

Digital Equipment Corporation
Maynard, Massachusetts

digital

Maintenance Manual

**VR12
POINT PLOT DISPLAY**

DEC-CR-H6AA-D

VR12 POINT PLOT DISPLAY MAINTENANCE MANUAL

DIGITAL EQUIPMENT CORPORATION □ MAYNARD, MASSACHUSETTS

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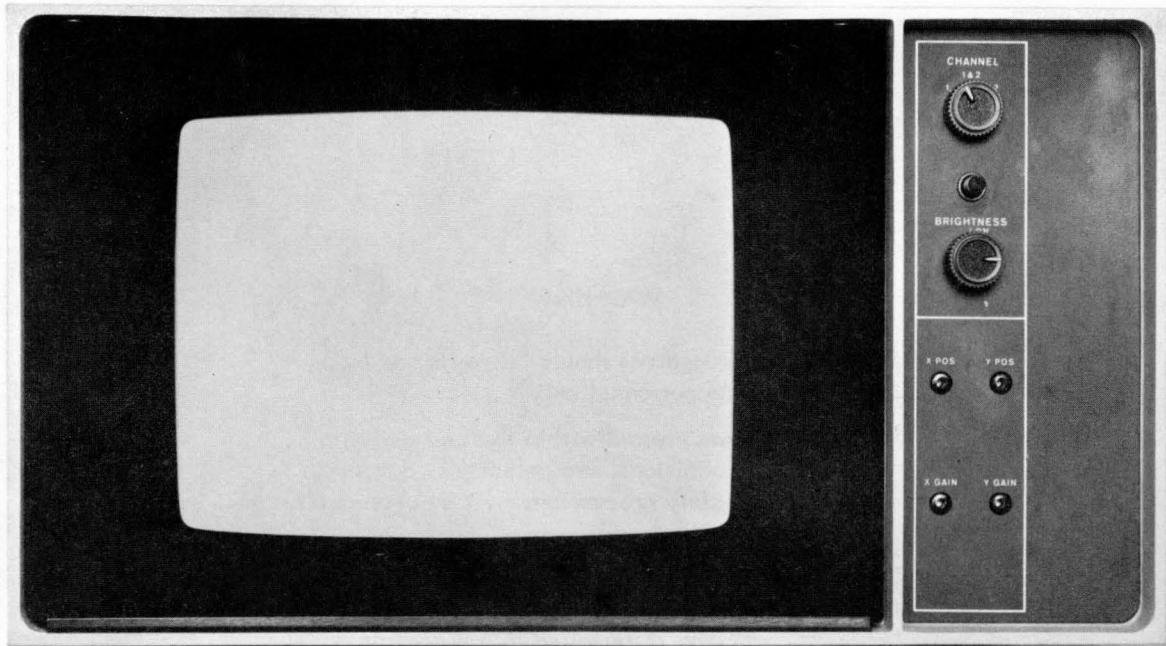
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WARNING

Maintenance procedures should be performed by qualified service personnel only.

High voltages are present within the unit and, under certain conditions, are potentially dangerous. All electrical safety precautions must be observed.

Inherent implosion protection is employed in the CRT design, however, the tube may be damaged if it is subjected to rough treatment or dropped while being removed from or installed in the display. Caution, therefore, must be exercised during these operations.



VR12 Display

CHAPTER 1 GENERAL INFORMATION

This manual presents information relevant to the installation, operation, and maintenance of the VR12 Cathode Ray Tube Display, designed and manufactured by Digital Equipment Corporation.

1.1 GENERAL DESCRIPTION

The VR12 is a compact, solid-state, CRT display with self-contained power supplies and a 6-3/4 in. by 9 in. viewing area.

A unique switching method, utilized within the electro-magnetic deflection system, provides high-speed plotting at low power consumption levels. The VR12 is capable of displaying 2000 random points or up to 75 in. of vector with no flicker.

For high reliability and ease of maintenance, modular solid-state construction is used throughout.

There are two intensification channels either or both of which may be selected for display if a multiplexed intensification pulse input (Z-input) is provided.

An option, the G814 Brightness Control with associated power supply, provides for digital intensity control over eight levels. Installation of the optional power supply allows a light pen to be used with the display. These options are described in Appendix A.

The VR12 is available in 19 in. rack-mounted and free-standing table top versions.

1.2 SPECIFICATIONS

Tables 1-1 and 1-2 list the physical and electrical characteristics of the VR12. A description of the operator's controls is contained in Chapter 3.

Table 1-1
Physical Specifications

Characteristic	
Height	10-1/2 in., 267 mm
Width	19 in., 483 mm
Depth	17 in., 432 mm
Weight (net)	68 lb, 30.8 kg
Weight (shipping)	78 lb, 35.4 kg
Screen Dimensions (overall)	7-5/8 in. x 10-1/8 in. (194 mm x 257 mm)
Screen Dimensions (useful)	6-3/4 in. x 9 in. (172 mm x 229 mm)
Aspect Ratio	3:4
Phosphor Type	P31 (P7 and others available upon request)
Optical Screen Transmission	50%
Temperature Range (operating)	50° F to 130° F 10° C to 54° C

Table 1-2
Electrical Specifications

Characteristic		
Power Requirements	117V ± 10% 220V ± 10%	50 or 60 Hz 50 or 60 Hz
Power Dissipation	150 W	
XY Input Sensitivity (Max. Gain Setting)	200 mV/in (Sensitivity Switch at H) 500 mV/in (Sensitivity Switch at L)	
XY Input Impedance	Max. Gain Setting	Min. Gain Setting
Low Sensitivity (L)	25K	20K
High Sensitivity (H)	10K	5K
XY Deflection Amplifier Speed	400 ns for 1/1024 of full screen deflection (non-intensified); 600 ns (intensified). Less than 15 µs for the maximum deflection step in any dimension.	
Deflection Method	Electro-magnetic (70° diagonal deflection angle)	
Focus	Electrostatic	
High Voltage	11.7 kV (Refer to Table 4-4); less than 50V ripple at 200 µA load.	

Table 1-2 (Cont)
Electrical Specifications

Characteristic	
CRT	Type 12M63, 12 in., 70°, with inherent implosion protection.
Spot Size	Less than 15 mils (1 of 512 spots composing a line is easily discernible)
Linearity	Better than $\pm 1.0\%$ over full screen.*
Repeatability	Better than 0.5%
Stability and Drift	Less than 0.15 in. of drift over an 8 hr period following an initial 1/2 hr warm-up period.
Input Levels	
X and Y	$\pm 50V$, Absolute Maximum, at low sensitivity, and $\pm 12V$ at high sensitivity.
Z-Input	Level change from +3V to ground
Z Select	+3V for Channel I Ground for Channel II
Z Direct	A positive going pulse not exceeding 35V. (ac coupled)
Intensity Amplifier Output	+60V to ground negative-going 200-ns pulse at the CRT cathode delayed 50 ns with respect to the Z input level transient.

*The worst-case measurement of an arbitrary unit of deflection related to full-scale deflection (X) by a factor (n) will not vary from the theoretical value of X/n by more than $\pm 1\%$; n=8 for practical measurement.

1.3 MAJOR SECTION DESCRIPTIONS

This discussion refers to drawing number D-IC-VR12-0-1 Block Schematic, and briefly describes each of the major sections which comprise the VR12. Detailed descriptions of the functional operation of each section are contained in Chapter 4, Principles of Operation.

1.3.1 XY-Control

Coordinate data is applied to the VR12 through BNC coaxial connectors located on the rear panel. Two connectors are provided for each input (X and Y) to allow for differential or single-ended operation. Each input is coupled to the XY-Control input through individual Polarity and Sensitivity switches also located on the rear panel. These switches determine the polarity of the presentation and select one of two deflection amplifier sensitivity levels. Each of the two attenuators (contained on the XY-Control module) consists basically of a

differential amplifier and front panel mounted controls for varying the size and position of the presentation in each dimension.

1.3.2 Deflection Amplifiers

A Type G912 Deflection Amplifier is provided for each attenuator output. These modules, which are pluggable and contain the required heat sinks, control the current flow through the X and Y deflection coils, thereby positioning the electron beam on the CRT screen.

To obtain high deflection speeds at low power consumption levels, automatic selection between two internal modes of operation (linear or switched) is provided.

1.3.3 Intensity Circuit

Potentials to the CRT cathode and Grid #1 are applied through the Type 682 Intensity Circuit Module which determines the brightness of the display. The brightness potentiometer is connected in the GRID #1 circuit. Inputs applied through the channel select input connector cause the CRT to be biased off or on, depending upon which channel(s) are to be displayed. Multiplexed Z-inputs received simultaneously with grounds at the Z Select input intensify Channel II; Z-inputs received simultaneously with +3V inputs at the Z Select input intensify Channel I. For simultaneous plotting of both channels, no input to Z Select is required. Channel selection is accomplished by a front panel mounted switch. The intensity control is also mounted on the front panel.

1.3.4 Low Voltage Power Supply System

Drawing number D-CS-7005005-0-1, contained in Chapter 7, illustrates the low voltage power supply arrangement. Input power is supplied to the display through a receptacle on the rear panel to the fused primary winding of the power transformer in the Type 713 Power Supply. The secondary winding of this transformer provides the CRT filament voltage and the ac voltages required to operate the Type 817 and 818 Power Supply modules where the display's dc operating potentials are developed. One dc voltage (+8V with reference to the floating ground) is obtained from circuitry separate from the power supply modules. Also contained in the system are: the cooling fan; ON-OFF switch; Brightness, Brightness Preset, and Focus controls; and the power-on indicator light.

1.3.5 High Voltage Power Supply (DEC No. 12 09666)

A highly reliable miniaturized modular type of power supply is used to develop the 11.7 kV CRT anode potential. The unit is encapsulated and equipped with no adjusting controls, therefore, in the event of failure, the unit should be treated as a "black box" by maintenance personnel."

CHAPTER 2 INSTALLATION

2.1 GENERAL

Environmental requirements are listed under Specifications in Section 1.2. All DEC cabinets are equipped with air intake blowers and fans for circulating cooling air throughout the cabinet interiors. When bench mounted, no cooling equipment is needed other than the fan provided in the unit.

Drawing number D-CS-7005995-0-1 in Chapter 7 illustrates the wiring configuration for 117 Vac and 220 Vac applications. Table 2-1 lists the cables and termination types for each cable.

Table 2-1
Interconnecting Cable Requirements

Cable	Type	Termination
X Input	Coaxial	BNC
Y Input	Coaxial	BNC
Z Input	Coaxial	BNC
Z Select	Coaxial	BNC
Direct IN	Coaxial	BNC
Aux Display	DEC Type B612A	Amphenol Blue Ribbon 24-contact.

The maximum separation between the VR12 and its signal source is dictated only by the interconnecting cable type, and the driving capabilities of the source. The characteristic impedance of the coaxial cables in use should match the impedance of the driving source. When operating single-ended, unused signal inputs should also be terminated in the characteristic impedance of the driving source.

CHAPTER 3 OPERATION

This chapter lists the controls and connectors and includes a brief description of the function of each.

3.1 CONTROLS AND CONNECTORS

All operator's controls are located on the front and rear panels as shown in Figures 3-1 and 3-2, respectively. Internally located controls which should be adjusted only during maintenance procedures are illustrated and discussed in Chapter 5, Maintenance.

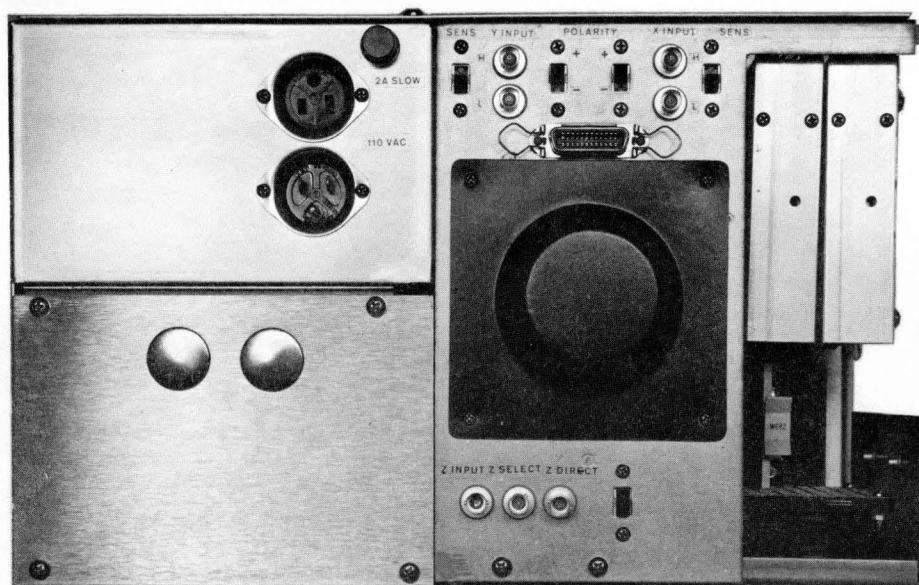
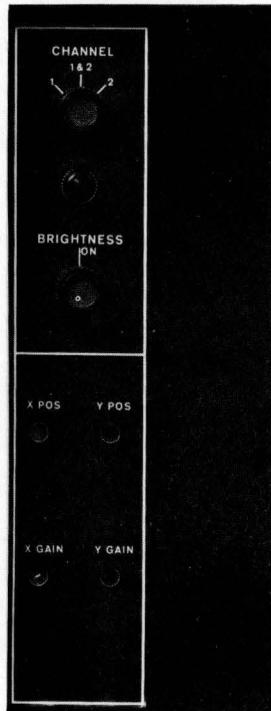


Figure 3-2 Rear Panel

Figure 3-1 Front Panel

3.1.1 Front Panel Controls

Table 3-1 contains a list of the front panel controls and includes the type and function of each.

Table 3-1
Front Panel Controls

Control	Type	Function
Channel Select	Three Position-Rotary Switch	Selects Intensity Channel 1, 2, or 1 and 2 for display, if a channel select signal is asserted and the Z-signal is multiplexed.
Brightness/OFF-ON	Potentiometer/Switch Combination	Turns power on and off and controls the brightness of the display presentation.
X Position	Potentiometer (Screwdriver Adjustment)	Controls the horizontal position of the display presentation.
Y Position	Potentiometer (Screwdriver Adjustment)	Controls the vertical position of the display presentation.
X Gain	Potentiometer (Screwdriver Adjustment)	Controls the horizontal size of the display.
Y Gain	Potentiometer (Screwdriver Adjustment)	Controls the vertical size of the display.

Also provided is a pilot lamp which, when lighted, indicates that the Brightness/OFF-ON switch is in the ON position when primary ac power to the equipment is present.

3.1.2 Rear Panel Controls and Connectors

Table 3-2 lists the rear panel controls and connectors.

Table 3-2
Rear Panel Controls and Connectors

Component	Type	Function
X Input	BNC Coaxial Connectors (two provided for differential inputs)	Input connectors for horizontal data.
Y Input	BNC Coaxial Connectors (two provided for differential inputs)	Input connectors for vertical data.

Table 3-2 (Cont)
Rear Panel Controls and Connectors

Component	Type	Function
Y Sensitivity	Two-position slide switch	Selects either the high or low sensitivity output from the Y section of the X-Y Control circuit.
X Sensitivity	Two-position slide switch	Selects either the high or low sensitivity output from the X section of the X-Y Control circuit.
Y Polarity	Two-position slide switch	When in the "--" position, reverses the polarity of all Y coordinates.
X Polarity	Two-position slide switch	When in the "--" position, reverses the polarity of all X coordinates.
Z Select	BNC Coaxial Connector	Input connector for the signal which causes the CRT to be intensified during the period of Z signal assertion associated with the intensity channel which is selected for display.
Z Input	BNC Coaxial Connector	Input connector for the signal which initiates the intensity circuit and which is a requirement for any level of brightness.
Direct	BNC Coaxial Connector	Input connector for signals possessing variable amplitudes or widths which cause variable intensity levels.
Auxiliary	Blue Ribbon Connector 24 contact	Allows the use of an auxiliary display. Simplifies remote operation by providing all required inputs through one cable. Also contains an input for the 3-bit logic to drive the G814 Option.
Manual/Auto	Two-position slide switch	Selects the manual or optional (G814) intensity mode. This switch is disabled when the G814 option is not installed.

CHAPTER 4 PRINCIPLES OF OPERATION

This chapter contains detailed descriptions of the operation of each section of the VR12. The material is arranged by section. Reference is made only to those engineering drawings contained in Chapter 7 and the module schematics which are included in this chapter.

4.1 X and Y SIGNALS INPUT CIRCUITRY

Signals applied through the X and Y BNC input connectors on the rear panel are asserted at the associated polarity switch as shown in Drawing D-IC-VR12-0-1. If the input is differential, all four input connectors are used. When operating single-ended, only one X and one Y input is utilized for data; the remaining input connector is terminated in the characteristic impedance of the signal cable.

The configuration of the Polarity switch wiring is such that its output is of the same polarity as the input when the switch is in the "+" position and of opposite polarity when it is in the "-" position. This output is applied to the associated Sensitivity switch which, depending upon its position, inserts 7.5K or 100 ohms in series with each side of the input. Maximum input sensitivity is obtained with the 7.5K resistance shorted.

4.2 XY - CONTROL (G917)

Inputs from both the X and Y Sensitivity switches are applied to a single Type G917 XY-Control module. The G917 contains two complete attenuator circuits and therefore is able to accomodate both the X and Y inputs. Figure 4-1 is a schematic diagram of the Type G917 XY-Control.

Four Type 664 Diodes limit each input to between +6.8V and -6.8V to protect the differential amplifiers from inputs of excessive amplitudes.

The differential input to each amplifier is applied through a voltage divider composed of R1, R2, and R14. R14 is the gain adjustment; at one extreme setting, the input is taken from across the entire 5K resistance of R14 and results in maximum gain. At R14's other extreme setting, the differential inputs are shorted together which results in no signal input to the amplifier. C1, R3 and C2, R4 are differentiating networks which improve the high frequency response of the amplifier (C1 and C2 being "speed up" capacitors).

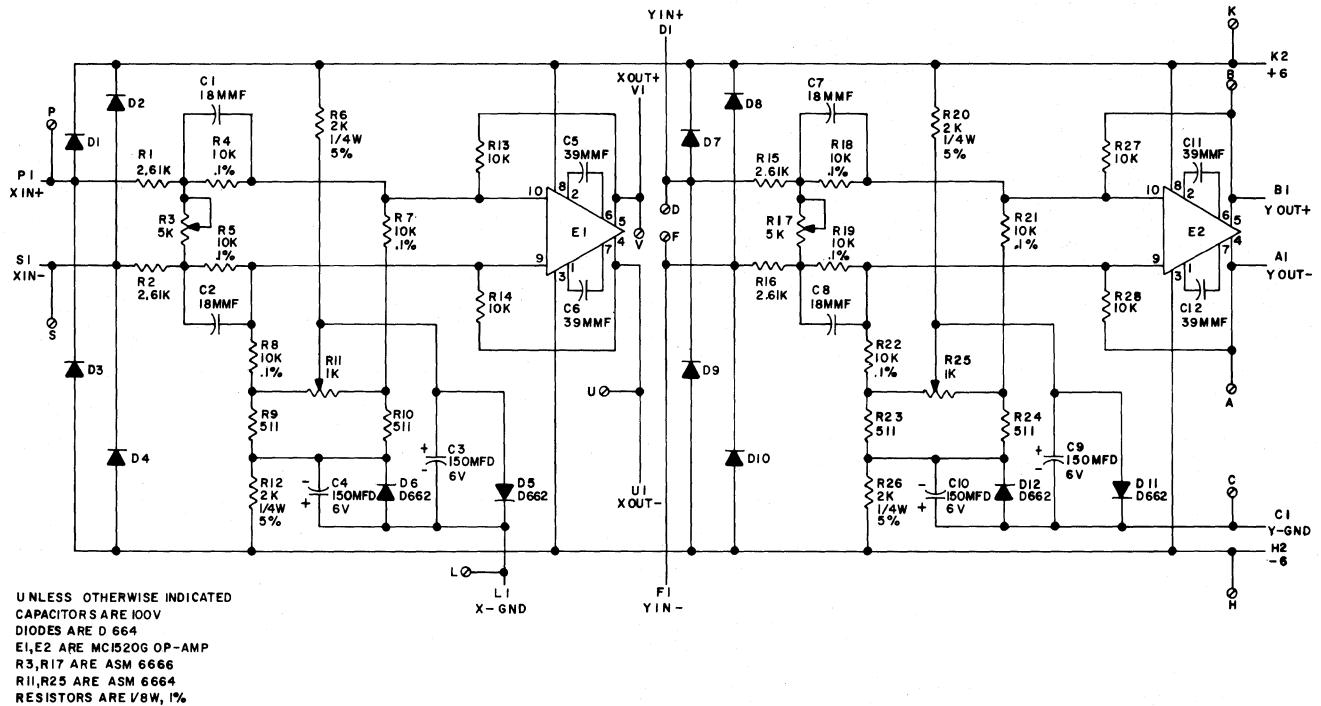


Figure 4-1 G917 XY-Control Schematic Diagram

R5, R6, R9, R10, and R13 comprise a bridge which develops a differential dc potential for the differential amplifier input and thereby provides a means of positioning the display presentation which does not interact with the gain control. The diode-capacitor networks connected to ground from R11 and R12 stabilize and filter the +6V and -6V bridge inputs to minimize hum.

A Motorola Type MC1520G Differential Output Monolithic Operational Amplifier performs the differential amplification function. The arrangement is such ($R_7 = R_8 = 10K$, $R_3 = R_4 = 10K$) that the amplifier operates with unity gain. C3 and C4 serve to reduce the amplifier gain at high frequencies to avoid oscillation.

The differential outputs of each attenuator are then applied to the inputs of the associated deflection amplifier (X or Y).

4.3 DEFLECTION AMPLIFIERS

Each Type G912 Deflection Amplifier Module, Figure 4-2, is composed of a two stage differential preamplifier, a high-speed differential switch, the logic required for controlling the switch, and a differential power amplifier.

