

**H-79-0378**

# **Graphic7<sup>TM</sup>**

## **COMPUTER GRAPHICS DISPLAY SYSTEM**

**MODELS 730 - 733  
MONOCHROME  
DISPLAY INDICATORS**

**TECHNICAL MANUAL**

Information Products Division  
Federal Systems Group



**SANDERS**

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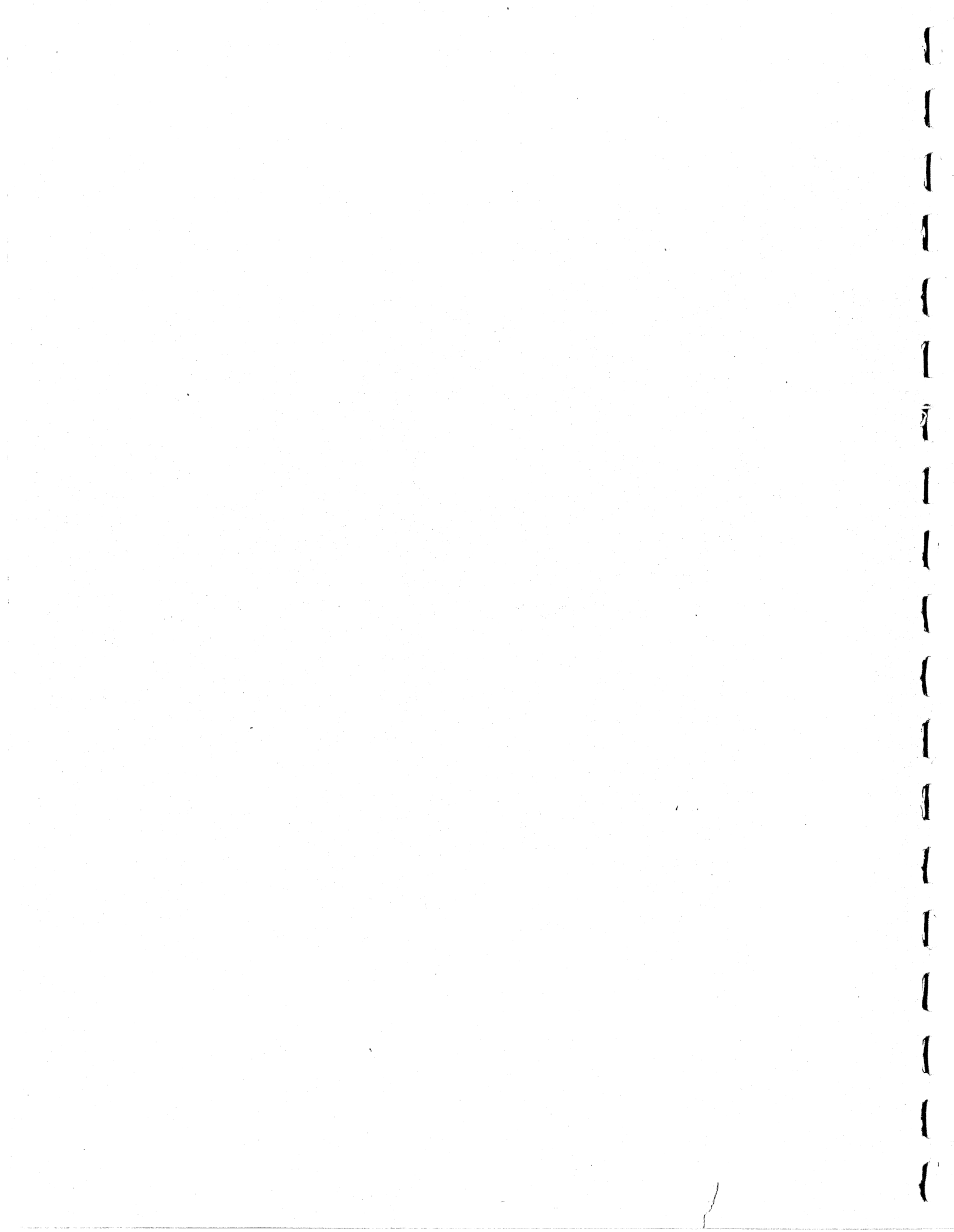
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## RECORD OF CHANGES

CHANGE NO.	DATE	TITLE OR BRIEF DESCRIPTION	ENTERED BY
1	FEB 81	Suppression of conducted emission	
2	MAR 81	Eliminate interaction of color controls	
3	AUG 81	Clarify description of protection circuits	



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## SAFETY PRECAUTIONS

The display indicator contains a high vacuum cathode ray tube. If the cathode ray tube is subjected to unusual stress or shock, it may implode violently. Always wear a face mask, gloves, and chest protector when handling the cathode ray tube.

DO NOT DROP THE CATHODE RAY TUBE!

NEVER PICK IT UP OR CARRY IT BY THE NECK!

DO NOT APPLY ANY LATERAL STRAIN ON THE NECK!

If a tube does implode, always wear gloves when sweeping up the pieces. The phosphor is poisonous. If you get cut or scratched, seek medical help immediately.

Dispose of pieces in a sealed metal container, marked to indicate the dangerous nature of the contents.

The cathode ray tube operates on extremely high voltages. Always turn off all power to the display indicator and allow 30 seconds for high voltages to dissipate before touching any connections to the cathode ray tube or the surface of the tube itself.



## SECTION 1

### GENERAL INFORMATION

#### 1.1 INTRODUCTION

This manual describes display indicators Models 730 through 733. This manual contains descriptive information, operation, theory, installation, and maintenance information.

#### 1.2 EQUIPMENT DESCRIPTION

##### 1.2.1 PHYSICAL DESCRIPTION

The display indicator (figure 1-1) is a self-contained, high speed, X-Y-Z cathode ray tube (CRT) indicator. Model differences are as follows:

<u>Model</u>	<u>Description</u>
730	Horizontal, desk top
731	Horizontal, 24-inch rack
732	Vertical, desk top
733	Vertical, 19-inch rack

The display indicator operates on input voltages of 100 to 120 Vac or 200 to 240 Vac. Refer to Section 3 for details.

Refer to table 1-1 for dimensions.

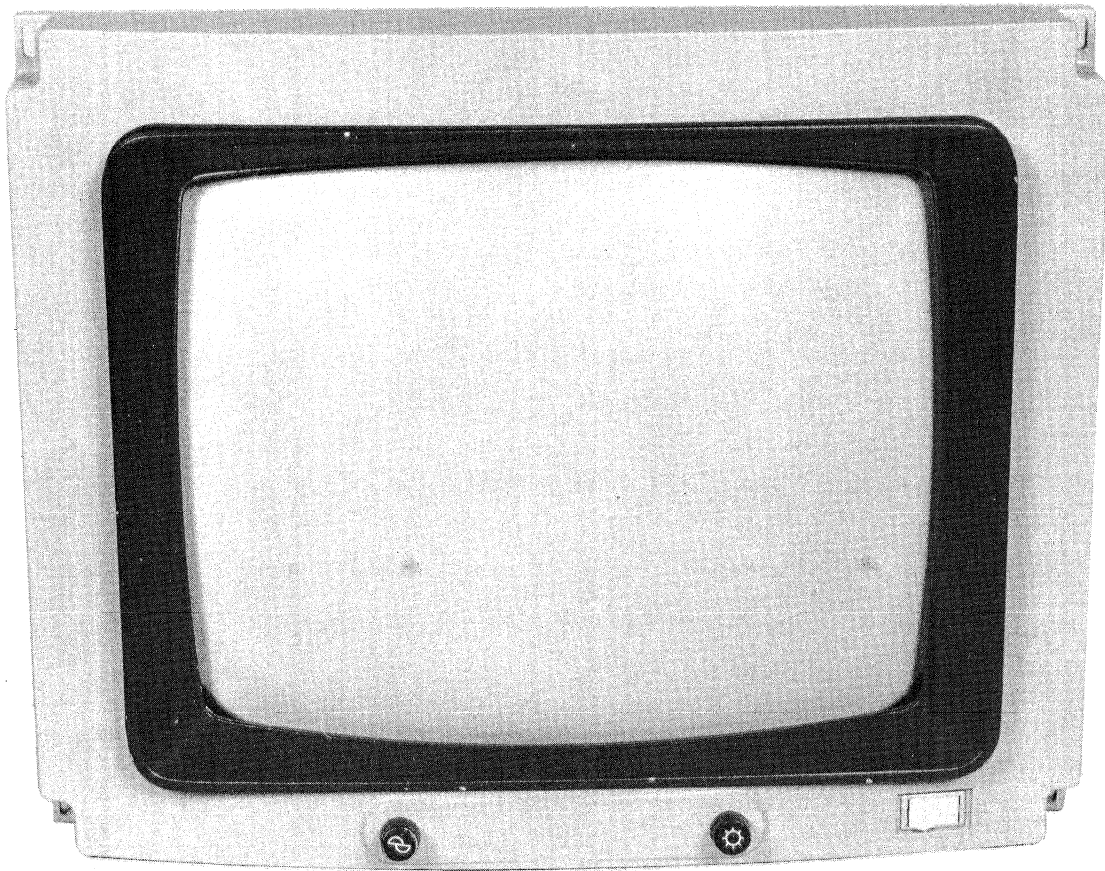
Front panel controls include the power on/off switch, the focus adjustment, and the brightness control. At the rear of the display indicator are a resettable circuit breaker and a self test pushbutton. Instructions for using these controls are contained in Sections 2 and 5.

The display indicator is designed for easy maintenance. Models 730 and 732 have plastic covers which are easily removed to gain access to components.

All connections to the terminal controller are made at the rear of the display indicator. Models 730 and 732 also have an accessory panel below the display indicator. Accessory devices such as keyboard, PHOTOPEN<sup>®</sup>, trackball, forcestick, or data tablet connect to the front of the accessory panel. Connections from the accessory panel to the terminal controller and the display indicator are at the rear.

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Figure 1-1. Display Indicator

### 1.2.2 FUNCTIONAL DESCRIPTION

The display indicator receives X (horizontal), Y (vertical), and Z (intensity) signals from the output channel card in the terminal controller in the form of analog voltages. In the display indicator, these signals are amplified and applied to the deflection yoke of the CRT (the X and Y signals control beam movement on the CRT screen) and to the CRT cathode (the Z signal controls beam intensity) to produce the display.

The display indicator (figure 1-2) essentially consists of a CRT with an electromagnetic deflection system; a high voltage power supply assembly; a low voltage power supply assembly; a video amplifier assembly that includes a CRT and amplifier protect circuit; and an off-line pattern generator.

The CRT is a 21-inch rectangular tube with an aluminum-backed P40 phosphor. The CRT is designed for electromagnetic deflection and low voltage electrostatic focus.

A neutral density, contrast enhancement, tempered glass implosion panel bonded to the face of the tube protects the operator against the effects of an implosion.

The electromagnetic deflection system consists of two identical deflection amplifiers and a wide-bandwidth 20-microhenry yoke. The deflection chain is designed to handle the bandwidth requirements of both vectors and symbols. It includes self-protection circuits against improper dc operating voltages, transient overdrive inputs, or excessive current. Excessive current trips the main circuit breaker.

The high voltage power supply operates from a +24V input and produces the following outputs:

- +15 kV or +18 kV  $\pm$  5% for the CRT anode
- +900V  $\pm$  6% for the control (focus) grid
- 35V  $\pm$  5% for the accelerator (intensity) grid
- +350 to +700V (adjustable) for the screen grid

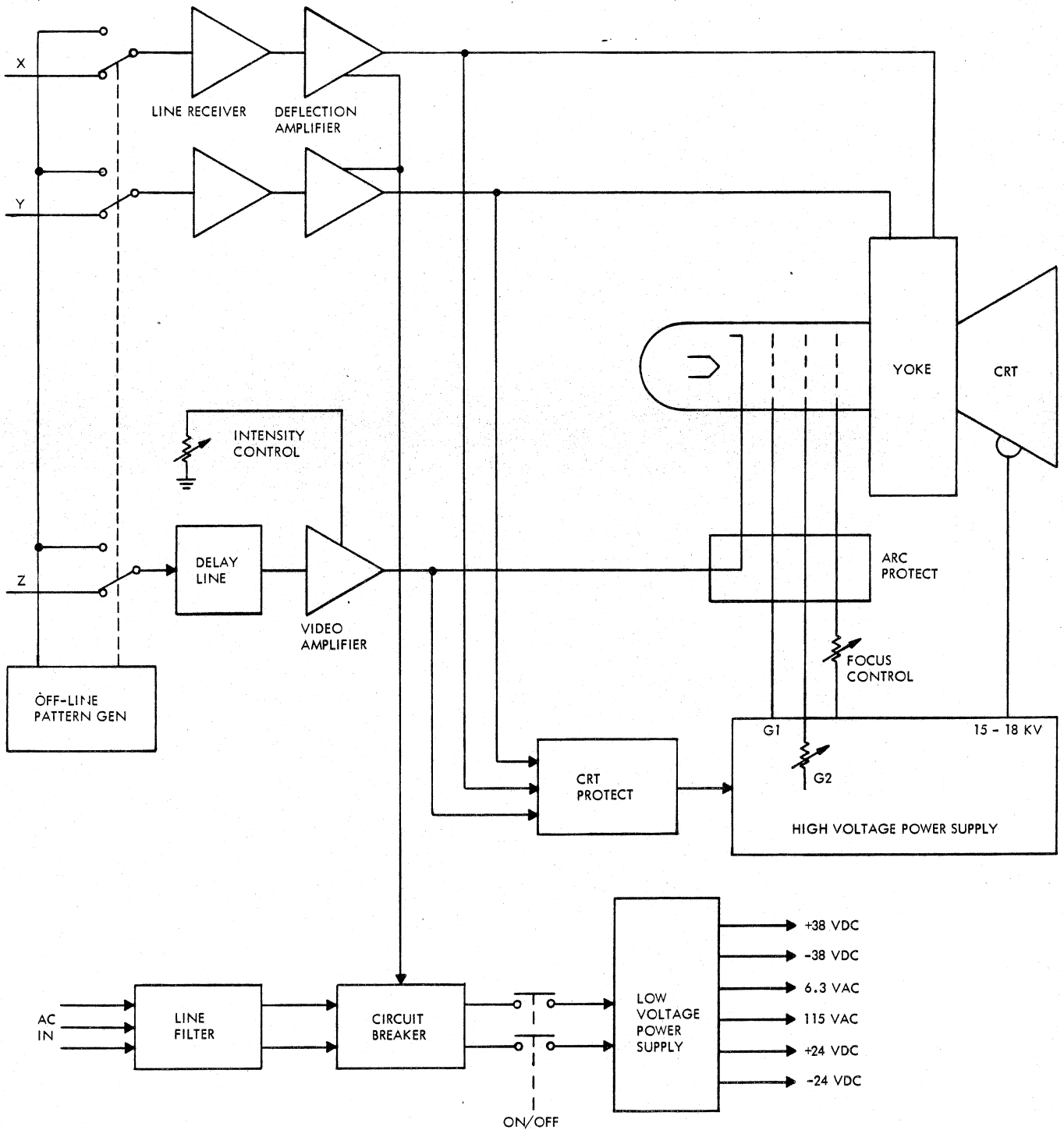
The high voltage power supply is controlled by an externally generated ENABLE signal that occurs only when the dc voltage levels within the video amplifier are correct and there is sufficient X or Y deflection activity to warrant unblinking the CRT.

The low voltage power supply operates from 50 to 60 Hz power sources (actually 43 to 63 Hz) within the ranges of 100V to 120V and 200V to 240V.

The low voltage power supply produces the following outputs:

- $\pm$ 38V  $\pm$  15% at 1A
- $\pm$ 24V  $\pm$  15% at 20A
- 6.3 Vac  $\pm$  15% at 0.66A
- 115 Vac  $\pm$  15% at 0.2A

The video amplifier controls the beam intensity. Incoming video is delayed to compensate for delays in the deflection amplifier. The video amplifier controls the high voltage power supply; the video amplifier determines the correct dc operating voltage and senses the magnitude of deflection activity with respect to the video drive requirements.



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Figure 1-2. Display Indicator Block Diagram

The video amplifier assembly also contains the off-line pattern generator that generates a circular pattern for an operator confidence check.

The CRT socket contains passive components that limit CRT arc-over voltages to safe current-limited levels.

### 1.2.3 SYSTEM DESIGN SPECIFICATIONS

Table 1-1 lists system design specifications. The equipment is certified to these specifications at the factory. It is not practical in all cases to measure listed characteristics in the field because the measurements involve use of complex optometric equipment.

Table 1-1. Typical Display Indicator Specifications

Parameter	Characteristics
OPERATIONAL CHARACTERISTICS	
Display type	X, Y, Z with CRT readout
CRT	Single gun, 21-inch rectangular, P40 phosphor*, electromagnetic deflection, electrostatic focus
Maximum image size	12 by 12 inches**
Video (Z) input	0 to +1.5V; 0V = screen blanked
Full screen deflection (X/Y)	X = $\pm 5V$ , Y = $\pm 5V$
Line width	0.020 inch for P40, P31 phosphors 0.030 inch for P39, P39D phosphors
Ambient light (perpendicular to CRT)	35 foot-candles (377 lux)
Recommended minimum refresh rate	P40 - at least 45 Hz P39, P39D - at least 40 Hz P31 - at least 50 Hz
Contrast	4:1 (P40 phosphor at 60 Hz refresh rate)
Drift	0.25 inch (6.4 mm) in 8 hours
Jitter	Less than 0.010 inch (0.25 mm)
Intensity levels	At least six discernible levels
Geometric distortion	0.120 inch, maximum

\* - Optional phosphors available: P31, P39, P39D

\*\* - 12 by 16 inches available as an option

Table 1-1. Display Indicator Specifications (Cont)

Parameter	Characteristics			
Vector linearity	±1% of vector length or ±0.020 inch, whichever is larger			
Vector end point accuracy	Less than 0.020 inch for vectors up to 3 inches long; less than 0.025 inch for vectors longer than 3 inches			
Repeatability	Less than 0.030 inch			
PHYSICAL CHARACTERISTICS				
Dimensions	730	731	732	733
Height (inches)	21.4	19.0	24.0	24.0
Width (inches)	23.5	24.0	23.2	18.3
Depth (inches)	30.4	28.9	29.3	28.9
Weight (lbs)	98			
ELECTRICAL CHARACTERISTICS				
Input power requirements, 110 Vac service	99-122 Vac, 60 Hz, 1 phase, 4.5A, 0.575 kVa worst case			
Input power requirements, 220 Vac service	198-242 Vac, 50 Hz, 1 phase, 2.38A, 0.575 kVa worst case			
Input power requirements, 240 Vac service	216-264 Vac, 50 Hz, 1 phase, 2.18A, 0.575 kVa worst case			
ENVIRONMENTAL CHARACTERISTICS				
Operating temperature range	+50°F to +95°F (+10°C to +35°C)			
Operating temperature change	18°F/60 minutes (10°C/60 minutes)			
Storage temperature range	+14°F to +122°F (-10°C to +50°C)			
Storage temperature change	27°F/60 minutes (15°C/60 minutes)			
Operating humidity range	20% to 80%			
Storage humidity range	10% to 90%			
Maximum operating altitude	10,000 feet (3,048 meters) above mean sea level			
Safe operating shock	2g for 10 ms			
Safe non-operating shock	3g for 10 ms			

## SECTION 2

### OPERATION

#### 2.1 GENERAL

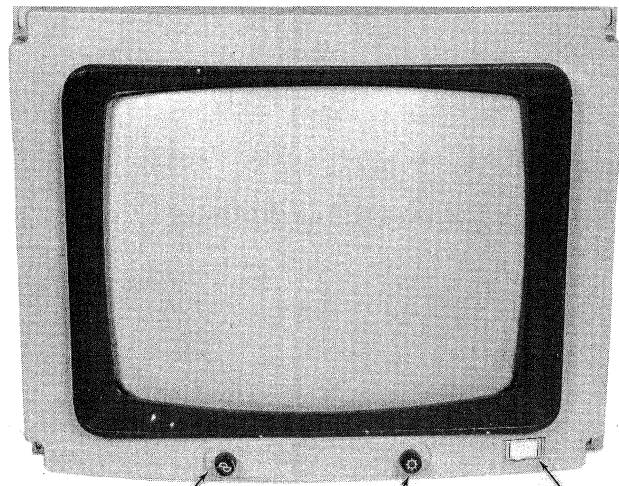
Operation of the display indicator is primarily under the X, Y, and Z control of the terminal controller. Front panel controls let you turn the display indicator on and off and adjust the brightness and focus. Controls at the rear of the chassis include a circuit breaker, impedance selector switch, and a self test pushbutton.

#### 2.2 OPERATOR CONTROLS

See table 2-1 and figure 2-1.

Table 2-1. Operator Controls

Control	Function
Power on/off switch	Pressing the unmarked side of the rocker switch applies power to the display indicator. Pressing the 0 side of the switch turns the display indicator off.
Intensity control (sunburst)	Varies the average display brightness by controlling the amplitude of the video signal.
Focus control (sine wave)	Adjusts CRT focus voltage.
Circuit breaker	Overload protection: 10A at 115V or 5A at 220V. Press to reset.
Impedance selector switch	Set at installation to compensate for the number of display indicators connected to a single terminal controller.
Self test pushbutton	Pressing this pushbutton overrides any other display on the screen and presents a circular pattern. Used as an operator confidence check and maintenance/troubleshooting.

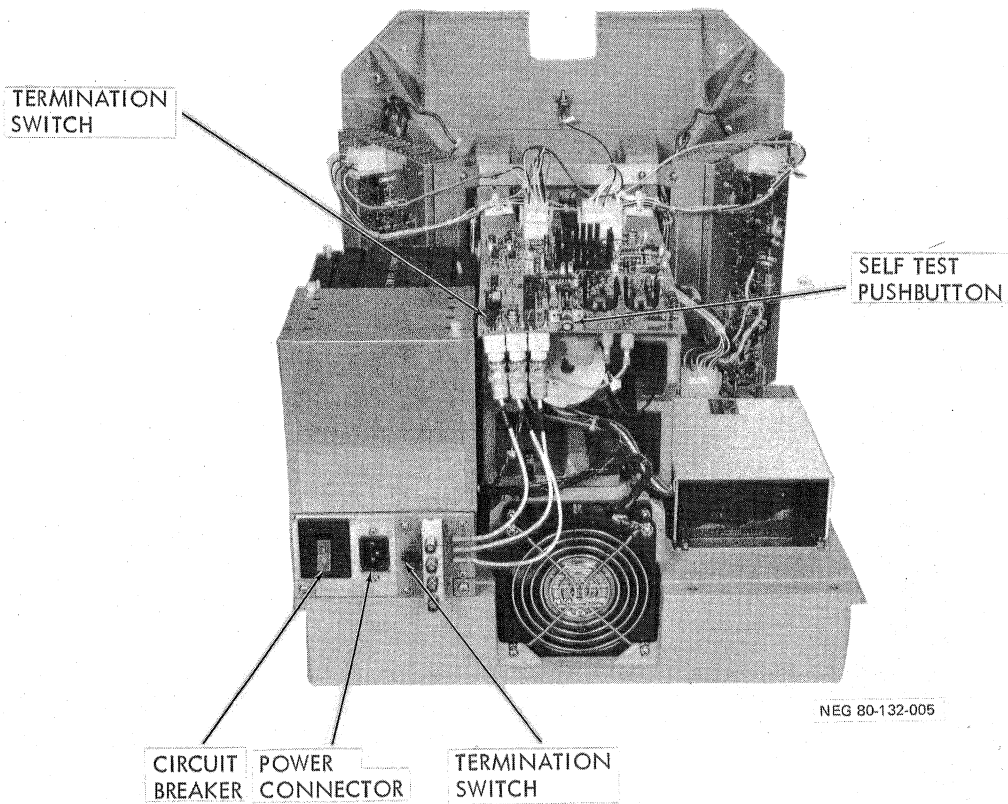


FOCUS

INTENSITY

POWER

NEG 80-132-118



TERMINATION SWITCH

SELF TEST PUSHBUTTON

CIRCUIT BREAKER

POWER CONNECTOR

TERMINATION SWITCH

NEG 80-132-005

Figure 2-1. Display Indicator Controls



## 2.3 OPERATING INSTRUCTIONS

### 2.3.1 NORMAL OPERATION

1. Verify that terminal controller is running and that X, Y, Z lines are connected from terminal controller to display indicator.
2. Press unmarked side of display indicator power on/off switch.
3. Adjust intensity control for comfortable presentation.
4. Adjust focus control for best presentation.

### 2.3.2 NORMAL TURN-OFF

1. Turn down intensity control.
2. Press 0 side of power on/off switch.

### 2.3.3 ABNORMAL CONDITION

If circuit breaker trips, immediately set power on/off switch to off. Investigate cause of overload. Use your nose to detect evidence of overheating. If everything seems normal, wait one minute, then reset circuit breaker and turn display indicator on again. If circuit breaker trips again, set power on/off switch to off, disconnect from power lines, and troubleshoot (see Section 5).

### 2.3.4 SELF TEST

1. Turn on display indicator.
2. Press self test pushbutton at rear of chassis. CRT screen shall display a circular pattern. Adjust intensity and focus controls for best presentation.
3. Observe pattern for circularity, constant intensity, and no breaks. If pattern is not circular or is not complete, adjust display indicator as directed in Section 5.

#### NOTE

Use of the impedance selector switch is explained in Section 4.

### 2.3.5 ACCESSORY DEVICES

Instructions for operating accessory devices (PHOTOPEN, keyboard, trackball, forcestick, or data tablet) are contained in the technical manuals for those devices.



## SECTION 3

### THEORY OF OPERATION

#### 3.1 LOW VOLTAGE POWER SECTION

The display indicator operates on input voltages from 100 Vac to 120 Vac and from 200 Vac to 240 Vac. The power cord supplied with the display indicator is one of the following:

1. For 100 Vac to 120 Vac operation, the power cord is Belden 17501; length 9 feet 8 inches, with standard 3-prong connector at the source end.
2. For 200 Vac to 240 Vac operation, the power cord is Belden 17519; length 9 feet 8 inches, with no connector on the source end. The appropriate connector is added at installation.

In either case, the power cord is color-coded as follows:

Light blue for the neutral line *w*  
Brown for the high line *B*  
Green/yellow for safety ground *G*

The power cord connects to a socket on the line filter, which forms part of the low voltage power supply. Refer to drawing 5978925 in Section 6 of this manual.

Line filter FL1 suppresses transients that may appear on the primary power line. The output of line filter FL1 goes to circuit breaker CB1.

Circuit breaker CB1 is set to open if the current at 115V exceeds 10A or if the current at 220V exceeds 5A. The circuit breaker also opens if the DC FAIL circuit is energized. The DC FAIL circuit is energized if there is a failure in the +24V circuit or in either of the X or Y deflection amplifiers.

The line output of circuit breaker CB1 is one of the following:

1. For 100 Vac to 120 Vac, from pin 4 of the circuit breaker to pin 14 of connector J3.
2. For 200 Vac to 240 Vac, from pin 5 of the circuit breaker to pin 15 of connector J3.

The neutral output of circuit breaker CB1 goes through pin 3 of connector J2 (ACNOUT) to front panel power on/off switch S1, thence through pin 6 of connector J2 (ACNIN) to pin 1 of connector J3.

Connector P3, which mates with J3, carries the jumpers that determine the operating voltage range of the low voltage power section. These jumpers are installed at the factory in response to the customer's purchase order, but may be changed in the field if the field conditions change (see Section 5). Table 3-1 lists the various jumper configurations.

Table 3-1. Low Voltage Power Supply Jumpers

Input Voltage	P3 Jumpers (three sets required)		
100 Vac	1 to 6	2 to 7 to 11	13 to 14
110 Vac	1 to 6	3 to 8 to 11	13 to 14
115 Vac	1 to 6	4 to 9 to 11	13 to 14
120 Vac	1 to 6	5 to 10 to 11	13 to 14
200 Vac	2 to 6	7 to 11 to 12	13 to 15
208 Vac	2 to 6	8 to 11 to 12	13 to 15
220 Vac	3 to 6	8 to 11 to 12	13 to 15
230 Vac	4 to 6	9 to 11 to 12	13 to 15
235 Vac	4 to 6	10 to 11 to 12	13 to 15
240 Vac	5 to 6	10 to 11 to 12	13 to 15

From pin 13 of connector J3 the high line voltage goes through pin 2 of connector J2 (ACLOUT) to the front panel power on/off switch S1, thence through pin 5 of connector J2 (ACLIN) to pin 11 of connector J3.

NOTE

For operation at 100 Vac to 120 Vac, the two sections of the transformer are wired in parallel. For operation at 200 Vac to 240 Vac, the two sections of the transformer are connected in series.

Varistors R1 and R2 regulate the ac output across the 115 Vac primary windings of the transformer in the presence of high transient line voltages.

A cooling fan in the display indicator is operated by 115 Vac from the transformer primary regardless of the input voltage configuration. The high line to the fan goes from pin 4 of connector J3 through pin 8 of connector J2; the return from the fan goes from pin 9 of connector J2 to pin 1 of connector J3. This line is the 115 Vac output of the low voltage power supply.

The transformer has four secondary windings. The output at terminals 18 and 19 is the 6.3 Vac filament voltage for the CRT.

The output of transformer pins 11 and 12 goes to full-wave bridge rectifier CR1, which produces +24V. The output of transformer pins 13 and 14 goes to full-wave bridge rectifier CR2, which produces -24V. The return lines to the rectifiers are tied together (24V COM). Each rectifier has the capacity to handle 22A of current; however, the total current drain from both rectifiers together (not necessarily the same) does not exceed 20A.

The output of transformer pins 15 and 17 goes to full-wave rectifier A2CR1, which produces  $\pm 38V$ . The 38V COM returns to transformer pin 16.

#### NOTE

The low voltage power supply assembly also contains I/O (input/output) connector CCA A1, which is associated with the signal input functions. See paragraph 3.7.

### 3.2 HIGH VOLTAGE POWER SUPPLY

The high voltage power supply (Sanders source control drawing 1088598) is a purchased item manufactured by CPS, 170 Wolfe Road, Sunnyvale, CA 94086. It is not field-repairable.

The input voltage to the high voltage power supply is  $\pm 24V \pm 15\%$ , with not more than 2.0V peak-to-peak ripple at 100/120 Hz. Table 3-2 lists and describes the outputs of the high voltage power supply.

The high voltage power supply has a 15-pin connector (J1) on the case and an 18-inch cable terminating in the anode connector. Table 3-3 identifies the signals and voltages present at connector J1. The anode lead carries the high voltage to the CRT anode button. See drawing 1088599 in Section 6.

The high voltage power supply also has a screwdriver adjustment (G2 ADJ) on the case. This adjustment varies the G2 voltage from +350V to +700V. Refer to Section 5 for instructions.

The power supply is so designed that the grid #1 voltage is the first to be developed when the power supply is turned on and the last to decay when the power supply is turned off. This feature protects the face of the CRT against burn spots.

The power supply can be disabled by a disable signal at pin 9 of connector J1. The disable signal is a logic low (0V to +0.6V) that comes from the video amplifier (J5-B). When this signal goes low, the grid #1 voltage drops to a value more negative than -82V in 500 microseconds or less to protect the CRT. All other voltages (including the anode voltage) drop to a value of 42.5V or less within 10 seconds.

The power supply is enabled when the control input at pin 9 of connector J1 is a logic high (+2.5V to +5.25V).

The power supply has internal short-circuit protection for all output voltages. The power supply is self-restoring when the overload is removed.

Table 3-2. High Voltage Power Supply Characteristics

Parameter	Anode	Focus	Grid #1	Grid #2
Nominal voltage	+15,000/18,000*	+900	-35	+350 to +700
Tolerance	5%	6%	5%	Not applicable
Maximum current	250 $\mu$ A	200 $\mu$ A	25 $\mu$ A	25 $\mu$ A
Line regulation	0.05% p-p	0.05% p-p	0.1% p-p	0.1% p-p
Load regulation	0.1% p-p	0.5% p-p for 10% load change	0.6% p-p for 10% load change	0.6% p-p for 10% load change
Dynamic regulation	0.3% overshoot recovering to 0.1% p-p in 10 ms with 1500 pF load			
Ripple	0.05% p-p at 250 $\mu$ A into 1500 pF load	0.1% p-p at 200 $\mu$ A	0.3% p-p with 1000 pF load	0.3% p-p with 20 pF load
Load capacitance	1500 pF	20 pF	1000 pF	20 pF
Temperature coefficient	0.02%/°C	0.01%/°C	0.01%/°C	0.1%/°C
Stability (8 hours, after 1 hour warmup)	0.05%	0.05%	0.05%	0.05%

\*18,000V needed for P40 phosphor

Table 3-3. High Voltage Power Supply Connections

Pin	Voltage
1	Signal ground
2	+24V input
3	No connection
4	Signal ground
5	Grid #2 output (+350V to +700V)
6	Grid #1 output (-35V)
7	Focus output (+900V)
8	No connection
9	Power supply control input
10	Signal ground
11	No connection
12	No connection
13	No connection
14	Signal ground
15	No connection

Table 3-4 lists other high voltage power supply characteristics.

Table 3-4. High Voltage Power Supply Characteristics

Parameter	Characteristic
Operating temperature range	+32°F to +131°F (0°C to +55°C)
Storage temperature range	-40°F to +185°F (-40°C to +85°C)
Humidity	5% to 90%, non-condensing
Operating altitude	10,000 feet (3048 meters)
Safe transport altitude	35,000 feet (10,668 meters)
Case dimensions	9.12 inches by 5.06 inches by 2.29 inches (232 mm by 129 mm by 58 mm)
Weight	2.75 pounds (1.25 kg)

### 3.3 CATHODE RAY TUBE

The CRT (P40 phosphor, non-etched implosion panel with high efficiency anti-reflective coating) is part number CK1742P40AR, manufactured by the Raytheon Company, Microwave and Power Tube Division, 465 Centre Street, Quincy, MA 02169; the corresponding Sanders Associates, Inc., source control number is 5977421P23. The outline drawing is 5977059 in Section 6 of this manual. Table 3-5 lists CRT characteristics.

Table 3-5. CRT Characteristics

Parameter	Characteristic	
Bulb transmittance	85% ± 3%	
Implosion panel transmittance	62% ± 5%	
Anti-reflective coating reflectance	$\theta = 0^\circ$ to $15^\circ$	$\theta = 30^\circ$
450-675 mu	0.6 absolute	
450-650 mu		1.0 absolute
425-700 mu	0.35 average	0.5 average
500-620 mu	0.35 average	0.5 average
Operating altitude	to 15,000 feet (4573 meters)	
Relative humidity	0% to 95% with condensation	
Operating temperature range	-49°F to +149°F (-45°C to +65°C)	
Storage temperature range	-67°F to +149°F (-55°C to +65°C)	

The CRT filament requires 6.3 Vac at 660 mA maximum.

Figure 3-1 shows details of the circuitry at the CRT socket.

### 3.4 ARC PROTECT CIRCUIT

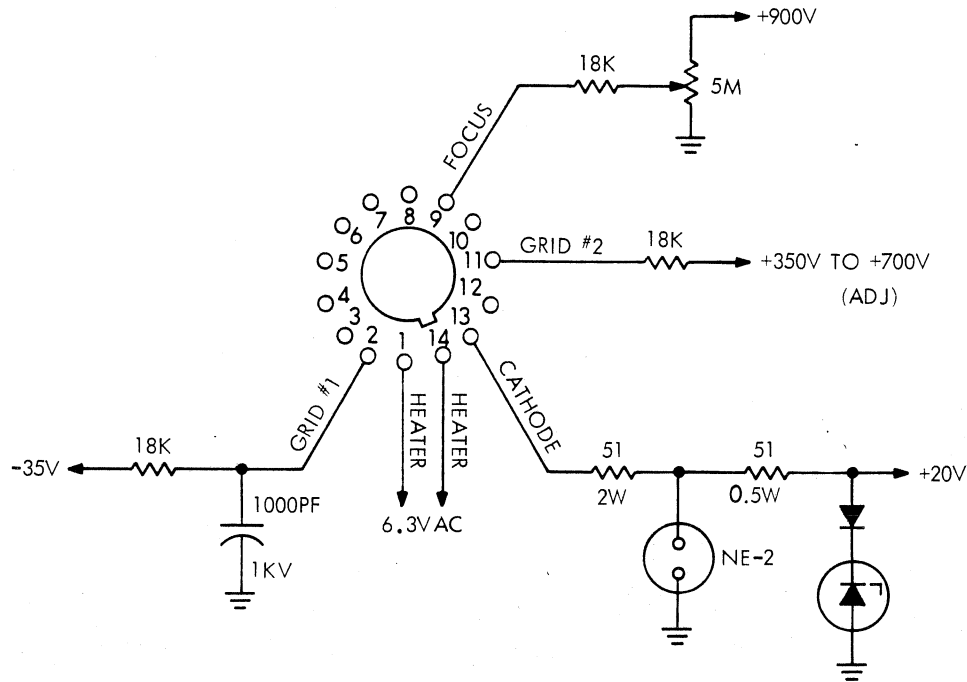
The arc protect circuit is built into the CRT socket connector and protects the low voltage electronic circuits in the display indicator against damage resulting from a malfunction within the CRT. The arc protect circuit consists of arc gaps that flash-over if an arc within the CRT puts high voltages on the tube pins.

The arc gaps for grid #1 and grid #2 are designed to flash-over at a potential of 1500 volts. The arc gap for the focus grid is designed to flash-over at a potential of 4500 volts.

### 3.5 DEFLECTION SYSTEM

The deflection system consists of the X and Y deflection amplifier assemblies (one for X, the other for Y) and the yoke assembly. The two deflection amplifier assemblies are identical. When you look from the rear of the display indicator, the X deflection amplifier is on the left, the Y deflection amplifier is on the right.





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Figure 3-1. CRT Socket Arrangement

The two deflection amplifiers receive X and Y input signals from the video cca (see paragraph 3.6). Each deflection amplifier produces an output driving current that goes through the horizontal (X) or vertical (Y) windings of the yoke. A +5V input to the deflection amplifier causes full-scale deflection to the right (horizontal amplifier) or to the top (vertical amplifier).

Each deflection amplifier consists of a heat sink, on which are mounted eight power transistors and a printed circuit assembly. Refer to drawings 5978938 and 5978939 in Section 6.

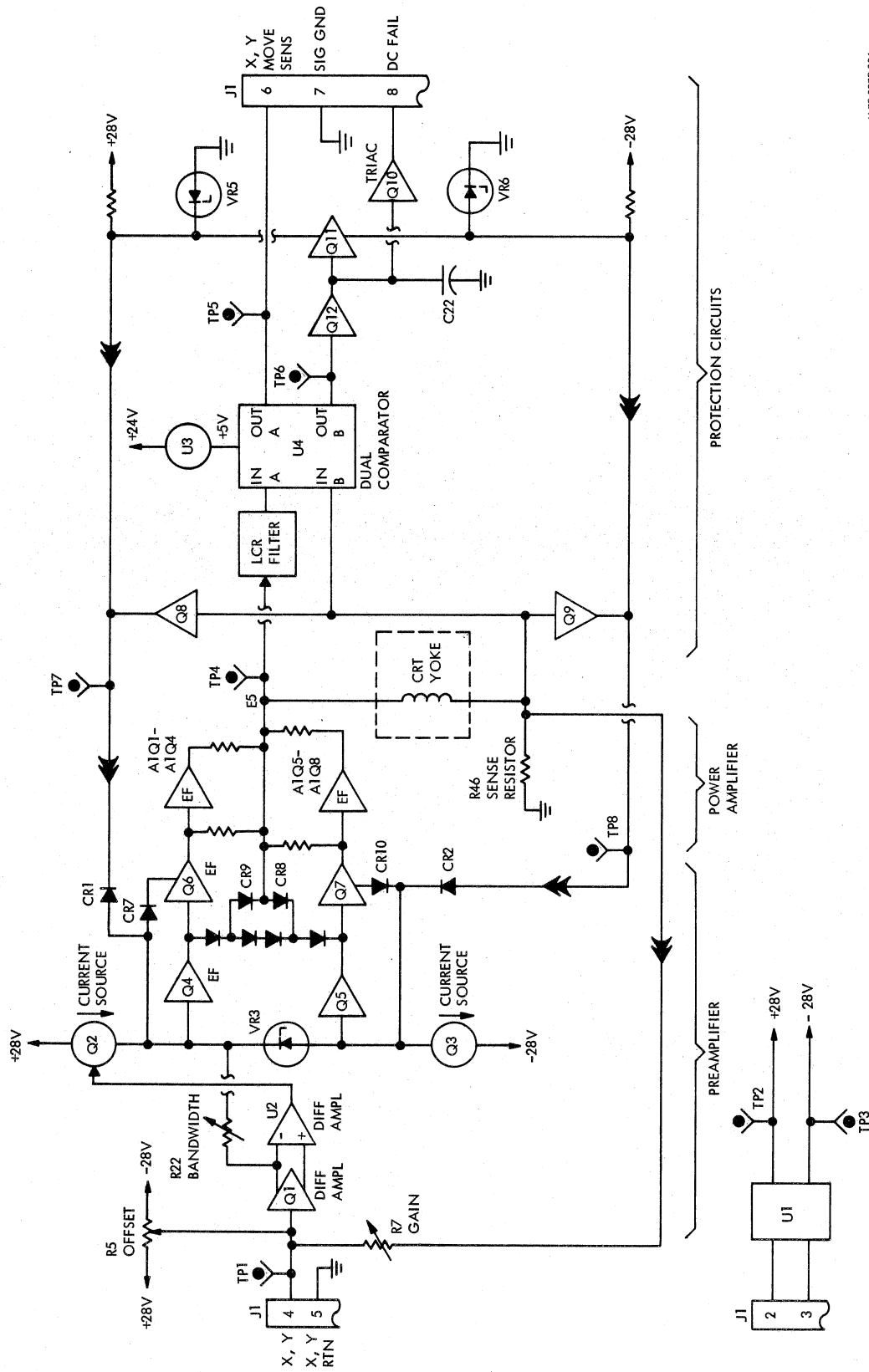
The deflection amplifier and its associated yoke winding form a closed loop, wide band (5 MHz), direct-coupled transconductance amplifier.

### 3.5.1 BLOCK DIAGRAM DESCRIPTION

See figure 3-2. The deflection amplifier consists of a preamplifier, a power amplifier, a current sense resistor, and protection circuits.

The preamplifier consists of a pair of cascaded differential amplifiers (Q1, U2) that drives a current steering network (Q2, Q3), complementary symmetry emitter followers (Q4, Q5), and current drivers (Q6, Q7).

The power amplifier consists of four parallel stages of complementary symmetry emitter followers (A1Q1 through A1Q8), mounted on a heat sink to handle yoke currents of up to  $\pm 10A$ . The outputs of the power amplifier stages are combined to supply the driving current to the CRT yoke.



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Figure 3-2. Deflection Amplifier Block Diagram

Current sense resistor R46 develops a sense voltage that is applied to the protection circuits.

The protection circuits perform the following actions:

1. During fast position moves, which require large voltage swings, the protection circuits prevent Q2 and Q3 from saturating.
2. If a transient overdrive condition occurs or there is a loss of the proper operating voltages within the preamplifier, the protection circuits clamp the preamplifier at zero volts, thus preventing excessive yoke current.
3. If a fault condition exists that would produce excessive current through drivers Q6, Q7, the protection circuits limit the current through Q4, Q5.
4. If the yoke current exceeds  $\pm 10A$ , the protection circuits clamp the preamplifier at zero volts.
5. If there is a fault in the power amplifier circuit, the protection circuits ground the DC FAIL line, which opens the display indicator's main circuit breaker.
6. The protection circuits also determine the amount of yoke activity present and generate a pulse-width modulated signal that goes to the video cca. In the video cca this signal determines the allowable CRT brightness as a function of deflection activity and video drive.

### 3.5.2 DETAILED DESCRIPTION

Refer to drawing 5978941 in Section 6.

#### 3.5.2.1 Power Circuits

Each deflection amplifier assembly receives input power of +38V and -38V from the low voltage power supply.

Dual voltage regulator U1 operates on the  $\pm 38V$  inputs and produces  $\pm 28V$  outputs. The +28V output is filtered by C5, C7, C8, and is measurable at test point TP2. The -28V output is filtered by C11, C12, C13, and is measurable at TP3.

#### NOTE

The case of voltage regulator U1 is at -38V with respect to ground.

The voltage level at E3 is approximately +24V. Voltage regulator U3 produces +5V for the operation of U4 and Q12. The voltage level at E4 is approximately -24V. Zener diode VR4 produces -5V for the operation of U4.

Zener diode VR2 operates from the +28V line and produces +21.9V for transistor amplifier module U2. Zener diode VR1 produces +8.2V for Q1 and U2.

### 3.5.2.2 Preamplifier

In the static (zero input) condition, differential amplifier Q1 is biased for approximately 2 mA on each side; the collectors rest at +7.5V.

Integrated circuit U2 consists of five high frequency transistors, of which only four are used. Transistors U2-4 and U2-5 are tied in parallel; their collector voltage is set at +21.9V by zener diode VR2. Transistors U2-2 and U2-3 are also tied in parallel; their collectors are held at +24.5V by the base potential of Q2.

Voltage dividers R17, R18, R20, and R24 provide a  $\pm 24V$  reference to current sources Q2, Q3. Constant current source Q3 is biased to provide 16 mA of collector current. Source Q2 is so biased that 32 mA flows through emitter resistor R16, but half of this current is shunted away through U2-2 and U2-3, leaving 16 mA as the collector current of Q2. (This current diverting operation requires that U2-2 and U2-3 operate in parallel to prevent excessive dissipation.)

Because Q2 and Q3 share the same collector current, there is essentially no base drive for emitter followers Q4 and Q5. Zener diode VR3 provides a base-spreading potential, biasing the bases of Q4 and Q5 at  $\pm 1.7V$  respectively, to prevent zero volt crossover distortion.

In the dynamic condition, a negative-going potential applied to the input of Q1 causes the bases of U2-4 and U2-5 to go in a positive direction while the bases of U2-2 and U2-3 go more negative, tending toward cut-off. The current through R16 is constant, held by the fixed Q2 emitter voltage through the action of voltage divider resistors in the Q2 base circuit.

As the collector current in U2-2 and U2-3 increases, the Q2 collector current increases proportionately. The increase in Q2 collector current pulls the bases of Q4 and Q5 in a more positive direction, causing Q4 to conduct more and Q5 to conduct less. Because drivers Q6, Q7 and power amplifiers A1Q1-A1Q8 are all emitter followers, the yoke voltage (E5) tracks the driver voltage, less the voltage drops across the transistors ( $V_{BE}$  drops) and the IR drop across the sensing resistor.

Yoke current passing through sense resistor R46 is converted to a low level ( $\pm 1.2V$ ) feedback signal. The loop is closed through feedback resistors R6-R8; GAIN potentiometer R7 adjusts picture size. CW OFFSET potentiometer R5 adjusts for cw offset. BANDWIDTH potentiometer R22 adjusts small signal bandwidth of optimum quality of characters displayed on the CRT screen. Refer to Section 5 for instructions for setting these potentiometers.

### 3.5.2.3 Power Amplifier

Each power stage (mounted on the heat sink) consists of four emitter followers in parallel. The summed output of the power stages goes to the CRT yoke.

Because of the balanced condition in all the emitter followers (Q4-Q7 in the preamplifier and A1Q1-A1Q8 in the power amplifier), a zero input condition sets the driven side of the yoke (E5) at 0 Vac; no yoke current flows.

In the dynamic condition, the instantaneous current into the yoke can be as much as 10A.

#### 3.5.2.4 Protection Circuits

During fast position moves, the preamplifier generates large voltage swings (up to  $\pm 24V$  at the collectors of Q2 and Q3). When it is generating such large voltage swings, the deflection amplifier is practically running in an open loop condition until the yoke current builds up. To prevent Q2 and Q3 from saturating, the voltage swings of Q2 and Q3 are limited by CR7 and CR10 to the levels of the  $\pm 24V$  from the low voltage power supply.

The slew rate of the amplifier is effectively limited by the voltage extremes of the signal at the Q2 and Q3 collectors. These voltage extremes are limited by the clamping action of CR1 and CR2 in conjunction with VR5 and VR6 to  $\pm 22V$ .

Furthermore, darlington amplifier Q8, Q9 can force the clamping action of CR1, CR2 to 0V, effectively returning the power stages to a zero current condition. A transient overdrive condition or the loss of proper operating voltages in the pre-amplifier could lead to excessive yoke current. The yoke current flowing through R46, divided by R47 and R57 at the bases of Q8 and Q9, causes either Q8 or Q9 to turn on (depending on the polarity of the yoke current) and clamp the preamplifier at 0V. This circuit is self-restoring.

If the current through drivers Q6, Q7 reaches excessive levels (threatening to burn out R35, R36), diodes CR8, CR9 become forward biased and limit the current through the collector resistors (R28, R29) of Q4, Q5.

U4 is a dual channel, high speed, bipolar comparator. Resistors R50, R51 set the reference voltage for each channel at 40 mV.

The inputs to channel B come from sense resistor R46, across divider resistors R50, R51. This division has no effect on the channel B output until the current exceeds  $\pm 10A$ . At this point, the comparator fires and the normally high output goes low. Q12 turns on, turning on Q11, forcing a 0V clamp condition at CR1, CR2. Capacitor C29 acts as a filter. This circuit is self-restoring; however, if the circuit fires and resets continuously, or if there is a fault in the power amplifier circuit, the dc level at C29 shifts downward and the dc level at C22 shifts upward. Eventually, Triac Q10 fires, grounding the DC FAIL line. A low on the DC FAIL line goes to the remote trip coil in the main circuit breaker, disconnecting input power to the display indicator. Once the circuit breaker trips, it requires manual reset.

The output of channel A, X/Y MOVE SENSE, is a pulse-width modulated signal that goes to the CRT protect circuit of the video cca. As long as yoke deflection activity is present, the output of channel A is low. During periods of no deflection activity, the output of channel A is high. Thus, the width of this signal is proportional to the time required for each low-to-high-to-low transition. The sensitivity of this circuit is held constant regardless of dc level by ac-coupling the top of the yoke signal through C26. Because the top of the yoke signal may be as much as  $\pm 24V$ , CR13 and CR14 limit the signal to prevent overdrive of the sample to U4A. Coil L1, R54, and C27 form a filter that bypasses the wideband "white" noise of the amplifier.

#### 3.5.2.5 Test Point Summary

Table 3-6 lists the test points in the deflection amplifier assembly and the signals/voltages observable at each.

Table 3-6. Deflection Amplifier Test Points

Test Point	Signal/Voltage
1	X or Y deflection input from video cca
2	+28V
3	-28V
4	Sense resistor voltage
5	X or Y SENSE output to video cca; quiescent high; low during yoke activity
6	X or Y OVERDRIVE to Q12; normally high
7	Clamping state, CR1
8	Clamping state, CR2

### 3.6 VIDEO SECTION

#### 3.6.1 BLOCK DIAGRAM DESCRIPTION

See figure 3-3. Functionally the video cca contains three circuits:

1. X and Y differential line receivers, a quadrature generator, and selector switches actuated by the self test pushbutton.
2. The video (Z) amplifier chain, which produces the video signal that goes to the CRT cathode.
3. A protection circuit that disables the high voltage power supplies if there is a failure of the  $\pm 28V$  on the video cca or if there is insufficient X and Y deflection activity.

The X and Y deflection signals from the output channel card in the terminal controller are buffered by U1, U4, and passed through the selector switches to their respective X and Y deflection amplifiers.

When you press the self test switch at the rear of the display indicator, the 8 kHz quadrature oscillator U2 is enabled and the selector switches are thrown to select the oscillator outputs (amplified by U3A, U3B). The oscillator outputs in quadrature cause the circular pattern to be displayed on the CRT.

In the video amplifier chain, the Z signals from the output channel card in the terminal controller pass through delay line DL1. This delay slows down the appearance of the Z signals at the CRT cathode so they arrive at the proper time relative to the X and Y deflection signals. (The X and Y signals encounter a delay in their respective deflection amplifier assemblies and in the deflection yoke.)

The delayed Z signal is applied to video amplifier U7 and optical coupler OC1. The setting of the front panel intensity control (sunburst) sets the signal level to

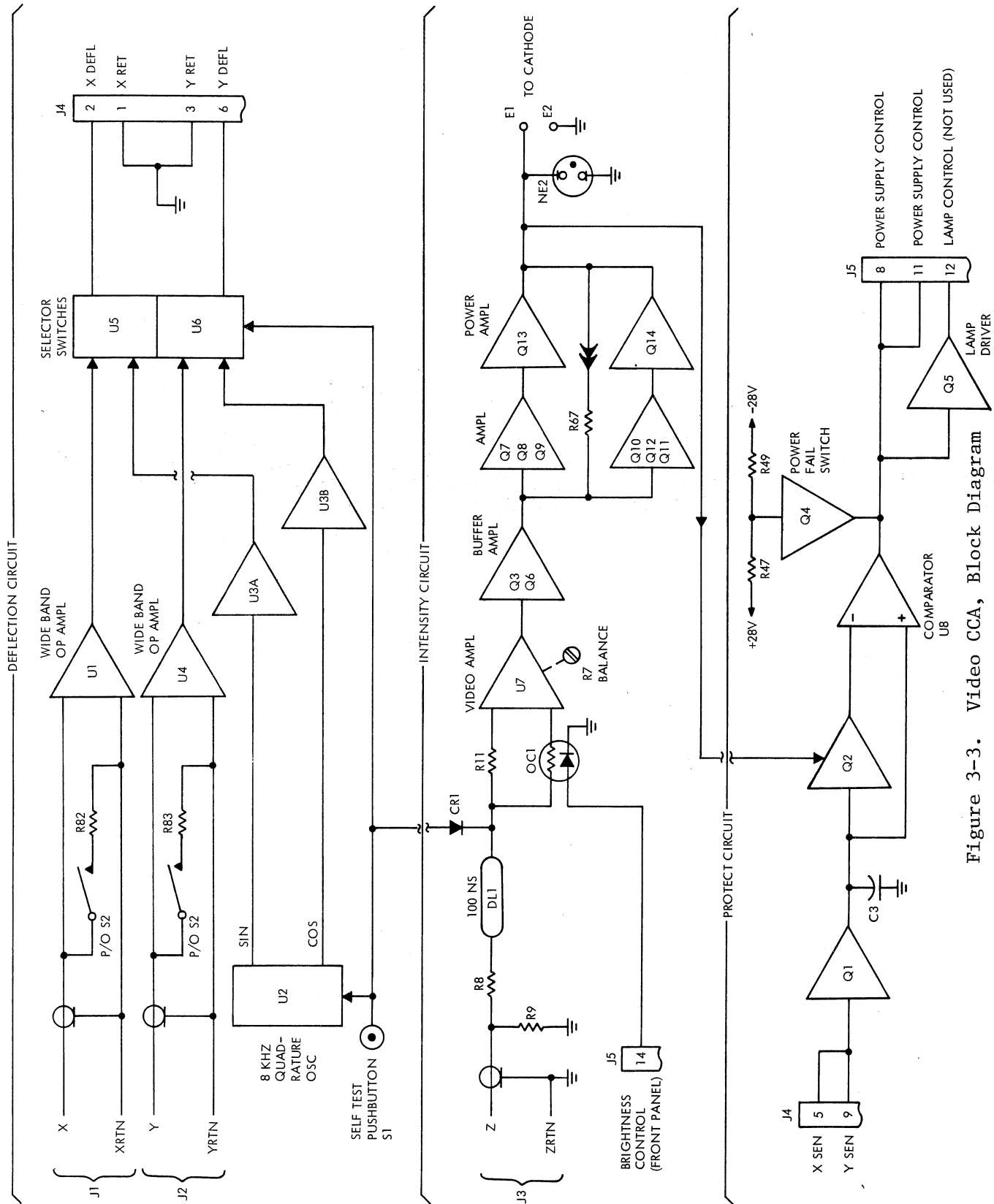


Figure 3-3. Video CCA, Block Diagram

the video amplifier. The amplified signal drives a push-pull amplifier chain that develops the output signal that goes to the CRT cathode. An output of +20V completely blanks the CRT beam; a -20V output completely unblanks the beam.

Gas tube NE2 protects the amplifier chain against the effects of an arc in the CRT. If high voltage arcs to the CRT cathode, the gas tube fires and holds the level at the power amplifiers to the ionization potential.

When you press the self test pushbutton, the Z input is over-ridden by a fixed voltage that unblanks the screen while the circular pattern is displayed.

In the protect circuit, the deflection sense signals X SEN and Y SEN are combined and charge capacitor C3 through amplifier Q1. Transistor switch Q2 controls the discharge rate of C3 as a function of the screen intensity demanded by the Z signal amplifier chain. If the intensity demand is too high for the amount of deflection taking place (threatening to burn the CRT screen), the output of the comparator drops to a logic low level, disabling the high voltage power supply.

If either the +28V or -28V levels on the video cca fails, switch Q4 places a logic low on the power supply control line, disabling the high voltage power supply.

Lamp driver Q5 is available to drive a LED that would light to show that the high voltage power supply is enabled. This circuit is not used.

### 3.6.2 DETAILED DESCRIPTION

Refer to drawing 5977083 in Section 6 of this manual.

#### 3.6.2.1 Power Circuits

The video cca receives input power of unregulated +38V and -38V from the low voltage power supply. The power circuits produce +5V regulated, +15V regulated, -15V regulated, +28V regulated, and -28V regulated.

The +5V is produced by zener diode VR6 (5.1V), filtered by C35. The voltage is measurable at test point TP9.

Dual voltage regulator U9 operates on the ±38V input and produces the ±28V outputs. The +28V output is filtered by C16, C18, C19, and is measurable at TP6. The -28V output is filtered by C17, C20, C21, and is measurable at TP5. The voltage regulator is rated at 200 mA maximum.

#### NOTE

The case of regulator U9 is at -38V with respect to ground.

Voltage regulator U10 operates on the +28V input and produces the +15V output at 1.5A maximum. The +15V output is filtered by C31, C34, and is measurable at TP7.

Voltage regulator U11 operates on the -28V input and produces the -15V output at 1.5A maximum. The -15V output is filtered by C32, C33, and is measurable at TP8.



Resistors R19 and R55 form a voltage divider between the +15V and +38V inputs. The junction of these two resistors is at +28V (approximately); current flow through R19 reduces the load on the positive side of dual regulator U9. A similar circuit (R23, R57) reduces the load on the negative side of U9. Current flow through R55 reduces the load on regulator U10 and current flow through R57 reduces the load on regulator U11.

### 3.6.2.2 Deflection Circuit

Switch S2 (accessible at the rear of the display indicator) is a termination switch, set at installation. When closed, the switch connects 82-ohm resistors across the lines to present an impedance of 75 ohms at J1 and J2. When more than one display indicator is connected to the terminal controller, the switch is left open.

Wide band amplifiers U1, U4 are used as differential buffers between the output channel card in the terminal controller and the deflection amplifier assemblies. The buffered X and Y signals are observable at test points TP3 and TP4. Buffer outputs go through selector switches U5, U6 to the respective deflection amplifier assemblies.

Self test pushbutton S1 is a dpdt switch. In the open position, it grounds the terminals of oscillator U2; disables amplifiers U3A, U3B; lets the outputs of U1, U4 pass through the selector switches; and has no effect on the Z signal chain. When you press the self test pushbutton, it enables oscillator U2 and amplifiers U3A, U3B; opens the X, Y signal path and lets the quadrature signals through the selector switches; and impresses a +0.2V bias on the Z signal chain.

Quadrature oscillator U2 generates sine and cosine components at an 8 kHz rate. These two sinusoids are amplified by U3A, U3B and pass through the selector switch to the X and Y deflection amplifiers, producing the circular display.

### 3.6.2.3 Video Amplifier Chain

Delay line DL1 introduces a delay of 100 ns.

The front panel brightness control (sunburst) regulates the current through the LED portion of optical coupler OC1. The amount of internally generated light controls the resistance of the device, thus controlling the amplitude of the Z signal applied to U7.

The range of Z signal input from the output channel card is 0V (beam off) to +1.5V (beam fully on). The range of Z output signal to the CRT cathode is +20V (beam off) to -20V (beam fully on). The CRT cathode acts as a capacitive load.

U7 is a differential output amplifier; R7 is its offset adjustment (refer to Section 5). Q3 and Q6 convert the differential output to a single-ended output, with Q3 setting the operating level of Q6.

The output of Q6 drives Q7, Q8, Q9 in parallel in the positive side of the video amplifier, and Q10, Q11, Q12 in the negative side. Each of these groups of parallel stages acts as a current source in conjunction with its power amplifier. When the Z input signal is 0V (beam off), the current flow through R76 is 80 mA, of which 30 mA comes through Q13 and the other 50 mA comes through Q7, Q8, Q9. Similarly, the

current flow through R80 is 80 mA, of which 30 mA is through Q14 and the other 50 mA is through Q10, Q11, Q12. Application of a Z signal causes an imbalance in this current relationship, which charges or discharges the CRT cathode circuit. Feedback resistor R67 lets the video amplifier stabilize at a particular output voltage (proportional to the input voltage) with the current sources in equilibrium.

When you press the self test pushbutton, the Z input signal level is set at +0.2V.

#### 3.6.2.4 Protect Curcuit

The X SEN and Y SEN signals are combined and applied to Q1 to charge C3 as a function of total deflection activity. Q2 controls the C3 discharge rate as a function of CRT cathode voltage (brightness demand). The voltage level on C3 is compared with a voltage present at voltage divider R17/R16/R52. If the C3 voltage falls below the reference voltage, the output of comparator U8 goes low, disabling the high voltage power supply.

Q4 monitors the outputs of the +28V and -28V regulators. If either voltage fails, the output of Q4 goes low and disables the high voltage power supply.

### 3.7 INPUT/OUTPUT CONNECTOR PANEL

On models 730 and 732 only, the X, Y, Z lines from the output channel card and the Z2 line from the accessory panel connect to a panel at the rear of the display indicator that is mounted on the low voltage power supply. The Z1 and Z2 lines are connected together at this point. Three coaxial cables run from the connector panel to the X, Y, Z connectors on the underside of the video cca.

Models 731 and 733 do not have this connector panel and have no provision for accepting a Z2 input (as from a PHOTOPEN). The X, Y, Z lines from the output channel card go directly to the X, Y, Z connectors on the underside of the video cca.

Drawing 5978958 in Section 6 shows the configuration of the input/output connector panel. The schematic diagram appears on drawing 5978925.

### 3.8 CONTROL PANEL

The control panel below the screen contains two potentiometers: the brightness control (sunburst) and the focus control (sinewave).

Refer to drawing 5978884 in Section 6.

The brightness control (R1) picks off a portion of +15V, which comes from the video cca. The output from the wiper arm goes to the optical coupler in the video cca.

The focus control (R6) picks off a portion of +900V, which comes from the high voltage power supply. R6 is rated at 1000 Vac. The output from the wiper arm goes to the focus grid (pin 9) of the CRT through an 18K resistor located in the CRT socket.

Drawing 5978882 in Section 6 shows the configuration of the control panel.

### 3.9 ACCESSORY PANEL

The accessory panel below the display indicator accommodates inputs from accessory devices such as a PHOTOPEN, trackball, forcestick, data tablet, and one or two keyboards. The cable from the accessory connects to the appropriate connector on the front of the accessory panel.

There are two connectors on the rear of the accessory panel. One accommodates a cable that goes to the multiport serial interface card in the terminal controller. The other accommodates a coaxial cable that goes to the Z2 connector at the rear of the display indicator when a PHOTOPEN is used.

Drawing 5977088 in Section 6 shows the accessory panel.

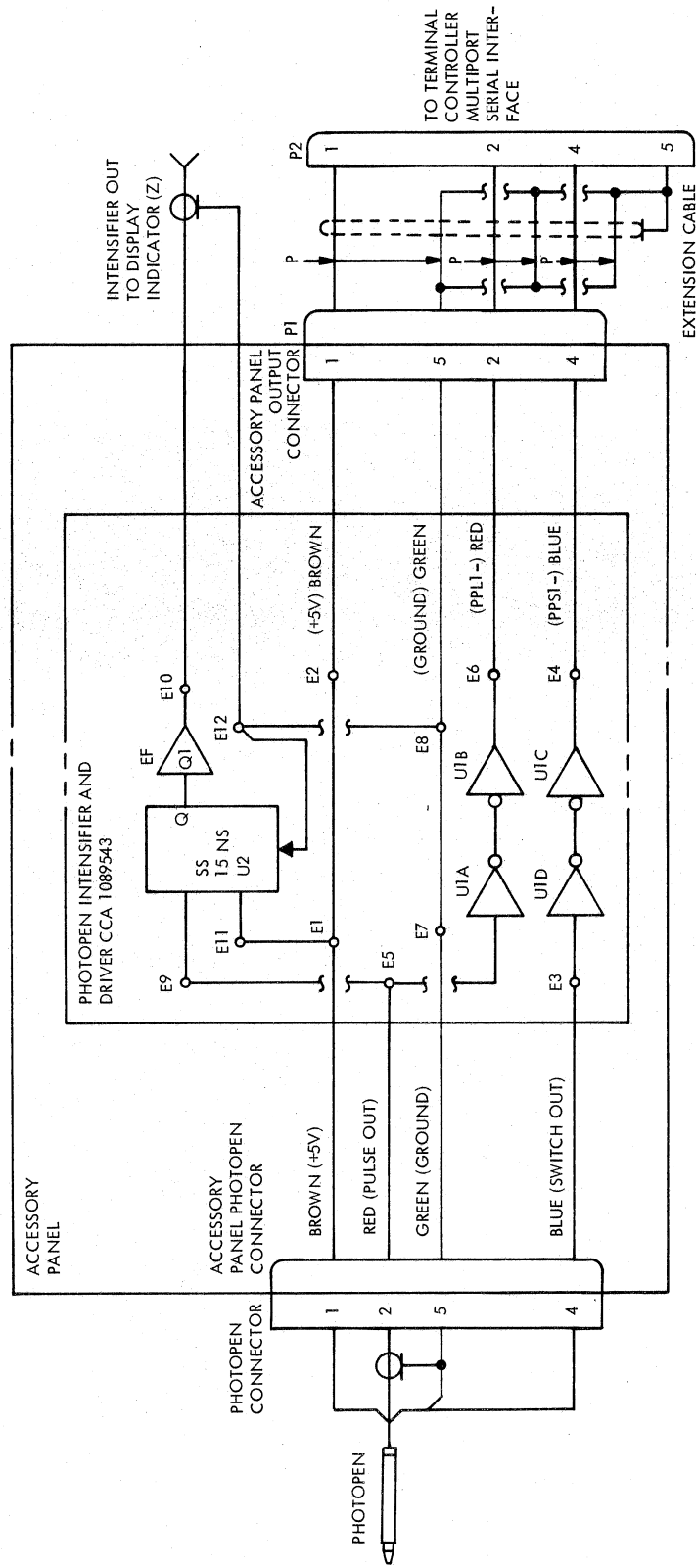
#### 3.9.1 PHOTOPEN INTENSIFIER AND DRIVER

When a PHOTOPEN is supplied as an accessory with the display indicator, the accessory panel contains a PHOTOPEN intensifier and driver circuit card assembly. This circuit card assembly mounts on two standoffs at the bottom of the accessory panel and connects to the PHOTOPEN connector on the front panel and to the output connector and the intensifier output connector at the rear of the accessory panel.

