SC ON and 10	SC ON and 25	SC ON and 25	SC ON and 25	SC ON and 25	The selection of these switches for a 4-wire, leased, multipoint application depends if actual communications are to be 2-way alternate or full-duplex. If they are to be full-duplex, the switch labeled SC ON/OFF should be set to OFF. If they are to be 2-way alternate, the switch labeled SC ON/OFF should be set to ON, and the conditions for the selection of the setting of the other switch corresponds to that given in this column for Request to Send/Clear to Send delay.
Receiver squelch selection that either enables or disables it from being employed, and if enabled, determines the length of the period it is employed following the drop of RTS	SQ OFF	SQ OFF	SQ ON and 40	SQ ON and 145	SQ ON and 145	SQ ON and 145	SQ ON and 145	

Interface Characteristics

Except for the incoming/outgoing analog phone line signals from/to the communication line, which characteristics have been previously defined, all signal interchange involving the modem module is at the following signal levels:

Inputs: -25.0 V to +0.8 V = mark or inactive
+2.0 V to +25.0 V = space or active

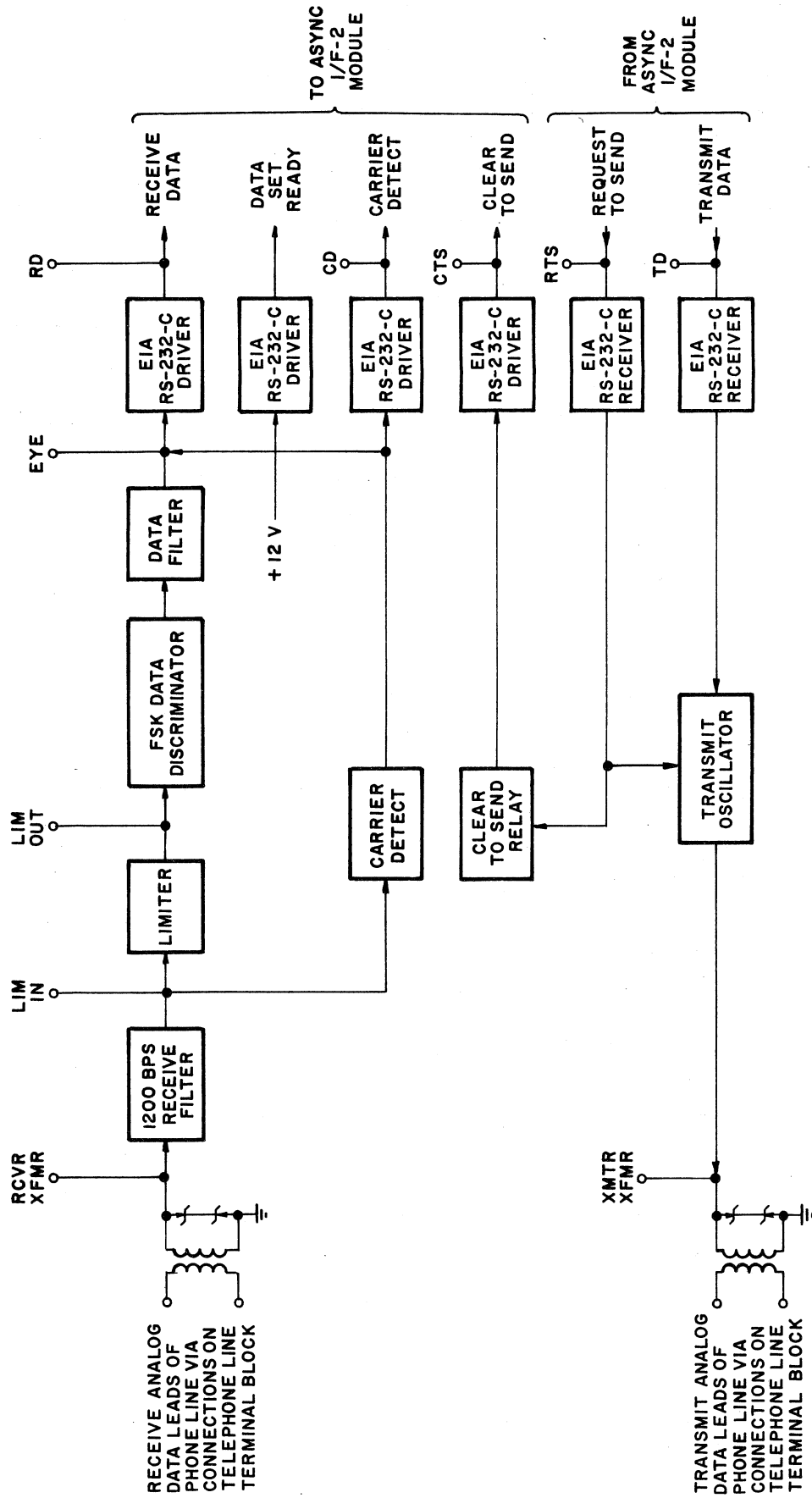
Outputs: -12.0 V to -3.0 V = mark or inactive
+3.0 V to +12.0 V = space or active

Modem Modules, CDC Part Numbers 51912402 and 51912403

Both of these versions have a receive/transmit data transfer rate of from 0 to 1200 bits per second on leased communication lines configured in full-duplex, 4-wire fashion. The only difference between these two versions is that part number 51912403 can provide its own regulation of power voltage and part number 51912402 cannot provide regulation. However, since the self-power regulation feature of part number 51912403 is not used in its employment in the CC617-B Display Terminal, the two versions, in this case, are considered identical operationally. A block diagram depicting the modulation/demodulation circuits of both versions is shown in figure 4-18.

Receive and Transmit Operation

The directional flow of an incoming signal on the receive analog data leads of the phone line through the demodulation circuitry is shown in figure 4-18 by arrows. In order for an incoming signal to be accepted by the receive filter through the receiver isolation transformer, it must have a power level of from -32 dBm (minimum) to 0 dBm (maximum) and be within the frequency range of 1050 to 2350 Hz. This 1050 to 2350 Hz frequency range represents the low-frequency limit of a mark and the high-frequency limit of a space. If the incoming signal meets these requirements, it is passed on through a limiter to an FSK data detector, and depending on whether this is the initial detection of a carrier, the carrier detection circuit either waits to activate or retains activation of the Carrier Detect signal to the async I/F-2 module. If this is the initial detection of a carrier, a fixed 40-millisecond delay within the carrier detect circuit must timeout before the circuit activates the Carrier Detect signal. This delay is incorporated to insure that the carrier supposedly detected, is in fact a true carrier and not just noise on the communication line. If the carrier is still being detected when the 40-millisecond delay times out, the carrier detect circuit activates the Carrier Detect signal to initiate a receive operation by the display terminal. Until activation of the Carrier Detect signal, flow of the incoming signal through the FSK data detector and the filter circuit that follows it, is insignificant because the resultant content of the signal is disabled from being transferred to the async I/F-2 module on the Receive Data signal line.



02360

Figure 4-18. Block Diagram of Modem Module Part Numbers 51912402/51912403

With the Carrier Detector signal active, the output from the FSK data detector through the filter circuit which represents the content of the incoming signal, is enabled to be placed on the Receive Data signal line. The FSK data detector is a frequency discriminating circuit that recognizes 1700 Hz as being the crossover point between the nominal frequency of a mark, which is 1200 Hz, and the nominal frequency of a space, which is 2200 Hz. The flow of the content of the incoming signal continues on the Receive Data line until a drop of the carrier is detected by the carrier detect circuit. When this occurs, a fixed 10-millisecond delay within the carrier detect circuit begins a time-out. During this 10-millisecond period, the Carrier Detect signal is kept active while the Receive Data line goes to an inactive marking state, which provides the display terminal with a clean termination of the received message.

The output of the modulation circuitry, which is connected to the transmit analog-data leads of the phone line via the transmitter isolation transformer, is controlled by the state of the Request to Send signal from the async I/F-2 module. To initiate a transmit operation, the display terminal activates the Request to Send signal, which enables the output of the modulation circuitry to be transmitted on the phone line. At this point, the response to the Request to Send of Clear to Send by the modem module, is not issued until a fixed 60-millisecond delay times out. During this period the Transmit Data line from the async I/F-2 module, which is the input to the modulation circuitry, is in an inactive marking state and these successive marks are what is modulated and transmitted as a carrier signal to prelude the transmission of actual data.

Once the 60-millisecond delay times out, the Clear to Send signal to the async I/F-2 module is activated by the modem module which allows the display terminal to place on the Transmit Data line the actual data to be modulated and transmitted. The FSK modulation of the content of the Transmit Data line is performed by the transmit oscillator circuit. The frequencies generated by the transmit oscillator is 1200 Hz for a mark and 2200 Hz for a space. These signals are transmitted at the power level of 0 dBm. The disabling of the transmit oscillator output occurs when the Request to Send signal is inactivated by the display terminal to end the transmit operation, and in response, the modem module inactivates the Clear to Send signal.

The significance, of the interface signals shown in figure 4-18 between the modem and async I/F-2 modules, is stated in table 4-5.

NOTE

In the case of both modem versions, the Data Terminal Ready signal originating from the async I/F-2 module does not interconnect with any of their circuitry and does not have any effect on their operation.

TABLE 4-5. MODEM MODULE/ASYNC I/F-2 SIGNAL DEFINITIONS

SIGNAL	DEFINITION	ACTIVE STATE
Request to Send	This signal turns the modem transmitter carrier on.	Spacing
Clear to Send	Indicates modem transmitter carrier is on and that data may be transmitted.	Spacing
Data Set Ready	This signal is continuously active.	Spacing
Carrier Detect	Indicates that a carrier is being received on the phone line by the modem.	Spacing
Receive Data	This signal line carries the demodulated data that the modem has received from the phone line when a carrier is being received. When a carrier is not being received, the modem keeps this signal line at a constant marking state.	Logical 1 equivalent to a mark and logical 0 equivalent to a space
Transmit Data	This signal line carries the data that the modem is to modulate and transmit on the phone line when the Request to Send signal is active. When the Request to Send signal is inactive, the async I/F-2 module keeps this signal line at a constant marking state.	Logical 1 equivalent to a mark and logical 0 equivalent to a space

There are no strapping options on either of these two modem module versions. Only two LED indicators are contained on them and are located along the outer board edge. When lit, these LEDs indicate that +12 V and -12 V are being received from the power supply assembly. The green LED shows the presence of +12 V and the yellow LED shows the presence of -12 V.

Interface Characteristics

Except for the incoming/outgoing analog phone line signals from/to the communication line, which characteristics have been previously described, all signal interchange of both modem module versions is with that of port A of the async I/F-2 module at the following signal levels:

Inputs: -25.0 V to +0.8 V = mark or inactive
 +2.0 V to +25.0 V = space or active

Outputs: -12.0 V to -3.0 V = mark or inactive
 +3.0 V to +12.0 V = space or active

POWER SUPPLY ASSEMBLY

The primary supplier of the low voltages used in the display terminal is the power supply assembly. Voltages produced by the assembly include regulated -5-V dc, -12-V dc, $+12\text{-V}$ dc, and unregulated -20-V dc, $+20\text{-V}$ dc, and 20-V ac. One of the major recipients of the power supply output is the $+5\text{-V}$ regulator card(s) housed in the logic chassis. As has been discussed earlier in this section, the $+5\text{-V}$ regulator(s) have the task of providing $+5\text{-V}$ dc to the other modules contained in the logic chassis. Between the power supply assembly and $+5\text{-V}$ regulator(s), all the basic low-voltage requirements of the display terminal are fulfilled. The major components that comprise the power supply assembly, along with the ac entry panel associated with the power supply, are shown in figure 4-19 and discussed in the following paragraphs.

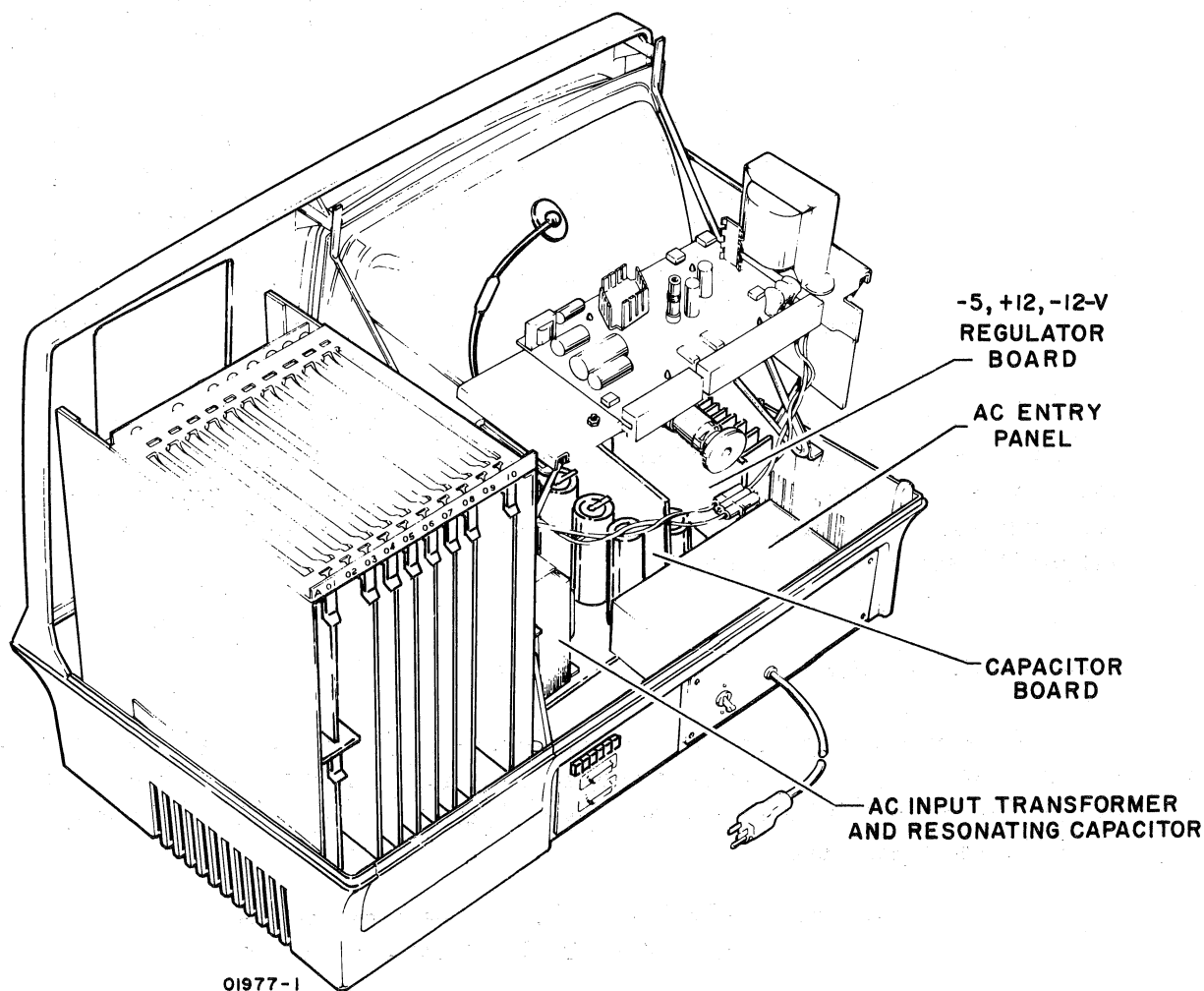


Figure 4-19. Power Supply Components

CAPACITOR BOARD

The capacitor board provides filtering for the rectified +20 and -20 voltages from the rectifier assembly. It distributes these voltages to the +15-V dc regulator on the crt monitor and to the +12, -12 regulator of the power supply assembly.

-5, +12, -12-V DC REGULATOR BOARD

This board provides regulated -5, +12, and -12-V dc and distributes the unregulated +12 V, -20 V to the logic chassis. Four test points are provided on this board for the +12, -12, and -5-V dc voltages and ground. The -5-V dc output is not used in the present configuration of CC617-A.

AC INPUT TRANSFORMER AND RESONATING CAPACITOR

The ac input transformer receives ac input voltage from the ac entry panel on its primary windings and provides stepped-down ac voltages to the rectifier and capacitor board. The transformer is a ferro-resonant type which has an associated resonating capacitor. The resonating capacitor is field-replaceable.

AC ENTRY PANEL

The ac entry panel contains the primary circuit breaker and the ac entry power cord. It provides the primary ac input voltage to the ac entry transformer. It is field-replaceable.

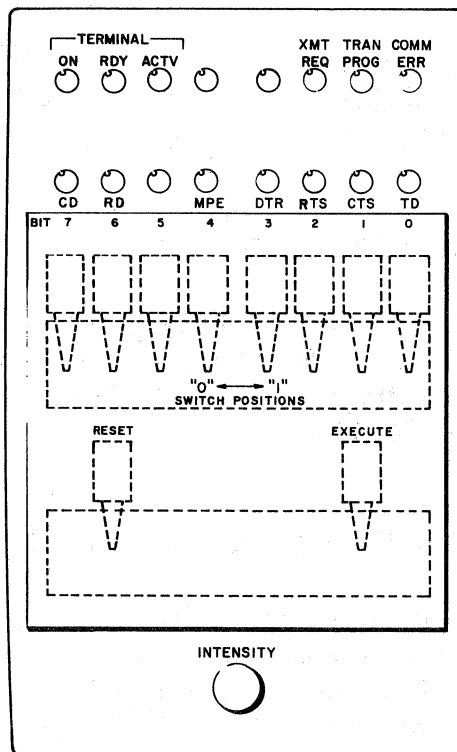
RECTIFIER

The nominal 20-volt ac secondary windings of the ac entry transformer are rectified to a pulsating dc voltage by the rectifier assembly. It is a silicon full-wave bridge rectifier that provides the +20 and -20-V dc input to the capacitor board for subsequent filtering.

MAINTENANCE PANEL

The maintenance panel, figure 4-20, contains a single PC board with:

- Sixteen LED indicators with their corresponding drivers
- Eight toggle switches
- Two momentary switches



02102

Figure 4-20. Maintenance Panel

All input signals used to control the LED indicators are TTL compatible. A logical 1 at the input of an LED driver turns the indicator on. A logical 0 at the input of an LED driver turns the indicator off. An open input is interpreted as a logical 1 light-emitting state.

The output signals of the maintenance panel are connected to the 10 switches that are accessible by removing the snap-on cover from the panel. Switches 0 through 7 are single-pole, double-throw, break-before-make type. In the Right position, their outputs are open, which represents a logical 1 state. In the Left position, their outputs are connected to Common, which represents a logical 0 state. The EXECUTE switch is a momentary, single-pole, double-throw, break-before-make switch. In the Left position (at rest), the NC contact is connected to Common and the NO contact is open. In the Right position, the NC contact is open and the NO contact is connected to Common. The RESET switch is identical to the EXECUTE switch, the only difference being that the NC contact is not used.

Eight indicators (upper row) reflect different terminal conditions, depending on whether the terminal is in a normal operating mode or in a diagnostic mode. For normal operating mode, six of the indicators are used to reflect the following program status conditions under program control.

- ON —
 - RDY —
- } Program execution started
- ACTV — Active
 - XMT REQ — Transmit request
 - TRAN PROG — Transaction in progress
 - COMM ERR — Communications error

In the diagnostic mode, the information that these eight indicators reflect is not as basic in nature as when in normal operating mode, and because the indicators are under program control, this information is likely to differ between different applications of the display terminal. In the diagnostic mode of the Ticketron application of the display terminal, these indicators reflect which quicklook is in execution according to the following:

- 0000 0001 — Test 001 (ROM checksum test)
- 0000 0010 — Test 002 (RAM memory test)
- 0000 0011 — Test 003 (Command test)
- 0000 0100 — Test 004 (Async comm channel test)
- 1111 1111 — Test 005 (Display test)
- 0000 0000 — Test 006 (Keyboard test)
- 0000 0111 — Test 007 (Ticket printer test)
- 0000 1000 — Test 010 (Matrix printer test)

Eight indicators (lower row) reflect the following communication interface status conditions. One indicator is not labeled and is controlled by the 2⁷ output of the STIC module auxiliary register.

- CD — Carrier Detect
- RD — Receive Data
- MPE — Memory Parity Error
- DTR — Data Terminal Ready
- RTS — Request To Send
- CTS — Clear To Send
- TD — Transmit Data

The functions, that the ten maintenance panel switches control, depend upon the firmware program employed in the application. In the Ticketron application of the display terminal, the eight switches (0 through 7) and the RESET switch provide manual controls for the diagnostic/autoload execution as follows:

- RESET switch — toggling this switch causes the quicklook-autoload sequence determined by the settings of the eight switches (0 through 7) to be reinitiated.
- Switches 7 through 0 = 0 — execute quicklook and autoload
- Switch 7 = 1 and switches 6 through 0 = 0 — bypass quicklook
- Switch 7 and 6 = 1 and switches 5 through 0 = 0 — bypass quicklook and autoload
- Switch 5 = 1 and switches 4 through 0 = 0 (switches 7 and 6 as desired) — program pause
- Switches 3, 2, 1, or 0 = 1 — quicklook only (selectable tests)

In the Ticketron application, the function of the other maintenance panel switch is:

- EXECUTE switch — toggling this switch following a transmission or checksum error causes a reload of a program page of the applications program to occur.

KEYBOARD MODULE OF THE CC617-A MODEL AND TICKETRON APPLICATION OF CC617-B

The keyboard module, figure 4-21, contains an 86-key keyboard assembly and a three-position keylock switch. A unique 8-bit binary code is assigned for each of the 86 keys. Each key, when pressed, presents its assigned code and a Data Ready signal in parallel to the display/keyboard I/F module located in the logic chassis. All voltages and control signals necessary for keyboard operation are provided from the display terminal via a 2-foot interconnecting cable between the keyboard module and the keyboard I/O connector of the terminal. Signals present on this cable are typically less than 30 V dc and greater than -13 V dc.

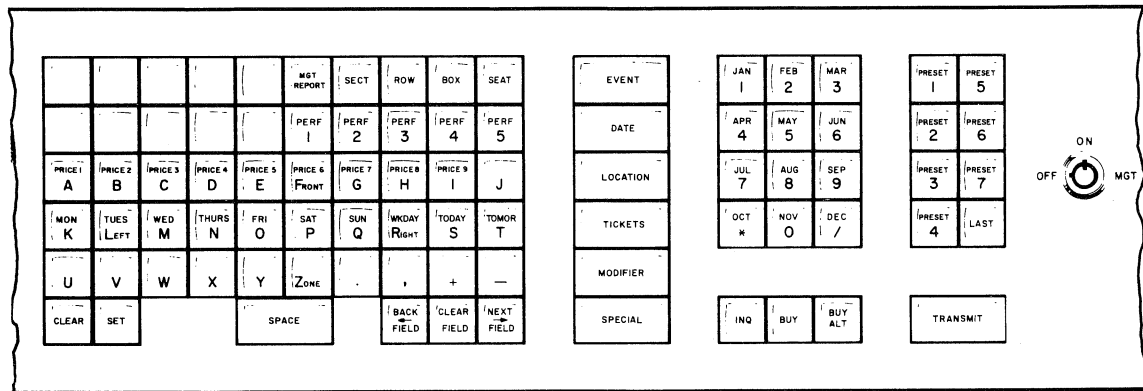


Figure 4-21. Keyboard Module

02098

The three-position OFF/ON/MGT keylock switch requires a key for operation and may be removed in either the OFF or ON position. Status codes are generated for each key position. When placed in the OFF position, the keylock switch disables the ac input power to the ticket printer. The ON and MGT positions apply power to the ticket printer and permit normal keyboard operation for ticket sales data input or management data input under software control.

The status bits provided to the keyboard interface logic for the different positions of the keylock switch are as follows:

Switch Position	Status Bits		Switch Contact
	2 ³	2 ²	
OFF	0	0	Open
ON	0	1	Closed
MGT	1	1	Closed

The switch contact controls the application of power to the ticket printer controller cabinet.

1. The first part of the document discusses the importance of maintaining accurate records of all transactions. This is essential for ensuring the integrity of the financial statements and for providing a clear audit trail. The records should be kept in a secure and accessible location, and should be updated regularly.

2. The second part of the document outlines the procedures for handling cash receipts and payments. It is important to ensure that all receipts are properly documented and that payments are made in a timely and accurate manner. The use of bank statements and reconciliation procedures is also discussed.

3. The third part of the document covers the process of preparing financial statements. This includes the calculation of net income, the preparation of the balance sheet, and the determination of the company's financial position. It is important to ensure that all statements are prepared in accordance with the applicable accounting standards.

4. The final part of the document discusses the importance of internal controls and the role of the accounting department in maintaining them. Internal controls are designed to prevent and detect errors and fraud, and to ensure the accuracy and reliability of the financial information. The accounting department plays a key role in the design and implementation of these controls.

This section contains the module interconnection and cabling diagrams for the display terminal. These diagrams are divided in two sets; on the first set, drawing number 62200815, applies to CC617-A and the second set, drawing number 62200826, applies to CC617-B. Logic diagrams for the various modules are contained in the respective hardware maintenance manual for that assembly. Refer to the preface of this manual for applicable publication numbers.

The pin numbering scheme of the modules within the logic chassis is shown in figure 5-1.

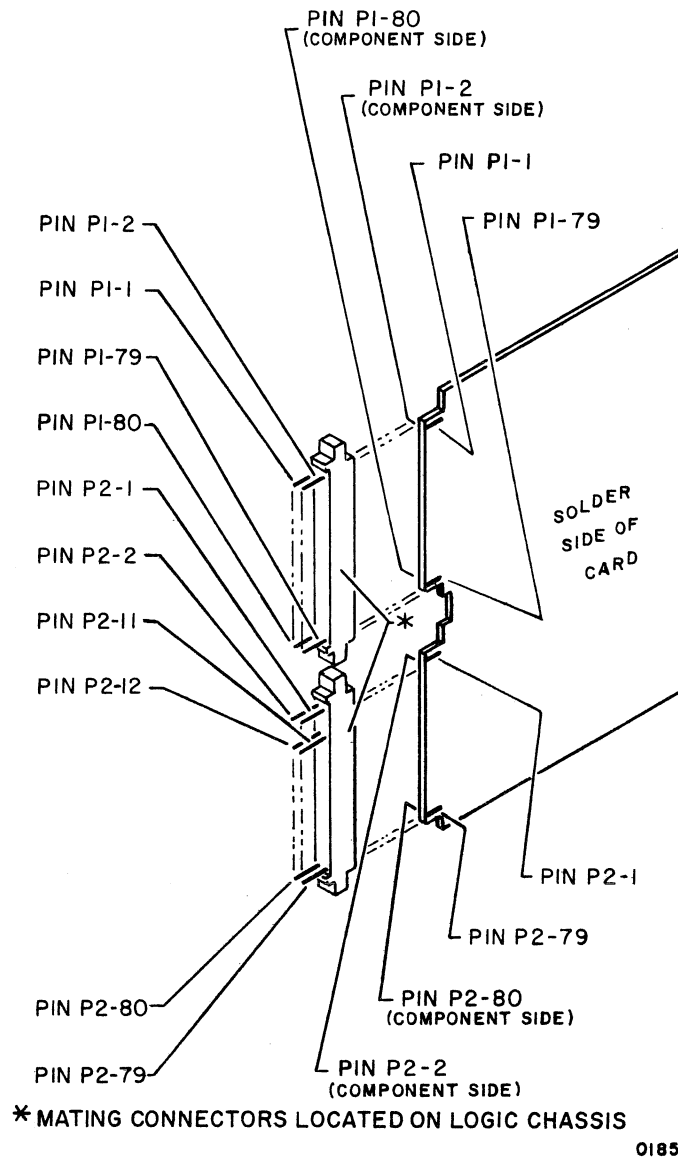


Figure 5-1. Pin Numbering Scheme of Modules in Logic Chassis

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Second block of faint, illegible text, continuing the document's content.

Third block of faint, illegible text, appearing to be a list or detailed notes.

Fourth block of faint, illegible text, possibly a concluding paragraph or signature area.

Fifth block of faint, illegible text at the bottom of the page.



**DIAGRAMS APPLICABLE
TO CC617-A**

RECAPITULATION OF CASES

AND

4	3	2	1
1	2	3	4
D	C	B	A

SHEET NO.	CROSS REFERENCE NUMBER	REV	LOGIC DIAGRAM TITLE	SHEET REVISION STATUS	REVISION RECORD
1		B	MODULE INTERCONNECTION DIAGRAM CONTROL SHEET	A	REV CO DESCRIPTION DRET DATE CHKD APP A 10842-40 RELEASED CLASS A E.E. 3/12/74 E.E. M.T. B CD 11623 REVISED SHTS 1&15 PER EQUIM 7-21-74 W.M. J.P.P.
2	A01	A	BUSSED SIGNAL CHART		
3	B01	A	+5V REGULATOR (SLAVE)		
4	02	A	+5V REGULATOR (MASTER)		
5	03	A	MAINT PANEL I/F CONNECTOR		
6	04	A	ROM MEMORY MODULE		
7	05	A	RAM MEMORY (1000-1FFF)		
8	06	A	RAM MEMORY (0000-0FFF)		
9	07	A	PROCESSOR		
10	08	A	STIC		
11	09	A	ASYNC I/F-2		
12	10	A	MODEM MODULE (OPTION)		
13	11	A	DISPLAY/KBOD I/F MODULE		
14	12	A	CABLE WIRING DIAGRAM		
15	13	B	CABLE WIRING DIAGRAM		
16	14	A	CABLE WIRING DIAGRAM		
17					

SHEET NO.	CROSS REFERENCE NUMBER	REV	LOGIC DIAGRAM TITLE	SHEET REVISION STATUS	REVISION RECORD
			LOGIC DIAGRAM TITLE		

REFERENCE DRAWING	CONTROL DATA	TITLE	MODULE INTERCONNECTION DIAGRAM CONTROL SHEET	CODE IDENT	DRAWING NO
	CC617A			15920	C 62200815
	E. ERSFELD 7-29-76			SCALE	SHEET 1 OF 17
	DWN CHD ENGR MFG APPR 3/12/74				
	COMPONENTS EXCEPT AS NOTED				
	TOLERANCE VALUE RATING				
	RES CAP				

NOTES
FOR LOGIC CHIP INFORMATION SEE DRAWING (82297000) KEY TO SYMBOLS.

MODULE NAME AND LOCATION

MAINT PANEL I/F CONNECTOR	02	03	04	05	06	07	08	09	10
MEMORY (ROM) (F000-FFFF)									
MEMORY (RAM) (0000-0FFF)									
MEMORY (RAM) (1000-1FFF)									
PROCESSOR									
STIC									
ASYNC I/F-2									
MODEM									
DISPLAY/KBD I/F MODULE									

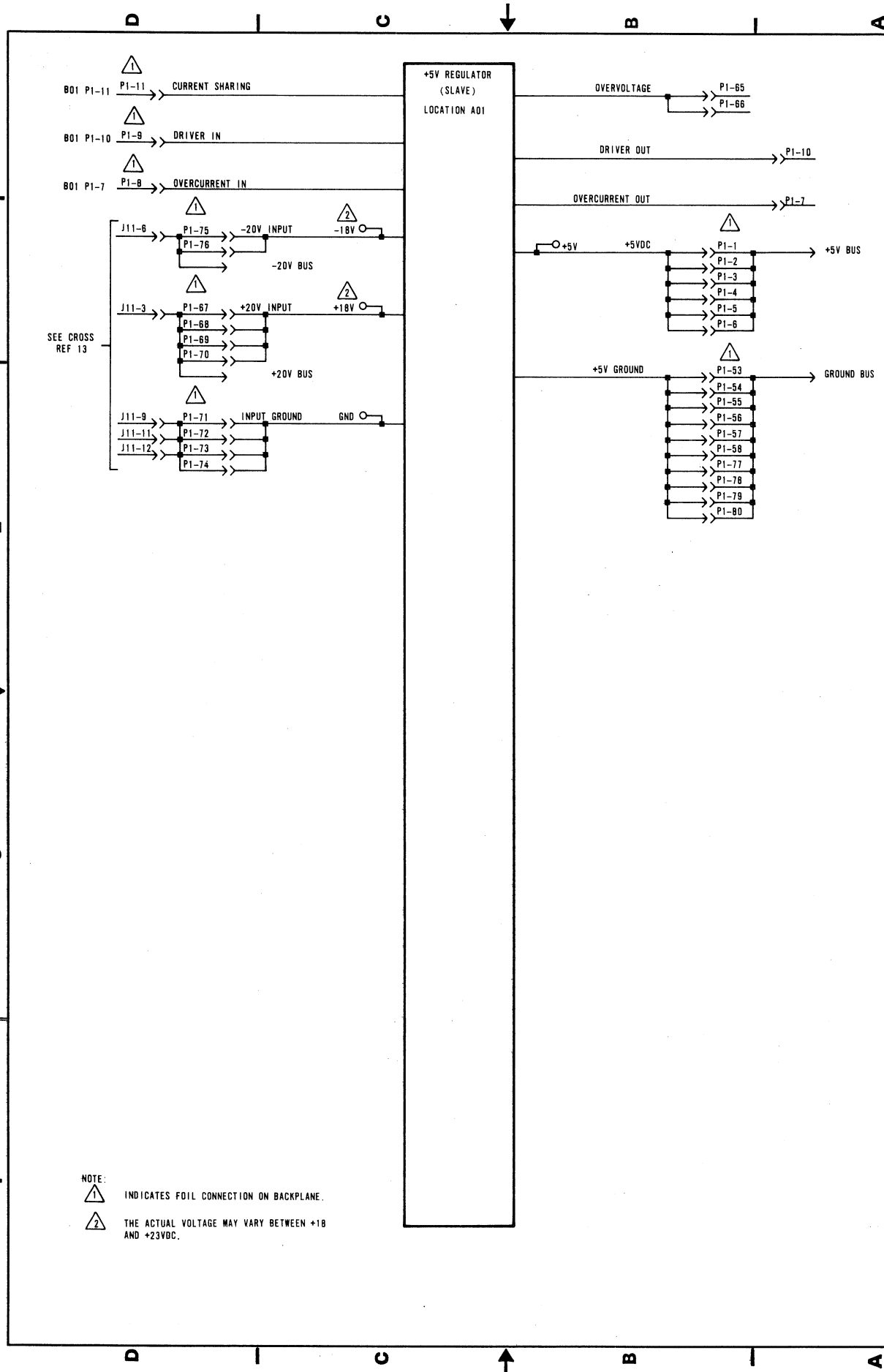
BUSSED SIGNAL NAME AND PIN NUMBER

+5V	P1-1, 2, 3, 4 P2-1, 2, 3, 4	X	X	X	X	X	X	X	X	X
GND	P1-77, 78, 79, 80 P2-77, 78, 79, 80	X	X	X	X	X	X	X	X	X
+20V	P1-71, 72 P2-71, 72				X		X	X		
-20V	P1-75, 76 P2-75, 76	X					X	X		
-PROCESSOR ON BUS	P2-8				X					
-INTA	P2-9				X					
-CONTROL PANEL STROBE	P2-10				X					
-HLDA	P2-11				X					
-SYNC	P2-12				X					
-STEP	P2-13				X					
-HOLD	P2-14				X					
-ENABLE CONTROL PANEL STROBE	P2-15				X					
-FETCH	P2-16				X					
-MT5	P2-17				X					
-MT4	P2-20				X					
-MT3	P2-18				X				X	
-MT2	P2-19				X					
-MT1	P2-21				X	X				
+2 MHZ	P2-22				X	X	X			
-ANTICIPATE READY	P2-37	X	X	X	X	X	X			
-MASTER RESET TO PROCESSOR	P2-38				X	X				
-READY	P2-39	X	X	X	X	X				X
+10 MHZ	P2-40	X	X	X	X					
-MEMORY REQUEST	P2-41	X	X	X	X	X				X
-I/O STROBE	P2-42				X					
-WRITE	P2-43	X	X	X	X	X	X			X
-MASTER RESET FROM PROC	P2-44	X			X	X	X			X
+ADDRESS BUS 2 ¹⁵	P2-45	X	X	X	X	X				X
+ADDRESS BUS 2 ¹⁴	P2-46	X	X	X	X	X				X
+ADDRESS BUS 2 ¹³	P2-47	X	X	X	X	X				X
+ADDRESS BUS 2 ¹²	P2-48	X	X	X	X	X				X
+ADDRESS BUS 2 ¹¹	P2-49	X	X	X	X					X
+ADDRESS BUS 2 ¹⁰	P2-50	X	X	X	X					X
+ADDRESS BUS 2 ⁹	P2-51	X	X	X	X					X
+ADDRESS BUS 2 ⁸	P2-52	X	X	X	X					X
+ADDRESS BUS 2 ⁷	P2-53	X	X	X	X					X
+ADDRESS BUS 2 ⁶	P2-54	X	X	X	X					X
+ADDRESS BUS 2 ⁵	P2-55	X	X	X	X					X
+ADDRESS BUS 2 ⁴	P2-56	X	X	X	X	X				X
+ADDRESS BUS 2 ³	P2-57	X	X	X	X	X				X
+ADDRESS BUS 2 ²	P2-58	X	X	X	X	X	X			X
+ADDRESS BUS 2 ¹	P2-59	X	X	X	X	X	X			X
+ADDRESS BUS 2 ⁰	P2-60	X	X	X	X	X	X			X
+DATA BUS 2 ⁷	P2-61	X	X	X	X	X	X			X
+DATA BUS 2 ⁶	P2-62	X	X	X	X	X	X			X
+DATA BUS 2 ⁵	P2-63	X	X	X	X	X	X			X
+DATA BUS 2 ⁴	P2-64	X	X	X	X	X	X			X
+DATA BUS 2 ³	P2-65	X	X	X	X	X	X			X
+DATA BUS 2 ²	P2-66	X	X	X	X	X	X			X
+DATA BUS 2 ¹	P2-67	X	X	X	X	X	X			X
+DATA BUS 2 ⁰	P2-68	X	X	X	X	X	X			X

NOTE: THESE SIGNALS ARE PRESENT ON LOCATIONS 02 THROUGH 10 THE X INDICATES WHERE THE SIGNALS ARE ACTUALLY USED.

REV	A
DWG NO	62200815
CROSS REF NO	
CODE IDENT	15920
BUSSED SIGNAL CHART	
SHEET	2

CROSS REF. NO.

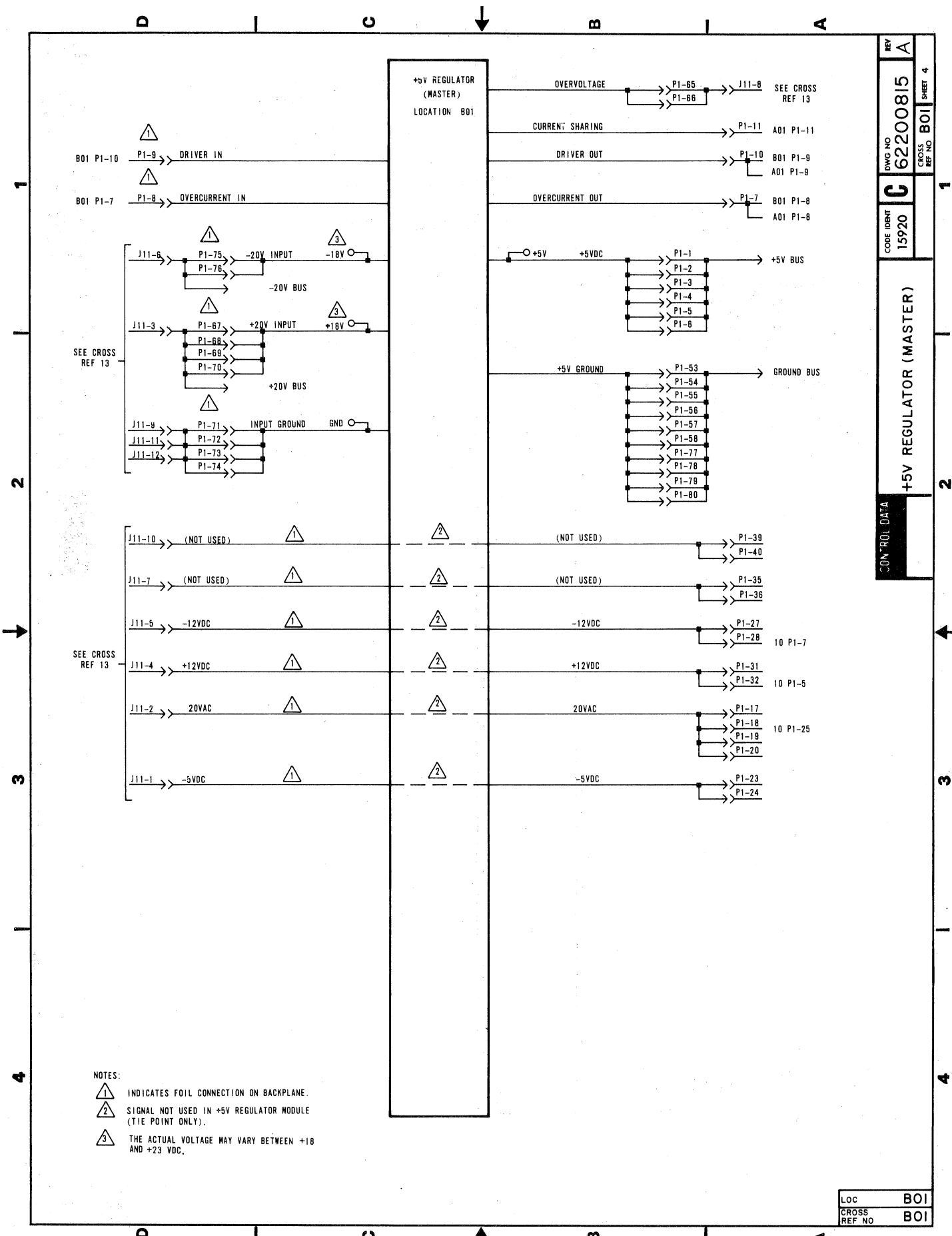


SEE CROSS REF 13

NOTE:
 1 INDICATES FOIL CONNECTION ON BACKPLANE.
 2 THE ACTUAL VOLTAGE MAY VARY BETWEEN +18 AND +23VDC.

REV	A
PWG. NO	62200815
CODE IDENT	C
CROSS REF. NO.	A01
SHEET	3
+5V REGULATOR (SLAVE)	
CONTROL DATA	

LOC A01
 CROSS REF NO A01

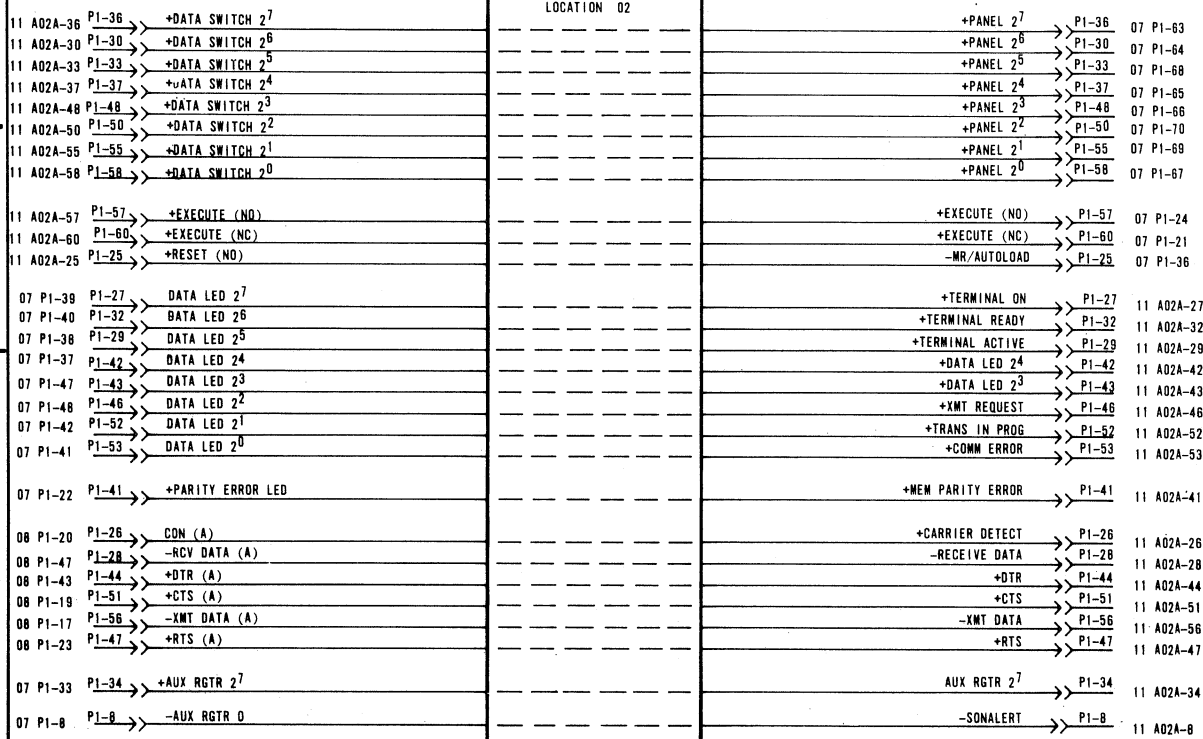


REV A	DWG NO 62200815	SHEET 4 BO1
CODE IDENT 15920	C	CROSS REF NO BO1
+5V REGULATOR (MASTER)		
CON * BO1 DATA		

LOC	BO1
CROSS REF NO	BO1

D I C I B I A

MAINT PANEL
I/F CONNECTOR
LOCATION 02

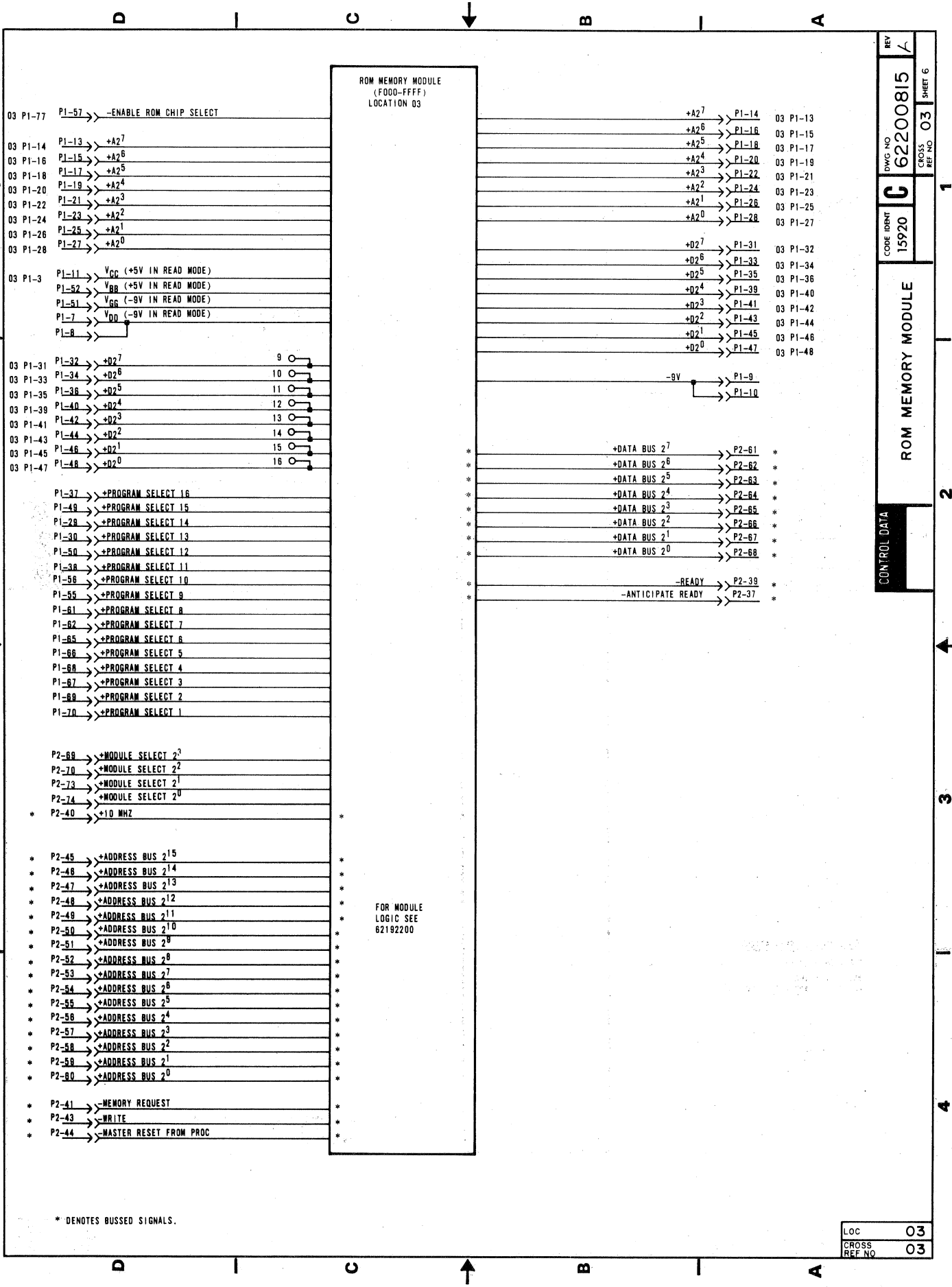


NON STANDARD ABBREVIATIONS
 CDN - CARRIER ON
 RCV - RECEIVED
 AUX RGTR - AUXILIARY REGISTER

NOTE: THIS CONNECTOR LOCATION IS A TIE POINT BETWEEN STIC, ASYNC I/F-2 AND MAINT PANEL MODULES.

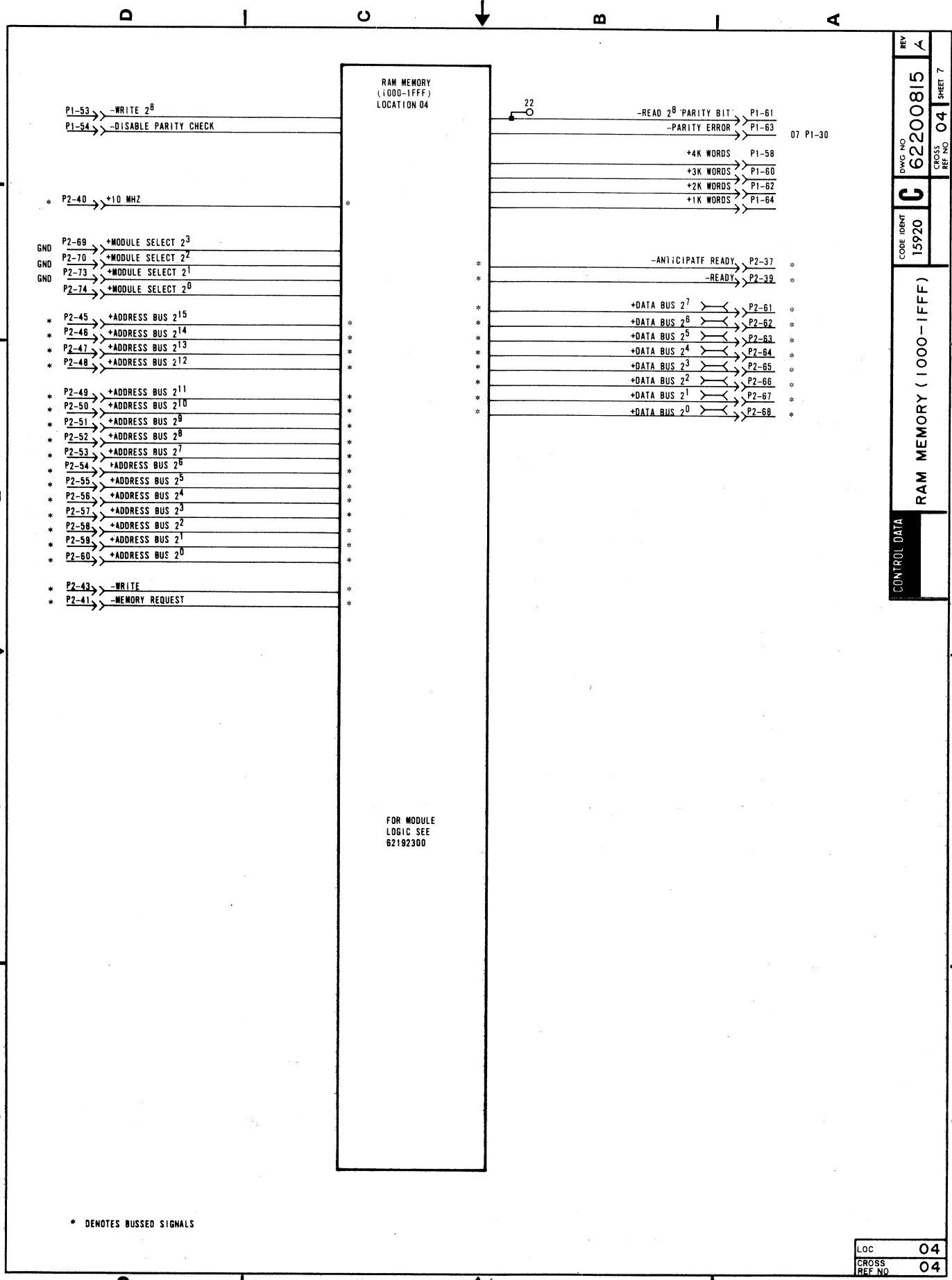
REV	A
DWG NO	62200815
CROSS REF NO	02
SHEET	5
CODE IDENT	C
15920	
CONTROL DATA	
MAINT PANEL I/F CONNECTOR	

LOC	02
CROSS REF NO	02



REV	7
DWG NO	62200815
CODE IDENT	15920
CROSS REF NO	03
SHEET	6
ROM MEMORY MODULE	

LOC	03
CROSS REF NO	03



P1-53 >> -WRITE 2⁸
P1-54 >> -DISABLE PARITY CHECK

* P2-40 >> +10 MHZ

GND P2-69 >> +MODULE SELECT 2³
GND P2-70 >> +MODULE SELECT 2²
GND P2-73 >> +MODULE SELECT 2¹
GND P2-74 >> +MODULE SELECT 2⁰

* P2-45 >> +ADDRESS BUS 2¹⁵
* P2-46 >> +ADDRESS BUS 2¹⁴
* P2-47 >> +ADDRESS BUS 2¹³
* P2-48 >> +ADDRESS BUS 2¹²

* P2-49 >> +ADDRESS BUS 2¹¹
* P2-50 >> +ADDRESS BUS 2¹⁰
* P2-51 >> +ADDRESS BUS 2⁹
* P2-52 >> +ADDRESS BUS 2⁸
* P2-53 >> +ADDRESS BUS 2⁷
* P2-54 >> +ADDRESS BUS 2⁶
* P2-55 >> +ADDRESS BUS 2⁵
* P2-56 >> +ADDRESS BUS 2⁴
* P2-57 >> +ADDRESS BUS 2³
* P2-58 >> +ADDRESS BUS 2²
* P2-59 >> +ADDRESS BUS 2¹
* P2-60 >> +ADDRESS BUS 2⁰

* P2-43 >> -WRITE
* P2-41 >> -MEMORY REQUEST

-READ 2⁸ PARITY BIT >> P1-61
-PARITY ERROR >> P1-63
+4K WORDS >> P1-58
+3K WORDS >> P1-60
+2K WORDS >> P1-62
+1K WORDS >> P1-64

-ANTICIPATE READY >> P2-37
-READY >> P2-39

+DATA BUS 2⁷ >> P2-61
+DATA BUS 2⁶ >> P2-62
+DATA BUS 2⁵ >> P2-63
+DATA BUS 2⁴ >> P2-64
+DATA BUS 2³ >> P2-65
+DATA BUS 2² >> P2-66
+DATA BUS 2¹ >> P2-67
+DATA BUS 2⁰ >> P2-68

REV	A	DWG NO	62200815
CODE IDENT	C	CROSS REF NO	04
SHEET 7	1	SHEET 7	1
RAM MEMORY (1000-1FFF)			
CONTROL DATA		1	
2		2	
3		3	
4		4	

LOC	04
CROSS REF NO	04

D I C B A

RAM MEMORY
(0000-OFFF)
LOCATION 05

P1-53 -> -WRITE 2⁸
P1-54 -> -DISABLE PARITY CHECK

-READ 2⁸ PARITY BIT -> P1-61
-PARITY ERROR -> P1-63 07 P1-30

* P2-40 -> +10 MHZ

+4K WORDS -> P1-58
+3K WORDS -> P1-60
+2K WORDS -> P1-62
+1K WORDS -> P1-64

GND P2-69 -> +MODULE SELECT 2³
GND P2-70 -> +MODULE SELECT 2²
GND P2-73 -> +MODULE SELECT 2¹
GND P2-74 -> +MODULE SELECT 2⁰

-ANTICIPATE READY -> P2-37
-READY -> P2-38

* P2-45 -> +ADDRESS BUS 2¹⁵
* P2-46 -> +ADDRESS BUS 2¹⁴
* P2-47 -> +ADDRESS BUS 2¹³
* P2-48 -> +ADDRESS BUS 2¹²

+DATA BUS 2⁷ -> P2-61
+DATA BUS 2⁶ -> P2-62
+DATA BUS 2⁵ -> P2-63
+DATA BUS 2⁴ -> P2-64
+DATA BUS 2³ -> P2-65
+DATA BUS 2² -> P2-66
+DATA BUS 2¹ -> P2-67
+DATA BUS 2⁰ -> P2-68

* P2-49 -> +ADDRESS BUS 2¹¹
* P2-50 -> +ADDRESS BUS 2¹⁰
* P2-51 -> +ADDRESS BUS 2⁹
* P2-52 -> +ADDRESS BUS 2⁸
* P2-53 -> +ADDRESS BUS 2⁷
* P2-54 -> +ADDRESS BUS 2⁶
* P2-55 -> +ADDRESS BUS 2⁵
* P2-56 -> +ADDRESS BUS 2⁴
* P2-57 -> +ADDRESS BUS 2³
* P2-58 -> +ADDRESS BUS 2²
* P2-59 -> +ADDRESS BUS 2¹
* P2-60 -> +ADDRESS BUS 2⁰

* P2-41 -> -MEMORY REQUEST
* P2-43 -> -WRITE

FOR MODULE
LOGIC SEE
62192300

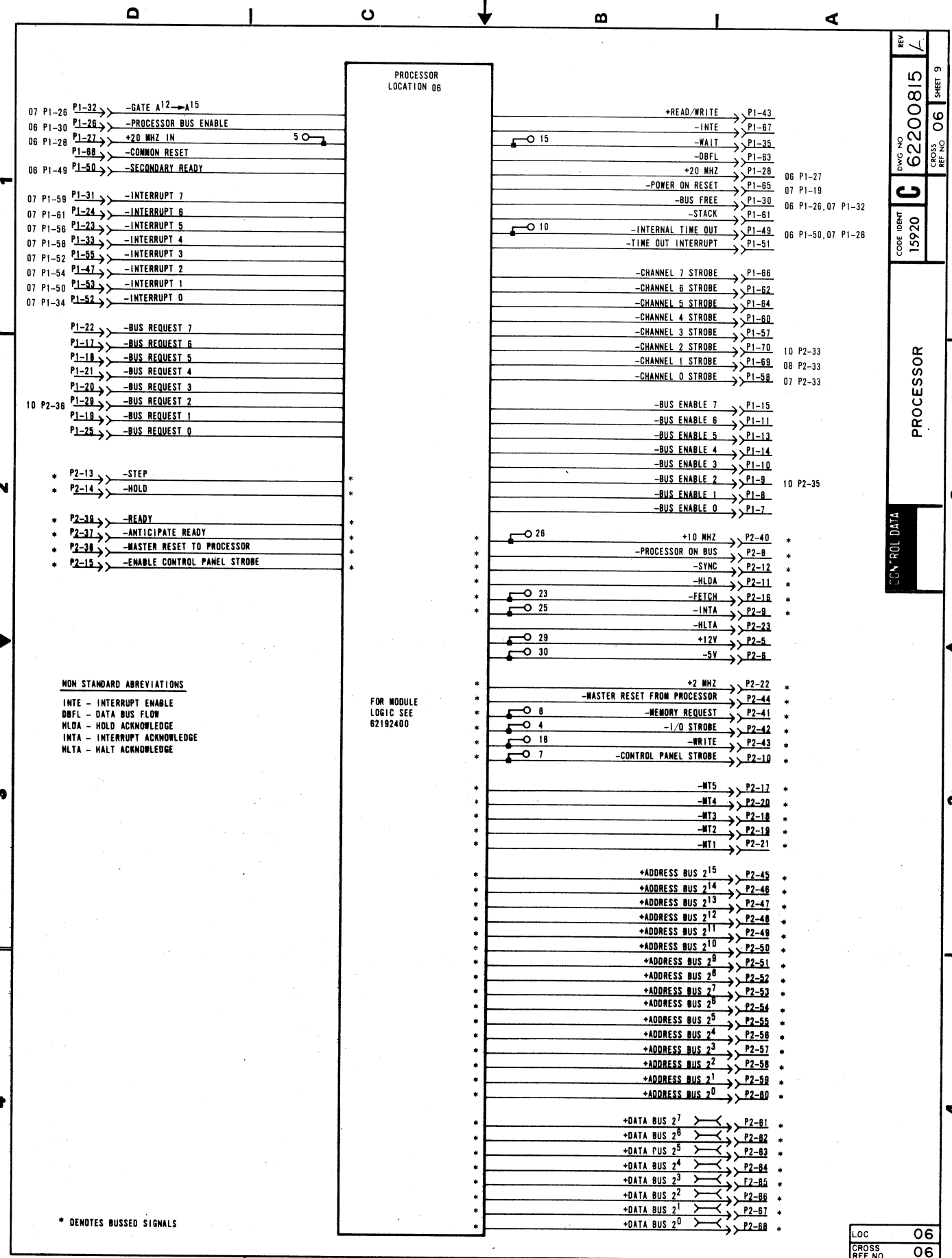
REV	A
DWG NO	62200815
CROSS REF NO	05
SHEET	8
CODE IDENT	15920
RAM MEMORY (0000-OFFF)	
CONTROL DATA	

1
2
3
4

1
2
3
4

* DENOTES BUSSED SIGNALS

LOC 05
CROSS REF NO 05



NON STANDARD ABBREVIATIONS
 INTE - INTERRUPT ENABLE
 DBFL - DATA BUS FLOW
 HLDA - HOLD ACKNOWLEDGE
 INTA - INTERRUPT ACKNOWLEDGE
 HLTA - HALT ACKNOWLEDGE

FOR MODULE LOGIC SEE 62192400

* DENOTES BUSSED SIGNALS

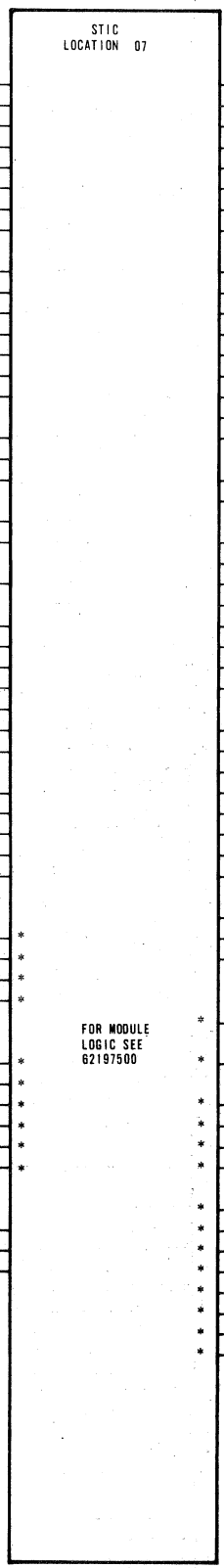
REV 1
 DWG NO 62200815
 CROSS REF NO 06
 SHEET 9

PROCESSOR

CONTROL DATA

LOC 06
 CROSS REF NO 06

D I C B A



- 02 P1-36 P1-63 → +PANEL 2⁷
- 02 P1-30 P1-64 → +PANEL 2⁶
- 02 P1-33 P1-68 → +PANEL 2⁵
- 02 P1-37 P1-65 → +PANEL 2⁴
- 02 P1-48 P1-66 → +PANEL 2³
- 02 P1-50 P1-70 → +PANEL 2²
- 02 P1-55 P1-69 → +PANEL 2¹
- 02 P1-58 P1-67 → +PANEL 2⁰

- P1-60 → -INTERRUPT 7
- P1-62 → -INTERRUPT 6
- P1-59 → -INTERRUPT 5
- P1-57 → -INTERRUPT 4
- P1-51 → -INTERRUPT 3
- P1-53 → -INTERRUPT 2
- P1-48 → -INTERRUPT 1

- 10 P2-34 P1-17 → -EXT INT #2
- 08 P1-25 P1-20 → -EXT INT #3
- P1-18 → -EXT INT #4

- 02 P1-57 P1-24 → +EXECUTE SWITCH N.O.
- 02 P1-60 P1-21 → +EXECUTE SWITCH N.C.

