CONTROL DATA®

MODEL dd 60B

COMPUTER CONTROL CONSOLE

REFERENCE/CUSTOMER ENGINEERING MANUAL

- General Description
- Operation
- Theory of Operation
- Maintenance
- Maintenance Aids
- Diagrams
- Parts Data

CONTROL DATA CORPORATION

DATA DISPLAY DIVISION
2401 NORTH FAIRVIEW AVENUE
SAINT PAUL, MINNESOTA 55113

MODEL dd 60B

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REFERENCE/CUSTOMER ENGINEERING MANUAL

SECTIONS IN THIS MANUAL:

Section I — General Description

Section II — Operation

Section III — Theory of Operation

Section IV — Maintenance

Section V — Maintenance Aids

Section VI — Diagrams

Section VII — Parts Data

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February 1967

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A

FOREWORD

This technical manual is for guiding personnel in the operation and maintenance of the dd 60B Computer Control Console, hereafter referred to as a Display Console. The manual consists of seven sections in one volume.

Section I, General Description — explains the purpose of the Display Console along with its operational, functional, and physical characteristics.

Section II, Operation — lists all operator controls and their functions and locations, operating procedures, and keyboard codes.

Section III, Theory of Operation — gives a comprehensive explanation of the Display Console logic, circuits, and functions.

Section IV, Maintenance — describes preventive and corrective maintenance of the Display Console, includes a list of required test equipment, and contains performance standards showing typical circuit waveform patterns.

Section V, Maintenance Aids — contains fuse data, cabling information, card placement charts, and card schematics.

Section VI, Diagrams — contains schematic, wiring, and logical diagrams.

Section VII, Parts Data — contains a reference designation chart, provisioning parts list, vendors listing, and illustrated parts breakdown.

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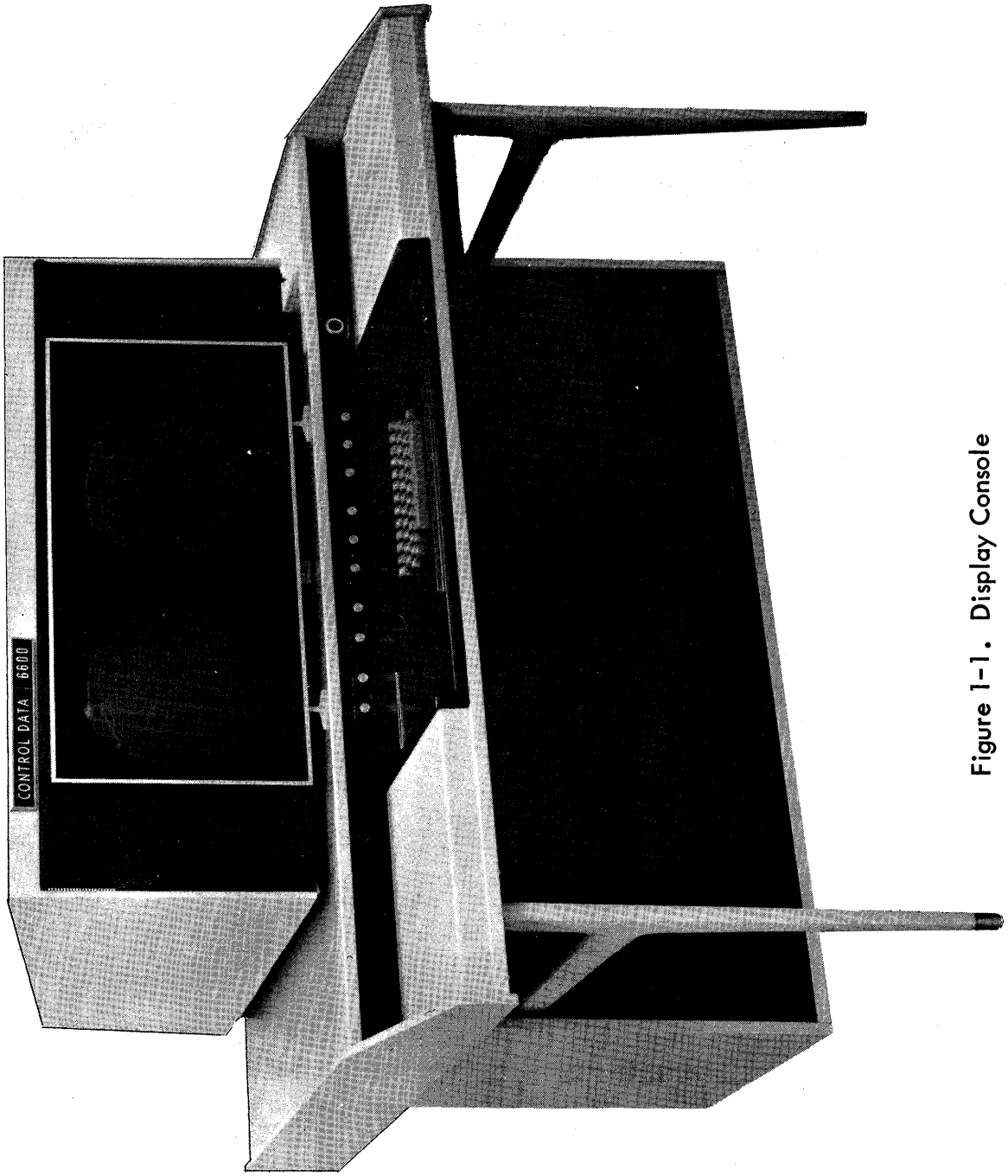


Figure 1-1. Display Console

SECTION I

GENERAL DESCRIPTION

The Model dd 60B Computer Control Console is an on-line, direct-reading, cathode ray tube (crt) Display Console. It provides real-time program monitoring in large-scale computer operations to present independent computer-regenerated displays on two 12-inch crt. Figure 1-1 is a photograph of the Display Console.

FUNCTIONAL DESCRIPTION.

The Display Console operates from a source of digital and analog horizontal (X) and vertical (Y) input information. Digital inputs are 9 bits for each of the X and Y inputs. Analog inputs control symbol formation. An operator, using the keyboard, may type messages for entry to the computer.

A symbol (characters, letters, numbers, etc) occupies a 5 by 7 symbol matrix located on the crt raster. The 7- by 7-inch raster is divided into 512 by 512 coordinate positions. Each raster position has an X and Y coordinate designating it individually from the other positions. With the X, Y address equal to 000, the crt beam is deflected to the lower left position and with the X, Y address equal to 777 octal, the crt beam is deflected to the upper right position.

Symbol repertoire and symbol size are controlled by external equipment — not a part of this Display Console. Symbol size control inputs allow three symbol sizes.

Major assemblies necessary to operate and control the crt consist of a 2-kv supply, 22-kv supply, 20-volt regulated supply, preamplifier, deflection amplifier, unblank amplifier, focus and astigmatism correction amplifier, high-voltage divider, keyboard, and blower. Figure 1-2 is a simplified block diagram of the Display Console.

The 2-kv power supply furnishes d-c voltages required by the deflection amplifier and focus and astigmatism correction amplifier. A thermal delay, contained in the 2-kv power supply, delays the d-c voltages to the deflection amplifier, focus and astigmatism correction amplifier, and 22-kv power supply until the various tube filaments are heated.

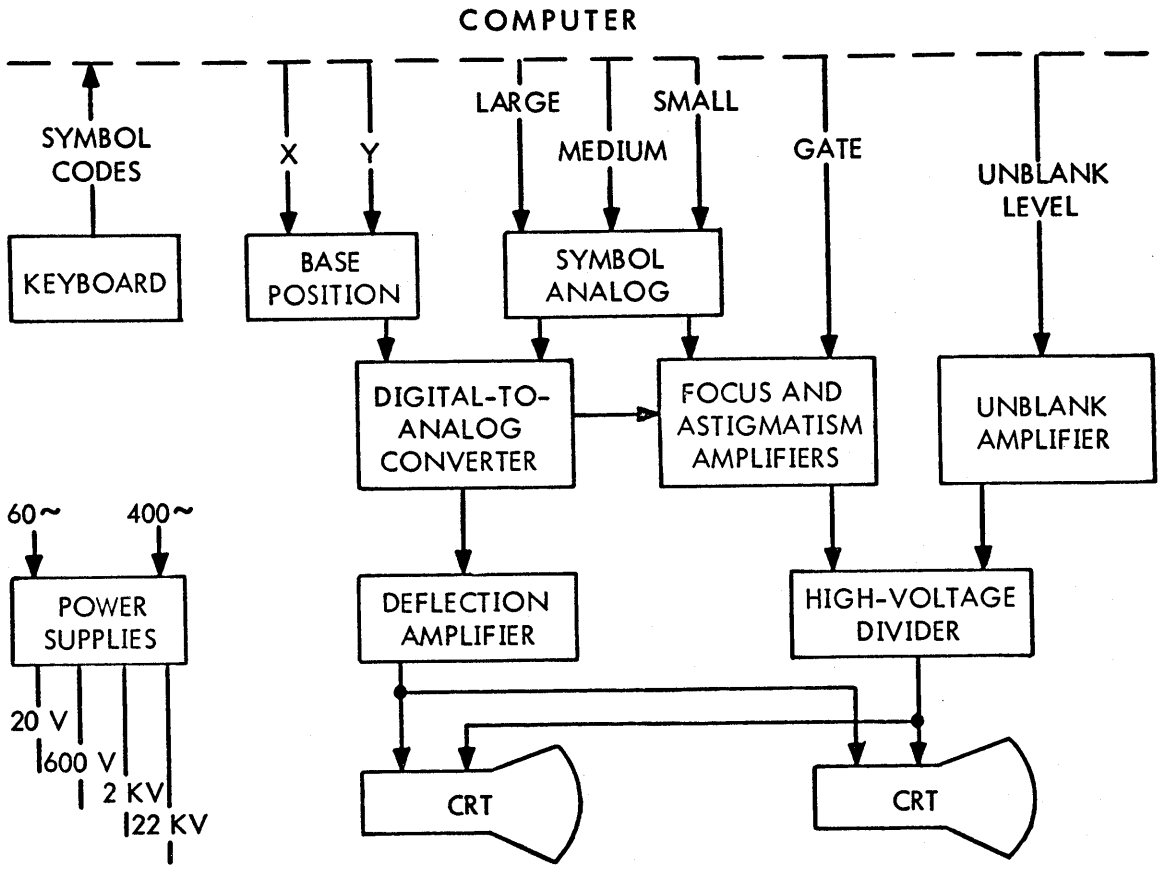


Figure 1-2. Display Console Simplified Block Diagram

The 22-kv supply requires 120-volt, 400-Hz, single-phase power and furnishes the high voltage for the crt. The output of this supply is connected across the high-voltage divider.