Drawing 1089543 in Section 6 shows the PHOTOPEN intensifier and driver cca; drawing 1089544 is the schematic. Figure 3-4 shows how the PHOTOPEN intensifier and driver cca connects to the three accessory panel connectors.

The PHOTOPEN intensifier and driver performs two functions:

1. When you make a PHOTOPEN strike (by simply holding the PHOTOPEN against a point on the face of the screen), the light pulse created as the CRT beam passes the PHOTOPEN triggers single-shot U2. The single-shot generates a 15 ns pulse and emitter follower Q1 passes that pulse to the Z2 input of the display indicator. This pulse intensifies that point on the screen of the CRT. In addition, inverters U1A, U1B pass the pulse out signal (PPL1-) to the multiport serial interface.
2. When you press the PHOTOPEN to activate the switch, inverters U1D, U1C pass the switch closure signal (PPS1-) to the multiport serial interface.



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Figure 3-4. PHOTOPEN Intensifier and Driver Connections

## SECTION 4

### INSTALLATION

This section contains the following information:

1. Unpacking and inspection instructions.
2. Adding a power connector in some cases.
3. Setting the termination switch.
4. Connecting cables.
5. Performing self test.
6. Performing system test.
7. Preparation for reshipment or storage.

#### 4.1 UNPACKING AND INSPECTION INSTRUCTIONS

##### WARNING

Implosion of the display indicator CRT can cause serious injury or death. Use extreme care when handling the display indicator. Wear chest protector and safety goggles or face shield. Avoid vibrating, shocking, or stressing the display indicator.

The display indicator is shipped from the factory completely assembled, packed, and strapped to a wooden pallet. Move the pallet to a suitable work area near the installation before unpacking.

Inspect the packing for obvious signs of damage before opening. If the package appears to be damaged, notify the carrier and Sanders Associates, Inc., immediately.

Unpack the display indicator as follows:

1. Carefully cut the two steel bands that secure the package to the pallet. Stand clear while cutting. Use a band cutter, and cut close to the edge of the pallet. Remove and dispose of the steel bands.
2. Lift the triple-walled cardboard outer container off the package.
3. Open the double-walled cardboard inner container.

4. Remove the expandable foam cap that fits over the display indicator.
5. Lift the display indicator out of the expandable foam base.
6. Remove the poly-film liner from around the display indicator. Save the expandable foam cap and base for reshipment and storage.

Inspect the display indicator for obvious signs of damage:

1. CRT not broken.
2. Case not chipped, cracked, or scratched.
3. Knobs secure and operate freely.
4. Rear connectors appear intact.

If the display indicator appears to be damaged, notify the carrier and Sanders Associates, Inc., immediately.

#### 4.2 PREPARATION FOR INSTALLATION

Preparation for installation includes adding the power connector (if required) and setting the termination switches on the video cca or LVPS.

##### 4.2.1 POWER CONNECTOR

### **CAUTION**

Be absolutely sure that the display indicator is configured to match the primary power lines. Connecting the display indicator to the wrong power lines can cause damage to the equipment.

1. Using voltmeter, measure the line voltage into which you will plug the display indicator.
2. Observe the markings on the display indicator; confirm that the display indicator is marked for operation with your line voltage, and that your voltage is one of the following:

100V	208V
110V	220V
115V	230V
120V	235V
200V	240V

3. For operation at voltages of 200V or more, Sanders does not furnish the power connector. Install the appropriate connector at the end of the display indicator power cable. The power cord is color-coded as follows:

Light blue for the neutral line  
Brown for the high line  
Green/yellow for safety ground

#### 4.2.2 SETTING TERMINATION SWITCH

1. Gain access to the video cca. (For models 730 and 732, remove the display indicator housing. For models 731 and 733, the video cca is directly accessible). The video cca is mounted above the neck of the CRT.
2. Locate the termination switch (see figure 2-1). Termination switch S2 is on the left side of the video cca (when you stand at the rear of the display indicator), adjacent to the three BNC connectors.
3. Set the switch toward the face of the CRT if only one display indicator is to be connected to one output channel. Set the switch toward the rear of the display indicator if more than one display indicator is to be connected to one output channel.
4. Reinstall display indicator housing (models 730 and 732).

As an alternative, you can use the termination switch on the LVPS. It is not necessary to set both switches.

#### 4.3 INSTALLATION

Installation consists of placing the display indicator in its operating position and connecting the X, Y, Z cables from the terminal controller.

##### 4.3.1 PLACING DISPLAY INDICATOR IN ITS OPERATING POSITION

Models 730 and 732 are intended for desk top mounting. Simply place the display indicator in a convenient position. Consider what other devices will be used in connection with the display indicator, such as keyboard, forcestick, trackball, data tablet, etc.

Install the model 731 (horizontal 24-inch rack) into its frame and secure.

Install the model 733 (vertical 19-inch rack) into its frame and secure.

Make sure the power on/off switch is off (press the 0 side).

Connect the power connector to the primary power outlet.

##### 4.3.2 CONNECTING CABLES

For models 730 and 732, connect the X, Y, and Z cables from the terminal controller to the X, Y, and Z1 connectors at the rear of the display indicator, adjacent to the low voltage power supply. If more than one display indicator is to be connected to a particular terminal controller output channel, use BNC T-connectors at the X and Y inputs.

#### NOTE

Do not use a T-connector on the Z input.  
Each display indicator must receive its  
own Z cable from the terminal controller.

For models 731 and 733, connect the X, Y, and Z cables from the terminal controller to the X, Y, and Z connectors on the underside of the video cca. If more than one display indicator is to be connected to a particular terminal controller output channel, use BNC T-connectors at the X and Y inputs. Do not use a T-connector at the Z input.

#### NOTE

The length of the Z cable to any display indicator should be the same as the total length of the corresponding X or Y path. This is an important consideration when using T-connectors. Maximum length of the Z cable is 50 feet (15.2 meters).

Figure 4-1 shows a typical installation.

When the installation includes an accessory panel (models 730 and 732 only), connect coaxial cable part number 5977162 from the INTENSIFIER output connector on the accessory panel to the Z2 connector at the rear of the display indicator. Connect cable part number 1088556\* from the PHOTOPEN output connector on the accessory panel to the appropriate input port on the multiport serial interface in the terminal controller. Connect the keyboard or position entry device (PHOTOPEN, trackball, forcestick, or data tablet) to the appropriate connector on the front of the accessory panel.

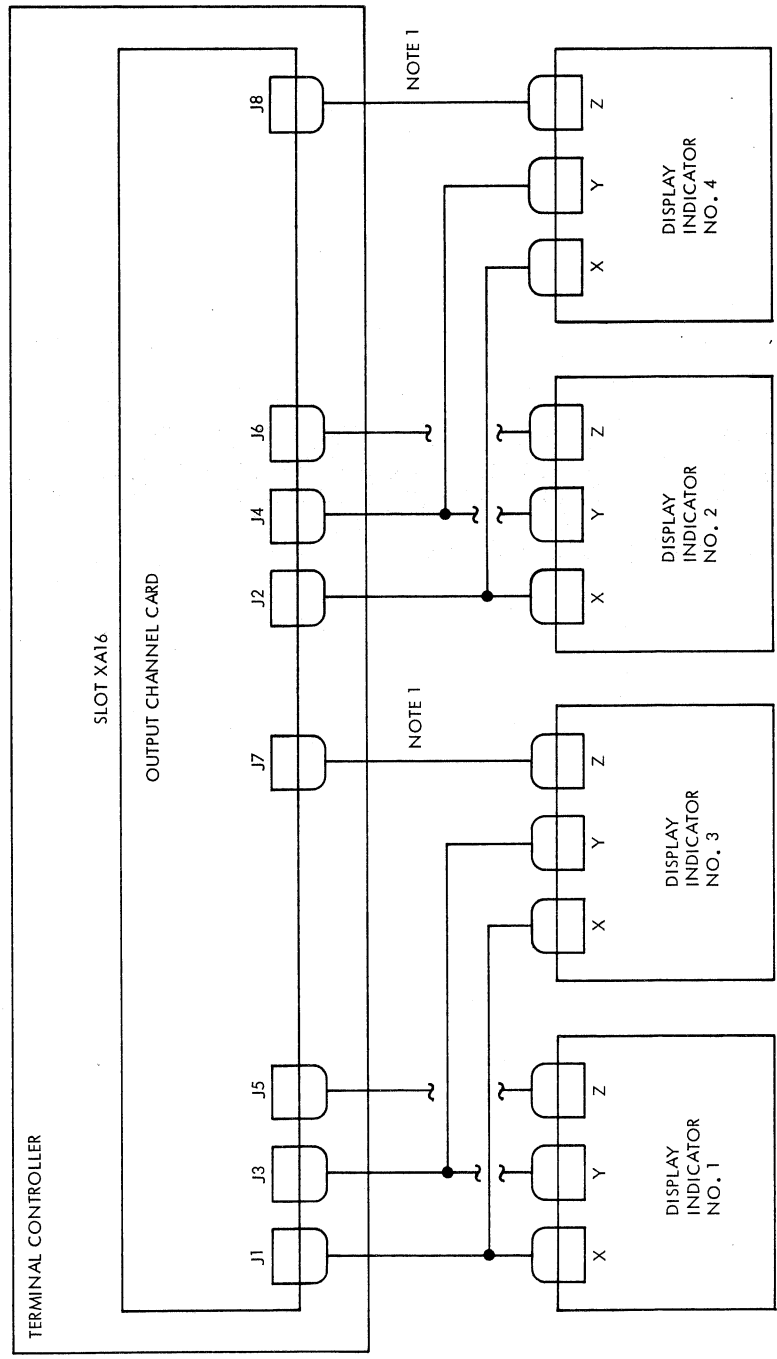
Models 731 and 733 do not have provision for accommodating accessory devices.

#### 4.4 SELF TEST AND INITIAL ADJUSTMENTS

1. Disconnect the Z input cable.
2. Press the unmarked side of the display indicator power on/off switch. Observe that the fan is running. If the fan is not running, turn off the display indicator and refer to troubleshooting instructions in Section 5.
3. Observe that the CRT screen is blank.
4. Press the self test pushbutton at the rear of the display indicator. The CRT shall display a circular pattern inscribed within the 12 inch by 12 inch display area.
5. Adjust the brightness (sunburst) and focus (sine wave) controls for the best presentation of the circular pattern.
6. Inspect the circular pattern for the following features:

\*G-condition (length) depends on installation arrangement.





NOTES:  
 1. LENGTH OF Z CABLE MUST BE SAME AS TOTAL LENGTH OF CORRESPONDING X OR Y SIGNAL PATHS.

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Figure 4-1. Typical Installation

a. The pattern is centered on the screen. If the pattern is off center, the OFFSET potentiometers in the X and Y deflection amplifiers may require adjustment. Refer to Section 5.

b. The pattern is a circle and not a straight line. If the pattern is a straight line, either vertical or horizontal, one of the deflection channels is not working. Refer to Section 5 for troubleshooting instructions.

c. The pattern is truly circular. If the pattern is misshapen, the GAIN potentiometers in the X or Y deflection amplifiers may require adjustment. Refer to Section 5.

7. Proceed to system test, paragraph 4.5.

#### 4.5 SYSTEM TEST AND ADJUSTMENTS

1. Set terminal controller to LOCAL mode (press DIS/LOC switch on terminal controller or type T, then carriage return on keyboard).

2. Reconnect Z input cable at rear of display indicator. The verification test pattern shall appear on the CRT screen (see figure 4-2).

3. Inspect the verification test pattern for the following features:

a. The pattern is level. If the pattern is cocked, the CRT yoke requires adjustment. Refer to Section 5.

b. Corners are square, properly closed with no overlap, and as bright as the rest of the display.

c. The rotated numerals at the lower left corner of the display show the proper number of intensity levels (you should be able to distinguish six levels).

#### NOTE

If items b or c above are not satisfactory, or if there is any other discrepancy between the displayed pattern and figure 4-2, the problem is in the terminal controller. Refer to Terminal Controller Maintenance Manual (H-80-0055) for further information.

#### 4.6 TURN-OFF PROCEDURE

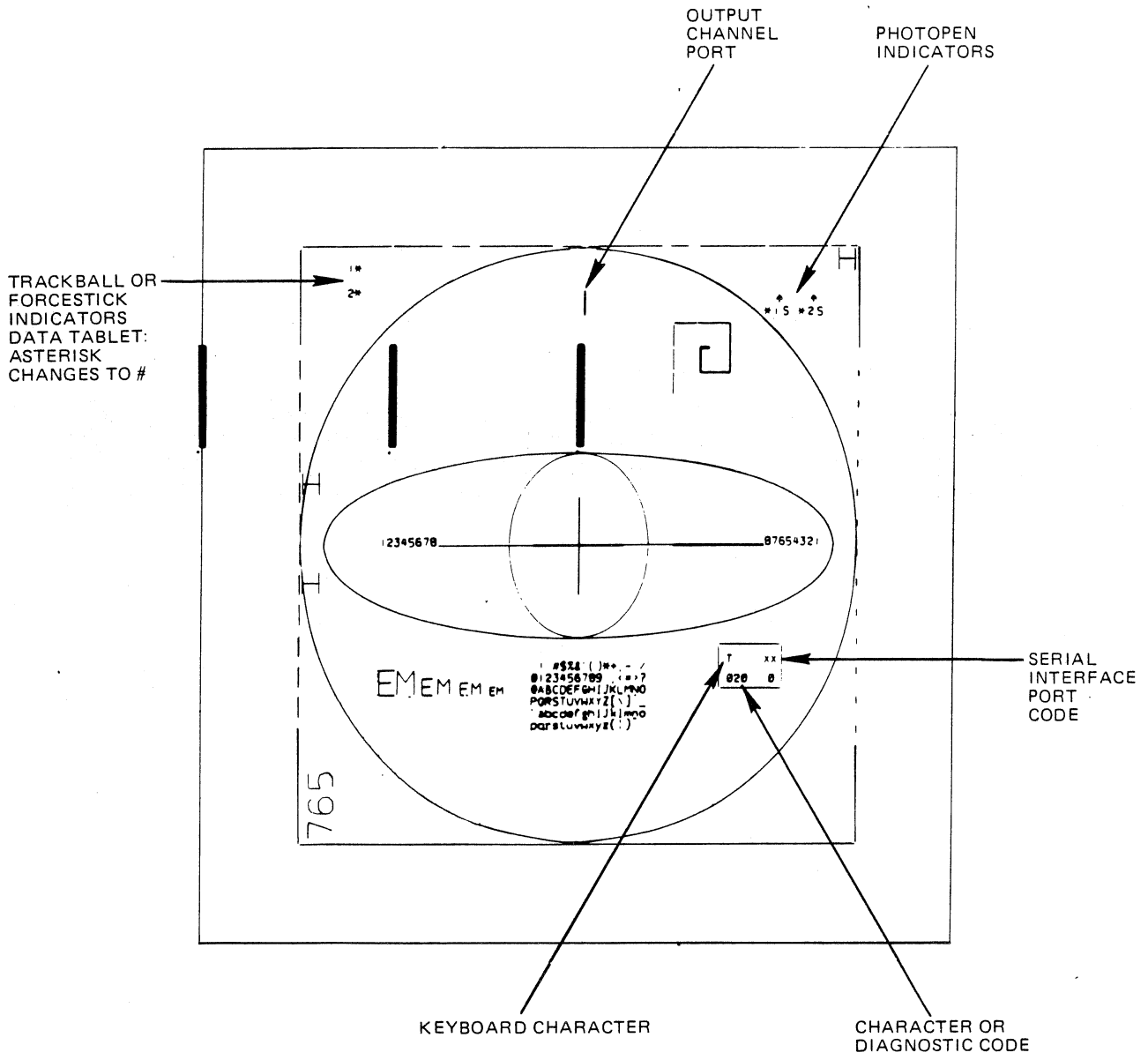
1. Turn down the brightness (sunburst) control.

2. Press the 0 side of the power on/off switch.

#### 4.7 PREPARATION FOR SHIPMENT OR STORAGE

1. Disconnect power plug from power outlet.

2. Disconnect all accessories from accessory panel.



**NOTE:**

This figure illustrates the verification test pattern that is generated when the ramp/conic generator option is installed in the terminal controller. If a ramp/conic generator card is not installed, each circle and ellipse will be displayed as four straight lines. If a 2-D coordinate converter card is installed in the terminal controller, all information contained within the ellipse will be rotated, translated and displayed at the top left of the display.

GA-77-419-04

Figure 4-2 Verification Test Pattern.

3. Disconnect X, Y, and Z cables at rear of display indicator.
4. Disconnect cable between accessory panel and terminal controller multipoint serial interface.
5. Disconnect cable between accessory panel and Z2 connector on display indicator (models 730, 732 only).
6. Wrap the display indicator in polyfilm and place it in the expanded foam base (see paragraph 4.1).
7. Cover it with the expanded foam cap.
8. Place the assembly in a suitable double-walled cardboard carton.
9. Place the double-walled cardboard carton on a wooden pallet.
10. Install a triple-walled cardboard carton around the inner carton. Fill any empty space with expanded foam pellets. Cover with a cap.
11. Secure the outer carton to the pallet with two 5/8-inch steel bands.

SECTION 5  
MAINTENANCE

5.1 GENERAL

This section contains preventive maintenance instructions; adjustment instructions; troubleshooting information; and disassembly and reassembly instructions.

5.2 PREVENTIVE MAINTENANCE INSTRUCTIONS

Clean the exterior surfaces of the display indicator with a soft cloth, warm water, and a mild detergent. Wring out the cloth before washing the display indicator. Be careful not to get any water inside. Wipe again with a soft cloth and clean water, wrung out, then wipe dry.

Keep all connections clean and tight.

On models 731, 733 use a long handled bristle brush to dust the chassis.

5.3 ADJUSTMENT INSTRUCTIONS

Table 5-1 lists all the internal adjustments of the display indicator.

Table 5-1. Internal Adjustments

Assembly	Adjustment	Instructions
Video amplifier	R7 OFFSET	See paragraph 5.3.1
High voltage power supply	G2 ADJ	See paragraph 5.3.2
X or Y deflection amplifier	R5 OFFSET	See paragraph 5.3.3
	R7 GAIN	See paragraph 5.3.4
	R22 BANDWIDTH	See paragraph 5.3.5
Yoke	Rotation	See paragraph 5.3.6

On models 731, 733, these adjustments are directly accessible. On models 730, 732, you must first remove the upper cover as follows:

1. Release the two draw catches at the rear of the display indicator, one on either side of the fan grille.
2. Carefully raise the back end of the upper cover, then withdraw it toward the rear.

### 5.3.1 VIDEO AMPLIFIER R7 OFFSET ADJUSTMENT

1. Disconnect X, Y, and Z cables at rear of display indicator.
2. Turn on display indicator.
3. Using oscilloscope or digital multimeter, measure CRT cathode voltage at E1 connector (underside of video amplifier board). Adjust R7 on video amplifier board until cathode voltage is +20.0V. See figure 5-1.
4. Go directly to paragraph 5.3.2.

### 5.3.2 HIGH VOLTAGE POWER SUPPLY G2 ADJUSTMENT

1. With display indicator on and X, Y, Z cables disconnected, carefully adjust G2 on high voltage power supply until you can just begin to see a spot at the center of the screen. See figure 5-2.

#### **CAUTION**

Do not allow the spot to get bright enough to burn the screen.

2. Immediately back off the G2 adjustment until the spot just disappears.
3. Now reconnect the X, Y, and Z cables (in that order) at the rear of the display indicator. Set the terminal controller to LOCAL mode to display the verification test pattern.
4. Carefully observe the test pattern to see if there is any sign of a spot on the screen that is not part of the pattern. If there is, go to step 5. If there is not, the adjustment is complete.
5. If there is a spot on the screen that is not part of the pattern, it is an indication of bias from the terminal controller output channel. Using an oscilloscope, measure the average CRT cathode voltage at the E1 connector on the video amplifier board. Readjust R7 on the video amplifier as necessary to make the average voltage +20V.

### 5.3.3 DEFLECTION AMPLIFIER OFFSET ADJUSTMENT

#### NOTE

This adjustment is required only if the test pattern is not centered on the screen.

1. Carefully adjust potentiometer R5 on both X and Y deflection amplifier assemblies as required to center the test pattern. See figure 5-3.

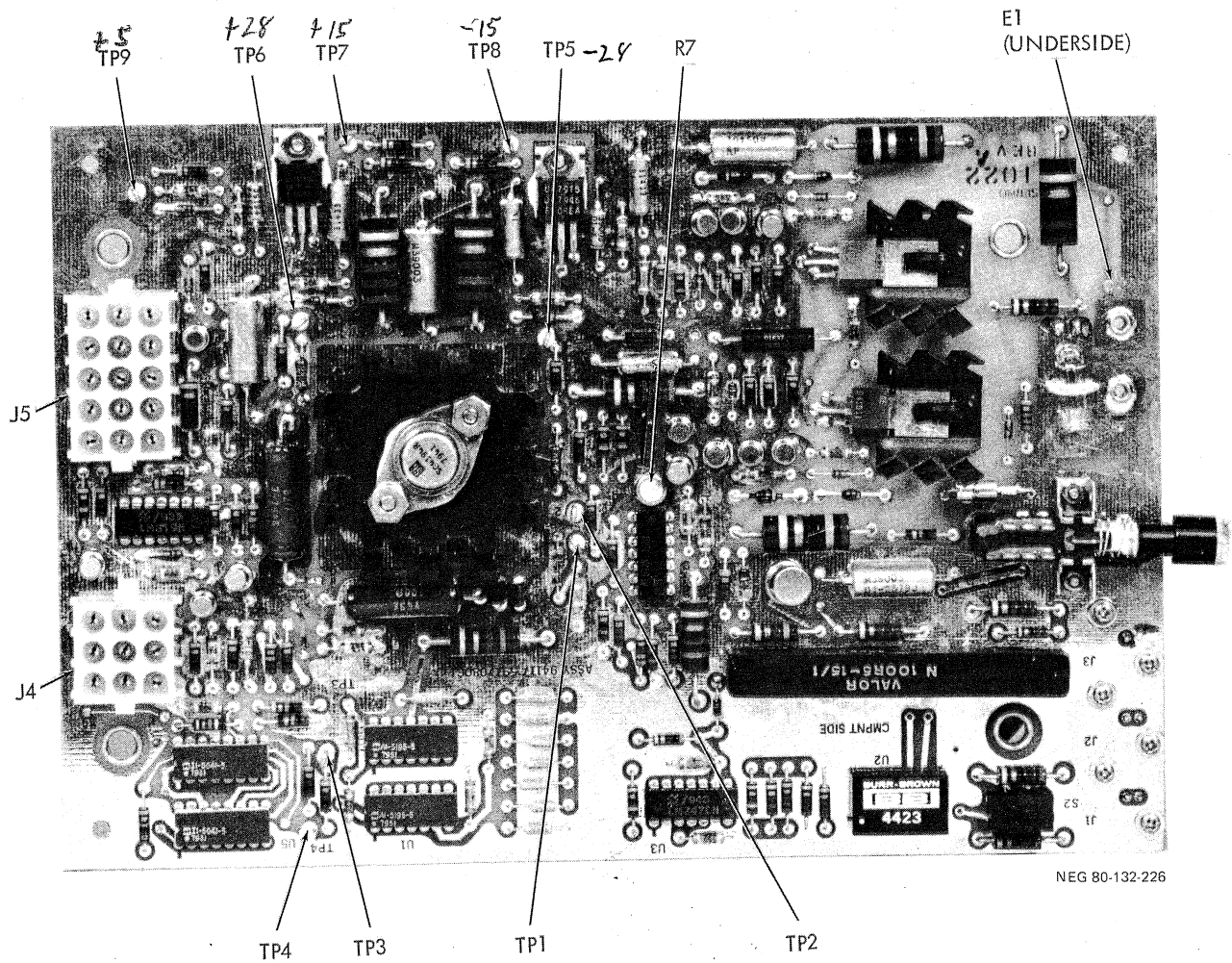


Figure 5-1. Video CCA

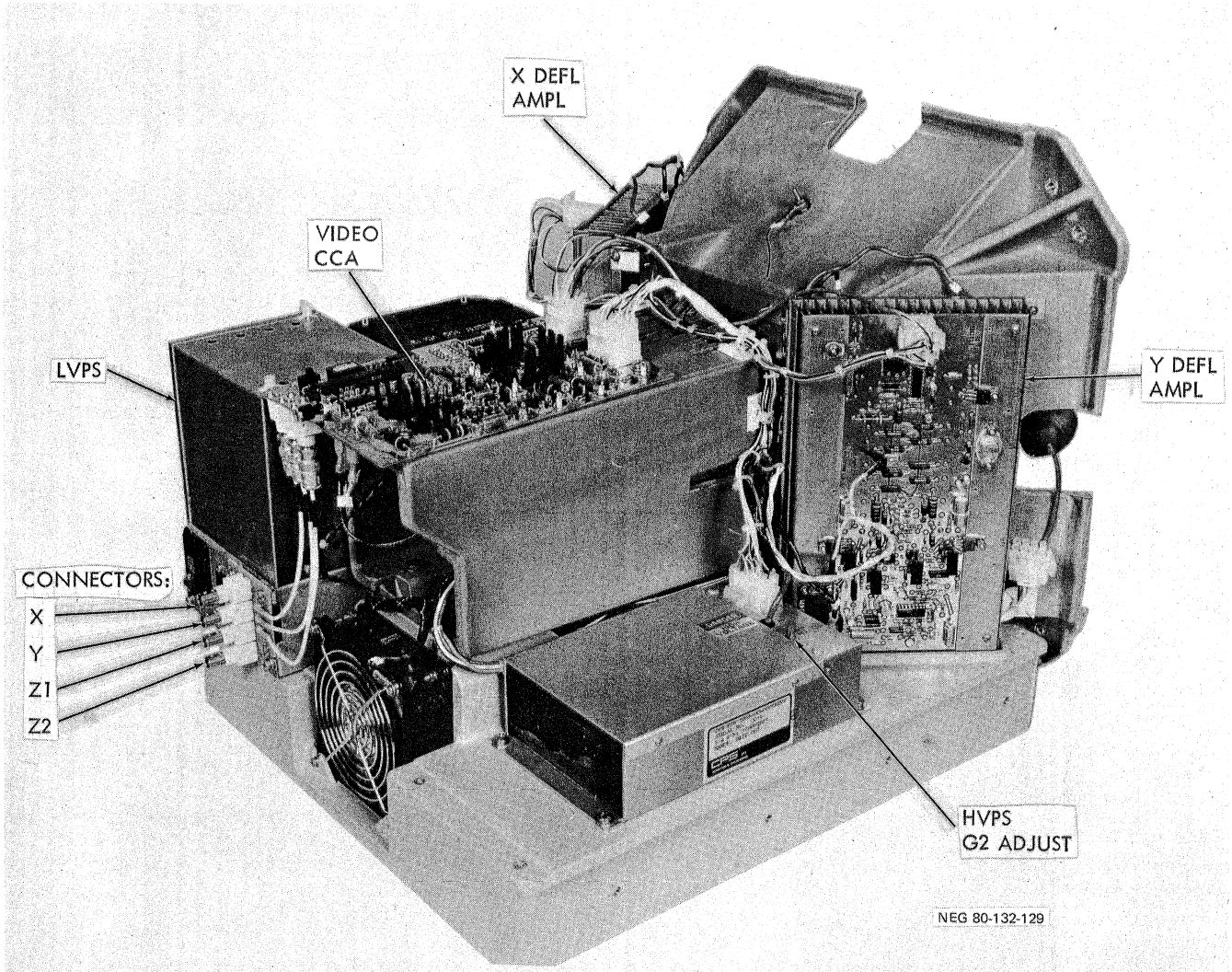


Figure 5-2. Display Indicator Components



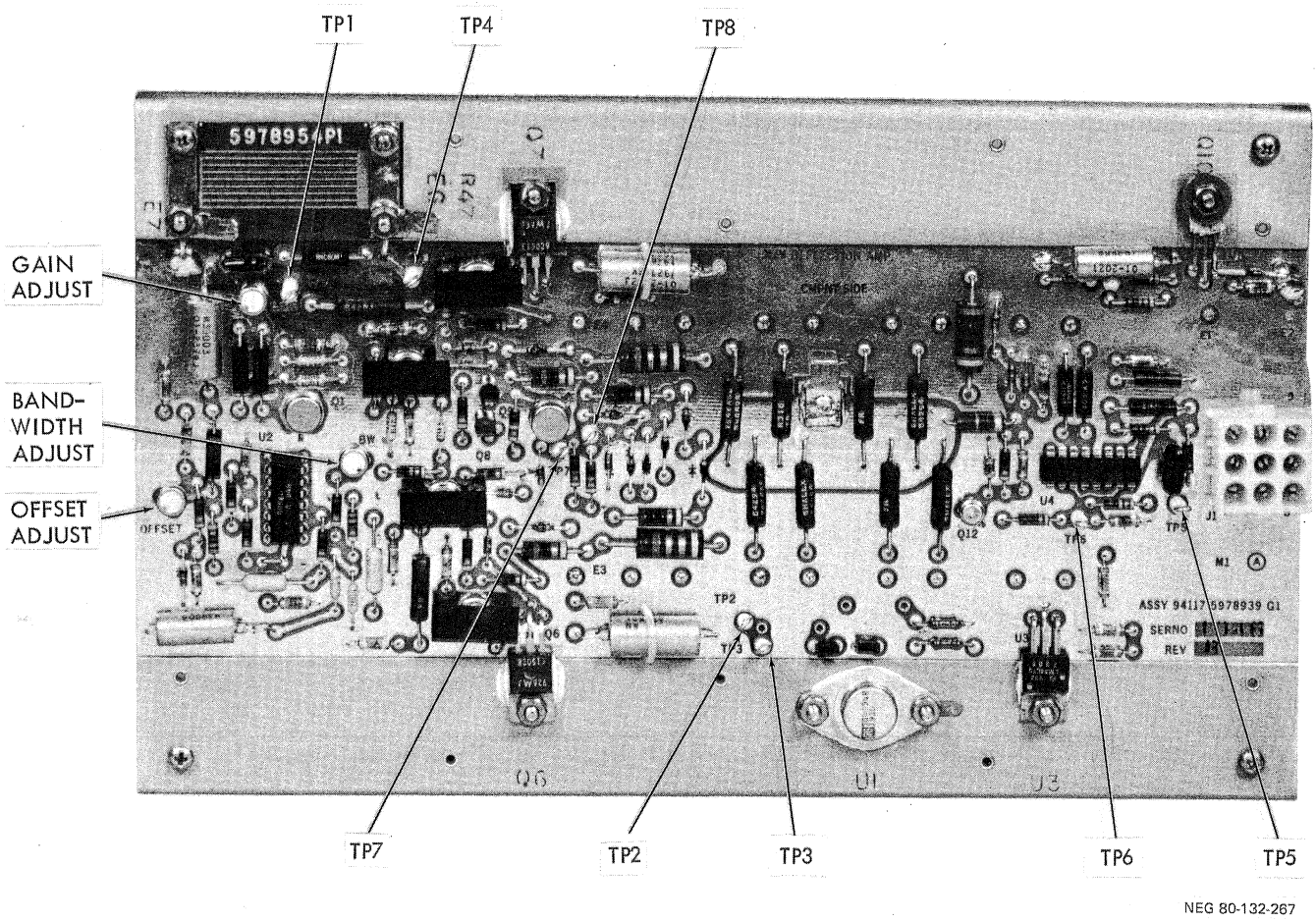


Figure 5-3. Deflection Amplifier

#### 5.3.4 DEFLECTION AMPLIFIER GAIN ADJUSTMENT

##### NOTE

This adjustment is required only if the verification test pattern does not just fill the screen.

Carefully adjust potentiometer R7 on both X and Y deflection amplifier assemblies as required to produce a display that just fills the screen.

#### 5.3.5 DEFLECTION AMPLIFIER BANDWIDTH ADJUSTMENT

##### NOTE

This adjustment is required only if the characters in the verification test pattern are not sufficiently clear.

1. Set up the verification test pattern on the display indicator.
2. Carefully adjust potentiometer R22 on both X and Y deflection amplifier assemblies as required to produce the clearest characters in the test pattern.

#### 5.3.6 YOKE ADJUSTMENT

##### NOTE

This adjustment is required only if the verification test pattern appears to be rotated on the CRT screen.

1. Very carefully insert narrow blade screwdriver through the hole in the top side of the tube shield until you feel the teeth on the yoke adjustment wheel. See figure 5-4.
2. Adjust the wheel as required to straighten the display on the CRT.

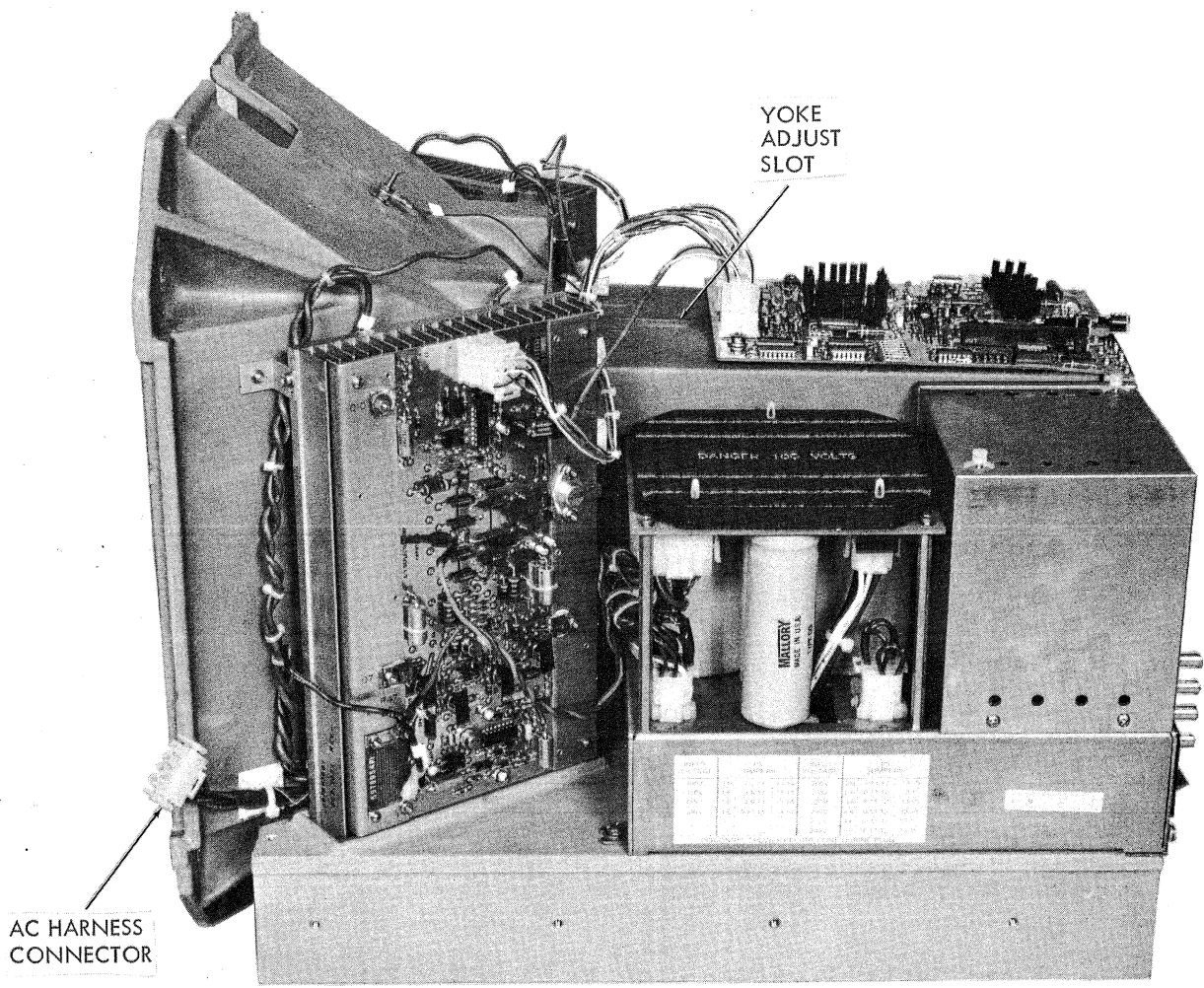
#### 5.4 TROUBLESHOOTING INFORMATION

##### 5.4.1 MAINTENANCE PHILOSOPHY

The maintenance philosophy for field repair of the display indicator is based on isolating a malfunction to a defective assembly and replacing that assembly. Return the defective assembly to Sanders Associates, Inc., for repair.

The following items are considered replaceable:

- Low voltage power supply
- High voltage power supply
- Video cca
- X and Y deflection amplifiers
- Control panel
- Accessory panel
- PHOTOPEN intensifier and driver cca
- Cathode ray tube



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Figure 5-4. Display Indicator, LVPS Side

## 5.4.2 TROUBLESHOOTING BY SYMPTOMS

Table 5-2 correlates symptoms with probable causes and suggested remedies.

Table 5-2. Troubleshooting by Symptoms

Symptom	Probable Cause	Remedy
Fan does not run when power turned on	Display indicator not receiving primary power	Check power plug; check power line voltage; check circuit breaker at rear of display indicator.
Display is a straight line	X or Y deflection channel not operating	Check X and Y cables from terminal controller to display indicator. Check X and Y deflection amplifiers (see paragraph 5.4.3). Check connectors to yoke. Check deflection circuit on video cca. If self test is ok but verification test fails, problem is in output channel card in terminal controller, cables, self test switch, or video cca receivers.
Display is cocked	Yoke out of adjustment	Rotate yoke.
Self test pattern is not truly circular	Deflection amplifiers not balanced in gain	Adjust X and Y deflection amplifier gain controls.
Display is not centered	Deflection amplifiers not properly adjusted for offset	Adjust X and Y deflection amplifier offset controls.
Verification test pattern characters not sharp	Deflection amplifiers not properly adjusted for bandwidth	Adjust X and Y deflection amplifier bandwidth controls.
Screen goes blank unexpectedly	Low voltage power supply problem or insufficient deflection activity for the brightness setting.	<ol style="list-style-type: none"> <li>1. Turn down brightness control (sunburst) and try again.</li> <li>2. Check low voltage inputs to video cca and deflection amplifiers.</li> </ol>
Self test pattern does not fill screen	Deflection amplifiers not properly adjusted for gain	Adjust X and Y deflection amplifier gain controls.

Table 5-2. Troubleshooting by Symptoms (Cont)

Symptom	Probable Cause	Remedy
Bright flashes on screen while adjusting brightness or focus	Defective brightness or focus control	Replace display control panel.
PHOTOPEN strikes not intensified	PHOTOPEN failure or problem in accessory panel	<ol style="list-style-type: none"> <li>1. Try different PHOTOPEN.</li> <li>2. Check PHOTOPEN connector at accessory panel input connector.</li> <li>3. Check cable from accessory panel output connector to display indicator Z2 input connector.</li> <li>4. Replace PHOTOPEN intensifier and driver cca in accessory panel.</li> </ol>
Circuit breaker trips	Improper line voltage or component failure	<ol style="list-style-type: none"> <li>1. Look for anything obvious.</li> <li>2. Replace deflection amplifiers.</li> <li>3. Replace low voltage power supply.</li> </ol>
Display won't focus	Defective high voltage power supply	Replace high voltage power supply.

### 5.4.3 USING TEST POINTS

#### 5.4.3.1 Video CCA (See figure 5-1.)

1. Use digital multimeter or oscilloscope to measure following voltages:

<u>Test Point</u>	<u>Voltage</u>	<u>If observation is incorrect</u>
5	-28V	Check output of low voltage power supply; if correct, replace video cca
6	+28V	
7	+15V	
8	-15V	
9	+5V	

2. With terminal controller operating in LOCAL mode, use oscilloscope to observe the following signals:

<u>Test Point</u>	<u>Signal</u>	<u>If observation is incorrect</u>
3	X input (+5V to -5V)	Check output channel card in terminal controller; check cables to display indicator; replace video cca
4	Y input (+5V to -5V)	

3. With terminal controller operating in LOCAL mode, use dual-trace oscilloscope to observe the following signals simultaneously:

<u>Test Point</u>	<u>Signal</u>	<u>If observation is incorrect</u>
1	Differential video. Signals of equal amplitude but opposite polarity. Total range typically 1.1V p-p from baseline of +2.4 to +3.4V	Replace video cca
2		

#### 5.4.3.2 Deflection Amplifier (See figure 5-3.)

1. Use digital multimeter or oscilloscope to measure following voltages:

<u>Test Point</u>	<u>Signal</u>	<u>If observation is incorrect</u>
2	+28V	Check output of low voltage power supply; if correct, replace deflection amplifier
3	-28V	

2. With display indicator operating in self test mode, use oscilloscope to observe the following signals:

<u>Test Point</u>	<u>Signal</u>	<u>If observation is incorrect</u>
1	Deflection input from video cca, typically $\pm 5V$	Replace video cca
4	Sense resistor voltage, typically $\pm 0.9V$	Replace deflection amplifier
5	SENSE output to video cca. Normally logic low, goes high in overcurrent condition	Replace deflection amplifier
6	Sense input to Q12. Logic high indicates normal deflection activity.	Replace deflection amplifier

3. With display indicator operating in self test mode, use dual-trace oscilloscope to observe the following signals simultaneously:

<u>Test Point</u>	<u>Signal</u>	<u>If observation is incorrect</u>
7, 8	Typically $\pm 22V$	Replace deflection amplifier

## 5.5 DISASSEMBLY AND REASSEMBLY

### WARNING

Turn off display indicator and PULL THE PLUG before disassembling. Disconnect X, Y, Z cables from terminal controller.

#### 5.5.1 VIDEO CCA

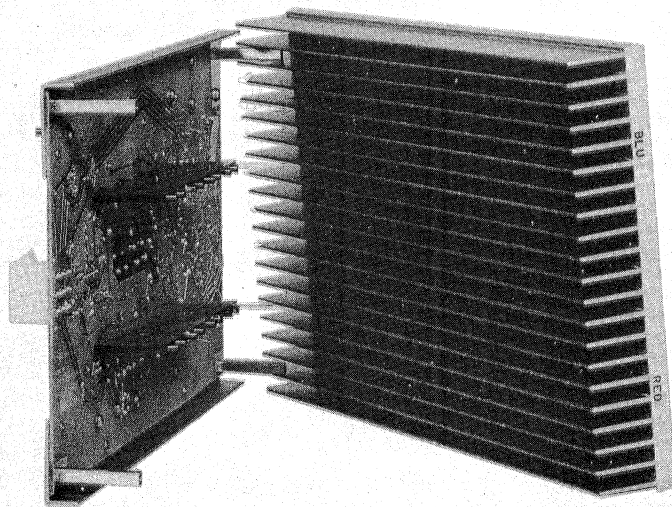
1. Disconnect cables from X, Y, Z connectors on underside of video cca.
2. Disconnect CRT cathode and ground leads from connectors E1, E2 on underside of video cca.
3. Disconnect two cable harness connectors from J4, J5 on video cca.
4. Remove four 10-32 screws, flat washers, and lock washers, and remove video cca.

#### 5.5.2 X OR Y DEFLECTION AMPLIFIER ASSEMBLY

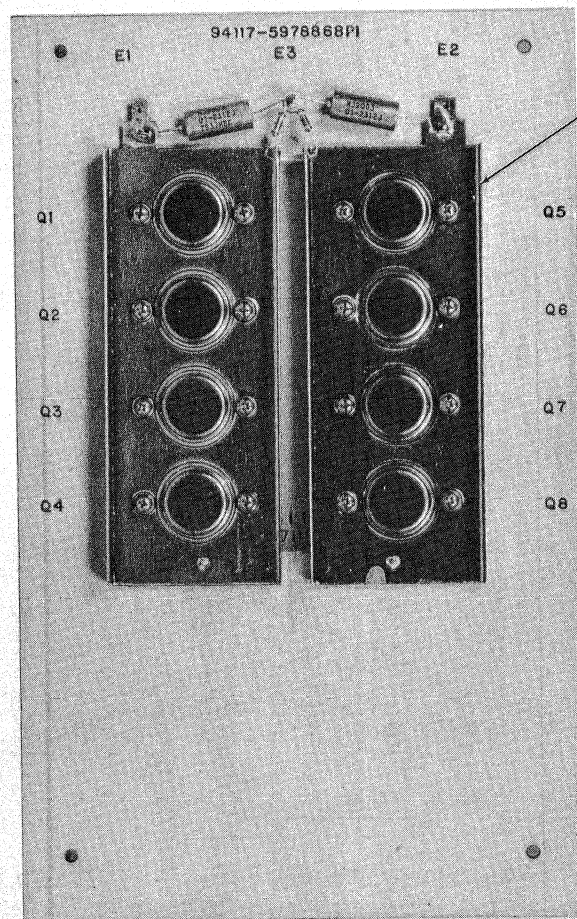
1. Note the colors of the yoke leads to the deflection amplifier; note which lead goes to which E-point on the deflection amplifier.
2. Remove the two yoke leads from the deflection amplifier by sliding the connectors off the E-points.
3. Disconnect the black lead at the sense resistor on the circuit card assembly.
4. Disconnect the red and blue leads from the collector plates mounted on the rear side of the deflection amplifier heat sink.
5. Disconnect the cable harness connector from J1 on the deflection amplifier.
6. Remove four 6-32 screws, flat washers, and lock washers, and remove deflection amplifier assembly.

##### 5.5.2.1 Disassembly of the Deflection Amplifier Assembly

1. Remove positive or negative collector plate as follows:
  - a. Refer to drawing 5978938 in Section 6. Unsolder capacitors C1 through C4 (items 10, 11). (See also figure 5-5.)



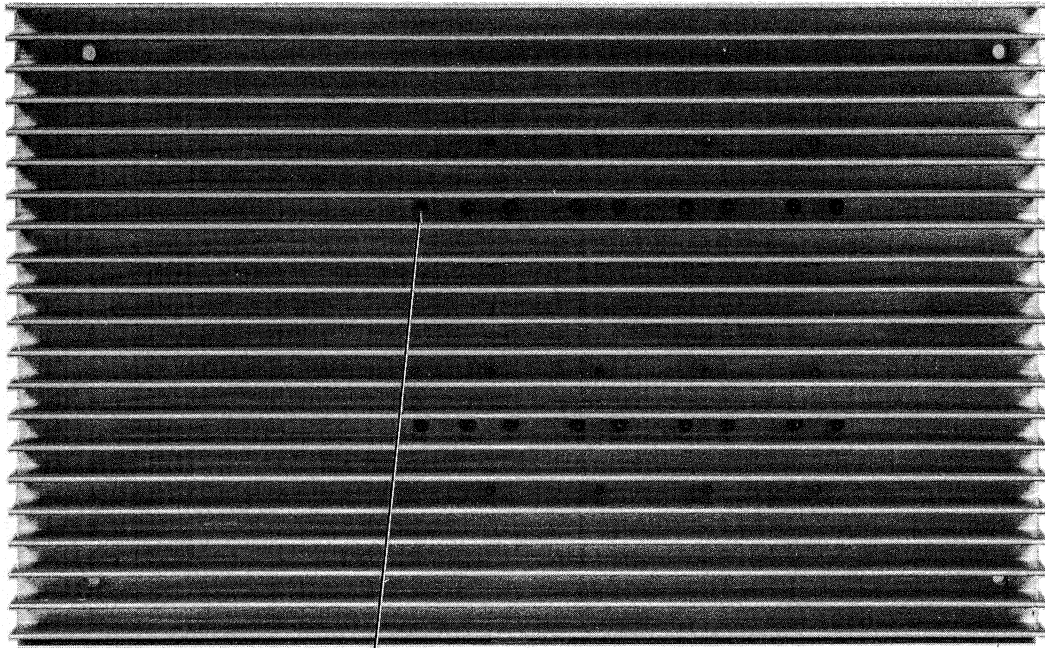
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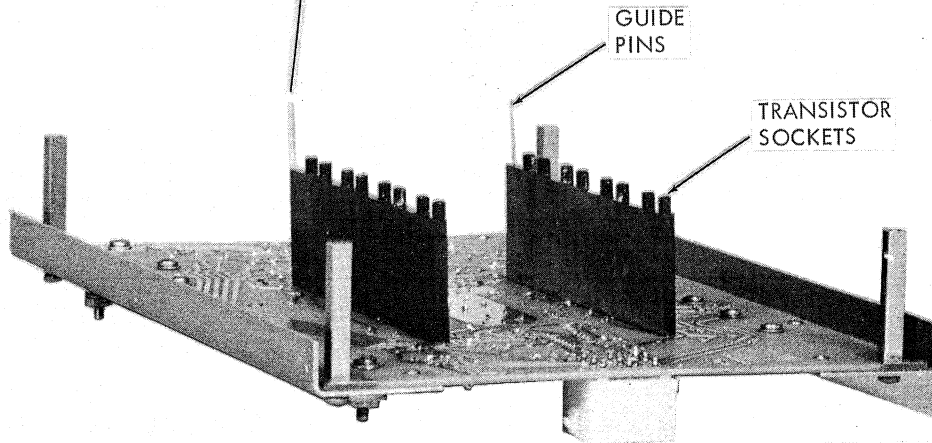
Figure 5-5. Reassembling Deflection Amplifier (Sheet 1 of 2)





NEG 80-132-268

ALIGN PINS AND SOCKETS CAREFULLY INTO HOLES;  
INSTALL TRANSISTORS AFTER ASSEMBLY



NEG 80-132-214

Figure 5-5. Reassembling Deflection Amplifier (Sheet 2 of 2)

b. Remove eight screws (12), flat washers (15), lock washers (16), and shoulder washers (14) and remove collector plate.

c. If transistors do not come out with collector plate, remove transistors after collector plate has been removed.

2. Reinstall transistors and collector plate as follows:

a. Coat underside of transistor with thermally conductive electrical insulating compound, type 120, manufactured by Wakefield Engineering, Inc., Wakefield, MA 01880 (FSCM 05820). Carefully plug transistors into their respective sockets.

NOTE

Transistors must be matched with respect to  $V_{BE}$ ; always use transistors with the same color dot marking.

b. Coat underside of collector plate with type 120 compound, set over transistors, and secure with hardware removed in step 1.

3. Remove circuit card assembly as follows:

a. Remove four screws (12), flat washers (15), lock washers (16), and spacers (8).

b. Remove circuit card assembly.

4. Reinstall circuit card assembly as follows:

a. Remove collector plate mounting hardware but do not unsolder the four capacitors. Swing the collector plates away from the transistors.

b. Remove the eight transistors.

c. Reinstall the circuit card assembly, using the hardware removed in step 3.

d. Install the transistors as in step 2a.

e. Install the collector plates as in step 2b.

### 5.5.3 INPUT/OUTPUT CONNECTOR PANEL

NOTE

This procedure applies to models 730, 732 only.

1. Disconnect X, Y, Z cables at underside of video cca.
2. Remove four 6-32 pan head screws, flat washers, and lock washers and remove input/output connector panel from low voltage power supply.

#### 5.5.4 LOW VOLTAGE POWER SUPPLY

1. (Models 730, 732 only) Remove input/output connector panel (paragraph 5.5.3).
2. Disconnect cable harness connector from J2 on low voltage power supply chassis. See figure 5-6.
3. Disconnect cable harness connector from A1J2 on underside of filter cca.
4. Disconnect power cord from ac input connector J1.
5. Remove four 10-32 screws, flat washers, and lock washers and remove low voltage power supply.

##### 5.5.4.1 Disassembly of the Low Voltage Power Supply

1. Remove four 6-32 pan head screws, flat washers, and lock washers that secure low voltage filter A2 to standoffs.
2. Disconnect low voltage power supply harness connector P1 from connector J1 on underside of low voltage filter A2 and remove low voltage filter A2 cca.
3. With the low voltage filter A2 removed, you have access to jumper connector P3.
4. To gain access to the transformer, you must first remove the shield. Remove four #6 self-tapping screws and remove the shield.
5. Removal of all other components is obvious and straightforward. All connections to components are by fast-on fasteners; no unsoldering is required.

#### 5.5.5 HIGH VOLTAGE POWER SUPPLY

**WARNING**

Be sure that display indicator is off for  
at least 60 seconds before proceeding.

1. Disconnect high voltage anode lead from connector on CRT bulb.
2. Remove Y deflection amplifier (on the right side when viewed from the rear of the display indicator). See paragraph 5.5.2.
3. Disconnect cable harness connector from high voltage power supply connector.

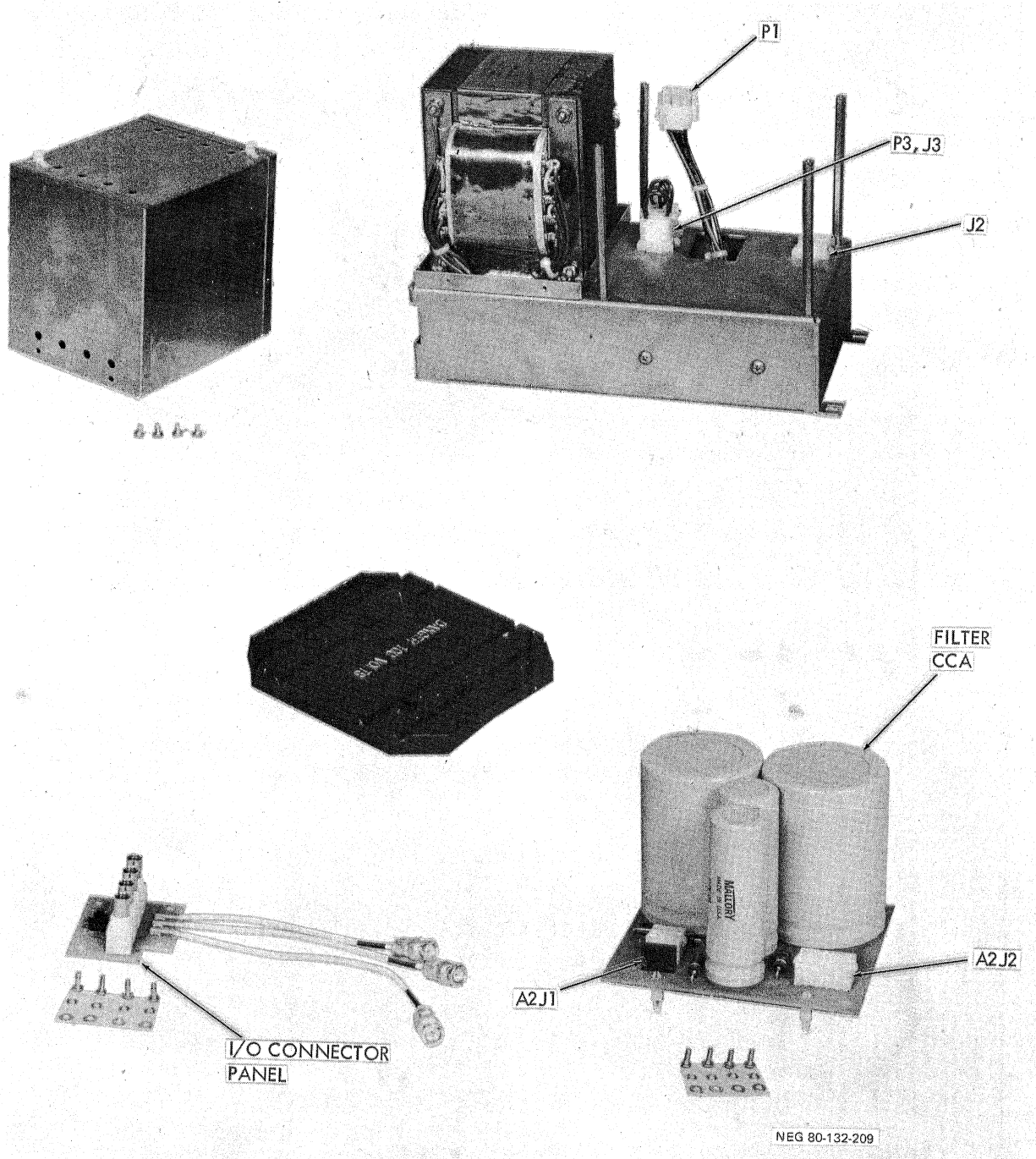


Figure 5-6. Low Voltage Power Supply

4. Remove two 1/4-20 hex head screws, flat washers, and lock washers at back end of high voltage power supply. Loosen but do not remove two 1/4-20 hex head screws at front end of high voltage power supply.

5. Withdraw high voltage power supply toward the rear. Guide the high voltage anode lead clear of obstructions as you do so.

#### 5.5.6 CATHODE RAY TUBE

**WARNING**

If the cathode ray tube is subjected to unusual stress or shock, it may implode violently. Always wear a face mask, gloves, and chest protector when handling the cathode ray tube.

**DO NOT DROP THE CATHODE RAY TUBE!  
NEVER PICK IT UP OR CARRY IT BY THE  
NECK! DO NOT APPLY ANY LATERAL STRAIN  
ON THE NECK!**

If a tube does implode, always wear gloves when sweeping up the pieces. The phosphor is poisonous. If you get cut or scratched, seek medical help immediately!

Dispose of pieces in a sealed metal container, marked to indicate the dangerous nature of the contents!

1. Gently disconnect the CRT socket from the CRT (easily accessible under the video cca). See figure 5-7.

2. Separate the front panel ac harness connectors (4-pin connectors, at the left side of the display indicator when looking from the rear, just forward of the deflection amplifier).

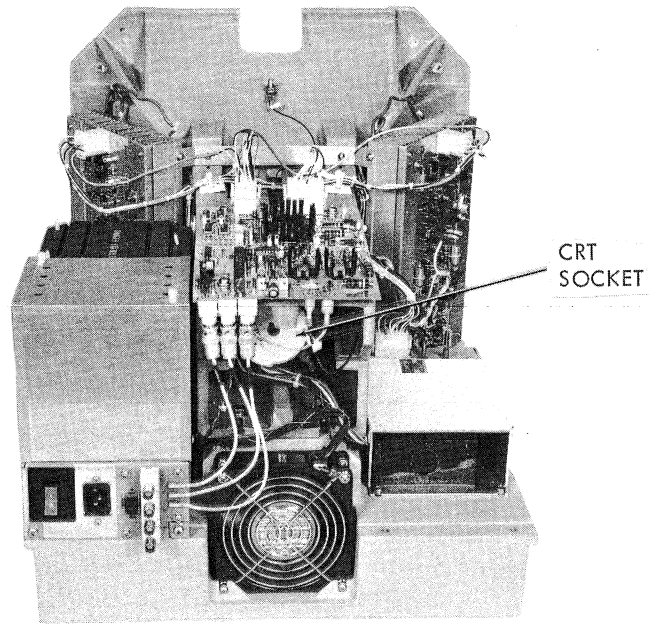
3. Separate the front panel harness connectors (12-pin connectors, at the right side of the display indicator when looking from the rear, just forward of the deflection amplifier).

4. Disconnect the anode lead from the CRT (right side of CRT when looking from the rear).

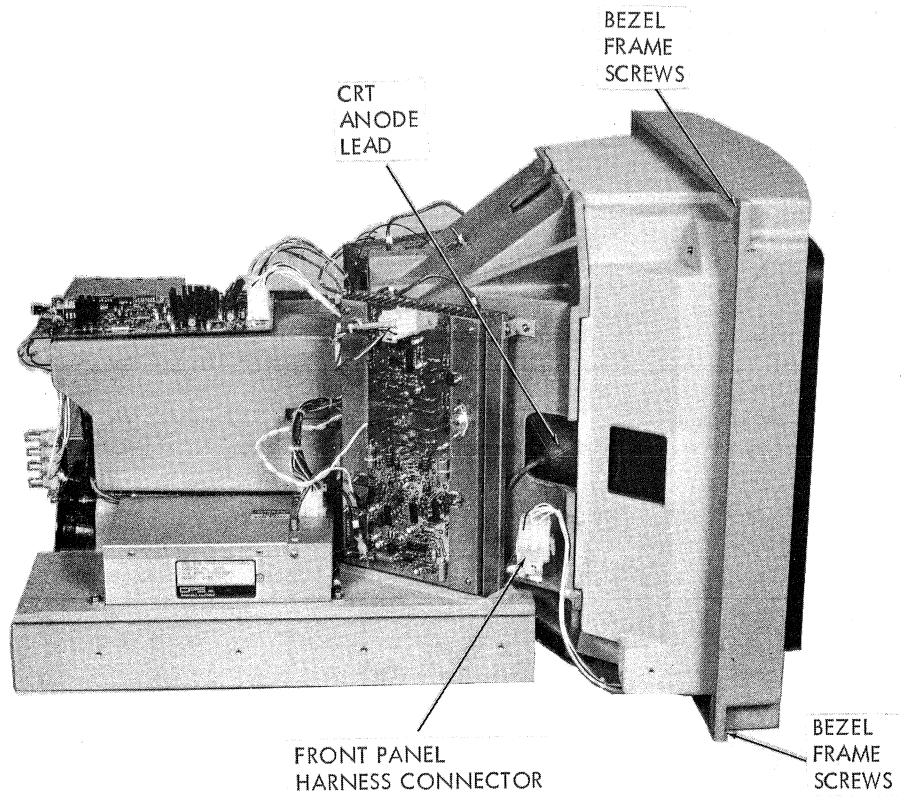
5. Tilt the display indicator up and remove two 1/4-20 screws at the underside of the bezel frame.

6. Remove two 1/4-20 screws at the top of the bezel frame and remove the bezel frame.

7. Remove four 1/4-20 screws, one at each corner of the CRT.
8. Grasp the CRT by the side and bottom of the bulb and slide straight out of the display indicator. The CRT weighs about 35 lbs. Try to avoid moving the yoke in its cradle.
9. Before installing a new CRT, first make sure the yoke is properly seated in its cradle.
10. Carefully slide the new CRT into place; try to avoid moving the yoke.
11. Secure with four 1/4-20 screws, one at each corner of the CRT.
12. Reinstall the bezel frame and secure with four 1/4-20 screws.
13. Reconnect the CRT socket and anode leads.
14. Reconnect the front panel harness connectors, one on each side of the CRT.
15. On the high voltage power supply, set the G2 adjustment fully counter-clockwise.
16. With the X, Y, Z cables disconnected, turn on the display indicator.
17. Adjust the high voltage power supply G2 adjustment clockwise until you can just see a dot at the center of the screen, then back off the G2 adjustment until the dot just disappears.
18. Connect the X, Y, Z cables. Set terminal controller to LOCAL mode to display the verification test pattern. Rotate the yoke until the pattern is properly oriented.
19. Examine verification test pattern and make any other needed adjustments as described in paragraph 5.3.