- 04 P1-63 P1-30 → -PARITY ERROR
- 05 P1-63 P1-73 → -DISABLE JUMP
- 06 P1-30 P1-32 → -BUS FREE
- 06 P1-65 P1-18 → -POMR
- 02 P1-25 P1-38 → -MR/AUTOLOAD
- 06 P1-49 P1-28 → -INTERNAL TIME OUT
- 07 P1-77 P1-7 → +ALARM
- 07 P1-23 P1-25 → +TIMER CLOCK

- 06 P1-58 P2-33 → -CHAN 0 STROBE
- P2-68 → +MODULE SELECT 2³
- P2-70 → +MODULE SELECT 2²
- P2-73 → +MODULE SELECT 2¹
- P2-74 → +MODULE SELECT 2⁰

- * P2-56 → +ADDRESS BUS 2⁴
- * P2-58 → +ADDRESS BUS 2²
- * P2-59 → +ADDRESS BUS 2¹
- * P2-60 → +ADDRESS BUS 2⁰

- * P2-21 → -MTI
- * P2-38 → -READY
- * P2-41 → -MEMORY REQUEST
- * P2-22 → +2 MHZ
- * P2-44 → -MASTER RESET FROM PROG
- * P2-43 → -WRITE

- P2-28 → -TEST RESET 1
- P2-27 → -TEST RESET 2
- P2-25 → -TEST RESET 3

- INTERRUPT 7 → P1-59
- INTERRUPT 6 → P1-61
- INTERRUPT 5 → P1-56
- INTERRUPT 4 → P1-58
- INTERRUPT 3 → P1-52
- INTERRUPT 2 → P1-54
- INTERRUPT 1 → P1-50
- INTERRUPT 0 → P1-34

- +AUX 7 → P1-33
- +AUX 6 → P1-29
- +AUX 5 → P1-35
- +AUX 4 → P1-31
- +AUX 3 → P1-45
- +AUX 2 → P1-46
- +AUX 1 → P1-43
- +AUX 0 → P1-44
- AUX 0 → P1-8

- SELECTABLE FREQ I → P1-10
- SELECTABLE FREQ II → P1-27

- +DATA 2⁷ LED → P1-39
- +DATA 2⁶ LED → P1-40
- +DATA 2⁵ LED → P1-38
- +DATA 2⁴ LED → P1-37
- +DATA 2³ LED → P1-47
- +DATA 2² LED → P1-48
- +DATA 2¹ LED → P1-42
- +DATA 2⁰ LED → P1-41

- +1200 HZ (75 BAUD) → P1-23
- +2400 HZ (150 BAUD) → P1-9
- +4800 HZ (300 BAUD) → P1-12
- +9600 HZ (600 BAUD) → P1-11
- +19,200 HZ (1200 BAUD) → P1-15
- +38,400 HZ (2400 BAUD) → P1-16
- +76,800 HZ (4800 BAUD) → P1-13
- +153,600 HZ (9600 BAUD) → P1-14

- +PARITY ERROR LED → P1-22
- GATE A¹² → A¹⁵
- (POMR+AUTOLOAD) → P1-74

- MR TO PROCESSOR → P2-38
- ANTICIPATE READY → P2-37

- +ADDRESS BUS 2¹⁵ → P2-45
- +ADDRESS BUS 2¹⁴ → P2-46
- +ADDRESS BUS 2¹³ → P2-47
- +ADDRESS BUS 2¹² → P2-48

- +DATA BUS 2⁷ → P2-61
- +DATA BUS 2⁶ → P2-62
- +DATA BUS 2⁵ → P2-63
- +DATA BUS 2⁴ → P2-64
- +DATA BUS 2³ → P2-65
- +DATA BUS 2² → P2-66
- +DATA BUS 2¹ → P2-67
- +DATA BUS 2⁰ → P2-68

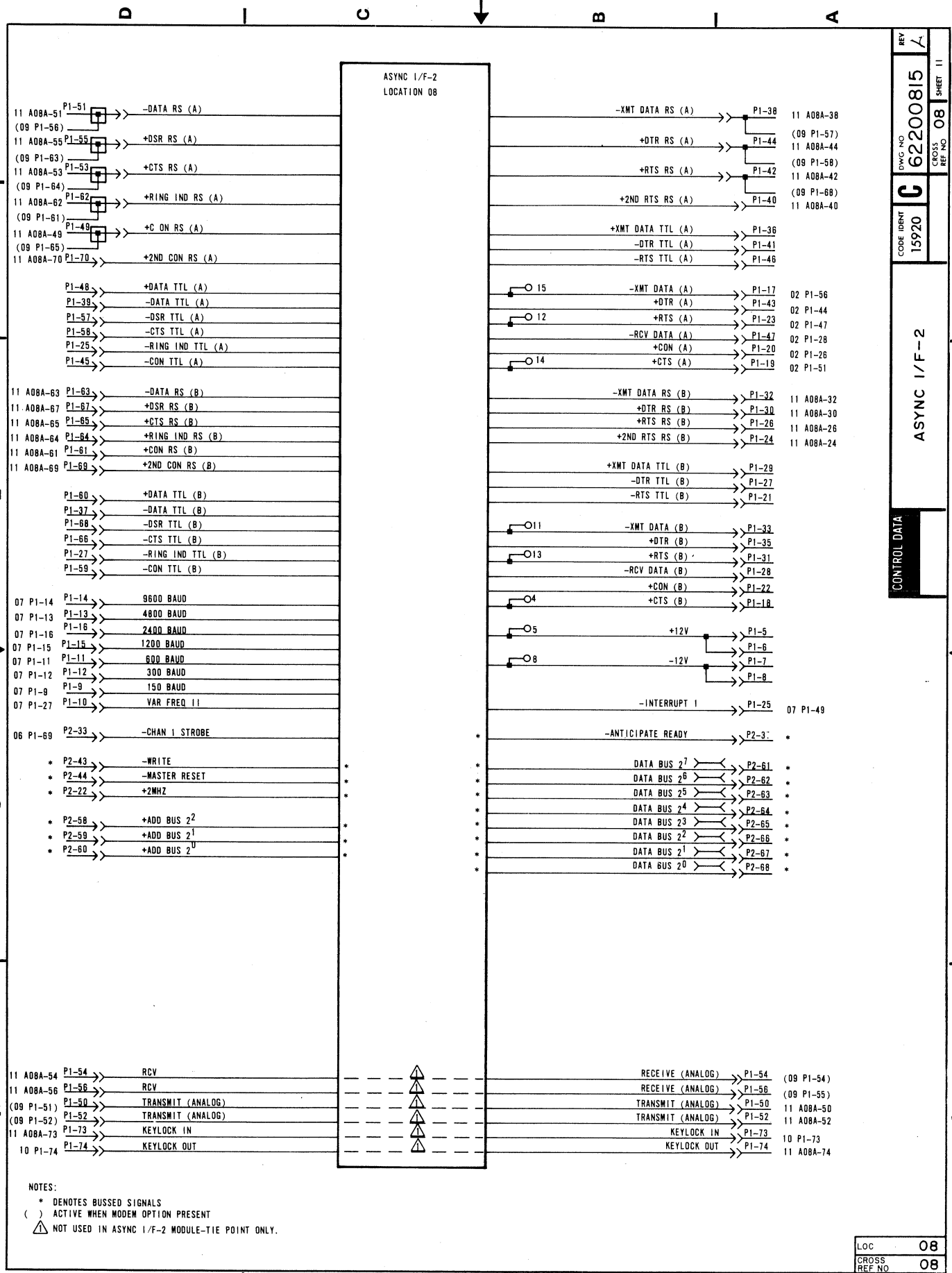
REV	7	DWG NO	62200815	SHEET 10
CODE IDENT	C	CROSS REF NO	07	
15920				
STIC				
CONTROL DATA				

FOR MODULE LOGIC SEE 62197500

NON STANDARD ABBREVIATIONS
 EXT INT - EXTERNAL INTERRUPT
 MR - MASTER RESET
 POMR - POWER ON MASTER RESET
 AUX - AUXILIARY

* DENOTES BUSSED SIGNAL

LOC 07
 CROSS REF NO 07

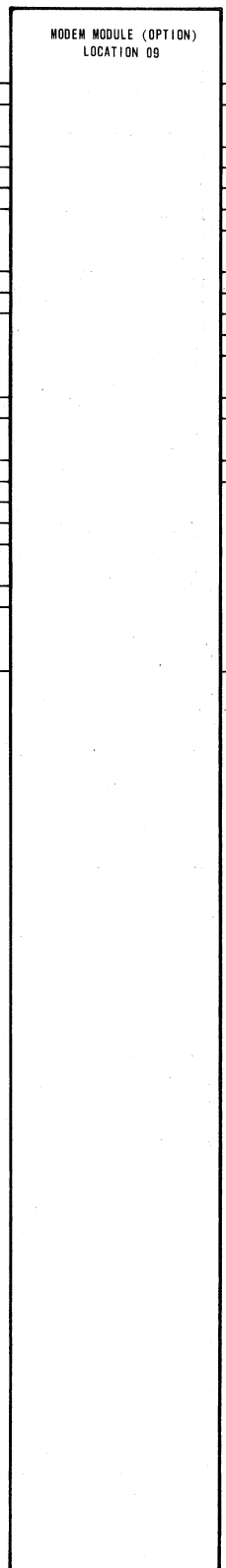


NOTES:
 * DENOTES BUSSED SIGNALS
 () ACTIVE WHEN MODEM OPTION PRESENT
 Δ NOT USED IN ASYNC I/F-2 MODULE-TIE POINT ONLY.

REV	A
DWG NO	62200815
CODE IDENT	15920
CROSS REF NO	08
ASYNC I/F-2	
CONTROL DATA	
SHEET 11	

Loc 08
 CROSS REF NO 08

D I C B I A

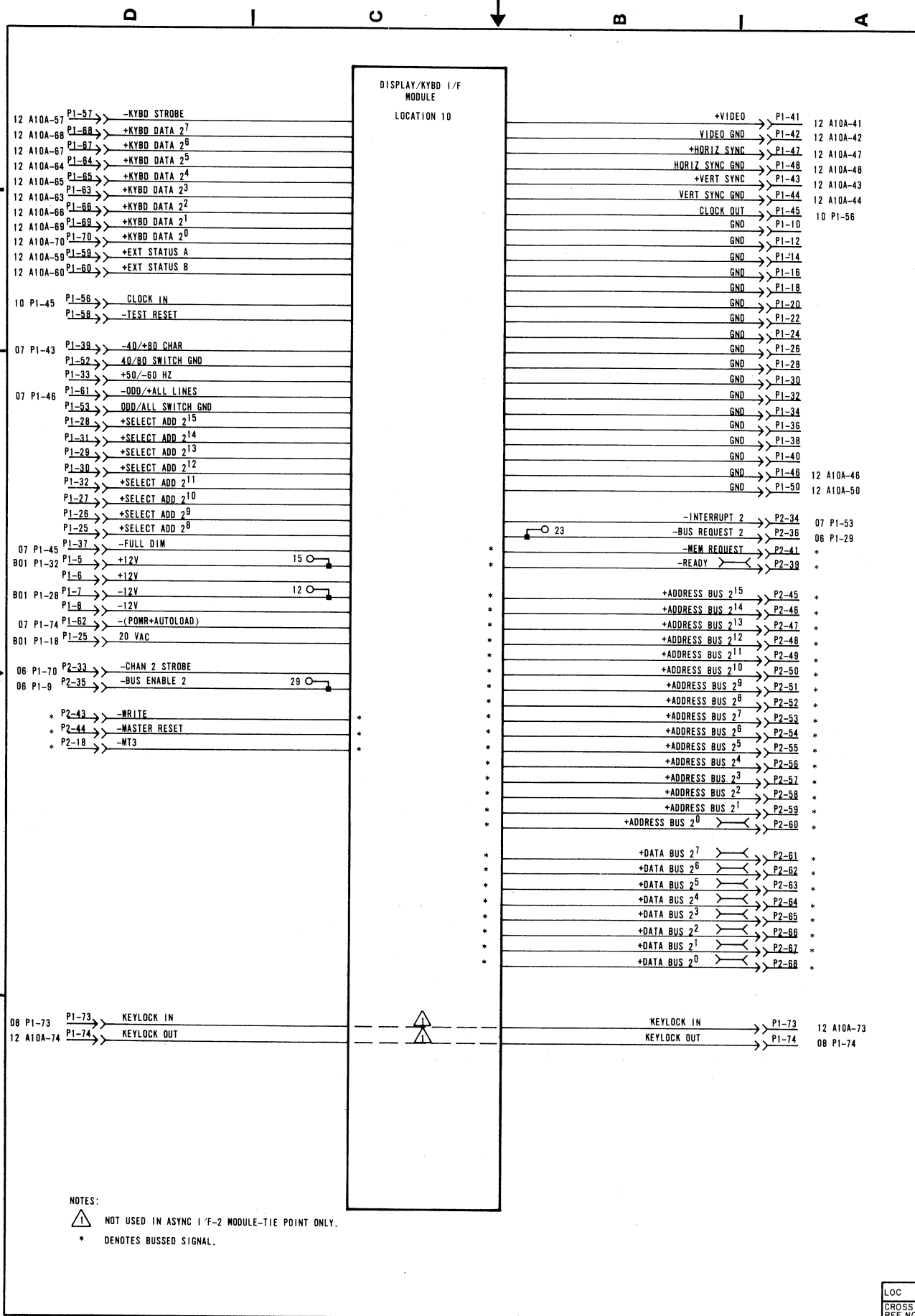


- 08 P1-54 >> RECEIVE (ANALOG)
- 08 P1-56 >> RECEIVE (ANALOG)
- 08 P1-38 P1-57 >> -TRANSMIT DATA (RS)
- 08 P1-44 P1-58 >> +DTR (RS)
- 08 P1-42 P1-68 >> +RTS (RS)
- P1-26 >> +RING INDICATOR
- P1-35 >> TRANSMIT DATA (TTL)
- P1-37 >> RTS (TTL)
- P1-40 >> DTR (TTL)
- 09 P1-71 P1-33 >> +20V (UNREG)
- 09 P1-76 P1-30 >> -20V (UNREG)
- P1-9 >> LOCAL LOOP BACK
- P1-10 >> REMOTE LOOP BACK
- P1-11 >> SWITCH COMMON
- P1-12 >> MARK TEST
- P1-13 >> SPACE TEST
- P1-27 >> COUPLER CUT THROUGH
- P1-28 >> SWITCH HOOK
- 09 P1-14 P1-15 >> OSCILLATOR IN

- TRANSMIT (ANALOG) >> P1-51 08 P1-50
- TRANSMIT (ANALOG) >> P1-52 08 P1-52
- RECEIVE DATA (RS) >> P1-56 08 P1-51
- RING INDICATOR (RS) >> P1-61 08 P1-62
- DSR (RS) >> P1-63 08 P1-55
- CTS (RS) >> P1-64 08 P1-53
- CON (RS) >> P1-65 08 P1-49
- RING INDICATOR (TTL) >> P1-16
- RECEIVE DATA (TTL) >> P1-36
- CTS (TTL) >> P1-38
- DSR (TTL) >> P1-39
- CON (TTL) >> P1-41
- +12V (REG) >> P1-34
- 12V (REG) >> P1-29
- DATA REQUEST >> P1-23
- OFF HOOK >> P1-24
- OSCILLATOR OUT >> P1-14 09 P1-15

REV	A
DWG NO	62200815
CROSS REF NO	09
SHEET	12
CODE IDENT	15920
MODEM MODULE (OPTION)	
CONTROL DATA	

LOC 09
CROSS REF NO 09



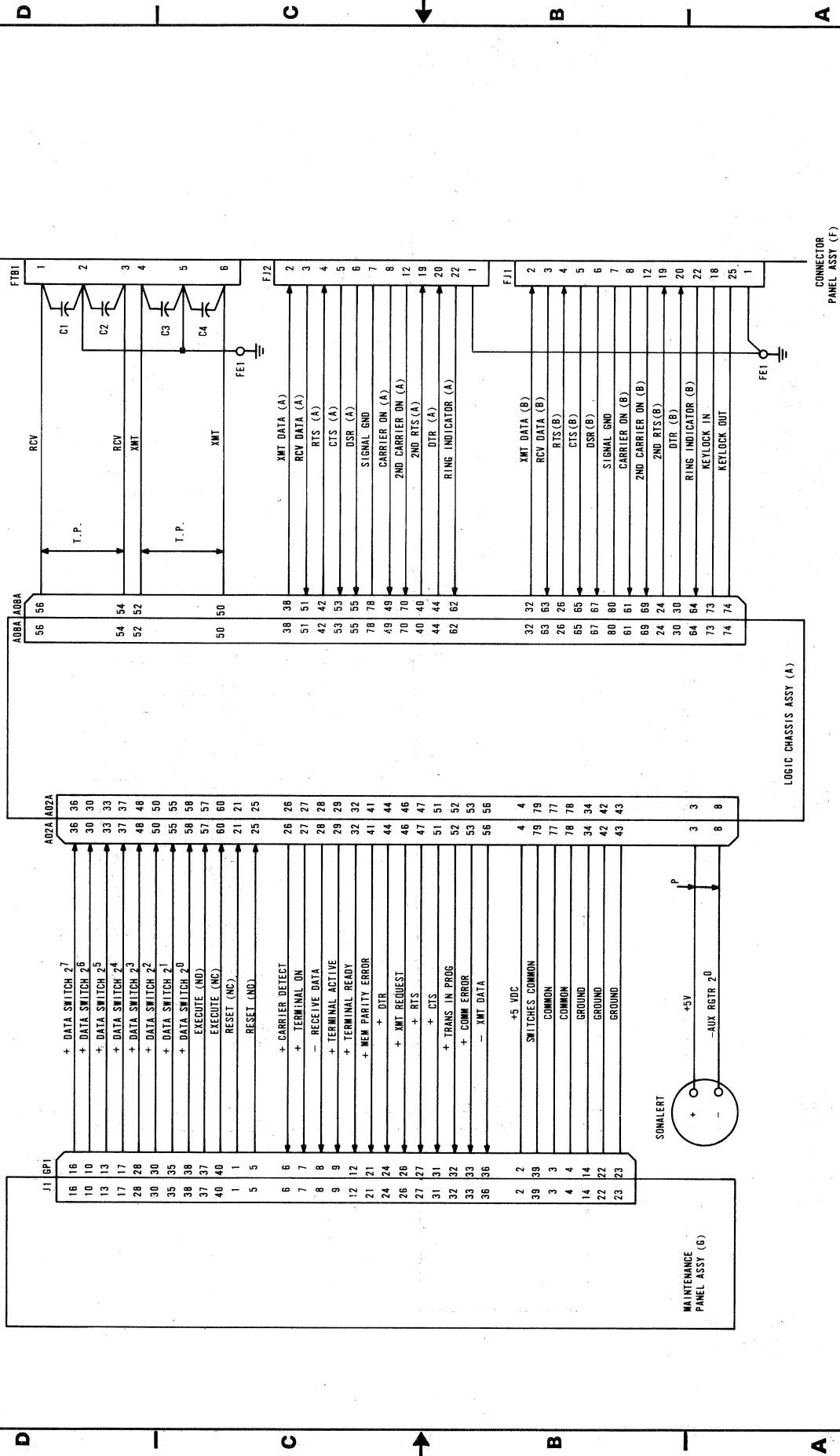
NOTES:
 ⚠ NOT USED IN ASYNC I/F-2 MODULE-TIE POINT ONLY.
 * DENOTES BUSSED SIGNAL.

REV	1
DWG NO	62200815
CROSS REF NO	10
SHEET	13
CODE IDENT	15920
DISPLAY/KYBD I/F MODULE	
CONTROL DATA	

LOC	10
CROSS REF NO	10

1 2 3 4

1 2 3 4



CONTROL DATA

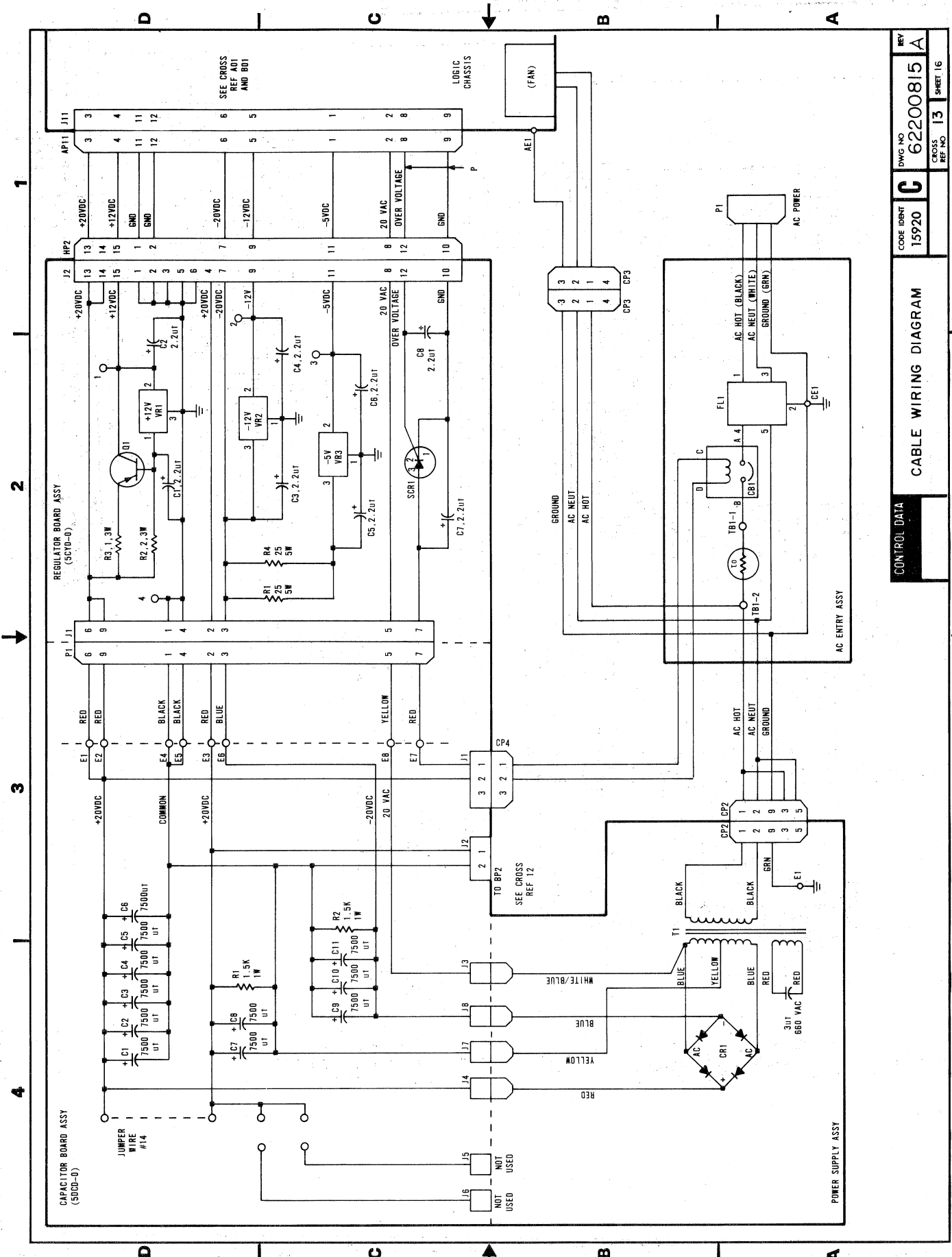
CABLE WIRING DIAGRAM

CODE IDENT 15920

DWG NO C 62200815

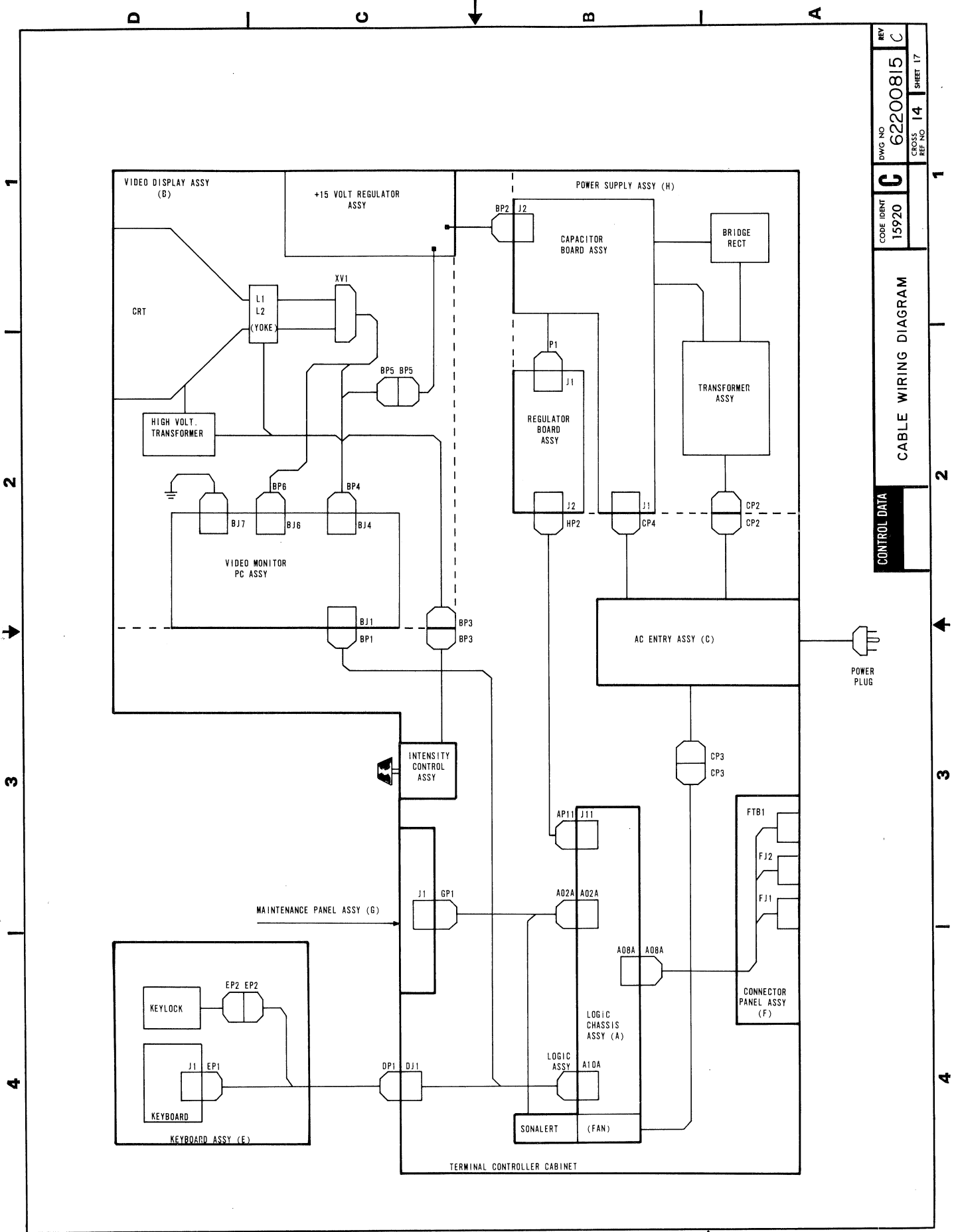
REV A

CROSS REF NO II SHEET 14



CONTROL DATA	CODE IDENT	DWG NO	REV
	15920	62200815	A
CABLE WIRING DIAGRAM		CROSS REF NO	SHEET 16
		13	

CONTROL DATA





**DIAGRAMS APPLICABLE
TO CC617-B**

MEMORANDUM FOR THE DIRECTOR

DATE: 10/1/50

4	3	2	1
D	C	B	A

SHEET NO.		CROSS REFERENCE NUMBER		REV	
1				A	
2				A	
3				A	
4				A	
5				A	
6				A	
7				A	
8				A	
9				A	
10				A	
11				A	
12				A	
13				A	
14				A	
15				A	

LOGIC DIAGRAM TITLE

MODULE INTERCONNECTION DIAGRAM CONTROL SHEET

BUSSED SIGNAL CHART

+5V REGULATOR (SLAVE, OPTION)

+5V REGULATOR (MASTER)

MAINT PANEL I/F CONNECTOR

PROGRAM MEMORY MODULE

PROCESSOR

STIC

ASYNC I/F-2

MODEM MODULE (OPTION)

DISPLAY/KYBD I/F MODULE

CABLE WIRING DIAGRAM

CABLE WIRING DIAGRAM

CABLE WIRING DIAGRAM

CABLE WIRING DIAGRAM

SHEET NO.		CROSS REFERENCE NUMBER		REV	

LOGIC DIAGRAM TITLE

SHEET NO.		CROSS REFERENCE NUMBER		REV	

SHEET NO.		CROSS REFERENCE NUMBER		REV	

SHEET NO.		CROSS REFERENCE NUMBER		REV	

SHEET NO.		CROSS REFERENCE NUMBER		REV	

SHEET NO.		CROSS REFERENCE NUMBER		REV	

SHEET NO.		CROSS REFERENCE NUMBER		REV	

SHEET NO.		CROSS REFERENCE NUMBER		REV	

SHEET NO.		CROSS REFERENCE NUMBER		REV	

SHEET NO.		CROSS REFERENCE NUMBER		REV	

SHEET NO.		CROSS REFERENCE NUMBER		REV	

SHEET NO.		CROSS REFERENCE NUMBER		REV	

SHEET NO.		CROSS REFERENCE NUMBER		REV	

SHEET NO.		CROSS REFERENCE NUMBER		REV	

SHEET NO.		CROSS REFERENCE NUMBER		REV	

SHEET NO.		CROSS REFERENCE NUMBER		REV	

SHEET NO.		CROSS REFERENCE NUMBER		REV	

SHEET NO.		CROSS REFERENCE NUMBER		REV	

SHEET NO.		CROSS REFERENCE NUMBER		REV	

SHEET NO.		CROSS REFERENCE NUMBER		REV	

SHEET NO.		CROSS REFERENCE NUMBER		REV	

SHEET NO.		CROSS REFERENCE NUMBER		REV	

SHEET NO.		CROSS REFERENCE NUMBER		REV	

SHEET NO.		CROSS REFERENCE NUMBER		REV	

SHEET NO.		CROSS REFERENCE NUMBER		REV	

SHEET NO.		CROSS REFERENCE NUMBER		REV	

SHEET NO.		CROSS REFERENCE NUMBER		REV	

SHEET NO.		CROSS REFERENCE NUMBER		REV	

SHEET NO.		CROSS REFERENCE NUMBER		REV	

SHEET NO.		CROSS REFERENCE NUMBER		REV	

SHEET NO.		CROSS REFERENCE NUMBER		REV	

SHEET NO.		CROSS REFERENCE NUMBER		REV	

SHEET NO.		CROSS REFERENCE NUMBER		REV	

SHEET NO.		CROSS REFERENCE NUMBER		REV	

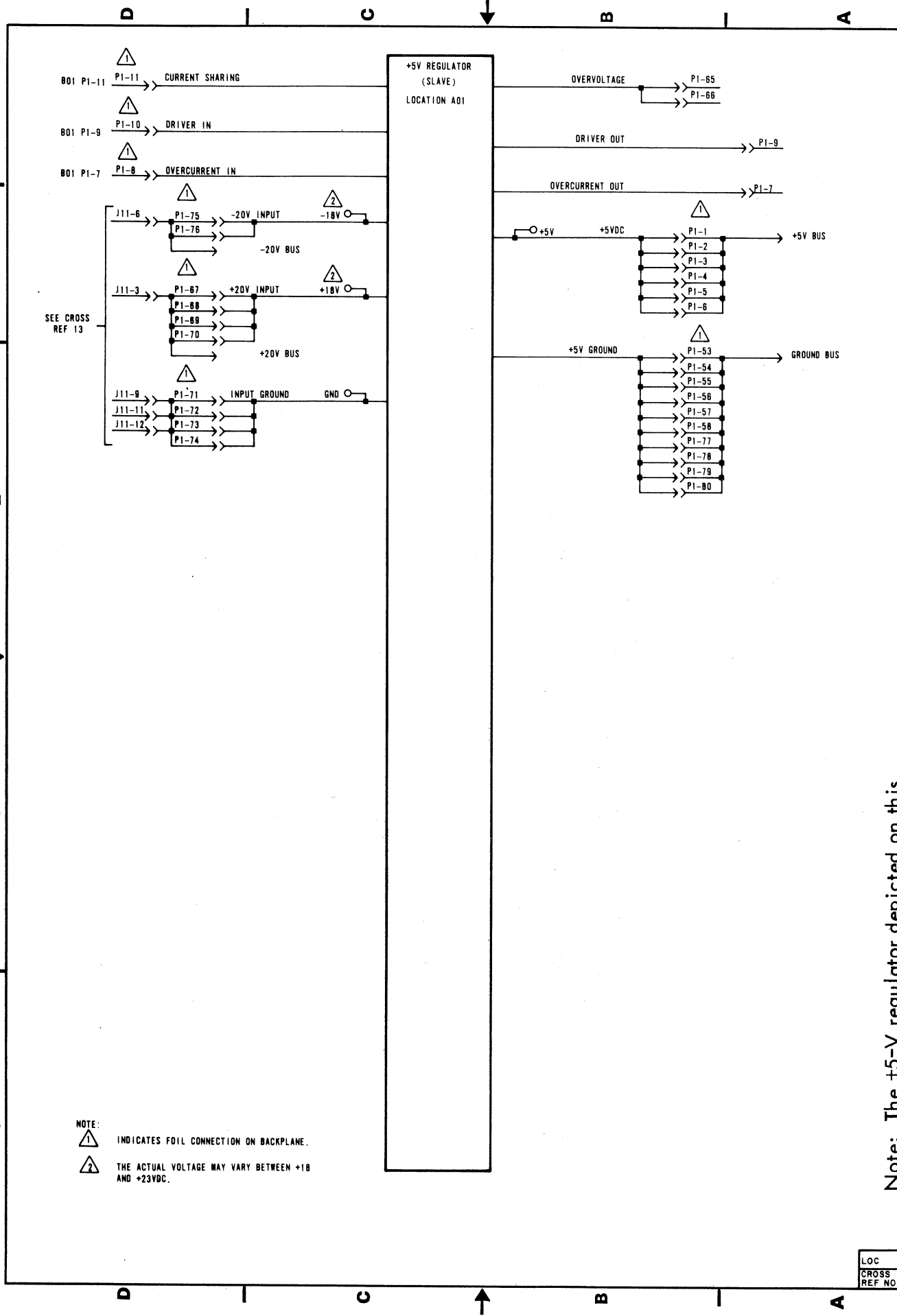
SHEET NO.		CROSS REFERENCE NUMBER		REV	

SHEET NO.		CROSS REFERENCE NUMBER		REV	

SHEET NO.		CROSS REFERENCE NUMBER		REV	

SHEET NO.		CROSS REFERENCE NUMBER		REV	

SHEET NO.		CROSS REFERENCE NUMBER		REV	



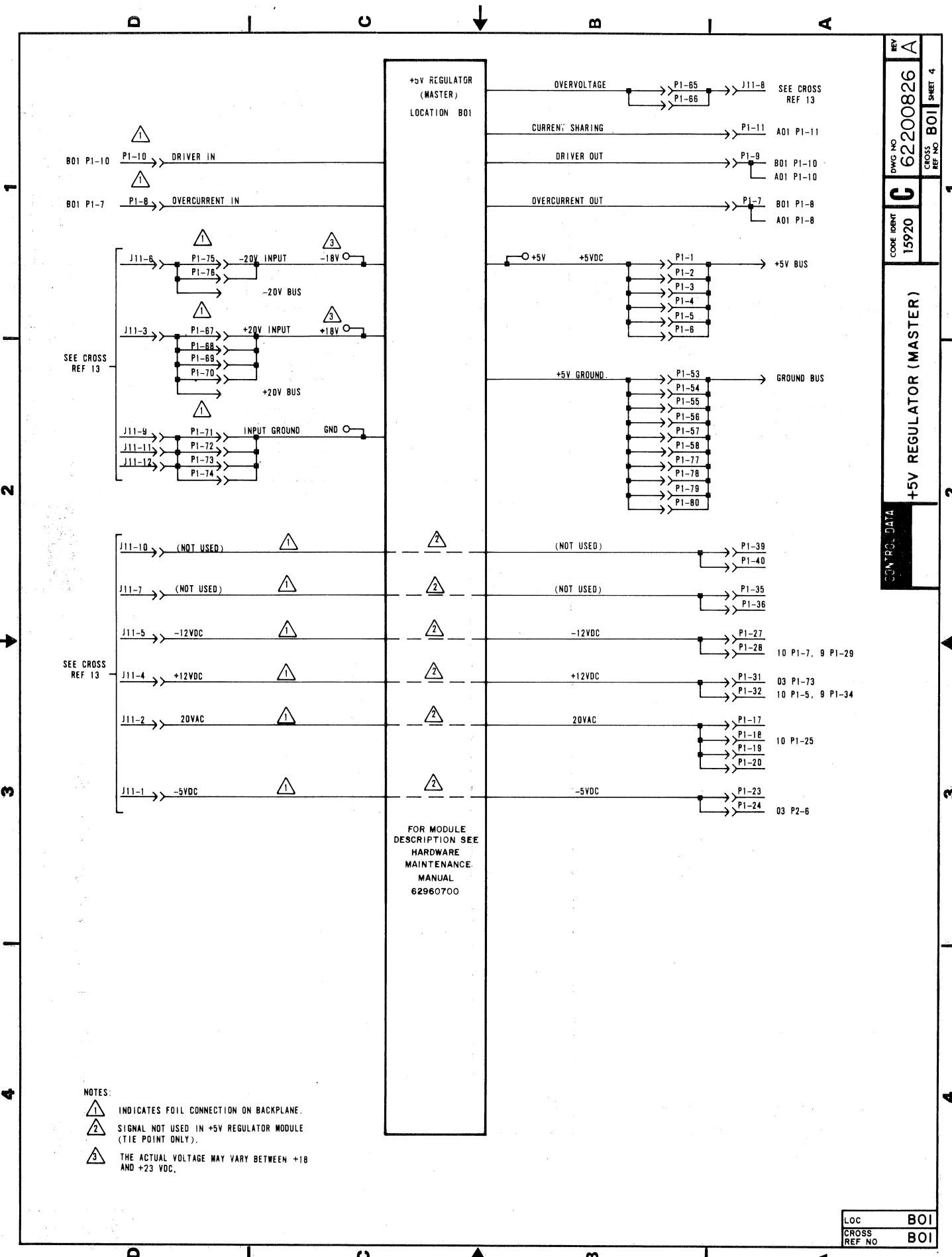
SEE CROSS REF 13

NOTE:
 ⚠ INDICATES FOIL CONNECTION ON BACKPLANE.
 ⚡ THE ACTUAL VOLTAGE MAY VARY BETWEEN +18 AND +23VDC.

Note: The +5-V regulator depicted on this diagram is not used.

REV	A
DWG NO	62200826
CROSS REF NO	A01
SHEET	3
CODE IDENT	C
	15920
+5V REGULATOR (SLAVE, OPTION)	
CON. DATA	

LOC	A01
CROSS REF NO	A01



REV	A
DWG NO	62200826
CODE IDENT	C
15920	
CROSS REF NO	B01
SHEET	4

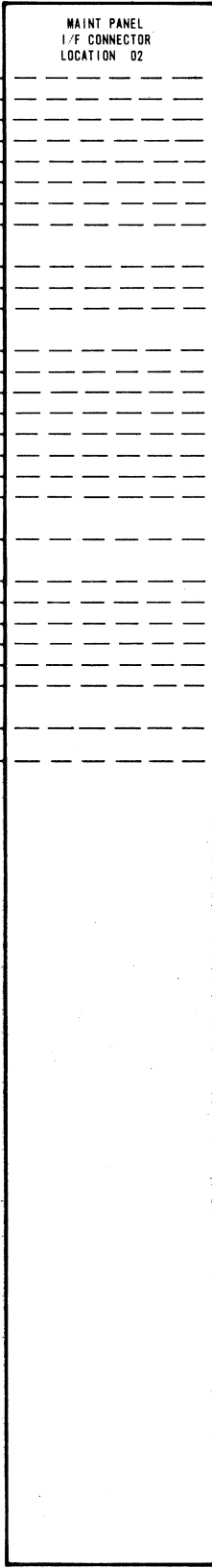
+5V REGULATOR (MASTER)

CONTR. DATA

LOC	B01
CROSS REF NO	B01

D I C B A

REV	A
DWG NO	62200826
CROSS REF NO	02
SHEET	5
CODE IDENT	C
15920	
MAINT PANEL I/F CONNECTOR	
CONTROL DATA	



11 A02A-36	P1-36	+DATA SWITCH 2 ⁷	+PANEL 2 ⁷	P1-36	07 P1-63
11 A02A-30	P1-30	+DATA SWITCH 2 ⁶	+PANEL 2 ⁶	P1-30	07 P1-64
11 A02A-33	P1-33	+DATA SWITCH 2 ⁵	+PANEL 2 ⁵	P1-33	07 P1-68
11 A02A-37	P1-37	+DATA SWITCH 2 ⁴	+PANEL 2 ⁴	P1-37	07 P1-65
11 A02A-48	P1-48	+DATA SWITCH 2 ³	+PANEL 2 ³	P1-48	07 P1-66
11 A02A-50	P1-50	+DATA SWITCH 2 ²	+PANEL 2 ²	P1-50	07 P1-70
11 A02A-55	P1-55	+DATA SWITCH 2 ¹	+PANEL 2 ¹	P1-55	07 P1-69
11 A02A-58	P1-58	+DATA SWITCH 2 ⁰	+PANEL 2 ⁰	P1-58	07 P1-67
11 A02A-57	P1-57	+EXECUTE (NO)	+EXECUTE (NO)	P1-57	07 P1-24
11 A02A-60	P1-60	+EXECUTE (NC)	+EXECUTE (NC)	P1-60	07 P1-21
11 A02A-25	P1-25	+RESET (NO)	-MR/AUTOLOAD	P1-25	07 P1-36
07 P1-39	P1-27	DATA LED 2 ⁷	+TERMINAL ON	P1-27	11 A02A-27
07 P1-40	P1-32	DATA LED 2 ⁶	+TERMINAL READY	P1-32	11 A02A-32
07 P1-38	P1-29	DATA LED 2 ⁵	+TERMINAL ACTIVE	P1-29	11 A02A-29
07 P1-37	P1-42	DATA LED 2 ⁴	+DATA LED 2 ⁴	P1-42	11 A02A-42
07 P1-47	P1-43	DATA LED 2 ³	+DATA LED 2 ³	P1-43	11 A02A-43
07 P1-48	P1-46	DATA LED 2 ²	+XMT REQUEST	P1-46	11 A02A-46
07 P1-42	P1-52	DATA LED 2 ¹	+TRANS IN PROG	P1-52	11 A02A-52
07 P1-41	P1-53	DATA LED 2 ⁰	+COMM ERROR	P1-53	11 A02A-53
07 P1-22	P1-41	+PARITY ERROR LED	+MEM PARITY ERROR	P1-41	11 A02A-41
08 P1-20	P1-26	COM (A)	+CARRIER DETECT	P1-26	11 A02A-26
08 P1-47	P1-28	-RCV DATA (A)	-RECEIVE DATA	P1-28	11 A02A-28
08 P1-43	P1-44	+DTR (A)	+DTR	P1-44	11 A02A-44
08 P1-19	P1-51	+CTS (A)	+CTS	P1-51	11 A02A-51
08 P1-17	P1-56	-XMT DATA (A)	-XMT DATA	P1-56	11 A02A-56
08 P1-23	P1-47	+RTS (A)	+RTS	P1-47	11 A02A-47
07 P1-33	P1-34	+AUX RGTR 2 ⁷	AUX RGTR 2 ⁷	P1-34	11 A02A-34
07 P1-8	P1-8	-AUX RGTR 0	-SONALERT	P1-8	11 A02A-8

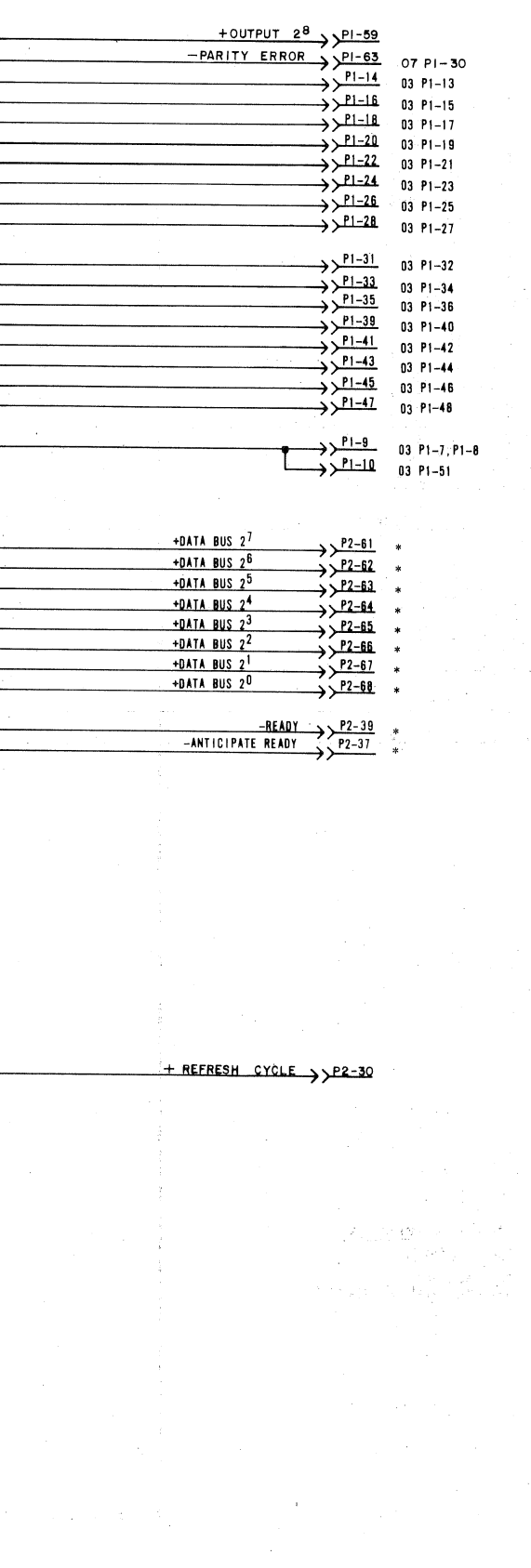
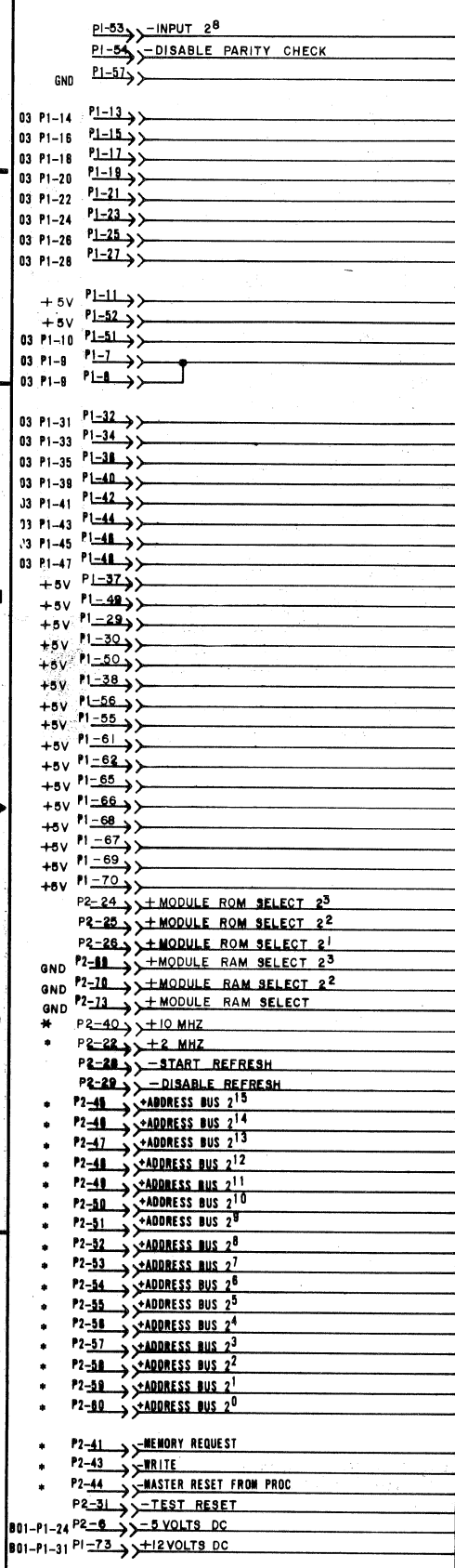
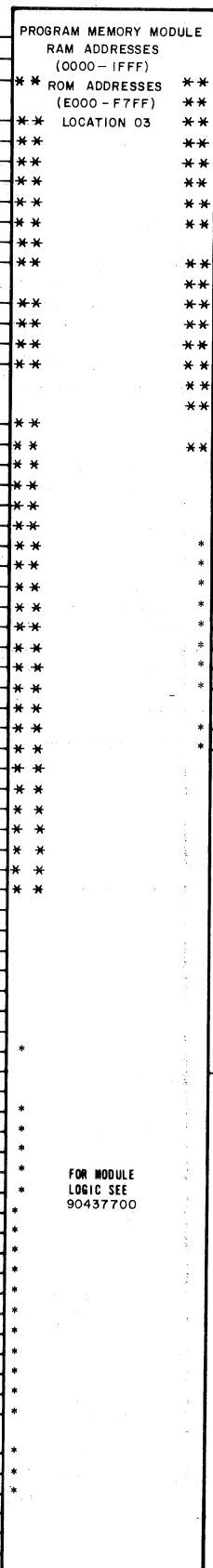
NON STANDARD ABBREVIATIONS
 COM - CARRIER ON
 RCV - RECEIVED
 AUX RGTR - AUXILIARY REGISTER

NOTE: THIS CONNECTOR LOCATION IS A TIE POINT BETWEEN STIC, ASYNC I/F-2 AND MAINT PANEL MODULES.

LOC	02
CROSS REF NO	02

D I C B A

REV	A
DWG NO	62200826
CROSS REF NO	03
SHEET	6
CODE IDENT	15920
PROGRAM MEMORY MODULE	
RAM ADDRESS (0000 - IFFF)	
ROM ADDRESS (E000 - F7FF)	
CONTROL DATA	



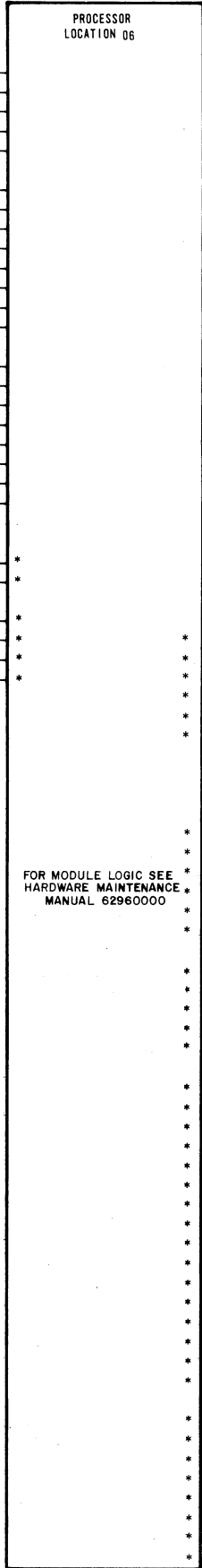
FOR MODULE LOGIC SEE 90437700

* DENOTES BUSSED SIGNALS.

** DENOTES FOIL ON BACK PLANE, SIGNALS NOT USED ON MODULE.

LOC 03

CROSS REF NO 03



- 07 P1-26 P1-32 -GATE A12 → A15
- 06 P1-30 P1-28 -PROCESSOR BUS ENABLE
- 06 P1-28 P1-27 +20 MHZ IN
- P1-60 -COMMON RESET
- 06 P1-48 P1-50 -SECONDARY READY
- 07 P1-58 P1-31 -INTERRUPT 7
- 07 P1-61 P1-24 -INTERRUPT 6
- 07 P1-56 P1-23 -INTERRUPT 5
- 07 P1-58 P1-33 -INTERRUPT 4
- 07 P1-52 P1-55 -INTERRUPT 3
- 07 P1-54 P1-47 -INTERRUPT 2
- 07 P1-50 P1-53 -INTERRUPT 1
- 07 P1-34 P1-52 -INTERRUPT 0
- P1-22 -BUS REQUEST 7
- P1-17 -BUS REQUEST 6
- P1-18 -BUS REQUEST 5
- P1-21 -BUS REQUEST 4
- P1-20 -BUS REQUEST 3
- 10 P2-36 P1-29 -BUS REQUEST 2
- P1-19 -BUS REQUEST 1
- P1-25 -BUS REQUEST 0
- * P2-13 -STEP
- * P2-14 -HOLD
- * P2-38 -READY
- * P2-37 -ANTICIPATE READY
- * P2-36 -MASTER RESET TO PROCESSOR
- * P2-15 -ENABLE CONTROL PANEL STROBE

NON STANDARD ABBREVIATIONS

INTE - INTERRUPT ENABLE
DBFL - DATA BUS FLOW
HLDA - HOLD ACKNOWLEDGE
INTA - INTERRUPT ACKNOWLEDGE
HLTA - HALT ACKNOWLEDGE

FOR MODULE LOGIC SEE
HARDWARE MAINTENANCE
MANUAL 62960000

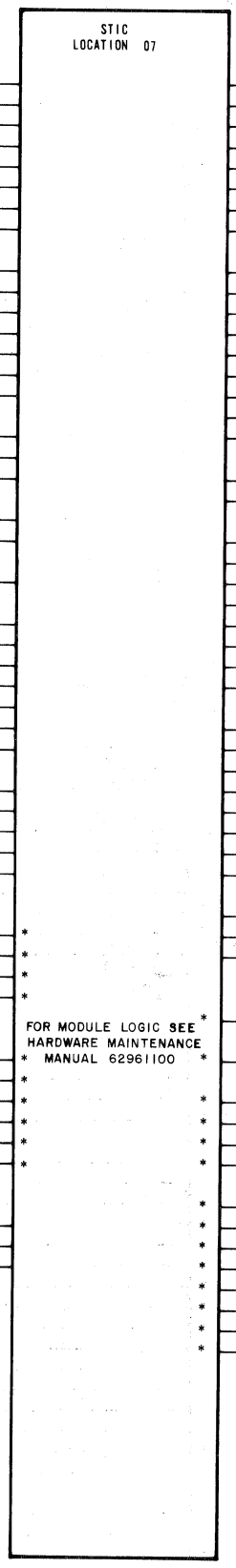
* DENOTES BUSSED SIGNALS

- +READ/WRITE P1-43
- INTE P1-67
- WAIT P1-35
- DBFL P1-63
- +20 MHZ P1-28
- POWER ON RESET P1-65
- BUS FREE P1-30
- STACK P1-61
- INTERNAL TIME OUT P1-49
- TIME OUT INTERRUPT P1-51
- CHANNEL 7 STROBE P1-66
- CHANNEL 6 STROBE P1-62
- CHANNEL 5 STROBE P1-64
- CHANNEL 4 STROBE P1-60
- CHANNEL 3 STROBE P1-57
- CHANNEL 2 STROBE P1-70
- CHANNEL 1 STROBE P1-69
- CHANNEL 0 STROBE P1-58
- BUS ENABLE 7 P1-15
- BUS ENABLE 6 P1-11
- BUS ENABLE 5 P1-13
- BUS ENABLE 4 P1-14
- BUS ENABLE 3 P1-10
- BUS ENABLE 2 P1-9
- BUS ENABLE 1 P1-8
- BUS ENABLE 0 P1-7
- +10 MHZ P2-40
- PROCESSOR ON BUS P2-8
- SYNC P2-12
- HLDA P2-11
- FETCH P2-16
- INTA P2-9
- HLTA P2-23
- +12V P2-5
- 5V P2-6
- +2 MHZ P2-22
- MASTER RESET FROM PROCESSOR P2-44
- MEMORY REQUEST P2-41
- 1.0 STROBE P2-42
- WRITE P2-43
- CONTROL PANEL STROBE P2-10
- MT5 P2-17
- MT4 P2-20
- MT3 P2-18
- MT2 P2-19
- MT1 P2-21
- +ADDRESS BUS 2¹⁵ P2-45
- +ADDRESS BUS 2¹⁴ P2-46
- +ADDRESS BUS 2¹³ P2-47
- +ADDRESS BUS 2¹² P2-48
- +ADDRESS BUS 2¹¹ P2-49
- +ADDRESS BUS 2¹⁰ P2-50
- +ADDRESS BUS 2⁹ P2-51
- +ADDRESS BUS 2⁸ P2-52
- +ADDRESS BUS 2⁷ P2-53
- +ADDRESS BUS 2⁶ P2-54
- +ADDRESS BUS 2⁵ P2-55
- +ADDRESS BUS 2⁴ P2-56
- +ADDRESS BUS 2³ P2-57
- +ADDRESS BUS 2² P2-58
- +ADDRESS BUS 2¹ P2-59
- +ADDRESS BUS 2⁰ P2-60
- +DATA BUS 2⁷ P2-61
- +DATA BUS 2⁶ P2-62
- +DATA BUS 2⁵ P2-63
- +DATA BUS 2⁴ P2-64
- +DATA BUS 2³ P2-65
- +DATA BUS 2² P2-66
- +DATA BUS 2¹ P2-67
- +DATA BUS 2⁰ P2-68

1
2
3
4

1
2
3
4

1
2
3
4



- 02 P1-36 P1-63 → +PANEL 2⁷
- 02 P1-30 P1-64 → +PANEL 2⁶
- 02 P1-33 P1-68 → +PANEL 2⁵
- 02 P1-37 P1-65 → +PANEL 2⁴
- 02 P1-48 P1-66 → +PANEL 2³
- 02 P1-50 P1-70 → +PANEL 2²
- 02 P1-55 P1-69 → +PANEL 2¹
- 02 P1-58 P1-87 → +PANEL 2⁰

- P1-60 → -INTERRUPT 7
- P1-62 → -INTERRUPT 8
- P1-55 → -INTERRUPT 5
- P1-57 → -INTERRUPT 4
- P1-51 → -INTERRUPT 3
- P1-63 → -INTERRUPT 2
- P1-48 → -INTERRUPT 1

- 10 P2-34 P1-63 → -INTERRUPT 2
- 08 P1-25 P1-48 → -INTERRUPT 1

- P1-17 → -EXT INT #2
- P1-20 → -EXT INT #3
- P1-18 → -EXT INT #4

- 02 P1-57 P1-24 → +EXECUTE SWITCH N.O.
- 02 P1-60 P1-21 → +EXECUTE SWITCH N.C.