One of two modes of operation is automatically selected by the logic contained within the deflection amplifier circuitry. Operation within the linear mode is initiated by an analog signal possessing magnitude and rise-time characteristics which allow linear operation of the preamplifiers.

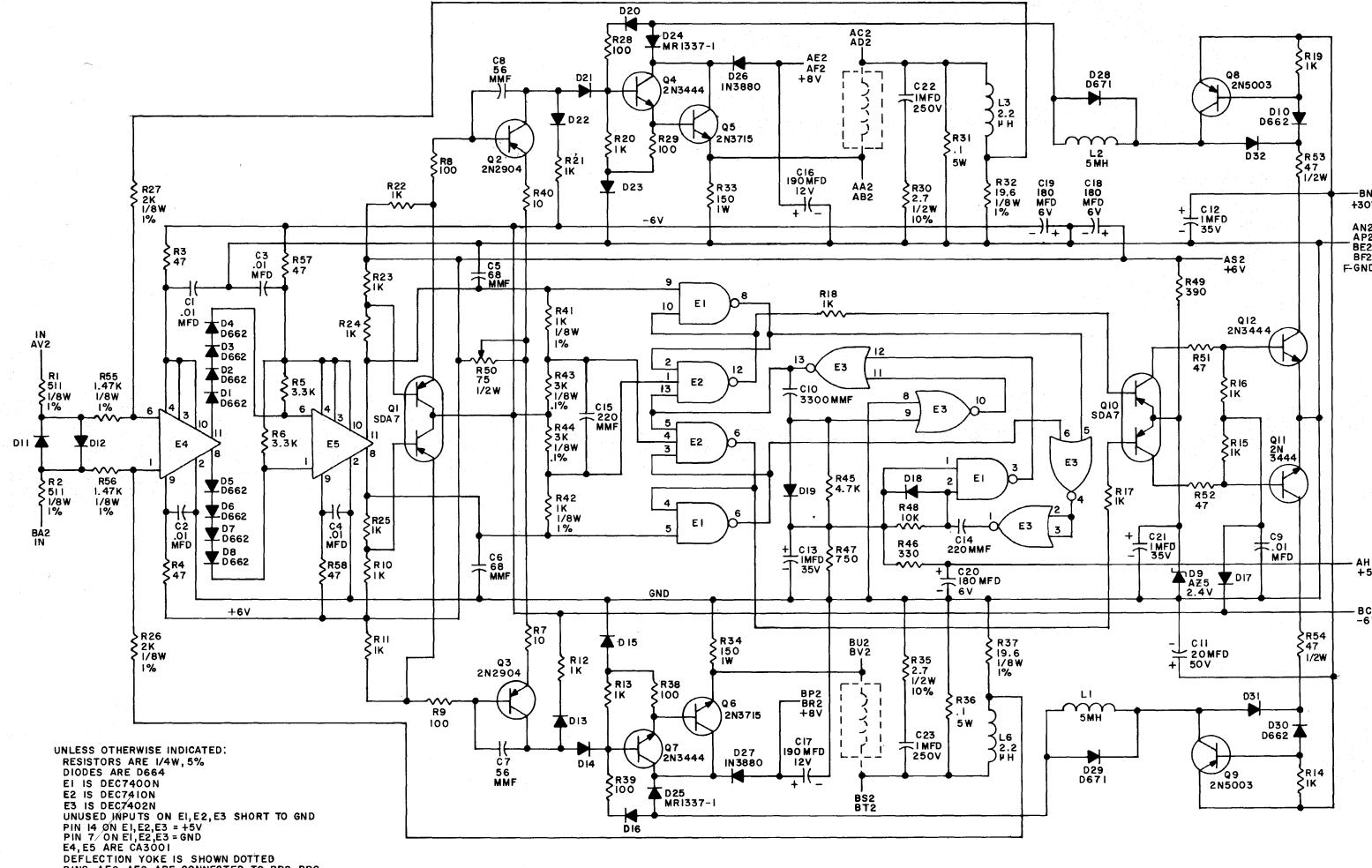


Figure 4-2 G912 Deflection Amplifier Schematic Diagram

The logic which causes operation within the switched mode is enabled when an analog input signal excursion is of such magnitude, rise-time, or both, that the preamplifier is driven into saturation.

4.3.1 Linear Mode

The XY-Control output, applied to the input terminals of the preamplifier, is limited in amplitude by D11 and D12 to protect the amplifier from damage due to inputs of excessive magnitude. R26 and R27 are feedback resistors across which potentials proportional to currents flowing in the deflection coils are developed; these currents effectively follow input signals of nominal amplitude and rise-times.

Eight diodes are provided for coupling between the two preamplifier stages to match the dc biasing. Because the preamplifier output is differential, the operation of the two amplifier sections (upper and lower in Figure 4-2) is complementary. As shown in the upper section of the figure, negative-going preamplifier outputs cause Q1 (the dual emitter follower transistor) and Q2 to increase conduction. The emitters of Q2 and Q3 are connected to +6V through R50, the quiescent current control. This potentiometer, when adjusted according to the instructions contained in Section 5.2.2.3, allows approximately 1.0A to flow in the deflection coils in the absence of an input signal.

Q2 drives Q4 and Q5 which compose a Darlington Amplifier. The current through the L4 section of the deflection coil is controlled by Q5. The parallel network between L4 and ground consists of a low-pass filter (L3, R32), an RC network (R30, C12) which prevents oscillation by compensating for deflection coil reactance, and a sampling resistor (R31) across which the feedback potential is developed. This circuitry is duplicated in the lower section of Figure 4-2; the operation for similar input signals is identical to that described above.

The magnitudes of the currents flowing through the two deflection coil sections (L3 and L4) therefore determine the relative position of the spot on the CRT screen in the X or Y dimension, depending upon which slot the module under discussion occupies.

4.3.2 Switched Mode

An analog input excursion possessing magnitude and rise-time characteristics such that the deflection coil amplifier is unable to provide current to the deflection coils at the required rate of change causes the rise-time of the feedback sample (proportional to deflection coil current) to differ from the input signal; this condition produces a difference potential at the preamplifier input of such magnitude that the preamplifier is driven into saturation. The saturated output of the preamplifier exceeds the threshold value required to set one of the two flip-flops which control the high-speed switches. If the input conditions are such that a "low" is present at pin 11 of the preamplifier second stage and the remaining enabling requirements are true, the upper flip-flop is set and the upper section of dual transistor Q10 conducts.

The positive output of Q10 turns on Q12 causing Q8 to conduct and thereby applying a +30V potential to the upper deflection coil section. This action causes a sharp positive swing in the rate of increase of current flow through the coil which results in a rapid positioning of the spot on the CRT screen. The slope of the feedback sample becomes steeper due to the increased rate of change; the difference at the preamplifier input, therefore, is less pronounced as the wave shape of the feedback sample becomes more similar to that of the input signal. When the difference potential reaches a value which no longer exceeds the switching threshold, the flip-flop is reset, the switch is opened, and the +30V is no longer impressed across the coil; the main amplifiers, with the preamplifiers operating in the linear mode, now supply the current required by the deflection coils as determined by the existing input signal.

Additional logic composed of four OR gates, an AND gate, and associated circuitry is provided to lock out inputs, caused by voltage spikes, to the switching logic for a period of approximately 5 μ s following the switching OFF of either section.

4.4 INTENSITY CIRCUIT (W682)

This discussion refers to Figure 4-3, the W682 Module Schematic, and is presented in four parts: the gating required for, and the generation of, the intensification pulse to the CRT cathode; the gating and switching which allows the selection of intensification channels; the circuitry which prevents spot burn of the CRT screen at power turn-off; and the circuitry which allows a direct input to be applied to the CRT control grid.

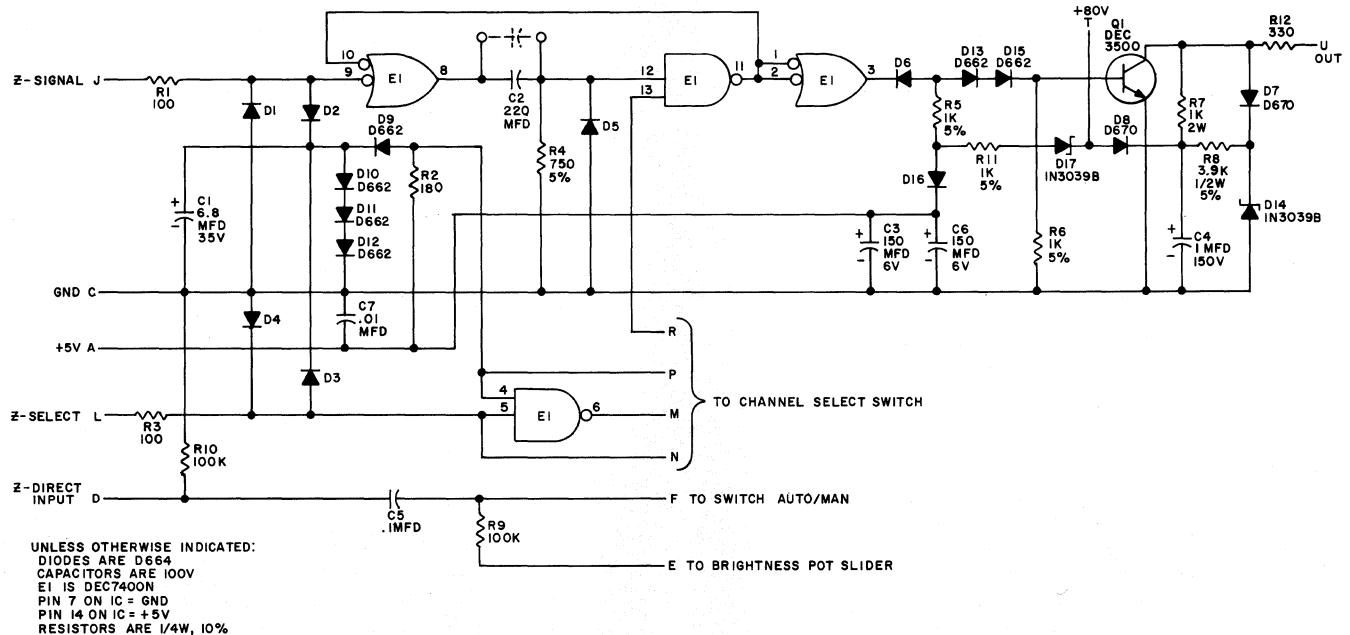


Figure 4-3 W682 Intensity Circuit Schematic Diagram

4.4.1 Z-Signal Gating and CRT Cathode Pulse Generation

Appropriate negative-going transitions (+3V to ground) are applied to a two-input NOR gate; the remaining low required for enabling is obtained from the output of a second NOR gate which, in turn, is dependent for enabling upon a high from the first gate (differentiated by R4-C2) and a high from the Z-Select Switch circuitry. The output from the second gate (a 100 ns negative-going pulse) is asserted at the first gate to lock out further inputs during the 100 ns period.

The 100 ns pulse is inverted in a third gate whose positive output pulse drives Q1. Q1 is normally turned off with its collector clamped at +60V by the 1N3038 Zener diode. This output is applied to the CRT cathode sending the tube into cut-off. When being driven, Q1's collector is at ground potential. The +60V to ground negative-going pulse is applied to the CRT cathode sending the tube into conduction. This pulse is 200 ns in duration and is delayed 50 ns with respect to the Z-Input signal transition.

Generation of an intensification pulse, allowing a point to be plotted, depends upon a +3V to ground transition at the Z-Signal input connector and a high output from the Z-Select circuitry which is discussed in the next section.

R12 is provided to protect the output transistor Q1 from damage in the event of CRT flashovers.

4.4.2 Z-Select Gating and Switching

To allow for selection between two intensity channels, the Z-Signal must be multiplexed. The periods associated with Z-Signal inputs are designated Channel I "times" and Channel II "times" for the purposes of this discussion.

High levels from the Z-Select switching network applied to the intensification gating circuitry are the requirements for generating intensification pulses as described in the previous section. Highs applied to the Z-Select Input during Channel I time enable the intensification gating if the Z-Select Switch is in the Channel I position. Lows applied to the Z-Select Input during Channel II time cause generation of highs from the output of the NOR gate and enable the intensification gating if the Channel Select Switch is in the Channel II position. Positioning the switch at Channel I and II results in a fixed high being asserted; enabling of the intensification gating takes place during both Channel I and Channel II times under this condition. Table 4-1 shows the input and output conditions.

4.4.3 Power Turn-Off Protection

It is desirable, upon power turn-off, to maintain the CRT cathode at a positive potential (cut-off) until the remaining CRT potentials and the CRT filament temperature have decayed to values which preclude the possibility of a spot burn on the CRT screen. This is accomplished in the following manner. Upon removal of

the +80V potential, the series diode D8 immediately becomes reverse biased and the Zener diode D14 stops conducting. Capacitor C4 is charged to approximately +60V and, as there is no load, discharge time is very slow; the CRT cathode is maintained at a positive potential for a safe period following power shut-off. In addition, upon removal of the +80V potential from Zener diode D17, Q1 is reverse biased and therefore cut-off preventing response to subsequent input pulses.

Table 4-1
Z-Select Gating Conditions

		Intensify	
Z-Select Switch Position	Z-Select Input Signal	Channel I Time	Channel II Time
Channel I	High	Yes	No
Channel I	Low	No	No
Channel II	High	No	No
Channel II	Low	No	Yes
Channel I and II	High	Yes	Yes
Channel I and II	Low	Yes	Yes

4.4.4 Direct Input

A simple RC coupling network composed of R10, C5, and R9 is provided to allow for the ac coupling of positive input pulses (Z-Direct) to Grid #1 of the CRT thereby producing a direct intensity control associated with the manual intensity control.

4.5 TYPE G817 POWER SUPPLY

Table 4-2 lists the voltages developed in the G817 and the sections of the display where they are utilized. The discussion which follows refers to Figure 4-4, the G817 Power Supply Schematic.

Two half-wave rectifier circuits composed of D1, D2 and their associated output components develop the +80 Vdc and -80 Vdc potentials with respect to chassis ground. The ac input is provided across pins V and P where pin V is connected to transformer tap 11 and pin P is connected to chassis ground. The filter associated with D1 is composed of C1, C2 and R5. The -80 Vdc output is brought out a pin U. The filter associated with D2 is composed of C3, C4, and R1. The +80 Vdc output is brought out at pin S and is also applied to the voltage divider (R2 and R3) which forms a portion of the brightness control circuitry.

Two full-wave rectifiers composed of D3, D4, D5, and D6 provide the +6 Vdc and -6 Vdc potentials. The ac input is furnished from transformer taps 6 and 8. Tap 7, the centertap, is connected to the floating ground and

is brought in through pins K and J. Both outputs are regulated by Zener diodes and exit the card at pins N and D for the +6 Vdc and -6 Vdc potentials, respectively. Filtering is accomplished by C9 and C7.

The remaining circuit on the G817 card is a half-wave rectifier composed of D7, its filter network (C5, C6) and a Zener diode regulator to provide a +5 Vdc output. The ac input is furnished from transformer taps 13 and 15 (where tap 15 is chassis ground). Input connections are to pins E and P while the +5 Vdc output is taken from pin C.

Table 4-2
G817 Power Supply Voltages

Potential	Reference	Used
-80 Vdc	Chassis Ground	CRT Grid #1 Biasing
+80 Vdc	Chassis Ground	Intensify Circuit
+6 Vdc	Floating Ground	XY - Control Deflection Amps.
-6 Vdc	Floating Ground	Input Attenuators, Deflection Amps.
-5 Vdc	Chassis Ground	Intensify Circuit

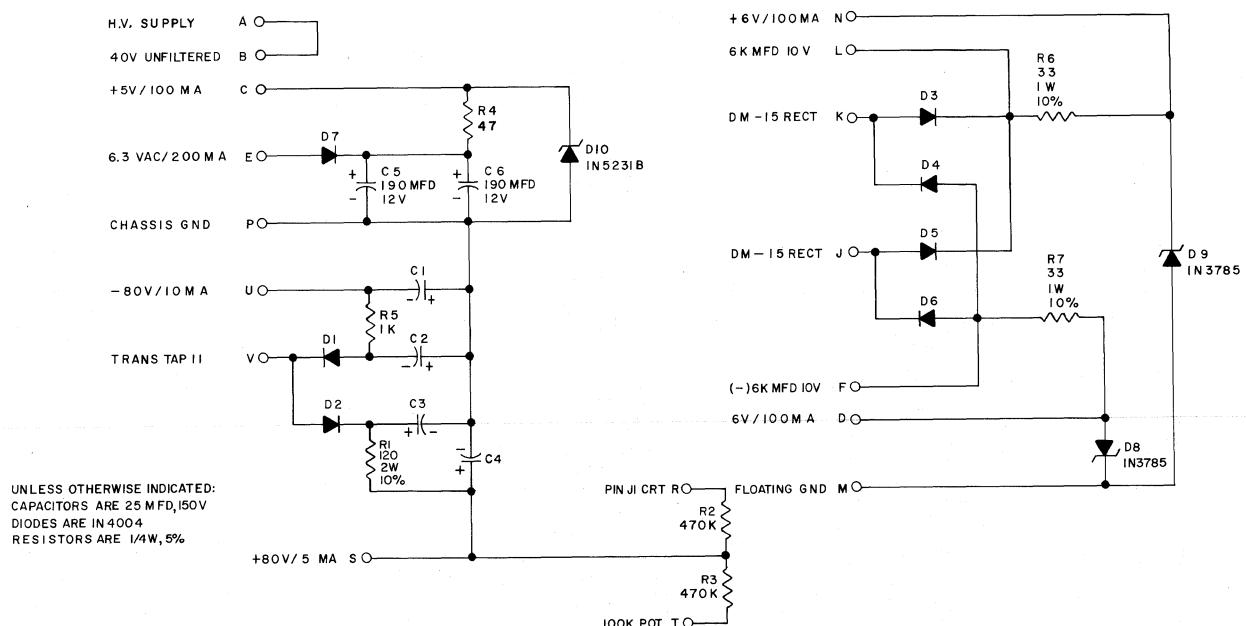


Figure 4-4 G817 Power Supply Schematic Diagram

4.6 TYPE G818 POWER SUPPLY

Table 4-3 lists the voltages developed in the G818 and the sections of the equipment where utilized. The discussion which follows refers to Figure 4-5, the Type G818 Schematic Diagram.

Table 4-3
G818 Power Supply Voltages

Potential	Reference	Used
400 Vdc	Chassis Ground	CRT Grid #2 and the focus adjusting circuitry
30 Vdc (Filtered)	Floating Ground	Deflection Amplifiers
5 Vdc	Floating Ground	Deflection Amplifiers

A voltage doubler consisting of C1, C2, D4, and D5 develops the +400 Vdc potential; the ac input is provided across pins H and S from transformer tap 12 and chassis ground. The output is taken from pin U and is with reference to chassis ground.

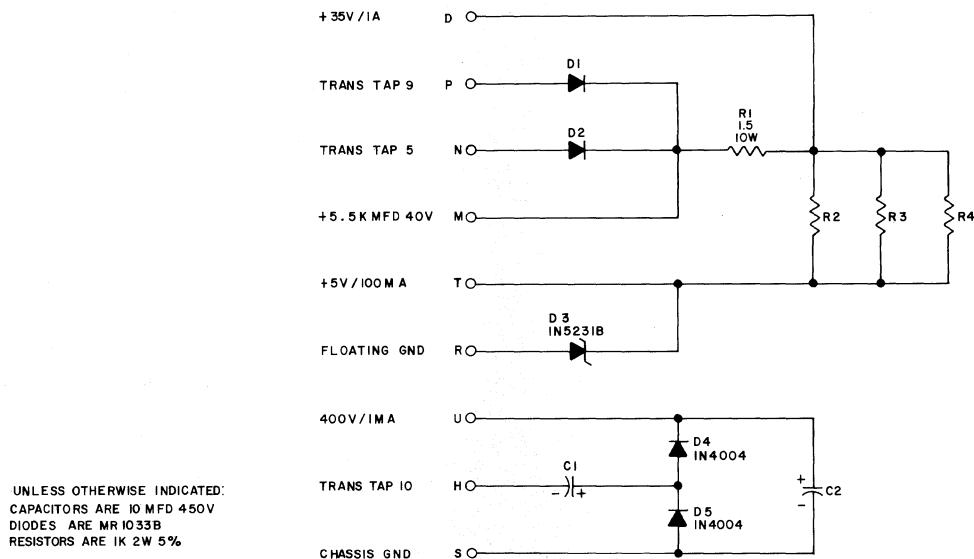


Figure 4-5 G818 Power Supply, Schematic Diagram

The remaining voltages are developed from a full-wave rectifier composed of D1 and D2. The ac input is impressed across pins P and N and is provided from transformer taps 9 and 5; the transformer centertap, 7, is connected to pin R and the floating ground system.

The power supply develops +35 Vdc which is brought out to pin M. This voltage is dropped to +30 Vdc by R1, filtered by C4, and brought out at pin D. This potential (+30 Vdc) is further dropped to +5 Vdc by the parallel resistor arrangement, R2, R3, and R4, and is held at +5V by Zener diode D3. The output is taken from pin T.

4.7 DEFLECTION COIL +8 Vdc POWER SUPPLY

One low voltage power supply is not located on either the G817 or G818 card. This is the +8 Vdc source which furnishes the deflection coil currents. The power supply is composed of a Type DM 15 full-wave rectifier, a 2N4276 regulating transistor, and its associated input and output components and a filter network as shown in Drawing number D-CS-7005995-0-1.

Ac input is provided from transformer taps 6 and 8 which are connected to the input of the DM 15 rectifier. Transformer tap 7 (the centertap) is connected to the floating ground.

Bias is controlled by the load current; the transistor therefore regulates the output voltage by increasing conduction as the output voltage drops and by decreasing conduction as the output voltage rises. C2 and C3 are filter capacitors.

4.8 HIGH VOLTAGE POWER SUPPLY (DEC No. 12 09666)

A solid-state encapsulated unit is provided to develop the CRT anode potential. Nominal output potentials at 200 μ A load are listed in Table 4-4.