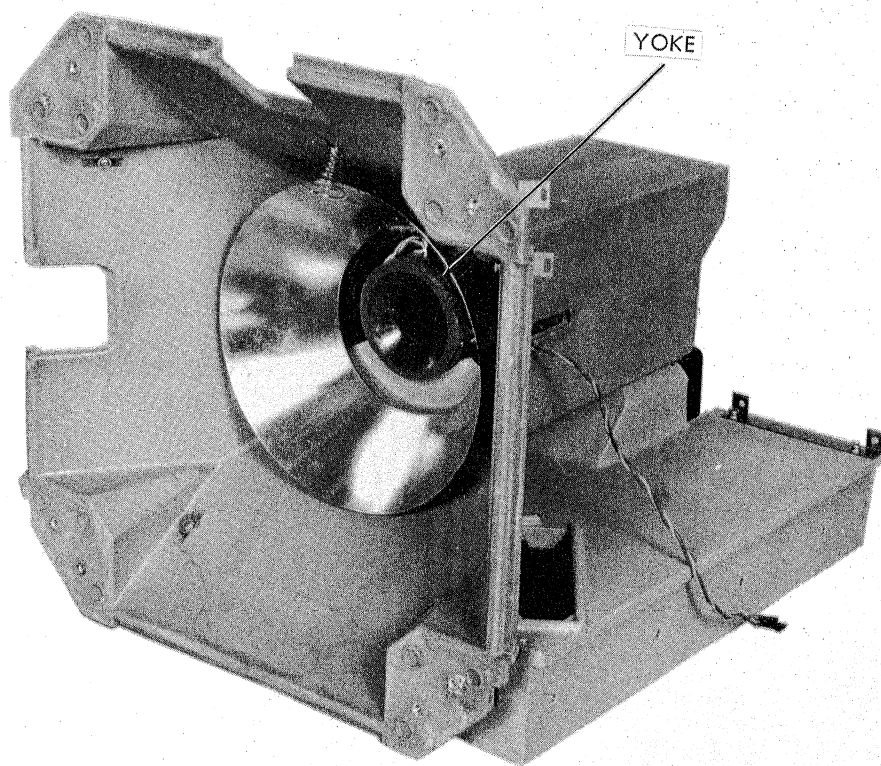


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Figure 5-7. CRT Removal (Sheet 1 of 2)



YOKE

NEG 80-132-040

Figure 5-7. CRT Removal (Sheet 2 of 2)

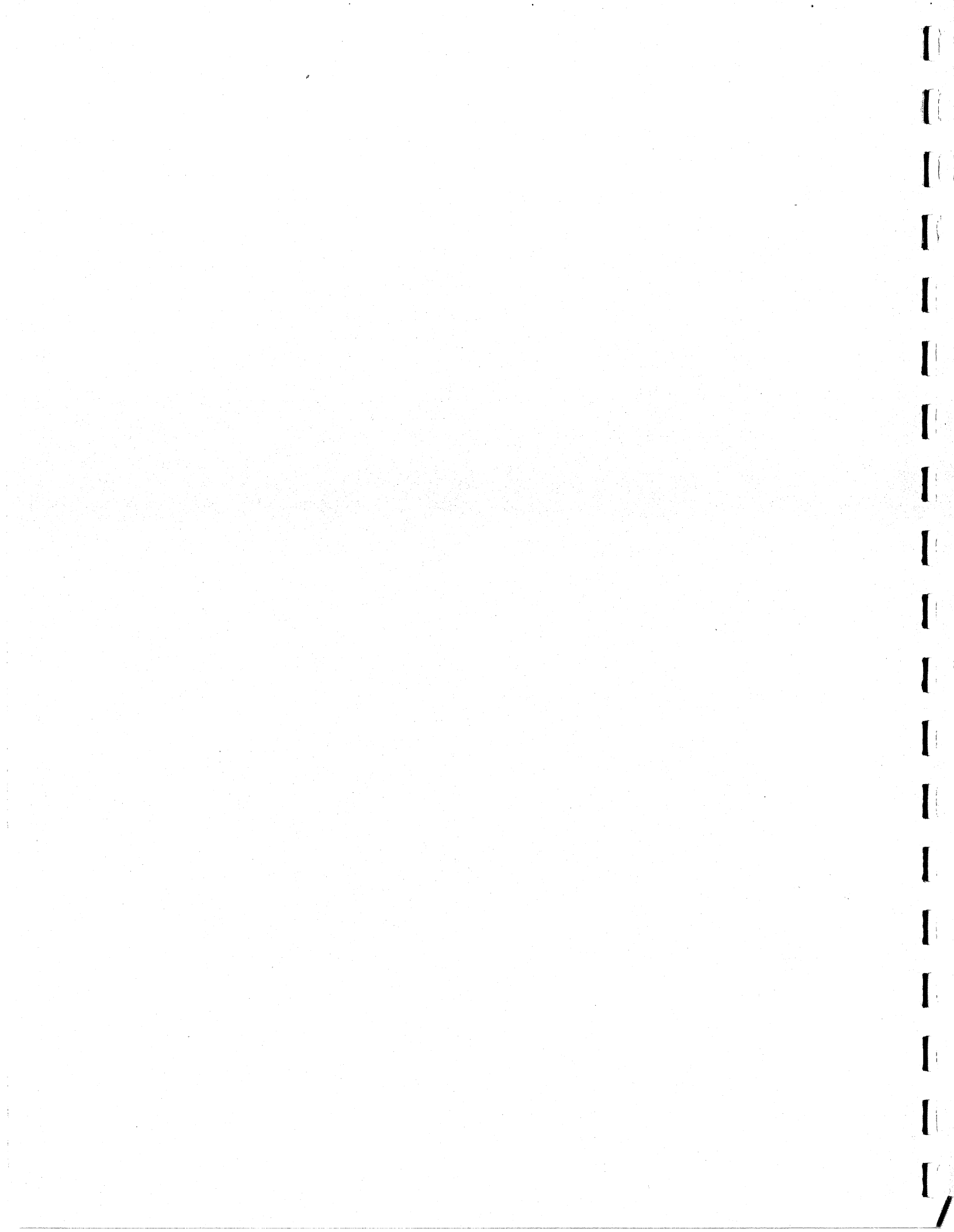


## SECTION 6

## DRAWINGS

This section contains the following drawings, arranged in numerical sequence (parts lists and wire lists, where applicable, preceding the mechanical drawing):

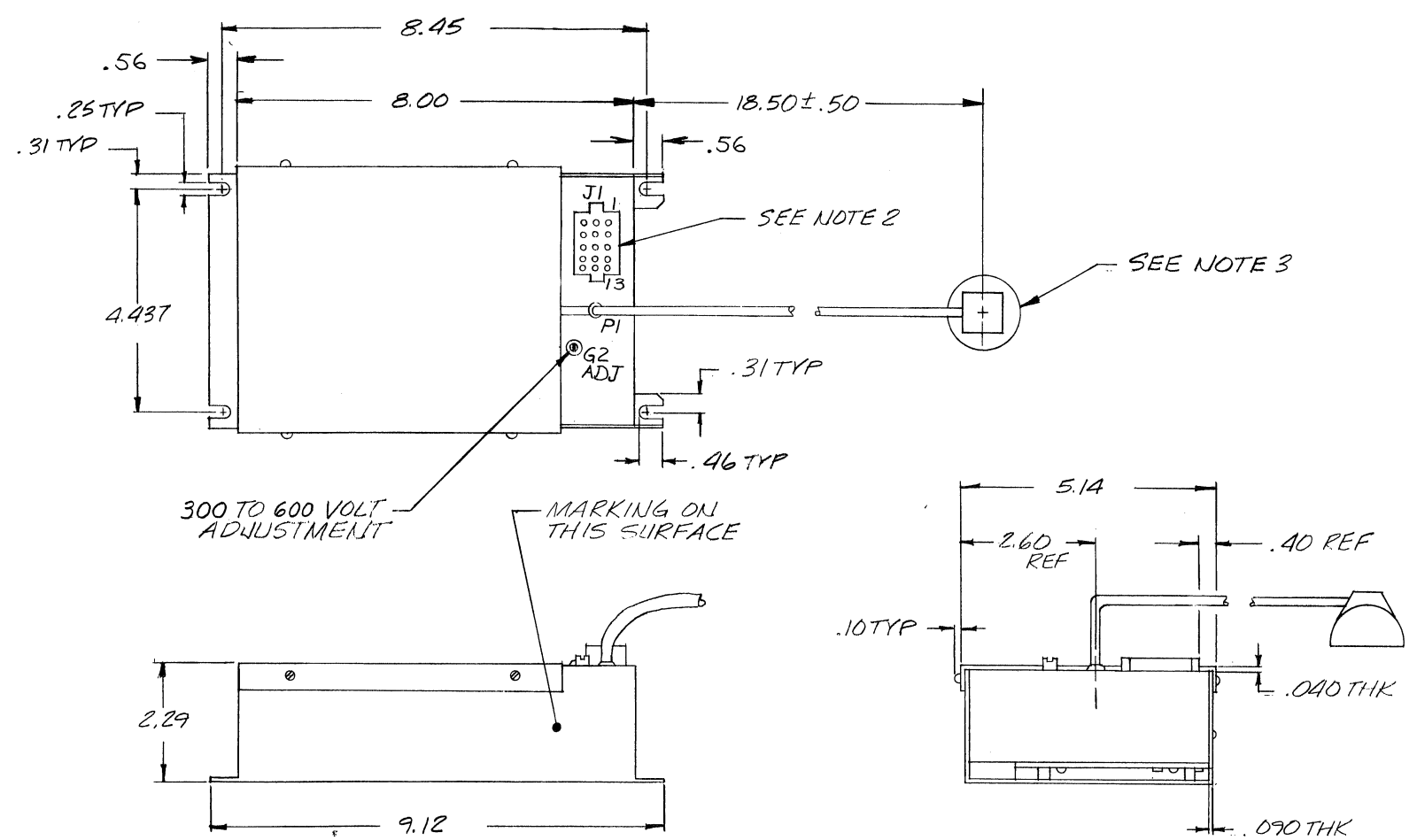
<u>ASSEMBLY</u>	<u>PARTS LIST</u>	<u>WIRE LIST</u>	<u>MECHANICAL</u>	<u>ELECTRICAL</u>	
Model 730 top assembly	PL5978881	-	5978881	5976288	} sheet 1 only
Model 731 top assembly	PL5978930G1	-	5978930G1	5976288	
Model 732 top assembly	PL5977077	-	5977077	5976288	
Model 733 top assembly	PL5978930G3	-	5978930G3	5976288	
Harness A/C	-		5978878	-	
Display control	PL5978882	-	5978882	5978884	
High voltage power supply	-	-	1088599	-	
Video cca	PL5977080	-	5977080	5977083	
Accessory panel (models 730, 732 only)	PL5977088	-	5977088	-	
PHOTOPEN intensifier/driver cca (models 730, 732 only)	PL1089543	-	1089543	1089544	
Chassis assembly	PL5978880	-	5978880	5976288	
Harness, main UDS	PL5978873	WL5978873	5978873	-	
Low voltage power supply	PL5978864	WL5978864	5978864	5978925	
Low voltage filter cca	PL5978923	-	5978923	5978925	
I/O connector panel cca	PL5978958	-	5978958	5978925	
Deflection ampl assy	PL5978938	-	5978938	5978941	
Deflection ampl cca	PL5978939	-	5978939	5978941	



4 3 2 1

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	1. REVISED AND REDRAWN	18 JUN 79	SG/
	A	2. REL FOR PREPROD	11 SEP 79	RL/WL
	B	REV PER ECO 76475	22 OCT 79	MDC/WL
	C	REV PER ECO 96343	26 FEB 80	WG/WL

D  
C  
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A



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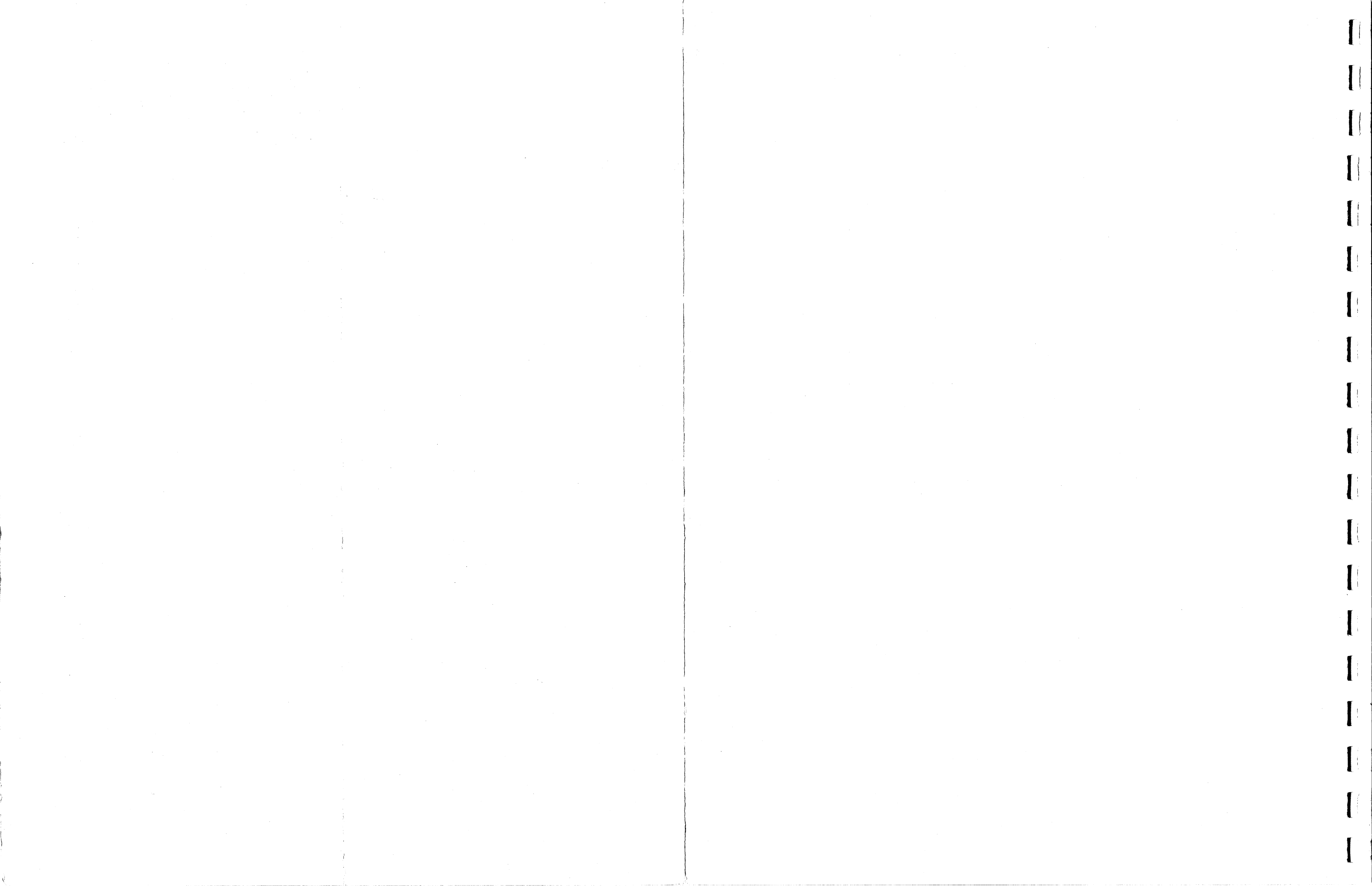
1088599

- NOTES**
3. RIGHT ANGLE CONN. TO MATE WITH JEDEC EIA J1-21.
  2. 15 PIN CONN. WITH PHOSPHOR BRONZE PRE-TINNED CONTACTS NO. 1-480711-0 (AMP INC., HARRISBURG, PA.)
  1. SHOP TOLERANCES AND DRAWING INTERPRETATION WITHIN 815002 SUPPLEMENT THIS DRAWING.

G6	G5	G4	G3	G2	G1	ITEM	SIZE	PART OR IDENTIFYING NO.	DESCRIPTION
						QTY PER ASSY		PARTS LIST	
						UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES		<div style="display: flex; justify-content: space-between;"> <div> <p>CONT NO.</p> <p>DR <i>[Signature]</i> DATE 4 JUN 79</p> <p>APP'D <i>[Signature]</i> 11 SEP 79</p> <p>CHK <i>[Signature]</i></p> <p>DES <i>[Signature]</i> 3/12/79</p> <p>ENG <i>[Signature]</i> 9-10-79</p> <p>PROJ <i>[Signature]</i> 9-12-79</p> </div> <div> <p><b>SANDERS ASSOCIATES, INC.</b> NASHUA, NEW HAMPSHIRE</p> <p>OUTLINE DRAWING, HVPS LOW VOLTAGE FOCUS</p> </div> </div>	
						.XX DECIMAL .XXX DECIMAL		SIZE CODE IDENT NO. DWG NO.	
						± .03 ± .010		C 94117 1088599	
						ANGLES ± 5°		SCALE 1/2 SHEET 1 OF 1	
						<b>PREPROD</b> CHANGE BY ECO ONLY		DO NOT SCALE PRINT	
						MFG <i>[Signature]</i> 9/12/79			
						APPLICATION			
						1088598 UDS			
						NEXT ASSY USED ON			

OP 332 REV-J

4 3 2 1



REVISIONS

APPROVED

DATE

DESCRIPTION

LTR

RC/ED

13 OCT 77

REL FOR PRODUCTION

REVISION STATUS

SH	1	2	3	4	5	6	7	8	9	10	11	12
REV	-	-										
SH	13	14	15	16	17	18	19	20	21	22	23	24
REV												

DWG REV	-
WL REV	X

2. PARTS LIST SHEET ONE IS THE CONTROLLING REVISION FOR THE COMBINED PARTS LIST, DRAWING AND WIRE LIST.
1. SHOP PRACTICE TOLERANCES AND DRAWING INTERPRETATION WITHIN 815002 SUPPLEMENT THIS DRAWING.

CONT. NO.

DR	DATE
APPD	8 SEP 77
CHK	
DEV	W.D. Totle 1 DEC 77
ENG	
GR	W.M. G. 9/1/77
FRG	W.D. Decker 9/9/77

SA SANDERS ASSOCIATES, INC. NASHUA, NEW HAMPSHIRE

CIRCUIT CARD ASSY.  
PHOTOPEN INTEN & DRVR

SIZE CODE IDENT NO.

A 94117 PL 1089543

SHEET 1 OF 2

**PRODUCTION CHANGE BY ECO ONLY**

MFG W. Koch 12-1-77

1089624 GRAPHIC 7

NEXT ASSY USED ON

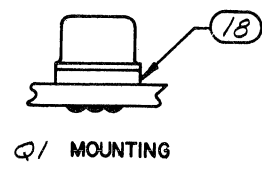
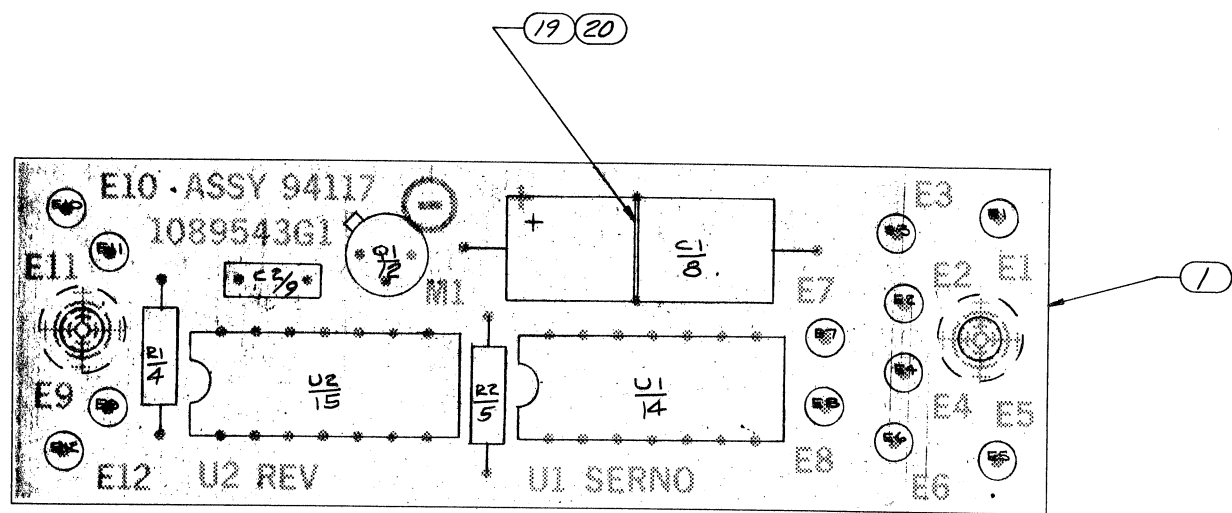
APPLICATION

# PARTS LIST

ITEM NO.	QTY PER ASSY		DWG SIZE	CODE IDENT	PART OR IDENTIFYING NO.	DESCRIPTION	SYM
	GI	G					
1	1		D		108954SG2	CIRCUIT CARD SUBASSY	
2							
3	1		-		RCR07G512J5	RES. 5.1K OHMS, ±5%, .25W	R1
4	1		-		RCR07G200J5	RES, 20 OHMS. ±5%, .25W	R2
5							
6							
7	1		-		CSR13C107K	CAP, 100 UF, ±10%, 10V	C1
8	1		-		CK05BX101K	CAP, 100 PF, ±10%, 200V	C2
9							
10							
11	1		-		JAN2N2222A	XSTR, NPN	Q1
12							
13	1		-		5N7437J	MED,	U1
14	1		-		9601DC	MED,	U2
15							
16							
17							
18	1		A		640048P1	WAFER, THERMAL	
19	2"		A		278002P13	WIRE, ELEC, AWG22	
20	1"		A		270006P5	INSUL TUBING	
21							
22	REF		C		1089544	SCHMATIC DIAGRAM	
23	REF				815003	PW & CMT BD, REQD FOR	

SHEET ONE REVISION LETTER IS THE IDENTIFYING REVISION FOR THIS MULTISHEET DWG SEE SHEET ONE FOR REVISION DESCRIPTIONS SYMBOLS : INDICATES VENDOR ITEM - SEE SPEC/SOURCE CONTROL DWG.	SIZE CODE IDENT NO. <b>A 94117 PL</b>	REV - <b>1089543</b> SHEET <b>2</b> of <b>2</b>
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REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
-		REL FOR PRODUCTION	13 Oct 77	RC/SDM

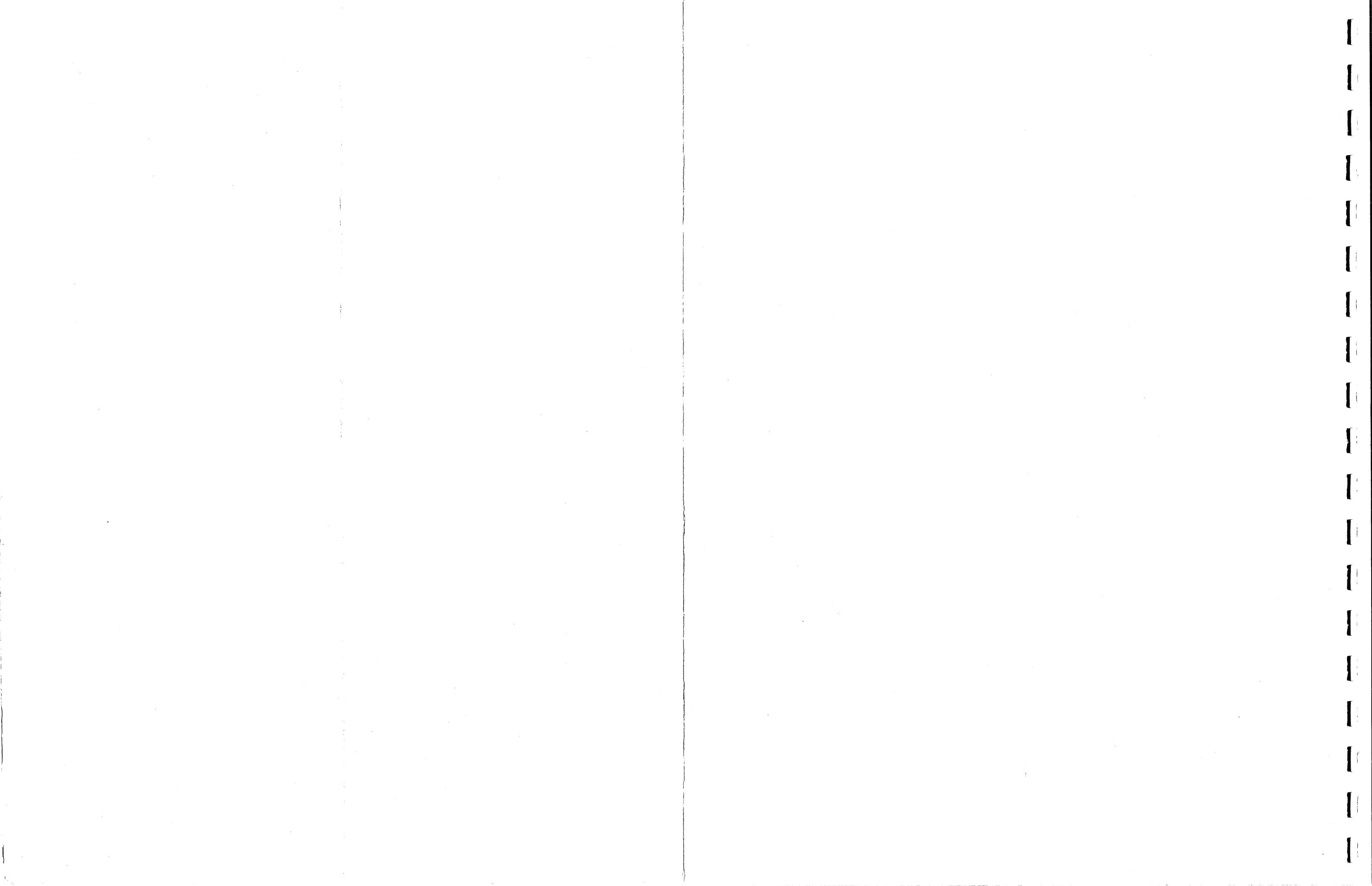


(G1) **FOR PARTS LIST**  
SEE PL 1089543

- NOTES**
1. THIS ASSY SHALL MEET THE REQUIREMENTS OF ITEM 23.
  2. PARTS LIST SHEET ONE IS THE CONTROLLING REVISION FOR THE COMBINED PARTS LIST AND DRAWING.
  3. MARK CHARACTERS .04-.16 HIGH, IN ACCORDANCE WITH MIL-STD-130.
  4. OTHER THAN SPECIFICALLY NOTED, CHARACTERS ARE REFERENCE AND NOT TO BE MARKED.
  5. MAX COMPONENT HEIGHT TO BE
  6. SOLDER TIPS OR WIRE TO BE .06 MAX FROM BOARD

G6	G5	G4	G3	G2	G1	ITEM	SIZE	PART OR IDENTIFYING NO.	DESCRIPTION
QTY PER ASSY						PARTS LIST			
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES						CONT NO.			
TOLERANCES						DR 24 Hours 8 SEP 77			
.XX DECIMAL .XXX DECIMAL						APPRO			
± — ± —						CHK			
ANGLES SURFACE QUALITY						E N G R G			
± — √ MAX						DEV D. D. Toole 10/26/77			
INTERPRET DRAWING PER 815002						E/M W. H. Smith 9/19/77			
<b>PRODUCTION CHANGE BY ECO ONLY</b>						FRS B. D. Packham 9/9/77			
MFG W. H. Smith 12-1-77						SIZE CODE IDENT. NO. DWG NO.			
APPLICATION						D 94117 1089543			
						SCALE 4:1 SHEET / OF /			

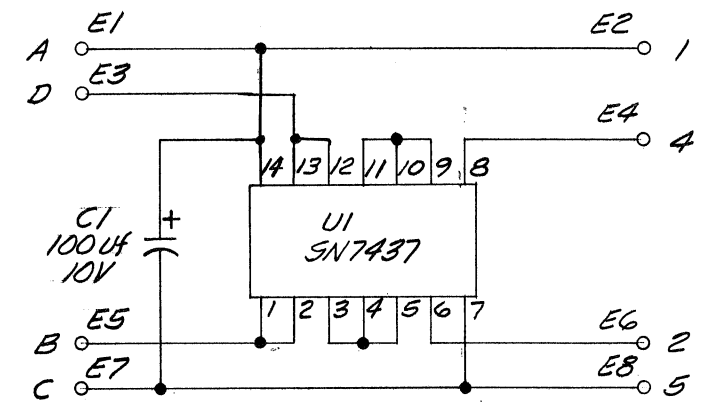
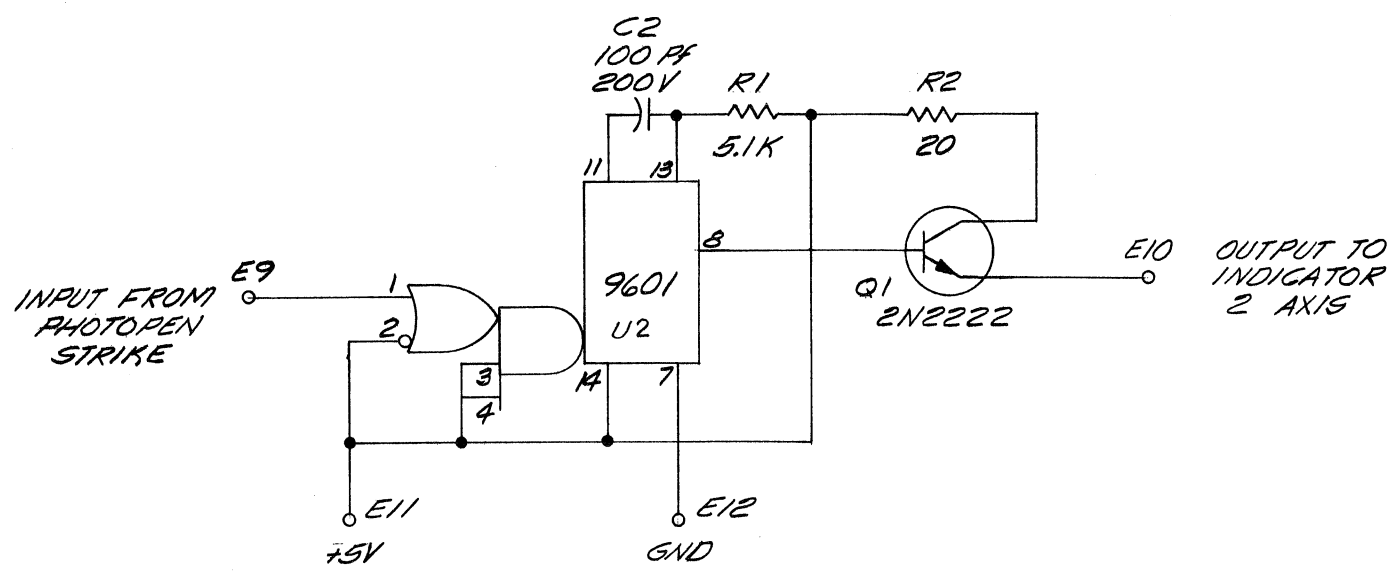
1089543





4 3 2 1

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
		- REL FOR PRODUCTION	13 OCT 77	RC/ED/M



3. PREFIX PARTIAL REFERENCE DESIGNATIONS WITH
2. UNLESS OTHERWISE SPECIFIED RESISTANCE VALUES ARE IN OHMS  
RESISTORS ARE ± 5%, .25W  
K=1,000  
MEG=1,000,000  
CAPACITANCE VALUES ARE IN PICOFARADS  
CAPACITORS ARE ± —%, —V  
UF=MICROFARADS  
INDUCTANCE VALUES ARE IN MICROHENRIES
1. INTERPRET DRAWING PER 815002

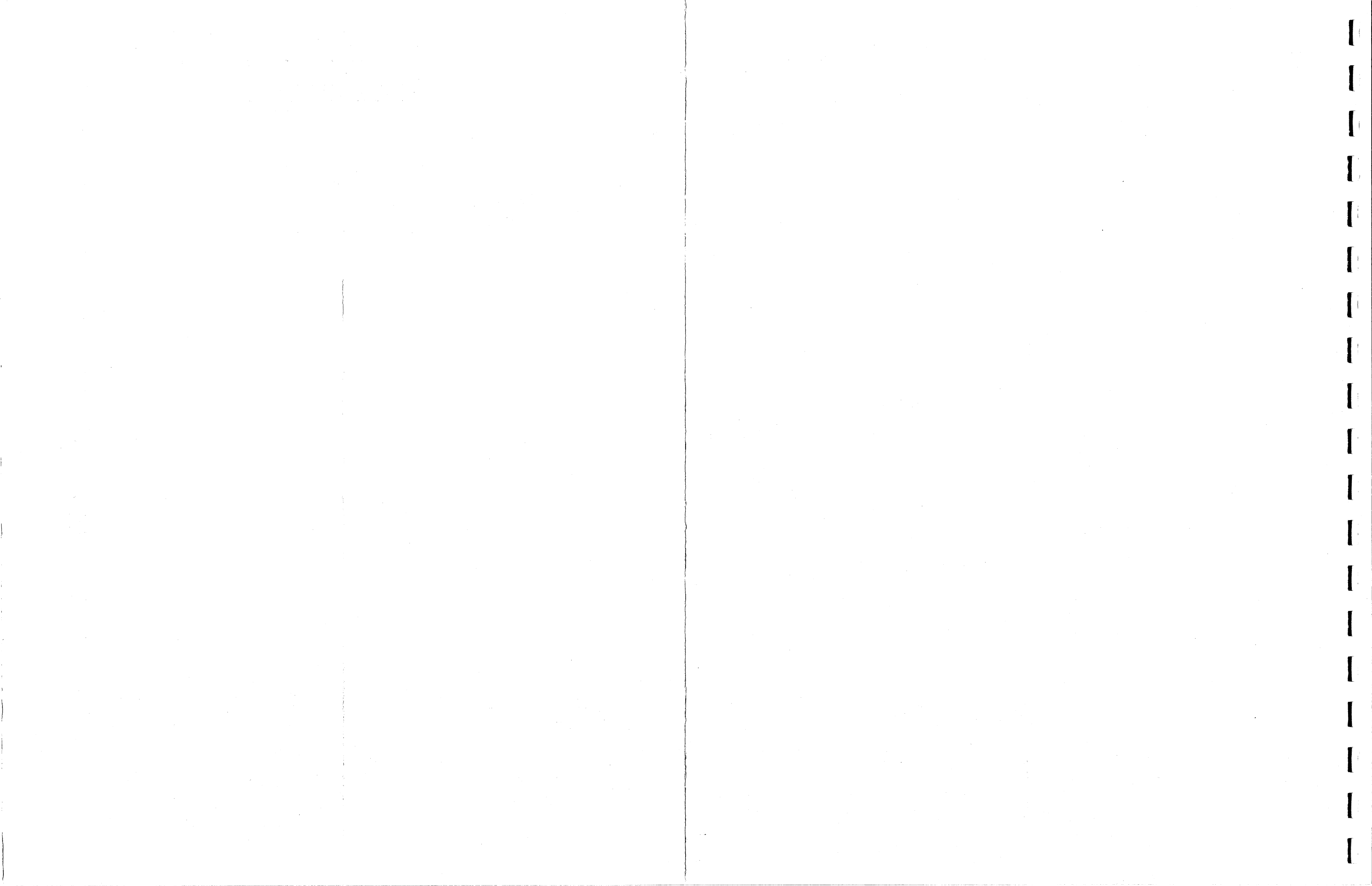
**NOTES**

REFERENCE DATA			PRODUCTION		CONT. NO.		SA SANDERS ASSOCIATES, INC. NASHUA, NEW HAMPSHIRE	
DESCRIPTION	LAST NO.	DELETED NO.	CHANGE BY ECO ONLY		DR	DATE	SCHEMATIC DIAG	
RESISTOR	R2		MFG	W. Koch 12-1-77	H. Hoos	9 SEP 77	PHOTOPEN INTEN & DRVR	
CAPACITOR	C2						SIZE CODE IDENT NO. DWG NO.	
DIODE	—						C	94117 1089544
TRANSISTOR	Q1						SCALE 1/1 SHEET 1 OF 1	
INDUCTOR	—						DO NOT SCALE PRINT	
MICROELEMENT	U2							
WIRING DIAGRAM			APPLICATION					

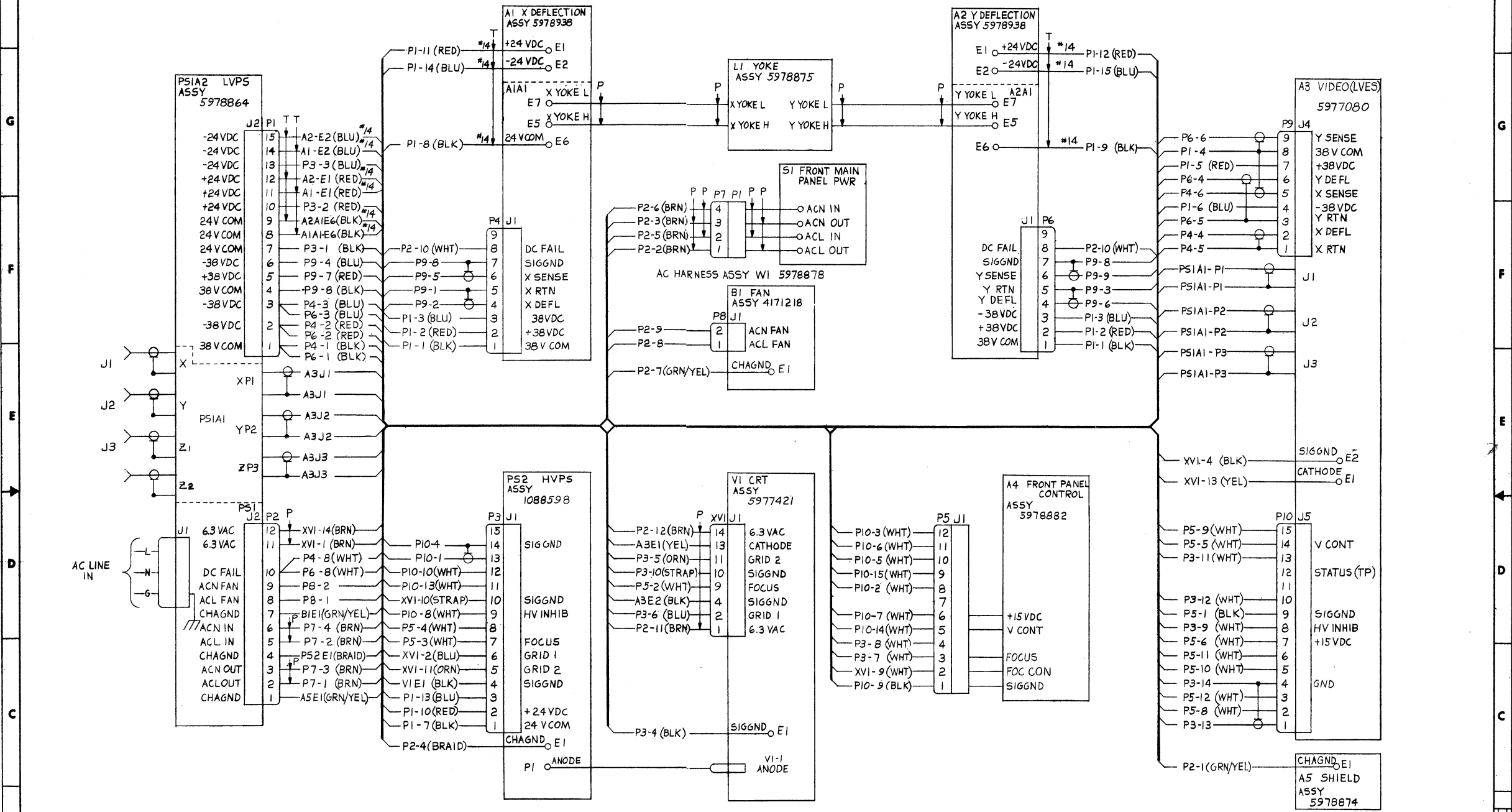
01-652 REV-C

1089544

4 3 2 1



ZONE LTR	DESCRIPTION	DATE	APPROVED
-	REL FOR PREPROD	3/1/80	[Signature]



USED ON

MODEL	P/N	DESCRIPTION
730	5978881G1	21" MONO HORIZ. DESK TOP
731	5978930G1	21" MONO HORIZ. 24" RACK
732	5977077G1	21" MONO VERT. DESK TOP
733	5978930G3	21" MONO VERT. 19" RACK

REVISION STATUS OF SHEETS						
SHEET	1	2	3	4	5	6
REVISION	-	-	-	-	-	-

3. REFERENCE DESIGNATIONS ARE ABBREVIATED  
PREFIX THE DESIGNATIONS WITH UNIT NO. OR  
ASSEMBLY DESIGNATION OR BOTH.

4. UNLESS OTHERWISE SPECIFIED  
RESISTANCE VALUES ARE IN OHMS  
RESISTORS ARE ± %, W  
K=1,000  
M=1,000,000  
CAPACITANCE VALUES ARE IN PICOFARADS  
CAPACITORS ARE ± %, V  
UF=MICROFARADS  
INDUCTANCE VALUES ARE IN MICROMHENRIES

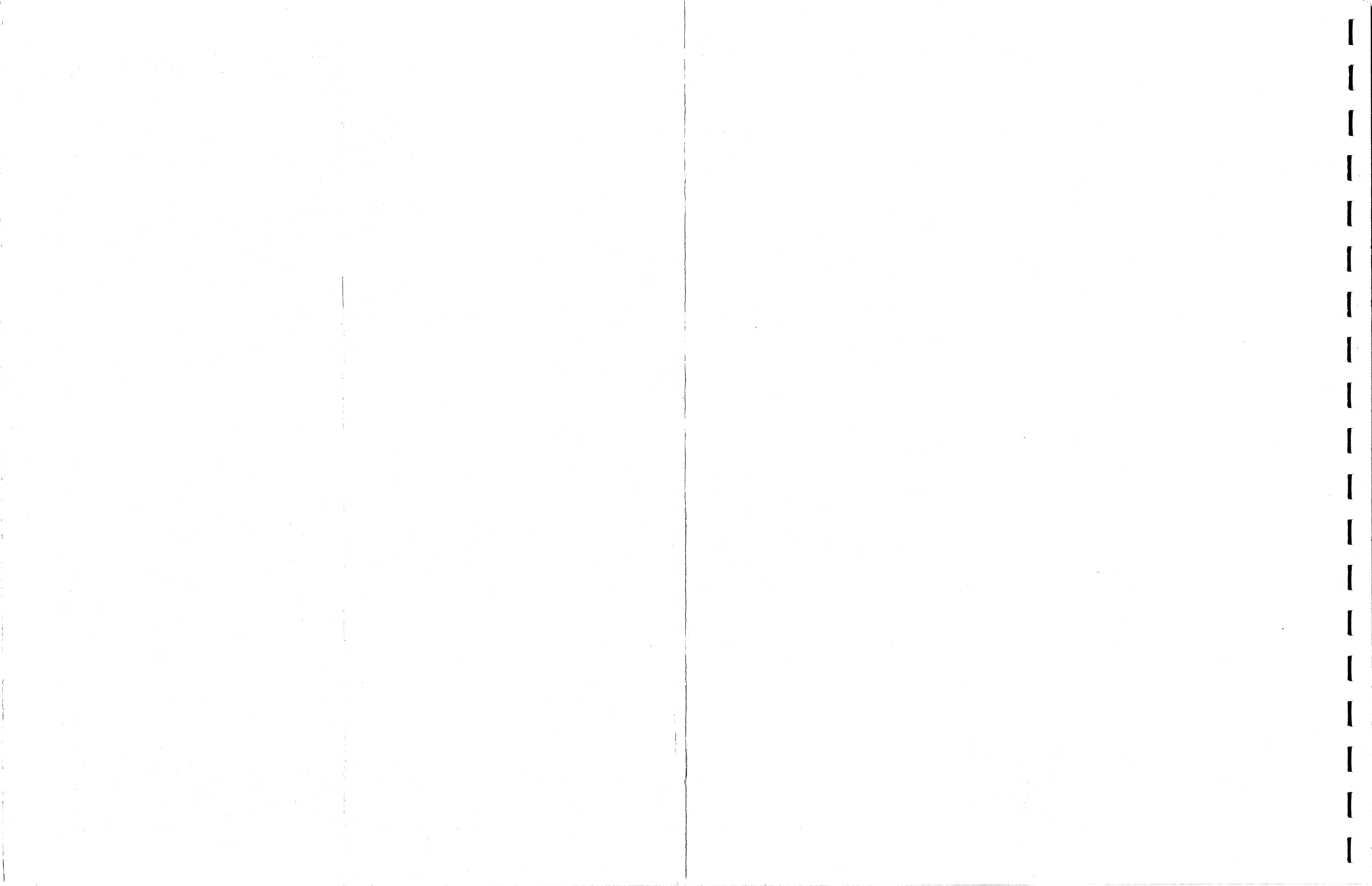
1. INTERPRET DRAWING PER 916002  
NOTES

REFERENCE DATA		PREPROD		SHEET NO.	
DESCRIPTION	LAST NO.	DELETED NO.	DATE	BY	CHKD
RESISTOR					
CAPACITOR					
DIODE					
TRANSISTOR					
INDUCTOR					
MICROELEMENT					
WIRING DIAGRAM					

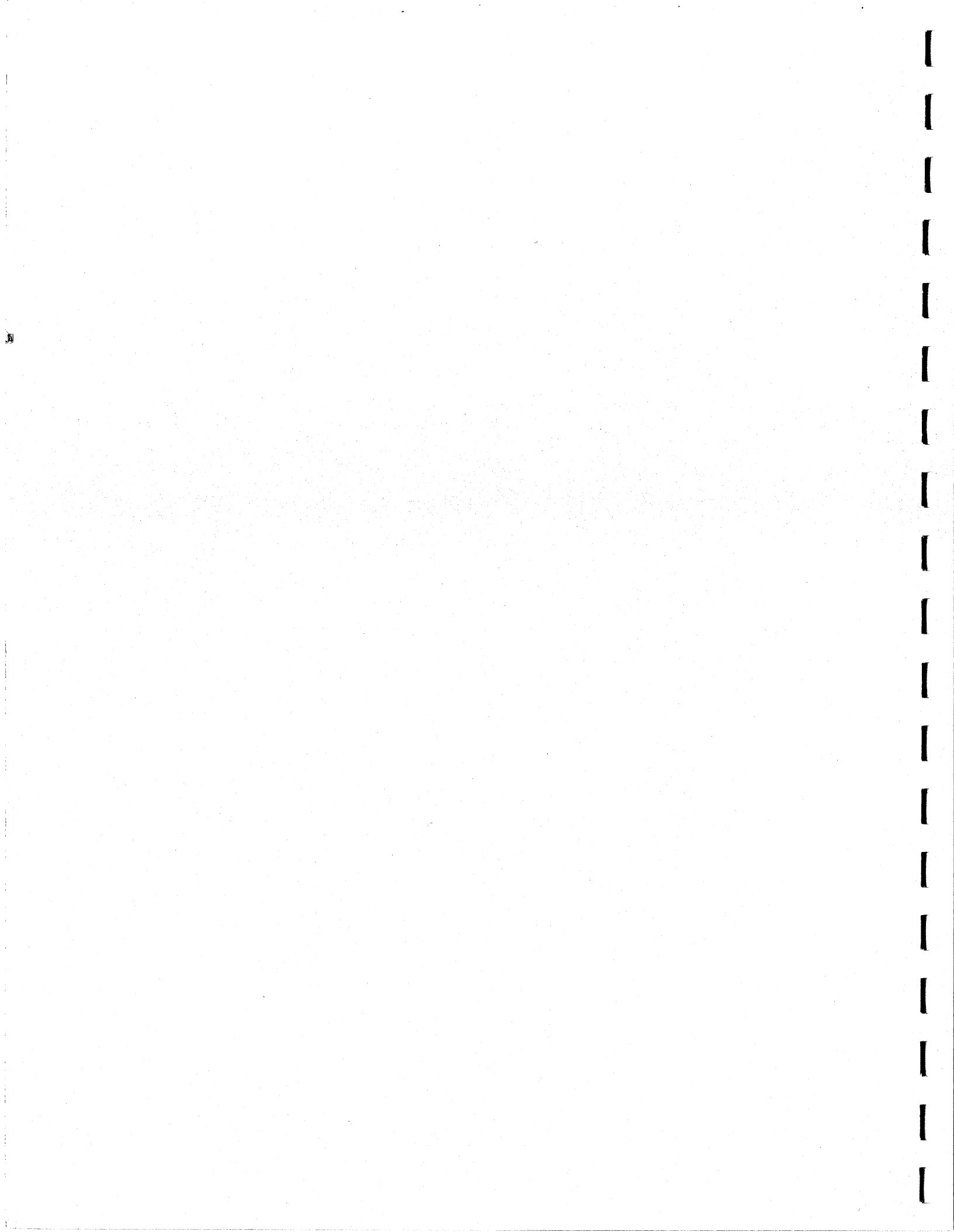
SANDERS ASSOCIATES, INC. MINNAPAC, NEW BRUNSWICK	
WIRING DIAGRAM	
UDS	
QTY	QTY USED
E 94117	5976288
DATE	REV
3/1/80	1

5976288



TO BE SUPPLIED

5977077  
Model 732 Top Assembly



M M

REVISION STATUS													REVISIONS			
SH	1	2	3	4	5	6	7	8	9	10	11	12	LTR	DESCRIPTION	DATE	APPROVED
PARTS	A	A	-	-	-	-	-	-	A	-	-	-	-	REL FOR PREPROD	28 Nov 79	my HGA
LIST	13	14	15	16	17	18	19	20	21	22	23	24	A	REV PER ECO 96273	22 JAN 80	NG/WL
DWG REV	-															
WL REV	X															

PREPROD	CHANGE BY ECO ONLY
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DR	DR	DATE
J. Marcom	5 NOV 79	
CHK	11-28-79	
APP	12-28-79	
ENG	12-28-79	
PROJ	11-27-79	

CONT NO.	5977077	UDS
	5978881	UDS
	5977077	UDS
NEXT ASSY	USED ON	
APPLICATION		

SA SANDERS ASSOCIATES, INC.	NASHUA, NEW HAMPSHIRE
CIRCUIT CARD ASSY	VIDEO (LVES)
SIZE	CODE IDENT NO.
A	94117
PL 5977080	

1. SHOP PRACTICE TOLERANCES AND DRAWING INTERPRETATION WITHIN 815002 SUPPLEMENT THIS DRAWING.

2. PARTS LIST SHEET ONE IS THE CONTROLLING REVISION FOR THE COMBINED PARTS LIST, DRAWING AND WIRE LIST.

# PARTS LIST

ITEM NO.	QTY PER ASSY		DWG SIZE	CODE IDENT	PART OR IDENTIFYING NO.	DESCRIPTION	SYM
	G	G					
1	1		J		5977081G1	CIRCUIT CARD SUBASSY, VIDEO LVES	
2	2			56117	HAI-5195-5	MED, OP. AMP	U1, 4
3	1			13919	4423	MED, SIN-COS OSC	U2, 4
4	1				LM747CN	MED, OP. AMP	U3
5	1			56117	H11-5041-5	MED, SWITCH, F.E.T.	U5, 6
6	2				NE592N	MED, VIDEO AMP	U7
7	1				LM319CN	MED, COMPARATOR DUAL	U8
8	1				SG4194R	MED, DUAL VOLT. REG (±28V)	U9
9	1				5976341PI	IC, 3 TERM VOLT REG +15VDC (TO 220 CASE)	U10
10	1		A		5976340PI	IC, 3 TERM VOLT REG - 15VDC (TO 220 CASE)	U11
11	1						
12							
13							
14							
15	2				2N2222A	XSTR, NPN T018 SW.	Q2, 5
16	2				2N2907A	XSTR, PNP T018 SW.	Q1, 4
17	5				2N4209	XSTR, PNP T015 VHF	Q3, 6, 10,
18	3					11, 12.	
19	1			02295	2N918	XSTR, NPN T072 VHF	Q7, 8, 9
20	1			02295	D40D11	XSTR, NPN	Q14
21	1				D41D11	XSTR, PNP	Q13
22							

SHEET ONE REVISION LETTER IS THE IDENTIFYING REVISION FOR THIS MULTISHEET DWG  
 SEE SHEET ONE FOR REVISION DESCRIPTIONS  
 SYMBOLS : INDICATES VENDOR ITEM - SEE SPEC/SOURCE CONTROL DWG.

SIZE CODE IDENT NO.

A 94117 PL 5977080

REV A SHEET 2



# PARTS LIST

ITEM NO.	QTY PER ASSY		DWG SIZE	CODE IDENT	PART OR IDENTIFYING NO.	DESCRIPTION	SYM
	G	G					
23	6				IN4148	DIODE, G.P. 90V, 100MA, 0.5W CR1, 3, 4, 5, 8, 9.	
24	1				IN270	DIODE, 100V, 60MA GERM.	CR2
25	2				IN3613	DIODE, RECT. 720V, 1A, 1W	CR6, 7.
26							
27	2				IN753A	DIODE, ZENER, 6.2V, 0.4W	VR1, 2.
28	1				IN4370A	DIODE, ZENER, 2.4V, 0.4W	VR3
29	1				IN5753D	DIODE, ZENER, 51V ±1%	VR4
30	1				IN748A	DIODE, ZENER, 3.9V, 0.4W	VR5
31	3				IN751A	DIODE, ZENER, 5.1V, 0.4W	VR6, 9, 13.
32	2				IN4956	DIODE, ZENER, 8.2V, 5W	VR7, 11.
33	2				IN4958	DIODE, ZENER, 10V, 5W	VR8, 12
34	1				IN3029B	DIODE, ZENER, 24V	VR10
35							
36							
37							
38	8				RLR07C1001GM	RES., MIL-R-39017/1, 1K ±2%, 25W R1, 2, 3, 4, 32, 33, 58, 60.	
39	12				RCR07G102JS	RES., MIL-R-39008/1, 1K ±5%, 25W R5, 13, 17, 20, 41, 54, 56, 59, 63, 73, 74, 75.	
40	1				RCR07G302JS	RES., MIL-R-39008/1, 3K ±5%, 25W R6	
41	1		A		4174378P009	POT, 5K ±20%, .5W ¼DIA R7	

SHEET ONE REVISION LETTER IS THE IDENTIFYING REVISION FOR THIS MULTISHEET DWG  
SEE SHEET ONE FOR REVISION DESCRIPTIONS  
SYMBOLS : INDICATES VENDOR ITEM - SEE SPEC/SOURCE CONTROL DWG.

SIZE CODE IDENT NO.

A 94117 PL 5977080

REV - SHEET 3

# PARTS LIST

ITEM NO.	QTY PER ASSY		DWG SIZE	CODE IDENT	PART OR IDENTIFYING NO.	DESCRIPTION	SYM
	G	G					
42	1				RCR07G510JS	RES., MIL-R-39008/1, 51Ω ± 5%, .25W R8	
43	1				RCR20G151JS	RES., MIL-R-39008/2, 150Ω ± 5%, .5W R9	
44	1				RCR20G121JS	RES., MIL-R-39008/2, 120Ω ± 5%, .5W R10	
45	3				RCR07G511JS	RES., MIL-R-39008/1, 510Ω ± 5%, .25W R11, 35, 37.	
46	1				RCR20G561JS	RES., MIL-R-39008/2, 560Ω ± 5%, .5W R12	
47	3				RCR07G202JS	RES., MIL-R-39008/1, 2K ± 5%, .25W R14, 36, 53.	
48	1				RCR07G513JS	RES., MIL-R-39008/1, 51K ± 5%, .25W R15	
49	1				RCR07G301JS	RES., MIL-R-39008/1, 300Ω ± 5%, .25W R16	
50	1				RRCR07G153JS	RES., MIL-R-39008/1, 15K ± 5%, .25W R18	
51	1		12697		VC5E-82	RES, 82Ω ± 5%, 5W R19	
52	2				5976325PI	RES, 70.6K ± 1%, .1W R21, 22	
53	1		12697		VC5E-100	RES, 100Ω ± 5%, 5W R23	
54	2				RRCR07G122JS	RES., MIL-R-39008/1, 1.2K ± 5%, .25W R24, 25	

SHEET ONE REVISION LETTER IS THE IDENTIFYING REVISION FOR THIS MULTISHEET DWG  
 SEE SHEET ONE FOR REVISION DESCRIPTIONS  
 SYMBOLS : INDICATES VENDOR ITEM - SEE SPEC/SOURCE CONTROL DWG.

SIZE CODE IDENT NO.

A 94117 PL 5977080

REV A SHEET 4

## PARTS LIST

ITEM NO.	QTY PER ASSY		DWG SIZE	CODE IDENT	PART OR IDENTIFYING NO.	DESCRIPTION	SYM
	G	G					
55	3				RCR07G512JS	RES, MIL-R-39008/1, 5.1K±5%, .25W R26, 27, 47	
56	2				RCR07G242JS	RES, MIL-R-39008/1, 2.4K±5%, .25W R28, 29.	
57	1				RCR07G203JS	RES, MIL-R-39008/1, 20K±5%, .25W R30.	
58	2				RCR07G103JS	RES, MIL-R-39008/1, 10K±5%, .25W R31, 77	
59	2				RCR32G271JS	RES, MIL-R-39008/3, 270Ω±5%, 1W R34, 45.	
60	2				RCR07G270JS	RES, MIL-R-39008/1, 27Ω±5%, .25W R38, 39	
61	1				RCR07G331JS	RES, MIL-R-39008/1, 330Ω±5%, .25W R40	
62	1				RCR32G751JS	RES, MIL-R-39008/3, 750Ω±5%, 1W R42	
63	2				RCR07G560JS	RES, MIL-R-39008/1, 56Ω±5%, .25W R43, 44	
64	1				RNR55H1000FS	RES, MIL-R-55182/1, 100Ω±1%, .1W R46	
65	1				RCR07G162JS	RES, MIL-R-39008/1, 1.6K±5%, .25W R48	

SHEET ONE REVISION LETTER IS THE IDENTIFYING REVISION FOR THIS MULTISHEET DWG  
SEE SHEET ONE FOR REVISION DESCRIPTIONS  
SYMBOLS : INDICATES VENDOR ITEM - SEE SPEC/SOURCE CONTROL DWG.

SIZE CODE IDENT NO.

A 94117 PL

5977080

REV - SHEET 5

# PARTS LIST

ITEM NO.	QTY PER ASSY		DWG SIZE	CODE IDENT	PART OR IDENTIFYING NO.	DESCRIPTION	SYM
	G /	G					
66	1				RCCR07G152JS	RES, MIL-R-39008/1, 1.5K±5%, .25W R49	
67	1				RCCR20G202JS	RES, MIL-R-39008/2, 2K±5%, .5W R50	
68	1				RCCR07G105JS	RES, MIL-R-39008/1, 1MEG±5%, .25W R51	
69	1				RCCR07G201JS	RES, MIL-R-39008/1, 200Ω±5%, .25W R52	
70	1				RCCR42G151JS	RES, MIL-R-39008/5, 150Ω±5%, 2W R55	
71	1				RCCR42G181JS	RES, MIL-R-39008/5, 180Ω±5%, 2W R57	
72	1				RCCR07G243JS	RES, MIL-R-39008/1, 24K±5%, .25W R61	
73	1				RCCR07G753JS	RES, MIL-R-39008/1, 75K±5%, .25W R62	
74	6				RCCR07G200JS	RES, MIL-R-39008/1, 20Ω±5%, .25W R64, 65, 66, 70, 71, 72	
75	1				RNR65H422IFS	RES, MIL-R-55182/, 4.22K±1%, .25W R67	
76	1				RCCR07G132JS	RES, MIL-R-39008/1, 1.3K±5%, .25W R68	

SHEET ONE REVISION LETTER IS THE IDENTIFYING REVISION FOR THIS MULTISHEET DWG  
SEE SHEET ONE FOR REVISION DESCRIPTIONS  
SYMBOLS : INDICATES VENDOR ITEM - SEE SPEC/SOURCE CONTROL DWG.

SIZE	CODE IDENT NO.	REV	SHEET
A	94117 PL	5977080	6

**PARTS LIST**

ITEM NO.	QTY PER ASSY		DWG SIZE	CODE IDENT	PART OR IDENTIFYING NO.	DESCRIPTION	SYM
	G/	G					
77	1				RCR07G681JS	RES, MIL-R-39008/1, 680Ω ± 5%, 25W R69	
78	2				RCR42G560JS	RES, MIL-R-39008/5, 56Ω ± 5%, 2W R76, 80	
79	1				RCR20G510JS	RES, MIL-R-39008/2, 51Ω ± 5%, .5W R78	
80	1				RCR42G510JS	RES, MIL-R-39008/5, 51Ω ± 5%, 2W R79	
81	1				RCR07G333JS	RES, MIL-R-39008/1, 33K ± 5%, .25W R81	
82	2				RCR20G820JS	RES, MIL-R-39008/2, 82Ω ± 5%, .5W R82, 83	
83							
84							
85							
86	13		A		4174298PI	CAP, CERAMIC, AXIAL LEAD, .01UF +80% -20%, 50WVDC, UNITRODE C1, 2, 8, 9, 11, 14, 15, 22, 23, 30, 36, 38, 39.	
87	1		A		M39003/01-2350	CAP, .47UF ± 10%, 50WVDC C3	
88	12		A		4174298P3	CAP, CERAMIC, AXIAL LEAD, 0.1UF, +80-20%, 50WVDC, UNITRODE, C4, 5, 10, 13, 18, 20, 24, 26, 27, 31, 32, 35.	

SHEET ONE REVISION LETTER IS THE IDENTIFYING REVISION FOR THIS MULTISHEET DWG  
 SEE SHEET ONE FOR REVISION DESCRIPTIONS  
 SYMBOLS : INDICATES VENDOR ITEM - SEE SPEC/SOURCE CONTROL DWG.

SIZE CODE IDENT NO.

A 94117 PL 5977080

REV - SHEET 7

PARTS LIST

ITEM NO.	QTY PER ASSY		DWG SIZE	CODE IDENT	PART OR IDENTIFYING NO.	DESCRIPTION	SYM
	G	G					
89	2				CK058X102K	CAP. .001UF ± 10%, 200V C6,7	
90	1				CM05ED300JF3	CAP MIL-C-5/18 30PF ± 5% 50WVDC C12	
91	4		A		M39003/01-2379	CAP 18UF ± 10%, 50WVDC C16,17,29,37.	
92	2		A		M39003/01-2356	CAP 1.0UF ± 10%, 50WVDC C19,21	
93	4		A		M39003/01-2304	CAP 6.8UF ± 10%, 35WVDC C25,28, 33,34.	
100	1			00779	42117-2	CONNECTOR, FASTON .250 RT.L	E1
101	1			00779	61947-1	CONNECTOR, FASTON .187 RT.L	E2
102	9		A		165046PI	TEST POINTS TP1-TP9	
103	3			00779	226993-1	BNC CONNECTORS J1,2,3	
104	1			00779	350432-1	CONNECTOR, 9 PIN J4	
105	1			00779	350434-1	CONNECTOR, 15 PIN J5	
106							
107	1		A		5977414PI	SWITCH DPDT S1	
108	1			10389	24-420-020	SWITCH DPDT S2	
109	1			15003	N100 R5-15/1	DELAY LINE 100NS (VALOR) DL1	
110	1				NE-2	LAMP, NEON DS1	
111	1			02735	CK2142	RAYSIATOR, OPTICAL COUPLER, OCI	
112							
113	1			98978	UR1066-47CE	HEATSINK	
114	2			05820	Z91-C1-80	HEATSINK	

SHEET ONE REVISION LETTER IS THE IDENTIFYING REVISION FOR THIS MULTISHEET DWG  
SEE SHEET ONE FOR REVISION DESCRIPTIONS  
SYMBOLS : INDICATES VENDOR ITEM - SEE SPLC/SOURCE CONTROL DWG.

SIZE	CODE IDENT NO.	REV	SHEET
A	94117 PL	5977080	8

## PARTS LIST

ITEM NO.	QTY PER ASSY		DWG SIZE	CODE IDENT	PART OR IDENTIFYING NO.	DESCRIPTION	SYM
	G/	G					
115	12		A		640048P1	TRANSIPAD	#
116	1		A		640049P1	TRANSIPAD	#
117	2		A		630003P17	EYELET	#
118	4		A		630003P60	EYELET	#
119							
120	6		A		MSS1861-3C	SCREW, SELF-TAPPING NO.2	
121	2		A		MSS1957-3	SCREW, PNHD .086(2)-56 X.250	
122	2		A		MSS1957-14	SCREW, PNHD.112(4)-40 X.31	
123	2		A		MSS1957-29	SCREW, PNHD.138(6)-32 X.44	
124	4			86928	5610-120-115	WASHER, NYLON	
125	6		A		MS15795-802	WASHER, FLAT NO.2	
126	2		A		MS35338-134	WASHER, LOCK-SPRING NO.2	
127	2		A		MS35338-135	WASHER, LOCK-SPRING NO.4	
128	4		A		MS15795-803	WASHER, FLAT NO.4	
129	2		A		MS15795-805	WASHER, FLAT NO.6	
130	2		A		MSS35333-71	WASHER, INTERNAL TOOTH	
131	4		A		NAS 620C2	WASHER, FLAT NO.2	
132							
133							
134	2		A		MS35649-264	NUT, PLAIN HEX.138(6)-32	
135	2		A		MS35649-224	NUT, PLAIN HEX.086(2)-56	
136	2		A		MS35649-244	NUT, PLAIN HEX.112(4)-40	
137							

SHEET ONE REVISION LETTER IS THE IDENTIFYING REVISION FOR THIS MULTISHEET DWG  
SEE SHEET ONE FOR REVISION DESCRIPTIONS  
SYMBOLS : INDICATES VENDOR ITEM -SEE SPEC/SOURCE CONTROL DWG.

SIZE CODE IDENT NO.