- 03 P1-83 P1-30 → -PARITY ERROR

- P1-73 → -DISABLE JUMP
- P1-32 → -BUS FREE
- P1-18 → -PWR
- P1-25 → -MR/AUTOLOAD
- P1-28 → -INTERNAL TIME OUT
- P1-7 → +ALARM
- P1-23 → +TIMER CLOCK

- 08 P1-58 P2-33 → -CHAN 0 STROBE
- P2-88 → +MODULE SELECT 2³
- P2-70 → +MODULE SELECT 2²
- P2-73 → +MODULE SELECT 2¹
- P2-74 → +MODULE SELECT 2⁰

- * P2-88 → +ADDRESS BUS 2⁴
- * P2-88 → +ADDRESS BUS 2²
- * P2-88 → +ADDRESS BUS 2¹
- * P2-80 → +ADDRESS BUS 2⁰

- * P2-21 → -MTI
- * P2-38 → -READY
- * P2-41 → -MEMORY REQUEST
- * P2-22 → +2 MHZ
- * P2-44 → -MASTER RESET FROM PROC
- * P2-43 → -WRITE

- P2-28 → -TEST RESET 1
- P2-27 → -TEST RESET 2
- P2-25 → -TEST RESET 3

- INTERRUPT 7 → P1-59 06 P1-31
- INTERRUPT 6 → P1-61 06 P1-24
- INTERRUPT 5 → P1-56 06 P1-23
- INTERRUPT 4 → P1-58 06 P1-33
- INTERRUPT 3 → P1-52 06 P1-55
- INTERRUPT 2 → P1-54 06 P1-47
- INTERRUPT 1 → P1-50 06 P1-53
- INTERRUPT 0 → P1-34 06 P1-52

- +AUX 7 → P1-33 02 P1-34
- +AUX 6 → P1-29
- +AUX 5 → P1-35
- +AUX 4 → P1-31
- +AUX 3 → P1-45 10 P1-37
- +AUX 2 → P1-46 10 P1-61
- +AUX 1 → P1-43 10 P1-39
- +AUX 0 → P1-44
- AUX 0 → P1-8 02 P1-8

- SELECTABLE FREQ I → P1-10 08 P1-10
- SELECTABLE FREQ II → P1-27

- +DATA 2⁷ LED → P1-39 02 P1-27
- +DATA 2⁶ LED → P1-40 02 P1-32
- +DATA 2⁵ LED → P1-38 02 P1-28
- +DATA 2⁴ LED → P1-37 02 P1-42
- +DATA 2³ LED → P1-47 02 P1-43
- +DATA 2² LED → P1-48 02 P1-46
- +DATA 2¹ LED → P1-42 02 P1-52
- +DATA 2⁰ LED → P1-41 02 P1-53

- +1200 HZ (75 BAUD) → P1-23 07 P1-25
- +2400 HZ (150 BAUD) → P1-9 08 P1-9
- +4800 HZ (300 BAUD) → P1-12 08 P1-12
- +9600 HZ (600 BAUD) → P1-11 08 P1-11
- +19,200 HZ (1200 BAUD) → P1-15 08 P1-15
- +38,400 HZ (2400 BAUD) → P1-16 08 P1-16
- +78,800 HZ (4800 BAUD) → P1-13 08 P1-13
- +153,600 HZ (9600 BAUD) → P1-14 08 P1-14

- +PARITY ERROR LED → P1-22 02 P1-41
- GATE A12 → A15 → P1-26 06 P1-32
- (POMR+AUTOLOAD) → P1-74 10 P1-62

- MR TO PROCESSOR → P2-38 *
- ANTICIPATE READY → P2-37 *

- +ADDRESS BUS 2¹⁵ → P2-45 *
- +ADDRESS BUS 2¹⁴ → P2-46 *
- +ADDRESS BUS 2¹³ → P2-47 *
- +ADDRESS BUS 2¹² → P2-48 *

- +DATA BUS 2⁷ → P2-61 *
- +DATA BUS 2⁶ → P2-62 *
- +DATA BUS 2⁵ → P2-63 *
- +DATA BUS 2⁴ → P2-64 *
- +DATA BUS 2³ → P2-65 *
- +DATA BUS 2² → P2-66 *
- +DATA BUS 2¹ → P2-67 *
- +DATA BUS 2⁰ → P2-68 *

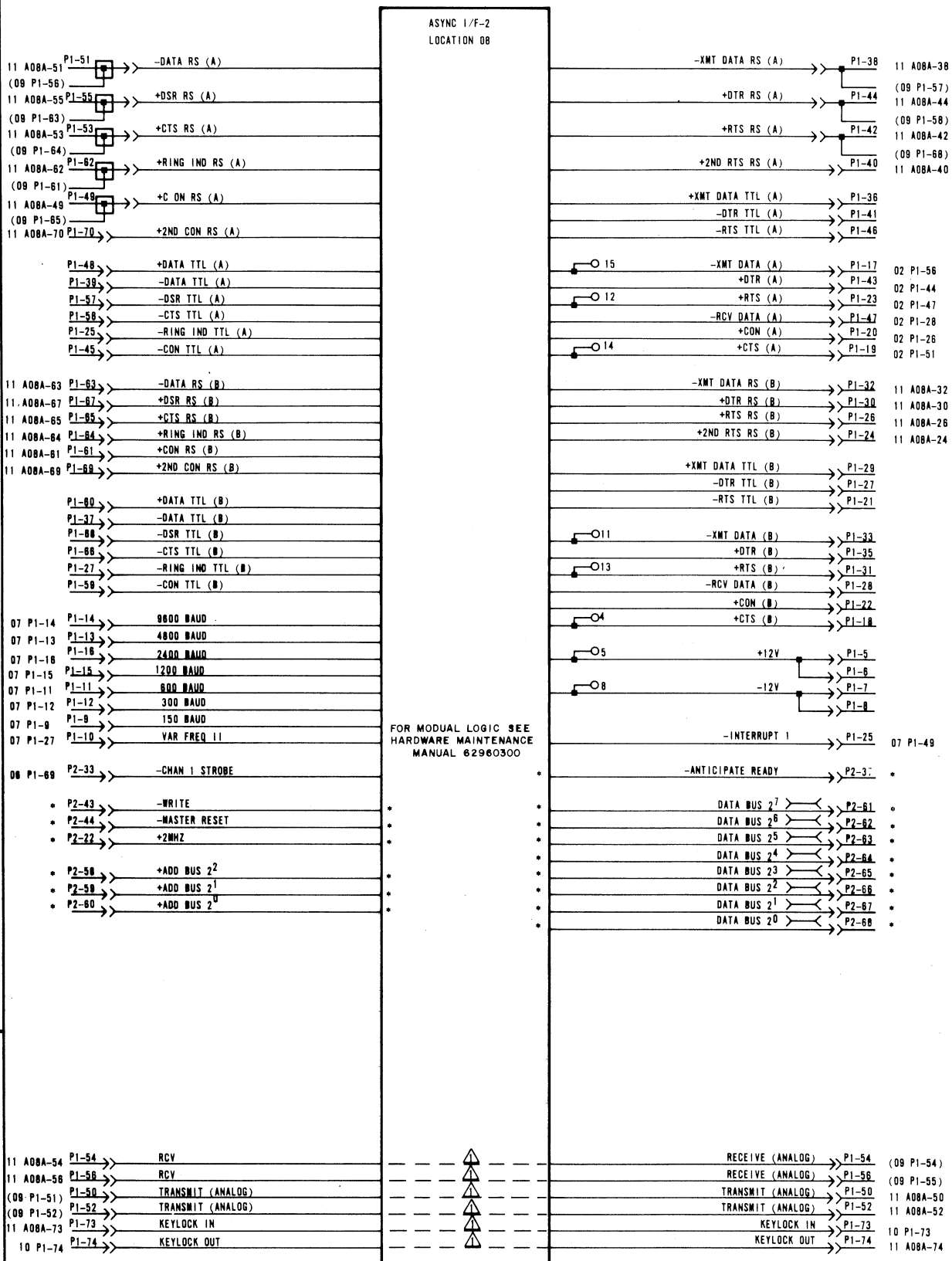
FOR MODULE LOGIC SEE *
HARDWARE MAINTENANCE *
MANUAL 62961100 *

NON STANDARD ABBREVIATIONS
EXT INT - EXTERNAL INTERRUPT
MR - MASTER RESET
POMR - POWER ON MASTER RESET
AUX - AUXILIARY

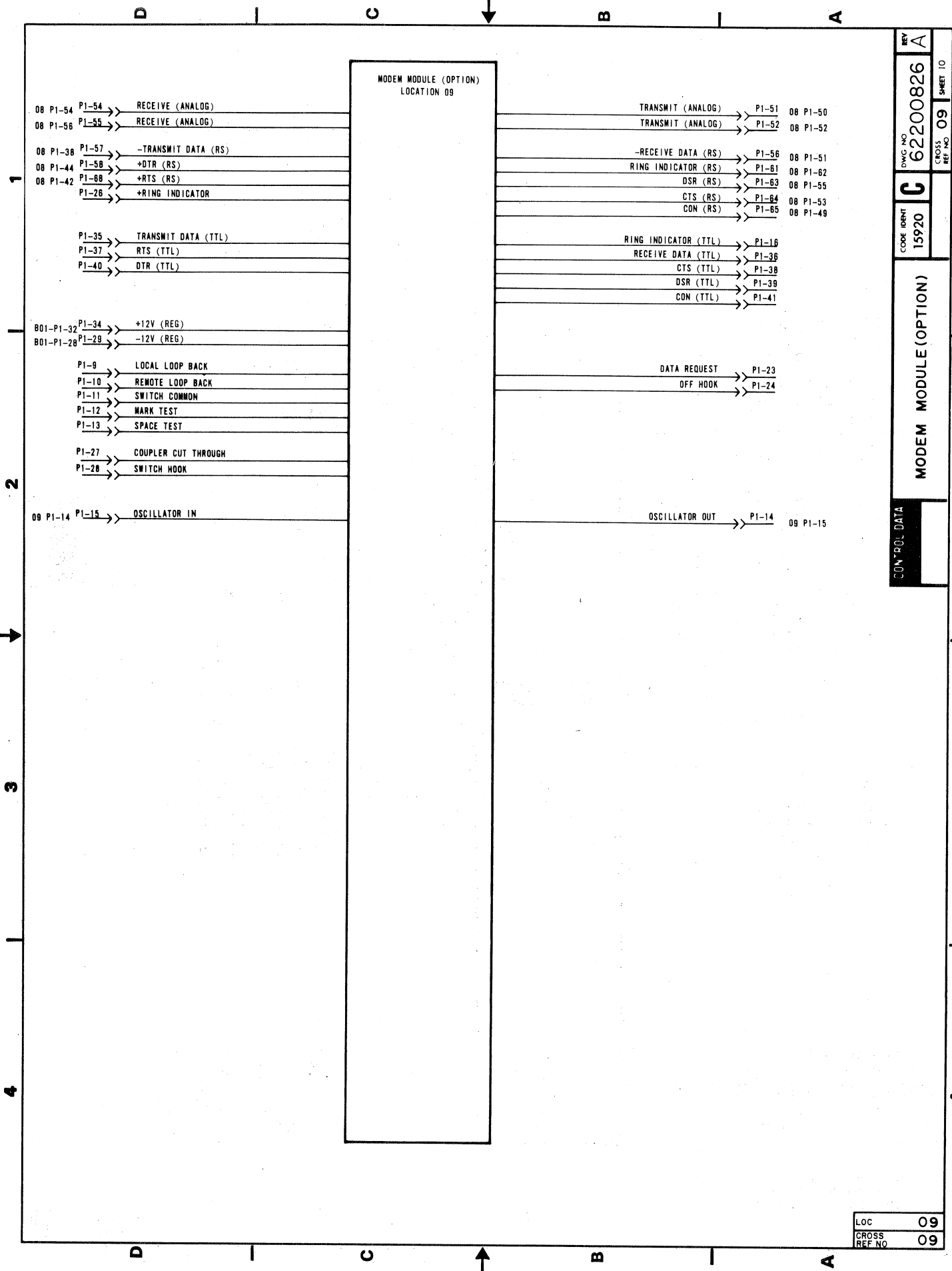
* DENOTES BUSSED SIGNAL

REV A	DWG NO 62200826	SHEET 8
CODE IDENT C	15920	CROSS REF NO 07
STIC		

LOC	07
CROSS REF NO	07



NOTES:
 * DENOTES BUSSED SIGNALS
 () ACTIVE WHEN MODEM OPTION PRESENT
 △ NOT USED IN ASYNC I/F-2 MODULE-TIE POINT ONLY.

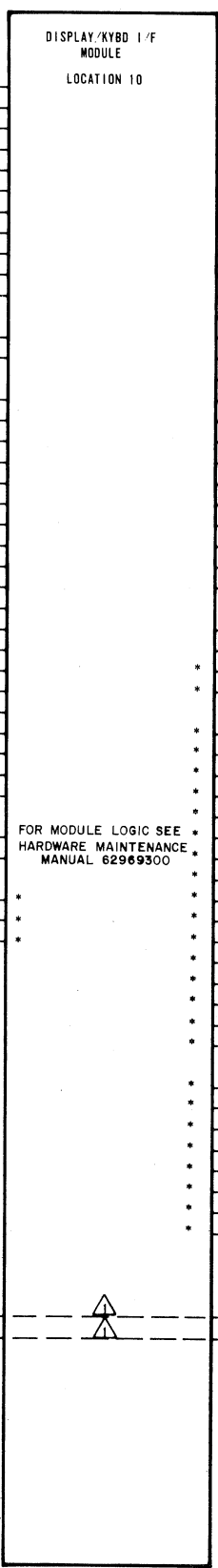


REV	A
DWG NO	62200826
CODE IDENT	C 15920
CROSS REF NO	09
SHEET NO	09
MODEM MODULE (OPTION)	
CON *POJ DATA	

LOC 09
CROSS REF NO 09

D I C B A

REV	A
DWG NO	62200826
CROSS REF NO	10
CODE IDENT	15920
CONTROL DATA	
DISPLAY/KYBD I/F MODULE	



- 12 A10A-57 P1-57 -KYBD STROBE
- 12 A10A-68 P1-68 +KYBD DATA 2⁷
- 12 A10A-67 P1-67 +KYBD DATA 2⁶
- 12 A10A-64 P1-64 +KYBD DATA 2⁵
- 12 A10A-65 P1-65 +KYBD DATA 2⁴
- 12 A10A-63 P1-63 +KYBD DATA 2³
- 12 A10A-63 P1-66 +KYBD DATA 2²
- 12 A10A-66 P1-68 +KYBD DATA 2¹
- 12 A10A-69 P1-70 +KYBD DATA 2⁰
- 12 A10A-70 P1-59 +EXT STATUS A
- 12 A10A-60 P1-60 +EXT STATUS B

- 10 P1-45 P1-56 CLOCK IN
- 10 P1-45 P1-58 -TEST RESET
- 07 P1-43 P1-39 -40/+80 CHAR
- 07 P1-43 P1-52 40/80 SWITCH GND
- 07 P1-43 P1-33 +50/-60 HZ
- 07 P1-46 P1-61 -ODD/+ALL LINES
- 07 P1-46 P1-53 ODD/ALL SWITCH GND
- 07 P1-46 P1-28 +SELECT ADD 2¹⁵
- 07 P1-46 P1-31 +SELECT ADD 2¹⁴
- 07 P1-46 P1-29 +SELECT ADD 2¹³
- 07 P1-46 P1-30 +SELECT ADD 2¹²
- 07 P1-46 P1-32 +SELECT ADD 2¹¹
- 07 P1-46 P1-27 +SELECT ADD 2¹⁰
- 07 P1-46 P1-28 +SELECT ADD 2⁹
- 07 P1-46 P1-25 +SELECT ADD 2⁸
- 07 P1-45 P1-37 -FULL DIM
- B01 P1-32 P1-5 +12V
- B01 P1-32 P1-6 +12V
- B01 P1-28 P1-7 -12V
- B01 P1-28 P1-8 -12V
- 07 P1-74 P1-82 -(PDMR+AUTOLOAD)
- B01 P1-18 P1-25 20 VAC

- 06 P1-70 P2-33 -CHAN 2 STROBE
- 06 P1-9 P2-35 -BUS ENABLE 2
- * P2-43 -WRITE
- * P2-44 -MASTER RESET
- * P2-18 -MT3

- 08 P1-73 P1-73 KEYLOCK IN
- 12 A10A-74 P1-74 KEYLOCK OUT

- +VIDEO P1-41
- VIDEO GND P1-42
- +HORIZ SYNC P1-47
- HORIZ SYNC GND P1-48
- +VERT SYNC P1-43
- VERT SYNC GND P1-44
- CLOCK OUT P1-45
- GND P1-10
- GND P1-12
- GND P1-14
- GND P1-16
- GND P1-18
- GND P1-20
- GND P1-22
- GND P1-24
- GND P1-26
- GND P1-28
- GND P1-30
- GND P1-32
- GND P1-34
- GND P1-36
- GND P1-38
- GND P1-40
- GND P1-46
- GND P1-50

- INTERRUPT 2 P2-34
- BUS REQUEST 2 P2-36
- MEM REQUEST P2-41
- READY P2-38

- +ADDRESS BUS 2¹⁵ P2-45
- +ADDRESS BUS 2¹⁴ P2-46
- +ADDRESS BUS 2¹³ P2-47
- +ADDRESS BUS 2¹² P2-48
- +ADDRESS BUS 2¹¹ P2-49
- +ADDRESS BUS 2¹⁰ P2-50
- +ADDRESS BUS 2⁹ P2-51
- +ADDRESS BUS 2⁸ P2-52
- +ADDRESS BUS 2⁷ P2-53
- +ADDRESS BUS 2⁶ P2-54
- +ADDRESS BUS 2⁵ P2-55
- +ADDRESS BUS 2⁴ P2-56
- +ADDRESS BUS 2³ P2-57
- +ADDRESS BUS 2² P2-58
- +ADDRESS BUS 2¹ P2-59
- +ADDRESS BUS 2⁰ P2-60

- +DATA BUS 2⁷ P2-61
- +DATA BUS 2⁶ P2-62
- +DATA BUS 2⁵ P2-63
- +DATA BUS 2⁴ P2-64
- +DATA BUS 2³ P2-65
- +DATA BUS 2² P2-66
- +DATA BUS 2¹ P2-67
- +DATA BUS 2⁰ P2-68

- 12 A10A-41
- 12 A10A-42
- 12 A10A-47
- 12 A10A-48
- 12 A10A-43
- 12 A10A-44
- 10 P1-56

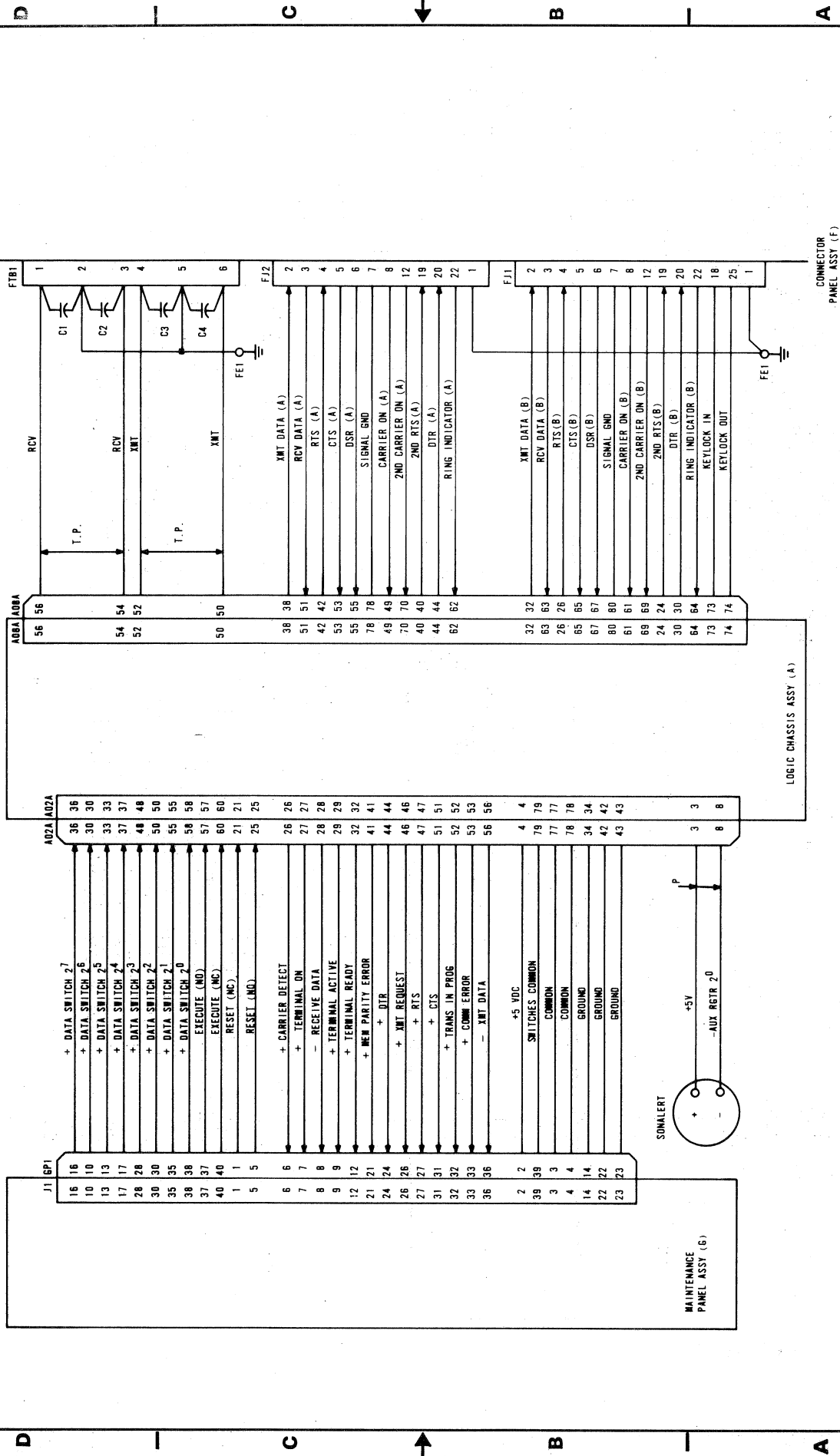
- 12 A10A-46
- 12 A10A-50

- 07 P1-53
- 06 P1-29

NOTES:
 ⚠ NOT USED IN ASYNC I/F-2 MODULE-TIE POINT ONLY.
 * DENOTES BUSSED SIGNAL.

Loc	10
CROSS REF NO	10

1 2 3 4



CONTROL DATA

CABLE WIRING DIAGRAM

CODE IDENT: **15920**

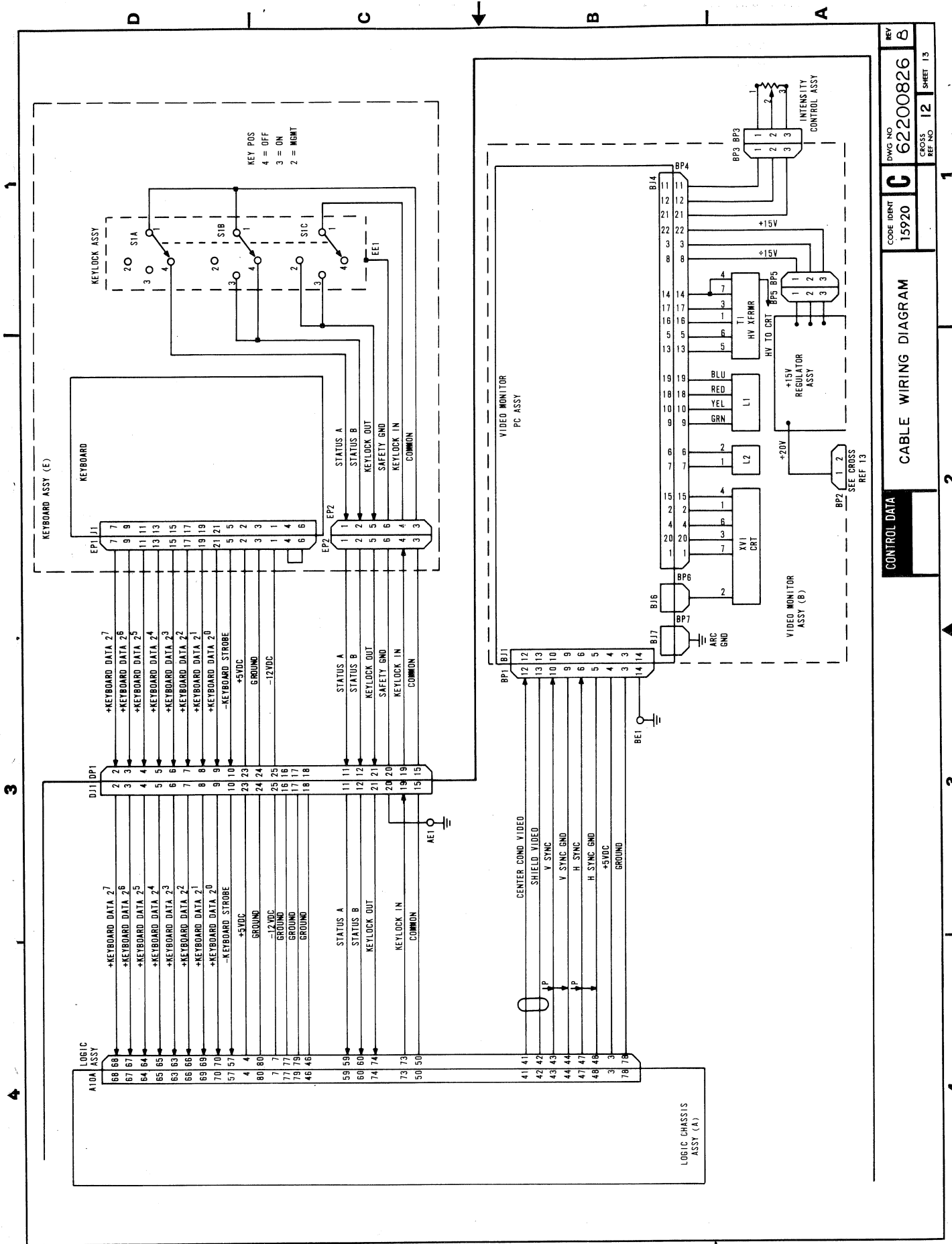
DWG NO: **62200826**

REV: **A**

CROSS REF NO: **11**

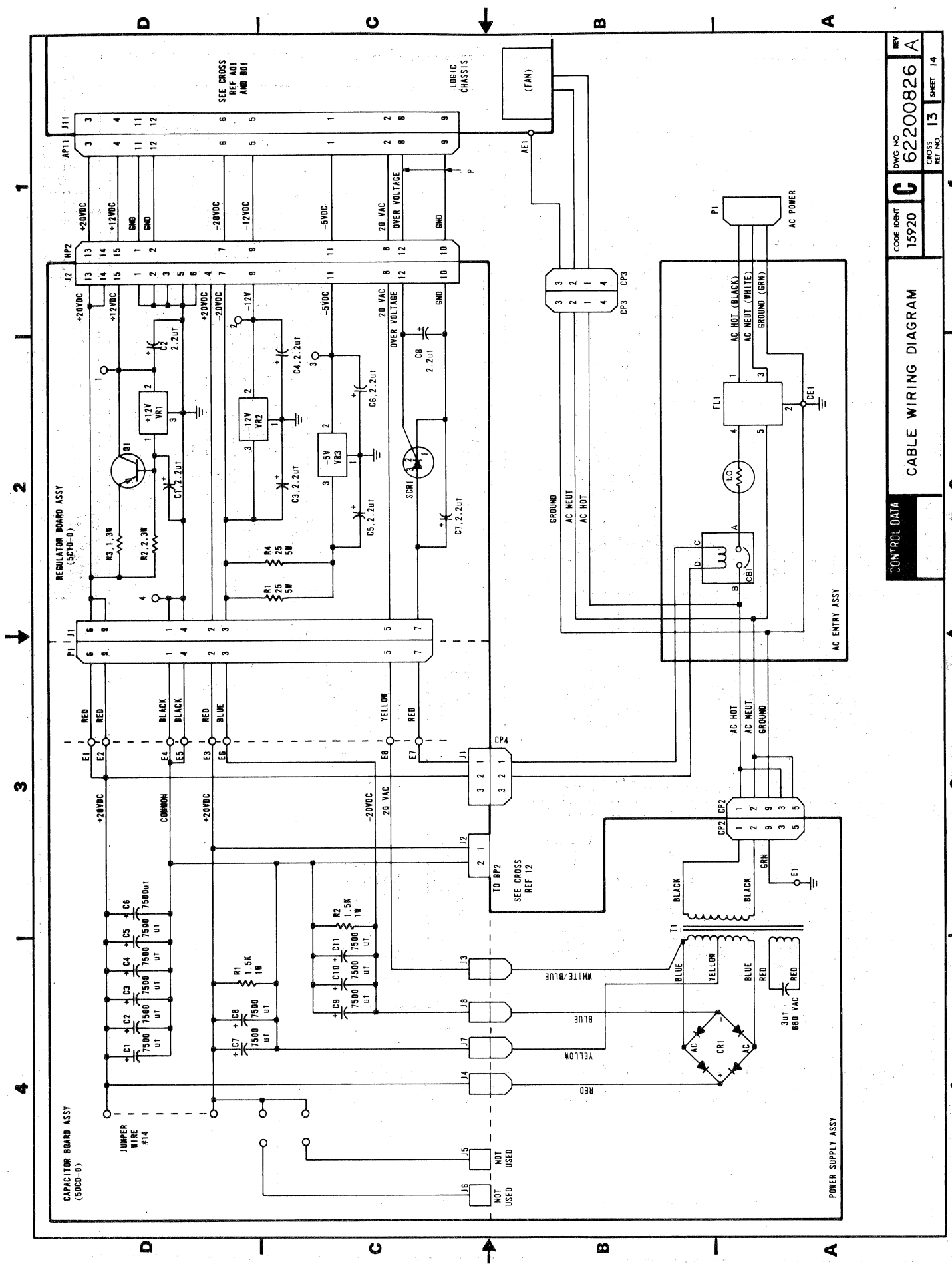
SHEET 12

1 2 3 4



REV	B
DWG NO	62200826
CODE IDENT	G
CROSS REF NO	12
SHEET	13
CONTROL DATA	
CABLE WIRING DIAGRAM	

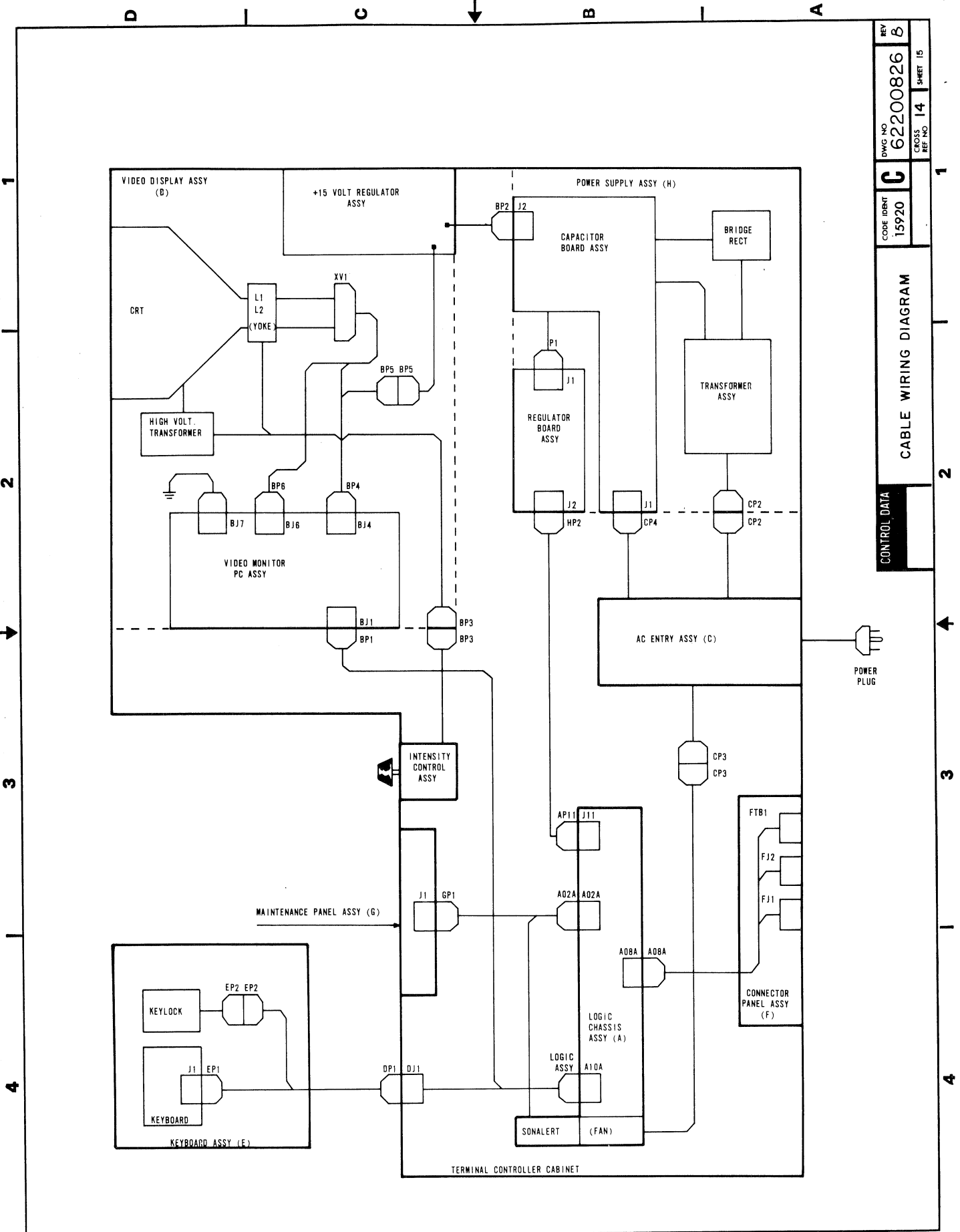


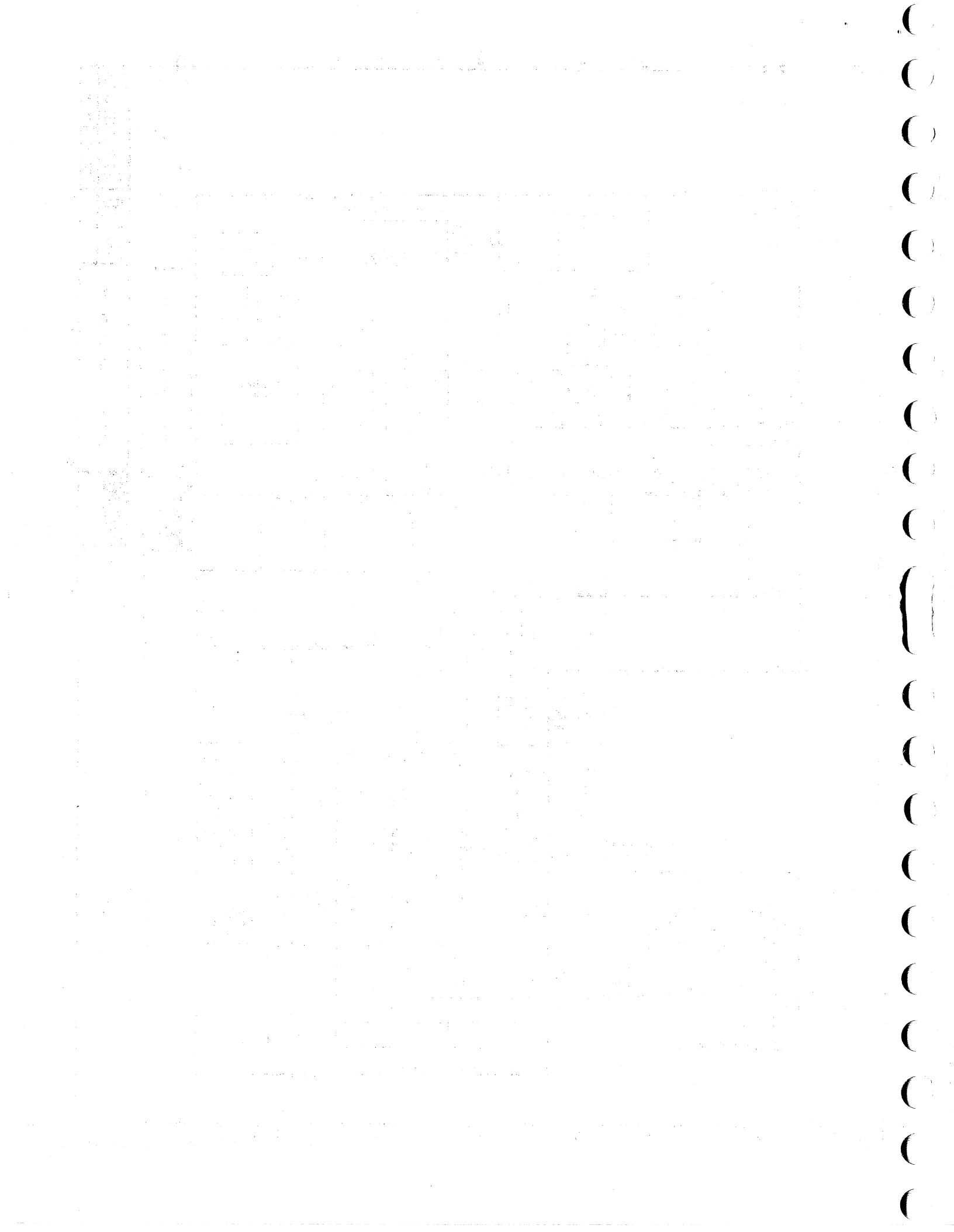


REV	DWG NO	CODE IDENT	CONTROL DATA
A	62200826	15920	
	CROSS REF NO		
	13		
	SHEET	14	

CABLE WIRING DIAGRAM

REV	B
DWG NO	62200826
CROSS REF NO	14
SHEET IS	15
CODE IDENT	C
15920	
CABLE WIRING DIAGRAM	
CONTROL DATA	





This section provides preventive maintenance, maintenance aids, troubleshooting information, and removal/replacement procedures for field maintenance of the display terminal. Troubleshooting information is in the form of diagnostic decision logic tables that reference recommended corrective actions to be performed. The maintenance philosophy for on-site repair of the terminal is limited to locating defective modules, subassemblies, or cables and replacing them. Component level maintenance is normally to be performed only at a repair center. However, replacement information is provided for those components listed on the equipment spare parts lists, in case limited access to a repair center make field replacement of these items desirable.

PREVENTIVE MAINTENANCE

Preventive Maintenance should be performed on a regular schedule to help prevent terminal equipment failures. The suggested plan for the performance of preventive maintenance specifically pertains to the Ticketron application of the display terminal in various type environments. If the terminal application is other than that of Ticketron, this plan should serve as a guideline for scheduling preventive maintenance for that application. The primary factor that has to be taken into consideration when setting up such a schedule is the equipment's usage.

- Arena: One PM call per month per terminal, during the exhibition of an event.
- Box Office: Four PM calls per year per terminal, performed at equal intervals.
- Remote (Department Stores, etc.): Four PM calls per year per terminal, commencing 3 months following the terminal's installation and scheduled at approximately equal intervals thereafter.

The preventive maintenance operations to be performed at these intervals are as follows:

<u>Interval</u>	<u>Operation</u>
Every month (arena) or every 3 months (box office or remote)	General inspection and cleaning of equipments in the terminal configuration.
Once a year	In addition to the general inspection and cleaning operations, additional cleaning and operational checks/adjustments should be made.

GENERAL PREVENTIVE MAINTENANCE PROCEDURE

Cleaning operations for the display terminal follow. Refer to the applicable equipments hardware maintenance manual for preventive maintenance procedures to be performed on any device that may be associated with the display terminal (such as, ticket printer, ticket printer controller, matrix printer, etc.). A general inspection of the equipments, including proper seating of external cable connectors, should also be made.

Remove power from the display terminal and clean as follows:

- 1) Dust keyboard with a soft-bristled brush.
- 2) Clean the crt screen, using name-brand glass cleaner and soft, lint-free cloth.
- 3) Wipe exterior of display terminal, using a damp lint-free cloth.

ANNUAL PREVENTIVE MAINTENANCE PROCEDURE

The following procedure lists the operational checks and adjustments that are to be performed on the display terminal at this interval. The general cleaning procedure described under the General Preventive Maintenance Procedure should also be performed at this time. Refer to the applicable equipments hardware maintenance manual for operational checks, lubrication, and adjustments to be performed on any device that may be associated with the display terminal (such as, ticket printer, ticket printer controller, matrix printer, etc.).

With power applied, perform the following operations:

- 1) Check and adjust, if required, the +5-V output of the regulator card at chassis location B01. Check for +5 volts $\pm 1\%$ at TP1 of the regulator card and adjust the potentiometer on the board edge for correct voltage. Refer to figure CRT24 for test points and potentiometer locations.
- 2) Check for proper character display. Refer to table CRT1, sheet 2. Perform related adjustments if required.

MAINTENANCE AIDS

Normal field maintenance does not require special tools or test equipment. Simple screwdrivers, wrenches, etc., for module removal, and a hand-held multimeter for voltage checks are adequate. A name-brand glass cleaner, lint-free cloth, and a soft bristled brush are recommended for general cleaning of the display terminal.

MAINTENANCE PANEL SWITCHES AND INDICATORS

The maintenance panel, see figure 6-1, provides several switches and indicators to control diagnostic execution and monitor terminal operations. These are described in the following paragraphs. Since the general operation of the maintenance panel switches and indicators are under program control, it is necessary that the person performing maintenance on the display terminal be familiar with the diagnostic-autoload sections of the firmware program employed in the application, so the maintenance panel as a maintenance aid can be used to its fullest. In the case of the Ticketron application of the display terminal, a detailed description of these aspects of that firmware program is contained in appendix C. For an application other than Ticketron, the customer will have to be consulted to gain an understanding about these aspects for that firmware program. If the differences are not too great, the information in appendix C may provide a basis of reference with the differences between the programs being taken into consideration accordingly.

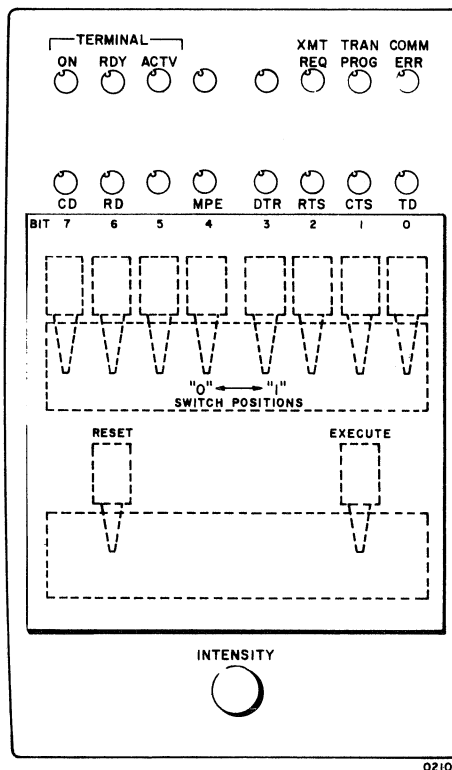


Figure 6-1. Maintenance Panel

Upper Eight Indicators

The type of information reflected by the upper row of maintenance panel indicators depends on whether the display terminal is in a normal operating state or a diagnostic state. The diagnostic state occurs during display terminal initialization

after a power-on master clear or manual reset has been performed, or during the execution of selected diagnostic-autoload sections of the firmware program initiated by manual intervention through the use of the RESET and 0 through 7 switches on the maintenance panel. In the case of the Ticketron application of the display terminal, the 8-bit binary codes that appear in these circumstances for that application are described in appendix C. When the display terminal is not in a diagnostic state, it is in the normal operating state and the information reflected by these indicators, under program control, is as follows:

- ON —
- RDY — } Program execution has been performed
- ACTV — Active
- XMT REQ — Transmit request
- COMM ERR — Communication error

Lower Eight Indicators

The lower row of indicators on the maintenance panel reflects the following communications interface status conditions:

- CD — Carrier detect
- RD — Receive data
- MPE — Memory (RAM) parity error (hardware generated)
- DTR — Data terminal ready
- RTS — Request to send
- CTS — Clear to send
- TD — Transmit data

Switches 0 through 7

These eight maintenance panel switches are used to control the diagnostic-autoload execution. Refer to procedure CRT1, Executing Quicklook Diagnostic, for applicable switch settings of the Ticketron application.

RESET Switch

This switch is used to reinstate the diagnostic-autoload sequence or exit from a selected section as determined by the settings of maintenance panel switches 0

through 7. This switch performs the same actions as those initiated by a power-on master clear. Refer to appendix C for specific use of the RESET switch in the Tickeron application.

EXECUTE Switch

This switch is used in conjunction with the autoload section of the firmware program to initiate a reload of an unsuccessfully loaded program page of the application program. Refer to the Autoload description contained in appendix C for specific use of the EXECUTE switch in the Tickeron application.

PRINTED-CIRCUIT BOARD VOLTAGE INDICATORS

Indicators are provided on several PC boards of the logic chassis to indicate the presence of voltages on the board. The indicators do not mean that the correct voltage is present, only that a positive or negative voltage level, sufficient to light the indicator, is there. All indicators must be in the on (illuminated) condition for correct operation. Indicator color, associated dc voltage, and card locations are described in table 6-1.

TABLE 6-1. PRINTED-CIRCUIT CARD VOLTAGE INDICATORS

INDICATOR COLOR	PRINTED-CIRCUIT CARD LOCATION					
	A01* and B01	03*	06	08	09**	10
Yellow	+20-V dc	—	+12-V dc	+12-V dc	+12-V dc	+12-V dc
Green	-20-V dc	-9-V dc	-5-V dc	-12-V dc	-12-V dc	-12-V dc
Red	+5-V dc	—	—	—	—	—

* Not applicable to the CC617-B model
 ** Only applicable to CC617-B model units that contain optional modem module

TROUBLESHOOTING AND CORRECTIVE MAINTENANCE

Troubleshooting information is in the form of diagnostic decision logic tables (DDLTL). A diagnostic decision logic table is a specialized format for portraying troubleshooting information with reference to specific procedures to be performed for corrective action.

The value of the DDLTL is that it presents a tabular display of conditions that can easily be examined to indicate which action or actions to be performed for each set of circumstances. Basically, the table is arranged in four sections or quadrants. These quadrants are called conditions, situations, actions, and sequence of actions. An example of such a table is shown in figure 6-2.

TABLE 6-X. POWER SUPPLY CHECKS

ASSUME						
Power cord is inserted in ac outlet.						
CONDITIONS	SITUATIONS					
	1	2	3	4	5	6
Does Power indicator switch illuminate when pressed?	Y	N	N	N	N	O T H E R
Has red circuit breaker CB2 tripped?	-	N	Y	Y	Y	
Will CB2 stay in when pressed?	-	-	Y	N	N	
Turn power off; disconnect plug in J1. Turn power on, will CB2 now stay set?	-	-	-	Y	N	
ACTIONS	SEQUENCE					
Go to table 6-__.	X	-	X	-	-	-
Replace power distribution assembly.	-	1	-	-	3	-
Check for faulty cables.	-	2	-	-	1	-
Replace power supply switch assembly.	-	3	-	-	2	-
Replace power supply (procedure ____).	-	4	-	X	-	-
Call Regional Tech Support.	-	-	-	-	-	X

02385

Figure 6-2. Diagnostic Decision Logic Table Example

CONDITIONS

The upper-left quadrant of a DDLT contains the conditions, or tests, to be performed. Conditions are in the form of questions that can be answered with a yes (Y) or a no (N). A condition that is irrelevant* to the current situation is answered with a (-). It also includes any basic assumptions, such as "Power cord is connected to ac outlet."

SITUATIONS

The various conditions are summarized in columns in the upper-right quadrant, numbered from 1 to 6 in the example. Each column summarizes a unique set of conditions. In using the tables, the conditions listed for column 1 must be examined before moving right to column 2, etc.

The example shows that two conditions (shaded area) are used to define situation number 2. That is, the power indicator/switch does not illuminate when pressed and red circuit breaker CB2 has not tripped. Assuming that these are the conditions observed, then this column would be followed (down) to indicate the sequence of actions to be performed.

* Irrelevant in this application means that the condition should be ignored when examining the various conditions in a given column.

ACTIONS

The lower-left quadrant of the table lists corrective actions for the various combinations of conditions covered in the table.

SEQUENCE OF ACTIONS

The lower-right quadrant lists the sequence of the actions to be performed for each situation with the second, third, fourth, and succeeding actions being performed only if a previous action failed to remedy a problem situation. The sequential numbering of actions reflects the probability of the corresponding action correcting the problem, with the most likely listed first. When only one action is listed, an X is used instead of a number.

Both actions and conditions may refer to specific procedures to follow, for example, when checking and adjusting power-supply voltages. The customer engineer may be directed to exit the table to perform the procedure and then return to the same point in the table to answer any questions that are related to the procedure. He would then continue from this point in the table if the fault still persists.

ARRANGEMENT OF DIAGNOSTIC AND CORRECTIVE MAINTENANCE INFORMATION

The arrangement of the diagnostic and corrective maintenance information is shown in figure 6-3.

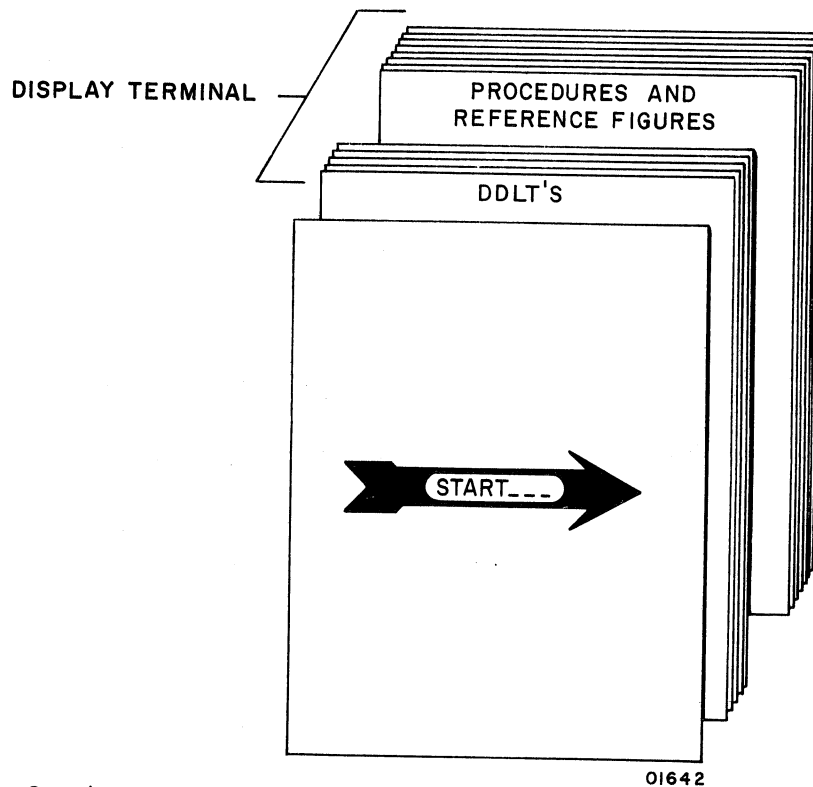
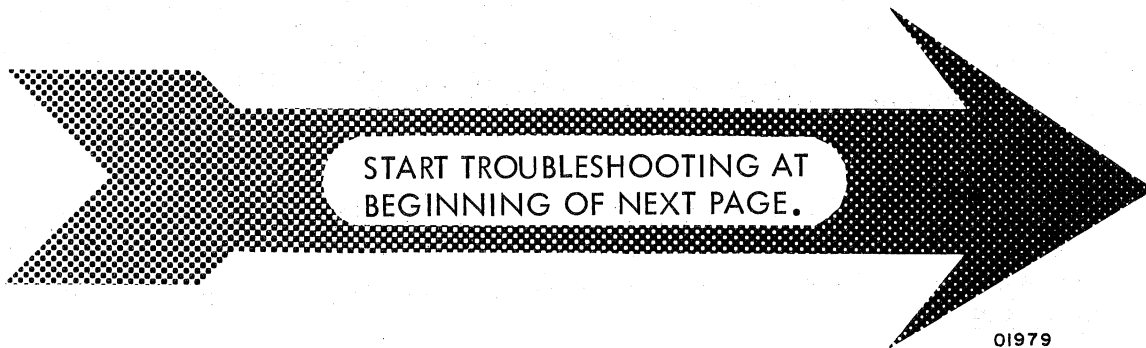


Figure 6-3. Arrangement of Diagnostic and Corrective Maintenance Information

NOTE

If you are unfamiliar with diagnostic decision logic tables, read the explanation of their use described earlier in this section. Then, start at the beginning of the next page and work your way through to the end of this section until you correct any fault.



NOTE

Because the diagnostic decision logic tables (DDLTL's) require much time, money, and effort — you, the user, determine whether they will continue in future manuals as a diagnostic aid.

Please use the comment sheet at the back of this manual to let us know the following: 1) Did you actually use these tables? 2) Do you think they are valuable and why or why not? 3) Do you feel this is the best approach to a "cookbook" troubleshooting manual that you have seen, considering that the DDLTL's tie everything together; that is, diagnostics, procedures, figures, and tables? 4) To you, what is their most serious shortcoming? 5) How would you improve the DDLTL's? Remember, the comment sheet is your direct link with the writer.

CRT DISPLAY/KEYBOARD

GRAND ST. STATION



TABLE CRT1. DDLT FOR DISPLAY TERMINAL (SHEET 1 OF 6)

INITIAL DISPLAY KEYBOARD CHECKS								
ASSUME								
Terminal power on. See note 1. Internal switches of display terminal set correctly for terminal configuration. (Refer to section 3.) Quicklook-autoload executed per procedure CRT1. See note 2.								
CONDITIONS	SITUATIONS							
	1	2	3	4	5	6	7	8
Did quicklook run to completion? See note 2.	Y	Y	Y	Y	Y	N	N	O T H E R
Did terminal successfully autoload?	Y	Y	Y	N	N	-	-	
Is data stable (no "swimming" or out of sync condition)?	Y	Y	N	-	-	-	-	
Turn intensity up. Is raster visible and fan running?	-	-	-	Y	Y	-	N	
Does display respond to correctly formatted keyboard input?	Y	N	-	Y	N	-	-	
ACTIONS	SEQUENCE							
Go to sheet 2 of this DDLT.	X	-	-	-	-	-	-	
Press RESET switch on maintenance panel (reload software).	-	1	-	1	1	-	-	
Check keyboard cable to connector panel.	-	2	-	-	-	-	-	
Check cables from connector panel to backplane and from backplane to video monitor.	-	3	-	-	-	-	4	
Check modem and Comm connections.	-	-	-	2	-	-	-	
Replace STIC PC board, procedure CRT18.	-	5	-	-	-	-	-	
Perform keyboard troubleshooting, sheet 6 of this DDLT.	-	6	-	-	-	-	-	
Replace display/keyboard I/F board, procedure CRT18.	-	4	1	-	3	-	5	
Isolate quicklook error per sheet 5 of this DDLT. See note 2.	-	-	-	-	-	X	-	
Reset circuit breaker at rear of display terminal.	-	-	-	-	-	-	1	
Check ac power cord	-	-	-	-	-	-	2	
Check continuity and connections of coax cable from video monitor to backplane.	-	-	-	-	2	-	3	
Perform internal crt checks per sheet 3 of this DDLT.	-	-	-	-	-	-	6	
Perform video board voltage checks per sheet 4 of this DDLT.	-	-	2	-	-	-	-	
Contact Regional Tech Support.	-	-	3	3	4	-	7	X
<p>NOTES:</p> <p>1) An immediate power-off, power-on application may cause the circuit breaker to trip. Wait a few seconds before reapplying power whenever terminal power is turned off.</p> <p>If input power circuit breaker trips, perform procedure CRT11.</p> <p>2) These items refer specifically to phases of the diagnostic-autoload (firmware) program used in the Ticketron application of the display terminal. If the terminal being troubleshooted is not employed in the Ticketron application, any differences that may exist between that program and the Ticketron program (described in appendix C) will have to be taken into consideration accordingly.</p>								

TABLE CRT1. DDLT FOR DISPLAY TERMINAL (SHEET 3 OF 6)

INTERNAL CRT DISPLAY CHECKS				
ASSUME				
No data and no raster. Checks of sheet 1 of this DDLT completed. Refer to procedure CRT2 for display cabinet hood removal.				
CONDITIONS	SITUATIONS			
	1	2	3	4
Are LED indicators on the +5-V regulator PC board(s) lit? See note below.	Y	Y	N	O
Is crt filament lit?	Y	N	N	T H E R
ACTIONS	SEQUENCE			
Check internal cable connections.	1	1	1	-
Perform power checks, procedure CRT15.	2	2	2	-
Check voltages at crt monitor board, procedure CRT13.	3	3	-	-
Replace crt monitor PC board, procedure CRT5.	4	4	-	-
Check Intensity control, procedure CRT14.	5	-	-	-
Replace high-voltage transformer assembly, procedure CRT3.	6	-	-	-
Replace yoke, procedure CRT9.	7	-	-	-
Replace crt, procedure CRT7.	8	5	-	-
Contact Regional Tech Support.	9	6	3	X
NOTE: The CC617-A model contains two +5-V regulator boards at chassis location A01 and B01, while the CC617-B model contains just one +5-V regulator board at location B01.				