For 117V operation; taps 1 and 3; and taps 2 and 4; are tied together. The 117 Vac potential is then applied across taps 1 and 4. For 240V operation: taps 2 and 3 are tied together; the 240 Vac potential is then applied across taps 1 and 4.

Table 4-4
DEC No. 12 09666 Power Supply Voltages

Input Volts ac 50 - 400 Hz	Nominal Output at 200 μ A load
105	10.5 kV
117	11.7 kV
125	12.5 kV
200	10.0 kV
220	11.0 kV
240	12.0 kV

CHAPTER 5 MAINTENANCE

This chapter describes maintenance and troubleshooting procedures for the VR12. Included are procedures for accomplishing internal adjustments, directions for the replacement and installation of subassemblies, typical voltage readings, troubleshooting charts, oscilloscope waveforms, and other pertinent information. Illustrated waveforms were photographed as a crossover test pattern* was displayed.

5.1 PREVENTIVE MAINTENANCE

Preventive maintenance consists of tasks accomplished periodically to keep the equipment clean, to discover conditions which, if ignored, could lead to failure at another time, and to determine that the equipment is performing properly in all modes. The interior and exterior of the unit should be cleaned on a regular schedule; the frequency of cleaning is dictated by environmental conditions at the site. While the cleaning task is being accomplished, a mechanical inspection should be made and abnormal conditions noted and corrected. Applicable diagnostic tests should be run on a regular schedule to insure proper operation.

5.2 CORRECTIVE MAINTENANCE

Corrective maintenance consists of the detection, diagnosis, and correction of a fault. The information in the following paragraphs should enable an experienced technician to isolate a fault to a particular subassembly, card, or component.

5.2.1 Typical Voltage Readings

This section contains typical voltage readings (listed in Table 5-1) measured at various points within the unit. In general, voltage readings in this equipment are not critical and may vary as much as $\pm 20\%$. Readings which vary widely from those shown are indicative of trouble. A properly calibrated meter should be available for troubleshooting. The readings appearing in this section were obtained with a meter of the 20,000 Ω/Vdc and 10,000

*The program for producing this waveform must be written in such a manner as to cause incremental (linear mode) operation in one dimension and (switched mode) operation in the other. The deflection amplifiers may then be tested in either mode by reversing their locations.

Ω /Vac sensitivity type. A reading appended by an asterisk indicates that the measurement was taken with respect to chassis ground. Unless otherwise indicated, all readings were obtained while displaying the crossover test pattern.

Table 5-1
Typical Voltage Readings

G817				G818		CRT	
Pin	Reading	Pin	Reading	Pin	Reading	Pin	Reading
A	+32 Vdc	M	0 Vdc	D	+33 Vdc	1	0 Vdc*
B	+32 Vdc	N	+6 Vdc	H	170 Vac	2	-85 Vdc*
C	+4.75 Vdc	P	0 Vdc*	M	+32 Vdc	3-5	None
D	-7.25 Vdc	R	+65 Vdc*	N	13 Vac	6	+87 Vdc*
E	6 Vac*	S	0 Vdc	P	13 Vac	8-9	None
F	-12 Vdc	T	0 Vdc*	R	0 Vdc*	10	+460 Vdc*
J	8 Vac	U	-80 Vdc*	S	0 Vdc*	11	+93 Vdc*
K	8 Vac	V	60 Vac*	T	+5 Vdc	12	6.5 Vac*
L	+11 Vdc			U	+440 Vdc*	Anode	11.7 kV

5.2.1.1 Deflection Coil +8V Supply - The +8 Vdc deflection coil power supply potential measures +8.75 Vdc with the meter connected between the collector of the regulator transistor (right side panel) and the floating ground.

5.2.1.2 High Voltage Power Supply - Perform steps a through e of Section 5.2.3.1. Attach the high voltage oscilloscope probe to the anode connector and place the connector in the CRT anode receptacle. Energize the VR12. The high voltage values should be within ± 1 kV of those listed in Table 4-4. The maximum ripple should not exceed 50V.

5.2.2 Internal Adjustments

This section contains the instructions for adjusting each of the internally located controls. Figures 5-1, 5-2 and 5-3 illustrate the control locations.

5.2.2.1 Brightness Preset - Set the front panel brightness control to its maximum clockwise position. Adjust the Brightness Preset control for the highest brightness level which does not cause blooming of the presentation.

5.2.2.2 Focus - It is not necessary to monitor any meter reading while adjusting the Focus control; simply set the control to provide the sharpest overall presentation.

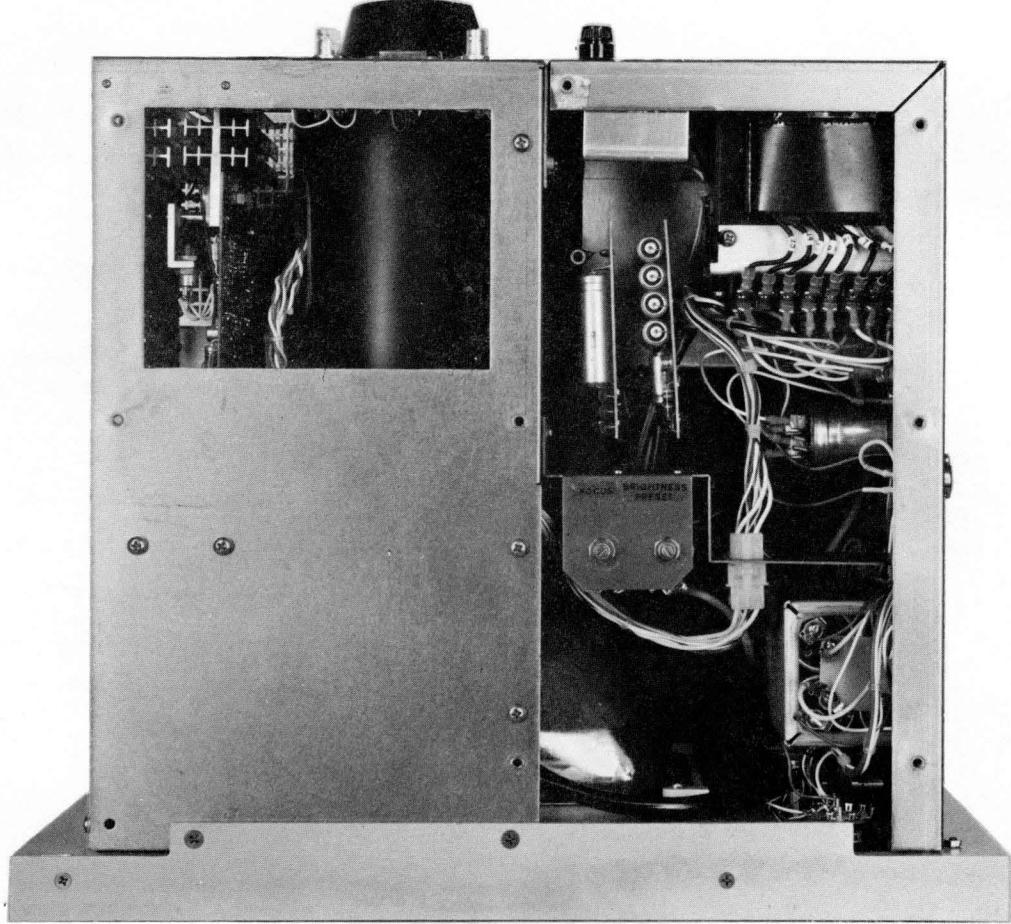


Figure 5-1 VR12 Top View

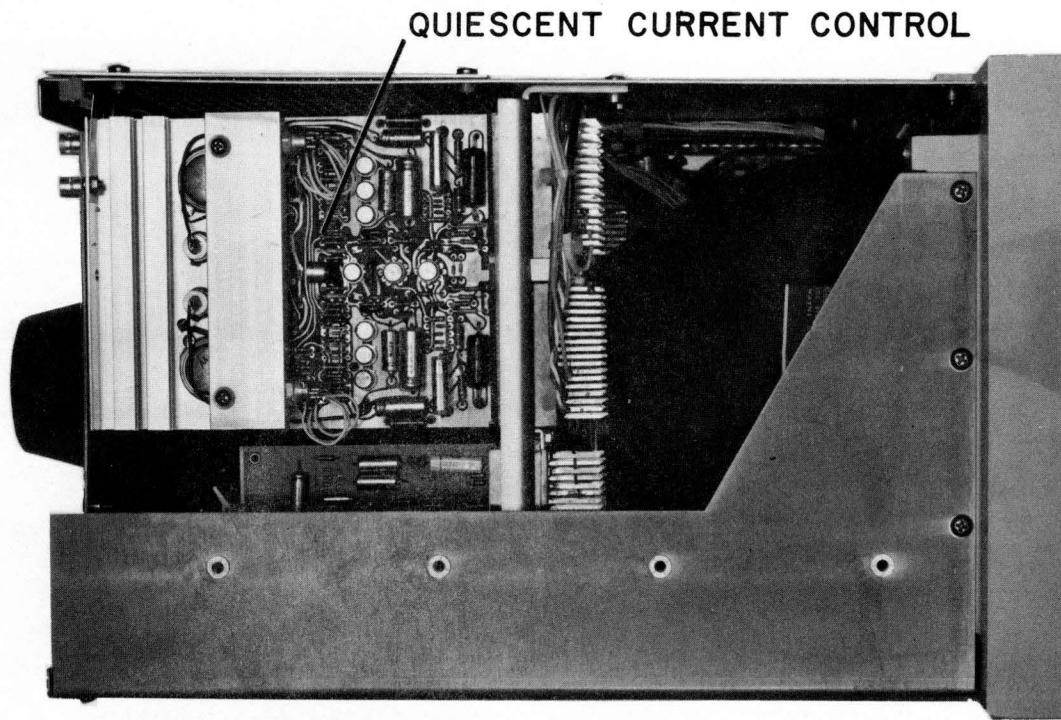


Figure 5-2 VR12 Left Side View

5.2.2.3 Deflection Amplifier Quiescent Current Adjustment - These adjustments (X and Y) should be made while displaying a crossover pattern. Both sensitivity switches must be positioned in accordance with the input signal amplitude. The display conditions which indicate that adjustment is necessary are:

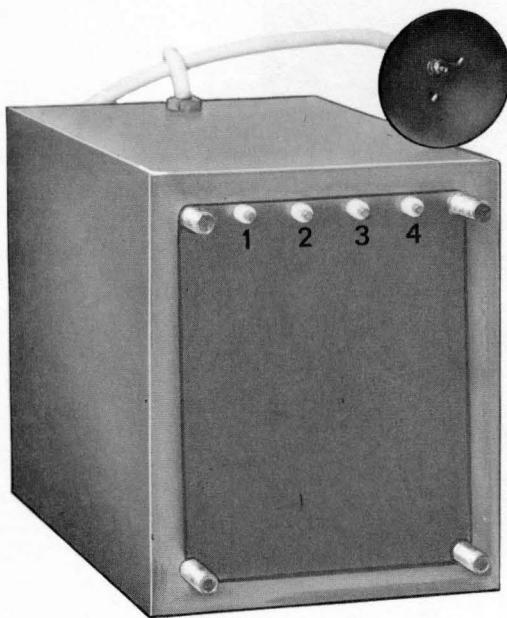


Figure 5-3 DEC No. 12 09666
High Voltage Power Supply

- a. The presence of curls at the center crossover point
- b. Instability
- c. Overheating of the +8 Vdc deflection coil power supply regulator transistor and the deflection amplifier power transistors

Starting from the fully counter-clockwise position and using a screwdriver with an insulated shaft, adjust the potentiometer on each deflection amplifier module to provide straight lines at the crossover points and the least amount of noise possible. Discontinuities of the display presentation are more noticeable when the presentation is reduced in size.

5.2.3 Assembly Replacement Instructions

This section contains instructions for the removal and replacement of all assemblies, modules, and major components.

5.2.3.1 CRT Removal - The CRT is removed from the

display in accordance with the following procedure:

- a. Observe all safety precautions when handling the CRT.
- b. Turn the VR12 OFF/ON switch to OFF.
- c. Remove the ac power plug. Allow one minute for the high voltage to discharge through the bleeder circuit.
- d. With a well insulated screwdriver, discharge the anode cap on the tube to chassis ground until no arcing is apparent.
- e. Carefully unplug the anode connector from the CRT.
- f. At the rear of the display, remove the four screws which hold the plastic cover over the CRT socket.
- g. Carefully remove the CRT socket.
- h. Loosen the screws which hold the retaining clip for each deflection amplifier module.
- i. While holding the associated clip down, remove each deflection amplifier module.
- j. Remove the deflection coil retaining clamp with a 1/4 in. nut driver inserted through the slot provided in the side of the CRT mu metal shield.

- k. Slide the deflection coil as far back on the tube neck as cable slack will allow; DO NOT FORCE.
- l. Remove the four screws which hold the CRT bezel. The retaining piece for the optional tinted screen will also become free during this procedure.
- m. Remove the four screws which hold the CRT to the front casting. Remove the upper two screws first! The metal shell around the CRT is part of the tube and is not removable. Support the bottom of the CRT with one hand as the last screw is removed.
- n. Carefully remove the CRT through the front of the unit. It may be necessary to guide the neck of the tube through the deflection coil to prevent the CRT base from catching on the coil.

5.2.3.2 CRT Installation - A CRT is installed by reversing the procedures in Section 5.2.3.1, with the following qualification. When connecting the anode plug, the rubber covering should be peeled back from the pins as far as it will go. Insert the longer pin into the anode socket and with a screwdriver place the shorter pin into the socket. When the hand is removed, the rubber covering should snap tightly against the tube. Assure that the aquadag grounding wire makes proper connection with the CRT.

5.2.3.3 Deflection Coil Removal

- a. Perform steps a through j of the CRT Removal procedure, Section 5.2.3.1.
- b. Unplug the eight-pin Amphenol connector associated with the deflection coil cable. Without forcing, push the coil as far forward on the neck of the tube as possible. Pull the plug through the slot in the mu-metal shield.
- c. Carefully slide the coil back on the tube neck and remove through the rear of the unit.

5.2.3.4 Deflection Coil Installation - A deflection coil is installed by reversing the procedures in the Removal Instructions, Section 5.2.3.3, with the following qualifications. The coil must be placed as far forward on the tube as possible to avoid shaded corners of the display presentation. Also, to provide an approximate horizontal alignment, the blue and white wires on the deflection coil should be in the 12:00 position. The presentation is oriented horizontally by rotating the deflection coil a small amount and tightening the clamp when the presentation is aligned horizontally.

5.2.3.5 XY - Control Removal

- a. Perform steps b through e of the CRT Removal Procedure, Section 5.2.3.1.
- b. Remove the four allen head screws associated with the X and Y Gain and Position controls from the front panel.
- c. Remove the two nuts from the rear of the panel.

- d. Being careful to exert no strain on the controls, turn the panel to the left to allow access to the four standoffs mounted on the G917 card.
- e. Remove the four standoffs.
- f. The card may now be raised to a position which will allow servicing. Complete removal from the unit requires that the signal cables be unsoldered. Care must be exercised when applying heat in this area, as lead length is critical and the coaxial cable insulation susceptible to damage.

5.2.3.6 XY-Control Installation - A G917 module is installed by reversing the procedures in the Installation Instructions, Section 5.2.3.5, with the following qualifications. The four nylon washers must be in place at the rear of the panel. If the standoffs are allowed to come in contact with the panel, improper operation will result. Also, if the standoffs have a slotted end, that end must face the front of the unit. Do not overtighten the plastic allen head screws.

5.2.3.7 Pluggable Modules - The Type W682 Intensity Circuit and G817, G818 Power Supply modules may be removed from or inserted into their sockets without removing any other component or assembly. Removal of the Type G912 Deflection Amplifier modules requires the release of retaining clips.

5.2.3.8 Power Supply Removal - This section contains the procedure for removing the entire power supply from the unit.

- a. Perform steps b through e of the CRT Removal Procedure, Section 5.2.3.1.
- b. Remove the Brightness control and pilot lamp from the front panel.
- c. Unplug the 15-pin Amphenol connector (main chassis harness).
- d. Remove the G817 and G818 Power Supply modules.
- e. Remove the six power supply retaining screws from the bottom of the unit.
- f. Remove the three screws that hold the right side panel to the front casting.
- g. Remove the two screws that hold the G817, G818 mounting bracket to the main chassis.
- h. Disconnect the red and white twisted pair (muffin fan ac supply) from the transformer.
- i. Remove the two screws from the bracket adjacent to the fuse.
- k. The complete power supply is now mechanically free from the main chassis with the exception of one wire soldered to the W682 socket. If the power supply is to be completely removed from the main chassis, this wire must be unsoldered.

5.2.3.9 Power Supply Installation - A power supply is installed by reversing the Removal Instructions in Section 5.2.3.8, with the following qualification. The Brightness potentiometer and the pilot lamp must be placed in their respective front panel locations before the power supply is placed in its main chassis position.

5.2.3.10 High Voltage Power Supply Removal

- a. Perform steps b through e of the CRT Removal Procedure, Section 5.2.3.1.
- b. Remove the white and red wires from terminals 1 and 2b of the power transformer.
- c. Remove the two screws which hold the subassembly to the bottom panel.
- d. Remove the two screws from the upper bracket interior and the two screws which hold the bracket from the side.
- e. Remove the cover from the ac power receptacle.
- f. Slide the power supply out through the rear of the unit.

5.2.3.11 High Voltage Power Supply Installation - A high voltage power supply is installed by reversing the Installation Procedure, Section 5.2.3.10.

5.3 TROUBLESHOOTING

In addition to troubleshooting charts, Figures 5-11 and 5-12, this section contains specific instructions for troubleshooting areas of the unit where the cause of faults may not be obvious.

5.3.1 Type G912 Deflection Amplifiers

Unless absolutely necessary, Type G912 modules should not be repaired in the field; they should be returned to DEC for repair. If it becomes necessary to repair a G912 in the field, use the following procedure:

5.3.1.1 Main Amplifier Section - The most common defects will probably be oscillation or complete offset of the output signals. To disable the feedback loop remove the base leads of the two switching transistors, Q8 and Q9, and the two leads which supply the +8V to D26 and D27, the diodes mounted on the heat sink. Connect the portion of the crossover pattern input signal (see Figure 5-6) which incrementally varies X or Y, depending upon the program, to the input of the amplifier under test, thereby causing operation within the linear mode. Trace the signal from input to output with the oscilloscope.

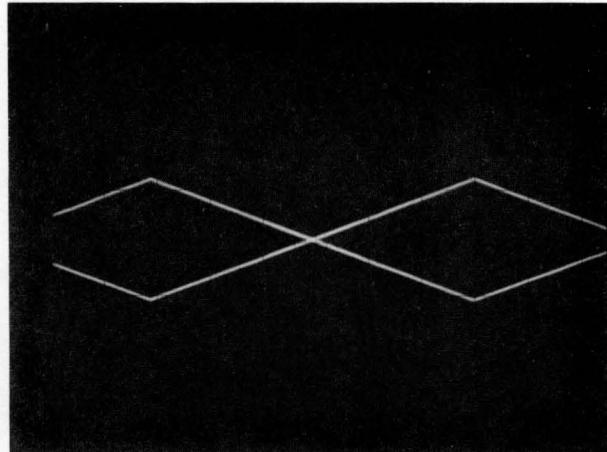
If the problems are isolated to one of the CA 3001 Differential Amplifiers (these amplifiers are susceptible to damage from excessive oscillation or shorts in external components), use the following procedure to test the CA 3001s.

- a. Disconnect the input signals to the VR12 at the rear panel.
- b. Adjust the associated position control (X or Y) until the dc voltages at pins 1 and 6 of the first CA 3001 are equal (approximately -1.2V.)
- c. Measure the dc output voltage of the first CA 3001 and the dc voltages at the input and output of the second CA 3001. These measurements must be symmetrical; if offset, replace the corresponding amplifier.

After replacement of an amplifier or a defective component, bias the output currents to approximately 1A (Section 5.2.2.3) in each branch of the differential output. Replace the wiring which was removed when disabling the feedback loop.

5.3.1.2 Switching Stage - Test the switching stage by connecting the portion of the crossover pattern input signal (X or Y depending upon the program) which exhibits characteristics required for entry into the switched mode to the input of the amplifier under test (see Figures 5-4 and 5-5). Depending upon the amplitude of the input signals at the base of Switch 1 and Switch 2, negative pulses (+30V to approximately +25V) and of from 1 μ s to 12 μ s duration should be present, as shown in Figure 5-7.

At pin 13 of E2, positive pulses, ground to +3V, with durations of from 3 μ s to 5 μ s should follow the switching pulses as shown in Figure 5-8.



Oscilloscope Settings

V

CH1

CH2

0.2V/Div.

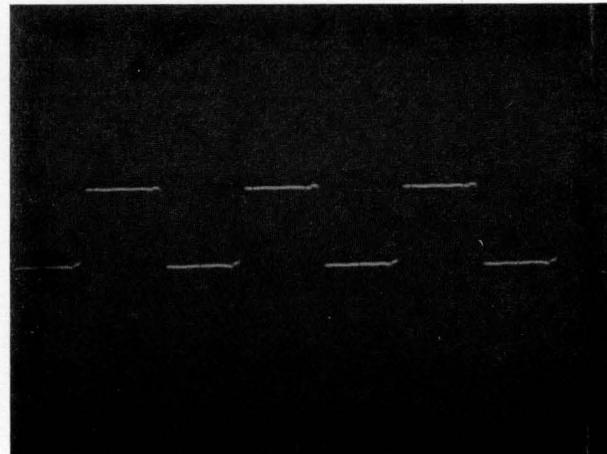
0.2V/Div.

added algebraically

H

20 μ s/Div.

Figure 5-4 Y-Input Signal (A4V and B4A)
(Switched Portion)



Oscilloscope Settings

V

CH1

CH2

0.2V/Div.