Digital position values are applied to the Display Console. These values are converted to analog voltage levels which control the base position for displaying a symbol. Analog voltage levels also are applied to the Display Console and control symbol formation centered at base positions.

Analog voltages and currents control the deflection amplifier. Both positive and negative X and Y deflection values are applied to the deflection amplifier through the preamplifier for push-pull type X, Y deflection. The deflection amplifier output is connected to the crt deflection plates. Varying the potential on the crt deflection plates positions the crt beam.

The unblank amplifier controls crt beam unblanking by varying the potential on the crt control grid, allowing the beam to excite the phosphor. The unblank circuitry also contains beam intensity adjustments.

Deflection analog voltages and currents are applied to the focus and astigmatism amplifier. Output of this amplifier controls the potential on the crt focus correction grid and accelerator anode. These focus and astigmatism correction potentials keep the display in focus as the beam moves across the crt face.

Controls are provided on the Display Console for varying intenstiy, focus, astigmatism, and X and Y gain and position.

A blower assembly, along with a frame-mounted blower, cools the internal circuitry. The blowers require 120-volt, 60-Hz, single-phase power.

The keyboard provides a means of transferring data to the computer for modification or generation of a display.

PHYSICAL DESCRIPTION.

Physical construction of the Display Console incorporates the latest recognized factors in human engineering, convenience, and safety. Similar functional parts of the unit utilize similar basic circuit modules to the maximum extent practical. Each of the identical modules is interchangeable without major readjustment. All parts bearing the same manufacturer's part number are electrically, mechanically, and functionally interchangeable.

The two 12-inch crt are type P31 phosphor. A shelf, extending on both sides and in front of the crt and control panel, forms a desk area. The keyboard occupies the desk area directly in front of the crt, providing maximum operator efficiency.

Figure 1-3 shows Display Console dimensions. The unit weighs approximately 390 pounds.

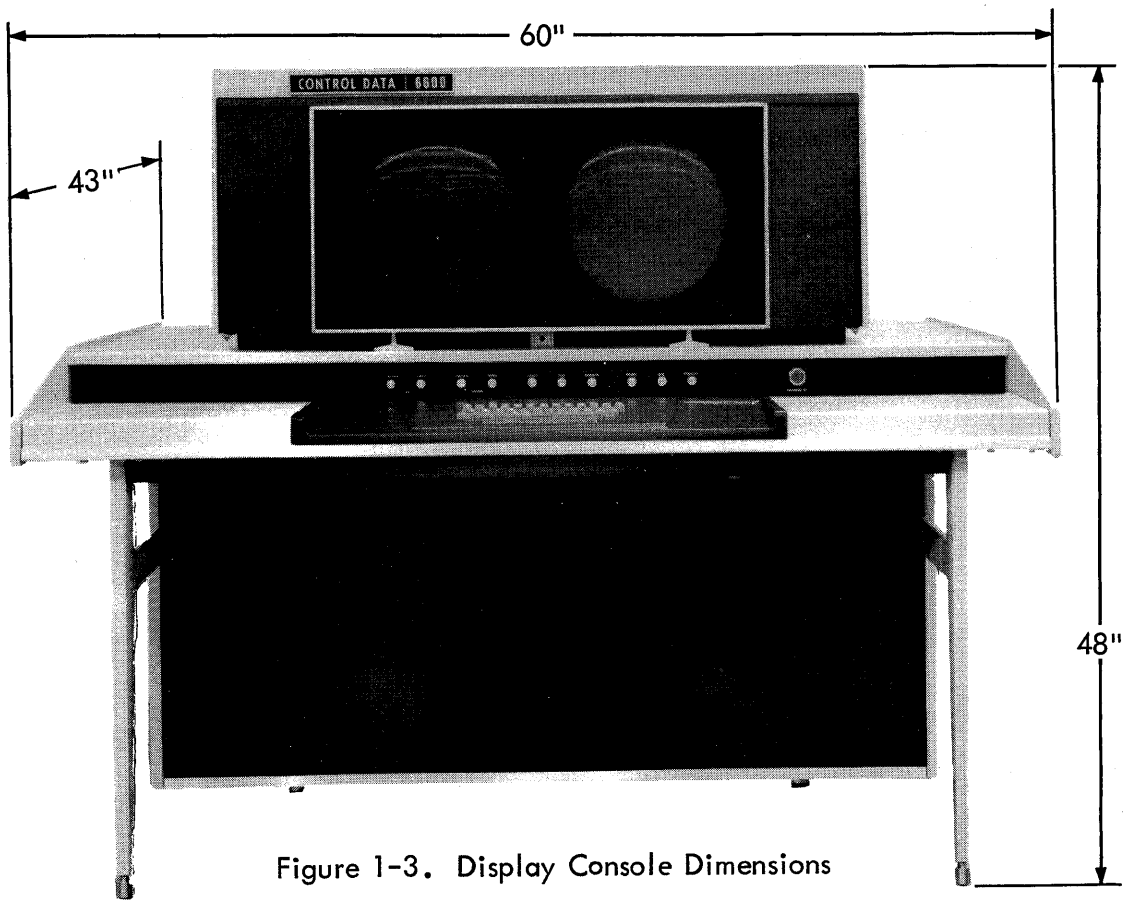


Figure 1-3. Display Console Dimensions

ELECTRICAL DATA.

The Display Console requires 208-volt, 400-Hz, 3-phase, 4-wire and 120-volt, 60-Hz, single-phase power. Power is furnished by an external source.

ENVIRONMENTAL DATA.

The Display Console uses ambient room air for cooling, eliminating necessity of special air ducting. Blowers contained within the unit circulate ambient room air through reusable air filters and out exhaust vents. The base-mounted blower provides 150 cfm at sea level and the frame-mounted blower provides 320 cfm.

For specified performance, observe temperature, relative humidity, and atmospheric pressure conditions under operational and nonoperational categories listed in table 1-1.

Addition to paragraph: ELECTRICAL DATA., page 1-4.

The customer shall provide accessible convenience outlets within fifteen feet of each cabinet in the Display Equipment to enable an oscilloscope cart to be positioned at the logic chassis within each cabinet. The convenience outlets may be located in the perimeter walls and/or in raised floor panels. The receptacles shall be of the single phase grounded type and shall be connected to the building power system. For 60 cycle installations, the nominal voltage shall be 120 V. For 50 cycle installations, the nominal voltage shall be 220, 230 or 240 volts. The receptacles shall comply with local electrical codes.

TABLE 1-1. ENVIRONMENTAL CONDITIONS

CONDITION	OPERATIONAL Normal/Standby	NONOPERATIONAL Storage/Transit (Note 2)
Temperature (Note 1)	62 to 82	0 to 110
Relative Humidity	40 to 60%	0 to 100% (Note 3)
Altitude	8,000 feet	12,000 feet

Note 1 — all temperatures in degrees Fahrenheit.

Note 2 — packed for shipment.

Note 3 — includes condensation in the form of moisture or frost.

TEST EQUIPMENT REQUIRED.

Maintenance of the Display Console requires use of an oscilloscope, multimeter with high-voltage probe, and high-voltage capacitor. Reference Section IV of this manual for a specific listing of required test equipment.

SECTION II

OPERATION

The Display Console is intended for continuously powered operation whenever a data source is operating. Control words and signals are sent to the Display Console. This section lists all controls governing the equipment and contains procedures for turning the equipment on and off as well as the keyboard codes.

CONTROLS.

There are three control areas for the operator; one area directly below the two crt, a POWER ON/OFF switch under the desk top on the right hand side, and a keyboard for data entry. An elapsed time meter, visible through the rear access doors, shows the amount of equipment operation time.

Physical controls on the Display Console provide a means of adjusting the crt. The control panel, POWER ON/OFF switch, elapsed time meter, and keyboard are shown in figures 2-1, 2-2, 2-3, and 2-4, respectively. Table 2-1 explains the functions of each control.