TABLE CRT1. DDLT FOR DISPLAY TERMINAL (SHEET 5 OF 6)

QUICKLOOK ERROR STOPS						
ASSUME						
Quicklook diagnostic executed (tests 001 through 005) and failed to complete, see note 2. Refer to procedure CRT1 for quicklook diagnostic execution, see note 1.						
CONDITIONS	SITUATIONS					
	1	2	3	4	5	6
Error code T001X displayed? See note 2. (ROM checksum error.)	Y	N	N	N	N	O
Error code T002X displayed? See note 2. (RAM failure.)	-	Y	N	N	N	T
Error code T003X displayed? See note 2. (Command failure.)	-	-	Y	N	N	H
Error code T004X displayed? See note 2. (Async failure.)	-	-	-	Y	N	E
Test 005 error? See note 2. (CRT did not display all A's, B's, C's, and D's.)	-	-	-	-	Y	R
ACTIONS	SEQUENCE					
For CC617-A: replace ROM board, chassis location 3 (procedure CRT18). For CC617-B: replace program memory board, chassis location 3 (procedure CRT18).	1	-	-	-	-	-
Replace processor board, chassis location 6 (procedure CRT18).	2	-	1	-	-	-
For CC617-A: replace RAM board, chassis location 5 (procedure CRT18). For CC617-B: replace program memory board, chassis location 3 (procedure CRT18).	-	1	2	-	-	-
For CC617-A: replace RAM board, chassis location 4 (procedure CRT18).	-	2	3	-	-	-
Replace Async I/F-2 board, chassis location 8 (procedure CRT18).	-	-	-	1	-	-
Replace STIC board, chassis location 7 (procedure CRT18).	3	-	-	2	-	-
Replace display/keyboard I/F board, chassis location 10 (procedure CRT18).	-	-	-	-	2	-
Verify correct settings of display/keyboard I/F board switches. Refer to section 3 of this manual.	-	-	-	-	1	-
Contact Regional Tech Support.	-	-	-	-	-	X
<p>NOTES:</p> <ol style="list-style-type: none"> 1) If quicklook fails to initiate or stops with an invalid error display, do the following: <ol style="list-style-type: none"> a) Turn power off and if the terminal is a CC617-A model, swap the two RAM boards at locations 4 and 5; or if the terminal is a CC617-B model, reseal the program memory board at location 3. Rerun quicklook tests. b) Perform steps indicated under Unable to Execute Quicklook Diagnostics, procedure CRT1. 2) These items refer specifically to aspects of the diagnostic-autoload (firmware) program used in the Ticketron application of the display terminal. If the terminal being troubleshooted is not employed in the Ticketron application, any differences that may exist between that program and the Ticketron (described in appendix C) will have to be taken into consideration accordingly. 						

TABLE CRT1. DDLT FOR DISPLAY TERMINAL (SHEET 6 OF 6)

KEYBOARD TROUBLESHOOTING					
ASSUME					
All cable connections from keyboard to display terminal and backplane OK. Program loaded without error. See note below.					
CONDITIONS	SITUATIONS				
	1	2	3	4	5
Keyboard data missing from all keys?	Y	N	N	N	O
Keyboard data missing from one key?	-	Y	N	-	T
Incorrect data from some or all keys?	-	-	Y	N	H
Keyboard data missing from several keys?	-	-	-	Y	R
ACTIONS	SEQUENCE				
Check internal cable connections in keyboard.	1	-	-	-	-
Replace display/keyboard I/F board, procedure CRT18.	3	-	1	-	-
Replace keyboard assembly, procedure CRT19.	2	2	2	1	-
Replace nonoperating switch, procedure CRT20.	-	1	-	-	-
Contact Regional Tech Support.	4	3	3	2	X
<p>NOTE: As referred to in procedure CRT1, if the terminal being troubleshooted is used in the Ticketron application, the keyboard octal codes can be verified with quicklook test 006. The same is true for any other applications that incorporate a similar test in its firmware program. The octal codes that are generated by the keyboard in the Ticketron application, are given in figure C-1 of appendix C. For similar information on keyboards employed in other applications, refer to the manual covering that keyboard, which was initially shipped with the display terminal.</p>					

Procedure CRT1 — Executing Quicklook Diagnostic (Ticketron Application Only)

This procedure describes the test operations that can be performed on the terminal using the ROM resident diagnostic program. Switches contained on the maintenance panel, behind a removable snap-on cover, are used to control the diagnostic execution. Refer to appendix C for a detailed description of the diagnostic test sections and autoloading program.

Maintenance Panel Switch Settings (Ticketron Application Only)

Establish the test operations to be performed according to the following switch settings. Placing a switch to the left equals logical 0, to the right equals logical 1. For an illustration of the maintenance panel, refer to figure 6-1.

- 1) Execute quicklook and autoloading: Switch 7 through Switch 0 all logical 0.

Execution will cause the terminal to automatically sequence through quicklook tests 001 through 005, and then jumps to the autoloading program. Autoloading will load the load page, program 1, and then jump to the start of program 1.

- 2) Bypass quicklook: Switch 7 a logical 1, Switch 6 through Switch 0 logical 0's.

Execution will cause the terminal to go directly to the autoloading program without performing the quicklook tests. The terminal will load the load page, program 1, and then jump to the start of program 1.

- 3) Bypass quicklook and autoloading: Switch 7 and Switch 6 logical 1's, Switch 5 through Switch 0 logical 0's.

Execution will cause a jump directly to the start of whatever program is resident in RAM memory.

- 4) Program pause: Switch 5 a logical 1, Switch 4 through Switch 0 logical 0's, Switch 7 and Switch 6 as desired.

Note that in the previous three test operations, the final action is a jump to the start of whatever program is resident in RAM memory. A program pause operation causes the terminal to pause before jumping to the start of the RAM program. The terminal remains in the pause condition until maintenance panel Switch 5 is placed in the logical 0 position which causes a jump to the start of the RAM program.

- 5) Quicklook only: Switch 3 through Switch 0 are used to select specific quicklook tests. If any of these switches is in a logical 1 position, the terminal will perform a selected portion of quicklook but will not continue on to the autoload and will not jump to the start of the resident RAM program.

The binary value of Switch 3 through Switch 0 determines which quicklook tests are to be performed, as follows:

<u>Binary Code</u>	<u>Quicklook Tests Performed</u>
0001	Test 001 through test 005, then halt.
0010	Test 002 through test 005, then halt. (Test 001 is not performed.)
0011	Tests 003 through test 005, then halt. (Tests 001 and 002 are not performed.)
0100	Test 004 and test 005, then halt. (Tests 001, 002, and 003 are not performed.)
0101	Test 005 only, then halt.
0110	Test 006 only (keyboard test). Remain in test 006 until RESET is again pressed.
0111	Test 007 only (ticket printer test). Remain in test 007 until RESET is again pressed.
1000	Test 010 only (matrix printer test). Remain in test 010 until RESET is again pressed.

NOTE

To exit from any of the above quicklook only tests, set the maintenance panel switches (Switch 7 through Switch 0) as desired, and press the RESET switch.

Test Execution (Ticketron Application Only)

Initiate diagnostic execution in one of the two following ways:

- If display terminal power is off, apply power by placing the circuit breaker located on the rear panel in the Up position.
- If display terminal power is on, toggle the manual RESET switch located on the maintenance panel and release.

The diagnostic will execute as established by the maintenance panel switch settings.

Normal and Error Indications (Ticketron Application Only)

During diagnostic test execution and program autoload, the crt displays a white block (microdisplay) in the upper-left corner of the screen.

The microdisplay contains a four-digit alphanumerical code that indicates what portion of the diagnostic is being executed. If an error occurs, the diagnostic stops and the code is followed by an X (an exception is quicklook test 003, in which no X will follow this code if an error occurs). The upper row of LEDs on the maintenance panel also indicates which portion of the diagnostic is being executed.

Quicklook Tests: During quicklook tests 001 through 004, the microdisplay code is a T followed by the test number being executed: such as, T001 for quicklook test 001, etc. At this same time, the upper row of maintenance panel indicators (LEDs) are lit to the binary value of the quicklook test being executed; such as, bit 0 indicator lit for test 001, etc. If an error is detected the diagnostic test stops, the maintenance panel LEDs (upper row) remain lit to the binary value of the test number, and the microdisplay code shown on the crt is followed by an X (an exception is quicklook test 003, in which no X will follow this code if an error occurs).

NOTE

For quicklook tests 005, 006, 007, and 010 the display and/or LED indications differ from that of tests 001 through 004. Normal and error indications of all quicklook tests are summarized in table CRT2.

TABLE CRT2. QUICKLOOK TESTS

QUICKLOOK TEST NUMBER	UPPER ROW OF LEDES	MICRODISPLAY	
		NORMAL	ERROR
001 (ROM checksum)	00000001	T001	T001X
002 (RAM test)	00000010	T002	T002X
003 (command test)	00000011	T003	T003
004 (async I/F test)	00000100	T004	T004X
005 (display test)	11111111	Entire crt display fills with all A's, then B's, C's, and D's.	
006 (keyboard test)	00000000	A000 (keylock OFF) A001 (keylock ON) A003 (keylock MGT) When a keyboard key is pressed, this code is replaced by K plus the octal code of that key. Refer to figure 6-2 for keyboard octal codes.	K plus incorrect octal code
007 (ticket printer test)	00000111	T007	T007NR if ticket printer is not ready
010 (matrix printer test)	00001000	T010	T010NR if matrix printer is not ready

Autoload: During program loading and checksumming, indications are provided in the microdisplay area of the crt. A microdisplay of L followed by a reference number indicates the loading of a page of program. For example, L001 indicates loading of the page whose reference designation is 001. If a transmission error occurs when loading a page, the autoload requests a reload of that page. If the page is then loaded correctly, the autoload proceeds with the next task to be performed. If transmission errors reoccur, then after the third unsuccessful reload, an X will be displayed after the page reference number. Once an X has appeared, manual intervention is required as follows:

- Press the EXECUTE switch on the maintenance panel to initiate another reload of the page (as many reloads as desired may be performed in this manner), or
- Press the RESET switch (or turn the terminal power off, then on again) with the maintenance panel Switches 0 through 7 in the logical 0 position. This executes quicklook tests 001 through 005 and autoload.

After loading a page, the autoload immediately checksums the page. If a checksum error occurs, the autoload determines if the page is a load page. If so, a jump is made to the start of the autoload program. If the page is not a load page, the autoload attempts to reload the page. Transmission errors are again checked as described previously. (Three reloads with transmission errors cause an error display.)

If the page is reloaded without transmission errors; it is again checksummed. If the checksum test detects an error, the page is again reloaded. If three reloads occur in succession, each with a checksum error, then the microdisplay will show an error code of C---X. For example, C005X indicates a checksum error of page reference number 005.

Once an X has appeared, manual intervention is required. Perform the same actions as specified for a transmission error; such as, press either the EXECUTE or RESET switch as described in the preceding steps.

A program or hardware fault may cause the loading of a nonexistent program or overlay. This will cause a microdisplay error code of P---X. The octal number of this code indicates the program and overlay number which was requested per the following:

- Convert the number to binary.
- The major 4 bits are the program number and the minor 4 bits are the overlay number requested.

Unable to Execute Quicklook: There are several signals on the logic chassis that are shared on a common bus by more than one logic module. These signals are shown on a Bussed Signal Chart contained in section 5 of this manual. Due to this commonality, it is possible that a hardware malfunction (for example, an address line fault) could occur on one logic module so quicklook would fail to initiate or be unable to provide any visual indication. If this condition occurs, the following procedure can be used to reduce the overall troubleshooting time.

- 1) Remove display terminal hood per procedure CRT2. Ensure that all connectors on the backplane are secure and all PC board voltage indicators are lit (see table 6-1).

CAUTION

Always turn power off when removing or inserting PC boards. The circuit breaker on the rear panel of the display terminal must be in the Down (off) position.

- 2) With display terminal power off, withdraw the following PC boards out of their connectors to isolate them from the bus (refer to procedure CRT19). It is not necessary to remove them completely from the logic chassis.
 - a) RAM board at chassis location 5, if terminal is a CC617-A model.
 - b) Async I/F-2 board at chassis location 8.
 - c) Display/keyboard I/F board at chassis location 10.
- 3) Reapply power. If quicklook provides a 0000 0010 display in the upper row of indicators on the maintenance panel, one of the preceding PC boards is at fault.
- 4) Reinsert the PC boards one at a time until the original symptoms occur and replace the board causing the failure.
- 5) If after performing steps 1 through 4, quicklook still fails to initiate, replace the following PC boards one at a time.
 - a) Processor board at chassis location 6.
 - b) STIC board at chassis location 7.
 - c) ROM board at chassis location 3, if terminal is a CC617-A model or program memory board at chassis location 3 if terminal is a CC617-B model.
- 6) If unable to isolate the problem using this procedure, contact Regional Tech Support.

Procedure CRT2 — Removing Display Cabinet Hood

To remove cabinet hood, perform the following:

WARNING

Use extreme care when handling TV module because rough handling can cause crt to implode with tremendous force resulting in severe injury. Do not nick or scratch glass or subject it to any undue pressure during replacement. When handling crt, always wear safety goggles and heavy gloves for protection.

WARNING

With power applied, severe shock will be received if high-voltage transformer or lead to anode or area of anode on crt is touched. Be careful when following procedures are performed not to touch anything higher than yoke. Keep tools out of area.

- 1) Remove two screws in rear of cabinet.
- 2) Lift cabinet hood back and up from chassis.

To install cabinet hood, perform the following:

- 3) Position cabinet hood in track of chassis.
- 4) Fasten two screws in rear of cabinet.

Procedure CRT3 — Replacing High-Voltage Transformer Assembly

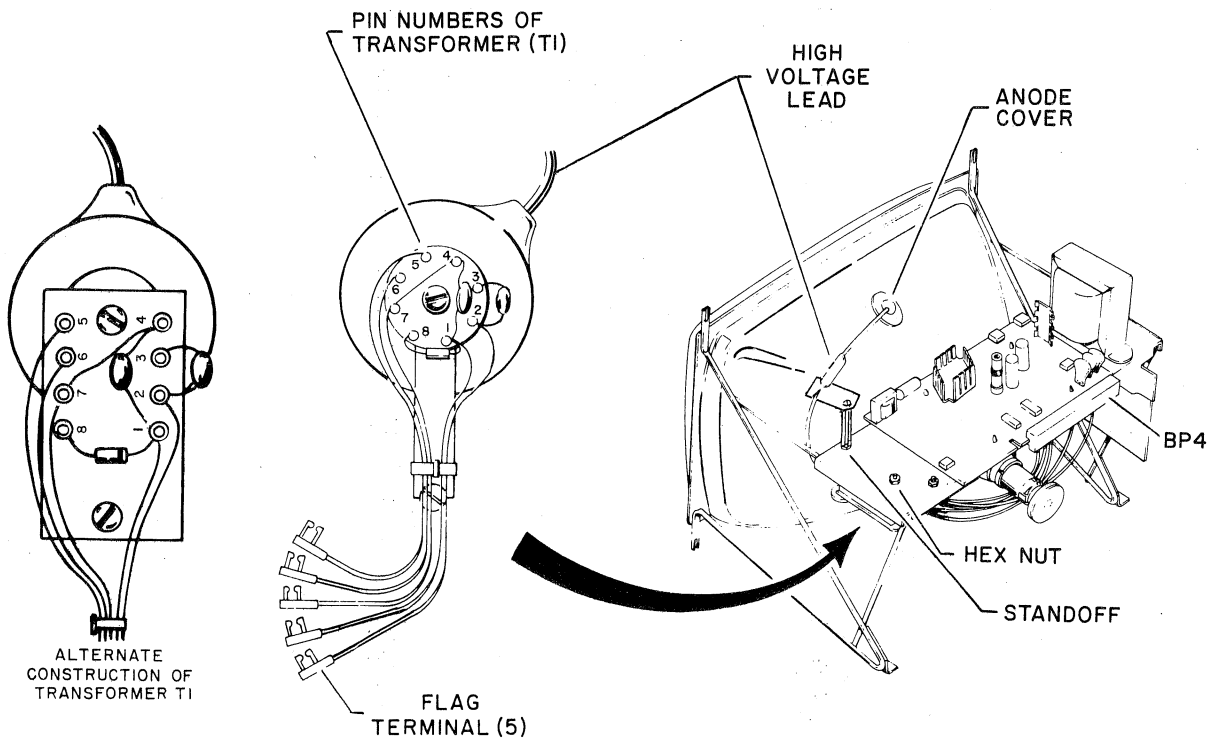
To remove high-voltage transformer assembly, perform the following:

- 1) Turn crt power off.
- 2) Disconnect ac power cord from site power outlet. High voltage normally bleeds off in less than a second when power is removed. However, due to the possibility of an open ground return, it is recommended that the following step be performed.

WARNING

Be careful not to scratch surface of cathode-ray tube. A scratch weakens the glass substantially and can cause the tube to implode.

- 3) Connect a heavily insulated wire to ground first and then, while carefully lifting rubber anode cover (figure CRT1), discharge surface under rubber cover (including anode terminal end) by sliding end of grounded wire under the rubber cover and into anode hole of cathode-ray tube.
- 4) Remove high-voltage lead by raising rubber cover and gently compressing spring loaded anode lead.
- 5) Remove the flag terminals on the five orange transformer wires from connector BP4. (To release each wire, insert the end of a paper clip into the top of the connector to compress flag terminal while gently pulling on wire from bottom of connector.)
- 6) Remove hex nut, standoff, and lockwashers (2) which hold transformer to chassis and carefully withdraw transformer and high-voltage lead from video module (figure CRT1).

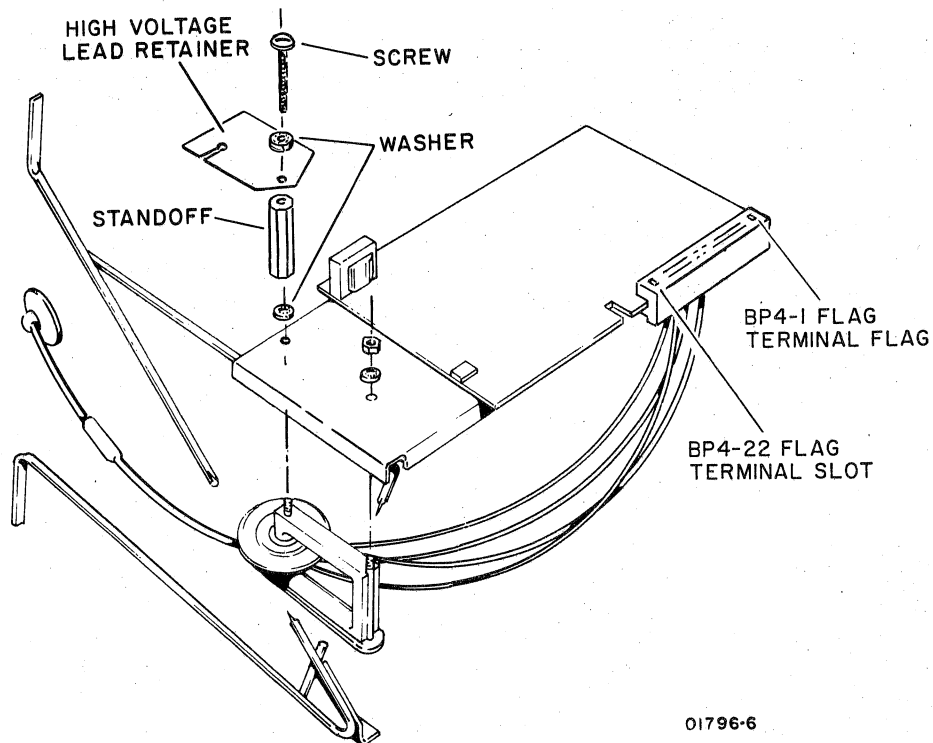


01796-2

Figure CRT1. High-Voltage Transformer Pin Numbers

To replace transformer assembly, perform the following:

- 7) Fasten transformer to chassis, using hex nut, standoff and lockwashers removed in step 6, as shown in figure CRT2.
- 8) Connect high-voltage lead to anode of cathode-ray tube.
- 9) Connect flag terminals on transformer wires to connector BP4: T1-1 to BP4-16, T1-2 to BP4-17, T1-5 to BP4-13, T1-6 to BP4-5, and T1-7 to BP4-14.



01796-6

Figure CRT2. High-Voltage Transformer Installation

Procedure CRT4 — Replacing Video Module +15-V dc Regulators

To remove +15-V dc regulators mounted on side of video module (figure CRT3) perform the following:

- 1) Turn crt power off and disconnect ac power cord from site power outlet.
- 2) Remove defective regulator by unscrewing screws that hold it to heat sink, grasp regulator firmly, and pull from socket.

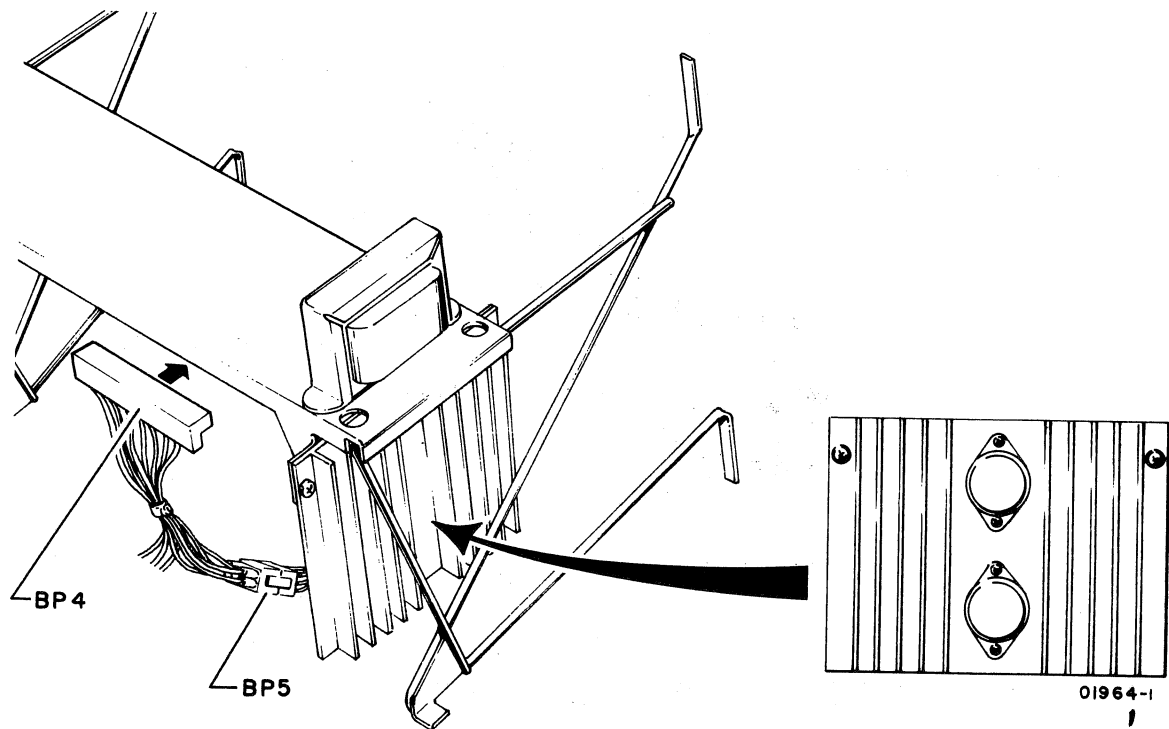


Figure CRT3. 15-Volt Regulator Assembly

To replace +15-V dc regulator, perform the following:

- 3) Clean surface of heat sink where regulator makes contact and add new insulating thermal compound (CDC part number 94657900) between heat sink washer and regulator.
- 4) Apply thermal compound to bottom of regulator and plug regulator in socket and fasten with screws.
- 5) Disconnect BP5 connector (figure CRT3), apply power, and test output of each regulator-to-ground for +15-V dc. Refer to figure CRT4. If output is not +15-V dc, replace regulator. If +15-V dc is found, go to step 6.
- 6) Replace BP5 connector (with power off) and then test regulators under load for +15-V dc (with power on) per steps 18 through 23 of procedure CRT13.
- 7) If voltage drops below +14.25-V dc with BP4 connected, replace crt monitor PC board (procedure CRT5).

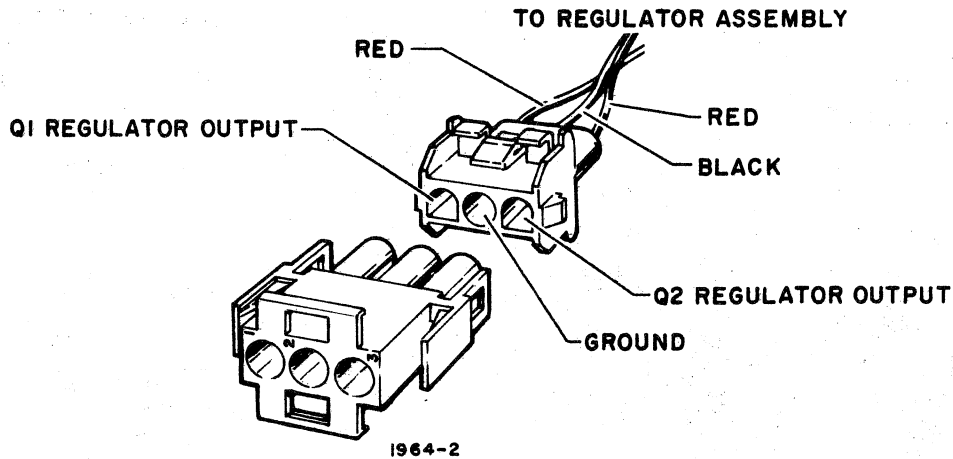


Figure CRT4. BP5 Connector Pins

Procedure CRT5 — Replacing CRT Monitor PC Board

To remove crt monitor PC board, refer to figure CRT5 and perform the following steps:

- 1) Turn crt power off and disconnect ac power cord from site power outlet.
- 2) Disconnect connector BP1.
- 3) Disconnect connector BP6 and BP7 from board.
- 4) Disconnect connector BP4.
- 5) Compress retainer clips on mounting pegs and release clips by pressing downward. Do for all four pegs. After releasing PC board from all four pegs, lift board to remove from video module.
- 6) Install new PC board by positioning board over mounting pegs (match holes on PC board with pegs) and gently pressing board down into position so that friction clips on pegs pass through holes sufficiently to lock board in place.
- 7) Replace connectors BP1, BP4, BP6, and BP7.
- 8) If video adjustments are necessary, refer to procedure CRT15.

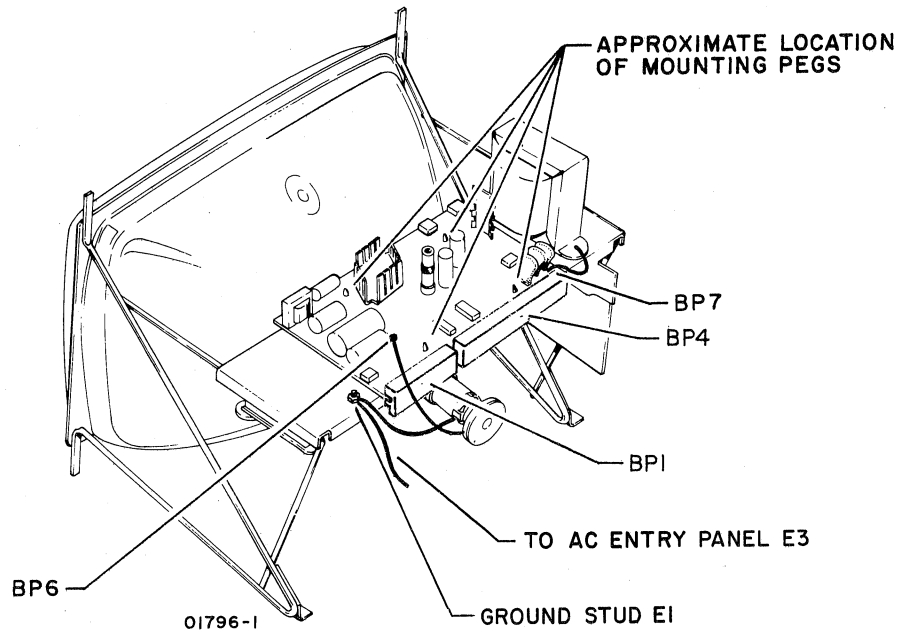


Figure CRT5. Video Module's CRT Monitor PC Board Connections

Procedure CRT6 — Removing Video Module

To remove video module, refer to figures CRT5, and CRT6 and perform the following:

- 1) Turn crt power off and disconnect ac power cord.
- 2) Disconnect connector BP1 and ground wires from E1.
- 3) Disconnect connector BP2 from J2 of capacitor board. BP2 goes to +15-V dc regulators mounted vertically on large heat sink on side of video module (figure CRT6).
- 4) Disconnect connector BP3 going to Intensity control on front panel.
- 5) Loosen two screws and remove four screws as shown in figure CRT7. Slots in bottom two frame brackets, which mount on bezel, allow just loosening those two screws.

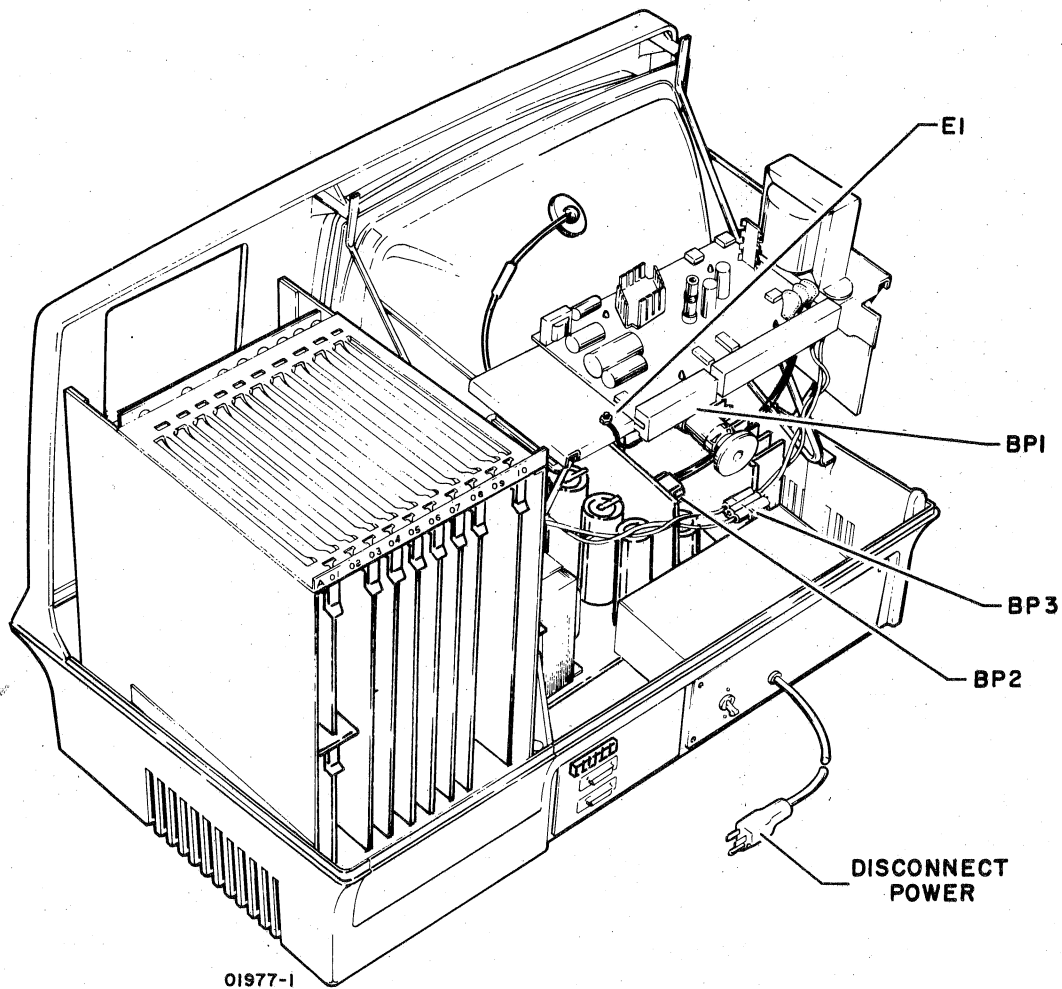


Figure CRT6. Video Module Connector Removal

WARNING

Use extreme care when handling TV module because rough handling can cause crt to implode with tremendous force resulting in severe injury. Do not nick or scratch glass or subject it to any undue pressure during replacement. When handling crt, always wear safety goggles and heavy gloves for protection.

- 6) Grasp video module on both sides of rod chassis and carefully withdraw entire module from cabinet (see figure CRT8). Check to see that neck of crt or mounting frame is not caught on cabling.

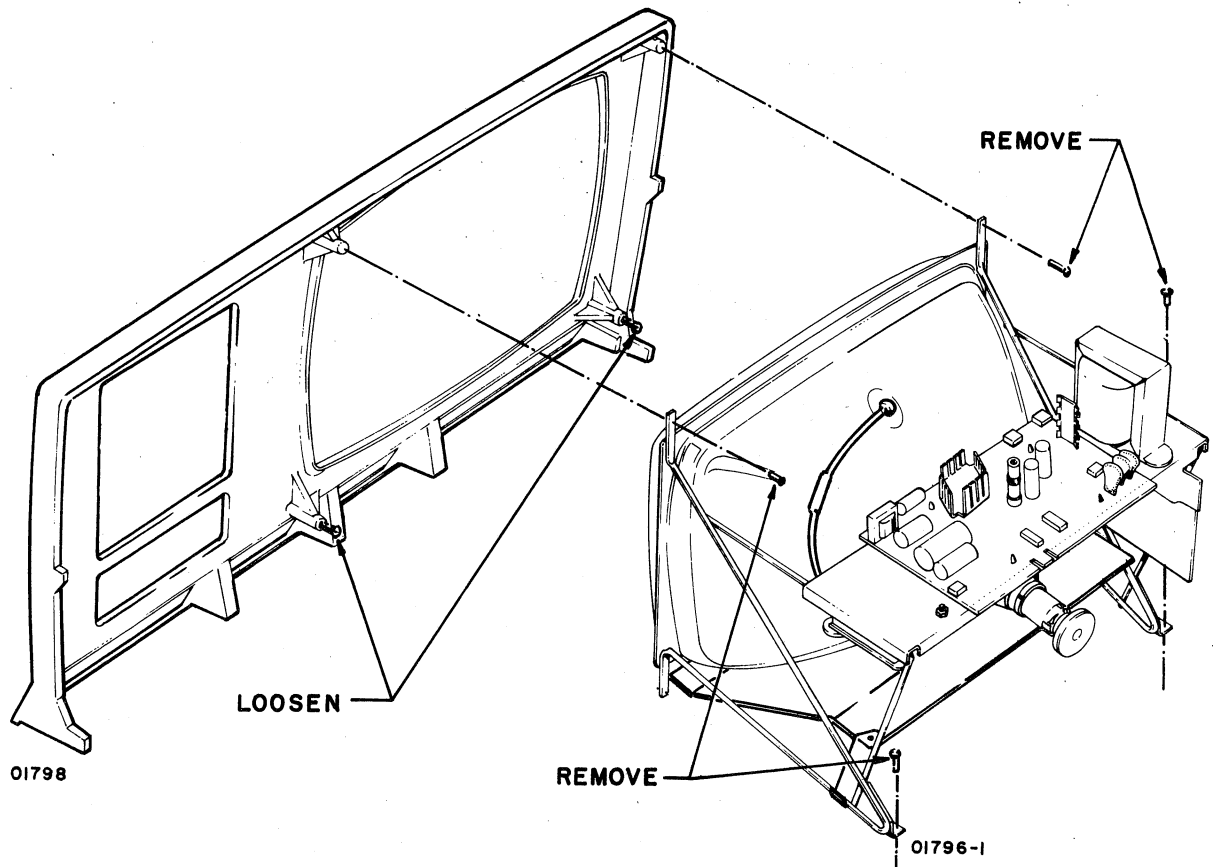


Figure CRT7. Video Module Mounting Screws

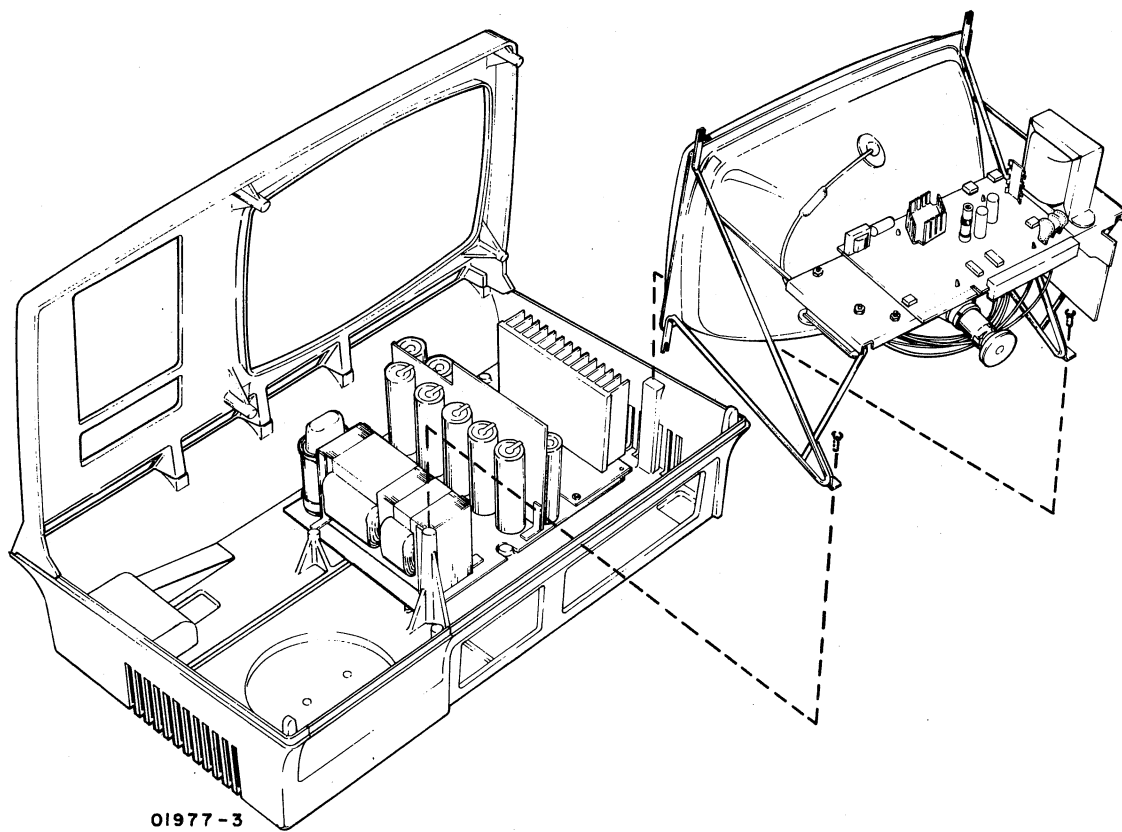


Figure CRT8. Video Module Removal

To install video module, perform the following:

- 7) Verify left-bottom and right-bottom screws are both partially screwed into mounting supports on bezel (figure CRT9).

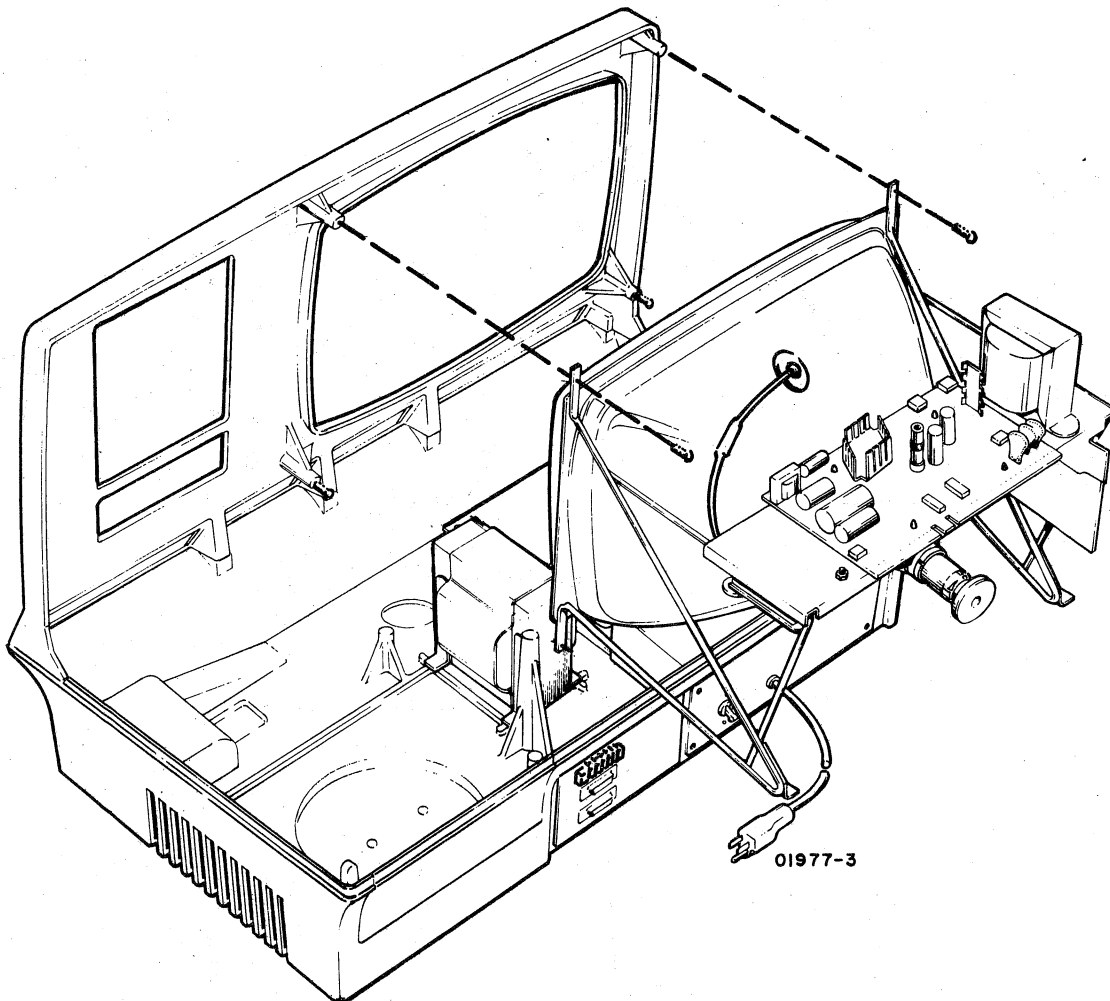


Figure CRT9. Video Module Installation

- 8) With video module in both hands, lower module into cabinet until slotted support in front fits over screws inserted partially in mounting (step 7).
- 9) Carefully steady module with one hand and insert top-left and top-right screws with other hand.
- 10) Tighten two top screws just snug. Do not overtighten.

- 11) Insert two cabinet screws which hold back of module in place. Do not tighten.
- 12) Tighten lower-left and lower-right screws just snug. Do not overtighten.
- 13) Tighten back two screws just snug. Do not overtighten.
- 14) Connect PC board BP1 connector and plug in connector BP2 from +15-V dc regulator to J2 of capacitor board. Also connect BP3 to INTENSITY control and three ground wires to E1.
- 15) Check that all other connectors (tube socket, BP4, BP5, and transformer lead into anode) are plugged in or attached correctly.

Procedure CRT7 — Replacing Cathode-Ray Tube

To replace crt, perform the following:

- 1) Turn power off and disconnect ac power cord from site power outlet.
- 2) Refer back to procedure CRT3, and perform step 3.
- 3) Remove video module from cabinet (see procedure CRT6, steps 1 through 6).
- 4) Loosen screw on rear leg of video shield that is beneath bell of crt and maneuver shield from rod chassis of video module.
- 5) Pull crt tube socket carefully from end of crt neck (see figure CRT10). Do not remove vinyl keyguide, which should be in position over end of tube for protection when socket is removed. During installation, keyguide assures that socket is correctly positioned.

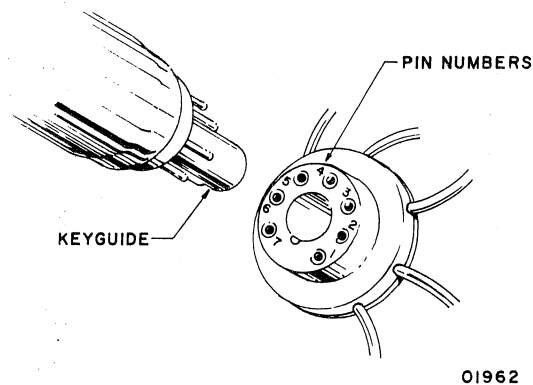


Figure CRT10. CRT Socket Removal

WARNING

Use extreme care when handling TV module because rough handling can cause crt to implode with tremendous force resulting in severe injury. Do not nick or scratch glass or subject it to any undue pressure during replacement. When handling crt, always wear safety goggles and heavy gloves for protection.

- 6) Using screwdriver, loosen screw in clamp which holds yoke in place (see figure CRT11).
- 7) After screw is loosened, gently slide yoke, ground clip, and shielding sleeve (which is between crt neck and yoke) back on crt neck to ensure it is loose enough for later removal.

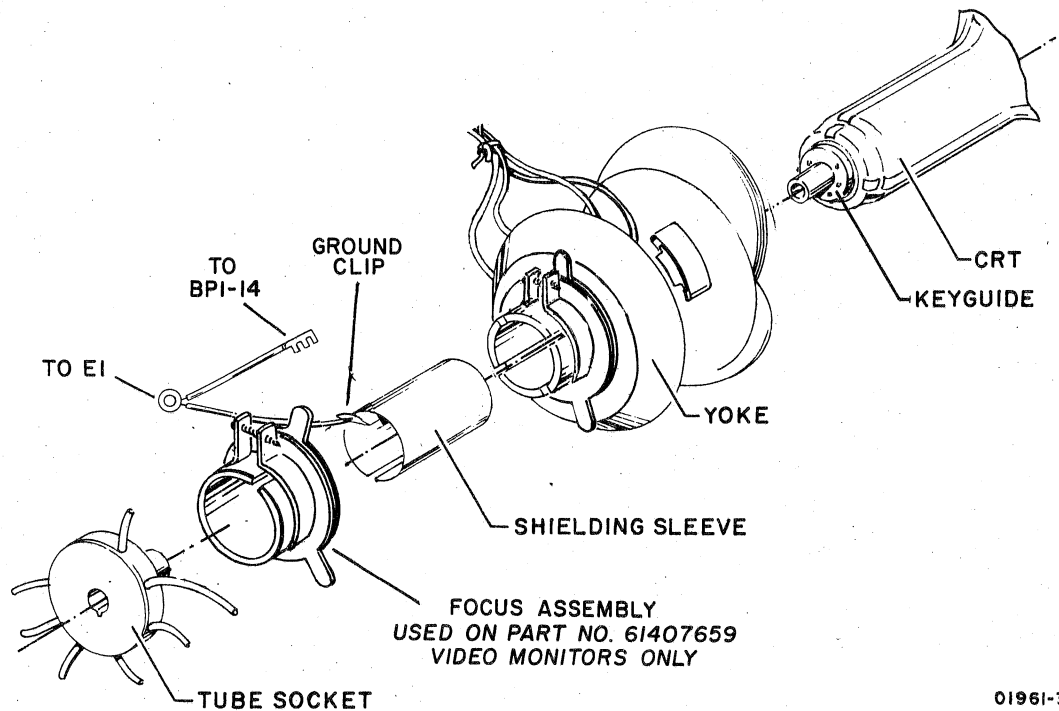


Figure CRT11. CRT Yoke Assembly

- 8) Remove four hex-head nuts which hold crt mounting plate to rod chassis of video module being careful that crt does not slip or fall when last screws are removed.

WARNING

Never allow crt to rest on or be supported by its neck.

- 9) Support crt neck with one hand and carefully remove yoke with other hand.
- 10) Withdraw crt carefully from rod chassis of video module. Place crt facedown on clean, soft cloth covering flat, stable surface (bench), with neck of crt pointing upward.
- 11) Remove replacement crt from shipping carton and place on clean, soft cloth covering flat, stable surface, facedown with neck pointing upward.
- 12) Place bad tube carefully into shipping carton and secure for shipment.
- 13) Without resting crt on its neck, position crt for mounting on video module chassis (neck is carefully inserted into chassis frame to vicinity of yoke).
- 14) Fasten crt mounting plate to rod chassis with four hex-head nuts.
- 15) Position shielding sleeve on neck of crt (figure CRT12) and slide yoke forward over sleeve until seated against tube.
- 16) Install focus assembly on neck of crt (over shielding sleeve) and butted up against yoke.*
- 17) Install crt ground clip under shielding sleeve and tighten the yoke and focus assembly clamps.* Do not overtighten.
- 18) Assure that keyguide is in place over pins on end of crt. Keyguide is illustrated in figures CRT10 and CRT11.
- 19) Carefully position tube socket over end of crt and gently push socket into place so pins enter socket without bending.
- 20) Reinstall video shield to rod chassis of video module and secure by tightening screw on rear leg of shield.
- 21) Install video module into cabinet. Refer to steps 7 through 15, procedure CRT6.
- 22) Before power is applied to device, insert high-voltage lead from high-voltage transformer into crt anode.
- 23) Perform monitor adjustments, procedure CRT8.

*Focus assembly applies to part number 61407659 video monitors only.

Procedure CRT8 — Monitor Adjustments

To adjust the crt monitor for correct video display, perform the following steps:

- 1) If this alignment is the result of yoke having been removed or a new crt installed, check that high-voltage lead was reinstalled, PC board connectors are reconnected, and plug BP2 from +15-V dc regulators to power supply is attached.
- 2) Place switch 0 on the maintenance panel to the right (logical 1 position) to disable a downline load and to cause quicklook tests 001 through 005 to be performed.*
- 3) Turn crt power on. Wait 30 seconds.

WARNING

With power applied, high voltage is present at the high voltage transformer and crt anode lead. Exercise caution when performing adjustments.

- 4) In the case of the Tickeron application of the display terminal, a full display of D's should appear on the crt at the completion of quicklook test 005. If display does not appear:
 - a) Turn INTENSITY knob clockwise until raster appears.
 - b) If no raster, go to sheet 1, table CRT1, DDLT for Display Terminal.
 - c) Increase video gain by turning contrast control (figure CRT13) fully clockwise. Characters should appear on display.
 - d) If no video appears, go to sheet 1 of table CRT1, DDLT for Display Terminal.
 - e) When characters can be made to appear on display, proceed with adjustment steps.
- 5) Adjust INTENSITY control until raster is just invisible in normal room lighting but dimly visible in the dark (shaded with hands).

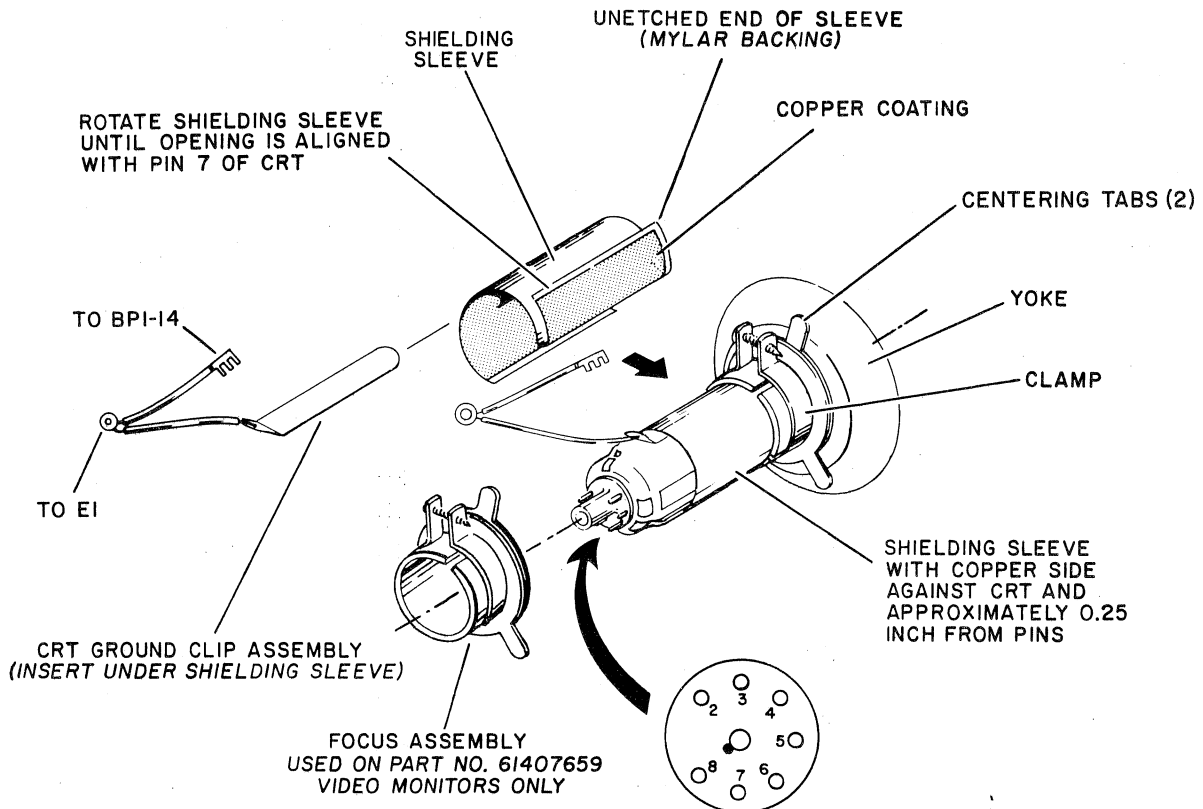
* For the Tickeron application of the display terminal, this action done in conjunction with a power-on is required to disable a downline load (autoload), and to cause a full display of a character to appear on the crt. For an application other than Tickeron, different action may be required to accomplish this.

Tilt Adjustments:

- 6) Enter a full display of D characters.
- 7) Check if full display of D characters is tilted on screen. If tilted do steps 7a, 7b, 7c, 7d.
 - a) Turn power off and loosen clamp screw (nearest crt) which holds yoke in position on neck of crt.
 - b) Reapply power and observe full display of D characters.
 - c) Rotate yoke both ways until the display characters are no longer tilted.
 - d) Turn power off and tighten yoke clamp. Do not overtighten.

Centering Adjustment:

- 8) Check if full display of D characters is centered correctly on the screen. If not, adjust the yoke centering tabs (figure CRT12) until display is centered. Initial setting of the centering tabs should be 180° apart.



01961-5

Figure CRT12. Shielding Sleeve Positioning

Linearity Adjustments:

- 9) Observe the D characters on the screen. Are D characters in leftmost column and rightmost column of sufficient vertical height (similar to D characters in center of screen)? If not, adjust the vertical linearity potentiometer (figure CRT13). Are D characters on left side of screen distorted while right side is not? If so, adjust horizontal linearity sleeve (shielding sleeve) per step 10.
- 10) Check that shielding sleeve on neck of crt is in place approximately as shown in figure CRT12. If shielding sleeve is not correctly positioned, left side of screen is distorted while right side is not. Pushing shielding sleeve toward the yoke has the effect of distorting left portion of screen; if pushed too far forward, the left hand side of screen is blacked out.

NOTE

Horizontal linearity sleeve adjustment affects the horizontal width. Refer to Size Adjustments (step 14) and perform both the horizontal linearity and horizontal size adjustments in iterative fashion.

- 11) After yoke and shielding sleeve are correctly adjusted and crt ground clip is under sleeve, carefully, without using force, tighten clamp screws on yoke and focus assembly until clamps are snug.*

Size Adjustments:

- 12) Enter a full display of D characters.
- 13) Adjust vertical height potentiometer (figure CRT13) until rectangle of display characters is 5.25 ± 0.1 inches in height.
- 14) Adjust horizontal width coil (figure CRT13) to obtain a display 8.0 ± 0.1 inches wide. Use a 3/32-inch nonmetallic hex driver.

Focus Adjustments:

- 15) Set the contrast control to its maximum clockwise position (figure CRT13).
- 16) Enter a full display of D characters.
- 17) Adjust the front panel INTENSITY control so that the raster (background scan lines) just disappear and a normal viewing intensity is obtained.

*Focus assembly applies to part number 61407659 video monitors only.

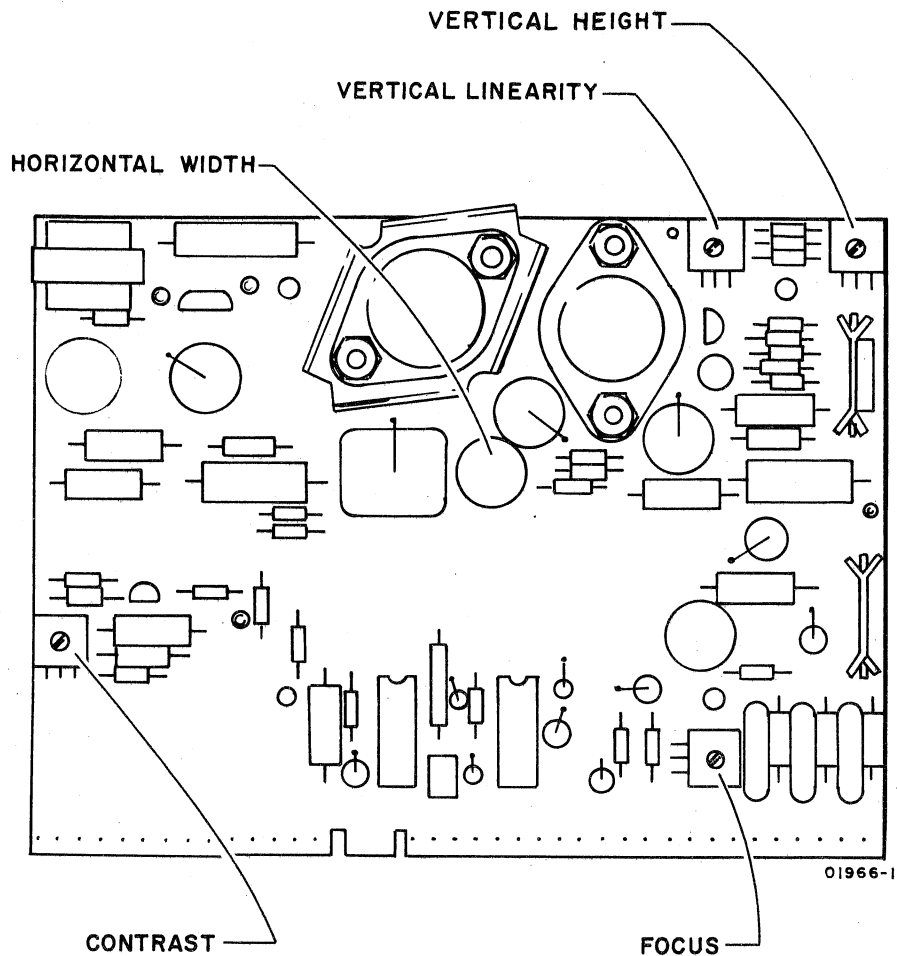
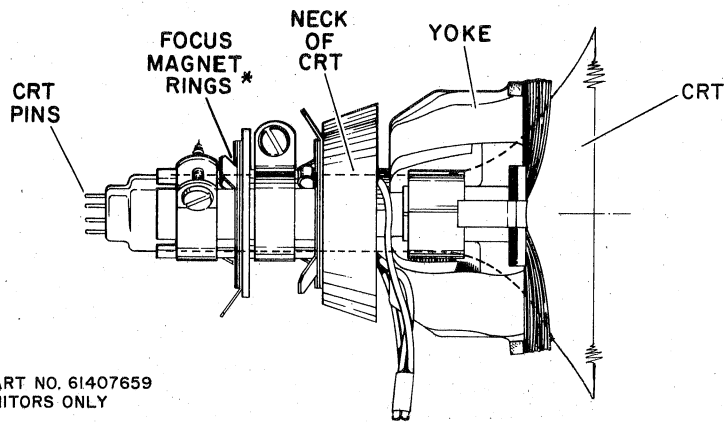


Figure CRT13. Monitor PC Board Adjustments

- 18) Adjust the focus control (figure CRT13) to obtain the best resolution of characters throughout the entire display.
- 19) Adjust the focus magnet rings* (figure CRT14) to reduce to a minimum any tails or halos visible on the characters. Especially those characters located in the corners of the display.
- 20) If necessary, repeat steps 17, 18, and 19 to obtain best possible character resolution over entire screen. Particular characteristics to be observed are:
 - Dot size and shape
 - Spacing between vertical strokes
 - Character separation
 - Tails or smearing

*Focus ring assembly applies to part number 61407659 video monitors only.