0.2V/Div.

added algebraically

H

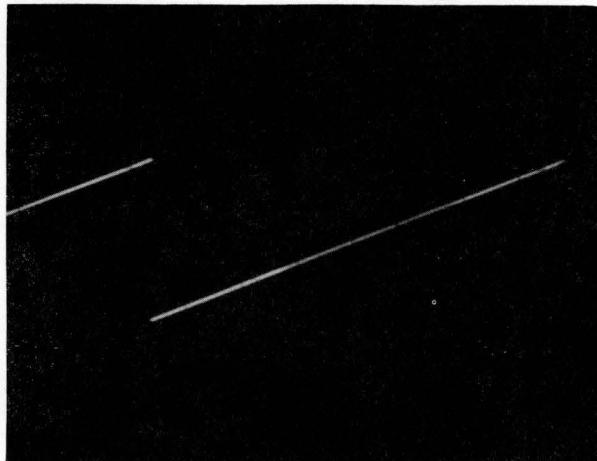
A

B

20 μ s/Div.

5 μ s/Div. (Delayed)

Figure 5-5 Y-Input Signal (A4V and B4A)
(Switched Portion)



Oscilloscope Settings

V

CH1

CH2

0.2V/Div.

0.2V/Div.

added algebraically

H

20 μ s/Div.

Figure 5-6 X-Input Signal (A1V and B1A)
(Incremental Portion)



Oscilloscope Settings

V =

H =

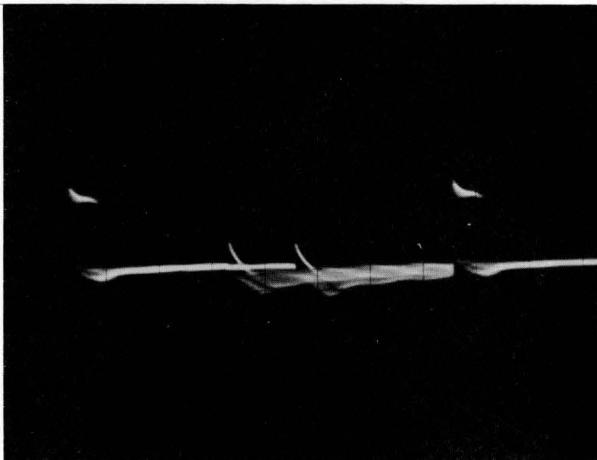
0.0V/Div.

2.0 μ s/Div.

AC Coupled

INT Sync

Figure 5-7 Switching Pulse (Q8, base)



Oscilloscope Settings

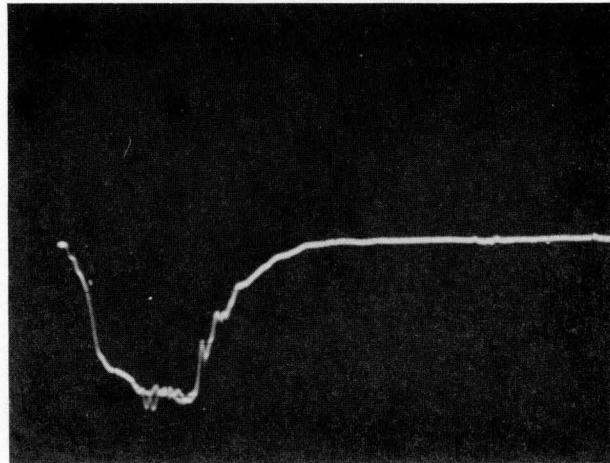
V =

H =

1.0V/Div.

10 μ s/Div.

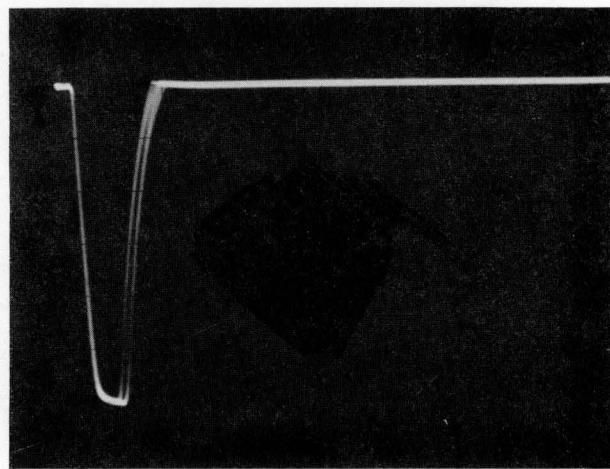
Figure 5-8 Lock-Out Pulses (E2, Pin 13)



Oscilloscope Settings

V = H =
1.0V/Div. 200 ns/Div.

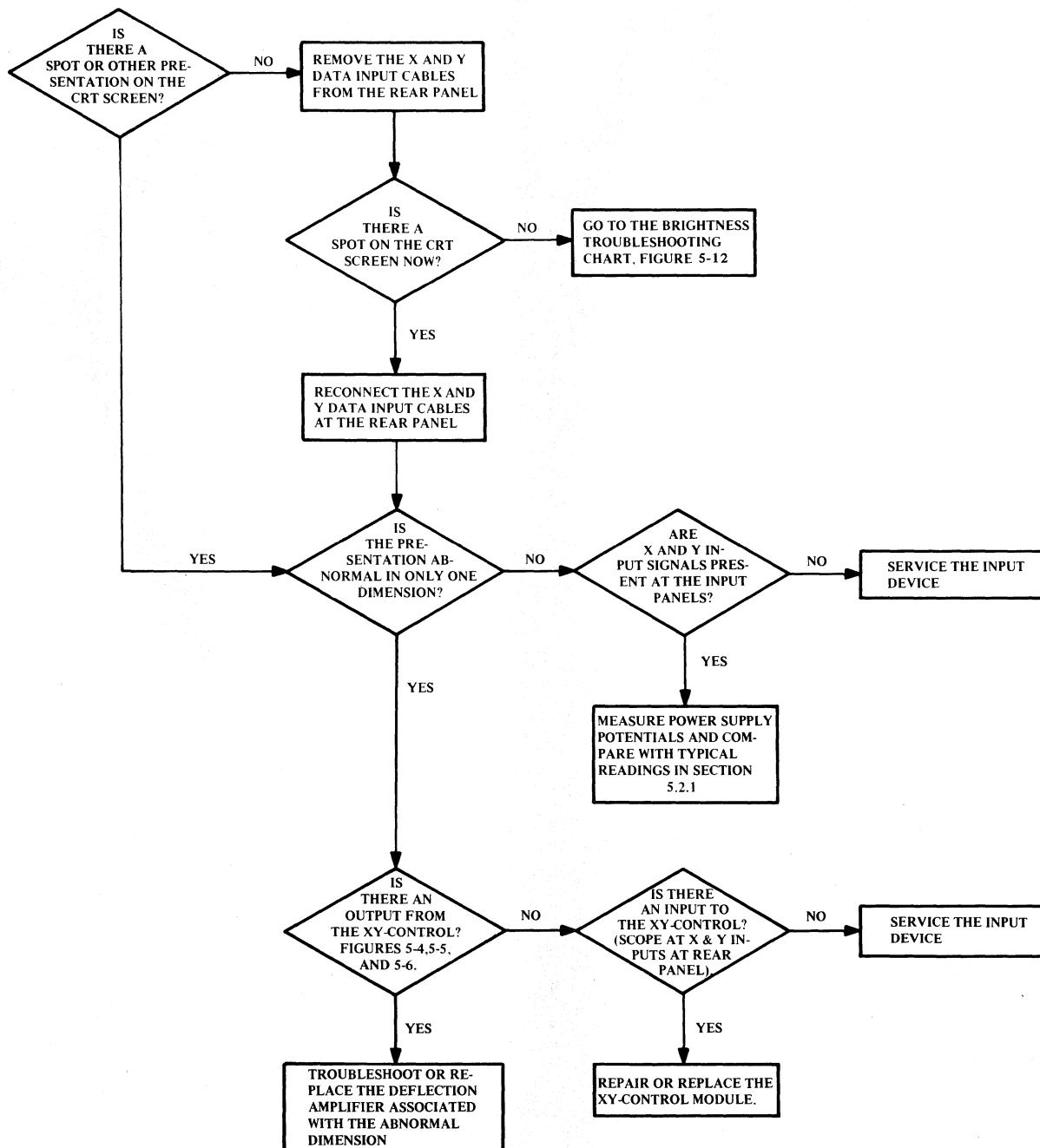
Figure 5-9 Z-Input Transition (C4J)



Oscilloscope Settings

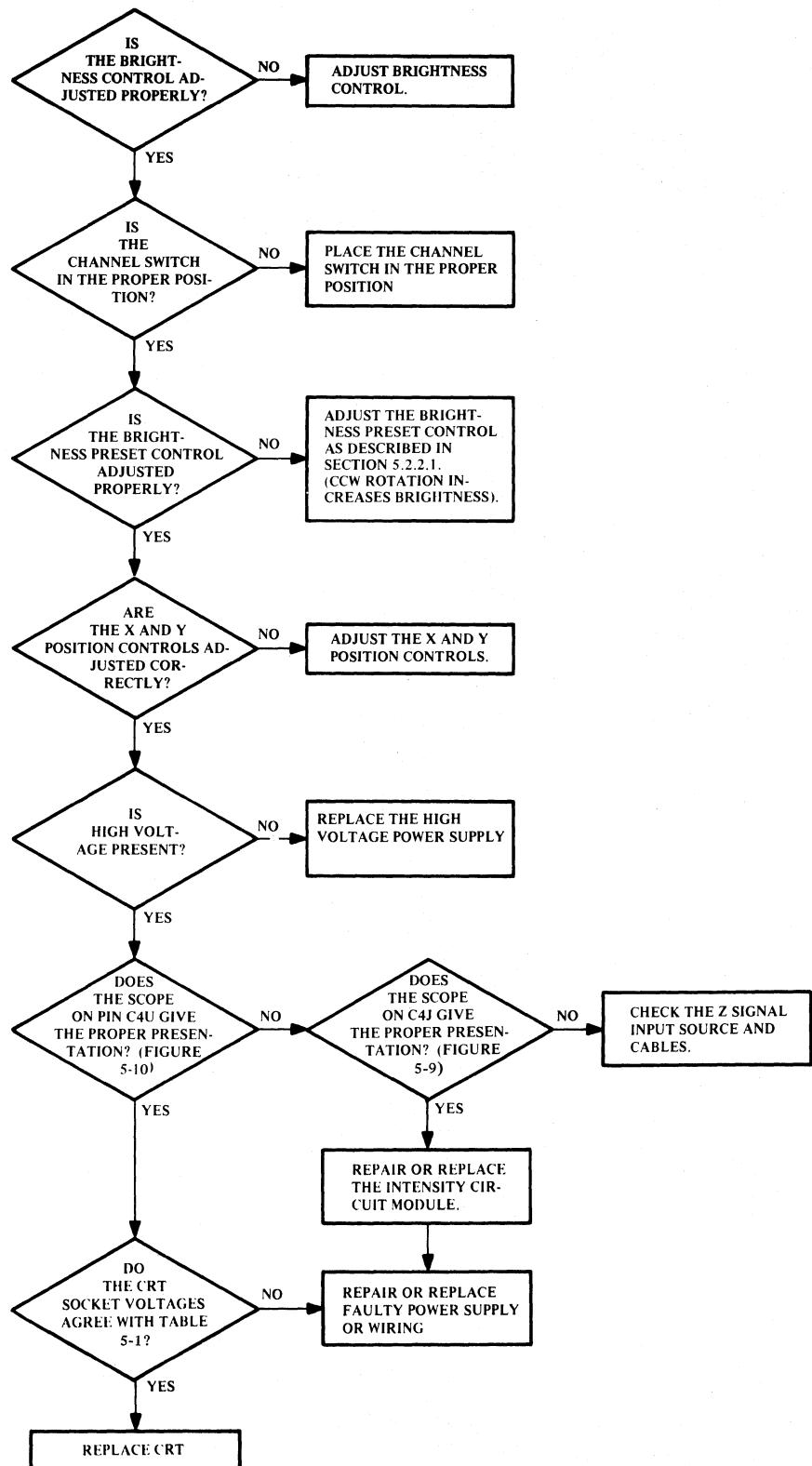
V = H =
10V/Div. 200 ns/Div.

Figure 5-10 Intensification Pulse (C4U)



12-0014

Figure 5-11 X and Y Signal Troubleshooting Chart



12-0013

Figure 5-12 Z Signal Troubleshooting Chart

CHAPTER 6
PARTS LIST

6.1 GENERAL

This chapter contains a list of the replaceable parts together with suggested quantities of each to be stocked at the user's site. The suggested quantities are not based on information gained from failure experience, therefore the actual number of each to be stocked is dependent upon the user's reliability requirements.

6.1.1 Modules

<u>DEC No.</u>	<u>Description</u>	<u>No. in Use</u>	<u>Suggested Spares</u>
G817	Power Supply	1	1
G818	Power Supply	1	1
G912	Deflection Amplifier	2	1
G917	XY-Control	1	1
W682	Intensity Circuit	1	1

6.1.2 Main Chassis

<u>DEC No.</u>	<u>Description</u>	<u>No. in Use</u>	<u>Suggested Spares</u>
12 01444	BNC Female Connector	7	0
12 02244	PCC Block	1	0
12 02625	18 - PCC Block	4	0
12 04709	DPDT Slide Switch	5	1
12 05033	Venturi Muffin - Fan	1	0
12 09340 00	AMP-8 Circuit Connector Pin Housing	1	0
12 09340 01	AMP-8 Circuit Connector Select Housing	1	0
13 00229	Resistor 100 Ω 1/4 W, 5%	4	0

<u>DEC No.</u>	<u>Description</u>	<u>No. in Use</u>	<u>Suggested Spares</u>
13 01422	Resistor 7.5 K 1/4 W, 5%	4	0
34 03515	Switch, 3 Position Wafer	1	0

6.1.3 Low Voltage Power Supply

<u>Circuit Designation</u>	<u>DEC No.</u>	<u>Description</u>	<u>No. in Use</u>	<u>Suggested Spares</u>
CI, C6-C9	10 09435	Capacitor 6KMFD, 10V	5	1
C2	10 09436	Capacitor 13KMFD, 15V	1	1
C3	10 09437	Capacitor 18KMFD, 10V	1	1
C4, C5	10 09434	Capacitor 5.5KMFD, 40V	2	1
L1	12 09348	Lamp, Signal		
P1	13 00530	Potentiometer, 100K, 2W, 10%	1	0
P2	13 09346	Potentiometer, 100K, 10% linear, with switch	1	0
P3	13 09402 17	Potentiometer, 500K, 2W, 10%,	1	0
Q1	15 09455	Transistor, 2N4276	1	1
R1	13 09452	Resistor, 0.1 ohm, 10W	1	0
R2	13 00171	Resistor, 10 ohm, 1W, 5%	1	0
T1	None	Transformer, Acme Mains, T/66/66	1	0
None	12 01251	AC Receptacle, Female	1	0
None	12 01252	AC Receptacle, Male	1	0
None	12 02625	M12-18PCC Block	2	0
None	12 03170	Terminal Strip Kulka #5	2	0
None	12 03480	Socket, CRT	1	0
None	12 09350 15	Amp-15 Circuit Connector Socket Housing	1	0
None	12 09351 15	Amp-15 Circuit Connector Pin Housing	1	0
None	12 09378	Pin Contact	23	0
None	12 09379	Socket Contact	23	0
None	12 09666	High Voltage Power Supply	1	0
None	90 07242	Fuseholder	1	0
None	None	Insulator, porcelain stand off	4	0

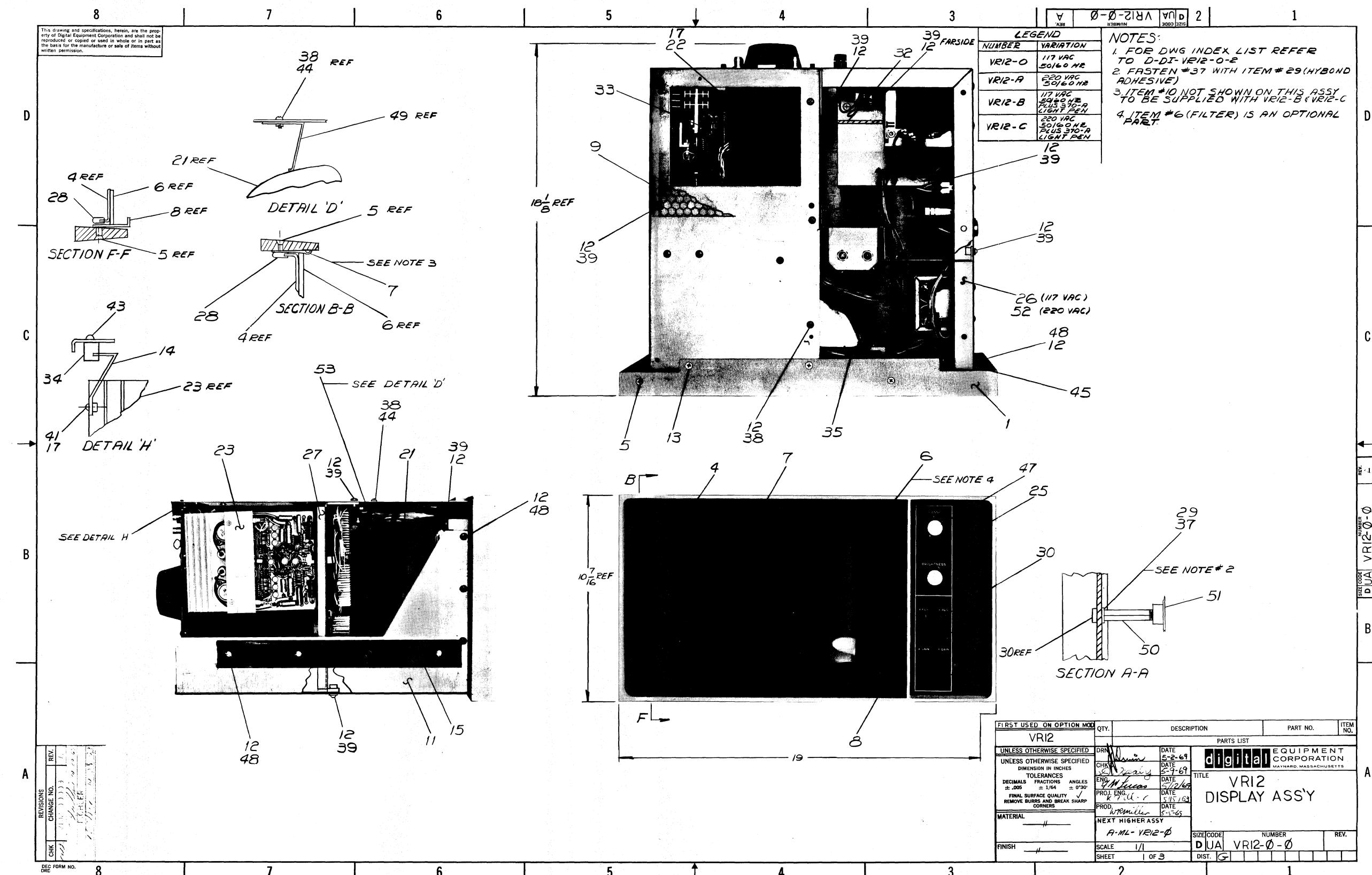
CHAPTER 7

ENGINEERING DRAWINGS

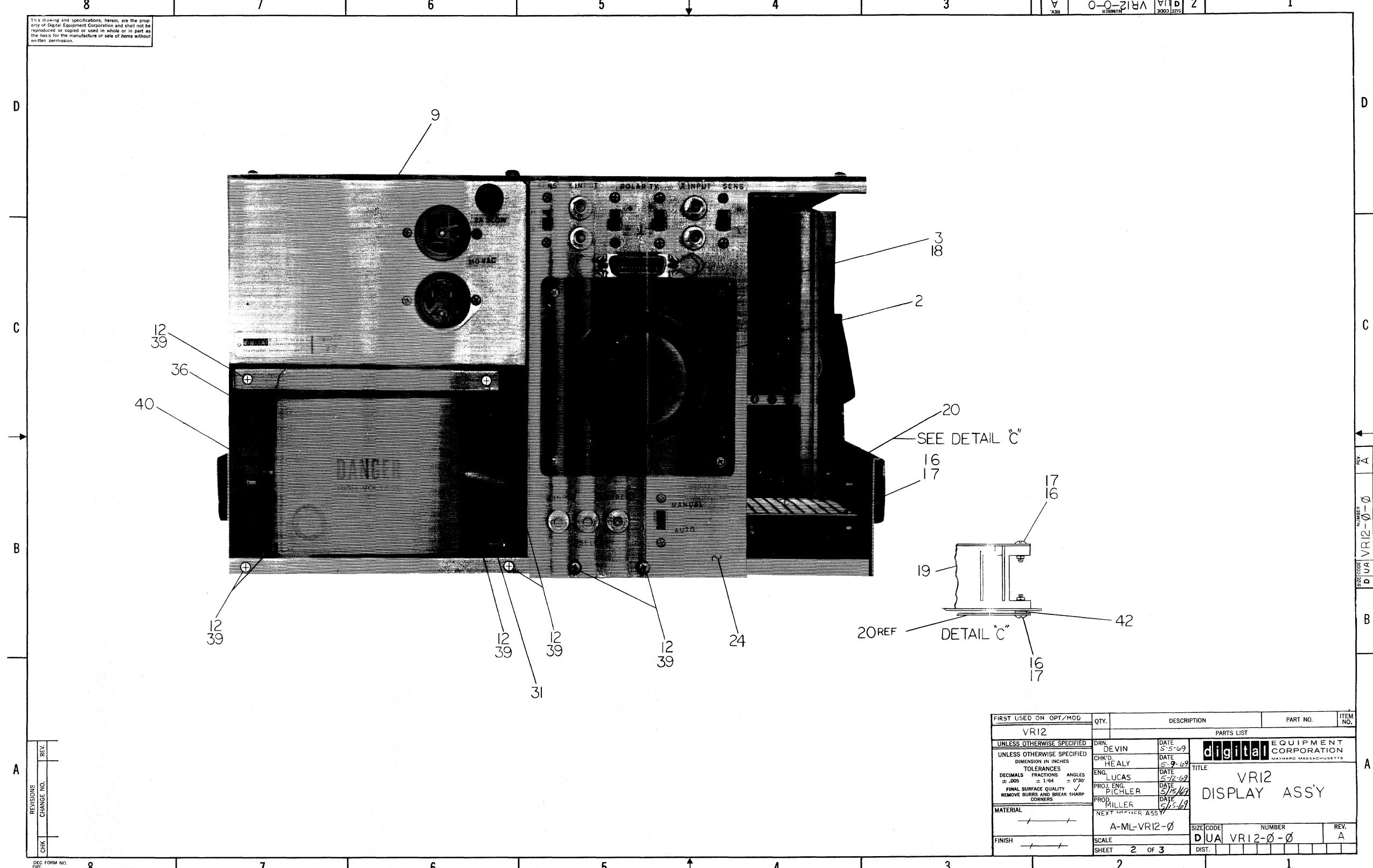
This chapter contains reduced size copies of block schematics and such other engineering drawings necessary for maintaining this equipment. Schematic drawings of the modules are interspersed throughout Chapter 4. If any discrepancy is found to exist between the drawings in this manual and the full-size set which accompanies the equipment, assume those supplied with the equipment to be correct.

