ADM-1A
Maintenance Manual

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SECTION 1
GENERAL DESCRIPTION

1.1 INTRODUCTION

This manual contains a general description, installation and operating instructions, theory of operations and maintenance information for the Lear Siegler ADM-1A Interactive Display Terminal.

Additional information is contained in the ADM-1A Operator's Handbook. The maintenance technician should be thoroughly familiar with material in the Operator's Handbook before attempting to troubleshoot or repair the ADM-1A.

1.2 ADM-1A BASIC ORGANIZATION

The ADM-1A Data Display Terminal is designed to provide input/output access to an electronic computer. The terminal consists of three basic functional modules: CRT Display Monitor, Keyboard and logic board.

These modules are assembled in attractive lightweight housing, with power supply, hardware, cabling, switches etc, to complete the ADM-1A terminal system.

1.2.1 CRT Display Monitor

The ADM-1A features a cathode ray tube with a 12" screen for display of alphanumeric data. Solid State monitor circuitry and printed circuit board construction insure reliability, high quality and uniformity in the ADM-1A.

This solid state monitor circuitry with raster scan converts data from the ADM-1A memory into screen display format.

Displayed characters are represented by a 5x7 dot matrix on the CRT screen. Each character row contains nine raster lines, seven for the character displayed and two for interline spacing. Horizontal intercharacter spacing is assured by reserving two dot columns between characters. Reverse image display is used to indicate the dursor position superimposed over data. Protected fields on the display are distinguished by reduced luminance.

A complete field of characters in the standard ADM-1A consists of 960 characters organized in 12 rows of 80 characters each.

The optional display contains 1920 character positions organized in 24 rows of 80 characters. The display is refreshed at 60 Hz (50 Hz, optional) providing flicker-free illuminance and high contrast even in high ambient illumination.

1.2.2 Keyboard

The ADM-1A is available with a choice of 2 keyboards for entry of data. The standard keyboard contains 60 keys. The optional keyboard contains 81 keys. Both keyboards provide a wide range of data and control functions. Both boards are illustrated in figures 1-1 and 1-2.

1.2.3 Logic Board

The central timing and control circuitry, the I/O interface and all data storage and handling circuitry is contained on the ADM-1A logic board. Circuitry is implemented on a single printed circuit board using TTL, MOS and MS1 solid state devices for hardware minimization and maximum reliability. The organization and theory of operation for the ADM-1A is discussed in Section 4.

1.3 ADM-1A CAPABILITIES

The ADM-1A has the following capabilities:

a. Receives and transmits USASCII-coded data from/to a remote computer and displays it on the CRT screen. The standard ADM-1A is capable of displaying 960 characters. Two optional character sets are available. The first optional set (Option 23) includes lower case and a numeric key pad capable of generating 1920 characters.

b. Through an optional extension port, permits interfacing with a hard-copy printer, magnetic tape or other terminals

c. Allows the operator to change between full-duplex, half-duplex and block modes.

d. While in half or full duplex operation, executes a line advance function from the bottom line of the screen, causing the entire display to move up one line, leaving a new blank line at the bottom (Roll Mode).

e. Provides for manual or remote incremental movement of the cursor to all positions on the screen.

f. Allows the operator or remote computer to position the cursor using an absolute address which contains the -x -y coordinates.

g. Operates at 3 selectable data rates, 9600 baud and two of the following: 110, 300, 600, 1200, 1800, 2400 or 4800 baud.

h. Contains standard editing capability for character type-over; clear screen to nulls (with or without clearing protected spaces); partial send function. An optional editing package is available to add the following functions: character insert, character delete, line insert and delete, erase to end of line/page/field, and backtab.

i. Contains a field protection code to prevent inadvertant typeover; to prevent transmission of protected data; to transmit an FS code to the computer when the memory address is a protected field; and to prevent overwriting of protected data by the computer while in the PROTECT MODE.

j. Contains a copy mode feature which automatically copies all received data to the printer, sending spaces when null codes or protected fields are encountered.

1.4 ADM-1A SPECIFICATION

GENERAL SPECIFICATIONS

Display Specifications

Screen Size, Diagonal/ View Area	12"/5.5 x 8.0
Lines x Characters	12 x 80 (24 x 80)
Displayable Positions	960 (1920)
Displayable Character Set	64 (96) (128)
Display Technique	5 x 7 Dot Matrix
Character Size	.19" H x .125W
Dot Size	.014" Max.
Non Glare Screen, Bonded Etched Faceplate	
Cursor	Reverse Video Block, Non-Destruct
Brightness Controls	
Refresh Rate	60Hz/50Hz
Phosphor	P4 (white)

Display Functions - Text Handling

Dual Intensity
Field Protect Mode
Automatic Skip Protected Over Fields
Skip to Unprotected Fields
Overstrike
Insert/Delete Character
Insert/Delete Line
Clear Screen
Erase to End of Screen
Erase Line/Field
Cursor Wraparound
Page/Roll, Mode
Function Control — ESC Sequence

Communications

Modes	Half/Full Duplex/Block
Operator Switchable Speeds	(3) from 110 to 9600
Maximum Rate	9600 bps
Block Transfer/ Character Transfer (TTY compatible)	
Maximum Block Size	960 (1920)

RS232C or
20ma Current Loop
Transmit Data Only
Polling/Addressing (optional)

Word Size	10 or 11 Bit

Computer Control of Block/Conversation Modes

Off-Line Mode

Data Entry
Data Edit
Field Definition
Program Mode — (option)

Keyboard

Keyboard Roll Over	2 Key
Cursor Control Keys	
Data Edit Controls	
Numeric Pad (Built in)	(option)
Numeric Key Pad (External)	(option)
Enable/Disable Keyboard	
Character Repeat	
Break Key	
Escape Key	
Generate Lower Case	(option)

Special Features

Absolute Cursor Addressing by Computer
Cursor Position Read by Computer
Audible Alarm
Storage & Display of Control Character from Keyboard or Computer

Options[1]

24 Line Display	Numeric Key Pad (external)
Editing	Numeric Key Pad (Built in)
Printer Port	Polling
RS232 Extension Port	Buzzer

Logic: The ADM-1A is a hybrid of sequential logic and ROM controlled processor which supplies the high speed and versatility required for a modern video display computer terminal.

The single logic board, P/N129338, contains all logic for the display refresh and function control of the terminal.

Subassemblies to the logic are:

a. Power supply P/N129312 interconnected by a 6 pin connector.

b. 60-key keyboard P/N128301 (129591 for numeric pad) interconnected by a 16 pin DIP socket.

c. Optional 81 key keyboard P/N128591 18 pin.

d. Monitor P/N129302 interconnected by a 9 pin Molex connector.

The logic of the ADM-1A is divided into two major funcitonal areas, they are: refresh timing and control.

The refresh timing logic provides the timing signals for operation of the terminal, and provides the drive signals for the CRT monitor.

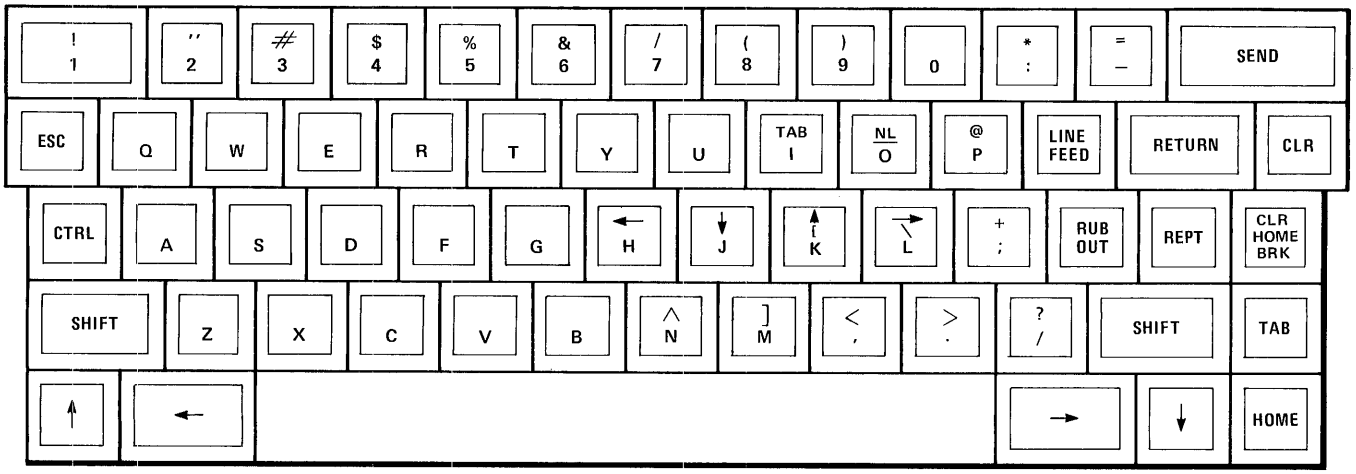


FIGURE 1-1. ADM-1A STANDARD KEYBOARD (PART NO. 129301-11)

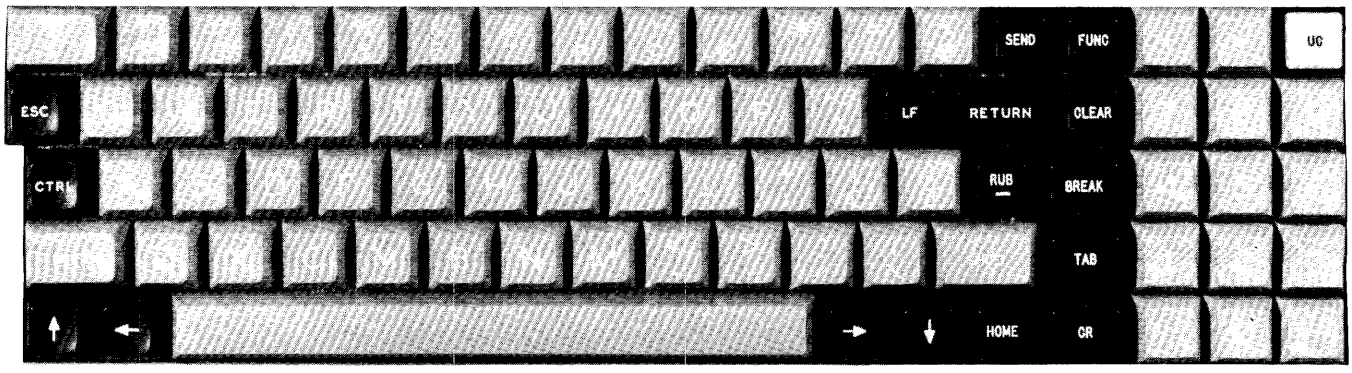


FIGURE 1-2. ADM-1A EXTENDED NUMERIC KEYBOARD (PART NO. 129591)

The control logic exercises control over the input/output and management of the data in the refresh memory. Character set is specified by ROM.

The control logic is a specially designed microprogrammed controller, which determines functions and abilities of the terminal by use of a ROM (Read Only Memory).

Configuration switches: The hardware configuration of various areas are selected by means of switches mounted on the P.C. Board. Switch selections are:

I/O word configuration
Aux interface word configuration
Interface control I/O of secondary channel
Interface control to printer
Enable/Disable of break
Blinking cursor
Method of display of control character
Upper case only select
12/24 row display enable
50/60Hz refresh
Program sensible switches for option control

These switches are not operator accessible, but are set at the factory in accordance with the required operating characteristics of the terminal.

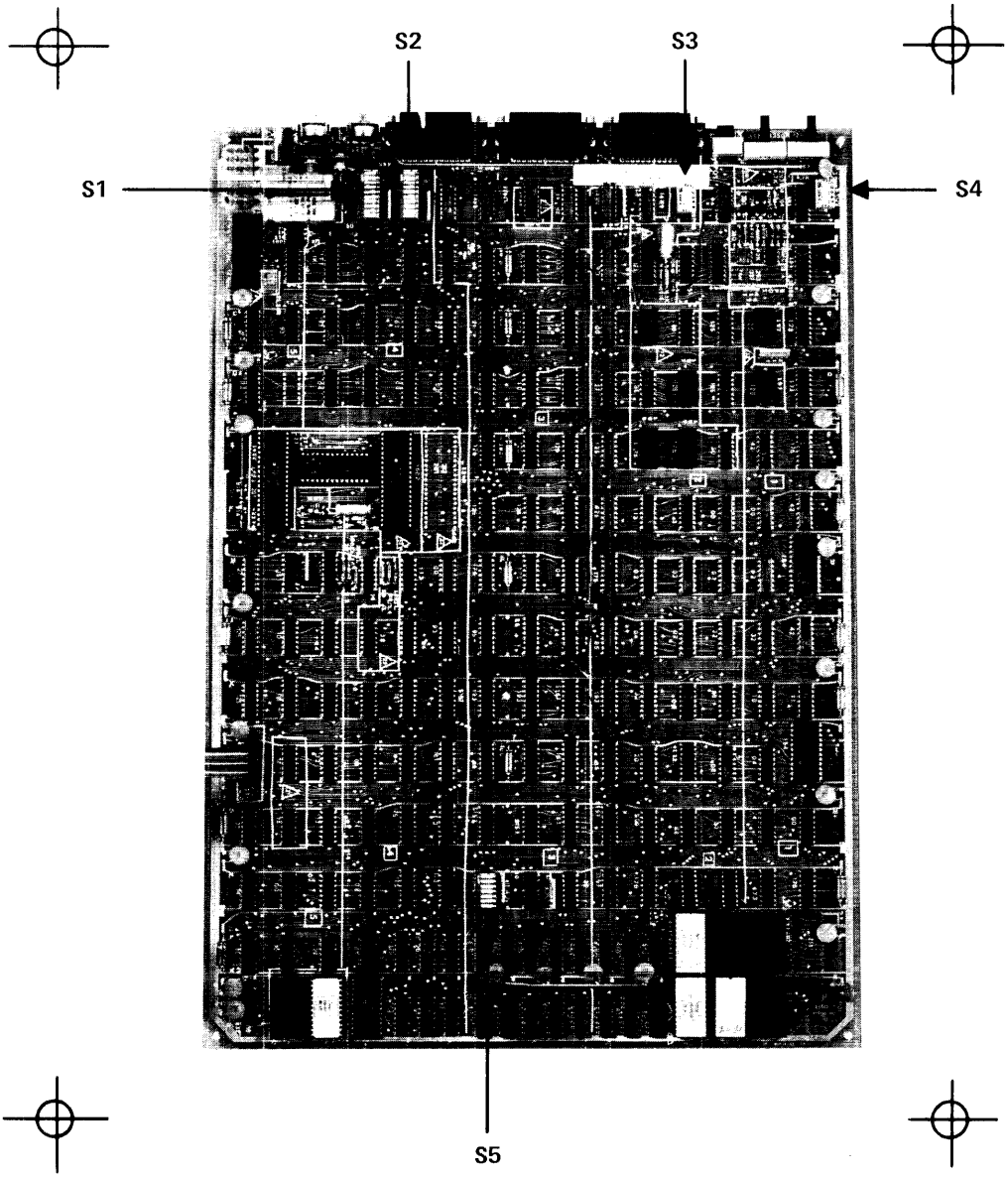


FIGURE 1-3. ADM-1A SWITCH LOCATIONS

FIGURE 1-4. ADM-1A SWITCH SETTINGS

The logic board switches listed below are used for configuring your ADM-1A terminal.

	SWITCH	FUNCTION	
		Off	On
I/O Primary Channel S1	1	Even parity	Odd parity
	2	8-bit word	7-bit word
	3	2 stop	1 stop
	4	No Parity	Parity
	5	Enable RFE sense (Receive Frame Error)	Disable RFE sense
	6	Enable ROE sense (Receive Overrun Error)	Disable ROE sense
	7	Receive data normal	Receive data blocked w/RTS
	8	Transmit null code	Disable
I/O S1	9	Bit 8 = 1.	Bit 8 = 0
	10	Bit 8 = 1.	Bit 8 = TSB 8
Printer S2	1	No parity bit	Parity bit
	2	2 stop	1 stop
	3	8-bit word	7-bit word
	4	Even parity	Odd parity
Primary Config. Input	5	RTS normal	RTS inhibit with CTS (Clear to Send)
	6	RTS normal	RTS inhibit with CF (Carrier Detect)
	7	RTS turnoff delay (4.5 msec)	No RTS turnoff delay
	8	RTS always high	RTS normal
	9	Secondary channel enable	Secondary channel disable
	10	Rec'v priority error enable	Rec'v priority error disable
Printer S3	1	J3 pin 6 open	RTS out on J3 pin 6
	2	J3 pin 8 open	RTS out on J3 pin 8
	3	Disable internal loopback	Enable internal loopback
	4	Long printer delay	Short printer delay
	5	Ready "true" select	Busy "true" select
Polling & Editing Options S4	1	Option 1 = true	Option 1 = false
	2	Option 2 = true	Option 2 = false
	3	Option 3 = true	Option 3 = false
	4	Online = true	Online = false
	5	Option 4 = true	Option 4 = false
Operational Features S5	1	Break enabled	Break disabled
	2	Upper case only	Upper/lower case
	3	Blinking cursor.	Non-blinking cursor
	4	No clear to protect	Clear to protect
	5	24-line enable	12-line enable
	6	Special display	Standard display
	7	60 Hz.	50 Hz

1.4.2 HARDWARE SPECIFICATIONS

DISPLAY

CRT Display Specifications

Diagonal Measurement – 12 inches
Phosphor – P4 Standard
Resolution (TV Lines)
Center – P4 900 at 40 fl;
Corner – P4 800 at 40 fl;
Resolution measured in accordance with EIA RS-375, except Burst Modulations, or Depth of Modulations, is adjusted for 100 percent.

KEYBOARD

Uppercase 60 key as specified by drawing 129301-11.

Uppercase/Lowercase with numeric pad. Drawing 129591.

Keyboard is powered by 5 volts (± 2 volts) supplied from the terminal power supply.

Input/Output specification:

Keyboard	Pin
Level ASCII coded data	9-15
strobe	6
control function	3
shift function	2
"send" function	5
repeat function	7
break function	4
+5 volts	1
common	8
*-12V	16

*NOT USED ON 129301 KEYBOARD.

Input Impedance

	Min. Shunt Resistance	Max. Shunt Capacitance
Video Input	3.3K ohms	40pF
Vertical Drive Input	3.3K ohms	40pF
Horizontal Drive Input	470 ohms	40pF

Video Amplifier

Bandwidth	12 MHZ (-3dB)
Rise and Fall Times	(10-90% amplitude) (35 nsec, linear mode
Storage Time	15 nsec Maximu, linear mode

Retrace and Delay Times

Vertical	900μsec retrace, maximum
Horizontal	7μsec retrace plus 4μsec delay, maximum

DATA DISPLAY SPECIFICATIONS

INTERFACES

The ADM-1A provides three external interface connections.

The interface to the "HOST" system is made through this connector. The interface may take the form of an EIA (RS232C) type, or a 20ma current loop.

EIA Interface (RS232)

This interface is compatible with 103 and 202 type modems, as well as direct EIA connection.

An optional accessory unit (129511) may be attached to the ADM-1A permitting bi-directional half duplex transmission over a single pair of wires.

The ADM-1A provides secondary channel turn around control via a 202 C/type modem using secondary channel. In this mode the host controls the transmit receive status at the terminal as follows:

INPUT		OUTPUT		
CF(8)	SB(12)	CA(4)	SA(11)	
OFF	ON	OFF	OFF	Idle
ON	OFF	OFF	ON	Receive
OFF	ON	ON	OFF	Send

Current Loop Interface

The ADM-1A current loop interface is in connector J-1. Switch accessible from the rear of the terminal selects the EIA or current loop connection. This selects either secondary channel or current loop on specified pin as identified in EIA interface.

Voltage sources for current loop operation are provided at pins 9 and 14 on connector J1. These are +22 volts with a 910 ohm series resistor. See below.

When the ADM-1A is arranged for "DC-1 box" operation pins 9 and 14 provide +22 and -22 volts to power the adapter box logic.

EIA Extension (optional)

Connector J-2 provides extension of the EIA interface to other terminals. Send and Receive as well as control signals are provided.

The pins 1, 2, 3, 4, 5, 6, 7, 8, 11, 12, and 20 are redriven from J1 through to J2.

J2	J1		EIA	Current Loop
	Pin	Signal	Function	Function
AA	1	AA	Chassis Ground	Chassis Ground
BA	2	BA	Send Data	Chassis Ground
BB	3	BB	Receive Data	Chassis Ground
CA	4	CA	Request to send	Chassis Ground
CB	5	CB	Clear to send	Chassis Ground
CC	6	CC	Data set ready	Chassis Ground
AB	7	AB	Signal to Ground	Signal Ground
CF	8	CF	Revd line sig. det.	Signal Ground
-	9		*+20V to DC1 box	Current loop source +20V, through 910 Ω
-	10	-		+Current loop receive**
SA	11	SA		-Current loop receive
SB	12	SB		+Current loop transmit**
-	13	-		-Current loop transmit
-	14	-	*-20V to DC1 box	
	14		Current loop source	+20V through 910 Ω
CD	20	CD	Data terminal ready	-

*Option connection within ADM-1A

**Optional 60 volt open circuit configuration.

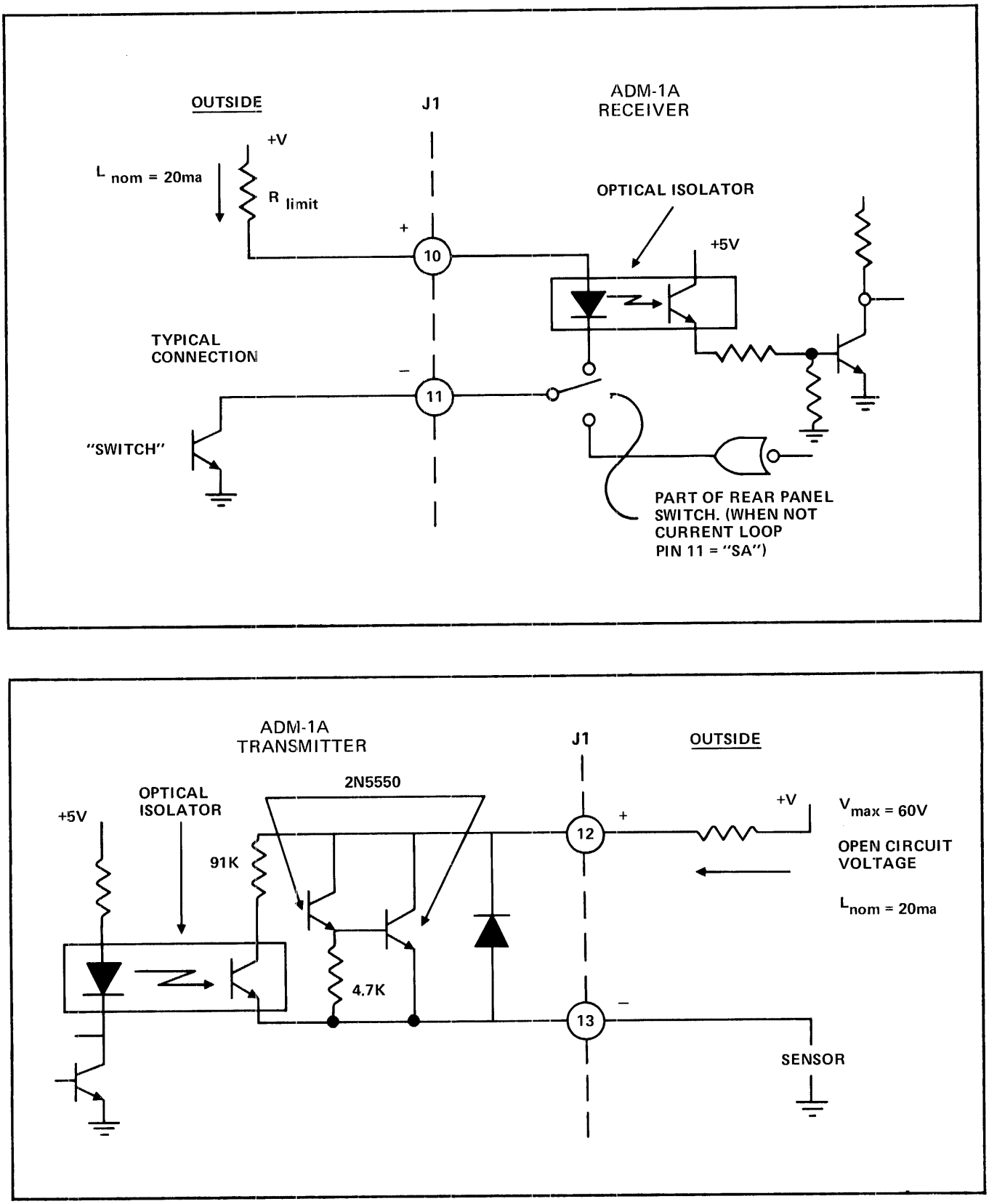


FIGURE 1-5. 20 MIL CURRENT LOOP

Auxiliary Printer Interface

J-3 provides an interface to an auxiliary device such as a printer. This interface supports an RS232 compatible device with serial interface.

The signals provided are:

Chassis Ground
Data from Device
Data to Device
Data Ready
Signal Common
Data Ready
Device Ready (or busy)

Data transmitted to the printer is formatted with carriage return line feed codes in standard mode. Unformatted print mode allows any and all codes to be provided by the user.

Printer control options

Select built in delay after each line.
Select ready or busy control from printer or pin 20.

1.4.3 MECHANICAL SPECIFICATIONS

Dimemsions	12" H x 16" W x 21" D.
Weight	45 pounds
Material	
Chassis	Clear Iridite
Cover	Standard, Prolane 1®
	Polyurethane enamel, two colors
	F63WW28 light blue
	F63L17 nitro blue
	Special: Polyurethane enamel colors per customer color specifications.
Logo	Standard Lear Siegler ADM logo, or special logo per customers specifications.

1.4.4 POWER REQUIREMENTS

115 Vac, 60 Hz, 130 Watts;
Optional 230 Vac, 50 Hz.

1.4.5 ENVIRONMENT

Temperature

Operating Range – +5° to +55° (+41° to 122°F).
Storage Range – -40° to 65°C (-40°F - 150°F)
Relative Humidity – 5 to 95% noncondensing.
Altitude – Up to 10,000 feet.

1.4.6 HUMAN FACTORS

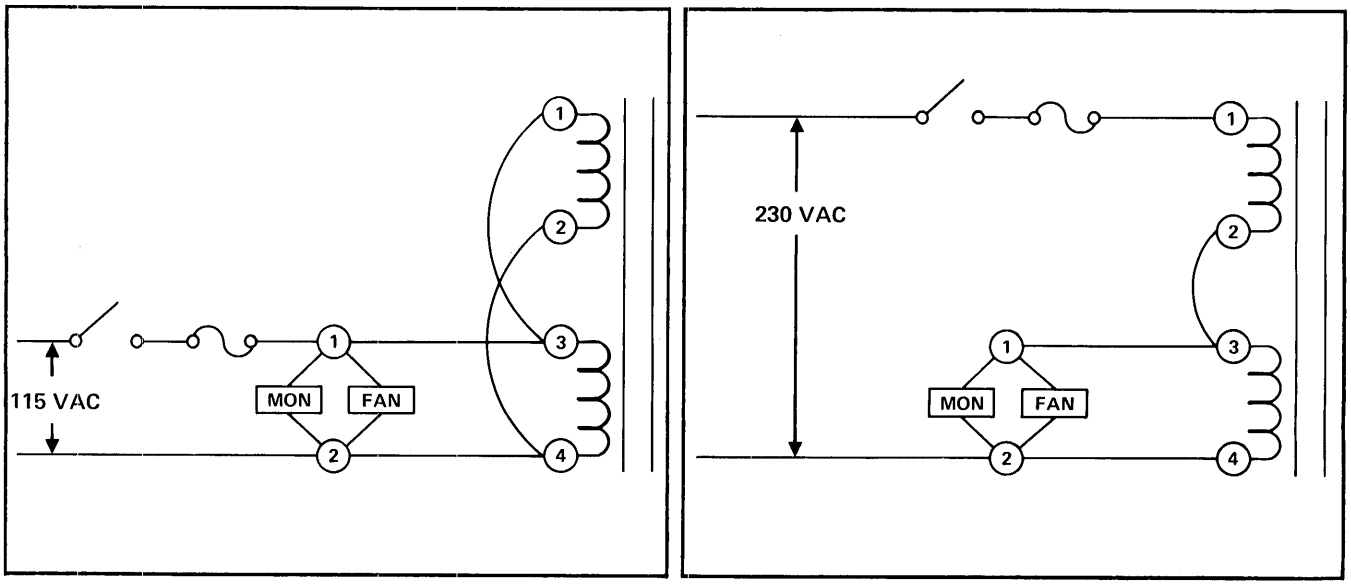
Units comply with DHEW Rules 42-CFR-Part 78, (For X-ray radiation).

Monitor viewing surface sloped at 15° angle from vertical.

Keyboard sloped at 11° from horizontal.

Standard keyboard layout similar to teletypewriter. Operational key provided for selected operations.

FIGURE 1-6. POWER OPTIONS



DATA DISPLAY SPECIFICATIONS

Input Impedance

	Minimum Shunt Resistance	Maximum Shunt Capacitance
(a) Video Input:	3.3k ohms	40pF
(b) Vertical Drive Input:	3.3k ohms	40pF
(c) Horizontal Drive Input:	470 ohms	40pF

Video Amplifier

(a) Bandwidth:	12 MHz (-3dB)
(b) Rise and Fall Times (10% to 90% amplitude):	Less than 35 nsec (linear mode)
(c) Storage Time:	15nsec, maximum (linear mode)

Retrace and Delay Times

(a) Vertical:	900μsec retrace, maximum
(b) Horizontal:	7μsec retrace plus 4μsec delay, maximum

CATHODE RAY TUBE DISPLAY SPECIFICATIONS

Nominal Diagonal Measurement (Inches)	Phosphor	*Resolution (TV Lines)	
		Center	Corner
12	P4	900 at 40 fL	800 at 40 fL
12	P31	900 at 20 fL	800 at 20 fL

*Resolution is measured in accordance with EIA RS-375 except Burst Modulation (or Depth of Modulation) is adjusted for 100 percent.

Geometric Distortion

The perimeter of a full field of characters shall approach an ideal rectangle to within ±1.5% of the rectangle height.

Power Requirements

Input Connector	Receptacle, Molex No. 03-06-1041 Supplied with Unit Mating Plug, Molex No. 03-06-2041 – Necessary Accessory (Available)
Input Voltage	105V to 130V rms (120V nominal); 50/60Hz
Input Power	24W (Nominal)
Output Voltages	+15V DC (short circuit protected) +12kV DC; 12.6V rms

ENVIRONMENTAL SPECIFICATIONS

Temperature (Chassis or Custom Unit)

Operating Range: 5°C to 55°C Ambient
Storage Rante: -40°C to 65°C

Humidity

5 to 80 percent (Noncondensing)

Altitude

Operating Range: Up to 10,000 feet

HUMAN FACTORS SPECIFICATIONS

X-Ray Radiation

These units comply with DHEW Rules-42-CFR-Part 78.

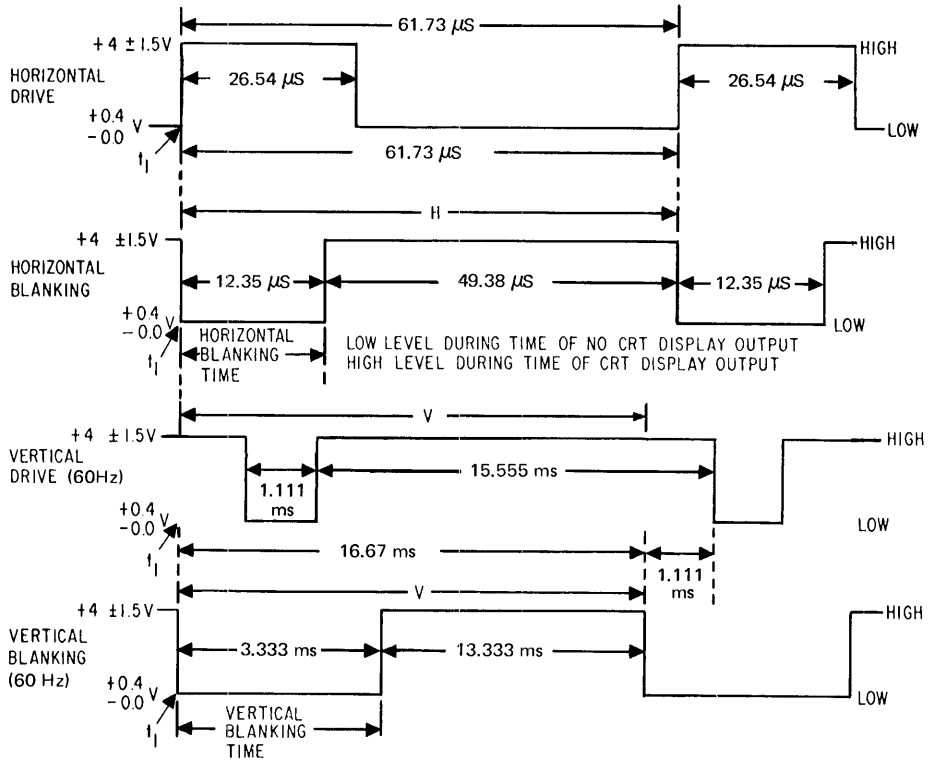
CONTROLS

Contrast, 500 ohm potentiometer carbon composition > 1/8 Watt

Brightness, 100 kilohm potentiometer > 1/8 Watt
Optional: The Brightness Control can be mounted on the printed circuit board as an internal set up control.

Internal Set Up Controls

Height
Vertical Linearity
Vertical Hold
Focus
Width
Low Voltage Adjust



SYNCHRONIZATION AND BLANKING GENERATOR WAVEFORMS

NOTES:

1. The leading edges of Drive and Blanking waveforms must start at time t_1. Nominal Blanking times should be observed.
2. H = time from start of one line to start of next line.
3. V = time from start of one field to start of next field.
4. Video pulse width should be equal to or greater than 100 nsec.

1.5 OPTIONS

The ADM-1A terminal may be obtained with a wide variety of options designed to increase its adaptability to a variety of applications. A complete description of all options currently available is given in Section 7 of this manual.

SECTION 2
INSTALLATION

2.1 GENERAL

This section contains information to aid in installing the ADM-1A and preparing it for use. Included are instructions and information for inspecting the ADM-1A, installing it in a suitable environment, setting internal switches, connecting power cables and turning on power.

2.2 VISUAL INSPECTION

It is recommended that the original shipping carton and all packing material be saved to prevent damage should the terminal need to be shipped or transported later.

Upon receipt, the ADM-1A should be carefully inspected for any signs of damage during shipping. The terminal has undergone stringent quality inspection and operational testing prior to shipping, and left the factory in perfect operating condition.

If the shipping container appears to be damaged, the carrier should be notified immediately, and damages noted on the bill of lading. Any concealed damages discovered after opening must be reported to the carrier as well.

Only the consignee may register a claim with the carrier for damages during shipment. Lear Siegler will cooperate fully with the customer should such action prove necessary.

2.3 INSTALLATION

Prior to installing the ADM-1A, be sure that the ON/OFF switch is in the OFF position, then complete the following steps:

1. Referring to figure 2-2 , connect the data interface cable to the terminal at point A with a 25-pin connector, using the appropriate pins designated in figure 2-1 below, depending on whether the installation is a 20 ma current loop interface or the standard RS-232-C.

NOTE

If the data interface in use does not supply a **clear to send** (CB) signal on pin 5, then jumper pins 4 and 5.

Pin No.	Signal Function			Code
1	Equipment Ground			AA
2	Transmit Data			BA
3	Receive Data			BB
4	Request to Send			CA
5	Clear to Send			CB
6	Data Set Ready			CC
7	Signal Ground			AB
8	Received Line Signal Detector			CF
9	Current Loop Power			
*10	Current Loop OUTPUT	+	Receive	
*11	Current Loop RETURN	—	Receive	SA
*12	Current Loop INPUT	+	Transmit	SB
*13	Current Loop RETURN	—	Transmit	
14	Current Loop Source			
15	Transmitter Signal Element Timing			
17	Receiver Signal Element Timing			
20	Data Terminal Ready			CD

FIGURE 2-1. INTERFACE CONNECTOR SIGNAL/PIN LIST

2. Plug the ADM-1A into a grounded AC outlet of the proper voltage and frequency.

3. Turn the ON/OFF rocker switch to ON.

The ADM-1A is designed to operate in a wide range of environmental conditions: 5°–55°C (41°–122°F); 5-95% noncondensing relative humidity.

The unit is designed to be set on a table, desk top or other suitable, hard flat surface.

CAUTION

In cold climates, care should be taken to allow the temperature of the terminal to equalize with room temperature before removing the unit from the shipping carton. This will prevent moisture from condensing on a cold terminal exposed to warm air. Avoid operating the unit on a soft surface, which may obstruct the flow of cooling air up through the bottom of the chassis. This can result in overheating and damage to the unit.

2.4 EXTERNAL CONTROLS

The external switches and adjustments may be found on the rear panel of the ADM-1A assembly, as shown in figure 2-2.

ON/OFF Switch

This is a two-position switch located in the upper right of the terminal's back panel. It controls the AC power to the unit and certain power-up and power-down sequences. Setting the switch to the ON position resets the circuitry within the ADM-1A, positions the cursor at HOME and clears the display memory to unprotected spaces.

Baud Rate

The Baud Rate Selector Switch selects the desired baud rate as specified on the equipment order. The HIGH position is normally set at the higher of the two user selected rates. The center position is the test position which is factory-set at 9600 baud. Baud rates may be changed by turning the rotary switches located inside the unit directly behind the baud rate selector.

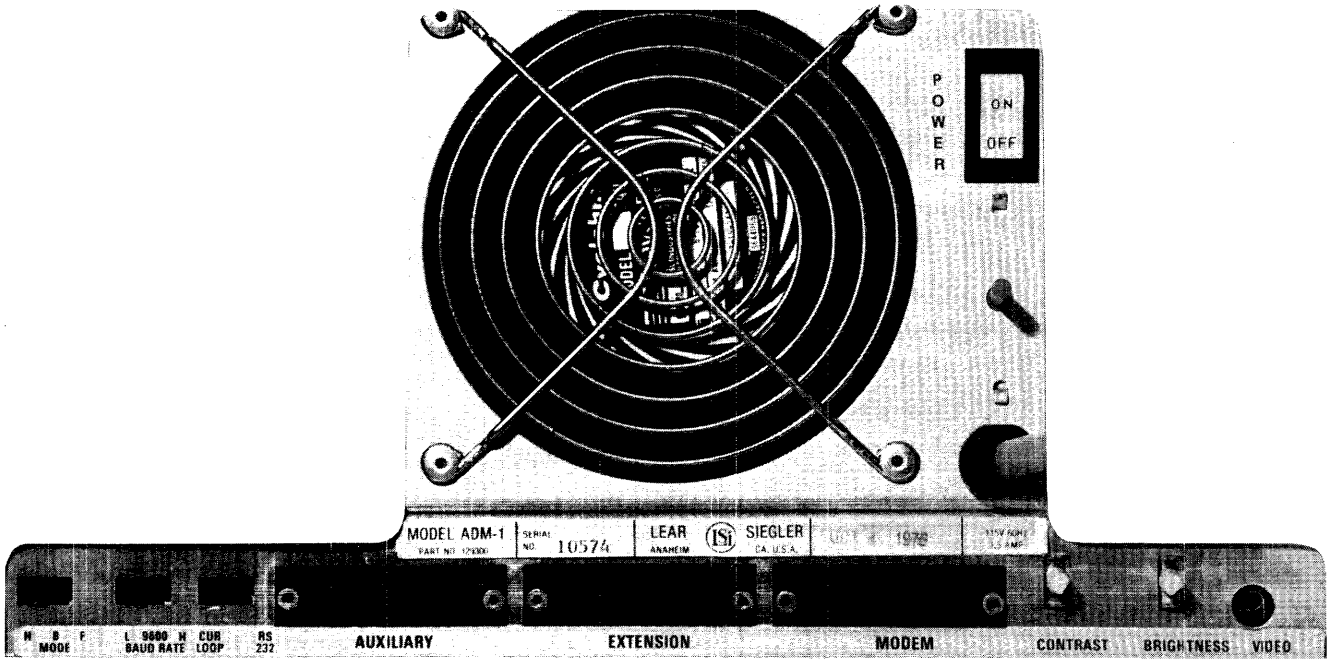


FIGURE 2-2. REAR PANEL ADM-1A

Mode Selector Switch

This 3-position switch selects the mode of operation of the ADM-1A.

a. **Conversation Mode** (Half-Duplex). In this mode, the ADM-1A can send and receive information to and from the remote computer, but only in one direction at a time. Characters are displayed and simultaneously transmitted, one character at a time, as they are typed at the keyboard. Received characters are displayed as they are received.

b. **Conversation Mode** (Full-Duplex). The ADM-1A can transmit and receive information in both directions simultaneously in full-duplex operation. Characters are transmitted as they are typed, but are displayed only upon reception. Display of characters typed in full-duplex is usually accomplished by remote computer or modem echoing the characters back to ADM-1A.

c. **Block Mode**. In the block mode, information is transmitted and received as complete messages or blocks of data. The operator enters the complete message, up to a full screen in length. The characters are stored and displayed, but not automatically transmitted. After entering the message, the operator can edit the information and then type a special control code which causes all or part of the message to be transmitted.

   In addition to the editing capability, the block mode provides a faster transmission of large blocks of data than does the conversation mode. It also permits more efficient utilization of the remote computer and data transmission lines for many applications.

Brightness Control

The brightness control is a potentiometer which controls the overall brightness of the CRT display. Brightness is usually adjusted so that the display raster (background) is barely visible or just below the point of visibility.

Contrast Control

The contrast adjustment potentiometer controls the brightness of the character relative to the background. Contrast should be adjusted after adjusting for brightness.

SECTION 3
OPERATION

3.1 GENERAL

This section contains information and instructions for using the ADM-1A keyboard and for programming control functions at the computer. The keyboard allows the operator to generate and transmit to the computer or auxiliary device all USASCII character codes.

3.2 DISPLAY CHARACTERS

In the standard ADM-1A, 64 characters are displayed on the screen (upper case alpha, numeric, most symbols and punctuation). When a non-displayable lower case character is typed, the proper lower case code is transmitted, but the character is displayed as upper case.

If the terminal contains the upper/lower case display feature, 95 characters will be displayed, (Upper and lower case alpha, numeric, all symbols and punctuation).

3.3 SPECIAL FUNCTION KEYS

The ADM-1A is equipped with an extended TTY-type keyboard. It contains seven additional keys for increased ease in performing cursor movements and functions.

HOME Key

This key causes the cursor to return immediately to the first character position of the first line (HOME position). If the ADM-1A is in the protect mode, and the HOME position is a protected character, the cursor will be sent to the first unprotected position on the screen.

RETURN Key

This key causes the cursor to move to the first character position of the line it is on, when the ADM-1A is in the PROTECT MODE. The return function also prevents storing or displaying space codes until the character or downline key is depressed. In the **conversation mode** a CR code (CTRL/M) is sent.

LINE FEED Key

If the ADM-1A is not in the Protect Mode, this key moves the cursor down one line. In the Protect Mode. It moves the cursor to the first unprotected position of the next line. In Conversation Mode an LF code (CTRL/J) is sent.

FIGURE 3-1. ADM-1A STANDARD KEYBOARD (60 KEY)

FIGURE 3-2. ADM-1 KEYBOARD OPERATIONS (60 KEY)

	Keys Used	
	Standard Keyboard	**Extended Keyboard**
A. CHARACTER DISPLAY		
1. Alphabetic Upper Case	A to Z	A to Z
2. Numeric	0 to 9	0 to 9
3. Special Characters	: – ; , . /	: – ; , . /
4. Special Characters with SHIFT key	! " # $ % & / ( ) * = @ _ [\ + ^] < > ?	! " # $ % & / ( ) * = @ _ [\ + ^] < > ?
5. No Display –USASCII SP	SPACE	SPACE
6. No Display – USASCII DEL	RUBOUT	RUBOUT
B. CURSOR CONTROL		
1. Position Home	CLR SHIFT/HOME, BRK CTRL/SHIFT/N	HOME
2. Position New Line (first char. pos.) Position New Line (same char. pos.)	CTRL/SHIFT/O LINE FEED & RTN.	CTRL/SHIFT/O LINE FEED & RTN.
3. Position First Char. Pos. (same line)	RETURN	RETURN
4. Position New Field	CTRL/I	TAB
5. Suppress Character Type-over	Consecutive SPACES after RETURN	Consecutive SPACES after RETURN
6. Increment Up	CTRL/K	↑
Down	CTRL/J	↓
Right	CTRL/L	→
Left	CTRL/H	←
C. TERMINAL CONTROL		
1. Break –USASCII	CLR HOME BRK	CLR HOME BRK
2. Clear Screen	CLR CTRL/HOME BRK	
3. Audible Tone (Bel)	CTRL/G	CTRL/G
4. Send Line Unprotected	SHIFT/SEND	SHIFT/SEND
5. Send Page Unprotected	SHIFT/CTRL/SEND	SHIFT/CTRL/SEND
6. Keyboard Unlock	CLR CTRL/SHIFT/HOME BRK	CLR CTRL/SHIFT/HOME BRK

⇌ Keys

These keys move the cursor one character position in the direction of the arrow. If the ADM-1A is in the Protect Mode, and the adjacent position in the direction of the arrow is protected, the cursor will skip the entire protected field and stop at the first unprotected position. The forespace and backspace functions may also be accomplished with the CTRL/L and CTRL/H functions.

↑ Key. This key moves the cursor straight up one line. If the ADM-1A is in the protect mode and the position directly above the cursor is protected, the cursor will move up and then to the left to the first unprotected position. This function may also be accomplished through the use of the CTRL/K keys.

Rept Key (Standard Keyboard only). This key may be held down while depressing a displayable character key or the ⇄ or ↑ ↓ keys to repeat at a character or cursor rate of 15 per second. On extended keyboard models, this function is accomplished by holding down the key for the character to be repeated.

Space Bar. Pressing the space bar causes the ASCII code for a space to be stored in the memory and a blank space to appear on the screen.

Shift Key. This key is used to type the upper case character shown on the key. It may also be used in conjunction with a CTRL sequence to perform various special functions.

Rub Out Key. This key is used in the Conversation Mode to transmit the ASCII code, DEL RUBOUT to the computer.

CLR/HOME/BRK Key. This key is used to perform the following functions:

a. To transmit a standard TTY break code, type only the CLR/HOME/BRK Key.

b. To perform the HOME function, type the CLR/HOME/BRK key while depressing the SHIFT key. If terminal is equipped with an extended keyboard this function is accomplished by depressing the HOME key.

c. To perform the clear to unprotected spaces function, type the CLR/HOME/BRK key while depressing the CTRL key.

d. To reset the keyboard lockout function (set only from the remote computer), type the CLR/HOME/BRK key while depressing the CTRL and SHIFT keys.

e. To reset ADM-1A operation, type the CLR/HOME/BRK key while depressing the CTRL, SHIFT and REPT keys. On terminals equipped with an extended keyboard, this function is accomplished by typing CLR/HOME/BRK while depressing CTRL, SHIFT and any displayable character. This terminates any operation that the ADM-1A is executing, clears the screen to spaces, homes the cursor, and sets the unprotected mode.

CTRL Key

This key, when depressed while typing another key, causes the bit pattern of the character code to be modified. The control character is transmitted in the Conversation Mode. Certain ADM-1A control functions are generated locally by typing a key while depressing the CTRL key.

a. **New Line** (CTRL/SHIFT/0). Positions the cursor to the first character position of the next line (or the first unprotected position in the next line if in the PROTECT MODE).

b. **BEEP.** (CTRL/G) Sounds an audible beep in the ADM-1A.

c. **Upline** (CTRL/K). This sequence causes the cursor to move up one line. On terminals equipped with an extended keyboard, this function may also be accomplished by the ↑ key.

d. **Downline** (CTRL/J). This sequence causes the cursor to move down one line. The extended keyboard contains a ↓ key which performs the same function.

e. **Backspace** (CTRL/H). This sequence causes the cursor to move back one space. This function may be accomplished by the ← key on extended keyboards.

f. **Forespace** (CTRL/L). This sequence moves the cursor forward one space. This function may be accomplished by the → key on extended keyboard models.

g. **Tab** (CTRL/I). This sequence positions the cursor at a preset position on the line. This function may also be accomplished by the Tab key on terminals equipped with the extended keyboard.

h. **Home** (CTRL/SHIFT/N). The function of this sequence is the same as that which is accomplished by the SHIFT/BRK sequence. On terminals equipped with the extended keyboard this function may also be accomplished by the HOME key.

Any remaining CTRL key combinations are not interpreted by the ADM-1A. They are normally only used when recognizable by the remote computer.

ESC key

Typing the ESC key generates a code which causes the ADM-1A to interpret the next character typed differently than it normally would. This escape sequence is used to perform the field protect, send, display clear and edit functions. (See section 3.4)

Code	ASCII Mnemonic	Function
CTRL/@	NUL	
CTRL/A	SOH	
CTRL/B	STX	
CTRL/C	ETX	
CTRL/D	EOT	
CTRL/E	ENQ	
CTRL/F	ACK	
CTRL/G	BEL	Sounds audible beep
CTRL/H	BS	Backspace
CTRL/I	HT	Tab
CTRL/J	LF	Line Feed
CTRL/K	VT	Up Line
CTRL/L	FF	Forespace
CTRL/M	CR	
CTRL/S/N	SO	Home
CTRL/S/O	SI	New Line
CTRL/P	DLE	
CTRL/Q	DC1	
CTRL/R	DC2	
CTRL/S	DC3	
CTRL/T	DC4	
CTRL/U	NAK	
CTRL/V	SYN	
CTRL/W	ETB	
CTRL/X	CAN	
CTRL/Y	EM	
CTRL/Z	SUB	
CTRL/[	ESC	
CTRL/\	FS	
CTRL/]	GS	
CTRL/	RS	

FIGURE 3-3. ADM-1A CONTROL CODES

3.4 ESCAPE SEQUENCES

Escape sequences are initiated using the ESC key to generate an internal USASCII Escape Code which conditions the ADM-1A under program control to interpret the following character or string of characters as special control instructions. These sequences are used for:

- Keyboard Enabling/Disabling
- Display clearing to spaces/nulls
- Field protection control
- Message transmission control
- Absolute cursor address Read/Positioning
- Data Editing

See figure 3-4 for a graphic illustration of specific sequences explained below.

ENABLE/DISABLE KEYBOARD

This function is normally used when the ADM-1A is connected on-line to a computer which transmits the following sequences:

ESC # – Disables all keyboard functions except keyboard unlock
ESC " – Restores keyboard control.

Since the ESC # may be accidentally initiated manually, the keyboard may be enabled manually by simultaneously depressing:

CLR
CTRL/SHIFT/HOME
BRK

CLEAR DISPLAY

The ADM-1A screen may be cleared in several ways:

- The operator can clear unprotected characters to spaces by the use of

  CLR
  CTRL/HOME
  BRK

  (or CTRL/CLR on the extended keyboard).

- The entire display may be cleared to nulls by operator or computer control using the following ESC codes:

ESC ; – clears foreground to spaces
ESC + – clears entire display to spaces
ESC : – clears entire display to nulls
ESC * – clears entire display to nulls
ESC K – (optional feature) clears foreground to nulls
ESC J – (optional feature) Resets the protect mode and clears memory to protected spaces.

Upon completion of the clear sequences, the cursor will be in the first unprotected position on the screen.

FIELD PROTECTION CONTROL

Writing unprotected characters is accomplished by sending or typing various ESC sequences.

- ESC) – Sets WRITE PROTECT MODE
- ESC (– Resets WRITE PROTECT MODE
- ESC & – Sets PROTECT MODE
- ESC ' – Resets PROTECT MODE

When in the PROTECT MODE, protected characters cannot be overwritten. The PROTECT MODE may also be reset by CLEAR operations, ESC* and ESC +. The PROTECT MODE is also reset by the following CLEAR operations: ESC;, ESC+, ESC:, ESC* or by initiation of a SEND operation:

- SHIFT/SEND Send line unprotected
- SHIFT/CTRL/SEND Send page unprotected

When the edit and print options are provided, the WRITE PROJECT mode will terminate when any of the following operations are performed:

- ESC Q Character Insert
- ESC W Character Delete
- ESC E Line Insert
- ESC R Line Delete
- ESC T Line Erase
- ESC Y Page Erase
- ESC P Print

* • ESC J Clear to Protected Spaces

The cursor will not reside in a protected position. Following any cursor motion operation, the content of the position indicated by the cursor is tested for protected status. If that position is protected, the cursor moves forward or backward (depending on the operation) until an unprotected position is located.

*Optional function only.

CAUTION

If the entire display area is protected, the cursor will have no place to stop. This will cause the terminal to lock up in search of an unprotected position. This search may be broken by the operator depressing the CLR/HOME/BRK keys.

Message Transmission Control

ESC 4 (Send) Line Unprotected – An ESC 4 (or shift/send key in Block Mode) causes the unprotected character positions, from the beginning of the current line to the original cursor position, to be transmitted to the remote computer. The last character position transmitted is followed by the transmission of a return code.

ESC 5 (Send) Page Unprotected – An ESC 5 sequence (or CTRL/SHIFT/SEND in Block mode) causes the unprotected character positions from the beginning of the page to the cursor position, to be transmitted to the remote computer. The last character position transmitted is followed by a (return code).

ESC 6 Send line protected – An ESC 6 sequence causes all character positions, from the beginning of the line through the cursor, to be transmitted to the remote computer. During transmission, ESC (and ESC) are inserted as protected fields, entered and exitted. The last character transmitted is followed by a (return code).

ESC 7 Send Page Protected – ESC 7 causes all character positions (protected and unprotected) from the beginning of the page to the cursor to be transmitted to the remote computer. During transmission, ESC (and ESC) are executed whenever protected fields are encountered. The last character transmitted is followed by a (return code).

ESC S Partial Send (Optional feature) – In the BLOCK MODE, the ESC S sequence causes an USASCII code to be stored in display memory at the cursor location. The cursor backspaces until a previous FS code is encountered, then advances to the 1st unprotected position and transmits through the next FS code. If there are no previous FS codes, transmission begins at the HOME position or the first unprotected position.

CURSOR ADDRESSING

The computer can position the ADM-1A cursor to any position through a 4-character sequence: ESC = YX. X and Y represent the row and column coordinates of the desired cursor position. The HOME position is addressed by ESC = SPACE SPACE. Successive positions are accessed by using ascending ASCII codes (see figure 3-6).

After the X coordinate is loaded, the position of the cursor is tested for protected status. If that position is protected, the cursor automatically skips to the first unprotected position. An ESC ? sequence causes the XY coordinates of the cursor followed by a CR code, to be transmitted to the computer.

EDIT OPTION

ESC Q Character Insert

- Resets Write Protect Mode
- Moves the character under the cursor and all following characters on that line or field one space to the right
- Writes a space at the original position of the cursor and leaves the cursor in that position

ESC W Character Delete

- Resets the Write Protect Mode
- Deletes the character under the cursor by moving all following characters on that line or field one space to the left
- Writes a space in the last position of the line or field
- Cursor does not move.

ESC E Line Delete

- Is not executed if Protect Mode is set
- Inserts a line of unprotected spaces at the line occupied by the cursor by moving the contents of that line and the lines below up one line
- Bottom line is lost.
- At completion, the cursor is at the first character position of the inserted line.

ESC R Line Delete

- Is not executed in the Protect Mode
- Resets the Write Protect Mode
- Deletes the line occupied by the cursor
- Moves lines below the cursor up one line
- Bottom line becomes unprotected spaces
- Cursor moves to the first position of the original line

FIGURE 3-4. ADM-1A DATA DISPLAY ESC SEQUENCES

			P PRINT
!		A	Q CHARACTER INSERT
" KEYBOARD ENABLE		B	R LINE DELETE
# KEYBOARD DISABLE		C	S PARTIAL SEND
$	4 SEND LINE (FOREGROUND)	D	T LINE ERASE
%	5 SEND PAGE (FOREGROUND)	E LINE INSERT	U FREE FORM ENTRY
& SET PROTECT MODE	6 SEND LINE (ALL)	F	V
/ RESET PROTECT MODE	7 SEND PAGE (ALL)	G	W CHARACTER DELETE
(END WRITE PROTECT		H	X RESET FREE FORM ENTRY
) START WRITE PROTECT		I BACK TAB	Y PAGE ERASE
* CLEAR ALL TO NULL	: CLR ALL TO NULL	J	Z
+ CLEAR ALL TO SPACES	; CLR FOREGROUND TO SPACES	K	[
		L SPECIAL PRINT	\
	= LOAD CURSOR	M	]
		N	^
	? READ CURSOR	O	_

ESC T Line Erase

– Replaces the contents of unprotected positions with spaces, beginning with the cursor position and ending with the last position in the line or field

ESC Y Page Erase

– Resets Write Protect Mode
– Writes spaces in all unprotected positions, from the position of the cursor to the end of the screen
– Cursor does not move

ESC I Back Tab Cursor

– Moves cursor to the first position of the last unprotected field.

PRINT OPTION

When received in text or entered from the keyboard, an ESC P sequence causes an EM code to be written at the cursor position. The cursor is moved to the HOME position and the print operation begins. Printing takes place in the following sequence:

- CR LF NUL
- Displayable line of text
- CR LF NUL

Transmission of trailing spaces is suppressed, reducing printing time. The Print operation terminates when the cursor reaches the EM code, at which time the final CR LF NUL is sent to the printer.