*USED ON PART NO. 61407659
VIDEO MONITORS ONLY

02576-1

Figure CRT14. Focus Magnet Rings

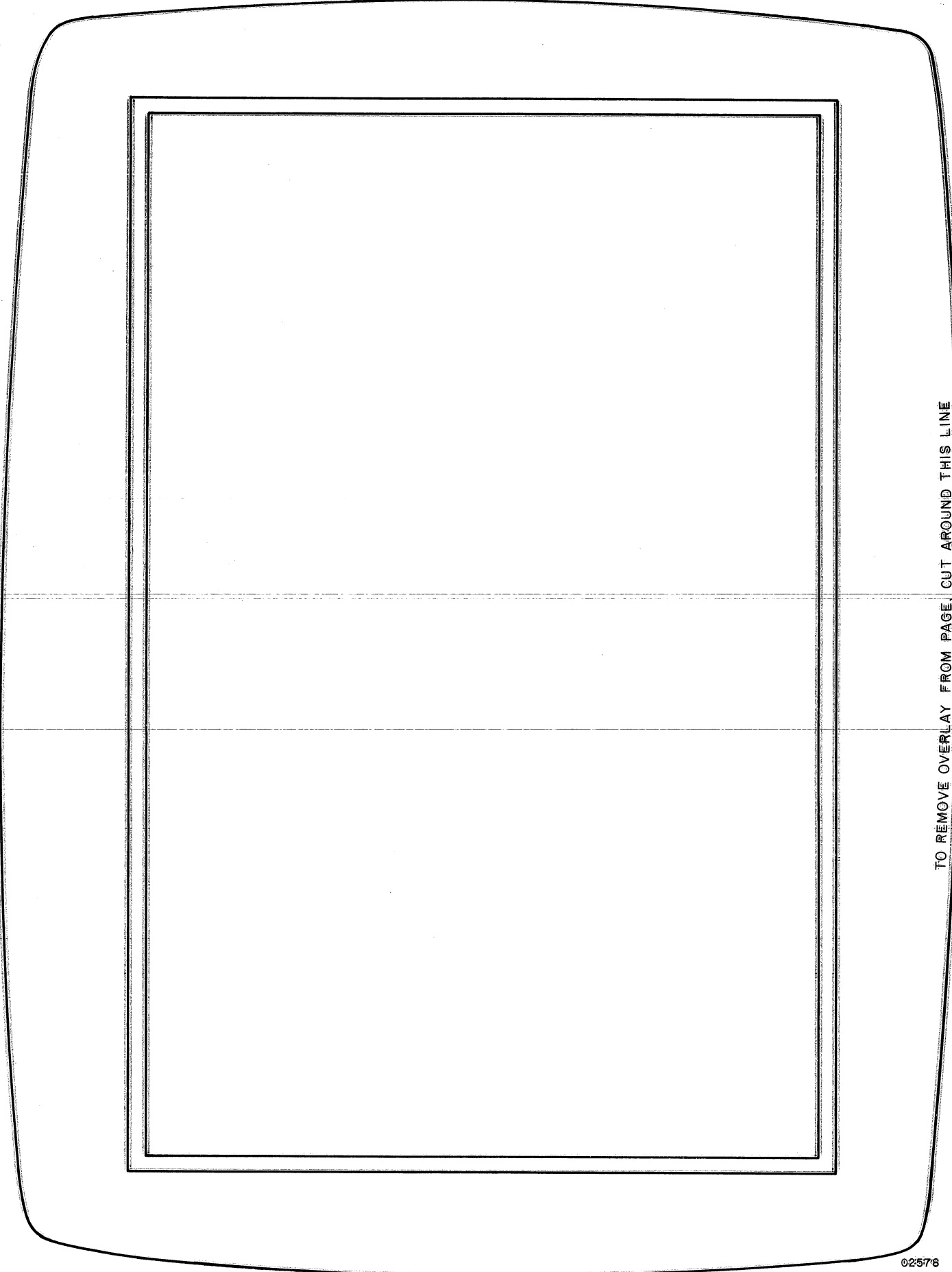
Geometric Distortion Checks and Adjustments:

In the following steps, the rectangle of displayed characters is checked for barrel/pincushion distortion. If the check indicates that correction is required, the following items will be needed:

<u>Items</u>	<u>Number required</u>
Wooden or plastic rod, preferably 1/4-inch in diameter and 12-inches long	1
Masking tape, preferably 1/4-inch wide	—
Adhesive, part number 51004063 (tube)	—
2.0-gauss (yellow) correction magnet, part number 51917051	As required
3.0-gauss (silver) correction magnet, part number 51917052	As required
4.0-gauss (red) correction magnet, part number 51917053	As required
5.7-gauss (green) correction magnet, part number 51917054	As required

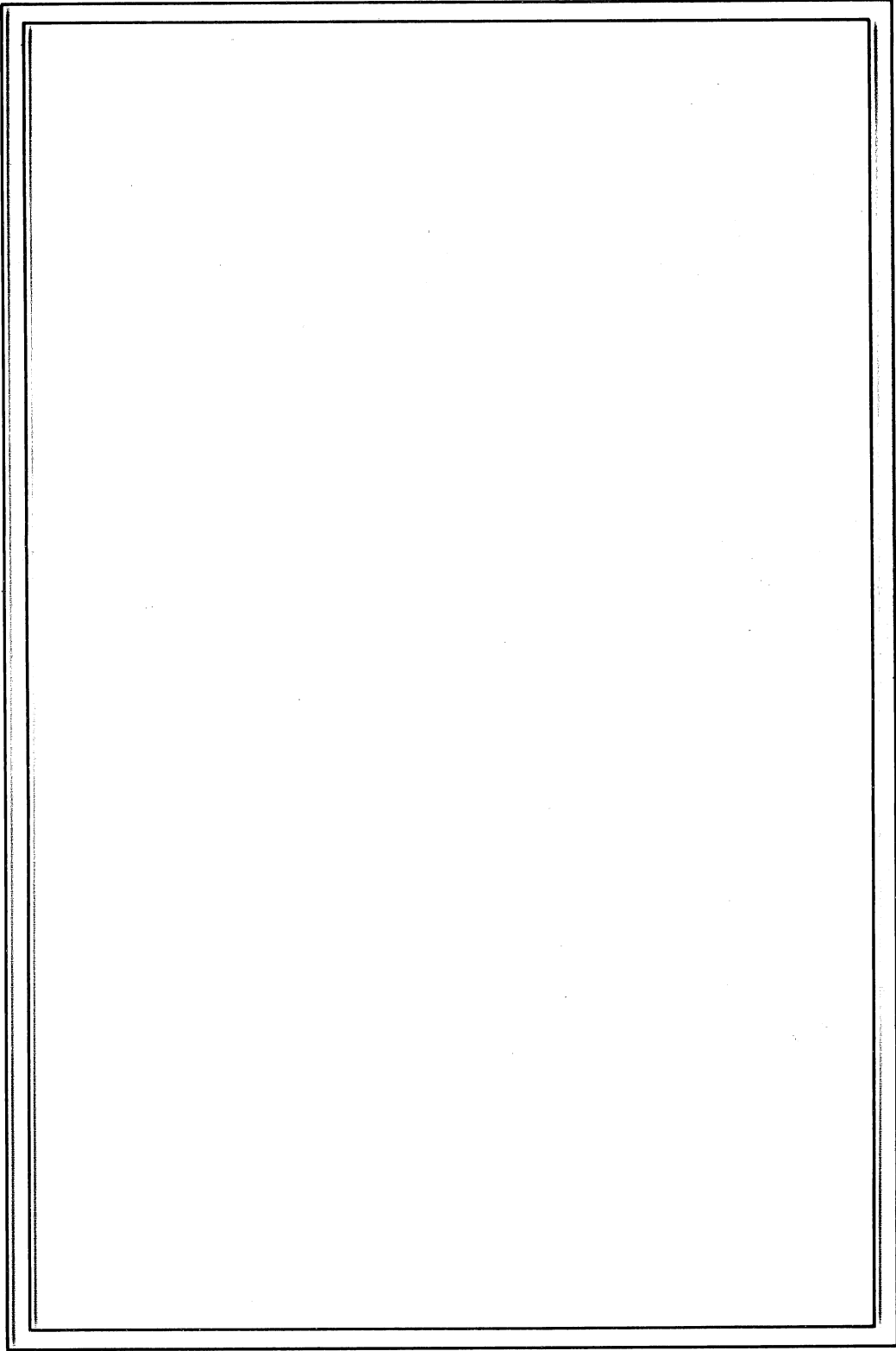
21) Enter a full display of D characters.

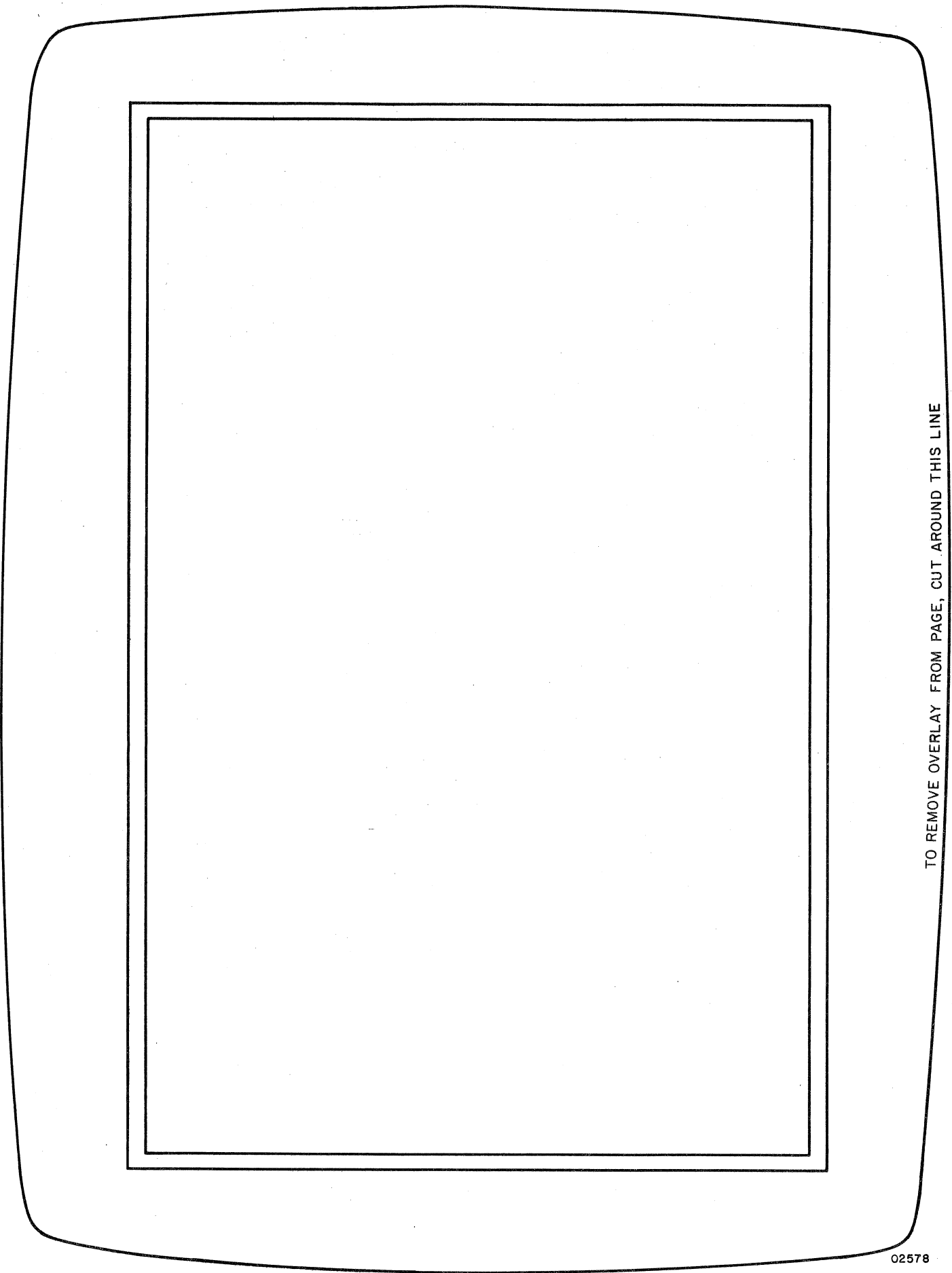
22) Remove figure CRT15 (plastic overlay) from manual and cut as noted on the figure to remove the sheet. If done properly, the overlay left after cutting, will fit within the crt bezel and lay flatly on the screen.



TO REMOVE OVERLAY FROM PAGE, CUT AROUND THIS LINE

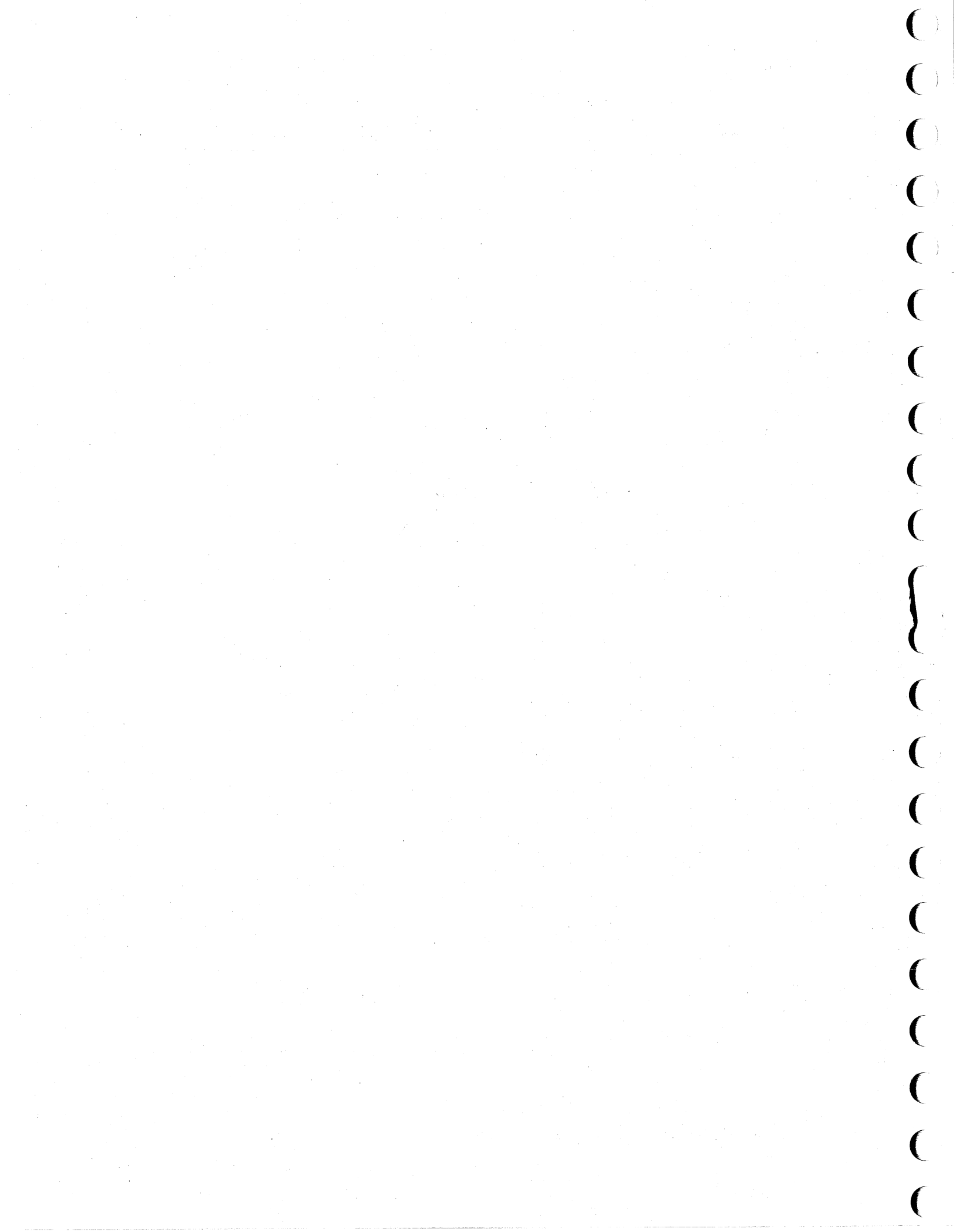
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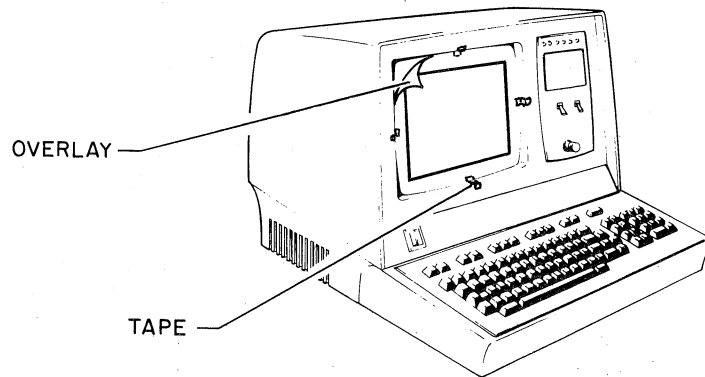


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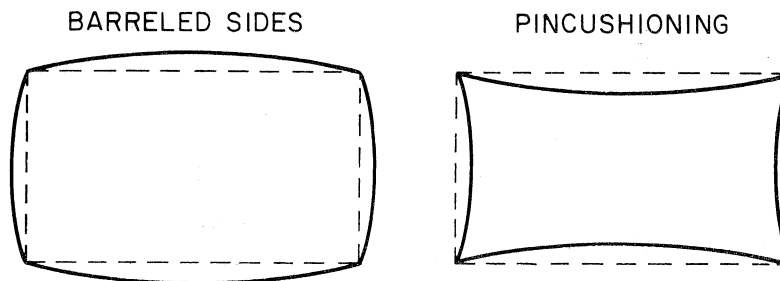
- 23) Using masking tape, fasten the overlay over the screen (figure CRT16).
- 24) Observe the display to see if perimeter of displayed characters protrude either inside or outside the double line of the overlay. Ideally, the perimeter should align, within the double lines of the overlay. If a horizontal or vertical edge deviates more than ± 0.05 of an inch from this ideal rectangle, the display is considered to be geometrically distorted and correction through performance of the following steps is required. Otherwise proceed to step 32.



02097

Figure CRT16. Applying Plastic Overlay to CRT Screen

- 25) By referring to figure CRT17 and the display, determine whether the perimeter edge requiring correction is caused by a barrel or a pincushion distortion.
- 26) Using 1/4-inch wide masking tape, fasten a 2.0-gauss (yellow) correction magnet (part number 51917051) to the end of wooden or plastic rod. In doing this, position the magnet so its yellow colored end is pointed away from side of the rod.



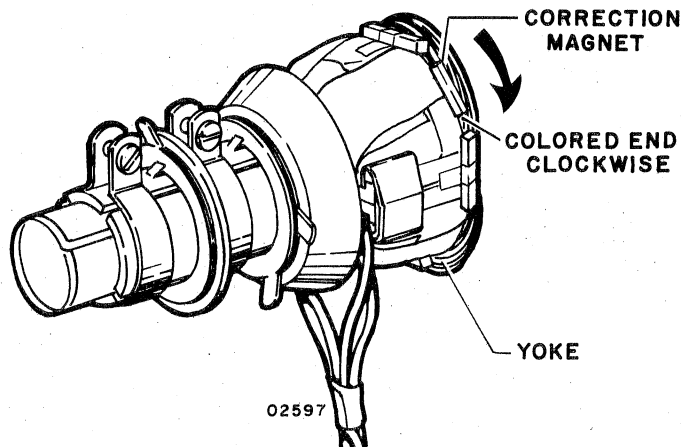
DASHED LINES SHOW NORMAL
UNDISTORTED SHAPE

Figure CRT17. Identifying Geometric Distortion

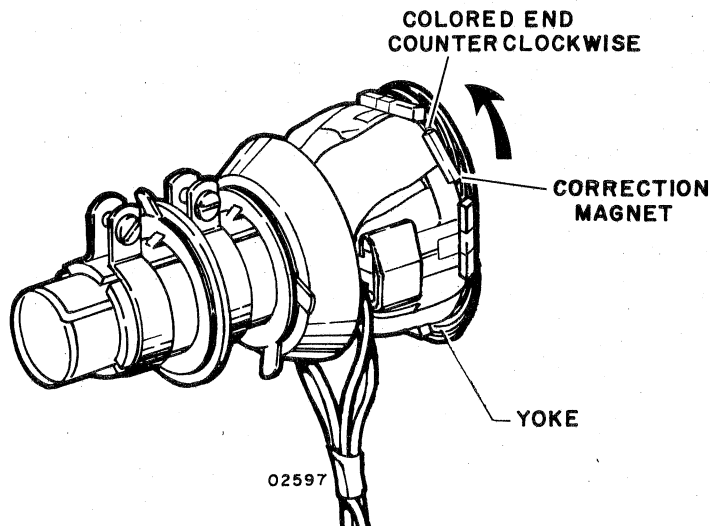
WARNING

Keep magnet away from high-voltage transformer and crt anode lead.

- 27) From the rear of the display terminal maneuver the magnet on the rod along and up-down the side of the crt yoke coil which corresponds to the perimeter edge requiring correction, and monitor the effect on the display. While doing this, attention must be given as to what direction the colored end of the magnet is pointed. A magnet with its colored end pointed clockwise has the effect of pulling the edge out. A magnet with its colored end pointed counterclockwise has the effect of pushing the edge in. Refer to figure CRT18.



MAGNET ADDED TO YOKE TO CORRECT PINCUSHIONING (SEE NOTE)



MAGNET ADDED TO YOKE TO CORRECT BARRELING (SEE NOTE)

NOTE: IF BOTH BARREL AND PINCUSHION DISTORTION WERE BEING CORRECTED, THE COLORED END OF THE CORRECTION MAGNETS WOULD BE PLACED ON THEIR RESPECTIVE SIDE OF THE YOKE AND THE RESULT WOULD BE A MIXTURE OF THE TWO EXAMPLES SHOWN.

Figure CRT18. Typical Positioning of Correction Magnets on Yoke

- 28) If the perimeter edge requiring correction can not be straightened by the action taken in step 27, perform the following as applicable and repeat the correction.
 - a) If the 2.0-gauss magnet causes an overreaction, break the magnet in half.
 - b) If the 2.0-gauss magnet causes no, or not enough, reaction, use a magnet with more strength (such as 3.0-gauss, silver, correction magnet). In some cases, a combination of two magnets may be required.
- 29) When the desired correction is obtained, note the magnet position and turn crt power off.
- 30) Unfasten magnet from rod and use adhesive (part number 51004063) to secure the magnet to the yoke coil where correction was achieved. Make sure that the colored end of magnet is pointed in the proper direction. It may be necessary to use masking tape to hold magnet in place during adhesive cure time.
- 31) If required, correct other perimeter edges in the same manner. Remove masking tape, if used, from magnets when adhesive has cured. Remove plastic overlay from crt screen and save it for possible future use.
- 32) Return maintenance panel switch 0 back to the left (logical 0 position).

Procedure CRT9 — Replacing Yoke on CRT

To remove yoke from neck of crt, perform the following:

- 1) Turn crt power off.
- 2) Disconnect ac power cord from site power outlet.

WARNING

Use extreme care when handling TV module because rough handling can cause crt to implode with tremendous force resulting in severe injury. Do not nick or scratch glass or subject it to any undue pressure during replacement. When handling crt, always wear safety goggles and heavy gloves for protection.

- 3) Connect heavily insulated wire to ground first and then, while carefully lifting rubber anode cover, discharge surface under rubber cover (including anode terminal end) by sliding end of grounded wire under rubber cover and into anode hole of cathode-ray tube.
- 4) Pull connector BP4 off edge of crt monitor PC board. Connector BP4 is largest connector with wires leading to yoke. Also disconnect ground wire, connected to crt ground clip assembly, from E1.
- 5) Disconnect flag terminals 9, 10, 18, and 19 from BP4 connector (four wires leading to yoke) by inserting small end of paper clip into top of connector in space available between flag terminal and insulation (see figure CRT19) and then pulling out wire gently from bottom of connector. (Flag terminal end has a wedge-type spring clip which, when released by paper clip, permits flag terminal to be withdrawn with wire from connector.)
- 6) Pull crt tube socket carefully off end of crt (figure CRT20). Do not remove vinyl keyguide.

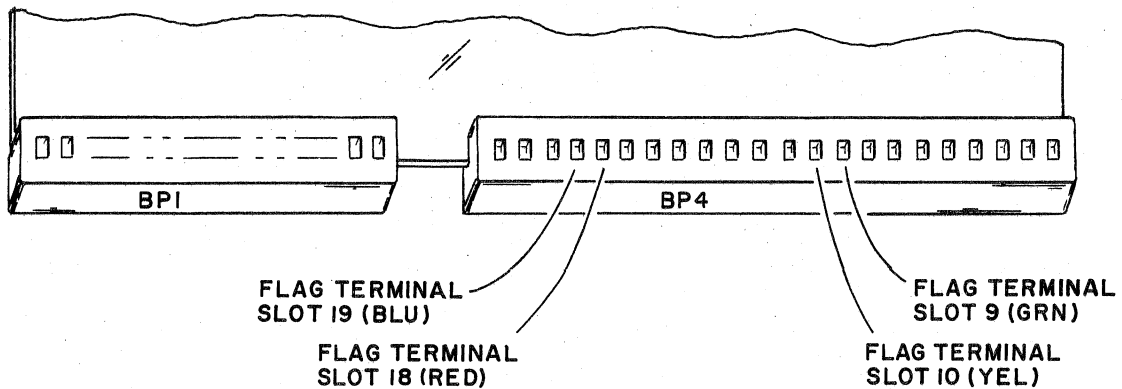


Figure CRT19. Removing Flag Terminals

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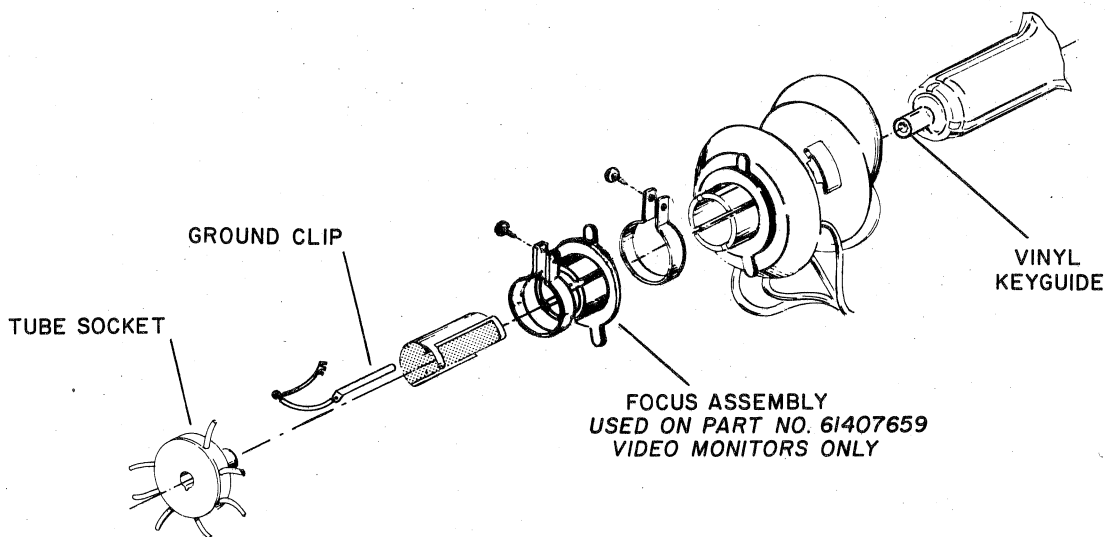


Figure CRT20. CRT Tube-Socket Removal

01961-6

- 7) Loosen clamps which hold yoke and focus assembly in place with screwdriver (figure CRT21).*
- 8) After clamps are loosened, gently slide crt ground clip back until yoke and focus assembly can be removed from device.*

WARNING

Never tighten clamp which holds yoke on neck of crt more than enough to hold yoke in place. If tightened excessively, it is possible to break neck of crt. Wear protective goggles and heavy gloves for protection.

To install yoke perform the following:

- 9) Position sleeve approximately as shown in figure CRT22, but with opening in sleeve facing downward.
- 10) Position yoke over sleeve with wires downward. Red and green wires on the left and yellow and blue on the right as viewed from rear of crt.

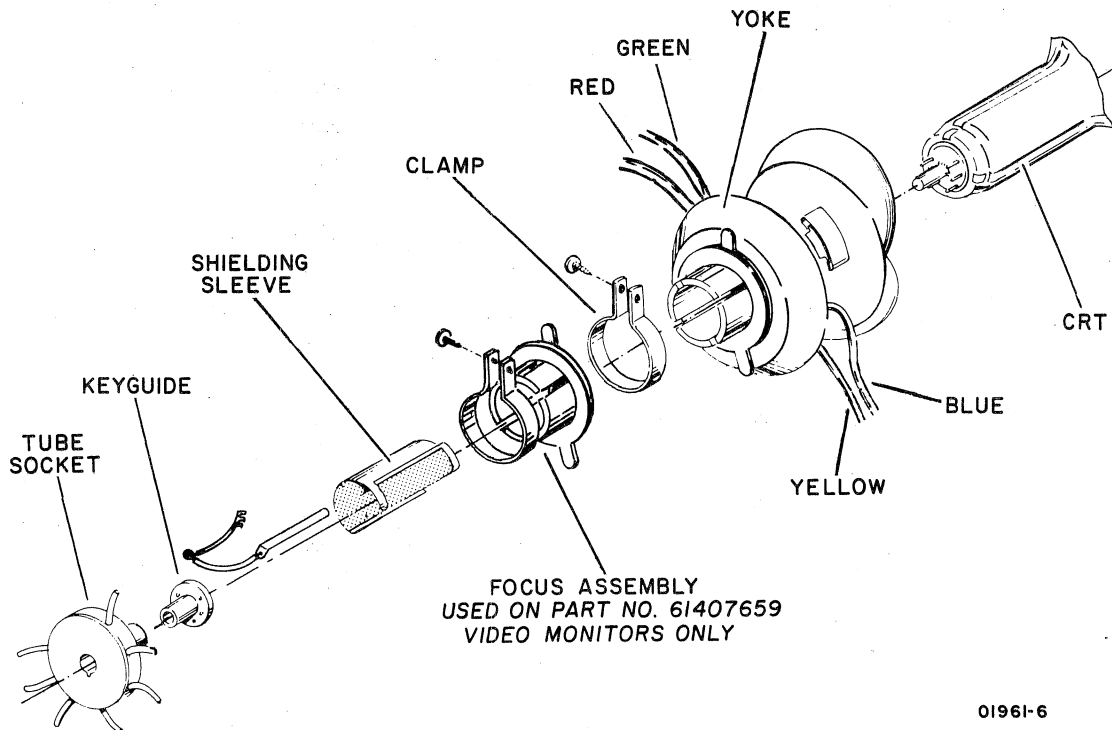
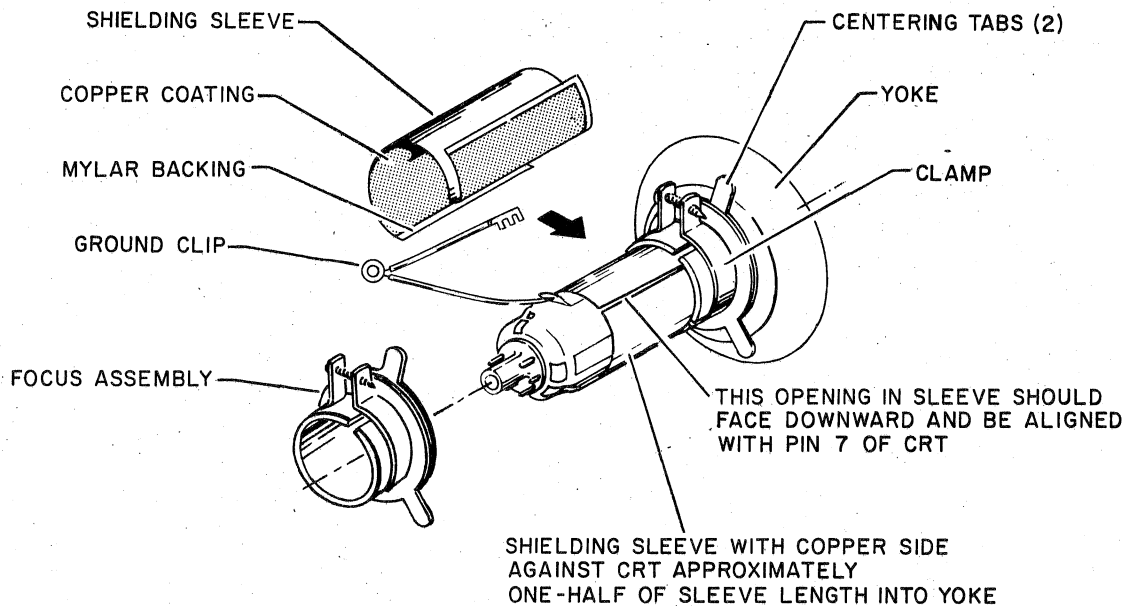


Figure CRT21. Yoke Assembly

* Focus assembly applies to part number 61407659 video monitor only.



01961-6

Figure CRT22. Positioning Shielding Sleeve

- 11) Position focus assembly over sleeve and butt up against yoke assembly.*
- 12) Insert crt ground clip underneath sleeve.
- 13) Tighten yoke and focus assembly clamps.* Do not overtighten.
- 14) Plug crt tube socket carefully on pins of crt, making sure guide matches slot in socket.
- 15) Insert flag terminals into BP4 connector:
 - a) Push green wire terminal into slot (pin location 9) until wedge-like clip locks itself in place.
 - b) Push yellow wire into slot 10.
 - c) Push red wire into slot 18.
 - d) Push blue wire into slot 19.
- 16) Plug BP4 connector onto edge of crt monitor PC board and reconnect ground wire from ground clip to E1.

* Focus assembly applies to part number 61407659 monitors only.

- 17) Verify that rear panel circuit breaker is in the Down (off) position and plug ac power cord into site power outlet.
- 18) Place maintenance panel switch 0 to the right (logical 1 position) to disable a downline load and to cause quicklook tests 001 through 005 to be performed.* Turn power on.

In the case of the Ticketron application of the display terminal, a full display of D's should appear on the crt at the completion of quicklook test 005. If display does not appear, go to sheet 1 of table CRT1, DDLT for Display Terminal. After display appears, go to step 19.

- 19) Observe the displayed characters and perform the applicable monitor adjustments (procedure CRT8) to obtain acceptable display quality.

WARNING

Do not overtighten clamps on crt.

- 20) Upon completion of monitor adjustments, tighten screws on crt clamps so yoke and focus assembly cannot move.**
- 21) Return maintenance panel switch 0 back to the left (logical 0 position).

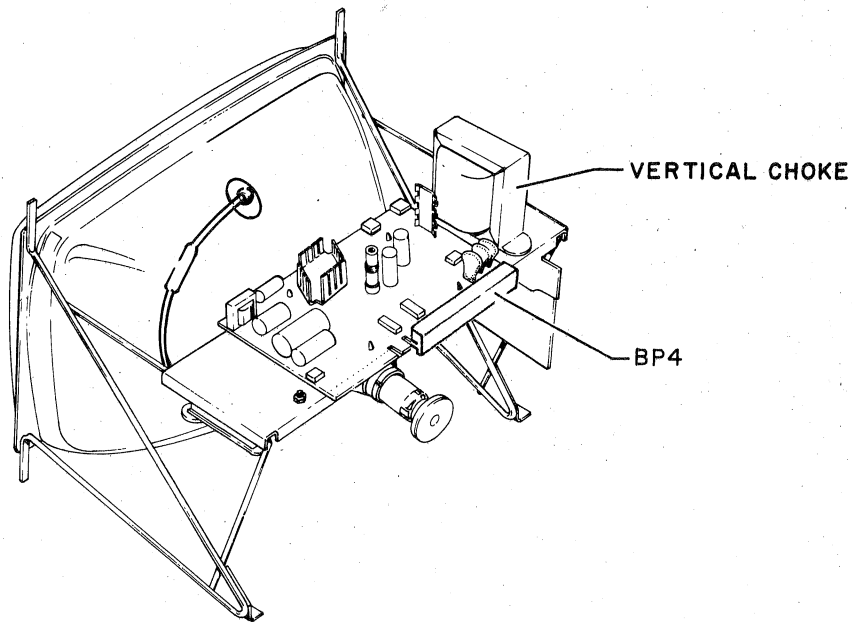
Procedure CRT10 — Replacing Vertical Choke

To replace vertical choke (figure CRT23), perform the following:

- 1) Turn crt power off and disconnect ac power cord from site power outlet.
- 2) Disconnect BP4 (longest) connector on crt monitor printed-circuit board. BP4 connector is on printed-circuit board next to vertical choke and has two flag terminals (pins 6 and 7) attached to wires leading to vertical choke.

* For the Ticketron application of the display terminal, this action done in conjunction with a power-on is required to disable a downline load (autoload) and to cause a full display of a character to appear on the crt. For an application other than Ticketron, different action may be required to accomplish this.

** Focus assembly applies to part number 61407659 video monitors only.



1796-1

Figure CRT23. Vertical Choke

- 3) Remove flag terminals 6 and 7 by inserting end of a small paper clip in space provided between installed flag terminal and connector insulation. Paper clip releases wedge-like friction lock on terminal and permits entire terminal to be removed out from bottom of connector.
- 4) Remove two hex nuts holding vertical choke to chassis.
- 5) Lift grounding wire from rear mounting screw, but do not remove from printed-circuit board.
- 6) Lift vertical choke from chassis.
- 7) Position new choke in place over two mounting screws so two wires are on side nearest printed-circuit board.
- 8) Connect grounding wire to rear mounting screw and fasten with hex nut.
- 9) Fasten other hex nut to front screw.
- 10) Insert flag terminals into slots 6 and 7 of BP4 connector until wires are locked and secured.
- 11) Connect BP4 connector to crt monitor printed-circuit board.

Procedure CRT11 — High +5-V Voltage Check

To determine if the input power circuit breaker is tripping because of a high +5-V dc condition, perform the following steps:

- 1) With input ac power off (input power circuit breaker in Down position), connect a voltmeter to measure +5 V dc at the voltage regulator in chassis location B01. Refer to figure CRT24.
- 2) Place the input power circuit breaker in the on (Up) position and observe voltmeter for a high +5-V reading.

The delay time between sensing an overvoltage condition and tripping the breaker should allow enough time to obtain this voltage reading. If unable to determine if the voltage is +5.5 V or greater in this manner back off the +5-V adjust potentiometer (counterclockwise) and recheck.

- 3) If voltage was high, attempt to readjust the regulator for correct +5-V dc tolerance per procedure CRT12. Replace the regulator if faulty per procedure CRT18.
- 4) For replacement of the input power circuit breaker refer to procedure CRT16.

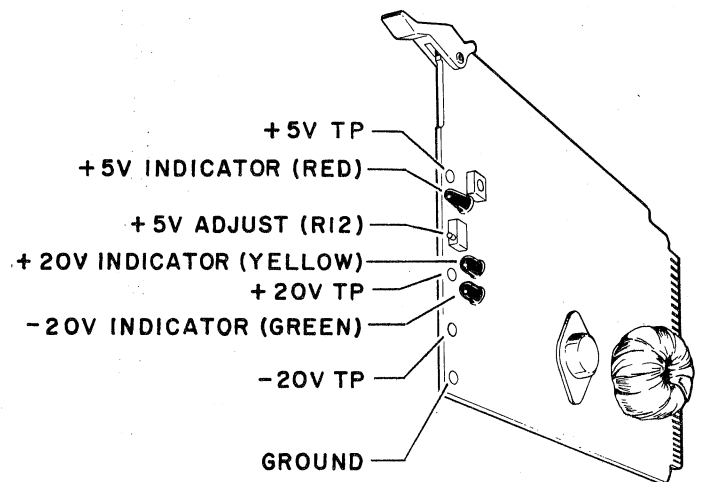


Figure CRT24. +5-Volt Regulator Test Points

Procedure CRT12 — +5-V Voltage Regulator Adjustments

To adjust the +5-volt regulator in the logic chassis, perform the following steps.

- 1) Set voltmeter to read +5 V dc.
- 2) With power applied, measure between the ground and +5-V test points on the voltage regulator in chassis location B01. Refer to figure CRT24.
- 3) Adjust the potentiometer at the board edge (R12) for a voltage of $+5 \pm 0.25$ volts.
 - a) The regulator in chassis location A01 of CC617-A model is a slave of regulator B01 and does not require the +5-V adjustment.
 - b) If the +5-V output rises to 5.6 V or greater, a zener diode will conduct and issue a signal to the power supply which will trip the input power circuit breaker and shut down all power to the display.

Procedure CRT13 — Measuring Voltages at CRT Monitor PC Board

To measure +465 V dc, perform the following:

- 1) Set voltmeter to measure +465 V dc.
- 2) Remove cabinet hood (two screws at rear of cabinet). See procedure CRT2.
- 3) Turn crt power on.
- 4) Connect black (-) lead from voltmeter to chassis ground.

WARNING

Do not touch anything with hands and use only one hand at a time to connect leads to test points.

5) Connect red (+) lead to resistor R8A, see figure CRT25.

6) Check that voltmeter indicates $+465 \text{ V dc} \pm 47 \text{ V dc}$.

7) If within tolerances, go to step 8; if not, go to sheet 4 of table CRT1, DDLT for Display Terminal.

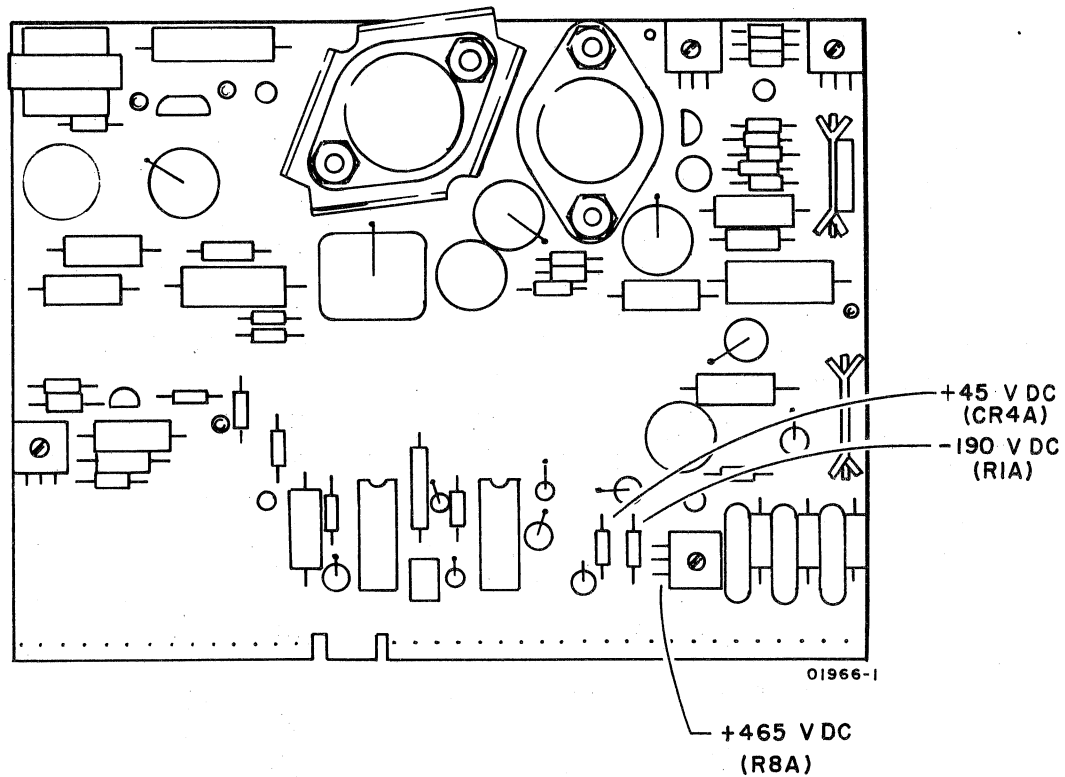


Figure CRT25. Test Points for $+465$, -190 , and $+45 \text{ V dc}$

To measure -190 V dc, perform the following:

- 8) Set voltmeter to measure -190 V dc.
- 9) Connect positive (+) lead to chassis ground. If voltmeter has separate switch for selecting ~~-dc~~, reverse polarity, such as Simpson Model 250, connect common (black lead) to chassis ground and select -dc on meter.
- 10) Connect negative (-) lead to R1A (figure CRT25).
- 11) Check that voltmeter indicates -190 V dc \pm 25 V dc.
- 12) If reading is within tolerances, go to step 13; otherwise, go to sheet 4 of table CRT1, DDLT for Display Terminal.

To measure +45 V dc, perform the following:

- 13) Set voltmeter to measure +45 V dc.
- 14) Connect black lead to chassis ground.
- 15) Connect red(+) lead to diode CR4A (figure CRT25).
- 16) Check that meter indicates +45 V dc \pm 4.5 V dc.
- 17) If within tolerances, go to step 18; if not go to sheet 4 of table CRT1, DDLT for Display Terminal.

To measure +5 V dc and +15 V dc, perform the following:

- 18) Set voltmeter to measure +15 V dc.
- 19) Connect black (-) lead to chassis ground.
- 20) Connect red (+) lead to pin 8 of BJ4 (figure CRT26).
- 21) Check that meter indicates +15 V dc \pm 0.75 V dc. If not, regulator Q1 is defective.
- 22) Connect red (+) lead to pin 22 of BJ4.
- 23) Check that meter indicates +15 V dc \pm 0.75 V dc. If not, regulator Q2 is defective.
- 24) Connect red (+) lead to pin 16 of either IC (figure CRT26).
- 25) Check that meter indicates +5 V dc \pm 0.25 V dc.
- 26) If voltage checks are within tolerance, perform the next action of table CRT1, sheet 3. If voltages are not within tolerance go to sheet 4 of table CRT1, DDLT for Display Terminal.

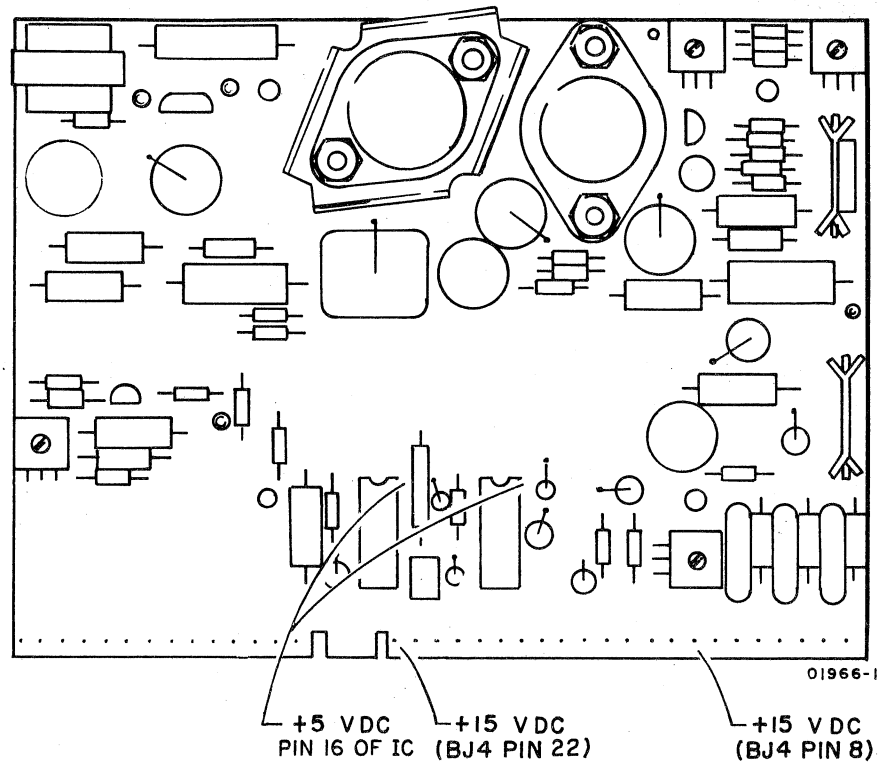


Figure CRT26. Test Pins for +5 and +15 V dc

Procedure CRT14 — Checking and Replacing Intensity Control on Display Panel

To check Intensity control, perform the following:

- 1) Turn crt power off and disconnect ac power cord from site outlet.
- 2) Set ohmmeter to X 1000 setting.
- 3) Attach one ohmmeter lead to center pin on top rear of Intensity control and the other lead to one of the other two pins.
- 4) Rotate Intensity control knob while holding leads to pins. Check that meter reads 0 ohm when Intensity is fully turned in one direction and 100 000 ohms when fully turned in the opposite direction. Replace Intensity control if unable to obtain correct results (steps 7 through 12 describe replacement).
- 5) Remove lead on outer pin and attach it to pin on other side of center pin. Keep other lead on center pin.
- 6) Rotate Intensity control knob as described previously (step 4) and observe meter for same readings. If unable to obtain correct results, replace Intensity control.

To replace Intensity control, perform the following:

- 7) Disconnect connector BP3 of control assembly.
- 8) Pull off knob to gain access to hex ringnut on front side of panel.
- 9) Remove hex ringnut using a 1/2-inch socket.
- 10) Withdraw old control assembly from unit.
- 11) Attach new control assembly to panel by inserting control post through hole in panel and screwing on hex ringnut from the front.
- 12) Connect connector BP3 to its mating connector.

Procedure CRT15 — Power Supply Voltage Checks

To determine power supply faults perform the following steps:

NOTE

No indicators are available on the power supply to indicate presence of voltages; however, indicators may be observed on PC boards in the logic, refer to table 6-1.

- 1) If all power is off, check that site power is available, ac power cord OK, internal power connectors seated correctly, and input power circuit breaker OK. If input power circuit breaker trips, perform procedure CRT11.

NOTE

The application of input power can be determined by observing fan operation.

- 2) If only a red (+5 V) indicator is off on a +5-volt regulator (CC617-A model chassis locations A01 and B01; CC617-B model chassis location B01), replace the +5-V regulator board, procedure CRT18.
- 3) If a yellow (+20 V) or green (-20 V) indicator is off on the single +5-volt regulator of the CC617-B model or on both +5-volt regulators of the CC617-A model, check cable connections and replace power supply per procedure CRT21.
- 4) For the CC617-A model, check that the LEDs for individual voltage regulators on the ROM, processor, async I/F-2, and display/keyboard I/F* modules are lit (chassis locations 03, 06, 08, and 10, respectively). For the CC617-B model, check that the LEDs for individual regulators on the processor, async I/F-2, display/keyboard I/F*, and optional modem* module are lit (chassis locations 06, 08, 09, and 10, respectively). Replace the PC board if an indicator is off (procedure CRT18) and check cabling.
- 5) Check for correct voltage at the +5-volt regulator in chassis location B01 per procedure CRT12. Adjust if necessary.

Procedure CRT16 — Replacing Display Terminal AC Entry Panel or Input Power Circuit Breaker

To remove ac power panel assembly, refer to figure CRT27 and perform the following:

- 1) Turn power off.
- 2) Pull ac plug from site power outlet.
- 3) Remove four screws which secure panel box to cabinet chassis.
- 4) Remove grounding wires connected to terminals E2, E3, and E4 on ac entry assembly.
- 5) Disconnect connector CP3 leading to the fan assembly.
- 6) Disconnect connector CP2 leading to the power supply.
- 7) Disconnect connector CP4 from capacitor board.
- 8) Withdraw entire ac power panel and its connectors from cabinet.

* No regulators are provided on the display/keyboard I/F module or in the case of the modem module with the CC617-B model, they may be provided but they are not used. The indicators light when +12 and -12-V dc is being received from the power supply regulator board.

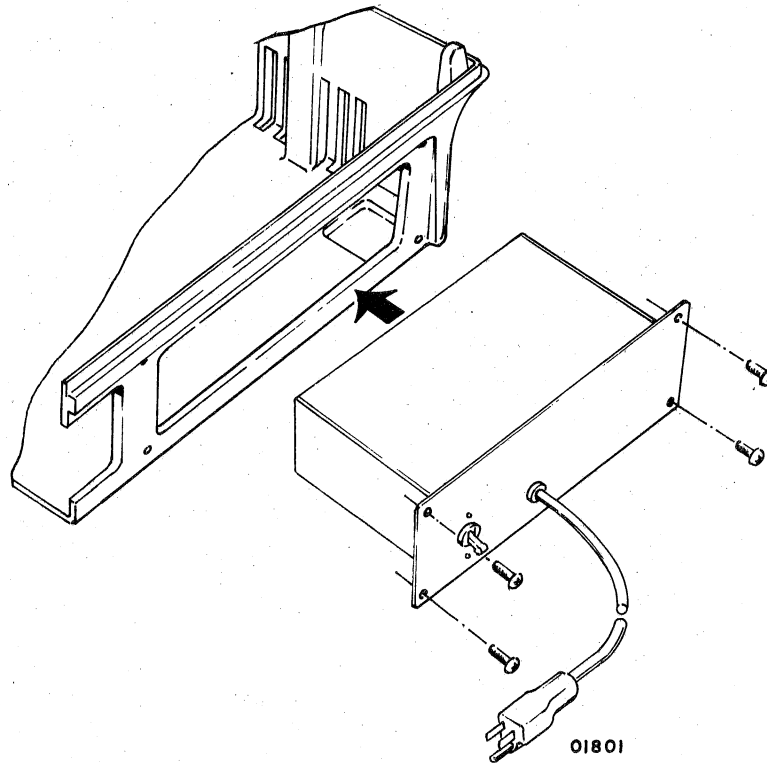


Figure CRT27. AC Entry Panel Removal

To replace the input power circuit breaker, do steps 9 through 13.

NOTE

Replacement of the circuit breaker requires that some soldering be done.

- 9) Remove two screws holding the ac entry panel cover.
- 10) Disconnect the three push-on connectors from the rear of CB1 at B, C, and D (figure CRT28).
- 11) Unsolder connection A at rear of CB1.
- 12) Remove the two screws mounting the circuit breaker to the panel.
- 13) Install a replacement circuit breaker (same part number as the one removed), by performing the preceding steps in reverse order.

To install ac entry panel, perform the following:

- 14) Feed connectors through chassis hole and insert ac power panel (box) into chassis compartment.
- 15) Attach grounding wires to E2, E3, and E4.
- 16) Connect cable connectors (CP3 goes to fan assembly, CP2 goes to power supply, CP4 goes to capacitor board).
- 17) Fasten four screws (figure CRT27).

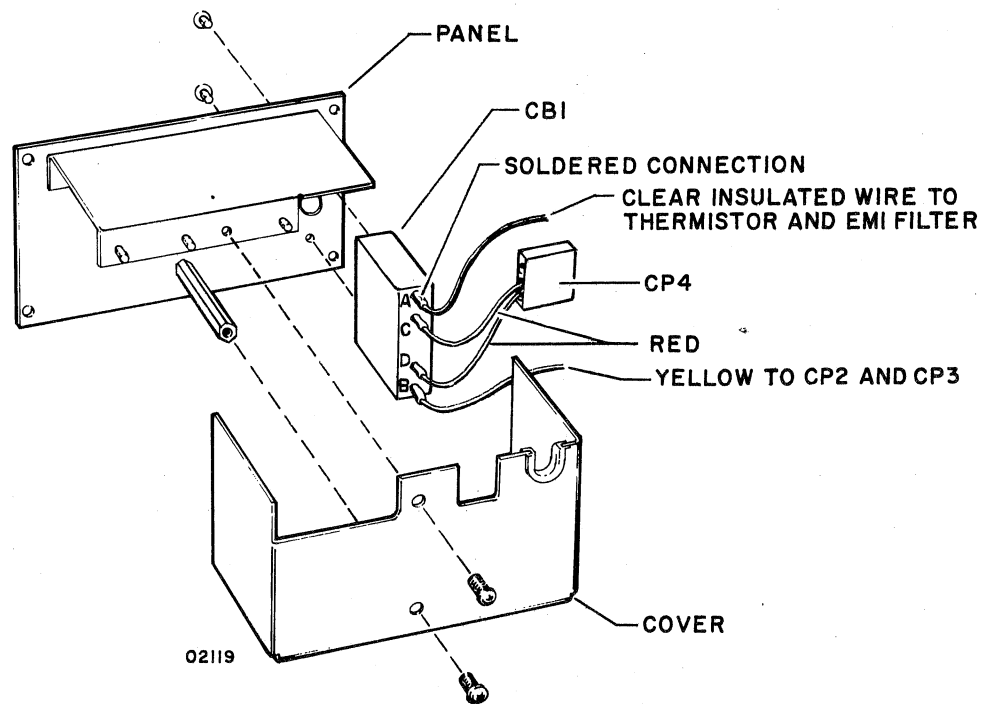


Figure CRT28. Circuit Breaker Connection

Procedure CRT17 — Replacing a Fan

To replace the fan, refer to figure CRT29 and perform the following steps:

- 1) Turn crt power off and disconnect ac power cord from site power outlet.
- 2) Remove four mounting screws from logic module card cage.
- 3) Lift card cage carefully upward and to rear sufficiently to gain access to connectors mounted on backplane of card cage. Tag connectors as required to ensure proper reconnection, disconnect cables, and remove card cage.
- 4) Disconnect connector CP3 from fan assembly to ac entry panel.
- 5) Remove mounting screws from fan assembly and lift free of cabinet.
- 6) Install a replacement fan assembly and reassemble unit per the reverse of the preceding steps.

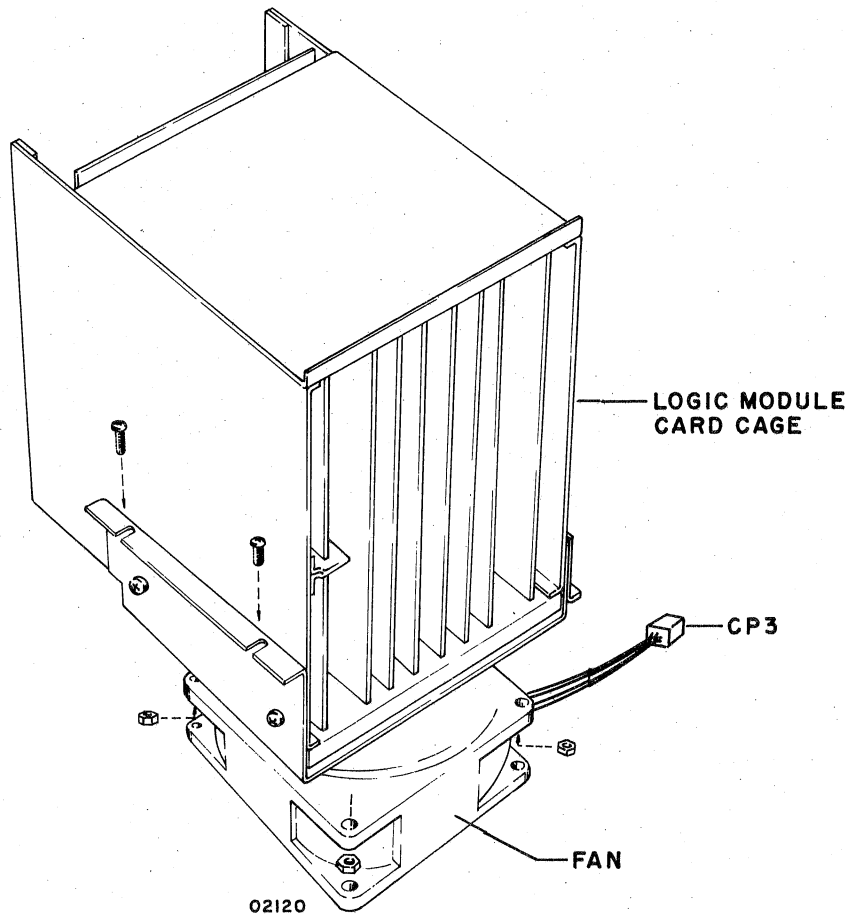


Figure CRT29. Logic Module Card Cage and Fan Removal

Procedure CRT18 — Replacing a Logic Card

To remove and replace a logic card, refer to figure CRT30 and perform the following steps:

- 1) Place the rear panel circuit breaker to the Down (off) position.
- 2) Remove two screws holding cabinet hood to chassis and remove cabinet hood.
- 3) Locate logic card to be removed and pull out simultaneously on both card ejectors. Slide logic card out of chassis.

- 4) Install logic card with component side facing right. If logic card contains switches, verify that the settings are correct. (Refer to section 3 for switch settings.) Seat the logic card in the connector by pressing on the card ejectors. If card contains voltage indicating LEDs as listed in table 6-1, verify that they are lit when power is applied.
- 5) If PC board being replaced is a +5-volt regulator, perform voltage adjustment procedure CRT12.