The following drawings are included in this chapter:

Drawing Number	Title	Page
D-UA-VR12-0-0	VR12 Display 117 VAC 50/60 Hz (3 Sheets)	7-3
A-PL-VR12-0-0	VR12 Display 117 VAC 50/60 Hz PL (3 Sheets)	7-8
D-DI-VR12-0-2	DWG Index List VR12	7-11
C-AD-7006258-0-0	Wired Assembly	7-12
A-PL-7006258-0-0	Wired Assembly PL. (2 Sheets)	7-13
D-IC-VR12-0-1	Block Schematic VR12	7-15
C-MU-VR12-0-3	Module Utilization	7-16
A-PL-VR12-0-3	Module Utilization List	7-17
A-PL-7006155-0-0	Top Mtg. Assembly	7-18
D-AD-7006155-0-0	Top Mtg. Assembly (2 Sheets)	7-19
A-PL-7005995-0-0	Power Supply Assembly (4 Sheets)	7-22
D-AD-7005995-0-0	Power Supply Assembly (2 Sheets)	7-27
D-CS-7005995-0-1	Power Supply	7-31
D-IA-7006241-0-0	CRT Yoke Assembly	7-33



D-UA-VR12-0-0 VR12 Display 117 VAC 50/60 Hz
(Sheet 1)



D-UA-VR12-0-0 VR12 Display 117 VAC 50/60 Hz
(Sheet 2)

This drawing and specifications, herein
erty of Digital Equipment Corporation and
reproduced or copied or used in whole
the basis for the manufacture or sale of

HARNESS TABLE

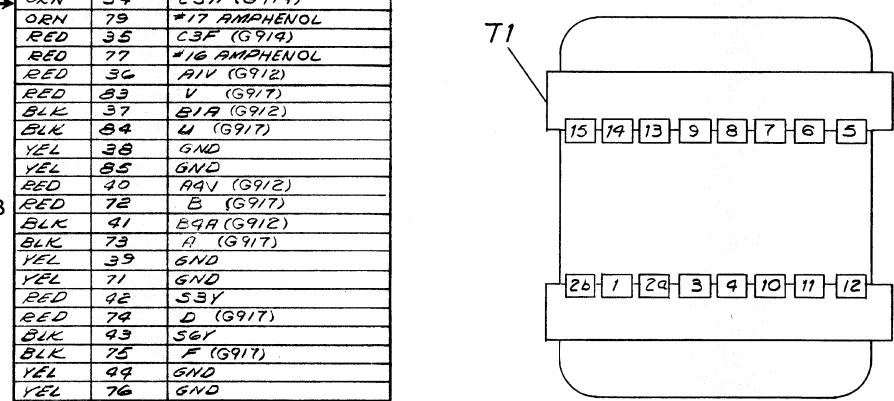
COLOR	HORN NO.	MAIN CHASSIS LOCATION	COLOR	HORN NO.	MAIN CHASSIS LOCATION
WHITE/NR	1	C3D (G914)	BLU	B6	K (G917)
WHIT/GRN	12	AM3	YEL	50	AIP (G912)
GRN	8	C4F (W682)	YEL	92	L (G917)
GRN	11	AM1	YEL	51	AGN (G912)
GRN	3	AM1 *60-J1-5	YEL	93	C (G912)
WHIT/DJ	4	C4D (W682)	YEL	91	AIP OR AGN (G912) *56-J1-13
WHIT/DJ	13	Z DIRECT	ORN	89	BIN (G912) *57-J1-4
WHIT/S	5	C4L (W682)	YEL	95	AGN OR AIP (G912) *68-J1-12
WHIT/S	16	Z SELECT	WHIT	85	B1C (G912) *66-J1-12
WHIT/BZ	6	C4J (W682)	GRN	94	AIE OR AGF (G912) *68-J1-1
WHIT/BZ	19	Z INPUT	GRN	81	AIE OR AIP (G912) *70-J1-3
WHIT/RED	7	PIN #1 FAN	BLU	B7	A1S (G912) *65-J1-10
WHIT/RED	9	T1-1	WHIT/YEL	82	A1H (G912) *67-J1-11
WHIT/RED	5	PIN #26 (FAN)	WHIT/ORN	31	C4M (W682)
WHIT/RED	10	T1-2A	WHIT/ORN	59	CH-3

* DENOTES CABLE HARNESS NO.
ATTACHED TO J1 MAT-N-LOC NO.

BLK	10	CAC (W6BZ)
BLK	18	E SELECT
BLK	19	CAC (W6BZ)
BLK	21	E INP:JT
WHITE/BLK	22	CAB (W6BZ)*69-J1-8
WHITE/BLK	23	CAB (W6BZ)*61-J1-6
WHITE/RED	24	CAB (W6BZ)
WHITE/RED	55	CH-COMM
WHITE/BRN	25	CAB (W6BZ)
WHITE/BRN	53	CH-E
WHITE/VIO	26	CAB (W6BZ)*63-J1-7
BRN	27	CIF (W6BZ)*59-J1-4
BLK	28	CIC (W6BZ)
BLK	80	COMM GND POINT
BLK	89	CAC (W6BZ)*61-J1-2
WHITE/BLK	30	CAN (W6BZ)
WHITE/VEL	52	CH-1
ATTACH POWER SUPPLY HARNESS WIRES PER TABLE BELOW - SEE D-UA-7005995-0-0 SHEET #2		
COLOR	HARN NO	MAIN CHASSIS LOCATION
ORN	80	2A (GB17)
YEL	81	2M (GB17)
BLK	59	C GND H.V. SUPPLY 1209666

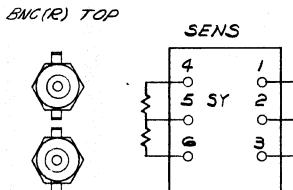
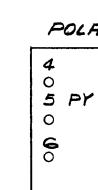
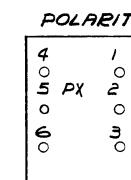
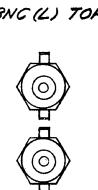
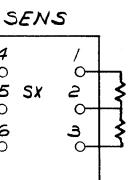
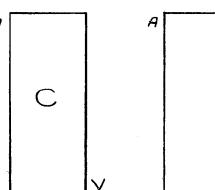
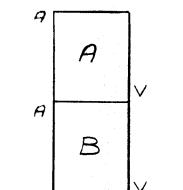
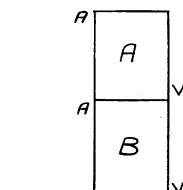
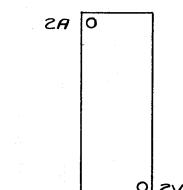
ATTACH POWER SUPPLY HARNESS
WIRES PER TABLE BELOW - SEE
D-UA-7005995-0-0 SHEET #2

			COLOR	HARN NO	MAIN CHASSIS LOCATION
BRN	27	C1F (W682)*59-J1-4			
BLK	28	C1G (W682)			
BLK	80	COMM GND POINT			
BLK	89	CAC (W682)*61-J1-2			
WHITE/BLK	30	CAN (W682)			
WHITE/BLK	52	CH-1			
			ORN	80	2A (GB17)
			YEL	81	2M (GB17)
			BLK	59	C GND H.V. SUPPLY 1209666



G817
*2
(D-BB-7005995)

G917
X&Y SET #
GAIN CONN

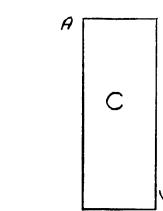
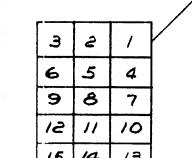
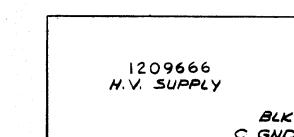


1209666
H V SUPPLY

A

C

G914
C3
(C-AD-7006258-0-0)



C1 G807
AUX P.S (OPTION)
(C 3D-72-26268-2)

FIRST USED ON OPTION/MOD	QTY.	DESCRIPTION	PART NO.	ITEM NO.
VR12				
PARTS LIST				
UNLESS OTHERWISE SPECIFIED	DR.	DATE 4-9-64	digital EQUIPMENT CORPORATION MAYNARD, MASSACHUSETTS	
UNLESS OTHERWISE SPECIFIED	CHNG.	DATE 4-13-67		
DIMENSIONS IN INCHES			TITLE	
TOLERANCES			VR12 ASSY	
DECIMALS FRACTION ANGLES				
$\pm .005$	$\pm 1/64$	$\pm 30^\circ$		
FINAL SURFACE QUALITY				
REMOVE BURRS AND BREAK SHARP CORNERS				
MATERIAL	NEXT HIGHER ASSY			
	A-ML-VR12-Ø Ø			
FINISH	SCALE	SIZE/CODE	NUMBER	REV.
		DUA	VR12-Ø Ø	A

DIGITAL EQUIPMENT CORPORATION MAYNARD, MASSACHUSETTS					QUANTITY/VARIATION				
PARTS LIST			CHECKED D. HEALY	SECTION 1	VR12-Ø	VR12-A	VR12-B	VR12-C	
MADE BY J. DEVIN	CHECKED D. HEALY	SECTION 1							
DATE 5/5/69	DATE 5/8/69								
ENG <i>4 Lucas 5/14/69</i>	PROD <i>Wermiller</i>	ISSUED SECT. 1							
DATE 5-5-69	DATE 5-5-69								
ITEM NO.	DWG NO./PART NO.	DESCRIPTION			VR12-Ø	VR12-A	VR12-B	VR12-C	
1	E-IA-7406891-0-0	BEZEL, CONTROL PANEL (VR12)			1	1	1	1	
2	C-MD-7406884-0-0	CAP (VR12)			1	1	1	1	
3	9006022-1	SCR, PAN HD PHL #6-32 x 3/8 SST			4	4	4	4	
4	D-MD-7406837-0-0	MASK, CATHODE RAY TUBE			1	1	1	1	
5	9006024-2	SCR, FLAT HD PHL #6-32 x 1/2 SST			4	4	4	4	
6	C-MD-7406881-0-0	FILTER			1	1	1	1	
7	C-SC-1209332-0-0	FINGERS, TOP			2	2	2	2	
8	C-MD-7407091-0-0	TRIM STRIP, BOTTOM, MASK			1	1	1	1	
9	E-IA-7406880-0-0	SCREEN, SAFETY, ASSY			1	1	1	1	
10		LIGHT PEN 370-A							1 1
11	D-IA-7406858-0-0	PLATE, BOTTOM, MTG			1	1	1	1	
12	9006071	SCR, PHL, PAN HD #10-32 x 3/8 SST			62	62	62	62	
13	9006071-2	SCR, FLAT HD PHL #10-32 x 3/8 SST			5	5	5	5	
14	B-MD-7407155-0-0	CLIP, AMPLIFIER			2	2	2	2	
15	D-SC-1209147-0-0	SLIDE, 16 "TRAVEL CHASSIS TRACK			PR	PR	PR	PR	
16	9006024-1	SCR, PAN HD, PHL #6-32 x 1/2 SST			8	8	8	8	
17	9006560	NUT, KEPS #6-32			15	15	15	15	
18	9006633	WASHER, LOCK INT TOOTH #6			4	4	4	4	
19	1205761	FAN, BUFFIN, 125V A.C.			1	1	1	1	
20	C-MD-7404881-0-0	FAN SCREEN			2	2	2	2	
21	1209597	CATHODE RAY TUBE TYPE 12 M63 THOMAS ELEC. INC.			1	1	1	1	
22	D-IA-7407111-0-0	SHIELD CRT.			1	1	1	1	
TITLE VR12 DISPLAY ASSY			ASSY NO. D-UA-VR12-Ø-Ø	SIZE CODE A PL	NUMBER VR12-Ø-Ø			REV. A	ECO NO. VR12-00009
			SHEET 1 OF 3	DIST. G					

DEC FORM NO.
DRA 110

DIGITAL EQUIPMENT CORPORATION
 MAYNARD, MASSACHUSETTS
PARTS LIST

MADE BY J. DEVIN	CHECKED D. HEALY	SECTION
DATE 5/5/69	DATE 5/8/69	1
ENG <i>J. Devin</i>	PROD <i>W. R. Miller</i>	ISSUED SECT.
DATE 5/14/69	DATE 5-5-69	1

ITEM NO.	DWG NO./PART NO.	DESCRIPTION	QUANTITY/VARIATION			
			VR12-Ø	VR12-A	VR12-B	VR12-C
23	G912	DEFLECTION AMPLIFIER G912	2	2	2	2
24	D-AD-7006155-0-0	TOP MTG ASSY VR12	1	1	1	1
25	C-IA-7406882-0-0	PANEL, CONTROL	1	1	1	1
26	D-AD-7005995-1-0	POWER SUPPLY ASSY (VR12)	1	1		
27	C-AD-7006258-0-0	WIRED ASSY	1	1	1	1
28	9006584	SPEED NUT C8091-6-32-4 TINNERMAN	4	4	4	4
29	9007594	ADHESIVE, HYBOND	A/R	A/RA	RA/R	
30	B-SC-1209383-0-0	GUIDE, SLEEVE	4	4	4	4
31	D-AD-7006261-0-0	HIGH VOLTAGE ASSY	1	1	1	1
32	C-IA-7406855-0-0	BRKT., PROTECTION	1	1	1	1
33	D-IA-7006241-0-0	CRT YOKE ASSY	1	1	1	1
34	B-IA-7407172-0-0	CLAMP, RETAINER	1	1	1	1
35	E-IA-7006242-0-0	HARNESS, MAIN CHASSIS	1	1	1	1
36	C-MD-7407411-0-0	PLATE END HIGH VOLTAGE BOX	1	1	1	1
37	9006712	WASHED, FLAT, NYLON, $\frac{1}{4}$ ID 3/8OD x 1/32THK.	4	4	4	4
38	9006565	NUT, KEPS #10-32	5	5	5	5
39	9006635	WASHER, LOCK INT TOOTH #10	41	41	41	41
40		"DANGER HIGH VOLTAGE" STICKER	3	3	3	3
41	9006020-1	SCR PAN HD PHL #6-32 x $\frac{1}{4}$ SST	4	4	4	4
42	9006656	WASHER, FLAT #6 SST	8	8	8	8
43	9006432	SCR RD HD SLOT #4-40 x $\frac{1}{4}$ NYLON	2	2	2	2
44	9006070-1	SCR, PAN HD, PHL #10-32 x 5/16 SST	2	2	2	2
TITLE		ASSY NO.	SIZE	CODE	NUMBER	
VR12 DISPLAY ASSY		D-UA-VR12-Ø-Ø	A	PL	VR12-Ø-Ø	
SHEET 2 OF 3		DIST.	G			

DEC FORM NO.
 DRA 110

A-PL-VR12-0-0 VR12 Display 117 VAC 50/60 Hz PL
 (Sheet 2)

DIGITAL EQUIPMENT CORPORATION
MAYNARD, MASSACHUSETTS
PARTS LIST

MADE BY	J. DEVIN	CHECKED	D. HEALY	SECTION
DATE	5/6/69	DATE	5/8/69	1
ENG	<i>R. J. Devin</i>	PROD	<i>w. miller</i>	ISSUED SECT.
DATE	5-5-69	DATE	5-5-69	1

TITLE VR12 DISPLAY ASSY

ASSY NO.
D-11A-VR12-0-0

SHEET 3 OF

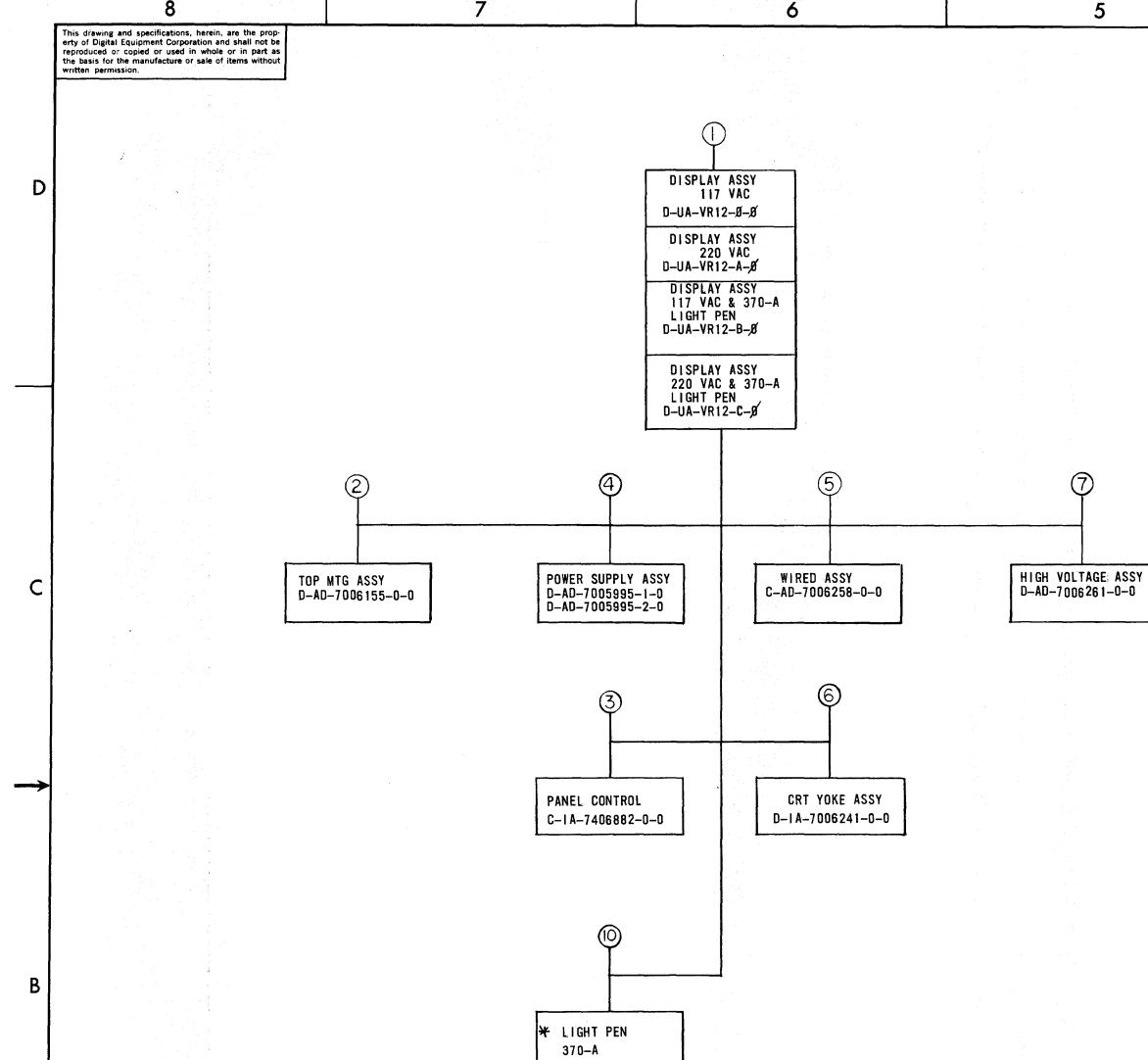
SIZE COD
A B

NUMBER

REV. ECO NO

**DEC FORM NO.
DRA 110**

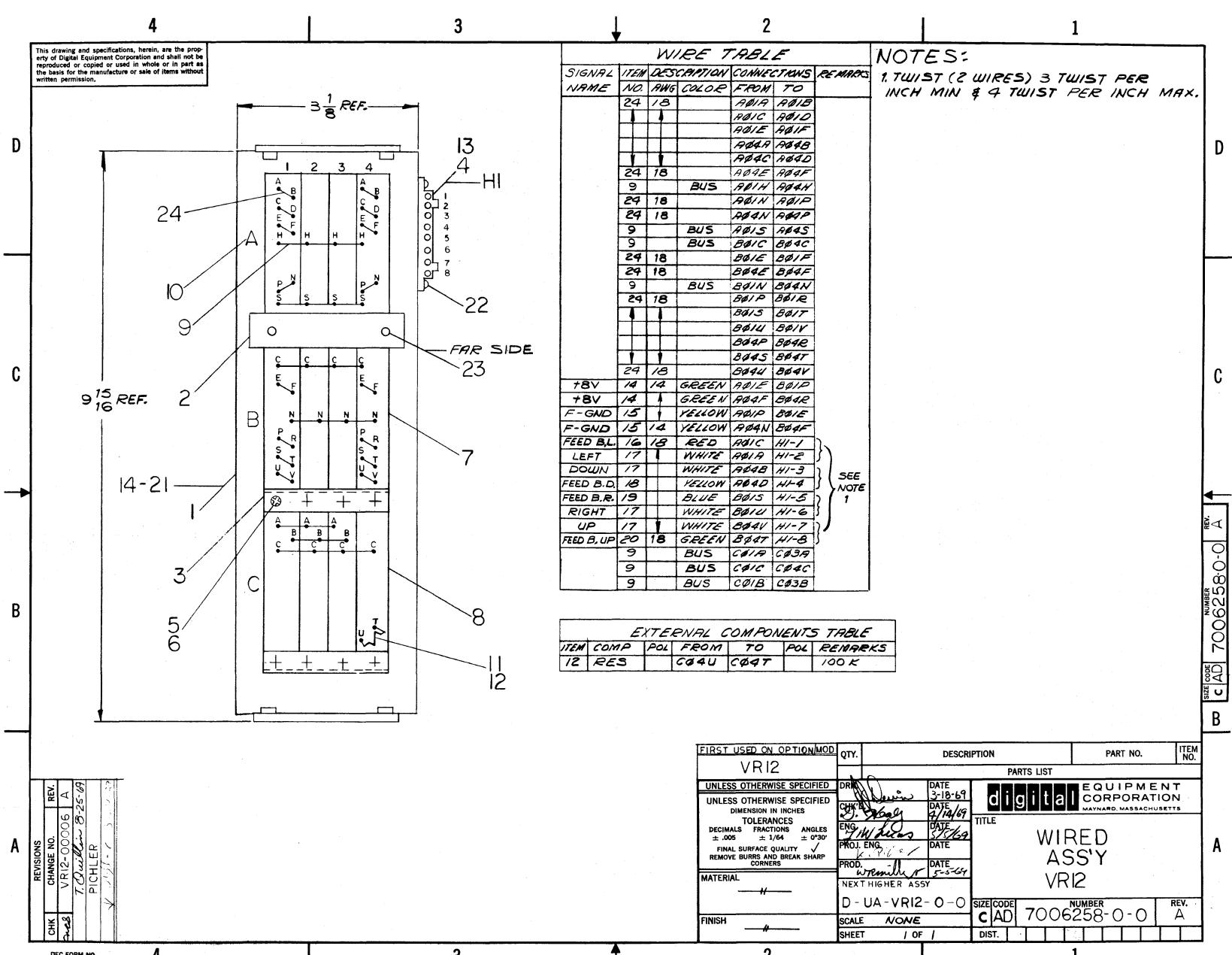
A-PL-VR12-0-0 VR12 Display 117 VAC 50/60 Hz PL
(Sheet 3)