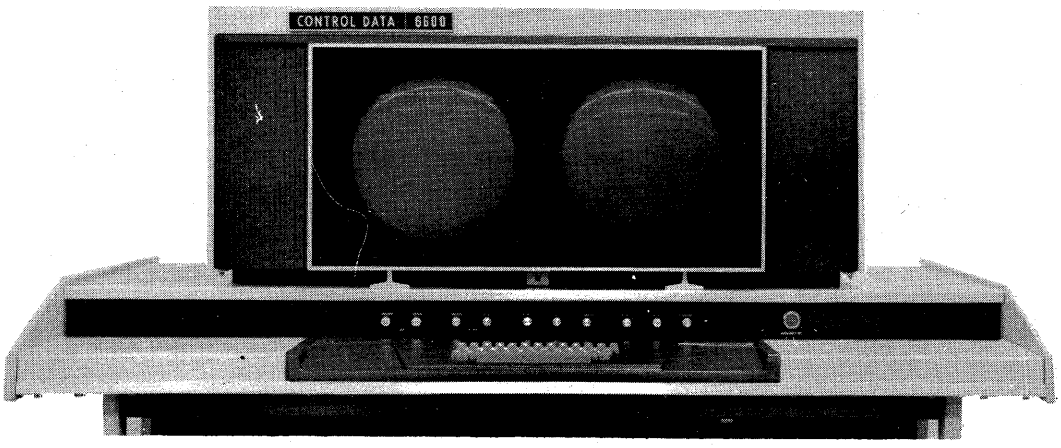


Figure 2-1. Operator Control Panel

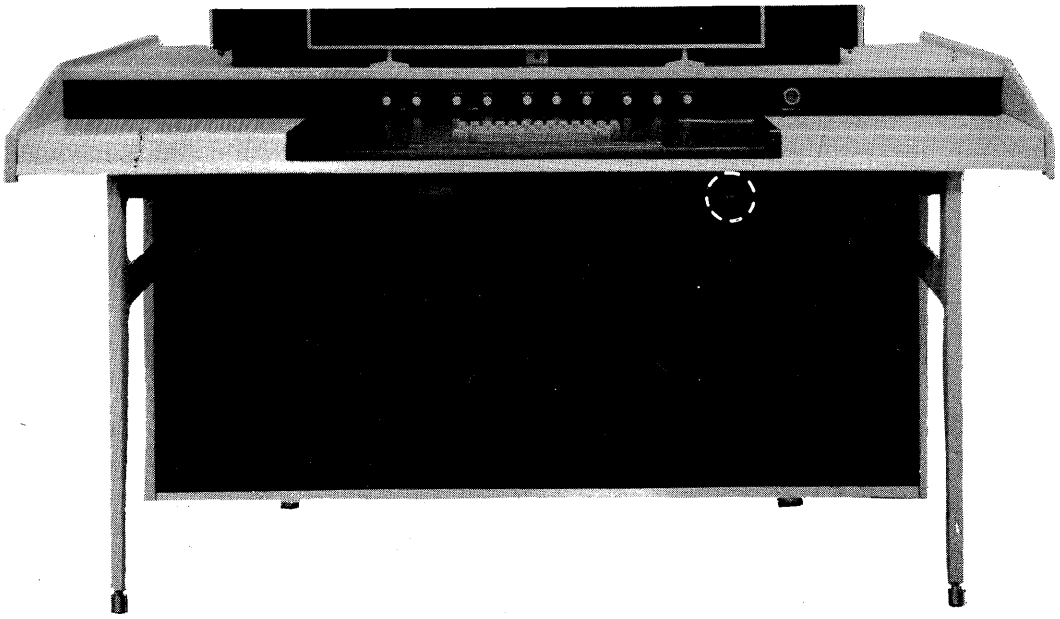


Figure 2-2. POWER ON/OFF Switch

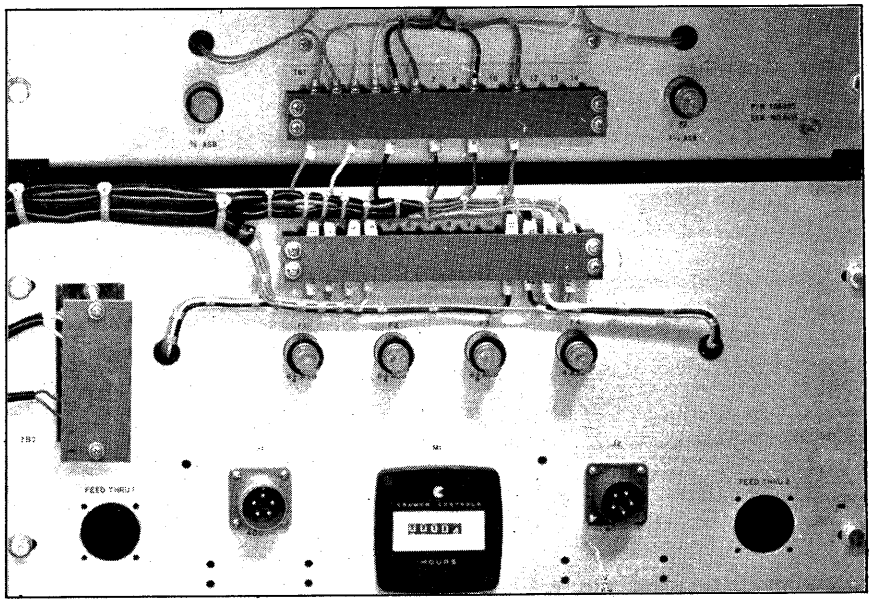


Figure 2-3. Elapsed Time Meter

Figure 2-4. Keyboard Configuration

TABLE 2-1. OPERATOR CONTROLS

NAME	TYPE	DESCRIPTION
	Reference figure 2-1	
HORIZONTAL GAIN	Pot.	Varies the width of the crt rasters.
VERTICAL GAIN	Pot.	Varies the height of the crt rasters.
HORIZONTAL CENTERING	Pot.	Varies the horizontal locations of the displays on the crt.
VERTICAL CENTERING	Pot.	Varies the vertical locations of the displays on the crt.
INTENSITY (2)	Pot's.	Varies the brightness of the crt display.
FOCUS (2)	Pot's.	Obtains the optimum image clarity in the center area of the crt display.
ASTIGMATISM (2)	Pot's.	Obtains the optimum image clarity at the edges of the crt display area.
EMERGENCY OFF	Pushbutton	Disconnects a-c voltages to the Display Console.

TABLE 2-1. OPERATOR CONTROLS (CONT)

NAME	TYPE	DESCRIPTION
	Reference figure 2-2	
POWER ON/OFF	Butterfly Switch	Applies or disconnects the a-c voltages to the Display Console.
	Reference figure 2-3	
M1	Meter	Registers equipment operation time.
	Reference figure 2-4	
Keyboard	Keys (49) Spacebar	Depression of each key sends a selected code to the computer.

NOTE

Three types of controls, FOCUS, INTENSITY, and ASTIGMATISM are separate for each crt. The remaining controls affect both crt equally.

OPERATING PROCEDURES.

Use the following procedures for turning the Display Console on and off and adjusting display appearance, if necessary.

TURN ON.

To turn on the Display Console —

(a) Rotate both INTENSITY controls fully counterclockwise.

(b) Depress the POWER ON/OFF switch to ON.

CAUTION

Failure to rotate INTENSITY controls fully counterclockwise may result in irreparable damage to the crt.

(c) After the 60- to 80-second incorporated time delay has passed, rotate INTENSITY controls clockwise to obtain proper intensity of the symbols on the crt.

TURN OFF.

To turn off the Display Console —

(a) Rotate both INTENSITY controls fully counterclockwise.

(b) Depress the POWER ON/OFF switch to OFF.

DISPLAY APPEARANCE.

Following adjustments are available for fine tuning. The controls are located on the front of the Display Console and do not require adjustment each time the equipment is turned on.

Intensity.

Adjust the INTENSITY controls until all programmed displays are visible.

NOTE

Placing INTENSITY controls at too high a level causes undesired traces on the screen; likewise, setting the level too low causes fading of some displays.

Horizontal and Vertical Gain and Centering.

Adjust the GAIN and CENTERING controls until the raster appears square and its corners just touch the edge of the crt face. This procedure must be performed while adjusting both the GAIN and CENTERING controls.

The GAIN controls increase or decrease the size of the raster around its center while the CENTERING controls move the center point of the raster in respect to the crt center.

Focus and Astigmatism.

(a) Set both FOCUS and ASTIGMATISM controls at the center of their travel.

(b) Adjust the FOCUS and ASTIGMATISM controls until the displays are clear and distinct at the center area of the scope.

NOTE

Focus and astigmatism correction is interacting. It may be necessary to compromise on the quality of one to gain optimum performance from the other.

KEYBOARD CODES.

Figure 2-5 lists the octal codes corresponding to the keys on the keyboard. A two-digit code of the form m/n identifies the octal translation for each symbol.

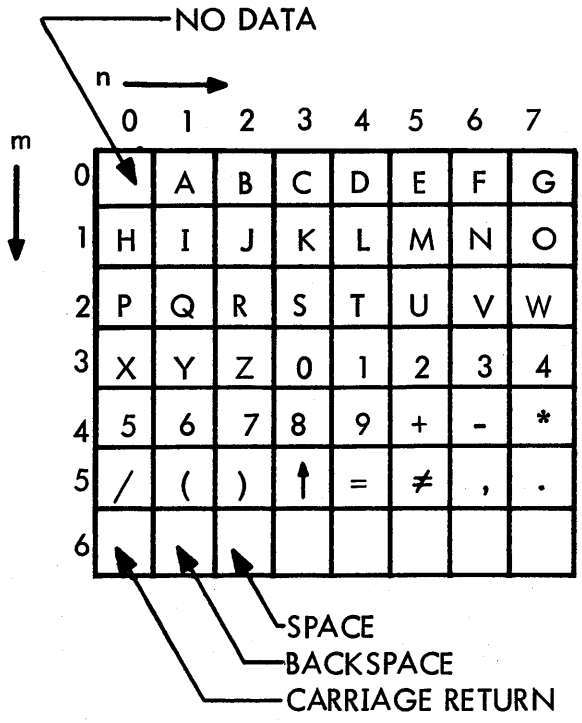


Figure 2-5. Keyboard Codes

SECTION III

THEORY OF OPERATION

The Display Console exhibits information corresponding to symbol codes contained in data words transferred from a data source such as a computer. Provision is made for four types of inputs: nine X (horizontal) and nine Y (vertical) reference position digital inputs, X and Y analog symbol formation values, analog symbol size control, and analog unblank time information.

The equipment contains two crt for display of data, four power supplies (two high-voltage and two low-voltage), and circuitry for digital-to-analog (d/a) X, Y positioning; blank and unblank control; and amplification of symbol size and formation.

The X, Y digital inputs are interface connections between the Display Console and the reference position digital source. These digital inputs are supplied to the d/a circuitry. The d/a circuitry determines the reference (start) coordinate for symbol logic on the raster of the crt. The X, Y digital input circuit switch time requirement is 3 microseconds.

Analog logic X, Y symbol formation and symbol size control are determined by external equipment and are sent to the Display Console. This logic is amplified and added to, or subtracted from, the symbol position X, Y coordinate. Symbol size and formation logic are amplified and coupled into the deflection amplifiers of the crt. The Display Console can accept three logic symbol size values (large, medium, and small).

Blanking and unblanking, as well as focus and astigmatism correction, are determined by analog (logical) information sent to the Display Console. These values are amplified and applied to their respective circuitry.