A

94117 PL

5977080

REV A

SHEET 9

**PARTS LIST**

ITEM NO.	QTY PER ASSY		DWG SIZE	CODE IDENT	PART OR IDENTIFYING NO.	DESCRIPTION	SYM
	G	G					
138	3 IN.		A		278000P13	WIRE, ELEC (BUS)	#
139	3 IN.		A		270006P8	INSULATION, TUBING	#
140							
141	REF		E		5977083	SCHEMATIC DIAGRAM	#
142	AR		A		746008P1	THERMAL COMPOUND	
143	AR		A		93002P1	SOLDER	
144	AR		A		4174230P1	SEALANT 738RTV	#
145	REF		A		815026	PW & CKT BD REQ T FOR	
146	REF		A		778000	APPL OF EPOXY MKG CMPD	

SHEET ONE REVISION LETTER IS THE IDENTIFYING REVISION FOR THIS MULTISHEET DWG SEE SHEET ONE FOR REVISION DESCRIPTIONS SYMBOLS : INDICATES VENDOR ITEM - SEE SPEC/SOURCE CONTROL DWG.		SIZE	CODE IDENT NO.	REV	SHEET
		A	94117 PL	—	10

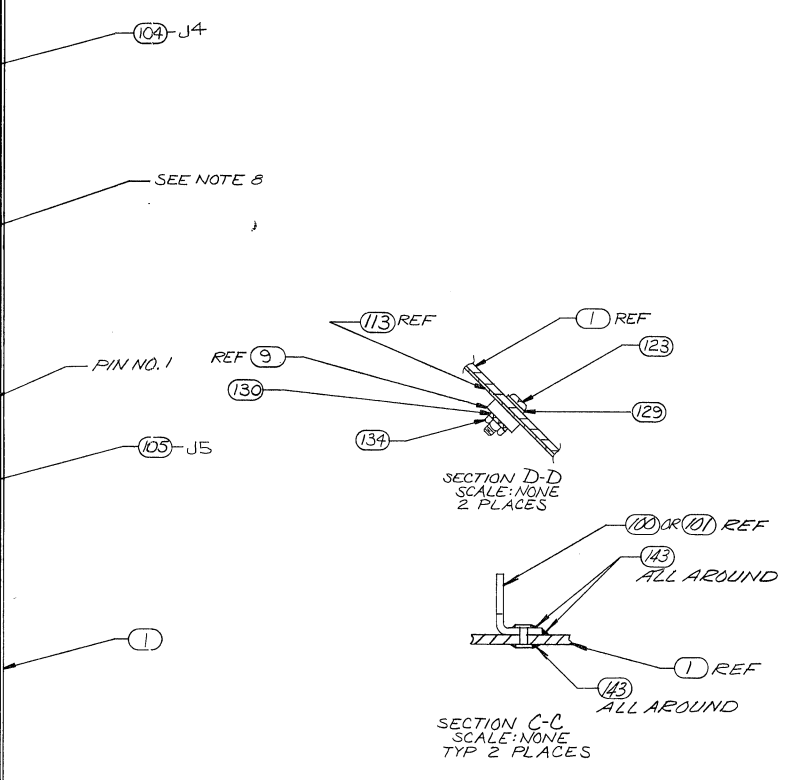
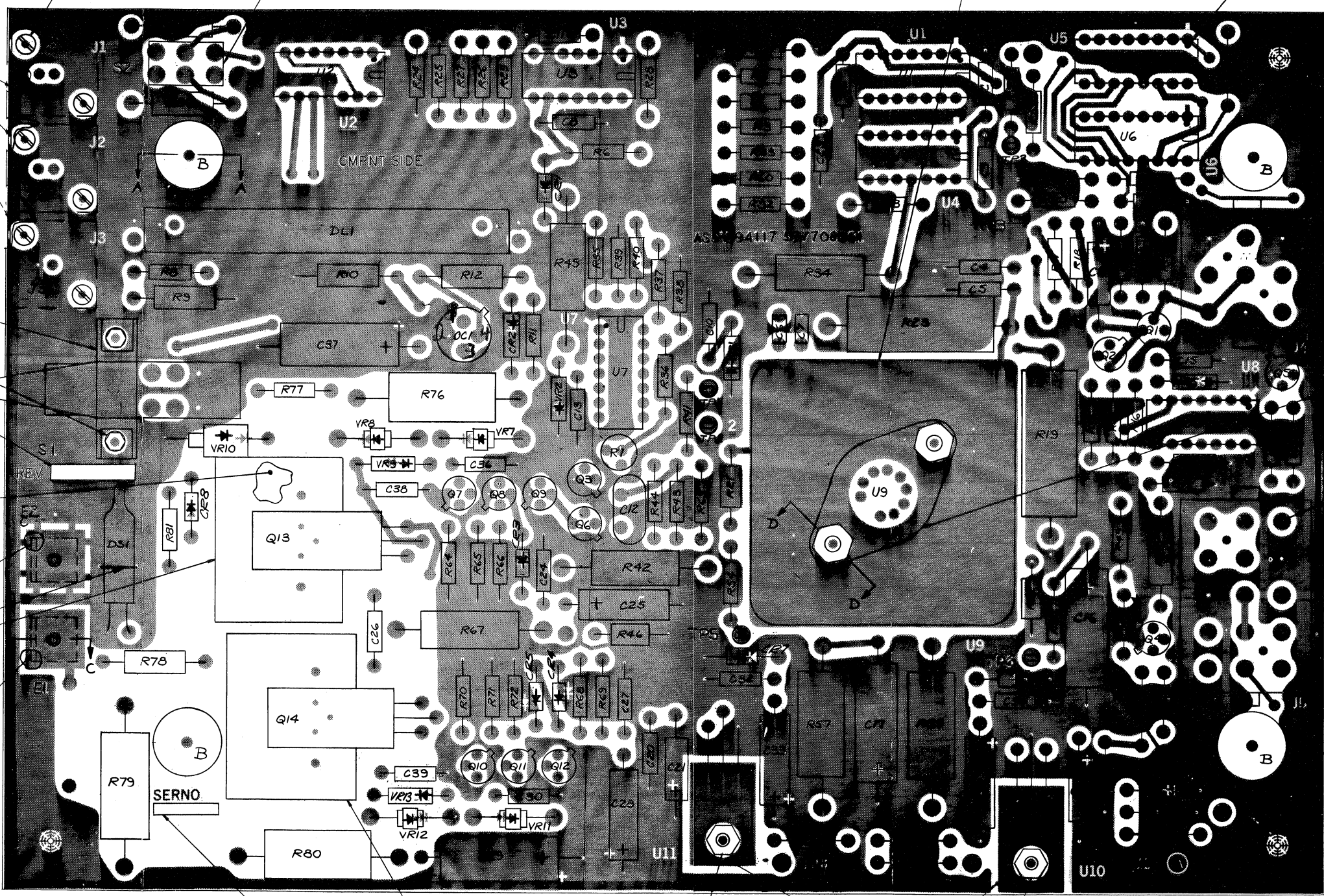
5977080



REVISIONS			
ZONE LTR	DESCRIPTION	DATE	APPROVED
1	REL FOR PREPROD	2/11/79	[Signature]

10 9 8 7 6 5 4 3 2

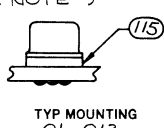
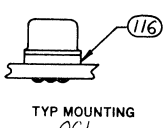
11,2,3-103  
 120  
 25  
 TYP  
 108-S2  
 124  
 118  
 1 REF  
 113  
 DENOTES PIN 1  
 104-J4  
 SEE NOTE 8  
 PIN NO. 1  
 REF 9  
 130  
 134  
 SECTION D-D  
 SCALE: NONE  
 2 PLACES  
 100 OR 101 REF  
 143  
 ALL AROUND  
 1 REF  
 143  
 ALL AROUND  
 SECTION C-C  
 SCALE: NONE  
 TYP 2 PLACES  
 144  
 TYP Q13 & Q14  
 101 117  
 137 138  
 114  
 100 117  
 SEE NOTES 4 & 7  
 121 131 126 135  
 SEE NOTE 9  
 SEE NOTES 4 & 7



(G1) FOR PARTS LIST  
 SEE PL. 5977080

- MARK SERIAL NO. & REV PERMANENT & LEGIBLE IN CONTRASTING COLOR.
- SOLDER TIPS OR WIRES TO BE .09 FROM BOARD.
- OTHER THAN SPECIFICALLY NOTED, CHARACTERS ARE REFERENCE AND NOT TO BE MARKED.
- MARK CHARACTERS .04-.16 HIGH, IN ACCORDANCE WITH MIL-STD-130.
- PARTS LIST SHEET ONE IS THE CONTROLLING REVISION FOR THE COMBINED PARTS LIST AND DRAWING.
- THIS ASSY SHALL MEET THE REQUIREMENTS OF ITEM 145.
- SHOP TOLERANCES AND DRAWING INTERPRETATION WITHIN 015002 SUPPLEMENT THIS DRAWING.

- INSTALL FLAT WASHER FAR AND NEAR SIDE
- APPLY ITEM 142 AT ASSY LEVEL.



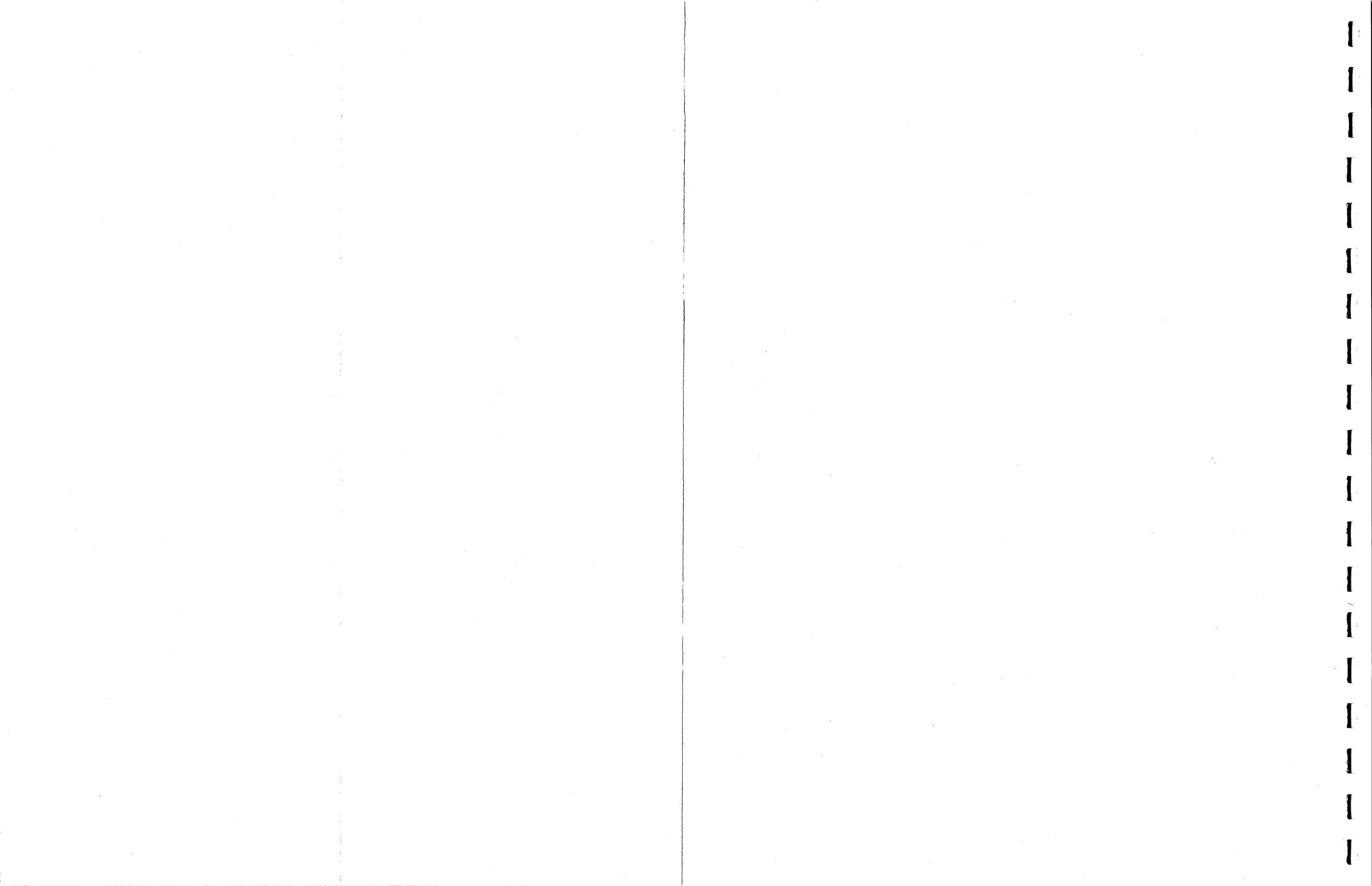
CODE IDENTIFY NO. 94117 5977080 REV SHEET - 1

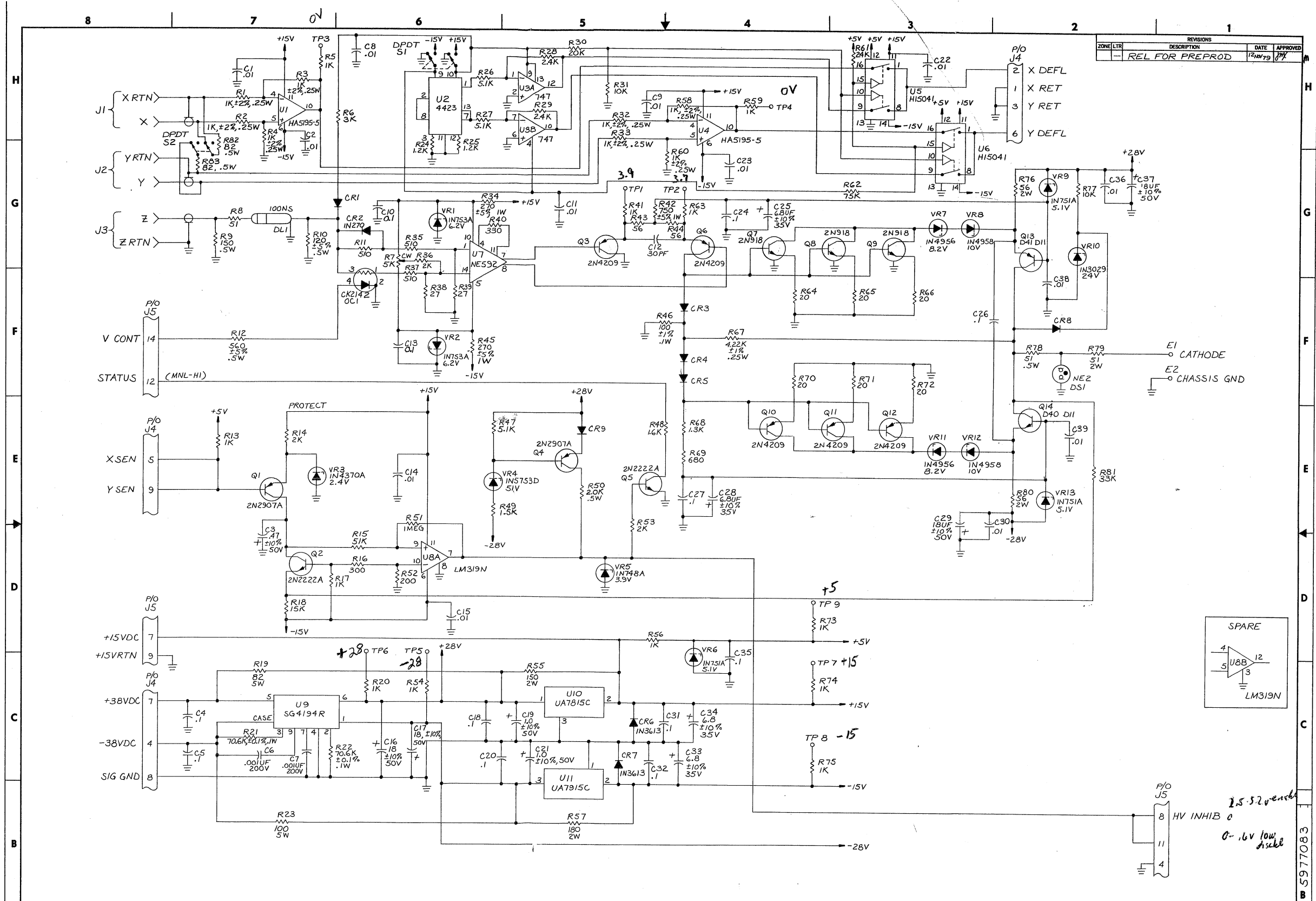
Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25	Q26	Q27	Q28	Q29	Q30	Q31	Q32	Q33	Q34	Q35	Q36	Q37	Q38	Q39	Q40	Q41	Q42	Q43	Q44	Q45	Q46	Q47	Q48	Q49	Q50	Q51	Q52	Q53	Q54	Q55	Q56	Q57	Q58	Q59	Q60	Q61	Q62	Q63	Q64	Q65	Q66	Q67	Q68	Q69	Q70	Q71	Q72	Q73	Q74	Q75	Q76	Q77	Q78	Q79	Q80	Q81	Q82	Q83	Q84	Q85	Q86	Q87	Q88	Q89	Q90	Q91	Q92	Q93	Q94	Q95	Q96	Q97	Q98	Q99	Q100
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES										PARTS LIST										DESCRIPTION																																																																															
TOLERANCES										QTY PER ASSY										PARTS LIST																																																																															
XXX DECIMAL										XXX DECIMAL										SANDERS ASSOCIATES, INC. BATHUA, NEW HAMPSHIRE																																																																															
ANGLES										SURFACE QUALITY										CIRCUIT CARD ASSY VIDEO (LVES)																																																																															
INTERPRET DRAWING PER 815002										PREPROD										J 94117 5977080																																																																															
CHANGE BY E&M UNIT										DATE										SCALE 3/1																																																																															
NEXT ASST										VARD OH										SHEET 1 OF 1																																																																															
APPLICATION										DATE										SCALE PRINT																																																																															

10 9 8 7 6 5 4 3 2

H  
G  
F  
E  
D  
C  
B

5977080





ZONE/LTR	DESCRIPTION	DATE	APPROVED
REL FOR PREPROD		12/19/79	JMK

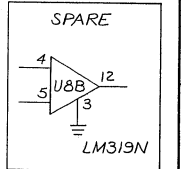
4. UNLESS OTHERWISE NOTED, DIODES ARE IN4148.
3. REFERENCE DESIGNATIONS ARE ABBREVIATED. PREFIX THE DESIGNATIONS WITH UNIT NO. OR ASSEMBLY DESIGNATION OR BOTH.
2. UNLESS OTHERWISE SPECIFIED, RESISTANCE VALUES ARE IN OHMS. RESISTORS ARE  $\pm 5\%$ ,  $.25W$ . K=1,000. MEG=1,000,000. MICROFARADS CAPACITANCE VALUES ARE IN MICROFARADS. CAPACITORS ARE  $\pm 20\%$ ,  $50V$ . PF= PICOFARADS. INDUCTANCE VALUES ARE IN MICROHENRIES.
1. INTERPRET DRAWING PER 815002

NOTES

DESCRIPTION	REFERENCE DATA	PREPROD	CONT. NO.
RESISTOR	R83	CHANGE BY 508 UNIT	1
CAPACITOR	C39		2
DIODE	CR9/VR13		3
TRANSISTOR	Q14		4
INDUCTOR			5
MICROELEMENT	U11		6
WIRING DIAGRAM			7

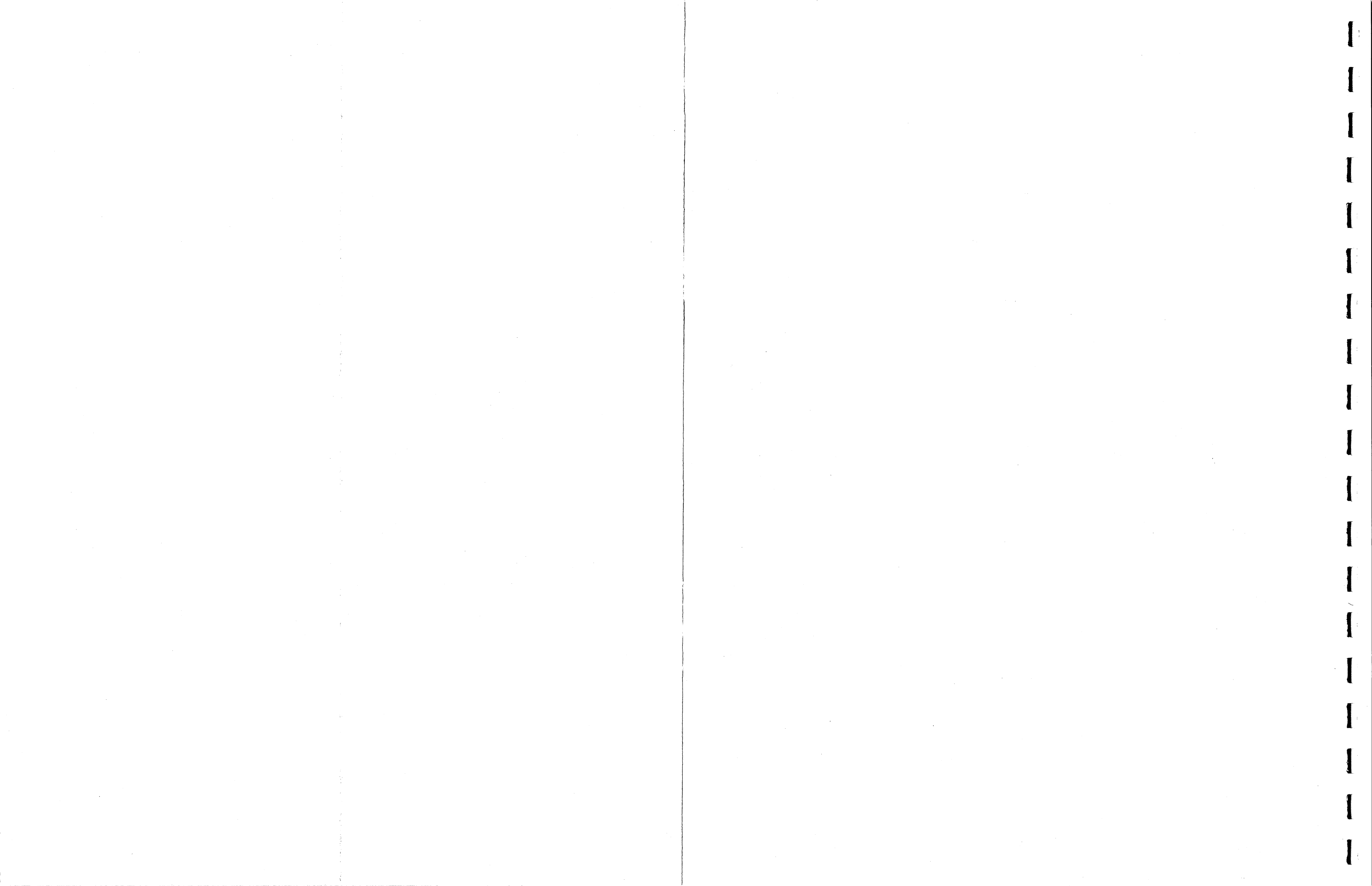
  

SA SANDERS ASSOCIATES, INC. NASHUA, NEW HAMPSHIRE	SCHEMATIC DIAGRAM VIDEO LVES
SIZE CODE IDENT NO. DWG NO.	E 94117 5977083
SCALE	NONE
SHEET	1 OF 1



P/O J5  
8 HV INHIB 0  
11 0-.16V low  
4 asch

B 5977083



REVISION STATUS												REVISIONS			
SH	1	2	3	4	5	6	7	8	9	10	11	12	DESCRIPTION	DATE	APPROVED
REVISION	---	---	---	---	---	---	---	---	---	---	---	---	REL FOR PREPROD	18 JAN 80	<i>[Signature]</i>
PARTS	SH 13	14	15	16	17	18	19	20	21	22	23	24			
LIST	REV														
DWG REV	---														
WL REV	X														

2. PARTS LIST SHEET ONE IS THE CONTROLLING REVISION FOR THE COMBINED PARTS LIST, DRAWING AND WIRE LIST.

1. SHOP PRACTICE TOLERANCES AND DRAWING INTERPRETATION WITHIN 815002 SUPPLEMENT THIS DRAWING.

MFG	<i>[Signature]</i>	CONT NO.	U DS	U DS	U DS	U DS	U DS	U DS
		DR	J. Macomx	DATE	6 SEPT 79			
		CHK	<i>[Signature]</i>	DATE	21 JAN 80			
		APP	<i>[Signature]</i>	DATE	19 JAN 80			
		REV	<i>[Signature]</i>	DATE	1-21-80			
		PROJ	FX Stale	DATE	1-21-80			

**SANDERS ASSOCIATES, INC**  
NASHUA, NEW HAMPSHIRE

PANEL, CONDU,  
ACCESSORY, ASSY

SIZE **A**    CODE IDENT NO. **94117**    PL **5977088**

SHEET 1

OF 3

**PARTS LIST**

ITEM NO.	QTY PER ASSY		DWG SIZE	CODE IDENT	PART OR IDENTIFYING NO.	DESCRIPTION	SYM
	G	G					
1	1		D		5977068G1	PANEL, CONN, ACCESSORY	
2	1		D		1089543G1	CCA, INT/DRVR	
3	2		A		7012241P1	CONN, PHOTOPEN, 5 POS	
4	1				UG-911 A/U	CONN, BNC	
5	2			94222	82-11-280-16	STUD, OVAL HEAD, SLOTTED	
6							
7	2			00779	330620	BUSHING	
8	4		A		MS51957-4	SCR, MACH, PAN HD .086(2)-56x.31 LG	
9	2		A		MS51957-15	SCR, MACH, PAN HD .112(4)-40X.38	
10	4		A		MS15795-802	WASHER, FLAT METAL NO. 2	
11	4		A		MS35338-134	WASHER, LKG NO.2	
12	2		A		MS15795-803	WASHER, FLAT METAL NO.4	
13	2		A		MS35338-135	WASHER, LKG NO.4	
14	2			94222	82-46-101-41	WASHER, NYLON WEAR	
15	6 IN		A		4174285P2	WIRE, ELEC AWG #24 BRN	
16	6 IN		A		4174285P7	WIRE, ELEC AWG #24 BLU	
17	6 IN		A		4174285P3	WIRE, ELEC AWG #24 RED	
18	6 IN		A		4174285P6	WIRE, ELEC AWG #24 GRN	
19	4 IN				RG187A/U	WIRE, COAXIAL	
20							
21	1 IN				2700006 P11	SLVG, TEFLON	#
22	1 IN		A		270029P4	SLVG, HEAT SHRINK	#
23	12 IN						

SHEET ONE REVISION LETTER IS THE IDENTIFYING REVISION FOR THIS MULTISHEET DWG  
 SEE SHEET ONE FOR REVISION DESCRIPTIONS  
 SYMBOLS : INDICATES VENDOR ITEM - SEE SPEC/SOURCE CONTROL DWG.

SIZE	CODE IDENT NO.
A	94117 PL
5977088	
REV	SHEET
-	2

PARTS LIST

ITEM NO.	QTY PER ASSY		DWG SIZE	CODE IDENT	PART OR IDENTIFYING NO.	DESCRIPTION	SYM
	G	G					
24	4		A	77963	MS35649-224	NUT, PLAIN HEX .086(2)-56	
25	1			94222	#379	LUG, GROUND	
26	2			94222	43-13-1-24	SPRING, EJECTOR	
27	2				82-32-101-20	RETAINER, SPLIT-RING	
28							
29	AR		A		93002P1	SOLDER	
30	REF		A		Y48000	APPL. OF EPDXY MKG. CMPD.	
31							

SHEET ONE REVISION LETTER IS THE IDENTIFYING REVISION FOR THIS MULTISHEET DWG  
 SEE SHEET ONE FOR REVISION DESCRIPTIONS  
 SYMBOLS : INDICATES VENDOR ITEM - SEE SPEC/SOURCE CONTROL DWG.

SIZE	CODE IDENT NO.	REV	SHEET
A	94117 PL	-	3



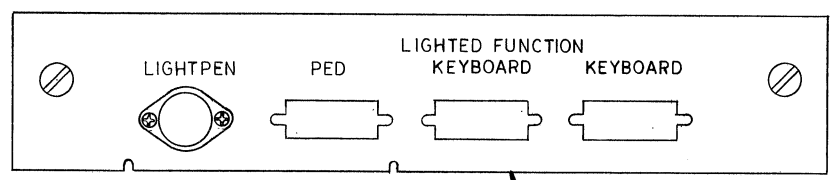
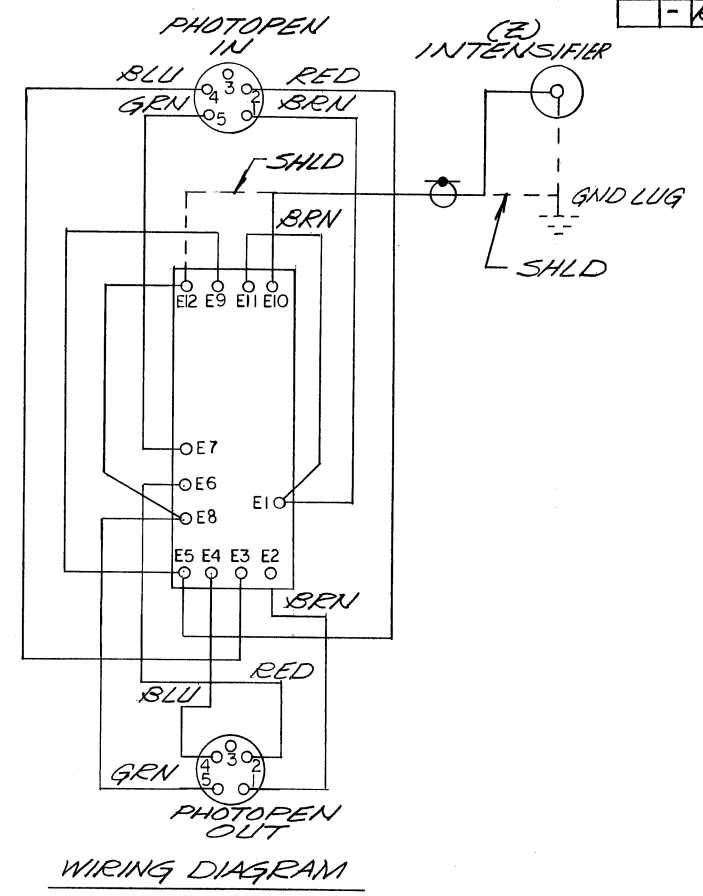
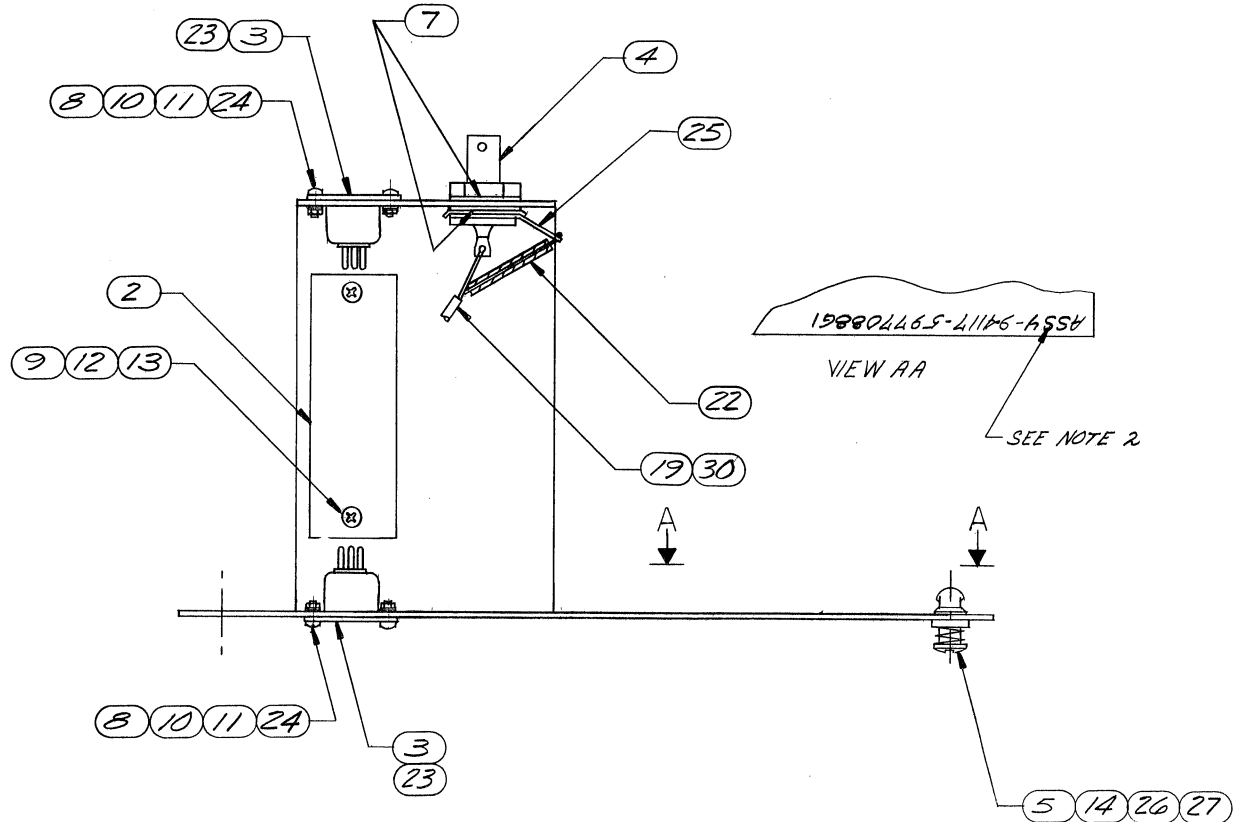


D  
C  
B  
A

OP-304 REV-1

D  
C  
B  
A

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
-		REL FOR PREPROD	18 JAN 80	JMY



(G1) **FOR PARTS LIST**  
REF PL 5977088

2. MARK CHARACTERS .04 - .16 HIGH, WITH CONTRASTING COLORS, GOTHIC TYPE & LOCATE APPROXIMATELY AS SHOWN, APPLY PER ITEM 31.

1. SHOP TOLERANCES AND DRAWING INTERPRETATION WITHIN 815002 SUPPLEMENT THIS DRAWING.

**NOTES**

G6	G5	G4	G3	G2	G1	ITEM	SIZE	PART OR IDENTIFYING NO.	DESCRIPTION
QTY PER ASSY						PARTS LIST			
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES						CONT NO.			
.XX DECIMAL .XXX DECIMAL						DATE			
ANGLES						DR 12-10-79			
±						DATE 21 JAN 80			
±						DATE 1/9/80			
±						DATE 1-21-80			
±						DATE 1-21-80			
PREPROD CHANGE BY ECO ONLY						SIZE CODE IDENT NO. DWG NO.			
NEXT ASSY USED ON						D 94117 5977088			
APPLICATION						SCALE 1/1/1 SHEET 1 OF 1			

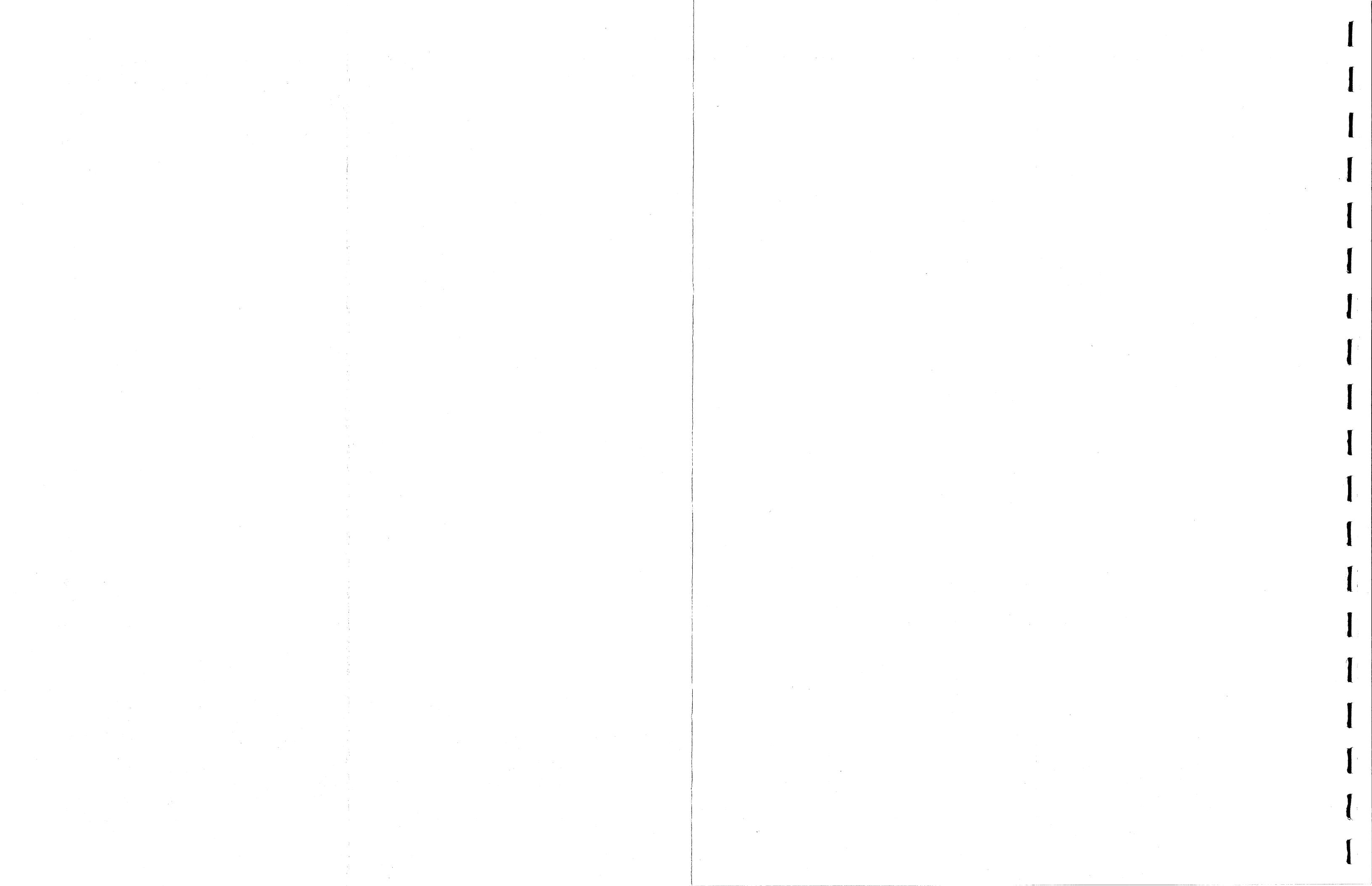
5977088

**SANDERS ASSOCIATES, INC.** NASHUA, NEW HAMPSHIRE

**PANEL, CONN, ACCESSORY, ASSY**

SIZE CODE IDENT NO. DWG NO.  
D 94117 5977088

SCALE 1/1/1 SHEET 1 OF 1



REVISION STATUS													REVISIONS			
SH	1	2	3	4	5	6	7	8	9	10	11	12	LTR	DESCRIPTION	DATE	APPROVED
PARTS	B	A	A										-	REL FOR PREPROD	10 OCT 79	<i>[Signature]</i>
	13	14	15	16	17	18	19	20	21	22	23	24	A	REV PER ECO 96284	14 JAN 80	WG/WL
LIST													B	REV PER ECO 96319	5 FEB 80	WG/WL

DWG REV	A
WL REV	-

3. SELECT VOLTAGE CONFIGURATION KIT  
(ITEM 11) AT FINAL TEST.

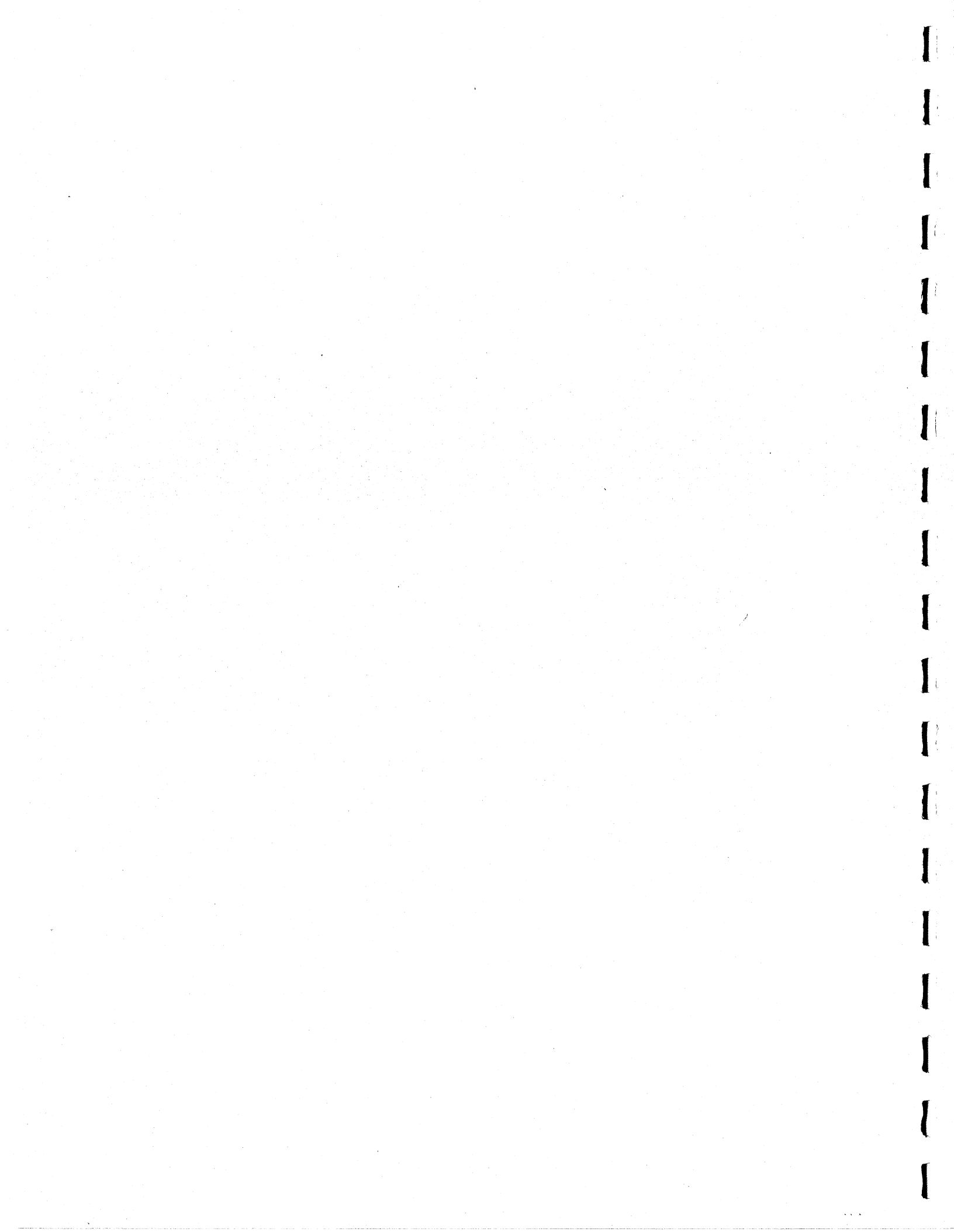
2. PARTS LIST SHEET ONE IS THE CONTROLLING REVISION FOR THE COMBINED PARTS LIST, DRAWING AND WIRE LIST.

1. SHOP PRACTICE TOLERANCES AND DRAWING INTERPRETATION WITHIN 815002 SUPPLEMENT THIS DRAWING.

DR	<i>[Signature]</i>	27	DATE
APPD	<i>[Signature]</i>	10/12/79	
CHK	<i>[Signature]</i>		
DEV	<i>[Signature]</i>	10/15/79	
ENG	<i>[Signature]</i>		
PROJ	<i>[Signature]</i>	10/12/79	

CONT NO.		DR		APPD		CHK		DEV		ENG		PROJ	
5978880		UDS		USED ON		APPLICATION							
NEXT ASSY		APPLICATION											
PREPROD		CHANGE BY ECO ONLY		MFG		10/15/79							
OP-1039 REV B		DWG SIZE		E									

SA SANDERS ASSOCIATES, INC.		NASHUA, NEW HAMPSHIRE	
LOW VOLTAGE			
POWER SUPPLY ASSY			
SIZE	CODE IDENT NO.		
A	94117	PL 5978864	
SHEET 1		OF 4	





# PARTS DATA

CCN NO. 7D002

PART NO. 5978864G1

LVPS

ASSEMBLY

ITEM NO.	REF DES	SA PART NUMBER	VENDOR PART NUMBER	MFR CODE	DESCRIPTION
----------	---------	----------------	--------------------	----------	-------------

## PARTS DELETED

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## PARTS ADDED

67	C5	N/A	MKS4R	26591	CAP. 1.0 UF, 25VAC + 10%
----	----	-----	-------	-------	--------------------------

PARTS LIST

ITEM NO.	QTY PER ASSY		DWG SIZE	CODE IDENT	PART OR IDENTIFYING NO.	DESCRIPTION	SYM
	G1	G2					
1	1		E		5978914G1	CHASSIS, LVPS	
2	1	1	AC		5978923G1	CCA, LOW VOLTAGE FILTER	A2
3	1	1	A/C		5978958G1	CCA, I/O CONNECTORS	A1
4	1		A		5976292P1	TRANSFORMER	T1
5	1		D		5978953P1	SHIELD, COVER, XFMR	
6	1		C		5978952P1	SHIELD, BASE, XFMR	
7	1	1	C		5978957P1	COVER, LOW VOLTAGE FILTER	
8	1	1	A		5978899P1	LABEL, VOLTAGE SELECTION	
9	1	1		00779	1-480706-0	CONN, 9 PIN, PLUG	P1
10	1	1		00779	1-480709-0	CONN, 12 PIN, CAP	J2
11	REF	REF	C		5978887G--	KIT, VOLTAGE CONFIGURATION (NOTE 3)	P3
12	1	1		00779	1-480711-0	CONN, 15 PIN, CAP	J3
13	2	2		30043	SDA 132B	BRIDGE, DIODE, CRI, 2	
14	3	3		28520	SB-625-8	SNAP BUSHING	
15	4	4		06540	8244-SS-0632-7	STANDOFF, 4.25 LG X.25 HEX	
16	12	12		06383	SST1.5 I-Q	CABLE TIE	
17	1	1	D		5977064P1	FILTER FLI	
18	1	1	C		5977062P1	CIRCUIT BREAKER CBI	
19	2	2		02295	V130LA20B	VARISTOR	R1, R2
20	2	2		06915	PS-4N	SPACER, NYLON	
22	2	2			MS51957-14	SCR, MACH FNH 4-40 X.31	
23	4	4			MS51861-24C	SCREW, SELF-TAP #6 (TYPE AB)-.38 LG	

SHEET ONE REVISION LETTER IS THE IDENTIFYING REVISION FOR THIS MULTISHEET DWG SEE SHEET ONE FOR REVISION DESCRIPTIONS SYMBOLS : INDICATES VENDOR ITEM - SEE SPEC/SOURCE CONTROL DWG.		SIZE	CODE IDENT NO.	REV A	SHEET 2
A	94117	PL	5978864		

**PARTS LIST**

ITEM NO.	QTY PER ASSY		DWG SIZE	CODE IDENT	PART OR IDENTIFYING NO.	DESCRIPTION	SYM
	G	G					
24	2	2			MS15795-803	WASHER, FLAT-METAL #4	
25	2	2			MS35338-135	WASHER, LOCKING #4	
26	12	12			MS15795-805	WASHER, FLAT-METAL #6	
27	12	12			MS35338-136	WASHER, LOCKING #6	
28	12	12			MS51957-28	SCREW, PAN-HD 6-32 X.37 LG	
29	6	6			MS15795-808	WASHER, FLAT #10	#
30	1	1	A		G10007PI	WASHER, INTERNAL TOOTH #10	
31	6	6			MS35338-138	WASHER, LOCKING #10	
32	2	2			MS51958-68	SCREW, PAN-HD, 10-32 X1.25 LG	
33	7	7			MS35650-304	NUT, PLAIN 10-32	
34	AR	AR	A		T46008PI	THERMAL CMPD	#
35	REF	REF	A		WL5978864	WIRE LIST, LOW VOLTAGE POWER SUPPLY	
36	REF	REF	E		5978925	SCHEMATIC DIAGRAM, LVPS	
37							
38							
39							
40							
41	11	11		00779	2-350803-2	FASTON, .250, 18-22 AWG	
42	7	7		00779	3-350819-2	FASTON, .250, 14-16 AWG	
43	1	1		00779	42741-2	FASTON, .250, 14-18 AWG	
44	4	4		00779	32837	TERMINAL, RING LUG #10, 16-22 AWG	
45	3	3		06915	CBS-8N	SUPPORT (RICHCO)	
46	2	2	C		5977092PI	INSULATOR, XFMR SHIELD	

SHEET ONE REVISION LETTER IS THE IDENTIFYING REVISION FOR THIS MULTISHEET DWG  
 SEE SHEET ONE FOR REVISION DESCRIPTIONS  
 SYMBOLS : INDICATES VENDOR ITEM - SEE SPEC/SOURCE CONTROL DWG.

SIZE CODE IDENT NO.

A 94117 PL 5978864

REV A SHEET 3

PARTS LIST

ITEM NO.	QTY PER ASSY		DWG SIZE	CODE IDENT	PART OR IDENTIFYING NO.	DESCRIPTION	SYM
	G/	G/					
47	6 IN		A		270006P6	INSULATION TUBING	#
48	AR		A		930002P1	SOLDER	
49	24 IN		A		5978963P410	WIRE, ELEC 14 AWG BLK	
50	12 IN		A		5978963P402	WIRE, ELEC 14 AWG RED	
51	72 IN		A		5978963P409	WIRE, ELEC 14 AWG WHT	
52	12 IN		A		5978963P413	WIRE, ELEC 14 AWG DK BLU	
53	312 IN		A		5978963P201	WIRE, ELEC 18 AWG BRN	
54	12 IN		A		5978963P202	WIRE, ELEC 18 AWG RED	
55	36 IN		A		5978963P209	WIRE, ELEC 18 AWG WHT	
56	30 IN		A		5978963P210	WIRE, ELEC 18 AWG BLK	
57	24 IN		A		5978963P214	WIRE, ELEC 18 AWG GRN/YEL	
58	AR		A		740014P1	RTV-731, RUBBER SILICONE	#
59	7			00779	350537-3	CONTACT SOCKET 14-20 AWG	
60	23			00779	350538-3	CONTACT PIN 14-20 AWG	
61	3			00779	350654-1	CONTACT PIN GND 14-20 AWG	
62							
63	-	1	D		5978953P2	SHIELD, COVER, X-FORMER	
64	-	1	C		5978952P2	SHIELD, BASE, X-FORMER	
65	-	1	A		5976292P2	TRANSFORMER T1	

SHEET ONE REVISION LETTER IS THE IDENTIFYING REVISION FOR THIS MULTISHEET DWG  
 SEE SHEET ONE FOR REVISION DESCRIPTIONS  
 SYMBOLS : INDICATES VENDOR ITEM -SEE SPEC/SOURCE CONTROL DWG.

SIZE CODE IDENT NO.

A 94117 PL 5978864

REV A SHEET 4



REVISION STATUS OF EACH SHEET		REVISIONS															
SHEET	1	2	3	4	5	6	7	8	9	10	11	12	13	LTR	DESCRIPTION	DATE	APPROVED
REVISION	—	—	—	—	—	—	—	—	—	—	—	—	—	—	REL FOR PREPROD	10 OCT 79	Jmy [Signature]
14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29		
30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45		

PARTS LIST SHEET ONE REVISION LETTER IS THE IDENTIFYING REVISION FOR THE PARTS LIST, WIRE LIST, AND DRAWING COMBINED. SYMBOL † INDICATES VENDOR ITEM - SEE SPEC/SOURCE CONTROL DWG INTERPRET DWG PER 815002

<b>SANDERS ASSOCIATES, INC</b> NASHUA, NEW HAMPSHIRE	
WIRE LIST	
LVPS	
SIZE	CODE IDENT NO.
A	94117
SCALE	WL597886A
SHEET	OF
1	4

CONT. NO.	DATE
1	10/12/79
2	10/15/79
3	10/16/79
4	10/17/79
5	10/18/79
6	10/19/79
7	10/20/79
8	10/21/79
9	10/22/79
10	10/23/79
11	10/24/79
12	10/25/79
13	10/26/79
14	10/27/79
15	10/28/79
16	10/29/79
17	10/30/79
18	10/31/79
19	11/1/79
20	11/2/79
21	11/3/79
22	11/4/79
23	11/5/79
24	11/6/79
25	11/7/79
26	11/8/79
27	11/9/79
28	11/10/79
29	11/11/79
30	11/12/79
31	11/13/79
32	11/14/79
33	11/15/79
34	11/16/79
35	11/17/79
36	11/18/79
37	11/19/79
38	11/20/79
39	11/21/79
40	11/22/79
41	11/23/79
42	11/24/79
43	11/25/79
44	11/26/79
45	11/27/79

**PREPROD**  
CHANGE BY ECO ONLY

MFG [Signature] 10/15/79

NEXT ASSY USED ON APPLICATION

597886A UDS

WIRE LIST

WIRE NUMBER	FROM			TO			NOTE			
	FUNCTION CODE	COLOR	LENGTH	LOCATION (REFERENCE DESIGNATION)	CONTACT PART NUMBER	TERM. STRIP (INCHES)		LOCATION (REFERENCE DESIGNATION)	CONTACT PART NUMBER	TERM. STRIP (INCHES)
001	ACN 5978963P201	BRN 6"		FL1 2-350803-2		1 .19	CB1 2-350803-2		1 .19	
002	ACL 5978963P201	BRN 4"		FL1 2-350803-2		2 .19	CB1 2-350803-2		3 .19	
003	CHAGND 5978963P214	GRN/YEL 3"		FL1 2-350803-2		3 .19	E1 32837		19	
004	CHAGND 5978963P214	GRN/YEL 8"		J2 350654-1		1 .19	E1 32837		19	
005	ACLOUT 5978763P201	BRN 10"		J2 350538-3		2 .19	J3 350538-3		13 .19	
006	ACNOU 5978763P201	BRN 12"		J2 350538-3		3 .19	CB1 2-350803-2		2 .19	
007	CHAGND 5978763P214	GRN/YEL 8"		J2 350654-1		4 .19	E1 32837		19	
008	ACLIN 5978763P201	BRN 10"		J2 350538-3		5 .19	J3 350538-3		11 .19	
009	ACMIN 5978763P201	BRN 19"		J2 350538-3		6 .19	T1 350538-3		1 .19	
010	CHAGND 5978763P214	GRN/YEL 8"		J2 350654-1		7 .19	E1 32837		19	
011	ACLFAN 5978763P201	BRN 16"		J2 350538-3		8 .19	T1 32837		4 .19	
012	ACNFAN 5978763P201	BRN 19"		J2 350538-3		9 .19	T1 32837		1 .19	
013	DC FAIL 5978763P210	BLK 10"		J2 350538-3		10 .19	CB1 2-350803-2		6 .19	
014	6.3 VAC 5978763P201	BRN 13"		J2 350538-3		11 .19	T1 32837		19 .19	

SHEET ONE REVISION LETTER IS THE IDENTIFYING REVISION FOR THIS MULTISHEET DWG.  
SEE SHEET ONE FOR REVISION DESCRIPTION  
LOWER CASE LETTERS IN TERMINATION COLUMN DESIGNATED BY ( )  
PREFIX PARTIAL REFERENCE DESIGNATIONS WITH

SIZE CODE IDENT. NO.  
A 94117 WL 5978864

REV. — SHEET 2

WIRE LIST

WIRE NUMBER	FUNCTION CODE	COLOR	LENGTH	FROM			TO			NOTE
				WIRE PART NUMBER	LOCATION (REFERENCE DESIGNATION)	CONTACT PART NUMBER	TERM. (STRIP (INCHES))	LOCATION (REFERENCE DESIGNATION)	CONTACT PART NUMBER	
015	6.3 VAC	BRN	13"	5978763P201	J2 350538-3	T1	12 .19	T1 18 .19		
016	115 VAC	BRN	6"	5978763P201	CB1 2-350803-2	J3 350538-3	7 .19	J3 14 .19		
017	230 VAC	BRN	6"	5978763P201	CB1 2-350803-2	J3 350538-3	5 .19	J3 15 .19		
018	+24 VDC	RED	10"	5978763P202	CB1 2-350803-2	CR1 2-350803-2	7 .19	CR1 4 .19		
019	OVAC	BRN	13"	5978763P201	J3 350538-3	T1	1 .19	T1 1 .19		
020	100 VAC	BRN	13"	5978763P201	J3 350538-3	T1	2 .19	T1 2 .19		
021	110 VAC	BRN	13"	5978763P201	J3 350538-3	T1	3 .19	T1 3 .19		
022	115 VAC	BRN	12"	5978763P201	J3 350538-3	T1	4 .19	T1 4 .19		
023	120 VAC	BRN	12"	5978763P201	J3 350538-3	T1	5 .19	T1 5 .19		
024	OVAC	BRN	14"	5978763P201	J3 350538-3	T1	6 .19	T1 6 .19		
025	100 VAC	BRN	13"	5978763P201	J3 350538-3	T1	7 .19	T1 7 .19		
026	110 VAC	BRN	13"	5978763P201	J3 350538-3	T1	8 .19	T1 8 .19		
027	115 VAC	BRN	12"	5978763P201	J3 350538-3	T1	9 .19	T1 9 .19		
028	120 VAC	BRN	12"	5978763P201	J3 350538-3	T1	10 .19	T1 10 .19		

SHEET ONE REVISION LETTER IS THE IDENTIFYING REVISION FOR THIS MULTISHEET DWG.  
 SEE SHEET ONE FOR REVISION DESCRIPTION  
 LOWER CASE LETTERS IN TERMINATION COLUMN DESIGNATED BY ( )  
 PREFIX PARTIAL REFERENCE DESIGNATIONS WITH

SIZE	CODE IDENT. NO.
A	94117
WL5978864	
REV.	SHEET
—	3

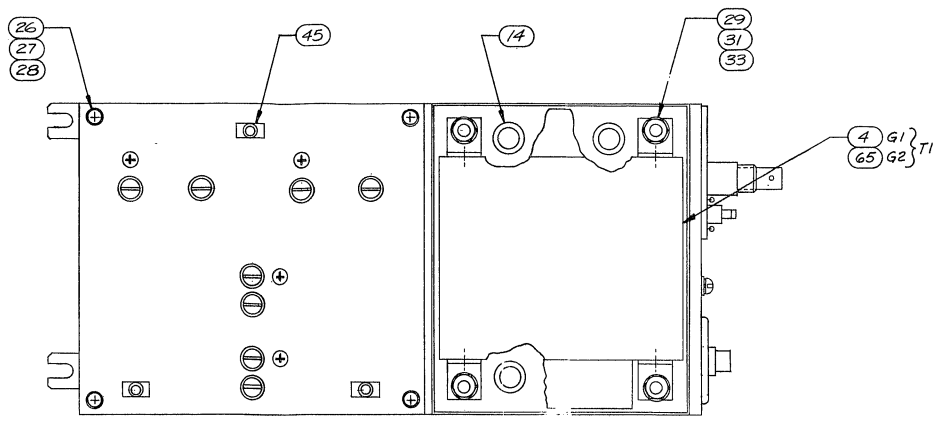
WIRE LIST

WIRE NUMBER	FUNCTION CODE		COLOR	LENGTH	FROM		TO		NOTE	
	WIRE PART NUMBER				LOCATION (REFERENCE DESIGNATION)	CONTACT PART NUMBER	LOCATION (REFERENCE DESIGNATION)	CONTACT PART NUMBER		TERM.
029	24 VAC	5978763 P409	WHT	16"	T1	T1	CR1	3-350819-2	AC	.19
030	24 VAC	5978763 P409	WHT	16"	T1	T1	CR1	3-350819-2	AC	.19
031	24 VAC	5978763 P409	WHT	13"	T1	T1	CR2	3-350819-2	AC	.19
032	24 VAC	5978763 P409	WHT	12"	T1	T1	CR2	3-350819-2	AC	.19
033	36 VAC	5978763 P209	WHT	16"	T1	T1	P1	350537-3	6	.19
034	36 VCOM	5978763 P210	BLK	16"	T1	T1	P1	350537-3	8	.19
035	36 VAC	5978763 P209	WHT	16"	T1	T1	P1	350537-3	9	.19
036	+24VDC	5978763 402	RED	10"	CR1	42741-2	P1	350537-3	1	.19
037	+24VRTN	5978763 P410	BLK	10"	CR1	3-350819-2	P1	350537-3	4	.19
038	-24VDC	5978763 P413	DKBLU	10"	CR2	3-350819-2	P1	350537-3	2	.19
039	-24VRTN	5978763 P410	BLK	10"	CR2	3-350819-2	P1	350537-3	7	.19

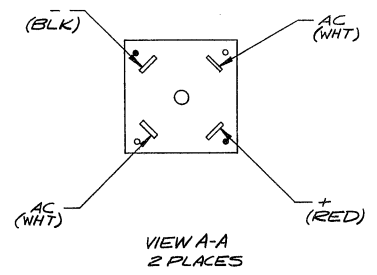
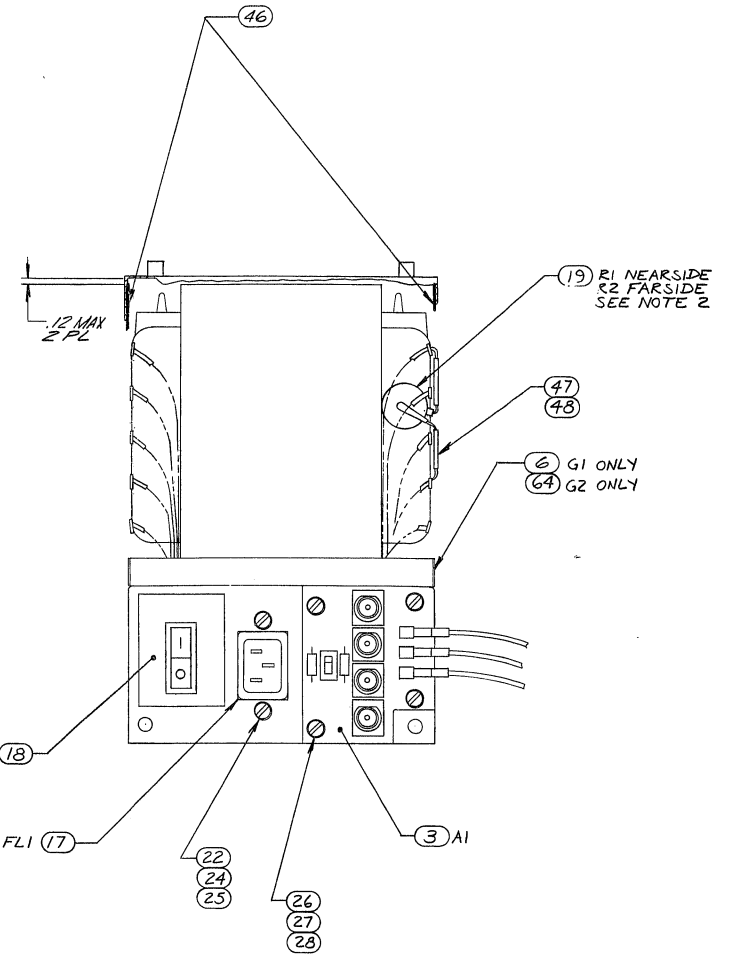
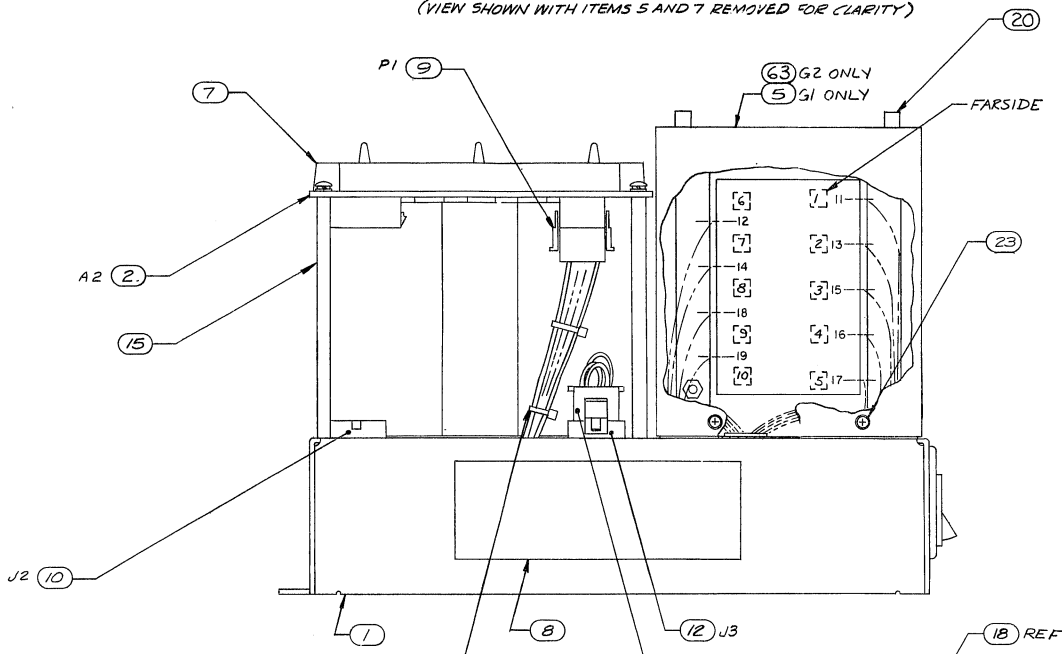
SHEET ONE REVISION LETTER IS THE IDENTIFYING REVISION FOR THIS MULTISHEET DWG.  
 SEE SHEET ONE FOR REVISION DESCRIPTION  
 LOWER CASE LETTERS IN TERMINATION COLUMN DESIGNATED BY ( )  
 PREFIX PARTIAL REFERENCE DESIGNATIONS WITH

SIZE	CODE IDENT. NO.
A	94117
WL	5978804
REV.	—
SHEET	4

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
-		REL FOR PREPROD	1/11/79	MS/WL
A		REV PER ECO 96284	1/11/80	MS/WL



(VIEW SHOWN WITH ITEMS 5 AND 7 REMOVED FOR CLARITY)



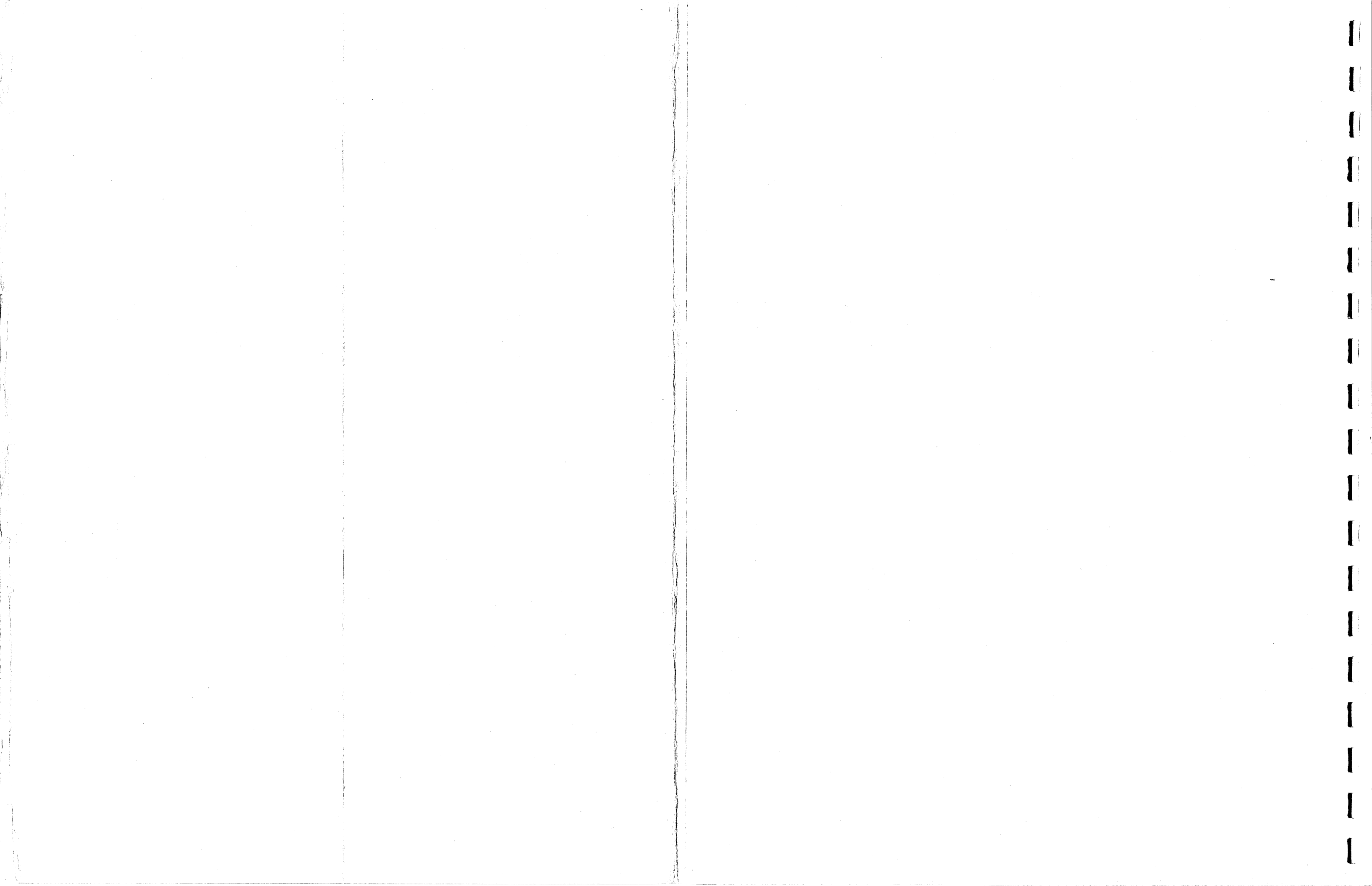
G2 G1 FOR PARTS LIST  
SEE PL 5978864  
FOR WIRE LIST  
SEE WL 5978864

2. ITEM 19 (R1) TO BE ATTACHED AS INDICATED BETWEEN PINS 1 & 4 AND ITEM 19 (R2) BETWEEN PINS 6 & 3 OF ITEM 4 USING ITEMS 47 & 48. ORIENTATE AS SHOWN.