NOTE : * LIGHT PEN ASS'Y 370-A USED ONLY WITH MODELS
VP12-B & VP12-C

FIRST USED ON OPTION/MOD		QTY.	DESCRIPTION	PART NO.	ITEM NO.
VR12-0			PARTS LIST		
UNLESS OTHERWISE SPECIFIED		DRW	DATE	digital EQUIPMENT CORPORATION MAYNARD, MASSACHUSETTS	
UNLESS OTHERWISE SPECIFIED		CHGD	DATE		
DIMENSION IN INCHES		ENG	DATE	TITLE	
TOLERANCES		PROL ENG	DATE	DWG INDEX LIST	
DECIMALS	INCHES	PROD	DATE	VR12	
$\pm .005$	$\pm 1/64$	NEXT HIGHER ASSY			
FINAL SURFACE QUALITY / REMOVE BURRS AND BREAK SHARP CORNERS		A-ML-VR12-0		SIZE CODE	NUMBER
MATERIAL		SCALE	—	D D1	VR12-0-2
<u>H</u>		SHEET	1 OF 1	DIST.	REV.
FINISH				G	A

TITLE
DWG INDEX LIST
VRI3



DIGITAL EQUIPMENT CORPORATION MAYNARD, MASSACHUSETTS PARTS LIST			QUANTITY/VARIATION											
MADE BY	J. DEVIN	CHECKED	D. HEALY	SECTION										
DATE	3/18/69	DATE	3/28/69	1										
ENG	<i>J. Lucas</i>	PROD	<i>wremler</i>	ISSUED SECT.										
DATE	5/5/69	DATE	5-5-69	1										
ITEM NO.	DWG NO./PART NO.		DESCRIPTION											
1	C-IA-7406856-0-0		FRAME LOGIC				1							
2	B-MD-7407114-0-0		BAR, MTG				1							
3	B-MD-7407157-0-0		"L" BRACKET LONG				2							
4	1209340-00		8 CIRCUIT MATE-IN-LOCK SOCKET AMP				1							
5	9006024-1		SCR, PHL HD PAN #6-32 x 1/2 SST				8							
6	9006560		NUT KEPS #6-32				10							
7	1202244		144 CONNECTOR BLOCK				1							
8	1202625		18 PIN CONN #1712-18-PCC SYLVANIA				4							
9	1202188		VOLTAGE CHAIN				A/R							
10	A-DC-7406371-0-0		LOGIC FRAME DECALS				A/R							
11	9107256-4		#22 TUBING (YELLOW)				A/R							
12	1302466		RESISTOR 100K 1/4 W 5%				1							
13	1209379-01		CONTACT TERM PIN SOCKET AMP INC				8							
14	9107370-55		#14 AWG STRD TEFLON (GREEN)				A/R							
15	9107370-44		#14 AWG STRD TEFLON (YELLOW)				A/R							
16	9107360-22		#18 AWG STRD TEFLON (RED)				A/R							
17	9107360-99		#18 AWG STRD TEFLON (WHITE)				A/R							
18	9107360-44		#18 AWG STRD TEFLON (YELLOW)				A/R							
19	9107360-66		#18 AWG STRD TEFLON (BLUE)				A/R							
20	9107360-55		#18 AWG STRD TEFLON (GREEN)				A/R							
21	9107350-99		#22 AWG STRD TEFLON (WHITE)				A/R							
22	9006022-1		SCR, PHL HD PAN 6-32 x 3/8 SST				2							
TITLE			ASSY NO.		SIZE	CODE	NUMBER		REV.	ECO NO.				
WIRED ASSY VR12			C-AD-7006258-0-0		A	PL	7006258-0-0		A	VR12-				
			SHEET 1 OF 2		DIST. C					.00006				

DEC FORM NO.
DRA 110

A-PL-7006258-0-0 Wired Assembly PL. (Sheet 1)

DIGITAL EQUIPMENT CORPORATION
MAYNARD, MASSACHUSETTS
PARTS LIST

MADE BY DATE	J. DEVIN 3/18/69	CHECKED DATE	D. HEALY 3/28/69	SECTION 1
ENG DATE	<i>J. Devin</i> <i>5/15/69</i>	PROD DATE	<i>W. J. Miller</i> <i>5-5-69</i>	ISSUED SECT. 1

TITLE WIRED ASSY VR12

ASSY NO.
C-AD-7006258-0-0
SHEET 2 **OF** 2

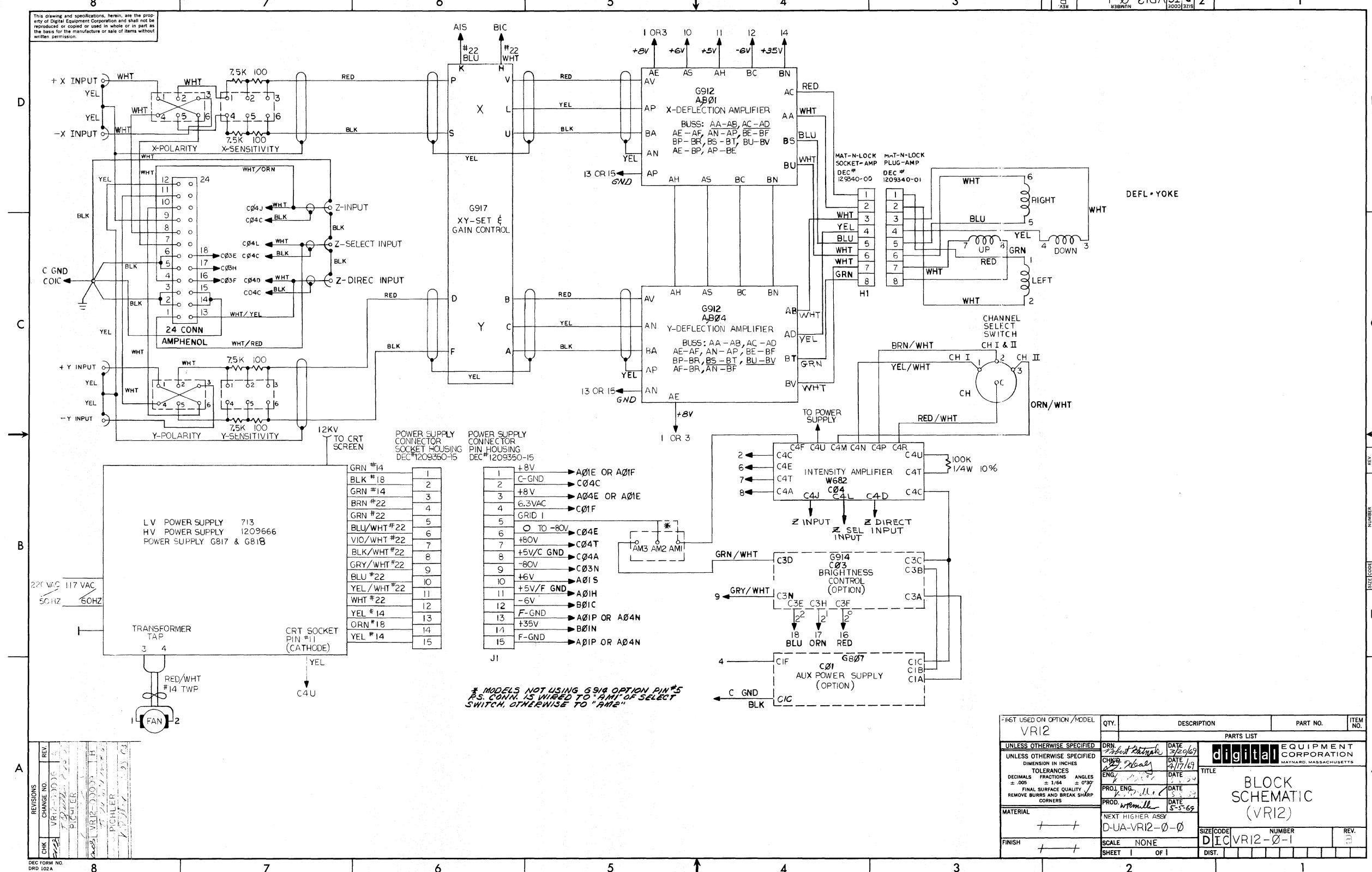
SIZE	COD
A	P
DIST.	

NUMBER
7006258-0-0

REV. ECO NO.

DEC FORM NO.
DRA 110

A-PL-7006258-0-0 Wired Assembly PL. (Sheet 2)



D-IC-VR12-0-1 Block Schematic VR12

91-7

4	3	1	2	1																																																
<p>This drawing and specifications, herein, are the property of Digital Equipment Corporation and shall not be reproduced or copied or used in whole or in part as the basis for manufacture or sale of items without written permission.</p>			<p>NOTES: 1. MODULE INFORMATION SHOWN IS SEEN FROM WIRING SIDE</p>																																																	
		<p>SEE NOTE #1</p>	<p>REV. B</p>																																																	
<p>REVISIONS CHANGE NO. CHK</p>	<p>FIRST USED ON OPTION MOD: VR12</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td colspan="2">UNLESS OTHERWISE SPECIFIED</td> <td>QTY.</td> <td>DESCRIPTION</td> <td>PART NO.</td> <td>ITEM NO.</td> </tr> <tr> <td colspan="2">UNLESS OTHERWISE SPECIFIED</td> <td>DRN: <i>Wm. Miller</i></td> <td>DATE: <i>5-9-69</i></td> <td colspan="2">EQUIPMENT CORPORATION</td> </tr> <tr> <td colspan="2">DIMENSION IN INCHES</td> <td>CDR'D: <i>A. S. Bailey</i></td> <td>DATE: <i>5-12-69</i></td> <td colspan="2">MAYNARD, MASSACHUSETTS</td> </tr> <tr> <td colspan="2">DECIMALS FRACTIONS ANGLES</td> <td>ENG: <i>R. P. Miller</i></td> <td>DATE: <i>5-12-69</i></td> <td colspan="2">TITLE: MODULE UTILIZATION</td> </tr> <tr> <td colspan="2">$\pm .005$ $\pm 1/64$ $\pm 0^{\circ}30'$</td> <td>PROJ. ENG: <i>R. P. Miller</i></td> <td>DATE: <i>5-12-69</i></td> <td colspan="2">SIZE CODE: C MU</td> </tr> <tr> <td colspan="2">FINAL SURFACE QUALITY ✓ REMOVE BURRS AND BREAK SHARP CORNERS</td> <td>PROD: <i>Wm. Miller</i></td> <td>DATE: <i>5-12-69</i></td> <td colspan="2">NUMBER: VR12-Ø-3</td> </tr> <tr> <td colspan="2">MATERIAL: <i>Aluminum</i></td> <td colspan="4">NEXT HIGHER ASSY: A-ML-VR12-Ø</td> </tr> <tr> <td colspan="2">FINISH: <i>None</i></td> <td>SCALE: <i>1/4"</i></td> <td>SHEET: <i>1 OF 1</i></td> <td>DIST.: <i>None</i></td> <td>REV.: <i>None</i></td> </tr> </table>			UNLESS OTHERWISE SPECIFIED		QTY.	DESCRIPTION	PART NO.	ITEM NO.	UNLESS OTHERWISE SPECIFIED		DRN: <i>Wm. Miller</i>	DATE: <i>5-9-69</i>	EQUIPMENT CORPORATION		DIMENSION IN INCHES		CDR'D: <i>A. S. Bailey</i>	DATE: <i>5-12-69</i>	MAYNARD, MASSACHUSETTS		DECIMALS FRACTIONS ANGLES		ENG: <i>R. P. Miller</i>	DATE: <i>5-12-69</i>	TITLE: MODULE UTILIZATION		$\pm .005$ $\pm 1/64$ $\pm 0^{\circ}30'$		PROJ. ENG: <i>R. P. Miller</i>	DATE: <i>5-12-69</i>	SIZE CODE: C MU		FINAL SURFACE QUALITY ✓ REMOVE BURRS AND BREAK SHARP CORNERS		PROD: <i>Wm. Miller</i>	DATE: <i>5-12-69</i>	NUMBER: VR12-Ø-3		MATERIAL: <i>Aluminum</i>		NEXT HIGHER ASSY: A-ML-VR12-Ø				FINISH: <i>None</i>		SCALE: <i>1/4"</i>	SHEET: <i>1 OF 1</i>	DIST.: <i>None</i>	REV.: <i>None</i>	<p>NUMBER: VR12-Ø-3</p> <p>SIZE CODE: C MU</p> <p>REV. B</p>
UNLESS OTHERWISE SPECIFIED		QTY.	DESCRIPTION	PART NO.	ITEM NO.																																															
UNLESS OTHERWISE SPECIFIED		DRN: <i>Wm. Miller</i>	DATE: <i>5-9-69</i>	EQUIPMENT CORPORATION																																																
DIMENSION IN INCHES		CDR'D: <i>A. S. Bailey</i>	DATE: <i>5-12-69</i>	MAYNARD, MASSACHUSETTS																																																
DECIMALS FRACTIONS ANGLES		ENG: <i>R. P. Miller</i>	DATE: <i>5-12-69</i>	TITLE: MODULE UTILIZATION																																																
$\pm .005$ $\pm 1/64$ $\pm 0^{\circ}30'$		PROJ. ENG: <i>R. P. Miller</i>	DATE: <i>5-12-69</i>	SIZE CODE: C MU																																																
FINAL SURFACE QUALITY ✓ REMOVE BURRS AND BREAK SHARP CORNERS		PROD: <i>Wm. Miller</i>	DATE: <i>5-12-69</i>	NUMBER: VR12-Ø-3																																																
MATERIAL: <i>Aluminum</i>		NEXT HIGHER ASSY: A-ML-VR12-Ø																																																		
FINISH: <i>None</i>		SCALE: <i>1/4"</i>	SHEET: <i>1 OF 1</i>	DIST.: <i>None</i>	REV.: <i>None</i>																																															

C-MU-VR12-0-3 Module Utilization

DIGITAL EQUIPMENT CORPORATION
MAYNARD, MASSACHUSETTS
PARTS LIST

MADE BY J. DEVIN
DATE 5/9/69
ENG K. Piller
DATE 5/5/69

CHECKED D. HEALY
DATE 5/9/69
PROD WRMiller
DATE 5-5-69

SECTION
1
ISSUED S
1

TITLE MODULE UTILIZATION LIST

ASSY NO.
A-ML-VR12-Ø-3

SHEET 1 OF 1

SIZE CODE
A PL

NUMBER

DEC FORM NO.
DRA 110

DIGITAL EQUIPMENT CORPORATION
MAYNARD, MASSACHUSETTS
PARTS LIST

MADE BY D. K. CRABBE

DATE 1/13/69

ENG *J Lucas*
DATE 5/15/69

CHECKED D. HEALY

DATE 4/15/69

PROD WR Miller
DATE 5-5-69

SECTION

1

ISSUED SECT.

1

QUANTITY / VARIATION

7006155-0

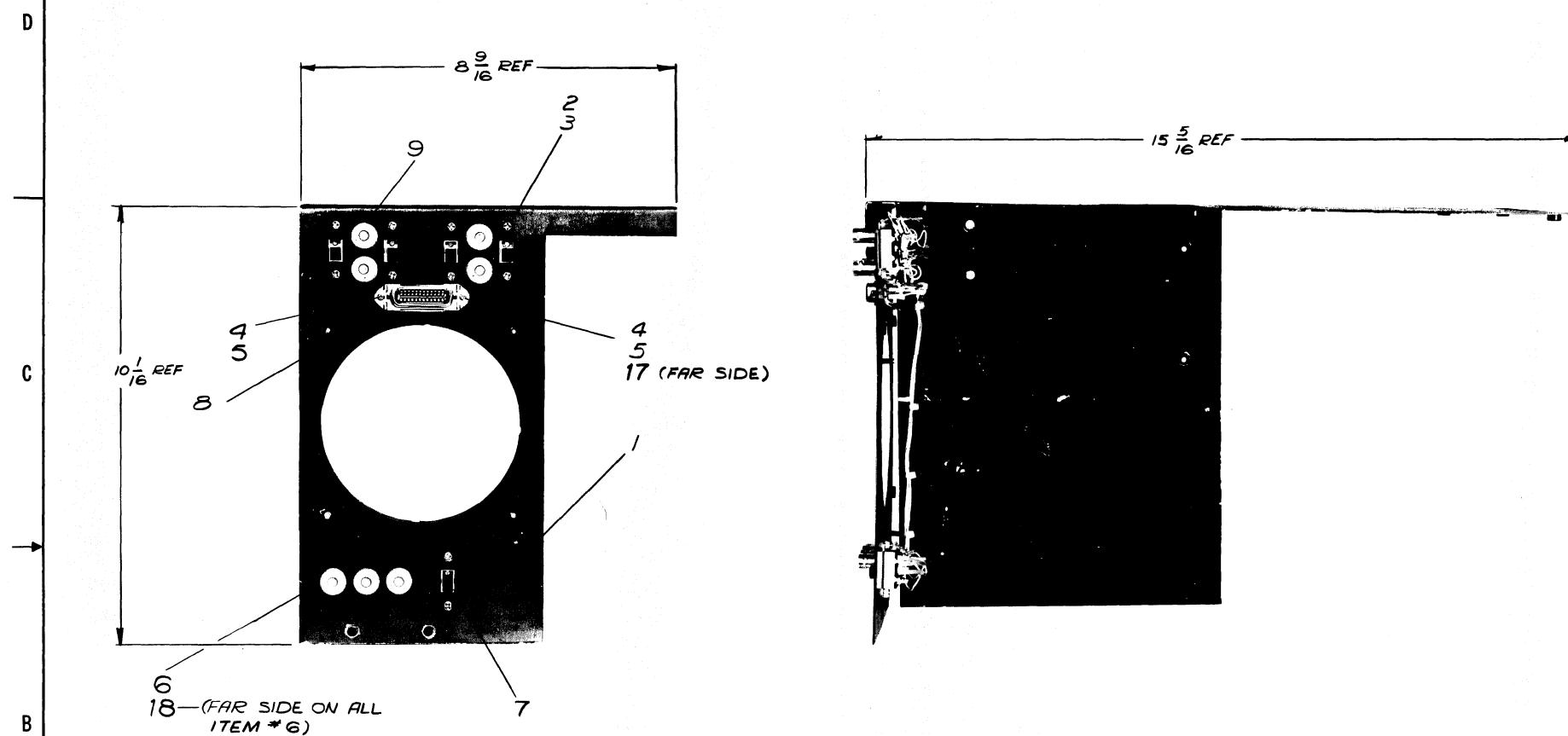
ITEM NO.	DWG NO./ PART NO.	DESCRIPTION	1	10	10	2	2	7	5	1	A/R	4	4						
1	E-IA-7406889-0-0	PLATE, TOP MTG.																	
2	9006020-1	SCR PAN HD PHL #6-32 x 1/4 SST																	
3	9006560	NUT, KEPS #6-32																	
4	9006557	NUT, KEPS #4-40																	
5	9006009-1	SCR PAN HD PHL #4-40 x 1/4 SST																	
6	I201444	CONN, BNC, #31-102 AMPHENOL																	
7	I204709	SWITCH, #DPDT STACKPOLE																	
8	I209630	MATING RECP #57-40240, 24CONTACTS AMPHENOL																	
9	A-DC-7406890-0-0	SCOTCHCALS																	
10	9107350-99	#22 AWG STRD TEF WIRE (WHT)																	
11	9107350-44	#22 AWG STRD TEF WIRE (YEL)																	
12	9107400-92	#22 AWG STRD TRACER WHT/RED																	
13	9107350-00	#22 AWG STRD TEF WIRE (BLK)																	
14	9107400-93	#22 AWG STRD TRACER WHT/ORN																	
15	9107400-94	#22 AWG STRD TRACER WHT/YEL																	
16	9107256	TUBING SHRINKABLE 1/8 (WHT)																	
17	9006761	TERMINAL #2104-06-00 SHAKEPROOF																	
18	9007612	LUG, SOLDER #31-757 AMPHENOL																	
19	I301422	RES 7.5K 1/4W 5%																	
20	I300229	RES 100 OHMS 1/4W 5%																	

TITLE TOP MTG ASSY (VR12)	ASSY NO. D-AD-7006155-0-0	SIZE CODE A PL	NUMBER 7006155-0-0	REV. A	ECO NO. VR12- 00006
	SHEET 1 OF 1				