A keyboard, mounted in the desktop of this equipment, provides a means of communicating with the data source. There are eight output lines from the keyboard.

BASIC THEORY AND CIRCUITS.

The Display Console utilizes both d/a and analog circuits. Symbol positioning utilizes d/a while deflection, unblank, symbol formation, and focus and

astigmatism correction are analog. The d/a converters transform the digital values into analog currents and voltages which, in turn, position the crt beams.

DIGITAL CIRCUITRY.

Basic building blocks are solid-state, transistorized circuits. Solid-state components permit convenient packaging and reduce overall power requirements. Transistorized circuits operate at conveniently low voltage levels and have switching times ranging from 25 to 100 nanoseconds. Figure 3-1 shows the delay between the rise and fall time of an input pulse versus the rise and fall time of an output pulse.

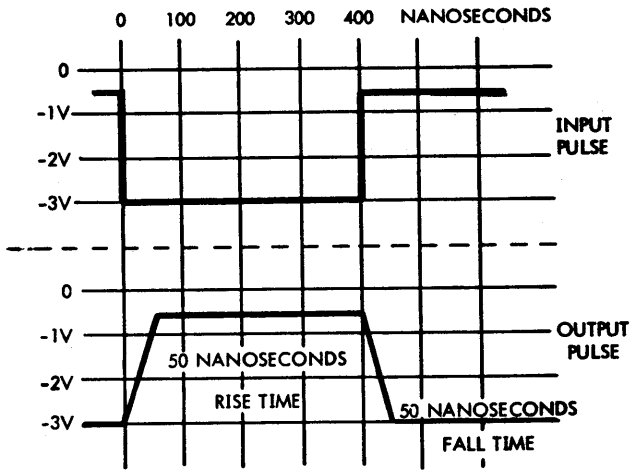


Figure 3-1. Inverter Switching Time

Single Inverter.

An inverter operates at two distinct signal or pulse levels, namely -3 volts and -0.5 volt. A -3-volt input to an inverter causes a -0.5-volt output and vice versa. In display logic, the -3 volts represents a logical 1 and the -0.5 volt represents a logical 0. Figure 3-2 is a schematic diagram of an inverter.

Input terminals connect to a voltage divider network through diodes CR1 and CR2. The divider network consists of resistors R3 through R7. Diodes CR1 and CR2 isolate input terminals from each other. Transistor Q1 controls the inverter circuit.

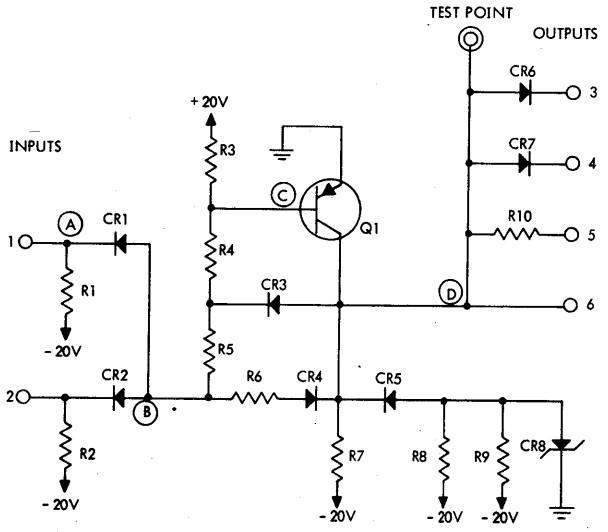


Figure 3-2. Inverter Schematic Diagram

An input signal of -0.5 volt (point A) results in a close to ground potential at point B, which results in a positive potential on the base of Q1 (point C). Transistor Q1 is cut off. This develops a high-voltage drop across the transistor (because of the high impedance) and less of a voltage drop across R7 resulting in a -3-volt level on the output lines (point D).

A -3-volt potential on either input pin results in a -3-volt potential at point B which places a negative potential on the base of transistor Q1 (point C). The transistor conducts and decreases the voltage drop across Q1, putting point D close to ground potential. This produces a greater voltage drop across R7 resulting in a -0.5-volt level on the outputs. Thus, a -3-volt input resulted in a -0.5-volt output. When the input returns to -0.5 volt, the output returns to -3 volts.

The inverter card has three types of outputs — standard diode (outputs 3 and 4), resistive (output 5), and shorted (output 6).

OR Circuit.

Diodes and resistors at the input of an inverter comprise the OR circuit. The inverter, figure 3-2, has two input OR circuits consisting of R1, CR1, R2, CR2, and involving the voltage divider R3 through R7.

The potential at point B, the common junction of the anodes of the OR diodes, is -0.5 volt (indicating a 0 input) only if both input levels at the cathodes of CR1 and CR2 are -0.5 volt. If either OR input goes to -3 volts (logical 1), the potential at point B then becomes more negative indicating a logical 1 input. This, in turn, forces the inverter output to -0.5 volt (logical 0).

Figure 3-3 shows two OR inputs, A and B, to the 1222 inverter. Arrows touching outer edges of the rectangle signify the OR function.

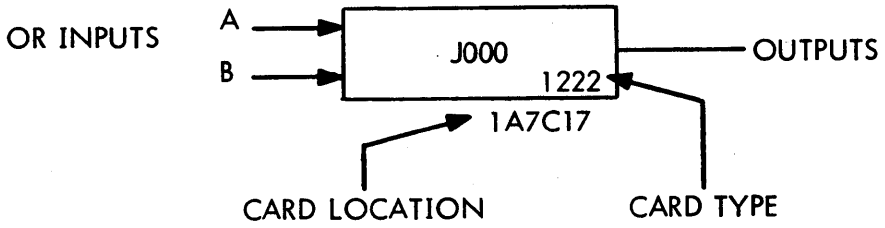


Figure 3-3. Inverter Logical Diagram Symbol

Inverters have variations in their output circuitry. Logical levels are the standard -0.5 volt and -3 volts. Figure 3-4 shows the logical diagram representation of the special circuits.

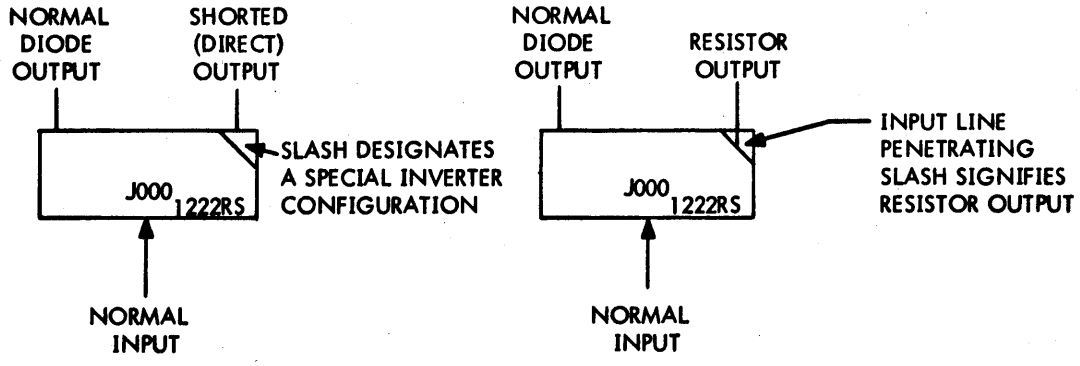


Figure 3-4. Special Logical Diagram Symbols

AND Circuit.

A small circle, figure 3-5, is the logical diagram representation of an AND circuit. A line represents the input to the AND, and an arrow represents the output which is an input to a logic element such as an inverter.

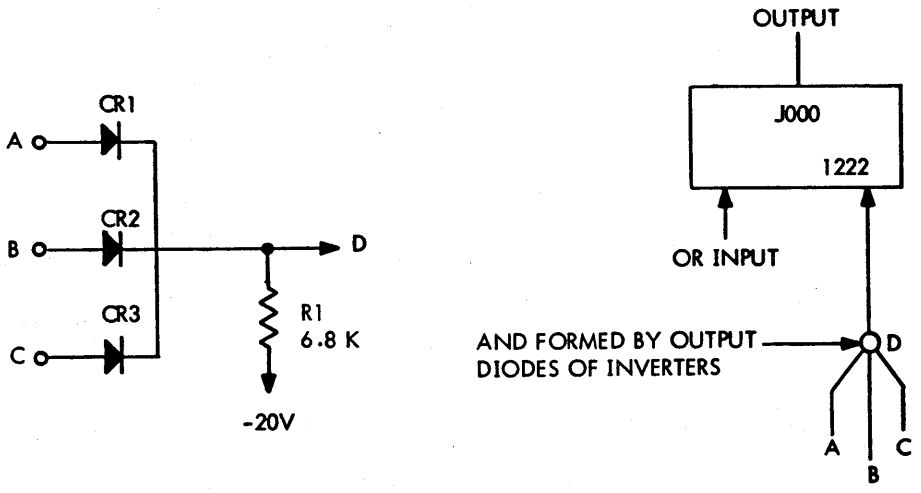


Figure 3-5. AND Circuit

The AND circuit performs the logical function of tying together up to four inputs, and giving out a -3-volt (logical 1) level when all AND inputs are equal to -3 volts. Diodes of an AND circuit are output diodes of inverters feeding it. As many as four diodes, each from different inverters, may be connected in an AND. Tying the common cathode connection of the diodes to the input of an inverter furnishes the remaining elements of the AND circuit. Inputs A, B, and C all must be at -3 volts before the output of the AND goes to -3 volts. If any inputs are at -0.5 volt, cathodes of all three diodes are held at this potential as is the output at D.

ANALOG CIRCUITRY.

Analog values converted from digital values deflect the crt beams, control unblank time, focus, etc. Since the deflection system is push-pull, four analog voltages are required to position the beam. These are a push and a pull analog signal generated for X, and a push and a pull analog signal generated for Y.

Figure 3-6 shows typical simplified d/a conversion waveforms, the digital values, and the resulting single analog voltage. The analog output level varies for each of the three binary inputs; ie, input 1 (binary) results in half as much analog voltage as input 2 (binary), and input 2 (binary) results in half as much analog voltage as input 3 (binary).