NOTE

On terminals equipped with the optional Copy Mode, all data received from the computer is copied to the printer. To reset this mode, ESC M is used.

FUNCTION	SEQUENCE
CURSOR ←	CTRL / H
CURSOR ↓	CTRL / J
CURSOR ↑	CTRL / K
CURSOR →	CTRL / L
HOME	CTRL/S/N
SKIP	CTRL / I
NEW LINE	CTRL/S/O
PROTECT ON	ESC &
PROTECT OFF	ESC '
START WRITE PROTECT	ESC)
END WRITE PROTECT	ESC (
CLEAR TO UNPROTECT SP	ESC +
SEND LINE UNPROTECT	ESC 4 or S/SEND
SEND PAGE UNPROTECT	ESC 5 or CTRL/S/SEND
SEND LINE PROTECT	ESC 6
SEND PAGE PROTECT	ESC 7
CLEAR SCREEN TO NULLS	ESC *
CLEAR SCREEN TO NULLS	ESC :
CLEAR UNPROT. TO SPACES	ESC +
CLEAR UNPROT. TO SPACES	ESC ;
KEYBOARD ENABLE	ESC ''
KEYBOARD DISABLE	ESC #
LOAD CURSOR	ESC =
READ CURSOR	ESC ?
(Optional Edit Package)	
CHAR INSERT	ESC Q
CHAR DELETE	ESC W
LINE INSERT	ESC E
LINE DELETE	ESC R
LINE ERASE	ESC T
ERASE PAGE	ESC Y
PARTIAL SEND	ESC S
BACK TAB	ESC I

FIGURE 3-5. ESCAPE SEQUENCES

X or Y	ASCII CODE	X	ASCII CODE	X	ASCII CODE
1	SPACE	28	;	55	V
2	!	29	<	56	W
3	"	30	=	57	X
4	#	31	>	58	Y
5	$	32	?	59	Z
6	%	33	@	60	[
7	&	34	A	61	\
8	'	35	B	62	]
9	(	36	C	63	^
10	)	37	D	64	_
11	*	38	E	65	`
12	+	39	F	66	a
13	,	40	G	67	b
14	-	41	H	68	c
15	.	42	I	69	d
16	/	43	J	70	e
17	0	44	K	71	f
18	1	45	L	72	g
19	2	46	M	73	h
20	3	47	N	74	i
21	4	48	O	75	j
22	5	49	P	76	k
23	6	50	Q	77	l
24	7	51	R	78	m
25	8	52	S	79	n
26	9	53	T	80	o
27	:	54	U		

*Y May never be greater than 24.

FIGURE 3-6. ABSOLUTE CURSOR POSITIONING

FIGURE 3-7. USASCII CHARACTER CODES

	CONTROL			GRAPHIC CHARACTER SET					
BITS	BITS	0	1	2	3	4	5	6	7
4321	765	000	001	010	011	100	101	110	111
0000		NUL	DLE	(SP)	∅	@	P	'	p
0001		SOH	DC1	!	1	A	Q	a	q
0010		STX	DC2	"	2	B	R	b	r
0011		ETX	DC3	#	3	C	S	c	s
0100		EOT	DC4	$	4	D	T	d	t
0101		ENQ	NAK	%	5	E	U	e	u
0110		ACK	SYN	&	6	F	V	f	v
0111		BEEP	ETB	'	7	G	W	g	w
1000		BS	CAN	(	8	H	X	h	x
1001		HT	EM	)	9	I	Y	i	y
1010		LF	SUB	*	:	J	Z	j	z
1011		VT	ESC	+	;	K	[	k	{
1100		FF	FS	,	<	L	\	l	:
1101		CR	GS	-	=	M	]	m	}
1110		SO	RS	.	>	N	^	n	~
1111		SI	US	/	?	O	-	o	RUB

Control Codes

(Generated by holding CTRL key while typing the corresponding key shown in columns 4 and 5.)

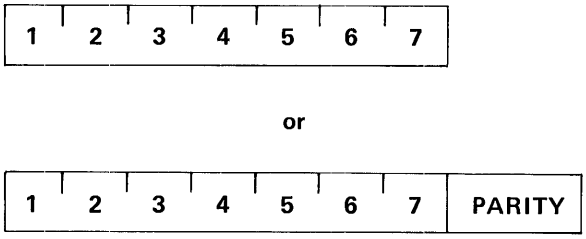
Displayable in standard ADM-1A

Displayable with ADM-1A Upper/Lower Case Display feature.

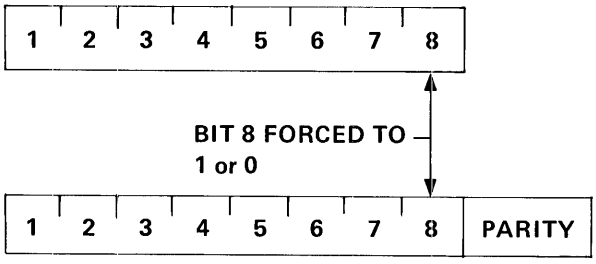
3.5 DATA CHARACTER FORMAT

The ADM-1 uses USASCII (United States of America Standard Code for Information Interchange). USASCII is a 7-bit code. But because many of the computers and other devices to which the ADM-1 may be interfaced use 8-bit words (plus parity or without parity), the ADM-1 offers a wide choice of word formats selectable by the user.

The data character may be 7 bits in length, with or without an optional parity bit generated on transmission:

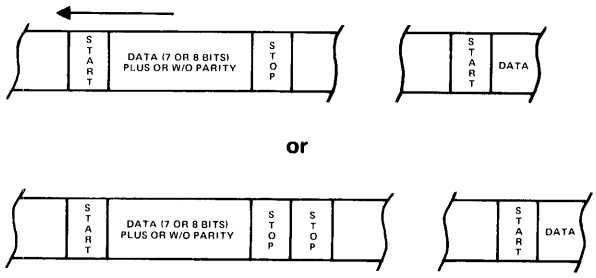


The data character may be 8 bits in length, with or without the optional parity bit. In the case of 8-bit characters, bit 8 is always forced to 1 or 0 as selected by the user.



3.6 DATA TRANSMISSION FORMAT

The ADM-1 uses asynchronous transmission. This means each character is transmitted as a complete, self-contained message consisting of the data character with or without parity, preceded by a start bit and followed by one or two stop bits.



When the start bit is received, a clock signal is initiated to clock in the remainder of the word. The one or two stop bits are used to signify the end of the word and terminate the receive clock.

Generally, transmission rates of 110 baud and lower use two stop bits, and rates of 150 and higher use one stop bit.

The ADM-1 control codes and the USASCII code set are shown in figure 3-7.

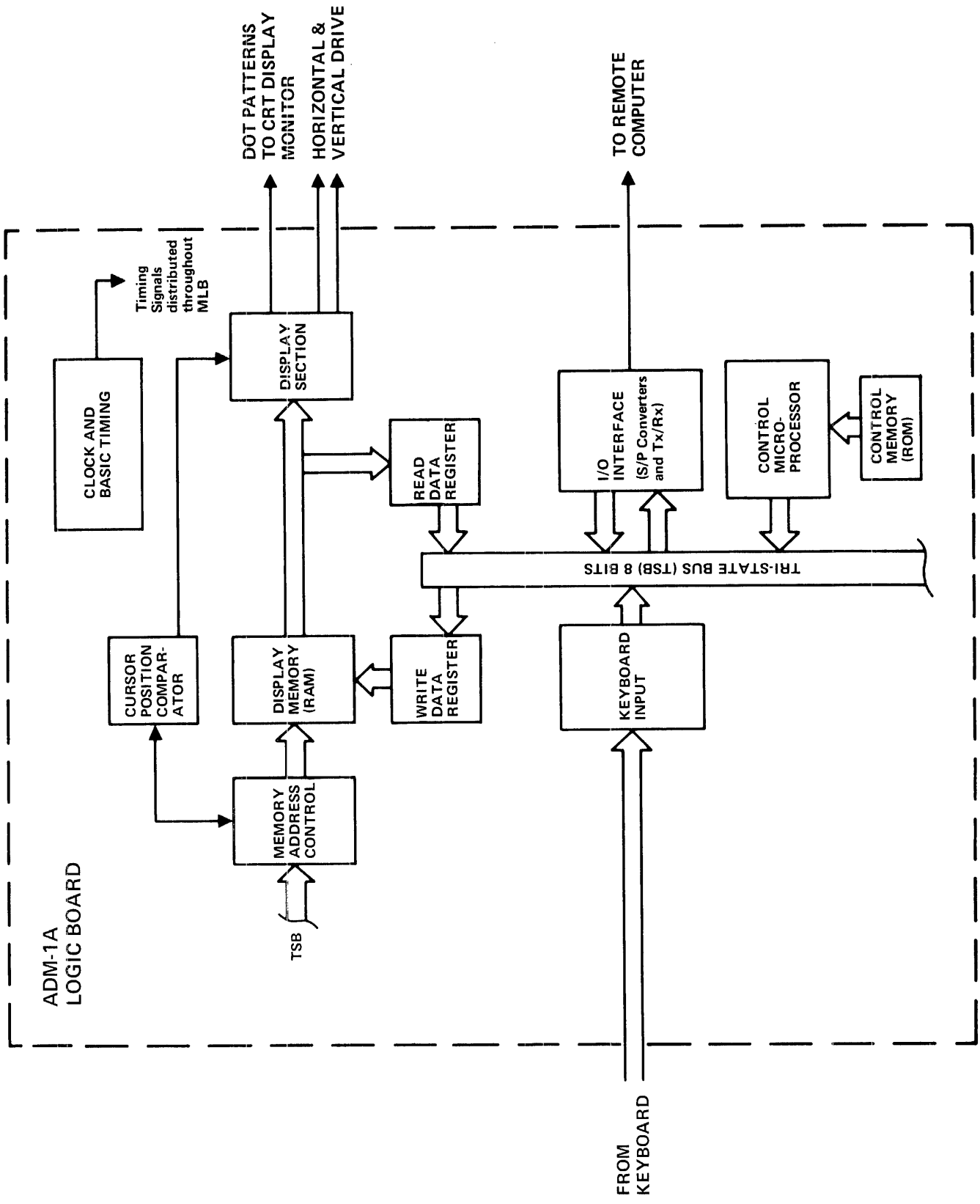


FIGURE 3-8. LOGIC BOARD, BASIC BLOCK DIAGRAM

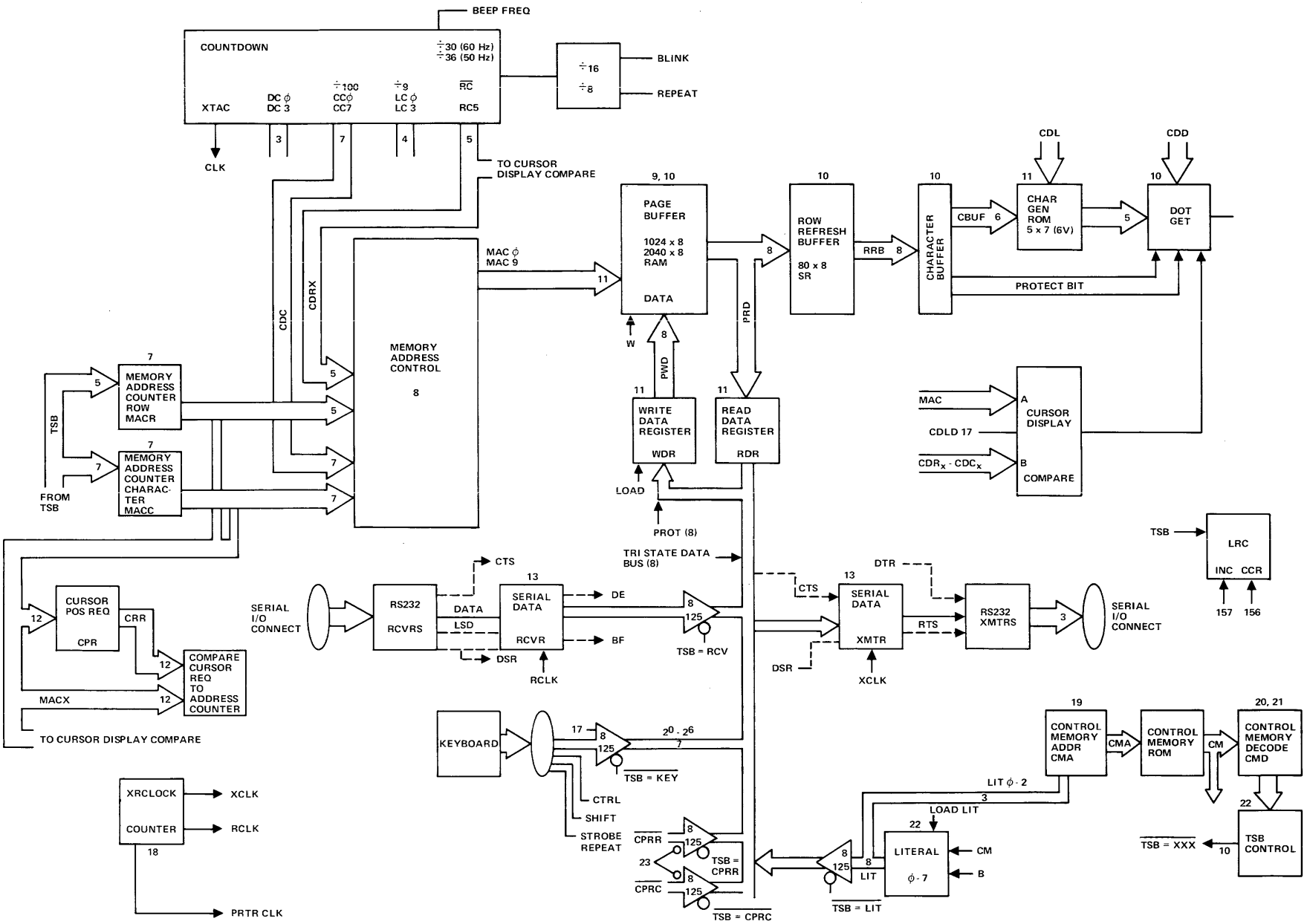


FIGURE 3-9. LOGIC BOARD BLOCK DIAGRAM

SECTION 4
THEORY OF OPERATIONS

4.1 GENERAL

This section describes the manner in which the ADM-1A performs its functions. The logic board and power supply are each described with reference to illustrations and diagrams.

Keyboard and monitor theory is to be found in the appendix.

4.2 GENERAL FUNCTIONAL DESCRIPTION

The general organization of the overall logic in the ADM-1A is shown in figure 3-8. This figure divides the ADM-1A logic into functional blocks and shows the relationship between the blocks.

4.3 LOGIC BOARD

The basic functional organization of the logic board is illustrated in figure 3-9.

The logic board is the principal element in the ADM-1A terminal. It is responsible for:

- Generating clock and timing signals for the terminal
- Receiving data and control information from the keyboard and remote computer
- Storing data for display and transmission
- Interpreting command controls and controlling the terminals' response to commands
- Generating cursor for display and maintaining cursor position
- Maintaining protected and unprotected status of data from display and transmission.
- Transmitting and receiving data from the remote computer
- Coordinating all transfers of data between the elements of the logic board.

4.3.1 Tri-State Bus

The various functional elements of the logic board are organized around the multi-directional Tri-State Bus (TSB) which provides a common data path between elements. The TSB is 8 bits wide. There are 3 possible states of its lines:

State One – A logical '1' or True condition characterized by a +2.8V to a +5V level or pulse.

State Two – A logical zero or false condition of –V to +.4V.

State Three – A high impedance load offered by transmitters of elements not connected to the bus at a given time.

Sources and destinations for character transfers over the TSB are determined by gating signals originating in the control logic.

4.3.2 Control Processor (Schematic 19, 21)

All logic board operations are sequenced and controlled by the Control Processor consisting of: Control Memory Address Counter (CMA and CMAP); Control Memory ROM, Control Memory Decode Logic; Literal Buffer; Condition Decode Logic and Tri-State Bus Control Logic.

4.3.3 Control Memory (Schematic 20)

Information transfers are controlled by program instructions stored in the control memory ROM. The standard ADM-1A functions are provided by two pages of 256 eight-bit words. These functions may be extended through the use of optional additional ROM modules. Maximum ROM capacity is 8 pages (2048 words).

4.3.4 Control Memory Address Counter (CMA and CMAP) (Schematic 19)

During control program execution, instructions are accessed through the address in the Control Memory Counter (CMA) whose function is identical to that of the program counter in the conventional computer.

The CMA is automatically incremented to the next sequential address after each instruction is accessed from the ROM. If the previous instruction was a jump command the CMA is forced to the jump destination address.

The CMA is an eight-bit counter capable of addressing any word of the 256 word page.

The Control Memory Address Page Register (CMAP) keeps track of the page selection. It is 4 bits wide and is loaded (during **jump** instructions) with the value of ROM via the Literal Buffer. The

MSB is not used for addressing since the eight-bit page maximum ROM capacity can be addressed using only 3 bits.

4.3.5 Literal Register (Schematic 22)

The Literal Register is an 8-bit holding register with its inputs connected to the ROM data outputs and its outputs gated onto the Tri-State Bus by TSB=LIT. This is a register used to transmit constants from the control program. The lower four bits are used as path to the page register (CMAP) during execution of a JMP instruction. It is used as a holding register for data transfers from the command memory to the Tri-State Bus.

4.3.6 Control Memory Decode Logic (Schematic 21)

Program commands from memory are decoded by the Control Memory Decode Logic (CMD) into 20 primary control lines. These lines are used to direct information transfers throughout the logic board. This decoding function is disabled during the second half of a JUMP, JUMP ON CONDITION or LOA LIT instruction.

4.3.7 Condition Decode Logic (Schematics 21, 24, 25, 19)

The basic ADM-1A program contains routines which sense the status of the keyboard, the Read Data Register, the UART and other logic board elements. This is accomplished by sampling the multi-source status line, COND. Prior to sampling COND the micro-processor enables only the COND path from the desired source. If the condition is satisfied, the program jumps to the appropriate routine. (True or False conditions may be selected by JTC, or JFC)

4.3.8 Tri-State Bus Control Logic (Schematic 22)

The microprogram performs data transfers over the Tri State Bus, gating any one of ten possible sources onto the bus, then the bus contents into into the desired destination. The signals which gate data onto the bus are generated in the Tri-State Bus Control Logic by decoding the lower 4 bits (CM0-CM3) of the microprogram instructions. For each of the TSB control commands, corresponding TSB control signals are generated. Each control signal causes the contents of a source to be gated through the Tri-State Bus.

4.3.9 Status Register (Schematic 26)

The microprogram can set, sense and clear a variety of flags in the 8-bit Status Register, setting global conditions to control the microprogram actions. The flags are placed on the Tri-State Bus by the Status Register where they are tested individually by the program. Flag conditions are shown on figure 4-9.

4.4 KEYBOARD INPUT (Schematic 17)

Data entered at the keyboard is gated onto the Tri-State Bus by 8 TSB drivers. These drivers are gated on by the microprocessor at the desired time by TSB = KEY.

Input lines from the keyboard, other than data, include:

- KEYSTROB — Keystrobe
- KREPT — Character Repeat
- KBREAK — Break Transmission
- KHEREIS — Send Key
- KCTRL — Control Key
- KSHIFT — Shift

KSTROBE, KBREAK, KHEREIS, KCTRL and KSHIFT are tested by the microprogram via individual COND paths to the microprocessor.

4.5 EXTERNAL I/O INTERFACE (Schematic 13, 14, 15)

The standard ADM-1A has one serial interface channel for communication with the remote computer. A second I/O channel is added on terminals with the optional printer interface.

The transmitter/receiver is a Universal Asynchronous Transmitter/Receiver (UART). The receiver accepts serial characters from the external interface and transmits parallel words to the TSB. (In most models, a 40-character buffer holds the characters received from the UART until the microprocessor returns to an idle state.) The buffer then dumps the input character-by-character onto the Tri-State-Bus.

Character patterns are selectable to match the user's word structure. The transmitter takes parallel words from the control section and transmits the appropriate 9-, 10- or 11-bit serial pattern over the external interface.

			TSB 1	2	3	4	5	6	7	8
CHIP OUTPUTS	RDR	sh12	M6-6	M6-5	M6-4	M6-3	N6-6	N6-5	N6-4	N6-3
	KEY	sh17	K1-8	K1-6	K1-11	K1-3	J1-8	J1-6	J1-11	J1-3
	RCV	sh13	F7-8	F7-6	F7-11	F7-3	E7-8	E7-6	E7-11	E7-3
	LIT	sh22	D15-6	D15-5	D15-4	D15-3	C15-6	C15-5	C15-4	C15-3
	CPC	sh23	F8-8	F8-6	F8-11	F8-3	E8-8	E8-6	E8-11	E8-3
	CPR	sh23	F10-8	F10-6	F10-11	F10-3	E10-8	E10-6	E10-11	E10-3
	LRC	sh23	D12-8	D12-6	D12-11	D12-3	C11-8	C11-6	C11-11	C11-3
	XRS	sh13	F9-8	F9-6	F9-11	F9-3	E9-8	E9-6	E9-11	E9-3
	ADD	sh26	D14-8	D14-6	D14-11	D14-3	C14-8	C14-6	C14-11	C14-3
	STB	sh26	D13-8	D13-6	D13-11	D13-3	C13-8	C13-6	C13-11	C13-3

CHIP INPUTS	WDR	sh12	M5-5	M5-12	M5-13	M5-4	N5-5	N5-12	N5-13	N5-4
	MACC	sh7	K9-13	K9-3	K9-6	K9-10	K6-13	J5-9 / N4-12	N4-13	
	E1-UART	sh13	E1-26	E1-27	E1-28	E1-29	E1-30	E1-31	E1-32	E1-33
	E6-UART	sh13	E6-26	E6-27	E6-28	E6-29	E6-30	E6-31	E6-32	E6-33
	$\overline{\text{NO LD}}$	sh13	D3-5	D10-5	D10-4	D10-3	D10-10	D10-9	D10-11	
	E5-UART	sh16	E5-26	E5-27	E5-28	E5-29	E5-30	E5-31	E5-32	E5-33
	LRC $	sh23	D11-9	D11-5	D11-12	D11-2	C12-9	C12-5	C12-12	
	$\overline{\text{COND}}$	sh24	B15-4	B15-3	B15-2	B15-1	B15-15	B15-14	B15-13	B15-12
			1	2	3	4	5	6	7	8

REF: 129338-7 ADM-1A LOGIC BOARD

FIGURE 4-1. TRI-STATE BUS SIGNAL LOCATIONS

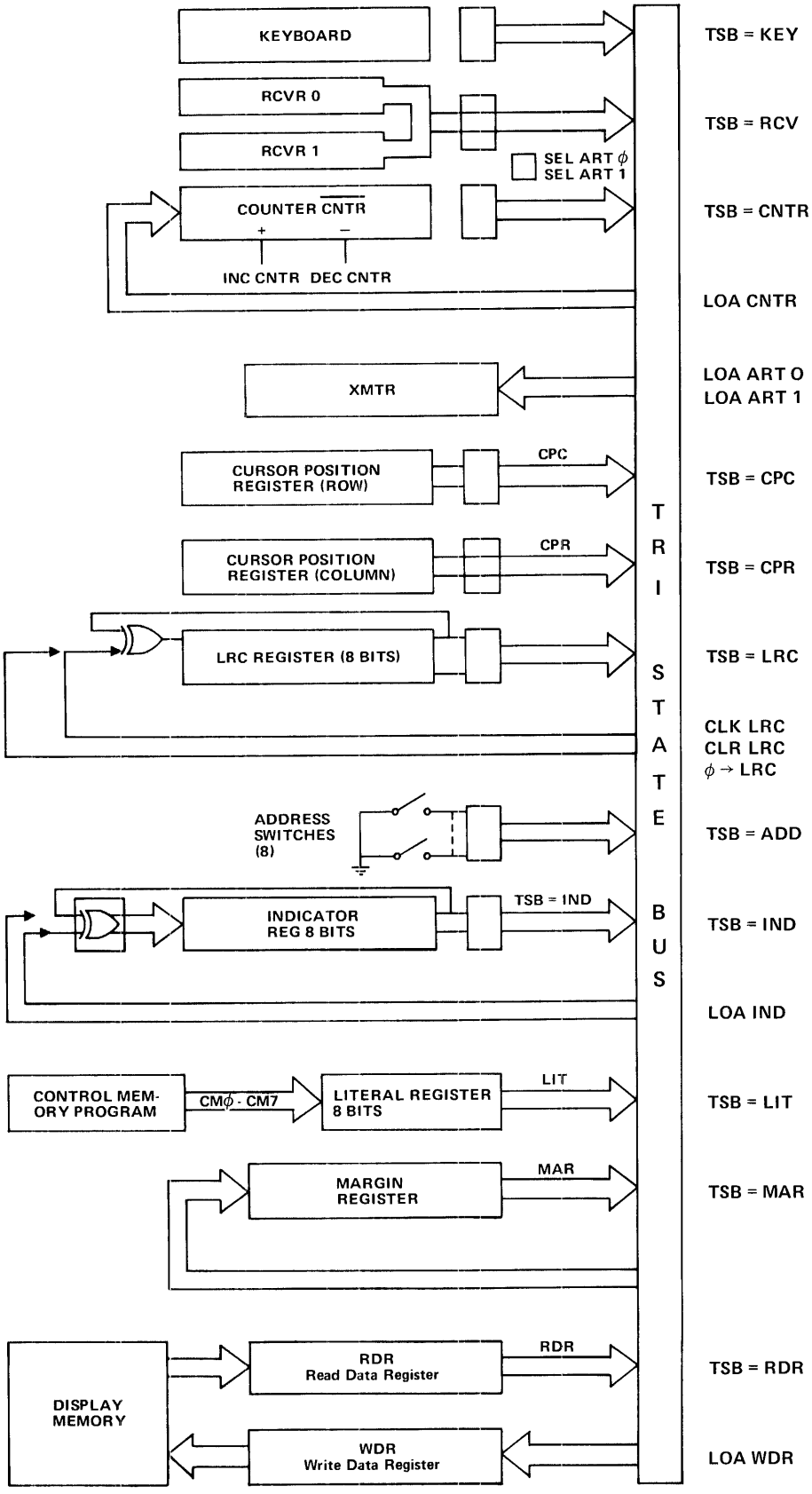


FIGURE 4-2. TRI-STATE BUS

The user may select either a 20mA current loop or an RS232C interface. The ADM-1A interface contains a Send Turnoff delay and Data Terminal Ready for 202 Bell Modem compatibility.

Transmission rates are user-selectable from 110 to 9600 baud.

The desired word format is selected from a range of word length and parity combinations through switches. Switch configurations are illustrated on figure 1-4.

4.6 DISPLAY SECTION (Schematic 1, 3, 4, 10, 11)

The Display Section provides the horizontal and vertical deflection timing and video display to the CRT monitor. The video includes displayable data from the RAM display memory, reduced intensity for protected field data, and the cursor.

Data from the RAM is accessed one 80-character line at a time and stacked into an 8 bit x 80 character shift register, or row refresh buffer. Memory addressing during display data access is provided by CDC1-6 and CDR0-4 from the clock and timing logic. After the display section initiates a horizontal raster scan it shifts a line of characters out of the register, one at a time, through the character buffer to the Character Generator (CG). The five low order bits go directly to the CG. Bits 6 and 7 are decoded to provide a blanking signal for non-displayable characters. Bit 8 contains the protected status of the character.

The Character Generator produces the displayable video pulses which comprise the 5 x 7 dot matrix illustrated in figure 4-3. To display each line of characters, the CG must receive all eighty characters seven times and generate seven lines of video pulses, one for each raster sweep. The raster count lines (CDL0–CDL2) tell the character generator which sweep is occurring.

The five bit video for each character is transferred to the shift register which serializes the data and clocks it out to the display monitor. If a character is protected (Bit 8 = TRUE) the video output level is lowered slightly, resulting in reduced intensity.

The character generator repeats the above line display sequence for each of the 12 or 24 lines, inserting the necessary blanked raster lines for vertical underline spacing. The entire screen is refreshed at 60 Hz (50 Hz optional).

Cursor display is also generated in the Display Section. The cursor position (MACR0-3 and MACC0-6) is contained in the Memory Address Counter. It is compared with the Display Address lines (CDR0-3 and CDC0-6). When the display scan reaches the cursor position, the two addresses will be equal and a cursor video gate will be generated.

4.6.1 Display Memory (Schematic 9)

The Display Memory is a random access memory (RAM) of eight-bit words with a capacity of 960 words (Twelve rows of 80 characters). The twenty-four row by eighty character display option includes a 1920 word RAM.

4.6.2 Display Memory Addressing

The Display Memory Addressing section produces the memory address lines (MA0 – MA9 and CEEVEN, CEODD) which access the RAM for display and read/write operations.

Address lines for read and write operations originate in the Memory Address Counter (MACR4 and MACC6). For display, the logic board timing section generates the address lines CC0-CC7, RC0-RC4. An address multiplexer selects the proper set of lines based on demand from the display section.

4.6.3 Read Data Register (Schematic 12)

The eight bit Read Data Register (RDR) buffers and drives the display memory output onto the Tri-State Bus. The register output is enabled by TSB = RDR. Loading of the register takes place during a READ instruction. The READ loads the RDR with the content of the RAM location indicated by MACC and MACR.

4.6.4 Write Data Register (Schematic 12)

Data characters to be written into the display memory are transferred from the source (keyboard or UART) over the Tri-State Bus into the eight bit Write Data Register (WDR). Input to the Write Data Register is by the LOA WDR instruction.

4.6.5 Cursor Position Comparator (Schematic 7)

Block mode transmissions start at the beginning of the page or line and continue to the cursor position. The function of the Cursor Position Comparator is to terminate the transfer. At the beginning of the block mode transfer, the cursor position register is

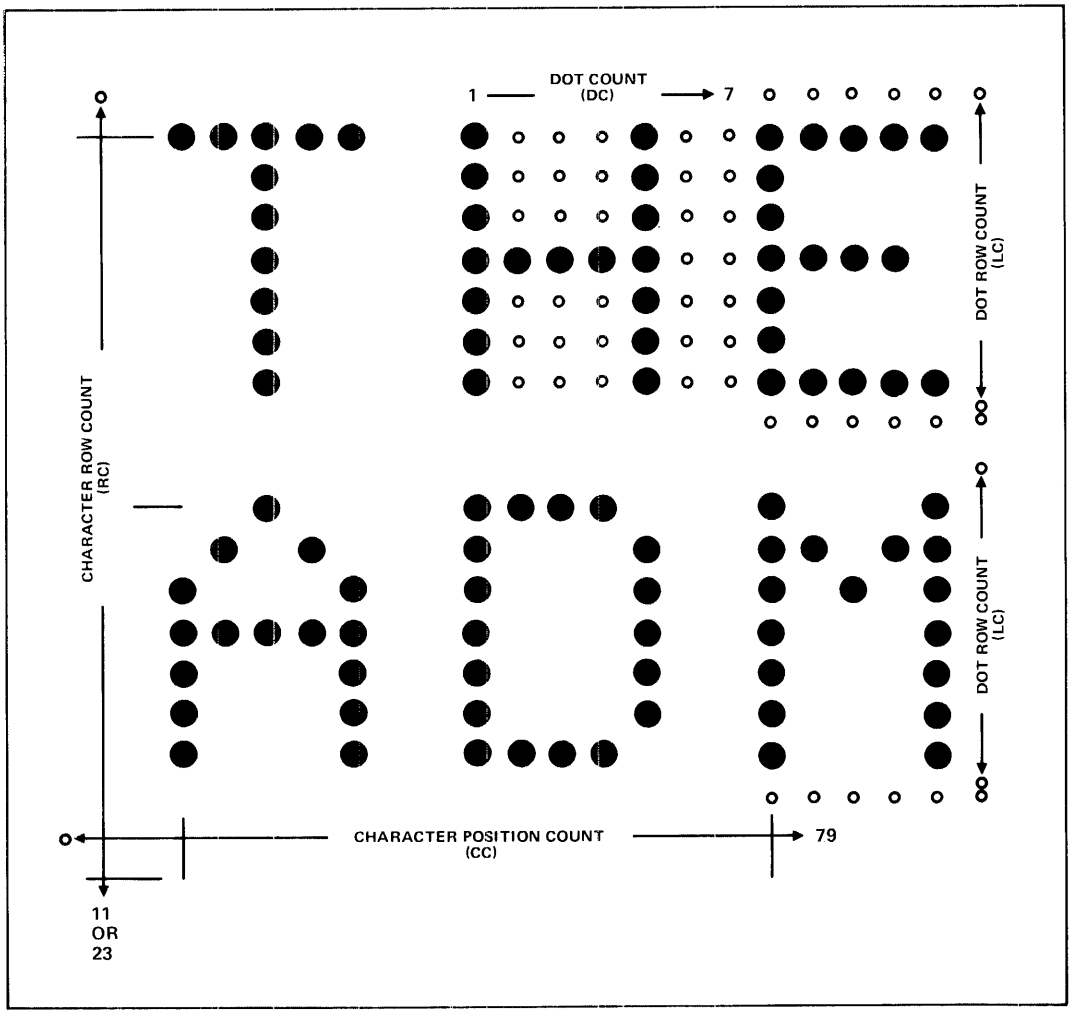


FIGURE 4-3. CRT DISPLAY MATRIX

loaded with the cursor position from the MAC. The MAC is then loaded with the transmission starting address and is incremented through the transmission. During the transfer, the MAC is compared to the Cursor Position Register. When they agree, the comparator generates CPR = MAC which is sensed by the program and terminates the transmission.

4.7 CLOCK AND TIMING (Schematic 2)

The ADM-1A master clock is a -11.3400 ± 0.02% MHz crystal-controlled oscillator. The oscillator output is applied as the clock pulse to a series of counters and gates to produce the basic timing signals for the ADM-1A. (See figure 4-4.)

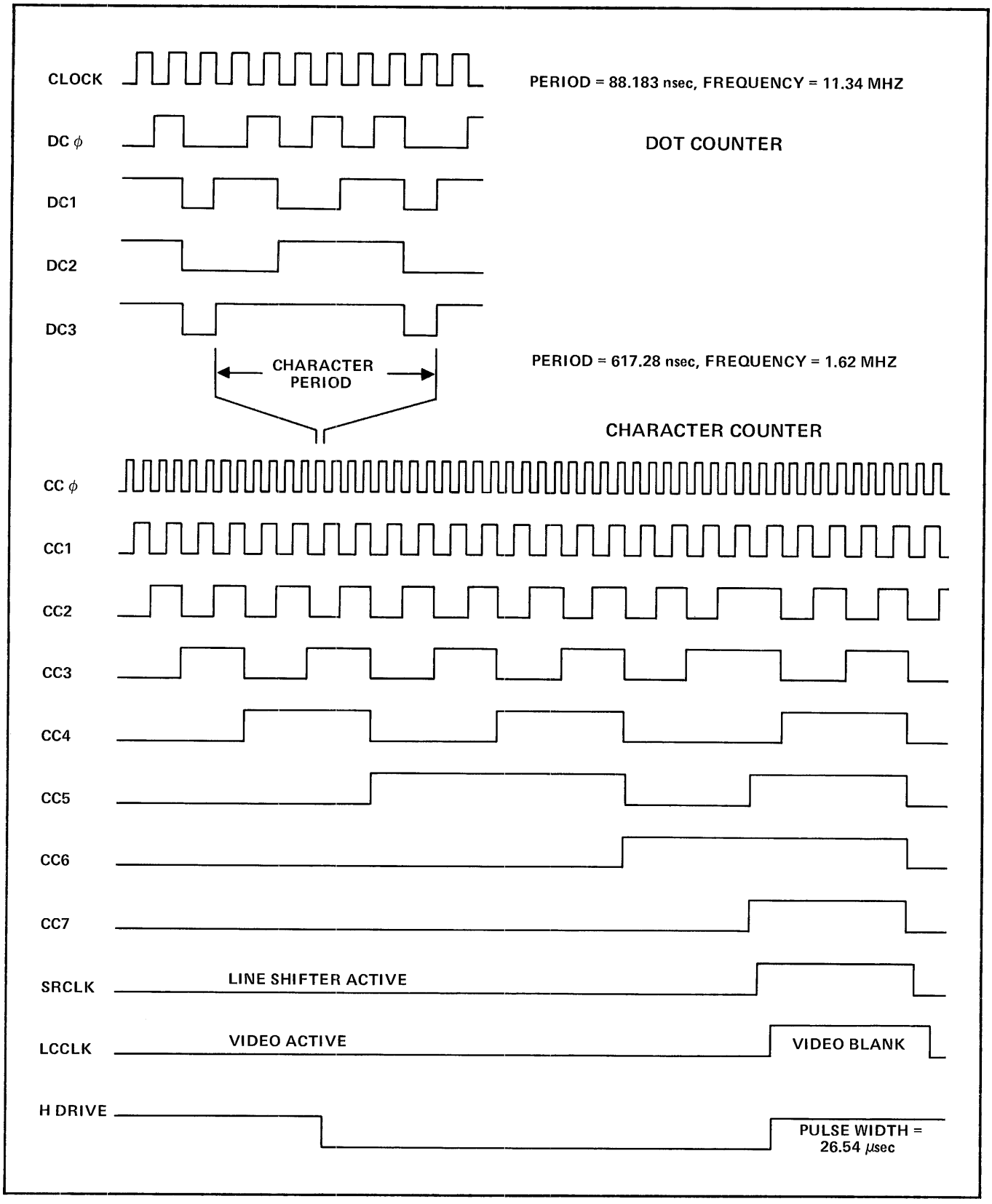


FIGURE 4-4. ADM-1A BASIC TIMING

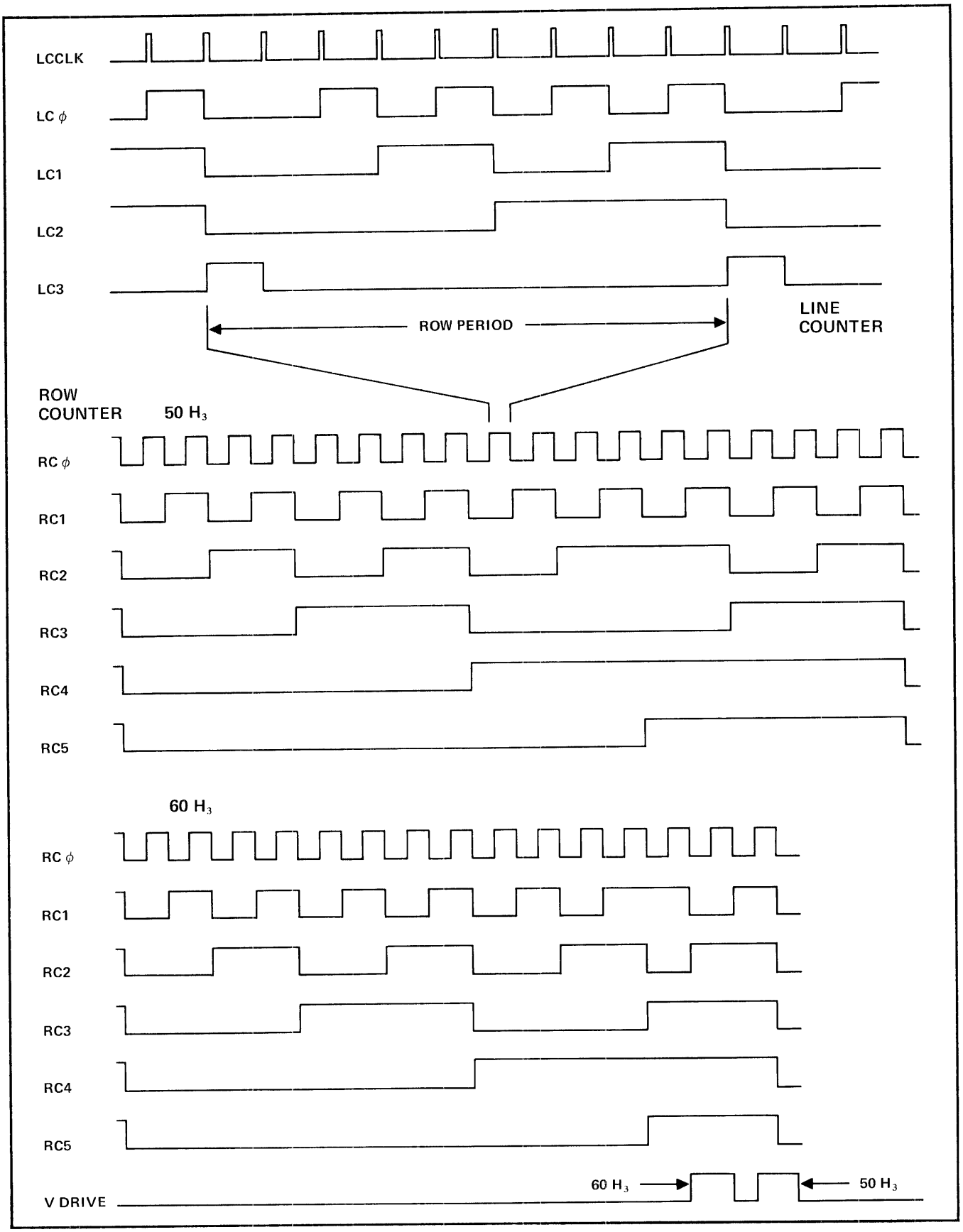


FIGURE 4-4. ADM-1A BASIC TIMING (Continued)

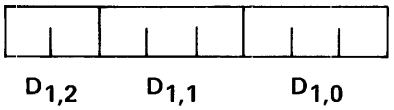
4.8 MICROPROGRAMMING CONTROL

4.8.1 Instruction Set

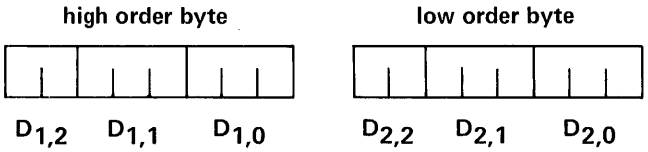
ADM-1A microprogram instructions occupy either one or two eight-bit bytes. The values of these single or double byte commands are expressed in this manual as three or six octal digits, respectively.

Microprogram instruction word format is illustrated below:

Single – Byte Instruction



Double – Byte Instruction



Where $D_{i,j}$ is the jth octal digit for the ith 8 bit byte.

Subfields of instructions will be indicated by only the high order and low order octal digits in parentheses, for example:

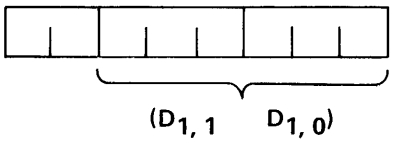


FIGURE 4-5. DISPLAY MEMORY CONTROL

Mnemonic	($D_{1,2}$ $D_{1,0}$)	Description
READ	001	Transfers the contents of the RAM location indicated by the contents of MACR, MACC into the RDR
WRITE	003	Transfers the contents of the WDR into the RAM location indicated by the contents of MACR, MACC
LOA WDR	005	Replaces the contents of the WDR with the contents currently on the TSB
CLR WDR	004	Clears the WDR
TSB=RDR	160	Sets the contents on the TSB equal to the contents of the RDR
SET WPROT	006	Sets the write protect bit on all words subsequently written into the RAM
CLR WPROT	007	Clears the write protect bit on all words subsequently written into the RAM unless the data source provides that bit
SET PROTM	016	Set the PROTM. This status bit is used as a global condition by the program to disable the overwriting of any characters in the RAM for which the WPROT bit is set.
CLR PROTM	017	Clear the PROTM. This global condition enables the overwriting of write protect characters.

FIGURE 4-6. JUMP COMMANDS

Mnemonic	($D_{1,2}$ $D_{2,0}$)	Description
JMP	10P LLL	Causes next instructions to be taken from the location indicated by LLL on page P.
MTC	3CC LLL	Causes next instructions to be taken from the location indicated by LLL on the local page if the condition indicated by CC is true. Instructions are taken in normal sequence otherwise. (See table of conditions for values of CC.)
JFC	2CC LLL	Causes next instructions to be taken from the location indicated by LLL on the local page if the condition indicated by CC is false. Instructions are taken in normal sequence otherwise. (See table of conditions for values of CC.)

FIGURE 4-7. DISPLAY MEMORY ADDRESS CONTROL

Mnemonic	($D_{1,2}$ $D_{1,0}$)	Description
CLR MACC	020	Set character counter to left margin
CLR MACR	030	Set row counter to top row
LOA MACC	021	Set character counter to value on tri-state bus*
LOA MACR	031	Set row counter to value on tri-state bus*
LOA CPR	027	Sets contents of CPC and CPR equal to current contents of MACC and MACR respectively
SET MACC	022	Set character counter to right margin
SET MACR	032	Set row counter to bottom row
INC MACC	023	Increment character counter (+1)†
INC MACR	033	Increment row counter (+1)†
DEC MACC	024	Decrement character counter (−1)†
DEC MACR	034	Decrement row counter (−1)†

*See cursor address value table, Figure 00.
†These operations will set OFLO if they cause character address to run off either margin or if they cause row address to run off top or bottom of page.

FIGURE 4-8. TABLE OF CONDITIONS

Mnemonic	Condition Identifier	Description
KEYSTR*	10	Key strobe
KEYBRK*	11	Break key
KEYHIS*	12	Send key
KEYRES*	17	
OFLO	20	True if last operation on MACC or MACR passed edge of screen. This instruction resets the flag.
CPR=MAC	21	True is (CPR) = (MAC) current cursor position is same as last cursor position saved by LOA CPR instruction
OPT1	22	True is SW A15-3 Off
OPT2	23	True is SW A15-1 Off
OPT 3	24	True is SW A15-2 Off
FUNKEY–	25	True is function key on keyboard 129 – not operated
FUNKEY –	26	Not used. Always True
FUNKEY –	27	Not used. Always True
PROTM	40	True if protect mode on
PROT	41	True if Bit 8 of RDR = 1 and PROTM True
KEYCTRL	42	True if control key operated
KEYSHFT	43	True if shift key operated
OPTS**	44	True if SW A15-4 Off
CONV	45	True if rear panel switch in full or half position
FULL DX	46	True if rear panel switch in full duplex position
OPT 4	47	True if SW A15-5 Off

*This group is a "one shot test" once tested and found to be true cannot get another TRUE sense until condition has been removed.
**Also known as "ONLINE."

4.8.2 Flag Control

Flags are set or cleared by the microprogram to either control certain hardware functions or set global conditions controlling the microprogram actions (see Table of flags below). General instructions for flags are as follows:

Mnemonic	$(D_{1,2}\ D_{1,0})$	Action
CLR	CAA	Clears the indicated flag. (See table flags for values of CAA)
SET	CAA	Sets the indicated flag. (See table flags for value of CAA)

FIGURE 4-9. TABLE OF FLAGS

Mnemonic	Set	CLR	Description
WPROT	006	007	Write Protect
PROTM	016	017	Protect Mode
STB1	061	060	Program Flag
STB2	063	062	Program Flag
STB3	065	064	Program Flag
STB4	067	066	Program Flag
STB5	071	070	Program Flag
STB6	073	072	Program Flag
STB7	075	074	Program Flag
STB8	077	076	Program Flag
BEEP	037	(– automatically)	Causes one BEEP
RTS0	121	122	Request to send (Mode-port)
RTS1	131	132	RTS (Printer port)

4.8.3 Literal Control

The literal register provides a means of entering a constant from the ROM onto the tri-state bus (TSB). This command is:

Mnemonic	$(D_{1,2}\ D_{1,0})$	$(D_{2,2}\ D_{2,0})$
LOA LIT	150	XXX

and causes the contents of LIT to be replaced by XXX.

4.8.4 Receiver/Transmitter Control

In addition to the main transmitter/receiver interface normally associated with the computer, an additional transmitter/receiver interface is accommodated by the following instructions. This facilitates such optional devices as an auxiliary printer.

FIGURE 4-10. TABLE OF CONDITION SIGNIFICANCE

Name of Condition	Use or Action Resulting
WPROT	Write Protect bit copies into RAM each Write.
PROTM	Write Protect mode, disallows overwriting protected characters
BEEP	Causes beep
STB 1 2 3 4 5 6 7 8	Status Bits set by microprogram for global control
RTSO	Request to send, Main ART (I/O)
RTS1	Request to send, Auxiliary ART (Printer)
TSB 1 2 3 4 5 6 7 8	Tri-State Bus Bits
KEYSTR	Keyboard Strobe
KEYBRK	Keyboard Break Key
KEYHIS	Keyboard Send Key

FIGURE 4-11. ASYNCHRONOUS RECEIVER/TRANSMITTER CONTROL

Mnemonic	($D_{1,2}$ $D_{1,0}$)	Description
SEL ART0	120	Selects main receiver transmitter interface
SEL ART1	130	Selects auxiliary receiver transmitter interface
LOA ART0	123	Loads main transmitter from TSB
LOA ART1	133	Loads auxiliary transmitter from TSB
CLR ART0	124	Clear main data ready flag
CLR ART1	134	Clear auxiliary data ready flag

4.8.5 LRC Register (Schematic 23)

A 7-bit modulo-2 adder, LRC, is provided for transmission checking as follows:

Mnemonic	($D_{1,2}$ $D_{1,0}$)	Description
CLR LRC	156	Clear LRC
CLK LRC	157	Replace each bit of the LRC with the Modulo 2 sum of its prior setting and the corresponding bit of the TSB.

4.8.6 Tri State Bus Control

The Tri State Bus contents are set equal to any one of the following registers by the indicated command.