1. SHOP TOLERANCES AND DRAWING INTERPRETATION WITHIN 815002 SUPPLEMENT THIS DRAWING.  
NOTES

QTY PER ASSY	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES	DATE	DESCRIPTION
XX DECIMAL	XXX DECIMAL	17 JUN 79	LOW VOLTAGE POWER SUPPLY ASSY
ANGLES	==	14 JUL 79	
		14 JUL 79	
5978880	U/S		PREPROD
NEXT ASSY	USED ON		CRANK BY SEA ONLY
APPLICATION			

5978864



REVISION STATUS												REVISIONS					
SH	1	2	3	4	5	6	7	8	9	10	11	12	LTR	DESCRIPTION	DATE	APPROVED	
PARTS	REV	B	B	A									-	REL FOR PREPROD	12 NOV 79	MM	
	SH	13	14	15	16	17	18	19	20	21	22	23	24	A	REV PER ECO 96277	17 JAN 80	WG/WL
LIST	REV													B	REV PER ECO 96315	15 FEB 80	RDM/WL
DWG REV	-																
WL REV	B																

2. PARTS LIST SHEET ONE IS THE CONTROLLING REVISION FOR THE COMBINED PARTS LIST, DRAWING AND WIRE LIST.

1. SHOP PRACTICE TOLERANCES AND DRAWING INTERPRETATION WITHIN 815002 SUPPLEMENT THIS DRAWING.

CONT NO.

DR	DR	APPR	CHK
J. McCamp	MM	10/17/79	
DEV	PA	BE	11-14-79
ENG	DR	11-14-79	
PROJ	11-18-79		

<b>PREPROD</b>	<b>CHANGE BY ECO ONLY</b>	5978880	UDS	USED ON
MFG	11/16/79	NEXT ASSY	APPLICATION	

<b>SA SANDERS ASSOCIATES, INC.</b>	NASHUA, NEW HAMPSHIRE	<b>HARNNESS,</b>	<b>MAIN UDS</b>	
SIZE	CODE IDENT NO.	SHEET 1 OF 3		
<b>A</b>	<b>94117 PL 59788873</b>			

PARTS LIST

ITEM NO.	QTY PER ASSY		DWG SIZE	CODE IDENT	PART OR IDENTIFYING NO.	DESCRIPTION	SYM
	G	G					
1	3		A	00779	1-480710-0	CONN, CA PLUG-15 PIN P1, P3, P10	
2	2		A	00779	1-480708-0	CONN, CA PLUG-12 PIN P2, P5	
3							
4	3		A	00779	1-480706-0	CONN, CA PLUG-9PIN P4, P6, P9	
5	52			00779	350570-3	SOCKET 18-22 AWG	
6	6			00779	350537-3	SOCKET 14-18 AWG	
7							
8	1		A		4173961P1	LUG, RING #10 16-22 AWG (32837)	
9	2			00779	3-350819-2	FASTON, .250, 18 AWG, BLUE	
10	1			00779	2-350803-2	FASTON, .250, 22 AWG,	
11	4			00779	3-520124-2	FASTON, .187, 18 AWG, BLUE	
12							
13	1		B	5976279G1		CABLE ASSY, COAX	
14	1		B	5976279G2		CABLE ASSY, COAX	
15	1		B	5976277G1		CABLE ASSY, FAN	
16	1		B	5976278G1		CABLE ASSY, GROUNDING	
17	1		B	5976279G3		CABLE ASSY, COAX	
18	1		C	5976280G1		CABLE ASSY,	
19	1		B	5976281G1		CABLE ASSY, AC	

SHEET ONE REVISION LETTER IS THE IDENTIFYING REVISION FOR THIS MULTISHEET DWG SEE SHEET ONE FOR REVISION DESCRIPTIONS SYMBOLS : INDICATES VENDOR ITEM - SEE SPEC/SOURCE CONTROL DWG.		SIZE	CODE IDENT NO.	REV	SHEET
		A	94117 PL	B	2
		5978873			



## PARTS LIST

ITEM NO.	QTY PER ASSY		DWG SIZE	CODE IDENT	PART OR IDENTIFYING NO.	DESCRIPTION	SYM
	G /	G					
20	108		A		4174285 P11	WIRE, ELEC	22 AWG, BLK
21	82		A		4174285 P13	WIRE, ELEC	22 AWG, RED
22	82		A		4174285 P17	WIRE, ELEC	22 AWG, BLU
23	284		A		4174285 P20	WIRE, ELEC	22 AWG, WHT
24							
25	22		A		5978964 P1	WIRE, 15KV	22 AWG, WHT
26							
27	23		A		5978963 P214	WIRE, ELEC	18 AWG, GRN/YEL
28							
29	46		A		5978963 P410	WIRE, ELEC	14 AWG, BLK
30	55		A		5978963 P402	WIRE, ELEC	14 AWG, RED
31	55		A		5978963 P413	WIRE, ELEC	14 AWG, BLU
32							
33							
34	REF		A		WL 5978873	WIRE LIST, MAIN HARNESS, UDS	
35	1			06383	PLM-2S-D	MARKER, TIE	
36							
37							
38	1				5977358 G1	SOCKET, CRT	
39							
40	86			06383	SST1M	CABLE TIE	
41							
42							

SHEET ONE REVISION LETTER IS THE IDENTIFYING REVISION FOR THIS MULTISHEET DWG  
SEE SHEET ONE FOR REVISION DESCRIPTIONS  
SYMBOLS : INDICATES VENDOR ITEM - SEE SPEC/SOURCE CONTROL DWG.

SIZE CODE IDENT NO.

A

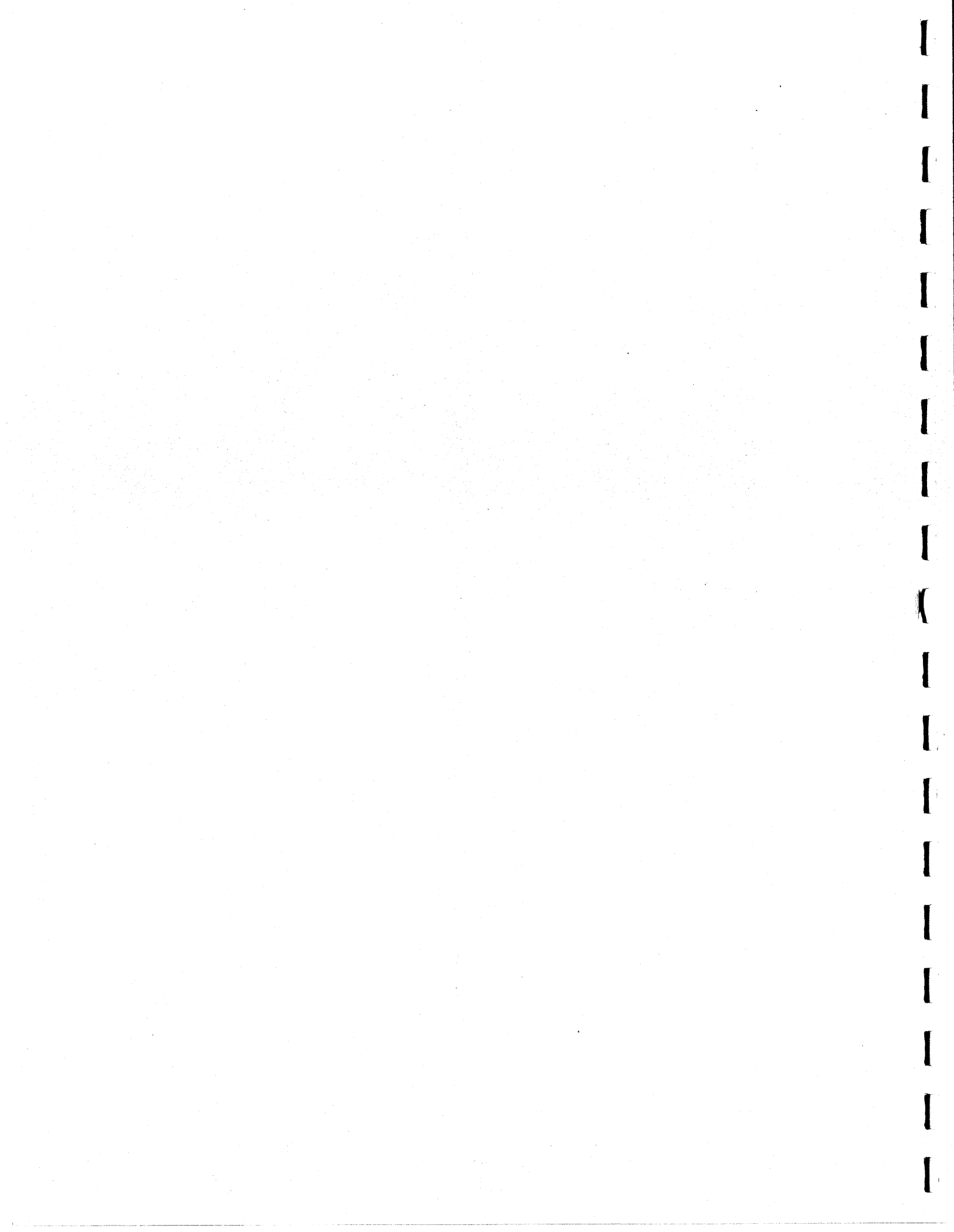
94117

PL

5978873

REV A

SHEET 3



REVISION STATUS OF EACH SHEET

SHEET	1	2	3	4	5	6	7	8	9	10	11	12	13
REVISION	B	-	A	B	A	A							
14	15	16	17	18	19	20	21	22	23	24	25	26	27
28	29	30	31	32	33	34	35	36	37	38	39	40	41
42	43	44	45										

PARTS LIST SHEET ONE REVISION LETTER IS THE IDENTIFYING REVISION FOR THE PARTS LIST, WIRE LIST, AND DRAWING COMBINED. SYMBOL † INDICATES VENDOR ITEM - SEE SPEC/SOURCE CONTROL DWG INTERPRET DWG PER 815002

REVISIONS

LTR	DESCRIPTION	DATE	APPROVED
-	REL FOR PREPROD	12 NOV 79	JHX
A	REV PER ECO 96277	17 JAN 80	WG/WL
B	REV PER ECO 96315	15 FEB 80	ROM/WL

**PREPROD**  
**CHANGE BY ECO ONLY**  
 MFG *J. Sanders* 11/16/79

CONT. NO. \_\_\_\_\_

DR	DATE
J. Sanders	22 OCT 79
CHK	DATE
P. Sanders	8 NOV 79
DEV	
E	
N	
G	
R	
R	
G	

5978880 UDS  
 NEXT ASSY USED ON  
 APPLICATION

**SA SANDERS ASSOCIATES, INC.**  
 NASHUA, NEW HAMPSHIRE

**HARNESSE, MAIN**  
 UDS

SIZE **A** CODE IDENT NO. **94117 WL** 59788873

SCALE SHEET 1 OF 6

WIRE LIST

WIRE NUMBER	FUNCTION CODE	COLOR	LENGTH	FROM		TO		NOTE
				LOCATION (REFERENCE DESIGNATION)	CONTACT PART NUMBER	LOCATION (REFERENCE DESIGNATION)	CONTACT PART NUMBER	
	WIRE PART NUMBER			TERM. (INCHES)	STRIP (INCHES)	TERM. (INCHES)	STRIP (INCHES)	
1	36VCOM 4174285P11	BLK	17.00	PI	350570-3	P4	350570-3	1 0.2
2	36VCOM 4174285P11	BLK	23.25	PI	↑	P6	↑	1 0.2
3	+36VDC 4174285P13	RED	17.00	PI		P4		2 0.2
4	+36VDC 4174285P13	RED	23.25	PI		P6		2 0.2
5	-36VDC 4174285P17	BLU	17.00	PI		P4		3 0.2
6	-36VDC 4174285P17	BLU	23.25	PI	↓	P6	↓	3 0.2
7	36VCOM SEE DWG 5976280	BLK		PI	350570-3	P9	350570-3	4 8
8	+36VDC 4174285P13	RED	16.50	PI	350570-3	P9	350570-3	5 0.2
9	-36VDC 4174285P17	BLU	16.50	PI	↑	P9	↑	6 0.2
10	24VCOM 4174285P11	BLK	25.00	PI	↓	P3	↓	7 0.2
11	24VCOM 5978963P410	BLK	23.50	PI	350537-3	A1A1	A1A1	8 0.25
12	24VCOM 5978963P410	BLK	21.50	PI	350537-3	A2A1	3-520124-2	9 0.25
13	+24VDC 4174285P13	RED	25.00	PI	350570-3	P3	350570-3	10 0.2
14	+24VDC 5978963P410	RED	32.00	PI	350537-3	A1	3-520124-2	11 0.25

SHEET ONE REVISION LETTER IS THE IDENTIFYING REVISION FOR THIS MULTISHEET DWG.  
SEE SHEET ONE FOR REVISION DESCRIPTION  
LOWER CASE LETTERS IN TERMINATION COLUMN DESIGNATED BY ( )  
PREFIX PARTIAL REFERENCE DESIGNATIONS WITH

SIZE CODE IDENT. NO.  
A 94117 WL 5978873

REV. --- SHEET 2 OF 6

WIRE LIST

WIRE NUMBER	FUNCTION CODE	COLOR	LENGTH	FROM		TO		NOTE
				LOCATION (REFERENCE DESIGNATION)	CONTACT PART NUMBER	LOCATION (REFERENCE DESIGNATION)	CONTACT PART NUMBER	
	WIRE PART NUMBER			TERM.	STRIP (INCHES)	TERM.	STRIP (INCHES)	
15	+24VDC 5978963P402	RED	28.50	P1	350537-3	A2	3-520124-2	E1 0.25 TWISTED WITH 12+18
16	-24VDC 4174285P17	BLU	25.00	P1	350570-3	P3	350570-3	3 0.2
17	-24VDC 5978963P413	BLU	29.00	P1	350537-3	A1	3-350819-2	E2 0.25 TWISTED WITH 11+14
18	-24VDC 5978963P413	BLU	25.50	P1	350537-3	A2	3-350819-2	E2 0.25 TWISTED WITH 12+15
19	CHAGND 5978963P214	GRN/YEL	22.75	P2	350570-3	A5	2-350803-2	E1 0.25
20	ACLOUT SEE DWG 5976281	BRN		P2		P1		1
21	ACNOUT SEE DWG 5976281	BRN		P2		P7		3
22	CHAGND SEE DWG 5976278	BRAND		P2		PS2		E1
23	ACLIN SEE DWG 5976281	BRN		P2		P7		2
24	ACNIN SEE DWG 5976281	BRN		P2		P7		4
25	CHAGND SEE DWG 5976277	GRN/YEL		P2		B1		E1
26	ACLFAN SEE DWG 5976277	BLK		P2		P8		1
27	ACNFAN SEE DWG 5976277	BLK		P2		P8		2
28	DCFAIL- 4174285P20	WHT	21.75	P2	350570-3	P4	350570-3	8 0.2 1

SIZE CODE IDENT. NO.

A 94117 WL 5978873

REV. A SHEET 3 OF 6

SHEET ONE REVISION LETTER IS THE IDENTIFYING REVISION FOR THIS MULTISHEET DWG.  
SEE SHEET ONE FOR REVISION DESCRIPTION  
LOWER CASE LETTERS IN TERMINATION COLUMN DESIGNATED BY ( )  
PREFIX PARTIAL REFERENCE DESIGNATIONS WITH

WIRE LIST

WIRE NUMBER	FUNCTION CODE		COLOR	LENGTH	FROM		TO		NOTE	
	WIRE PART NUMBER				LOCATION (REFERENCE DESIGNATION)	CONTACT PART NUMBER	LOCATION (REFERENCE DESIGNATION)	CONTACT PART NUMBER		
29	DC FAIL	4174285P20	WHT	27.0	P2	350570-3	P6	350570-3	8	/
30	G.3VAC	SEE DWG 5977358	BRN	25.50	P2		XVI		1	
31	G.3VAC	SEE DWG 5977358	BRN	25.50	P2		XVI		14	
32	SIGGND	SEE DWG 5977358	BLK	9.00	XVI		A3		E2	
33	SIGGND	4174285P11	BLK	18.25	P3	350570-3	VI	4173961P1	E1	
34	GRID 2	SEE DWG 5977358	ORN	27.0	P3		XVI		11	
35	GRID 1	SEE DWG 5977358	BLU	26.25	P3		XVI		2	
36	FOCUS	5978964P1	WHT	21.0	P3	350570-3	P5		3	
37	FOCCON	4174285P20	WHT	21.0	P3	350570-3	P5		4	
38	HVINHIB	4174285P20	WHT	14.75	P3	350570-3	P10		8	
39	SIGGND	SEE DWG 5977358	BRN	26.25	P3		XVI		10	
40	BIT 1	4174285P20	WHT	14.75	P3	350570-3	P10		13	
41	BIT 2	4174285P20	WHT	14.75	P3	350570-3	P10		10	
42	DYNCON	SEE DWG 5976279G 2	WHT		P3		P10		1	

SHEET ONE REVISION LETTER IS THE IDENTIFYING REVISION FOR THIS MULTISHEET DWG.  
 SEE SHEET ONE FOR REVISION DESCRIPTION  
 LOWER CASE LETTERS IN TERMINATION COLUMN DESIGNATED BY ( )  
 PREFIX PARTIAL REFERENCE DESIGNATIONS WITH

SIZE	CODE IDENT. NO.
A	94117
WL 5978873	
REV.	SHEET
B	4 of 6

WIRE LIST

WIRE NUMBER	FUNCTION CODE		COLOR	LENGTH	FROM		TO		NOTE
	WIRE PART NUMBER				LOCATION (REFERENCE DESIGNATION)	CONTACT PART NUMBER	LOCATION (REFERENCE DESIGNATION)	CONTACT PART NUMBER	
42A	DYN RTN	SEE DWG 5976279G2	BLK		P3		P10		
43	XDEFL	SEE DWG 5976279G1	WHT		P4		P9		
43A	XRTN	SEE DWG 5976279G1	BLK		P4		P9		
44	XSENSE	SEE DWG 5976280	WHT		P4		P9		
44A	SIGGND	SEE DWG 5976280	BLK		P4		P9		
45									
46	SIGGND	4174285P11	BLK	24.25	P5	350570-3	P10		
47	FOCUS	SEE DWG 5977358	WHT	24.0	P5		XVI		
48	VCONT	4174285P20	WHT	24.25	P5	350570-3	P10		
49	H5VDC	4174285P20	WHT	24.25	P5	350570-3	P10		
50									
51	GRNCON	4174285P20	WHT	24.25	P5	350570-3	P10		
52	COLRTN	4174285P20	WHT	24.25	P5	350570-3	P10		
53	YELCON	4174285P20	WHT	24.25	P5	350570-3	P10		

SHEET ONE REVISION LETTER IS THE IDENTIFYING REVISION FOR THIS MULTISHEET DWG.  
 SEE SHEET ONE FOR REVISION DESCRIPTION  
 LOWER CASE LETTERS IN TERMINATION COLUMN DESIGNATED BY ( )  
 PREFIX PARTIAL REFERENCE DESIGNATIONS WITH

SIZE	CODE IDENT. NO.
A	94117
WL	5978873
REV. A	
SHEET	5 of 6

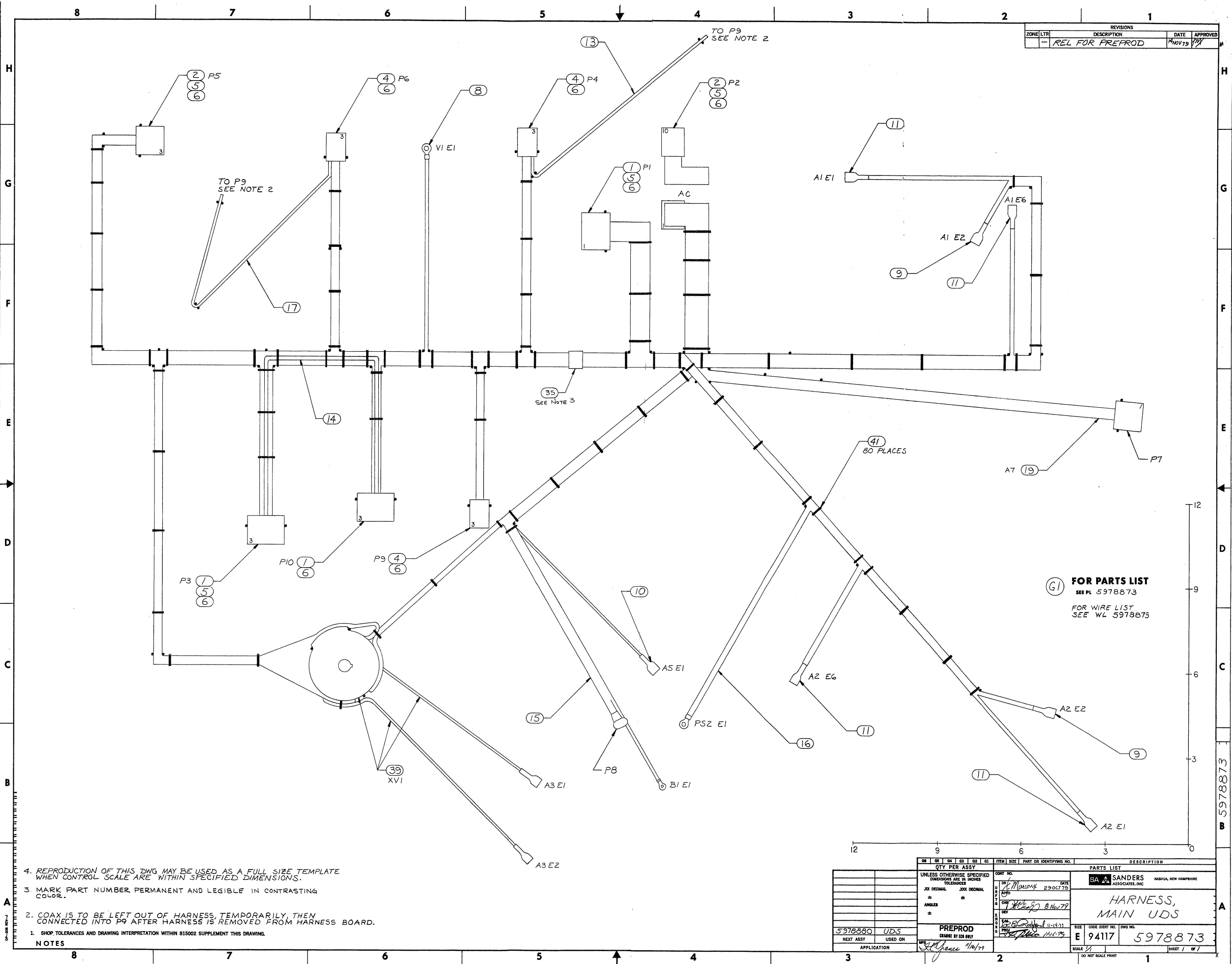
WIRE LIST

WIRE NUMBER	FUNCTION CODE		COLOR	LENGTH	FROM		TO		NOTE
	WIRE PART NUMBER	WIRE PART NUMBER			LOCATION (REFERENCE DESIGNATION)	LOCATION (REFERENCE DESIGNATION)	TERM.	TERM.	
					CONTACT PART NUMBER	CONTACT PART NUMBER	STRIP (INCHES)	STRIP (INCHES)	
54	ORNCN 4174285P20		WHT 24.25		P5 350570-3	P10 350570-3	11 0.2	6 0.2	
55	REDCON 4174285P20		WHT 24.25		P5 350570-3	P10 350570-3	12 0.2	3 0.2	
56	YDEFL SEE DWG 5976279G3		WHT		P6	P9	4	6	
56A	YRTN SEE DWG 5976279G3		BLK		P6	P9	5	3	
57	YSENSE SEE DWG 5976280		WHT		P6	P9	6	9	
57A	SIGGND SEE DWG 5976280		BLK		P6	P9	7	8	
58	CATHODE SEE DWG 5977358		YEL		XV1	A3	13	E1	
NOTE 1	2 WIRES IN "FROM" CONTACT								

SHEET ONE REVISION LETTER IS THE IDENTIFYING REVISION FOR THIS MULTISHEET DWG.  
 SEE SHEET ONE FOR REVISION DESCRIPTION  
 LOWER CASE LETTERS IN TERMINATION COLUMN DESIGNATED BY ( )  
 PREFIX PARTIAL REFERENCE DESIGNATIONS WITH

SIZE	CODE IDENT. NO.
A	94117
REV. A	WL 5978873
	SHEET 6 OF 6





REVISIONS			
ZONE LTR	DESCRIPTION	DATE	APPROVED
-	REL FOR PREPROD	11/14/79	

(G1) **FOR PARTS LIST**  
SEE PL 5978873  
**FOR WIRE LIST**  
SEE WL 5978875

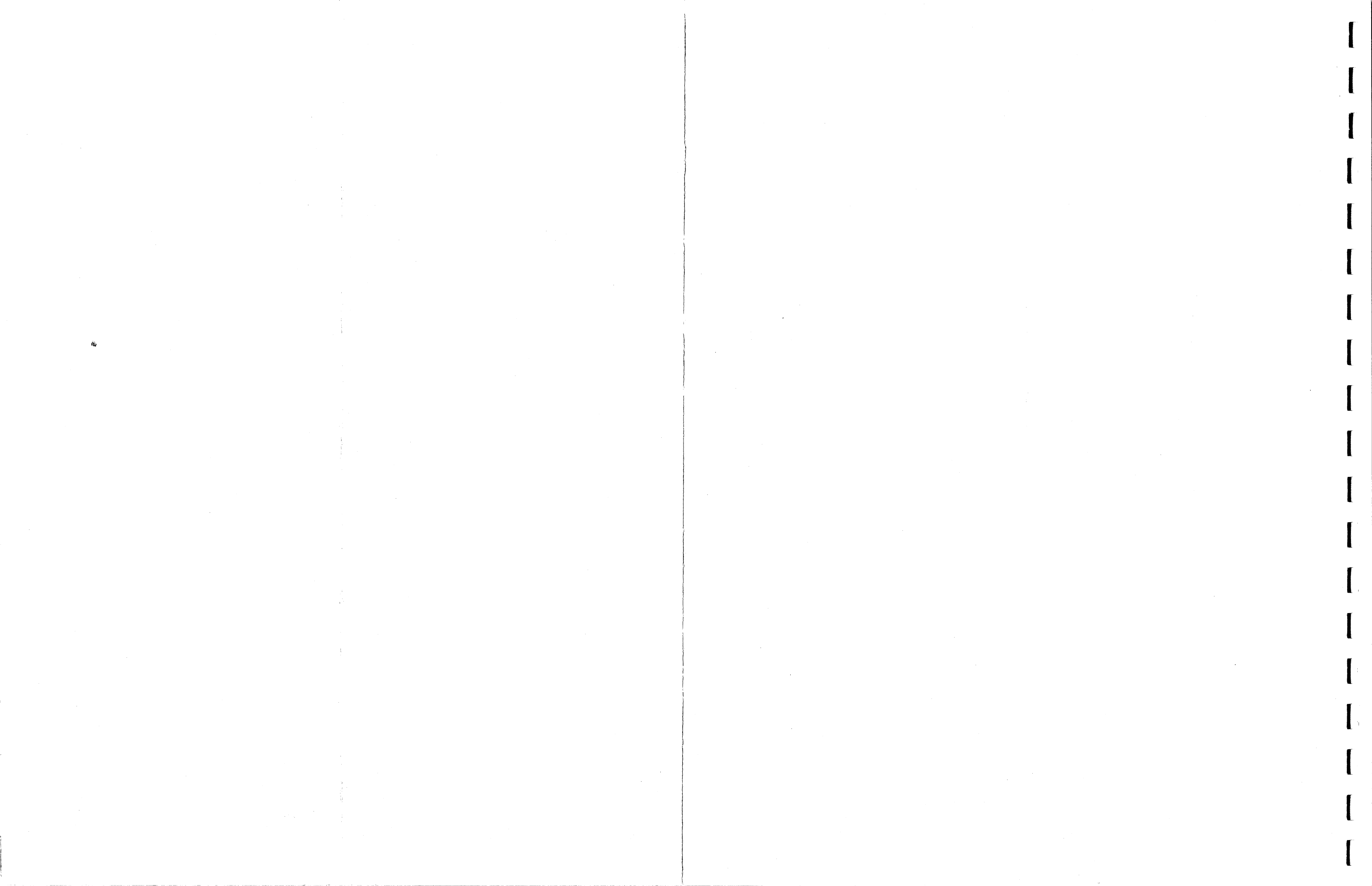
- NOTES**
1. SHOP TOLERANCES AND DRAWING INTERPRETATION WITHIN 815002 SUPPLEMENT THIS DRAWING.
  2. COAX IS TO BE LEFT OUT OF HARNESS, TEMPORARILY, THEN CONNECTED INTO P9 AFTER HARNESS IS REMOVED FROM HARNESS BOARD.
  3. MARK PART NUMBER PERMANENT AND LEGIBLE IN CONTRASTING COLOR.
  4. REPRODUCTION OF THIS DWG MAY BE USED AS A FULL SIZE TEMPLATE WHEN CONTROL SCALE ARE WITHIN SPECIFIED DIMENSIONS.

QTY PER ASSY	ITEM	SIZE	PART OR IDENTIFYING NO.	DESCRIPTION
	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES			
				DR: M. M. M. DATE: 29 OCT 79
				CHK: W. B. G. DATE: 8 Nov 79
				APP: [Signature] DATE: 11-14-79
5978880	UDS			PREPROD CHANGE BY ECR BBT
				DATE: 11/14/79
				SCALE: 1/1
				DO NOT SCALE PRINT

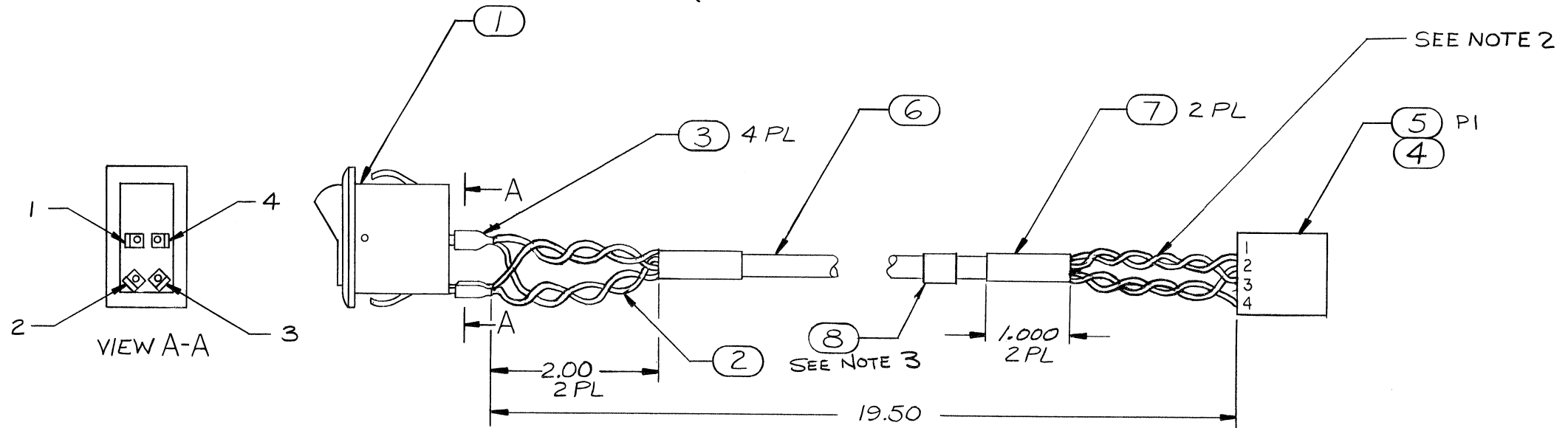
5978873

A

B



REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	-	REL FOR PREPROD	19 NOV 79	<i>DMX ent</i>



WIRE NO.	FROM	TO	NOTES
1	SI-1	PI-1	TWISTED WITH WIRE 3
2	SI-2	PI-2	TWISTED WITH WIRE 4
3	SI-3	PI-3	TWISTED WITH WIRE 1
4	SI-4	PI-4	TWISTED WITH WIRE 2

1	8		PLM-25-D	MARKER, TIE
2	7	A	270028P7	SLEEVING, SHRINK
15.5	6	-	1/4 FR	SLEEVING, EXPANDO (BENTLEY-HARRIS)
1	5	-	1-480703-0	CONN, CAP 4 PIN (AMP)
4	4	-	350538-3	CONTACT, PLUG (AMP)
4	3	-	3-350819-2	CONTACT, FASTON, .250, 16-18 AWG (AMP)
70"	2	A	5978963P201	WIRE, ELEC 18 AWG, BRN
1	1	B	5977415PI	SWITCH, A/C, DPST

3. MARK PART NUMBER PERMANENT AND LEGIBLE IN CONTRASTING COLOR.
2. WIRE LENGTHS ARE AFTER WIRE IS TWISTED AT 3 TURNS PER INCH.
1. SHOP TOLERANCES AND DRAWING INTERPRETATION WITHIN 815002 SUPPLEMENT THIS DRAWING.

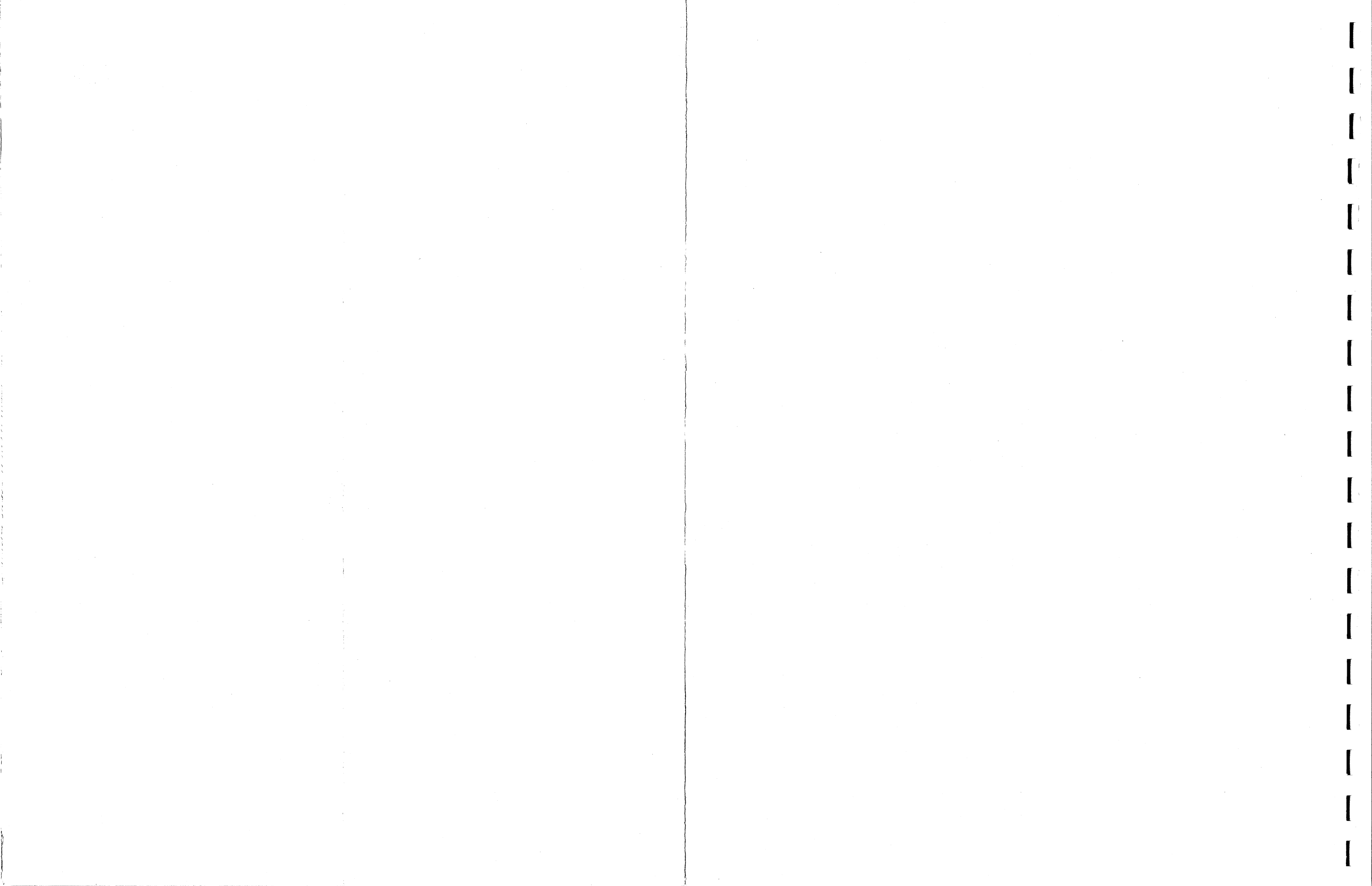
NOTES

G6	G5	G4	G3	G2	G1	ITEM	SIZE	PART OR IDENTIFYING NO.	DESCRIPTION
						QTY PER ASSY			
						PARTS LIST			
						UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES			
						.XX DECIMAL .XXX DECIMAL			
						± .50 ± .125			
						ANGLES ±			
						PREPROD CHANGE BY ECO ONLY			
						MFG <i>AG</i> 11/6/79			
						GENUSE UDS			
						NEXT ASSY USED ON			
						APPLICATION			
						CONT NO.			
						DR <i>J. Maroney</i> 2 NOV 79			
						DATE			
						APPD			
						CHK <i>AB</i> 5/16/79			
						DEV			
						E/M <i>RC</i> 11/12/79			
						PROJ <i>PL</i> 11-11-79			
						SA SANDERS ASSOCIATES, INC. NASHUA, NEW HAMPSHIRE			
						CABLE ASSY, A/C HARNESS			
						SIZE CODE IDENT NO. DWG NO.			
						C 94117 5978878			
						SCALE 1/1 SHEET 1 OF 1			

OP 332 REV-7

5978878

DO NOT SCALE PRINT



REVISION STATUS												REVISIONS				
SH	1	2	3	4	5	6	7	8	9	10	11	12	LTR	DESCRIPTION	DATE	APPROVED
PARTS	REV	B	B	-									-	REL FOR PREPROD	11/19/79	REC
	SH	13	14	15	16	17	18	19	20	21	22	23	A	REV PER ECO 96276	15 JAN 80	WG/WL
	REV												B	REV PER ECO 96302	23 JAN 80	WG/REP
LIST																

M  
M  
M

CONT NO.  
 DR. MALCOM 18 SEP 79  
 APPD  
 GARY [Signature] 11/17/79  
 EAM [Signature]  
 PGM [Signature] 11-18-79

5977073	UDS	
5977072		
5977071		
5977077		
5978930		
5978881	UDS	
NEXT ASSY.	USED ON	
APPLICATION		

SA SANDERS ASSOCIATES, INC  
 NASHUA, NEW HAMPSHIRE  
 CHASSIS ASSY  
 UDS  
 SIZE CODE IDENT NO.  
 A 94117 PL 5978880  
 SHEET 1 OF 3

- 2. PARTS LIST SHEET ONE IS THE CONTROLLING REVISION FOR THE COMBINED PARTS LIST, DRAWING AND WIRE LIST.
- 1. SHOP PRACTICE TOLERANCES AND DRAWING INTERPRETATION WITHIN 815002 SUPPLEMENT THIS DRAWING.

PREPROD  
 CHANGE BY ECO ONLY  
 MFG [Signature] 11/19/79

PARTS LIST

ITEM NO.	QTY PER ASSY		DWG SIZE	CODE IDENT	PART OR IDENTIFYING NO.	DESCRIPTION	SYM
	G1	G2					
1	2	2	A/D		5978938G1	DEFL AMPL ASSY A1, A2	
2	1	-	A/E		5978864G1	LVPS ASSY PSI	
3	1	1	A/E		5978873G1	HARNESS, MAIN UDS, W1	
4	-	1	A/E		5978864G2	LVPS ASSY PSI	
5	1	1	E		5978935PI	BASE, DISPLAY	
6	1	1	E		5978933PI	ENCLOSURE, TUBE	
7	1	1	C		5978872PI	COVER, BOTTOM CHASSIS	
8	1	1	B		4172084PI	SPRING, HELIX CONICAL	
9	1	1	C		5978870G1	BRKT, MTG DEFL AMP	
10	2	2	B		5978869G1	BRKT, MTG DEFL AMP	
11	1	1	B		5978915PI	BRKT, MTG LVPS	
12	80"	80"		17452	5B2004	TAPE, ADHESIVE. 50 WIDE	
13	8	8		06383	ABM2S-A	MTG BASE, ADHESIVE BACK	
14	1	1	B		4171218G1	FAN, TUBEAXIAL, BI	
15	4	4	A		4171224PI	CLIP, FASTENING	
16	2	2	B		5976296G1	STUD, PLATE, MTG FAN	
17	1	1	A		4171225PI	FAN GUARD	
18	8	8			MS3367-5-9	TIE, CABLE	
19	8	8			5976288	WIRING DIAGRAM	

SIZE CODE IDENT NO.

A 94117 PL 5978880

REV B SHEET 2

SHEET ONE REVISION LETTER IS THE IDENTIFYING REVISION FOR THIS MULTISHEET DWG SEE SHEET ONE FOR REVISION DESCRIPTIONS SYMBOLS : INDICATES VENDOR ITEM - SEE SPEC/SOURCE CONTROL DWG.

## PARTS LIST

ITEM NO.	QTY PER ASSY		DWG SIZE	CODE IDENT	PART OR IDENTIFYING NO.	DESCRIPTION	SYM
	G1	G2					
24	4				MS35307-310	SCR HEX HD 1/4-20 x 1.25	
25	1				MS51957-50	SCR MACH PN .164(8)-32 x 1.25	
26	6				MS51958-62	SCR MACH PN .190(10)-32 x .44	
27	6				MS51957-32	SCR MACH PN .138(6)-32 x .75	
28	4				MS51957-28	SCR MACH PN .138(6)-32 x .38	
29	2				MS51957-33	SCR MACH PN .138(6)-32 x .88	
30	2				MS51957-84	SCR MACH PN 1/4-20 x 1.25 LG	
31	2						
32	2						
33	2						
34	2				MS35649-264	NUT, PLAIN HEX .138(6)-32	
35	1				MS35333-71	WASHER INTERNAL TOOTH	
36	6				MS15795-810	WASHER FLAT 1/4	
37	4				MS35338-139	WASHER LKG 1/4	
38	1				MS35333-72	WASHER, INTERNAL TOOTH NO.8	
39	6				MS15795-808	WASHER, FLAT NO. 10	
40	6				MS35338-138	WASHER, LKG NO. 10	
41	2				MS15795-841	WASHER, FLAT NO. 8	
42	1				MS35338-137	WASHER, LKG NO. 8	
43	12				MS15795-805	WASHER, FLAT NO. 6	
44	12				MS35338-136	WASHER, LKG NO. 6	
45	2				MS35649-284	NUT, PLAIN HEX .164(8)-32	
46	2				MS35649-2254	NUT, PLAIN HEX 1/4-20	

SHEET ONE REVISION LETTER IS THE IDENTIFYING REVISION FOR THIS MULTISHEET DWG  
SEE SHEET ONE FOR REVISION DESCRIPTIONS  
SYMBOLS : INDICATES VENDOR ITEM - SEE SPEC/SOURCE CONTROL DWG.

SIZE CODE IDENT NO.

A

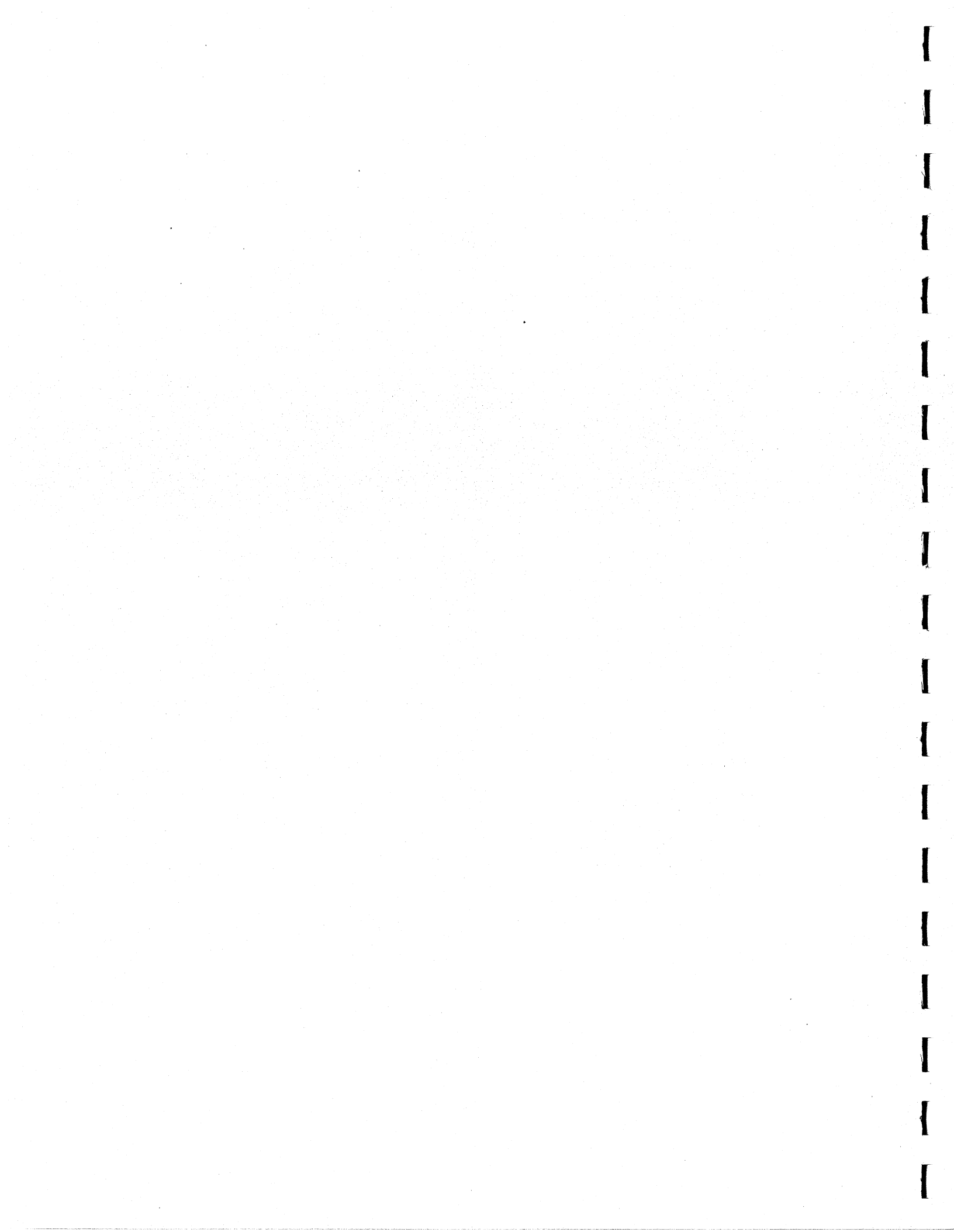
94117

PL

5978880

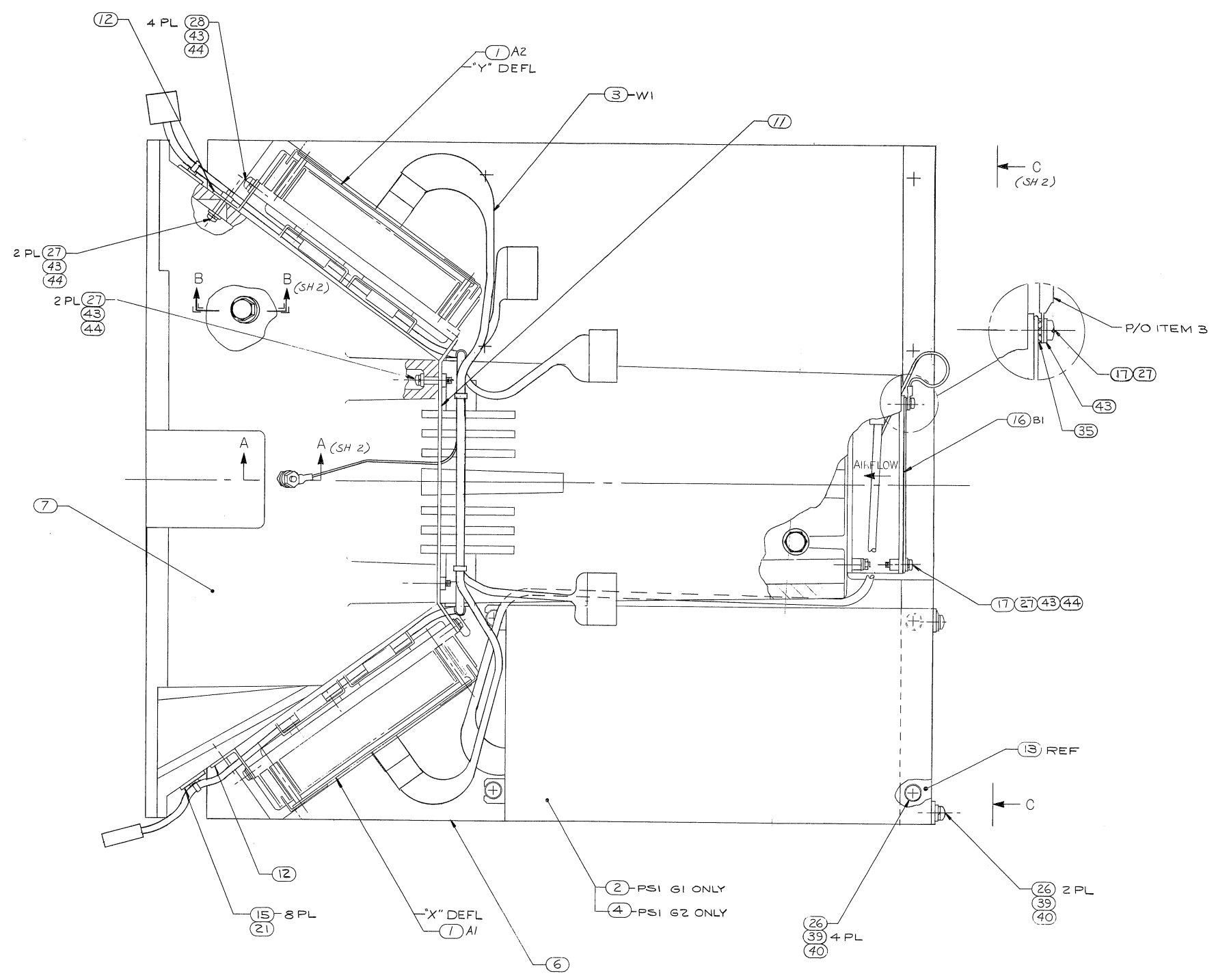
REV -

SHEET 3





REVISIONS				
ZONE	LTN	DESCRIPTION	DATE	APPROVED
-		REL FOR PREPROD	NOV 73	[Signature]



REVISION STATUS OF SHEETS						
SHEET	1	2	3	4	5	6
REVISION	-	-	-	-	-	-

G1 G2 FOR PARTS LIST  
SEE PL 5978880

2 APPLY ITEM 14 (TAPE) COMPLETELY AROUND OUTSIDE OF ITEM 8 (COVER) AND SECURE TO ITEM 6 (BASE).

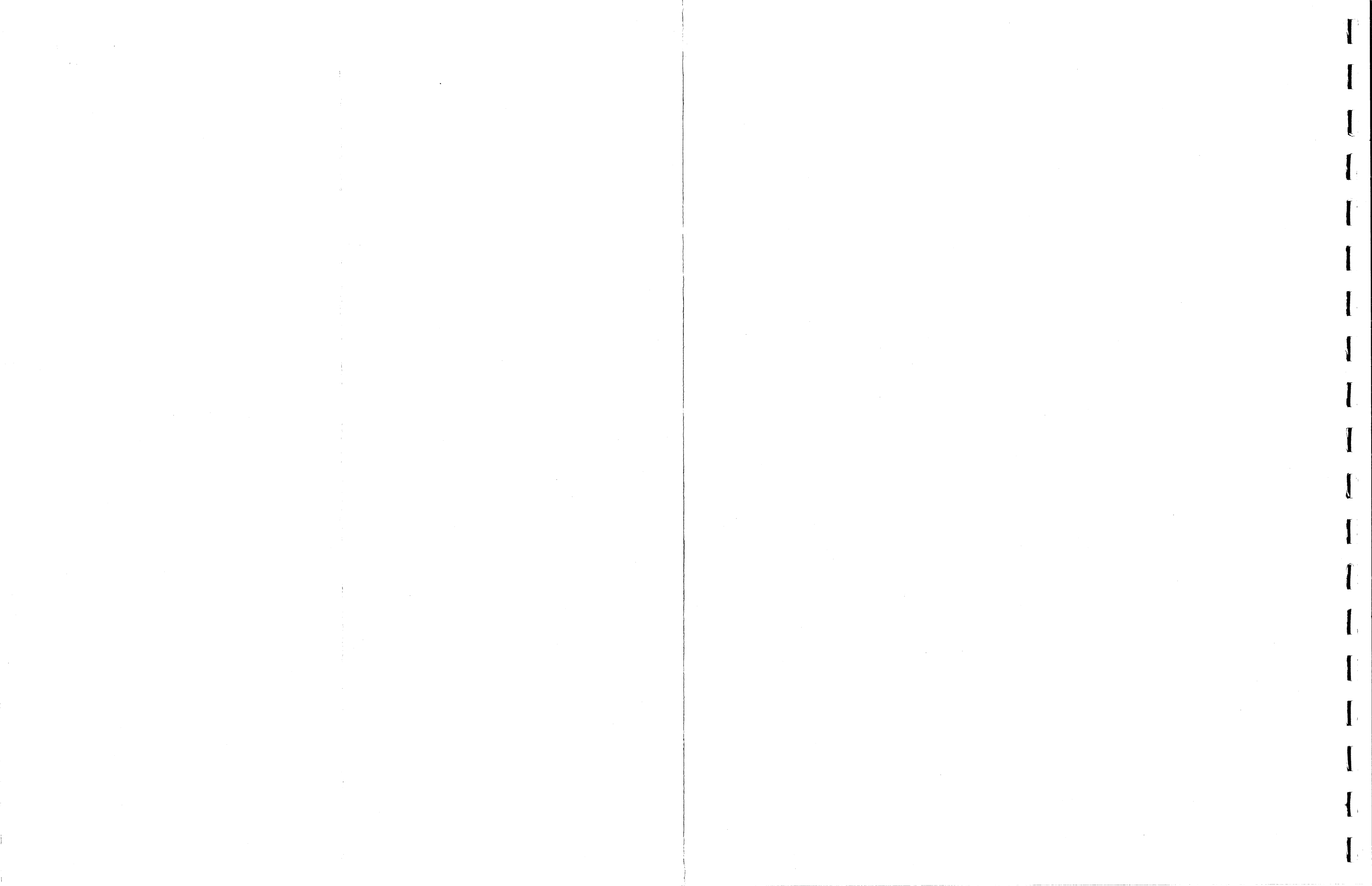
1. SHOP TOLERANCES AND DRAWING INTERPRETATION WITHIN 815002 SUPPLEMENT THIS DRAWING.

NOTES

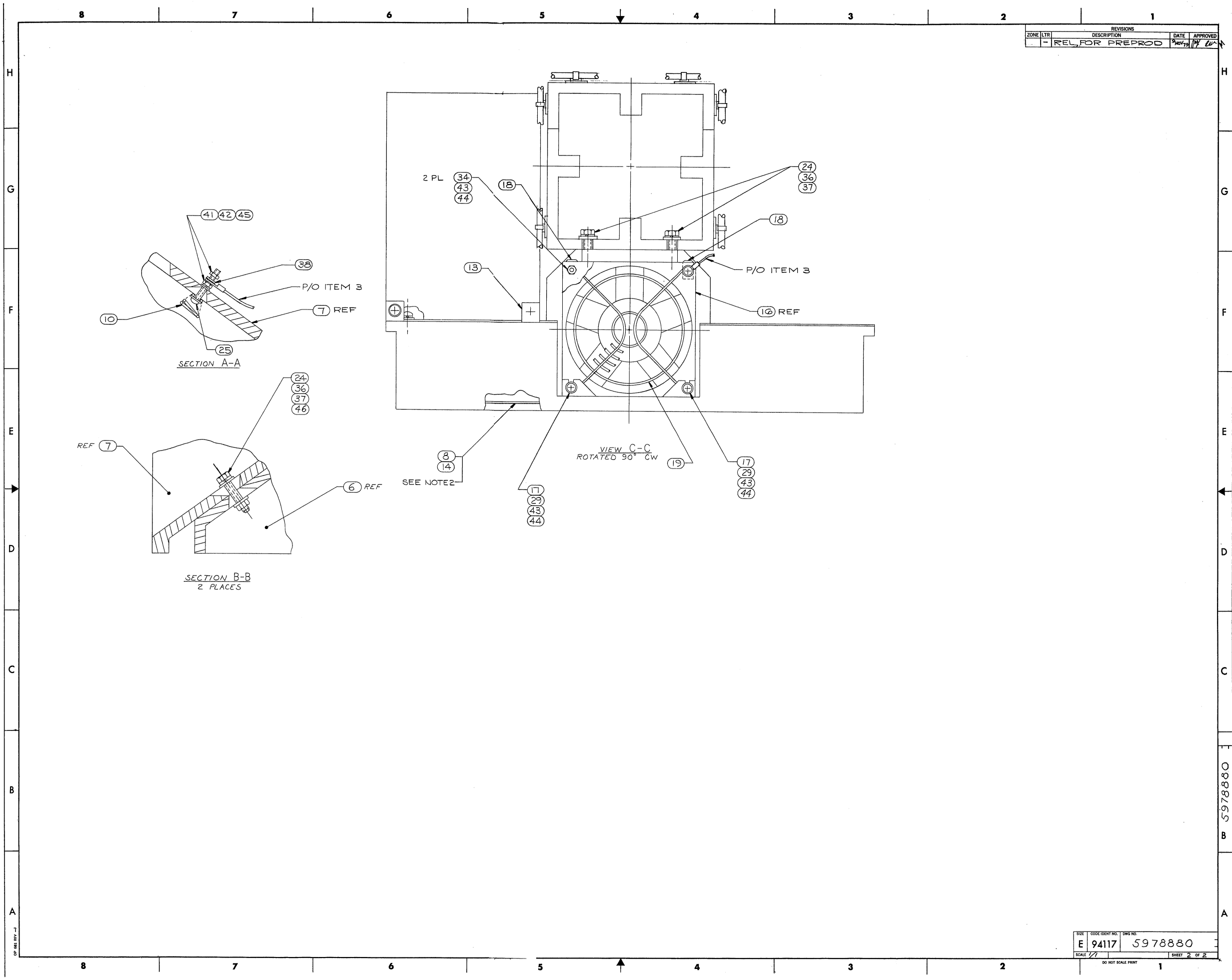
ITEM	QTY PER ASSY	DESCRIPTION	DATE	APPROVED
5978929	FACTS			
5971076	UDS			
5978932	UDS			
5971075	UDS			
5971074	UDS			
5971073	UDS			
5971072	UDS			
5971071	UDS			
5971070	UDS			
5978930	UDS			
5978881	UDS			

ITEM	SIZE	PART OR IDENTIFYING NO.	DESCRIPTION
SA SANDERS ASSOCIATES, INC.			NASHUA, NEW HAMPSHIRE
CHASSIS ASSY			
UDS			
SIZE	CODE IDENT NO.	DWG NO.	
E	94117	5978880	
SCALE	1/1		
SHEET 1 OF 2			



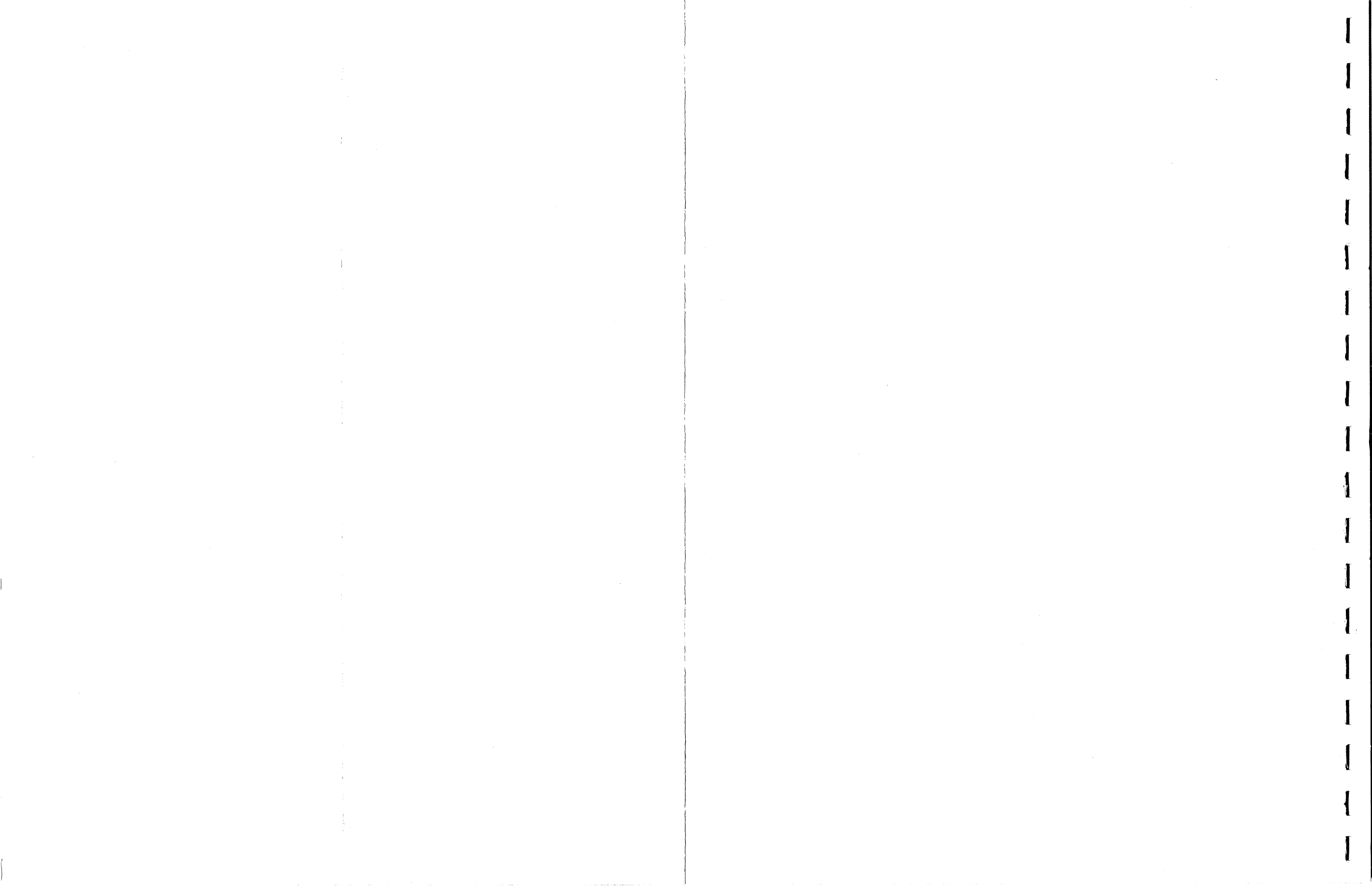
REVISIONS		DATE	APPROVED
ZONE	LTR		
REL FOR PREPROD			



SIZE	CODE IDENT NO.	DWG NO.
E	94117	5978880
SCALE	1/1	SHEET 2 OF 2

5978880

DO NOT SCALE PRINT



REVISION STATUS													REVISIONS			
SH	1	2	3	4	5	6	7	8	9	10	11	12	LTR	DESCRIPTION	DATE	APPROVED
PARTS	REV	C	B	B									-	REL FOR PREPROD	11/26/79	REL
	SH	13	14	15	16	17	18	19	20	21	22	23	A	REV PER ECO 96271	10 JAN 80	WG/WL
	REV												B	REV PER ECO 96305	25 JAN 80	ROM/WL
													C	REV PER ECO 96342	15 FEB 80	ROM/WL

DWG REV	B
WL REV	X

3. 'P' COND TO BE DETERMINED BY CUSTOMER

2. PARTS LIST SHEET ONE IS THE CONTROLLING REVISION FOR THE COMBINED PARTS LIST, DRAWING AND WIRE LIST.

1. SHOP PRACTICE TOLERANCES AND DRAWING INTERPRETATION WITHIN 815002 SUPPLEMENT THIS DRAWING.

<b>SA SANDERS ASSOCIATES, INC.</b>		NASHUA, NEW HAMPSHIRE	
MODEL 730 ASSY			
21" MONO HDT			
SIZE	CODE IDENT NO.	SHEET 1 OF 3	
A	94117	PL 5978881	

CONT NO.	DATE
DR. M. M. (M) 5007	11-27-79
APP	
CHK	
DEV	
ENG	
GR	
PROJ	

PREPROD	USED ON
CHANGE BY ECO ONLY	APPLICATION
	FINAL
	FINAL
	NEXT ASSY
	UDS
	GRA-7
	UDS
	USED ON
	APPLICATION
MPG	

OP-1039 REV B DWG SIZE E

PARTS LIST

ITEM NO.	QTY PER ASSY		DWG SIZE	CODE IDENT	PART OR IDENTIFYING NO.	DESCRIPTION	SYM
	G1	G2					
1	1	-	A/E		5978880G1	CHASSIS ASSY UDS	
2	-	1	A/E		5978880G2	CHASSIS ASSY UDS	
3	1	1	A/C		5978882G1	CCA DISPLAY CONTROL, A4	
4	1	1	A/U		5977080G1	CCA VIDEO (LVES), A3	
5	1	1	C		59788878G1	HARNES A/C	
6	1	1	A/D		5977088G1	CONN. ASSY, ACCESSORY PANEL, A6	
7	1	1	E		5978993PI	FRAME BEZEL DESK TOP	
8	1	1	E		5978934PI	BEZEL 21" CRT	
9	1	1	E		597742IP	CATHODE RAY TUBE 21IN MONO, VI, NOTES	
10	1	1	E		5978937PI	EXTENSION, 21IN. CRT	
11	1	1	D		5978874PI	SHIELD TUBE, A5	
12	1	1	D		5978875PI	YOKE, LI	
13	1	1	B		4172083PI	PAD COMPRESSION, YOKE	
14	2	2	B		4172087PI	PAD SUPPORT, YOKE	
15	1	1	A		1088598PI	HVPS LOW VOLTAGE FOCUS, PS2	
16							
17	1	1	E		5978995PI	COVER, UPPER DESK TOP	
18	1	1	J		5978994PI	COVER, LOWER DESK TOP	
19	12IN	12IN	A		4174119PI	TAPE	
20	2	2	C		5976323PI	KNOB CONTROL	
21	1	1	C		5976326P2	INSERT, CONTROL KNOB, BRT	
22	1	1	C		5976326PI-	INSERT, CONTROL KNOB, FOCUS	
23	2	2	A		MS35489-10	GROMMET, RUBBER	

SHEET ONE REVISION LETTER IS THE IDENTIFYING REVISION FOR THIS MULTISHEET DWG SEE SHEET ONE FOR REVISION DESCRIPTIONS SYMBOLS : INDICATES VENDOR ITEM - SEE SPEC/SOURCE CONTROL DWG.