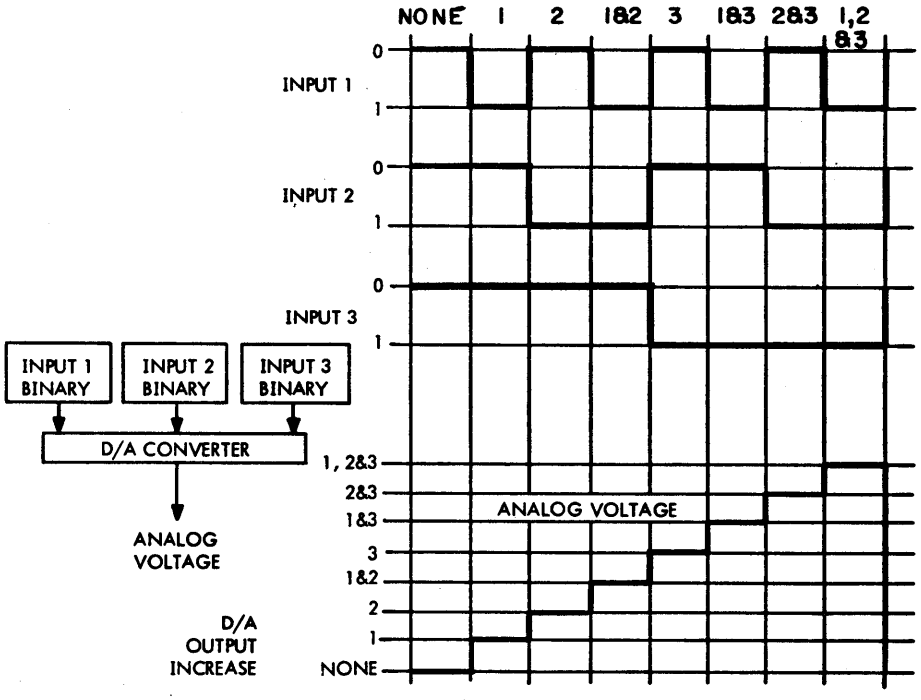


Figure 3-6. Simplified D/A Conversion Waveforms

Each X, Y positioning value generates sufficient X and Y deflection voltages to position the electron beam at a desired crt raster position. Symbol formation levels move the beam around the base X, Y position. Each beam movement depends upon the sum of the outputs of two analog sources; positioning and symbol.

X, Y positioning requires two circuits each because of the push-pull method of beam positioning. Four deflection values are necessary and require four identically constructed d/a conversion networks. Each network converts digital outputs from several digital values to one analog value. Throughout the following discussions only one analog deflection circuit is described since the other three are identical.

NOTE

See Section V of this manual for schematic diagrams of cards referenced in the discussions.

D/A Conversion.

D/a converters change one or more binary values into a single current or voltage level. When there are several digital values, such as a register, the most significant bit causes the greatest variation in current flow.

Each d/a network, which converts more than one digital value, utilizes several type 002C d/a converters. A type 027 resistor card terminates the outputs of each d/a converter series and outputs one variable value. This is referred to as d/a converter network. D/a inputs connect to the outputs of type 619 line terminators.

The type 002C d/a converter card has two d/a converter circuits, each having a reference input, a digital input, and an output. Pins 3 and 9 are d/a reference voltage inputs, pins 1 and 7 are digital inputs, and pins 5 and 11 are outputs. Figure 3-7 shows a simplified diagram of the type 002C d/a conversion network which is for base positioning.

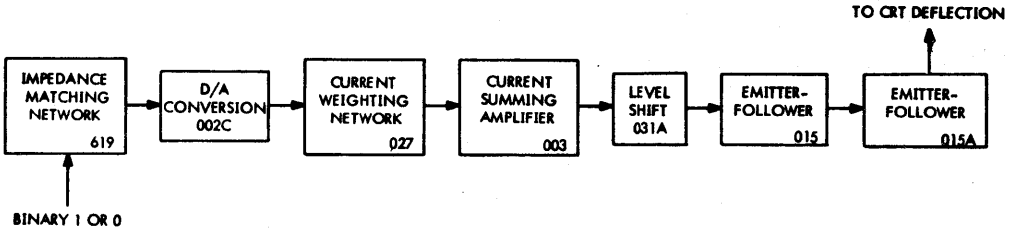


Figure 3-7. D/A Conversion Network

D/A Reference Voltage.

Two voltage regulator cards, types 401 and 443, control the analog reference voltage source for the positioning d/a converters. A voltage divider, connected to the regulated 20 volts, furnishes the base voltage source. A pot. on the 401 regulator card controls the output of the type 443 regulator card which is 4.7 volts ±0.1 volt. This voltage may be varied depending upon the amount of total deflection necessary from the d/a converters.

Current Summing.

The output of the d/a converter network goes to a type 003 current summing card. Four current summing cards are used, two for each of the X and the Y deflection signals. Figure 3-8 shows a simplified d/a summing network.

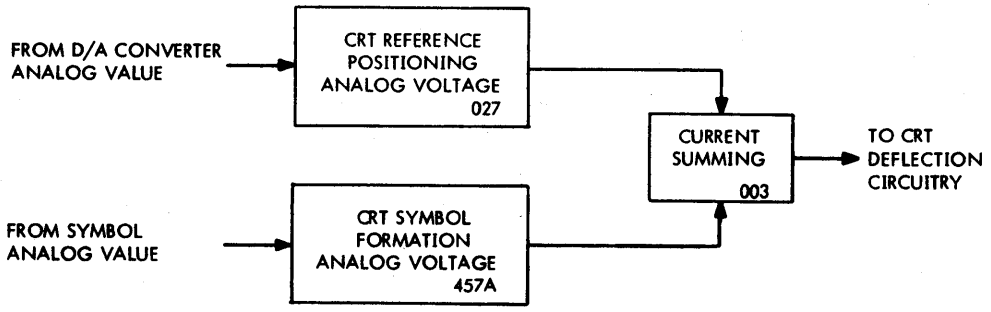


Figure 3-8. D/A Summing Network

The summing takes the algebraic sum of symbol generator or vector generator currents and base positioning currents and combines them into a single variable current. Output of the current summing card is approximately 4.7 volts. Output variations are caused by increasing or decreasing current flow.

The 003 card drives two cards, an 031A card and an 015 card. The 031A card is a differential amplifier level-shift circuit. It converts 5 volts, 003 card output, to - 15 volts. Output of the 015A card is used for deflection. The 429A card provides for focus and astigmatism correction through the 015A card. Table 3-1 lists the various card types and briefly describes their functions.

TABLE 3-1. CARD TYPES AND FUNCTIONS

TYPE	FUNCTION
002C	D/a converters for forming or locating the base position
003	D/a summing network
015	Emitter-follower amplifier card
015A	Emitter-follower amplifier card
016	Standard inverter with six inputs and six outputs

TABLE 3-1. CARD TYPES AND FUNCTIONS (CONT)

TYPE	FUNCTION
C19	Emitter-follower with one output resistive; mixes symbol formation and size analog values
019	Emitter-follower for current amplification (unblank and focus)
027	Resistor card for weighting the d/a analog levels
029	Differential input deflection preamplifier
031A	Level-shift differential amplifier
039	Coaxial cable terminator
040	Deflection buffer amplifier
S45	Coaxial cable terminator
205	Unblank amplifier
401	Card with variable output which drives 443 voltage regulator card
429A	X and Y gain control and mixer for automatic focus circuits
443	D/a 5-volt regulator card (adjust reference levels)
452A	Amplifier
456A	Analog current modifier with a variable output (deflection level adjustment)
456B	Analog current modifier with a variable output (intensity level adjustment)
457A	Resistor or capacitor cards for termination or pulse delay
478	Relay card
619	Logical line terminator for voltage level shift and impedance match to 72-ohm line
620	Class A amplifier with feedback to match 72-ohm line and shift reference level
1021	Logical inverter
1222RS	Inverter card; two inputs, and two outputs; for splitting analog symbol size value between symbol size and unblank circuitry
UA2A	Unblank amplifier

MONITOR.

The monitor portion of the Display Console contains the crt, power supplies, deflection amplifiers, and crt controls. Figure 3-9 is a simplified functional block diagram of the monitor, located in the upper portion of the Display Console.

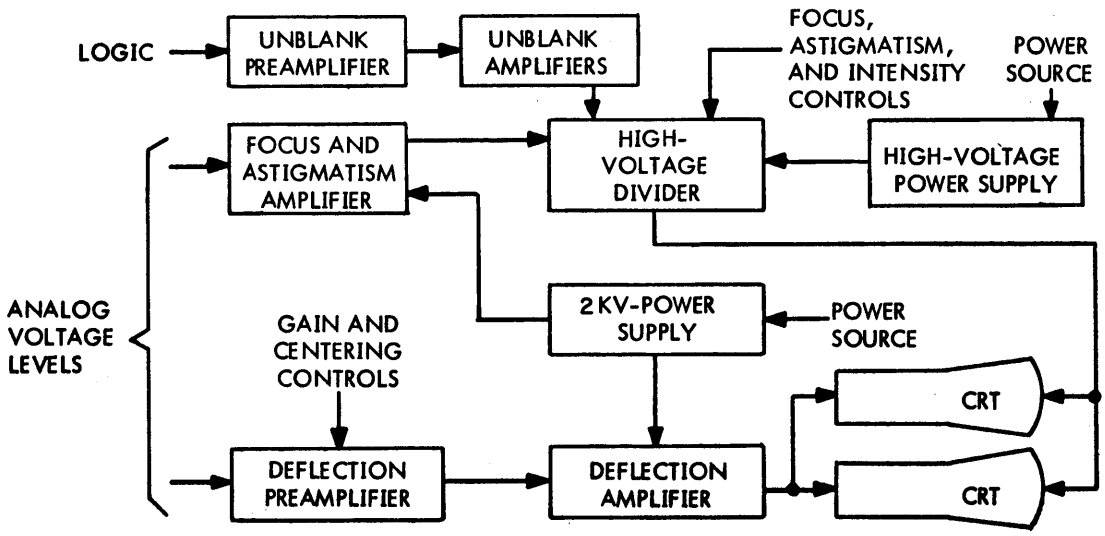


Figure 3-9. Monitor Functional Block Diagram

A high-voltage system, unblank circuitry, focus and astigmatism correction, and deflection circuitry control and drive the crt. Following paragraphs discuss the 2-kv and 22-kv supplies and the crt circuitry. The 2-kv supply furnishes the necessary voltages for deflection amplifiers while the 22-kv supply and high-voltage divider provide high voltage necessary for the crt focus, intensity, and unblank.