FIGURE 4-12. TRI STATE BUS CONTROL (SCHEMATIC NO. 22)

Mnemonic	($D_{1,2}$ $D_{1,0}$)	Description
TSB=RDR	160	Set the TSB contents equal to RDR
TSB=KEY	161	Set the TSB contents equal to KEY
TSB=REV	162	Set the TSB contents equal to REV
TSB=LIT	163	Set the TSB contents equal to LIT
TSB=CPC	164	Set the TSB contents equal to CPC
TSB=CPR	165	Set the TSB contents equal to CPR
TSB=LRC	166	Set the TSB contents equal to LRC
TSB=XRS	167	Set the TSB contents equal to XRS
TSB=ADD	170	Set the TSB contents equal to ADD
TSB=STB	171	Set the TSB contents equal to STB

THE PROGRAM LISTING FOR THE BUFFERED ADM-1A IS AS FOLLOWS:

```
                        2 * ADM10 ADM-1 STD PAGE 0 (10-25-76)
                        3 * PROM # 129313-05
                        4 *     ADM-1 REWRITE
                        5 *   STB USAGE
                        6 *   STB1 - KEYBOARD LOCK INDICATOR
                        7 *   STB2 - CHAR RECIEVED FROM COMPUTER;
                        8 *          ALSO TEMP FLAG IN SEND
                        9 *   STB3 - TEMP FLAG IN SEND, ERASE, PRINT
                       10 *   STB4 - TEMP FLAG IN PRINT
                       11 *   STB5 - CONV MODE SET BY COMPUTER
                       12 *   STB6 -TEMP FLAG IN SEND, INDICATES
                       13 *          "ESC O" SEQUENCE
                       14 *   STB7 - INDICATES PROGRAMMED CONTROL OF
                       15 *          BLOCK/CONV IS ACTIVE
0 000 124              16 RESET       CLR ARTO
0 001 017              17             CLR PROTM
0 002 074              18             CLR STB7
0 003 320 005          19             JTC OFLO    RESET1
0 005 100 070          20 RESET1      JMP         CLEAR
0 007 303 315          21 CD          JTC TSB4    CDOOX1
0 011 202 020          22             JFC TSB3    IDLE
0 013 201 020          23             JFC TSB2    IDLE
0 015 200 020          24             JFC TSB1    IDLE
0 017 037              25             SET BEEP
0 020 171              26 IDLE        TSB=STB
0 021 201 024          27             JFC TSB2    IDLEO5
0 023 124              28             CLR ARTO
0 024 062              29 IDLEO5      CLR STB2
0 025 066              30             CLR STB4
0 026 120              31             SEL ARTO
0 027 167              32             TSB=XRS
0 030 300 176          33             JTC TSB1    RCVDAT
0 032 204 037          34             JFC TSB5    IDLEO
0 034 206 037          35             JFC TSB7    IDLEO
0 036 122              36             CLR RTSO
0 037 171              37 IDLEO       TSB=STB
0 040 311 054          38             JTC KEYBRK  KBRK
0 042 300 020          39             JTC TSB1    IDLE
0 044 310 114          40             JTC KEYSTR  KEYST
0 046 212 020          41             JFC KEYHIS  IDLE
0 050 101 202          42             JMP         SEND
0 052 101 060          43 KBRKL1X     JMP         KBRKL
0 054 300 052          44 KBRK        JTC TSB1    KBRKL1X
0 056 342 066          45             JTC KEYCTRL KBC
0 060 243 020          46             JFC KEYSHFT IDLE
0 062 020              47 HOME        CLR MACC
0 063 030              48 HOME2       CLR MACR
0 064 101 031          49 HOME1       JMP         SKIP21
0 066 343 020          50 KBC         JTC KEYSHFT IDLE
0 070 150 040          51 CLEAR       LOA LIT     40
0 072 163              52             TSB=LIT
0 073 005              53             LOA WDR
0 074 007              54 CLEAR1      CLR WPROT
```

```
0 075 030        55                 CLR MACR
0 076 020        56                 CLR MACC
0 077 001        57 CLEAR3          READ
0 100 341 103    58                 JTC PROT     CLEAR4
0 102 003        59                 WRITE
0 103 023        60 CLEAR4          INC MACC
0 104 220 077    61                 JFC OFLO     CLEAR3
0 106 020        62                 CLR MACC
0 107 033        63                 INC MACR
0 110 220 077    64                 JFC OFLO     CLEAR3
0 112 100 063    65                 JMP          HOME2
0 114 171        66 KEYST           TSB=STB
0 115 206 123    67                 JFC TSB7     KEYST10
0 117 204 156    68                 JFC TSB5     KEYST50
0 121 100 125    69                 JMP          KEYST20
0 123 245 156    70 KEYST10         JFC CONV     KEYST50
0 125 161        71 KEYST20         TSB=KEY
0 126 306 144    72                 JTC TSB7     KEYST30
0 130 305 144    73                 JTC TSB6     KEYST30
0 132 204 144    74                 JFC TSB5     KEYST30
0 134 203 144    75                 JFC TSB4     KEYST30
0 136 302 144    76                 JTC TSB3     KEYST30
0 140 201 144    77                 JFC TSB2     KEYST30
0 142 300 352    78                 JTC TSB1     ESC
0 144 167        79 KEYST30         TSB=XRS
0 145 121        80                 SET RTS0
0 146 204 144    81                 JFC TSB5     KEYST30
0 150 205 144    82                 JFC TSB6     KEYST30
0 152 161        83                 TSB=KEY
0 153 123        84                 LOA ART0
0 154 346 020    85                 JTC FULLDX   IDLE
0 156 161        86 KEYST50         TSB=KEY
0 157 100 202    87                 JMP          CSD
0 161 024        88 BKSP            DEC MACC
0 162 220 171    89                 JFC OFLO     UPLIN1
0 164 022        90                 SET MACC
0 165 034        91 UPLIN           DEC MACR
0 166 220 171    92                 JFC OFLO     UPLIN1
0 170 032        93                 SET MACR
0 171 001        94 UPLIN1          READ
0 172 341 161    95                 JTC PROT     BKSP
0 174 100 020    96                 JMP          IDLE
0 176 063        97 RCVDAT          SET STB2
0 177 301 226    98                 JTC TSB2     RCVPE
0 201 162        99                 TSB=RCV
0 202 306 210   100 CSD             JTC TSB7     CD7
0 204 205 007   101                 JFC TSB6     CD
0 206 100 231   102                 JMP          CHAR
0 210 205 231   103 CD7             JFC TSB6     CHAR
0 212 204 231   104                 JFC TSB5     CHAR
0 214 203 231   105                 JFC TSB4     CHAR
0 216 202 231   106                 JFC TSB3     CHAR
0 220 201 231   107                 JFC TSB2     CHAR
0 222 200 231   108                 JFC TSB1     CHAR
0 224 100 020   109                 JMP          IDLE
```

```
0 226 150 177   110 RCVPE     LOA LIT     177
0 230 163       111           TSB=LIT
0 231 005       112 CHAR      LOA WDR
0 232 003       113 CHARO     WRITE
0 233 023       114 FORSP     INC MACC
0 234 220 064   115           JFC OFLO    HOME1
0 236 020       116 NEWLIN    CLR MACC
0 237 027       117 DNLIN     LOA CPR
0 240 033       118           INC MACR
0 241 220 064   119           JFC OFLO    HOME1
0 243 030       120           CLR MACR
0 244 171       121           TSB=STB
0 245 206 253   122           JFC TSB7    ROLL4
0 247 304 255   123           JTC TSB5    ROLL5
0 251 100 064   124           JMP         HOME1
0 253 245 064   125 ROLL4     JFC CONV    HOME1
0 255 340 064   126 ROLL5     JTC PROTM   HOME1
0 257 020       127           CLR MACC
0 260 007       128           CLR WPROT
0 261 160       129           TSB=RDR
0 262 033       130 ROLL1     INC MACR
0 263 320 300   131           JTC OFLO    ROLL2
0 265 001       132           READ
0 266 034       133           DEC MACR
0 267 005       134           LOA WDR
0 270 003       135           WRITE
0 271 023       136           INC MACC
0 272 220 262   137           JFC OFLO    ROLL1
0 274 020       138           CLR MACC
0 275 033       139           INC MACR
0 276 100 262   140           JMP         ROLL1
0 300 150 040   141 ROLL2     LOA LIT     40
0 302 163       142           TSB=LIT
0 303 005       143           LOA WDR
0 304 032       144           SET MACR
0 305 003       145 ROLL3     WRITE
0 306 023       146           INC MACC
0 307 220 305   147           JFC OFLO    ROLL3
0 311 164       148           TSB=CPC
0 312 021       149           LOA MACC
0 313 100 020   150           JMP         IDLE
0 315 304 344   151 CD00X1    JTC TSB5    CD0011
0 317 302 335   152           JTC TSB3    CD00011
0 321 301 327   153           JTC TSB2    CD000101
0 323 200 161   154           JFC TSB1    BKSP
0 325 101 000   155           JMP         SKIP
0 327 300 165   156 CD000101  JTC TSB1    UPLIN
0 331 340 236   157           JTC PROTM   NEWLIN
0 333 100 237   158           JMP         DNLIN
0 335 301 020   159 CD00011   JTC TSB2    IDLE
0 337 200 233   160           JFC TSB1    FORSP
0 341 020       161           CLR MACC
0 342 101 031   162           JMP         SKIP21
0 344 201 020   163 CD0011    JFC TSB2    IDLE
0 346 302 371   164           JTC TSB3    CD001111
```

```
0 350 200 020   165                 JFC  TSB1        IDLE
0 352 171       166 ESC             TSB=STB
0 353 301 362   167                 JTC  TSB2        ESCRCV
0 355 210 355   168 ESCKEY          JFC  KEYSTR      ESCKEY
0 357 161       169                 TSB=KEY
0 360 101 036   170                 JMP              DESC
0 362 124       171 ESCRCV          CLR  ARTO
0 363 167       172                 TSB=XRS
0 364 200 364   173 ESCRCV1         JFC  TSB1        ESCRCV1
0 366 162       174                 TSB=RCV
0 367 101 036   175                 JMP              DESC
0 371 300 236   176 CD001111        JTC  TSB1        NEWLIN
0 373 100 062   177                 JMP              HOME
```

```
PAGE   1 ADM11                    03/01/77

                        2 * ADM11 ADM-1 STD PAGE 1  (10-25-76)
1 000 240 034   3 SKIP          JFC PROTM       IDLE1
1 002 001       4               READ
1 003 341 017   5               JTC PROT        SKIP2
1 005 023       6               INC MACC
1 006 220 000   7               JFC OFLO        SKIP
1 010 020       8               CLR MACC
1 011 033       9               INC MACR
1 012 220 000  10               JFC OFLO        SKIP
1 014 030      11               CLR MACR
1 015 101 031  12               JMP             SKIP21
1 017 311 034  13 SKIP2         JTC KEYBRK      IDLE1
1 021 023      14               INC MACC
1 022 220 031  15               JFC OFLO        SKIP21
1 024 020      16               CLR MACC
1 025 033      17               INC MACR
1 026 220 031  18               JFC OFLO        SKIP21
1 030 030      19               CLR MACR
1 031 001      20 SKIP21        READ
1 032 341 017  21               JTC PROT        SKIP2
1 034 100 020  22 IDLE1         JMP             IDLE
1 036 306 052  23 DESC          JTC TSB7        DESC7
1 040 205 056  24               JFC TSB6        CHAR1
1 042 304 123  25               JTC TSB5        DESC65
1 044 303 075  26               JTC TSB4        DESC64
1 046 302 170  27               JTC TSB3        DESC63
1 050 301 065  28               JTC TSB2        DESC62
1 052 322 034  29 DESC7         JTC OPT1        IDLE1
1 054 102 000  30               JMP             OPTION
1 056 100 231  31 CHAR1         JMP             CHAR
1 060 242 034  32 KBRKL         JFC KEYCTRL     IDLE1
1 062 243 034  33               JFC KEYSHFT     IDLE1
1 064 060      34               CLR STB1
1 065 300 072  35 DESC62        JTC TSB1        DESC2/3
1 067 060      36               CLR STB1
1 070 100 020  37               JMP             IDLE
1 072 061      38 DESC2/3       SET STB1
1 073 100 020  39               JMP             IDLE
1 075 302 052  40 DESC64        JTC TSB3        DESC7
1 077 301 113  41               JTC TSB2        ESC01X101
1 101 300 106  42               JTC TSB1        DESC2/9
1 103 007      43 DESC2/8       CLR WPROT
1 104 100 020  44               JMP             IDLE
1 106 006      45 DESC2/9       SET WPROT
1 107 100 020  46               JMP             IDLE
                       47 * ESC *(0101010) CLEAR SCREEN TO NULLS
                       48 * ESC +(0101011) CLEAR FOREGRND TO SPACES
                       49 * ESC :(0111010) CLEAR SCREN TO NULLS
                       50 * ESC ;(0111011) CLEAR FOREGRND TO SPACES
1 111 201 052  51 ESC01110      JFC TSB2        DESC7
1 113 004      52 ESC01X101     CLR WDR
1 114 200 120  53               JFC TSB1        CLEAR1X
1 116 100 070  54               JMP             CLEAR
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1 120 017          55 CLEAR1X      CLR PROTM
1 121 100 074      56              JMP         CLEAR1
1 123 303 140      57 DESC65       JTC TSB4    DESC654
1 125 202 052      58              JFC TSB3    DESC7
1 127 027          59 ESCSEND      LOA CPR
1 130 064          60              CLR STB3
1 131 201 134      61              JFC TSB2    ESCSEND1
1 133 065          62              SET STB3
1 134 300 215      63 ESCSEND1     JTC TSB1    SEND1
1 136 101 216      64              JMP         SEND11
1 140 202 111      65 DESC654      JFC TSB3    ESC01110
1 142 171          66              TSB=STB
1 143 201 034      67              JFC TSB2    IDLE1
1 145 162          68              TSB=RCV
1 146 200 034      69              JFC TSB1    IDLE1
1 150 301 355      70              JTC TSB2    RCA
1 152 124          71 LCA          CLR ARTO
1 153 167          72              TSB=XRS
1 154 200 154      73 LCA2         JFC TSB1    LCA2
1 156 162          74              TSB=RCV
1 157 031          75              LOA MACR
1 160 124          76              CLR ARTO
1 161 167          77 LCA1         TSB=XRS
1 162 200 161      78              JFC TSB1    LCA1
1 164 162          79              TSB=RCV
1 165 021          80              LOA MACC
1 166 101 031      81              JMP         SKIP21
1 170 201 052      82 DESC63       JFC TSB2    DESC7
1 172 300 177      83              JTC TSB1    DESC2/7
1 174 016          84              SET PROTM
1 175 100 062      85              JMP         HOME
1 177 017          86 DESC2/7      CLR PROTM
1 200 100 020      87              JMP         IDLE
1 202 121          88 SEND         SET RTSO
1 203 063          89              SET STB2
1 204 073          90              SET STB6
1 205 150 033      91              LOA LIT     33
1 207 243 321      92              JFC KEYSHFT SEND31.5
1 211 027          93 SEND05       LOA CPR
1 212 064          94              CLR STB3
1 213 242 216      95              JFC KEYCTRL SEND11
1 215 030          96 SEND1        CLR MACR
1 216 020          97 SEND11       CLR MACC
1 217 124          98              CLR ARTO
1 220 121          99              SET RTSO
1 221 167         100              TSB=XRS
1 222 205 222     101 SEND1.2       JFC TSB6    SEND1.2
1 224 072         102              CLR STB6
1 225 062         103              CLR STB2
1 226 171         104 SEND2        TSB=STB
1 227 001         105              READ
1 230 341 346     106              JTC PROT    SEND4
1 232 202 261     107              JFC TSB3    SEND3
1 234 201 261     108              JFC TSB2    SEND3
1 236 062         109              CLR STB2
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1 237 150 033   110 SEND20          LOA LIT         33
1 241 167       111 SEND21          TSB=XRS
1 242 204 241   112                 JFC TSB5        SEND21
1 244 163       113                 TSB=LIT
1 245 123       114                 LOA ARTO
1 246 201 261   115                 JFC TSB2        SEND3
1 250 150 051   116                 LOA LIT         51
1 252 171       117                 TSB=STB
1 253 301 241   118                 JTC TSB2        SEND21
1 255 150 050   119                 LOA LIT         50
1 257 201 241   120                 JFC TSB2        SEND21
1 261 167       121 SEND3           TSB=XRS
1 262 204 261   122                 JFC TSB5        SEND3
1 264 160       123                 TSB=RDR
                124 * DECODE FOR NULL; IF SO DON'T SEND
1 265 306 303   125                 JTC TSB7        SEND3.1
1 267 305 303   126                 JTC TSB6        SEND3.1
1 271 304 303   127                 JTC TSB5        SEND3.1
1 273 303 303   128                 JTC TSB4        SEND3.1
1 275 302 303   129                 JTC TSB3        SEND3.1
1 277 301 303   130                 JTC TSB2        SEND3.1
1 301 200 304   131                 JFC TSB1        SEND30
1 303 123       132 SEND3.1         LOA ARTO
1 304 321 316   133 SEND30          JTC MAC=CPR     SEND30.5
1 306 023       134                 INC MACC
1 307 220 226   135                 JFC OFLO        SEND2
1 311 020       136                 CLR MACC
1 312 033       137                 INC MACR
1 313 220 226   138                 JFC OFLO        SEND2
1 315 030       139                 CLR MACR
1 316 062       140 SEND30.5        CLR STB2
1 317 150 015   141 SEND31          LOA LIT         15
1 321 167       142 SEND31.5        TSB=XRS
1 322 204 321   143                 JFC TSB5        SEND31.5
1 324 205 321   144                 JFC TSB6        SEND31.5
1 326 163       145                 TSB=LIT
1 327 123       146                 LOA ARTO
1 330 171       147                 TSB=STB
1 331 205 340   148                 JFC TSB6        SEND32
1 333 150 060   149                 LOA LIT         60
1 335 072       150                 CLR STB6
1 336 205 321   151                 JFC TSB6        SEND31.5
1 340 340 034   152 SEND32          JTC PROTM       IDLE1
1 342 301 034   153                 JTC TSB2        IDLE1
1 344 100 236   154                 JMP             NEWLIN
1 346 202 304   155 SEND4           JFC TSB3        SEND30
1 350 301 261   156                 JTC TSB2        SEND3
1 352 063       157                 SET STB2
1 353 101 237   158                 JMP             SEND20
1 355 167       159 RCA             TSB=XRS
1 356 124       160                 CLR ARTO
1 357 027       161                 LOA CPR
1 360 121       162 RCA1            SET RTSO
1 361 205 360   163                 JFC TSB6        RCA1
1 363 204 360   164                 JFC TSB5        RCA1
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J 365 165          165              TSB=CPR
J 366 123          166              LOA ARTO
J 367 167          167 RCA2         TSB=XRS
J 370 204 367      168              JFC TSB5        RCA2
J 372 164          169              TSB=CPC
J 373 123          170              LOA ARTO
J 374 063          171              SET STB2
J 375 101 217      172              JMP             SEND31
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                    2 * ADM12 ADM-1 EDIT PAGE 2 (10-25-76)
                    3 * PROM # 129314-03
2 000 306 010       4 OPTION    JTC TSB7    DOPT7
2 002 323 006       5 OPTION1   JTC OPT2    IDLE2
2 004 103 000       6           JMP         OPTION3
2 006 100 020       7 IDLE2     JMP         IDLE
2 010 305 002       8 DOPT7     JTC TSB6    OPTION1
2 012 304 107       9           JTC TSB5    DOPT75
2 014 303 053      10           JTC TSB4    DOPT74
2 016 202 364      11           JFC TSB3    DOPT10000
2 020 301 002      12           JTC TSB2    OPTION1
2 022 200 002      13           JFC TSB1    OPTION1
2 024 340 006      14 LININS    JTC PROTM   IDLE2
2 026 020          15           CLR MACC
2 027 027          16           LOA CPR
2 030 007          17           CLR WPROT
2 031 032          18           SET MACR
2 032 160          19           TSB=RDR
2 033 034          20 LININS2   DEC MACR
2 034 001          21           READ
2 035 033          22           INC MACR
2 036 320 040      23           JTC OFLO    LININS3
2 040 321 213      24 LININS3   JTC MAC=CPR LINER
2 042 005          25           LOA WDR
2 043 003          26           WRITE
2 044 023          27           INC MACC
2 045 220 033      28           JFC OFLO    LININS2
2 047 020          29           CLR MACC
2 050 034          30           DEC MACR
2 051 240 033      31           JFC PROTM   LININS2
2 053 302 002      32 DOPT74    JTC TSB3    OPTION1
2 055 301 002      33           JTC TSB2    OPTION1
2 057 200 002      34           JFC TSB1    OPTION1
2 061 064          35 BAKTAB    CLR STB3
2 062 171          36           TSB=STB
2 063 024          37 BAKTAB1   DEC MACC
2 064 220 075      38           JFC OFLO    BAKTAB2
2 066 022          39           SET MACC
2 067 034          40           DEC MACR
2 070 220 075      41           JFC OFLO    BAKTAB2
2 072 032          42           SET MACR
2 073 100 171      43           JMP         UPLIN1
2 075 001          44 BAKTAB2   READ
2 076 341 103      45           JTC PROT    BAKTAB3
2 100 065          46           SET STB3
2 101 241 063      47           JFC PROT    BAKTAB1
2 103 202 063      48 BAKTAB3   JFC TSB3    BAKTAB1
2 105 101 017      49           JMP         SKIP2
2 107 303 251      50 DOPT75    JTC TSB4    DOPT754
2 111 302 207      51           JTC TSB3    DOPT753
2 113 301 142      52           JTC TSB2    DOPT752
2 115 200 002      53           JFC TSB1    OPTION1
2 117 027          54 CHARI     LOA CPR
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2 120 007          55                  CLR WPROT
2 121 150 040      56                  LOA LIT         40
2 123 163          57                  TSB=LIT
2 124 005          58                  LOA WDR
2 125 160          59                  TSB=RDR
2 126 001          60 CHARI1           READ
2 127 341 136      61                  JTC PROT        CHARI2
2 131 003          62                  WRITE
2 132 005          63                  LOA WDR
2 133 023          64                  INC MACC
2 134 220 126      65                  JFC OFLO        CHARI1
2 136 164          66 CHARI2           TSB=CPC
2 137 021          67                  LOA MACC
2 140 100 020      68                  JMP             IDLE
2 142 300 316      69 DOPT752          JTC TSB1        SENDS
2 144 340 205      70 LINDEL           JTC PROTM       LINDEL4
2 146 020          71                  CLR MACC
2 147 027          72                  LOA CPR
2 150 007          73                  CLR WPROT
2 151 160          74                  TSB=RDR
2 152 033          75 LINDEL1          INC MACR
2 153 320 170      76                  JTC OFLO        LINDEL2
2 155 001          77                  READ
2 156 034          78                  DEC MACR
2 157 005          79                  LOA WDR
2 160 003          80                  WRITE
2 161 023          81                  INC MACC
2 162 220 152      82                  JFC OFLO        LINDEL1
2 164 020          83                  CLR MACC
2 165 033          84                  INC MACR
2 166 240 152      85                  JFC PROTM       LINDEL1
2 170 150 040      86 LINDEL2          LOA LIT         40
2 172 163          87                  TSB=LIT
2 173 005          88                  LOA WDR
2 174 032          89                  SET MACR
2 175 003          90 LINDEL3          WRITE
2 176 023          91                  INC MACC
2 177 220 175      92                  JFC OFLO        LINDEL3
2 201 165          93                  TSB=CPR
2 202 031          94                  LOA MACR
2 203 164          95                  TSB=CPC
2 204 021          96                  LOA MACC
2 205 100 020      97 LINDEL4          JMP             IDLE
2 207 301 216      98 DOPT753          JTC TSB2        DOPT7532
2 211 300 002      99                  JTC TSB1        OPTION1
2 213 064         100 LINER            CLR STB3
2 214 222 260     101                  JFC OPT1        ERASE
2 216 200 002     102 DOPT7532         JFC TSB1        OPTION1
2 220 027         103 CHARD            LOA CPR
2 221 007         104                  CLR WPROT
2 222 160         105                  TSB=RDR
2 223 023         106 CHARD1           INC MACC
2 224 320 237     107                  JTC OFLO        CHARD2
2 226 001         108                  READ
2 227 341 237     109                  JTC PROT        CHARD2
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2 231 024       110                 DEC MACC
2 232 005       111                 LOA WDR
2 233 003       112                 WRITE
2 234 023       113                 INC MACC
2 235 222 223   114                 JFC OPT1        CHARD1
2 237 024       115 CHARD2          DEC MACC
2 240 150 040   116                 LOA LIT         40
2 242 163       117                 TSB=LIT
2 243 005       118                 LOA WDR
2 244 003       119                 WRITE
2 245 164       120                 TSB=CPC
2 246 021       121                 LOA MACC
2 247 100 020   122                 JMP             IDLE
2 251 302 002   123 DOPT754         JTC TSB3        OPTION1
2 253 301 002   124                 JTC TSB2        OPTION1
2 255 200 002   125                 JFC TSB1        OPTION1
2 257 065       126 PAGER           SET STB3
2 260 027       127 ERASE           LOA CPR
2 261 007       128                 CLR WPROT
2 262 150 040   129                 LOA LIT         40
2 264 163       130                 TSB=LIT
2 265 005       131                 LOA WDR
2 266 171       132                 TSB=STB
2 267 001       133 ERASE1          READ
2 270 341 312   134                 JTC PROT        ERASE2
2 272 003       135                 WRITE
2 273 023       136 ERASE11         INC MACC
2 274 220 267   137                 JFC OFLO        ERASE1
2 276 202 304   138                 JFC TSB3        ERASE12
2 300 020       139                 CLR MACC
2 301 033       140                 INC MACR
2 302 220 267   141                 JFC OFLO        ERASE1
2 304 165       142 ERASE12         TSB=CPR
2 305 031       143                 LOA MACR
2 306 164       144                 TSB=CPC
2 307 021       145                 LOA MACC
2 310 100 020   146                 JMP             IDLE
2 312 302 273   147 ERASE2          JTC TSB3        ERASE11
2 314 202 304   148                 JFC TSB3        ERASE12
2 316 027       149 SENDS           LOA CPR
2 317 064       150                 CLR STB3
2 320 150 034   151                 LOA LIT         34
2 322 163       152                 TSB=LIT
2 323 007       153                 CLR WPROT
2 324 005       154                 LOA WDR
2 325 003       155                 WRITE
2 326 160       156                 TSB=RDR
2 327 024       157 SENDS1          DEC MACC
2 330 220 340   158                 JFC OFLO        SENDS2
2 332 022       159                 SET MACC
2 333 034       160                 DEC MACR
2 334 220 340   161                 JFC OFLO        SENDS2
2 336 101 215   162                 JMP             SEND1
2 340 001       163 SENDS2          READ
2 341 341 327   164                 JTC PROT        SENDS1
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2 343 306 327  165                    JTC TSB7      SENDS1
2 345 305 327  166                    JTC TSB6      SENDS1
2 347 204 327  167                    JFC TSB5      SENDS1
2 351 203 327  168                    JFC TSB4      SENDS1
2 353 202 327  169                    JFC TSB3      SENDS1
2 355 301 327  170                    JTC TSB2      SENDS1
2 357 300 327  171                    JTC TSB1      SENDS1
2 361 033      172                    INC MACR
2 362 101 216  173                    JMP           SEND11
2 364 201 002  174 DOPT10000          JFC TSB2      OPTION1
2 366 075      175                    SET STB7
2 367 071      176                    SET STB5
2 370 300 006  177                    JTC TSB1      IDLE2
2 372 070      178                    CLR STB5
2 373 100 020  179                    JMP           IDLE
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                    2 * ADM13 ADM-1 PRINT PAGE 3 (10-25-76)
                    3 * PROM # 129314-04
3 000 306 006       4 OPTION3       JTC TSB7        DOPT3-7
3 002 324 247       5 OPTION31      JTC OPT3        IDLE3
3 004 100 ***       6               JMP             OPTION4
3 006 305 002       7 DOPT3-7       JTC TSB6        OPTION31
3 010 301 002       8               JTC TSB2        OPTION31
3 012 300 230       9               JTC TSB1        OPTION32
3 014 204 347      10               JFC TSB5        OPTION33
3 016 303 002      11               JTC TSB4        OPTION31
3 020 302 002      12               JTC TSB3        OPTION31
3 022 150 035      13 PRINT09       LOA LIT         35
3 024 163          14               TSB=LIT
3 025 005          15               LOA WDR
3 026 003          16               WRITE
3 027 020          17               CLR MACC
3 030 030          18               CLR MACR
3 031 064          19 PRINT9.5      CLR STB3
3 032 130          20               SEL ART1
3 033 131          21               SET RTS1
3 034 171          22 PRINT10       TSB=STB
3 035 303 072      23               JTC TSB4        PRINT14
3 037 167          24 PRINT11       TSB=XRS
3 040 205 037      25               JFC TSB6        PRINT11
3 042 204 037      26               JFC TSB5        PRINT11
3 044 150 015      27               LOA LIT         15
3 046 163          28               TSB=LIT
3 047 133          29               LOA ART1
3 050 167          30 PRINT12       TSB=XRS
3 051 204 050      31               JFC TSB5        PRINT12
3 053 205 050      32               JFC TSB6        PRINT12
3 055 150 012      33               LOA LIT         12
3 057 163          34               TSB=LIT
3 060 133          35               LOA ART1
3 061 167          36 PRINT13       TSB=XRS
3 062 204 061      37               JFC TSB5        PRINT13
3 064 205 061      38               JFC TSB6        PRINT13
3 066 150 000      39               LOA LIT         00
3 070 163          40               TSB=LIT
3 071 133          41               LOA ART1
3 072 167          42 PRINT14       TSB=XRS
3 073 204 072      43               JFC TSB5        PRINT14
3 075 132          44               CLR RTS1
3 076 171          45               TSB=STB
3 077 302 177      46               JTC TSB3        PRINT21
3 101 131          47               SET RTS1
3 102 001          48 PRINT15       READ
3 103 160          49               TSB=RDR
3 104 306 154      50               JTC TSB7        PRINT18
3 106 301 154      51               JTC TSB2        PRINT18
3 110 205 210      52               JFC TSB6        PRINT20
3 112 304 154      53               JTC TSB5        PRINT18
3 114 303 154      54               JTC TSB4        PRINT18
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3 116 302 154   55                  JTC  TSB3      PRINT18
3 120 300 154   56                  JTC  TSB1      PRINT18
3 122 171       57                  TSB=STB
3 123 303 154   58                  JTC  TSB4      PRINT18
3 125 027       59                  LOA  CPR
3 126 023       60 PRINT16          INC  MACC
3 127 320 166   61                  JTC  OFLO      PRINT19
3 131 001       62                  READ
3 132 160       63                  TSB=RDR
3 133 306 151   64                  JTC  TSB7      PRINT17
3 135 205 151   65                  JFC  TSB6      PRINT17
3 137 304 151   66                  JTC  TSB5      PRINT17
3 141 303 151   67                  JTC  TSB4      PRINT17
3 143 302 151   68                  JTC  TSB3      PRINT17
3 145 301 151   69                  JTC  TSB2      PRINT17
3 147 200 126   70                  JFC  TSB1      PRINT16
3 151 164       71 PRINT17          TSB=CPC
3 152 021       72                  LOA  MACC
3 153 001       73                  READ
3 154 167       74 PRINT18          TSB=XRS
3 155 204 154   75                  JFC  TSB5      PRINT18
3 157 205 154   76                  JFC  TSB6      PRINT18
3 161 160       77                  TSB=RDR
3 162 133       78                  LOA  ART1
3 163 023       79                  INC  MACC
3 164 220 102   80                  JFC  OFLO      PRINT15
3 166 020       81 PRINT19          CLR  MACC
3 167 033       82                  INC  MACR
3 170 220 034   83                  JFC  OFLO      PRINT10
3 173 022       84                  SET  MACC
3 173 032       85                  SET  MACR
3 174 065       86                  SET  STB3
3 175 220 034   87                  JFC  OFLO      PRINT10
3 177 132       88 PRINT21          CLR  RTS1
3 200 065       89                  SET  STB3
3 201 066       90                  CLR  STB4
3 202 201 247   91                  JFC  TSB2      IDLE3
3 204 120       92                  SEL  ART0
3 205 121       93                  SET  RTS0
3 206 101 317   94                  JMP            SEND31
3 210 204 154   95 PRINT20          JFC  TSB5      PRINT18
3 212 203 154   96                  JFC  TSB4      PRINT18
3 214 202 154   97                  JFC  TSB3      PRINT18
3 216 200 154   98                  JFC  TSB1      PRINT18
3 220 065       99                  SET  STB3
3 221 163      100                  TSB=LIT
3 222 150 040  101                  LOA  LIT       40
3 224 005      102                  LOA  WDR
3 225 003      103                  WRITE
3 226 305 034  104                  JTC  TSB6      PRINT10
3 230 204 002  105 OPTION32         JFC  TSB5      OPTION31
3 232 303 002  106                  JTC  TSB4      OPTION31
3 234 202 002  107                  JFC  TSB3      OPTION31
3 236 017      108 UNFM             CLR  PROTM
3 237 124      109                  CLR  ART0
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3 240 167       110 UNFM1       TSB=XRS
3 241 300 251   111             JTC TSB1        UNFM2
3 243 310 344   112             JTC KEYSTR      UNFM4
3 245 211 240   113             JFC KEYBRK      UNFM1
3 247 100 020   114 IDLE3       JMP             IDLE
3 251 162       115 UNFM2       TSB=RCV
3 252 306 270   116             JTC TSB7        UNFM22
3 254 305 270   117             JTC TSB6        UNFM22
3 256 204 270   118             JFC TSB5        UNFM22
3 260 203 270   119             JFC TSB4        UNFM22
3 262 302 270   120             JTC TSB3        UNFM22
3 264 201 270   121             JFC TSB2        UNFM22
3 266 300 305   122             JTC TSB1        UNFM3
3 270 005       123 UNFM22      LOA WDR
3 271 124       124             CLR ARTO
3 272 003       125             WRITE
3 273 023       126             INC MACC
3 274 220 240   127             JFC OFLO        UNFM1
3 276 020       128             CLR MACC
3 277 033       129             INC MACR
3 300 220 240   130             JFC OFLO        UNFM1
3 302 030       131             CLR MACR
3 303 100 020   132             JMP             IDLE
3 305 005       133 UNFM3       LOA WDR
3 306 124       134             CLR ARTO
3 307 167       135 UNFM30      TSB=XRS
3 310 200 307   136             JFC TSB1        UNFM30
3 312 162       137             TSB=RCV
3 313 206 331   138             JFC TSB7        UNFM31
3 315 305 331   139             JTC TSB6        UNFM31
3 317 204 331   140             JFC TSB5        UNFM31
3 321 203 331   141             JFC TSB4        UNFM31
3 323 302 331   142             JTC TSB3        UNFM31
3 325 301 331   143             JTC TSB2        UNFM31
3 327 200 247   144             JFC TSB1        IDLE3
3 331 003       145 UNFM31      WRITE
3 332 023       146             INC MACC
3 333 220 270   147             JFC OFLO        UNFM22
3 335 020       148             CLR MACC
3 336 033       149             INC MACR
3 337 220 270   150             JFC OFLO        UNFM22
3 341 030       151             CLR MACR
3 342 100 020   152             JMP             IDLE
3 344 161       153 UNFM4       TSB=KEY
3 345 240 270   154             JFC PROTM       UNFM22
3 347 203 002   155 OPTION33    JFC TSB4        OPTION31
3 351 202 002   156             JFC TSB3        OPTION31
3 353 067       157             SET STB4
3 354 240 031   158             JFC PROTM       PRINT9.5

**************  END OF LIST  **********************
```

FIGURE 4-13. ADM-1A INSTRUCTION SET

CLK LRC	157	JFC OPT4	247	JTC TSB5	304
CLR ARTO	124	JFC OPT5	244	JTC TSB6	305
CLR ART1	134	JFC PROT	241	JTC TSB7	306
CLR LRC	156	JFC PROTM	240	JTC TSB8	307
CLR MACC	020	JFC TIME	247	LOA ARTO	123
CLR MACR	030	JFC TSB1	200	LOA ART1	133
CLR PROTM	017	JFC TSB2	201	LOA CPR	027
CLR RTSO	122	JFC TSB3	202	LOA LIT	150
CLR RTS1	132	JFC TSB4	203	LOA MACC	021
CLR STB1	060	JFC TSB5	204	LOA MACR	031
CLR STB2	062	JFC TSB6	205	LOA WDR	005
CLR STB3	064	JFC TSB7	206	NOP	000
CLR STB4	066	JFC TSB8	207	READ	001
CLR STB5	070	JMP	100	SEL ARTO	120
CLR STB6	072	JTC CONV	345	SEL ART1	130
CLR STB7	074	JTC FULLDX	346	SET BEEP	037
CLR STB8	076	JTC FUNKEY	325	SET MACC	022
CLR WDR	004	JTC KEYBRK	311	SET MACR	032
CLR WPROT	007	JTC KEYCTRL	342	SET PROTM	016
DEC MACC	024	JTC KEYHIS	312	SET RTSO	121
DEC MACR	034	JTC KEYLCL	314	SET RTS1	131
ERROR	177	JTC KEYPRT	316	SET STB1	061
INC MACC	023	JTC KEYRCV	315	SET STB2	063
INC MACR	033	JTC KEYRES	317	SET STB3	065
JFC CONV	245	JTC KEYSHFT	343	SET STB4	067
JFC FULLDX	246	JTC KEYSTR	310	SET STB5	071
JFC FUNKEY	225	JTC KEYSTR2	313	SET STB6	073
JFC KEYBRK	211	JTC MAC = CPR	321	SET STB7	075
JFC KEYCTRL	242	JTC OFLO	320	SET STB8	077
JFC KEYHIS	212	JTC ONLINE	344	SET TIME	036
JFC KEYLCL	214	JTC OPT1	322	SET WPROT	006
JFC KEYPRT	216	JTC OPT2	323	TSB = ADD	170
JFT KEYRCV	215	JTC OPT3	324	TSB = CPC	164
JFC KEYRES	217	JTC OPT4	347	TSB - CPR	165
JFC KEYSHFT	243	JTC OPT5	344	TSB = KEY	161
JFC KEYSTR	210	JTC PROT	341	TSB = LIT	163
JFC KEYSTR2	213	JTC PROTM	340	TSB = LRC	166
JFC MAC = CPR	221	JTC TIME	347	TSB = RCV	162
JFC OFLO	220	JTC TSB1	300	TSB = RDR	160
JFC ONLINE	244	JTC TSB2	301	TSB = STB	171
JFC OPT1	222	JTC TSB3	302	TSB = XRS	167
JFC OPT2	223	JTC TSB4	303	WRITE	033
JFC OPT3	224				

SECTION 5
MAINTENANCE

5.1 GENERAL

The ADM-1A is a self-contained terminal, suitable for a normal office or commercial environment. It requires both a power connector and a data signal interface connection to the computer or optional printer.

This section contains instructions and information for performing routine and corrective maintenance of the ADM-1A. It is assumed that the maintenance technician is thoroughly familiar with information in Sections One through Four of this manual.

5.2 INSTALLATION

With the power switch OFF, plug the ADM-1A power cord into a standard 115 Vac grounded outlet.

Connect the RS 232 cable from the remote computer or modem to the interface connector on the rear of the ADM-1A. Figure 5-1 illustrates the signal pin list for the RS 232 interface connector.

Any operating problem following installation should be approached initially by checking internal and external adjustments and switches. Figure 1-4 shows the possible switch settings for the ADM-1A.

Although the switches on the ADM-1A allow the user many possible options, certain switches can create problems if set incorrectly.

Switch S1-8 (location A4) controls the transmission of null codes. On unbuffered units (-13 compatible) this function must be suppressed. This is accomplished by turning S1-8 to the ON position. On buffered units switch S1-8 should be in the OFF position to enable this function.

Switch S5-4 (location N7) controls the loading of protected characters into memory. On unbuffered units, S5-4 should be set in the OFF position. On buffered units, loading of protected characters into memory is accomplished by setting S5-4 to the "ON" position. Refer to pages 1-4 and 1-5 for switch locations and settings.

FIGURE 5-1. INTERFACE CONNECTOR SIGNAL/PIN LIST

PIN NO.	SIGNAL NAME	BELL SYSTEM CODE
1		
1	Frame Ground	AA
2	Transmit Data	BA
3	Receive Data	BB
4	Request to Send	CA
5	Clear to Send	CB
7	Signal Ground	AB
**9	Current Loop Supply	
20	Data Terminal Ready	CD
**10	Current Loop OUTPUT +	Receive
*11	Current Loop RETURN —	
*12	Current Loop INPUT +	Transmit
*13	Current Loop RETURN —	
**14	D/C	

*Current Loop Interface only

**If D/C Box is installed, then Pin 9 = +20; Pin H = –20.

5.3 ROUTINE MAINTENANCE

The ADM-1A with its solid state and modular electronics is easier to care for than an electric typewriter. It only needs a light cleaning from time to time to remain as attractive as it is functional.

Lightly dust the unit using a brush or soft damp lint-free cloth. Conventional spray cleaners may be used, but petroleum-base cleaners should be avoided, as they may harm plastic or painted surfaces. Avoid wiping dust or lint onto the keyboard area. If a spray cleaner is used, prevent excessive spraying which may run down between the keys.

5.4 OPENING THE ADM-1A COVER

To remove the cover of the terminal (along with the monitor CRT) for access to adjustments or other maintenance, proceed as follows:

a. Remove the two slot-head screws located under the front corners of the terminal base.

b. Lift the cover from the front upward and to the rear until it is lowered to rest on the table.

c. To remove the cover from the base, disconnect the cable from the monitor to the printed circuit board. Slide the cover toward the left on its hinge pins, and remove the cover from the base.

5.5 ADJUSTMENTS

External Controls on the rear of the ADM-1A terminal are explained in Section 2.4.

5.6 KEYBOARD MAINTENANCE

The keyboard is a single replacement part. The standard keyboard assembly has 60 keys which operate switches and provide pulses to the logic board, generating the ASCII characters for transmission or display.

The keyboard assembly may be replaced as a complete unit or by replacing integrated key rows. To remove the keyboard for trouble-shooting or replacement, disconnect the connector at the rear of the keyboard. Then, remove the screws on each end and lift the keyboard out. When the keyboard is replaced be sure that pin 1 of the connector (brown wire) matches up with pin 1 of the socket (notched corner - left rear of socket). See figure 5-2. This is very important. Improper keyboard replacement will cause the keyboard to blow up. Then reinstall the cover and check to see if any keys are binding against the case.

5.7 CORRECTIVE MAINTENANCE

Corrective maintenance consists of locating the cause of the malfunction and repairing it. The cause may only be isolated at the module level:

Keyboard
Power Supply
(logic) P.C. board
Monitor
  Board
  P.S.

The failed module may be sent to the repair facility or returned to Lear Siegler for repair or replacement, or the user may choose to isolate the cause in the component level and replace the failed component.

Repair at the component level should not be attempted except by trained personnel using suitable tools and test equipment.

5.7.1 Failure Analysis

Effective trouble-shooting may be accomplished in a minimum of time by following a series of logical steps. The ultimate aim is to effectively pinpoint the actual problems using the information available.

Locating the malfunction is the first logical step. The following procedure has been shown to be an effective plan for casualty analysis:

1. **Investigate.** Record the state of the machine when the error occurred. Look for the obvious symptoms, including operator error, loose plugs or connectors, data set errors, blown fuses, or computer error. Verify that all option configuration switches are proper for the terminal configuration.

2. **Isolation.** Modular replacement is the fastest method of isolation, where the replacement is available. Isolation of the circuit board, keyboard module, video monitor, power supply, or inter-connecting wires should be the first step.

3. **Component Isolation.** Isolation to a smaller component may be accomplished in some

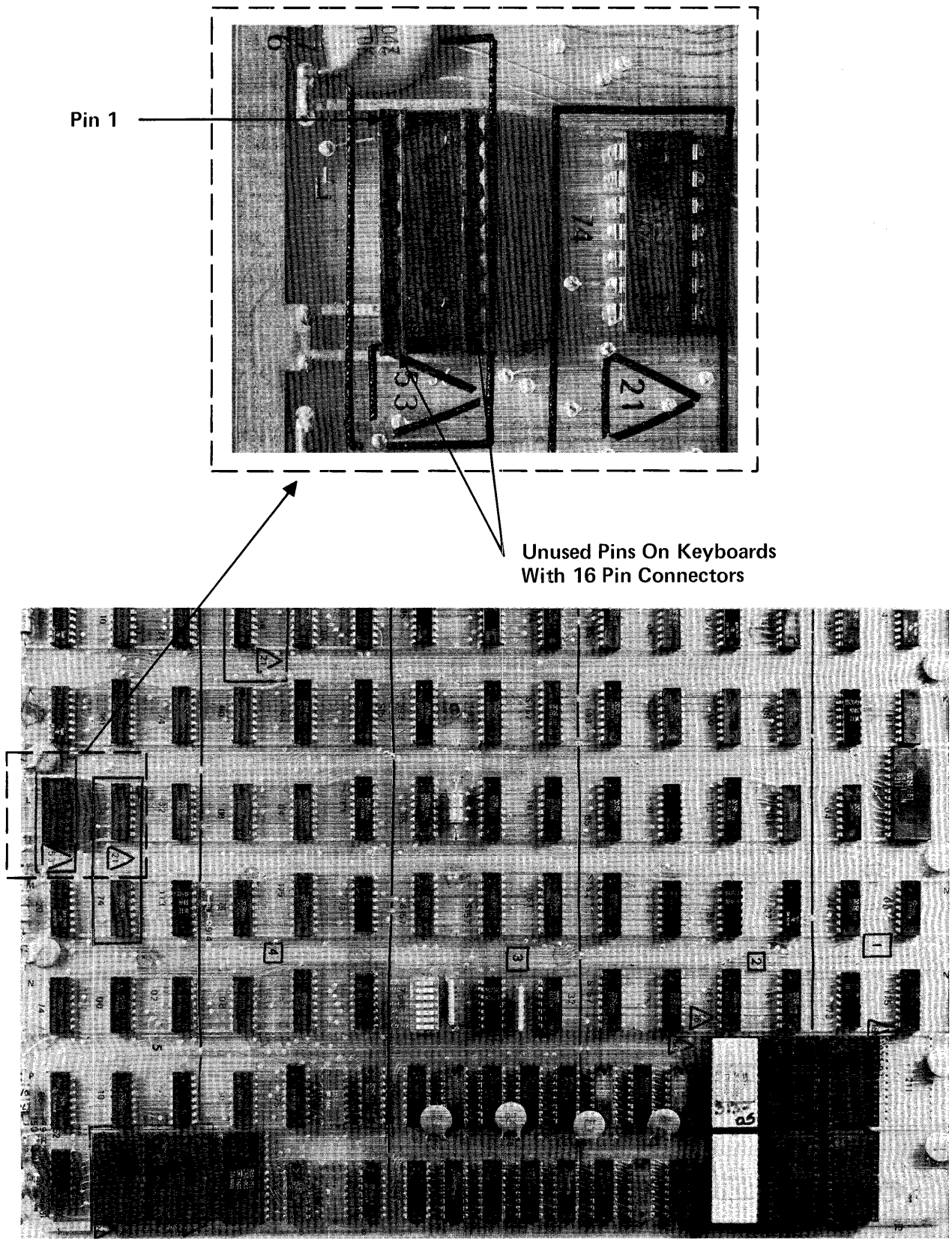


FIGURE 5-2. PROPER KEYBOARD REPLACEMENT

cases with the use of an oscilloscope and multimeter. For malfunctions on the logic board, contact the service depot in your area.

4. **Replace** the faulty module or component and retest by running the same operation in the same state in which the malfunction occurred.

5. **Record** the symptoms, cause and module or component isolation method used for future reference.

5.7.2 Failure Isolation

The display terminal consists of a monitor assembly, power supply, keyboard and logic board. All assemblies are replaceable by disconnecting cables and removing screws.

The following list describes the various problem areas. Figure 5-4 describes the problems and symptoms and the most likely assembly to be at fault.

1. Check all switch settings to be sure that they conform to the needs of the terminal's operating environment (See figure 1-4).

2. Be sure the ADM-1A power cord is plugged into a grounded AC outlet of the proper voltage and frequency.

3. Check to see that the ON/OFF switch on the back of the terminal is in the ON position.

4. Check to see that the fan starts when the unit is ON. If it does not, check the power switch and push the red reset button.

5. If the unit is equipped with a beeper, listen for a 1–2 KH_Z tone which lasts approximately one second at turn on. This tone is caused by the system clock starting and may not be audible where there is a high ambient sound.

6. If the cursor does not appear after normal warm-up time, depress the HOME key. If the cursor still has not appeared, reset the display by simultaneously depressing CTRL, SHIFT, REPT and CLR/HOME/BRK Keys. If there is still no cursor, it is possible that the brightness or contrast is misadjusted. They may be adjusted as follows:

   a) Set the contrast control to the middle of the range.

   b) Turn the brightness control clockwise until the screen is bright, then reduce brightness slowly until the background is barely visible. The cursor should be present.

   c) Adjust brightness and contrast for desired display.

   d) If the cursor has still not appeared, check the power supply voltage and replace the monitor if necessary.

7. If the problem is associated with the transmitting and receiving of data, use the following procedure:

   a) Place the half-duplex switch in the FULL position

   b) Remove the cable from the terminal output connector and jumper Pin 2 to Pin 3 and Pin 4 to Pin 5.

   c) Whatever is typed on the keyboard should now appear on the screen.

   This test checks the transmission of characters from the keyboard, and the display of characters in the BLOCK MODE.

8. If power-on does not completely clear the screen, a race condition may exist between ENPC and $\overline{\text{VARICLK}}$. (Schematic p. 19) or the cross-stalk may be clearing KRESET early and the problem cannot be rectified by normal trouble-shooting procedures, try the following:

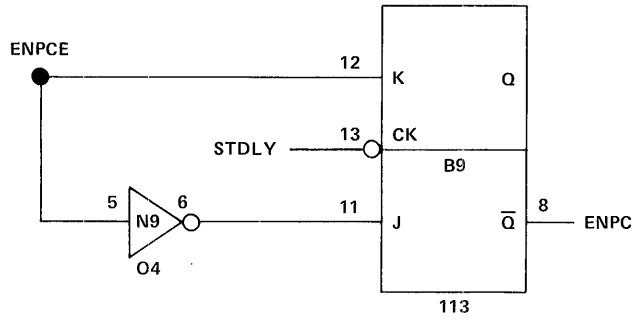
   a) Cut etches in J9-10 on the component side.

   b) Cut etches in N12-10 on the solder side.

   c) Add 30 GA jumper wires

From	To
K14-8	B9-12
B9-12	N9-3
A13-6	B9-11
J9-12	B9-13
B9-8	N12-10

d) Change schematic sheet 19 Zone B3



If the above has not solved the problem, perform the following modification:

a) Cut an etch at H4-6 and at feed-through below resister pack (see figure 5-3)

b) Add 30 gauge wire between each point as indicated in figure 5-3 .

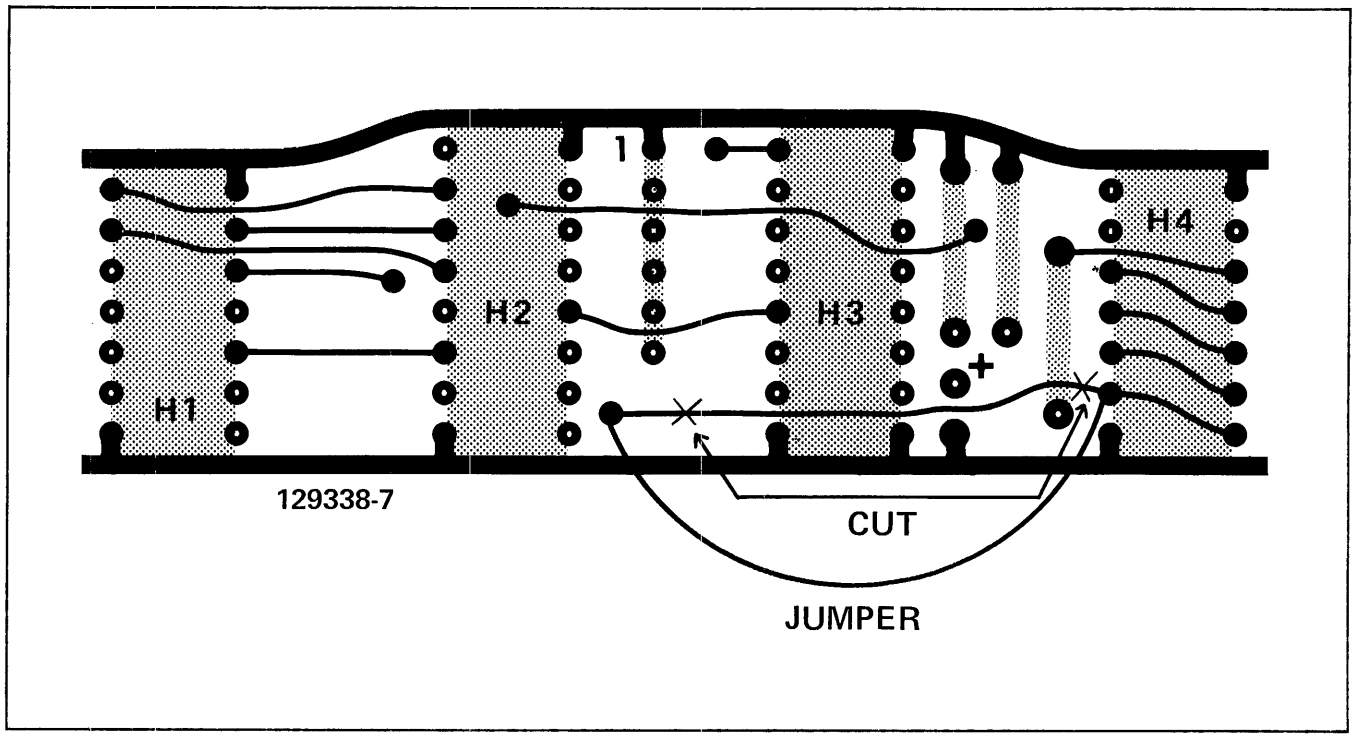


FIGURE 5-3.

5.7.3 Trouble Shooting the Monitor

The monitor receives video and sync signals from the control board and performs normal CRT functions. The high voltage for the monitor is generated from its own low voltage supply (15 V DC).

CAUTION

Discharge High Voltage before attempting to remove monitor assembly.

5.7.4 Removing and Replacing the Monitor CRT and Subassemblies

CAUTION

Be sure to discharge anode voltage to ground before attempting to disassemble any monitor subassembly or CRT.

FIGURE 5-4. ADM-1 FAILURE ANALYSIS GUIDE

Type of Failure	Probable Location of Failure			
	Logic Board	Keyboard	Power Supply	Monitor
Audio Signal	1	2	2	
Clear Memory	1	2		
Clear Memory (Power Up)	1			
Cursor Control	1	2		
EDIT Control Option	1	2		
Parity Error	1			
Receive Data*	1			
Transmit Data*	1	2		
Video:				
Character/No Cursor	1			
No Character/Cursor	1			
No Character/No Cursor	3		1	2
Data/No Sync	2			1
Data Wavy	1		1	2
Randomly Generated, Wrong Characters**	2	1		

*Check word structure specification and baud rate.

**Insure good connection of cable from keyboard to logic board.

To remove the CRT, proceed as follows:

1. Unhook both ends of the spring that lies across the CRT.
2. Remove the connector from the base of the CRT.
3. Remove the anode connector from the lower surface of the CRT.
4. Using a socket wrench or screwdriver, loosen the clamps at both sides of the CRT. Turn them to clear the frame.
5. Grasping the CRT firmly, lift it upwards and out of the ADM-1 case.

To remove the flyback assembly, proceed as follows:

1. Disconnect the anode connector from the CRT.
2. Disconnect the Molex connector from the flyback assembly to the monitor circuit board.
3. Using a screwdriver, loosen the hex-head screw that clamps the flyback assembly to the molded cover.
4. Lift the flyback assembly upwards until the screw clears the slot in the mounting plate, then remove assembly from the cover.

To remove the monitor circuit board, proceed as follows:

1. Remove the flyback assembly.
2. Disconnect all Molex connectors from the monitor circuit board.
3. Slide the circuit board from the slots in the molded cover and remove.

To replace the CRT, flyback and monitor circuit board, perform the preceding steps in reverse order.

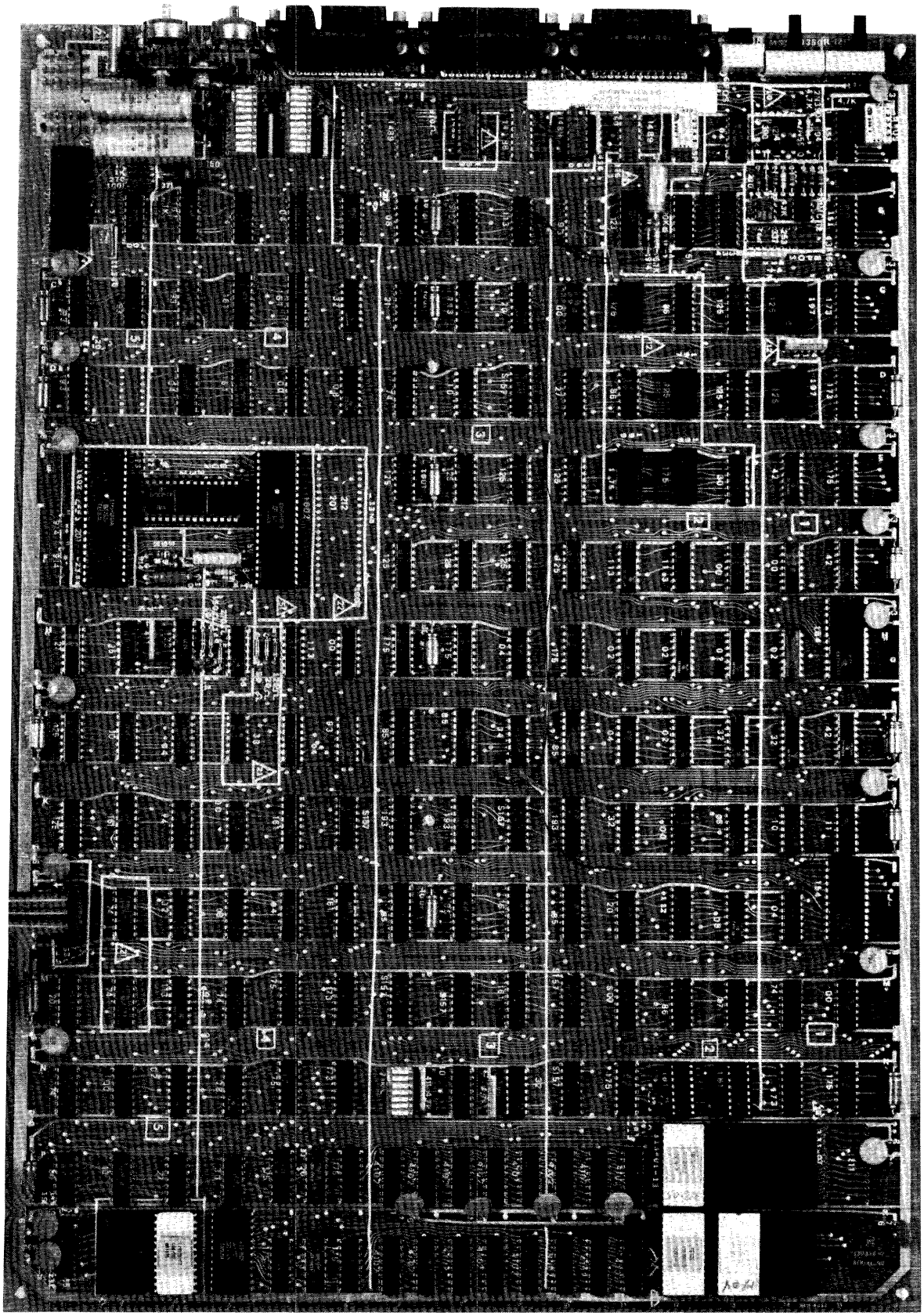


FIGURE 5-5. ADM-1A LOGIC BOARD

5.8 MAINTENANCE OF MAIN LOGIC BOARD AND POWER SUPPLY

The main logic board is essentially a self-contained functional unit with one exception: DC logic level +5 Volts is obtained from the separate POWERTEC or DATA POWER supply.

For maintenance and trouble shooting, refer to Figure 5-6 for identification of connectors and terminals external to the main logic board and normal input-output signals.

Connector J1 is used for Data Signal interface connection to the main logic board. Connectors J2 and J3 are used for the same purpose with RS232C Extension Option and Serial Printer Option, respectively.

Connector J4 is used to supply output signals from the main logic board to the CRT monitor. If proper signals are present at the terminals of connectors J5 and J6, examine the integrity of the connector pins on P4. Check for obvious faults on the pc board. It is strongly recommended that no involved repairs be attempted on this board. Instead, contact the Authorized Service Representative for the area.

Connector J5 primarily handles power inputs to the main logic. The absence of proper inputs at terminals one, two and three indicates a failure of the AC power feed. Lack of proper voltage at terminal six indicates a problem with the chassis-mounted power supply or connector cable. Improper signals on terminals four and five indicate trouble with the main logic board.

If noted signal levels are not present at the terminals of connector J6 as the keyboard is operated, examine the keyboard assembly for obvious faults.

Keyboard output levels are compatible with TTL circuits with 'Logic One' greater than +2.6V at 0.10 ma and 'Logic Zero' less than 0.6V. The outputs are bounce-free so that only one signal will be generated for each key depression. Two key rollover interlocking is provided for all encoded keys. If a key is depressed before a previous key is released, the second keycode is transmitted after the first key is released. A strobe pulse is provided with each encoded key output.

5.8.1 Power Supply

DC voltages of -5, +12, and -12 volts utilized within the main logic board are generated by regulator IC chips on that board. A separate +5V power supply for the logic level voltage is mounted above the main circuit board on the chassis.

Recommended adjustment procedure for the separate power supply is as follows:

1. Adjust current limit potentiometer to maximum current output (normal operating position).

2. Adjust overvoltage protection potentiometer to maximum position.

3. Adjust output voltage to 6V DC.

4. Adjust the overvoltage protection potentiometer to the point where the output voltage shuts off.

5. Turn output voltage down to the level of the overvoltage control (or lowest setting), then bring the output voltage up again, and adjust the output, watching the meter, until it reaches 6V DC. The output should then go back to overvoltage DC.

6. If the overvoltage protection adjustment is correct, adjust the output voltage control to 5.3V DC.

5.8.2 Power Supply Adjustment Procedure

1. Remove all power distribution cables and connect digital voltameter to the +5V output. Turn 1 limit and E limit potentiometers to maximum.

2. Turn E limit potentiometer counter-clockwise fully, and turn power off. Reconnect all power distribution cables.

3. Turn power on and connect digital voltameter to capacitor C-27 on the main logic board. Adjust the power supply output voltage to 4.9V DC.

4. Adjust 1 limit potentiometer until output starts to drop.

5. Turn 1 limit potentiometer approximately 1/8 turn clockwise and recycle power.

6. Place oscilloscope leads on a +5 V output. Check to see that the AC component is 50 millivolts.

FIGURE 5-6. MAIN LOGIC BOARD TERMINAL IDENTIFICATION CHART

Connector	Symbol	Pins	Function
RS232C Interface	J1	1-25	See Table V.1
RS232C Extension	J2	1	Equipment Ground
		2	Transmit Data
		3	Receive Data
		4	Request to Send
		5	Clear to Send
		6	Data Set Ready
		7	Signal Ground
		8	Received Line Signal
		15	Transmitter Signal Element Timing
		17	Receiver Signal Element Timing
		20	Data Terminal Ready
Serial Printer (Option)		1	Equipment Ground
		2	—
		3	Receive Data
		6	Printer Ready
		7	Signal Ground
		8	Receiver Line Signal
		20	Printer Ready
Monitor I/O	J4	1	Brightness
		2	Brightness
		3	Brightness
		4	Contrast
		5	Chassis Ground
		6	Video & Video Ground
		7	Horizontal Ground
		8	Horizontal Drive
		9	Vertical Drive
Logic Board Power	J5	1	AC Feed
		2	AC Feed
		3	Equipment Ground
		4	Speaker
		5	Speaker
		6	D-C Feed
Keyboard I/O	J6	1	Power
		2	SHIFT
		3	CTRL
		4	BRK
		5	SEND
		6	STROBE
		7	REPEAT
		8	SIGNAL COMMON
		9	BIT1
		10	BIT2
		11	BIT3
		12	BIT4
		13	BIT5
		14	BIT6
		15	BIT7
		16	LINE 16

7. Reassemble the unit. Place voltage meter leads across the electrolytic capacitor C27 to determine supply equals 5 volts.

5.8.3 Component Replacement

The replacement of a component on any printed circuit board requires care to prevent damage to the circuit board etch. Clipping a component from the circuit board rather than unsoldering is the preferred method. Excessive heat from a soldering iron may result in damage to the component being replaced. The use of a soldering iron with an isolation transformer, a small copper alligator clip as a heat sink, and a delay between the soldering of individual pins of a clip are recommended.

In accordance with good maintenance practices, Lear Siegler does not recommend individual component replacement on any printed circuit board. Contact the factory repair depot for rebuilt or factory-tested replacement assemblies.