SIZE CODE IDENT NO.

A 94117 PL

5978881

REV B SHEET 2

PARTS LIST

ITEM NO.	QTY PER ASSY		DWG SIZE	CODE IDENT	PART OR IDENTIFYING NO.	DESCRIPTION	SYM
	G1	G2					
24	10	10	A		MSS1958-62	SCR MACH PNH .190(10)-32x.44	
25	8	8	A		MSS1958-64	SCR MACH PNH .190(10)-32x.56	
26	16	16	A		MSS1957-81	SCR MACH PNH .250-20 X.75	
27	8	8	A		NAS662-2LER8	SCR FLAT HD .086(2)-56 X.50	
28							
29	8	8	A		MS15795-802	WASHER FLAT NO. 2	
30	18	18	A		MS15795-808	WASHER, FLAT NO. 10	
31	12	12	A		MS15795-810	WASHER, FLAT NO. 250	
32	18	18	A		MS35338-138	WASHER, LKG NO. 10	
33	16	16	A		MS35338-139	WASHER, LKG NO. 250	
34	8	8	A		MS35338-134	WASHER, LKG NO. 2	
35	8	8	A	94222	MS35649-224	NUT, PLAIN HEX. 086(2)-56	
36	2	2	-	94222	82-47-112-15	CLIP-ON RECEPTACLE	
37	2	2	-		07-10-101-12	DRAW CATCH	
38							
39	4	4	A		MS15795-811	WASHER FLAT, LG PATTERN	
40	REF	REF	J		5976288	WIRING DIAGRAM	
41	2	2	A		MS3367-4-9	TIE, CABLE	
42	-	-	E		5978995P2	COVER, UPPER DESK TOP	
43	-	-	J		5978994P2	COVER, LOWER DESK TOP	

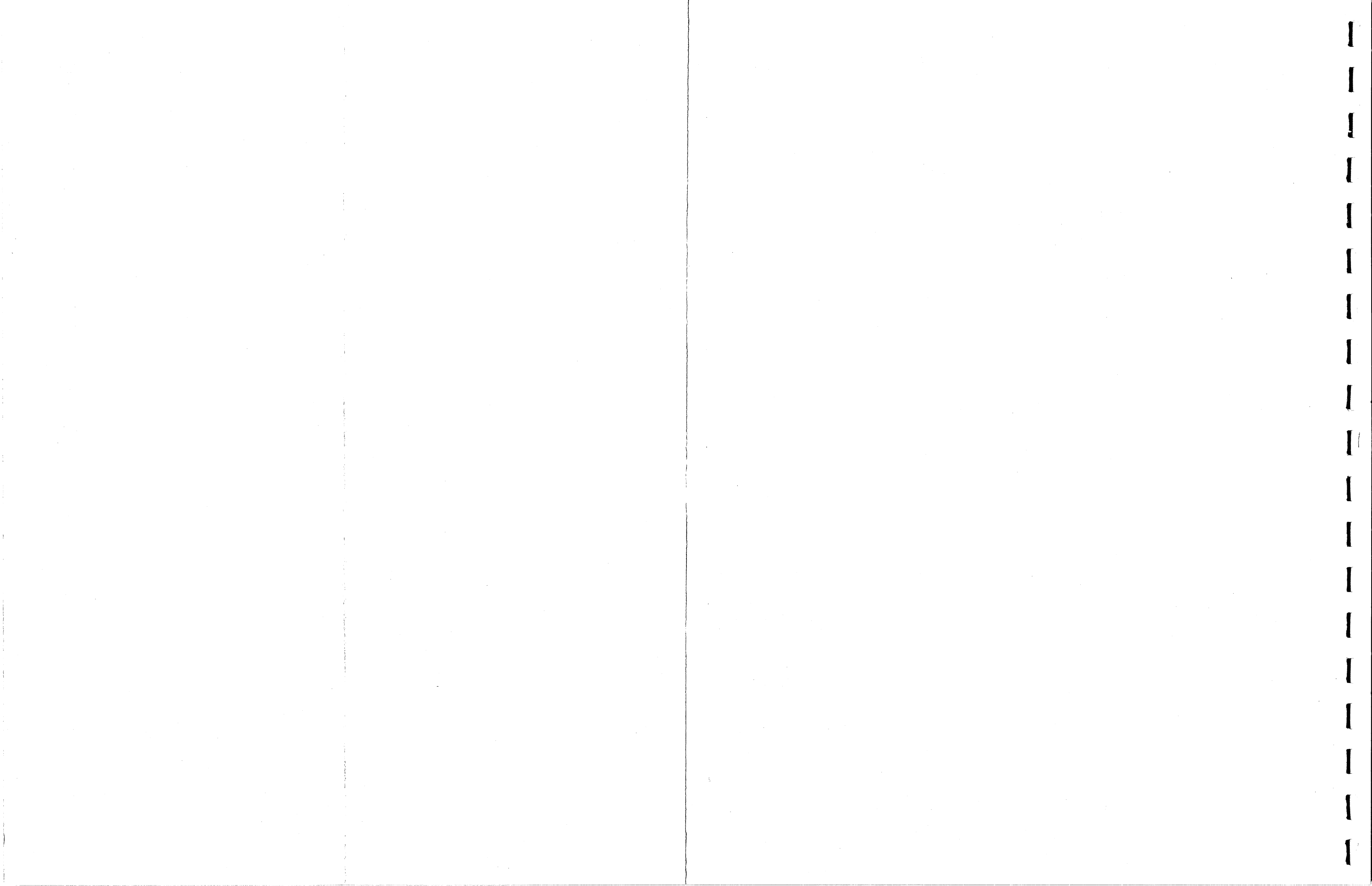
SHEET ONE REVISION LETTER IS THE IDENTIFYING REVISION FOR THIS MULTISHEET DWG  
 SEE SHEET ONE FOR REVISION DESCRIPTIONS  
 SYMBOLS : INDICATES VENDOR ITEM - SEE SPEC/SOURCE CONTROL DWG.

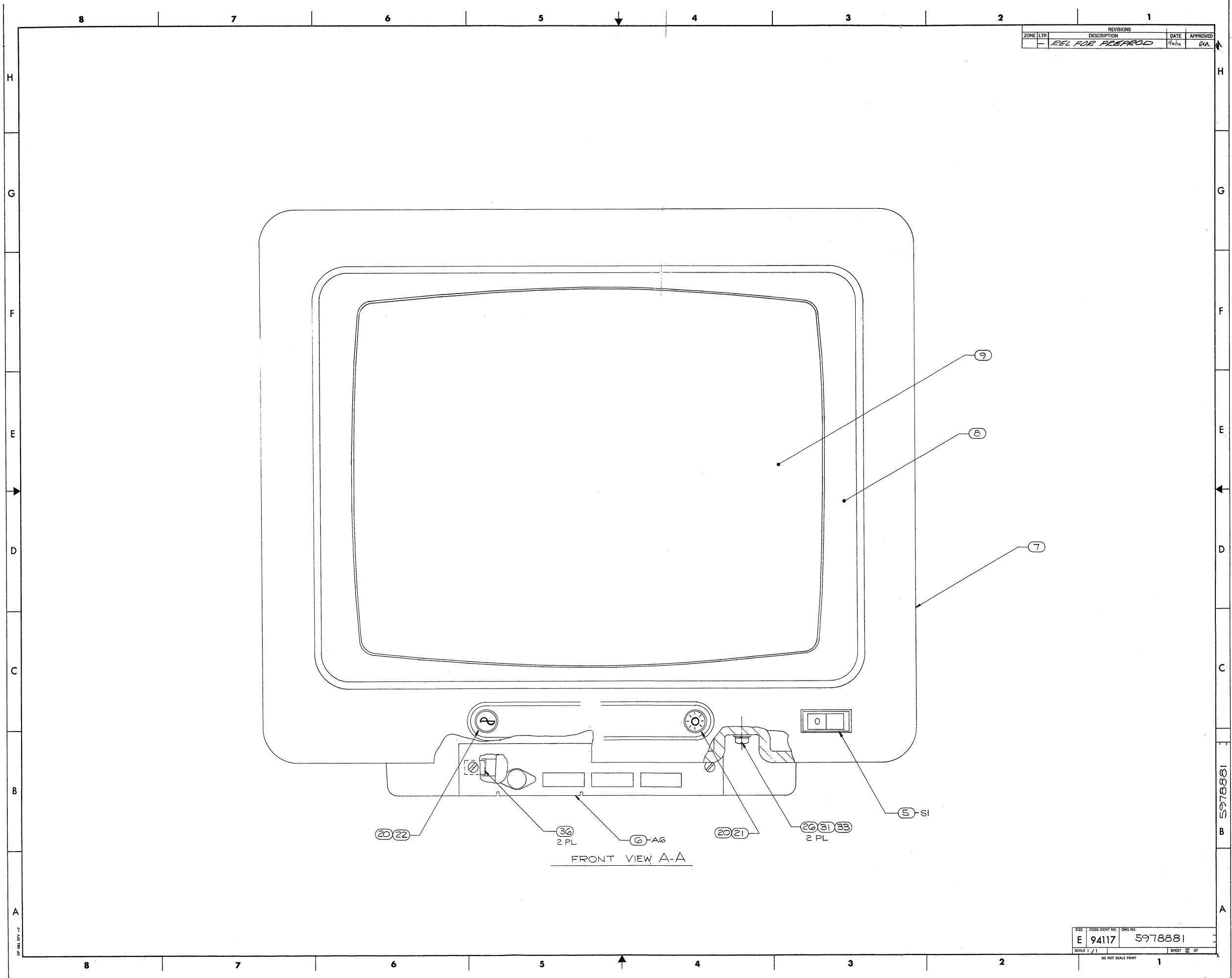
SIZE	CODE IDENT NO.	REV	SHEET
A	94117 PL	B	3
		5978881	











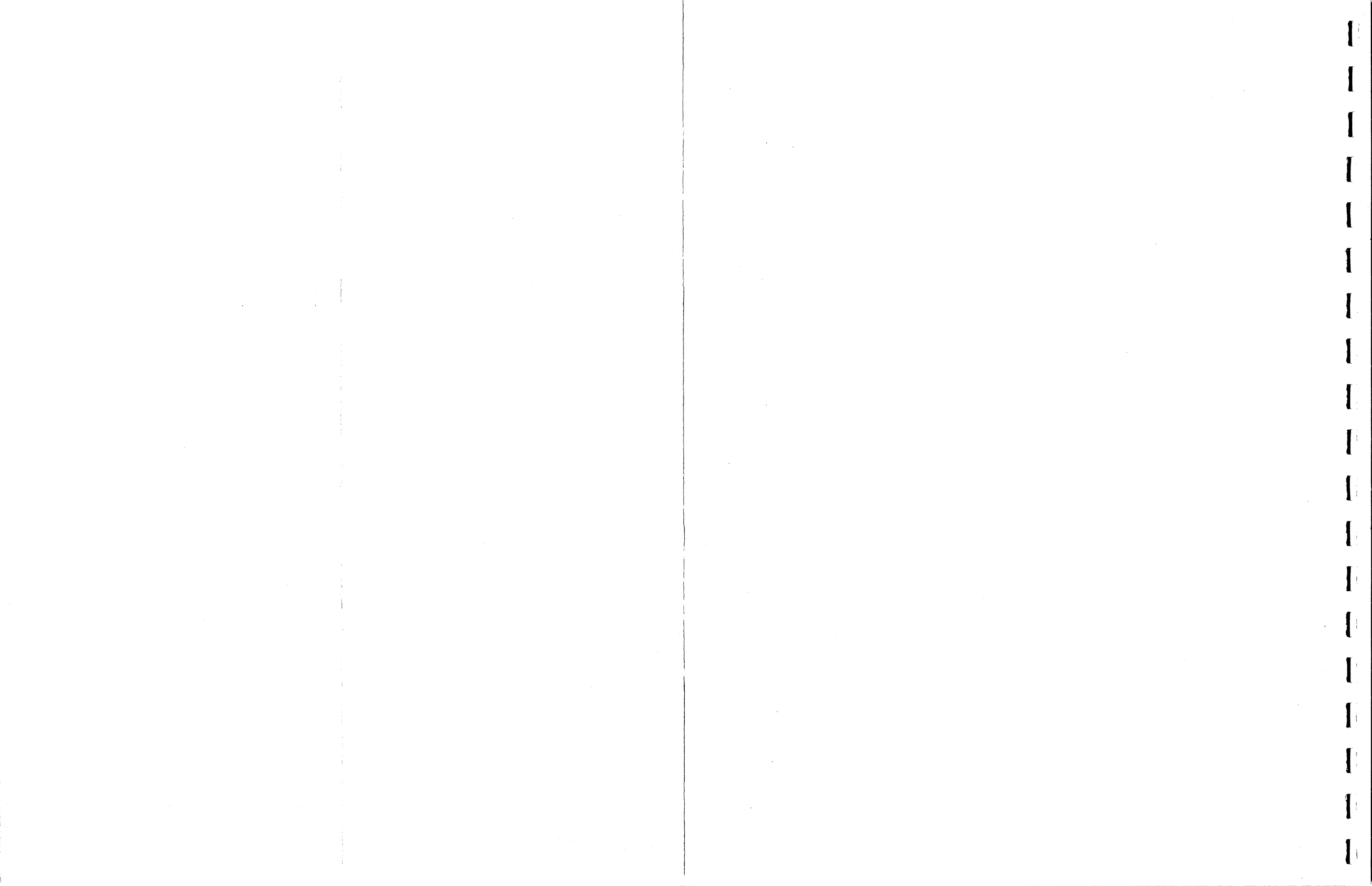
REVISIONS		DATE	APPROVED
ZONE	LTR		

REL FOR PREPROD

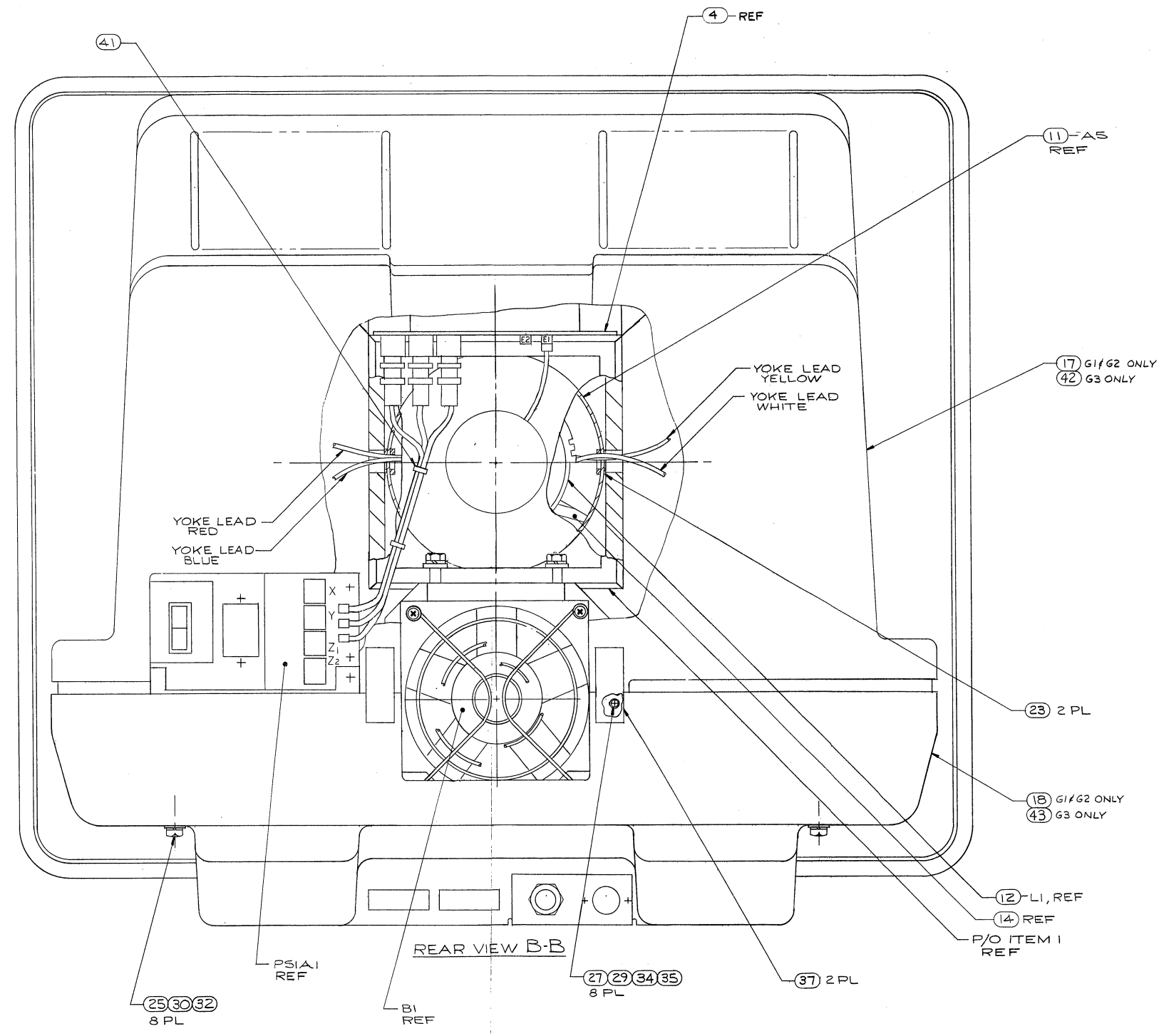
FRONT VIEW A-A

SIZE	CODE IDENT NO	ORIG NO
E	94117	5978881
SCALE	DO NOT SCALE PRINT	
1 / 1	SHEET 2 OF	

5978881



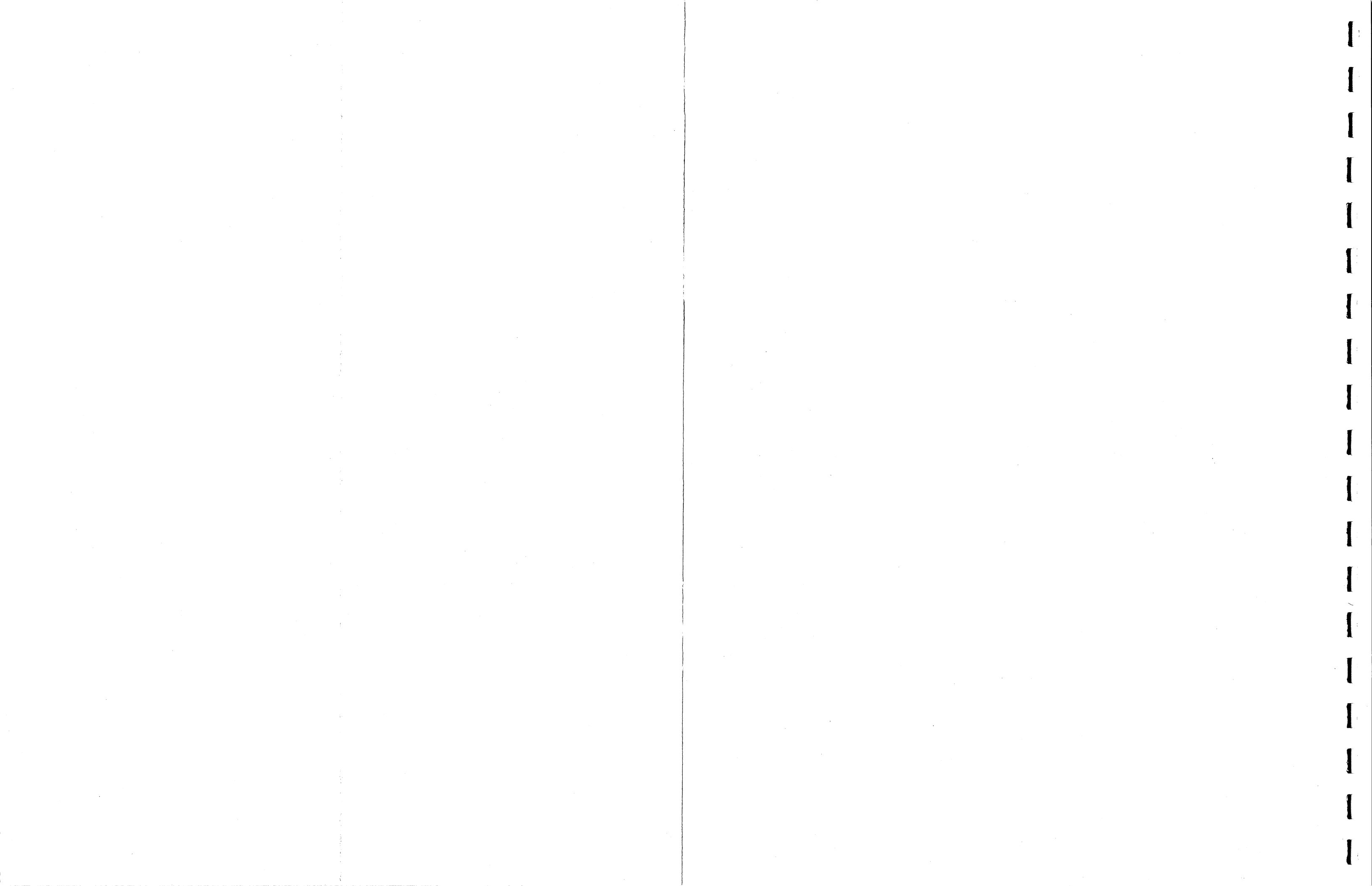
ZONE LTR		REVISIONS		DATE	APPROVED
		REF FOR PREPROD		1/1/79	ALP
A		REV PER ECO 96342		5 FEB 80	ROW



SIZE	CODE IDENT NO.	DWG NO.
E	94117	5978881
SCALE	1/1	SHEET 3 OF 3

5978881

DO NOT SCALE PRINT



REVISION STATUS												REVISIONS				
SH	1	2	3	4	5	6	7	8	9	10	11	12	LTR	DESCRIPTION	DATE	APPROVED
	—												—	REL FOR PREPROD	29 Oct 79	JMY 11-14-79
PARTS	SH 13	14	15	16	17	18	19	20	21	22	23	24				
LIST	REV															

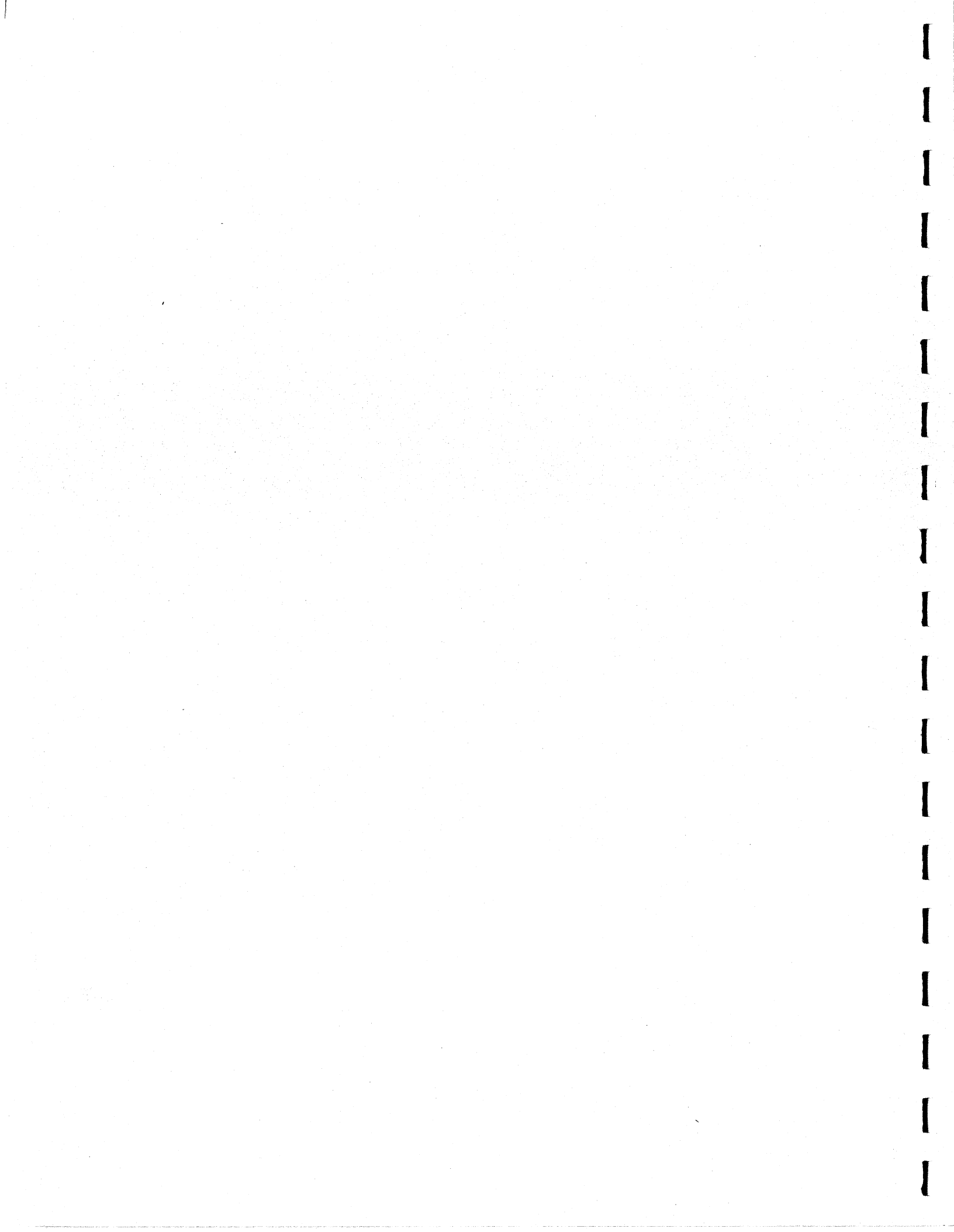
<p>2. PARTS LIST SHEET ONE IS THE CONTROLLING REVISION FOR THE COMBINED PARTS LIST, DRAWING AND WIRE LIST.</p> <p>1. SHOP PRACTICE TOLERANCES AND DRAWING INTERPRETATION WITHIN 815002 SUPPLEMENT THIS DRAWING.</p>	<p>CONT NO.</p> <p>DATE 8/11/79</p> <p>APPROVED 11-14-79</p> <p>PROJ. 11-14-79</p>
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<p><b>PREPROD</b></p> <p>CHANGE BY ECO ONLY</p> <p>MFG 11/14/79</p>	<p>SA SANDERS ASSOCIATES, INC. NASHUA, NEW HAMPSHIRE</p> <p>CIRCUIT CARD ASSY</p> <p>DISPLAY CONTROL</p> <p>SIZE A CODE IDENT NO. 94117 PL 5978882</p> <p>GEN. USE UDS</p> <p>NEXT ASSY USED ON</p> <p>APPLICATION</p>
---	--

<p>OP-1039 REV B</p>	<p>DWG SIZE D</p> <p>SHEET 1 OF 2</p>
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# PARTS DATA

CCN NO. 7D001

ASSEMBLY CCA, DISPLAY CONTROL PART NO. 5978882

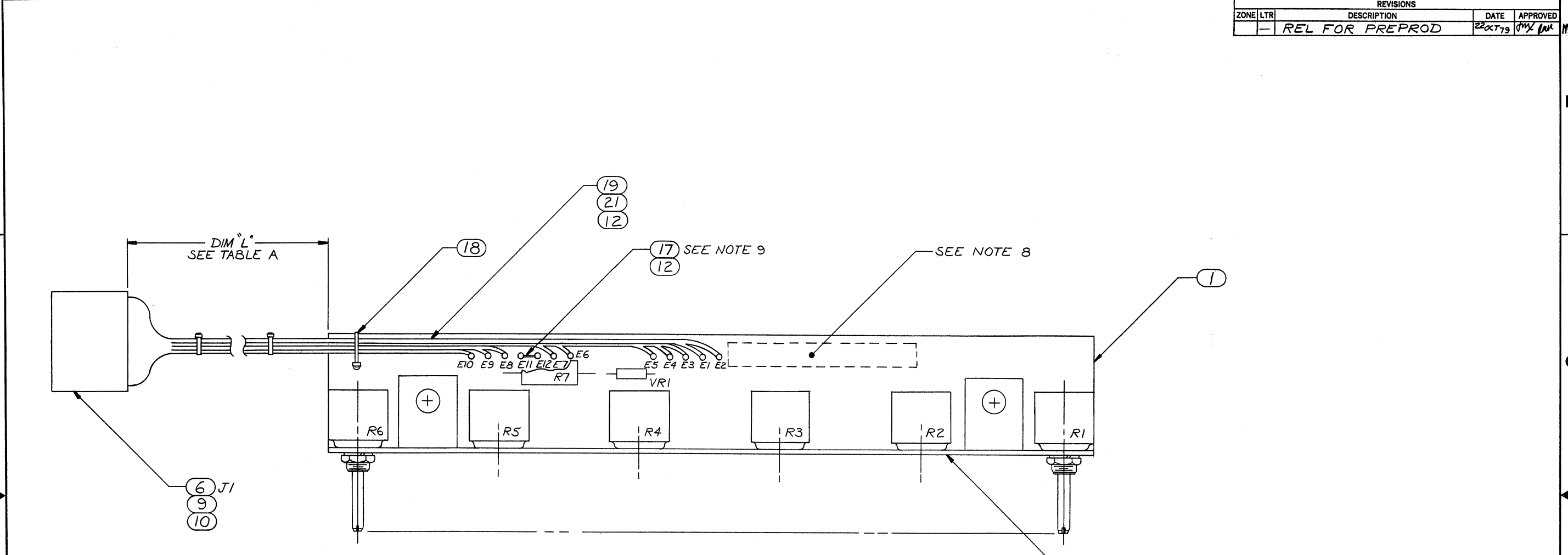
ITEM NO.	REF DES	SA PART NUMBER	VENDOR PART NUMBER	MFR CODE	DESCRIPTION
<b>PARTS DELETED</b>					
5	R7		RCR32G201JS		Resistor 200 OHMS ± 5% 1W
8	VR1		IN748A		Diode 3.9V
<b>PARTS ADDED</b>					
5	R7		RCR32G271JS		Resistor 270 OHMS ± 5% 1W
7	Q1		2N2222A		Transistor Q1
8	VR1		IN750A		Diode 4.7V
24	C1		4174298P3		Capacitor, ceramic axial lead .1 microfarad + 80-20% 50 WVDC

**PARTS LIST**

ITEM NO.	QTY PER ASSY		DWG SIZE	CODE IDENT	PART OR IDENTIFYING NO.	DESCRIPTION	SYM
	G1	G2					
1	1	1	F		5978883G1	CCSA DISPLAY CONTROL	
2	1	1	C		5977070P1	BRKT CONTROL BD	
3	1	-	A		5977146P1	POTENTIOMETER, 5MEG R6	
4	-	0	A		5977145P1	POTENTIOMETER, 5K- R1-G.	
5	1	-	A		5977145P1	POTENTIOMETER, 5K R1, R6	
6	1	1	A	00779	RCR32G20WS	POTENTIOMETER, 5K R1, R7	
7	1	1	A	00779	1-480709-0	RES, 200 OHMS ±5%, 1W R7	
8	-	1			IN748A	CONN, CAP 12 PIN, J1 (AMP)	
9	3	10		00779	350561-3	DIODE 3.9V VRI	(AMP)
10	2	2		00779	350538-3	CONTACT, PLUG	(AMP)
11						CONTACT, PLUG	
12	AR	AR			93002P1	SOLDER	
13	REF	REF	D		5978884	SCHEM, DISPLAY CONTROL	
14	REF	REF	A		778000	APPL OF EPOXY MKG CMPD	
15	REF	REF	A		815003	PW & CKT BD, REQD FOR	
16							
17	-	1IN			278000P13	WIRE, BUS 22AWG	
18	6	6		06383	SST1M	CABLE TIE	
19	27IN	54IN	A		4174285P11	WIRE, ELEC 22 AWG, BLK	
20	54IN	190IN	A		4174285P20	WIRE, ELEC 22 AWG, WHT	
21	54IN	4IN	A		5978964P1	WIRE, 15KV 22 AWG, WHT	

SHEET ONE REVISION LETTER IS THE IDENTIFYING REVISION FOR THIS MULTISHEET DWG  
 SEE SHEET ONE FOR REVISION DESCRIPTIONS  
 SYMBOLS : INDICATES VENDOR ITEM - SEE SPEC/SOURCE CONTROL DWG.

SIZE	CODE IDENT NO.
A	94117 PL 5978882
REV	2
SHEET	2



REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
-		REL FOR PREPROD	22 OCT 79	JMK/PLM

TABLE A

"G" COND	DIM "L"	WIRE PER TABLE (SH2)
G1	21 IN.	B
G2	21 IN.	C
G3	21 IN.	D

REVISION STATUS OF SHEETS						
SHEET	1	2	3	4	5	6
REVISION	-	-				

G3 G2 G1 FOR PARTS LIST  
SEE PL 5978882

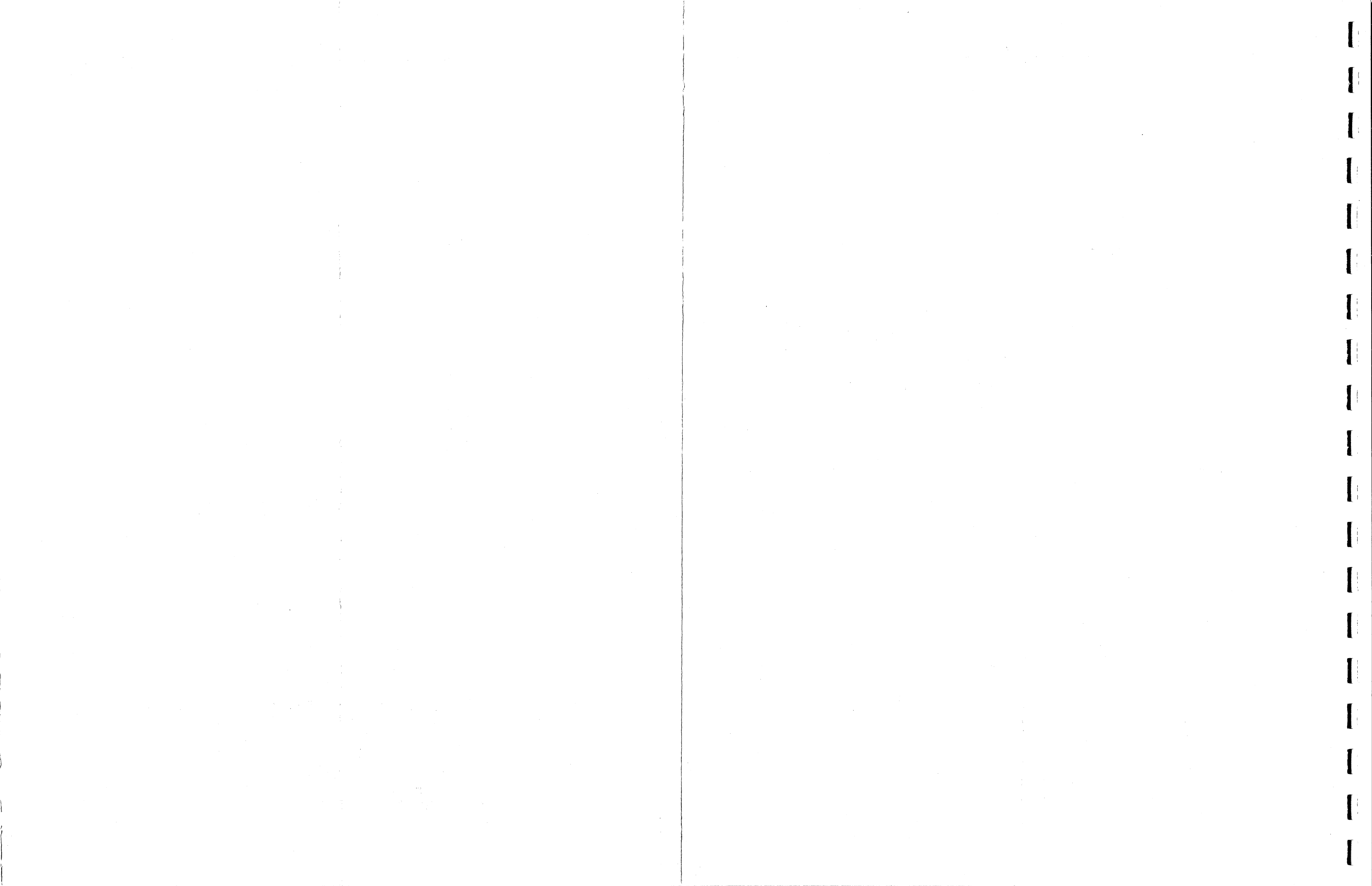
9. JUMPER TO BE USED ON G2 & G3 CONDITIONS ONLY.
8. MARK SERIAL NO., REV, AND "G" CONDITION .04-.16 HIGH CHARACTERS, FAR SIDE. APPLY PER ITEM 14.
7. PREFIX PARTIAL REFERENCE DESIGNATIONS WITH
6. SOLDER TIPS OR WIRE TO BE .06 MAX FROM BOARD
5. MAX COMPONENT HEIGHT TO BE
4. OTHER THAN SPECIFICALLY NOTED, CHARACTERS ARE REFERENCE AND NOT TO BE MARKED.
3. PARTS LIST SHEET ONE IS THE CONTROLLING REVISION FOR THE COMBINED PARTS LIST AND DRAWING.
2. THIS ASSY SHALL MEET THE REQUIREMENTS OF ITEM 15.
1. SHOP TOLERANCES AND DRAWING INTERPRETATION WITHIN 815002 SUPPLEMENT THIS DRAWING.

NOTES

5978929	FACTS	G6	G5	G4	G3	G2	G1	ITEM	SIZE	PART OR IDENTIFYING NO.	DESCRIPTION	
5977076	UDS	QTY PER ASSY						PARTS LIST				
5978992		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES						CONT NO.				
5977075		TOLERANCES						DR DATE				
5977074		.XX DECIMAL .XXX DECIMAL						13 OCT 79				
5977073		ANGLES						CHK DATE				
5977072								11-14-79				
5977071								11-14-79				
5977077								11-14-79				
5978930								11-14-79				
5978881	UDS	PREPROD						MFG DATE				
		CHANGE BY ECR ONLY						11/14/79				
		APPLICATION						SCALE 2/1				
								SHEET 1 OF 2				

0-334 REV-J

5978882



8

7

6

5

4

3

2

1

REVISIONS			
ZONE	LTR	DESCRIPTION	DATE
	-	REL FOR PREPROD	26 OCT 73
			MMX RSM

TABLE B (G1)

FROM	TO	WIRE ITEM NO.	CONTACT ITEM NO.
J1-1	E10	19	9
J1-2	E9	21	10
J1-3	E8	21	10
J1-5	E2	20	9
J1-6	E1	20	9

TABLE C (G2)

FROM	TO	WIRE ITEM NO.	CONTACT ITEM NO.
J1-1	E10	19	9
J1-2	J1-3	21	10
J1-4	E9	20	9
J1-5	E2	20	9
J1-6	E1	20	9
J1-8	E7	20	9
J1-9	E6	19	9
J1-10	E5	20	9
J1-11	E4	20	9
J1-12	E3	20	9

TABLE D (G3)

FROM	TO	WIRE ITEM NO.	CONTACT ITEM NO.
J1-1	E10	19	9
J1-2	J1-3	21	10
J1-4	E9	20	9
J1-5	E2	20	9
J1-6	E1	20	9
E11	E12	20	9

D

C

B

A

D

C

B

A

5978882

SIZE	CODE IDENT NO.	DWG NO.
D	94117	5978882
SCALE NONE		SHEET 2 OF 2

DO NOT SCALE PRINT

8

7

6

5

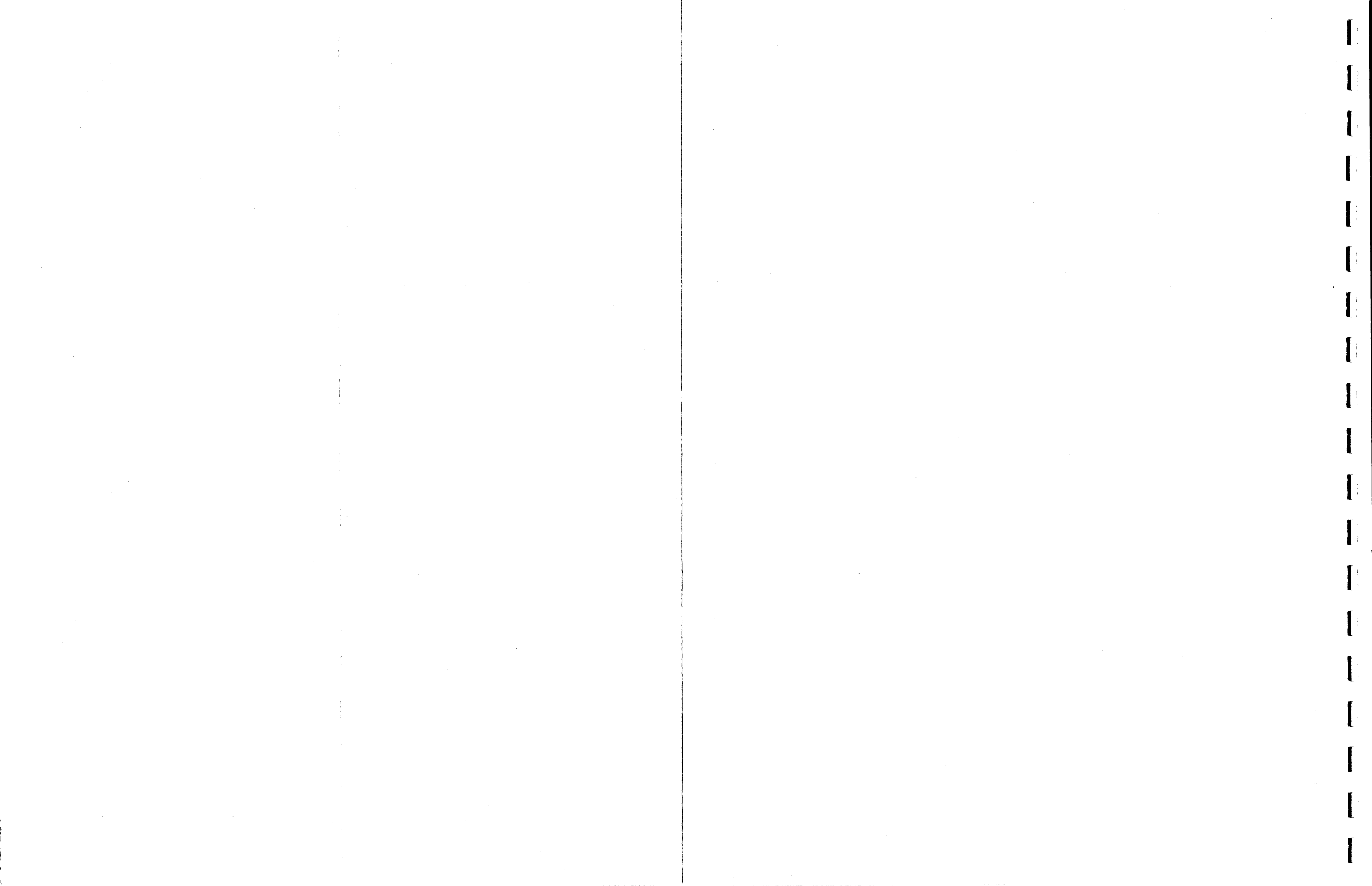
4

3

2

1

OP 654 REV 1



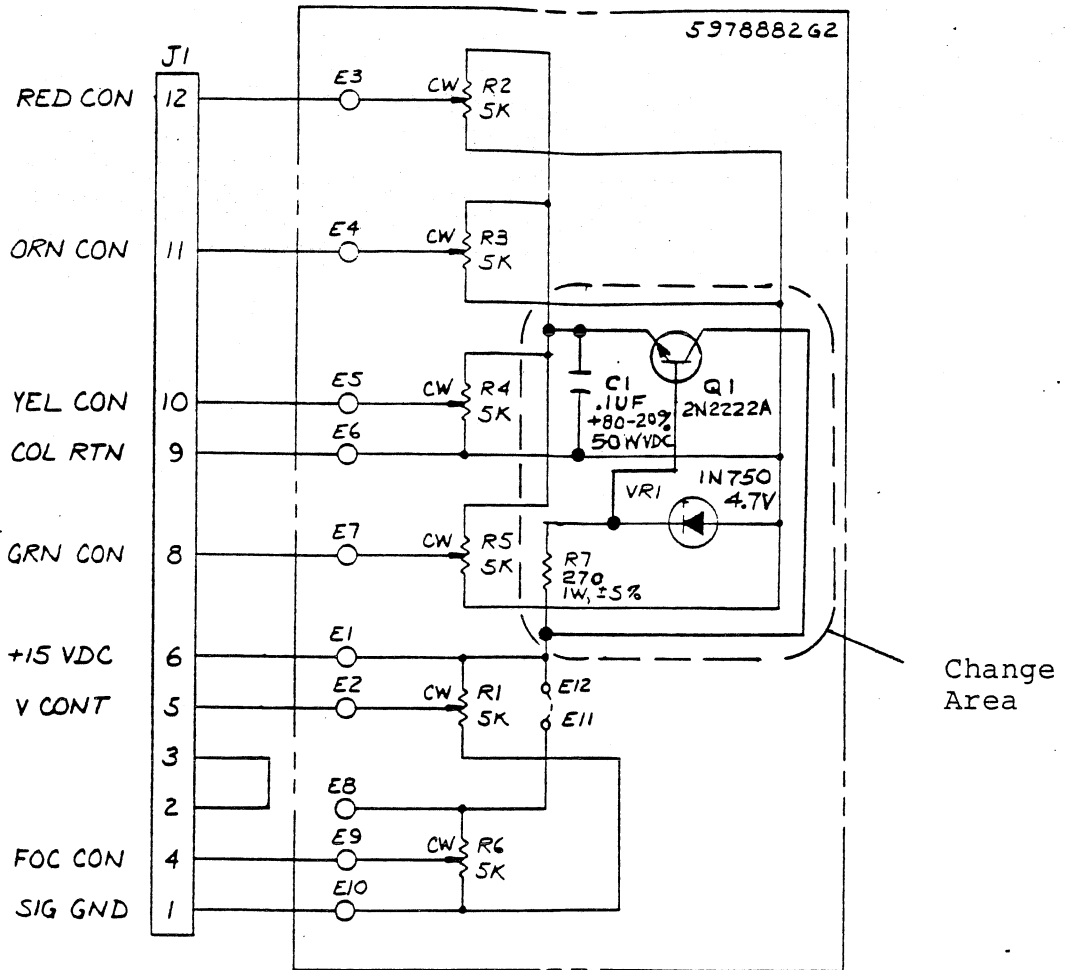
MANUAL NO. H-79-0378

DESCRIPTION G7 DISPLAY TECH MAN MOD 730-733

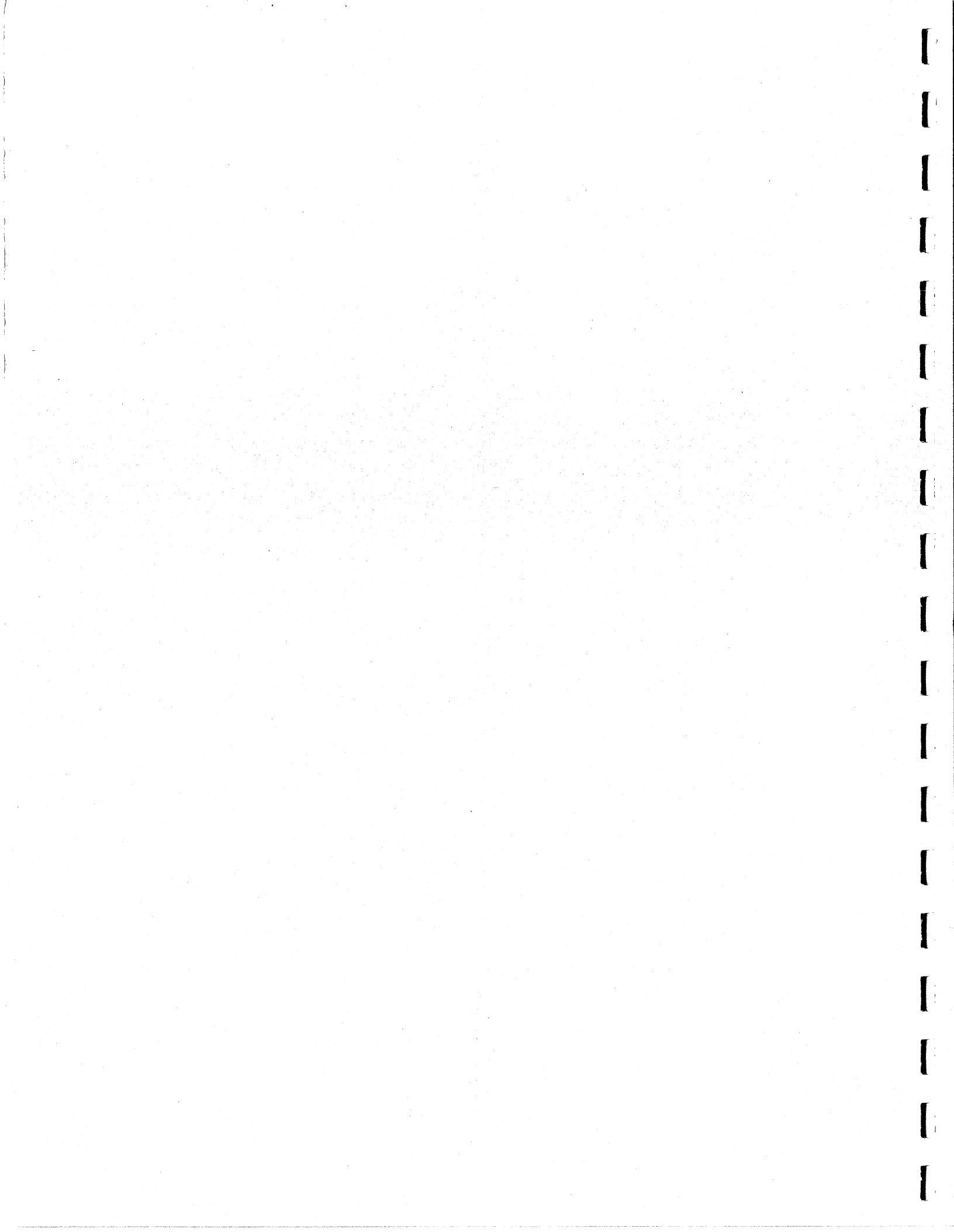
CCN NO. 7D001 DATE 3-13-81 CHANGE NO. 002

CHANGE INSTRUCTIONS

DRAWING ZONE C4

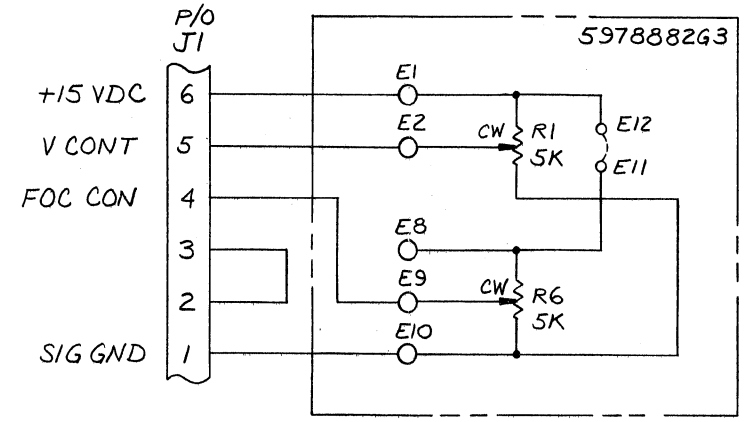
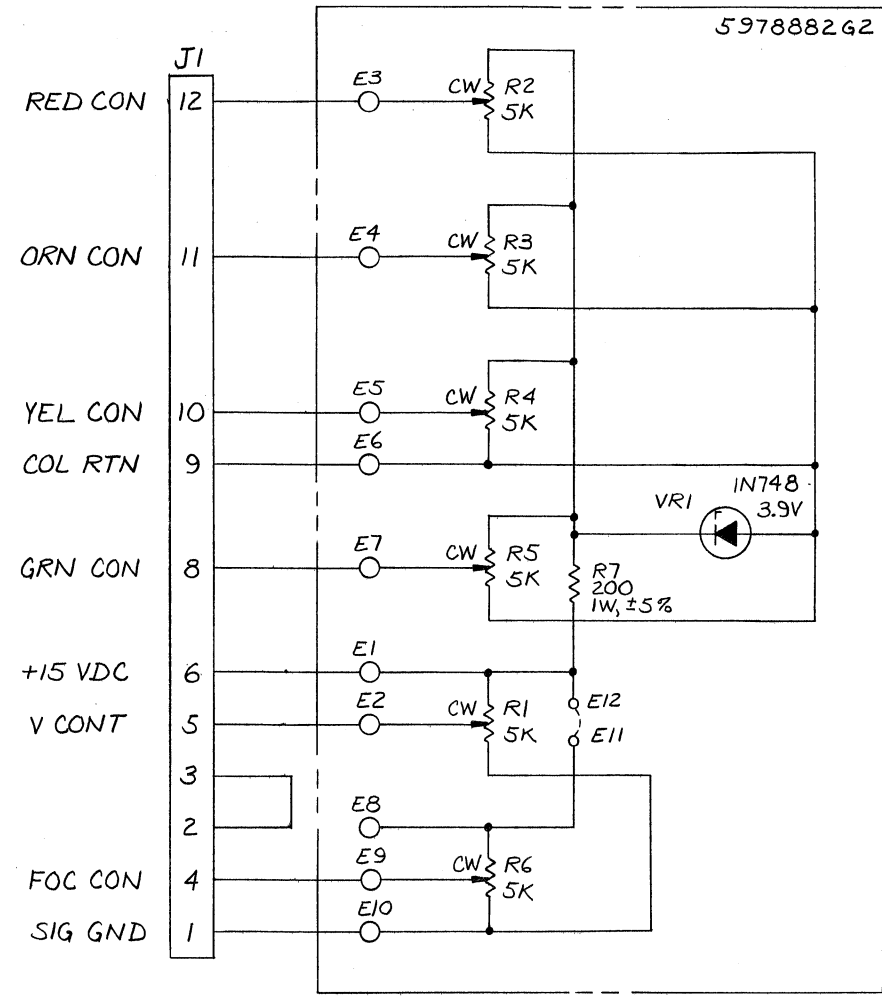
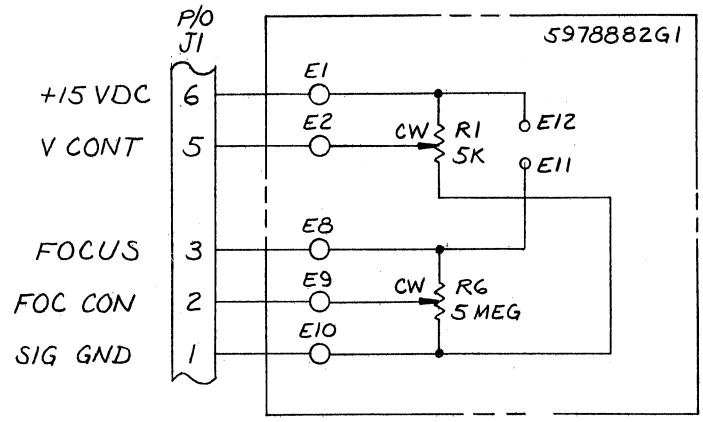


THIS PAGE OUTLINES THE CHANGE TO THE DISPLAY CONTROL SCHEMATIC DIAGRAM 5978884.