DEC FORM NO.
DRA 110

A-PL-7006155-0-0 Top Mtg. Assembly

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REVISIONS		CHANGE NO.	REV.
CHK	✓	VR12-00005	A
T.C.	✓	TC-22-825-25	
PICHLER	✓	K-27-67	

DEC FORM NO. 8

FIRST USED ON OPTION / MOD		QTY.	DESCRIPTION	PART NO.	ITEM NO.
VR12					
UNLESS OTHERWISE SPECIFIED					
DIMENSION IN INCHES					
DECIMALS FRACTIONS					
DECIMALS	± 1/64		ANGLES	DATE 4-10-69	
FRACTIONS	± .006		± 0°30'	DATE 4-16-69	
FINAL SURFACE QUALITY	✓		REMOVE BURRS AND BREAK SHARP CORNERS	DATE 5-7-69	
MATERIAL				DATE 5-5-69	
FINISH				DATE 5-5-69	
NEXT HIGHER ASSY		D-UA-VR12-Ø-Ø			
SIZE CODE		D AD	NUMBER 7006155-0-0	REV. A	
SHEET 1 OF 2		DIST. G			

D-AD-7006155-0-0 Top Mtg. Assembly (Sheet 1)

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D

C

B

A

REVISIONS	REV
CHANGE NO.	
CHK	

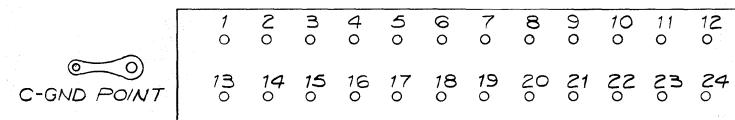
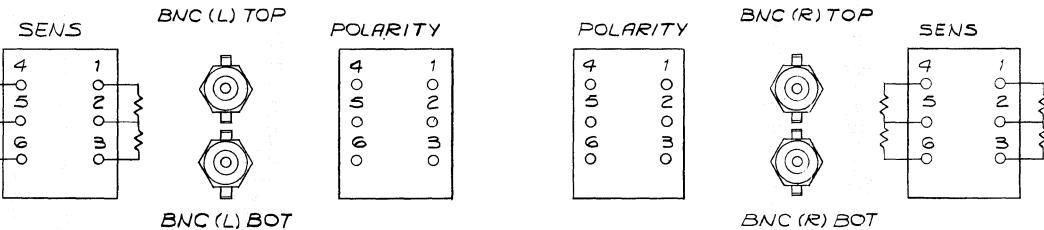
DEC FORM NO.
DRD 100

8

JUMPER WIRE TABLE

WIRE	ITEM NO.	COLOR	TYPE / ITEM	FROM	TO	TYPE / ITEM
10 WHT	* A		BNC RIGHT(TOP)	P1Y	* A	
10 WHT	* A		S1Y	P2Y	* A	
10 WHT	* A		BNC RIGHT(BOT)	P3Y	* A	
10 WHT	* A		P5Y	P4Y	* A	
10 WHT	* A		S4Y	P5Y	* A	
10 WHT	* A		P1Y	P6Y	* A	
19 RES 7.5K	* A		S1Y	S2Y	* A	
19 RES 7.5K	* A		S4Y	S5Y	* A	
20 RES 100	* A		S2Y	S3Y	* A	
20 RES 100	* A		S5Y	SGY	* A	
10 WHT	* A		BNC LEFT (TOP)	P1X	* A	
10 WHT	* A		S1X	P2X	* A	
10 WHT	* A		BNC LEFT (BOT)	P3X	* A	
10 WHT	* A		P3X	P4X	* A	
10 WHT	* A		S4X	P5X	* A	
10 WHT	* A		P1X	P6X	* A	
19 RES 7.5K	* A		S1X	S2X	* A	
19 RES 7.5K	* A		S4X	SSX	* A	
20 RES 100	* A		S2X	S3X	* A	
20 RES 100	* A		S5X	SGX	* A	
11 YEL	* A		GND BNC RIGHT(TOP)	GND BNC RIGHT(BOT)	* A	
11 YEL	* A		GND BNC LEFT (TOP)	GND BNC LEFT (BOT)	* A	
12 WHT/RED	* A		Z SELECT	1	* A,16	
13 BLK	* A,16		3	2	* A,16	
13 BLK	* A		C GND POINT	2 4 3	* A	
14 WHT/CRN	* A		BNC BOT(RIGHT)	4	* A,16	
13 BLK	* A,16		6	5	* A,16	
13 BLK	* A		C GND POINT	5 6 6	* A	
10 WHT	* A		P6X	7	* A,16	
10 WHT	* A		P4X	8	* A,16	
11 YEL	* A		GND BNC(LEFT)	9	* A,16	
10 WHT	* A		P6Y	10	* A,16	
10 WHT	* A		P4Y	11	* A,16	
11 YEL	* A		GND BNC(RIGHT)	12	* A,16	
15 WHT/YEL	* A		Z DIRECT	13	* A,16	
13 BLK	* A,16		13	14	* A,16	
13 BLK	* A		C GND POINT	14 6 5	* A,16	
13 BLK	* A		C GND POINT	Z INPUT	* A	
13 BLK	* A		Z SELECT	Z INPUT	* A	
13 BLK	* A		Z SELECT	Z DIRECT	* A	

* LETTER DESIGNATION "A" INDICATES WIRE IS TO BE SOLDERED PER TABLE ABOVE (JUMPER WIRE TABLE)



AMPHENOL 24 CONTACT CONN.

C-GND POINT

4	1
0	0
5	2
0	0
6	3
0	0

Z-DIRECT Z-SELECT Z-INPUT



NOTE: ALL ABOVE PARTS SHOWN
ARE VIEWED FROM WIRING SIDE.

FIRST USED ON OPTION/MODEL	QTY.	DESCRIPTION	PART NO.	ITEM NO.
VR12				
PARTS LIST				
UNLESS OTHERWISE SPECIFIED	DRN	DATE	digital EQUIPMENT CORPORATION	
UNLESS OTHERWISE SPECIFIED	CHKD	DATE	MAYNARD MASSACHUSETTS	
DIMENSION IN INCHES			TITLE	
TOLERANCES			TOP MTG ASSY	
DECIMALS FRACTIONS ANGLES			(VR12)	
± . . . ± . . . ± . . .			D-AD-7006155-0-0	
FINAL SURFACE QUALITY: SMOOTH REMOVE BURRS AND BREAK SHARP CORNERS			SIZE CODE NUMBER REV.	
MATERIAL			D-AD-7006155-0-0 A	
FINISH			DIST. G	
SCALE			SHEET 2 OF 2	

DIGITAL EQUIPMENT CORPORATION MAYNARD, MASSACHUSETTS				QUANTITY/VARIATION								
PARTS LIST												
MADE BY D.K.CRABBE DATE 3/7/69		CHECKED D. HEALY DATE 4/4/69	SECTION 1									
ENG <i>T. J. Muller</i> DATE 5/5/69		PROD <i>w. R. Muller</i> DATE 5-5-69	ISSUED SECT. 1									
ITEM NO.	DWG NO./PART NO.	DESCRIPTION										
1	E-IA-7406883-0-0	PLATE, SIDE MTG.		1	1							
2	D-IA-7406887-0-0	BRKT, MTG FLIP CHIP BDS		1	1							
3	B-MD-7406852-0-0	PLATE, GROUND		2	2							
4	C-IA-7406849-0-0	COVER, CAP HOLD DOWN		1	1							
5	9007112	FASTON TAB 60145-1 AMP INC		16	16							
6	B-IA-7406854-0-0	BRACKET, TRANSFORMER		4	4							
7	C-MD-7406853-0-0	RETAINER TERM STRIP		1	1							
8	G817	POWER SUPPLY G817		1	1							
9	G818	POWER SUPPLY G818		1	1							
10	1202625	CONN 18 PIN #1712-18 PCC SYLVANIA		2	2							
11	9006071-3	SCR PHL TRUSS HD #10-32 x 3/8 SST		10	10							
12	9006051-1	SCR PHL PAN HD #8-32 x 3 SST		4	4							
13	B-MD-7407156-0-0	"L" BRACKET SHORT		2	2							
14	9006026-1	SCR PHL PAN HD #6-32 x 3.4 SST		2	2							
15	9006022-1	SCR PHL PAN HD #6-32 x 3/8 SST		7	7							
16	9006020-1	SCR PHL PAN HD #6-32 x 1/4 SST		3	3							
17	9006024-1	SCR PHL PAN HD #6-32 x 1/2 SST		5	5							
18	9006560	KEPS NUT #6-32		9	9							
19	9006633	WASHER INT #6		8	8							
20	9007951	WASHER SHOULDER NYLON #2660 HERMAN SMITH		2	2							
21	9006635	WASHER INT #10		18	18							
22	9007776	TAB FASTON #61349-1 AMP		30	30							
TITLE POWER SUPPLY ASSY VR12			ASSY NO. D-AD-7005995-0-0	SIZE A	CODE PL	NUMBER 7005995-0-0				REV. A	ECO NO. VR12- 00009	
SHEET 1 OF 4			DIST. C									

DEC FORM NO.
DRA 110

DIGITAL EQUIPMENT CORPORATION MAYNARD, MASSACHUSETTS PARTS LIST			QUANTITY/VARIATION								
ITEM NO.	DWG NO./PART NO.	DESCRIPTION	SECTION	1	1	1	1	1	1	1	1
23	9107917	CONN, SOLDERLESS 50902, RED ARK-LES	20	20							
24	9006660	WASHER, FLAT 3/8 D.D.X 3/16 I.D. X 1/16THK SST	4	4							
25	9107370-44	#14 GA TEF STRD INS WIRE (VEL)	A/RA/R								
26	9107370-55	#14 GA TEF STRD INS WIRE (GRN)	A/RA/R								
27	9107370-22	#14 GA TEF STRD INS WIRE (RED)	A/RA/R								
28	9107370-11	#14 GA TEF STRD INS WIRE (BRN)	A/RA/R								
29	9107370-33	#14 GA TEF STRD INS WIRE (ORN)	A/RA/R								
30	9107370-99	#14 GA TEF STRD INS WIRE (WHT)	A/RA/R								
31	9107560-1	BUS WIRE #22 AWG	A/RA/R								
32	9107360-55	STRD INS WIRE (GRN)	A/RA/R								
33	1609598	TRANSFORMER T/66:66 ACME	1	1							
34	1203480	CRT SOCKET #212 MINC ALDEN	1	1							
35	1201252	RECEP 160-5 MALE AMPH.	1	1							
36	1201251	RECEP #160-4 FEM AMPH.	1	1							
37	9007242	FUSE HOLDER #HKP	1	1							
38	9006908	TERM STRIP #8-140 SINCH JONES	2	2							
39	9006966	TERM CERAMIC #3650-2 #6THD CTC	4	4							
40	1009436	13K MFD/15V CAPACITOR	1	1							
41	1009437	18K MFD/10V CAPACITOR	1	1							
42	9007031	TIE WRAP SST-1-B	A/RA/R								
43	1209378-01	PIN CONTACT AMP	1	1							
44	1300530	POT. 100K 2W	1	1							
TITLE POWER SUPPLY ASSY VR12			ASSY NO. D-AD-7005995-0-0	SIZE A	CODE PL	NUMBER 7005995-0-0			REV. A	ECO NO.	
SHEET 2 OF 4			DIST. G								

DEC FORM NO.
DRA 110

DIGITAL EQUIPMENT CORPORATION MAYNARD, MASSACHUSETTS PARTS LIST				QUANTITY/VARIATION							
MADE BY D.K. CRABBE DATE 3/7/69 ENG A Fugard DATE 5/5/69		CHECKED D. HEALY DATE 4/4/69 PROD W Pmiller DATE 5-5-69	SECTION 1 ISSUED SECT. 1								
ITEM NO.	DWG NO./PART NO.	DESCRIPTION			7005995-1	7005995-2	7005995-3	7005995-4	7005995-5	7005995-6	7005995-7
45	1300171	RESISTOR 10 OHMS 1W 10%			1	1					
46	1309452	RESISTOR 0.1 OHM 10V			1	1					
47	1509455	TRANSISTOR 2N4276 MOTOROLA			1	1					
48	1105799	DIODE PACK DM-15			1	1					
49	1009435	6 KMFID /10V CAPACITOR			5	5					
50	1009434	5.5 KMFID/40V CAPACITOR			2	2					
51	9107370-00	#14 AWG TEF STRD INS WIRE (BLK)			A/RA/R						
52	9107360-33	#18 AWG TEF STRD INS WIRE (ORN)			A/RA/R						
53	9107400-98	#22 AWG STRD TRACER WHT/GRY			A/RA/R						
54	9107350-33	#22 AWG TEF STRD INS WIRE (ORN)			A/R A/R						
55	9007919	CONN SOLDERLESS, #50906, BLUE, ARK-LES			1	1					
56	9006760	TERMINAL 2101-06-00 SHAKEPROOF			7	7					
57	9006721	WASH INS #294457 MONAD MILLS			1	1					
58	9006761	TERMINAL (#2104-6-00) SHAKEPROOF			1	1					
59	9007212	1 AMP SLO BLO FUSE (117V)			1						
60	9007216	2 AMP SLO BLO FUSE (220V)			1						
61	1309402-17	POT 500K 2W			1	1					
62	9006025-1	SCR PH HD PAN #6-32 x 5/8 SST			4	4					
63	9007112	FASTON TAB #60145-1 AMP INC			19	19					
64	E-IA-7006306-0-0	POWER SUPPLY CABLE HARNESS			1	1					
REF	D-CS-7005995-0-1	POWER SUPPLY CIRCUIT SCHEMATIC									
65	9107350-00	#22 AWG TEF STRD INS WIRE (BLK)			A/R A/R						
TITLE POWER SUPPLY ASSY VR12			ASSY NO. D-AD-7005995-0-0	SIZE CODE A PL	NUMBER 7005995-0-0			REV. ECO NO.	A		
SHEET 3 OF 4			DIST. G								

DEC FORM NO.
DRA 110

DIGITAL EQUIPMENT CORPORATION
MAYNARD, MASSACHUSETTS
PARTS LIST

MADE BY D. K. CRABBE
DATE 3-7-69

CHECKED D. HEALY
DATE 4/4/69
PROD wRmiller
DATE 5-5-69

	SECTION I
	ISSUED S I

TITLE
POWER SUPPLY VR12

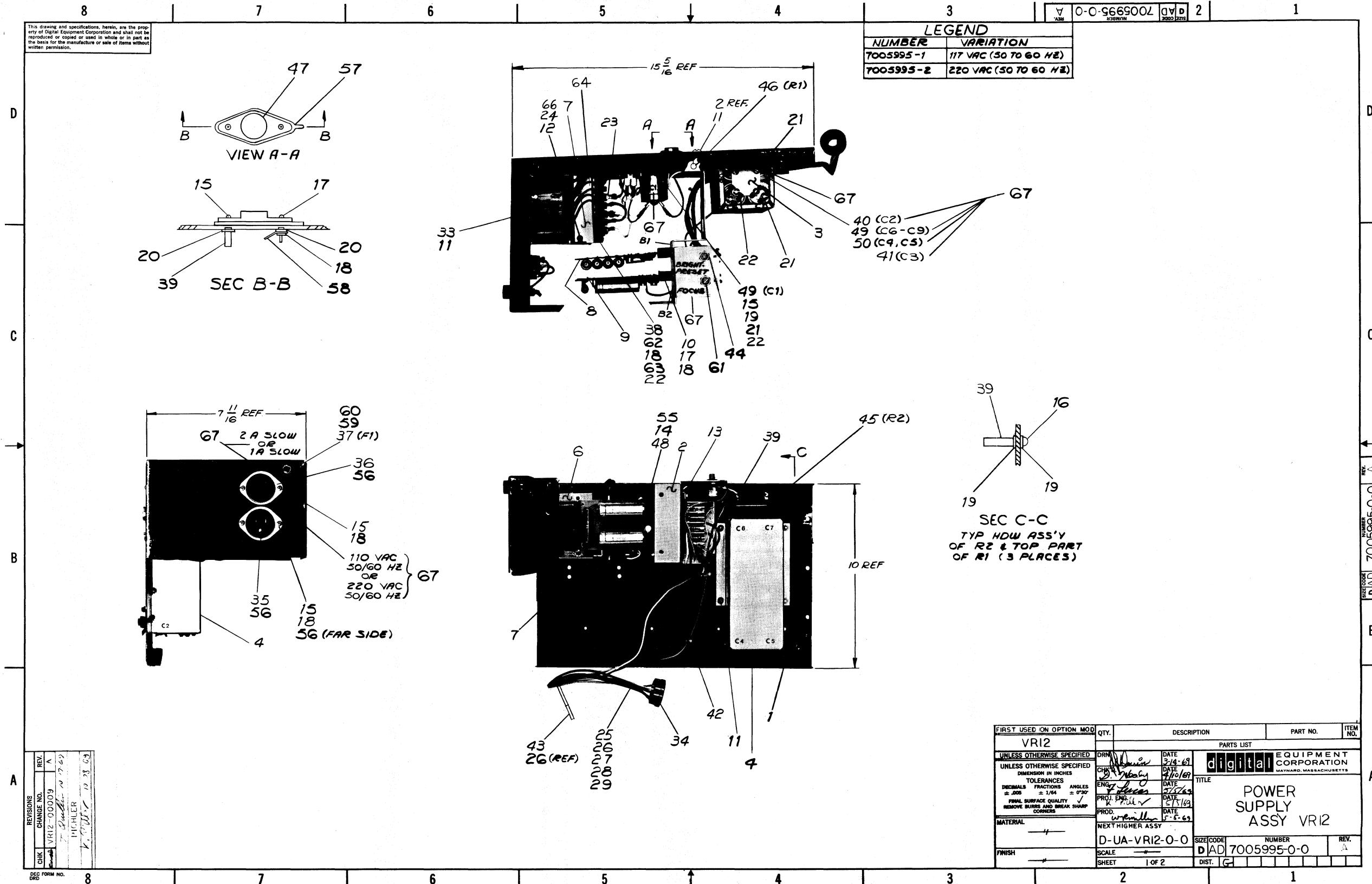
ASSY NO.
D-AD-7005995-0-0
SHEET 4 OF 4

SIZE CO
A P
DIST.

E NUMBER
7005995-0-0

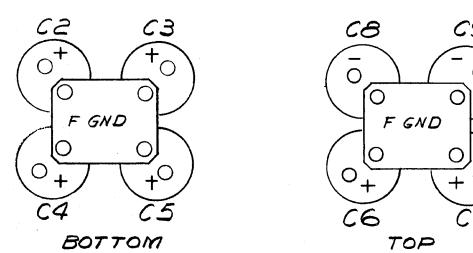
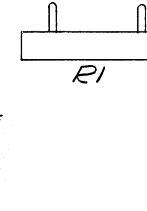
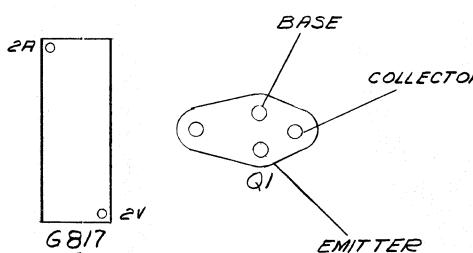
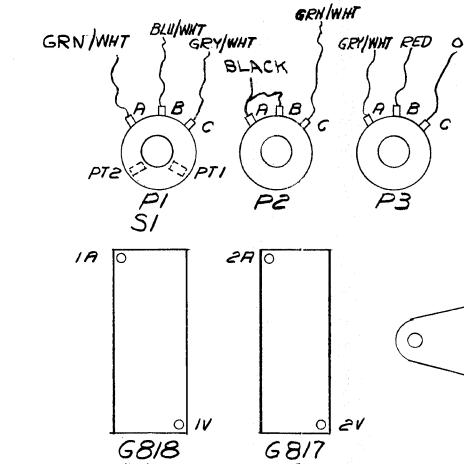
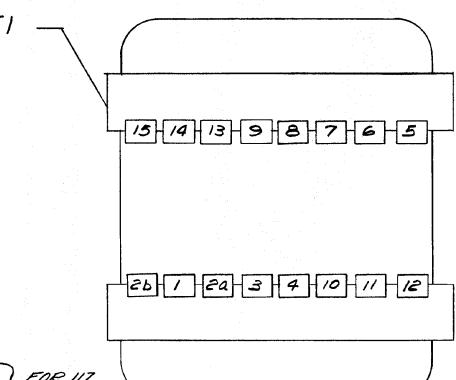
REV.	ECO NO
A	

DEC FORM NO.
DRA 110



D-AD-7005995-0-0 Power Supply Assembly (Sheet 1)