5.8.4 Replacing the Fan Assembly

Fan rivets must be drilled or popped off to remove. The new fan should be reinstalled using #8 screws (1/2" long), and nuts. Star-type lock washers or the equivalent must be used to insure that the fan will not loosen up with extended operation.

5.9 CONTINUOUS TESTING

The following procedure should be used when performing continuous testing of the ADM-1A.

1. With the terminal ON, select the Block Mode operation and install wrap-around plug for self-testing.
2. Clear the screen to NULLS.
3. Set the PROTECT MODE.
4. Upline.
5. Perform the sequence: ESC/ESC/7 twenty-one times.
6. Depress SHIFT/SEND to perform a Send Line function.

SECTION 6
WARRANTY

6.0 WARRANTY

Lear Siegler, Incorporated, Electronic Instrument Division certifies that each ADM-1A data display terminal will be free from defective materials for 90 days from the date of shipment to the original purchaser.

Lear Siegler agrees to correct any defects within the period of warranty. The ADM-1A should be returned, freight prepaid, to the authorized factory repair depots.

6.1 RETURNING GOODS FOR REPAIR

Equipment returned to Lear Siegler must be shipped prepaid and must have a Return Goods Authorization (RGA) number on the outside top of the carton or the shipment may be lost, misrouted or returned.

Step 1

Prepare the following information:

Model Number of terminal to be returned
Serial Number
Reported Symptom or failure
Type of modification or option to be installed (if applicable)

Step 2

Please call

(714) 774-1010 ext. 371, or
(800) 854-3805

or write:

Lear Siegler
714 No. Brookhurst
Anaheim, CA 92803
Attn: Customer Service

Please state that you would like a Return Goods Authorization number. At this time, the manufacturer will record the information from the list prepared in Step 1.

Step 3

The customer service department will provide an RGA number and the address of the repair depot to which your terminal is to be shipped.

NOTE

All modifications and repairs are FOB Anaheim, Calif, Philadelphia, Pennsylvania or Chicago, Illinois, whichever repair depot is used. Warranty repairs are to be sent prepaid and will be returned prepaid.

CITIES WHERE SERVICE MAY BE REQUESTED WITHIN A 25 MILE RADIUS* TO SUPPORT ADM-1A (30 DAYS PRIOR WRITTEN NOTICE REQUIRED)

ALABAMA
- Birmingham
- Huntsville

ARIZONA
- Phoenix

CALIFORNIA
- Los Angeles
- Oakland
- Palo Alto
- Sacramento
- San Diego
- San Francisco
- San Jose
- Santa Barbara
- Stockton

COLORADO
- Denver

CONNECTICUT
- Hartford
- Norwalk

DELAWARE
- Wilmington

FLORIDA
- Miami
- Orlando
- Tampa

GEORGIA
- Atlanta

HAWAII
- Honolulu

IDAHO
- Boise

ILLINOIS
- Chicago
- Peoria

INDIANA
- Fort Wayne
- Indianapolis

KENTUCKY
- Louisville

LOUISIANA
- New Orleans

MARYLAND
- Silver Springs

MASSACHUSETTS
- Boston
- Chicopee

MICHIGAN
- Detroit
- Grand Rapids

MINNESOTA
- Minneapolis

MISSOURI
- Kansas City
- St. Louis

NEBRASKA
- Omaha

NEW JERSEY
- Clifton
- Princeton
- Trenton

NEW MEXICO
- Albuquerque

NEW YORK
- Albany
- Hempstead, LI
- New York City

NORTH CAROLINA
- Charlotte
- Greensboro

OHIO
- Cincinnati
- Cleveland
- Columbus
- Dayton
- Toledo

OKLAHOMA
- Tulsa

OREGON
- Portland

PENNSYLVANIA
- Harrisburg
- Philadelphia
- Pittsburgh

RHODE ISLAND
- Providence

SOUTH CAROLINA
- Columbia

TENNESSEE
- Knoxville
- Memphis
- Nashville

TEXAS
- Austin
- Corpus Christi
- Dallas
- El Paso
- Fort Worth
- Houston
- Lubbock
- San Antonia

UTAH
- Salt Lake City

VIRGINIA
- Richmond

WASHINGTON
- Seattle

WISCONSIN
- Madison
- Milwaukee

CANADA
- Calgary
- Edmonton
- Hamilton
- Montreal
- Ottawa
- Quebec City
- Toronto
- Vancouver

*Radius varies depending on service center and may extend as far as 50 miles.

Fees for opening additional service centers are based upon the number of units to be installed within the service center area. Please contact your local LSI service representative for additional information.

Effective 3/1/77

SECTION 7
ADM-1A OPTIONS

10	Current Loop
11	RS-232 Extension
12	Polling
14	Beep
16	Alternate Send/ESC/Alt
18	Free Form Printer
20	Split Baud Rate
21	Composite Video
22	Data Input Processor
23	Lower Case
24	24 Lines
25	Receive Bit 8 Control
50	Edit Package# 1
51	Serial Printer Interface
52	Special Character Set
53	Extended Keyboard
60	Numeric Keypad
61	129316-1 Cable
	Extended Edit Package

NOTE: BE SURE SWITCH SETTINGS CONFORM TO OPTIONS INSTALLED. SEE PAGE 7-3.

SWITCH CONFIGURATIONS
(UNLESS OTHERWISE SPECIFIED ON DTO)

SW	STANDARD SWITCH CONFIGURATION NONBUFF ON	NONBUFF OFF	BUFF ON	BUFF OFF	ON	OFF	
S1							
1		•		•	ODD PARITY	EVEN PARITY	UART WORD STRUCTURE
2	•		•		7 BIT	8 BIT	
3	•		•		2 STOP	2 STOP	
4	•		•		PARITY	NO PARITY	
5	•			•	DISABLE	EN RFE SENSE	RECEIVE FRAME ERROR
6	•			•	DISABLE	EN ROE SENSE	RECEIVE OVER RUN ERROR
7		•		•	DATA BLANKED W/RTS	NORMAL	LOCAL COPY SUPPRESS
8		•		•	DISABLE	ENABLE	NULL CODE XMISSION
9		•		•	BIT 8 = 0	BIT 8 = 1	XMIT & REC BIT CONT (ONLY ONE ON)
10	•		•		BIT 8 = TSB 8		
S2							
1	X	X	X	X	PARITY	NO PARITY	PTR UART WORD STRUCTURE (OPT 51)
2	X	X	X	X	1 STOP	2 STOP	
3	X	X	X	X	7 BIT	8 BIT	
4	X	X	X	X	ODD PARITY	EVEN PARITY	
5		•		•	INHIBIT	RTS NORMAL	RTS INHIBIT WITH CTS (CL TO SEND)
6		•		•	INHIBIT	RTS NORMAL	RTS INHIBIT WITH CF (CARR DET)
7		•		•	DELAY	NO DELAY	RTS TURNOFF DELAY (4.5 MS)
8		X		X	RTS HIGH	NORMAL	RTS HIGH
9	X		X		DISABLED	ENABLED	SECONDARY CHANNEL
10		•		•	DISABLED	ENABLED	RECEIVE PARITY ERROR
S3 (SEE OPT 51)							
S4 1 2 3 4 5							REFER TO SHT 21
S5							
1		•		•	DISABLE	ENABLE	BREAK
2		•		•	ENABLE	UPPER CASE ONLY	LOWER CASE DISPLAY
3		•		•	DISABLE	ENABLE	CURSOR BLINK
4		•		•	ENABLE	DISABLE	CLEAR TO PROTECT
5	X	X	X	X	12 LINE	24 LINE	12/24 LINE DISPLAY (OPT 24)
6	•		•		DISABLE	ENABLE	L.C. REVERSE DISPLAY
7		•		•	50 HZ	60 HZ	50/60 HZ OPERATION

X = DEPENDENT ON REFERENCED OPTION

SIZE	CODE IDENT		REV
A	98438	129503	A
SCALE		SHEET 20	

SWITCH CONFIGURATION

SWITCH CONDITIONS FOR S4 ARE DEPENDENT ON OPTIONS INSTALLED.

STD - ALL OPTIONS EXCEPT FOLLOWING:	STD - WITH PTR	STD - WITH EDIT	STD - WITH PTR & EDIT					POLLING	POLLING WITH EDIT & PTR					S4	
OFF	OFF	OFF	ON					ON	OFF					1	(OPT B)
OFF	OFF	OFF	OFF					OFF	OFF					2	(OPT C)
OFF	ON	ON	ON					ON	OFF					3	(OPT A)
OFF	OFF	OFF	OFF					OFF	OFF					4	(OPT D)
OFF	OFF	OFF	OFF					OFF	OFF					5	(OPT E)

SIZE	CODE IDENT		REV
A	98438	129503	A
SCALE		SHEET 21	

ROM PLACEMENT

ITEM NO.	NON-BUFFERED (-13)						BUFFERED (-23)								PART NO.		LOCATION
	STD-ALL OPTIONS EXCEPT:	OPT 50	OPT 51	OPT 50 & 51			STD-ALL OPTIONS EXCEPT:	OPT 12	12 COMBINED WITH 50 &/OR 51	OPT 50	OPT 51	OPT 50 & 51					
1	1	1	1	1											129313-01	PG 0-1	P12
2		1		1											129314-01	2	R12
3			1	1											129314-02	2 OR 3	R12/R13
4																	
5								1	1						129313-02 (POLLING)	PG 0-1	P12
6								1	1						129313-03 (POLLING)	2-3	P13
7									1						129313-04 (POLL-EDIT-PTR)	4-5	P14
8							1			1	1	1			129313-05 (STD)	0-1	P12
9																	
10										1		1			129314-03 (STD-EDIT)	2	R12
11											1	1			129314-04 (STD-PTR)	2 OR 3	R12/R13
12																	
13																	
14																	
15																	

SIZE	CODE IDENT		REV
A	98438	129503	A
SCALE		SHEET 18	

OPTION 10
CURRENT LOOP

GENERAL DESCRIPTION

The ADM-1A Current Loop is a bipolor constant current interface connection which allows a cable to be attached between the terminal and the computer for transmittal and receival of data.

The Current Loop Interface allows the ADM-1A to be cabled directly to the computer many feet away in local installations. It is the basic interface in teletype applications.

This factory-installed option is switch-selectable. When Switch 6 (RS 232/CL) on the bank of switches to the left of the keyboard is in the OFF position, Current Loop is enabled.

SPECIFICATIONS

Input Diode:
- Forward DC current – 150mA
- Reverse current – 10μA
- Peak Forward current – 3.0A

Output Transistor
- Power dissipation at 25°C – 2.6mW/°C

Input to Output voltage – 1500 watts
DC Forward current gain – 100
Collector to emitter breakdown volt – 30

INSTALLATION

1. Install Part # 128348-2 (Two) MCT2 in locations B13 and B14 on the logic board.

2. Install the two transistors (Part #2N3904) at locations A13 and A14/15.

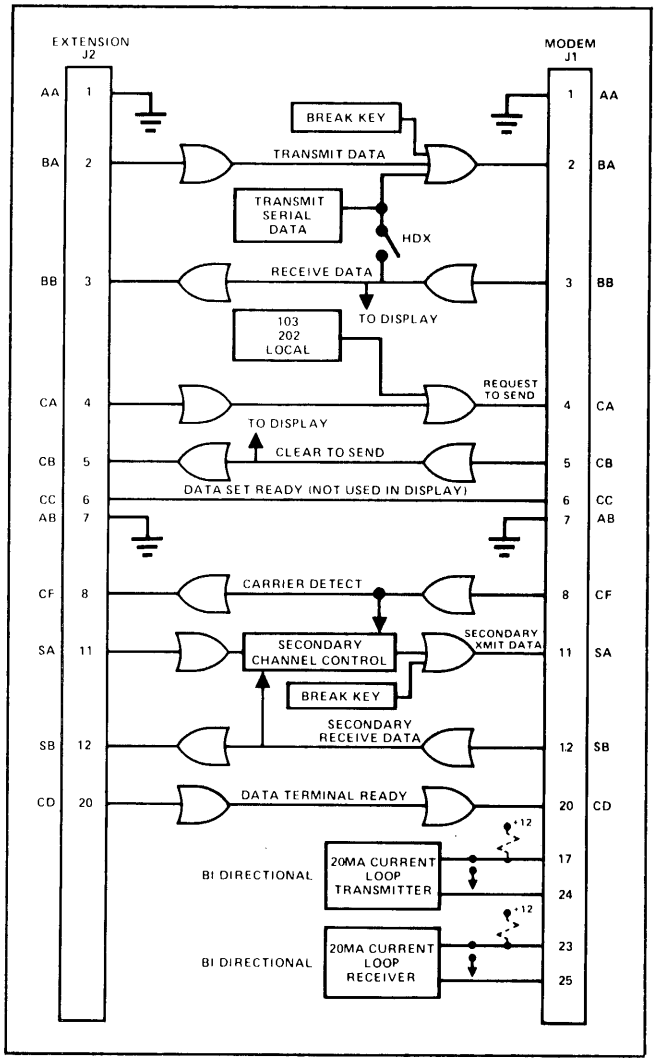
3. Install the two transistors (Part # 2N5550) at location A14.

4. Install diode (Part #1N914) at location AB13.

5. Install diode (Part# 1N4001) at location A14.

6. Install 220 resistor (Part #128533-221) at location AB13.

7. Install the two 620 resistors (Part # 128533-221) at location AB14.



8. Install the two 4.7K resistors (Part # 128533-472) at locations AB14 and A14.

9. Install the three 91K resistors (Part # 128533-913) at locations AB14/15, AB14 and AB14.

10. Install the two ½ watt resistors (Part LEB 9115) at location A7.

11. If not present, install the switch provided at location A13.

12. Set CL/RS 232 Switch to CL.

TEST PROCEDURES

1. Using a # 17-02050-1-390 Amphenlo connector and five two-inch jumpers with male pins construct a wraparound plug. Connect jumpers:

FROM	TO
2	3
4	5
7	13
9	10
11	12

2. Using the wraparound plug, perfrom a I/O self-check of the non-polling current loop option as follows:

   a. Connect the wraparound plug to the I/O connector.
   b. Put the terminal in full-duplex operation.
   c. Power down, then power up (Master Clear).
   d. Type: A, B' D, H, P, I.
   e. If characters appear as typed on the screen the I/O operation is correct.

3. If the option still does not appear to be operating, re-check all switch settings and installation.

OPTION 11
RS-232 EXTENSION

GENERAL DESCRIPTION

The RS-232 Extension option adds a secondary RS-232-C input/output port to the ADM-1A terminal for daisychaining additional ADM-1A's (in polling applications) or other auxiliary devices such as printers, magnetic tape units, disc drives, etc. The diagram shows the RS-232 Extension in relation to the main RS-232 interface for both kinds of applications.

APPLICATION

The RS-232 Extension may also be used to interface a wide variety of auxiliary devices to the computer I/O channel. Typical of such devices are printers, tape or disk storage units, processors and modems.

In all applications it is important to note that while the RS-232 Extension permits communication between any terminal or device and the computer, it does not provide for terminal-to-terminal or terminal-to-auxiliary device communication.

The RS-232 Extension option adds the EXTENSION port connector (J2) and the logic board circuitry necessary to extend the RS-232 interface. The illustrations on this page show the rear panel connector location and a schematic diagram of the main RS-232 and extension interfaces.

In polling applications where multiple ADM-1A terminals are daisychained on a single computer I/O channel, the RS-232 Extension provides the interface port from each terminal on the chain to the next. In this type of polling configuration, each terminal must also be equipped with the Polling option (No. 12) to determine when it is being addressed by the computer, and when it is cleared to transmit data.

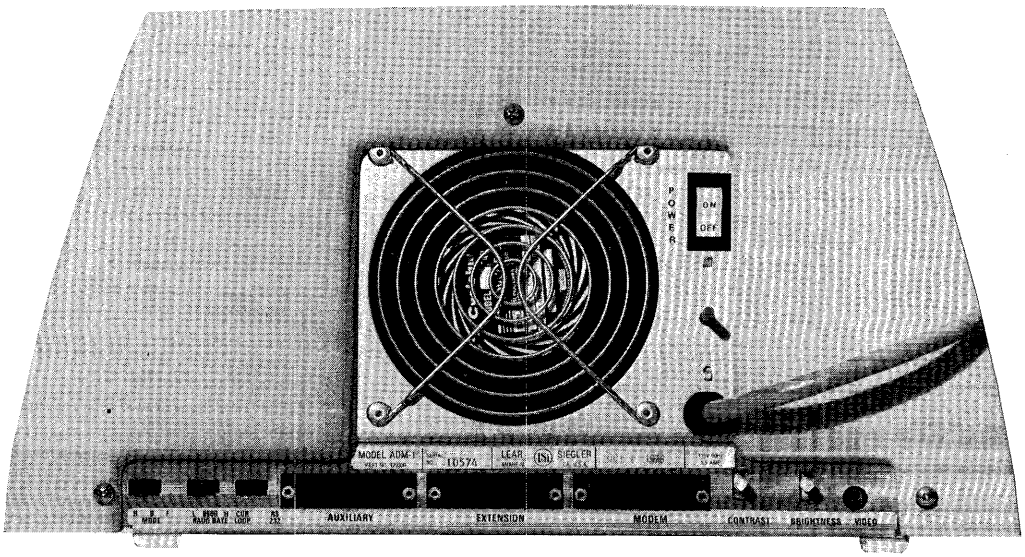
SPECIFICATIONS

Interface – meets all requirements of EID Standard RS-232-C

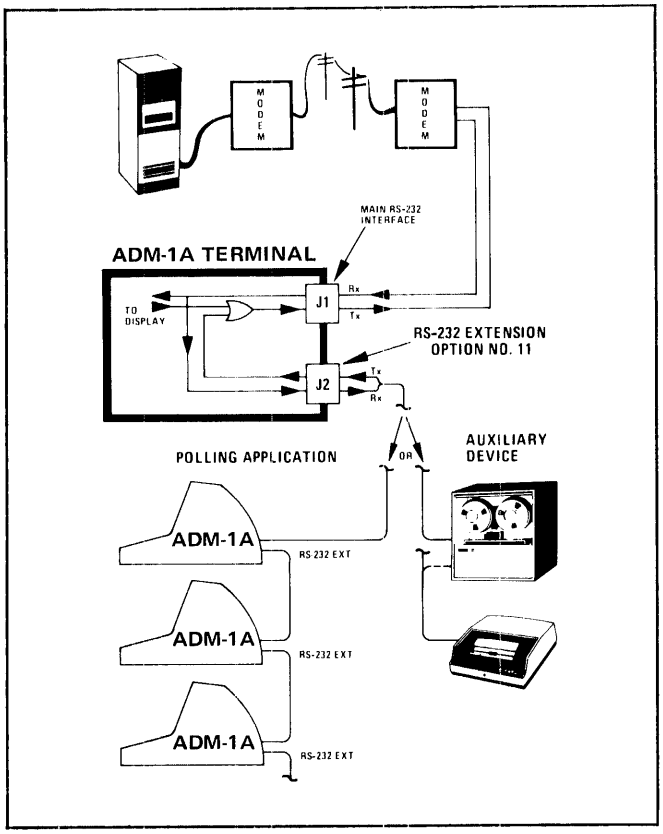
Connector – 25-pin Amphenol Series 17 Receptacle (equivalent to Amphenol part number 17-10250).

Transmission Rates – Determined by extension devices, remote computer and modems.

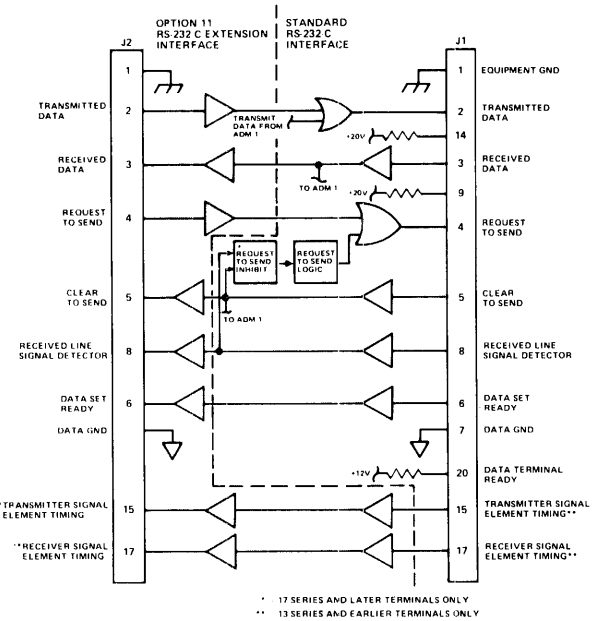
Daisychain Cable Length – 50 feet or more to devices with RS-232-C standard interfaces.



ADM-1A REAR PANEL - CONNECTOR LOCATIONS



RS-232 STANDARD AND EXTENSION INTERFACES SIMPLIFIED SCHEMATIC DIAGRAM



INSTALLATION

1. Install Part #128438-1489 at location A10 on the logic board.
2. Install Part # 128348-1488 (Two) at locations A8 and A9.
3. Install connector (Part #206584-1) at J2 at location A9 using the jack sockets provided.
4. Check all switch settings to be sure that they are correct.

TEST PROCEDURES

1. Connect the terminal to another unit.
2. Type data on the screen. The data should appear on both terminals.
3. If data does not appear on boht terminals, check all switch settings and installation to be sure they are correct.
4. If further problems exist, troubleshoot the problem using schematic sheet # 14.

OPTION 12
POLLING

GENERAL DESCRIPTION

The ADM-1A may be equipped to act as a polling terminal in a multipoint communications network.

When equipped with the polling interface and set up for polling operation, the ADM-1A is prevented from initiating transmission except under the control of the network command center. All message transmission is between the network command center and the selected terminal or terminals.

Operation of the communications network and the interaction of the ADM-1A terminals with the center is entirely controlled by the Polling/Addressing dialog initiated by the center. The following pages illustrate this sequence.

INSTALLATION

The Polling option may be ordered with the terminal or at a later date. It consists of the replacement of 2 ROMS, 4 IC's and an eight position switch which are installed in the areas designated on the logic board. (See Appendix D.) For the proper switch settings for this option, see figure 1-4.

SENDING DATA

Information to be sent by the ADM-1A must be entered on the display screen by the operator from the keyboard. When the information is entered on the screen, the terminal waits for a valid error-free POL sequence from the control center.

When a POL sequence is received, and the terminal has determined that it is the addressed unit, it transmits the sequence:

STX text ETX LRC

(The LRC character represents the sum of the ETX character and the number of characters in the text in a module-2 ASCII character.)

The text of the message may be sent in one of two formats, depending on whether or not the protect mode is set on the ADM-1A.

Protect Mode OFF - All unprotected characters (except NULL) are sent. An ASCII character is inserted in the character string when the cursor begins a new line.

Protect Mode ON - All unprotected characters are sent to the control center. When a protected character is encountered, the terminal transmits FS to mark the position of the protected character.

After the terminal has sent the LRC character, it waits for the center to acknowledge receipt of the message. An acknowledgement will consist of one of three characters (ACK, NAK or EOT). The terminal will respond to each character in a different way:

ACK (The message was received successfully.) The terminal sends EOT and disconnects.

NAK (Message received with errors.) The terminal re-transmits the message and again awaits acknowledgement.

EOT (Re-transmission may be required.) The next character may be the terminal address. The terminal positions the cursor at the HOME position and awaits a new header sequence from the control center.

ERROR or another character. Terminal positions the cursor at the HOME position and waits for the next header sequence from the control center.

ADM-1A POLLING OPTION

The operation of the ADM-1A with the Polling Option is somewhat different than the operation of the standard ADM-1A. The operator or programmer should be familiar with these differences before attempting to use the terminal.

- In the Polling terminal, the COMPOSE MODE is set. To perform any SEND operation, the unit must be removed from this mode.
- In the Polling terminal, many ESC sequence responses available in the standard ADM-1A cannot be performed. **The following cannot be done on a Polling terminal:**

Symbol	Hex Code	Action
"	22	Enable Keyboard
#	23	Disable Keyboard
4	34	Send Line Unprotected
5	35	Send Page Unprotected
6	36	Send Line Protected
7	37	Send Page Protected
?	3F	Read Cursor
B	42	Set Block Mode
C	43	Set Conversation Mode
S	53	Partial Send

- In the Polling terminal, the Set-up Phase of a PRINT operation is as follows:

  a. Sets Printing Flag
  b. Clear W PROT
  c. Write "EM" at Cursor Position
  d. HOME Cursor

- In the Polling terminal, when it is in the Compose Mode, like the standard ADM-1A, the compose flag may be cleared and data may be printed. However, unlike the standard ADM-1A, it cannot:

  - Remain in text rcv mode until ETX LRC
  - Print the data when rcv seq is complete

ADM-1A SWITCH SETTINGS

After the Polling Option has been installed in the ADM-1A, DIP switches must be set at the proper configuration for Polling prior to attempting to use the terminal as a Polling unit.

Switch conditions for setting the switch located at S4 on the logic board are dependent on the other options installed in the unit.

If the terminal includes both a **printer and the optional edit package,** the switch at S4 should be set as follows:

1 OFF
2 OFF
3 OFF
4 OFF
5 OFF

If the terminal includes only a Polling Option without either the printer or the Edit package, the switch at S4 should be set as follows:

1 ON
2 OFF
3 ON
4 OFF
5 OFF

SETTING THE TERMINAL ADDRESS

The address is set at the terminal by means of eight rocker switches on a DIP device located at the bottom of the display unit, and accessible through an opening in the bottom panel.

Any one of 96 ASCII characters may be assigned as the terminal address. The terminal will recognize and respond only to a header containing its preset address. To preset the address, perform the following:

- Turn the Display Unit on its side to expose the bottom panel.

- Remembering that a switch in the ON position represents a logical '0', and a switch in the OFF position represents a logical '1', set the switches to represent the selected address. For example, the setting below represents an address equal to the ASCII character 'D':

SWITCH #	1	2	3	4	5	6	7	8
VALUE = 'D'	0	0	1	0	0	0	1	0
SETTING	ON	ON	OFF	ON	ON	ON	OFF	ON

- When the switches have been set at the selected address, return the terminal to an upright position.

OPERATION ADM-1A IN THE POLLING STATUS

In order for the ADM-1A to utilize the Polling Option, it must first be set up for Polling. This is a simple four-step operation.

1. Set the FULL/HALF/BLOCK switch at the back of the terminal to the BLOCK position.
2. Press the BRK key.
3. Type the message to be sent in response to POL.
4. Position the cursor and lock the keyboard.

   - If the cursor is to be positioned at the first character position on the line in which it rests, depress the SEND and SHIFT keys. This positions the cursor, locks the keyboard and readies the ADM-1A for a message from the control center.

   - If the cursor is to be positioned at HOME, depress the SEND and CTRL keys. This positions the cursor, locks the keyboard and readies the ADM-1A for polling.

Upon receipt of the POL header from the control center, follow the instructions for Sending Data.

REMOVING THE ADM-1A FROM POLLING STATUS

To remove the ADM-1A from polling operation and recover keyboard control, simultaneously depress the CTRL/SHIFT/BRK keys.

POLLING/ADDRESSING DIALOG

In order for information to be transmitted or received between the ADM-1A and the control center, the network control center must first initiate operation with a character sequence. This sequence consists of the following:

EOT The EOT character signifies the beginning of a signal form the control center.

A_1A_1 Two characters (transmitted twice) representing the address of the terminal. (The ADM-1A address may be selected from any of the 96 ASCII characters, space thru DEL.)

Function Code This code is used to signify the operation to be performed. It must be one of the following:

p Used when asking for messages from a selected terminal. (POL)

q Used to transmit messages from the control center to the selected terminal. (SELECT)

r Used to transmit messages to all terminals which are not busy in a sequential order. (SEQUENTIAL SELECT)

s Used to transmit messages to a selected terminal regardless of busy status. (FAST SELECT)

t To transmit messages to all terminals in a sequential order regardless of busy status. (BROADCAST SELECT)

v,w,x,y Used to specify the information that the selected terminal is to send. The four possible SEND functions are: Send Line Foreground, Send Page Foreground, Send Line All, or Send Page All. (See page for a description of these functions.

ENQ The inquiry signal is the final code in the header sequence. It is used only with function codes p and q.

NOTE: If a parity error is detected in the header sequence, the ADM-1A ignores the entire message.

POL

When a terminal is addressed by the sequence: EOT A_1A_1 p ENQ it responds as follows:

- If the ADM-1A has **no message** waiting to send, it transmits an EOT character to the center.
- If the selected ADM-1A **does have a message** waiting to send, Operator Procedures (Page 7-9) should be followed.

The POL function is a continuous operation, constantly being sent by the control center to selected ADM-1A's. (See Figure 7-1, Poll Function Dialog, Flow Diagram.)

SELECT

When the selected ADM-1A is addressed by the sequence: EOT A_1A_1 q ENQ it responds as follows:

- If the **terminal is busy**, it transmits NAK to the center. It then disconnects. The terminal is busy when it is waiting to be polled (to transmit), when the operator is entering data, or when the terminal is sending data to the printer.
- If the **terminal is not busy**, it transmits ACK to the center. It then waits for the control center to send it a STX character. (Note: Any character received between the ACK and STX is ignored.)
- After the selected terminal receives the STX signal, the following events occur:

  1. The terminal clears the LRC accumulator to make it available to check the incoming message upon receipt.
  2. When the message is received by the terminal, the LRC character is compared with the value of the message. The parity error flag is also tested at this time.
  3. If no error is found in either parity or the LRC value, the selected character sends ACK to the control center, acknowledging the receipt of the message. The terminal then disconnects.
  4. If an error is detected in the message, the selected terminal transmits the NAK character to the control center and waits for the message to be transmitted.

     The control center then re-transmits the message, beginning again with the STX character. If the center wishes to terminate the operation after the receipt of a NAK character, it transmits an EOT character, indicating the end of the operation and setting the selected ADM-1A at idle.

Figure 7-2 illustrates the logical flow of the SELECT operation.

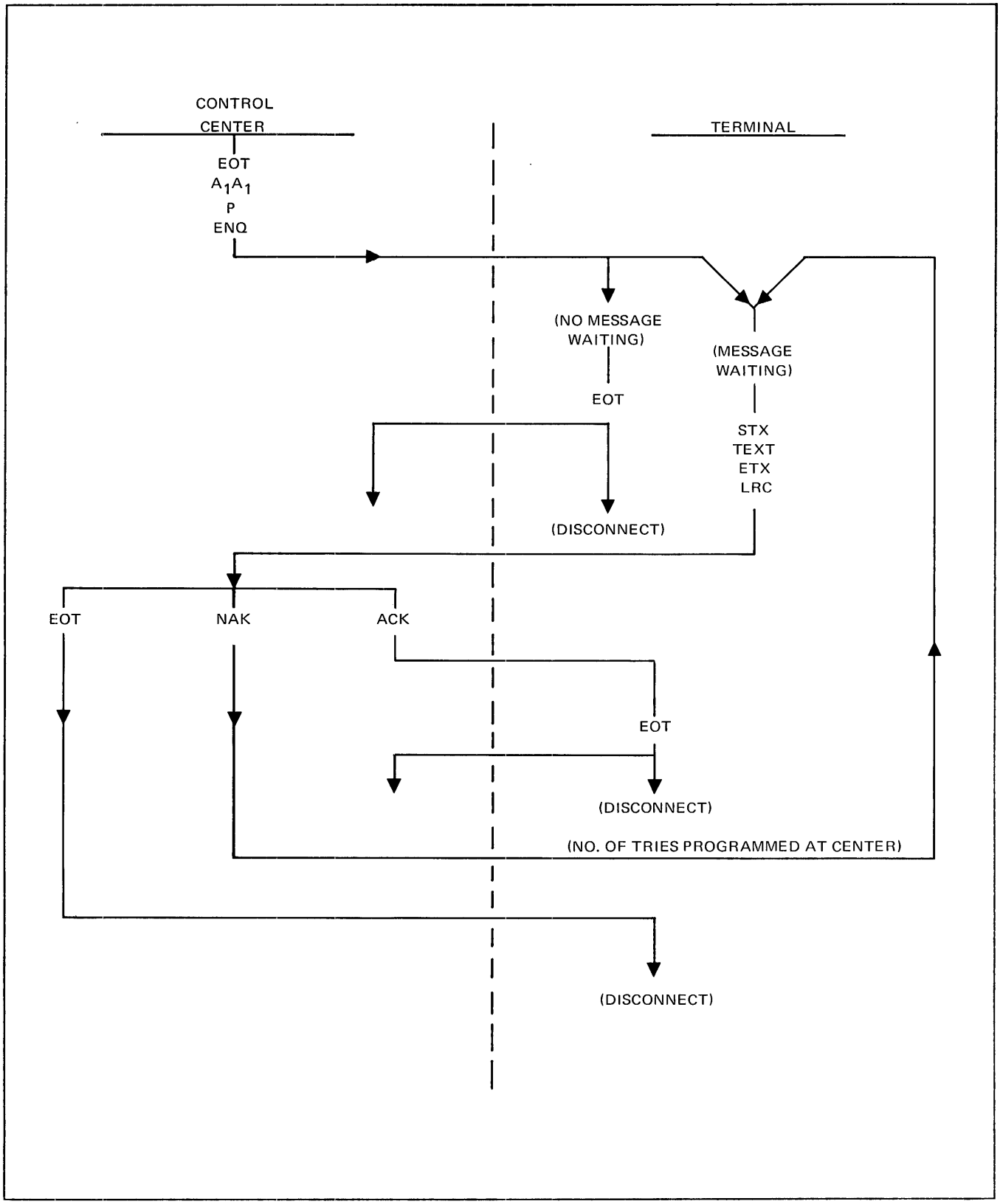


FIGURE 7-1. POLL FUNCTION DIALOG, FLOW DIAGRAM

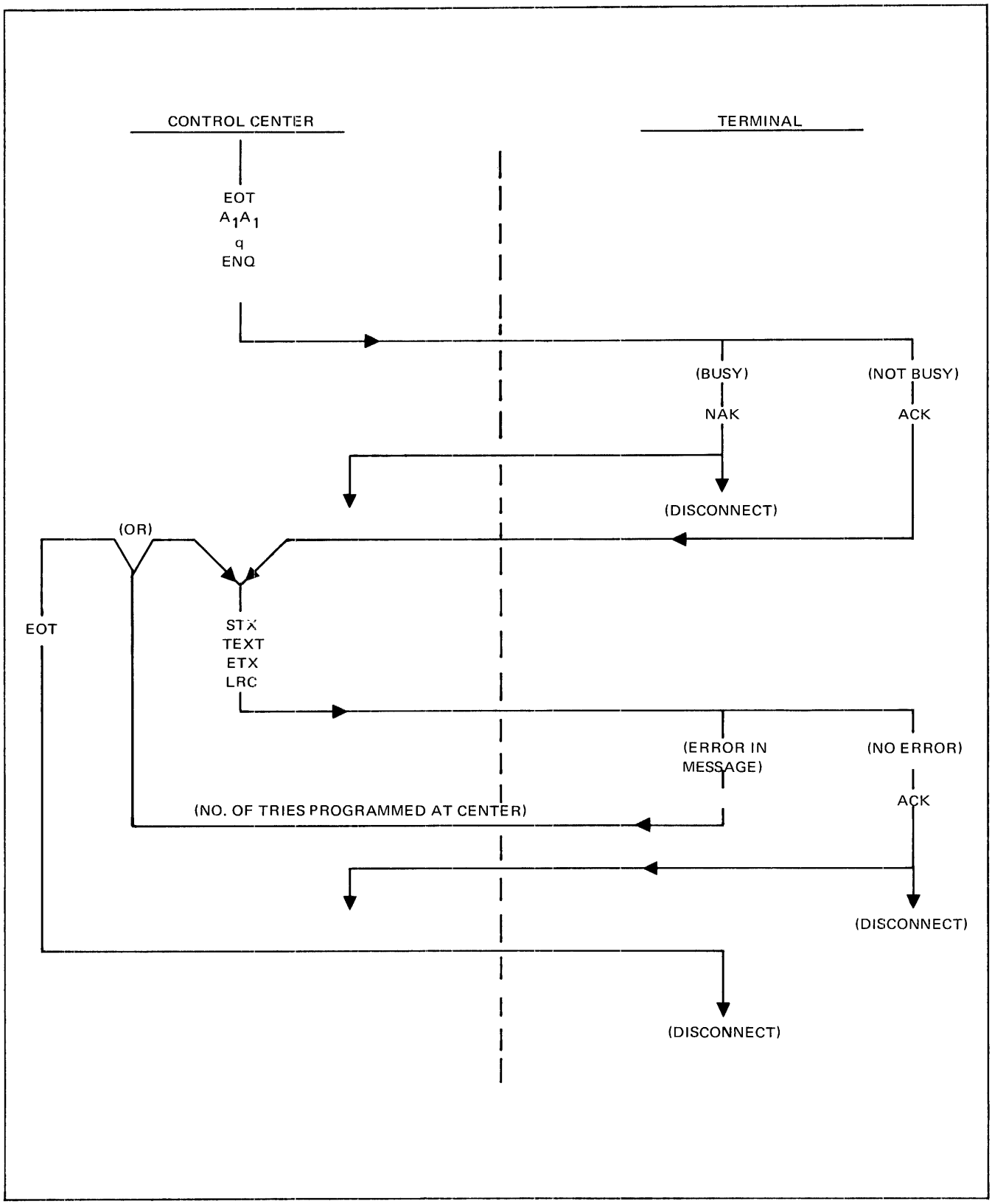


FIGURE 7-2. SELECT FUNCTION DIALOG, FLOW DIAGRAM

SEQUENTIAL SELECT

The Sequential Select Operation sequentially addresses a number of terminals with a single extended header, so that all terminals which are not busy will receive the same message. The header sequence is:

EOT A_1A_1 r A_2A_2 r . . . A_nA_n s

The last terminal addressed is addressed with s (Fast Select). The Fast Select operation must be followed with the sequence: STX text ETX LRC.

All terminals except the last terminal selected will connect if they are not busy. The last terminal addressed (A_nA_n) must connect, whether idle or busy.

When the r is received in the function position of the header, each terminal tests to see whether or not its address was selected. If its address was among those selected, the terminal tests its busy status. If it is not busy, it will wait for the STX code and prepare to accept the incoming message. If the terminal is busy, it will disconnect without responding.

Following the receipt of ETX LRC, all selected terminals except A_n disconnect without responding. Terminal A_n will either send ACK or NAK to the center and then disconnect.

Figure 7-3 illustrates the SEQUENTIAL SELECT operation.

FAST SELECT

Fast Select permits fast, unconditional selection of a terminal. The header sequence used to begin this operation is:

EOT A_1A_1 s followed by STX text ETX LRC

Upon receiving the header, the selected ADM-1A will unconditionally connect, regardless of its busy status, and wait for STX. The terminal will not respond until after it has received the LRC character.

Figure 7-4 illustrates the Fast Select Operation.

BROADCAST SELECT

The Broadcast Select function sequentially addresses a number of terminals with a single extended header, so that all addressed terminals whether busy or not, will receive the same message. Broadcast Select is the same as Sequential Select, except that the message is received by all selected terminals regardless of busy status.

The header sequence used for the Broadcast Select operation is:

EOT A_1A_1 t A_2A_2 t . . . . A_nA_n s

The last terminal addressed by the Broadcast Select sequence is always followed by the sequence:

STX text ETX LRC

Upon receipt of the header sequence, all terminals connect, unconditionally, and wait for STX. Following the receipt of the LRC character, all addressed terminals except A_n will send either ACK or NAK and then disconnect.

Figure 7-5 illustrates the Broadcast Select operation.

SEND

When the function characters v, w, x, or y are received by the selected terminal in the sequence:

EOT A_1A_1 v (or w, x, y)

the control center has specified the type or amount of data to be sent. There are four possible SEND functions.

SEND LINE FOREGROUND (v)
The selected terminal will send all unprotected data in the line on which the cursor rests. The terminal sends FS characters to mark the positions of all protected characters. NULL characters are not transmitted.

SEND PAGE FOREGROUND (w)
The selected terminal will send all protected data on the page, beginning at the HOME position. The terminal sends FS characters to mark the positions of all protected characters. NULL characters are not transmitted.

SEND LINE ALL (x)
The selected terminal will send all characters on the line on which the cursor rests, regardless of protected status. All characters are transmitted with ESC preceding the first character of a protected field, and another ESC character following the last character of a protected field.

SEND PAGE ALL (y)
The selected terminal will send all data on the page, regardless of protected status, beginning with the HOME position. All characters are transmitted, with the sequence ESC preceding the first character following the last character of a protected field.

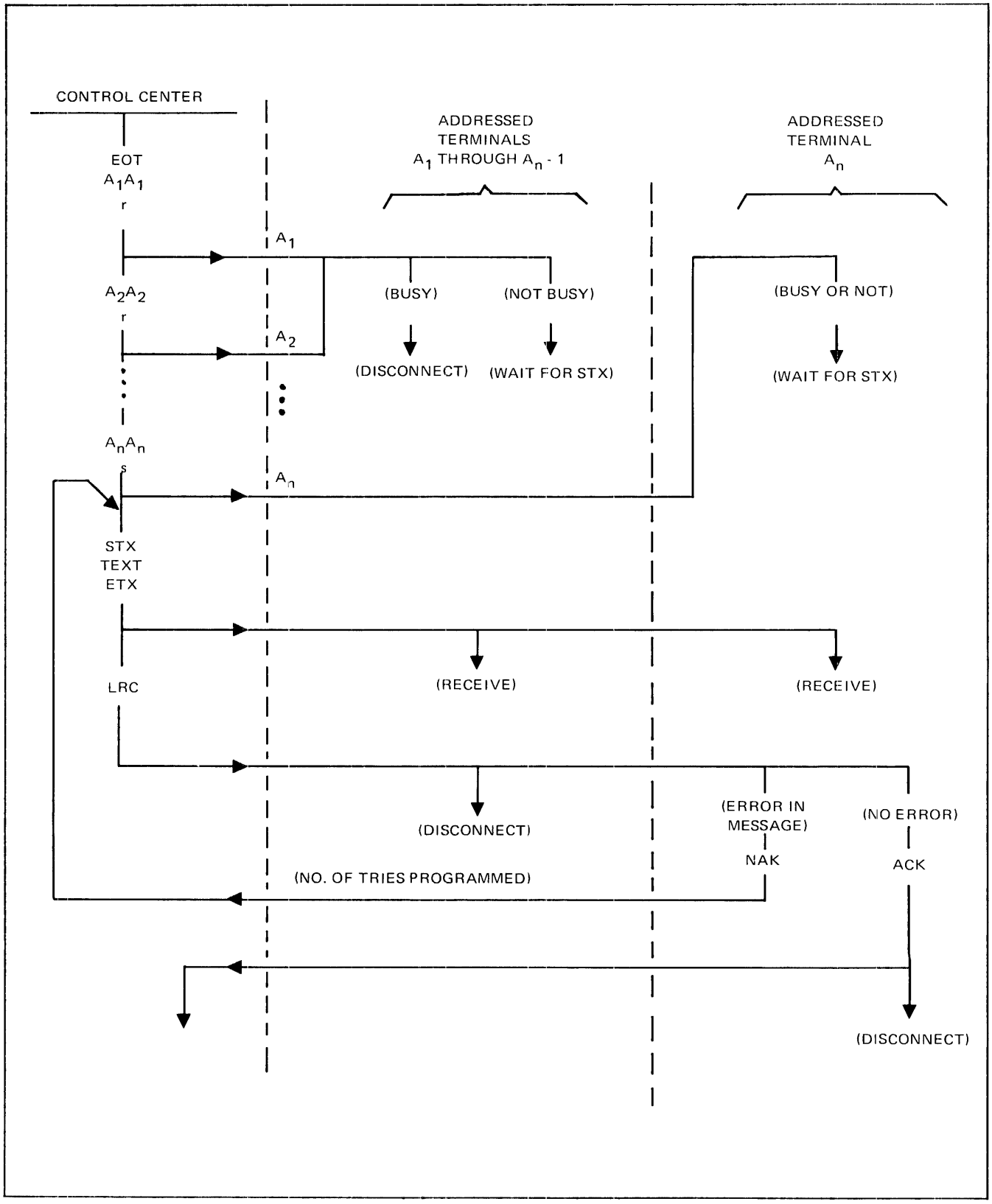


FIGURE 7-3. SEQUENTIAL SELECT FUNCTION DIALOG, FLOW DIAGRAM

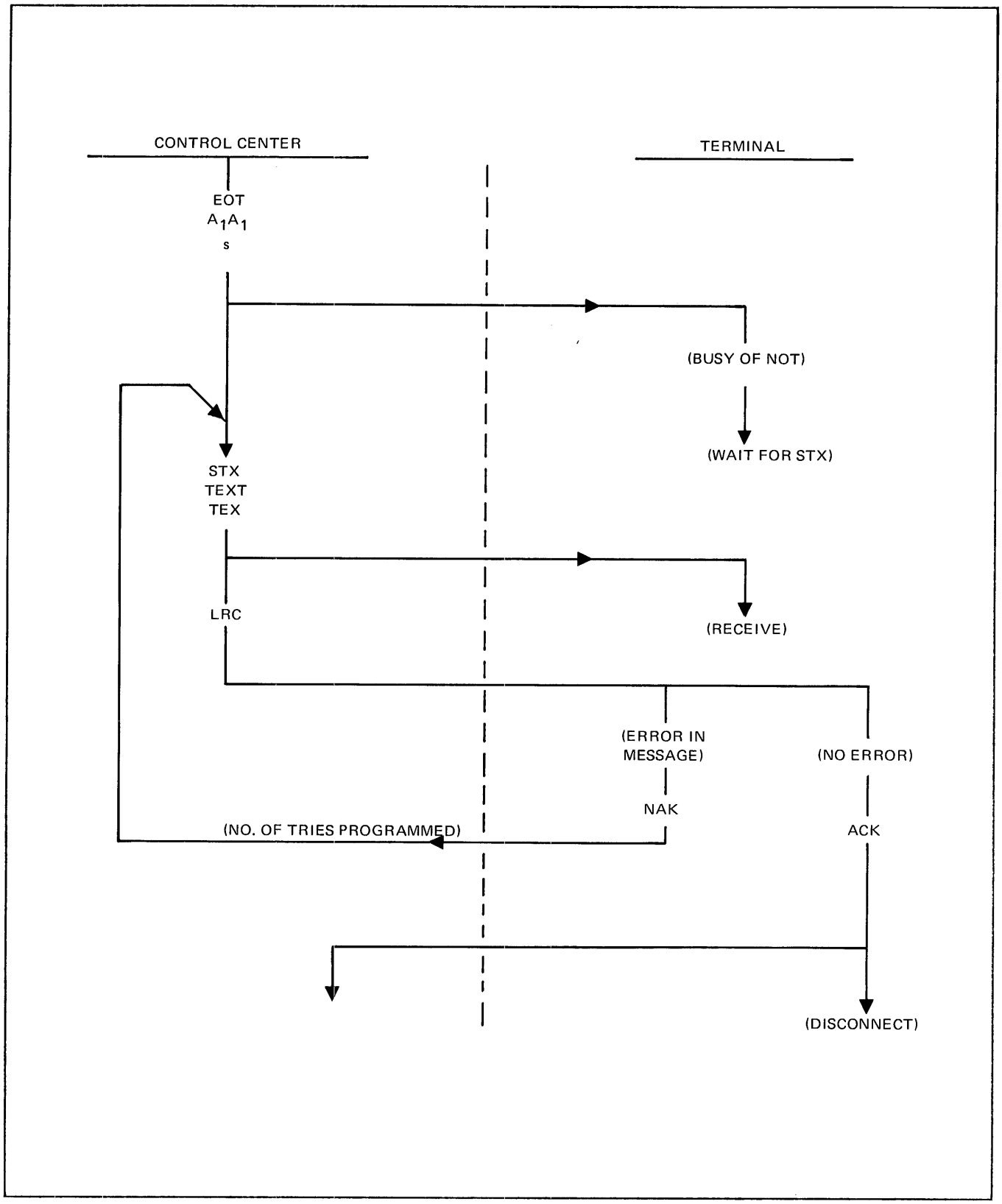


FIGURE 7-4. FAST SELECT FUNCTION DIALOG, FLOW DIAGRAM

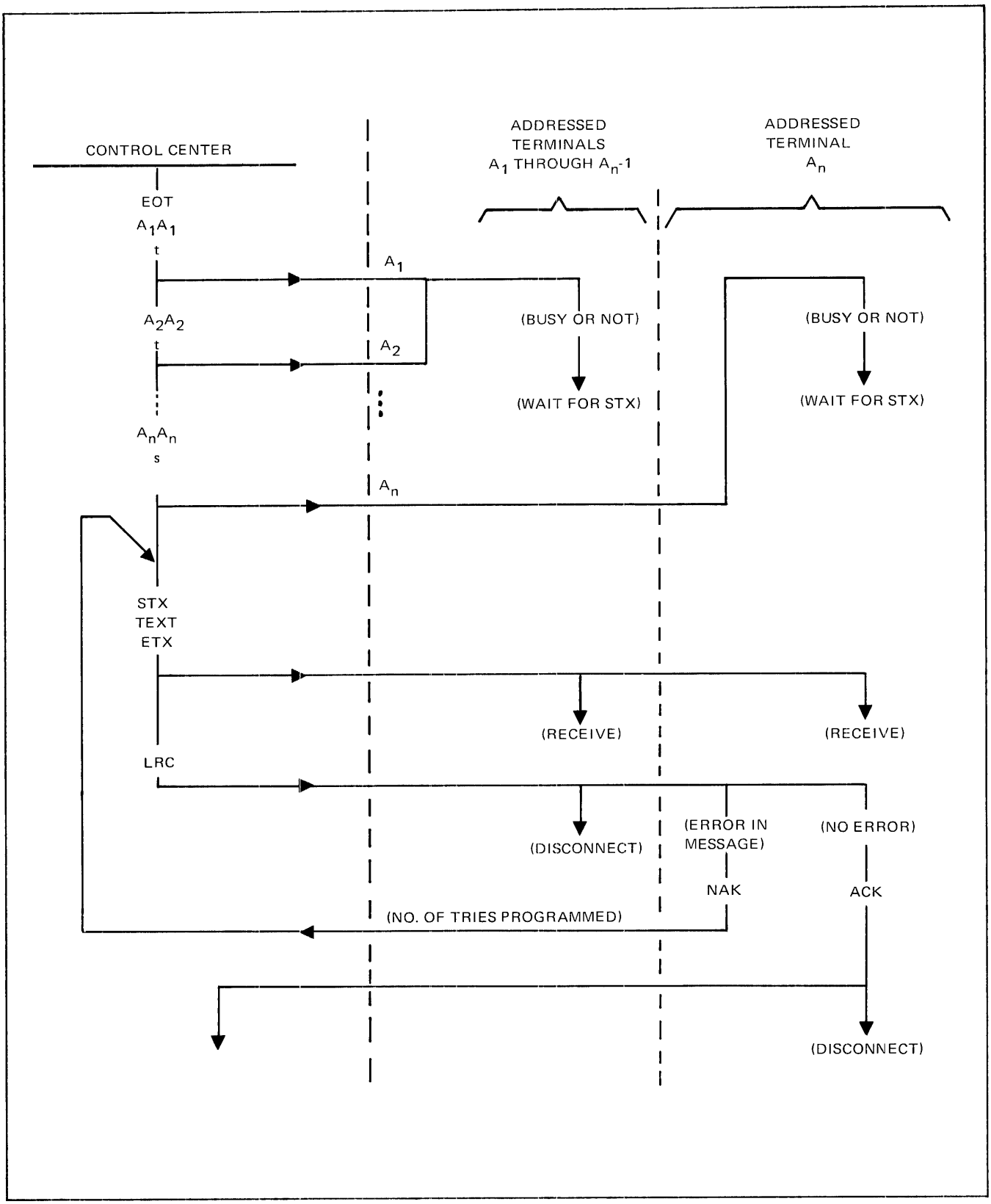


FIGURE 7-5. BROADCAST SELECT FUNCTION DIALOG, FLOW DIAGRAM

INSTALLATION

NOTE: It is recommended that this option be installed at the factory since the extensive test procedures and equipment needed to check it out are not possible in the field.

1. Install Part #128578-30 at location E13 on the logic board.

2. Install Part #128348-86 (Two) at locations D11 and C12.

3. Install Part #128348-125 (Four) at locations C11, D12, C14 and D14.

4. Install Part #128348-175 (Two) at locations E11 and E12.

5. Install the 8-position switch (Part #435166-5) at location B13/14 making sure that pin one is nearest the outer board.

6. After setting the address on the switch, place the cover (Part #435238-5) over the switch.

7. Install ROMs, when needed, at the proper locations depending on the configuration of the unit and the other options installed.

   Buffered Units With Printer and/or Edit Options
   1. Install Part # 129313-04 at location P14 on the logic board.
   2. Install Part #129313-02 at location P12 on the logic board.
   3. Install Part # 129313-03 at location P13 on the logic board.

   Buffered Units Without Printer or Edit Option
   1. Install Part # 129313-02 at location P12 on the logic board.
   2. Install Part #129313-03 at location P13 on the logic board.

   Un-Buffered Units cannot accept the Polling Option.

8. Set the switches at S4 depending on the options installed in the unit.

Polling With Edit or Printer	Polling Without Edit or Printer
1 OFF	1 ON
2 OFF	2 OFF
3 OFF	3 ON
4 OFF	4 OFF
5 OFF	5 OFF

9. Set all other switches to conform to the configuration of the terminal for the environment in which it is to be used.

TEST PROCEDURES

1. Check to be sure that the switch settings, baud rates, word structure, modem and address settings are correct before proceding.

2. Try to type on the terminal without depressing the BRK key. If this is possible, recheck all of the above.

3. Trying Polling the terminal. Take it through each of the operations in the Polling Manual.

4. If the terminal is unable to perform all of the operations, it is suggested that you try writing a software trap to determine the actual response coming back from the terminal. If the response is NAK, recheck the LRC and the address setting.

5. If you have gone through the procedures in the Polling Manual and are still unable to poll the termianl, call Lear Siegler Field Services Department at (714) 774-1010 Ext. 215.

OPTION 14
BEEP

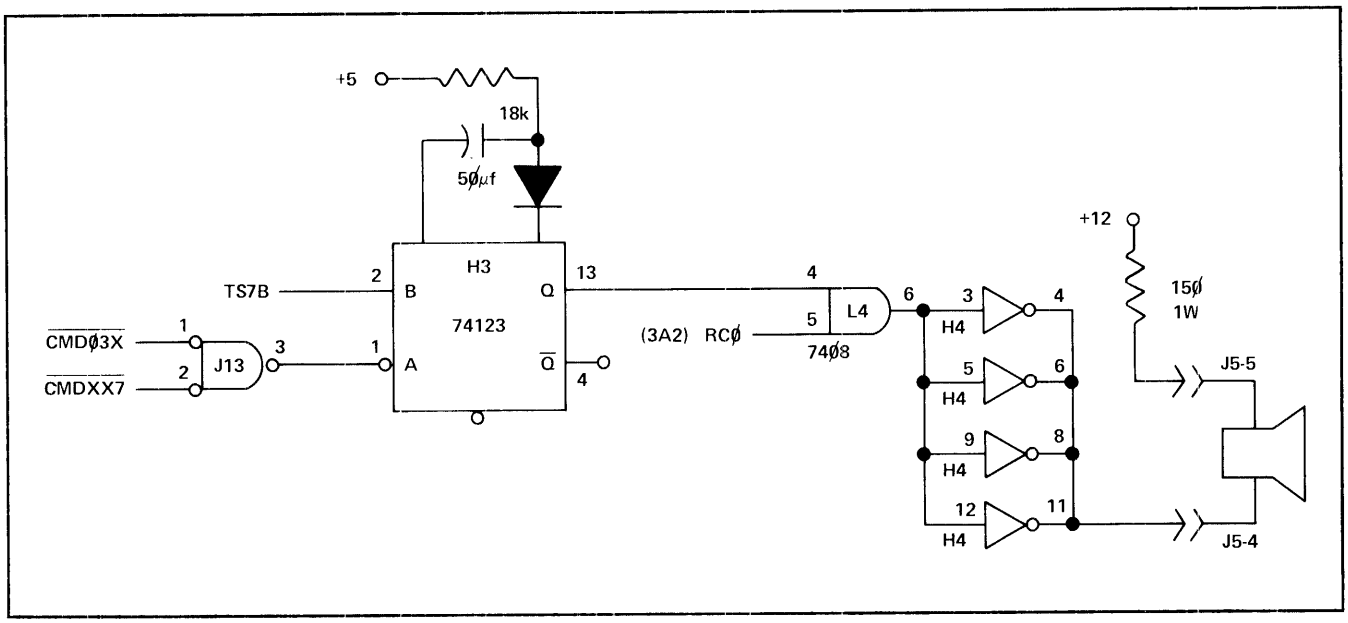
GENERAL DESCRIPTION

When the Beep Option has been installed in the ADM-1A, this allows the terminal to emit an audible signal upon receipt of a CTRL/G from the computer or microprogram.

The actual sound is created by putting the Row Counter (RC0) through a speaker. The duration of the signal is determined by signals received via the Tri-State Bus. Gate J13-3 triggers a one-shot impulse if the ASCII BEL code is received into the data input buffer.

INSTALLATION

This option should be ordered with the terminal. It consists of the addition of speaker and wire connections.



OPTION 16
ALTERNATE SEND/ESC/ALT OPTION

GENERAL DESCRIPTION

The SEND/ESC/ALT Option modifies the operation of the ADM-1A for direct teletypewriter compatibility while it is in the Conversation Mode.