REVISIONS			
ZONE	LTR	DESCRIPTION	DATE
-		REL FOR PREPROD	8 OCT 79



1. INTERPRET DRAWING PER 815002
2. UNLESS OTHERWISE SPECIFIED  
RESISTANCE VALUES ARE IN OHMS  
RESISTORS ARE ± 10%, .5 W  
K=1,000  
MEG=1,000,000  
CAPACITANCE VALUES ARE IN PICOFARADS  
CAPACITORS ARE ± %, - V  
UF=MICROFARADS  
INDUCTANCE VALUES ARE IN MICROHENRIES
3. PREFIX PARTIAL REFERENCE DESIGNATIONS WITH

NOTES

REFERENCE DATA		PREPROD		CONT NO.	
DESCRIPTION	LAST NO.	DELETED NO.	CHANGE BY ECO ONLY	DATE	DATE
RESISTOR	R7		MFG	10/1/79	12 OCT 79
CAPACITOR	-				9 OCT 79
DIODE	VR1				10/12/79
TRANSISTOR	-				10/12/79
INDUCTOR	-		5978882	UDS	
MICROELEMENT	-				
WIRING DIAGRAM		APPLICATION		SCALE	

SA SANDERS ASSOCIATES, INC. NASHUA, NEW HAMPSHIRE

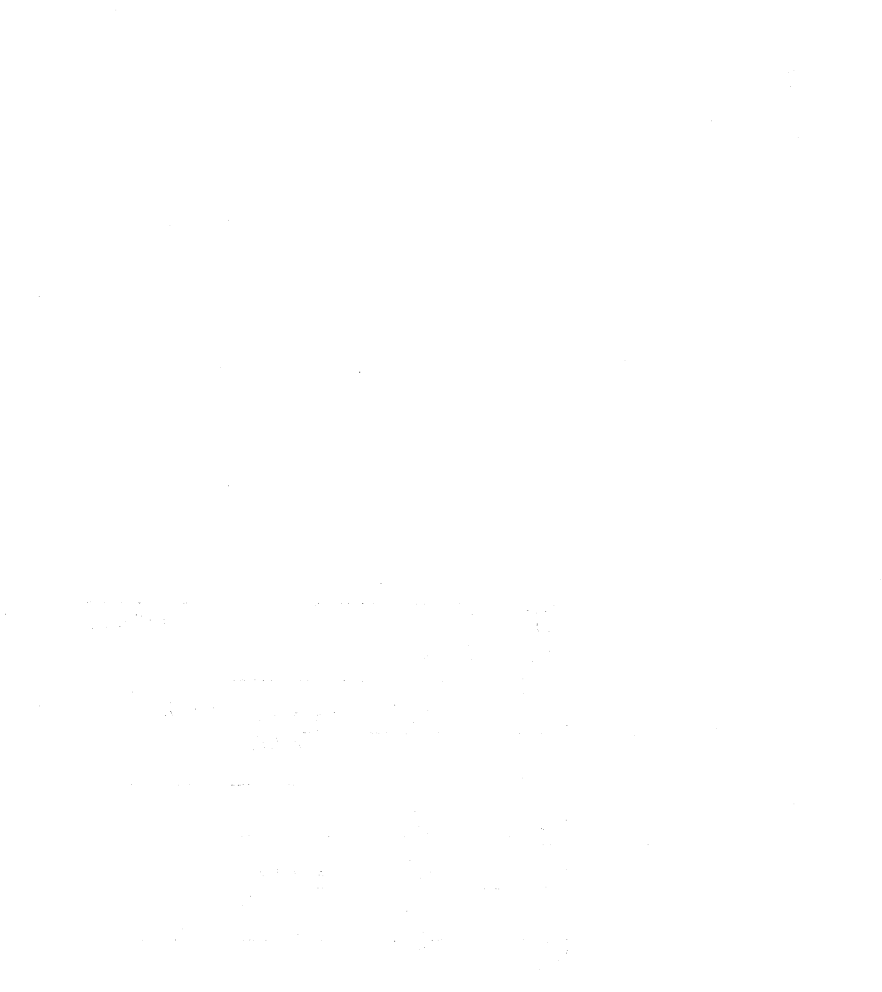
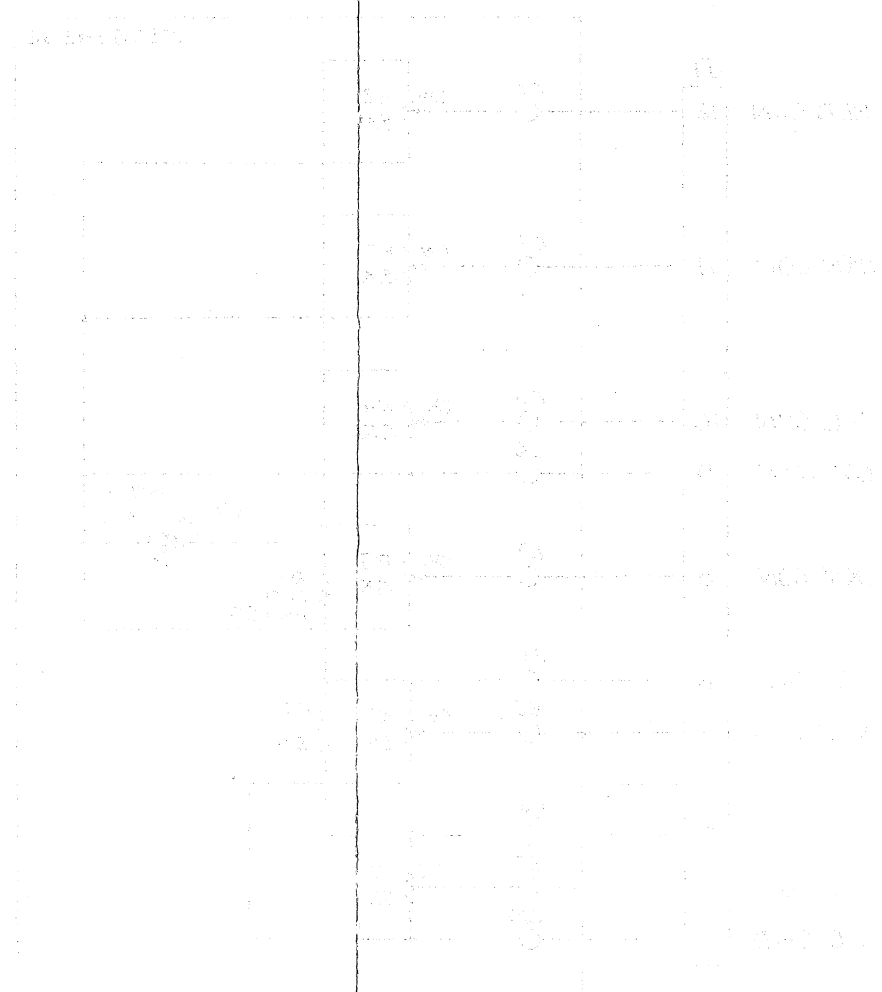
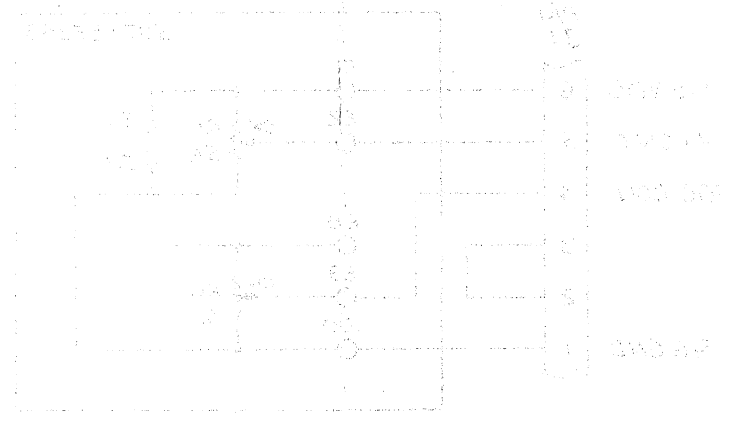
SCHEMATIC DIAGRAM  
DISPLAY CONTROL

SIZE CODE IDENT NO. DWG NO.  
D 94117 5978884

SHEET 1 OF 1  
DO NOT SCALE PRINT

5978884

FOR THE RECORD



NO.	DESCRIPTION	QUANTITY	UNIT	REMARKS
1	100V AC	5	PCS	
2	100V AC	5	PCS	
3	100V AC	5	PCS	
4	100V AC	5	PCS	
5	100V AC	5	PCS	

100V AC

100V AC

100V AC

100V AC

100V AC

REVISION STATUS													REVISIONS			
SH	1	2	3	4	5	6	7	8	9	10	11	12	LTR	DESCRIPTION	DATE	APPROVED
	A												-	REL FOR PREPROD	12 SEPT 79	P.K.
													A	REV PER ECO 962294	17 JAN 80	RDM/WL

DWG REV	A
WL REV	X

3. SELECT ONE ALTERNATE ITEM ONLY.

2. PARTS LIST SHEET ONE IS THE CONTROLLING REVISION FOR THE COMBINED PARTS LIST, DRAWING AND WIRE LIST.

1. SHOP PRACTICE TOLERANCES AND DRAWING INTERPRETATION WITHIN 815002 SUPPLEMENT THIS DRAWING.

<b>SA SANDERS ASSOCIATES, INC.</b>		NASHUA, NEW HAMPSHIRE	
CIRCUIT CARD ASSY			
LOW VOLTAGE FILTER			
SIZE	CODE IDENT NO.	A 94117 PLS978923	
SHEET 1		OF 2	

DR	PP Marshall	DATE	JUN 79
APPD			
CHK			
DES			
ENG			
PROJ			

PREPROD	CHANGE BY ECO ONLY
5978864	LIDS
NEXT ASSY	USED ON
APPLICATION	
MFG	9/2/79

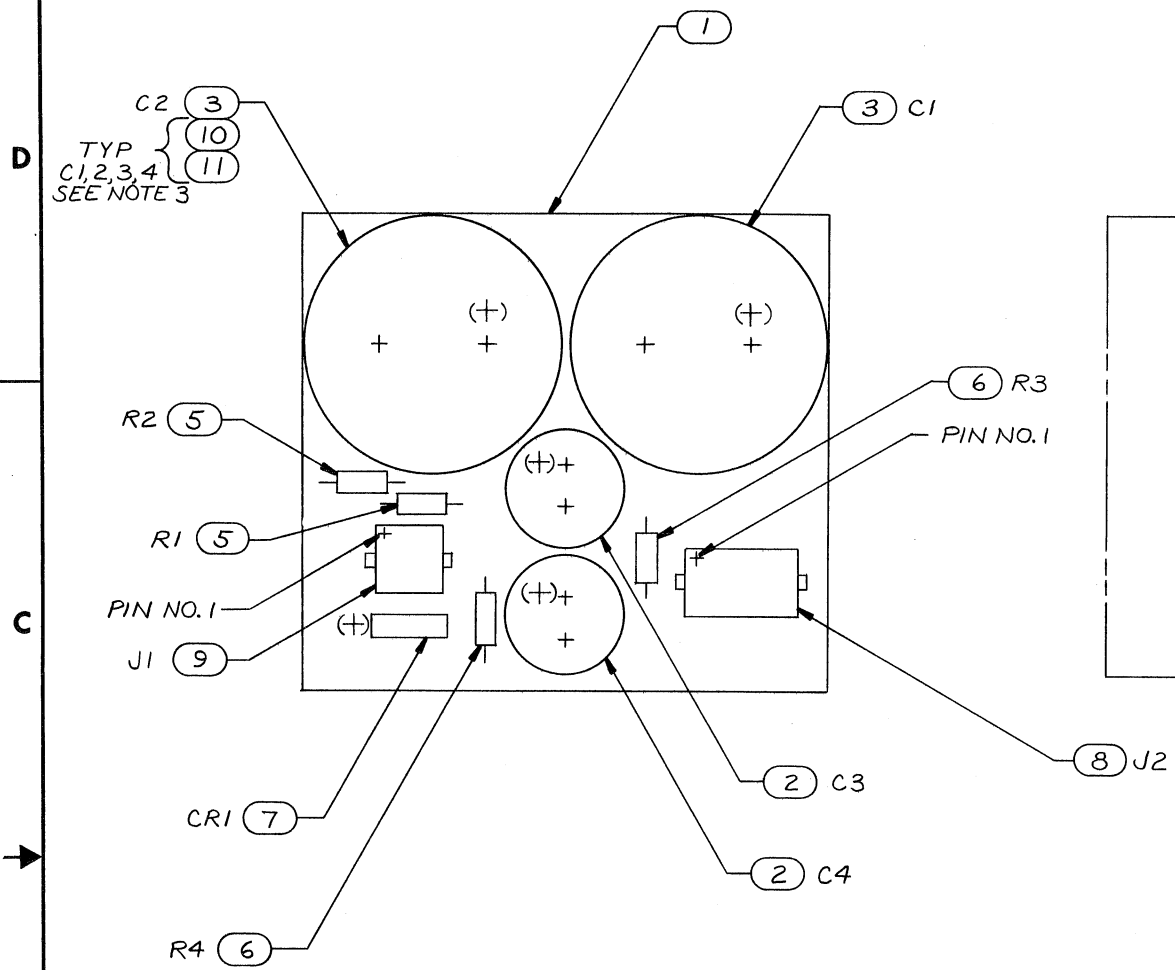
**PARTS LIST**

ITEM NO.	QTY PER ASSY		DWG SIZE	CODE IDENT	PART OR IDENTIFYING NO.	DESCRIPTION	SYM
	G	G					
1	1		E		5978924G2	CCSA, LOW VOLTAGE FILTER	
2	2		A		5977010PI	CAP, ELECTROLYTIC, 3300-4900UF, -10+75%, 60 VDC C3, 4	
3	2		A		5977011PI	CAP, ELECTROLYTIC, 26,000-36,000UF -10+75%, 40 VDC C1, 2	
4							
5	2				RCR42G122JS	RES, 1.2K OHMS, 2W R12	
6	2				RCR42G272JS	RES, 2.7K OHMS, 2W R3,4	
7	1			14099	3SBMB2F	BRIDGE, DIODE CRI	
8	1			00779	350434-1	CONN, ELEC, 15 PIN J2	
9	1			00779	350432-1	CONN, ELEC, 9 PIN J1	
10	8				MS51958-61	SCREW, MACH, PH, .190-32X.38 LG	
11	8				MS35333-73	WASHER, LOCK, INTERNAL TOOTH.190	
12	REF		E		5978925	SCHEMATIC DIAGRAM	
13	REF		A		7780000	EPOXY MARKING CMPD, APPL OF	
14	AR		A		93002PI	SOLDER	

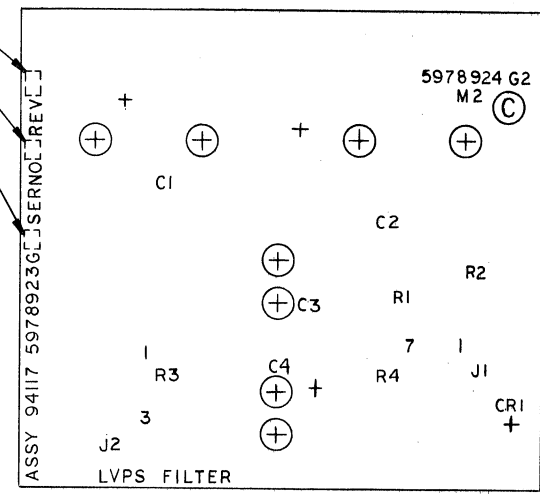
SHEET ONE REVISION LETTER IS THE IDENTIFYING REVISION FOR THIS MULTISHEET DWG  
 SEE SHEET ONE FOR REVISION DESCRIPTIONS  
 SYMBOLS : INDICATES VENDOR ITEM - SEE SPEC/SOURCE CONTROL DWG.

SIZE	CODE IDENT NO.	REV	SHEET
A	94117 PL	A	2
		5978923	

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
-		REL FOR PREPROD	22 AUG 79	JMK
A		REV PER ECO 96294	17 JAN 80	RDPM WL



SEE NOTE 2



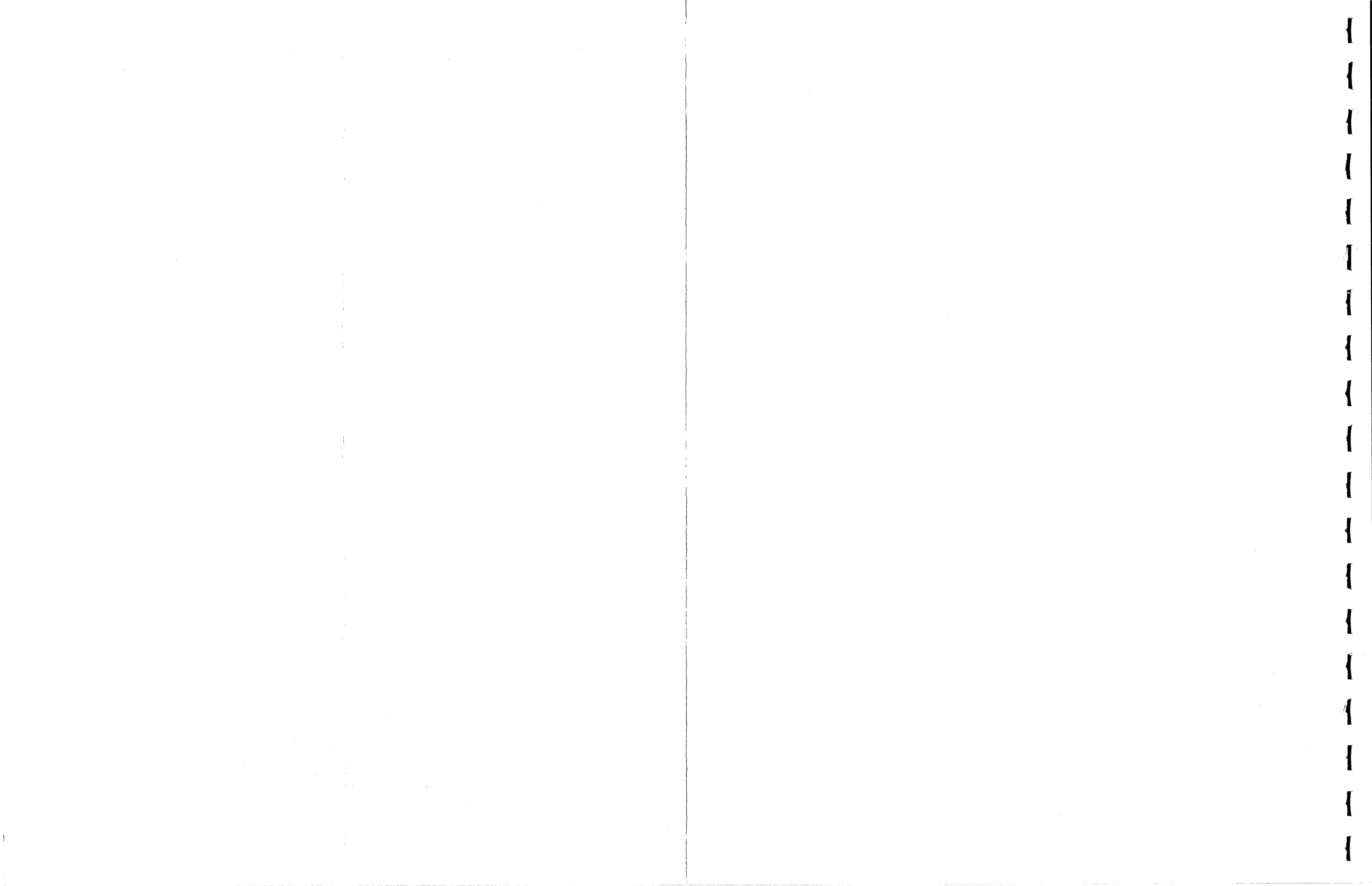
(G1) FOR PARTS LIST  
SEE PL 5978923

3. TORQUE CAPACITOR MOUNTING SCREWS TO 20-25 IN-LBS. (TYP 4 CAPS)
2. MARK APPROPRIATE "G" COND. SER NO. AND REV .04-.16 HIGH, GOTHIC TYPE, CONTRASTING COLOR, AND LOCATE APPROX. AS SHOWN. APPLY PER ITEM 13.
1. SHOP TOLERANCES AND DRAWING INTERPRETATION WITHIN 815002 SUPPLEMENT THIS DRAWING.

NOTES

G6	G5	G4	G3	G2	G1	ITEM	SIZE	PART OR IDENTIFYING NO.	DESCRIPTION
QTY PER ASSY						PARTS LIST			
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES						CONT. NO.			
TOLERANCES						DATE			
.XX DECIMAL .XX DECIMAL						DR <i>Macon</i> 21 AUG 79			
± ±						CHK <i>Lucille</i> 12 SEP 79			
ANGLES						DR <i>Lucille</i> 12 SEP 79			
± ±						CHK <i>Lucille</i> 12 SEP 79			
5978864 UDS						PREPROD			
NEXT ASSY USED ON						CHANGE BY ECO ONLY			
APPLICATION						MFG <i>HEG</i> 9/12/79			
SA SANDERS ASSOCIATES, INC. NASHUA, NEW HAMPSHIRE						CIRCUIT CARD ASSY LOW VOLTAGE FILTER			
SIZE CODE IDENT NO. DWG NO.						D 94117 5978923			
SCALE 1/1						SHEET 1 OF 1			

5978923



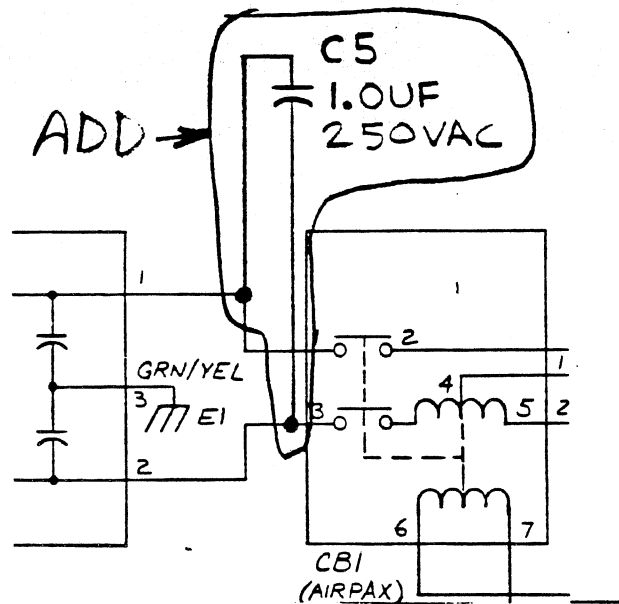
MANUAL NO. H-79-03 78

DESCRIPTION MODELS 730-733 MONOCHROME DISPLAY TECHNICAL MANUAL

CCN NO. 7D002 DATE 2-23-81 CHANGE NO. 001

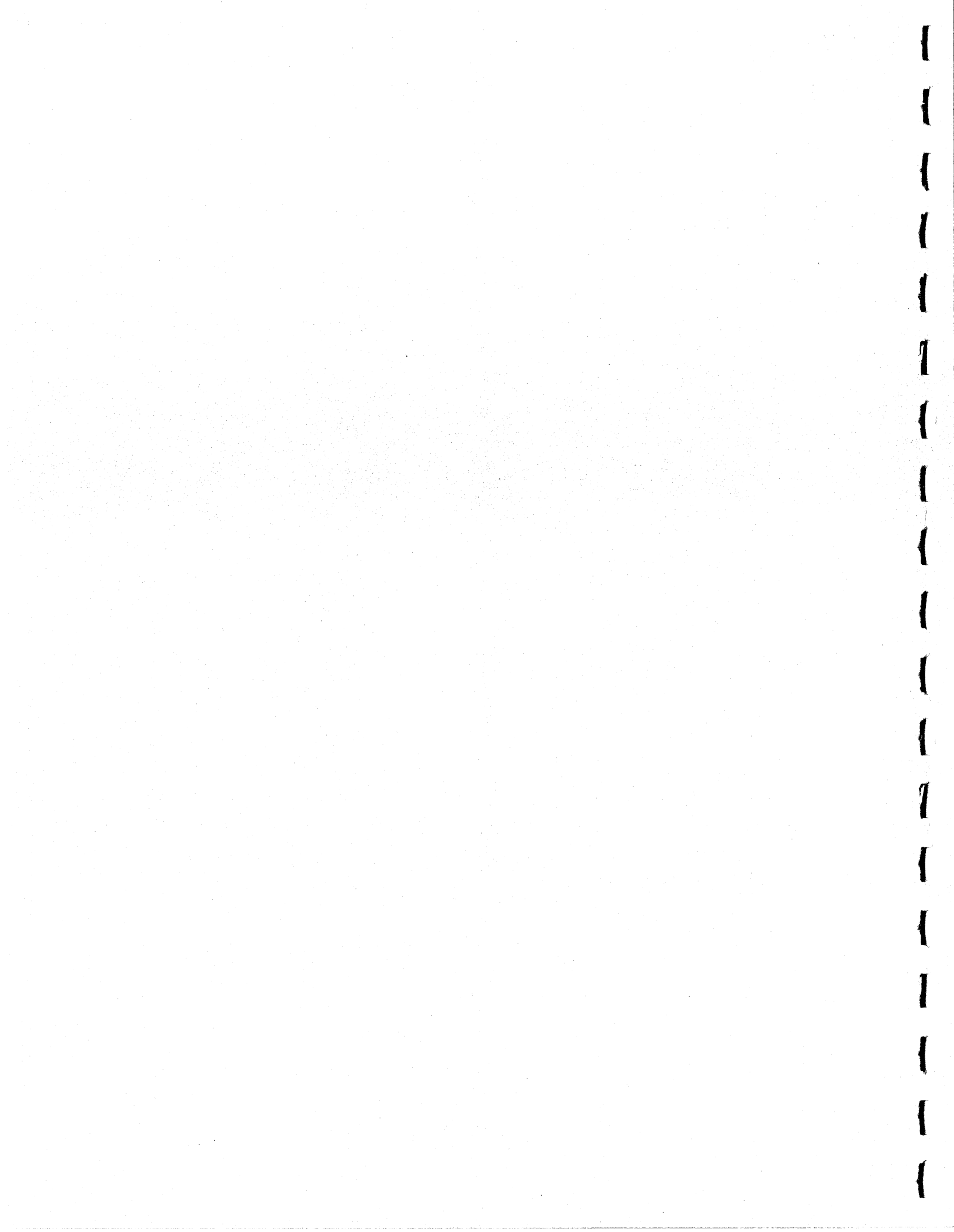
CHANGE INSTRUCTIONS

DRAWING ZONE D7



THIS PAGE OUTLINES THE CHANGE TO THE LVPS SCHEMATIC DIAGRAM 5978925.

5978925  
CHANGE 1





REVISIONS		DATE	APPROVED
-	REL FOR PREPROD	12 SEP 75	RL/BJ
A	REV PER ECO 96294	17 JAN 76	NRM/ML

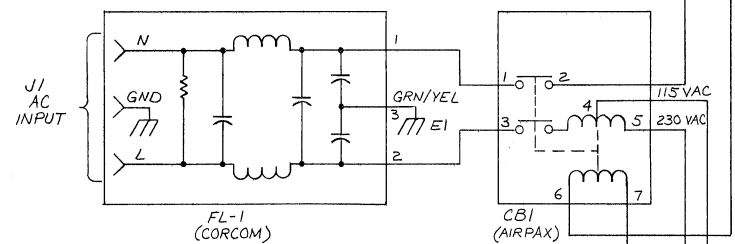
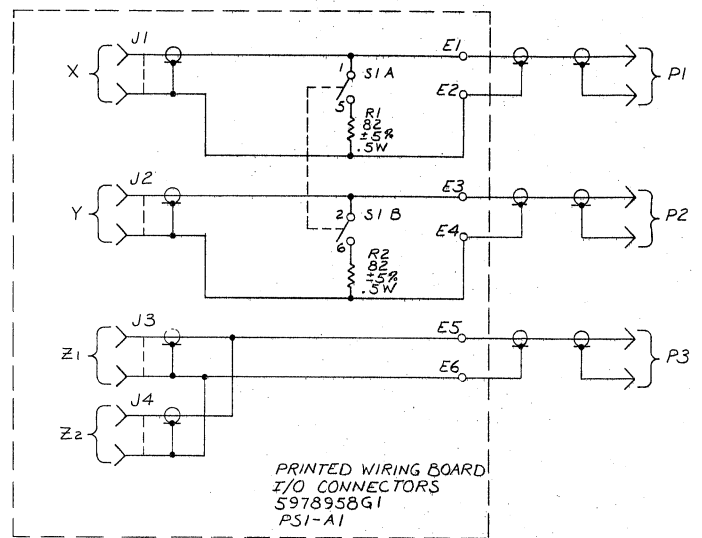
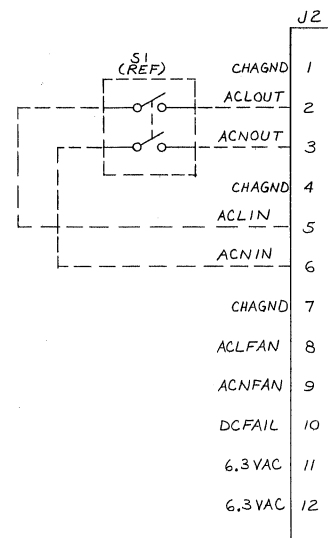
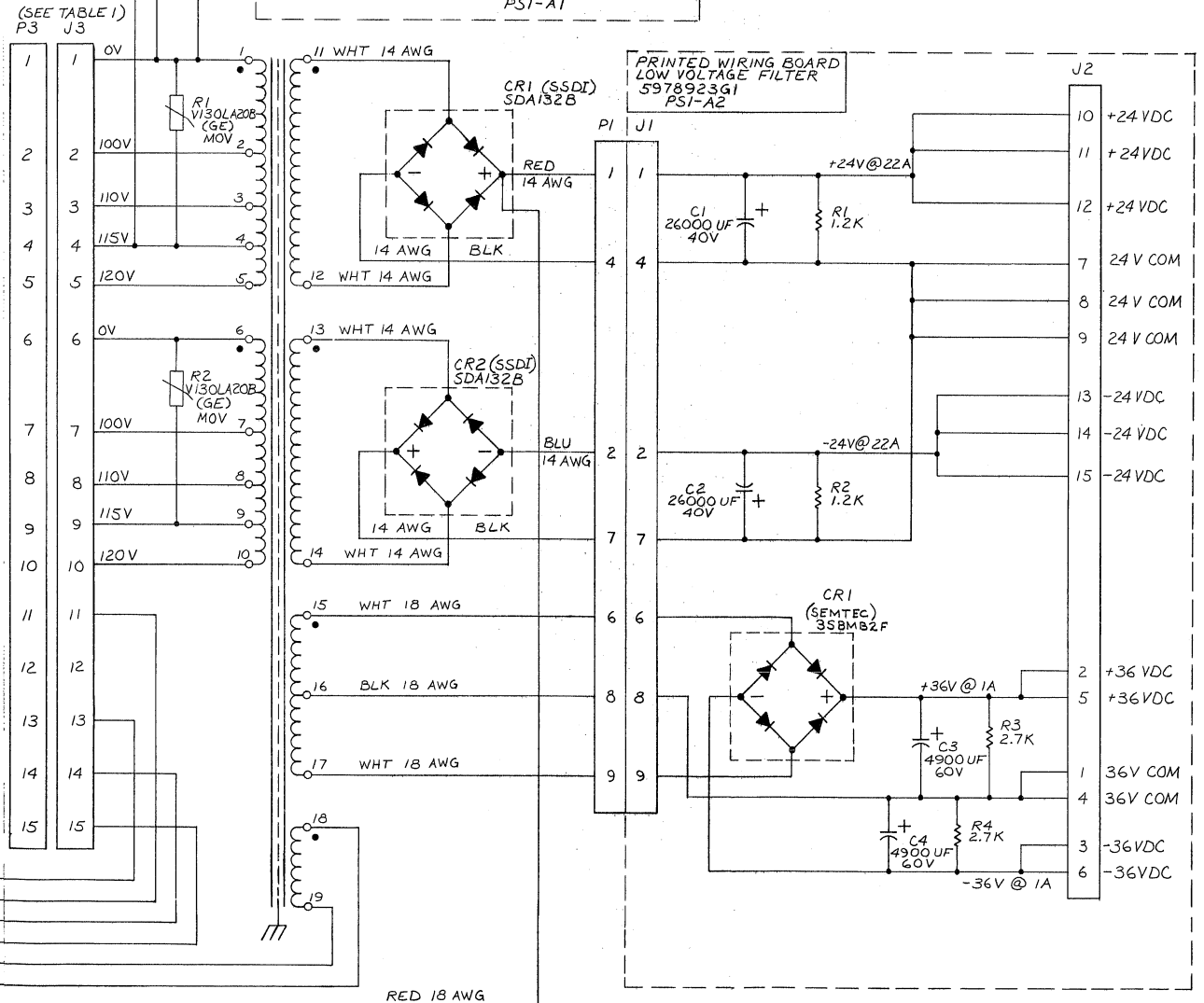


TABLE 1

INPUT VOLTAGE	P3 JUMPER		
100V	1-6	2-7-11	13-14
110V	1-6	3-8-11	13-14
115V	1-6	4-9-11	13-14
120V	1-6	5-10-11	13-14
200V	2-6	7-11-12	13-15
208V	2-6	8-11-12	13-15
220V	3-6	8-11-12	13-15
230V	4-6	9-11-12	13-15
235V	4-6	10-11-12	13-15
240V	5-6	10-11-12	13-15

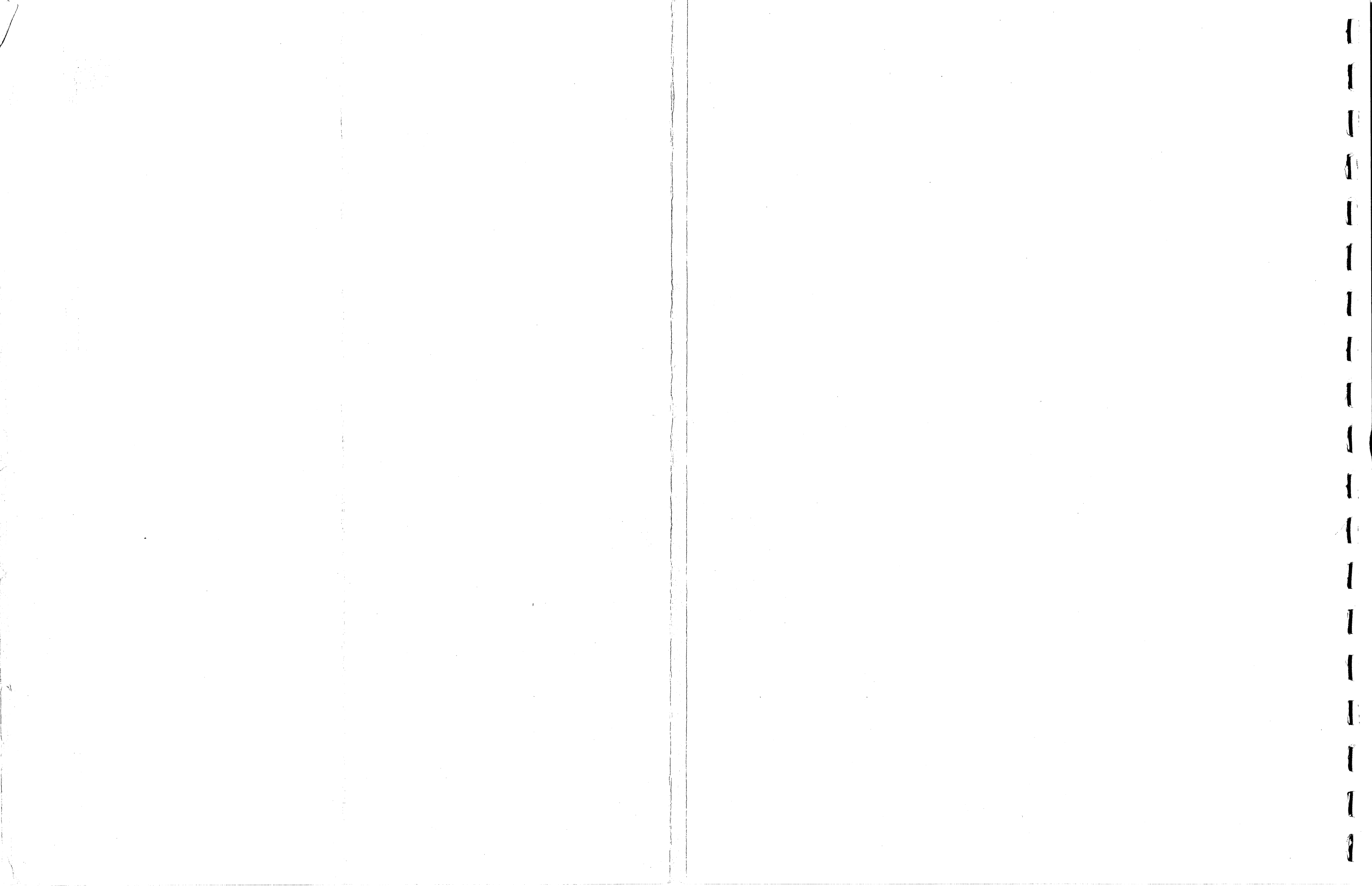


- UNLESS OTHERWISE SPECIFIED, ALL WIRES SHALL BE BROWN.
- UNLESS OTHERWISE SPECIFIED, ALL WIRING SHALL BE UL STYLE 1015 (CSA TYPE TEW).
- REFERENCE DESIGNATIONS ARE ABBREVIATED. PREFIX THE DESIGNATIONS WITH UNIT NO. OR ASSEMBLY DESIGNATION OR BOTH.
- UNLESS OTHERWISE SPECIFIED, RESISTANCE VALUES ARE IN OHMS. RESISTORS ARE ± 5%, 2 W. K=1,000. MB=1,000,000. CAPACITANCE VALUES ARE IN PICOFARADS. CAPACITORS ARE ± 5%, V. UF=MICROFARADS. INDUCTANCE VALUES ARE IN MICROHENRIES.

1. INTERPRET DRAWING PER 815002

REFERENCE DATA		PREPROD	CONT. NO.	SANDERS ASSOCIATES, INC.	
DESCRIPTION	LAST NO.	DELETED NO.	DATE	MAHWAH, NEW HAMPSHIRE	
RESISTOR	R4		13 AUG 75	SCHEMATIC DIAGRAM	
CAPACITOR	C4		12 SEPT 75	LOW VOLTAGE P. S.	
DIODE	CR2			E 94117 5978925	
TRANSISTOR				SCALE NONE	
INDUCTOR				DO NOT SCALE PRINT	
MICROELEMENT				SHEET 1 OF 1	

5978925



REVISION STATUS												REVISIONS					
SH	1	2	3	4	5	6	7	8	9	10	11	12	LTR	DESCRIPTION	DATE	APPROVED	
REVISION	A	A	-	-	-	-	-	-	-	-	-	-	-	-	REL FOR PREPROD	21 DEC 79	WJ Pak
REVISION	13	14	15	16	17	18	19	20	21	22	23	24	A	REV PER ECO 96337	20 FEB 80	WG/WL	

W  
W

DWG REV	-
WL REV	X

3. P' COND TO BE DETERMINED BY CUSTOMER

- 2. PARTS LIST SHEET ONE IS THE CONTROLLING REVISION FOR THE COMBINED PARTS LIST, DRAWING AND WIRE LIST.
- 1. SHOP PRACTICE TOLERANCES AND DRAWING INTERPRETATION WITHIN 815002 SUPPLEMENT THIS DRAWING.

**PREPROD**  
CHANGE BY ECO ONLY

CONT NO.	
D	1
R	1
R	1
F	1
T	1
G	1
E	1
N	1
O	1
R	1
G	1

DATE	12-21-79
BY	J. Moncont
CHK	W. J. Pak
DATE	12-25-79
BY	W. J. Pak
CHK	W. J. Pak
DATE	12-21-79
BY	W. J. Pak
CHK	W. J. Pak

**SA SANDERS ASSOCIATES, INC.**  
NASHUA, NEW HAMPSHIRE

MODEL 731/733 ASSY  
21" MONO, 19" x 24" RACK

SIZE CODE IDENT NO.  
**A 94117** PL 5978930

SHEET 1 OF 5

MFG  
1/180  
W. J. Pak

## PARTS LIST

ITEM NO.	QTY PER ASSY		DWG SIZE	CODE IDENT	PART OR IDENTIFYING NO.	DESCRIPTION	SYM
	G1	G2					
1	1	-	A/E		5978880G1	CHASSIS, ASSY UDS	
2	+	1	A/E		5978880G2	CHASSIS, ASSY UDS	
3	1	1	A/C		5978882G1	CCA, DISPLAY CONTROL, A4	
4	1	1	A/U		59777080G1	CCA, VIDEO (LVES), A3	
5	1	1	C		5978878G1	HARNES A/C	
6	1	1	E		5978906P1	FRAME, BEZEL RACK, 19/24"	
7	1	1	E		5978934P1	BEZEL, 21" CRT	
8	1	1	A		5977421P	CATHODE RAY TUBE, VI NOTE 3	
9	1	1	E		5978937P1	EXTENSION, 21" CRT	
10	1	1	D		5978874P1	SHIELD, TUBE, A5	
11	1	1	D		5978875P1	YOKE, LI	
12	1	1	D		4172083P1	PAD, COMPRESSION, YOKE	
13	1	1	B		4172087P1	PAD, SUPPORT, YOKE	
14	2	2	B		1088598P1	HVPS, LOW VOLTAGE FOCUS, PS2	
15	1	2	A		5976323P1	KNOB, CONTROL	
16	2	2	B		5976326P1	INSERT, CONTROL KNOB FOCUS	
17	1	1	C		5976326P2	INSERT, CONTROL KNOB BRIGHTNESS	
18	1	1	C		4174119P1	TAPE	
19	12 IN	12 IN	A		5978889P1	SLIDES, CHASSIS	
20	1	1	A		5978905P1	SPACER, SLIDE	
21	2	2	D		5976322G1	BRKT, ADAPTER, SLIDE	
22	-	-	B		5976322G2	BRKT, ADAPTER, SLIDE	
23	-	-	B				

SHEET ONE REVISION LETTER IS THE IDENTIFYING REVISION FOR THIS MULTISHEET DWG  
SEE SHEET ONE FOR REVISION DESCRIPTIONS  
SYMBOLS : INDICATES VENDOR ITEM - SEE SPEC/SOURCE CONTROL DWG.

SIZE CODE IDENT NO.

A

94117

PL

5978930

REV A

SHEET 2

## PARTS LIST

ITEM NO.	QTY PER ASSY		DWG SIZE	CODE IDENT	PART OR IDENTIFYING NO.	DESCRIPTION	SYM
	G1	G2					
24	2	2	C		5976283P1	BRKT, EXTENSION, MTG, SLIDE	
25	10	10	A		MSS1958-64	SCR, MACH PNH .190(10)-32x.62	
26	16	16	A		MSS1957-81	SCR, MACH PNH .250-20 X.75	
27	20	20	A		MSS1958-62	SCR, MACH PNH .190(10)-32X 44	
28							
29							
30	30	30	A		MS15795-808	WASHER, FLAT NO.10	
31	12	12	A		MS15795-810	WASHER, FLAT NO..250	
32	30	30	A		MS35338-138	WASHER, LKG NO.10	
33	16	16	A		MS35338-139	WASHER, LKG NO.: 250	
34	4	4	A		MS15795-811	WASHER, FLAT NO.250 LG, PATTEAN	
35	10	10	A		MS35650-304	NUT, PLAIN HEX .190(10)-32	
36							
37							
38	2	2	A		MS3367-4-9	TIE, CABLE	
39	2	2	A		MS35489-10	GROMMET, RUBBER	
40							
41							
42	-	-	C		5976327P1	BRKT, EXTENSION, MTG, SLIDE	
43	-	-	C		5976327P2	BRKT, EXTENSION, MTG, SLIDE	

SHEET ONE REVISION LETTER IS THE IDENTIFYING REVISION FOR THIS MULTISHEET DWG  
SEE SHEET ONE FOR REVISION DESCRIPTIONS  
SYMBOLS : INDICATES VENDOR ITEM - SEE SPEC/SOURCE CONTROL DWG.

SIZE CODE IDENT NO.

A 94117 PL

5978930

REV -

SHEET 3

# PARTS LIST

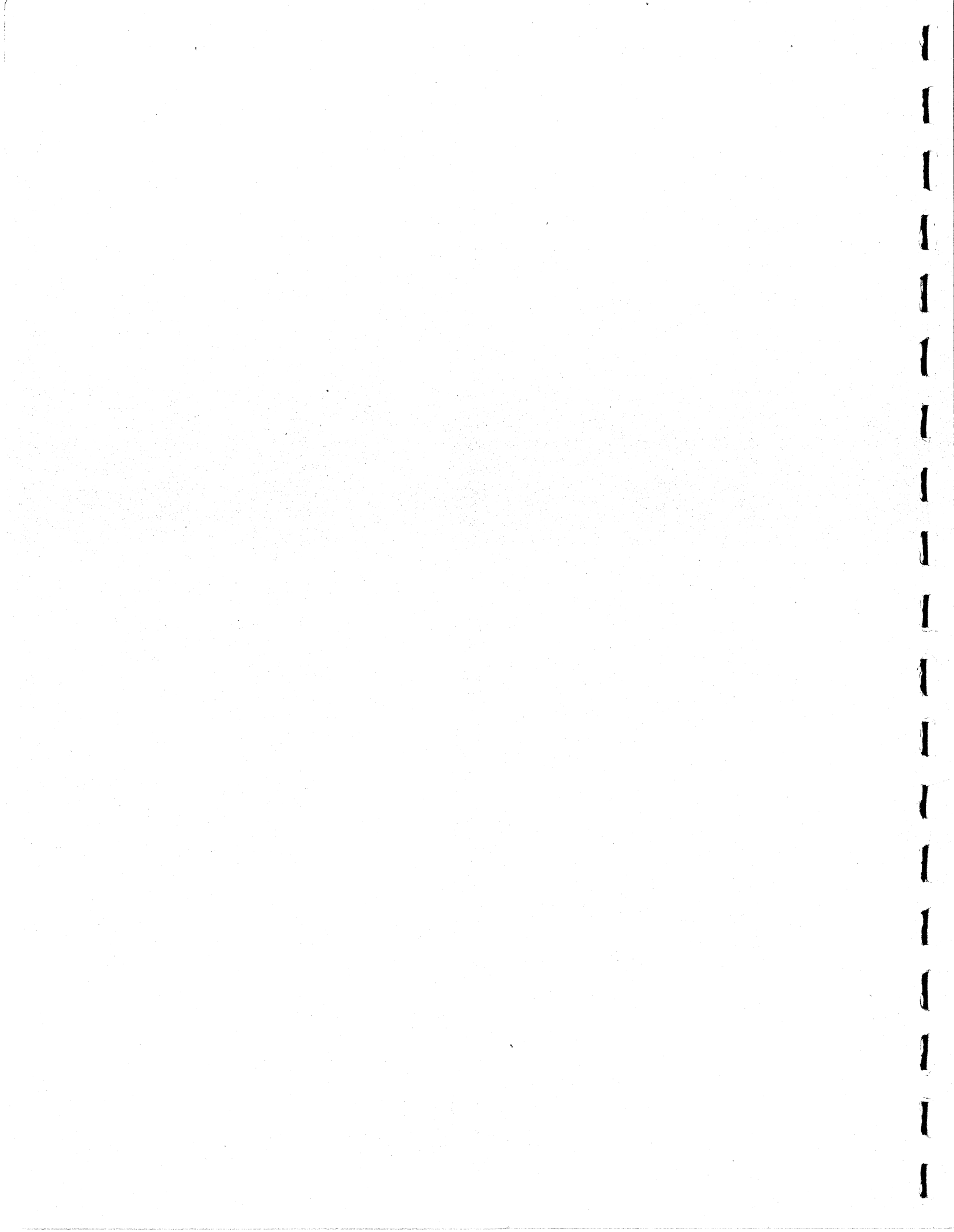
ITEM NO.	QTY PER ASSY		DWG SIZE	CODE IDENT	PART OR IDENTIFYING NO.	DESCRIPTION	SYM
	G	G					
1	-		A/E		5978880G1	CHASSIS ASSY, UDS	
2	1		A/E		5978880G2	CHASSIS ASSY, UDS	
3	1		A/C		5978882G1	CCA, DISPLAY CONTROL, A4	
4	1		A/J		5977080G1	CCA, VIDEO (LVES)	A3
5	1		C		59788878G1	HARNES, A/C	
6	1		E		5978906P1	FRAME, BEZEL RACK, 19"24"	
7	1		E		5978934P1	BEZEL 21" CRT	
8	1		A		5977421P----	CATHODE RAY TUBE, VI, NOTE 3	
9	1		E		5978937P1	EXTENSION, 21" CRT	
10	1		D		5978874P1	SHIELD, TUBE, A5	
11	1		D		5978875P1	YOKE, L1	
12	1		B		4172083P1	PAD, COMPRESSION, YOKE	
13	1		B		4172087P1	PAD, SUPPORT, YOKE	
14	2		A		1088598P1	HVPS, LOW VOLTAGE FOCUS, PS2	
15	1		B		5976323P1	KNOB, CONTROL	
16	2		C		5976326P1	INSERT, CONTROL KNOB, FOCUS	
17	1		C		5976326P2	INSERT, CONTROL KNOB, BRIGHTNESS	
18	1		A		4174119P1	TAPE	
19	12 IN.		A		5978889P1	SLIDES, CHASSIS	
20	1		D		5978905P1	SPACER, SLIDE	
21	-		B		5976322G1	BRKT, ADAPTER, SLIDE	
22	1		B		5976322G2	BRKT, ADAPTER, SLIDE	
23	1		B				

SHEET ONE REVISION LETTER IS THE IDENTIFYING REVISION FOR THIS MULTISHEET DWG SEE SHEET ONE FOR REVISION DESCRIPTIONS SYMBOLS : INDICATES VENDOR ITEM - SEE SPEC/SOURCE CONTROL DWG.	SIZE CODE IDENT NO. <b>A 94117 PL 5978930</b>	REV -	SHEET 4
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# PARTS LIST

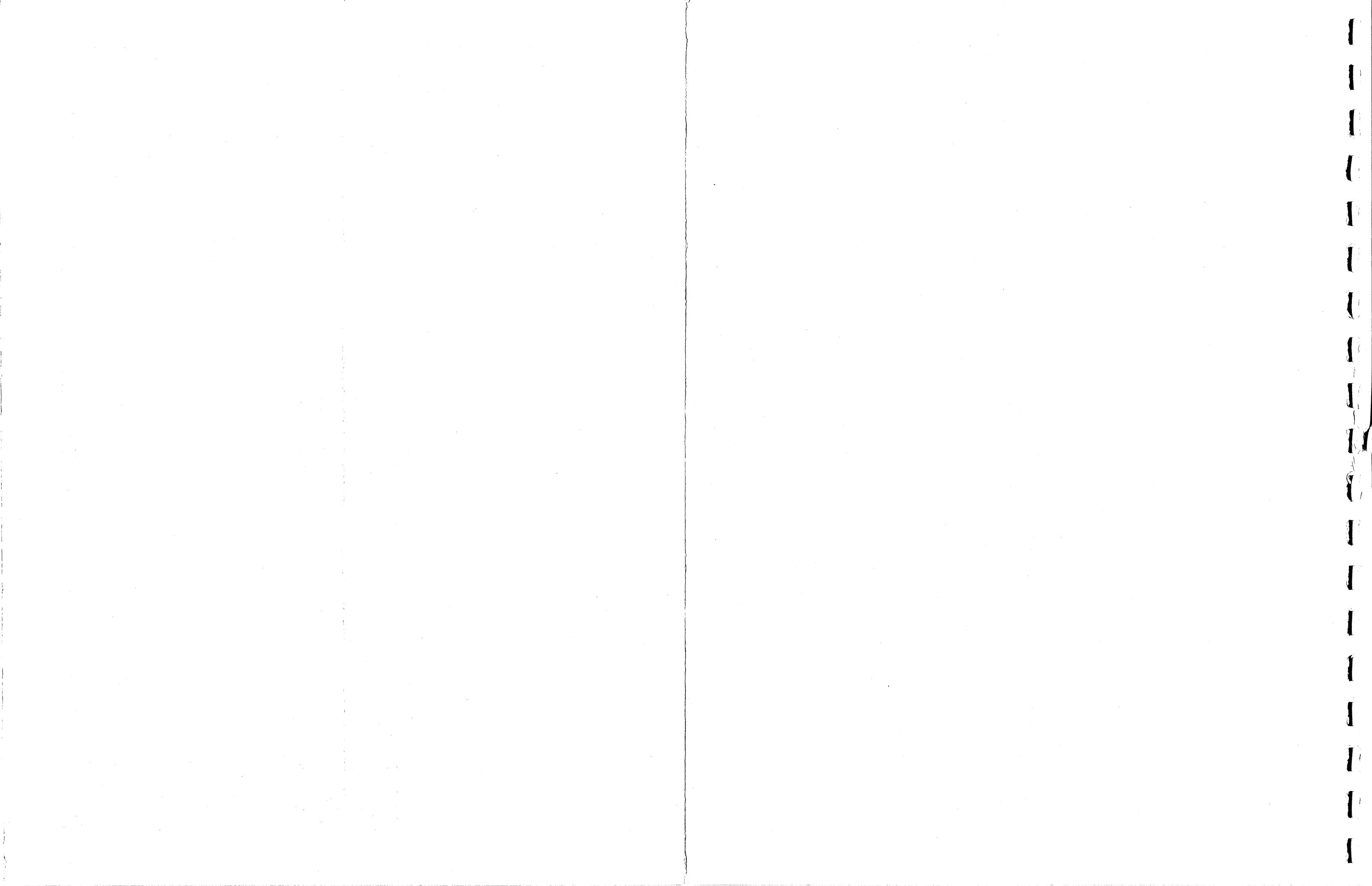
ITEM NO.	QTY PER ASSY		DWG SIZE	CODE IDENT	PART OR IDENTIFYING NO.	DESCRIPTION	SYM
	G	G					
24	-		C		5976283PI	BRKT, EXTENSION, MTG, SLIDE	
25	2		A		MS51958-64	SCR, MACH PNH .190(10)-32 X.62	
26	16		A		MS51957-81	SCR, MACH PNH. 250-20 X.75	
27	20		A		MS51958-62	SCR, MACH PNH .190(10)-32 X.44	
28							
29							
30	24		A		MS15795-808	WASHER, FLAT NO. 10	
31	12		A		MS15795-810	WASHER, FLAT NO. 250	
32	32		A		MS35338-138	WASHER, LKG NO. 10	
33	16		A		MS35338-139	WASHER, LKG NO. 250	
34	4		A		MS15795-811	WASHER, FLAT NO. 250 LG PATTERN	
35	10		A		MS35650-304	NUT, PLAIN HEX .190(10)-32	
36							
37							
38	2		A		MS3367-4-9	TIE, CABLE	
39	2		A		MS35489-10	GROMMET, RUBBER	
40							
41							
42	1		C		5976327P1	BRKT, EXTENSION, MTG, SLIDE	
43	1		C		5976327P2	BRKT, EXTENSION, MTG, SLIDE	

SHEET ONE REVISION LETTER IS THE IDENTIFYING REVISION FOR THIS MULTISHEET DWG SEE SHEET ONE FOR REVISION DESCRIPTIONS SYMBOLS : INDICATES VENDOR ITEM - SEE SPEC/SOURCE CONTROL DWG.	SIZE CODE IDENT NO. <b>A 94117 PL 5978930</b>
REV --	SHEET 5

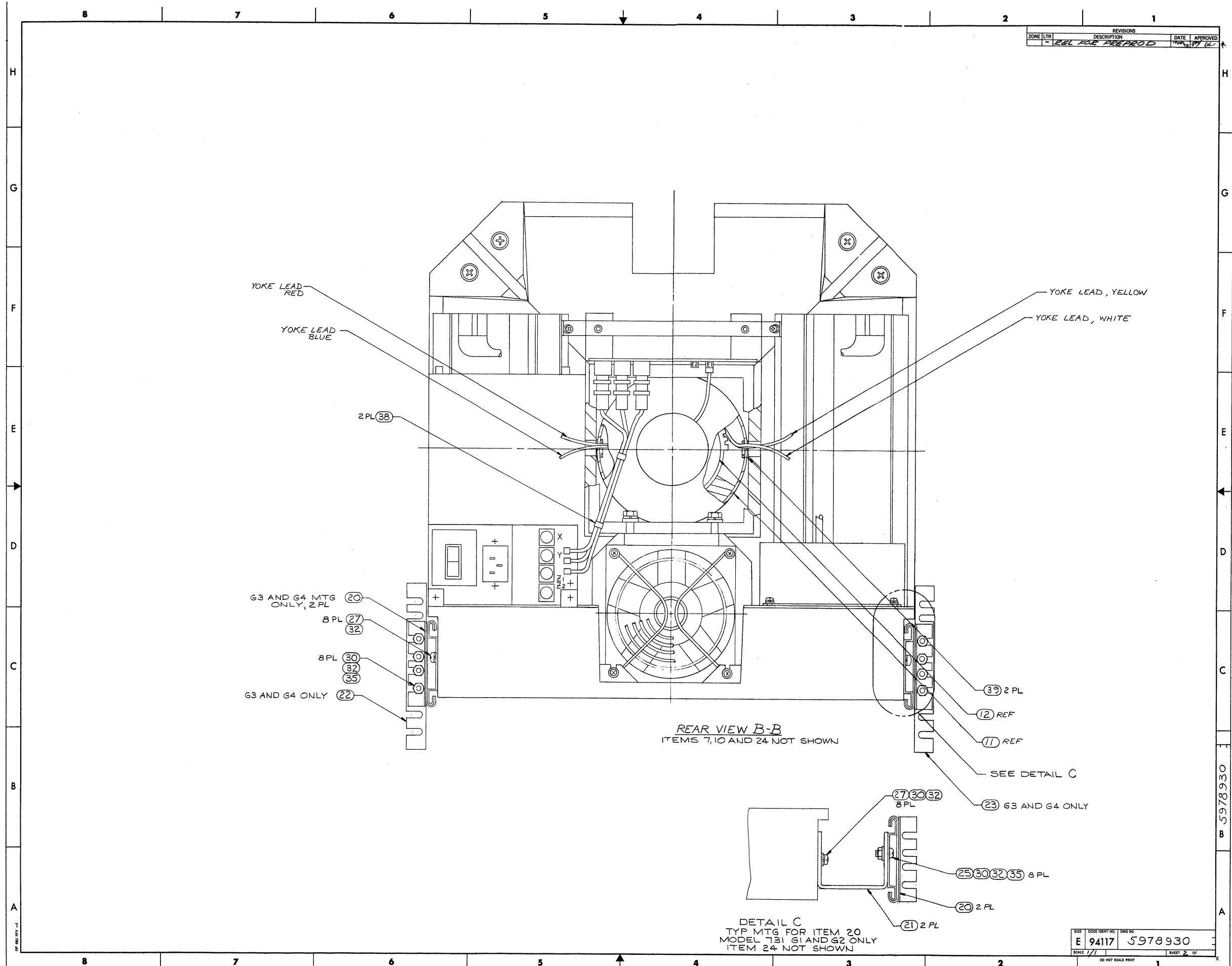








REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
-	EBL	FOR REPROD		



YOKE LEAD  
RED

YOKE LEAD  
BLUE

YOKE LEAD, YELLOW

YOKE LEAD, WHITE

G3 AND G4 MTG ONLY, 2 PL (20)

8 PL (27)

(32)

8 PL (30)

(32)

(35)

G3 AND G4 ONLY (22)

(39) 2 PL

(12) REF

(11) REF

SEE DETAIL C

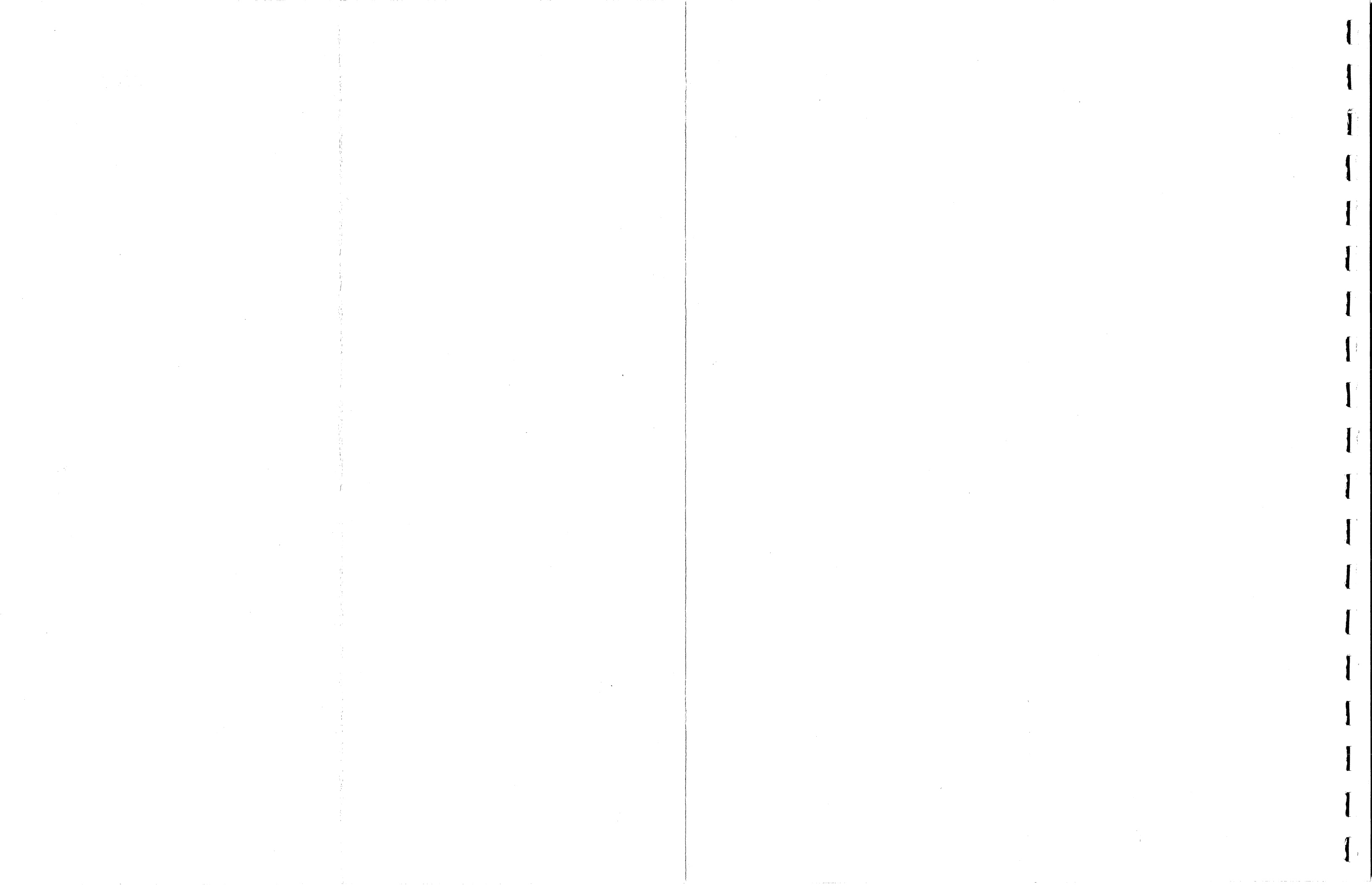
(23) G3 AND G4 ONLY

REAR VIEW B-B  
ITEMS 7, 10 AND 24 NOT SHOWN

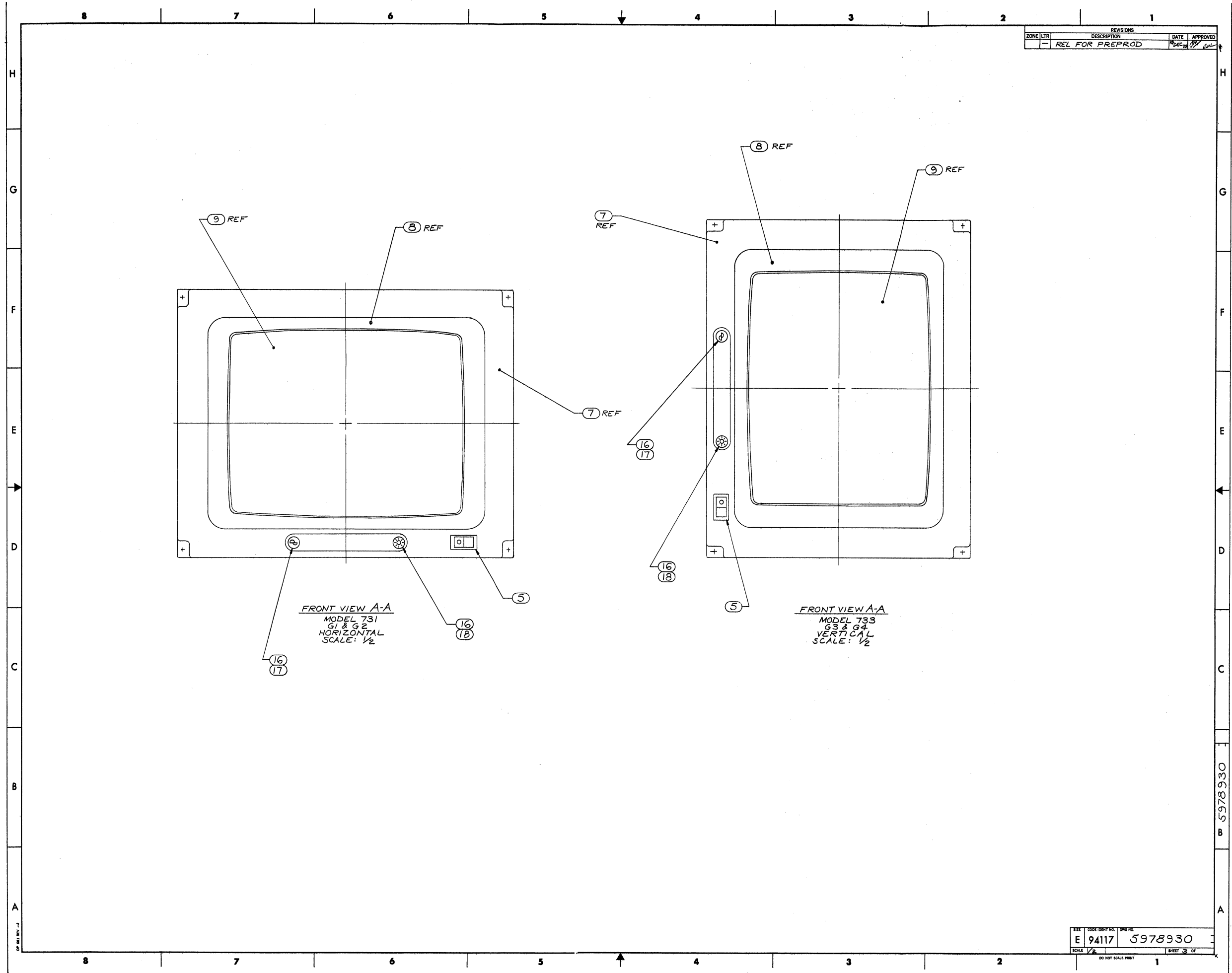
DETAIL C  
TYP MTG FOR ITEM 20  
MODEL 731 G1 AND G2 ONLY  
ITEM 24 NOT SHOWN

SIZE	CODE IDENTIFY NO.	DWG NO.
E	94117	5978930
SCALE	1/1	SHEET 2 OF

5978930



REVISIONS			
ZONE	LTR	DESCRIPTION	DATE APPROVED
-		REL FOR PREPROD	Model 731



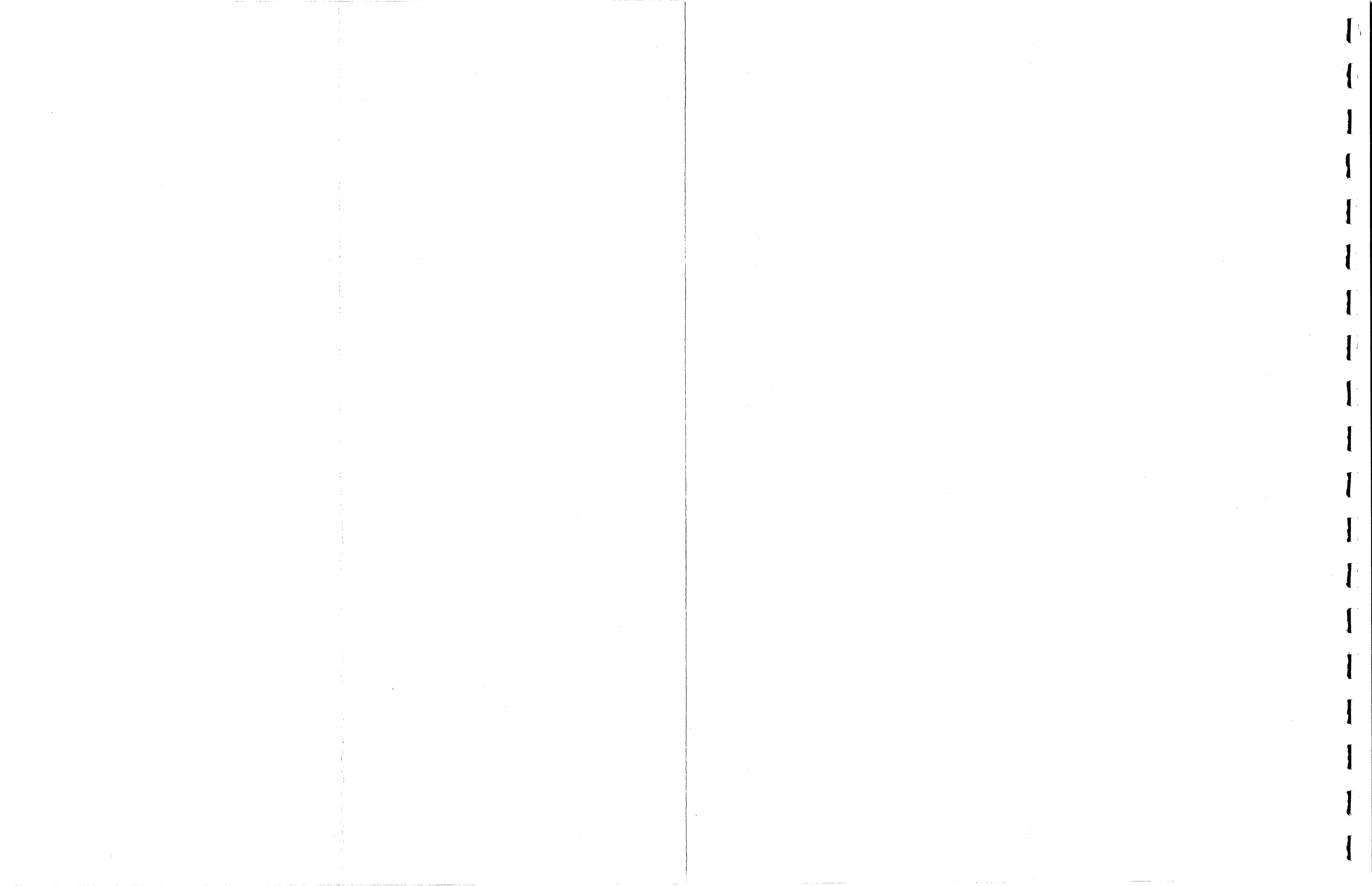
FRONT VIEW A-A  
 MODEL 731  
 G1 & G2  
 HORIZONTAL  
 SCALE: 1/2

FRONT VIEW A-A  
 MODEL 733  
 G3 & G4  
 VERTICAL  
 SCALE: 1/2

SIZE	CODE IDENT NO.	DWG NO.
E	94117	5978930
SCALE	1/2	SHEET 3 OF

DO NOT SCALE PRINT

5978930



REVISION STATUS												REVISIONS					
SH	1	2	3	4	5	6	7	8	9	10	11	12	LTR	DESCRIPTION	DATE	APPROVED	
PARTS	SH	13	14	15	16	17	18	19	20	21	22	23	24	—	REL FOR PREPROD	11-17-79	REL A
LIST	REV	—															
DWG REV	—																
WL REV	<input checked="" type="checkbox"/>																

2. PARTS LIST SHEET ONE IS THE CONTROLLING REVISION FOR THE COMBINED PARTS LIST, DRAWING AND WIRE LIST.
1. SHOP PRACTICE TOLERANCES AND DRAWING INTERPRETATION WITHIN B15002 SUPPLEMENT THIS DRAWING.