CATHODE RAY TUBES.

The crt are identical and connected in parallel, therefore, only theory of one is explained.

The Display Console crt is electrostatically deflected, ie, changing the potentials on the deflection plates moves the beam. Figure 6-15 is a schematic

diagram of the crt and high-voltage divider. The four deflection plates in the crt bend the electron beam for symbol formation. The crt also contains grids for focus and astigmatism correction and a control grid for turning the beam on and off and varying its intensity.

Crt deflection plates, which are directly coupled to the output of the deflection amplifier, must be at approximately the same potential as the crt acceleration electrode to obtain optimum spot size. Adjustment of the ground reference pot., located on the high-voltage system shield, matches the acceleration potential to that of the deflection amplifier. Adjusting the pot. moves the zero reference point of the voltage divider in either the positive or the negative direction. This, in effect, raises or lowers the accelerator to ground potential, thus providing a means of obtaining correct relationship between deflection plates and high-voltage circuits.

HIGH-VOLTAGE SYSTEM.

The Display Console crt requires a total cathode-to-post accelerator voltage of 16 kv which the high-voltage power supply furnishes. A transformer, selenium rectifiers, and high-voltage capacitors make up the high-voltage power supply. The 16 kv is, in turn, connected across the high-voltage divider. The high-voltage divider furnishes the different potentials required by the crt.

Filtering.

A resistance-capacitance filter, connected between the positive and negative terminals of the high-voltage divider, reduces the high-voltage ripple to a level low enough to prevent flickering of the crt image. To compensate for the voltage drop produced by the current passing through the resistive elements of the filter, the high-voltage supply must provide 1 kv to 2 kv more than the crt requires.

High-Voltage Divider.

Capacitors and fixed and variable resistors make up the high-voltage divider. Controls on the Display Console front panel provide a means of manually adjusting astigmatism, focus, and intensity static voltages. A variable resistor on the high-voltage divider provides a means of adjusting relationship between accelerator voltage and deflection plates. Focus (common) for both crts

The voltage divider network contains several capacitors. Two couple-in the correction and unblank voltages to crt grids. One couples the unblank voltage to the crt control grid and the other couples in the focus and astigmatism correction voltages. Unblank circuitry operates at the highest difference of potential, ie, the grid is the electrical point in the crt furthest from the ground potential. The unblank coupling capacitor is the most critical capacitor in the high-voltage divider. A d-c restore circuit consisting of a diode and a resistor located between the intensity control and the unblank voltage input, tends to return the a-c coupled unblank voltage to the level determined by the intensity control pot. In a typical high-voltage system, the unblank coupling capacitor has approximately 5 kv to 10 kv across it.

Intensity balance between the two crt is adjustable. A static potential is applied to the center arm of pot. R39 on the high-voltage divider. The two remaining terminals of the pot. are connected, one each, to the two crt unblank circuits. Adjusting the pot. increases the unblank signal to one crt and decreases the unblank signal to the other crt which increases the intensity on one crt and decreases the intensity on the other crt.

UNBLANKING.

The unblank levels, developed in the unblank control logic, determine the voltage level at the output of the unblank amplifier. Output of the unblank amplifier enters the high-voltage divider through the control grid coupling capacitor. The intensity control provides the base control voltage reference which, when the unblank amplifier is not operating, allows the electron beam to excite the phosphor. The phosphor then emits light at the normal intensity level determined by the setting of the intensity pot. When the unblank amplifier conducts completely, the control voltage is lowered to the point that the beam is not strong enough to cause the phosphor to emit light. Varying the rate of conduction of the unblank amplifier causes a variable intensity by changing the bias on the crt control grid.

POWER SUPPLIES.

The following paragraphs describe the ±20-volt regulated supplies, 2-kv supply, and the 22-kv supply.

Depressing the ON switch applies 60-Hz, 120-volt, single-phase and 400-cycle, 208-volt, 3-phase power to the Display Console. The 120 volts applies input power to the ±20-volt supplies; the 208 volts applies input power to the 2-kv

and 22-kv supplies. The 208 volts immediately energizes the filament transformer in the 2-kv power supply which furnishes 6.3 volts to the various tube filaments, a thermal delay, and energizes the filament transformer in the deflection amplifier.

20-Volt Power Supplies.

There are two 20-volt regulated supplies in the Display Console. These two supplies furnish power necessary for digital, d/a, and analog circuits. They employ a transistorized regulator, figure 6-10. These supplies are not discussed in detail because they are encased in epoxy and are not repairable. Failure of power supply necessitates replacement of the supply.

2-Kv Power Supply.

The 2-kv supply, figure 6-11, furnishes the voltages necessary for the deflection amplifier and correction voltage circuits. It consists of two transformers, T1 and T2, chokes L1A and L1B, diodes CR1 through CR12, thermal delay relay K2, and power relay K1.

Initial application of power places 208 volts on the deenergized contacts of solenoid K1 and the primary of filament transformer T1. Also, +20 volts is placed on the holding contact of K1 and the heater of the type 6N060 delay, K2. K2 imparts a 60- to 80-second delay between application of 208 volts to the secondary contacts of K1 and the energizing of K1. After the delay elapses, K2 places 20 volts on the solenoid of K1 which energizes it. K1, in turn, places 208 volts on the primary of T2, which is a delta-double-wye transformer. The output from pins 4, summed, is 600 volts while the output from pins 6, summed, is 1400 volts. CR1 through CR6, L1A, and C3 and C4 form the filtering and rectifying network for the 1400 volts. CR7 through CR12, L1B, and C1 and C2 form the rectifying and filtering for the 600 volts.

The 600 volts go directly to deflection and focus and astigmatism correction amplifiers. The voltage level at the anodes of CR2, 4, and 6 of the 1400-volt circuit and CR8, 10, and 12 of the 600-volt circuit serves as the base level upon which the voltage potential of the circuit is added. For example, the 600-volt potential across CR7 and CR8 is added to the base level (in this case, ground) placed on the anode of CR8. The result is a +600-volt potential between pin 8 of L1B to ground.

Applying the 600-volt level to the anode of CR2, which has a 1400-volt potential between it and CR1, biases the output at pin 8 of L1A to 2 kv (600 volts +1400 volts).

22-Kv Power Supply.

The 22-kv supply furnishes the high-voltage potential for the crt high-voltage divider. It requires 120-volt, 400-Hz, single-phase power on the primary. The output of the supply is partially filtered, thus, it requires filtering at the voltage divider.

DEFLECTION.

Base deflection involves positioning of the crt beam at any one of 512 by 512 raster reference positions. The X, Y coordinates specify the raster base position. D/a converters are weighted such that they convert the binary values to an analog voltage value. The 027 card provides weighting of the respective d/a converters to make a current level for each d/a converter proportional to the current of the two associated with the X or Y deflection bits. The 003 card sums the current formed by the 027 card, thus, providing one analog level. Symbols are formed by moving the crt beam around the base position in a manner dictated by symbol formation signals generated by the computer.

KEYBOARD.

Each keyboard key, when activated, grounds one input pin of the diode encoder. Grounding an input pin causes the diode encoder to output a 6-bit keyboard code. These keyboard codes are sent to the computer.

Depressing S1, figure 6-5, places a ground on input pin 60 of the diode encoder, figure 6-13. This grounds the cathodes of the diodes connected between pin 60 and diode encoder output lines 2 to the fifth and 2 to the fourth. Remaining output lines are unaffected. The diode encoder outputs a binary 001 111. This binary output is inverted at the computer or 110 000 resulting in an octal code of 60 (carriage return) entering the computer logic.

SECTION IV

MAINTENANCE

Maintenance procedures for the Display Console should be performed only by experienced display equipment personnel. Adjustments referred to as factory-set or factory adjustments should be made only as a last resort.

Two types of controls are utilized in the Display Console; normal operator controls and maintenance adjustment controls. Normal operator controls, described in Section II of this manual, are externally located on the Display Console. Maintenance adjustments, described in this section, are internal and are made only if the display becomes unsuitable or after component replacement.

Complete maintenance of the Display Console requires both preventive and corrective procedures. Preventive steps consist mainly of cleaning and visual inspection while corrective measures consist of trouble analysis and correction. Performance standards, tables 4-3 through 4-8, show oscilloscope waveforms at critical areas.

PREVENTIVE MAINTENANCE.

Preventive maintenance requirements are the dusting of exteriors with a lint-free cloth as required, cleaning the reusable air filters, visual inspections, and vacuum cleaning. The following periodic inspections should be performed during the recommended periods.

WEEKLY.

(a) Remove the two reusable air filters and wash them with warm water. The filters are accessible through the rear access doors.

(b) Vacuum the interior.

(c) Ascertain that the blower is operating.

QUARTERLY.

(a) Inspect cables and wiring for connector and connection looseness, insulation breakdown and rips, or any other damage.

(b) Check the power supplies and monitor components for leaky capacitors, wire damage, and corrosion. Inspect all transformers for evidence of bulging, cracking, or leaking.

(c) Check all mechanical components for looseness, binding, and damage.

(d) Inspect the high-voltage system for insulation breakdown, component damage, and signs of arcing.

(e) Measure the output of the regulated 20-volt supplies. Check for the correct voltages and for excessive noise.

TEST EQUIPMENT REQUIRED.

Test equipment recommended for maintenance of the Display Console is listed in table 4-1.