In the Block Mode, the ADM-1A internal ESC functions remain unchanged. The transmission of ESC functions from the remote computer are not affected by this option.

This option allows the operator to type the ESC code sequences and transmit them without initiating the normal ADM-1A internal commands.

In addition to the ESC modifications, this option provides for the transmission of the teletypewriter ASCII ALT character code. This code is transmitted by typing CTRL/SHIFT/ESC while in the Conversation Mode.

To prevent inadvertent message transmission, the SEND key is disabled when typed unshifted. To send a message with the SEND/ESC/ALT Option installed, the operator must depress the SHIFT/SEND keys simultaneously.

No special switch settings are required on terminals with this option installed.

INSTALLATION

This option may be ordered with the ADM-1A terminal or at a later date.

It is installed by replacing ROM 129313-05 with the ROM provided on the location indicated on the logic board. (See Appendix B.)

OPTION 18
FREE FORM PRINTER

GENERAL DESCRIPTION

With the Free Form Printer installed in an ADM-1A Polling terminal, it is able to transmit a continuous stream of data without the need for inserting control characters or creating internal delays. This allows for greater flexibility in formatting the printed copy. This is an especially desirable feature when used with printers having more than 80-character lines.

Free Form transmission is initiated by typing ESCp or SHIFT/PRINT. Printing begins at the location of the cursor and continues to EM, the stored stop code. This option does not automatically insert control characters at the end of the line, but transmits continuously from line to line. Null characters on the screen are not sent to the printer. All trailing spaces are transmitted. When the cursor reaches the stop code, transmission ceases and the code is not over-written.

All control codes to be used for print formatting must be written into the ADM-1A display buffer. Characters are written by executing an ESC/U, entering the control character, and ESC/X. Control codes include: CR, LF, FF, VT, BEL, ESC, BS, RS, and US.

Although the data stream is continuous, the Printer Ready status line may be used to create breaks in transmission, allowing for mechanical printer functions and other delays. If the printer is expected to go "Not Ready" following a control character, the character should be followed by one or two DEL characters to prevent loss of data.

INSTALLATION

This option may be ordered with the terminal or at a later date. It is installed through the replacement of ROM 129313-04 at location P14 on the logic board with the ROM provided with this option.

For the proper switch settings for this option, see page 7-3.

OPTION 20
SPLIT BAUD RATE

GENERAL DESCRIPTION

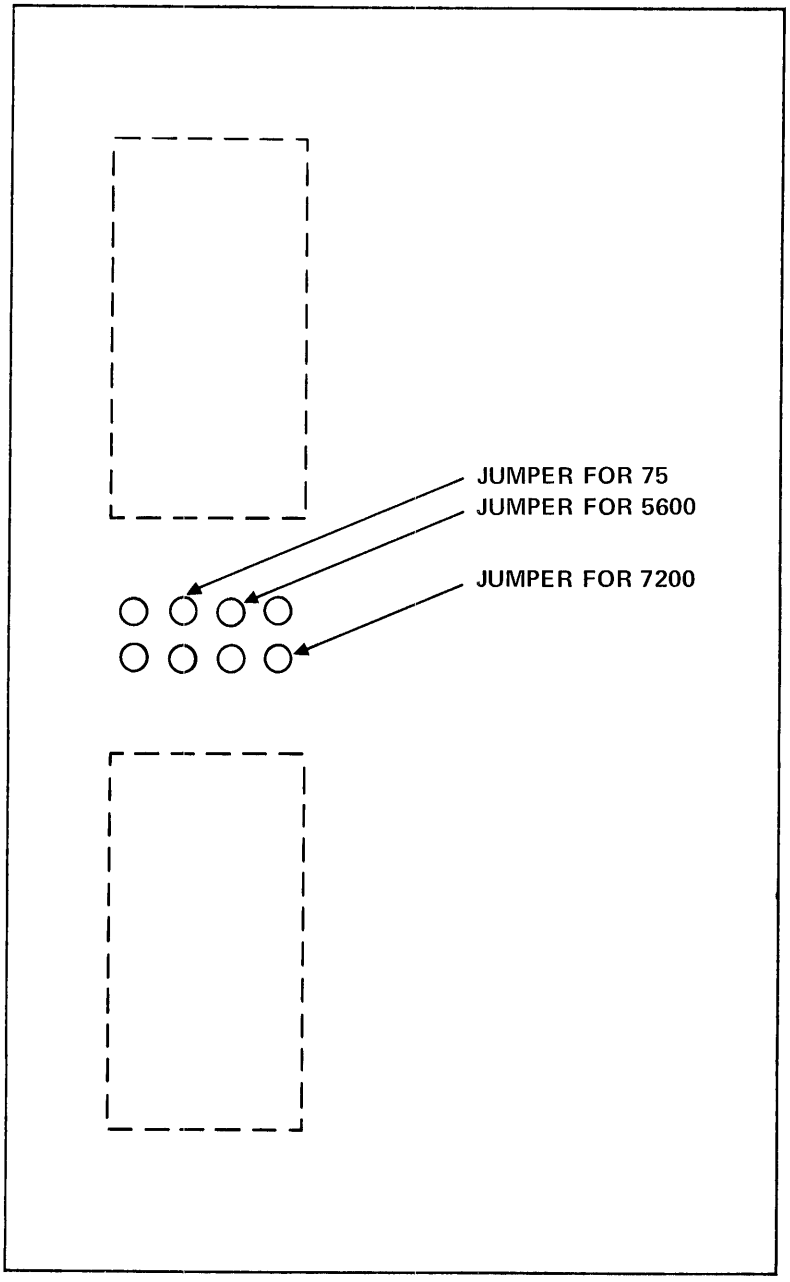
The Split Baud Rate Option gives the ADM-1A the capability of transmitting data at one rate and receiving at another. With this option installed, the alternate baud rate is selected on a switch located in the rear of the ADM-1A.

INSTALLATION

To split baud rate, cut an etch at switch position 2. Install jumpers as shown below. (one only)

This option may be ordered with the ADM-1A terminal or at a later date.

For proper switch settings, see page 7-4.



OPTION 21
COMPOSITE VIDEO

GENERAL DESCRIPTION

The Composite Video Option converts video and sync signals from ADM-1A terminals to a composite video output through the use of an internal piggyback board. Data is then transmitted to a compatible composite video monitor located up to 1000 feet away through a single co-axial cable.

The Composite Video Option provides the capability of locating the control terminal in an area separate from the electronics making it ideal for such applications as airport control towers, emergency communications centers, hospital areas, and other environments in which it is necessary to locate the terminal some distance from the computer.

COMPOSITE VIDEO SPECIFICATIONS

Horizontal Frequency: ADM-1A – 65μsec ±.02%*

Vertical Frequency: 60 cycles ±.02%*

Horizontal Pulse Width: 5.1μsec ±5%

Vertical Pulse Width: 180μsec ±5%

*Crystal Tolerance

INSTALLATION

1. Install Part #128348-38 at location J4 on the logic board.
2. Install Part #128348-74 (Two) at locations L2 and M2.
3. Install 20 ohm resistor (Part #128533-200) at location H4/5.
4. Install 120 ohm resistor (Part #128533-121) at location H4/5.
5. Install 150 ohm resistor (Part #128533-151) at location H4/5.
6. Install coaxial connector (Part #50107-1) at location A2.

Also included within the Composite Video option may be a heat-shrinkable sleeving, a contact (Part #201097-1), a ferrule, a connector and a cable. These parts comprise the external cable and are determined by the customer's requirements.

TEST PROCEDURES

1. Using a scope, check the output voltage at the output jack. Total voltage should be 1½ volts (1 volt video, ½ volt sync). Sweep rate should be 16.6 miliseconds veritcal, 63.5 microseconds horizontal. If the voltage levels are not correct, troubleshoot the problem using Schematic Sheet #4.
2. Connect the ADM-1A up to the Composite Video screen. Type characters on the screen. The characters should appear on the slave monitor. If they do not appear, troubleshoot the problem using Schematic Sheet #4.

OPTION 22
DATA INPUT PROCESSOR

GENERAL DESCRIPTION

The Data Input Processor is a necessary option. It must be factory installed since it represents the configuration difference between buffered and unbuffered units.

If the ADM-1A is an unbuffered unit, it will contain a 40-pin socket and 128348-1602 UART. Switch settings for unbuffered units are shown on page 7-4.

If the ADM-1A is a buffered unit, it will contain a 28-pin socket, a 40-pin socket, a fifo and a 128348-1602 UART. Switch settings for buffered units are shown on figure 1-4.

The positioning of the above parts is shown on the logic board drawing in Appendix D. See schematic sheet 13 for logic differences between buffered and unbuffered units.

INSTALLATION

Standard ADM-1A terminals are equipped with the normal configuration for buffered units. If an unbuffered unit is required, this option must be requested at the time the terminal is ordered.

OPTION 23
LOWER CASE

GENERAL DESCRIPTION

This option allows the ADM-1A terminal to receive and display lower case characters on the monitor when transmitted from the remote computer or other auxiliary device.

With the Extended Keyboard option installed, the ADM-1A can both receive and transmit lower case characters.

INSTALLATION

1. Install 24-pin socket at location R3 on the logic board.

2. Install Lower Case Character Generator in the scoket at location R3.

3. Set Switch S5-2 to the ON position to enable this option.

4. If negative characters are desired with this option, set switch S5-6 to the OFF position.

TEST PROCEDURES

1. Try typing each of the lower case characters.

2. If lower case is not displaying on the screen, re-check the switch settings on the terminal to be sure that the lower case option is enabled.

3. Check to be sure that the lighted UC key is off, since this key will disable the option when lit.

4. If lower case characters still do not appear, re-check the installation of the character generator to see that pin 1 is plugged into pin 1 on the logic board.

OPTION 24
24 LINES

GENERAL DESCRIPTION

The ADM-1A standard display contains storage for 12 80-character lines. Option 24 expands the display memory of the ADM-1A to 24 80-character lines or maximum storage of 1920 characters.

INSTALLATION

1. Install the eight RAMs (Part # 128348-4102) on the logic board in locations: R7, R8, R9, R10, R11, R12, R7/8, R8/9, R10/11.
2. Set switch S5-5 to the OFF position to enable this option.

TEST PROCEDURES

1. Write data on the screen - about ten lines.
2. If the option was installed incorrectly, every other line will be unintelligible. If this is the case, re-check the positioning of the RAMs.
3. If there are only twelve lines of data, re-check the switch settings to be sure that the 24-line option is enabled.

OPTION 25
RECEIVE BIT 8 CONTROL

GENERAL DESCRIPTION

The installation of this option allows the ADM-1A to receive the 8th bit (Protect Bit) from the computer and write it into memory. This is described as Condition A.

In Condition B (Standard) the ADM-1A is unable to sense the protect bit.

INSTALLATION

This no cost option may be ordered with the ADM-1A terminal or may be installed at a later date.

To modify the ADM-1A to incorporate this feature, cut an etch to E7-2 and install a jumper from E7-2 to E7-7. (See Schematic sheet 13.)

SWITCH SETTINGS

Switch A4-2 must be in the OFF position to enable this option.

OPTION 50
EDIT PACKAGE #1

GENERAL DESCRIPTION

The ADM-1A when equipped with Edit Package #1 can perform the following operations:

Character Insert (ESC Q). Causes the cursor and all characters to the right of the cursor to be shifted one position to the right. The cursor remains in the blank space created by the operation. The next character typed is inserted at the cursor position.

Character Delete (ESC W). Causes the character under the cursor to be deleted. All characters to the right of the cursor position on the line shift to the left to fill the space left by the deletion. A space is written in the last position on the line.

Line Insert (ESC E). Creates unprotected spaces on the line on which the cursor is positioned. All lines shift down and data on the last line of the screen is lost. The cursor remains on the blank line. This feature is inoperative in the Protect Mode.

Line Delete (ESC R). Deletes the entire line on which the cursor is positioned. All lines below the

cursor move up one line. This feature is inoperative in the Protect Mode.

Erase Page (ESC Y). Clears the unprotected data on the display from the cursor position to the end of the page.

ADDITIONAL FEATURES

Other features available on the ADM-1A with the Edit Package #1 installed include:

Back Tab (ESC I). In the Protect Mode causes the cursor to move backwards to the first character position of the nearest unprotected field. If the cursor is already in the first position, it backspaces to the first position of the previous unprotected field.

Send Partial Page (ESC S). In the Block Mode, causes an ASCII FS code to be stored in the display memory. The cursor backspaces until a previously stored FS code is encountered, then advances to the first unprotected position of the next line, transmitting all unprotected characters through the next FS code. The last character position is followed by a CR code.

INSTALLATION

1. If required, install Part #129301-21 Keytop set on the appropriate keys.

2. Install ROMs, when needed, at the proper locations depending on the configuration of the units and the other options installed.

   Unbuffered Models

   1. Install Part #129313-01 (if not present) at location P12 on the logic board.
   2. Install Part #129314-01 at location R12 on the logic board.
   3. If the terminal is equipped with a printer, check to be sure Part #129314-02 is installed at location R13.

   Buffered Models Without Polling

   1. Check to be sure that Part #129313-05 is installed at location P12.
   2. Install Part #129314-03 at location R12 on the logic board.

   Buffered Models With Polling

   1. Check the logic board to be sure that Part #'s 129313-02 and 129313-03 are installed at locations P12 and P13.
   2. Install Part #129313-04 at location P14. This will activate both the edit and Printer options.

3. Set the switch at S4 - 3 to the OFF position if the terminal is equipped with a Printer or polling option.

4. If the terminal is equipped with neither a printer or Polling, Switch S4 - 3 should be ON.

TEST PROCEDURES

1. Check to be sure that all switches are set correctly.

2. Try all edit functions from the keyboard. (Consult Operator's Handbook).

3. If switch settings are correct and the edit functions do not work, the ROM may be defective.

OPTION 51
SERIAL PRINTER INTERFACE OPTION

GENERAL DESCRIPTION

The printer interface option allows the ADM-1A to control a serial printer which is compatible with EIA RS-232 standards.

The interface will permit operation of the printer at any one of the transmission baud rates available for the ADM-1A.

The interface connector J3 on the ADM provides the following signals to/from the printer:

Pin	1	Ground
	3	Serial Data
	6	ADM Ready
	7	Common
	8	ADM Ready
	20	Printer Ready

The ADM-1A has provision for sending data to the printer in two modes: (1) page format and (2) free form.

(1) Page format: (ESC P)

a. The control character GS is written at the cursor position.

b. The cursor is moved to the HOME position.

c. The code sequence CR LF NULL is sent to the printer followed by the data on the screen.

d. NULL characters and trailing spaces are not sent.

At the end of each line, the CR LF NULL sequence is repeated before moving on to the next line. Upon reaching the STOP code, the operation is terminated, a final CR LF NULL is sent, and the STOP code is overwritten with a space.

If a STOP code is present in the text area, the printing will cease at that point.

While printing in this mode, the flow of data from ADM-1A may be controlled by the printer or by circuitry internal to the ADM-1A in the following ways:

1. INTERNAL – NO DELAY
   Data flow is continuous without delay between characters or rows.

2. INTERNAL – DELAY

3. EXTERNAL – PRINTER READY
   The ADM-1A monitors the state of the printer READY line (pin 20 of J3) to determine the "availability" of the printer to accept data. This arrangement is used with "buffered" printers which accept a full line of data before initiating the print operation.

These control configurations are established by jumper straps soldered on the ADM pc board as factory options and must be properly determined prior to preparation of the DTO form to assure that the proper configuration is shipped.

CONTROL TYPE	PRINTER TYPE (typical)
1.	Extel 150 baud
2.	G.E. Terminet
3.	Centronics

(2) Free Form format:

Envoked by ESC L (ADM-1A)

Printing begins at the location of the cursor and stops at an EM code. This mode does not insert line control characters (CR LF, etc.) into the data stream and does not provide any internal time delays. The data stream is continous, although the printer READY control operation as described above can be used to control operation as described above can be used to control the transfer of data. If the printer goes NOT READY, upon receipt of a control character (CR LF, etc.), that character should be followed by one or two RUBOUT characters to assure that no data will be lost.

In order to write control characters on the terminal screen, the system or operator should place the terminal in the free form or unformat mode (ESC U) prior to sending the text containing control characters that are to be written on the screen.

In free form print mode, nulls on the screen are NOT sent to the printer, and trailing spaces are NOT suppressed.

INSTALLATION

1. If no socket is present at location E/F5, install socket for UART at that location.

2. Install UART (Part #128348-1602) in the socket located at E/F5 on the logic board.

3. Install Part #128348-123 at location B11 on the logic board.

4. Install Part #128348-1488 at location A9 on the logic board.

5. Install Part #128348-1489 (Two) at locations A10 and A11 on the logic board.

6. Install 6-position switch (Part #435641) at location A12 so that pin 1 is toward the printer port connector and away from the outer board.

7. Install connector (Part #206584-1) in J3 at location A11/12 on the logic board, using the two jack sockets provided.

8. Install the 100μfd capacitor (Part #128349 -107) at location B11/12 on the logic board.

9. Install diode (Part #IN914) at location B11 on the logic board.

10. Install the 5.1K resistor (Part #128533-512) at location B11/12 on the logic board.

11. Install the 20K resistor (Part #128533-203) at location B11/12 on the logic board.

12. Install CTS switch (Part #CTS235-1) at location B1 with pin 1 toward the outer board.

13. Install ROMs, when needed, at the proper locations depending on the configuration of the unit and the other options installed.

Unbuffered Models

1. Check the logic board to be sure that Part #129313-01 is present at location P12 on the logic board.
2. Install Part #129314-02 at location R12/13.
3. If the terminal is equipped with the Edit Package (Option 50) check to be sure that Part #129314-01 is installed at location R12.

Buffered Models Without Polling

1. Check to be sure that Part #129313-05 is installed at location P12.
2. Install Part#129314-04 at location R12/13 on the logic board.

Buffered Models With Polling

1. Check to be sure that Part #'s 129313-02 and 129313-03 are present at locations P12 and P13.
2. Install Part #129313-04 at location P14. (Note: If the unit is equipped with the (Note: If the unit is equipped with the Edit Package, this ROM may already be installed).

16. Set Switches S2 and S4 as required to conform to the configuration of the printer.

17. Set Switch S3 as shown below:

1	ON - RTS on Pin 6
2	ON - RTS on Pin 8
3	ON - RTS 1 to CTS1
4	ON - Printer Delay
5	ON - Busy OFF - Ready
6	ON - J3 Pin 20 Active

TEST PROCEDURES

1. Check all switch settings to be sure that they conform to that of the printer.

2. Check to be sure that the proper cable and auxiliary jack are being used.

3. Connect the terminal to the printer.

4. Type some characters on the screen.

5. Type ESC/P. The printer should be working.

6. For further test operations, check the Option brochure.

OPTION 52
SPECIAL CHARACTER SET

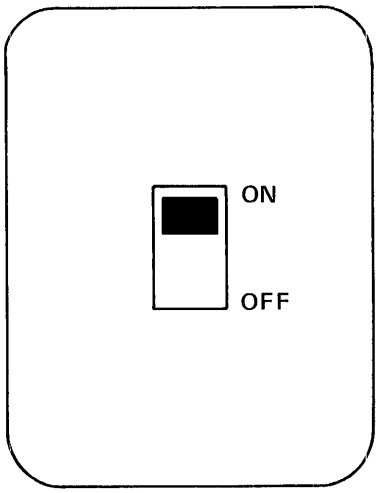
GENERAL DESCRIPTION

The Special Character Set Option available on the ADM-1A allows the user to select between a wide variety of foreign language and technical characters not traditionally available on a CRT display terminal. This option allows for the versatility of accessing up to 192 displayable characters. The character set selected is determined by the requirements of the individual user.

FUNCTIONAL DESCRIPTION

Through the addition of a three-position switch and a mask programmable ROM or an auxiliary board, the Extended ADM-1A Keyboard allows the user to select between lower case and any other 64-character set, as well as providing standard upper case, by setting the position of the switch installed with this option, on the upper left of the keyboard.

When the switch is in the ON position, the Special Character Set is enabled. When the switch is in the OFF position, Lower Case is enabled. Both optional character sets are disabled when the lighted UC key is ON, enabling only the Upper Case character set.



INSTALLATION

1. Add character set and character generator determined by customer requirements.
2. Install switch on keyboard. (Refer to Drawing 128591 Option 53.)
3. Replace 200r with 150r.

OPTION 53
EXTENDED KEYBOARD

GENERAL DESCRIPTION

The 81-key solid-state keyboard on the ADM-1A video display terminal incorporates optional features which are not available on the ADM-1A standard keyboard.

- A numeric pad (with period, comma, plus and minus) for rapid entry of numeric data.
- Lower case ASCII characters, expanding the displayable character set from 64 to 128 (includes upper and lower case, punctuation and control.)
- The UC (upper case) key to lock the keyboard into upper case letters.

SPECIFICATIONS

UL Approved. TTL compatible.
Output Levels: Bounce-Free
  Logic '1' 2.4V at .10 ma
  Logic '0' .6V at -10 ma
Two-Key Rollover
Repeat Function: Occurs when a key is depressed longer than 500-0 +200 ms
Dimensions: 14.6L x 6.0W x 1.12H

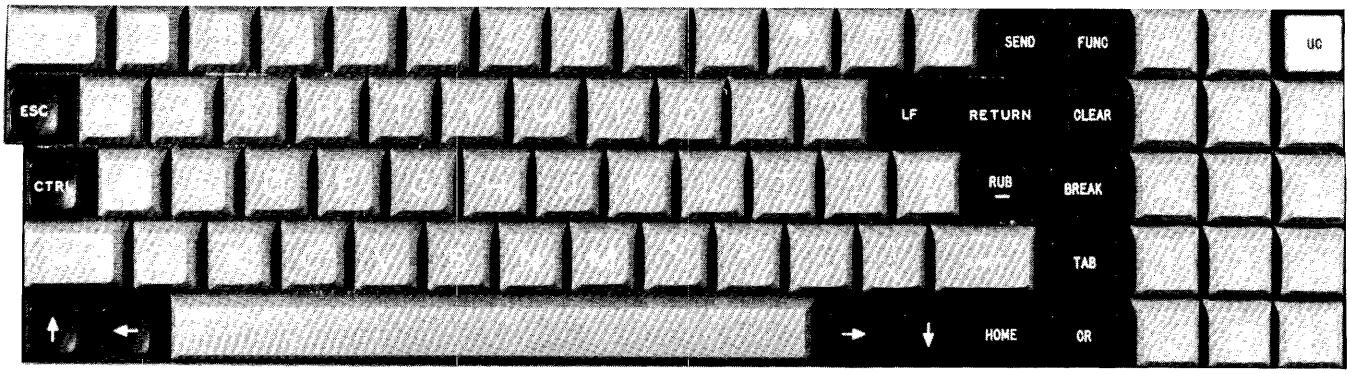
OPTIONS AVAILABLE WITH THE EXTENDED KEYBOARD

- Lower Case (Switch selectable)
- Edit Option
- Special Character Set
- Send/ESC/ALT Option

INSTALLATION

The ADM-1A Extended Keyboard should be ordered with the terminal.

NOTE: When plugging keyboard connector into socket, (16-pin keyboard) connector should be placed so that Pin 1 on socket and connector match up. This will leave 2 pin sockets in front.



OPTION 60
NUMERIC KEYPAD

GENERAL DESCRIPTION

The ADM-1A Numeric Keypad accessory is designed for fast, efficient entry of numeric data; faster than the standard keyboard because the ten numeric keys (0-9) and decimal point (period) are arranged in the familiar circular pattern. A Return key permits easy one-hand entry of multiple line tabular information.

Functionally, the auxiliary keypad parallels the standard alphanumeric keyboard, and is unaffected by the keyboard shift function. A three foot interface cable permits keypad positioning on either side of the ADM-1A terminal for most convenient operation.

Installation of the Numeric Keypad accessory may be performed at the factory or in the field by qualified ADM-1A service personnel.

SPECIFICATIONS

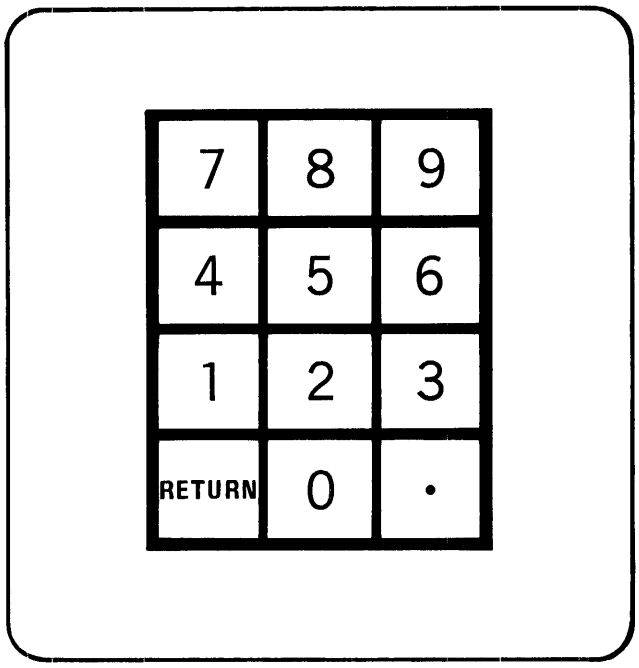
Dimensions – 3" high, 5" wide, 8½" deep

Weight – 1 pound, 5 ounces

Key Pattern – 12 keys (numeric 0-9, decimal point, RETURN) arranged in calculator type pattern

Interface – 3-foot flat ribbon cable mates with DIP socket on standard ADM-1A keyboard

key pattern



OPTION 61
129316-1 CABLE

GENERAL DESCRIPTION

This is a special conductive cable which is used to connect a Direct-Connect box to the terminal via the modem jack.

It is available in lengths from 10' to 50', and is supplied with Direct-Connect Box Pin designations are as follows:

Pin	Function
1	Frame Ground
2	Transmit Data
3	Receive Data
4	Request to Send
5	Clear to Send
6	Data Set Ready
7	Signal Ground
8	Carrier Detect
*9	+ 20V CL or DC1 Box Supply
11	Secondary transmit data
12	Secondary receive data
*14	- 20V supply to DC1 Box
17	CL Transmitter
20	Data Terminal Ready
23	CL Receiver

PARTS LIST

FIND NO.	QTY REQD				PART NUMBER	DESCRIPTION	LOCATION/REF DES	NOTES
1				1	129316-1	CABLE, RS232 & CURRENT LOOP		
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								

OPTION 61
TITLE OUTPUT CABLE
SHEET 1 OF 1

SIZE	CODE IDENT		REV
A	98438	129503	A
SCALE		SHEET 17	

GENERAL DESCRIPTION

This Edit Option allows the operator to perform various operations not possible with the standard unit.

This option may be installed on any ADM-1A equipped with the Extended keyboard. It may be ordered to function with Edit Package #1 or separately.

FUNCTIONAL CHARACTERISTICS

This option allows the Function Key to operate like the ESC Key on the standard terminal. Additional function commands are added: Clear to Protected spaces (ESC J); Clear to unprotected nulls (ESC K); Set Copyprint (ESC F); Reset Copyprint (ESC G). All function commands can be initiated from the computer using the ESC sequence or from the keyboard using the Function Key.

The CTRL Key, when used with any of the characters in Columns 1 and 2 of the Displayable Character Set transmits a 3-character sequence to the computer: SOH/Character/CR.

When the ADM-1A is operating in the Block Mode, this option causes an FS code to be automatically transmitted at the beginning of each protected field and a GS at the end of a line.

COPYPRINT

With this option installed on the ADM-1A, the Copyprint feature operates like an extension port, but has the added advantage of being controlled by the keyboard or computer.

When an ESC F is transmitted from the computer, or a FUNC/F is received from the keyboard, the printer will begin to copy all received data until such time as an ESC G (or FUNC/G) is set , terminating this operation.

INSTALLATION

This option should be ordered with the terminal and factory installed.

SECTION 8
PAINT

8.1 DRYING:

POLANE T®, catalyzed with POLANE® Catalyst V66 V 27, air-dries to touch and handle in 30-60 minutes, and can be force dried for 30 minutes at 180°-200° F. POLANE T® catalyzed with POLANE® Catalyst V66 V 29 air dries to touch and handle in 2-4 hours and can be force dried in 30 minutes at 200°-250° F.

8.2 POT LIFE:

POLANE T® is a two-component system — but this does not affect its production versatility. Finish coats have an 8 hr. working pot life after catalyzation. If it's necessary to "carry" catalyzed material over a week-end, simply add 80% uncatalyzed material to the mixture to extend pot life. On Monday, the required amount of catalyst is added.

8.3 PRECAUTIONS:

Do not spray hot. Heat will shorten pot life.

Do not pump from drums into circulating systems. Friction heat developed by pumps and circulation will shorten pot life.

Do not dip.

Do not flo-coat.

The catalyzing ratios as outlined have been established to provide optimum hardness, flexibility and chemical and solvent resistance. Slight over or under catalyzation will not seriously affect performance.

Excessive over catalyzation will result in increased hardness with marked brittleness and less flexibility. The gloss will also be increased. In the case of the spray fillers and glazing fillers, sanding will become more difficult.

Excessive under catalyzation will produce insufficient hardness, poor adhesion and poor chemical and solvent resistance.

POLANE T® should be applied only in well-ventilated areas. Wearing of a chemical cartridge respirator is recommended.

8.4 CHARACTERISTICS:

The tests below were conducted on standard POLANE T® quality. Test surface — Panels of Parker Bonderite 1000 with 1 to 1.2 mil dry film thickness of POLANE T®.

All tests conducted after fourteen days air curing period.

1. 5% salt spray — 500 hours, plus. Excellent
2. 100% relative humidity — 500 hours. No effect.
3. Water immersion — fresh, salt, distilled — 100 hours, plus. No effect.
4. Lacquer thinner, acetone, gasoline, Xylol resistance. 20 rubs with saturated cloth.
5. Excellent resistance to lubricating oils, coolants and phosphate ester hydraulic fluids.
6. 24 hours boiling water. Excellent.
7. Cold check: 16 cycles; 24 hours, 100% humidity; 24 hours, —10° F; 24 hours —72° F. — excellent.
8. Pencil hardness — H to 2H.
9. Flexibility — ⅛ inch conical mandrel. No effect.
10. Excellent abrasion resistance. Taber abrasion — CS17 wheel, 1000 gm. load: 2,500 revolutions/1 mil removal; 0.090 gm. loss/1,000 cycles.

Gloss — textured finish gloss range 10°-30°, measured on 60° photovoltmeter. Higher ranges are available.

8.5 APPLICATION CATALYZATION:

POLANE T® is a two-component finish, and must be catalyzed 6 parts base materials to 1 part POLANE® Catalyst V66 V 27 or V66 V 29. This mixture is then split into two batches — one for the smooth and one for the spatter coat that is necessary to obtain the textured effect.

Prior to application, the smooth base coat should then be reduced three parts catalyzed material to one part POLANE® Reducer R7 K 69.

The spatter coat is not reduced.

POLANE® Catalyst V66 V 27 is recommended for interior use. POLANE® Catalyst V66 V 29 is recommended for exterior use. The use of POLANE® Catalyst V66 V 27 on an exterior exposure would lead to premature chalking or loss

of gloss. The POLANE® Catalyst V66 V 29 produces a more chalk resistant coating with excellent gloss retention. POLANE® Catalyst V66 V 29 does however increase the cure time requirement.

8.6 REDUCTION:

POLANE T® Reducer R7 K 69 is a medium to fast evaporating solvent recommended for reducing catalyzed POLANE T® first smooth coat to spraying viscosity.

For more specific information on the catalyzation and reduction of POLANE T® materials, follow instructions on the direction label or request a detailed data sheet on the particular POLANE T® material in question.

8.7 SPRAYING:

POLANE T® Base coat can be applied with standard pressure or suction feed spray equipment. The texture coat must use pressure equipment.

Polane T® First (Base) Coat

Pressure feed — Use De Vilbiss MBC gun with E tip and needle and No. 765 air cap.
5-8 p.s.i. fluid pressure.
40-45 p.s.i. atomizing pressure.

Suction feed — Use De Vilbiss MBC gun with E tip and needle and No. 30 air can.
40-50 p.s.i. atomizing pressure.

The smooth first coat should be sprayed to approximately 1 mil dry. Allow 5 minutes to flash-off before application of the spatter coat.

Polane T® — Second Texture Coat

Use De Vilbiss MBC gun with E tip and needle and No. 70 air cap of Binks No. 19 gun with 66-66PD nozzle combination.
15 p.s.i. fluid pressure.
15-20 p.s.i. atomizing pressure.

For application by Ransburg, DeVilbiss or Nordson electronstatic hand guns, the solvent balance can generally be adjusted to the proper polarity using R7 K 69 reducer to produce satisfactory wrap of base coat.

These adjustments will vary with the particular POLANE T® material involved, and specific recommendations should be requested from the laboratory before conducting trial runs or tests.

In regard to the texture coat, the texture may be varied by balancing the atomizing against the fluid pressure until the desired size is obtained. The lower the atomizing pressure, the larger the pattern. The flatness of the pattern can be set by adjusting the viscosity of the spatter coat. The lower the viscosity, the flatter the texture. Recommendations above indicate no reduction for the spatter coat to obtain an acceptable pattern; however, reduction may be necessary to obtain special effects. Once the variables — viscosity, atomizing and fluid pressure — have been set, it is a simple matter to obtain a consistent texture on each part.

SECTION 9
PARTS LIST

If it becomes necessary to order spare or renewal parts for the ADM-1A terminal from Lear Siegler/ Electronic Instrumentation Division, include the following:

1) Part Description
2) Part Number
3) ADM-1A Serial Number

Routine Parts Information and/or order placement should be sent to:

Lear Siegler, Inc.
Electronic Instrumentation Division
Data Products Customer Service
714 North Brookhurst
Anaheim, California 92803

Emergency parts information and/or order placement may be made by telephoning:

Data Products Customer Service
(714) 774-1010 ext. 371
or
(800) 854-3805

ADM-1A PARTS LIST

Ref. Des.	Description	LSI Part No.	Mfg. Part No. MIL Type Des.	Mfg. Code	Qty.	Note
1	Board Assy, Std w/Printer	129338-21			1	
2	IC	128348-S00			1	
3	IC	128348-S157			8	
4	IC	128348-U			1	
5	IC	128348-11			2	
6	IC	128348-112			1	
7	IC	128348-113			6	
8	IC	128348-123			2	
9	IC	128348-125			13	
10	IC	128348-1488			3	
11	IC	128348-1489			4	
12	IC	128348-1502			1	
13	IC	128348-151			4	
14	IC	128348-154			2	
15	IC	128348-1602			5	
16	IC	128348-161			11	
17	IC	128348-166			1	
18	IC	128348-173			5	
19	IC	128348-175			13	
20	IC	128348-193			5	
21	IC	128348-2			6	
22	IC	128348-21			1	
23	IC	128348-2513			1	
24	IC	128348-27			4	
25	IC	128348-32			6	
26	IC	128348-33571			2	
27	IC	128348-38			1	
28	IC	128348-4102			16	
29	IC	128348-42			5	
30	IC	128348-6			1	
31	IC	128348-74			10	
32	IC	128348-7812			1	
33	IC	128348-7912			1	
34	IC	128348-8			6	
35	IC	128348-8554			1	
36	IC	128348-85			6	
37	IC	128348-86			4	
38	IC	128348-93			6	
39	Cap	128349-506			1	
40	Cap, CM 15-101	128518-101			1	
41	Cap 2.2 UF	128518-225			2	
42	Resistor	128555-102			3	
43	Resistor	128555-103			1	
44	Resistor	128555-121			1	
45	Resistor	128533-151			1	
46	Resistor	128533-185			1	
47	Resistor	128533-200			1	
48	Resistor	128533-201			1	
49	Resistor	128533-203			1	
50	Resistor	128533-221			1	
51	Resistor	128533-271			2	

ADM-1A PARTS LIST (Continued)

Ref. Des.	Description	LSI Part No.	Mfg. Part No. MIL Type Des.	Mfg. Code	Qty.	Note
52	Resistor	128533-393			1	
53	Resistor	128533-472			2	
54	Resistor	128533-512			1	
55	Resistor	128533-621			2	
56	Resistor	128533-913			3	
57	IC	128578-0			9	
58	IC	128578-10			4	
59	IC	128578-20			3	
60	IC	128578-30			3	
61	IC	128578-4			8	
62	Heat Sink	128593-3			1	
63	Plate, Closure	129305-19			1	
64	ROM	129315-2			1	
65	ROM	129315-3			1	
66	ROM	129315-4			1	
67	ROM	129315-5			1	
68	ROM	129314-5			1	
69	ROM	129314-4			1	
70	Cap	129529-104			22	
71	Cap	129529-108			2	
72	ROM	129351-6			1	
73	Board, PC	129558-7			1	
74	Cap, TE1059.5	129549-107			1	
75	Cap	129469-106			16	
76	Resistor, EB9115	129471-911			2	
77	Resistor	129472-151			1	
78	Screw, Jack	129475-5			5	
79	Network, Resistor	129476-472			8	
80	Resistor, Network	129476-512			1	
81	Pot, 100K YQ8383	801001			1	
82	Pot, 500 YQ8384	801002			1	
83	Socket CA14S10SD	802001			10	
84	Socket CA16S10SD	802002			2	
85	Socket, CA-18S-10SD	802003			1	
86	Socket CA24S10SD	802006			8	
87	Socket CA28S10SD	802007			1	
88	Socket CA40S10SD	802008			2	
89	Switch, MSS4350	804002			2	
90	Switch, 435640-3	804005			2	
91	Switch, 435640-1	804007			1	
92	Switch, CTS-235-1	804008			3	
93	Switch, 435640-7	804010			2	
94	Switch, 435668-7	804014			1	
95	Switch, MSS-4200R	804015			1	
96	Rectifier, Bridge W005M	808002			1	
97	Diode, IN 914	808003			7	
98	Diode, IN 4001	808004			1	
99	Diode, IN 5231B	808006			1	
100	Contact, 02-09-1133	809005			2	
101	Contact, 02-09-2133	809006			13	

ADM-1A PARTS LIST (Continued)

Ref. Des.	Description	LSI Part No.	Mfg. Part No. MIL Type Des.	Mfg. Code	Qty.	Note
102	Connector, 09-18-5061	809010			1	
103	Connector, 09-18-5094	809011			1	
104	Connector, 50107-1	809014			As req.	
105	Connector, 206584-1	809017			2	
106	Transistor, 2N3904	810001			2	
107	Transistor, 2N5550	810004			2	
108	Crystal, 800A-11.340 MHZ	811005			1	
109	Cover, 435238-5	815002			1	
110	Isolator, Optical MCI-2	819001			1	
111	Screw, 4-40X5/16 SL, BH, BRS, NI-P	821419			1	
112	Screw, 6-32X1/4 SL, BH, BRS, NI-P	821618			1	
113	Nut, 4-40 8003	822402			1	
114	Washer, 4 MW 401M	823401			1	
115	Washer, 4 Flat	823404			1	
116	Rivet, R3479X3/16	824006			2	
117	Rivet, R3479X1/4	824010			4	
118	Insulator, Mylar, 43-77-2	839001			1	
119	Insulator, 97405 or 4X1/32	839003			1	
1	ADM-1A Final Assy, 129338					
	Board	129300-7			1	
2	Wire Assy	128565-10			1	
3	Wire Assy	128565-5			1	
4	Wire Assy	128565-6			1	
5	Wire Assy	128565-7			1	
6	Wire Assy	128565-8			1	
7	Wire Assy	128565-9			1	
8	Cap	128587-1			1	
9	Plate, Hinge	128595-3			1	
10	Keyboard	129301-11			1	
11	Monitor, P4 Etch	129302-2			1	
12	Housing, ADM1 Extended Keyboard	129304-7			1	
13	Bracket, Fan	129305-13			1	
14	Stiffener	129305-15			1	
15	Plate, Top	129305-3			1	
16	Base, Chassis	129305-5			1	
17	Brkt, Keyboard	129305-7			1	
18	Plate, Ident Rev. A	129306-5			1	
19	Regulator	129312-3			1	
20	Transformer	129312-5			1	
21	Cable Assy	129318-1			1	
22	Cable	129318-11			1	
23	Nameplate	129336-3			1	
24	Nameplate	129336-5			1	
25	Nameplate	129336-7			1	

ADM-1A PARTS LIST (Continued)

Ref. Des.	Description	LSI Part No.	Mfg. Part No. MIL Type Des.	Mfg. Code	Qty.	Note
26	Nameplate	129336-9			1	
27	Board Assy, Std w/o Printer	129338-11			1	
28	Board Assy, Std w/Printer	129338-21			1	
29	Logo	129362			1	
30	Nameplate	129365-3			1	
31	Nameplate	129365-5			1	
32	Cord, Power 115VAC	129455-3			1	
33	Switch, TA101-TWB	804003			1	
34	Cable, Ribbon, 5142-024	812001			1	
35	Guard, Finger, 6-182-033	815001			1	
36	Gasket, 3/16X3/4X5'	819002			1	
37	Nut, Press 6-32-2	822602			21	
38	Nut, F19716-06	822605			1	
39	Nut, SS032-2	822606			5	
40	Circuit Breaker, 81504.5	836001			1	
41	Block, 912-2-K179-K475-K474	837001			1	
42	Fan 3-15-2470	838002			1	

APPENDIX A: ADM-1A MONITOR

CRT DISPLAY MONITOR
(See Schematic TV9-12)

The display monitor employed in the ADM-1A is a solid state unit for use in industrial and commercial installations.

The monitor features printed circuit board construction for reliability and uniformity. All circuits are transistorized. The synchronization circuits have been designed to accept separate vertical and horizontal drive signals, allowing for interface with industrial or simple sync sources. This feature simplifies the user's sync processing and mixing, allowing the unit to operate without composite syncs. The electronic packaging has been miniaturized for compatibility with small volume requirements.

Video Amplifier

The video amplifier consists of Q101 and its associated circuitry. The incoming video signal is applied to the monitor through the contrast control on logic board 129338 and R109 to the base of transistor Q101.

Transistor Q101 and its components comprise the video output driver with a gain of 17. Q101, operating as a Class B amplifier, remains OFF until a DC-coupled, positive signal arrives at its base and turns on the transistor. R111 adds series feedback which makes the terminal-to-terminal voltage gain relatively independent of transistor variations, as well as stabilizing the device against voltage and current changes caused by ambient temperature changes.

The negative signal at the collector of Q101 is DC-coupled to the cathode, resulting in a maximum available contrast ratio.

The brightness of the screen is determined by the negative potential at the grid and is varied by the brightness control located on the logic board 129338.

Vertical Deflection

Transistor Q102 is a programmable unijunction transistor. Together with its external circuitry, it forms a relaxation oscillator operating at a vertical rate of 60 (vert frequency) cycles. Resistor R115, variable resistor R116 and capacitors C105 and C106 form an RC network providing proper timing. When power is applied, C105 and C106 charge exponentially through the junction of R116 and R115 until voltage at the junction of R116 and C105 equals the anode 'A' firing voltage. At this time, one of the unijunctions diodes between anode and anode gage G becomes forward biased. This feature programs the firing of Q102 and prevents the unijunction from controlling the parameter.

The vertical oscillator is synchronized externally to the verticial interval from the vertical drive pulse at R113. At the time of the vertical interval, an external negative pulse is applied through R113, C104 and C101 to gate Q102, causing the firing level of the unijunction to decrease. (See Schematic TV 9-12).

The sawtooth voltage at anode Q102 is directly coupled with the base of Q103. Q103 is a driver amplifier which has two transistors connected as a Darlington Pair. Their input and output leads exit as a three terminal device. This device exhibits a high input impedance to Q102 and thereby maintains impedance isolation between Q102 and Q104.

C105 and C106 modify the output waveform to compensate for the sensitivity of the unijunction oscillator. The sawtooth waveform output at Q103 is coupled through the vertical parabola (P122). The parabolic waveform is then added to the oscillator's waveform, changing its slope. The slope change rate is determined by the position of the variable resistor (R121) linearity adjustment.

Q103 supplies current through R123 and R124 to vertical output transistor, Q104. Height control (R124) varies the amplitude of the sawtooth voltage present at the base of Q104, varying the size of the vertical raster.

The vertical output (Q104) uses a power-type transistor which operates as a class A amplifier. No output transformer is necessary since the output impedance of the transistor permits an impedance match with the yoke.

C107 is a DC-blocking capacitor, allowing only AC voltage to produce yoke current. L1 is relatively high impedance when compared to yoke inductance. During retrace time, a large positive pulse is produced by L1 which reverses the current

through the yoke and moves the beam from the bottom of the screen to the top.

Resistor R126 prevents oscillations by providing damping across the vertical deflection coils.

HORIZONTAL DEFLECTION

A driver stage (Q105 and T101) is used to obtain a signal appropriate for driving the horizontal output transistor (Q106).

A positive pulse is coupled through R127 through the base of Q105. The amplitude and duty cycle of this waveform must be as indicated in the electrical specifications (figure A-1) for proper circuit operation.

The driver stage is cut off and driven by the base signal. The output signal appears as a rectangular waveform. It is transformer coupled to the base of the horizontal output stage. The polarity of the voltage at the driver transformer is set up so that Q106 is cut off when Q105 conducts and vice versa.

During conduction of the dirver transistor, energy is stored in the coupling transformer. The voltage at the secondary is then positive and keeps Q106 cut off. As soon as the primary current of T101 is interrupted due to the base signal driving Q105 into cut off, the secondary voltage changes polarity. Q106 starts conducting, and its base current flows. This gradually decreases at a rate determined by the transformer inductance and circuit resistance.

The Horizontal Output Stage has five main functions:

- To supply the yoke with correct horizontal scanning currents.
- To develop a "C" VDC supply voltage for use with the CRT.
- To develop a + VDC supply voltage for the video output stage.
- To develop a + VDC supply voltage for the CRT bias.

Q106 acts as a switch which is controlled by a rectangular waveform on the base. When Q106 is turned on, the supply voltage plus the charge on C113 causes yoke current to increase in a linear manner and moves the beam from the near center to the right side of the screen. At this time, the transistor is turned off by a positive voltage on its base which causes the output circuit to oscillate. A high reactive voltage in the form of a negative half circle pulse is developed by the yoke's inductance and the primary of T2. The peak magnetic energy which was stored in the yoke during scan time is then transferred to C109 and the yoke's distributed capacity. During this cycle, the beam is returned to the center of the screen.

The distributed capacity now discharges into the yoke and induces a current in a direction opposite the current in the previous part of the cycle. The magnetic field thus created moves the scanning beam to the left of the screen.

After slightly more than a half a cycle, the voltage across C109 biases the damper diode CR103 into conduction and prevents the flyback pulse from oscillating. The magnetic energy that was stored in the yoke from the discharge of distributed capacity is released to provide sweep for the first half scan and to charge C113 through the rectifying action of the damper diode. The beam is then at the center of the screen. This cycle will be repeated when the base voltage of C106 again becomes negative.

C113 blocks DC currents through the yoke causing the "S" shaping of the current waveform. "S" shaping compensates for stretching at the left and right sides of the picture tube caused by the fact that the curvature of the CRT face and the deflected beam do not describe the same arc.

L101 is an adjustable width control. It is placed in series with the horizontal deflection coils. The variable inductive reactance allows a greater or lesser amount of deflection current to flow through the horizontal yoke, varying the width of the horizontal scan.

The negative flyback pulse developed during horizontal retrace time is rectified by CR104 and filtered by CR110. This produces -160 VDC which is coupled through the brightness control to the cathode of the CRT.

This pulse is transformer coupled to the secondary of transformer T2 where it is rectified by CR2, CR106 and CR105 to produce rectified voltages of approximately 12 kV (9 and 12 inches) or 9 kV (5 inches), "C" VDC and "B" VDC respectively. 12 kV or 9 kV is the anode voltage for the CRT. "C" VDC serves as the source voltage for grids 2 and 4 (focus grid) of the CRT. The "B" VDC potential is the supply voltage for the video output amplifier Q101.

MONITOR ELECTRICAL SPECIFICATIONS

FIGURE A-1. INPUT DATA SPECIFICATIONS

	Video	Vertical Drive Signal	Horizontal Drive Signal
Input Connector	(Necessary Accessory – Available) Printed circuit board card edge connector – Viking No. 2VK10S/1-2 or Amphenol No. 225-21031-101		
Pulse Rate or Width	Pulse Width: 100 nsec or greater	Pulse Rate: 47 to 63 pulses/sec	Pulse Rate: 15,000 to 16,500 pulses/sec
Amplitude	Low = Zero $^{+0.4}_{-0.0}$ volts High = 4 ± 1.5 volts		
Signal Rise and Fall Times (10% to 90% amplitude)	Less than 20 nsec	Less than 100 nsec	Less than 50 nsec
Input Signal Format			

DATA DISPLAY SPECIFICATIONS

Input Impedance

	Minimum Shunt Resistance	Maximum Shunt Capacitance
(a) Video Input:	3.3 k ohms	40 pF
(b) Vertical Drive Input:	3.3 k ohms	40 pF
(c) Horizontal Drive Input:	470 ohms	40 pF

Video Amplifier

(a) Bandwidth:	12 MHz (-3 dB)
(b) Rise and Fall Times (10% to 90% amplitude):	Less than 35 nsec (linear mode)
(c) Storage Time:	15 nsec, maximum (linear mode)

Retrace and Delay Times

(a) Vertical:	900 μsec retrace, maximum
(b) Horizontal:	7 μsec retrace plus 4 μsec delay, maximum

CATHODE RAY TUBE DISPLAY SPECIFICATIONS

Nominal Diagonal Measurement (inches)	Phosphor	*Resolution (TV Lines)	
		Center	Corner
12	P4	900 at 40 fL	800 at 40 fL
12	P31	900 at 20 fL	800 at 20 fL

*Resolution is measured in accordance with EIA RS-375 except Burst Modulation (or Depth of Modulation) is adjusted for 100 percent.

Geometric Distortion

The perimeter of a full field of characters shall approach an ideal rectangle to within ±1.5% of the rectangle height.

Power Requirements

Input Connector Receptacle, Molex No. 03-06-1041 Supplied with Unit
Mating Plug, Molex No. 03-06-2041 – Necessary Accessory (Available)

Input Voltage 105 V to 130 V rms (120 V nominal); 50/60 Hz

Input Power 24W (Nominal)

Output Voltages +15 V DC (short circuit protected)
+12 kV DC; 12.6 V rms

ENVIRONMENTAL SPECIFICATIONS

Temperature (Chassis or Custom Unit)

Operating Range: 5°C to 55°C Ambient

Storage Range: -40°C to 65°C

Humidity

5 to 80 percent (Noncondensing)

Altitude

Operating Range: Up to 10,000 feet

HUMAN FACTORS SPECIFICATIONS

X-Ray Radiation

These units comply with DHEW Rules–42-CFR-Part 78

CONTROLS

(1) Contrast, 500 ohm potential carbon composition ⩾ 1/8 watt

(2) Brightness, 100 kilohm potentiometer ⩾ 1/8 Watt

Optional: The Brightness Control can be mounted on the printed circuit board as an internal setup control.

Internal Setup Controls

(1) Height

(2) Vertical Linearity

(3) Vertical Hold

(4) Focus

(5) Width

(6) Low Voltage Adjust

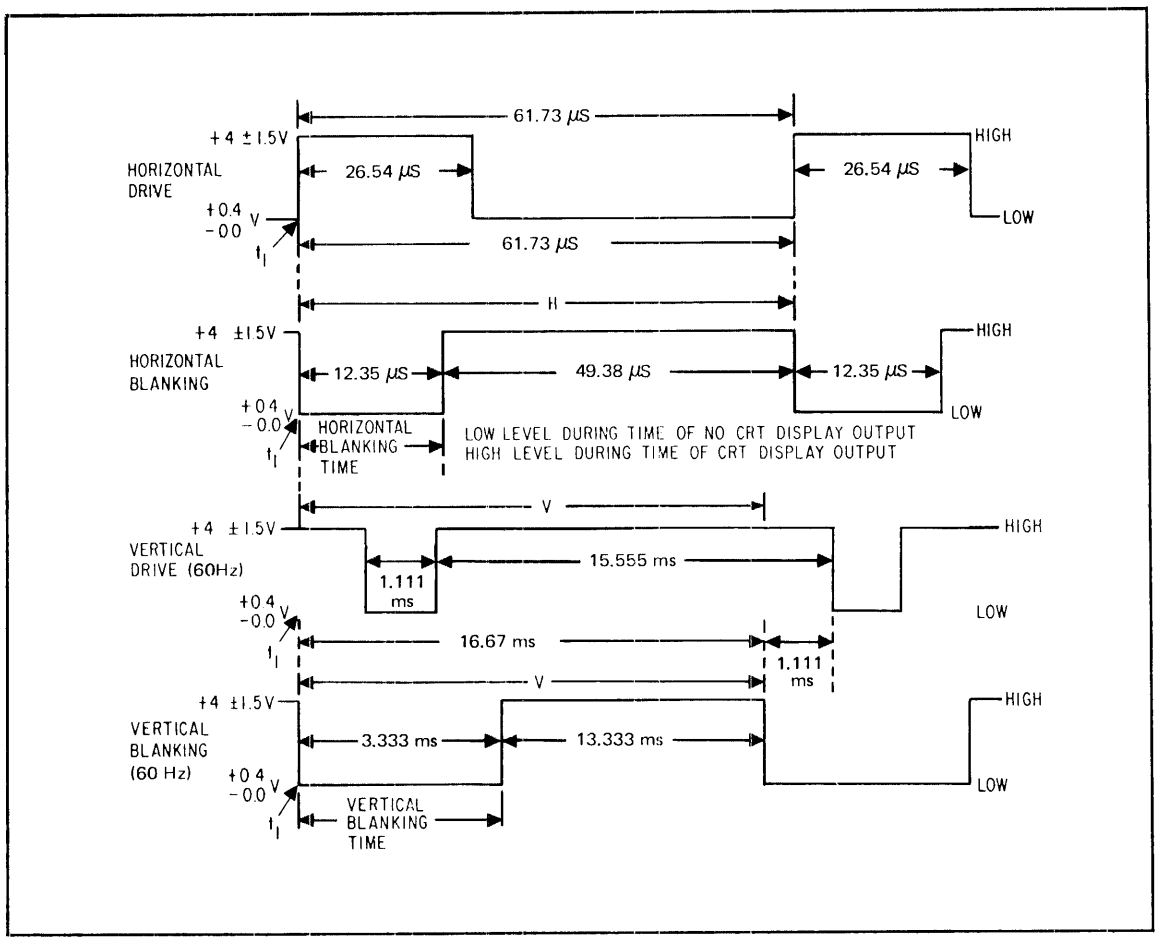


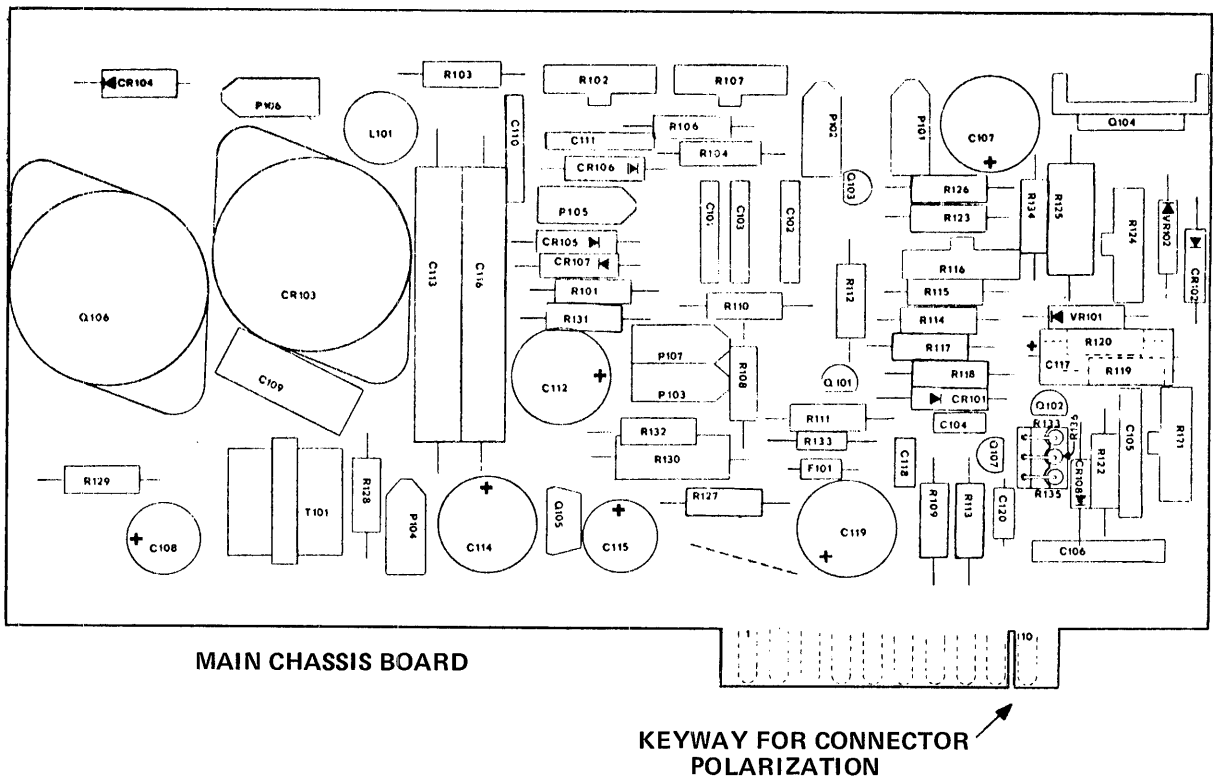
FIGURE A-2. SYNCHRONIZATION AND BLANKING GENERATOR WAVEFORMS

NOTES:
1. The leading edges of Drive and Blanking waveforms must start at time T_1. Nominal Blanking Times should be observed.
2. H = time from start of one line to start of next line.
3. V = time from start of one field to start of next field.
4. Video pulse width should be equal to or greater than 100 nsec.