**SA SANDERS ASSOCIATES, INC.** NASHUA, NEW HAMPSHIRE

**DEFLECTION AMPL ASSY**

SIZE: **A** CODE IDENT NO.: **94117** PL **5978938**

SHEET **1** OF **2**

**PREPROD**  
CHANGE BY ECO ONLY

MFG: *[Signature]* 11/19/79

OP-1039 REV B

DWG SIZE: **D**

CONT NO. **5287880** USED ON **WDS**

APPLICATION: **DEFLECTION AMPL ASSY**

DR	DATE
APPRO	11/16/79
CHK	
DEV	
ENGR	
PROJ	

PARTS LIST

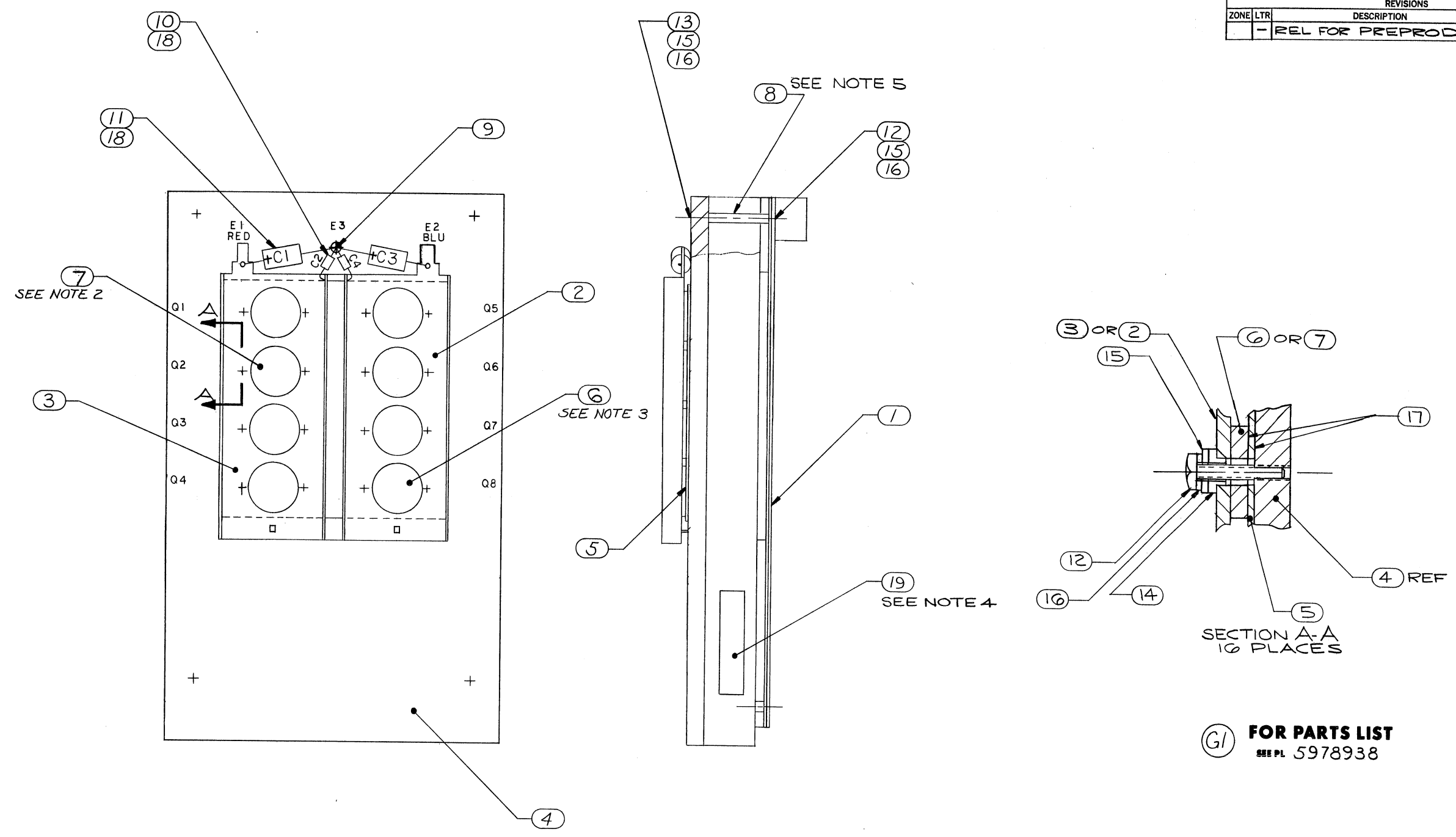
ITEM NO.	QTY PER ASSY		DWG SIZE	CODE IDENT	PART OR IDENTIFYING NO.	DESCRIPTION	SYM
	G/	G					
1	1		A/J		5978939G1	CCA DEFLECTION AMP	
2	1		C		5978998G1	PLATE, COLLECTOR NEGATIVE	
3	1		C		5978999G1	PLATE, COLLECTOR, POSITIVE	
4	1		D		5978868P1	HEATSINK	
5	1		C		5977008P1	PLATE, ISOLATOR	
6	4		B		4172984P1	TRANSISTOR, PNP 2N3792 Q56,7,8	
7	4		B		4172983P1	TRANSISTOR, NPN 2N3716 Q1,2,3,4	
8	4		B		4172222P1	SPACER CIRCUIT CARD	
9	1		A		256016P2	TERM, STUD	#
10	2		A		4174298P1	CAP, 010UF +80-20%, 50WVDC C2,4	
11	2		A		M39003/01-2312	CAP, 47UF ±10%, 35WVDC C1,3	
12	20		A		M551957-17	SCR MACH PH 4-40X.50	
13	4		A		M551957-18	SCR MACH PH 4-40X.62	
14	16		A	13103	7721-3PP\$	WASHER, SHOULDER	
15	24		A		MS15795-803	WASHER, FLAT #4	
16	24		A		MS35338-135	WASHER, LKG #4	
17	AR		A		746008P1	INSULATION CMPD, ELEC	
18	AR		A		93002P1	SOLDER	
19	1		A		417182P1	MARKER, IDENTIFICATION	
20	REF		A		4172234	TRANSISTOR MATCHING	
22	REF		J		5978941	SCHEMATIC DIAGRAM	

SHEET ONE REVISION LETTER IS THE IDENTIFYING REVISION FOR THIS MULTISHEET DWG  
 SEE SHEET ONE FOR REVISION DESCRIPTIONS  
 SYMBOLS : INDICATES VENDOR ITEM - SEE SPEC/SOURCE CONTROL DWG.

SIZE	CODE IDENT NO.	REV	SHEET 2
A	94117 PL	5978938	



REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
-		REL FOR PREPROD	11/17/79	UAS



(G1) FOR PARTS LIST  
SEE PL 5978938

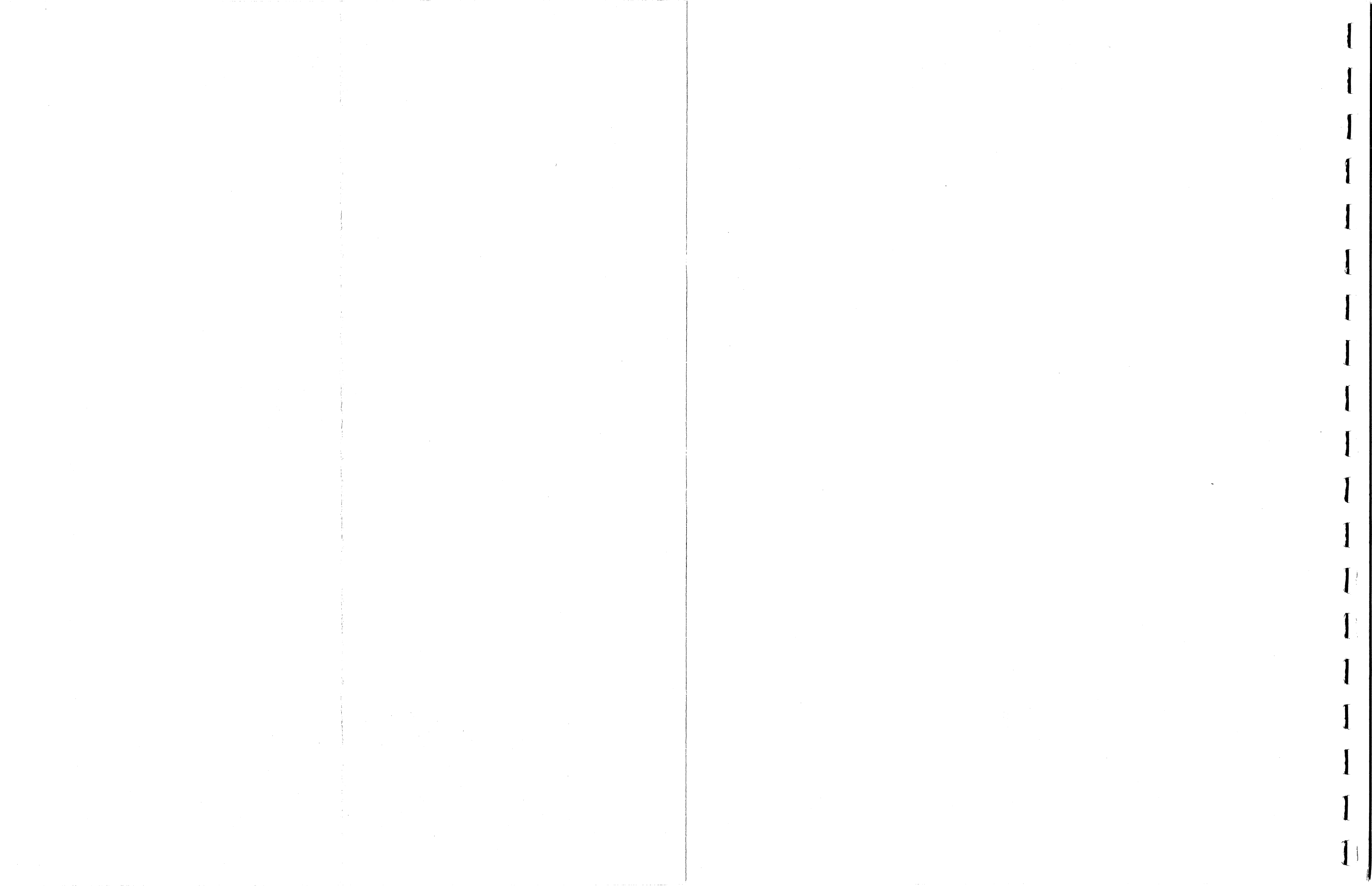
5. POSITION ITEM 8 (SPACER) BETWEEN ITEM 4 (HEATSINK) FINS TO PROVIDE MIN RESTRICTION OF AIRFLOW.
4. MARK PT. NO., SERNO., AND REV PERMANENT & LEGIBLE
3. Q5,6,7,8 ARE A MATCHED SET. USE SAME COLOR DOT. REF ITEM 21.
2. Q1,2,3,4 ARE A MATCHED SET. USE SAME COLOR DOT. REF ITEM 21.
1. SHOP TOLERANCES AND DRAWING INTERPRETATION WITHIN 815002 SUPPLEMENT THIS DRAWING.

NOTES

G6	G5	G4	G3	G2	G1	ITEM	SIZE	PART OR IDENTIFYING NO.	DESCRIPTION
QTY PER ASSY						PARTS LIST			
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES						SA SANDERS ASSOCIATES, INC. NASHUA, NEW HAMPSHIRE			
.XX DECIMAL .XXX DECIMAL						DEFLECTION AMP ASSY			
± — ± —						DR J. MacCarty DATE 11-16-79			
ANGLES ± —						CHK			
± —						DEV R. Grant 11-16-79			
5978880 UDS						MFG 11-17-79			
NEXT ASSY USED ON						SIZE CODE IDENT NO. DWG NO.			
APPLICATION						D 94117 5978938			
						SCALE 1/1 SHEET 1 of 1			

DO NOT SCALE PRINT

5978938



REVISIONS

LTR	DESCRIPTION	DATE	APPROVED
-	REL FOR PREPROD	14 NOV 79	DWY PAR
A	REV PER ECO 96258 SEE DWG REV A	12 DEC 79	RDM/WL
B	REV PER ECO 96267 SEE DWG REV B	27 DEC 79	D/WL

REVISION STATUS

SH	1	2	3	4	5	6	7	8	9	10	11	12
PARTS	B	-	-	-	-	B						
LIST	13	14	15	16	17	18	19	20	21	22	23	24
DWG REV												
WL REV												

DWG REV	B
WL REV	X

3. ITEM NUMBERS WITH SUBSCRIPTS ARE ALTERNATE ITEMS, SELECT ONE ONLY.

2. PARTS LIST SHEET ONE IS THE CONTROLLING REVISION FOR THE COMBINED PARTS LIST, DRAWING AND WIRE LIST.

1. SHOP PRACTICE TOLERANCES AND DRAWING INTERPRETATION WITHIN 815002 SUPPLEMENT THIS DRAWING.

SA SANDERS ASSOCIATES, INC. NASHUA, NEW HAMPSHIRE

CIRCUIT CARD ASSY

X/Y DEFLECTION AMPLIFIER

SIZE A CODE IDENT NO. 94117 PL 5978939

CONT NO.

DWG: J. Maroney 3/18/79

DR: [ ]

FT: [ ]

T: [ ]

G: [ ]

CHK: [ ]

DEV: P. Grant 11-16-79

ENG: [ ]

NO: [ ]

PRO: [ ]

RG: [ ]

5978938 UDS

NEXT ASSY USED ON

APPLICATION

PREPROD

CHANGE BY ECO ONLY

11/19/79

OP-1039 REV B

DWG SIZE

SHEET 1 OF 7

PARTS LIST

ITEM NO.	QTY PER ASSY		DWG SIZE	CODE IDENT	PART OR IDENTIFYING NO.	DESCRIPTION	SYM
	G	G					
1	1		J		5978940G2	CIRCUIT CARD SUBASSY	
2	1		C		5978866PI	BRKT HEATSINK RIGHT	
3	1		C		5978997PI	BRKT HEATSINK LEFT	
4	16		A		4174298PI	CAP, CERAMIC, AXIAL LEAD, .01 UF, +80-20%, 50 WVDC C6,7,8,9,12,13,14,15,16,17,19,21,23,24,25,28.	
5	4		A		4174298P3	CAP, CERAMIC, AXIAL LEAD, .1 UF +80-20%, 50 WVDC C1,2,26,29	
6	2				M3900301-2374	CAP, 10UF, ±10%, 50 WVDC C5, 11	
7	2				M3900301-2312	CAP, 47UF, ±10%, 35 WVDC C16, 20	
8	1				M3900301-2356	CAP, 1UF, ±10%, 50 WVDC C22	
9	2				CKD5BX102K	CAP, .001UF, ±10%, 200 WVDC C3, 4	
10	1				CM05CD100D13	CAP, 10PF, ±.5PF, 500 WVDC C10	
11	1				CM05FD101N13	CAP, 100PF, ±5%, 500 WVDC C30	
12	1				GC101E472X	CAP, CERAMIC, AXIAL LEAD, .0047 UF +80-20%, 100 WVDC (ANALYTICALS) C21	
13							
14							
15							
16	1		A		4174378P4	POT, 1/4" DIA, 100 OHMS, ±20%, 50W R7	
17	2		A		4174378P13	POT, 1/4" DIA, 50K OHMS, ±20%, 50W R5,22	
18	1		D		5978954PI	SENSE RES, .15 OHMS, ±5%, 20W R46	
19							

SHEET ONE REVISION LETTER IS THE IDENTIFYING REVISION FOR THIS MULTISHEET DWG. SEE SHEET ONE FOR REVISION DESCRIPTIONS. SYMBOLS : INDICATES VENDOR ITEM - SEE SPEC/SOURCE CONTROL DWG.

SIZE	CODE IDENT NO.	REV	SHEET
A	94117 PL	5978939	2

PARTS LIST

ITEM NO.	QTY PER ASSY		DWG SIZE	CODE IDENT	PART OR IDENTIFYING NO.	DESCRIPTION	SYM
	G1	G					
20	3				RNR60H51R1FS	RES, 51.1 OHMS, ±1%, .125W	R6, 51, 53
21	1				RNR60H1000FS	RES, 100 OHMS, ±1%, .125W	R8
22	1				RNR60H1001FS	RES, 1K OHMS, ±1%, .125W	R2
23	1				RNR60H2211FS	RES, 2.21K OHMS, ±1%, .125W	R52
24	1				RNR60H6341FS	RES, 6.34K OHMS, ±1%, .125W	R50
25	1				RNR60H2762FS	RES, 27.6K OHMS, ±1%, .125W	R4
26	2				RNR55H7062BS	RES, 70.6K OHMS, ±1%, .100W	R1, 3
28							
29	1				RLR07C2000GM	RES, 200 OHMS, ±2%, .25W	R25
30	2				RLR07C3900GM	RES, 390 OHMS, ±2%, .25W	R17, 20
31	2				RLR07C2401GM	RES, 2.4K OHMS, ±2%, .25W	R18, 24
32	1				RLR07C6801GM	RES, 6.8K OHMS, ±2%, .25W	R19
34							
35	8				RRC07G100JS	RES, 10 OHMS, ±5%, .25W	R11, 12, 14, 15, 26, 27, 30, 31
36	3				RRC07G201JS	RES, 200 OHMS, ±5%, .25W	R54, 55, 56
37	2				RRC07G331JS	RES, 330 OHMS, ±5%, .25W	R10, 21
38	2				RRC07G102JS	RES, 1K OHMS, ±5%, .25W	R47, 48
39	1				RRC07G152JS	RES, 1.5K OHMS, ±5%, .25W	R9
40	1				RRC07G512JS	RES, 5.1K OHMS, ±5%, .25W	R63
41	4				RRC07G103JS	RES, 10K OHMS, ±5%, .25W	R23, 49, 59, 62
42	1				RRC07G272JS	RES, 2.7K OHMS, ±5%, .25W	R57

SHEET ONE REVISION LETTER IS THE IDENTIFYING REVISION FOR THIS MULTISHEET DWG. SEE SHEET ONE FOR REVISION DESCRIPTIONS. SYMBOLS : INDICATES VENDOR ITEM - SEE SPEC/SOURCE CONTROL DWG.

SIZE CODE IDENT NO.

A 94117 PL 5978939

REV - SHEET 3

PARTS LIST

ITEM NO.	QTY PER ASSY		DWG SIZE	CODE IDENT	PART OR IDENTIFYING NO.	DESCRIPTION	SYM
	G/	G					
43	2				RCR07G104JS	RES, 100K OHMS, ±5%, .25W	R60, G1
44							
45							
46							
47	1				RLR20C1000GM	RES, 100 OHMS, ±2%, .5W	R16
48	1				RLR20C2200GM	RES, 220 OHMS, ±2%, .5W	R13
49							
50	2				RLR20G100JS	RES, 10 OHMS, ±5%, .5W	R35, 36
51	2				RLR20G270JS	RES, 27 OHMS, ±5%, .5W	R32, 33
52							
53	2				RCR32G2R7JS	RES, 2.7 OHMS, ±5%, 1W	R34, 37
54	1				RCR32G621JS	RES, 620 OHMS, ±5%, 1W	R58
55							
56	8				RWR89SR316FM	RES, .316 OHMS, ±1%, 3W	R38 - 45
57	2				RWR89SI960FM	RES, 196 OHMS, ±1%, 3W	R28, 29
58							
59	1				2N3424	XSTR, NPN	Q1
60	2				2N3494	XSTR, PNP	Q2, 5
61	2				2N3119	XSTR, NPN	Q3, 4
62	1				2N6237	XSTR, SCR	Q10
63	1				2N6660	XSTR, N CHANNEL FET	Q11
64	1			01295	TIS-150	XSTR, NPN DARLINGTON	Q8
65	1			01295	TIS-175	XSTR, PNP DARLINGTON	Q9

SHEET ONE REVISION LETTER IS THE IDENTIFYING REVISION FOR THIS MULTISHEET DWG  
 SEE SHEET ONE FOR REVISION DESCRIPTIONS  
 SYMBOLS : INDICATES VENDOR ITEM - SEE SPEC/SOURCE CONTROL DWG.

SIZE CODE IDENT NO.

A 94117 PL

5978939

REV -

SHEET 4

PARTS LIST

ITEM NO.	QTY PER ASSY		DWG SIZE	CODE IDENT	PART OR IDENTIFYING NO.	DESCRIPTION	SYM
	G	G					
66	1			04713	ZN 2907A	XSTR, PNP	Q12
67	1			04713	MJE 15028	XSTR, NPN	Q6
68	1			04713	MJE 15029	XSTR, PNP	Q7
70							
71	1				IN 756A	DIODE, ZENER, 8.2V	VR1
72	1				IN 753A	DIODE, ZENER, 6.2V	VR2
73	1				IN 746A	DIODE, ZENER, 3.3V	VR3
74	1				IN 751A	DIODE, ZENER, 5.1V	VR4
75	2				IN 969B	DIODE, ZENER, 22V	VR5, 6
76							
77	7				IN 4148-1	DIODE, SIGNAL CR1, 2, 7, 10, 13, 14, 15	
78	8				IN 3613	DIODE, SIGNAL CR3, 4, 5, 6, 8, 9, 11, 12	
79							
80	1		A	00779	MS75089-11	INDUCTOR, 100UH, ±10%, .160A	L1
81	1			34333	42822-2	FASTON, .250	
82	1				5G4194R	MICROELEMENT (SIL. GEN. INC)	U1
83	1				89650	TRANS, MED (RCA)	U2
84	1			18324	LM340T-5.0	VOLTAGE REGULATOR (SIGNETICS)	U3
85	1			07263	DS 7534	MICROELEMENT (FAIRCHILD)	U4
86	1		A		630003P17	EYELET	
87	1			00779	350432-1	CONN, 9 PIN	V1
88	8		A		165046 P1	TEST POINT TPI-8	

SHEET ONE REVISION LETTER IS THE IDENTIFYING REVISION FOR THIS MULTISHEET DWG  
 SEE SHEET ONE FOR REVISION DESCRIPTIONS  
 SYMBOLS : INDICATES VENDOR ITEM - SEE SPEC/SOURCE CONTROL DWG.

SIZE	CODE IDENT NO.
A	94117 PL
REV	5978939
SHEET	5

PARTS LIST

ITEM NO.	QTY PER ASSY		DWG SIZE	CODE IDENT	PART OR IDENTIFYING NO.	DESCRIPTION	SYM
	G1	G					
89	1		A		640085 P2	MTG PAD, ELEC-ELECTRONIC CMPNT	#
90	1		A		640048 P1	MTG PAD, ELEC-ELECTRONIC CMPNT	#
91	5		A		640049 P1	MTG PAD, ELEC-ELECTRONIC CMPNT	#
92	4		A		4174145 P1	HEAT SINK-175	
93	9		A		MS51957-17	SCREW, PAN HD, .112-40 UNC X.50 LG	
94	2		C		5978865 P1	HOUSING, DEFL AMP CONTACT	
95	4		A		MS35338-135	WASHER, LOCK-SPLIT NO. 4	
96	5		A		MS35333-70	WASHER, INTERNAL TOOTH, NO 4	
97	13		A		MS15795-803	WASHER, FLAT NO. 4	
98	2		B		5976291 P1	SLEEVEING, INSULATION	
99	9		A		MS35649-244	NUT, PLAIN, HEX .112-40 UNC	
100	9		A		630002 P9	EYELET, METALLIC	
101	3		-	13103	56-77-11	INSULATOR	#
102	1		-	13103	4799A	INSULATOR	#
103	2		-	13103	7721-7 PPS	WASHER, SHOULDER	#
104	6 IN		A		270006 P5	INSULATION TUBING	
105	AR		A		746008 P1	INSULATION CMPD, ELEC	
106	AR		A		930002 P1	SOLDER	
107	8 IN.		A		278002 P13	WIRE ELEC (UNINSULATE) ANG 22	#
108	REF		A		778000	APPL OF EPOXY MKG CMPD	
109	REF		A		815026	PW AND CKT BD, REQT FOR	
110	REF		A		5978941	SCHEMATIC DIAG.	
111	16		J	71468	030-1990-006	CONTACT STRAIGHT	

SHEET ONE REVISION LETTER IS THE IDENTIFYING REVISION FOR THIS MULTISHEET DWG SEE SHEET ONE FOR REVISION DESCRIPTIONS SYMBOLS : INDICATES VENDOR ITEM - SEE SPEC/SOURCE CONTROL DWG.

SIZE CODE IDENT NO.

A 94117 PL

5978939

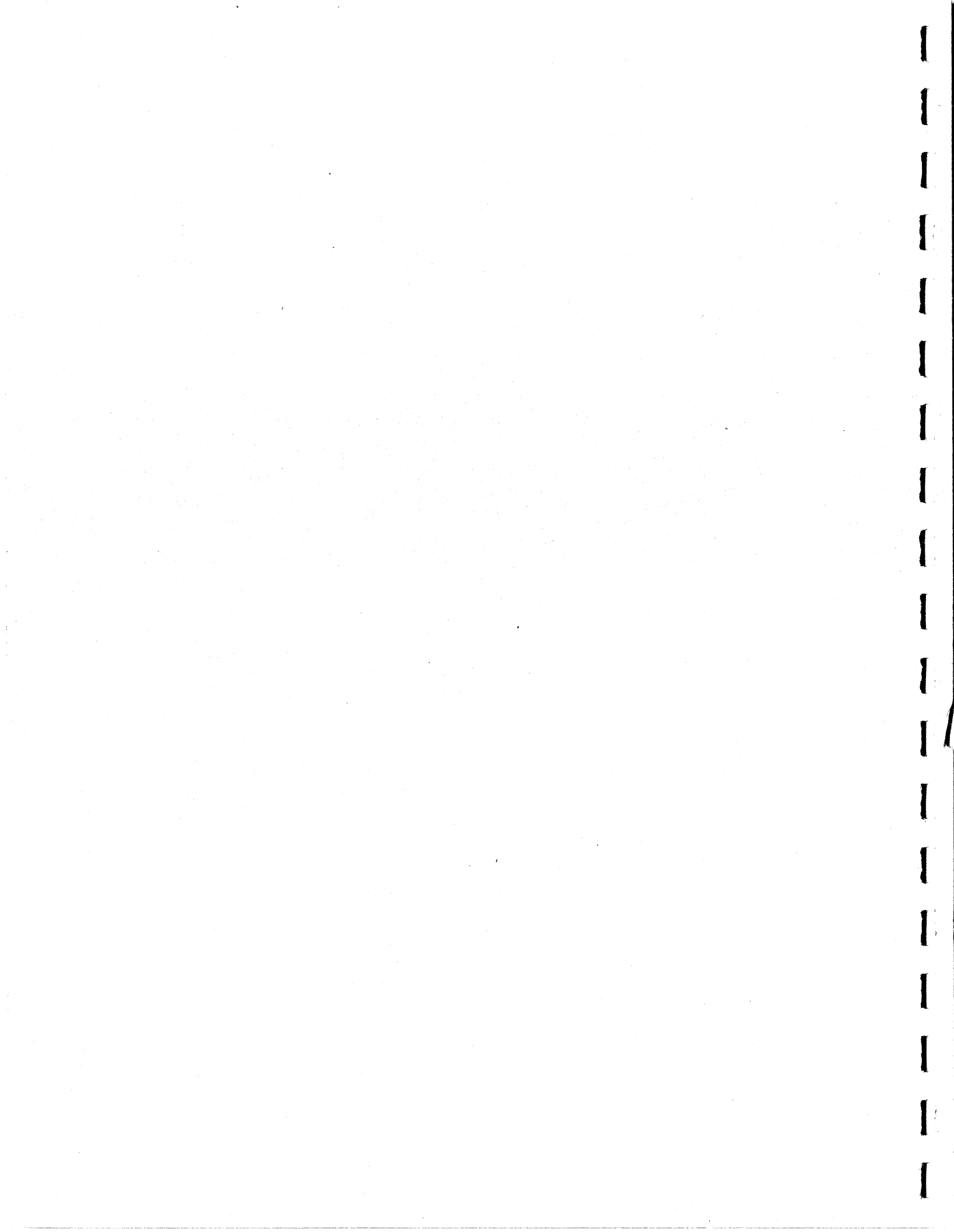
REV B SHEET 6



# PARTS LIST

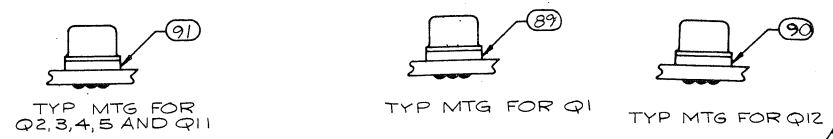
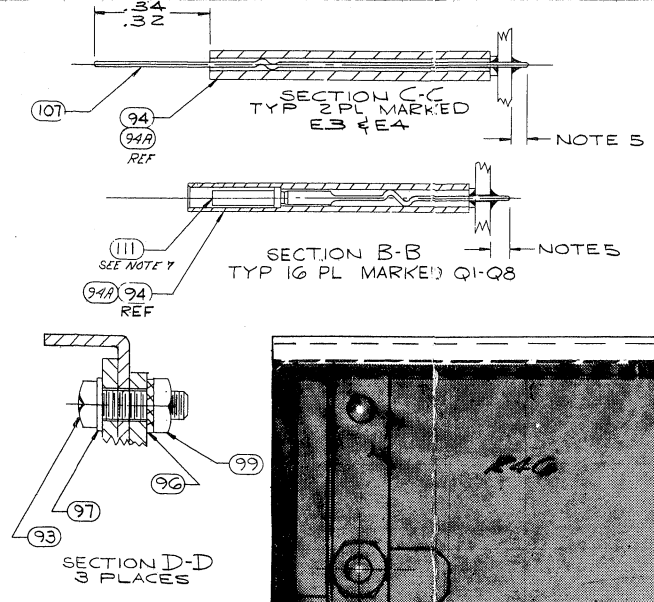
ITEM NO.	QTY PER ASSY		DWG SIZE	CODE IDENT	PART OR IDENTIFYING NO.	DESCRIPTION	SYM
	G	G					
81A REF 99A REF			D		4174212P001 5976312P1	CONTACT, FASTON.250 (SEE NOTE 3) HOUSING, DEFL AMP CONTACT (SEE NOTE 3)	

SHEET ONE REVISION LETTER IS THE IDENTIFYING REVISION FOR THIS MULTISHEET DWG SEE SHEET ONE FOR REVISION DESCRIPTIONS SYMBOLS : INDICATES VENDOR ITEM - SEE SPEC/SOURCE CONTROL DWG.		SIZE <b>A</b>	CODE IDENT NO. <b>94117 PL</b>	REV <b>B</b>	SHEET <b>7</b>
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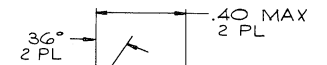
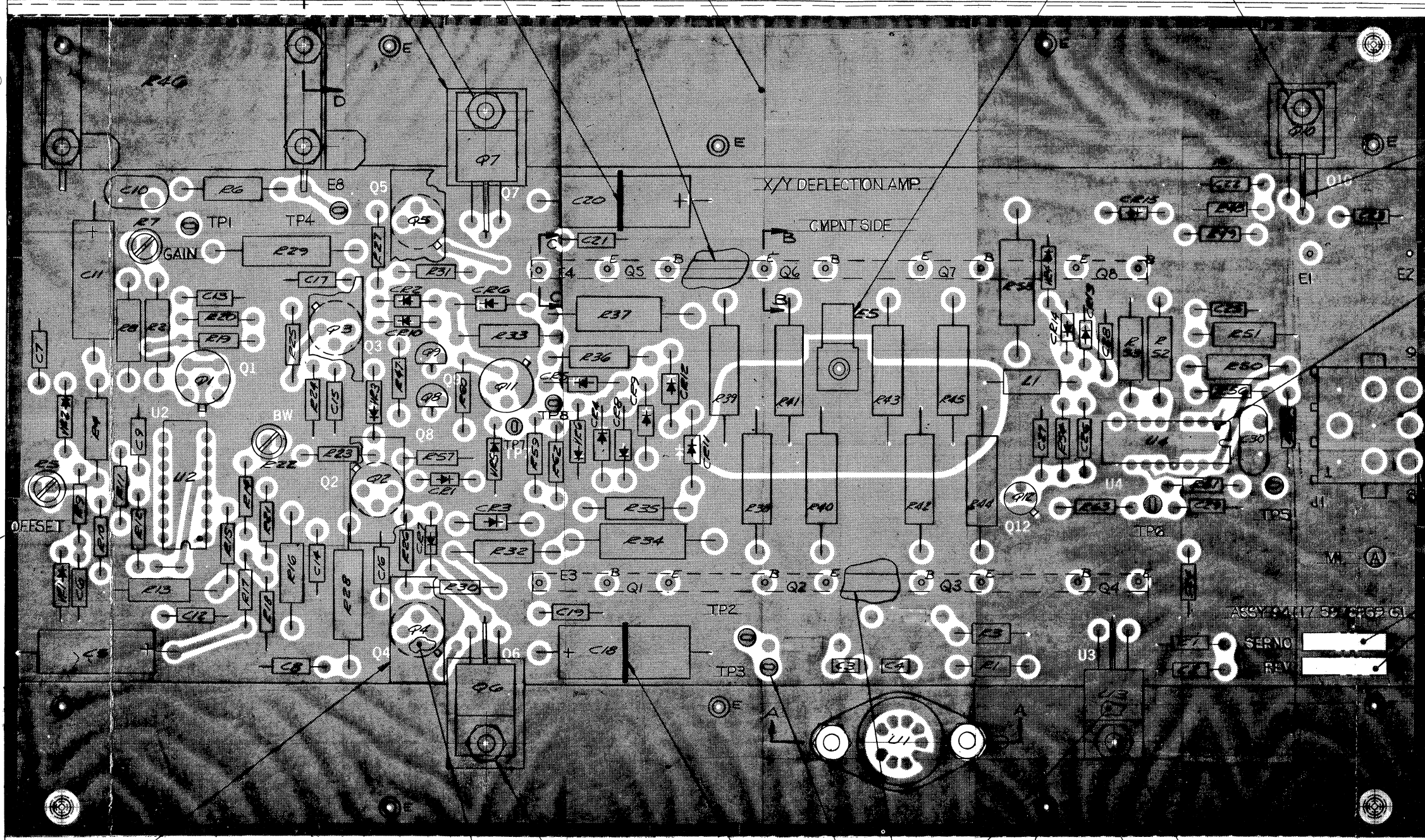


10 9 8 7 6 5 4 3 2

REVISIONS			
ZONE LTR	DESCRIPTION	DATE	APPROVED
-	REL FOR PREPROD	12 NOV 79	RDH/MC
A	REV PER ECO 96258	12 DEC 79	RDH/MC
B	REV PER ECO 96247	21 DEC 79	B/



(81)  
(81A)  
(86)  
(106) APPLY ALL AROUND TO  
PREVENT MOVEMENT.



(104) 4 PL

DENOTES PIN  
NO. 1 TYP

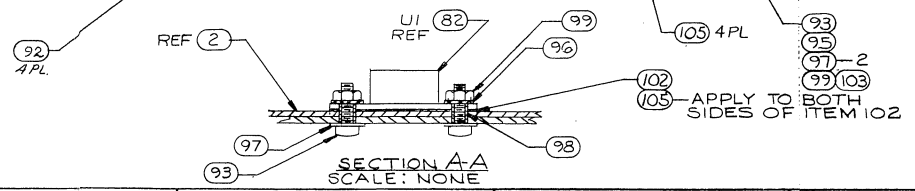
(87)-J1

MAX COMP HEIGHT  
EXCLUDING J1

SEE NOTE G

(G1) FOR PARTS LIST  
SEE PL 5978939

- FORM SLIGHT SWAGE IN ITEM 111 APPROX .45 SHOWN TO PROVIDE SNUG FIT IN ITEM 94 OR 94A.
- MARK SERNO & REV IN CONTRASTING COLOR .04-.10 HIGH IN GOTHIC TYPE. APPLY PER ITEM 108.
- SOLDER TIPS OR WIRE TO BE .09 MAX FROM BOARD.
- OTHER THAN SPECIFICALLY NOTED, CHARACTERS ARE REFERENCE AND NOT TO BE MARKED.
- MARK CHARACTERS .04-.15 HIGH, IN ACCORDANCE WITH MIL-STD-130.
- PARTS LIST SHEET ONE IS THE CONTROLLING REVISION FOR THE COMBINED PARTS LIST AND DRAWING.
- THIS ASSY SHALL MEET THE REQUIREMENTS OF ITEM 109.



94117 5978939 B 1

(100) TYP 9 PL  
MRK "E"

QTY PER ASSY	CONT NO.	DATE	DESCRIPTION
1	1	11/16/79	CIRCUIT CARD ASSY
1	2	11/16/79	X/Y DEFLECTION AMP

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES	XXX DECIMAL	XXX DECIMAL
ANGLES		
INTERPRET DRAWING PER 815002		
PREPROD		
CHANGED BY		
DATE		

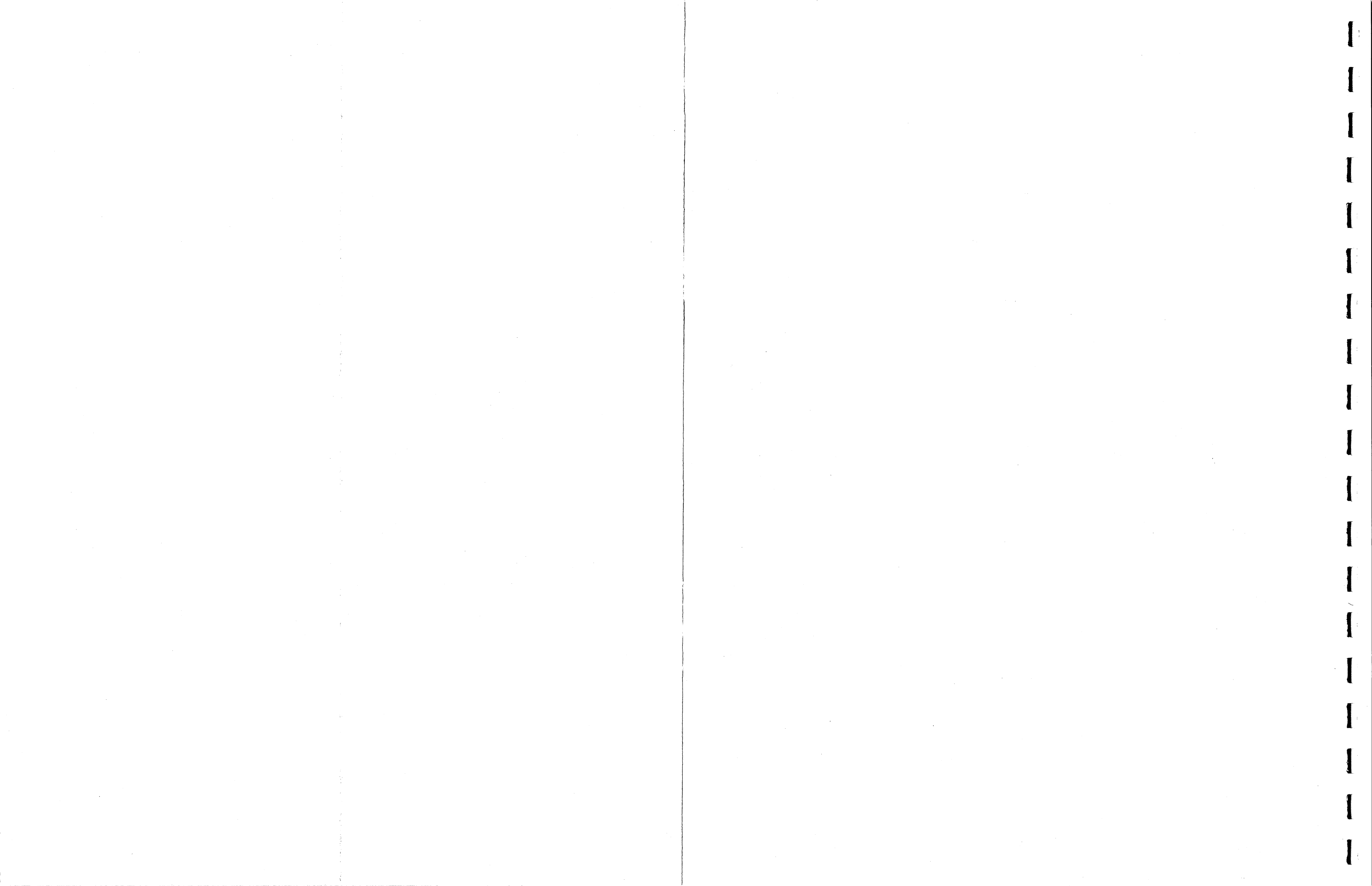
  

PARTS LIST	DESCRIPTION
94117 5978939	CIRCUIT CARD ASSY
94117 5978939	X/Y DEFLECTION AMP

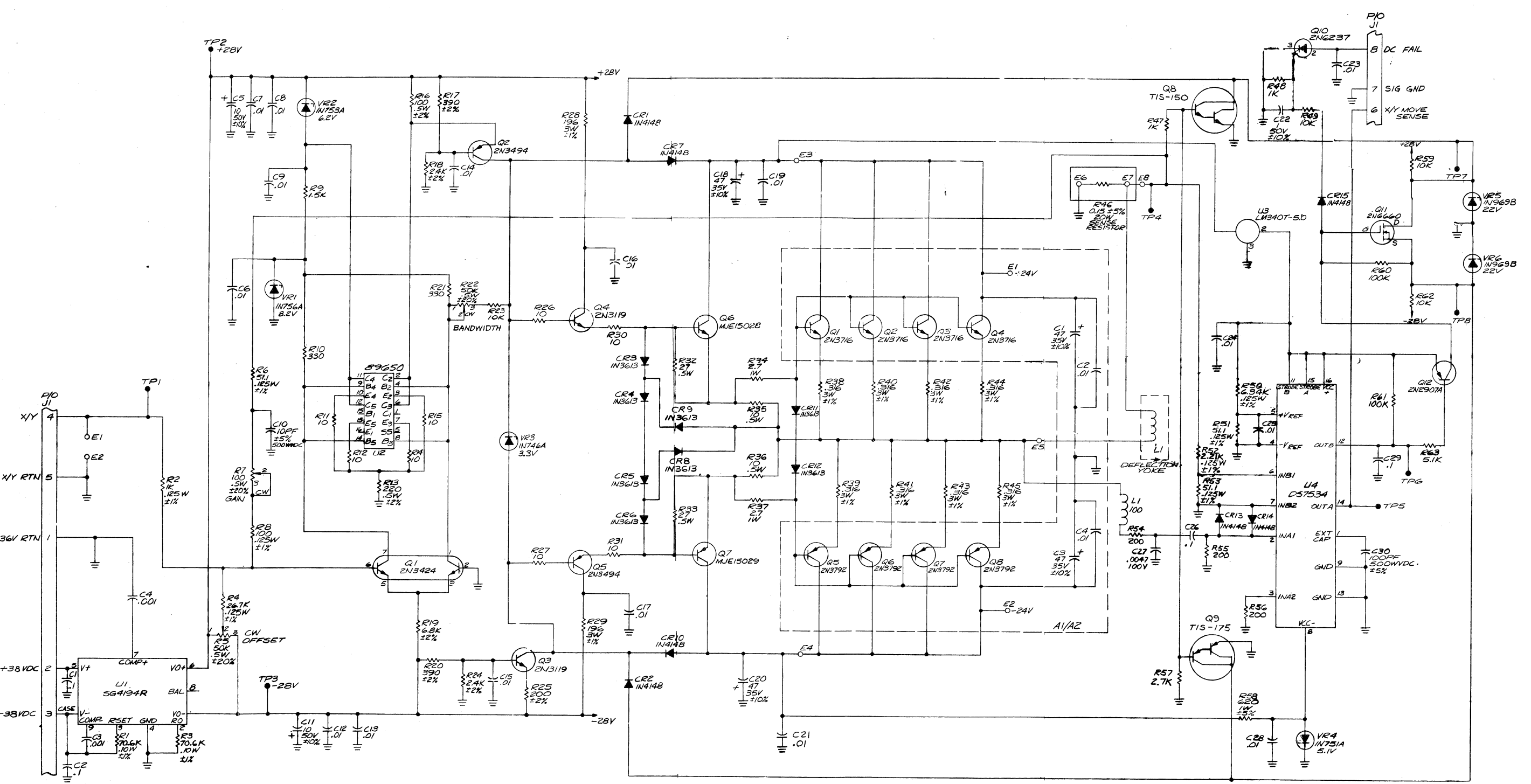
UNLESS OTHERWISE SPECIFIED

10 9 8 7 6 5 4 3 2

5978939



REV	DATE	APPROVED
1	11-15-79	SA SANDERS



3. PREFIX PARTIAL REFERENCE DESIGNATIONS WITH 1A1A1/1A2A1  
 2. UNLESS OTHERWISE SPECIFIED RESISTANCE VALUES ARE IN OHMS. RESISTORS ARE ± 5%, .25W K=1,000. MEG=1,000,000. CAPACITANCE VALUES ARE IN MICROFARADS. CAPACITORS ARE .50V ±5%. PF= PICO FARADS. INDUCTANCE VALUES ARE IN MICROHENRIES.  
 1. INTERPRET DRAWING PER 818002

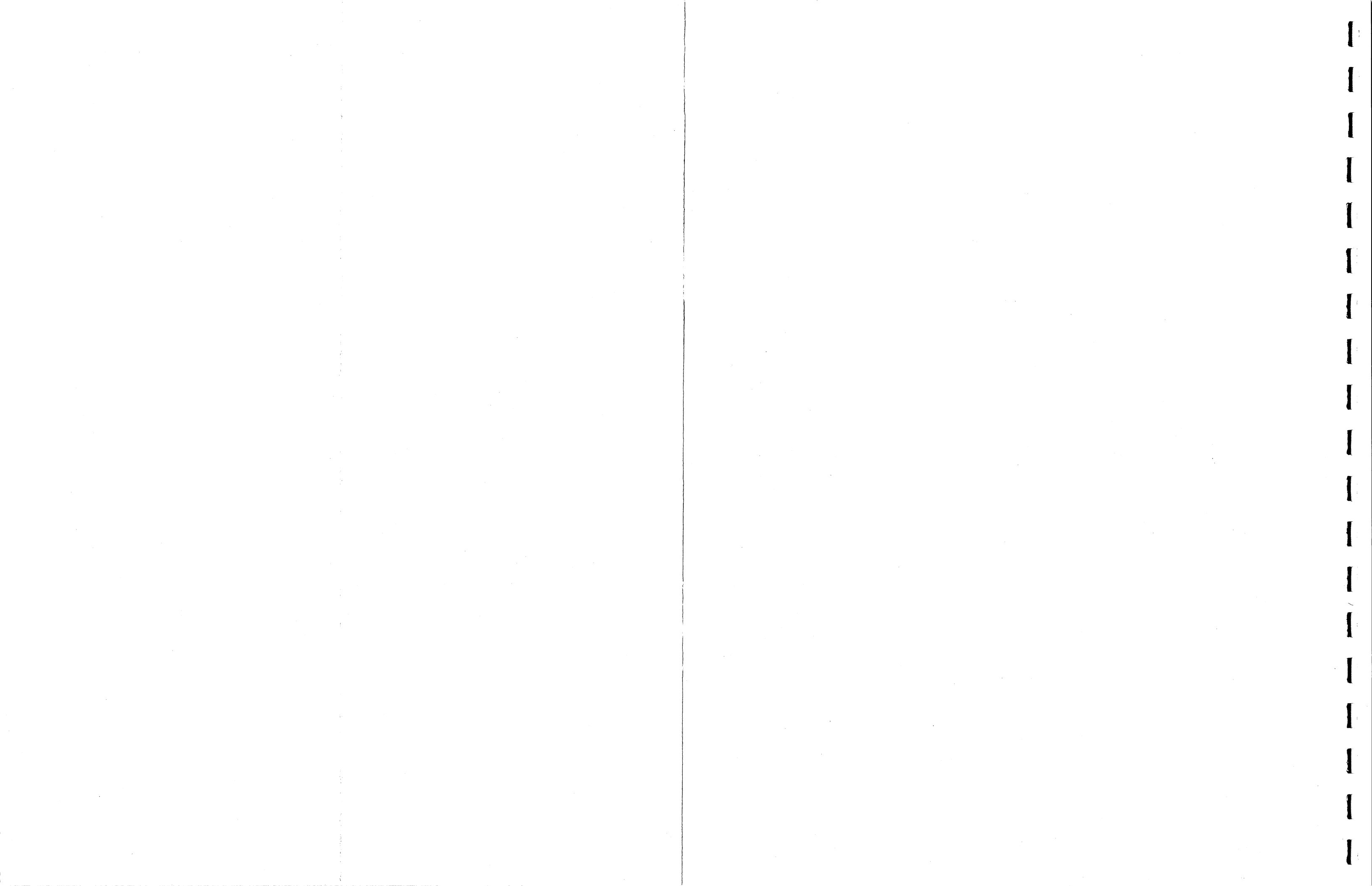
NOTES

94117 5978941

DESCRIPTION	REFERENCE DATA	DELETED NO.	PREPROD	DATE	APPROVED
RESISTOR	R63		SA SANDERS	11-15-79	SA SANDERS
CAPACITOR	C30				
DIODE	CR15				
TRANSISTOR	Q12				
INDUCTOR	L1				
MICROELEMENT	L4				
WIRING DIAGRAM					

SANDERS ASSOCIATES, INC. SCHEMATIC DIAGRAM X/Y DEFLECTION AMPL

5978941



REVISIONS

LTR	DESCRIPTION	DATE	APPROVED
-	REL FOR PREPROD	9-12-79	Rg/WL
A	REV PER ECO 96265	15 JAN 80	WG/WL

REVISION STATUS

SH	1	2	3	4	5	6	7	8	9	10	11	12
REVISION	A	-										
PARTS	13	14	15	16	17	18	19	20	21	22	23	24
LIST												

DWG REV	A
WL REV	X

- PARTS LIST SHEET ONE IS THE CONTROLLING REVISION FOR THE COMBINED PARTS LIST, DRAWING AND WIRE LIST.
- SHOP PRACTICE TOLERANCES AND DRAWING INTERPRETATION WITHIN 815002 SUPPLEMENT THIS DRAWING.

CONT NO.	
DR	R.P. Marshall 9/12/79
APPD	[Signature]
CHK	[Signature]
DES	[Signature]
ENGR	[Signature]
PROJ	[Signature]

5978864	USED ON
NEXT ASSY	APPLICATION

**PREPROD**  
CHANGE BY ECO ONLY

MFG [Signature] 9/12/79

**SA SANDERS ASSOCIATES, INC.** NASHUA, NEW HAMPSHIRE

CIRCUIT CARD ASSY  
I/O CONNECTOR PANEL

SIZE CODE IDENT NO.  
**A 94117 PL 5978958**

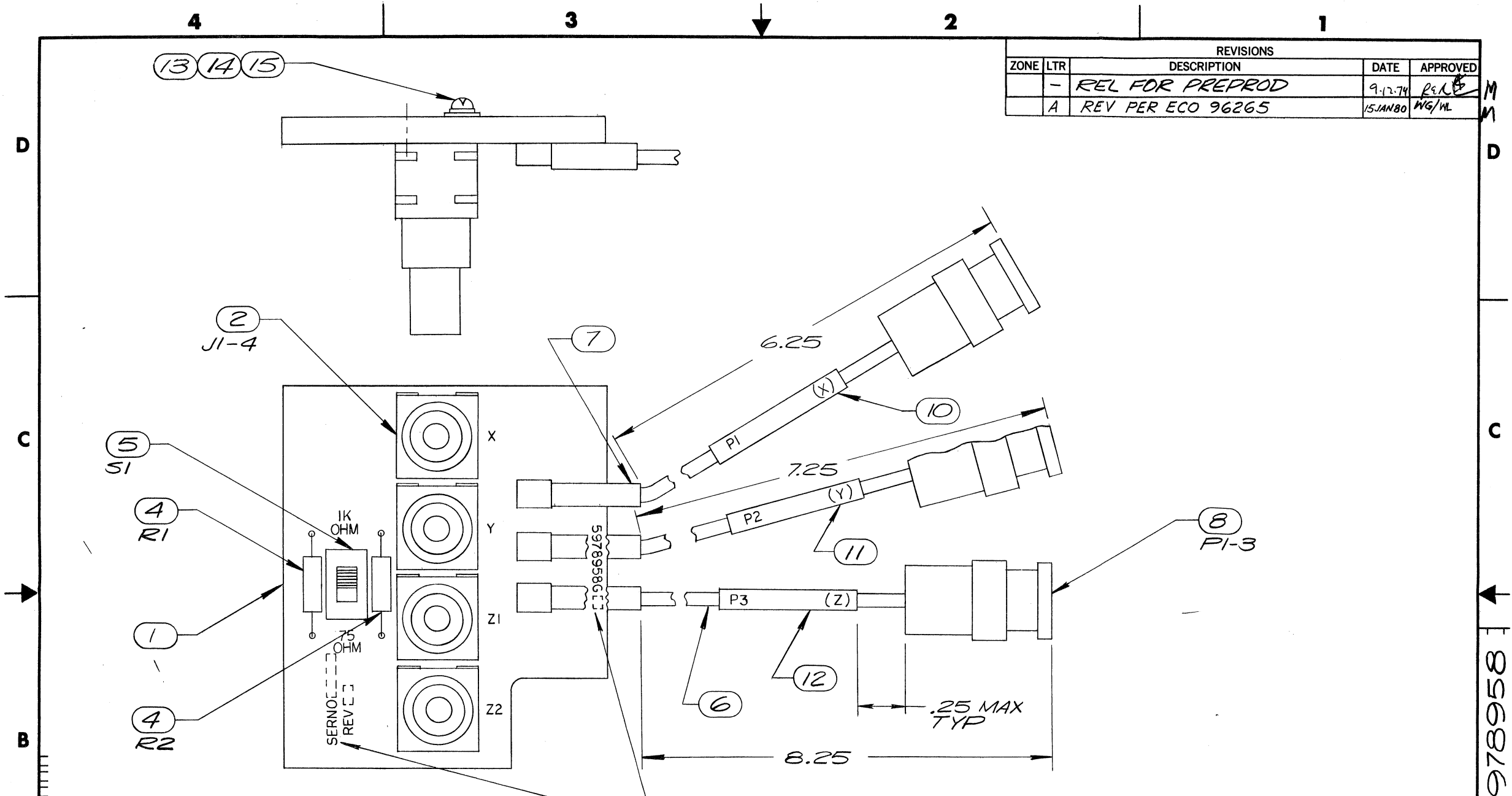
PARTS LIST

ITEM NO.	QTY PER ASSY		DWG SIZE	CODE IDENT	PART OR IDENTIFYING NO.	DESCRIPTION	SYM
	G1	G					
1	1		D	89110	597895961	CCSA, I/O CONNECTOR PANEL	
2	4				226993-1	CONN, VERT PCB BNC JACK J1,2,3,4	
3							
4	2			10389	ICPZ0G820VS	RES, 82 OHMS, ±5%, .5W	R1, 2
5	1				24-420-020	SWITCH	51
6	24IN				RG-187A/U	WIRE, COAX 75 OHMS, MIL-C-17C	
7	3			06000	D-607-10	COAXIAL TERMINATOR	
8	3			94375	819B1800W	CONN, COAX	P1,2,3
9	REF				5978925	SCHEMATIC DIAGRAM, LVPS	
10	1		E		5977016P1	MARKER, CABLE	
11	1		C		5977016P2	MARKER, CABLE	
12	1		C		5977016P3	MARKER, CABLE	
13	8				MS24625-3	SCREW, THD CUTTING, TYPE 8 FOR BT .086-32X.25LG	
14	8				MS15795-802	WASHER, FLAT .086	
15	8				MS35338-134	WASHER, LOCK .086	
16	REF		A		778000	EPOXY MARKING CMPD, APPL OF	
17	REF		A		815003	PW AND CKT BD, REQD FOR	

SHEET ONE REVISION LETTER IS THE IDENTIFYING REVISION FOR THIS MULTISHEET DWG  
 SEE SHEET ONE FOR REVISION DESCRIPTIONS  
 SYMBOLS : INDICATES VENDOR ITEM - SEE SPEC/SOURCE CONTROL DWG.

SIZE	CODE IDENT NO.	REV	SHEET
A	94117 PL	-	2
			5978958





REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	-	REL FOR PREPROD	9-12-79	R.P. Marshall
A		REV PER ECO 96265	15 JAN 80	WGS/HL

8. MARK CHARACTERS .04-.16 HIGH, GOTHIC TYPE, CONTRASTING COLOR, AND LOCATE APPROX AS SHOWN. APPLY PER ITEM 16.

MARK APPROPRIATE SERNO, REV AND "G" COND. FAR SIDE SEE NOTE 8

(G1) **FOR PARTS LIST**  
SEE PL 5978958

- 7 PREFIX PARTIAL REFERENCE DESIGNATIONS WITH P51-A1
- 6. SOLDER TIPS OR WIRE TO BE .09 MAX FROM BOARD
- 5. MAX COMPONENT HEIGHT TO BE
- 4. OTHER THAN SPECIFICALLY NOTED, CHARACTERS ARE REFERENCE AND NOT TO BE MARKED.
- 3. PARTS LIST SHEET ONE IS THE CONTROLLING REVISION FOR THE COMBINED PARTS LIST AND DRAWING.
- 2. THIS ASSY SHALL MEET THE REQUIREMENTS OF ITEM 17.
- 1. SHOP TOLERANCES AND DRAWING INTERPRETATION WITHIN 815002 SUPPLEMENT THIS DRAWING.

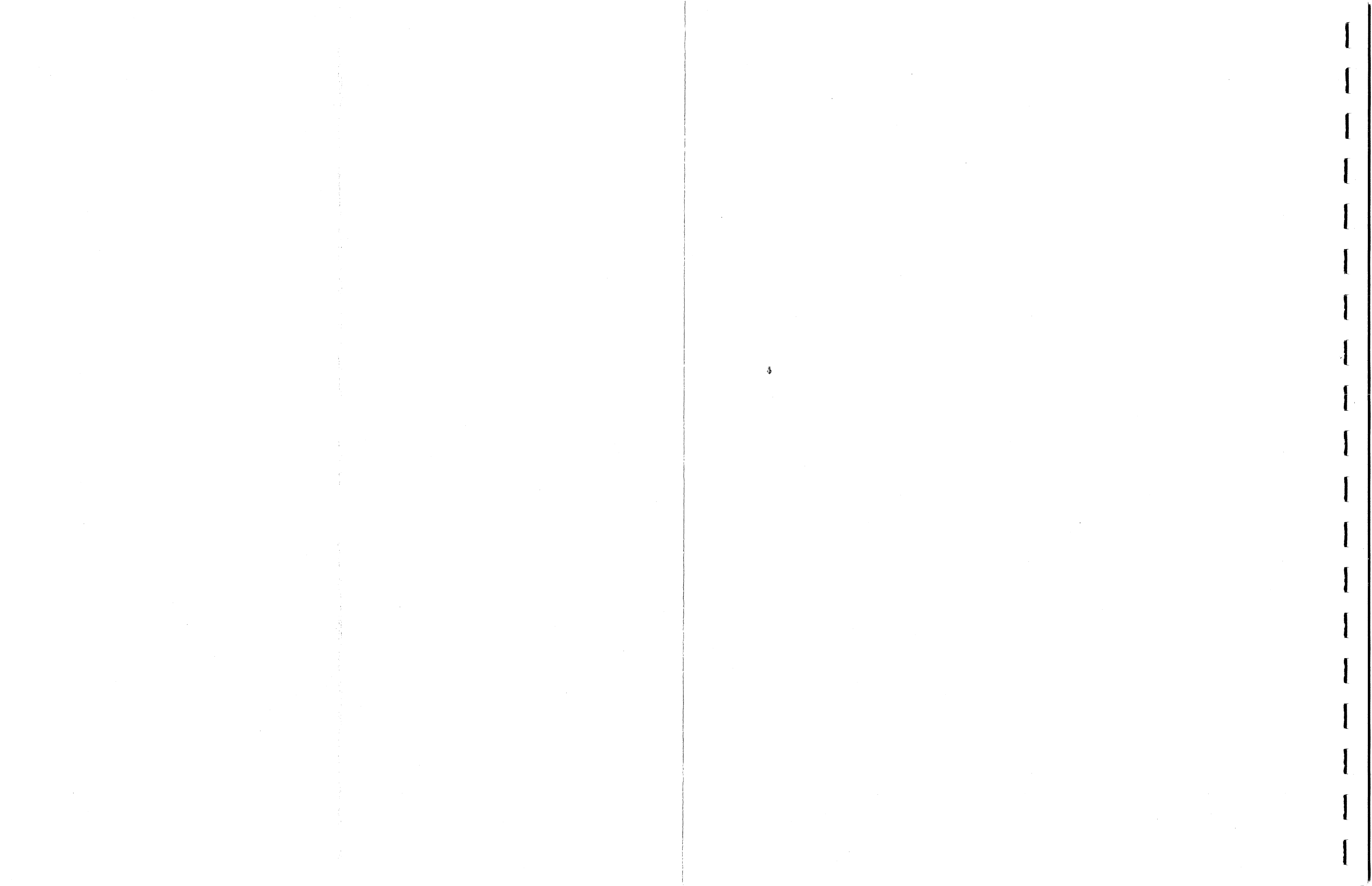
NOTES UNLESS OTHERWISE SPECIFIED

G6	G5	G4	G3	G2	G1	ITEM	SIZE	PART OR IDENTIFYING NO.	DESCRIPTION
						QTY PER ASSY		PARTS LIST	
						UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES		CONT NO.	
						.XX DECIMAL .XXX DECIMAL		DR R.P. Marshall 9/12/79 DATE	
						± .25 ± —		APPD [Signature] 12 SEP 79	
						ANGLES		CHK [Signature]	
						± —		DES [Signature] 9/12/79	
						<b>PREPROD</b>		ENG [Signature] 9-12-79	
						CHANGE BY ECO ONLY		PROJ [Signature] 9-12-79	
						MFG J.E. Gianes 9/12/79		SA SANDERS ASSOCIATES, INC NASHUA, NEW HAMPSHIRE	
5978864 UDS						NEXT ASSY		USED ON	
APPLICATION						SIZE		CODE IDENT NO. DWG NO.	
						C		94117 5978958	
						SCALE 2/1		SHEET 1 OF 1	

OP 332 REV-J

B 5978958

DO NOT SCALE PRINT



Name: \_\_\_\_\_

Company: \_\_\_\_\_

Address: \_\_\_\_\_

\_\_\_\_\_

Telephone: [    ] \_\_\_\_\_

Date: \_\_\_\_\_

Description of problem (or suggestion for improvement):

Sanders Equipment \_\_\_\_\_

Part Number \_\_\_\_\_

Software/Firmware System \_\_\_\_\_

Version \_\_\_\_\_

Host computer \_\_\_\_\_

Host operating system \_\_\_\_\_ Version \_\_\_\_\_

Host-GRAPHIC 7 interface \_\_\_\_\_

My problem is: hardware  software   
firmware  manual

Related tech manual number \_\_\_\_\_

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