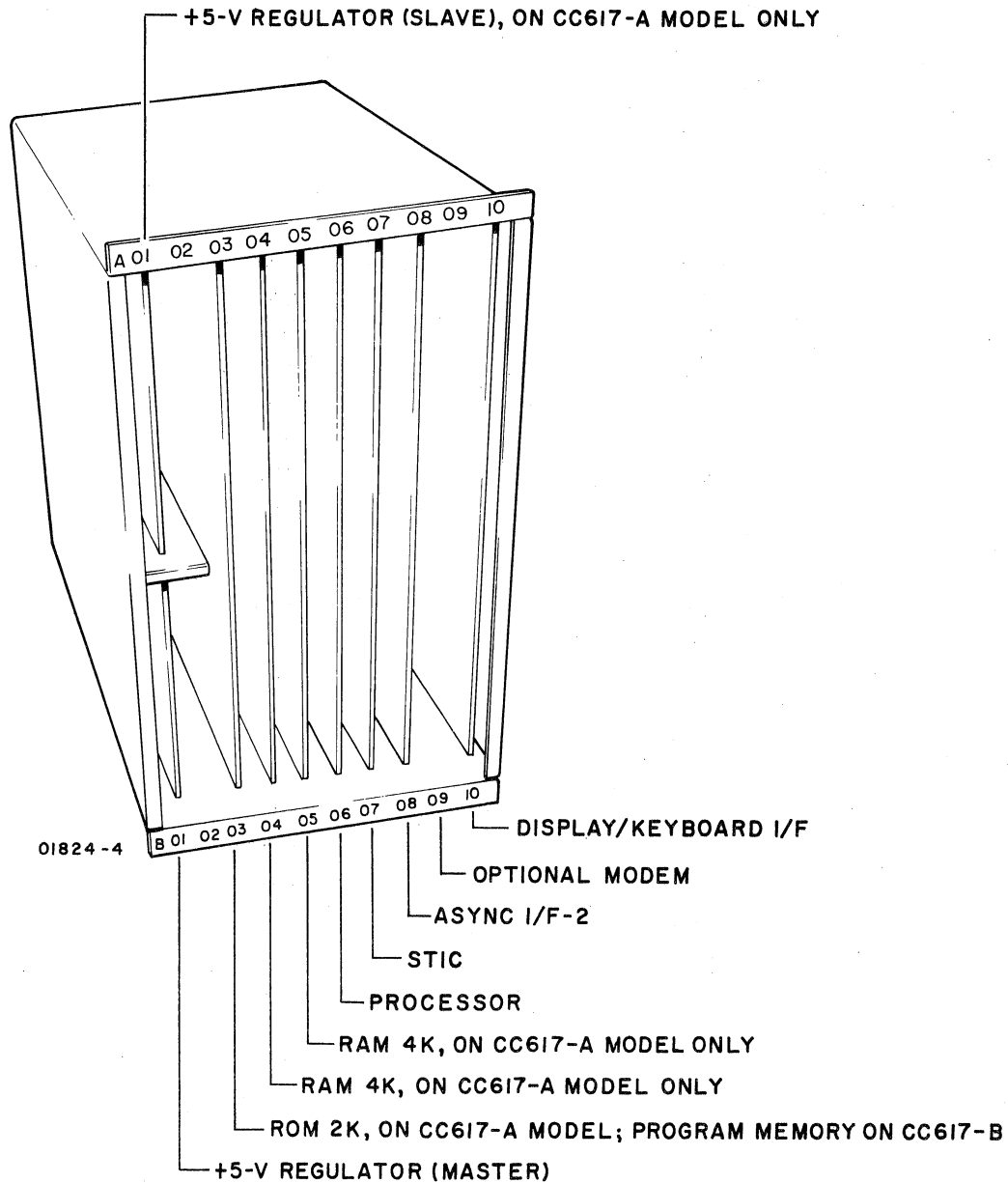
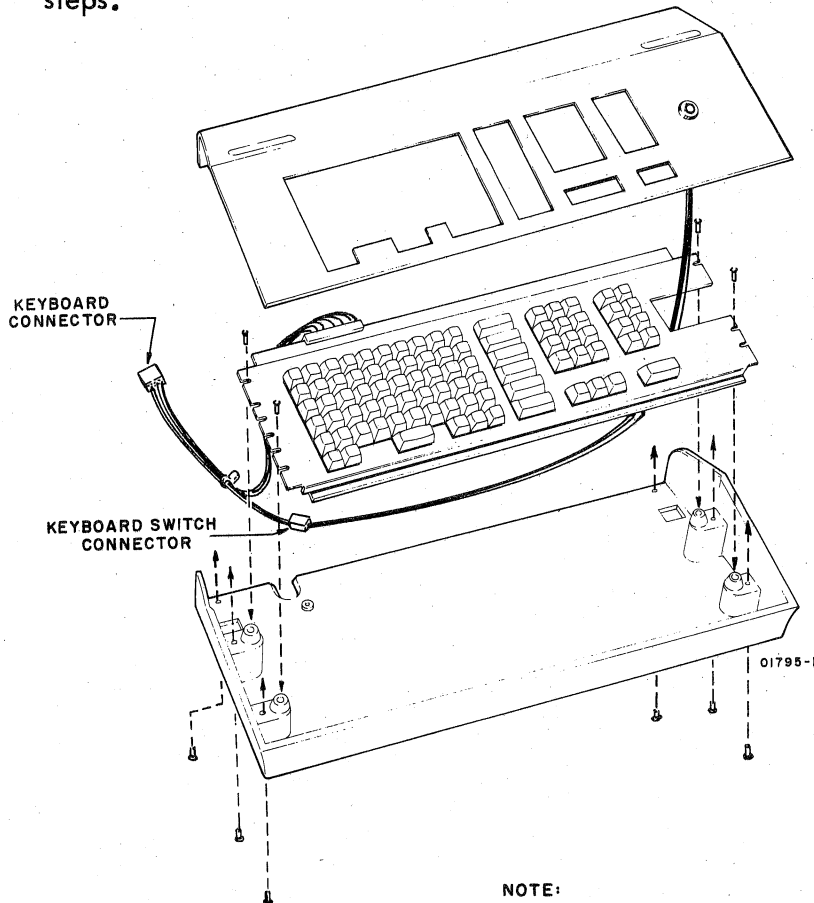


Figure CRT30. Logic Card Locations

Procedure CRT19 — Replacing Keyboard Assembly

Perform the following steps to replace a keyboard assembly. Refer to figure CRT31 and pay special attention to its note.

- 1) Turn display terminal power off. Place circuit breaker at the rear of the display in the Down (off) position.
- 2) Remove six screws from bottom of keyboard cabinet.
- 3) Open both halves of keyboard cabinet being careful not to damage connected cable inside.
- 4) Disconnect connector from keyboard assembly PC board and if existent, connector to the keylock switch.
- 5) Remove four screws mounting keyboard assembly to top half of keyboard cabinet.
- 6) Install a new keyboard assembly by performing the reverse of the preceding steps.



NOTE:
THE KEYBOARD CABINET ASSEMBLY SHOWN, IS REPRESENTATIVE OF A TYPICAL KEYBOARD MODULE USED IN AN APPLICATION OF THE DISPLAY TERMINAL. CERTAIN FEATURES SHOWN THEREFORE, MAY DIFFER WITH THE APPLICATION.

Figure CRT31. Keyboard Cabinet Assembly

Procedure CRT20 — Replacing Keyboard Keyswitches

Perform the following steps to replace the keyswitches of a keyboard. Refer to figure CRT31.

- 1) Remove the keyboard assembly from the keyboard cabinet per steps 1 through 5 of procedure CRT19.
- 2) To replace a keyswitch pry off the keycap and unsolder the faulty switch from the keyboard assembly PC board. Install a new keyswitch, soldering its pins to the PC board and press the keycap onto the switch.
- 3) Reinstall the keyboard assembly in the keyboard cabinet per the reverse of steps 1 through 5 of procedure CRT19.

Procedure CRT21 — Replacing Power Supply

To replace the power supply, perform the following steps:

- 1) Turn crt power off.
- 2) Disconnect ac power cord from site power outlet.
- 3) Remove video module (procedure CRT6, steps 1 through 6).
- 4) Disconnect connector AP2 from power supply to backplane.
- 5) Disconnect connectors CP2 and CP4 from ac entry panel to power supply.
- 6) Loosen ac entry panel screws (figure CRT27).
- 7) Remove four screws mounting power supply to cabinet frame.
- 8) Lift power supply free of cabinet and install a replacement power supply per the reverse of the preceding steps.

Procedure CRT22 — Resonating Capacitor Replacement

To replace the ferro transformer resonating capacitor, perform the following steps:

- 1) Gain access to the power supply by removing the video module from the display terminal. Refer to procedure CRT6, steps 1 through 6.

NOTE

The vendor has increased the length of the resonating capacitor. This requires that all new capacitors be mounted horizontally instead of vertically.

- 2) For serial numbers 101 through 112 (preproduction units with capacitor mounted vertically), perform step a. For serial numbers 113 and up (production units with capacitor mounted horizontally), perform step b.
 - a) Remove the resonating capacitor (part number 95686705), mounting clamp (part number 95656900), and associated screws, nuts and washers. Leave boot (part number 94780200) and wire leads attached to transformer.
 - b) Remove the resonating capacitor (part number 95686705), from the two mounting clamps (part number 71491961). Leave boot and wire leads attached to transformer.
- 3) Install replacement capacitor horizontally using two mounting clamps (part number 71491961) and associated hardware per figure CRT32.
- 4) Connect wire leads along with boot to capacitor and reinstall shield to top of power supply.
- 5) Reinstall the video module in the display terminal. Refer to procedure CRT6, steps 7 through 15.

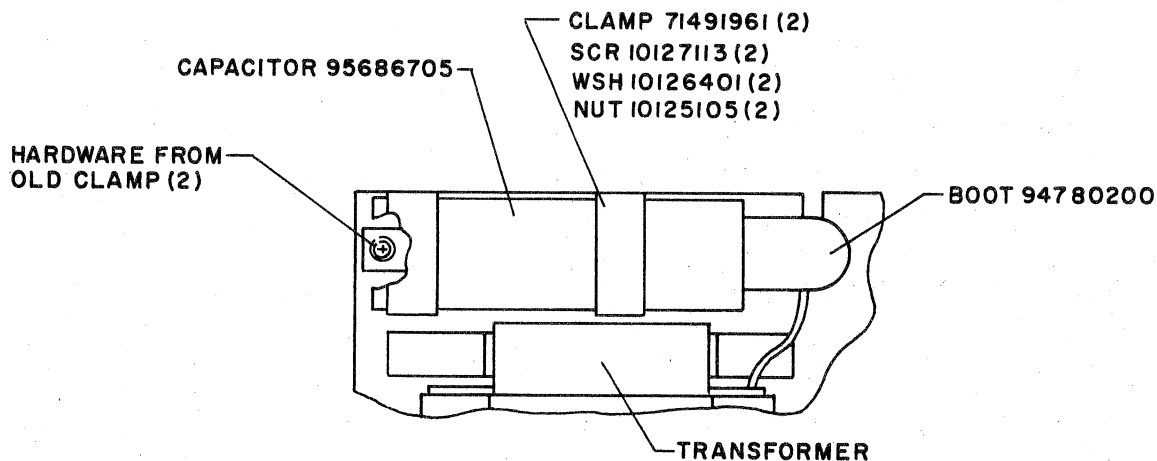


Figure CRT32. Resonating Capacitor Mounting

INDEX

ATM

INDEX

CRT DISPLAY/KEYBOARD

<u>Procedures</u>		<u>Page</u>
CRT1	— Executing Quicklook Diagnostic (Ticketron Application Only)	6A-7
CRT2	— Removing Display Cabinet Hood	6A-12
CRT3	— Replacing High-Voltage Transformer Assembly	6A-12
CRT4	— Replacing Video Module + 15-V dc Regulators	6A-14
CRT5	— Replacing CRT Monitor PC Board	6A-16
CRT6	— Removing Video Module	6A-17
CRT7	— Replacing Cathode-Ray Tube	6A-21
CRT8	— Monitor Adjustments	6A-24
CRT9	— Replacing Yoke on CRT	6A-33
CRT10	— Replacing Vertical Choke	6A-37
CRT11	— High +5-V Voltage Check	6A-39
CRT12	— +5-V Voltage Regulator Adjustments	6A-40
CRT13	— Measuring Voltages at CRT Monitor PC Board	6A-40
CRT14	— Checking and Replacing Intensity Control on Display Panel	6A-43
CRT15	— Power Supply Voltage Checks	6A-44
CRT16	— Replacing Display Terminal AC Entry Panel or Input Power Circuit Breaker	6A-45
CRT17	— Replacing a Fan	6A-47
CRT18	— Replacing a Logic Card	6A-48
CRT19	— Replacing Keyboard Assembly	6A-50
CRT20	— Replacing Keyboard Keyswitches	6A-51
CRT21	— Replacing Power Supply	6A-51
CRT22	— Resonating Capacitor Replacement	6A-52

Figures

CRT1	— High-Voltage Pin Numbers	6A-13
CRT2	— High-Voltage Transformer Installation	6A-14
CRT3	— 15-Volt Regulator Assembly	6A-15
CRT4	— BP5 Connector Pins	6A-16
CRT5	— Video Module's CRT Monitor PC Board Connections	6A-17
CRT6	— Video Module Connector Removal	6A-18
CRT7	— Video Module Mounting Screws	6A-19
CRT8	— Video Module Removal	6A-19
CRT9	— Video Module Installation	6A-20
CRT10	— CRT Socket Removal	6A-21

Figures

Page

CRT11	—	CRT Yoke Assembly	6A-22
CRT12	—	Shielding Sleeve Positioning	6A-25
CRT13	—	Monitor PC Board Adjustments	6A-27
CRT14	—	Focus Magnet Rings	6A-28
CRT15	—	CRT Raster Overlay	6A-29
CRT16	—	Applying Plastic Overlay to CRT Screen	6A-31
CRT17	—	Identifying Geometric Distortion	6A-31
CRT18	—	Typical Positioning of Correction Magnets on Yoke	6A-32
CRT19	—	Removing Flag Terminals	6A-34
CRT20	—	CRT Tube-Socket Removal	6A-34
CRT21	—	Yoke Assembly	6A-35
CRT22	—	Positioning Shielding Sleeve	6A-36
CRT23	—	Vertical Choke	6A-38
CRT24	—	+5-Volt Regulator Test Points	6A-39
CRT25	—	Test Points for +465, -190, and +45 V dc	6A-41
CRT26	—	Test Pins for +5 and +15 V dc	6A-43
CRT27	—	AC Entry Panel Removal	6A-46
CRT28	—	Circuit Breaker Connection	6A-47
CRT29	—	Logic Module Card Cage and Fan Removal	6A-48
CRT30	—	Logic Card Locations	6A-49
CRT31	—	Keyboard Cabinet Assembly	6A-50
CRT32	—	Resonating Capacitor Mounting	6A-52

Tables

CRT1	—	DDLT for Display Terminal	6A-1
CRT2	—	Quicklook Tests	6A-9

This section provides the parts data information necessary for on-site maintenance of the display terminal. In the case of the CC617-B model, this information will have to be supplemented by the parts data information contained in the keyboard module manual that was initially shipped with the equipment. That manual will provide the parts data necessary for replacement of keycaps, keyswitches, the keyboard itself, and other associated items such as the keyboard interconnection cable. Regarding replacement of the program memory module used in the application of CC617-B, the assembly part number is stamped on the module itself along the outer board edge. This part number represents the entire module including the firmware. If an internal modem module is used in the application of CC617-B, the assembly part number of that module also appears on the module itself.

The column headings of the assembly parts lists that appear in this section are defined in table 7-1.

TABLE 7-1. DEFINITION OF COLUMN HEADINGS ON ASSEMBLY PARTS LISTS

COLUMN HEADING	EXPLANATION
FIND NO.	Identifies an electrical or mechanical part on an assembly drawing. If more than one listing appears for a find number, refer to LI, WK IN, and WK OUT.
LI (Line Item)	Gives a chronological or historical record of the addition of a new part to a find number. For example, 01 indicates that the part was the first one used, and 02 indicates the second, etc. See also WK IN and WK OUT.
PART NUMBER	Gives the Control Data Corporation part identification. Use this number when ordering replacements.
CD (Check Digit)	Gives the information-control system a means of cross-checking the correctness of a part number.
QUANTITY	Lists the total number of a part required to complete an assembly. The vertical line near the center of the column acts as a decimal point. Numbers to the left of the line are whole numbers. Those to the right of the line are tenths, hundredths, and thousandths.
U/M (Unit of Measure)	Indicates how the information-control system counts or supplies a part.
PART DESCRIPTION	Describes the physical appearance, type, or name of a part.
MC (Material Control Code)	Supplies additional descriptive data to the information-control system.
YLD (Yield)	A 2-digit number that indicates the usable portion of any quantity of parts expressed as a percentage.
ECO NO. IN	Engineering Change Order that adds a new part to an assembly. See also WK IN.
ECO NO. OUT	Engineering Change Order that deletes a part from an assembly. See also WK OUT.
S/N (Serial Number)	Used to specify an ECO's effectivity by serial number.
WK IN (Week In)	Lists the date when manufacturing begins using a new part and when it is available for parts replacement. For example, 7222 means a part is available as of the 22nd week of 1972.
WK OUT (Week Out)	Lists the date when manufacturing no longer uses a part in building an assembly. See also WK IN. Do not order a part after its week-out date.

00643-1

HARDWARE PRODUCT CONFIGURATOR (HPC)						QSE	PRODUCT NO. 18330	MODEL NO.				
SHEET REV STATUS						REVISION RECORD						
SHEET NUMBER												
						REV.	ECO NO.	DESCRIPTION	DRFT.	DATE	CHKD.	APP.
								RELEASED CLASS C				
						01	C603	F/N 2 WAS 15622800	R	1-22-76	R	RL
						02	C666	ADDED F/N 3, 4 & 5 TO HPC F/N 5 TO APL	C	2-24-76	R	RL
						03	C668	DELETED F/N 4	R	2-26-76	R	RL
						A	6570-88	RELEASED CLASS A		3/1/76		M.L.T.
						B	12424	REVISED PER ECO	MD	8/31/77	R	RL
PRODUCT NAME TICKETRON TERMINAL												
PRODUCT DESCRIPTION The Ticketron Terminal consists of a Programmable Terminal Controller with associated I/O interfaces and a 12-inch CRT Display enclosed in a common cabinet. It has a detachable keyboard. Features include a Micro Processor Module, Random Access Memory Modules, Video Controller, 2 Asynchronous RS-232-C Modem interfaces and a Maintenance Panel. The controller chassis has provisions for future implementation of an Internal Modem.												
This terminal is used with the existing Ticketron Ticket Printer Controller and Ticket Printer.												
HPC PARTS LIST												
PART OR DOCUMENT NO.	*	QTY. REQ.	EQUIP. NO.	TITLE	PART OR DOCUMENT NO.	QTY. REQ.	EQUIP. NO.	TITLE				
FIND 1	1	1	CC617-A	Ticketron Term.	FIND 3	1		Cable Data Set				
FIND 2	1	1	XA175-A	Firmware Mod.	FIND 4	1	CA137-M	Keyboard				
					FIND 5	1		Pkg Matl				
NOTE: 1. RELEASE OF THIS DOCUMENT DOES NOT IMPLY RELEASE OF THE DOCUMENTS CONTAINED HEREIN.												
								PL 66298757				
* See detached parts list.								DETACHED LIST				
ORIG.	L. Langlie		1-13-76	CONTROL DATA	TITLE							
PROG. MGT.	R. J. [Signature]		1-14-76		HARDWARE PRODUCT CONFIGURATOR							
ENG.	R. J. [Signature]		2-25-76				CODE IDENT	A	DWG NO.			
MFG.	M. [Signature]		2/26/76				15920		66298757		B	
PROD. PRICING												
SCHED. ULING											SHEET OF	

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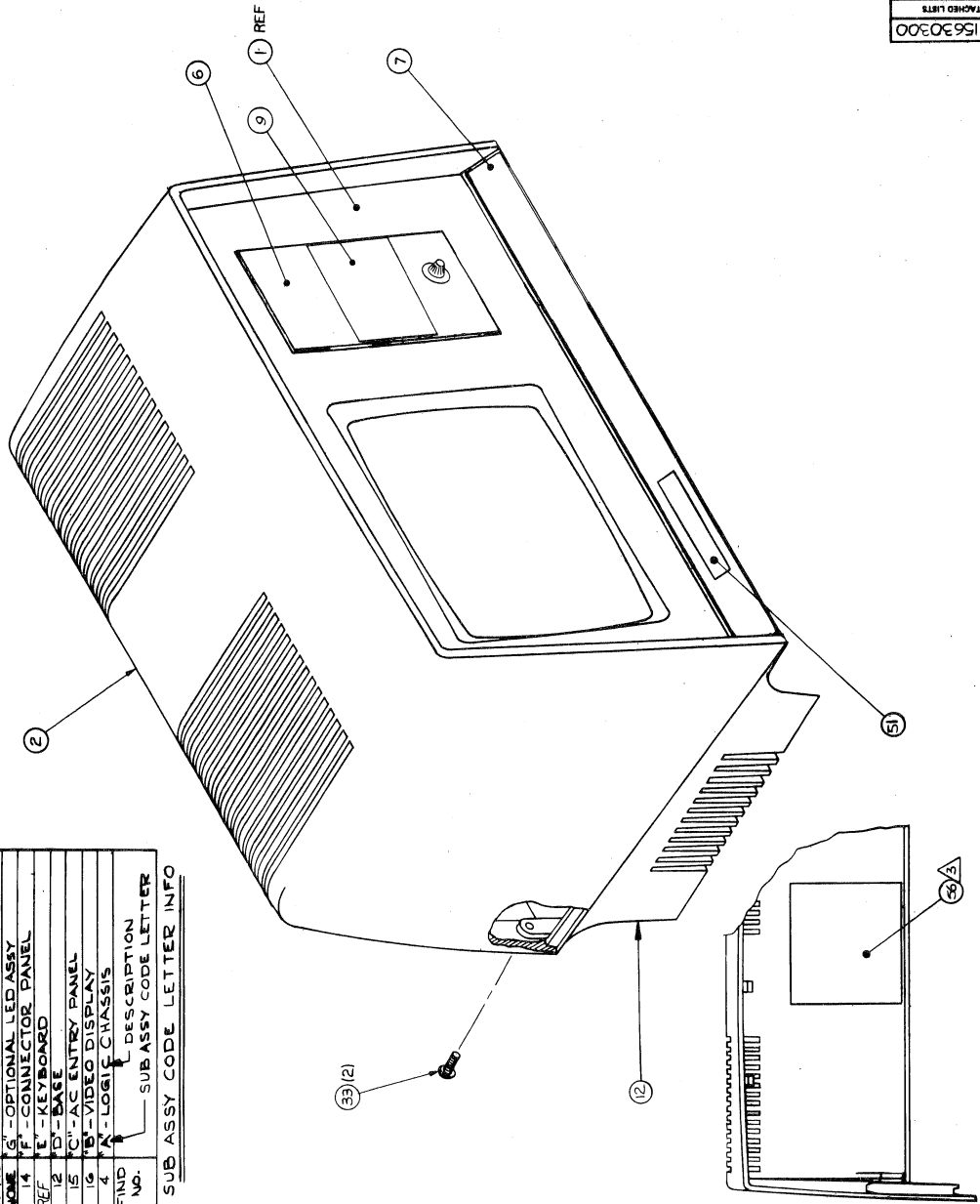
ASSEMBLY PARTS LIST

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0860		66298757		7	B	A	HPC-QSE18330 TICKETRON TERM		T	REL	08-16-77	1	0012424		
T		WIND NO.	LI	PART NUMBER	CD	QTY	U/M	PART DESCRIPTION	MC	YLD	ECO. NO. IN	ECO. NO. OUT	S/N	WK IN	WK OUT
		001	01	15630200	2	1		PC TERM, TKTRN DSPL 60HZ (EC)	N						
		002	01	15628800	3	1		PC FIRMWARE, SMC 2KXR EROM (EC)	N						
		003	01	61406100	0	2		PC CABLE ASSY DATA SET 1UFT 6IN	A						
		004	01	15630905	6	1		PC KEYBOARD TICKETRON EC	N		12424			7734	
		005	01	41035800	6	1		PC PKG DSPL AND KEYBOARD	P						
								0005 TOTAL LINES							

00009912

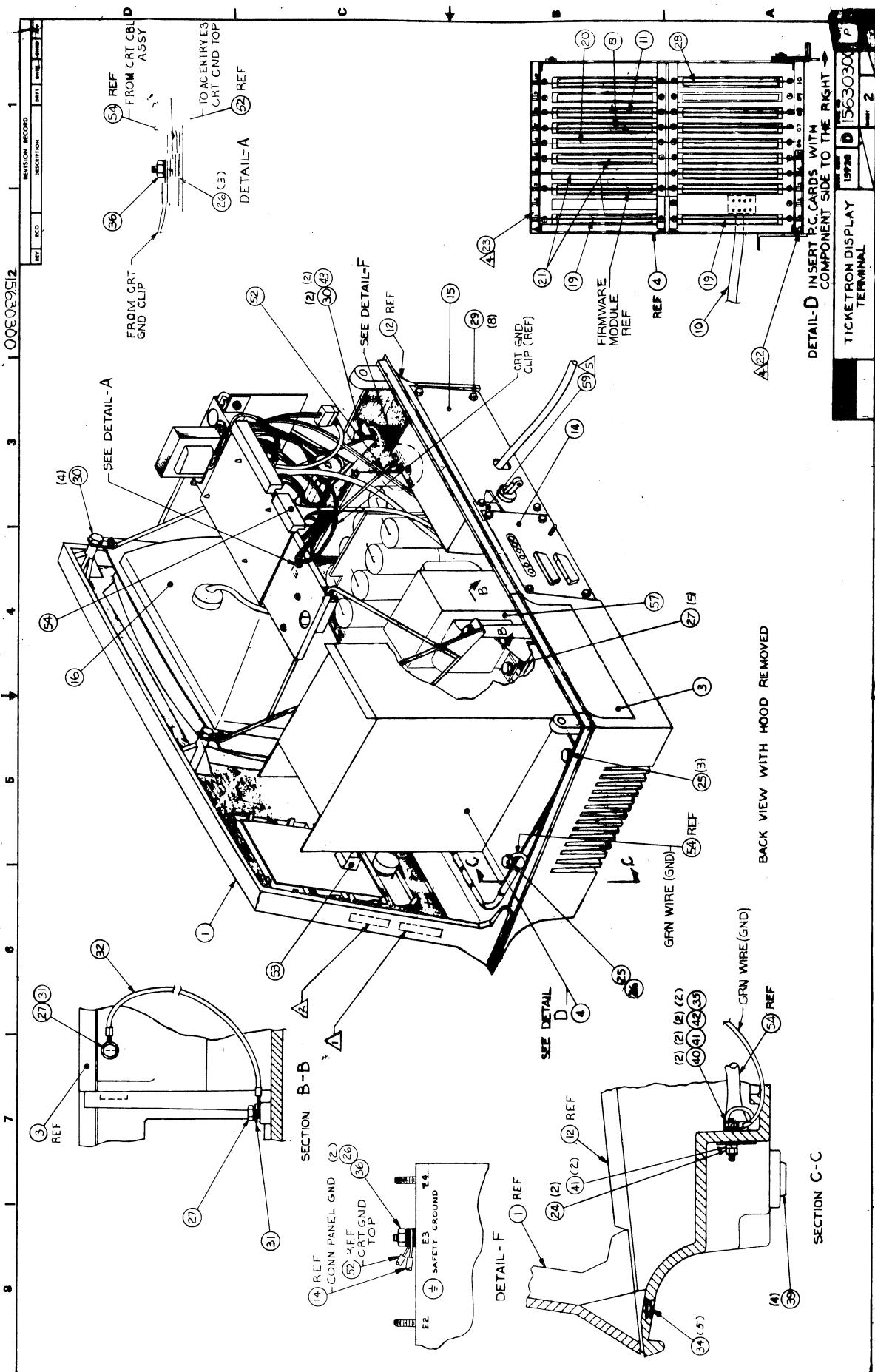
REV	DATE	DESCRIPTION	BY	CHKD	APP'D
1	10/15/78	REPLACE A SIZE AND REVISE	AA		
2	11/14/78	REVISION	AA		
3	11/14/78	REVISION	AA		
4	11/14/78	REVISION	AA		
5	11/14/78	REVISION	AA		
6	11/14/78	REVISION	AA		
7	11/14/78	REVISION	AA		
8	11/14/78	REVISION	AA		
9	11/14/78	REVISION	AA		
10	11/14/78	REVISION	AA		
11	11/14/78	REVISION	AA		
12	11/14/78	REVISION	AA		
13	11/14/78	REVISION	AA		
14	11/14/78	REVISION	AA		
15	11/14/78	REVISION	AA		
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50	11/14/78	REVISION	AA		

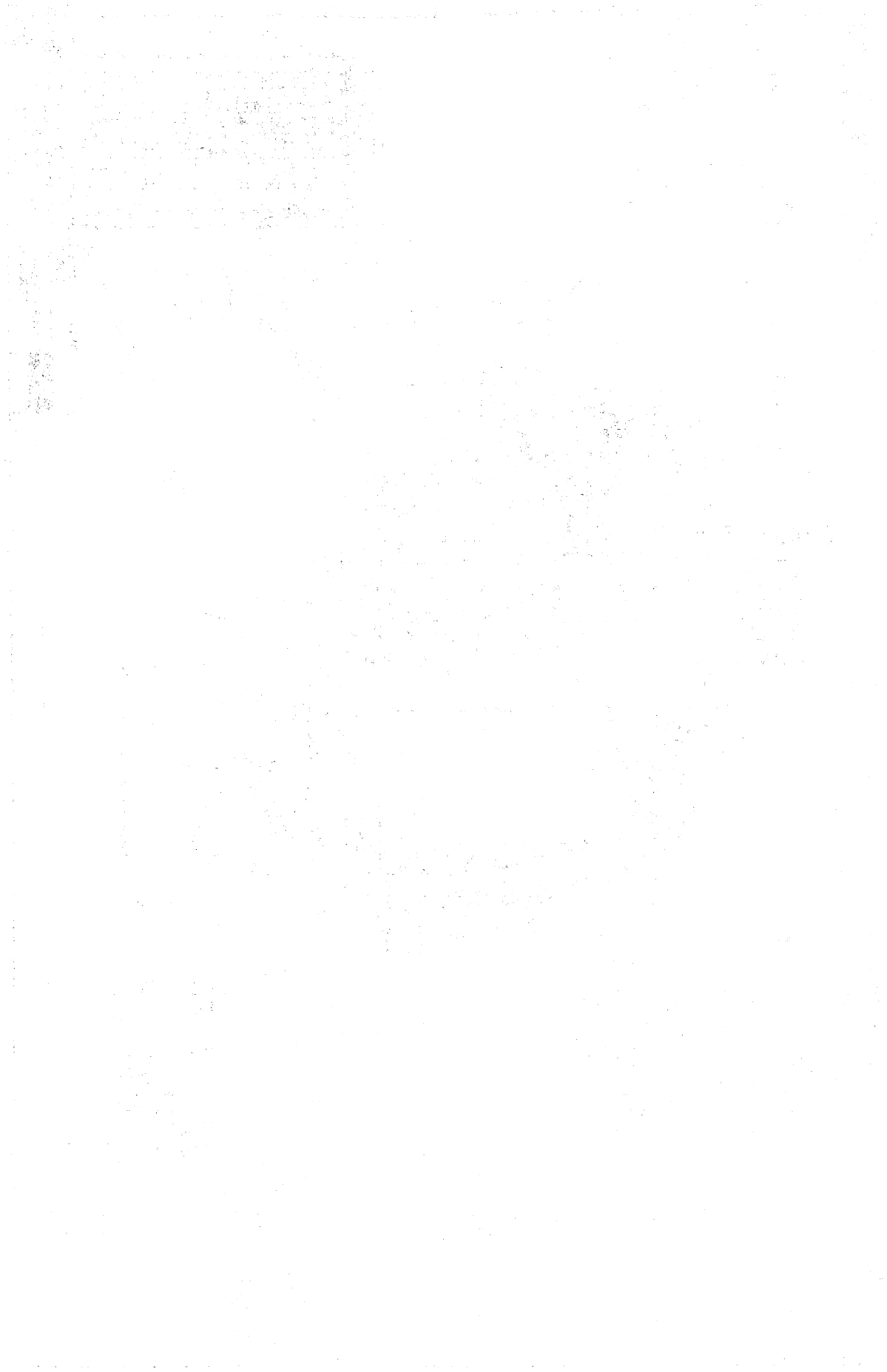
6	L - INDICATOR PANEL
17418	PH - POWER SUPPLY
1086	G - OPTIONAL LED ASSY
14	F - CONNECTOR PANEL
REF	E - KEYBOARD
12	D - BASE
15	C - AC ENTRY PANEL
16	B - VIDEO DISPLAY
4	A - LOGIC CHASSIS
FIND NO.	L - DESCRIPTION
	SUB ASSY CODE LETTER
	SUB ASSY CODE LETTER INFO



- NOTES:
- 1 MARK "TOP ASSY 15630300" IN AREA SHOWN PER CDC SPEC 10121508.
 - 2 APPLY SERIAL NO. IN THIS AREA PER CDC STD 101025.
 - 3 BRUSH OFF EXCESS PAINT OVER SPRAY AND SOLVENT CLEAN BEFORE APPLYING.
 - 4 SEE ENGRG SPEC 1603800, COLOR CODE KEYING SPECIFICATION.
 - 5 ATTACH FIND NO.58 (COPPER FOIL) TO FIND NO.12 APPROXIMATELY AS SHOWN. DRIVE SCREWS THRU FOIL THEN TIGHTEN.
 - 6 IF RIGHT LOWER HALF OF RASTER EXCEED GEOMETRIC TOLERANCE ATTACH MAGNET 5, F/N 63 THRU 66, PER ENR SPEC 1604225.
 - 7 IF FOCUSING OF RASTER CORRECTS IS REQUIRED, SEE ENR SPEC 1604277.

APL 15630300		ATTACHED LISTS	
SCALE	1" = 1"	DO NOT SCALE DRAWING	
UNLESS OTHERWISE SPECIFIED	TOLERANCES		
FRACTIONS	DECIMALS		
1/16" - 3/16"	0.03125 - 0.0625		
3/16" - 1/2"	0.0625 - 0.125		
1/2" - 3/4"	0.125 - 0.1875		
3/4" - 1"	0.1875 - 0.25		
1" - 1 1/2"	0.25 - 0.375		
1 1/2" - 2"	0.375 - 0.5		
2" - 3"	0.5 - 0.75		
3" - 4"	0.75 - 1.0		
4" - 6"	1.0 - 1.5		
6" - 10"	1.5 - 2.5		
10" - 18"	2.5 - 4.5		
18" - 30"	4.5 - 7.5		
30" - 48"	7.5 - 12.0		
48" - 72"	12.0 - 18.0		
72" - 96"	18.0 - 24.0		
96" - 120"	24.0 - 30.0		
120" - 144"	30.0 - 36.0		
144" - 168"	36.0 - 42.0		
168" - 192"	42.0 - 48.0		
192" - 216"	48.0 - 54.0		
216" - 240"	54.0 - 60.0		
240" - 264"	60.0 - 66.0		
264" - 288"	66.0 - 72.0		
288" - 312"	72.0 - 78.0		
312" - 336"	78.0 - 84.0		
336" - 360"	84.0 - 90.0		
360" - 384"	90.0 - 96.0		
384" - 408"	96.0 - 102.0		
408" - 432"	102.0 - 108.0		
432" - 456"	108.0 - 114.0		
456" - 480"	114.0 - 120.0		
480" - 504"	120.0 - 126.0		
504" - 528"	126.0 - 132.0		
528" - 552"	132.0 - 138.0		
552" - 576"	138.0 - 144.0		
576" - 600"	144.0 - 150.0		
600" - 624"	150.0 - 156.0		
624" - 648"	156.0 - 162.0		
648" - 672"	162.0 - 168.0		
672" - 696"	168.0 - 174.0		
696" - 720"	174.0 - 180.0		
720" - 744"	180.0 - 186.0		
744" - 768"	186.0 - 192.0		
768" - 792"	192.0 - 198.0		
792" - 816"	198.0 - 204.0		
816" - 840"	204.0 - 210.0		
840" - 864"	210.0 - 216.0		
864" - 888"	216.0 - 222.0		
888" - 912"	222.0 - 228.0		
912" - 936"	228.0 - 234.0		
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960" - 984"	240.0 - 246.0		
984" - 1008"	246.0 - 252.0		
1008" - 1032"	252.0 - 258.0		
1032" - 1056"	258.0 - 264.0		
1056" - 1080"	264.0 - 270.0		
1080" - 1104"	270.0 - 276.0		
1104" - 1128"	276.0 - 282.0		
1128" - 1152"	282.0 - 288.0		
1152" - 1176"	288.0 - 294.0		
1176" - 1200"	294.0 - 300.0		
1200" - 1224"	300.0 - 306.0		
1224" - 1248"	306.0 - 312.0		
1248" - 1272"	312.0 - 318.0		
1272" - 1296"	318.0 - 324.0		
1296" - 1320"	324.0 - 330.0		
1320" - 1344"	330.0 - 336.0		
1344" - 1368"	336.0 - 342.0		
1368" - 1392"	342.0 - 348.0		
1392" - 1416"	348.0 - 354.0		
1416" - 1440"	354.0 - 360.0		
1440" - 1464"	360.0 - 366.0		
1464" - 1488"	366.0 - 372.0		
1488" - 1512"	372.0 - 378.0		
1512" - 1536"	378.0 - 384.0		
1536" - 1560"	384.0 - 390.0		
1560" - 1584"	390.0 - 396.0		
1584" - 1608"	396.0 - 402.0		
1608" - 1632"	402.0 - 408.0		
1632" - 1656"	408.0 - 414.0		
1656" - 1680"	414.0 - 420.0		
1680" - 1704"	420.0 - 426.0		
1704" - 1728"	426.0 - 432.0		
1728" - 1752"	432.0 - 438.0		
1752" - 1776"	438.0 - 444.0		
1776" - 1800"	444.0 - 450.0		
1800" - 1824"	450.0 - 456.0		
1824" - 1848"	456.0 - 462.0		
1848" - 1872"	462.0 - 468.0		
1872" - 1896"	468.0 - 474.0		
1896" - 1920"	474.0 - 480.0		
1920" - 1944"	480.0 - 486.0		
1944" - 1968"	486.0 - 492.0		
1968" - 1992"	492.0 - 498.0		
1992" - 2016"	498.0 - 504.0		
2016" - 2040"	504.0 - 510.0		
2040" - 2064"	510.0 - 516.0		
2064" - 2088"	516.0 - 522.0		
2088" - 2112"	522.0 - 528.0		
2112" - 2136"	528.0 - 534.0		
2136" - 2160"	534.0 - 540.0		
2160" - 2184"	540.0 - 546.0		
2184" - 2208"	546.0 - 552.0		
2208" - 2232"	552.0 - 558.0		
2232" - 2256"	558.0 - 564.0		
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2280" - 2304"	570.0 - 576.0		
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2328" - 2352"	582.0 - 588.0		
2352" - 2376"	588.0 - 594.0		
2376" - 2400"	594.0 - 600.0		
2400" - 2424"	600.0 - 606.0		
2424" - 2448"	606.0 - 612.0		
2448" - 2472"	612.0 - 618.0		
2472" - 2496"	618.0 - 624.0		
2496" - 2520"	624.0 - 630.0		
2520" - 2544"	630.0 - 636.0		
2544" - 2568"	636.0 - 642.0		
2568" - 2592"	642.0 - 648.0		
2592" - 2616"	648.0 - 654.0		
2616" - 2640"	654.0 - 660.0		
2640" - 2664"	660.0 - 666.0		
2664" - 2688"	666.0 - 672.0		
2688" - 2712"	672.0 - 678.0		
2712" - 2736"	678.0 - 684.0		
2736" - 2760"	684.0 - 690.0		
2760" - 2784"	690.0 - 696.0		
2784" - 2808"	696.0 - 702.0		
2808" - 2832"	702.0 - 708.0		
2832" - 2856"	708.0 - 714.0		
2856" - 2880"	714.0 - 720.0		
2880" - 2904"	720.0 - 726.0		
2904" - 2928"	726.0 - 732.0		
2928" - 2952"	732.0 - 738.0		
2952" - 2976"	738.0 - 744.0		
2976" - 3000"	744.0 - 750.0		
3000" - 3024"	750.0 - 756.0		
3024" - 3048"	756.0 - 762.0		
3048" - 3072"	762.0 - 768.0		
3072" - 3096"	768.0 - 774.0		
3096" - 3120"	774.0 - 780.0		
3120" - 3144"	780.0 - 786.0		
3144" - 3168"	786.0 - 792.0		
3168" - 3192"	792.0 - 798.0		
3192" - 3216"	798.0 - 804.0		
3216" - 3240"	804.0 - 810.0		
3240" - 3264"	810.0 - 816.0		
3264" - 3288"	816.0 - 822.0		
3288" - 3312"	822.0 - 828.0		
3312" - 3336"	828.0 - 834.0		
3336" - 3360"	834.0 - 840.0		
3360" - 3384"	840.0 - 846.0		
3384" - 3408"	846.0 - 852.0		
3408" - 3432"	852.0 - 858.0		
3432" - 3456"	858.0 - 864.0		
3456" - 3480"	864.0 - 870.0		
3480" - 3504"	870.0 - 876.0		
3504" - 3528"	876.0 - 882.0		
3528" - 3552"	882.0 - 888.0		
3552" - 3576"	888.0 - 894.0		
3576" - 3600"	894.0 - 900.0		
3600" - 3624"	900.0 - 906.0		
3624" - 3648"	906.0 - 912.0		
3648" - 3672"	912.0 - 918.0		
3672" - 3696"	918.0 - 924.0		
3696" - 3720"	924.0 - 930.0		
3720" - 3744"	930.0 - 936.0		
3744" - 3768"	93		





BUILD ARC 440

ASSEMBLY PARTS LIST

PRINT DATE 08-16-77 PAGE 1 FILE CHANGE NO. 0001244

DIV.		ASSEMBLY NUMBER		CD	REV.	DWG.	DESCRIPTION			MC	STATUS	STATUS DATE		ENG. RESP.		FILE DATE	
0860		15630300		0	P	U	TERM, TKTRN DSPL 60HZ (TA)			N	REL	02-16-76		CC617A		08-16-77	
TRND NO	LI	PART NUMBER	CD	QTY	U/M	PART DESCRIPTION				MC	YLD	ECO. NO. IN	ECO. NO. OUT	S/N	WK IN	WK OUT	
001	01	71491851	3	1		PC REZEL CRT 12 INCH MOD				A							
002	02	71491938	8	1		PC HOOD, TERMINAL 2SHIELDED+				P		11470			7618		
003	02	71491939	6	1		PC PANEL, BASE 2SHIELDED+				P		11470			7618		
004	01	61406200	8	1		PC LOGIC CHASSIS ASSY				A							
006	01	61407400	3	1		PC INDICATOR PANEL ASSY				A							
007	02	71491968	5	1		PC PANEL, SWITCH (SHIELDED)				V		11470	11649		7618	7641	
007	03	71491969	3	1		PC PANEL, SWITCH (SHIELDED/PTD)				V		11649	11773		7641	7719	
007	04	71491845	5	1		PC PANEL BLANK, SWITCH, PLASTIC)				P		11773			7719		
008	01	90425500	7	1		PC CD ASSY 5AR0-0(STIC)				A							
009	01	71491300	1	1		PC COVER PANEL INDICATOR				P		11773			7719		
010	01	61407300	5	1		PC CABLE ASSY DC POWFR				A							
011	01	90413100	0	1		PC CD ASSY 4CQD (ASYNC I/F=2)				A							
012	03	71491974	3	1		PC BASE, TERMINAL 2SHIELDED+				P		11470A			7620		
013	01	10127122	9	1		PC MSCH PAN PHL R-32X 3/8				B			12010			7717	
014	01	61406800	5	1		PC CONNECTOR PANEL ASSY				A							
015	01	61371117	5	1		PC REPLACED BY 61371119 11687				A			11687			7642	
015	02	61371119	1	1		PC PANEL ASSY (AC ENTRY) 60 HZ				A		11687			7642		
016	01	61407438	3	1		PC REPLACED BY 61407658 11897				G			11897			7708	
016	02	61407658	6	1		PC VIDEO DISPLAY ASSY				G		11897	12010		7708	7717	
016	03	61407659	4	1		PC VIDEO DISPLAY ASSY				G		12010			7717		
019	01	90393600	3	2		PC CD ASSY 4BRD +5V 10AMP				A							
020	01	90391000	8	1		PC REPLACED BY 90445754 11642				A			11642			7646	
020	02	90445754	6	1		PC CD ASSY 4A0D-1 (PROC MOD)				A		11642			7646		
021	01	90391603	9	2		PC CD ASSY 4ASD(0) 4KX9 RAM MOD				A							

BUILD ARC 440

ASSEMBLY PARTS LIST

PRINT DATE 08-16-77 PAGE 2 FILE CHANGE NO. 0001244

DIV.		ASSEMBLY NUMBER		CD	REV.	DWG.	DESCRIPTION			MC	STATUS	STATUS DATE		ENG. RESP.		FILE DATE	
0860		15630300		0	P	U	TERM, TKTRN DSPL 60HZ (TA)			N	REL	02-16-76		CC617A		08-16-77	
TRND NO	LI	PART NUMBER	CD	QTY	U/M	PART DESCRIPTION				MC	YLD	ECO. NO. IN	ECO. NO. OUT	S/N	WK IN	WK OUT	
022	01	71474105	5	1		PC LABEL B, CC CHAS 3.4IN VINYL				P							
023	01	71474107	1	1		PC LABEL A, CC CHAS 6.4IN VINYL				P							
024	01	71455801	2	2		PC STANDOFF MALE/FEMALE 4-40 STL				P							
025	02	51858501	3	9		PC SCREW 10X1/2 TYPE A HEX HD				B		114708	12010		7618	7717	
025	03	51858501	3	4		PC SCREW 10X1/2 TYPE A HEX HD				B		12010			7717		
026	01	10126403	4	7		PC WSHR NO.10 EXT TOOTH LK TYP A				B			11897	11897		7708	
026	02	10126403	4	8		PC WSHR NO.10 EXT TOOTH LK TYP A				B		11897	12010		7708	7717	
026	03	10126403	4	6		PC WSHR NO.10 EXT TOOTH LK TYP A				B		12010			7717		
027	02	51858529	4	2		PC SCREW SELF TAPPING				B		114708	12010		7618	7717	
027	03	51858529	4	7		PC SCREW SELF TAPPING				B		12010			7717		
028	04	90445751	2	1		PC REPLACED BY 90445764 11780				A			11619	11780		7636	7646
028	05	90445764	5	1		PC CARU ASSY 5CUD-4				A			11780			7646	
029	01	00860303	7	8		PC MSCH SLF-LKG HEX 6-32X3/8				B							
030	01	00860310	2	6		PC MSCH SLF-LKG HEX 8-32X5/16				B							
030	02	00860311	0	6		PC MSCH SLF-LKG HEX 8-32X3/8				B		12010	12010		7717	7717	
031	01	10125606	3	2		PC WASHER FLT NO.8 STL CP				B							
032	01	61391105	6	1		PC GND WIRE ASSY 7.5 16GA				A							
033	01	10127153	4	2		PC MSCH PAN PHL 1/4-20X 1/2				B							
034	01	51858503	9	5		PC SCREW 3/4L SZ 10 HEX				B							
035	01	95125301	2	AR		OZ LOC TITE SEALANT RED				B			11774			7732	
035	02	95125301	2	010		OZ LOC TITE SEALANT RED				B		11774			7732		
036	01	10125108	0	2		PC NUT HEX MCH 10-32 STL CP OR Z				B							
037	02	10127121	1	1		PC MSCH PAN PHL R-32X .312				B		11563	12010		7624	7717	
039	01	51805801	1	4		PC PUMPER, RUBRER .300H SLF-STKG				B							

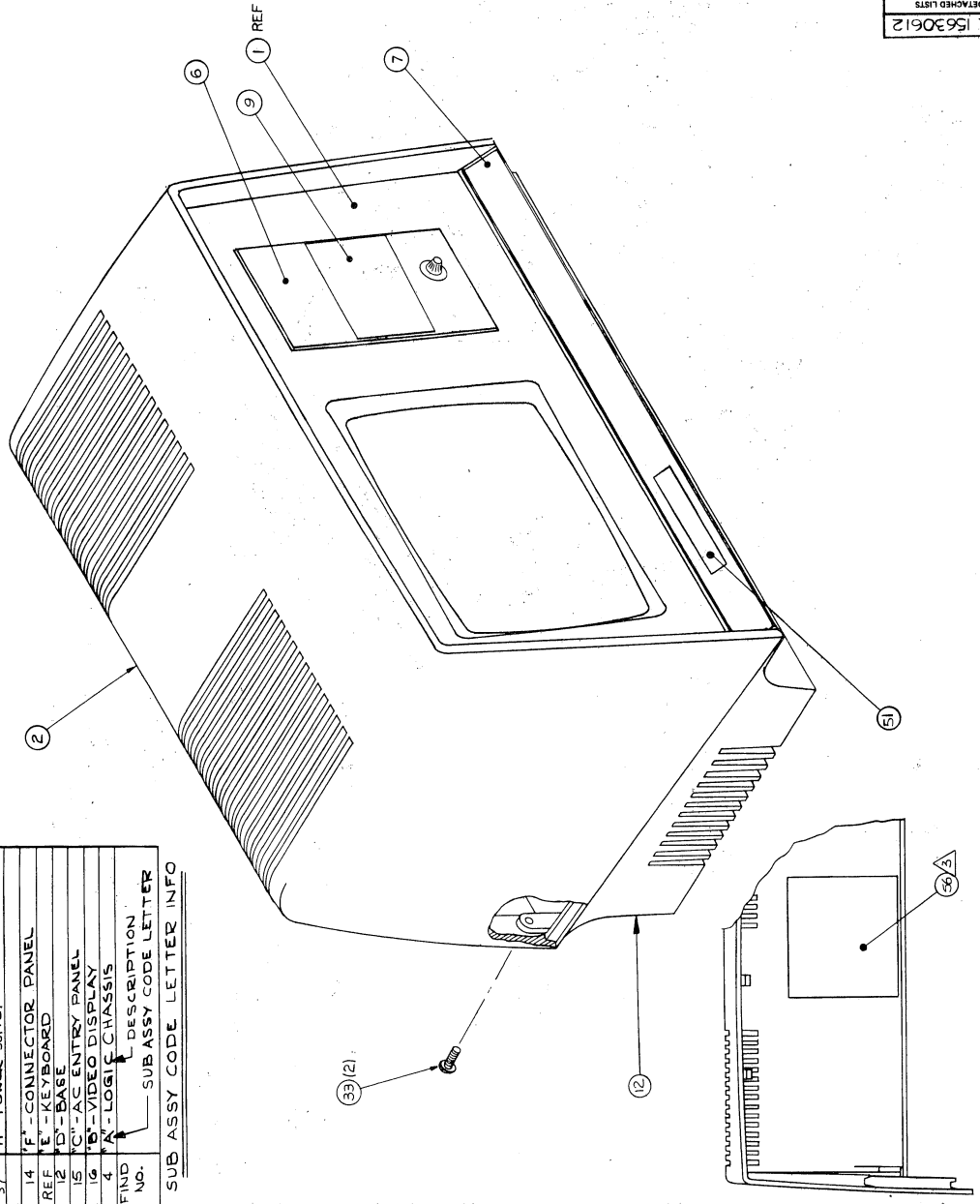
ASSEMBLY PARTS LIST

DIV.		ASSEMBLY NUMBER		CD	REV.	DWG.	DESCRIPTION			MC	STATUS	STATUS DATE		ENG. RESP.	FILE DATE	
0860		15630300		0	P	D	TERM, TKTRN DSPL 60HZ (TA)			N	REL	02-16-76		CC617A	08-16-77	
TP/IND NO	LI	PART NUMBER	CD	REV.	QTY	U/M	PART DESCRIPTION			MC	YLD	ECO. NO. IN	ECO. NO. OUT	S/N	WK IN	WK OUT
040	01	10125603	0		2		PC WASHER FLT NO.4 STL CP			B						
041	01	10126400	0		4		PC WSHR NO.4 EXT TOOTH LK TYP A			B						
042	01	10125103	1		2		PC NUT HEX MCH 4-40 STL CP OR ZP			B						
043	02	10126402	6		9		PC WSHR NO.8 EXT TOOTH LK TYP A			B	11563	12010			7624	7717
043	03	10126402	6		2		PC WSHR NO.8 EXT TOOTH LK TYP A			B	12010				7717	
051	01	15010307	5		1		PC TD EMBLEM, PRODUCT MEDIUM AL			P						
052	01	61391103	1		1		PC GROUND WIRE ASSY 14 INCH			A						
053	01	61407100	9		1		PC CABLE ASSY MAINT PNL			A						
054	01	61407200	7		1		PC CABLE ASSY KYRD CRT I/F			A						
056	01	71491818	2		1		PC LABEL CARD LOCATION PAPER			P						
057	01	61407421	9		1		PC POWER SUPPLY ASSY			A						
059	02	95558018	8		050		PC TAPE, COPPER FOIL W 1.00			B	11620				7634	
060	01	66298750	2		REF		PC SPL DISPLAY TERM TICKETRON			D						
061	01	66298605	8		REF		PC GENEALOGY TICKETRON DISPLAY			D						
062	01	51006067	6		050		OZ ADHESIVE, SILIC			B	11620	12010			7634	7717
062	02	51004063	7		050		ADHESIVE, AMBER SYN ELASTOMER			B	12010				7717	
063	01	51917050	0		500		PC MAGNET BAR			P	11620	12010			7634	7717
063	02	51917054	2		1		PC MAGNET BAR			P	12010				7717	
064	01	51917051	8		500		PC MAGNET BAR			P	11620	12010			7634	7717
064	02	51917051	8		1		PC MAGNET BAR			P	12010				7717	
065	01	51917052	6		500		PC MAGNET BAR			P	11620	12010			7634	7717
065	02	51917052	6		1		PC MAGNET BAR			P	12010				7717	
066	01	51917053	4		500		PC MAGNET BAR			P	11620	12010			7634	7717

ASSEMBLY PARTS LIST

DIV.		ASSEMBLY NUMBER		CD	REV.	DWG.	DESCRIPTION			MC	STATUS	STATUS DATE		ENG. RESP.	FILE DATE	
0860		15630300		0	P	D	TERM, TKTRN DSPL 60HZ (TA)			N	REL	02-16-76		CC617A	08-16-77	
TP/IND NO	LI	PART NUMBER	CD	REV.	QTY	U/M	PART DESCRIPTION			MC	YLD	ECO. NO. IN	ECO. NO. OUT	S/N	WK IN	WK OUT
066	02	51917053	4		1		PC MAGNET BAR			P		12010				7717
067	01	51917054	2		500		PC MAGNET BAR			P	11620	12010			7634	7717
067	02	16042739	9		REF		PC GEOM DIST CORRECTION			D	12010				7717	
068	01	51917055	9		500		PC MAGNET BAR			P	11620	12010			7634	7717
068	02	16042747	2		REF		PC RING MAGNET ADJUSTMENT SPEC			D	12010				7717	
0076 TOTAL LINES																

SHEET REVISION STATUS		REVISION RECORD	
REV	ECO	DESCRIPTION	DATE
2		RELEASED CLASS C	7-19-74
1		REMOVED KEYBOARD	7-19-74
		PL CHANGE ONLY	8-4-74
		PL CHANGE ONLY	8-11-74
		RELEASED CLASS A	9-11-74
		PL CHG ONLY	11-17-74
		PL CHG ONLY	1-11-75
		REVISED PER ECO	1-11-75
		REVISED PER ECO	1-11-75
		REVISED PER ECO	1-11-75
		REVISED PER ECO	1-11-75

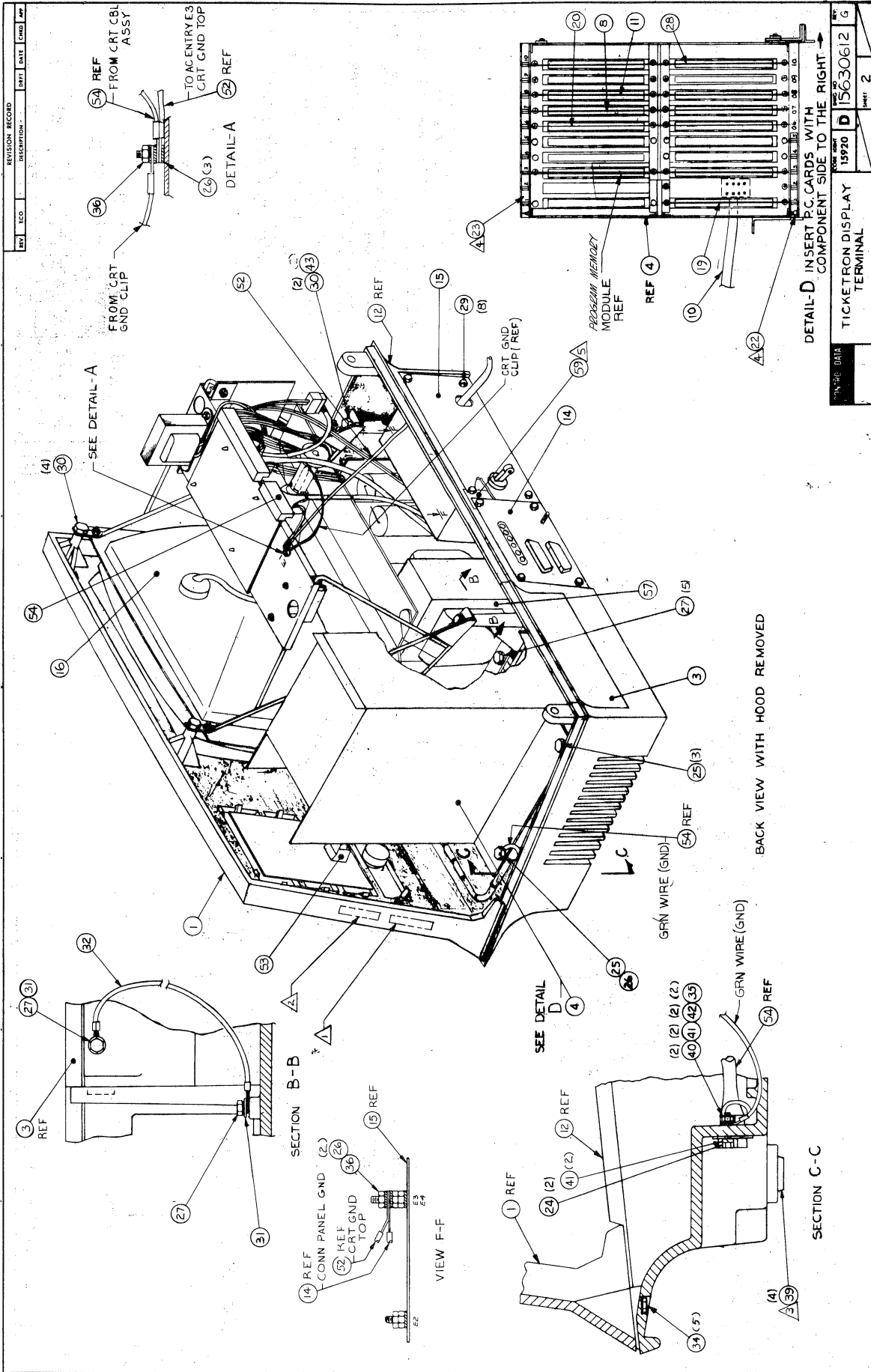


6	INDICATOR PANEL
57	POWER SUPPLY
14	CONNECTOR PANEL
REF	KEYBOARD
12	BASE
15	AC ENTRY PANEL
16	VIDEO DISPLAY
4	LOGIC CHASSIS
FIND NO.	DESCRIPTION
	SUB ASSY CODE LETTER
	SUB ASSY CODE LETTER INFO

NOTES:

- 1 MARK "TOP ASSY 15630612" IN AREA SHOWN PER CDC SPEC 10121508.
- 2 APPLY SERIAL NO. IN THIS AREA PER CDC STD 101025.
- 3 BRUSH OFF EXCESS PAINT OVER SPRAY AND SOLVENT CLEAN BEFORE APPLYING.
- 4 SEE ENGRG SPEC 16036800, COLOR CODE KEYING SPECIFICATION.
- 5 ATTACH FIND NO. 59 (COPPER FOIL) TO FIND NO. 12. APPROXIMATELY AS SHOWN. DRIVE SCREWS THRU FOIL, THEN TIGHTEN.
- 6 IF EIGHT LOWER HALF OF DISTIE EXCEEDS SPECIFIED TOLERANCES, ATTACH MAGNETS - FIN 63 THRU 65 PER ENGR SPEC 16042735.
- 7 IF EXCESS OF DISTIE COMPONENTS IS REQUIRED, SEE ENGR SPEC 16042747.