MONITOR TROUBLESHOOTING GUIDE

	Symptom	Possible Remedy
1.	Screen is dark	Check "A" bus Q106, Q105, CR2
2.	Loss of video	CR 105, Q101
3.	Power consumption is too high	Check horizontal drive waveform; check proper placement of horizontal linearity sleeve; Q105, Q106
4.	Low voltage bus incorrect (for units with a low voltage supply)	Q202, Q203, Q1 (Note: Low voltage supply will indicate low or "0" volts due to its current limiting action if a short is evident in the "A" volt line.

The voltage waveforms are shown in Figure A-4. Refer to Appendix A for interconnecting cabling diagrams, circuit board component locations and monitor schematic.



NOTE:
F101 AND R108 ARE USED ONLY WHEN LOW VOLTAGE POWER SUPPLY IS NOT SUPPLIED.

FIGURE A-3. MONITOR CIRCUIT BOARD COMPONENTS LOCATION

MONITOR ADJUSTMENTS

When making internal adjustments to the CRT monitor, reference should be made to Schematic 35-163.

SYNCHRONIZATION AND DRIVE SIGNALS

Apply horizontal and vertical drive signals to the horizontal and vertical drive terminals as indicated on the schematic. Adjust their levels to a nominal +4V peak-to-peak. The duty cycle of each signal must be adjusted as described above.

The Horizontal drive signal is required to initiate horizontal scan and high voltage and should be connected before applying power to the monitor.

LOW VOLTAGE SUPPLY

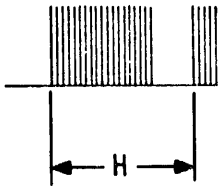
Set the DC voltage resistor R208 as indicated on the schematic. This voltage can be monitored at the junction of R114 and R130.

BRIGHTNESS

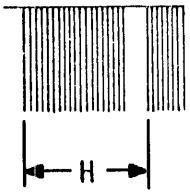
Normally, the monitor will be used to display alphanumeric or other black and white information. Moreover, the usual visual polarity produces white characters on a black background.

The brightness control should be adjusted at a point where the white raster is extinguished.

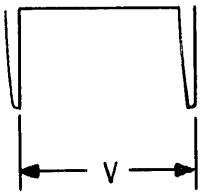
WAVEFORMS



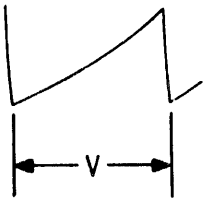
Q101-B
2.5V P-P



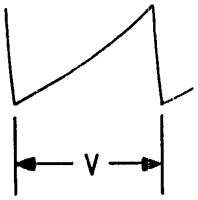
V1-CATHODE
20V P-P



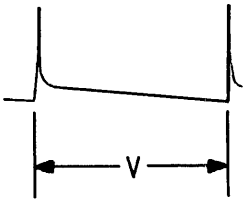
CR101-ANODE
3V P-P



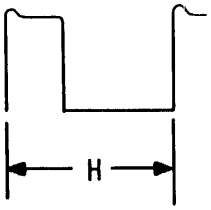
Q103-B
4.5V P-P



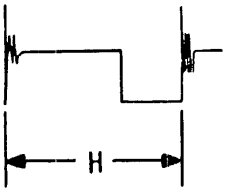
Q104-B
1.2V P-P



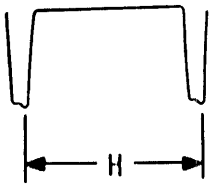
Q104-C
45V P-P



Q105-B
3V P-P



Q105-C
30V P-P



Q106-C
170V P-P

FIGURE A-4. VOLTAGE WAVEFORMS FOR MONITOR

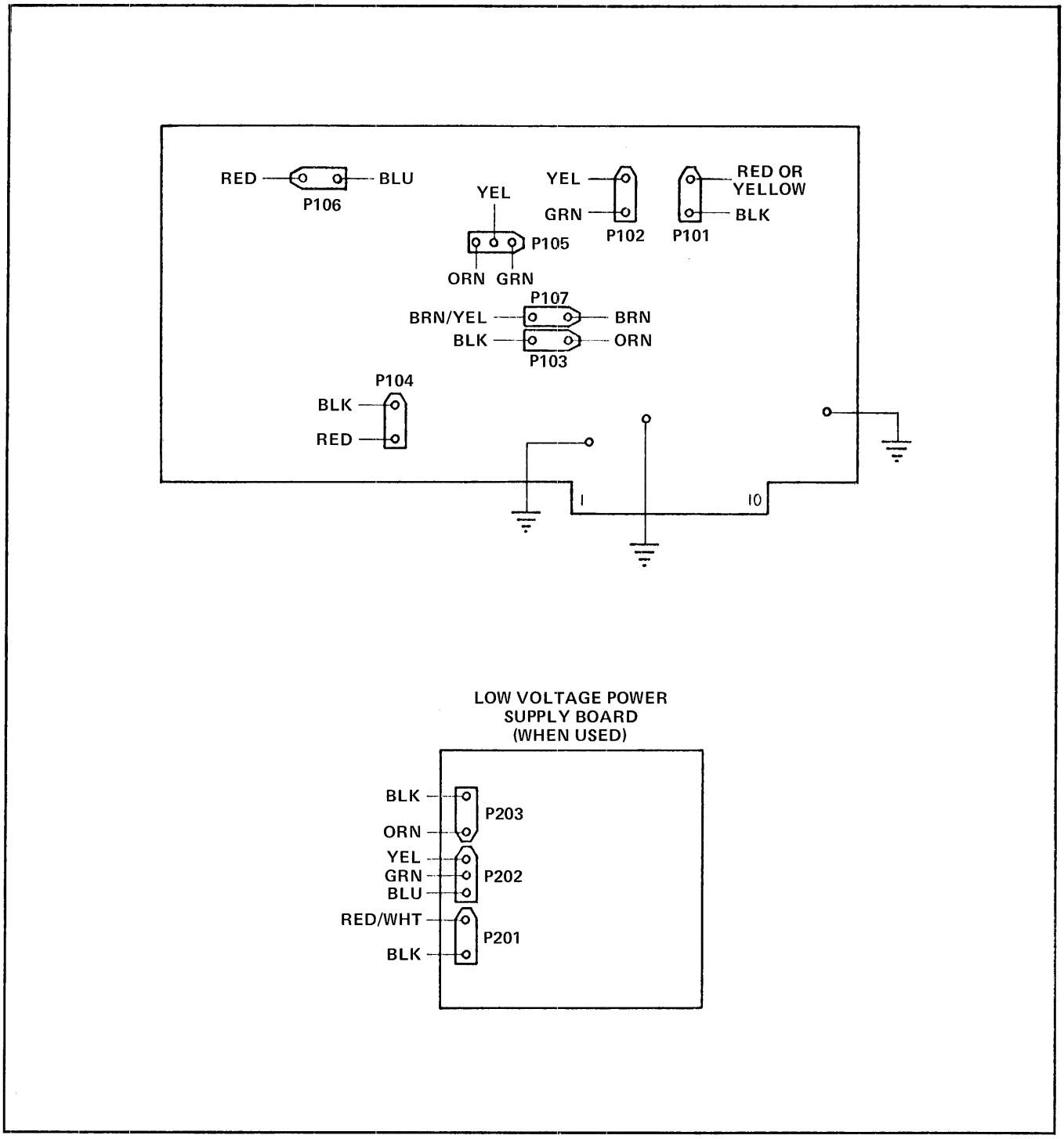


FIGURE A-5. MONITOR INTERCONNECTING CABLING DIAGRAM

The CRT will then be at its cut-off point, and a maximum contrast ratio can be obtained when the video signal is applied.

VIDEO CONTRAST

Q101 is designed to operate linearly when a +2.5 V signal is applied to its base. The ADM-1A incorporates a 500 ohm external contrast control to maintain this level. This control should be adjusted for a typical signal level of 2.5 V peak-to-peak when measured at the video input terminal of the printed circuit board edge connector. (Refer to Schematic)

In all cases, the output DC impedance of the video signal source must be 500 ohms or less.

VERTICAL ADJUSTMENTS

There is a slight interaction among the vertical frequency, height and linearity controls. A change in the height of the picture may affect linearity.

1. Apply video and synchronization signals to the monitor.
2. Set the vertical frequency control, R116, near the mechanical center of its rotation.
3. Adjust the vertical height control, R124, for the desired height.
4. Adjust the vertical linearity control, R121, for the best vertical linearity.
5. Remove the vertical drive signal from the unit. Or, alternatively, use a short jumper lead and short the vertical drive input terminal of the printed circuit card edge connector to ground.
6. Readjust the vertical frequency control, R116, until the picture rolls up slowly.
7. Restore vertical drive to the monitor.
8. Recheck height and linearity.

HORIZONTAL ADJUSTMENTS

Raster width is affected by a combination of the low voltage supply, width coil L101, and the horizontal linearity sleeve located on the neck of the CRT beneath the yoke.

1. Apply video and synchronization signals to the monitor. Insert the horizontal linearity sleeve about 2/3 its length under the yoke. (If you received a monitor from the factory in which the placement of the linearity sleeve has been determined, mark the sleeve and reinsert it in the place indicated). If the linearity sleeve is inserted further than necessary, excessive power will be consumed and the horizontal output circuitry could be overstressed.
2. Adjust the horizontal width coil, L101, for the desired width.
3. Insert the linearity sleeve further under the yoke to obtain the best linearity. Although this adjustment will affect the raster width it should not be used solely for that purpose. The placement of the linearity sleeve should be optimized for the best linearity.
4. Readjust L101 for the proper width.
5. Observe final horizontal linearity and width and touch up either adjustment as needed.
6. To adjust Horizontal Linearity after yoke is placed correctly:
   a) Loosen strap that holds CRT yoke in place.
   b) Type H's across the CRT and along the left or right margin.
   c) Adjust the nu-metal strip (not yoke) forward or back until the character on the left looks the same as that on the right.

No horizontal hold control is used in this monitor. The raster should be properly locked and centered when the horizontal drive signals are used as described above.

FOCUS ADJUSTMENT

The focus control, R107, provides an adjustment for maintaining best overall display focus. However, because of the construction of the gun assem-

bly in the CRT, this control does not have a large effect on focus.

CENTERING

If the raster is not properly centered, it may be repositioned by rotating the ring magnets behind the deflection yoke.

The ring magnets should not be used to offset the raster from its nominal center because it would degrade the resolution of the display. If the picture is tilted, rotate the entire yoke.

CHANGE NOTICE

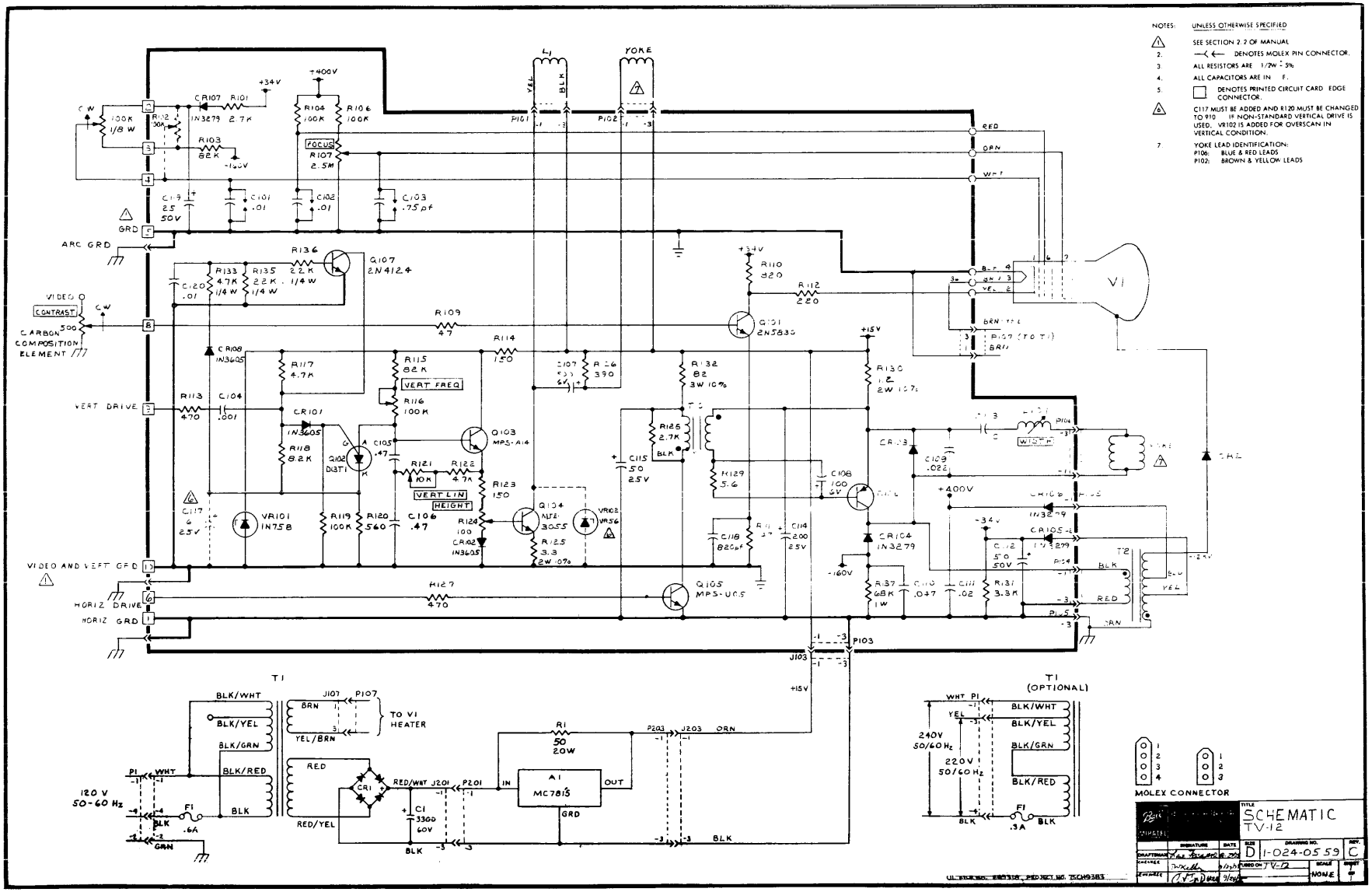
The following change(s) will be incorporated into the piece(s) of equipment manufactured by BBRC/EDD described below.

This change would not affect form, fit, or function as it would be viewed as an improvement to the overall performance of the monitor.

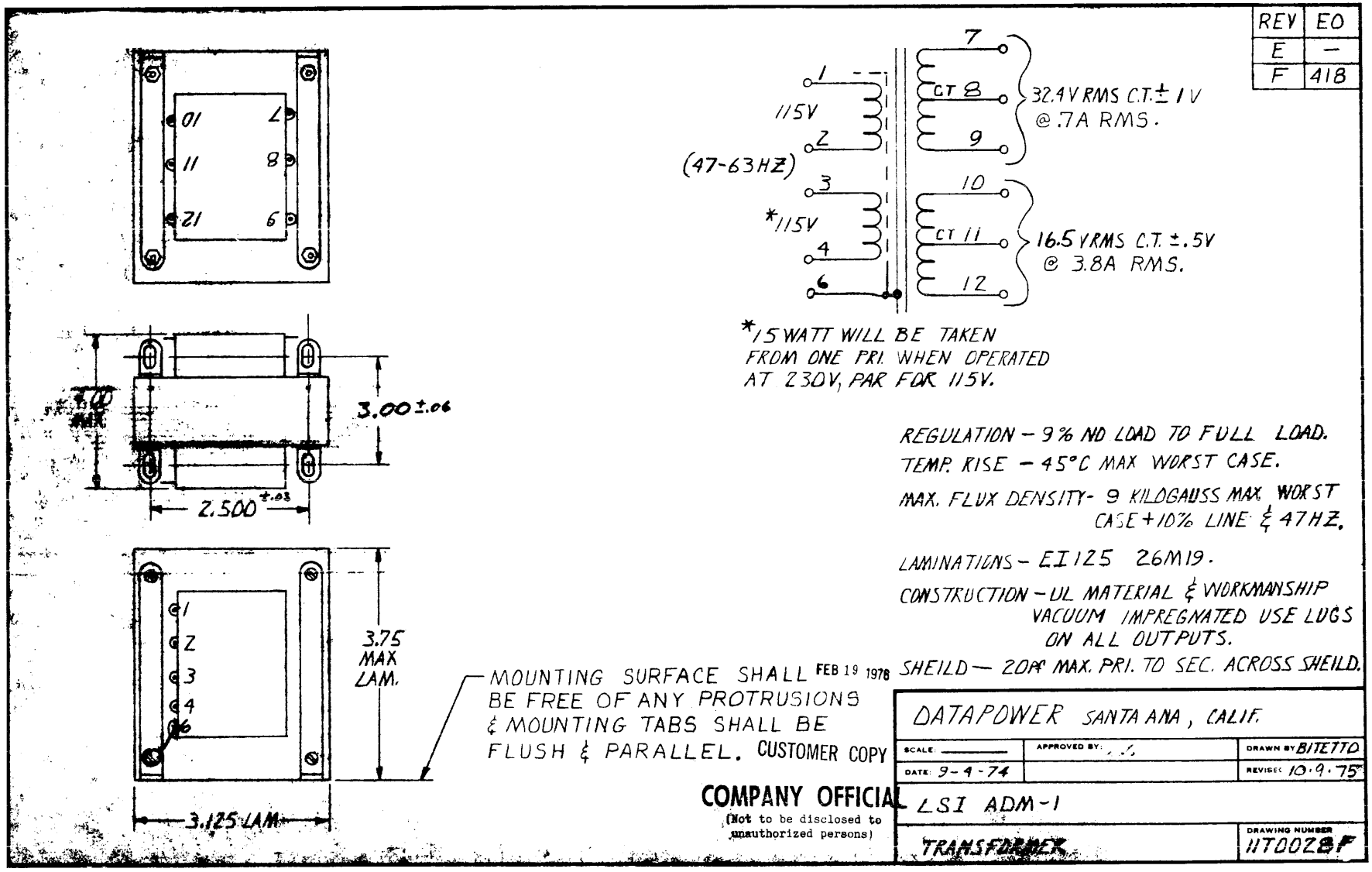
PRODUCT AFFECTED: TV12

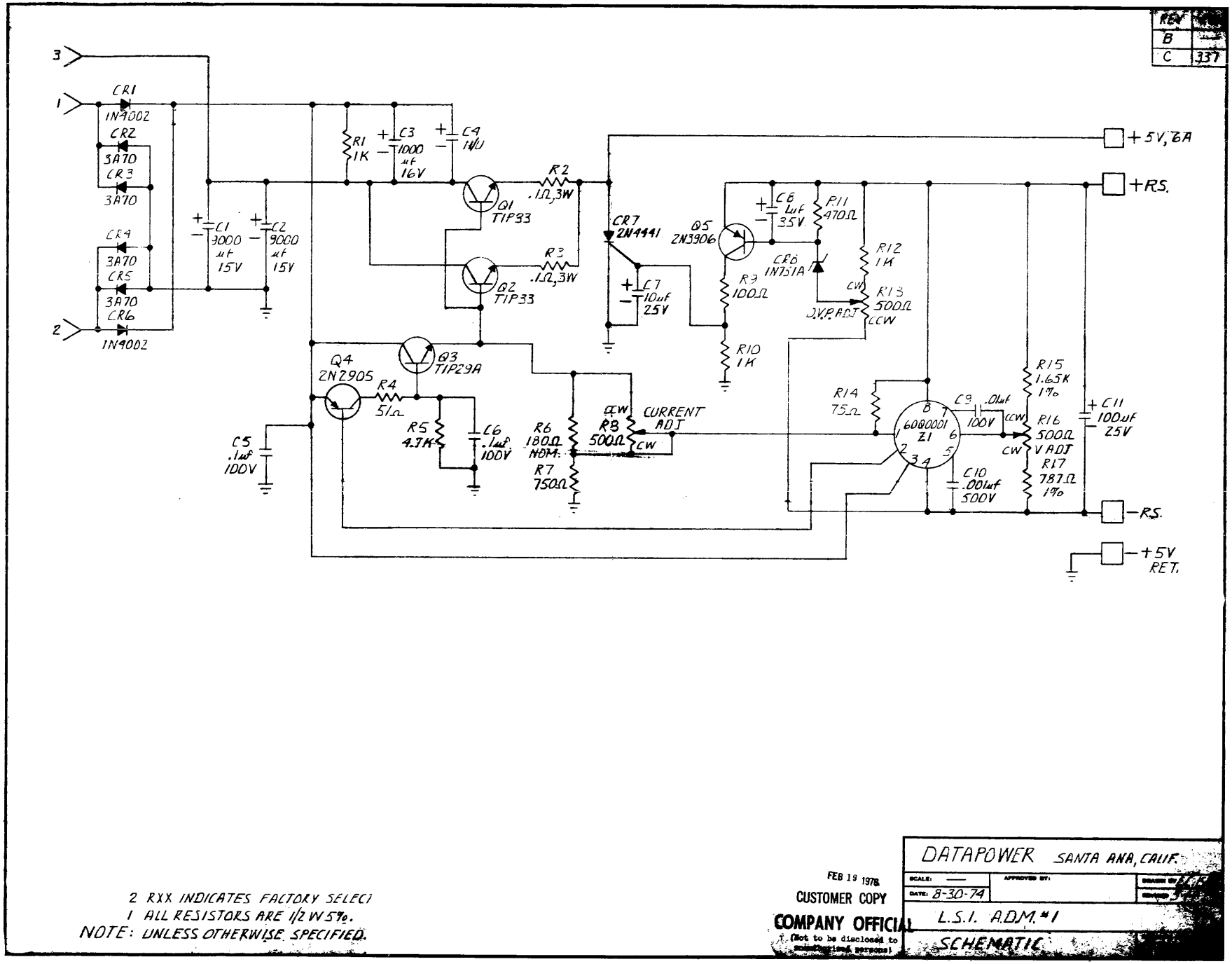
REASON FOR CHANGE: To provide better temperature stability

CHANGE	FROM	TO
R123	150 ohm 1/2 watt 5% resistor	56 ohm 1/2 watt 5% resistor
R124	100 ohm var. res. 1/8 w.	250 ohm var. res. 1/8 w.
R125	3.3 ohm 2 w. 10% resistor	6.8 ohm 2 w. 5% resistor
R126	390 ohm 1/2 w. 5% resistor	680 ohm 1/2 w. 5% resistor


NOTES: UNLESS OTHERWISE SPECIFIED
1. SEE SECTION 2.2 OF MANUAL
2. DENOTES MOLEX PIN CONNECTOR.
3. ALL RESISTORS ARE 1/2W ± 5%
4. ALL CAPACITORS ARE IN µF.
5. DENOTES PRINTED CIRCUIT CARD EDGE CONNECTOR.
6. C117 MUST BE ADDED AND R120 MUST BE CHANGED TO 910 IF NON-STANDARD VERTICAL DRIVE IS USED. VR102 IS ADDED FOR OVERSCAN IN VERTICAL CONDITION.
7. YOKE LEAD IDENTIFICATION:
P106: BLUE & RED LEADS
P102: BROWN & YELLOW LEADS
L1
YOKE
+400V
+34V
CR107 IN3279
R101 2.7K
R102 50K
R103 82K
-160V
R104 100K
R106 100K
FOCUS
R107 2.5M
C101 .01
C102 .01
C103 .75pf
C119 2.5 50V
GRD
ARC GRD
VIDEO CONTRAST
CARBON COMPOSITION ELEMENT
R133 4.7K 1/4W
R135 2.2K 1/4W
R136 2.2K
Q107 2N4124
C120 .01
R109 47
R114 150
CR108 IN3605
R117 4.7K
R115 82K
VERT FREQ
R116 100K
VERT DRIVE
R113 470
C104 .001
CR101 IN3605
R118 8.2K
Q102 D13T1
C105 .47
Q103 MPS-A14
R121 10K
R122 4.7K
VERT LIN
HEIGHT
R123 150
C117 6 25V
VR101 IN758
R119 100K
R120 560
C106 .47
R124 100
CR102 IN3605
Q104 MPS-U05
R125 3.3 2W 10%
VR103 VR56
VIDEO AND VERT GRD
HORIZ DRIVE
HORIZ GRD
R127 470
Q105 MPS-U05
C107 6V
R126 390
C115 50 25V
R132 82 3W 10%
R125 2.7K
R129 5.6
C108 100 6V
C118 820pf
C114 200 25V
R137 68K 1W
C110 .047
C111 .02
R131 3.3M
R130 1.2 2W 10%
+15V
+34V
R110 820
R112 220
Q101 2N5838
-34V
-160V
+400V
CR103
CR104 IN3279
CR105 IN3279
CR106 IN3279
C109 .022
C112 50 50V
T2
WIDTH
P103
J103
P101
P102
P104
P105
P106
P107 (TO T1)
RED
ORN
WHT
BRN
BLK
YEL
V1
T1
BLK/WHT
BLK/YEL
BLK/GRN
BLK/RED
J107
P107
BRN
YEL/BRN
TO V1 HEATER
RED
RED/YEL
120 V 50-60 Hz
P1
WHT
F1 .6A
BLK
GRN
CR1
RED/WHT J201
P201
C1 3300 60V
R1 50 20W
A1 MC7815
IN
OUT
GRD
P203
J203
ORN
T1 (OPTIONAL)
WHT P1
240V 50/60Hz
220V 50/60Hz
F1 .3A
MOLEX CONNECTOR
SCHEMATIC
TV-12
SIZE D
DRAWING NO. 11-024-0559
REV. C
SCALE NONE
SHEET 49
UL RECOG. E82318, PROJECT NO. 75CH9383

APPENDIX B: ADM-1A POWER SUPPLY

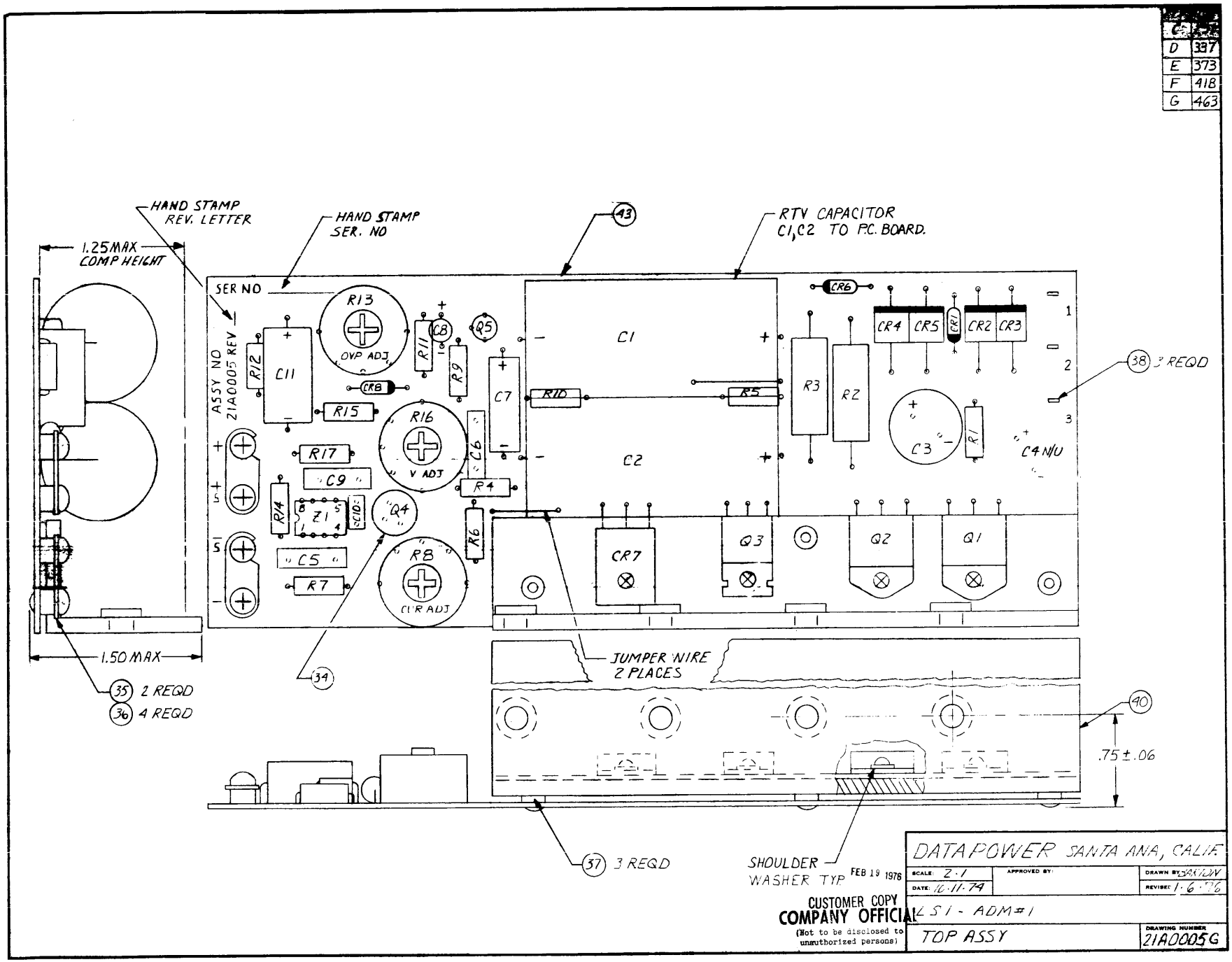

01
11
21
7
8
6
1
115V
2
(47-63HZ)
3
*115V
4
6
7
CT 8
9
32.4V RMS C.T.± 1V
@.7A RMS.
10
CT 11
12
16.5V RMS C.T. ±.5V
@ 3.8A RMS.
*15 WATT WILL BE TAKEN
FROM ONE PRI. WHEN OPERATED
AT 230V, PAR FOR 115V.
3.00 MAX
3.00±.06
2.500±.03
1
2
3
4
6
3.75
MAX
LAM.
3.125 LAM
REGULATION – 9% NO LOAD TO FULL LOAD.
TEMP. RISE – 45°C MAX WORST CASE.
MAX. FLUX DENSITY- 9 KILOGAUSS MAX. WORST
CASE+10% LINE & 47HZ.
LAMINATIONS – EI125 26M19.
CONSTRUCTION – UL MATERIAL & WORKMANSHIP
VACUUM IMPREGNATED USE LUGS
ON ALL OUTPUTS.
SHEILD – 20A MAX. PRI. TO SEC. ACROSS SHEILD.
MOUNTING SURFACE SHALL BE FREE OF ANY PROTRUSIONS & MOUNTING TABS SHALL BE FLUSH & PARALLEL.
FEB 19 1976
CUSTOMER COPY
COMPANY OFFICIAL
(Not to be disclosed to unauthorized persons)
REV | EO
E | –
F | 418
DATAPOWER SANTA ANA, CALIF.
SCALE
APPROVED BY:
DRAWN BY BITETTO
DATE 9-4-74
REVISED 10-9-75
LSI ADM-1
TRANSFORMER
DRAWING NUMBER
117002 F



2 RXX INDICATES FACTORY SELECT
1 ALL RESISTORS ARE 1/2 W 5%.
NOTE: UNLESS OTHERWISE SPECIFIED.

FEB 19 1978
CUSTOMER COPY
COMPANY OFFICIAL
(Not to be disclosed to [illegible])

DATAPOWER SANTA ANA, CALIF.
SCALE: —
APPROVED BY:
DRAWING NO. 4[illegible]
DATE: 8-30-74
REVISED 3[illegible]
L.S.I. A.D.M. #1
SCHEMATIC

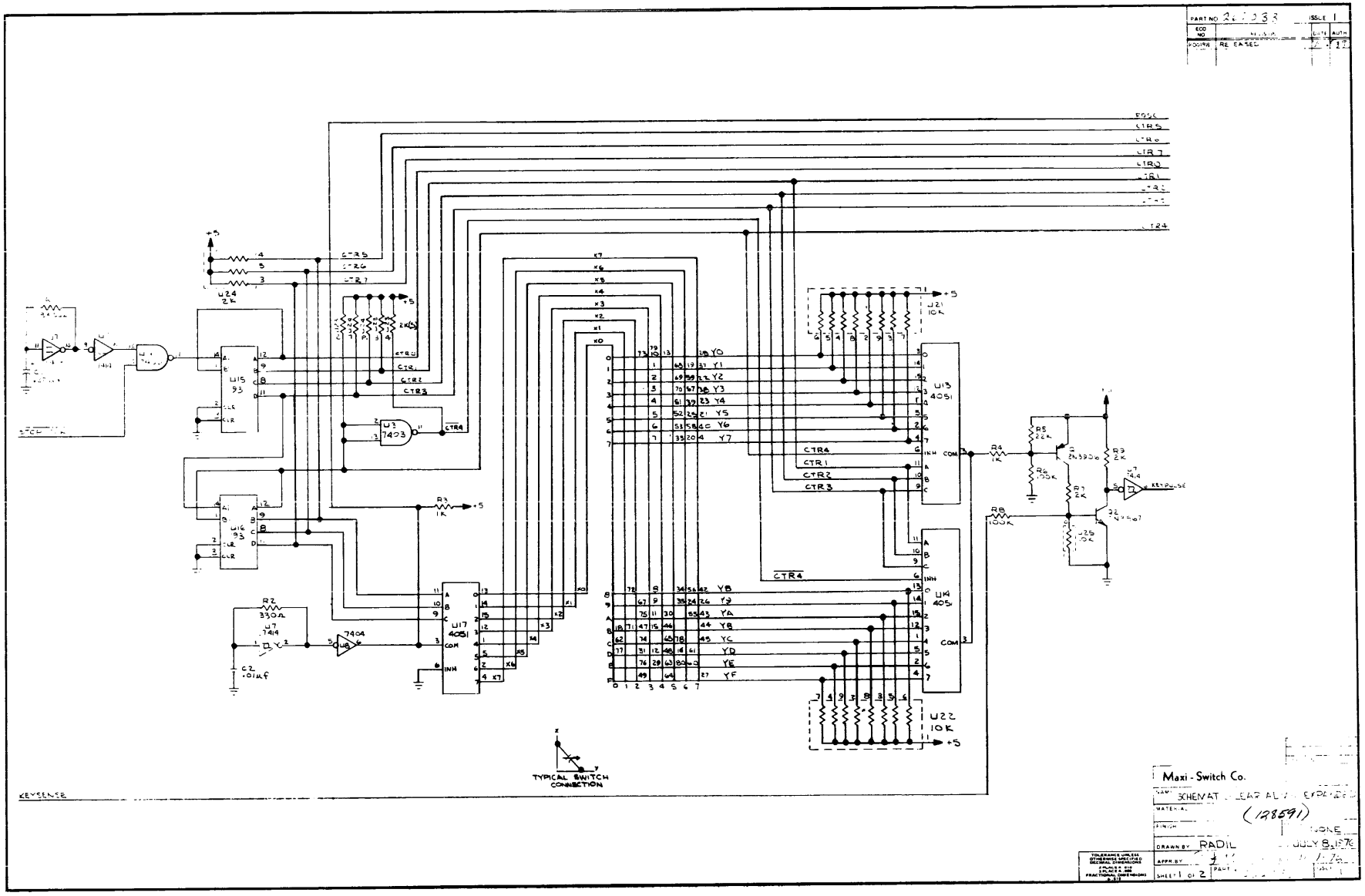


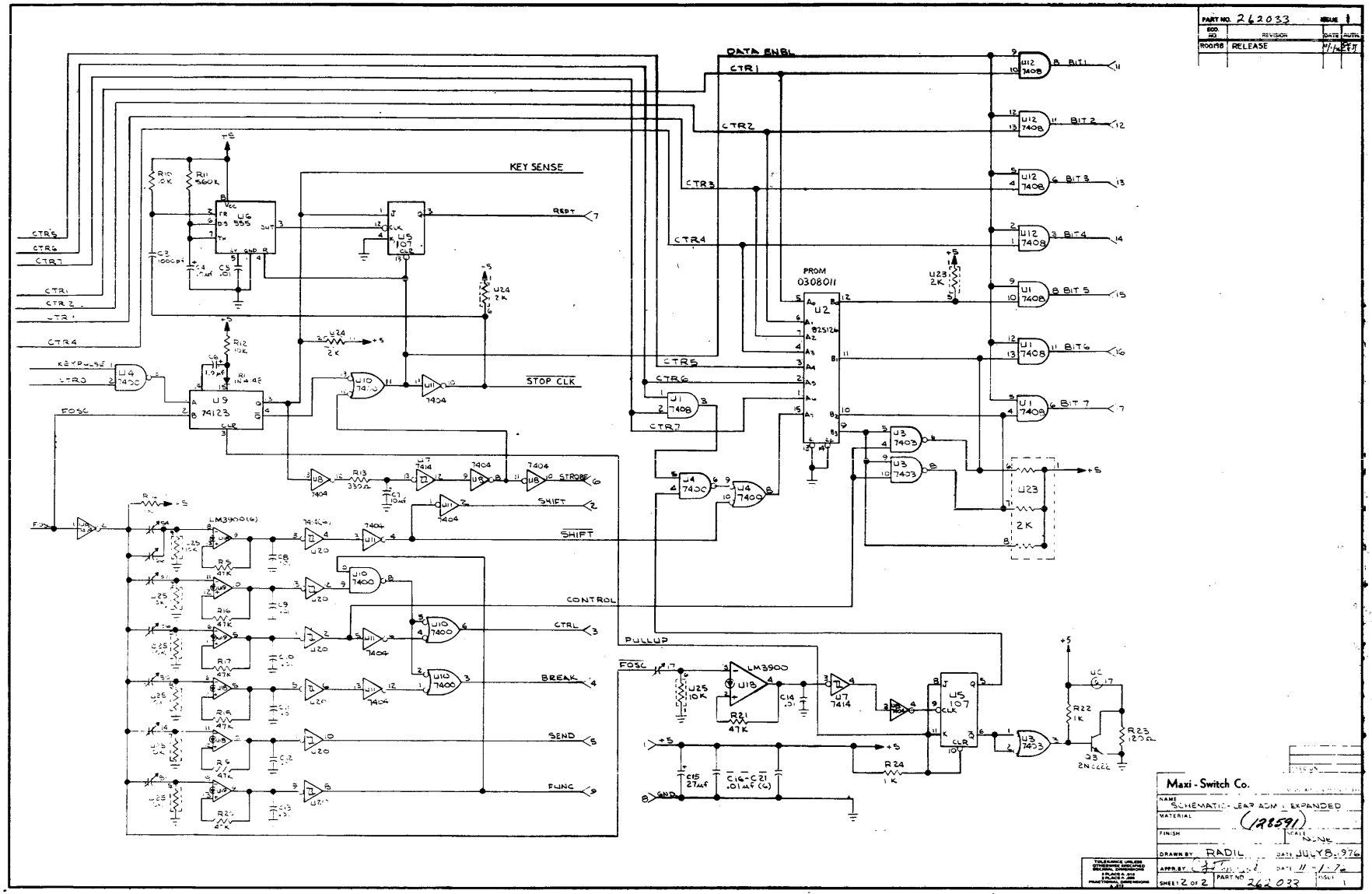
D	337
E	373
F	418
G	463

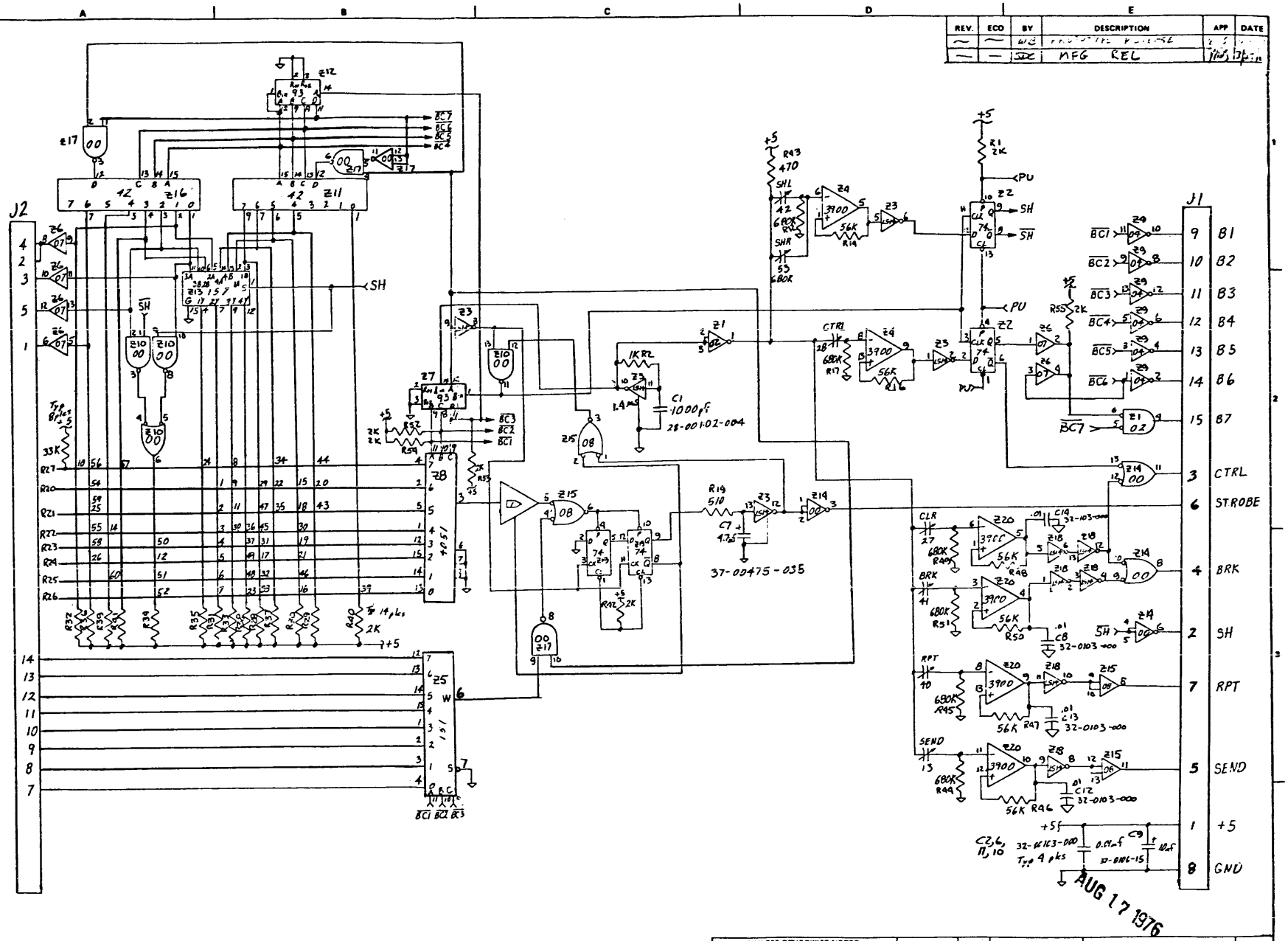
QTY.	REFERENCE DESIGNATION	DESCRIPTION	VENDOR/PART NO.	DATAPOWER PART NO.
1	R9	RESISTOR, 100 Ω, 1/2W, 5%	CARBON COMP	13R0101
1	R14	RESISTOR, 75 Ω, 1/2W, 5%	CARBON COMP	13R0750
1	R11	RESISTOR, 470 Ω, 1/2W, 5%	CARBON COMP	13R0471
1	R7	RESISTOR, 750 Ω, 1/2W, 5%	CARBON COMP	13R0751
3	R1, 1D, 12	RESISTOR, 1K, 1/2W, 5%	CARBON COMP	13R0102
1	R5	RESISTOR, 4.7K, 1/2W, 5%	CARBON COMP	13R0472
1	R15	RESISTOR, 1.65K, 1/4W, 1%	RN60D	42R1651
1	R17	RESISTOR, 787 Ω, 1/4W, 1%	RN60D	42R7870
2	R2, 3	RESISTOR, .1 Ω, 3W, 10%	IRC PW-3	56R0109
1	R6	RESISTOR, 180 Ω, 1/2W, 5%	CARBON COMP (NOM.)	13R0181
3	R8, 13, 16	POT 500 Ω	CTS 115R501A	74R0501
1	R4	RESISTOR, 51 Ω, 112W, 5%	CARBON COMP	13R0510
1	C10	CAPACITOR, .001μf, 500V	MALLORY J6	15C0002
1	C9	CAPACITOR, .01μf, 100V	SPRAGUE 225P10391WD3	11C0001
2	C5, 6	CAPACITOR, .1μf, 100V	SPRAGUE 225P10491WD3	11C0002
1	C8	CAPACITOR, 1μf, 35V	ITT 4321216110	26C0002
1	C7	CAPACITOR, 10μf, 25V	SPRAGUE WH11D106G025A	35C0002
1	C11	CAPACITOR, 100μ, 25V	SPRAGUE WH11D1076025E	35C0004
2	C1, 2	CAPACITOR, 9000μf, 15V	STM 39CS15JL93	35C0023
1	C3	CAPACITOR, 1000μf, 16V	NIPPON CHEMI-CON CEO-4W	36C0002
1	Q4	TRANSISTOR	2N2905	14Q0001
1	Q5	TRANSISTOR	2N3906	12Q0001
1	Q3	TRANSISTOR	TIP29A	15Q0003

QTY.	REFERENCE DESIGNATION	DESCRIPTION	VENDOR/PART NO.	DATAPOWER PART NO.
2	Q1, 2	TRANSISTOR	TIP33	15Q0011
2	CR1, 6	DIODE	IN4002, ITT	13D0002
1	CR8	DIODE	IN751A	12D0003
4	CR2-5	DIODE	3A70, SOL	13D0001
1	CR7	SCR	2N 4441, MOT	14D0002
1	Z1	I.C. REGULATOR	DATAPOWER	60Q0001
1		TRANSISTOR PADS	T0-5 MCNABB 400003	00Q0003
2		SHORTING BAR	H.H. SMITH 878	00E0007
4		SPACER	USECO # 1530-B-1/8	35H0016
3		1/32 WASHER	SEASTROM 5602-18-32	84H0002
3		SPADE-STANDOFF	AUTO SPLICE 7-815-31	41E0003
1		BRACKET - HEATSINK	DATAPOWER	15N0039
1		P.C. BOARD	DATAPOWER	D41P0002
	REF	TRANSFORMER	DATAPOWER	ITT0028

APPENDIX C: ADM-1A KEYBOARD


PART NO 26-2233
ISSUE 1
RE ERASED
FOSC
CTR5
CTR6
CTR7
CTR0
CTR1
CTR2
CTR3
CTR4
U24 2K
U15 93
U16 93
U3 7403
U17 4051
U7 7414
7404
R2 330Ω
C2 .01MF
R3 1K
U21 10K
U13 4051
U14 4051
U22 10K
R4 1K
R5 22K
R6 150K
R7 2K
R8 100K
R9 2K
Q1 2N3906
Q2 2N4401
.25 10K
KEYPULSE
TYPICAL SWITCH CONNECTION
KEYSENSE
Maxi-Switch Co.
SCHEMATIC FOR ALARM EXPANDER
(128591)
MATERIAL
FINISH
NONE
DRAWN BY RADIL
JULY 8, 1976
APPR BY
SHEET 1 OF 2


PART NO. 262033
ISSUE 1
ECO NO.
REVISION
DATE
DRAWN
R00198
RELEASE
DATA ENBL
CTR1
CTR2
CTR3
CTR4
CTR5
CTR6
CTR7
KEY SENSE
REPT
STOP CLK
PROM
030801
U2
82S126
B BIT 1
BIT 2
BIT 3
BIT 4
B BIT 5
BIT 6
BIT 7
FOSC
SHIFT
CONTROL
CTRL
BREAK
SEND
FUNC
STROBE
PULLUP
LM3900
2K
Maxi - Switch Co.
NAME SCHEMATIC - JEEP ASM - EXPANDED
MATERIAL (198591)
FINISH
SCALE NONE
DRAWN BY RADIL
DATE JULY 8, 1976
APPR BY
DATE
SHEET 2 OF 2
PART NO 262033
ISSUE 1


REV. ECO BY DESCRIPTION APP DATE
MFG REL
J2
J1
B1
B2
B3
B4
B5
B6
B7
CTRL
STROBE
BRK
SH
RPT
SEND
+5
GND
SCHEMATIC
key tronic corporation
SPOKANE, WASH., U.S.A.
DWG. NO. 35-1473
SHEET 1 OF 2
ADM-1 KEYBOARD
MANUFACTURE PARTS AND/OR ASSY'S PER K.T.C. DOCUMENT: FTP 35-0565
STANDARD DETECTOR
AUG 17 1976

C-4

APPENDIX D: ADM-1A SCHEMATICS P.C. BOARD ASSEMBLY CIRCUIT BOARD

SCHEMATICS

Attention: Due to the nature of the following material, various changes in the logic may occur from time to time. Thus, these materials may not always conform exactly to the specifications within.