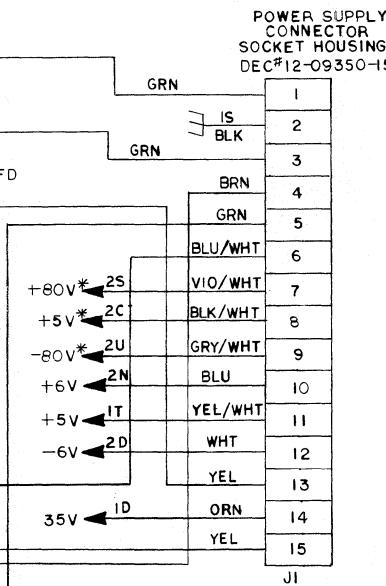
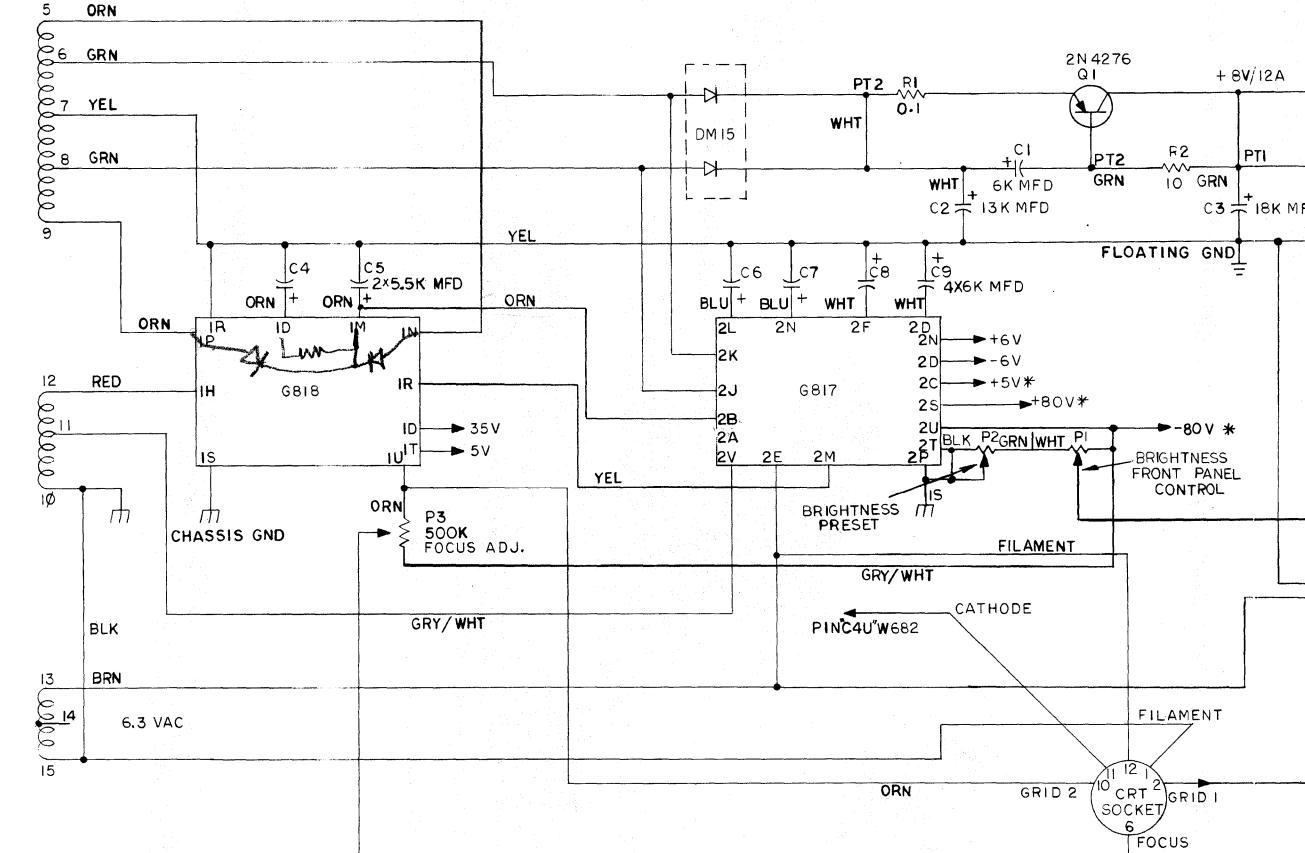
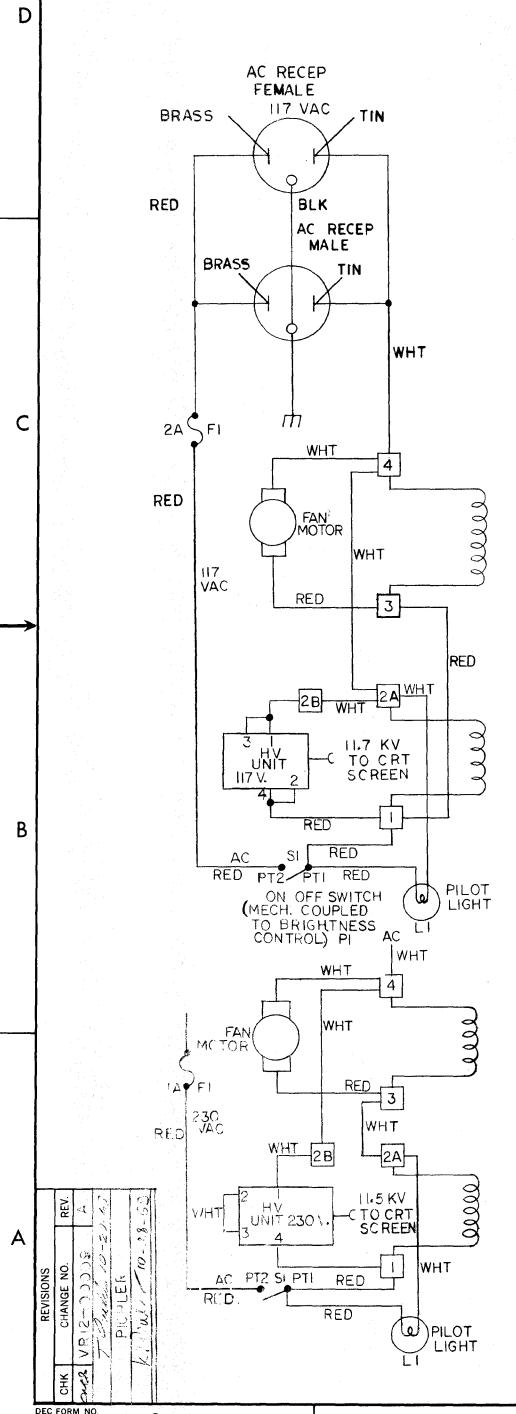
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<table border="1"> <thead> <tr> <th>COLOR</th><th>HARN. NO.</th><th>AS. LOCATION</th> <th>COLOR</th><th>HARN. NO.</th><th>AS. LOCATION</th> </tr> </thead> <tbody> <tr><td>GRN</td><td>26</td><td>C3H *44-JI-1 **</td><td>BLU</td><td>15</td><td>C6(+)</td></tr> <tr><td>GRN</td><td>27</td><td>C3H *45-JI-3 SEE NOTE</td><td>BLU</td><td>66</td><td>B1</td></tr> <tr><td>GEN</td><td>20</td><td>C3H</td><td>BLU</td><td>16</td><td>C7(+)</td></tr> <tr><td>GEN</td><td>9</td><td>R2-P1</td><td>BLU</td><td>67</td><td>2N</td></tr> <tr><td>BRN</td><td>83</td><td>EE *47-JI-4</td><td>GRN</td><td>36</td><td>T1-G</td></tr> <tr><td>BRN</td><td>77</td><td>2E</td><td>GEN</td><td>74</td><td>2K</td></tr> <tr><td>BRN</td><td>40</td><td>77-18</td><td>GRN</td><td>37</td><td>T1-B</td></tr> <tr><td>WHIT/BLU</td><td>5</td><td>PI-B *48-JI-6</td><td>GRN</td><td>75</td><td>2J</td></tr> <tr><td>WHIT/WHT</td><td>88</td><td>2S *53-JI-7</td><td>ORN</td><td>35</td><td>T1-S</td></tr> <tr><td>WHIT/WHT</td><td>85</td><td>EC *50-JI-8</td><td>ORN</td><td>73</td><td>1N</td></tr> <tr><td>BLU</td><td>89</td><td>2N *54-JI-10</td><td>ORN</td><td>38</td><td>T1-9</td></tr> <tr><td>WHIT/WHT</td><td>87</td><td>1T *52-JI-11</td><td>ORN</td><td>76</td><td>1P</td></tr> <tr><td>WHIT/GRY</td><td>84</td><td>2U *49-JI-9</td><td colspan="6"> <small>* DENOTES CABLE HARNESS NO. ATTACHED TO JI MAT-N-LOK NO. ** ATTACH ITEM #55 TO HARNESS NO'S 26 & 27</small> </td></tr> <tr><td>WHIT/GRY</td><td>70</td><td>2V</td><td colspan="6"></td></tr> <tr><td>WHIT/GRY</td><td>28</td><td>77-11</td><td colspan="6"></td></tr> <tr><td>WHT</td><td>86</td><td>2D *51-JI-12</td><td colspan="6"></td></tr> <tr><td>ORN</td><td>90</td><td>1D *55-JI-14</td><td colspan="6"></td></tr> <tr><td>BLK</td><td>82</td><td>1S *46-JI-2</td><td colspan="6"></td></tr> <tr><td>YEL</td><td>22</td><td>F-GND (TOP) *43-JI-13</td><td colspan="6"></td></tr> <tr><td>YEL</td><td>23</td><td>F-GND (TOP) *56-JI-15</td><td colspan="6"></td></tr> <tr><td>YEL</td><td>12</td><td>F-GND (TOP)</td><td colspan="6"></td></tr> <tr><td>YEL</td><td>21</td><td>F-GND (BOTTOM)</td><td colspan="6"></td></tr> <tr><td>WHIT/GRN</td><td>6</td><td>P1-A</td><td colspan="6"></td></tr> <tr><td>WHIT/GRN</td><td>62</td><td>P2-C</td><td colspan="6"></td></tr> <tr><td>GRN/WHT</td><td>4</td><td>P1-C</td><td colspan="6"></td></tr> <tr><td>GRN/WHT</td><td>63</td><td>2U</td><td colspan="6"></td></tr> <tr><td>RED</td><td>1</td><td>SI-PT1 (FOR 220 VAC)</td><td colspan="6"></td></tr> <tr><td>RED</td><td>33</td><td>TI-1 (FOR 220 VAC)</td><td colspan="6"></td></tr> <tr><td>RED</td><td>33</td><td>TI-1 (FOR 117 VAC)</td><td colspan="6"></td></tr> <tr><td>RED</td><td>1</td><td>SI-PT1 (FOR 117 VAC)</td><td colspan="6"></td></tr> <tr><td>RED</td><td>2</td><td>SI-PT2</td><td colspan="6"></td></tr> <tr><td>RED</td><td>58</td><td>F1</td><td colspan="6"></td></tr> <tr><td>RED</td><td>3</td><td>SI-PT1</td><td colspan="6"></td></tr> <tr><td>RED</td><td>7</td><td>LI-PT1</td><td colspan="6"></td></tr> <tr><td>WHT</td><td>8</td><td>LI-PT1 (FOR 220 VAC)</td><td colspan="6"></td></tr> <tr><td>WHT</td><td>31</td><td>TI-1-A (FOR 220 VAC)</td><td colspan="6"></td></tr> <tr><td>WHT</td><td>31</td><td>TI-2-A (FOR 117 VAC)</td><td colspan="6"></td></tr> <tr><td>WHT</td><td>8</td><td>LI-PT3 (FOR 117 VAC)</td><td colspan="6"></td></tr> <tr><td>WHT</td><td>13</td><td>CB(-)</td><td colspan="6"></td></tr> <tr><td>WHT</td><td>65</td><td>2F</td><td colspan="6"></td></tr> <tr><td>BLK</td><td>29</td><td>TI-10</td><td colspan="6"></td></tr> <tr><td>BLK</td><td>39</td><td>TI-15</td><td colspan="6"></td></tr> <tr><td>BLK</td><td>01</td><td>TI-15</td><td colspan="6"></td></tr> <tr><td>BLK</td><td>78</td><td>2P</td><td colspan="6"></td></tr> <tr><td>YEL</td><td>17</td><td>71-7</td><td colspan="6"></td></tr> <tr><td>YEL</td><td>42</td><td>F-GND (TOP)</td><td colspan="6"></td></tr> <tr><td>YEL</td><td>34</td><td>71-7</td><td colspan="6"></td></tr> <tr><td>YEL</td><td>72</td><td>1R</td><td colspan="6"></td></tr> <tr><td>WHT</td><td>14</td><td>P2-R1</td><td colspan="6"></td></tr> <tr><td>WHT</td><td>19</td><td>C2(+)</td><td colspan="6"></td></tr> <tr><td>WHT</td><td>10</td><td>2D</td><td colspan="6"></td></tr> <tr><td>WHT</td><td>64</td><td>C9(-)</td><td colspan="6"></td></tr> <tr><td>WHT</td><td>11</td><td>C1(+)</td><td colspan="6"></td></tr> <tr><td>WHT</td><td>18</td><td>C6(+)</td><td colspan="6"></td></tr> <tr><td>WHT</td><td>32</td><td>TI-4</td><td colspan="6"></td></tr> <tr><td>WHT</td><td>57</td><td>AC REC MALE (FIN)</td><td colspan="6"></td></tr> <tr><td>BLK</td><td>59</td><td>C-GND H.H. SUPPLY</td><td colspan="6"></td></tr> <tr><td>BLK</td><td>73</td><td>1S</td><td colspan="6"></td></tr> <tr><td>RED</td><td>30</td><td>TI-12</td><td colspan="6"></td></tr> <tr><td>RED</td><td>71</td><td>1H</td><td colspan="6"></td></tr> <tr><td>ORN</td><td>24</td><td>C6(+)</td><td colspan="6"></td></tr> <tr><td>ORN</td><td>68</td><td>1M</td><td colspan="6"></td></tr> <tr><td>ORN</td><td>25</td><td>C4(+)</td><td colspan="6"></td></tr> <tr><td>ORN</td><td>69</td><td>1D</td><td colspan="6"></td></tr> <tr> <td>A</td><td>REVISIONS CHANGE NO. CHK</td><td>REV.</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td> </tr> </tbody></table>		COLOR	HARN. NO.	AS. LOCATION	COLOR	HARN. NO.	AS. LOCATION	GRN	26	C3H *44-JI-1 **	BLU	15	C6(+)	GRN	27	C3H *45-JI-3 SEE NOTE	BLU	66	B1	GEN	20	C3H	BLU	16	C7(+)	GEN	9	R2-P1	BLU	67	2N	BRN	83	EE *47-JI-4	GRN	36	T1-G	BRN	77	2E	GEN	74	2K	BRN	40	77-18	GRN	37	T1-B	WHIT/BLU	5	PI-B *48-JI-6	GRN	75	2J	WHIT/WHT	88	2S *53-JI-7	ORN	35	T1-S	WHIT/WHT	85	EC *50-JI-8	ORN	73	1N	BLU	89	2N *54-JI-10	ORN	38	T1-9	WHIT/WHT	87	1T *52-JI-11	ORN	76	1P	WHIT/GRY	84	2U *49-JI-9	<small>* DENOTES CABLE HARNESS NO. ATTACHED TO JI MAT-N-LOK NO. ** ATTACH ITEM #55 TO HARNESS NO'S 26 & 27</small>						WHIT/GRY	70	2V							WHIT/GRY	28	77-11							WHT	86	2D *51-JI-12							ORN	90	1D *55-JI-14							BLK	82	1S *46-JI-2							YEL	22	F-GND (TOP) *43-JI-13							YEL	23	F-GND (TOP) *56-JI-15							YEL	12	F-GND (TOP)							YEL	21	F-GND (BOTTOM)							WHIT/GRN	6	P1-A							WHIT/GRN	62	P2-C							GRN/WHT	4	P1-C							GRN/WHT	63	2U							RED	1	SI-PT1 (FOR 220 VAC)							RED	33	TI-1 (FOR 220 VAC)							RED	33	TI-1 (FOR 117 VAC)							RED	1	SI-PT1 (FOR 117 VAC)							RED	2	SI-PT2							RED	58	F1							RED	3	SI-PT1							RED	7	LI-PT1							WHT	8	LI-PT1 (FOR 220 VAC)							WHT	31	TI-1-A (FOR 220 VAC)							WHT	31	TI-2-A (FOR 117 VAC)							WHT	8	LI-PT3 (FOR 117 VAC)							WHT	13	CB(-)							WHT	65	2F							BLK	29	TI-10							BLK	39	TI-15							BLK	01	TI-15							BLK	78	2P							YEL	17	71-7							YEL	42	F-GND (TOP)							YEL	34	71-7							YEL	72	1R							WHT	14	P2-R1							WHT	19	C2(+)							WHT	10	2D							WHT	64	C9(-)							WHT	11	C1(+)							WHT	18	C6(+)							WHT	32	TI-4							WHT	57	AC REC MALE (FIN)							BLK	59	C-GND H.H. SUPPLY							BLK	73	1S							RED	30	TI-12							RED	71	1H							ORN	24	C6(+)							ORN	68	1M							ORN	25	C4(+)							ORN	69	1D							A	REVISIONS CHANGE NO. CHK	REV.	8	7	6	5	4	3	2	1
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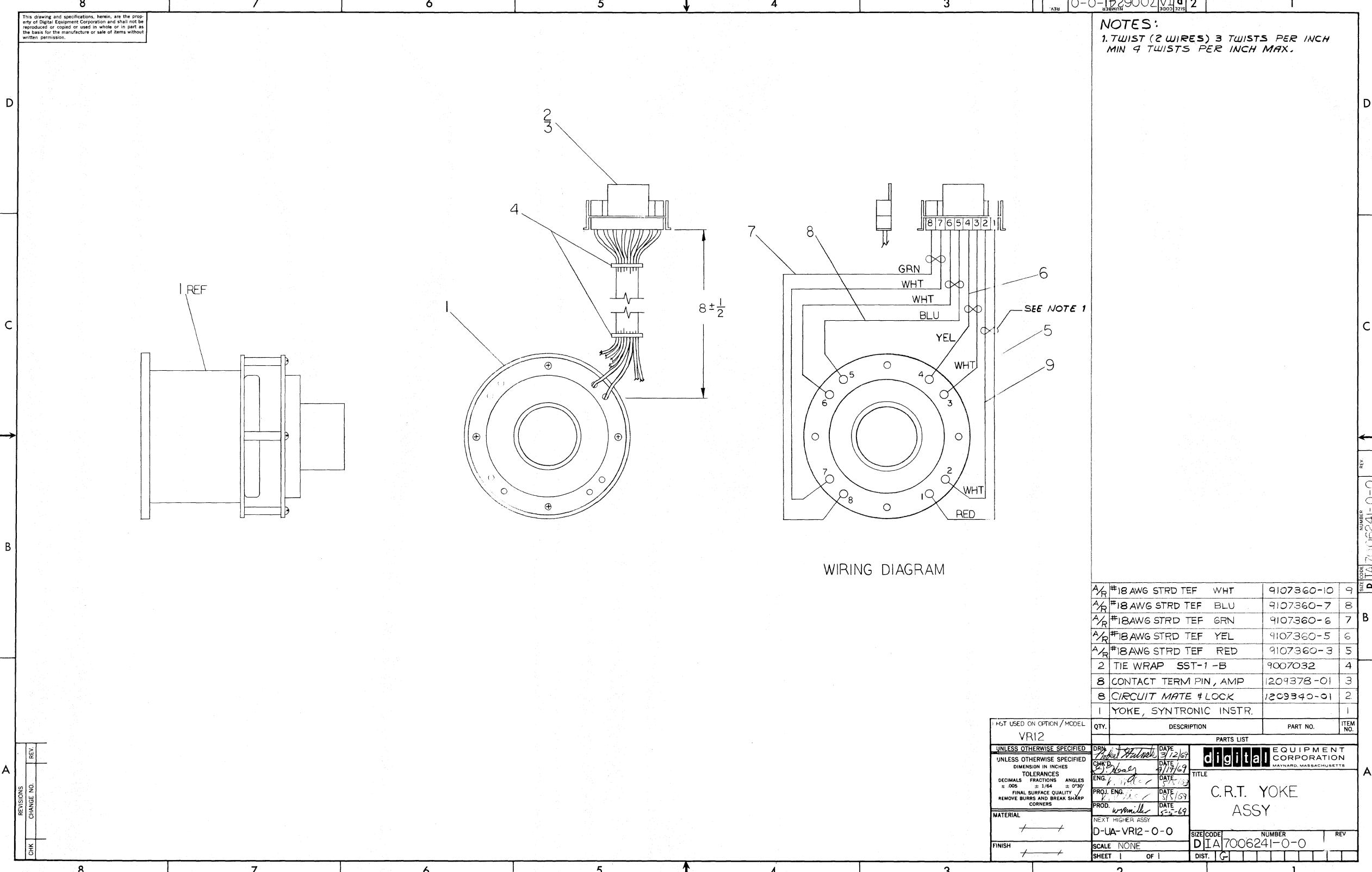
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REF DESIGNATION	DESCRIPTION	PART NO.
PARTS LIST		
FUSE 1 AMP SLOW BLOW	A-PL-7005995-0-0	9007212
FUSE 2 AMP SLD BLOW		9007216
FI FUSE HOLDER # HKP		9007242
AC RECEPT FEM 160 4 AMPH		1201251
AC RECEPT MALE #160-5 AMPH		1201252
J1 AMP 15-CIRCUIT		1209350-15
SI CRT SOCKET ALDEN #212		1203480
P3 POT 500KΩ 2W		130942-17
L1 PILOT LITE 117V		1209348
P1 POT 100K 2W		1309346
C2 CAP 13K MFD 15V		1009436
T1 TRANSFORMER T66166		16C9598
Q1 TRANSISTOR 2N4276		1509455
C5,C4 CAP 5.5K MFD 40V		1009434
C3 CAP 18K MFD 10V		1009437
C1,C6-C9 CAP 6K MFD 10V		1009435
P2 POT 100K 2W		1300530
R2 RESISTOR 10 Ω 1W 5%		1300171
R1 RESISTOR 0.1 Ω 1W 5%		1309452
DM15 RECTIFIER DM15		1105799
REF DESIGNATION		

FIRST USED ON OPTION/MODEL VR12		UNLESS OTHERWISE SPECIFIED DRW Dk Carter DATE 7/12/68	
		UNLESS OTHERWISE SPECIFIED CJK DATE 7/17/68	
		DIMENSION IN INCHES ENG. K. P. L. DATE 7/17/68	
		TOLERANCES DECIMALS FRACTIONS ANGLES ± 0.0000 ± 0.0000 ± 0° 90° REMOVE BURRS AND BREAK SHARP CORNERS PROJ. ENG. K. P. L. DATE 7/17/68	
		MATERIAL PROD. A. R. M. DATE 5-7-68	
TRANSISTOR & DIODE CONVERSION CHART		FIRST USED ON D-AD-7005995-0-0	
DEC	EIA	DEC	EIA
2N4276			
FINISH		SCALE NONE	SHEET 1 OF 1 DIST.
		SIZE CODE DCS	NUMBER 7005995-0-1 REV. A

D-CS-7005995-0-1 Power Supply



D-IA-7006241-0-0 CRT Yoke Assembly

**Digital Equipment Corporation
Maynard, Massachusetts**

digital