CONTROL DATA		TITLE	
DESIGNED BY	D. WELLS	TICKETRON DISPLAY TERMINAL	
CHECKED BY		DRAWING NO	
DATE	6-22-76	15920	
SCALE	1:1	DRAWING ID	
		15630612	
DETACHED LISTS		SCALE	
		NHA 15630611	
		SHEET 1 OF 2	



BUILD ARC 440

ASSEMBLY PARTS LIST

BUILD ARC 440										PRINT DATE		PAGE		FILE CHANGE NO.	
										12-15-77		1		00012648	
DIV.	ASSEMBLY NUMBER	CD	REV.	DWG.	DESCRIPTION				MC	STATUS	STATUS DATE	ENG. RESP.	FILE DATE		
0860	15630612	B	G	U	TERM, TKTRN DSPL 60HZ (TA)				N	REL	08-18-76	UC9178	12-15-77		
FOUND NO	LI	PART NUMBER	CD	QTY	U/M	PART DESCRIPTION			MC	YLD	ECO. NO. IN	ECO. NO. OUT	S/N	WK IN	WK OUT
001	01	71491851	3	1		PC REZEL CRT 12 INCH MOD			A						
002	01	71491938	8	1		PC HOOD, TERMINAL 2SHIELDED*			F						
003	01	71491939	6	1		PC PANEL, BASE 2SHIELDED*			F						
004	01	61407497	9	1		PC LOGIC CHASSIS ASSY			A						
006	01	61407400	3	1		PC INDICATOR PANEL ASSY			A						
007	02	71491848	5	1		PC PANEL BLANK, SWITCH, PLASTIC			F		11773			7719	
008	01	90425500	7	1		PC CD ASSY 5AND=0(STIC)			S						
009	01	71491300	1	1		PC COVER PANEL INDICATOR			F		11773			7719	
010	01	61407300	5	1		PC CABLE ASSY DC POWER			A						
011	01	90413100	0	1		PC CD ASSY 4CQD (ASYNQ I/F=2)			S						
012	01	71491974	3	1		PC BASE, TERMINAL 2SHIELDED*			F						
014	01	61406800	5	1		PC CONNECTOR PANEL ASSY			A						
015	01	61371119	1	1		PC PANEL ASSY (AC ENTRY) 60 HZ			A			16628		7820	7820
015	02	61407961	4	1		PC PANEL ASSY (AC ENTRY)			A		12648				
016	03	61407659	4	1		PC VIDEO DISPLAY ASSY			G		12010			7717	
019	01	90393600	3	1		PC CD ASSY 48BD +5V 1UAMP			S						
020	02	90445754	6	1		PC CD ASSY 4AQD=1 (PROC MOD)			S		11642			7646	
022	01	71474105	5	1		PC LABEL B, CC CHAS 3.4IN VINYL			F						
023	01	71474107	1	1		PC LABEL A, CC CHAS 6.4IN VINYL			F						
024	01	71455801	2	2		PC STANDOFF MALE/FEMALE 4=40 STL			F						
025	02	51858501	3	4		PC SCREW 10x1/2 TYPE A HEX HD			B		12010			7717	

BUILD ARC 440

ASSEMBLY PARTS LIST

BUILD ARC 440										PRINT DATE		PAGE		FILE CHANGE NO.	
										12-15-77		2		00012648	
DIV.	ASSEMBLY NUMBER	CD	REV.	DWG.	DESCRIPTION				MC	STATUS	STATUS DATE	ENG. RESP.	FILE DATE		
0860	15630612	B	G	U	TERM, TKTRN DSPL 60HZ (TA)				N	REL	08-18-76	UC9178	12-15-77		
FOUND NO	LI	PART NUMBER	CD	QTY	U/M	PART DESCRIPTION			MC	YLD	ECO. NO. IN	ECO. NO. OUT	S/N	WK IN	WK OUT
026	03	10126403	4	6		PC WSHR NO.10 EXT TOOTH LK TYP A			B		12010			7717	
027	02	51858529	4	7		PC SCREW SELF TAPPING			B		12010			7717	
028	02	90445764	5	1		PC CARD ASSY 5CUD=4			S		11780			7646	
029	01	00860303	7	6		PC WSCR SLF-LKG HEX 6=32X3/8			B						
030	02	00860311	0	6		PC WSCR SLF-LKG HEX 8=32X3/8			B		12010			7717	
031	01	10125606	4	2		PC WASHER FLT NO.8 STL CP			B						
032	01	61391105	6	1		PC GND WIRE ASSY 7.5 16GA			A						
033	01	10127153	4	2		PC WSCR PAN PHL 1/4=20X 1/2			B						
034	01	51858503	9	5		PC SCREW 3/4L SZ 10 HEX			B						
035	02	95125301	2	010	OZ	LOC TITE SEALANT RED			B		11774			7723	
036	01	10125108	0	2		PC NUT HEX MCH 10=32 STL CP OR ZP			B						
039	01	51805801	1	4		PC BUMPER, RUBBER .300H SLF-STKG			B						
040	01	10125603	0	2		PC WASHER FLT NO.4 STL CP			B						
041	01	10126400	0	4		PC WSHR NO.4 EXT TOOTH LK TYP A			B						
042	01	10125103	1	2		PC NUT HEX MCH 4=40 STL CP OR ZP			B						
043	02	10126402	6	2		PC WSHR NO.8 EXI TOOTH LK TYP A			B		12010			7717	
051	01	15010307	5	1		PC ID EMBLEM, PRODUCT MEDIUM			L						
052	01	61391103	1	1		PC GROUND WIRE ASSY 14 INCH			A						
053	01	61407100	9	1		PC CABLE ASSY MAINT PNL			A						
054	01	61407200	7	1		PC CABLE ASSY KYBU CRT I/F			A						
056	01	71492004	8	1		PC LABEL, CARD LOCATION (VINYL)			P						

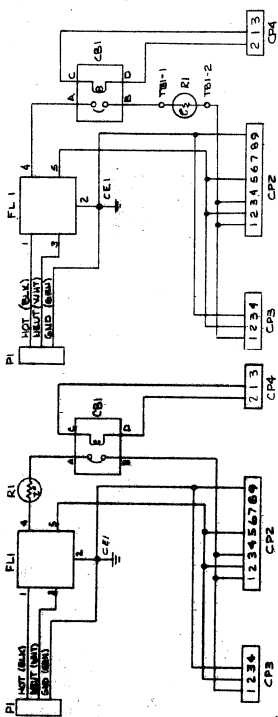
BUILD ARC 440

ASSEMBLY PARTS LIST

PRINT DATE 12-15-77 PAGE 3 FILE CHANGE NO. 00012648

DIV.		ASSEMBLY NUMBER		CD	REV.	DWG.	DESCRIPTION		MC	STATUS	STATUS DATE		ENG. RESP.	FILE DATE	
0860		15630612		B	G	D	TERM, TKTRN DSPL 60HZ (TA)		N	REL	08-18-76		UC017B	12-15-77	
LINE NO	LI	PART NUMBER	CD	QUANTITY	U/M	PART DESCRIPTION	MC	YLD	ECO. NO. IN	ECO. NO. OUT	S/N	WK IN	WK OUT		
057	01	61407421	9	1		PC POWER SUPPLY ASSY	A								
059	03	95558018	8	29		FT TAPE, COPPER FOIL W 1.00	B		11774			7732			
060	01	66299500	0		REF	PC SPL DISPLAY TERMINAL	D								
061	01	66299263	5		REF	PC GENAALOGY	D								
062	02	51004063	7		050	OZ ADHESIVE, SEALANT SIL RUBBER	B		12010			7717			
063	02	51917054	2	1		PC MAGNET BAR	F		12010			7717			
064	02	51917051	8	1		PC MAGNET BAR	F		12010			7717			
065	02	51917052	6	1		PC MAGNET BAR	F		12010			7717			
066	02	51917053	4	1		PC MAGNET BAR	F		12010			7717			
067	01	16042739	9		REF	PC GEOM DIST CORRECTION	D		12010			7717			
068	01	16042747	2		REF	PC KING MAGNET ADJUSTMENT SPEC	D		12010			7717			
0052 TOTAL LINES															

REV	ECO	REVISION RECORD	DATE	BY



SCHMATIC DIAGRAM
TAB 17

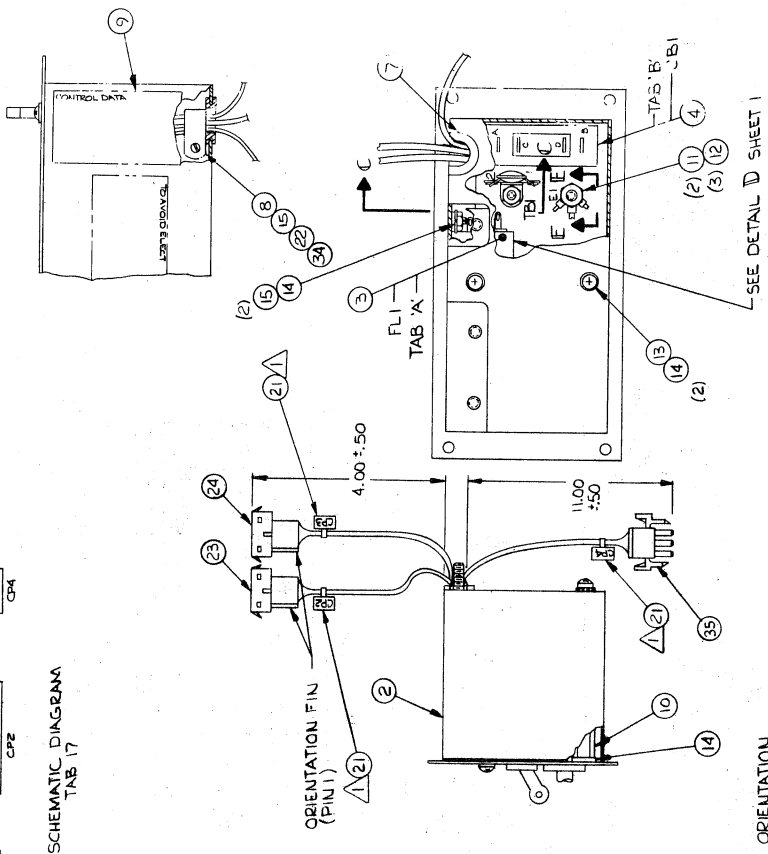
SCHMATIC DIAGRAM
TAB 19

SPECIFICATION INFORMATION

- I. INPUT
 - A. VOLTAGE - 96 TO 128 VOLTS.
 - B. CURRENT - SEE TABULATION TABLE (TABULATED FROM 1.5 TO 8.0 AMPERES MAXIMUM).
 - C. OVERCURRENT PROTECTION - TOGGLE CIRCUIT BREAKER INCLUDED. TRIPS ON-ON & 1.7-1.9 ARE WITH THE RELAY TRIP COIL CAPABLE OF WITHSTANDING THE CURRENT FROM THE TRIP COIL SOURCE. FOR DETAILED INFORMATION ON CIRCUIT BREAKER SEE CDC-ONG 51807700.
 - D. FREQUENCY - 47 TO 440 HZ.
- II. RFI - RFI FILTER IS PROVIDED TO REDUCE BOTH SUSCEPTIBILITY AND CONDUCTED EMISSIONS. FOR DETAILED INFORMATION ON THE RFI FILTER SEE CDC-ONG 51807700.
- III. UL AND CSA INFORMATION - THIS ASSEMBLY SHALL BE CONSTRUCTED WITH UL RECOGNIZED COMPONENTS. ALL COMPONENTS SHALL BE CONSTRUCTED TO FACILITATE UL RECOGNITION ON THE EQUIPMENT.
- IV. PHYSICAL DIMENSIONS - THE APPROXIMATE SIZE 3.41 X 6.82 X 3.5. REFER TO DRAWING, SHEET 1.

APPLICABLE DOCUMENTS

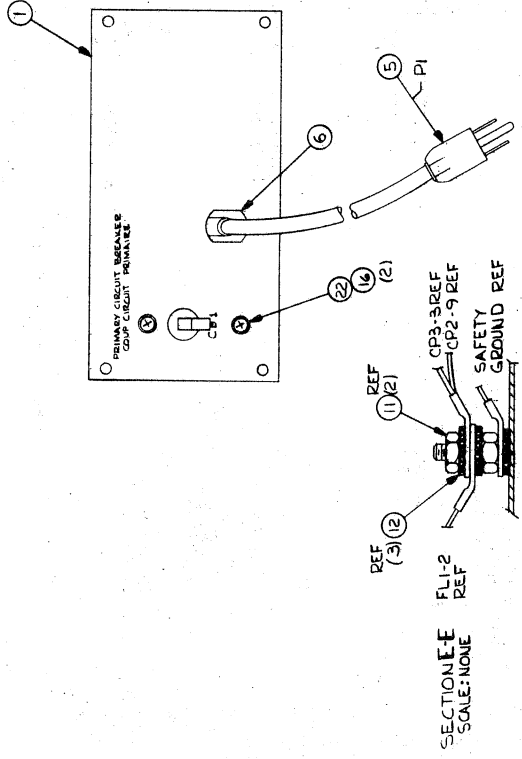
- CDC-ONG 51807700 FILTER, RFI 115-275 VAC
- CDC-ONG 51807700 CIRCUIT BREAKER WITH TRIP COIL



SEE DETAIL D SHEET 1

ORIENTATION FIN (PIN 1)

TABS 17 & 19 ONLY



SECTION E
SCALE-NONE

UNR NO. JEA	CODE ENTRY	DATE	REV

PANEL ASSY (AC ENTRY)
60 HZ

61371100 K
Sheet 2

ASSEMBLY PARTS LIST

										PRINT DATE		PAGE		FILE CHANGE NO.	
										10-10-76		1		0011734A	
										STATUS DATE		ENG. RESP.		FILE DATE	
										04-28-75		LTAT		10-10-76	
DIV.	ASSEMBLY NUMBER	CD	REV.	DWG.	DESCRIPTION	MC	STATUS	STATUS DATE		ENG. RESP.		FILE DATE			
TRND NO.	LI	CD	REV.	U/M	QUANTITY	U/M	MC	YLD	ECC. NO. IN	ECC. NO. OUT	S/N	WK IN	WK OUT		
001	01				71455100	9	1								
					PC PLATE, AC ENTRY 60HZ (CRS)		P								
002	01				71455000	1	1								
					PC COVER AC ENTRY		P								
003	01				51899703	6	1								
					PC FILTR, RFI 5A 115-275V SLD		P								
004	01				51907705	1	1								
					PC CB TRIP COIL 275V 3.5AMP		P								
005	01				51899900	8	1								
					PC CORD, 3 WIRE PWR UL 99T GRA		P								
006	01				36150909	6	1								
					PC BUSHING, STRAIN-REL BLK NYL		B								
007	01				51809821	5	167								
					FT CHAN, RUBBER 1/32 SLT EXTR U		B								
008	01				24565003	1	1								
					PC CLAMP, 5/16DIA CABLE BLK NYLO		R								
009	01				15010500	5	1								
					PC ID PLATE, CABINET SHALL VINYL		P								
010	01				36053425	9	1								
					PC STANDOFF, HEX CFS 6-3BX3.000		P								
011	01				10125108	0	2								
					PC NUT HEX MCH 10-32 STL CP OR Z		B								
012	01				10126403	4	3								
					PC WSHR NO.10 EXT TOOTH LK TYP A		B								
013	01				10127113	8	2								
					PC MSCR PAN PHL 6-32X3/8 (TYP I)		B								
014	01				10126401	8	5								
					PC WSHR NO.6 EXT TOOTH LK TYP A		B								
015	01				10125105	6	3								
					PC NUT HEX MCH 6-32 STL CP OR ZP		B								
016	01				10127111	2	2								
					PC MSCR PAN PHL 6-32X1/4 (TYP I)		B								
017	01				51908602	9	1								
					PC THMS, DISC 2.5 OHM 10P 14MW		P								
018	01				24563704	6	067								
					FT INS SLVNG HI TEMP 18AWG		B								
019	01				36085800	5	1								
					PC LUG TERMINAL STRIP		P			11658			7634		
020	01				61407541	4	REF								
					PC W/L AC ENTRY PANEL 60HZ		D								
021	01				94277409	2	3								
					PC STRAP CABLE TIE TYPE A		B								

ASSEMBLY PARTS LIST

										PRINT DATE		PAGE		FILE CHANGE NO.	
										10-10-76		2		0011734A	
										STATUS DATE		ENG. RESP.		FILE DATE	
										04-28-75		LTAT		10-10-76	
DIV.	ASSEMBLY NUMBER	CD	REV.	DWG.	DESCRIPTION	MC	STATUS	STATUS DATE		ENG. RESP.		FILE DATE			
TRND NO.	LI	CD	REV.	U/M	QUANTITY	U/M	MC	YLD	ECC. NO. IN	ECC. NO. OUT	S/N	WK IN	WK OUT		
022	01				10126103	0	3								
					PC WSHR NO.6 INTL TOOTH LOCK STL		B								
023	01				51905904	2	1								
					PC CONN RECP 9 CONTACTS		P								
024	01				51905902	6	1								
					PC CONN RECP 4 CONTACTS		P								
025	01				51906200	4	6								
					PC CONTACT, SKT 20-148A STRIP T		P								
026	01				62121109	3	3								
					PC TERM RECP FSTN 16-14 AWG BLU		B								
026	02				62121109	3	2								
					PC TERM RECP FSTN 16-14 AWG BLU		B		11658A			11658A	7634	7634	
027	01				51797236	0	2								
					PC LUG, CRMP R TFRM 16-148A 16SS		B								
028	01				93463444	5	2	250							
					FT WIR 18GA STRD YEL 300V UL PVC		W								
029	01				93464222	4	2								
					FT WIR 18GA STRD RED 300V UL PVC		W								
030	01				93464444	4	833								
					FT WIR 18GA STRD YEL 300V UL PVC		W								
031	01				93463555	8	1								
					FT WIR 18GA STRD GRN 300V UL PVC		W								
032	01				24528617	4	333								
					FT T80, INSUL NO.6 BLK UL PVC		B								
033	01				51797217	0	1								
					PC LUG, CRMP R TFRM +22-188A 10S		B								
034	01				10125605	5	1								
					PC WSHR NO.6 TYP A PLAIN STL CP		B								
035	01				51906001	6	1								
					PC CONN PLUG 3 PIN		P								
036	01				51906201	2	4								
					PC CONTACT, SKT 20-148A STRIP T		P								
037	01				62121108	5	1								
					PC TERM RECP FSTN 18-22 AWG RED		B		11658A				7634		
0038 TOTAL LINES															

DWN	R Trautman	1/2/76	CONTROL DATA	TITLE	SPL TICKETRON	PREFIX	DOCUMENT NO.	REV
CHKD	E Grono	1/76				SPL	66298750	P
ENG	L Rajewsky	1/76		FIRST USED ON	CCL17A		SHEET	1 of 3
MFG	T Forman	2/76	CODE IDENT					
APPR	E Noe	2/76	15920					

SHEET REVISION STATUS				REVISION RECORD						
REV	ECO	DESCRIPTION	DRFT	DATE	APP					
N	J	N	N	CD12424	Retyped page 1, deleted pages 4 thru 7 per ECO			9-6-77	AB	
N	P	P	P	12510	F/N 9 WAS 90460400	RJH		1-5-77	AL	

NOTES: 1. Equipment Configurator 15630200
2. Top Level Assembly 15630300

DETACHED LISTS

AA3180 REV. 8-71

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CONTROL DATA			CODE IDENT	SHEET	PREFIX	DOCUMENT NO.	REV.
			15920	2	SPL	66298750	P
FIND NO.	PART IDENTIFICATION	QUANTITY REQUIRED	UNIT OF MEAS	NOMENCLATURE OR DESCRIPTION	SPECIFICATIONS, NOTES, OR MATERIAL		
1	90445764	1		P.C. Assy 5CUD-4	Disp /Kybd IF		
2	90393600	2		P.C. Assy 4BBD	SV Reg		
3	90445754	1		P.C. Assy 4A4D-1	Processor		
4	90425500	1		P.C. Assy 5ARD-0	Stic		
5	90391603	2		P.C. Assy 4ASD	RAM		
6	90460522	1		P.C. Assy 5DCD-0	Capacitor Bd		
7	90413100	1		P.C. Assy 4C4D	Async IF-2		
8	51908902	1		Sonalert			
9	90445824	1		P.C. Assy 5CYD-1	Power Supply		
10	61407429	1		Xfmr Assy 120/20V			
11							
12	90445717	1		P.C. Assy 5BVD-1	Non-Composite		
13	15130504	2		Regulator (+15V)			
14	61407419	1		Choke Assy			
15	61407418	1		Yoke Assy			
16	51907303	1		CRT 12 inch Phosphor 6RA	P4		
17	61375200	1		Cable Assy - Intensity	Potentiometer/ Cable Assy		
18	51907705	1		CB Magnetic			
19	51915101	1		Knob, Plain			
20	51886600	1		Fan			

AA3181 REV. 8-71

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DWN	D. Wells	6/17/76	CONTROL DATA	TITLE	SPL	DOCUMENT NO.	REV
CHKD	G. Papp	7/9/76		SPL TICKETRON	SPL	66299500	J
ENG	R. H. Johnson	7/17/76		FIRST USED ON			
MFG	R. H. Johnson	8/17/76		CC617B			
APPR			CODE IDENT			SHEET	1 of 3
			15920				
SHEET REVISION STATUS				REVISION RECORD			
				3	2	1	REV
							ECO
							DESCRIPTION
							DRFT
							DATE
							APP
							RELEASED CLASS C
							7-9-76 JKH
							DELETED F/N 27 → 111
							DELETED PAGES 4 → 7
							R 7-14-76 JKH
							A A A A 10842-54 RELEASED CLASS C
							7-14-76 M.C.T.
							A B B B 11870 CHG F/N 1
							WLL 11/16/76 JKH
							A C C C CD11642 CHG F/N 3
							WLL 1-18-77 JKH
							D C D D 11773 F/N 28 WAS 7149/201
							WLL 2-21-77 JKH
							D E E E 12001 DELETED F/N 11
							F/N 16 WAS 5707330
							WLL 3-27-77 JKH
							F E F F 12115 F/N 26 WAS 614-71417
							WLL 5-18-77 JKH
							G E G G 12010 Revised Per ECO
							WLL 6-7-77 JKH
							H E H H 12190 A.C.T. F/N 32
							WLL 6/14/77 JKH
							H J J J 12510 F/N 9 WAS 90460400
							RJH 1-5-78 JKH

NOTES:
 1. Equipment Configurator 15630611
 2. Top Level Assembly 15630612

DETACHED LISTS

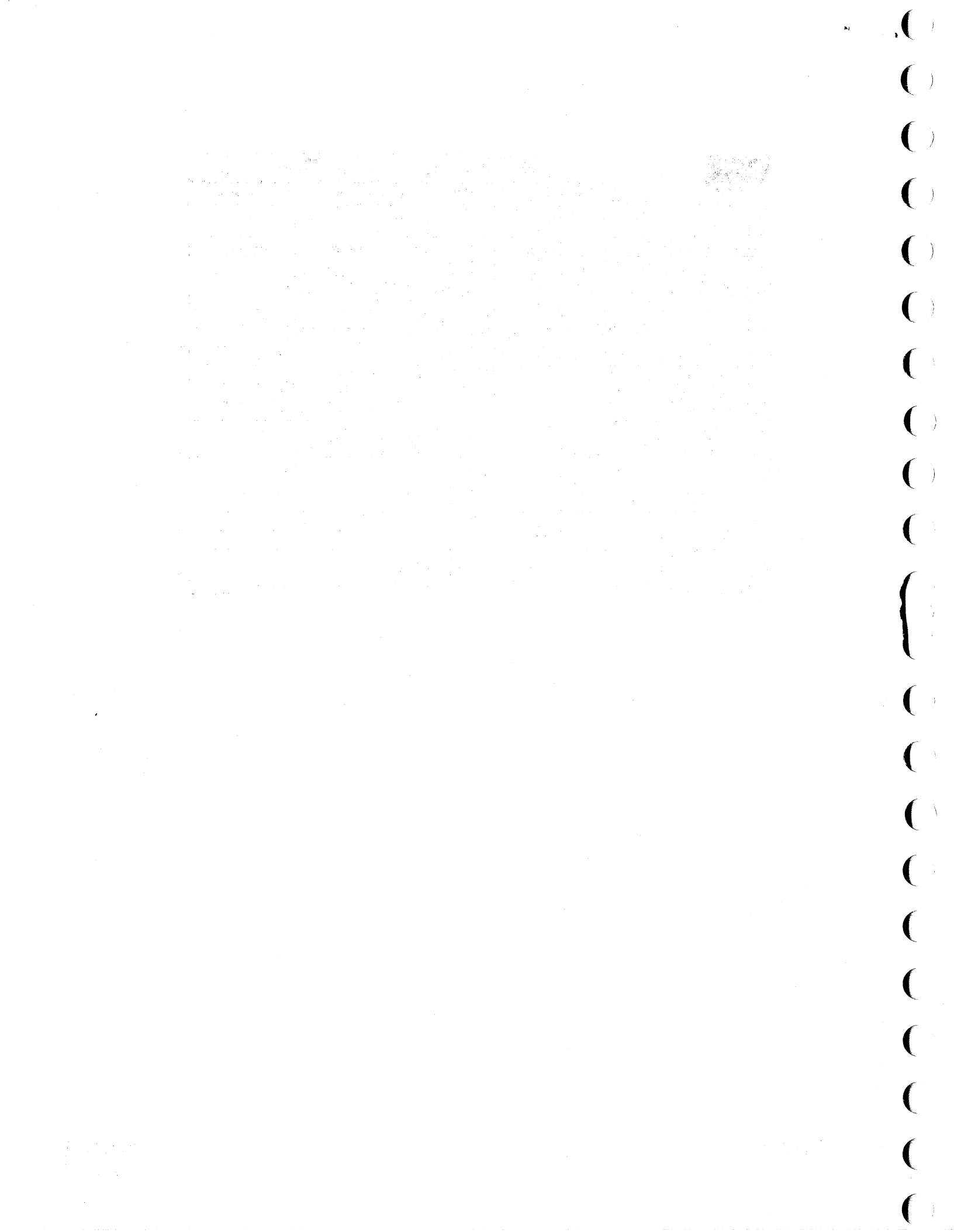
AA3180 REV. 8 71

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CONTROL DATA			CODE IDENT	SHEET	SPL	DOCUMENT NO.	REV
			15920	2		66299500	J
FIND NO.	PART IDENTIFICATION	QUANTITY REQUIRED	UNIT OF MEAS	NOMENCLATURE OR DESCRIPTION	SPECIFICATIONS, NOTES, OR MATERIAL		
1	90445764	1		P.C. Assy 5CUD-4	Disp/Kybd IF		
2	90393600	1		P.C. Assy 4BBD	5V Reg		
3	90445754	1		P.C. Assy 4A0D-1	Processor		
4	90425500	1		P.C. Assy 5ARD-0	Stic		
5	95686705	1		Cap 3 uf 660 VAC			
6	90460522	1		P.C. Assy 5DCD-0	Capacitor Bd		
7	90413100	1		P.C. Assy 4C0D	Async IF-2		
8	51908902	1		Sonalent			
9	90445824	1		P.C. Assy 5CYD-1	Power Supply		
10	61407429	1		Xfmr Assy 120/20V			
11							
12	90445717	1		P.C. Assy 5BVD-1	Non-Composite		
13	15130504	2		Regulator (+15V)			
14	61407419	1		Choke Assy			
15	61407418	1		Yoke, Assy			
16	51907303	1		CRT 12 inch Phosphor 6RA P4			
17	61375200	1		Cable Assy - Intensity	Potentiometer/ Cable Assy		
18	51907705	1		CB Magnetic			
19	51915101	1		Knob, Plain			
20	51886600	1		Fan			

AA3181 REV. 8 71

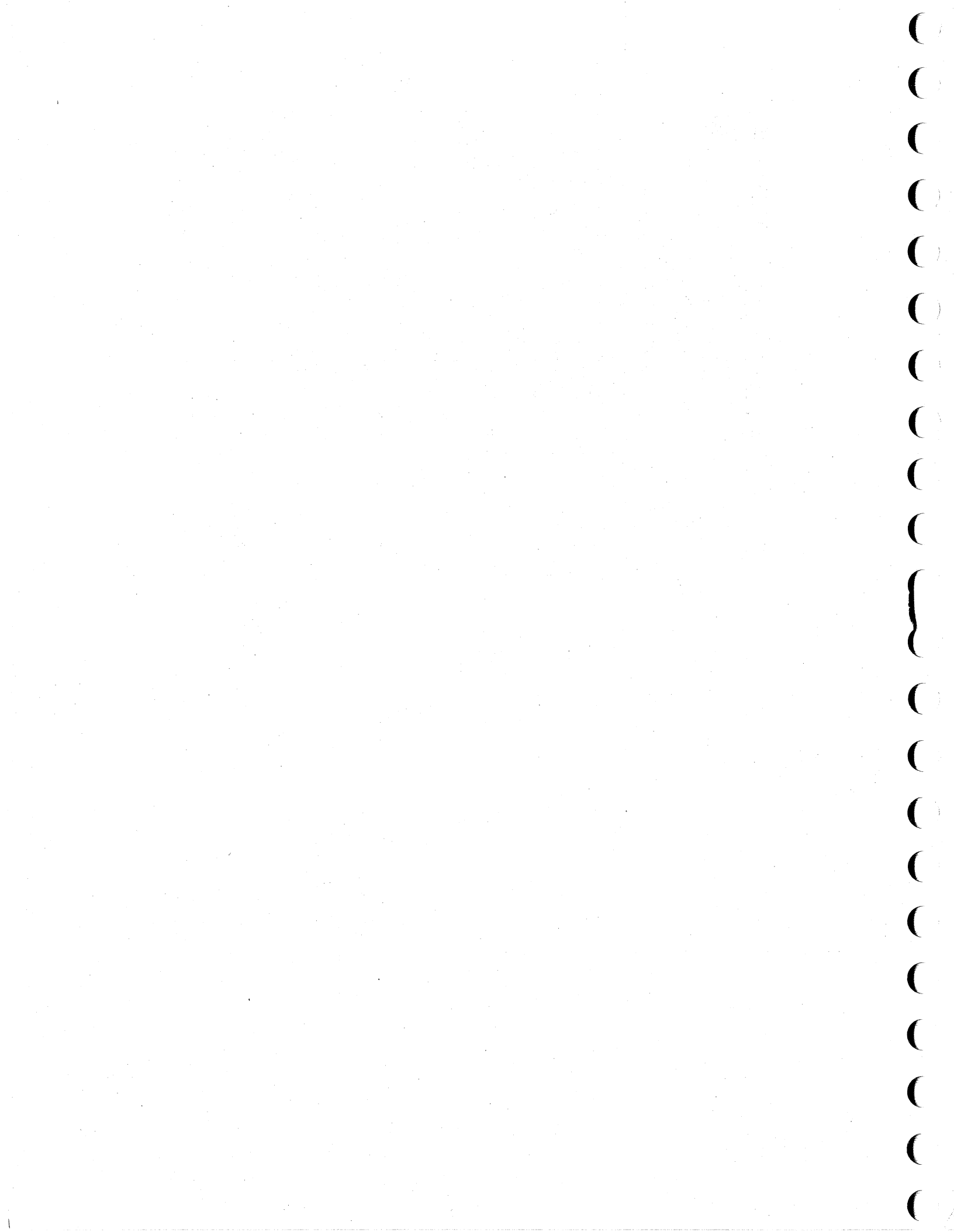
PRINTED IN U.S.A.



CONTROL DATA		CODE IDENT		SHEET		DOCUMENT NO.		REV.				
		15920		3		66299500		H				
FIND NO.	PART IDENTIFICATION	QUANTITY REQUIRED								UNIT OF MEAS	NOMENCLATURE OR DESCRIPTION	SPECIFICATIONS, NOTES, OR MATERIAL
21	51899703	1									Line Filter	
22	90439900	1									P.C. Assy 5CXD-0	Maint Panel
23	61407421	1									Power Supply Assy	
24	71491300	1									Cover Panel Maint.	
25	51585701	1									Rectifier Bridge	
26	61407695	1									High Voltage Transformer Assy	
27	91004063	AR									Adhesive/ Sealant Silicone Rubber	
28												
29	51917051	AR									△ △ 2.0 △	YEL
30	51917052	AR									△ △ 3.0 △	SILVER
31	51917053	AR									△ △ 4.0 △	RED
32	51917054	AR									△ △ 5.7 △	GREEN
33	51777314	4									SUPPORT CIRCUIT BOARD	

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Wire list information applicable to the display terminal is contained in section 5, Diagrams, of this manual in the form of module interconnection diagrams.

SECRET

1. The following information is being furnished to you for your information:

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23. This information is being furnished to you for your information.

This appendix contains the pin assignments of the display terminal connectors that are used to make external interface connections. This information is provided as follows:

- Table A-1 lists the pin assignments of the keyboard module connector located at the bottom right front of the display terminal.
- Table A-2 lists the pin assignments of the external modem connector on the connector panel located at the rear of the display terminal.
- Table A-3 lists the pin assignments of the printer or ticket printer controller connector on the connector panel.
- Table A-4 lists the assignments of the terminal block on the connector panel for connection of the telephone line when an internal modem is used.

TABLE A-1. KEYBOARD CONNECTOR SIGNAL PIN ASSIGNMENTS


PIN NUMBER	SIGNAL NAME	SIGNAL DIRECTION
1	Not Assigned	
2	Keyboard Data 2^7	Input
3		Input
4		Input
5		Input
6		Input
7		Input
8		Input
9		Keyboard Data 2^0	Input
10	Keyboard Strobe	Input
11	Status A	Input
12	Status B	Input
13	Not Assigned	—
14	Not Assigned	—
15	Signal Ground	Not Applicable
16	Signal Ground	Not Applicable
17	Signal Ground	Not Applicable
18	Signal Ground	Not Applicable
19	Keylock In	Not Applicable
20	Frame Ground	Not Applicable
21	Keylock Out	Not Applicable
22	Not Assigned	—
23	+5-V dc	Output
24	Ground	Not Applicable
25	-12-V dc	Output

TABLE A-2. MODEM CONNECTOR SIGNAL PIN ASSIGNMENTS

PIN NUMBER	SIGNAL NAME	SIGNAL DIRECTION
1	Frame Ground	Not Applicable
2	Transmit Data	Output
3	Receive Data	Input
4	Request to Send	Output
5	Clear to Send	Input
6	Data Set Ready	Input
7	Signal Ground	Not Applicable
8	Carrier On	Input
9	Not Assigned	—
10	Not Assigned	—
11	Not Assigned	—
12	Secondary Carrier On	Input
13	Not Assigned	—
14	Not Assigned	—
15	Not Assigned	—
16	Not Assigned	—
17	Not Assigned	—
18	Not Assigned	—
19	Secondary Request to Send	Output
20	Data Terminal Ready	Output
21	Not Assigned	—
22	Ring Indicator	Input
23	Not Assigned	—
24	Not Assigned	—
25	Not Assigned	—

TABLE A-3. PRINTER CONNECTOR SIGNAL PIN ASSIGNMENTS

PIN NUMBER	SIGNAL NAME	SIGNAL DIRECTION
1	Frame Ground	Not Applicable
2	Transmit Data	Output
3	Receive Data	Input
4	Request to Send	Output
5	Clear to Send	Input
6	Data Set Ready	Input
7	Signal Ground	Not Applicable
8	Carrier On	Input
9	Not Assigned	—
10	Not Assigned	—
11	Not Assigned	—
12	Secondary Carrier On	Input
13	Not Assigned	—
14	Not Assigned	—
15	Not Assigned	—
16	Not Assigned	—
17	Not Assigned	—
18	Keylock In	Not Applicable
19	Secondary Request to Send	Output
20	Data Terminal Ready	Output
21	Not Assigned	—
22	Ring Indicator	Input
23	Not Assigned	—
24	Not Assigned	—
25	Keylock Out	Not Applicable

TABLE A-4. TELEPHONE-LINE TERMINAL BLOCK ASSIGNMENTS

TERMINAL NUMBER	TELEPHONE SIGNAL NAME AND DIRECTION	
	2-WIRE HALF-DUPLEX	4-WIRE FULL-DUPLEX
1	Not Used	Data Ring Receive (DRR) — Input
2	Not Used	Frame Ground
3	Not Used	Data Tip Receive (DTR) — Input
4	Data Ring Transmit/Receive (DTR/DRR)	Data Ring Transmit (DRT) — Output
5	Frame Ground*	Frame Ground
6	Data Tip Transmit/Receive (DTT/DTR)	Data Tip Transmit (DTT) — Output

* This is not to be mistaken for the Signal Ground (SG) interface connection used between modem module part number 51912400 and a Bell System CBS Data Coupler (see interface diagram of modem module 51912400 in section 4, Theory of Operation).

Faint, illegible text, possibly bleed-through from the reverse side of the page. The text is arranged in several paragraphs and is too light to transcribe accurately.



This appendix contains information on the display character repertoire for the display terminal. The display character repertoire consists of 96 standard ASCII alphanumeric characters and punctuation marks including a space and 16 special characters. The repertoire and its code set are shown in table B-1. The code set shown in the table is in binary. Shown in figures B-1 and B-2 are the dot matrix patterns of the repertoire with figure B-1 showing the patterns for the 80 character display format and figure B-2 showing the patterns for the 40 character display format. Note that in the 80 character format, the symbol generation circuitry of the display terminal employs a 7- by 9-dot matrix, and in the 40 character format, it employs a 14- by 18-dot matrix. The codes of the repertoire code set that appear on the two figures are in hexadecimal.

TABLE B-1. DISPLAYABLE CODES

BITS					0	0	0	0	1	1	1	1
b ₄	b ₃	b ₂	b ₁	COL ROW	0	1	2	3	4	5	6	7
0	0	0	0	0	NUL		SP	0	@	P	'	p
0	0	0	1	1	SOH		!	1	A	Q	a	q
0	0	1	0	2	STX		"	2	B	R	b	r
0	0	1	1	3	ETX		#	3	C	S	c	s
0	1	0	0	4	EOT		\$	4	D	T	d	t
0	1	0	1	5	ENQ		%	5	E	U	e	u
0	1	1	0	6	ACK		&	6	F	V	f	v
0	1	1	1	7	BEL		'	7	G	W	g	w
1	0	0	0	8	BS		(	8	H	X	h	x
1	0	0	1	9	HT		)	9	I	Y	i	y
1	0	1	0	10{A}	LF		*	:	J	Z	j	z
1	0	1	1	11{B}	VT		+	;	K	[	k	{
1	1	0	0	12{C}	FF		,	<	L	\	l	|
1	1	0	1	13{D}	CR		-	=	M	]	m	}
1	1	1	0	14{E}	SO		.	>	N	^	n	~
1	1	1	1	15{F}	SI		/	?	0	_	o	DEL

01692

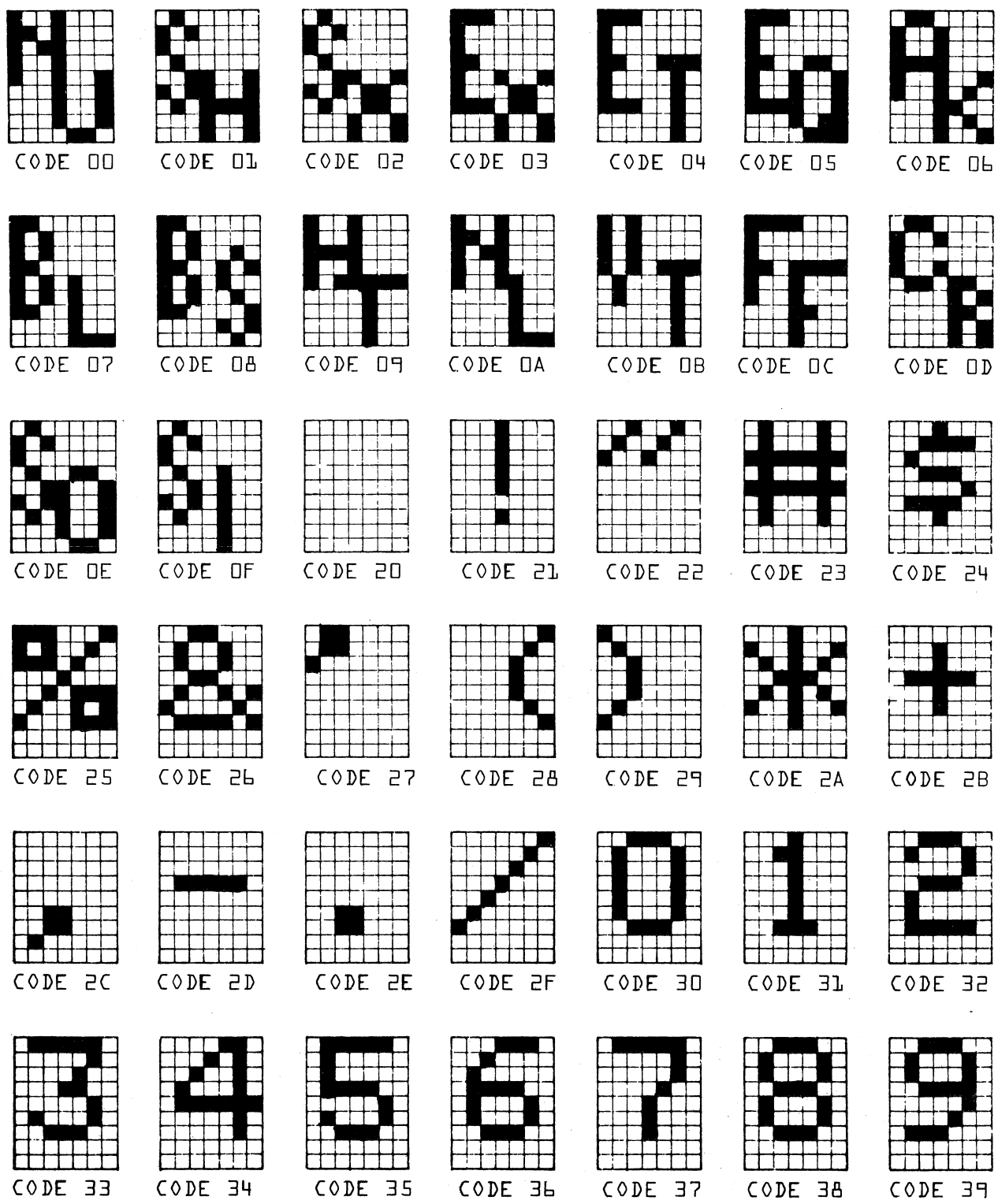


Figure B-1. Dot Matrix in 80 Character Display Format

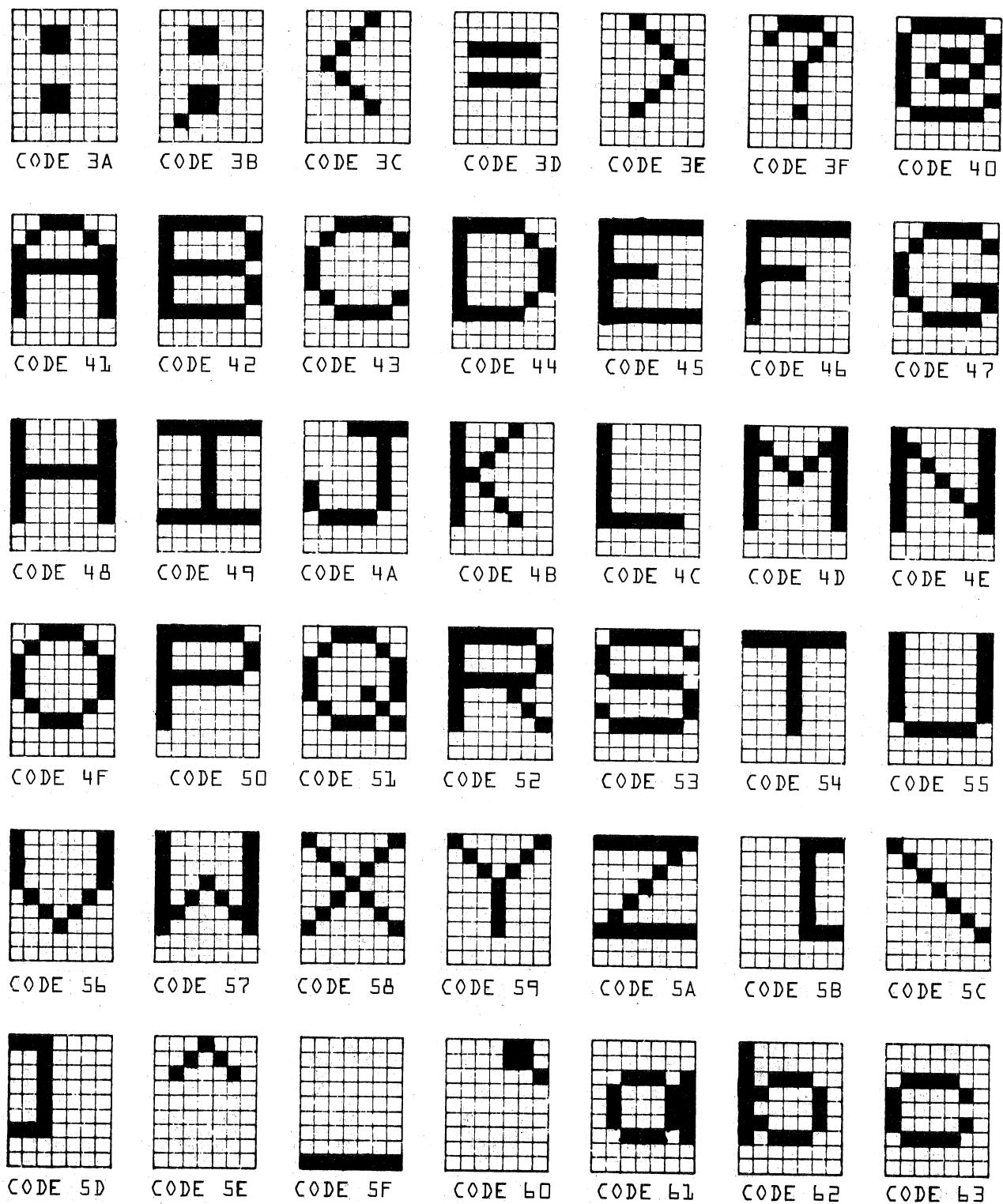


Figure B-1. Dot Matrix in 80 Character Display Format (Contd)

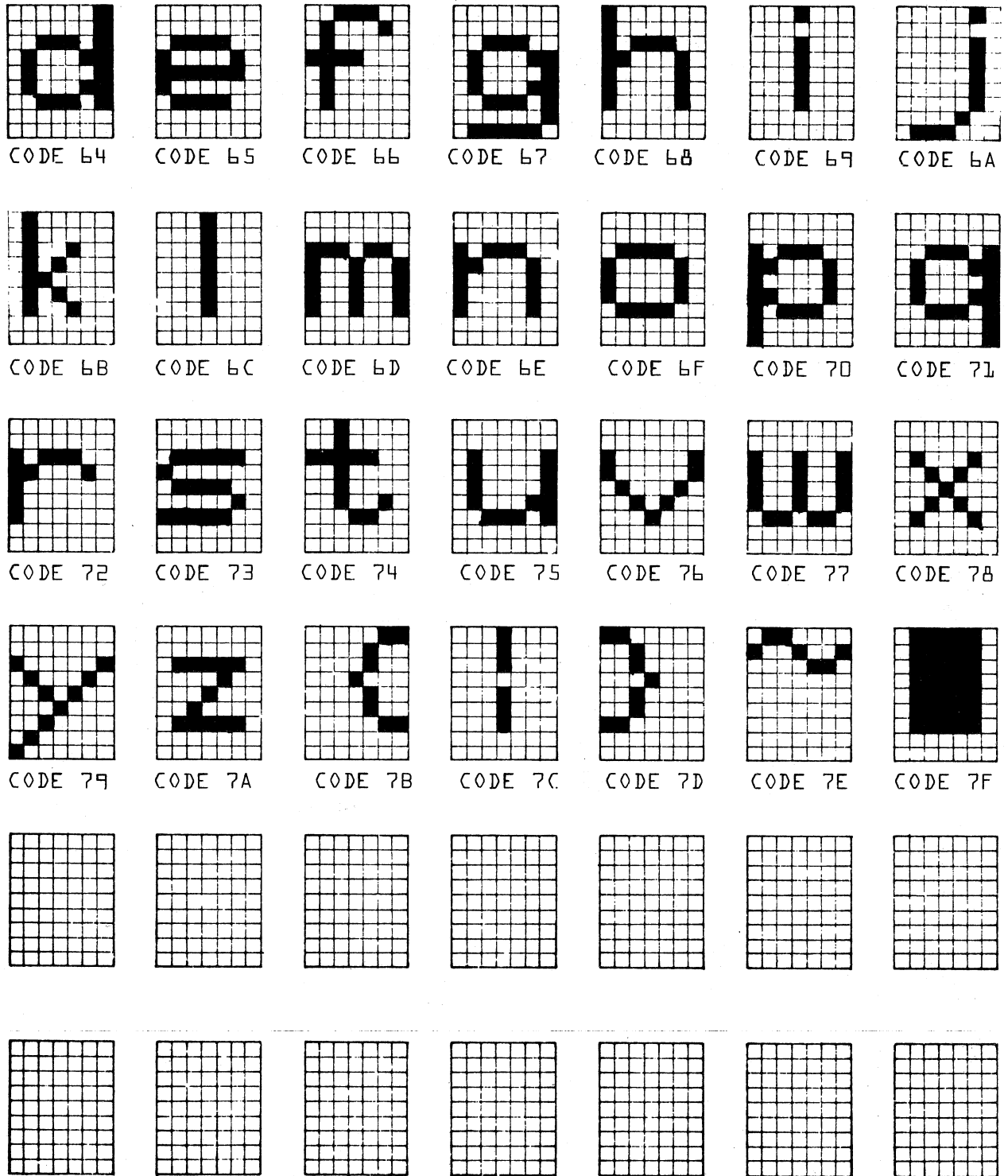
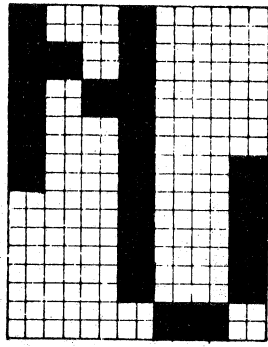
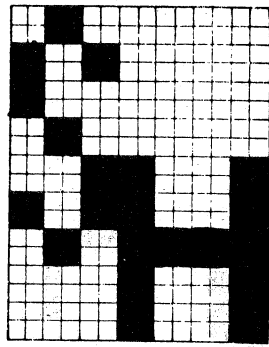


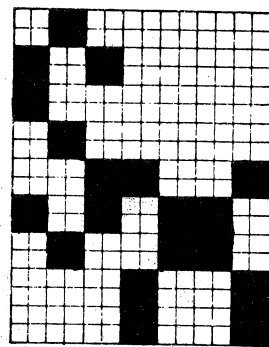
Figure B-1. Dot Matrix in 80 Character Display Format (Contd)



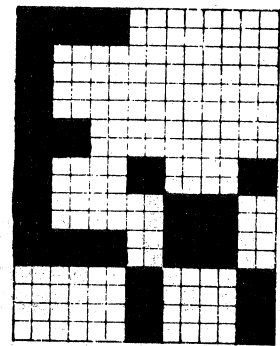
CODE 00



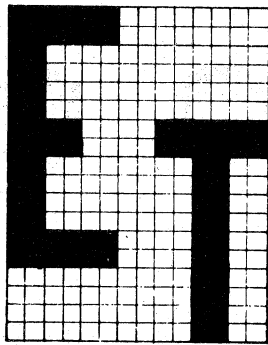
CODE 01



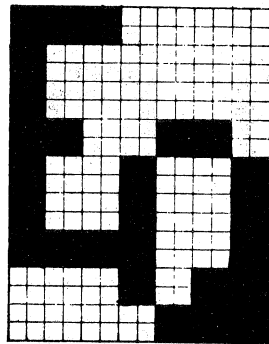
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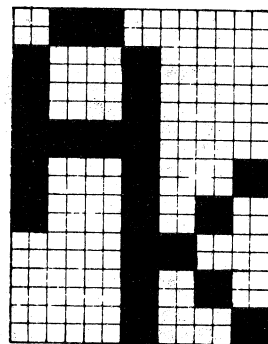
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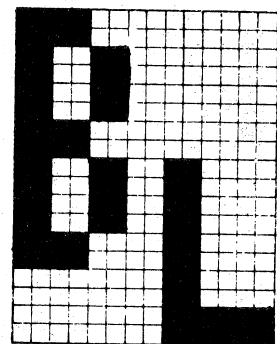
CODE 04



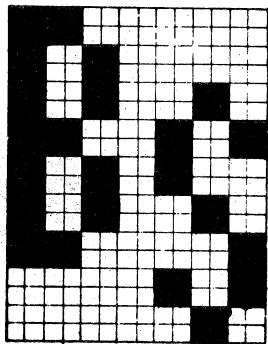
CODE 05



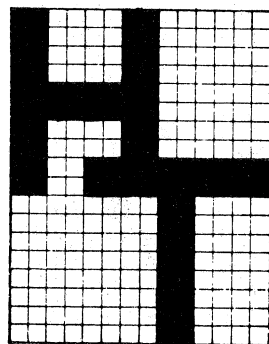
CODE 06



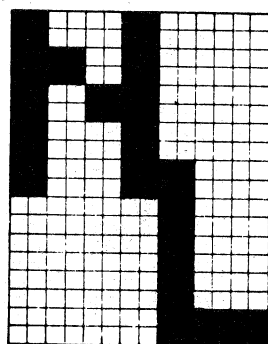
CODE 07



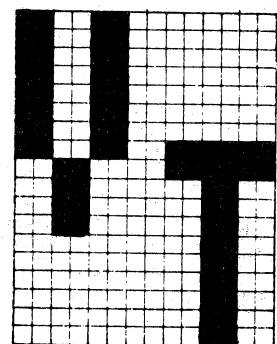
CODE 08



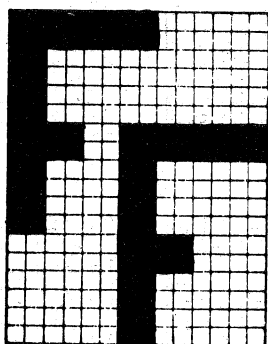
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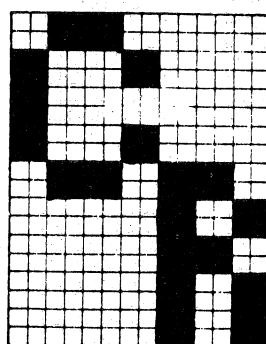
CODE 0A



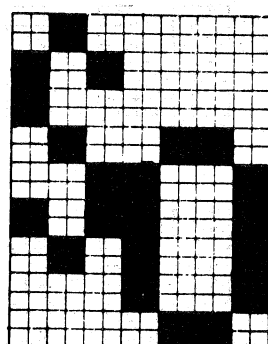
CODE 0B



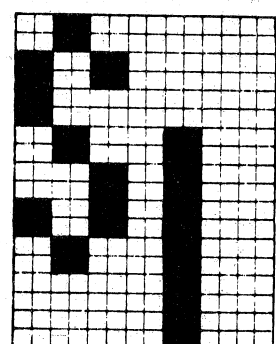
CODE 0C



CODE 0D

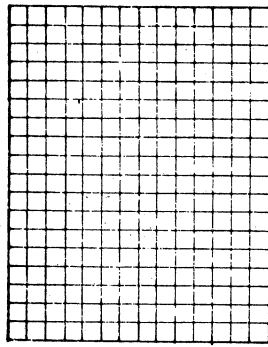


CODE 0E

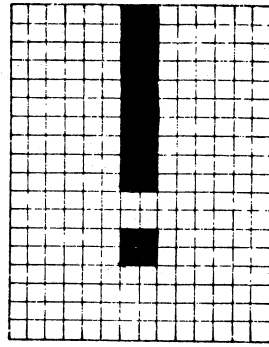


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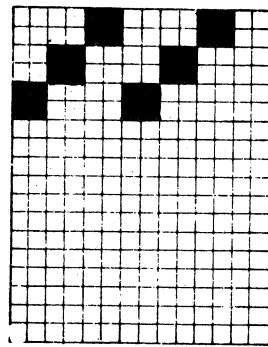
Figure B-2. Dot Matrix in 40 Character Display Format



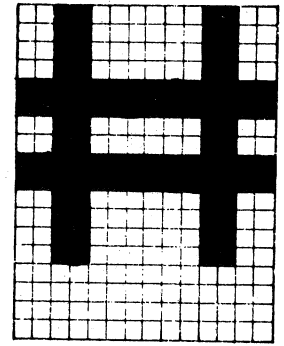
CODE 20



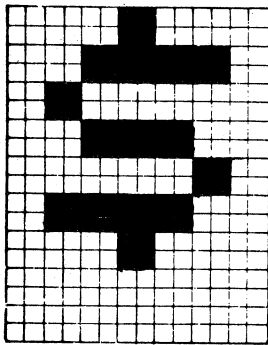
CODE 21



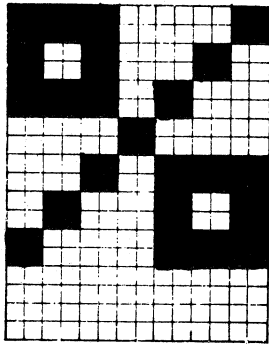
CODE 22



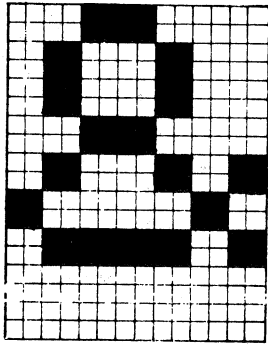
CODE 23



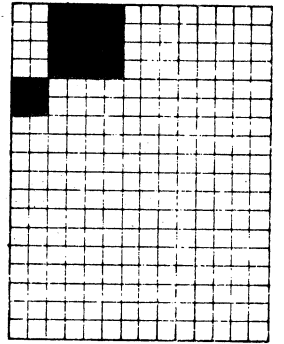
CODE 24



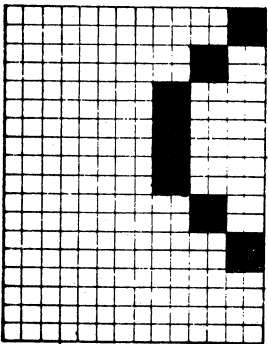
CODE 25



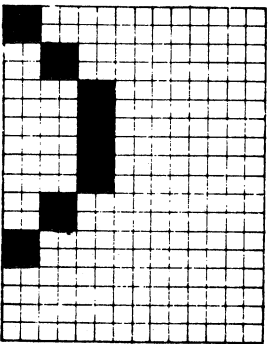
CODE 26



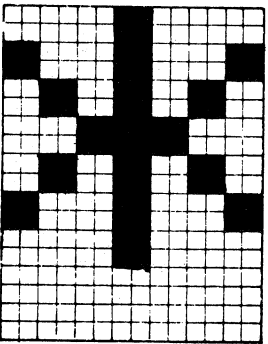
CODE 27



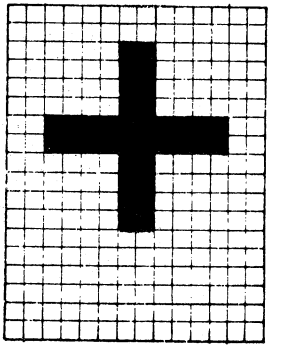
CODE 28



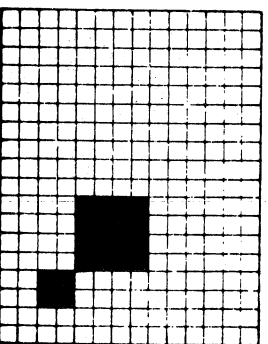
CODE 29



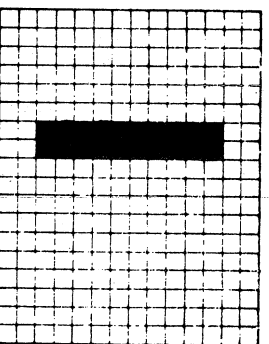
CODE 2A



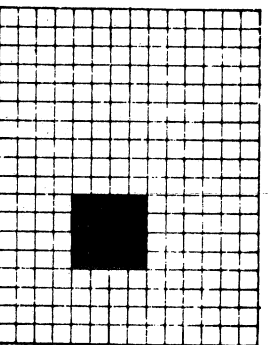
CODE 2B



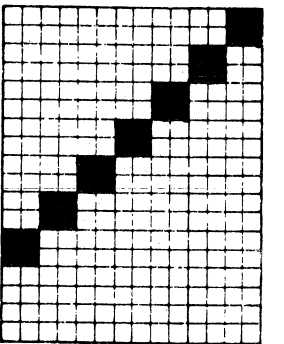
CODE 2C



CODE 2D

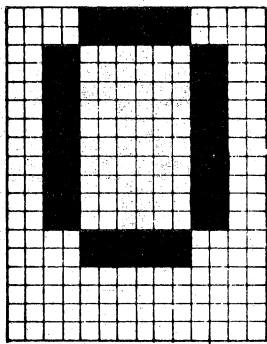


CODE 2E

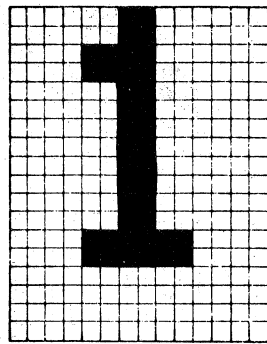


CODE 2F

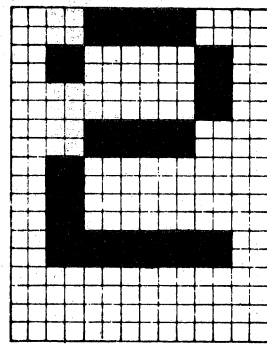
Figure B-2. Dot Matrix in 40 Character Display Format (Contd)