LSi
4/77

		SCH SHT NO	FUNCTION OFF	FUNCTION ON	SIGNAL OFF	SIGNAL ON	DESCRIPTION
S1	1	13	EVEN PARITY	ODD PARITY	OPEN	GND	UART
	2	13	8 BIT WORD	7 BIT WORD	OPEN	GND	
	3	13	2 STOP	1 STOP	OPEN	GND	
	4	13	NO PARITY	PARITY	OPEN	GND	
	5	13	ENABLE RFE SENSE	DISABLE	RFE	GND	RECEIVE FRAME ERROR ENA (-13)
(A4)	6	13	ENABLE ROE SENSE	DISABLE	ROE	GND	RECEIVE OVER RUN ERROR ENA (-13)
	7	13	RECEIVE DATA NORMAL	RECV. DATA BLKD W/RTS	+5V	RTS0	LOCAL COPY SUPPRESS
	8	13	XMIT NULL CODE	DSABLE NUL CD XMIT	+ 5V	NO LD	NULL CODE XMISSION
	9	13	BIT 8 = 1	BIT 8 = 0	OPEN	GND	XMIT & REC BIT CONTROL
	10	13		BIT 8 = TSB8	OPEN	TSB8	(SWITCH OPERATED TOGETHER)
S2	1	16	NO PARITY	PARITY	OPEN	GND	PTR UART
	2	16	2 STOP	1 STOP	OPEN	GND	
	3	16	8 BIT WORD	7 BIT WORD	OPEN	GND	
	4	16	EVEN PARITY	ODD PARITY	OPEN	GND	
	5	15	RTS NORMAL	RTS INHBT WITH CTS	+5V	CTS0	RTS INHBT W/CTS (CLEAR TO SEND)
(A5)	6	15	RTS NORMAL	RTS INHBT WITH CF	+5V	CF	RTS INHBT W/CF (CARRIER DETECT)
	7	15	RTS TRNOF DLY (4.5msec)	NO RTS TRNOF DELAY	+5V	GND	RTS TURNOFF DELAY ENABLE
	8	14	RTS LOW ALL THE TIME	NORMAL RTS	+5V	RTS 0	RTS SELECT
	9	15	SECONDARY CHNL ENBL	SECONDARY CHNL DSBL	+5V	GND	SECONDARY CHANNEL SELECT
	10	13	REC PRTY ERROR ENABLE	REC PRTY ERROR DISABLE	+5V	GND	RECEIVE PARITY ERROR ENABLE
S3	1	16	J3 PIN 6 OPEN	J3 PIN 6 HAS RTS 1	OPEN	RTS 1	RTS OUT ON J3 PIN 6
	2	16	J3 PIN 8 OPEN	J3 PIN 8 HAS RTS 1	OPEN	RTS 1	RTS OUT ON J3 PIN 8
(A12)	3	16	DISABLE INTRNL LOOPBK	ENBL INTRNL LOOPBK	OPEN	RTS 1	INTERNAL LOOPBK RTS 1 to CTS 1
	4	16	LONG PRINTER DELAY	SHORT PRINTER DELAY	OPEN	+5	PRINTER DELAY ENA
	5	16	READY "TRUE" SELECT	BUSY "TRUE" SELECT	+5V	GND	BUSY-READY SELECT
	6	16	J3 PIN 20 OPEN	J3 PIN 20 ACTIVE	OPEN	CLOSE	PRINTER READY
S4	1	24	OPT 1 = TRUE	OPT 1 = FALSE	+5V	GND	OPTION B
	2	24	OPT 2 = TRUE	OPT 2 = FALSE	+5V	GND	OPTION C
(A15)	3	24	OPT 3 = TRUE	OPT 3 = FALSE	+5V	GND	OPTION A
	4	25	OPT 5= TRUE	OPT 5 = FALSE	+5V	GND	OPTION D
	5	25	OPT 4 = TRUE	OPT 4 = FALSE	+5V	GND	OPTION E
S5	1	17	BREAK ENABLED	BREAK DISABLED	+5V	GND	BREAK ENABLE
	2	11	UPPER CASE ONLY	UPPER/LOWER CASE	+5V	GND	LOWER CASE ENABLE
	3	11	BLINKING CURSOR	NON-BLINKING CURSOR	+5V	GND	CURSOR BLINK ENABLE
(N7)	4	22	NO CLEAR TO PROTECT	CLEAR TO PROTECT ENA	+5V	GND	CLEAR TO PROT
	5		24 EN	12 EN	1	0	12/24 LINE
	6	11	B4	STD	+5V	GND	BASIC 4/STD DISPLAY
	7	3	60 HZ	50 HZ	+5V	GND	50/60 ENABLE

REVISIONS

SHT	ZONE	LTR	DESCRIPTION	DATE	APPROVED

LEAR SIEGLER, INC.
ELECTRONIC INSTRUMENTATION DIVISION
ANAHEIM, CALIFORNIA 92803

SCHEMATIC - ADM-1A

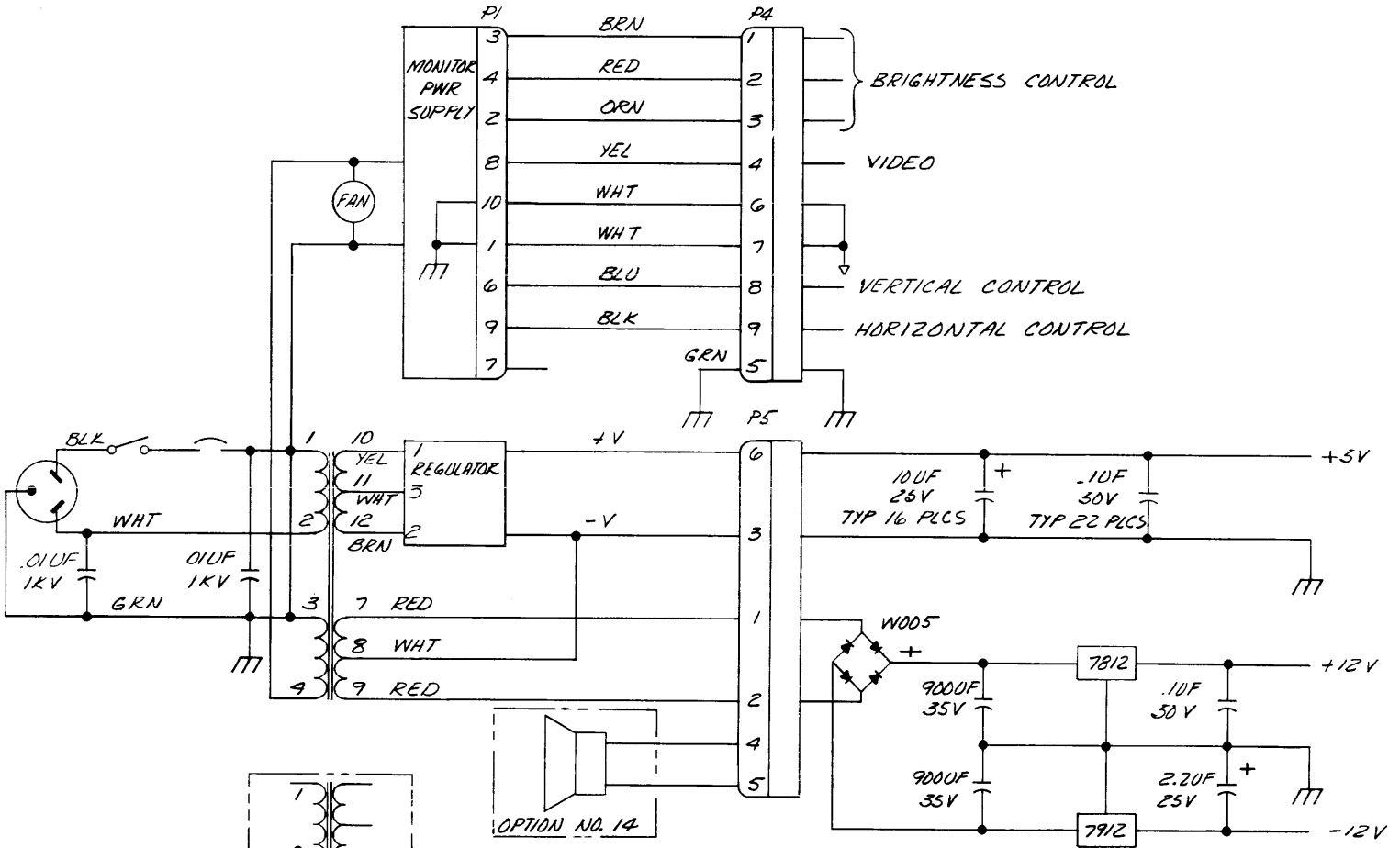
SIZE	CODE IDENT NO.	DWG NO.	LTR
C	98438	129339	

SCALE -13 BD | SHEF | 2 of 26

CONTR NO.
DR
CHK
DSGN
ENGR
PROJ Christenson
REL
APPD
APPD

UNLESS OTHERWISE SPECIFIED
DIM. IN INCHES
TOLERANCES
X ± .1
XX ± .03
XXX ± .010
ANGLES ± 0.5°
MACH. FIN. 7

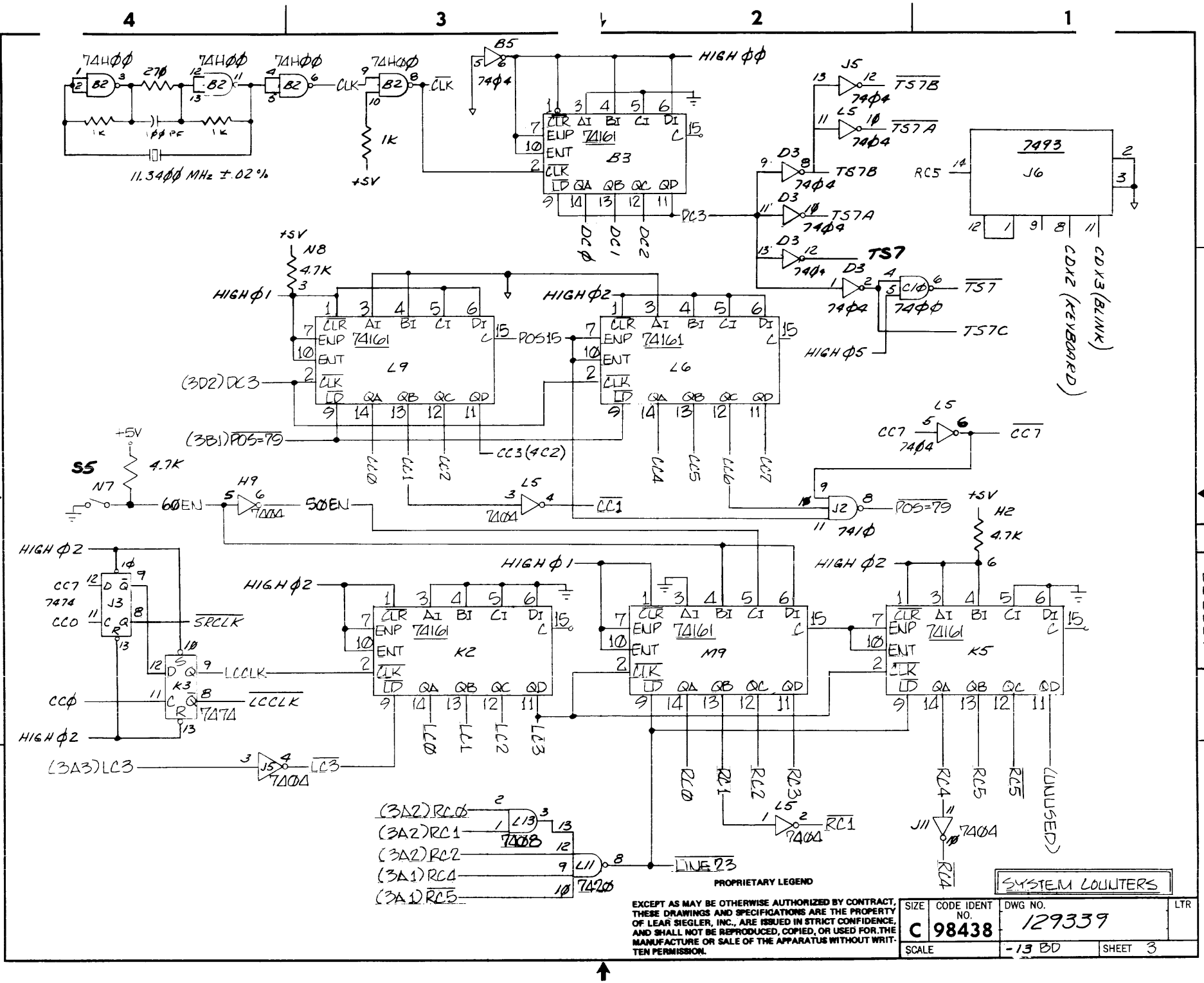
DASH NO.	NEXT ASSY	USED ON	APPLICATION
-	129300		



POWER DISTRIBUTION

SIZE	CODE IDENT NO.	DWG NO.	LTR
C	98438	129339	
SCALE		-13 BD	SHEET 2

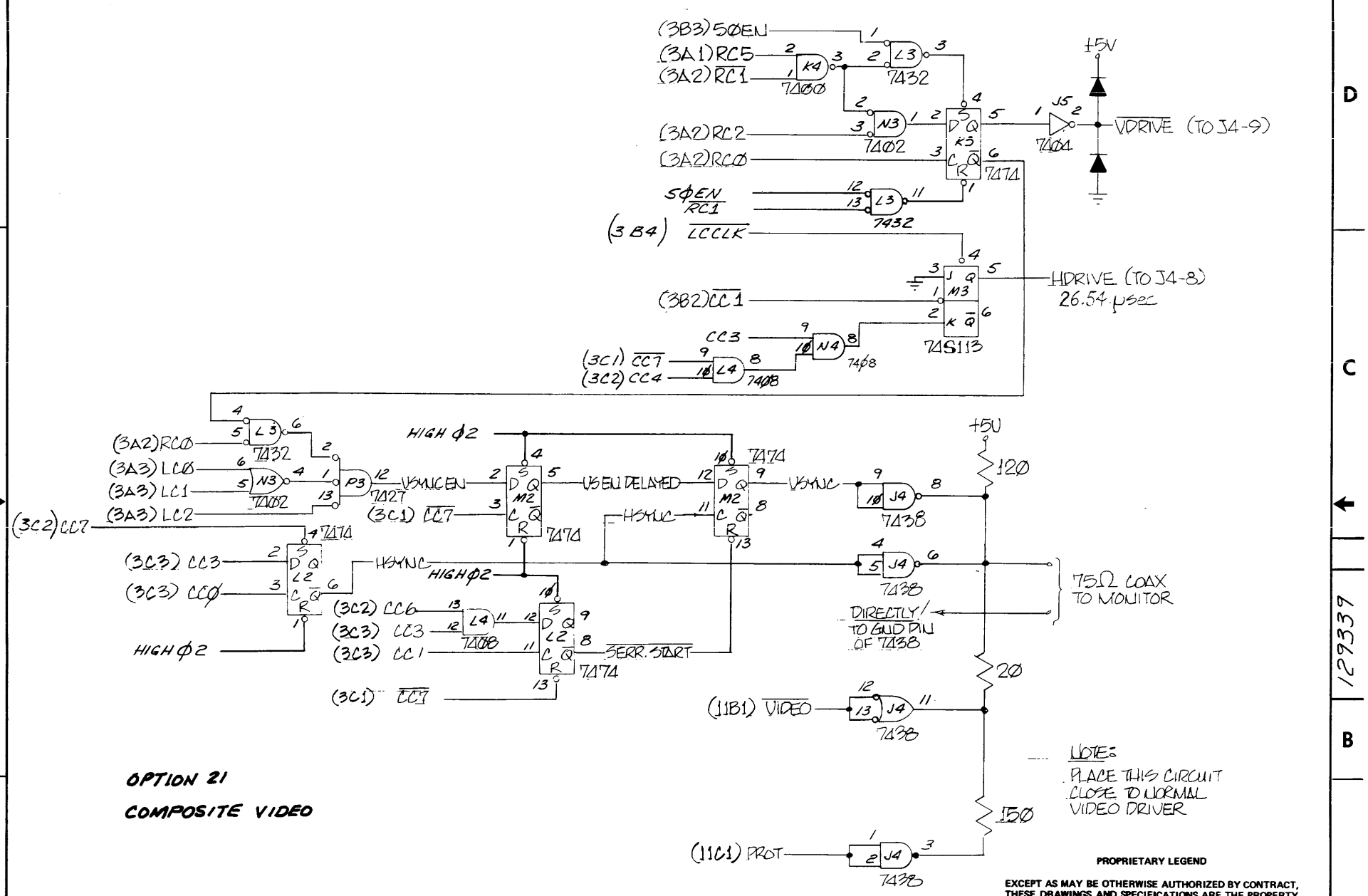
129339



PROPRIETARY LEGEND

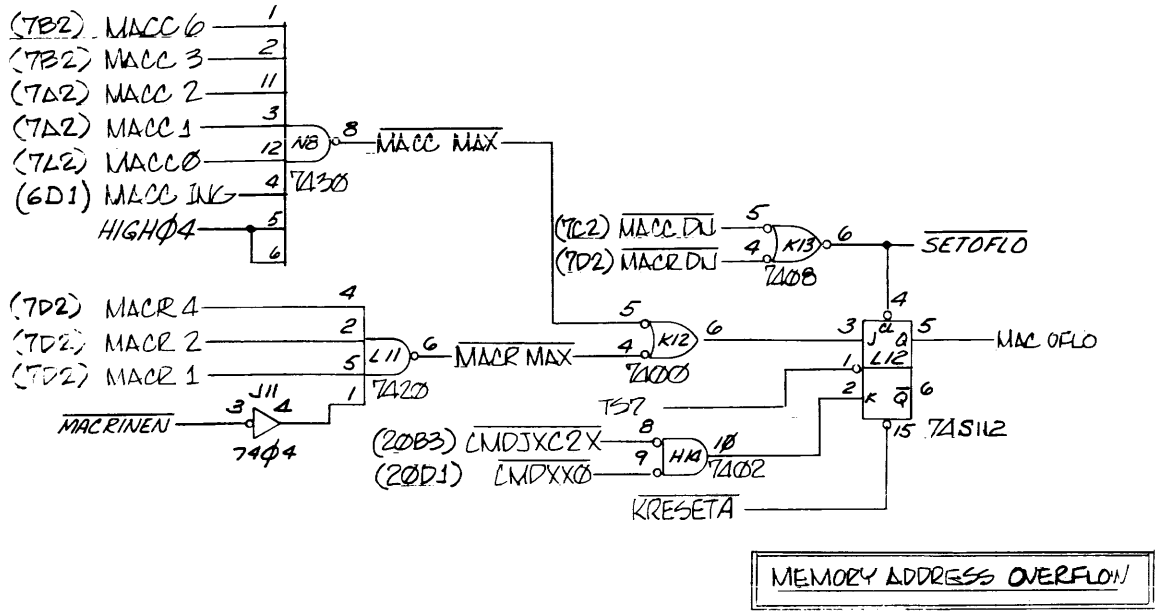
SIZE	CODE IDENT NO.	DWG NO.	LTR
C	98438	129339	
SCALE	-13 BD	SHEET 3	

129339



SIZE	CODE IDENT NO.	DWG NO.	LTR
C	98438	129339	
SCALE		-13 BD	SHEET 4

129339



MEMORY ADDRESS OVERFLOW

SIZE	CODE IDENT NO.	DWG NO.	LTR
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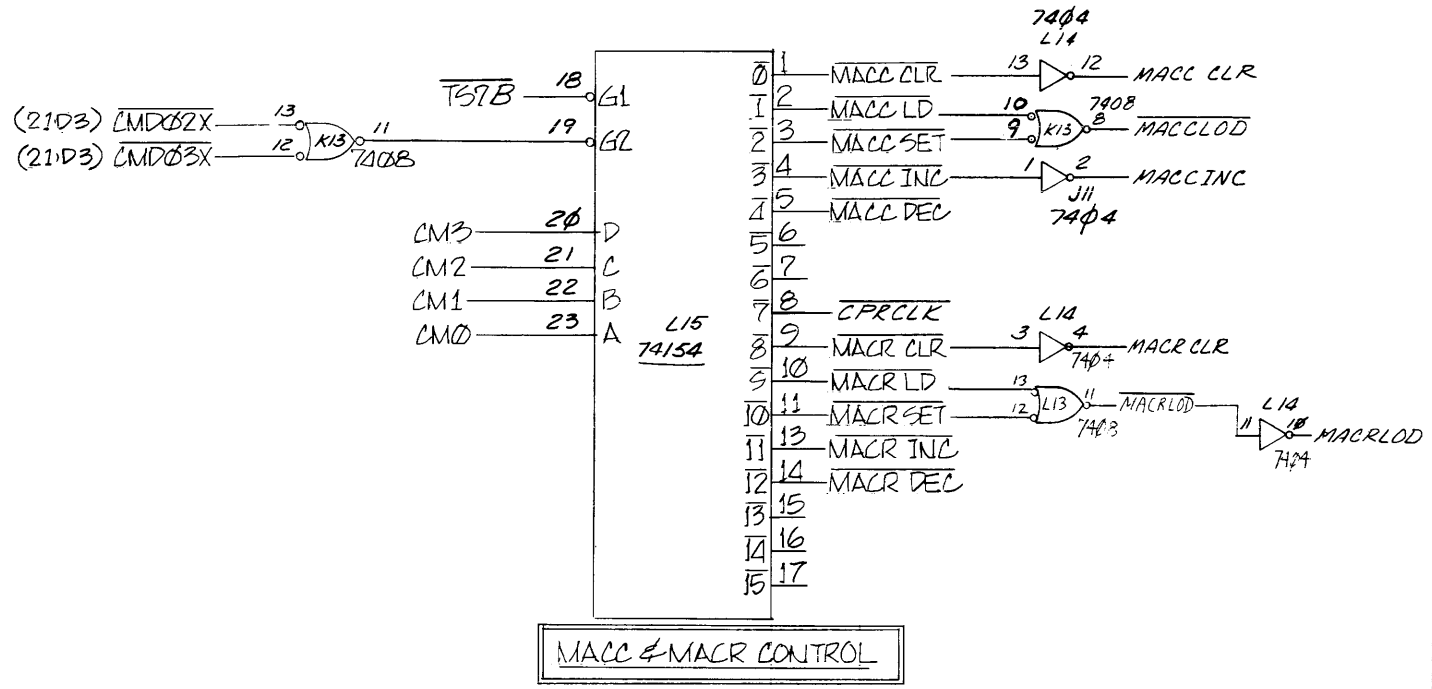
SCALE		-13BD	SHEET 5

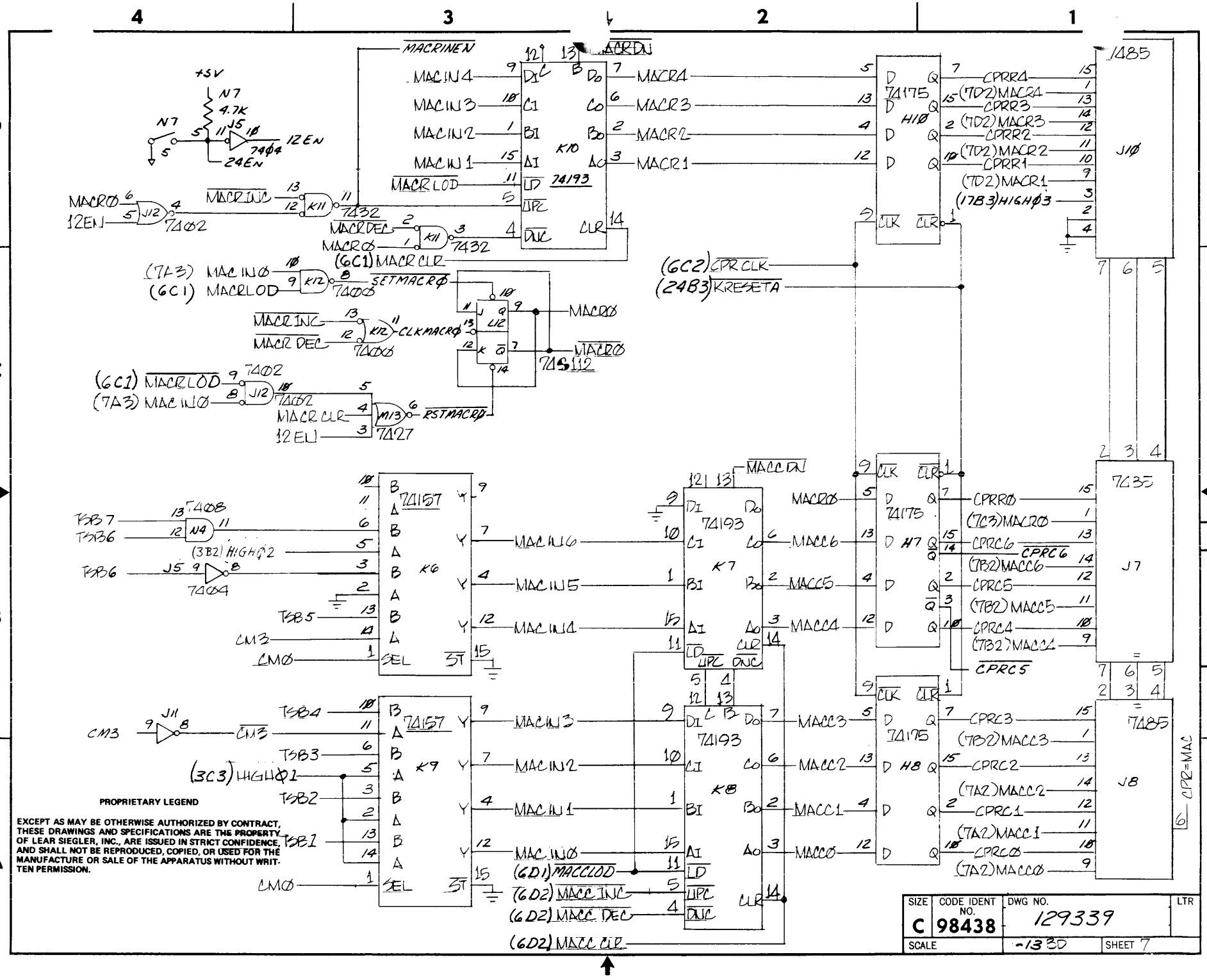
129339



MACC & MACR CONTROL

129339

SIZE	CODE IDENT NO.	DWG NO.	LTR
C	98438	129339	
SCALE		-13 BD	SHEET 6


4
3
2
1
D
C
B
A
+5V
N7
4.7K
N7
J5
12EN
74Ø4
24EN
MACRINEN
MACRDN
MACIN4
MACIN3
MACIN2
MACIN1
MACRLOD
K10
74193
MACRA
MACR3
MACR2
MACR1
MACRØ
12EN
J12
7AØ2
MACRINC
K11
7432
MACRDEC
MACRØ
(6C1) MACRCLR
(7A3) MACINØ
(6C1) MACRLOD
K12
SETMACRØ
MACRINC
MACR DEC
CLKMACRØ
74SØØ
74S112
MACRØ
MACRØ
(6C1) MACRLOD
(7A3) MACINØ
MACR CLR
12EN
M13
7427
RSTMACRØ
(6C2) CPR CLK
(2483) KRESETA
74175
H1Ø
CPRR4
(7D2) MACR4
CPRR3
(7D2) MACR3
CPRR2
(7D2) MACR2
CPRR1
(7D2) MACR1
(17B3) H16HØ3
J1Ø
1485
TSB7
TSB36
TSB6
(3B2) HIGHØ2
74Ø8
N4
J5
74Ø4
TSB5
CM3
CMØ
74157
K6
MACIN6
MACIN5
MACIN4
MACC6
MACC5
MACC4
CPRC6
(7B2) MACC6
CPRC5
(7B2) MACC5
CPRC4
(7B2) MACC4
CPRC5
J7
7435
CM3
J11
CM3
TSB4
TSB3
(3C3) HIGHØ1
TSB2
TSB1
CMØ
74157
K9
MACIN3
MACIN2
MACIN1
MACINØ
(6D1) MACCLOD
(6D2) MACC INC
(6D2) MACC DEC
(6D2) MACC CLR
74193
K8
MACC3
MACC2
MACC1
MACCØ
MACC DN
74175
H8
CPRC3
(7B2) MACC3
CPRC2
(7A2) MACC2
CPRC1
(7A2) MACC1
CPRCØ
(7A2) MACCØ
J8
7485
CPR=MAC
PROPRIETARY LEGEND
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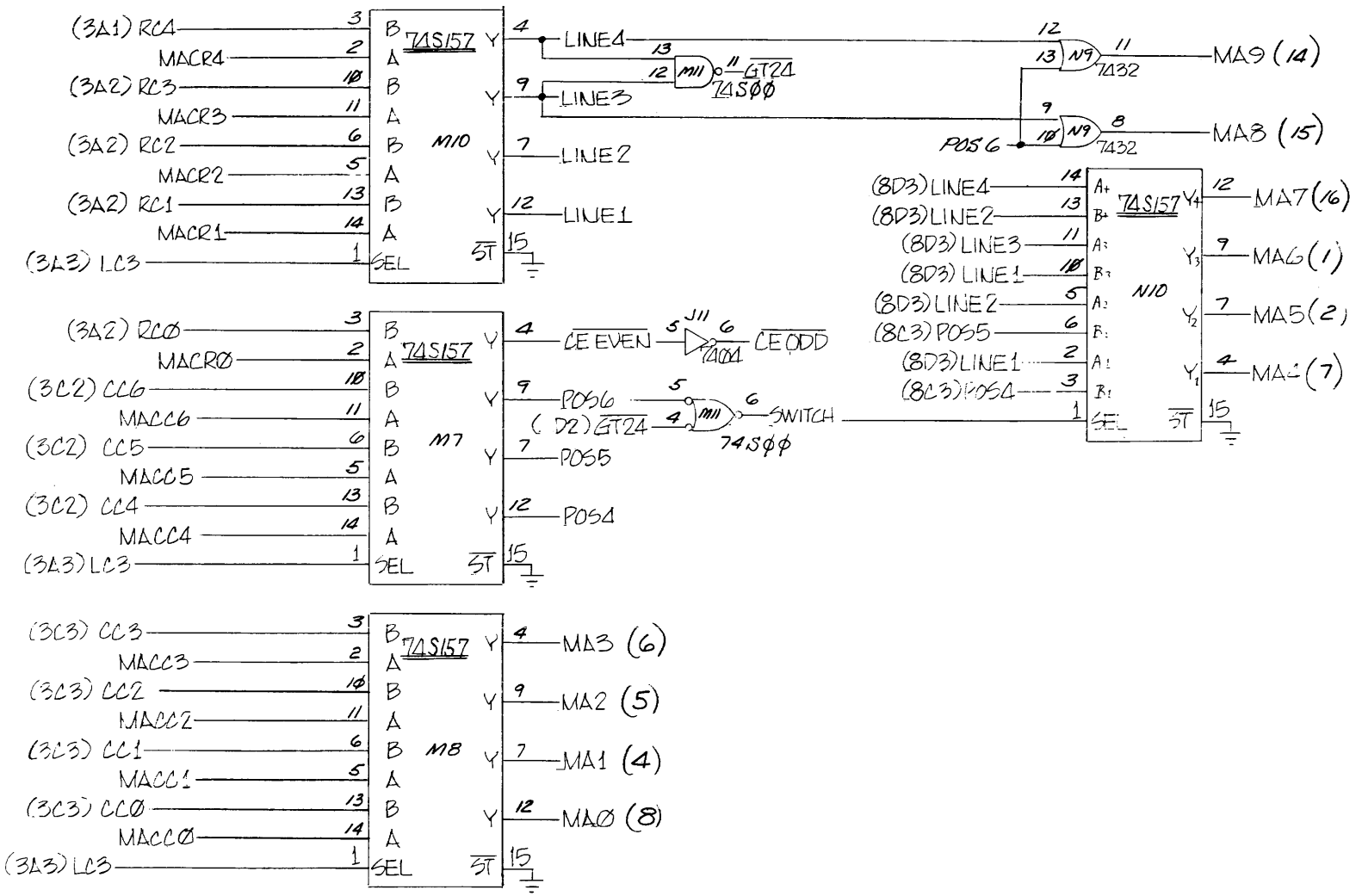
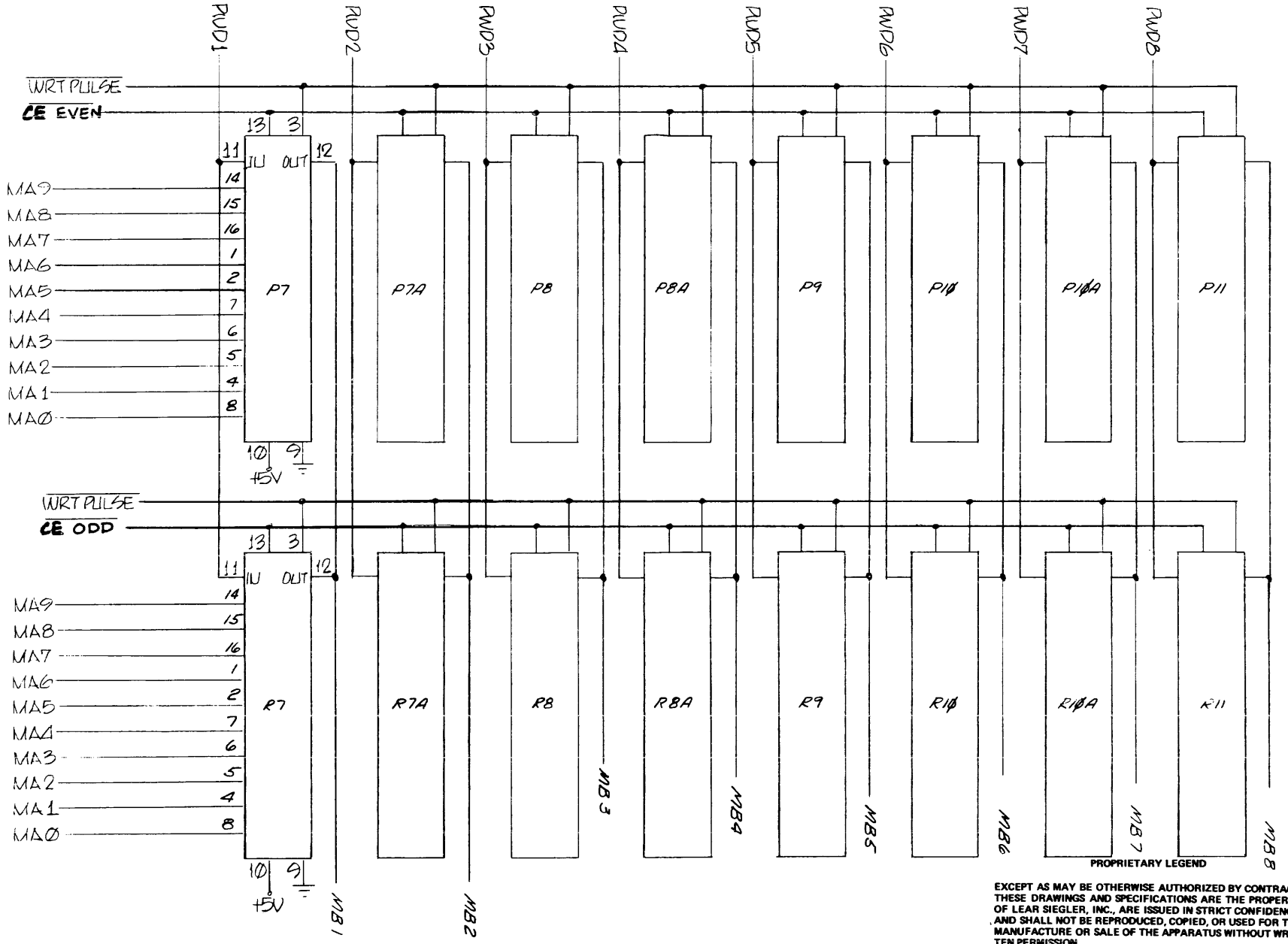
SIZE C
CODE IDENT NO. 98438
DWG NO. 129339
LTR
SCALE
-13 3D
SHEET 7
129339



RAM ADDRESS

SIZE	CODE IDENT NO.	DWG NO.	LTR
C	98438	129339	
SCALE		-13 BD	SHEET 8

129339

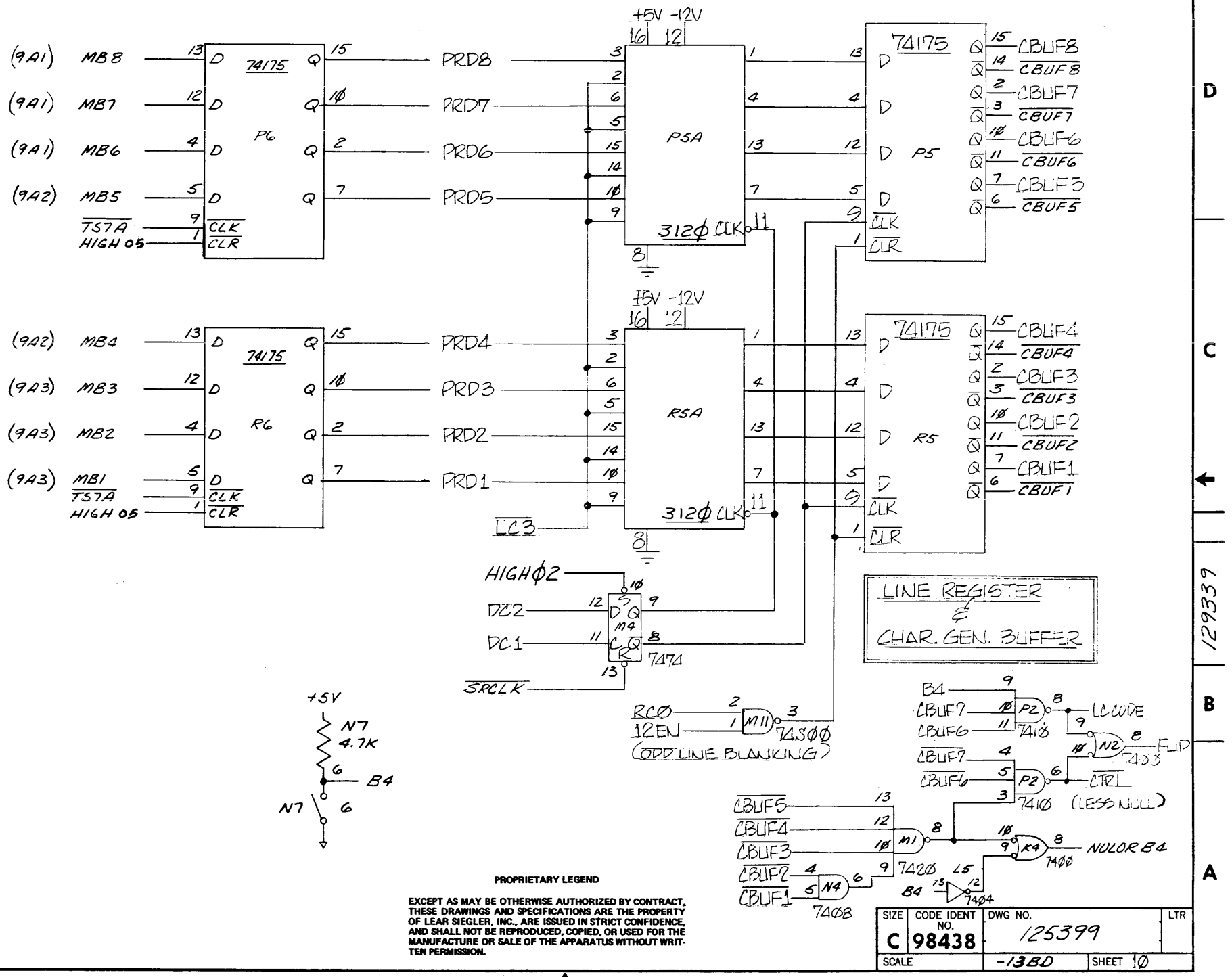


DATA MEMORY

PROPRIETARY LEGEND

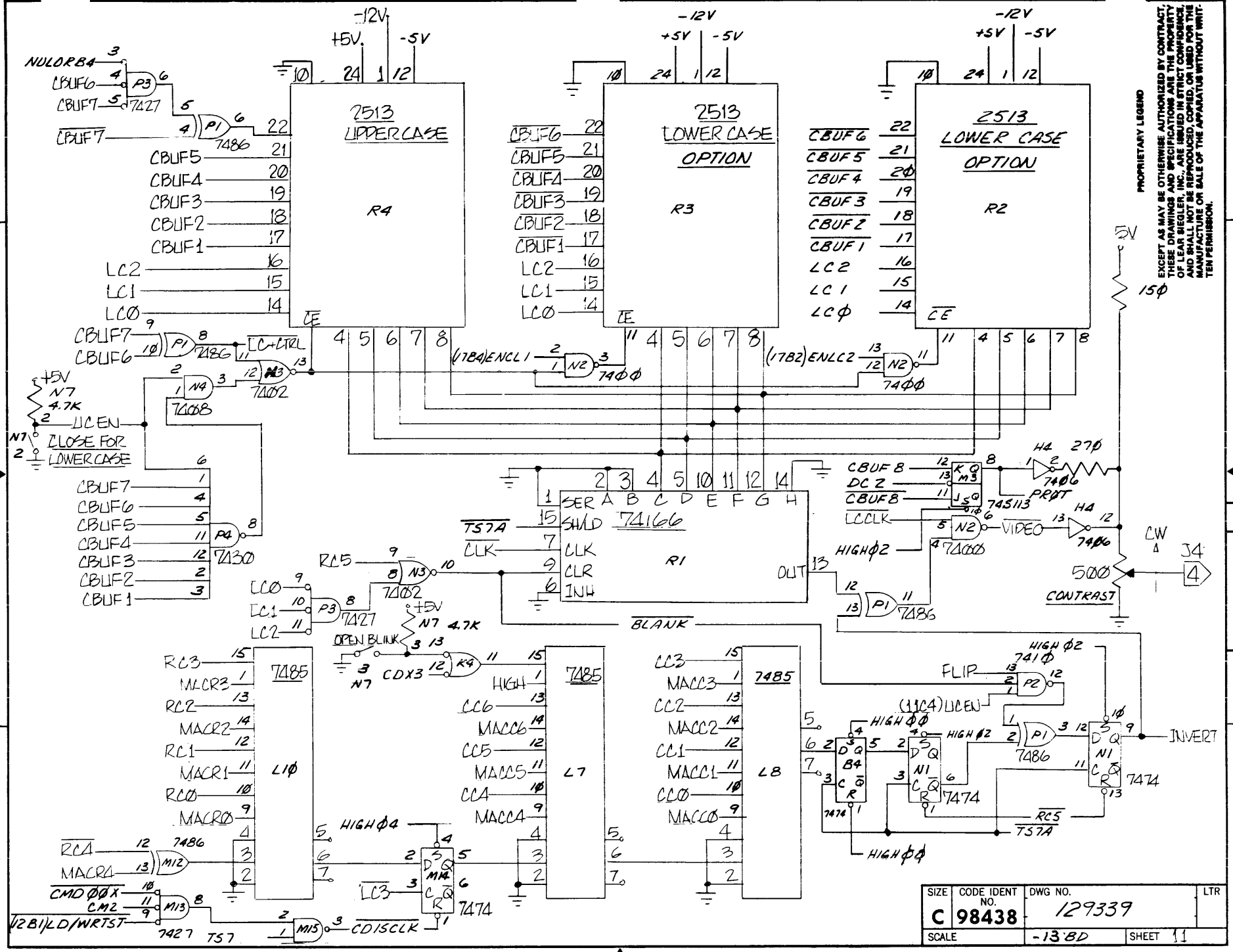
SIZE	CODE IDENT NO.	DWG NO.	LTR
C	98438	129339	
SCALE		-13 BD	SHEET 9

129339



SIZE	CODE IDENT NO.	DWG NO.	LTR
C	98438	125399	
SCALE		-13BD	SHEET 10

129339


2513 UPPER CASE R4
2513 LOWER CASE OPTION R3
2513 LOWER CASE OPTION R2
74166 R1
7485 L10
7485 L7
7485 L8
7474
7427
7486
7430
7402
7408
7400
74123
7406
74174
+5V
-12V
-5V
LC+CTRL
LCEN
CLOSE FOR LOWER CASE
OPEN BLINK
BLANK
FLIP
INVERT
VIDEO
CONTRAST
HIGHΦ2
HIGHΦΦ
HIGHΦ4
CDISCLK
TS7
TS7A
RC5
LC3
CDX3
(1784)ENCL1
(1782)ENLC2
(1104)LCEN
(2B1)LD/WRTST
PROPRIETARY LEGEND
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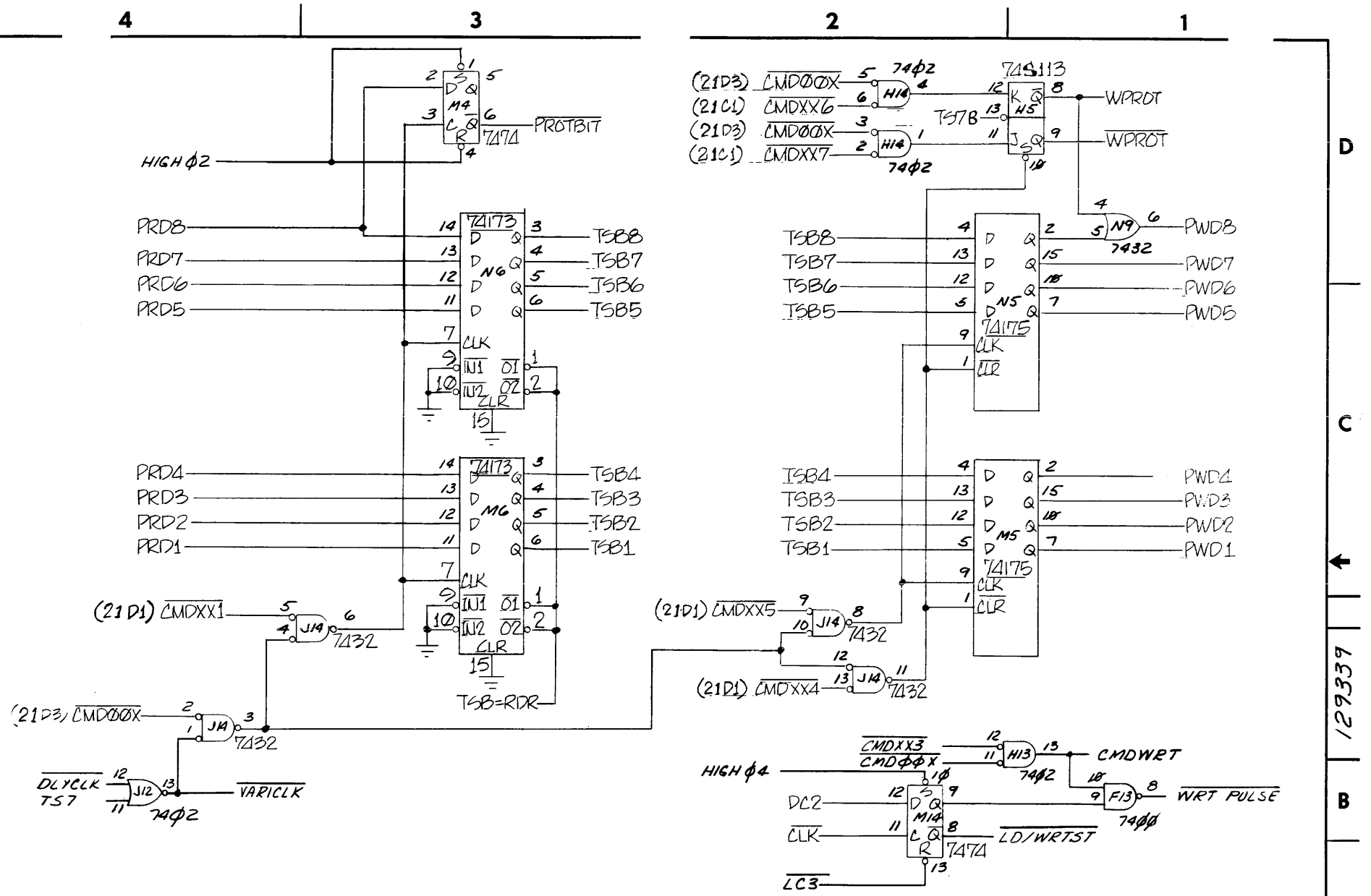
SIZE C
CODE IDENT NO. 98438
DWG NO. 129339
LTR
SCALE
-13 BD
SHEET 11
129339


4
3
2
1
D
C
B
A
HIGH φ2
PRD8
PRD7
PRD6
PRD5
PRD4
PRD3
PRD2
PRD1
PROTBIT
7474
74173
N6
M6
TSB8
TSB7
TSB6
TSB5
TSB4
TSB3
TSB2
TSB1
TSB=RDR
(21D1) CMDXX1
(21D3) CMDØØØX
DLYCLK
TS7
VARICLK
74φ2
7432
(21D3) CMDØØØX
(21C1) CMDXX6
(21D3) CMDØØØX
(21C1) CMDXX7
74S113
TS7B
WPROT
WPROT
PWD8
PWD7
PWD6
PWD5
PWD4
PWD3
PWD2
PWD1
7432
N5
M5
74175
(21D1) CMDXX5
(21D1) CMDXX4
CMDXX3
CMDφφφX
HIGH φ4
DC2
CLK
LC3
CMDWRT
WRT PULSE
LD/WRTST
74φφ
PROPRIETARY LEGEND
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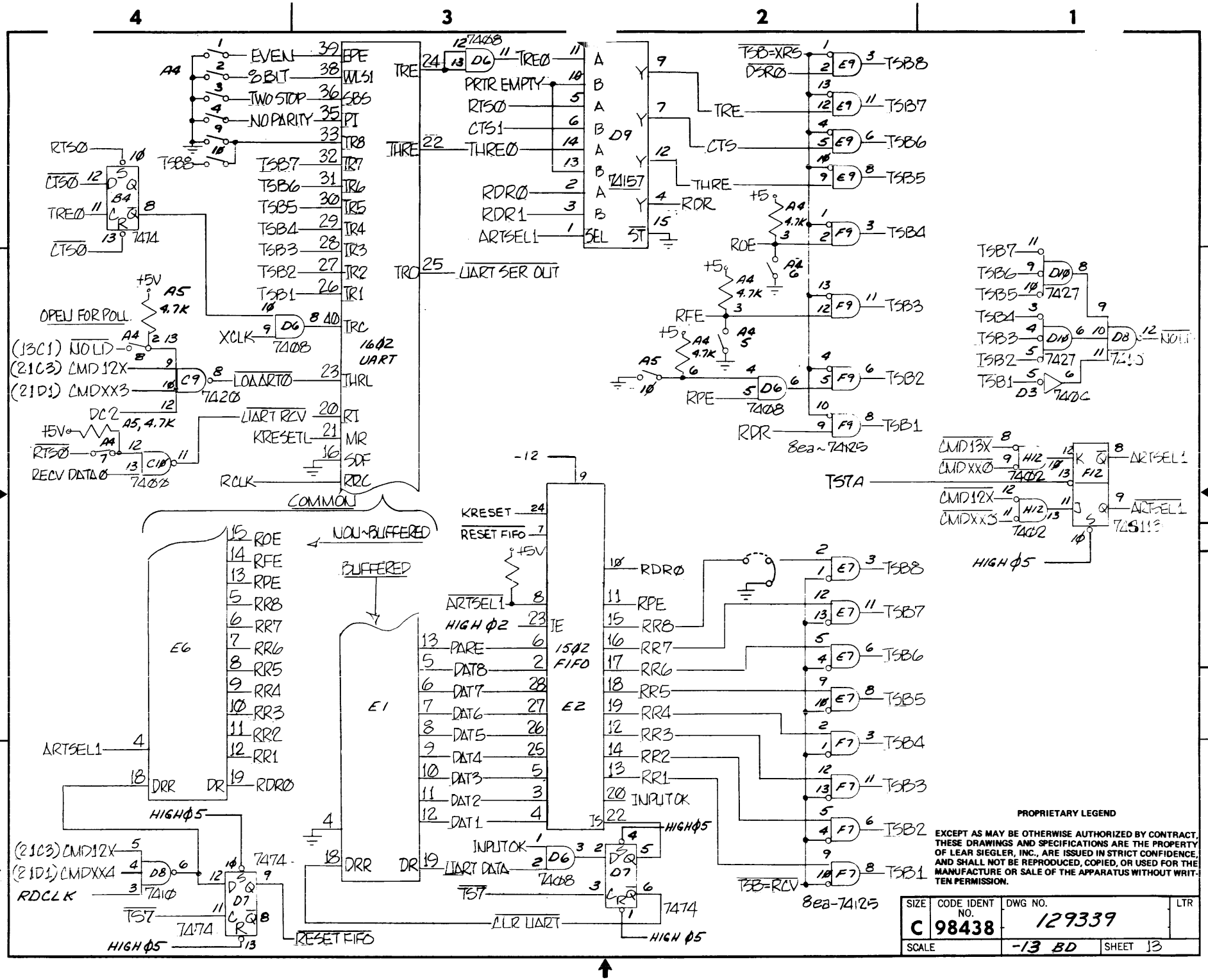
SIZE C
CODE IDENT NO. 98438
DWG NO. 129339
LTR
SCALE
-13 BD
SHEET 12
129339


4
3
2
1
D
C
B
A
EVEN
8 BIT
TWO STOP
NO PARITY
EPE
WLS1
SBS
PI
TR8
TR7
TR6
TR5
TR4
TR3
TR2
TR1
TRC
TSB7
TSB6
TSB5
TSB4
TSB3
TSB2
TSB1
RTSØ
CTSØ
TREØ
7474
XCLK
7408
1602 UART
TRE
THRE
TRO
UART SER OUT
PRTR EMPTY
RTSØ
CTS1
THREØ
RDRØ
RDR1
ARTSEL1
D9
74157
RDR
TSB=XRS
DSRØ
TSB8
TSB7
TSB6
TSB5
TSB4
TSB3
TSB2
TSB1
RFE
RPE
RDR
8ea~74125
OPEN FOR POLL
NOLD
CMD12X
CMDXXØ
CMDXX3
LOADARTØ
THRL
UART RCV
RI
KRESETL
MR
SDF
RRC
RCLK
RECV DATAØ
DC2
A5, 4.7K
COMMON
NOW~BUFFERED
BUFFERED
KRESET
RESET FIFO
ARTSEL1
HIGH Ø2
IE
1502 FIFO
E1
E2
E6
RDE
RFE
RPE
RR8
RR7
RR6
RR5
RR4
RR3
RR2
RR1
RDRØ
INPUTOK
IS
PARE
DAT8
DAT7
DAT6
DAT5
DAT4
DAT3
DAT2
DAT1
DRR
DR
HIGHØ5
RDCLK
UART DATA
TST
CLR UART
RESET FIFO
TSTA
CMD13X
CMDXXØ
CMD12X
CMDXX3
HIGH Ø5
129339
PROPRIETARY LEGEND
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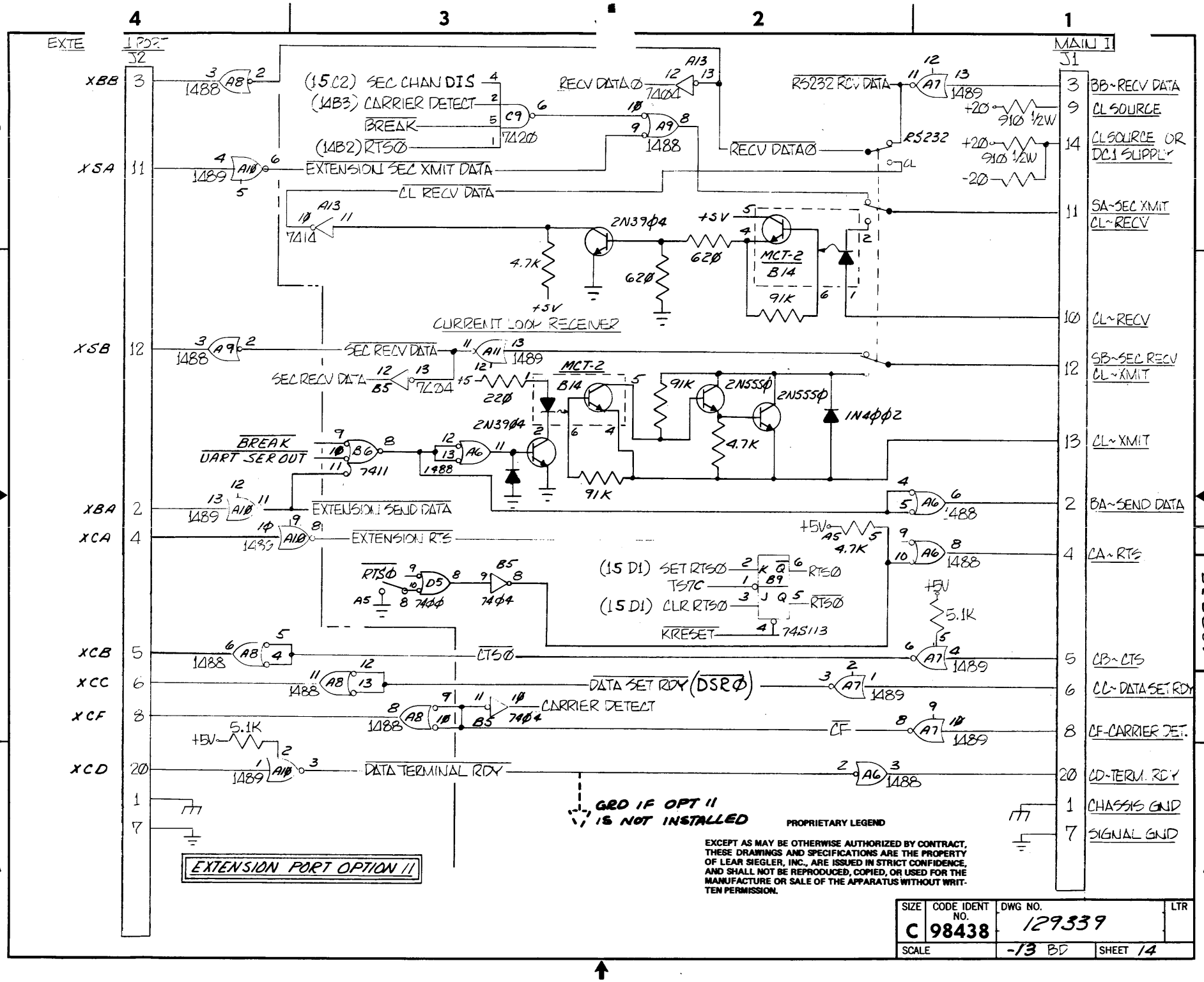
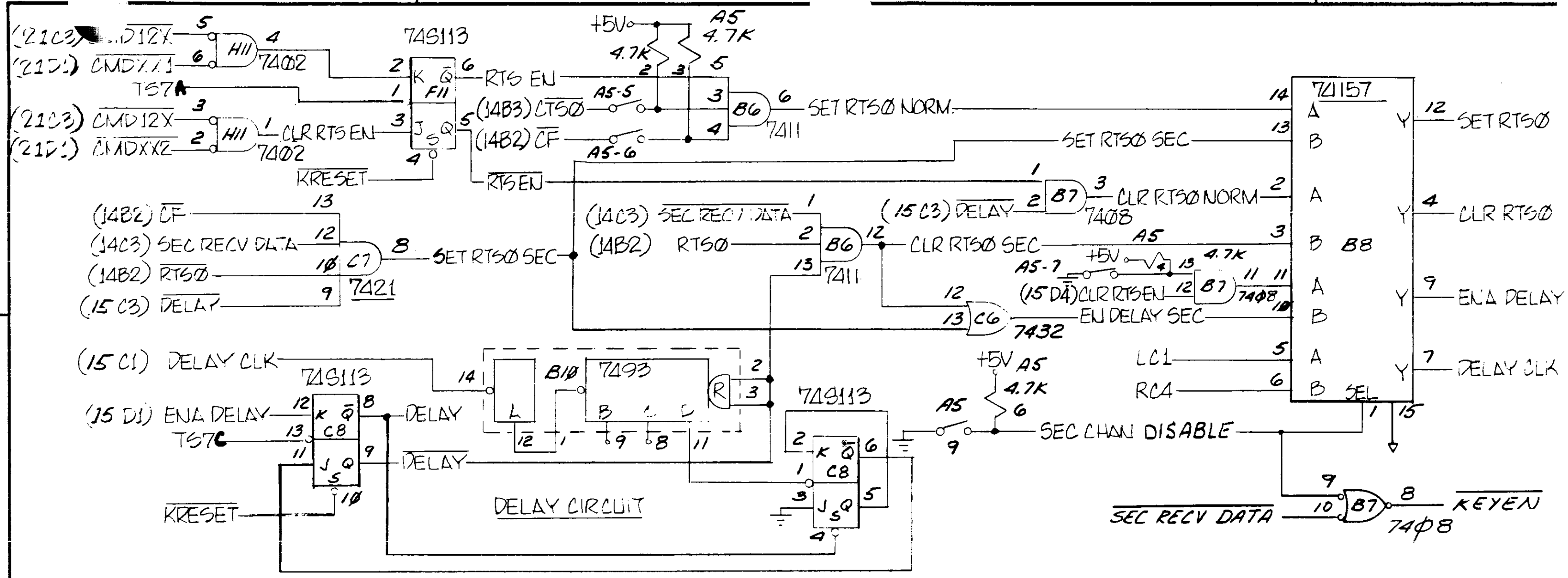
SIZE C
CODE IDENT NO. 98438
DWG NO. 129339
LTR
SCALE
-13 BD
SHEET 13



SIZE	CODE IDENT NO.	DWG NO.	LTR
C	98438	129339	
SCALE		-13 BD	SHEET 14

129339



PROPRIETARY LEGEND

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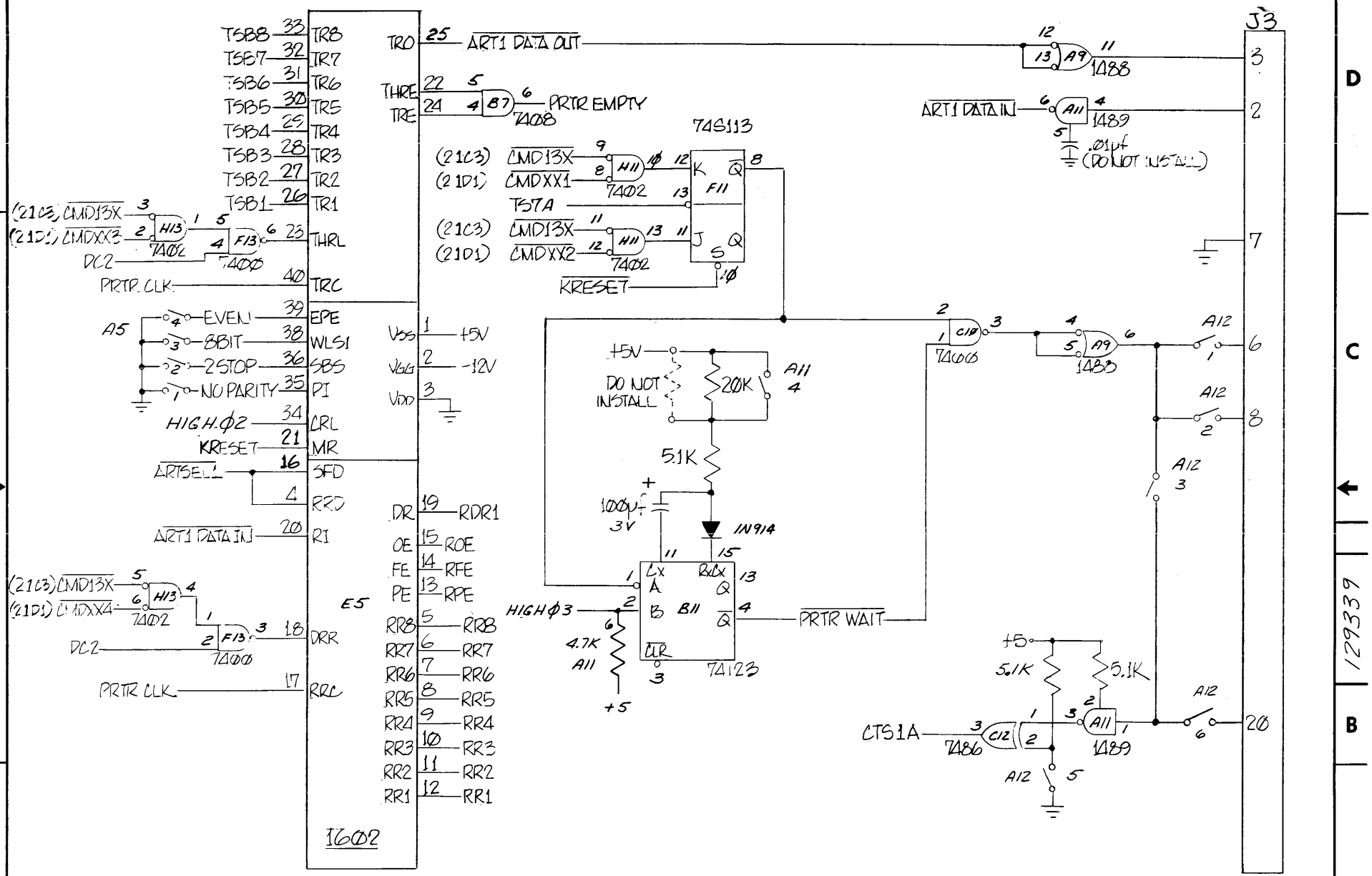
SIZE	CODE IDENT NO.	DWG NO.	LTR
C	98438	129339	
SCALE		-13 BD	SHEET 15