TABLE 4-1. TEST EQUIPMENT

ITEM	DESCRIPTION
Oscilloscope	Tektronix, Model 543A, or equivalent
Dual-Trace Preamplifier	Tektronix, Type CA, or equivalent
Blocking Capacitor	Plastic Capacitors, Inc., OF 200-502, 0.005 microfarad, 20 kv
Multimeter	Simpson 269, Type 2, or equivalent
High-Voltage Probe	No. 0119, 16 kv, or equivalent
X 10 Probes (two)	Tektronix, or equivalent
X 100 Probes (two)	Tektronix, or equivalent

The oscilloscope should have dual-trace and external-triggering facilities allowing comparison of two traces while using a third pulse for a trigger. Signals

used within the equipment are usually in the nanosecond range. High-voltage readings for maintaining the high-voltage section require use of a multimeter and a high-voltage probe. Various other corrective maintenance functions also require use of a multimeter. The blocking capacitor, for coupling the oscilloscope to the high-voltage section, prevents high voltages from damaging the oscilloscope.

CORRECTIVE MAINTENANCE.

Two methods of corrective maintenance are used on the Display Console. The first is alignment and adjustment of controls and the second is detection, isolation, and replacement of a malfunctioning component. Replacement of a component may necessitate use of alignment procedures in addition to the component replacement. Section VII, Parts Data, contains a parts breakdown for all major assemblies.

Test pattern 1, figure 4-1, is recommended for Display Console maintenance. It provides a means of ascertaining the equipment is functioning properly.

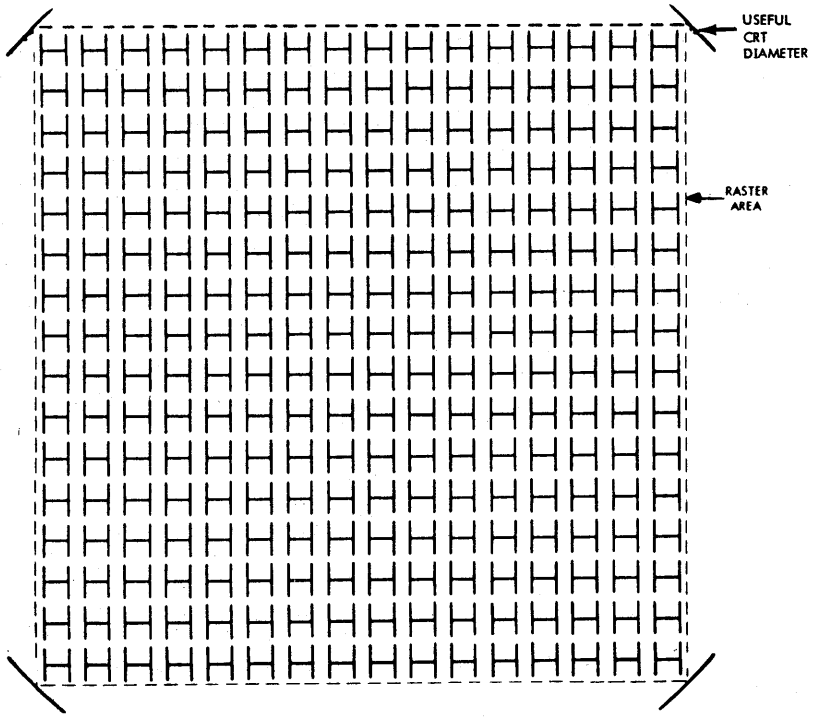


Figure 4-1. Test Pattern 1

NOTE

The number and size of symbols are determined by logic data from an external source and must be programmed for display.

ELECTRICAL ALIGNMENT.

Electrical alignment procedures, listed in following paragraphs, should be performed only when the display has become unsuitable.

NOTE

All potentiometers (pot's.) on cards are numbered top to bottom, pot. 1, pot. 2, pot. 3, and pot. 4. Pot. 1 is associated with test point (tp) A, pot. 2 with tp B, etc.

D/A Reference Voltage Adjustment.

Adjustment of the digital-to-analog (d/a) converters is categorized into two groups: (1) reference voltage (4.7 volts ± 0.1 volt) and (2) d-c balance adjustments. The reference voltage is a stable, regulated voltage supply. Adjustment of the reference voltage varies the overall raster size of both crt. The d-c balance adjustments balance the push-pull output of a d/a converter. This is necessary for best operation of the transistor deflection preamplifiers, final deflection amplifier, and to provide a balanced push-pull signal as an input to the focus and astigmatism correction circuits.

To adjust the reference voltage, turn pot. 1 at card location 1A6B1 (401 card) until the voltage at tp A at card location 1A6B2 (443 card) is 4.7 volts ± 0.1 volt.

NOTE

After adjusting the reference voltage, the HORIZONTAL and VERTICAL GAIN controls on the Display Console may need readjustment.

Adjustment of d-c balance is described later in this section.

Deflection Preamplifier and Amplifier Alignment.

The purpose of deflection preamplifier and amplifier alignment is to align the horizontal (X) and vertical (Y) axis in a straight X and Y axis line. This alignment corrects the balance of the X and Y push-pull preamplifiers and amplifier which are separate circuits and require separate alignment adjustments.

(a) Program a test pattern, figure 4-1, to determine if the linearity of either the X or the Y axis varies.

(b) To determine if Y deflection balance is correct, rotate the VERTICAL CENTERING control from fully counterclockwise to fully clockwise. If the pattern becomes compressed at either the top or bottom of the screen, the Y deflection circuitry is out of balance and needs alignment.

(c) To determine if the X deflection balance is correct, rotate the HORIZONTAL CENTERING control from fully counterclockwise to fully clockwise. If the pattern becomes compressed at either the left or right side of the screen, the X deflection circuitry is out of balance and needs alignment.

If unbalance conditions exist, proceed with deflection preamplifier and amplifier alignments.

Deflection Preamplifier Alignment.

The deflection preamplifiers are card type 029. Each 029 card has an adjustment pot. which increases or decreases the amount of drive to the deflection amplifier.

(a) Adjust pot. 1 on 1A7 at card location 01 (X axis 029 card) so that the H's on the screen are linear left to right.

(b) Adjust pot. 1 on 1A7 at card location 03 (Y axis 029 card) so that the H's on the screen are linear top to bottom.

Deflection Amplifier Alignment.

The deflection amplifier has pot's. and trimmers (variable capacitors) for fine-tuning the amplifier. The trimmers have the greatest effect at the start of the sweeps (X and Y) and the pot's. have the greatest effect for the remainder of the sweeps.

(a) Program a display to correspond to test pattern 1, figure 4-1.

(b) Adjust the X trimmer and pot. located on the front of the deflection amplifier (2 of figure 4-2) to align the H's in the lower rows directly under the H's in the upper rows.

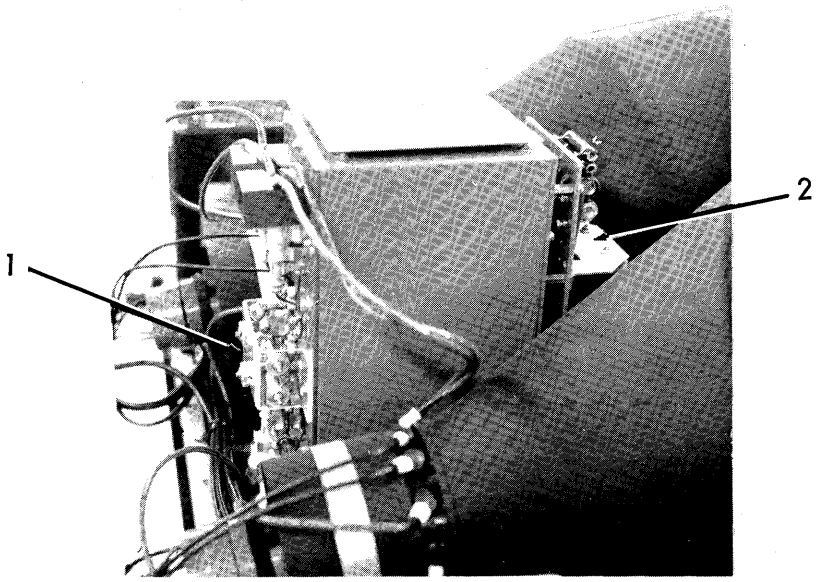


Figure 4-2. Deflection Amplifier

(c) Adjust the Y deflection trimmer and pot. located on the rear of the deflection amplifier (1 of figure 4-2) so that the crossbars of the H's form a straight line left to right.

Focus and Astigmatism Correction.

Focus and astigmatism correction procedures make it possible to obtain an optimum display. FOCUS correction accomplishes the overall focusing while astigmatism correction focuses the beam at the edges of the crt.

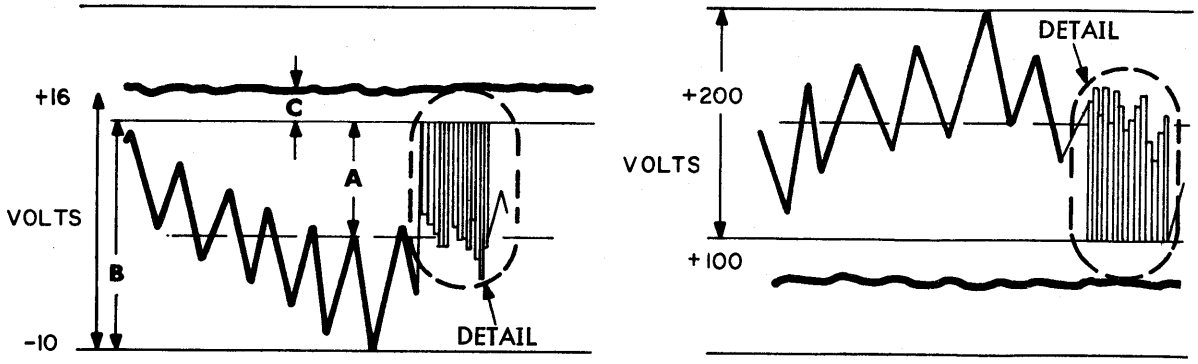
Focus Correction.

(a) Connect the oscilloscope probe to tp A on 1A7 at card location 05 (452A card, focus and astigmatism correction output).

(b) Initially set all pot's. at card location 1A6C13 (429A card) to the center of their travel.