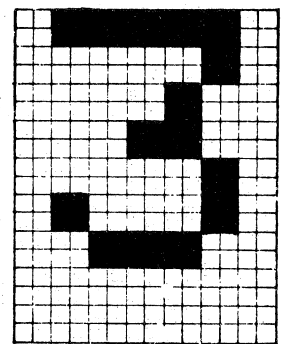
CODE 30



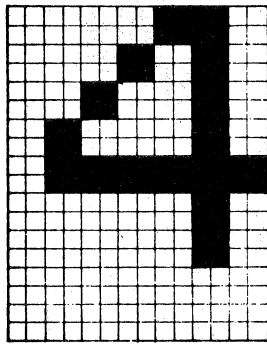
CODE 31



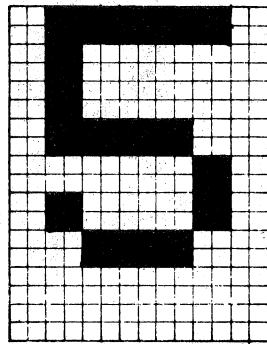
CODE 32



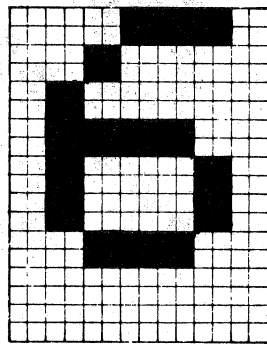
CODE 33



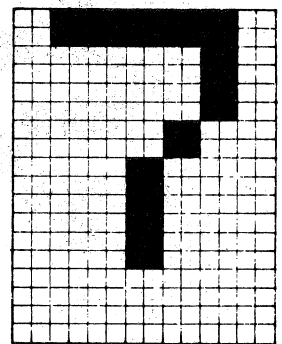
CODE 34



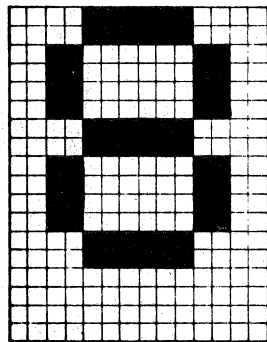
CODE 35



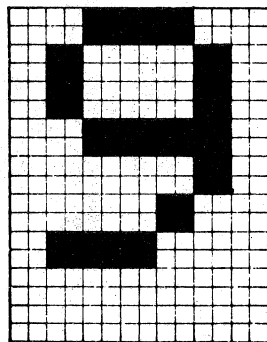
CODE 36



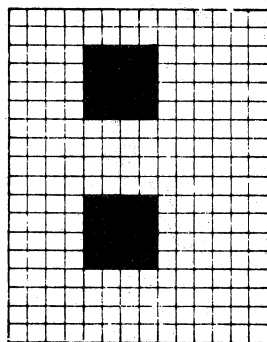
CODE 37



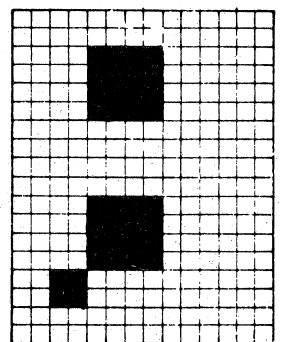
CODE 38



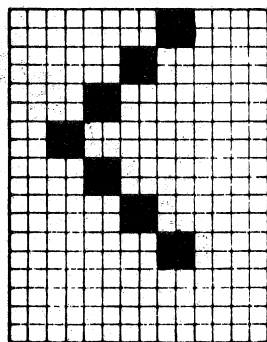
CODE 39



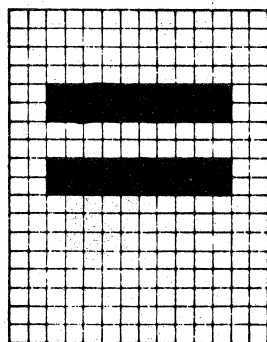
CODE 3A



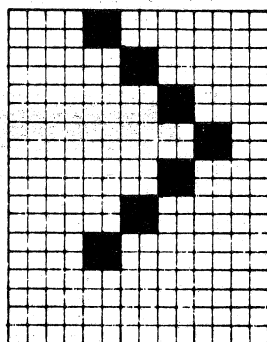
CODE 3B



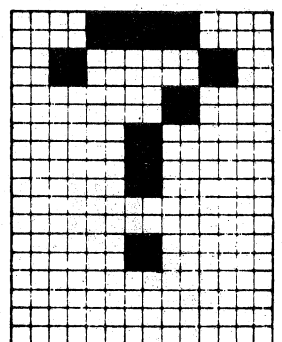
CODE 3C



CODE 3D

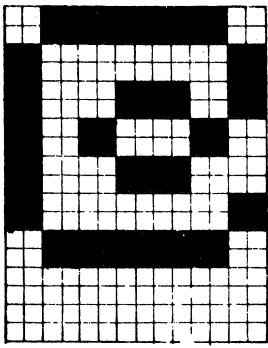


CODE 3E

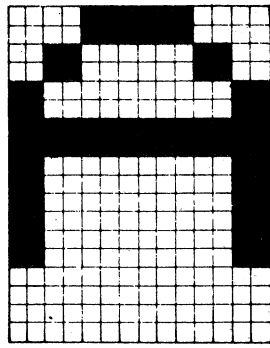


CODE 3F

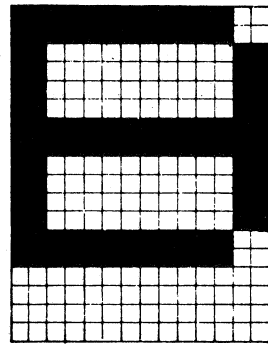
Figure B-2. Dot Matrix in 40 Character Display Format (Contd)



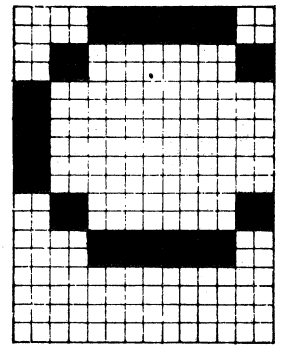
CODE 40



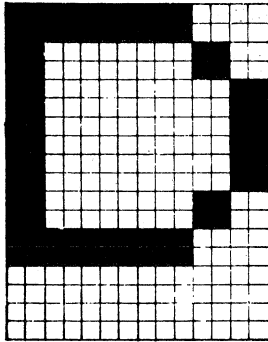
CODE 41



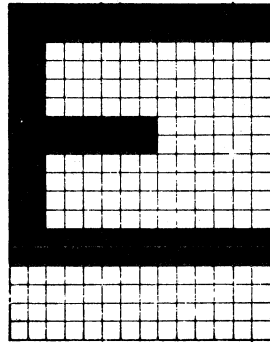
CODE 42



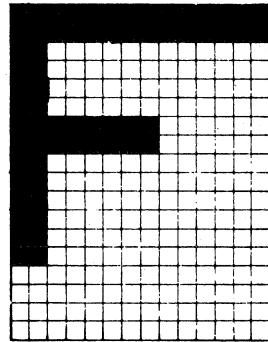
CODE 43



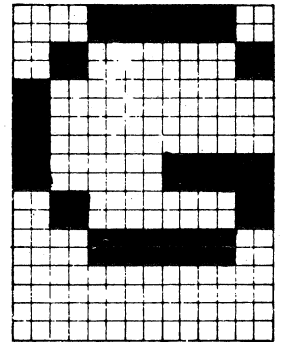
CODE 44



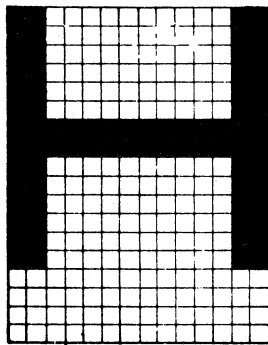
CODE 45



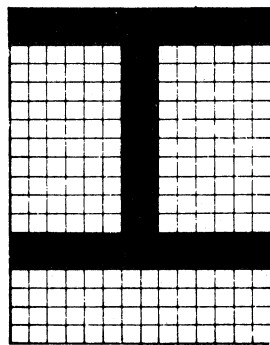
CODE 46



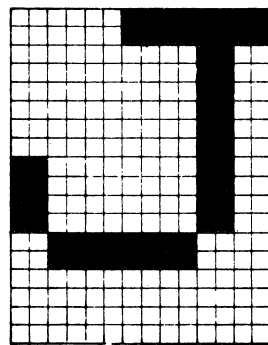
CODE 47



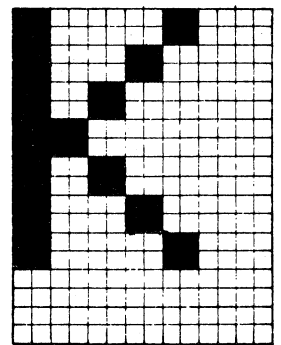
CODE 48



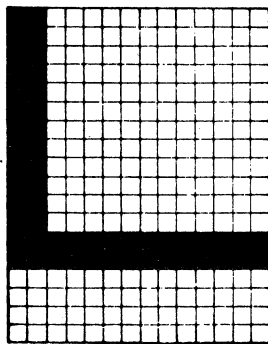
CODE 49



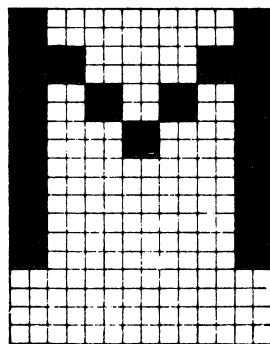
CODE 4A



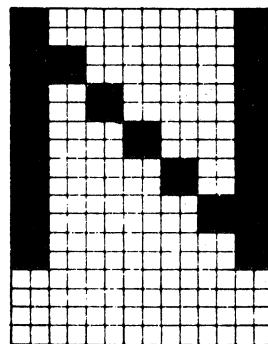
CODE 4B



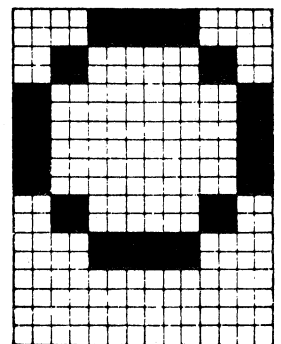
CODE 4C



CODE 4D

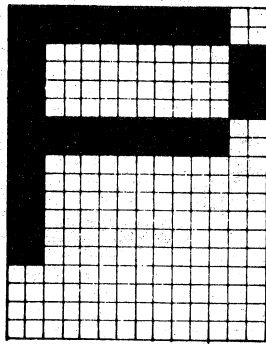


CODE 4E

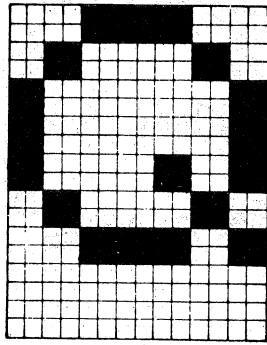


CODE 4F

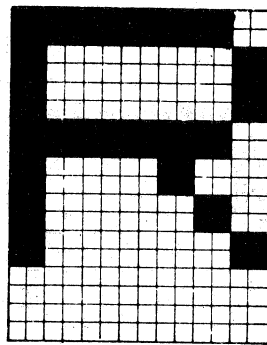
Figure B-2. Dot Matrix in 40 Character Display Format (Contd)



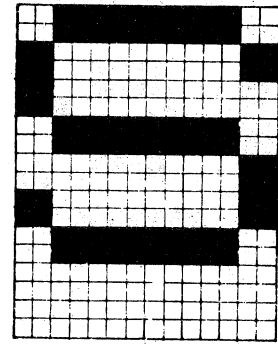
CODE 50



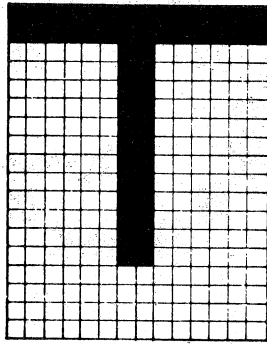
CODE 51



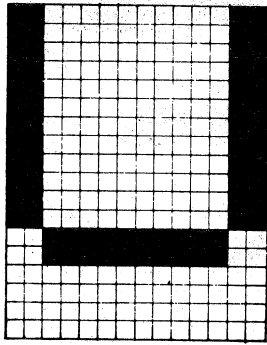
CODE 52



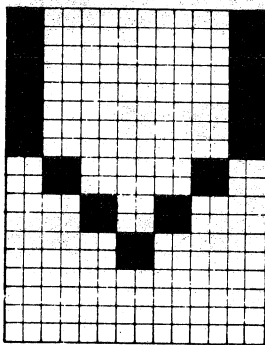
CODE 53



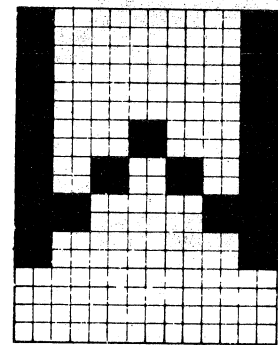
CODE 54



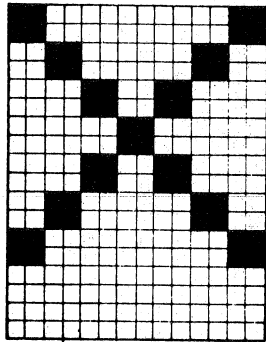
CODE 55



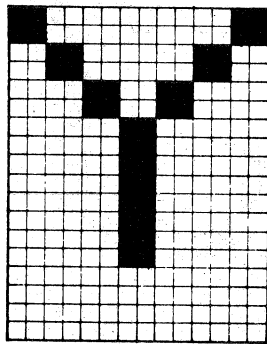
CODE 56



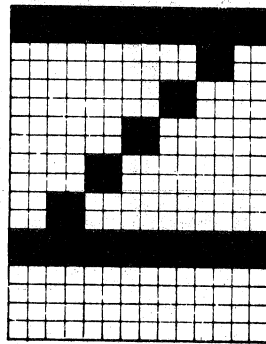
CODE 57



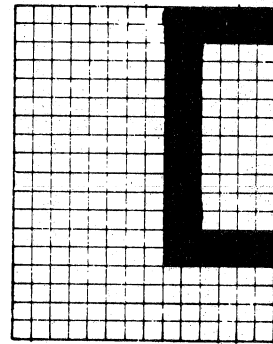
CODE 58



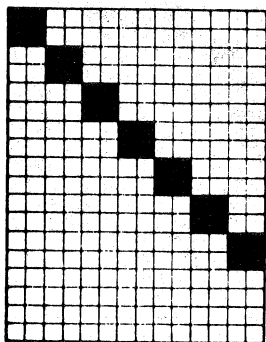
CODE 59



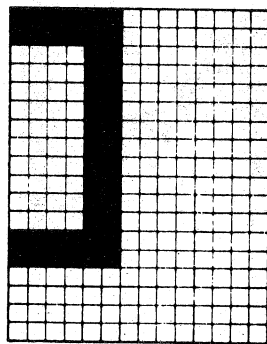
CODE 5A



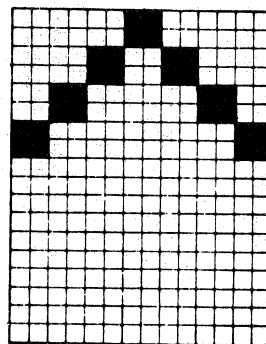
CODE 5B



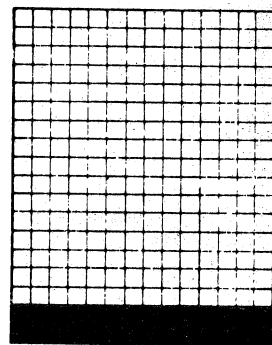
CODE 5C



CODE 5D

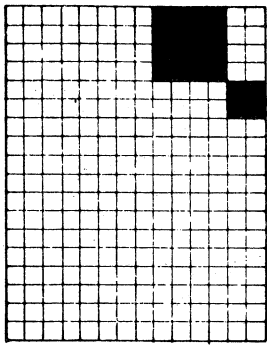


CODE 5E

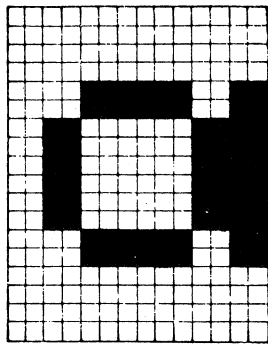


CODE 5F

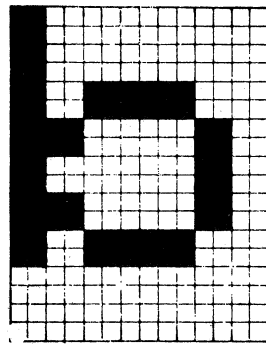
Figure B-2. Dot Matrix in 40 Character Display Format (Contd)



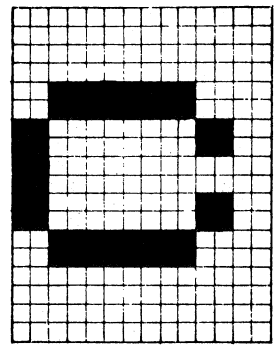
CODE 60



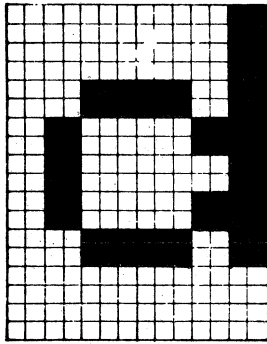
CODE 61



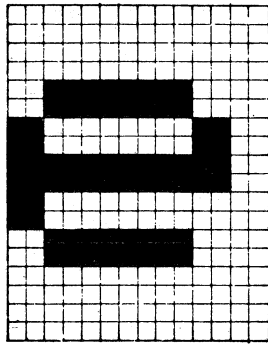
CODE 62



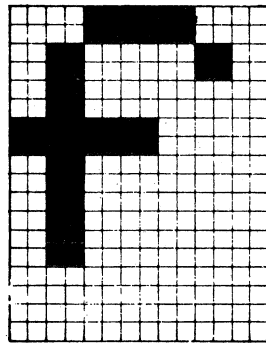
CODE 63



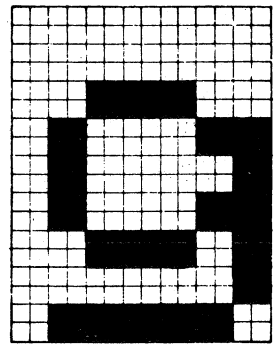
CODE 64



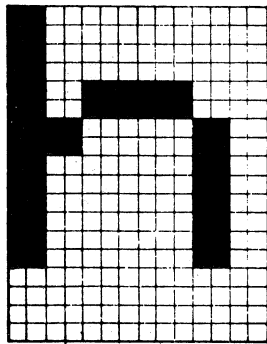
CODE 65



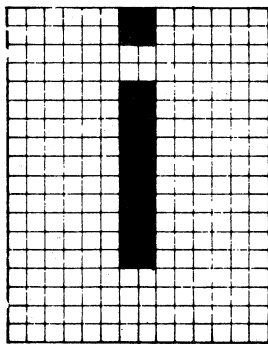
CODE 66



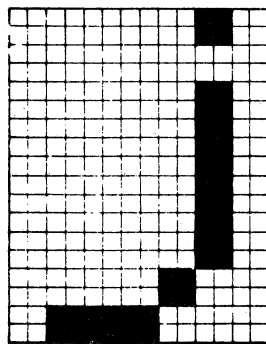
CODE 67



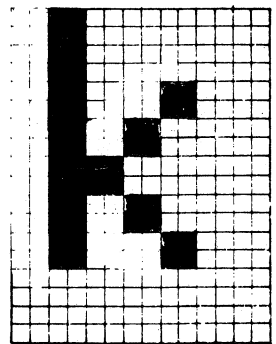
CODE 68



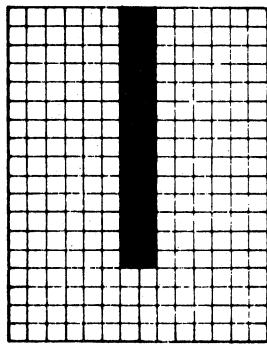
CODE 69



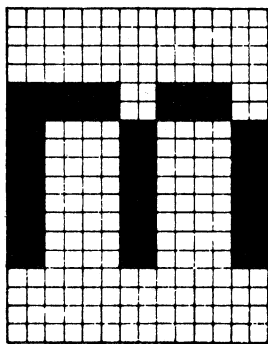
CODE 6A



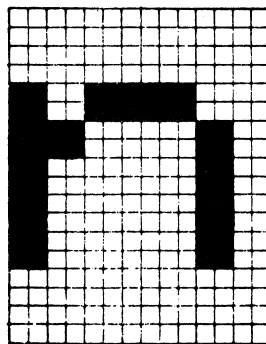
CODE 6B



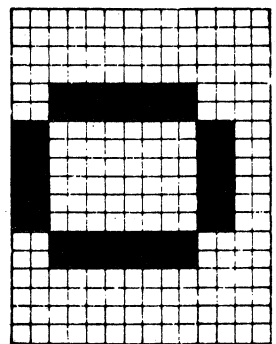
CODE 6C



CODE 6D

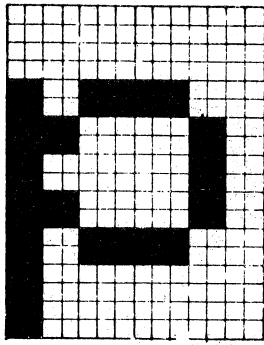


CODE 6E

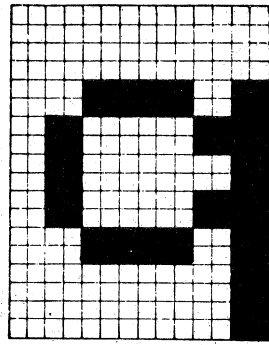


CODE 6F

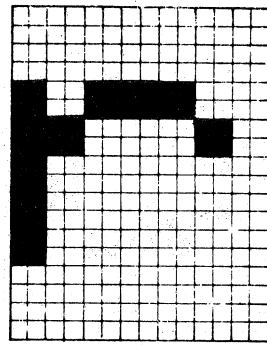
Figure B-2. Dot Matrix in 40 Character Display Format (Contd)



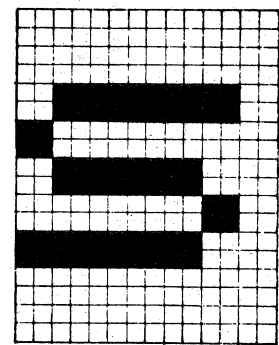
CODE 70



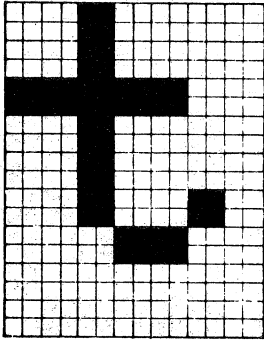
CODE 71



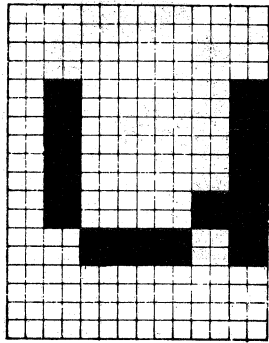
CODE 72



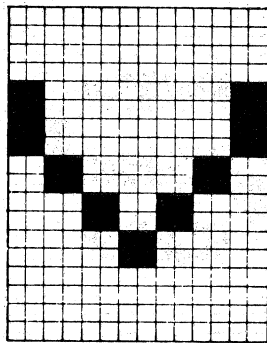
CODE 73



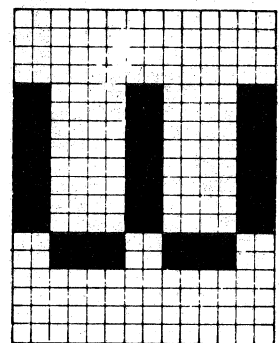
CODE 74



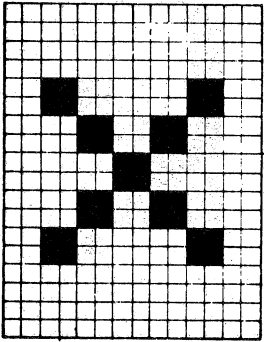
CODE 75



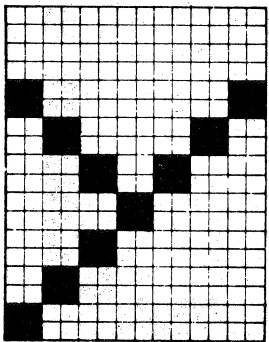
CODE 76



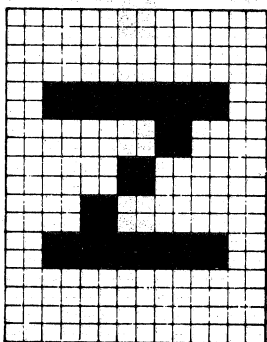
CODE 77



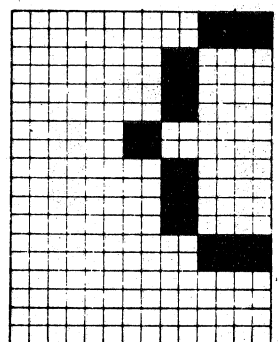
CODE 78



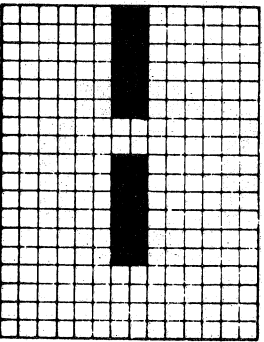
CODE 79



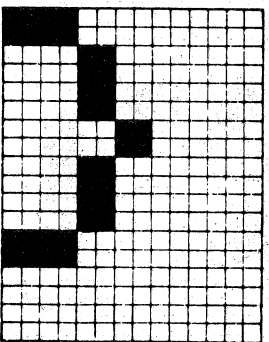
CODE 7A



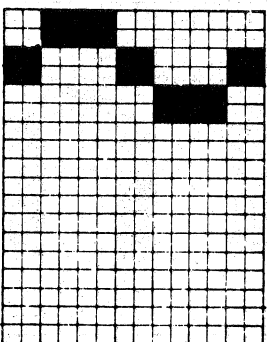
CODE 7B



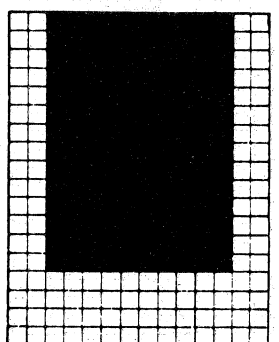
CODE 7C



CODE 7D



CODE 7E



CODE 7F

Figure B-2. Dot Matrix in 40 Character Display Format (Contd)

This appendix contains a description of the diagnostic-autoload sequence of the firmware program that is employed in the Ticketron application of the display terminal. Included as part of the description is the effect and characteristics that each section of the program introduces to the display terminal as they are executed. The execution of the diagnostic-autoload sequence occurs during display terminal initialization following a power-on master clear or a manual reset; or during manual intervention when the maintenance panel switches are used to reinstate a selected section of the diagnostic program or to cause the autoload program to reload a page of the applications program.

QUICKLOOK DIAGNOSTIC

A quicklook diagnostic is provided that does a short self-diagnostic of the display terminal hardware before loading the applications program. This diagnostic and autoload program is resident in nonvolatile ROM. It is entered in power on and manual reset situations.

The quicklook diagnostic has the following test sections:

- Test 001 — ROM checksum test
- Test 002 — RAM memory test
- Test 003 — Command test
- Test 004 — Async comm channel test
- Test 005 — Display test
- Test 006 — Keyboard test
- Test 007 — Ticket printer test
- Test 010 — Matrix printer test

These tests may be selectively executed through use of the maintenance panel switches. Refer to procedure CRT1, Executing Quicklook Diagnostic in section 6, for applicable switch settings.

During normal operation, all maintenance panel switches are in the logical 0 position (switches 0 through 7 placed to the left). Then upon a power-on application or manual reset, the quicklook-autoload program is executed in the following sequence:

- 1) The program automatically sequences through quicklook tests 001 through 005.
- 2) After finishing quicklook test 005, the autoload program is automatically initiated.
- 3) The autoload program initially requests and loads the load page of the applications program.
- 4) Then, using the load page as a table, the autoload program requests and loads all pages of program 1.
- 5) When program 1 has been loaded, the autoload jumps to the start of program 1 for execution.

QUICKLOOK TEST DESCRIPTIONS

Quicklook tests are described in following paragraphs.

Test 001

This is the ROM checksum test. It checks that the ROM program (quicklook and autoload) in the terminal is correct. When the test starts, T001 is displayed in the upper-left corner of the crt (termed a microdisplay) and the bit pattern 0000 0001 appears in the upper row of LEDs on the maintenance panel. Test 001 requires less than a second to execute. If the test completes successfully, the quicklook program automatically jumps to test 002. If a ROM checksum error occurs, the microdisplay changes to T001X, and the test halts. The bit pattern 0000 0001 remains in the upper row of LEDs.

Test 001 will be performed even if the crt itself is not functioning. In this case, the bit pattern 0000 0001 in the upper row of LEDs indicates that test 001 is being performed. If this bit pattern persists, and is not replaced by the test 002 bit pattern within a second, then a test 001 failure has occurred.

Test 001 is in the nature of a self-check diagnostic, resident in ROM, which checks the validity of ROM. It can detect only minor errors in ROM. If there is an extensive malfunction of ROM, or if an error occurs in the part of ROM used for storage of test 001, then the indications produced by test 001 will be indeterminate.

However, in such a case, it is unlikely that the terminal will complete test 001 and automatically advance to test 002. The fact that the terminal does not complete test 001 and advance to test 002 indicates some sort of malfunction in the terminal. Following are possible causes of such a malfunction.

- Memory error in one or more of the ROM program bytes which comprise the test 001 program.
- Wrong PROM chip or chips installed on the ROM module of the CC617-A model or program memory module of the CC617-B model, or PROM chip or chips missing all together.
- Massive failure of ROM, or the ROM module of the CC617-A model is not installed in the terminal.
- Failure in the RAM module at location 04 of the CC617-A model, or the RAM module is missing all together. This RAM module in the CC617-A model or its corresponding RAM segment of the program memory module in the CC617-B model contains page 20. Locations 000g through 077g of this page comprise the stack area used by the processor module in the execution of test 001.
- Failure of the processor module or the STIC module so that program is not executed or not executed correctly.
- Power supply failure.

Test 002

This is the RAM memory test. It tests that the entire 8K of terminal RAM memory is operating correctly. The test writes a pattern into RAM memory, and then reads this pattern back. When the test starts, T002 is displayed on the crt microdisplay and the bit pattern 0000 0010 appears on the top row of LEDs on the maintenance panel.

Test 002 requires about a second. If the test is completed successfully, the terminal sets every RAM location to contain 000g, and then automatically jumps to test 003. Since the display refresh memory is part of RAM, every location in the display refresh memory now contains 000g. A memory location containing 000g is displayed on the crt as the character NU (null); hence at the successful conclusion of test 002, the crt display will be filled with a pattern of all NU's when the display is turned on by the next text segment (test 003).

Test 002 erases whatever program previously resided in the RAM of the terminal. Test 002 is normally performed prior to loading a RAM program into the terminal; hence the erasing of the previous RAM program is not objectionable.

During the actual execution of test 002, the crt is turned off. At the conclusion of the test, the crt is turned on again. This is done to avoid confusing the operator with the peculiar crt display that is created when the random test pattern is loaded into RAM.

If an error is detected while executing test 002, the crt is turned on and the display T002X appears in the microdisplay. The diagnostic stops and the bit pattern 0000 0010 remains in the upper row of LEDs. The remainder of the crt display will contain whatever pattern resulted from loading the random test pattern into RAM.

Test 002 will be performed even if the crt is not functioning. In this case, the bit pattern 0000 0010 in the upper row of LEDs indicates that test 002 is being performed. If this pattern persists, and is not replaced by the test 003 bit pattern within a second, then a test 002 failure has occurred.

If test 001 (ROM checksum test) has executed successfully, then a test 002 failure may be due to one of the following:

- On the CC617-A model — malfunction of a single memory chip on either RAM module or malfunction of the entire module at location 05.
On the CC617-B model — malfunction of the RAM of the program memory module at location 03.
- On the CC617-A model — RAM module at location 05 not installed in the terminal.

Test 003

This is the command test. It is designed to execute most of the instruction set of the processor module. Improper execution of an instruction or failure to execute an instruction are detected as errors.

When the test starts, T003 is displayed in the microdisplay of the crt and the bit pattern 0000 0011 appears in the upper row of LEDs on the maintenance panel. If test 003 is performed immediately after test 002, the remainder of the crt will be filled with the all NU pattern left over from test 002. This is normal.

Test 003 requires less than a second. If the test is completed successfully, quick-look diagnostic automatically jumps to test 004. If an error is detected, the test halts. The display T003 remains on the crt; however, no X is being displayed following the T003. The bit pattern 0000 0011 remains in the upper row of LEDs.

Test 003 will be performed even if the crt is not functioning. In this case, the bit pattern 0000 0011 in the upper row of LEDs indicates that test 003 is being performed. If this bit pattern persists and is not replaced by the test 004 bit pattern within a second, then a test 003 failure has occurred.

If test 001 and test 002 have executed successfully, then a test 003 failure is most likely due to a faulty processor module.

Test 004

This is the test of the asynchronous I/F-2 module. Each of the two ports of this module are operated in loop-back mode. Port A, the communications port, sends and receives characters with 8 data bits; port B, the interface to the TPE (old Ticketron electronics) and the matrix printer, sends and receives characters with 7 data bits.

When the test starts, T004 is displayed on the crt and the bit pattern 0000 0100 appears in the upper row of LEDs on the maintenance panel. If test 002 was previously performed, the remainder of the crt will be filled with the all NU pattern left over from test 002. This is normal.

Test 004 requires about a second. If the test is completed successfully, the terminal automatically jumps to test 005. If an error is detected, the crt microdisplay changes to T004X and the test halts. The bit pattern 0000 0100 remains in the upper row of LEDs.

Test 004 will be performed even if the crt is not functioning. In this case, the bit pattern 0000 0100 in the upper row of LEDs indicates that test 004 is being performed. If this bit pattern persists, and is not replaced by the test 005 bit pattern within about a second, then a test 004 failure has occurred.

If tests 001 through 003 have executed successfully, then a test 004 failure is most likely due to a faulty async I/F-2 module.

Note that test 004 does not check the operation of the modem.

Test 005

This is the crt display test. It is in the nature of a display rather than a test, since no automatic error detection occurs. Instead, the operator or serviceman is given the opportunity to observe the crt display and the upper row of maintenance panel LEDs to quickly determine if these displays are working correctly.

When the test starts, all eight LEDs which comprise the upper row of maintenance panel LEDs are turned on. This not only indicates that test 005 is in progress, but also provides a lamp test. The crt is filled with all A's. This pattern remains for about a second. Then the crt is filled with all B's, then all C's, then all D's, each pattern remaining for about a second before automatically sequencing to the autoloader.

At the conclusion of test 005, the terminal examines maintenance panel switches 0 through 3. If these are all logical 0 (as they would be in a normal power on sequence), then the diagnostic jumps to the autoloading program. The upper row of maintenance panel LEDs is turned off. The display L000 (load reference page 0) appears in the microdisplay of the crt. The remainder of the crt contains the all D's pattern left over from test 005.

If any of the maintenance panel switches 0 through 3 are a logical 1, as they would be in a selective quicklook test, then the quicklook-autoloading sequence will halt at the end of test 005. The upper row of LEDs will remain on. The crt will remain at the all D's pattern. This pattern can be used to perform the crt monitor adjustments (focus, linearity, etc.).

Test 005 will be performed even if the crt is not functioning. In this case, the bit pattern of all indicators lit in the upper row of LEDs indicates that test 005 is in progress.

As previously mentioned, if any of the maintenance panel switches 0 through 3 are set to a logical 1, the diagnostic will halt at the end of test 005. To exit from this test, set the maintenance panel switches 0 through 7 as desired and toggle the maintenance panel RESET switch. The terminal will then perform the action dictated by the setting of the 0 through 7 maintenance panel switches.

Test 006

This is the keyboard test. Upon entry, the crt microdisplay will display A, followed by a code which indicates the setting of the Keylock switch on the keyboard. These codes are:

- A 000 — Keylock switch at OFF
- A 001 — Keylock switch at ON
- A 003 — Keylock switch at MGT

Then, each time a keyboard key is pressed, the crt microdisplay will display K followed by the octal code produced by the key (refer to figure C-1). If the position of the Keylock switch is changed, the crt will display A followed by the code indicating the new setting of the Keylock switch.

To exit from test 006, set the maintenance panel switches 0 through 7 as desired and toggle the maintenance panel RESET switch.

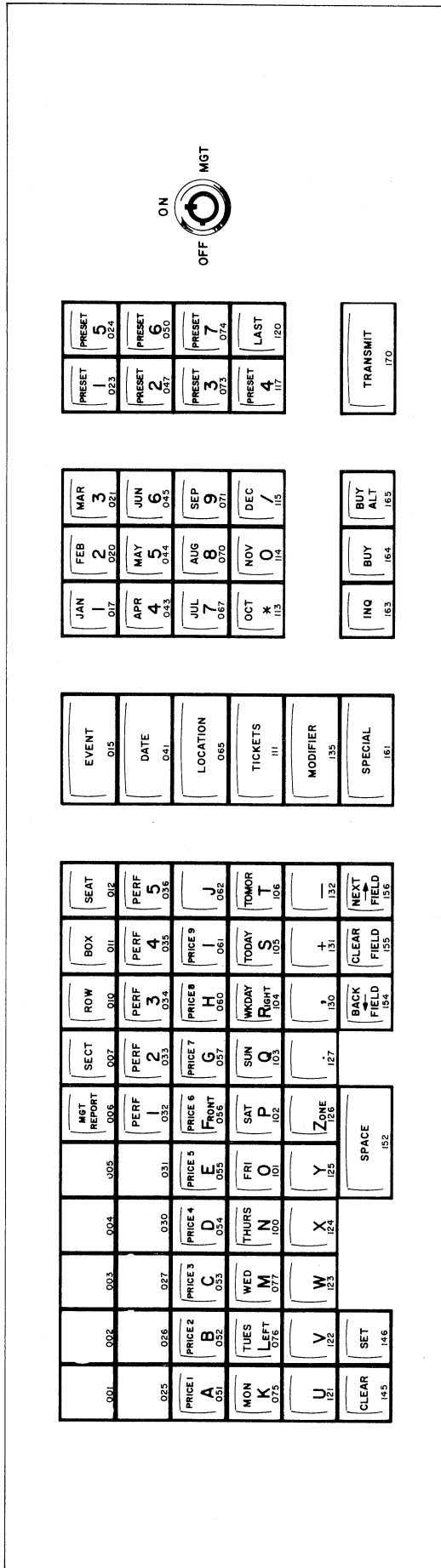


Figure C-1. Keyboard Ocatal Codes

Test 007

This is the ticket printer test. Upon entry, the crt microdisplay will display T007. Then, each time a key is pressed on the keyboard, the ticket printer will produce a test ticket as shown in figure C-2.

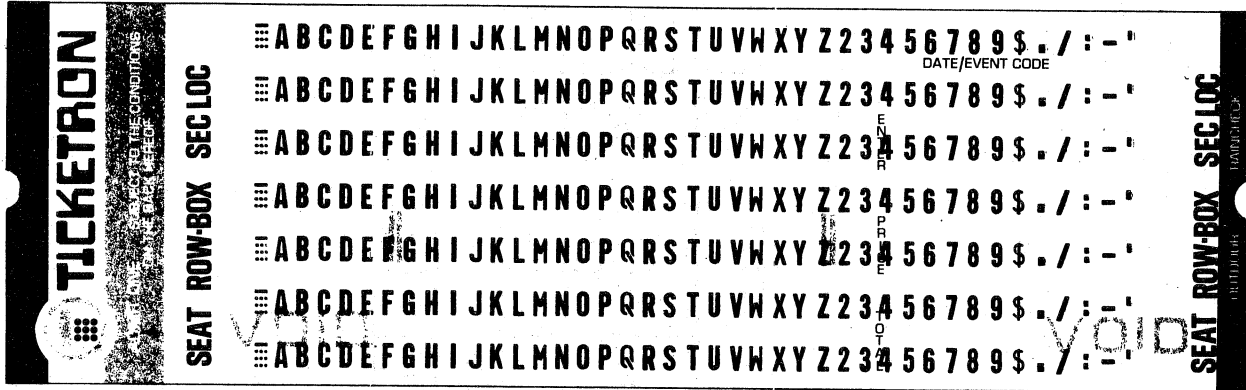


Figure C-2. Test Ticket

NOTE

Upon entry to this test, it may be necessary to press a key twice to produce the first test ticket. After that, a key need be pressed only once to produce a test ticket.

If the ticket printer is in a not ready condition when entering test 007, then the crt will display T007NR. A not ready condition may be produced by one of the following:

- TPE (old Ticketron electronics) not turned on. Turn the Keylock switch on the keyboard to ON or MGT. Make sure the TPE is plugged into an electrical outlet.
- Power switch in the ticket printer is OFF. Turn it to ON.
- Ticket printer is out of stock. Load new stock.
- Ticket printer stock is not at head of form. Press the green button to advance stock to head of form.
- One or more printer fuses are bad. Examine and replace bad fuses.

When the not ready condition is replaced by a ready condition, the NR portion of the crt display will vanish, leaving T007. Test tickets can then be produced.

NOTE

Test 007 examines for a new ready condition only at the start of the test. Thus, if test 007 is started with the printer ready, and the printer subsequently goes not ready during the progress of test 007, this fact will not be indicated. If the printer refuses to print, and the serviceman suspects that the printer has gone not ready, he can toggle the maintenance panel RESET switch without changing the settings of the maintenance panel 0 through 7 switches. This will restart test 007, and a not ready condition, if present, will be indicated by the crt display T007NR.

To exit from test 007, set the maintenance panel switches 0 through 7 as desired and toggle the maintenance panel RESET switch.

Test 010

This is the matrix printer test. Upon entry, the crt microdisplay will display T010. Then, each time a key is pressed on the keyboard, the matrix printer will print a line as follows:

```
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOQRSTUVWXYZE\]^_`
```

02183

If the matrix printer is in a not ready condition when entering test 010, then the crt will display T010NR. A not ready condition may be produced by one of the following:

- START switch on the matrix printer is not lit. Press the START switch.
- Fuse blown in the matrix printer. Examine and replace bad fuses.

When the not ready condition is replaced by a ready condition, the NR portion of the crt display will vanish, leaving T010. The matrix printer can then be made to print lines of print by pressing a key on the keyboard.

NOTE

Test 010 examines for a not ready condition only at the start of the test. Thus, if test 010 is started with the matrix printer ready, and the matrix printer subsequently goes not ready during the progress of the test, this fact will not be indicated. If the serviceman suspects that the matrix printer has gone not ready, he can toggle the maintenance panel RESET switch without changing the settings of the maintenance panel 0 through 7 switches. This will restart test 010 and a not ready condition, if present, will be indicated by the crt display T010NR.

To exit from test 010, set the maintenance panel switches 0 through 7 as desired and toggle the maintenance panel RESET switch.

AUTOLOAD

The terminal must be loaded with an application program in order to perform its required functions. The autoload routine is a ROM resident program that is used to load the applications program into the RAM memory of the terminal. A selection of applications programs is stored in the higher-level processor, and any of these applications programs can be loaded into the terminal through the online communications system. The autoload program in the terminal controls this loading, and also performs the functions of checking the loaded program and jumping to the start of the loaded program. The normal loading sequence is as follows:

- 1) On power-on or manual reset, the terminal sequences automatically through quicklook tests 001 through 005. Refer to Quicklook Diagnostic paragraphs, this section, for a description of the quicklook tests.
- 2) If quicklook tests 001 through 005 are performed successfully, the diagnostic jumps to the autoload program.
- 3) The autoload program requests the load page from the higher-level processor. This page is always loaded into page 1 of terminal memory.

Note that the applications programs stored in the higher-level processor are divided into pages. The load page contains a page table which describes each program page available from the higher-level processor.
- 4) First the autoload examines the load page to see if page 2 is also defined as a load page. This will occur if the page table is so long that it cannot be accommodated on page 1, but runs over into page 2.

- 5) If the page table in page 1 defines page 2 as also being a load page, then the autoload will request this page from the higher-level processor and load it into page 2 of terminal memory.
- 6) The autoload loads program 1. It does this by scanning the page table and requesting a load of each page which is defined by the page table as being part of program 1. One by one, each page of program 1 is requested from the higher-level processor and loaded into the page of terminal memory specified by the page table.
- 7) When all the pages of program 1 have been loaded, the autoload jumps to the start of program 1. The start of program 1 is location 0008 of the starting page of program 1. The starting page of program 1 is the page of program 1 that is listed nearest the start of the page table.

The preceding sequence of events assumes that the terminal is set up for normal operation; such as all the maintenance panel switches (switches 0 through 7 set to logical 0 (left)). Once the normal loading sequence has concluded, program 1 will have been loaded into the terminal, and the autoload program will have jumped to the start of program 1. The terminal is now executing program 1.

The execution of program 1 may, at a certain point, specify a change to another program, for example, program 2. This is done by a call to the autoload. The autoload first clears the indicators in the page table which define program 1 as the resident program. The autoload then loads program 2. It does this by scanning the page table and requesting a load of each page which is defined by the page table as being part of program 2. Each page is loaded into the page of terminal memory specified by the page table. When all the pages of program 2 have been loaded, the autoload jumps to the start of program 2. The start of program 2 is location 0008 of the page of program 2 which appears earliest in the page table.

In a similar manner, any applications program may be written so that at a certain point (probably immediately after a certain test or a certain keyboard input) a change occurs to another applications program. Program 1 is loaded on the initial power up. From then on program 1 may, at a certain point, specify a change to another program and that program may, at a certain point, specify a change to get another program or perhaps a change back to program 1.

In addition to specifying program changes, an applications program may request a program overlay. The bulk of the program remains resident, but an overlay of one or more pages is loaded into the terminal. Such additional pages may overlay or replace resident pages of the program, or may be loaded into pages of terminal memory not previously in use. The page table specifies the pages which comprise the overlay, and specifies where these pages are to be loaded. Overlays are defined by program number and overlay number, and each program may have several overlays.

An overlay is loaded by a call to the autoloader. The autoloader first scans the page table to find the page numbers of all pages which comprise the overlay. If indicators are set showing any of these pages to be part of the resident program, the indicators are cleared. Then the pages of the overlay are loaded. In the process of loading the overlay, some of the pages of the original program may be overlaid (such as, replaced) by pages of the overlay. When all the pages of the overlay have been loaded, the autoloader returns to the point in the applications program that is called the overlay.

The original program to be loaded is defined as overlay 0. Thus, when program 1 is first loaded, it is actually program 1, overlay 0 that is loaded. Actual overlays for a program start with overlay 1, overlay 2, etc.

Once a particular applications program and overlay are resident in the terminal, it is verified by continual checksum tests. The checksum testing routine is contained in the autoloader, but must be called by the applications program at periodic intervals. Each time the checksum routine is called, it will checksum another page of resident program. If the page has a checksum error, the autoloader will reload the page. However, if the page in error is a load page rather than a program page, then the entire program is in doubt since the checksum for program pages are stored in the load page. Hence, if a load page checksum error is detected, the terminal jumps to the start of the autoloader. Program 1, overlay 0 is loaded, replacing whatever program and overlay were resident in the terminal.

AUTOLOAD INDICATIONS

During program loading and checksumming, certain indications are provided to the operator via the microdisplay. This is a small white box which appears in the upper-left corner of the crt.

During the loading of a page, the display L appears, followed by a reference number of the page being loaded. Thus, L000 appears for page reference number 0.

The page reference number is not the same as the page of terminal memory into which the page is being loaded. Rather, it is an artificial number which uniquely identifies each of the program pages stored in the higher-level processor.

If a table describing the program pages stored in the higher-level processor is available, then the page reference number can be found for the following:

- The program and overlay to which the particular page reference number belongs.
- The page of terminal memory into which the page is to be loaded.

If a transmission error occurs in the loading of a page, the autoloader will request a reload of the page. If the page is then loaded correctly, the autoloader will go to the next task to be performed. If another transmission error occurs, the autoloader will request a second reload. After the third unsuccessful reload, an X will be displayed after the page reference number; for example, L005X for three unsuccessful reloads of reference number 5.

Once an X has appeared, the terminal waits for one of the following manual interventions.

- Toggle the EXECUTE switch on maintenance panel. This will cause the autoloader to request another reload of the page. As many reloads as desired may be requested in this manner.
- Toggle the RESET switch on maintenance panel, or turn terminal power off, then on again. This will cause the terminal to perform quicklook tests 001 through 005 and then jump to the start of autoloader.

After loading a page, the autoloader immediately checksums the page, and as previously described, the checksum routine in the autoloader may be called on a periodic basis by the applications program. If the checksum routine detects an error, the autoloader will determine if the page is a load page. If so, a jump will be made to the start of the autoloader program. This will be indicated by the display L000 on the crt (reference number 000, the load page, is always the first reference number to be loaded). If the page is not a load page, the autoloader will try to reload the page.

As previously described, in loading or reloading a page, a check is made for transmission errors. If three reloads occur with transmission errors, an error display will appear.

However, if the page is reloaded without transmission errors, it is again checksummed. If the checksum test detects an error, the page is again reloaded. If three reloads occur in succession, each followed by a checksum error, then the display C---X will appear on the crt. For example, if the page reference number in question is reference number 5, then the display C005X will appear. The display of C rather than L indicates that a checksum error rather than a transmission error has occurred.

Once an X has appeared, the terminal waits for manual intervention. At this point, the operator or serviceman has the same options of manual intervention as in the case of an L failure — toggling the EXECUTE switch of another reload, or toggling RESET (or turn power off, then on) to return to the start of the quicklook autoloader sequence.

The loading of a nonexistent program or overlay may be requested due to a program or hardware fault. In such a case, the autoloader will halt with the display P---X, with the display indicating the program and overlay number which was requested. The display will show an octal number; convert this to a binary. The major 4 bits are the program number and the minor 4 bits are the overlay number requested.

LOAD PAGE AND PAGE TABLE

The load page is always reference number, and is always loaded into page 1 of terminal memory.

The load page is composed as follows:

- Locations 000g and 001g — Version number
- Locations 002g and 003g — Terminal status word
- Locations 004g and 005g — Terminal option word
- Location 006g — Always 000g
- Location 007g — Page 1 checksum offset. Transmitted from the higher-level processor as 000g, this location will be used as an offset to make the checksum of page 1 come out correct.
- Locations 010g and following: The page table, which contains an entry for each page of terminal program stored in the higher-level processor. Each entry is three bytes long:

First byte — Program and overlay number. Program number is the major 4 bits and overlay number is the minor 4 bits. Program numbers up to and including 15 and overlay numbers up to and including 15 are permitted, except that program 15, overlay together, which would be all 1's is not permitted. There is no program 0. If the first byte of the page entry is 000g, this indicates that the page is a load page.

Second byte — Page number. Page number occupies bits 5 through 0. Page numbers up to and including 37g are permitted. Bit 6 of the second byte is always 0. Bit 7 is transmitted from the higher-level processor as 0, and will be used as the entry flag. If this bit is set to 1, it indicates that the page is part of the resident applications program and overlay.

Third byte — Page checksum. Transmitted from the higher-level processor as 0, this byte will be used to hold the page checksum if the page is loaded into the terminal. The character 377g follows the last entry in the page table and indicates the end of the table.

The sequence of entries in the page table agrees with the page reference numbers assigned to program pages. Thus, the first table entry is the entry for reference number 0 (the load page), the second table entry is the entry for reference number 1, and so forth. Since there are 3 bytes per entry, the reference number of an entry can be determined by:

$$\text{Reference Number} = \frac{\text{Entry Address} - \text{Starting Address of Table}}{3}$$

The first locations in the load page are used in the following manner. Version number (locations 0 and 1) is transmitted back to the higher-level processor in every message from the terminal. It is used to assure that the program stored in terminal memory is the most recent. Terminal status word (locations 2 and 3) and terminal option word (locations 4 and 5) provide information on how the terminal is to be employed. This data may be used by the applications program to enable or inhibit certain program functions, or to cause the loading of certain overlays or a change of applications program.

VERSION NUMBER

A given selection of program pages in the higher-level processor is assigned a version number. Anytime that a program page is revised, added, or deleted from this selection, the version number is incremented. The version number is used to ensure that the terminal is always using the latest version of program.

The version number is transmitted to the terminal in locations 0 and 1 of the load page. Thereafter, every terminal message to the higher-level processor will contain a version field consisting of the following two characters:

- The version field code, 023 B.
- The version number, taken from location 1 of page 1. (This is the minor portion of the version number.)

The higher-level processor compares the version number in the terminal message with the current version number. If different, the higher-level processor ignores the terminal message and sends a program load command to the terminal. When the terminal receives the program load command, it stops what it is doing and goes to the start of the autoloader. The terminal will request and receive the current version of the load page and will then request and receive the current version of the program 1.

The request for a load of page reference number 0 (the load page) always contains a version number of 0.

PROGRAM LOADING MESSAGES

Page request, page load, and load command messages are described in the following paragraphs.

Page Request Message

The page request message is generated by the autoloader program in the terminal to request a page from the higher-level processor as follows:

- Character 1 — Terminal signature
- Character 2 — Length of message text = 004
- Character 3 — Version field code = 023B = \$13
- Character 4 — Version number
- Character 5 — Page request code = 022B = \$12
- Character 6 — Page reference number
- Character 7 — Checksum (straight add of characters 2 through 6)
- Character 8 — Finish code = 017B = \$0F

Page Load Message

The page load message is sent by the higher-level processor in response to the terminal's page request message and includes the requested page. The page load message is only sent when the page requested by the autoloader program is existent. Its content is as follows:

- Character 1 — Unit select
- Character 2 — Unit select
- Character 3 — Memory select code = 027B = \$17
- Character 4 — Open
- Character 5 — 16-byte word; number of bytes in a page minus one
- Character 6 — Always 255
- Character 7 — Reference number
- Character 8 — Starting location in page
- Character 9 through N — Data bytes
- Character N+1 — Checksum (Checksum: Straight add of characters 5 through N)

- Character N+2 — Checksum (Checksum: Straight add of characters 5 through N)
- Character N+3 — Finish code = 017B = \$0F
- Character N+4 — Finish code = 017B = \$0F

Load Command Message

The load command message is sent by the higher-level processor to command the autoloading program to initiate the loading of an entire new program. This is the response the higher-level processor issues when a message from the terminal does not contain the current program version number. The content of the load command message is as follows:

- Character 1 — Unit select
- Character 2 — Unit select
- Character 3 — Program load select code = 025B = \$15
- Character 4 — Finish code = 017B = \$0F

MANUAL INTERVENTION OF DIAGNOSTIC-AUTOLOAD PROGRAM

Manual intervention of the diagnostic-autoload program in the display terminal is enabled through the use of the switches on the maintenance panel. The operations that can be performed by this action are described in the following paragraphs.

BYPASS QUICKLOOK

This operation is selected by setting switch 7 to a logical 1, with switches 0 through 6 remaining in the normal logical 0 position. Then on a power-on master clear or manual reset (maintenance panel RESET switch toggled), the quicklook tests are bypassed and the program jumps directly to the start of autoloading.

BYPASS QUICKLOOK AND AUTOLOAD

This operation is selected by setting switches 6 and 7 to a logical 1, with switches 0 through 5 remaining in the normal logical 0 position. Then on a power-on master clear or manual reset, both the quicklook and autoloading are bypassed and the program jumps to the start of whatever applications program is resident in the terminal.

SELECT PORTION OF QUICKLOOK

To select specific quicklook tests, switches 0 through 3 are set to correspond with an assigned binary code and switches 4 through 7 are left in the normal logical 0 position. Then with a power-on master clear or manual reset, the program jumps directly to the portion of the quicklook that has been selected. Upon performance of the selected portion of the quicklook, the program halts and waits until manual intervention via the maintenance panel switches exits it from that portion of the quicklook. A listing of the mentioned binary codes is contained in procedure CRT1, Executing Quicklook Diagnostic, section 6.

PROGRAM PAUSE

This operation can be used in conjunction with either a bypass quicklook or bypass quicklook and autoload operation or it can be used during the normal diagnostic-autoload sequence when display terminal initialization is occurring. It is selected by switch 5 being set to a logical 1 which causes the program sequence to halt before jumping to the start of the applications program. The program sequence remains in this pause condition until switch 5 is set back to a logical 0 which then allows a jump to the start of the applications program to occur.

CONVERSIONS

D

Conversion information for decimal, binary, octal, and hexadecimal numbering system is contained in table D-1.

TABLE D-1. CONVERSION TABLE

DECIMAL (Base = 10)	BINARY (Base = 2)	OCTAL (Base = 8)	HEXADECIMAL (Base = 16)
0	0	0	0
1	1	1	1
2	10	2	2
3	11	3	3
4	100	4	4
5	101	5	5
6	110	6	6
7	111	7	7
8	1000	10	8
9	1001	11	9
10	1010	12	A
11	1011	13	B
12	1100	14	C
13	1101	15	D
14	1110	16	E
15	1111	17	F
16	10000	20	10
17	10001	21	11
18	10010	22	12
19	10011	23	13
20	10100	24	14
21	10101	25	15
22	10110	26	16
23	10111	27	17
24	11000	30	18
25	11001	31	19
26	11010	32	1A
27	11011	33	1B
28	11100	34	1C
29	11101	35	1D
30	11110	36	1E
31	11111	37	1F
32	100000	40	20
33	100001	41	21
34	100010	42	22
35	100011	43	23
36	100100	44	24

1. The first part of the document discusses the importance of maintaining accurate records of all transactions.

2. It is essential to ensure that all entries are dated and clearly describe the nature of the transaction.

3. The second part of the document outlines the various methods used to collect and analyze data.

4. These methods include direct observation, interviews, and the use of standardized questionnaires.

5. The results of these methods are then compared to identify patterns and trends in the data.

6. The third part of the document discusses the challenges associated with data collection and analysis.

7. These challenges include the potential for bias, the difficulty of obtaining representative samples, and the complexity of interpreting the results.

8. The fourth part of the document provides a detailed description of the data collection process.

9. This process involves the selection of a sample, the design of the data collection instrument, and the implementation of the data collection strategy.

10. The fifth part of the document discusses the various methods used to analyze the data.

11. These methods include descriptive statistics, inferential statistics, and qualitative analysis.

12. The final part of the document discusses the importance of reporting the results of the study.

13. This involves the preparation of a clear and concise report that summarizes the findings and discusses their implications.

14. The report should be written in a professional and objective manner, and should be accessible to a wide range of readers.

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Hardware Maintenance Manual

PUBLICATION NO. 62953000 REVISION D

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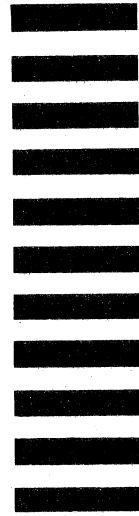
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