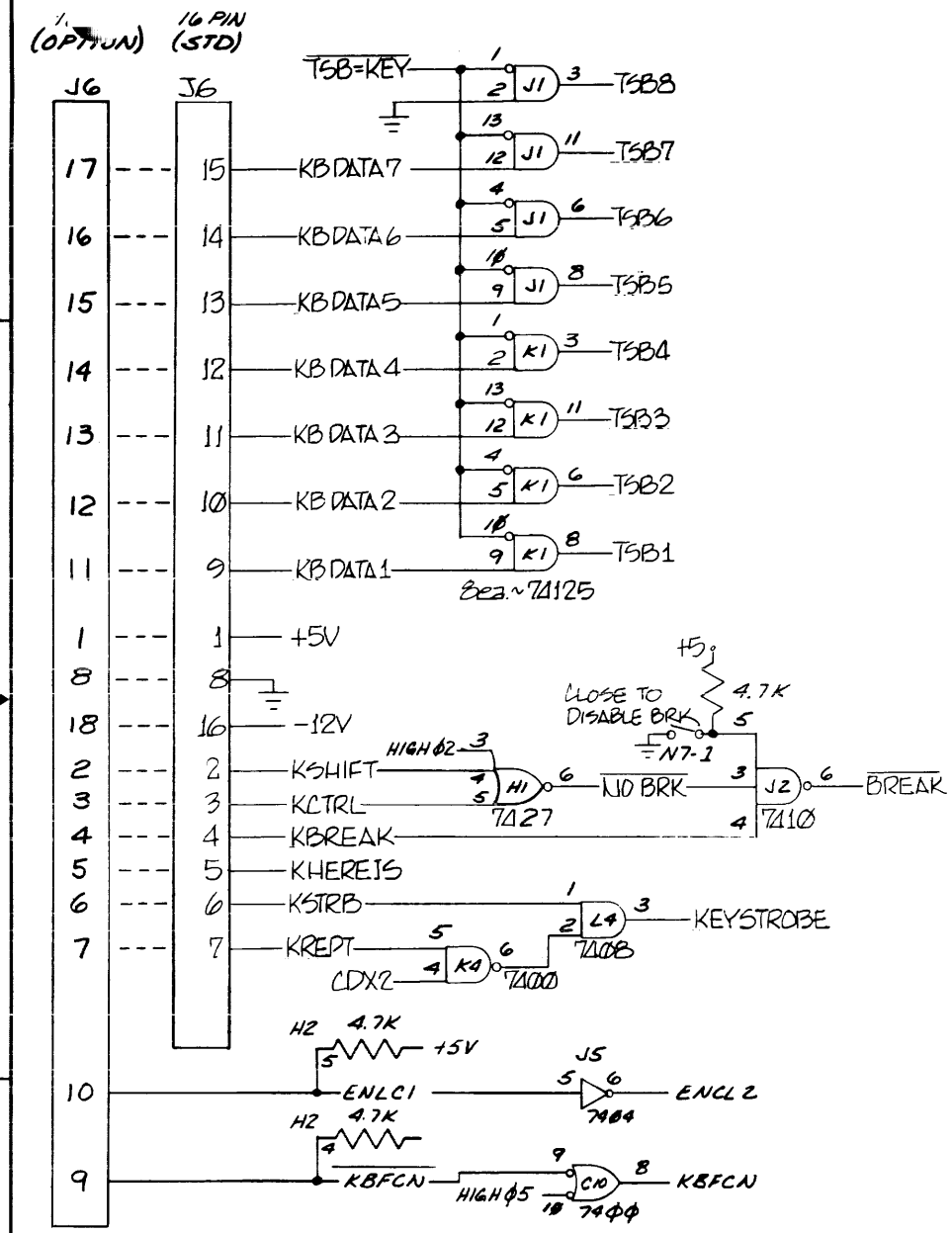
129339



PRINTER INTERFACE OPTION

SIZE	CODE IDENT NO.	DWG NO.	LTR
C	98438	129339	
SCALE		-13 BD	SHEET 16

129339

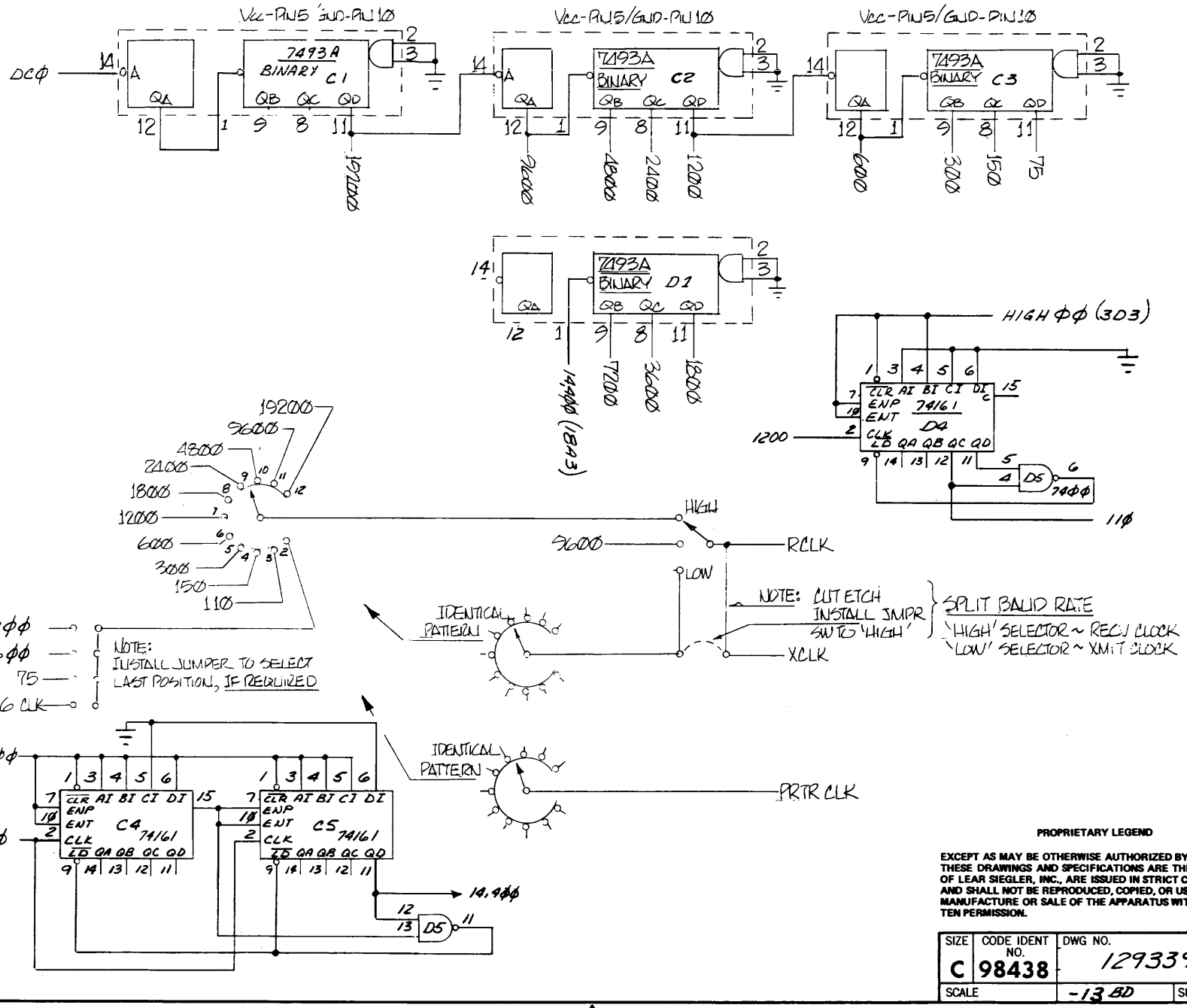


KEYBOARD INTERFACE

SIZE	CODE IDENT NO.	DWG NO.	LTR
C	98 38	129339	
SCALE		-13 BD	SHEET 17

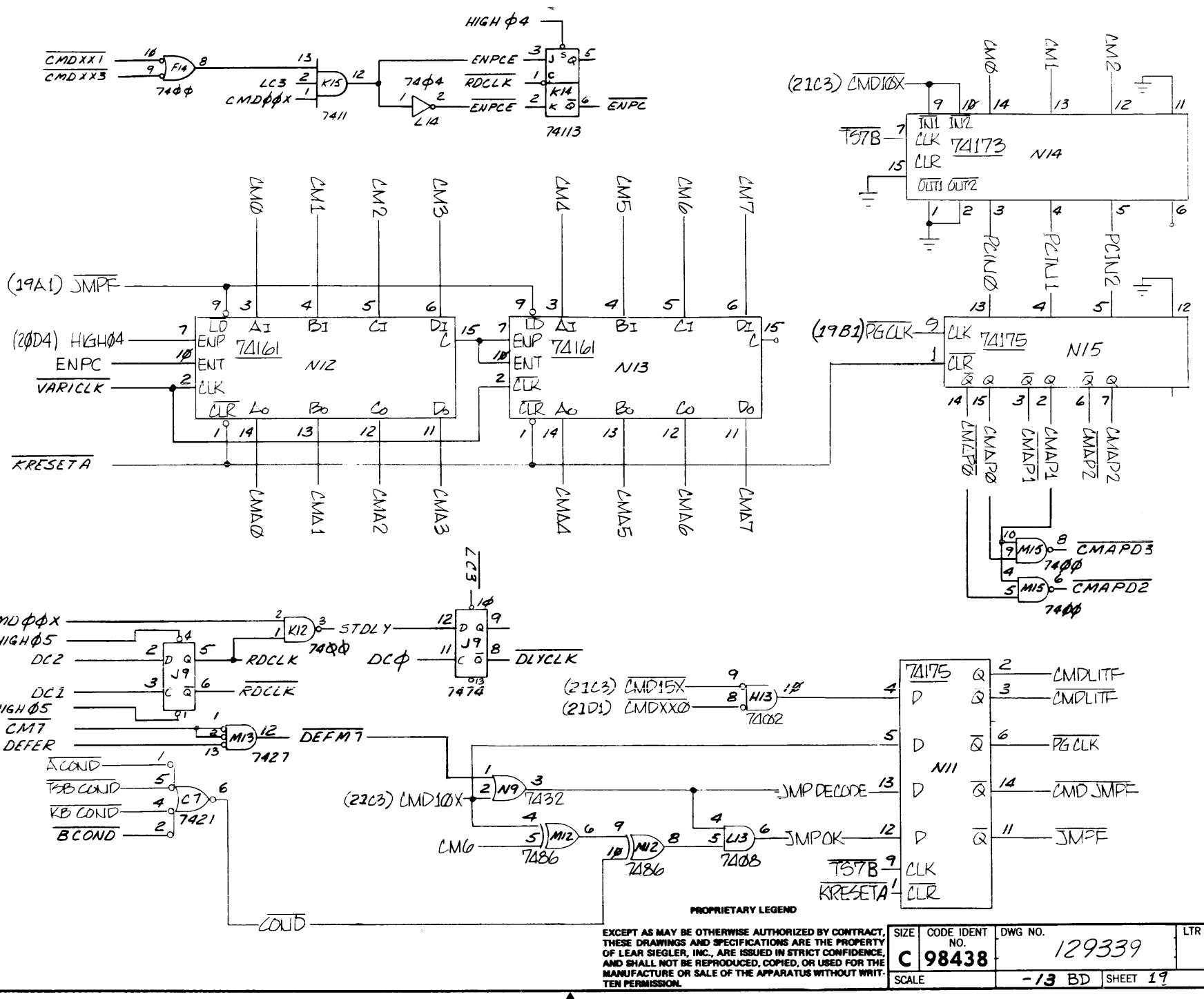
129339

BAUD RATE GENERATION



SIZE	CODE IDENT NO.	DWG NO.	LTR
C	98438	129339	
SCALE		-13 BD	SHEET 18

129339


4
3
2
1
D
C
B
A
HIGH φ4
CMDXX1
CMDXX3
F14
74φφ
LC3
CMDφφX
K15
7411
74φ4
ENPCE
RDCLK
ENPCE
L14
K14
74113
ENPC
(21C3) CMD10X
CM0
CM1
CM2
T57B
74173
N14
OUT1
OUT2
PCINØ
PCIN1
PCIN2
(19A1) JMPF
CM3
CM4
CM5
CM6
CM7
(20D4) HIGHØ4
ENPC
VARICLK
LD
ENP
ENT
CLK
CLR
7416I
N12
N13
AI
BI
CI
DI
LO
BO
CO
DO
AO
KRESETA
CMA0
CMA1
CMA2
CMA3
CMA4
CMA5
CMA6
CMA7
(19B1) PGCLK
74175
N15
CMAPØ
CMAP1
CMAP2
M15
CMAPD3
CMAPD2
74φφ
LC7
CMDφφX
HIGHØ5
DC2
DC1
CM17
DEFER
K12
STDLY
RDCLK
DCφ
DLYCLK
7474
M13
7427
DEFM7
ACOND
TSB COND
KB COND
BCOND
C7
7421
COND
(21C3) CMD15X
(21D1) CMDXXØ
H13
7402
74175
N11
CMDLITF
PGCLK
CMD JMPF
JMPF
(22C3) CMD10X
N9
7432
JMP DECODE
CM6
M12
7486
JMPOK
L13
7408
T57B
KRESETA
CLK
CLR
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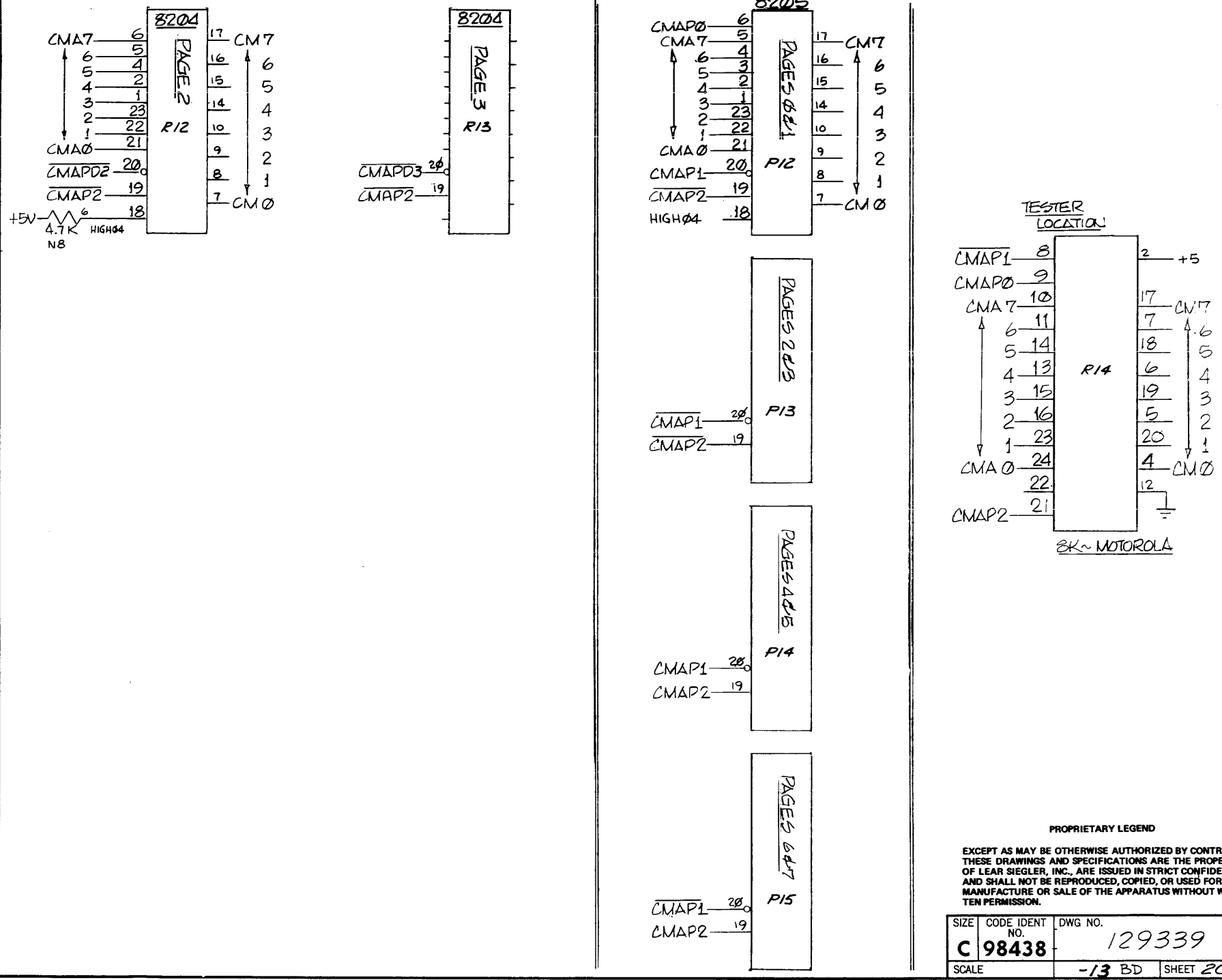
SIZE
C
CODE IDENT NO.
98438
DWG NO.
129339
LTR
SCALE
-13 BD
SHEET 19
129339



PROPRIETARY LEGEND

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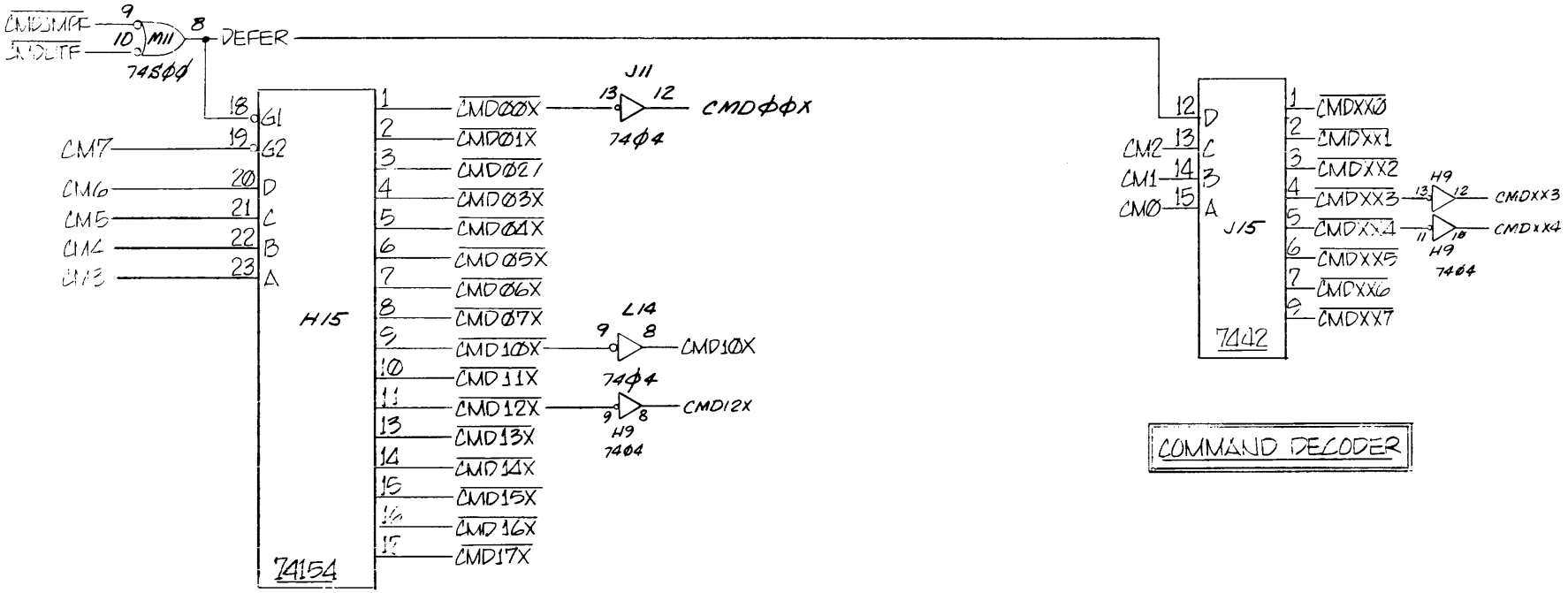
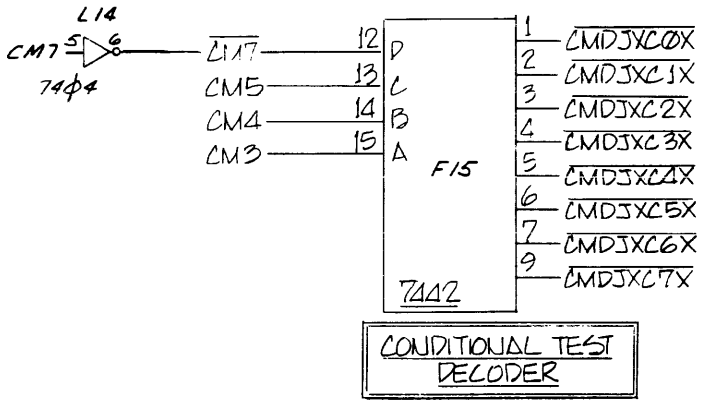
SIZE	CODE IDENT NO.	DWG NO.	LTR
C	98438	129339	
SCALE		-13 BD	SHEET 20

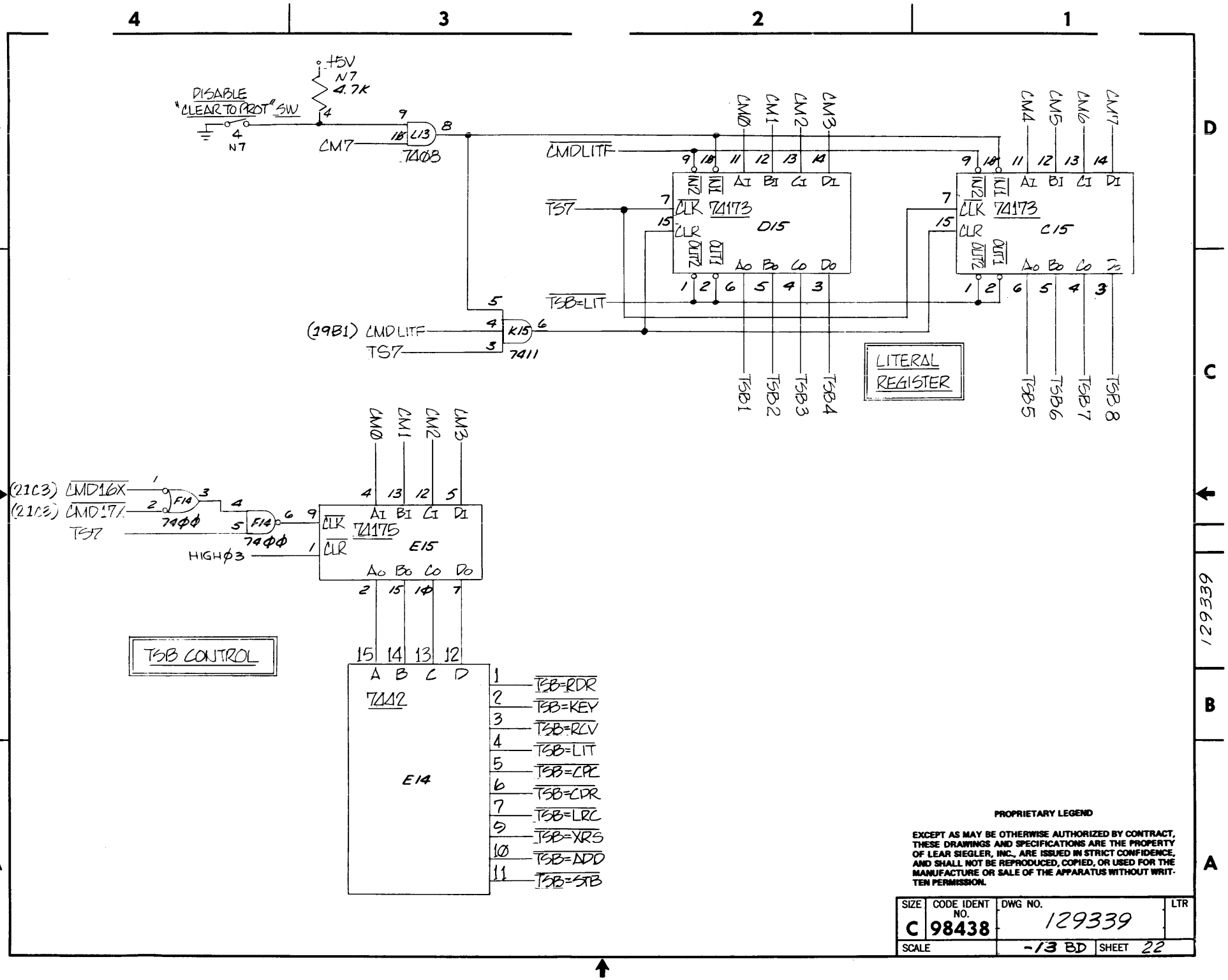
129339





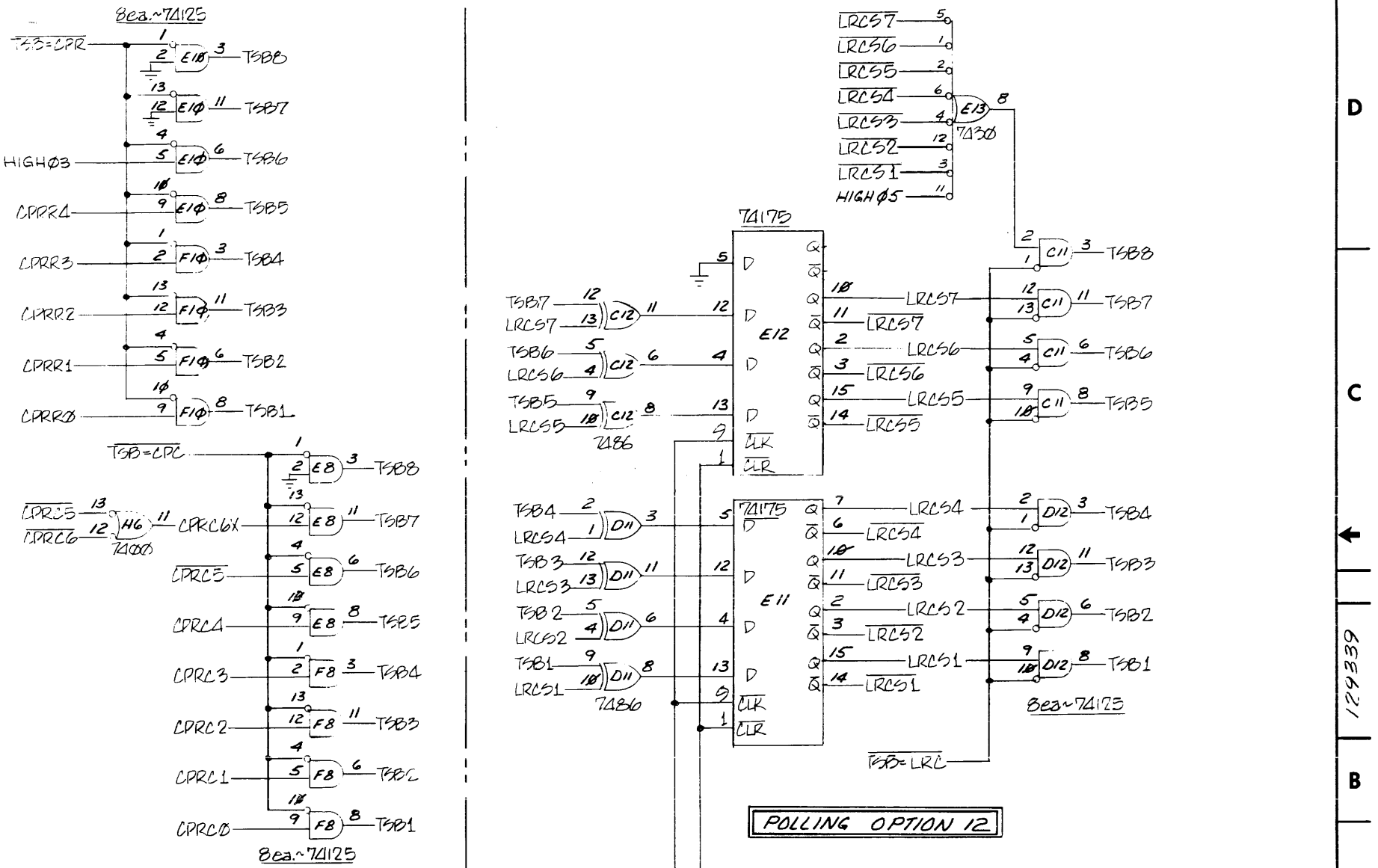
SIZE	CODE IDENT NO.	DWG NO.	LTR
C	98438	129339	
SCALE		-13 BD	SHEET 21

129339



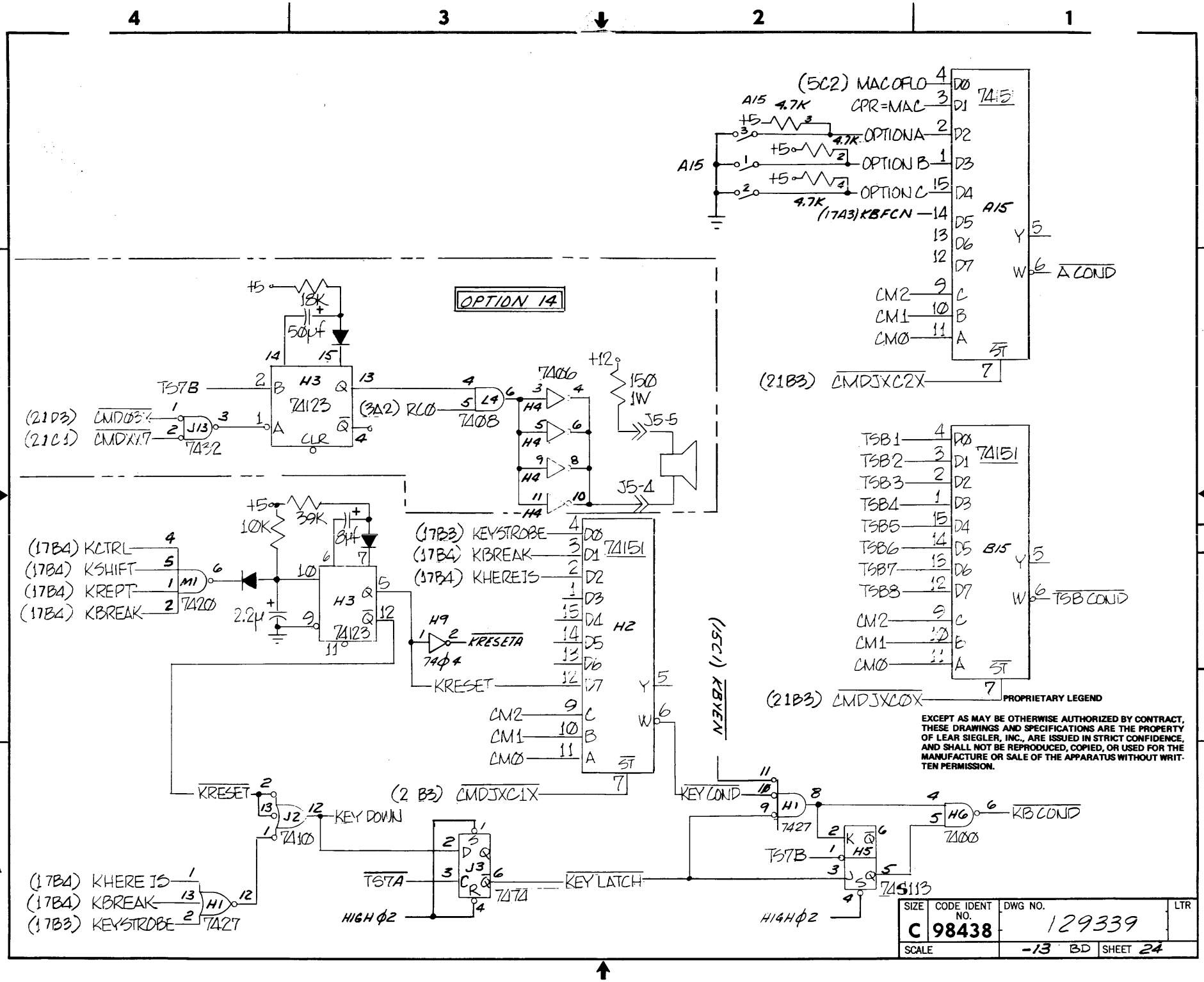
SIZE	CODE IDENT NO.	DWG NO.	LTR
C	98438	129339	
SCALE		-13 BD	SHEET 22

129339



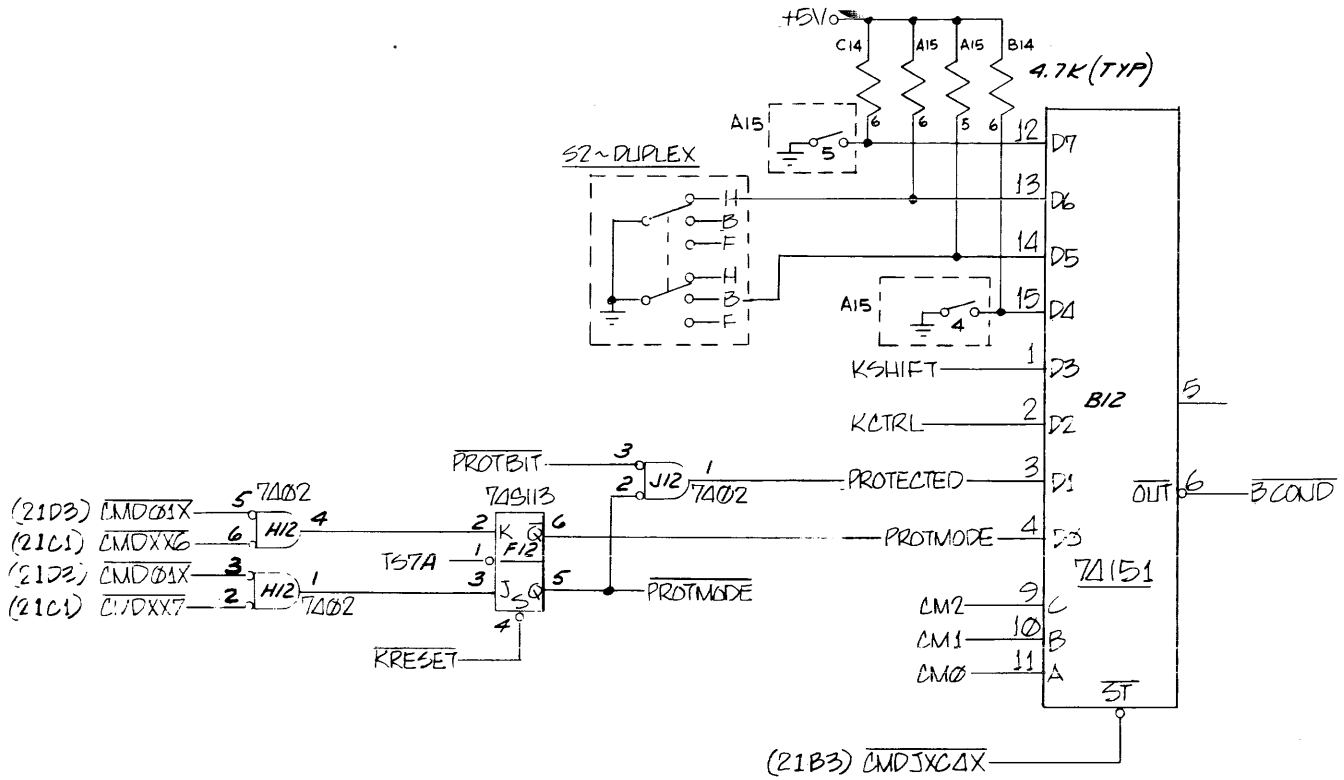
SIZE	CODE IDENT NO.	DWG NO.	LTR
C	98438	129339	
SCALE		-13 BD	SHEET 23

129339



SIZE	CODE IDENT NO.	DWG NO.	LTR
C	98438	129339	
SCALE		-13 BD	SHEET 24

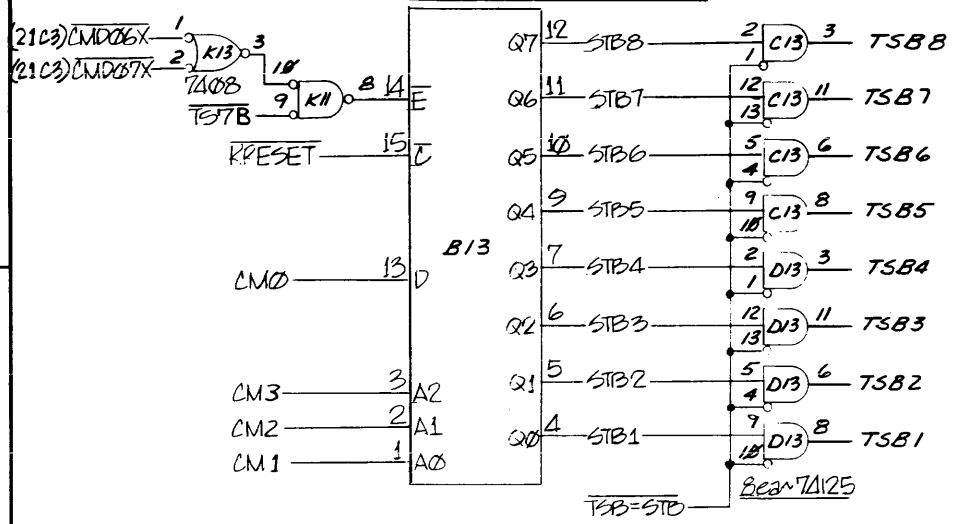
129339



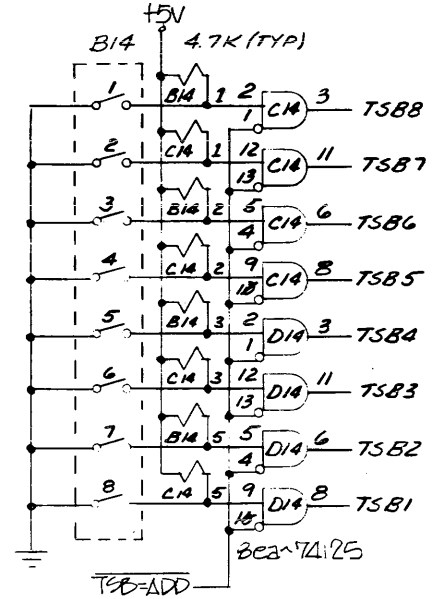
SIZE	CODE IDENT NO.	DWG NO.	LTR
C	98438	129339	
SCALE		-13 BD	SHEET 25

129339

NATIONAL DM8334
8 BIT ADDRESSABLE LATCH



STATUS REGISTER



ADDRESS SWITCH

POLLING OPTION 12

SIZE	CODE IDENT NO.	DWG NO.	LTR
C	98438	129339	
SCALE		-13 BD	SHEET 26

129339

LEAR SIEGLER, INC.
ELECTRONIC INSTRUMENTATION DIVISION
ANAHEIM, CALIFORNIA

ADCN

ADVANCE DRAWING CHANGE NOTICE

✓	MAY BE REWORKED	1
	CANNOT BE REWORKED	2
	NOW SHOP PRACTICE	3
	RECORD CHANGE	4
	PARTS MADE OK	5

REASON: To Force "SEC RECV DATA" True, When Unit Detached From Modem.

EFFECTIVITY

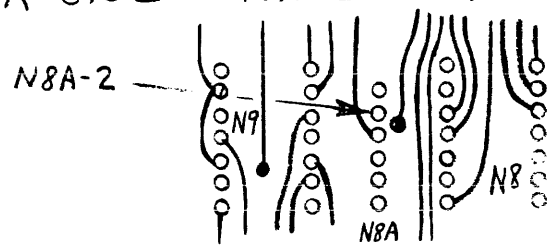
ADCN SHEET	OF	
JOB NO	DATE	
DRAFTED G. Strohmeyer	12/16/76	
CHECKED		
APPROVED		
APPROVED	12/16/76	
RELEASED H. Turner	12/16/76	

ADCN	DRAWING NUMBER	SH NO
8	129338 "B"	1

DRAWING TITLE: P.C. BOARD ASSY. ADM-1

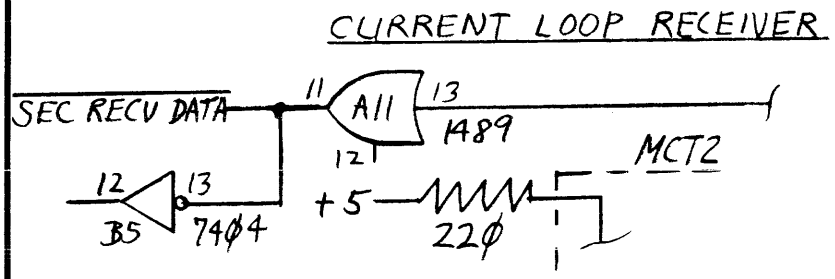
THE DRAWING WILL BE CHANGED TO INCLUDE THIS ADCN

1. ADD 30 GA. JUMPER FROM A11-12 TO N8A-2 (RESISTOR PAC), ON SOLDER SIDE. N8A-2 TERMINATION SHOWN BELOW.

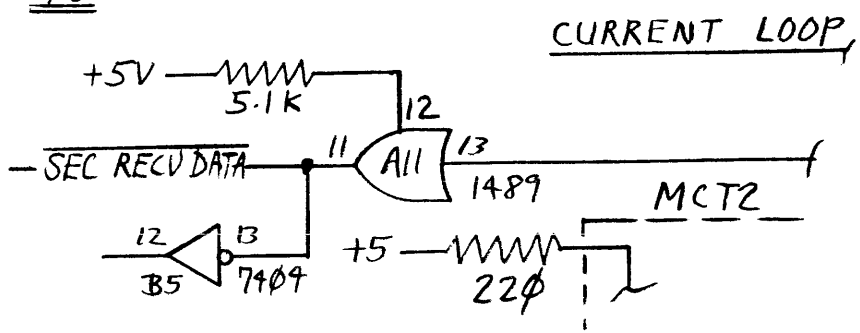


2 REVISE SCHEMATIC SHEET 14, ZONE - C3, AS SHOWN BELOW:

WAS



IS



LEAR SIEGLER, INC.
ELECTRONIC
INSTRUMENTATION DIVISION
ANAHEIM, CALIFORNIA

ADCN

ADVANCE DRAWING CHANGE NOTICE

✓	MAY BE REWORKED	1
	CANNOT BE REWORKED	2
	NOW SHOP PRACTICE	3
	RECORD CHANGE	4
	PARTS MADE OK	5

REASON: Spare input pulled high – should be low, or tied to another input.

EFFECTIVITY: -13 PCB ONLY

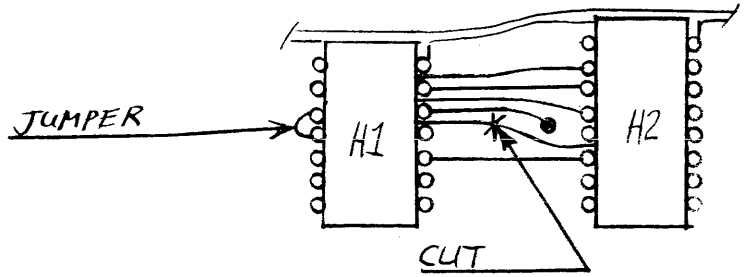
ADCN SHEET / OF /		
JOB NO.	DATE	
DRAFTED G. Strohmeyer	12/11/76	
CHECKED		
APPROVED		
APPROVED [signature]	3/11/76	
RELEASED W. Turner	12/30/76	

ADCN	DRAWING NUMBER	SH NO
9	129338 "B"	1

DRAWING TITLE: P.C. BOARD ASSY. ADM-1

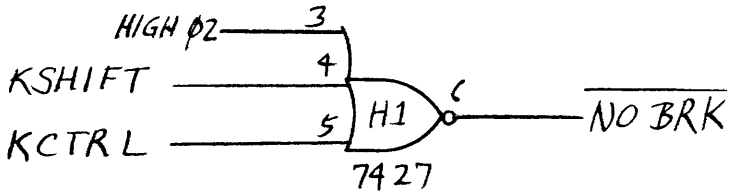
THE DRAWING WILL BE CHANGED TO INCLUDE THIS ADCN

1. ON COMPONENT SIDE, CUT ETCH WHERE SHOWN BELOW, AND INSTALL 30 GA. JUMPER BETWEEN PINS H1-3 AND H1-4.

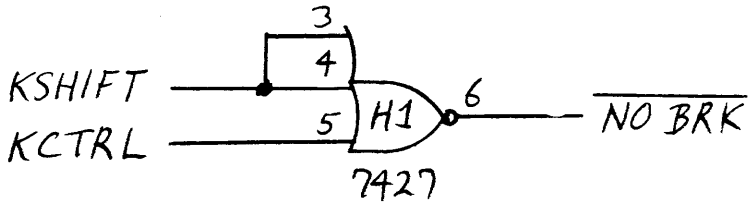


2 ON SCHEMATIC SHEET 17, ZONE-B3, REVISE AS SHOWN:

WAS



IS



LEAR SIEGLER, INC.
ELECTRONIC
INSTRUMENTATION DIVISION
ANAHEIM, CALIFORNIA

ADCN

ADVANCE DRAWING CHANGE NOTICE

✓	MAY BE REWORKED	1
	CANNOT BE REWORKED	2
	NOW SHOP PRACTICE	3
	RECORD CHANGE	4
✓	PARTS MADE OK	5

REASON: Make one-shot trigger delay more consistant with +5V PS rise-time.

EFFECTIVITY: Mfg convenience; part availability

ADCN SHEET 1 OF 1		
JOB NO.	DATE	
DRAFTED G. Strohmeyer	1/3/77	
CHECKED		
APPROVED		
APPROVED	1/3/77	
RELEASED	1/3/77	

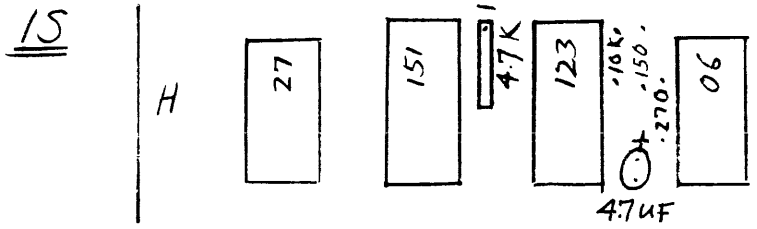
ADCN	DRAWING NUMBER	SH NO
10	129338 "B"	1

DRAWING TITLE: P.C. BOARD ASSY., ADM-1

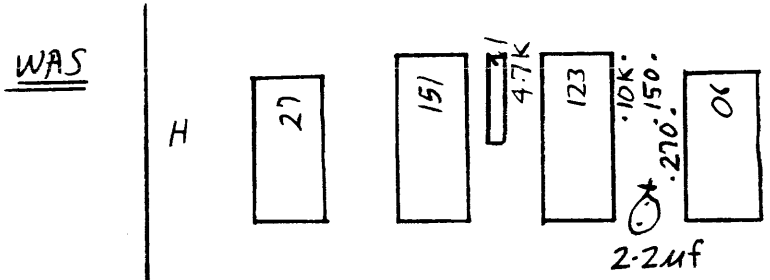
THE DRAWING WILL BE CHANGED TO INCLUDE THIS ADCN

REVISE ASSY. AS SHOWN:

IS

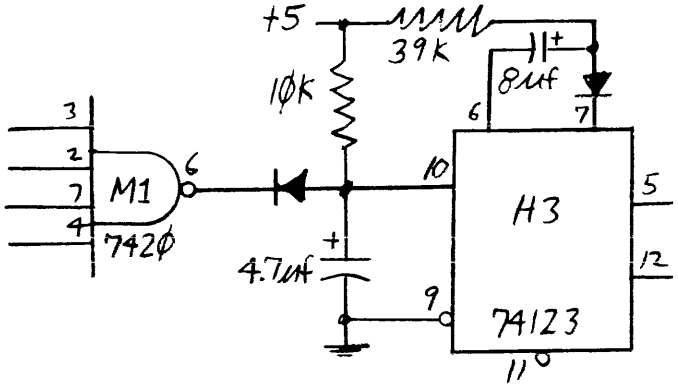


WAS

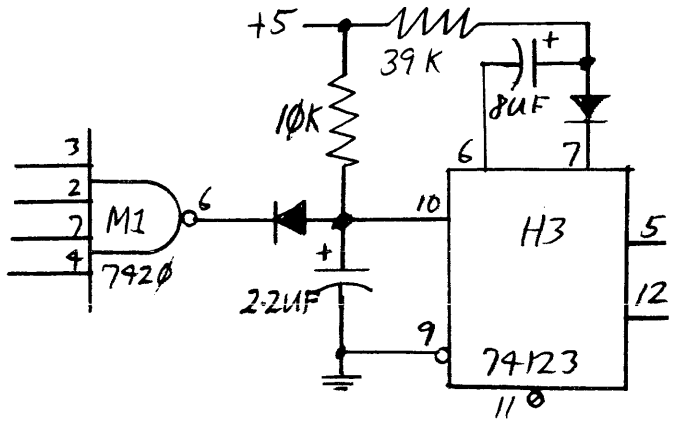


REVISE LOGICS Sheet 24, Zone B-4, AS SHOWN:

IS



WAS



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ADCN

ADVANCE DRAWING CHANGE NOTICE

	MAY BE REWORKED	1
	CANNOT BE REWORKED	2
	NOW SHOP PRACTICE	3
	RECORD CHANGE	4
✓	PARTS MADE OK	5

REASON: Cross-talk from Beep-Drivers Still Clearing "KRESET"

EFFECTIVITY: -13, @MFG. CONVEN'CE

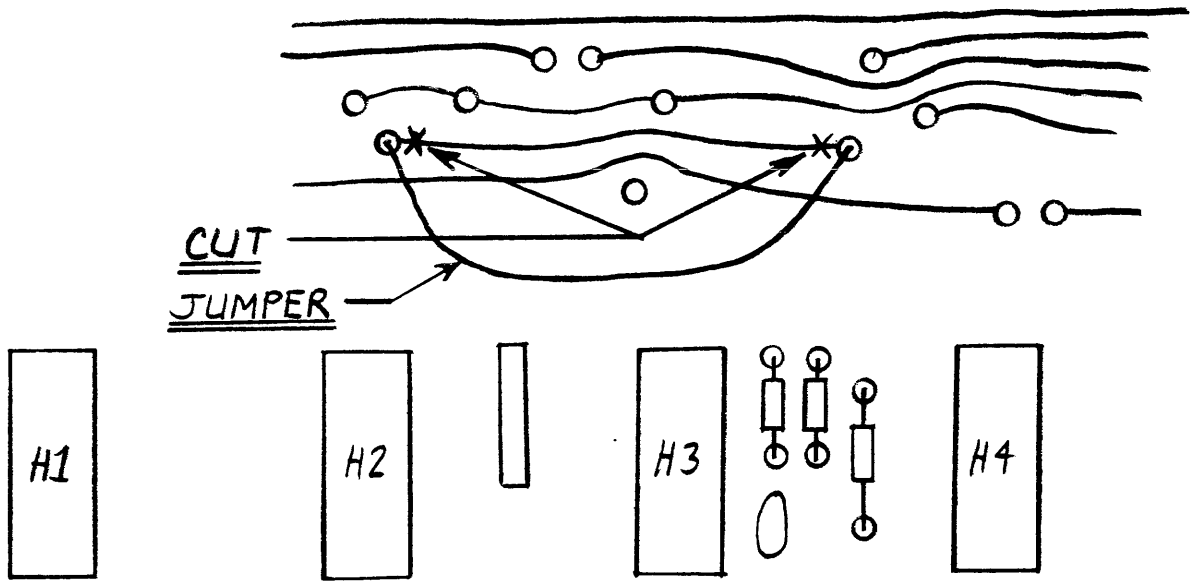
ADCN SHEET / OF /		
JOB NO.	DATE	
DRAFTED G. Strohmeyer	2/25/77	
CHECKED		
APPROVED	2/25/77	
APPROVED	2/25/77	
RELEASED K. Turner	3/25/77	

ADCN	DRAWING NUMBER	SH NO
11	129338 "B"	1

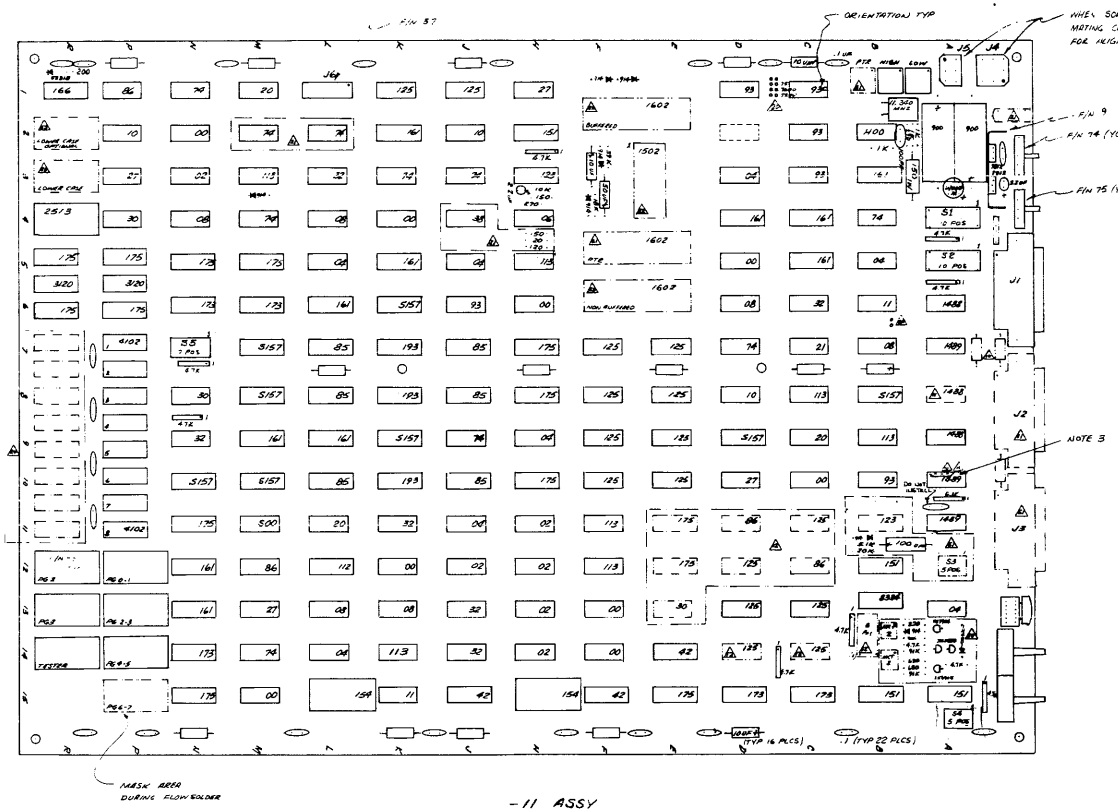
DRAWING TITLE: P.C. BOARD ASSY., ADM -1

THE DRAWING WILL BE CHANGED TO INCLUDE THIS ADCN

ON COMPONENT SIDE, CUT ETCH 2-PLACES AS SHOWN BELOW, AND INSTALL 30 GA. JUMPER IN INDICATED FEED-THRUS.



REVISIONS				
SHT	ZONE	LTR	DESCRIPTION	DATE / APPROVED
1		A	INC ADCN 1-4 (W Kelly 3-19-76)	3/22/76
		B	INC ADCN 5-6-7 CREATE -11 ADD SM 3 & 4 FOR -1 WHERE SM 1 & 2 (W Kelly 11-1-76)	11/4/76



-11 ASSY

NOTES.
1 FOR FINAL CONFIGURATION & OPTIONS REFER TO 129503
2 BOARD MODIFICATIONS.

3 IN UNITS WITHOUT EXTENSION PORT (OPT 11) OR PRINTER PORT (OPT 51) INSTALL 22 AWG SOLID BUS WIRE JUMPER IN I.C. SOCKET AT A10 PIN 3 TO 7.

SEE SEPARATE PARTS LIST PL 129338

REVISION STATUS				
SHEET	1	2	3	4
REV	B	A	A	B

DASH NO.	NEXT ASSY	USED ON
01	129308-01	ADM-1
	APPLICATION	

UNLESS OTHERWISE SPECIFIED
DIM. IN INCHES
TOLERANCES
X ± .1
XX ± .03
XXX ± .010
ANGLES ± 0.5°
MACH. FIN. √

CONTR NO.	
DR W Kelly	12-16-75
CHK	
DSGN	
ENGR	
PROJ	6-10-76
REL	6-10-76
APPD	
APPD	

LEAR SIEGLER, INC.
ELECTRONIC INSTRUMENTATION DIVISION
ANAHEIM, CALIFORNIA 92803

P.C. BOARD ASSY
ADM-1

SIZE	CODE IDENT NO.	DWG NO.	LTR
D	98438	129338	B

SCALE 1/1 SHEET 1 OF 6

129338 B

1A9318-1
1A9318-2
SERIAL NO. 1A1425
7-28-72