(c) Program a dot pattern into the Display Console starting at the upper left and going to the lower right. Position the pattern at the center of the scope. Adjust the GAIN controls to give the proper sized raster.

(d) Adjust pot. 1 at card location 1A6C13 (429A card) until 2A = B, figure 4-3.



Type 452A Card Output Focus Amplifier Circuit

Figure 4-3. Approximate Focus and Astigmatism Waveshapes

(e) Connect the probe to focus correction input 1A3TB1-1 of the high-voltage divider. Adjust pot. 2 at card location 1A6C13 (429A card) until focus voltage output B is 200 volts ac peak-to-peak (pp).

(f) The ratio of B to C is between 1:13 and 1:17, figure 4-3. If not, adjust pot. 3 at card location 1A6C13 (429A card) until they are of the proper ratio.

(g) Connect the probe to astigmatism input 1A3TB1-2 of the high-voltage divider. Set the FOCUS and ASTIGMATISM operator controls at the center of their travel. Adjust R5, figure 4-4, to obtain the best overall focus and astigmatism results. This adjustment varies, depending upon the overall dynamic characteristics of the crt, and will be between 0 and 65 volts ac pp.

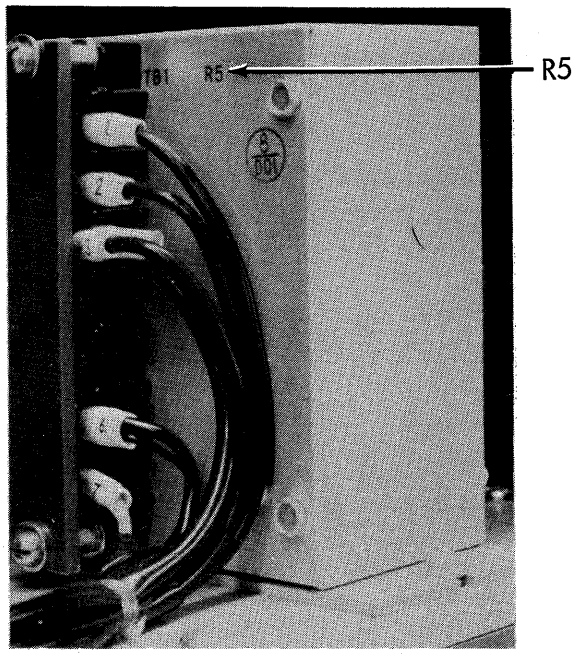


Figure 4-4. Focus and Astigmatism Correction Amplifier

(h) Remove the 429A card from 1A6C13.

(i) Observe the dot test pattern and adjust the FOCUS and ASTIGMATISM operator controls until the dots at the center areas are sharp and round.

(j) Observe size and roundness of the dot at the upper left. Turn the FOCUS controls until the upper left corner dot is best.

(k) Rotate the ASTIGMATISM controls to obtain the optimum upper left dot. Note the direction of ASTIGMATISM control rotation.

NOTE

Astigmatism and focus adjustments are interacting.

(l) Replace the 429A card in card location 1A6C13 and refocus and center dot by adjusting the FOCUS and ASTIGMATISM controls. Refocus the upper left dot using the FOCUS controls. Note the direction of FOCUS control movement.

NOTE

If FOCUS controls are turned in the same direction as in step (j), increase the focus correction voltage by turning pot. 2 at 1A6C13 until the waveshapes amplitude increases slightly. If the FOCUS controls need to be turned in the opposite direction, decrease the amplitude.

Proper adjustment of pot. 2 at 1A6C13 is indicated when FOCUS controls do not need changing to obtain the sharpest possible spot anywhere between the center and upper left dot as in step (l).

Astigmatism Correction.

NOTE

Voltage output of the 452A card is approximate. Adjust as necessary for best results on the crt.

(a) Adjust the FOCUS and ASTIGMATISM controls to obtain the sharpest dots in the center of the crt.

NOTE

DO NOT change the FOCUS controls during the next step.

(b) Adjust R5, figure 4-4, and the front panel ASTIGMATISM controls for the most compatible dots (upper left and center).

D-C Balance Adjustment.

The following procedures are for checking and adjusting the gain for the symbol d/a amplifiers — 456A cards.

(a) Display test pattern 1, figure 4-1.

(b) Turn the VERTICAL GAIN control toward maximum. The pattern should stay centered (the top should have the same displacement as the bottom). If not, adjust the pot's. R1 and R2 at card location 1A6C08 (456A card) to obtain equal displacement.

(c) Turn the HORIZONTAL GAIN control toward maximum. The pattern should stay centered (the right side should have the same displacement as the left side). If not, adjust the pot's. R1 and R2 at card location 1A6C09 (456A card) to obtain equal displacement.

Symbol Adjustments.

Symbol adjustments affect the overall appearance of the symbols displayed. These adjustments are for symbol size, intensity, and shape.

Size.

Use the following procedure for adjusting the size of the large, medium, and small symbols (016 card).

(a) Adjust the large symbols to the correct size using pot. 1 at card location 1A6B04 (456A card) for HORIZONTAL and pot. 2 for VERTICAL size.

(b) Adjust pot's. R1A, R2A, R1C, and R2C at card location 1A6B18 (016 card) for medium symbols so that the medium symbols are half as large as the large symbols.

(c) Adjust pot's. R1A, R2A, R1C, and R2C at card location 1A6B17 (016 card) for small symbols so that the small symbols are half as large as the medium symbols.

Intensity.

Symbol intensity adjustments place all symbols at the same level of intensity. Begin the intensity adjustments with the large sized symbols and adjust for the desired intensity with the operator's INTENSITY controls. Adjust the intensity for each size with pot's. on 456B cards as listed in table 4-2.

TABLE 4-2. SYMBOL INTENSITY ADJUSTMENTS

SIZE	CRT	POT.	CARD LOCATION
Overall	Left (V1)	R2A	1A6C20
Overall	Right (V2)	R2A	1A6C23
Large	Left (V1)	R2D	1A6C20
Large	Right (V2)	R2D	1A6C23
Medium	Left (V1)	R2B	1A6C20
Medium	Right (V2)	R2B	1A6C23
Small	Left (V1)	R2C	1A6C20
Small	Right (V2)	R2C	1A6C23

Shaping.

(a) Generate all symbols or a representative group of symbols in a convenient size.

NOTE

Symbol shaping adjustments made for the convenient size symbols selected apply to all symbol sizes. Adjustment of basic symbol shapes is considered a factory adjustment.

(b) Adjust trimmer capacitors as follows.

(1) C1 (location 1A6C03) and C1 (located on chassis 1A7) for X symbol shape.

(2) C2 (location 1A6C03) and C2 (located on chassis 1A7) for Y symbol shape.

NOTE

Final deflection amplifier adjustments may affect symbol shapes requiring retouching of shaping trimmers.

Unblank Adjustments.

(a) Generate test pattern 1, figure 4-1, or a convenient test pattern.

(b) Observe the symbols on the display raster (left crt) and adjust pot. 1 on 1A7 at card location 07 (205 card) for best symbol appearance with respect to the unblank points of the symbols.

(c) Adjust the pot. 1 on 1A7 at card location 09 (205 card) for the best symbol appearance on the right crt with respect to the unblank points of the symbols.

Intensity Balance Adjustment.

WARNING

The intensity balance pot., located on the high-voltage divider, has a potential on the pot. shaft of approximately 6 kv. To adjust this pot., use a screwdriver with a plastic or insulated handle and shaft.

A modulation pot. (R39) located on high-voltage divider A3 is adjusted for equal intensity on both crt. R13 on the high-voltage divider is selective. These pot's. normally do not need adjustment except when a crt is replaced. The adjustment procedure is listed below.

(a) Remove all input display data and signals.

(b) Rotate both operator INTENSITY controls fully clockwise (maximum intensity).

(c) Select value of R13 until the spots are just visible on both crt (value equals 82 to 100 kilohms).

NOTE

Increasing the value of R13 decreases crt intensity.

(d) Adjust modulation pot. R39 (using insulated screwdriver) on the high-voltage divider to obtain equal intensity on both crt.

The intensity adjustments are correct when both crt have equal intensity and the spots are just visible with the operator INTENSITY controls fully clockwise.

REMOVE AND REPLACE PROCEDURES.

Reference to wiring and schematic diagrams is necessary to replace failed components within the Display Console. The illustrated parts breakdown in Section VII shows the location of subassemblies within the major assemblies. Tabulated parts lists associated with callouts on the drawings, show the part number and designation of the respective parts.

CRT Replacement.

This portion contains procedures for removing a defective crt and installing a new crt. After installation, the crt is rotated so that the display is parallel to the desk top.

WARNING

Handle crt carefully since they are dangerous to the person and expensive to replace. Avoid jarring, scratching, or thermal shock. Turn off the Display Console before touching the crt or its connections and clamp.

Removal.

The following procedures apply whenever a crt is to be removed.

(a) Disconnect the crt base socket and all connecting wires.

(b) Remove the screws that fasten the crt shield to the main frame (do not unfasten the crt neck clamp).

(c) Remove the crt and crt shield.

(d) Place the crt and shield face down on a soft surface to prevent scratching the face.

(e) Loosen the crt neck clamp.

(f) Slide the crt shield up and over the crt neck.

(g) Place the crt in the original carton or equivalent packing.

Installation.

The following procedures apply when a crt is installed. Install the shield immediately after removing the crt from its packing.

(a) Remove the crt from the packing container and place it face down on a soft pad to prevent scratching the face.

(b) Place the crt shield up and over the neck of the crt. Be sure the accelerator post is aligned with the appropriate slot in the shield.

(c) Tighten the crt neck clamp taking care not to crack the neck.

(d) Install the crt and shield in the main frame, refasten the strap at the rear, and replace the four front panel-to-shield screws.

(e) Connect the wires and socket to the crt. The signal and power interconnection diagram shows the wire connections.

(f) Perform procedures (a) through (d) of the intensity balance adjustment.

(g) Turn on the Display Console, display test pattern 1, and make necessary focus and astigmatism adjustments until the symbols are satisfactory (refer to the focus and astigmatism adjustment procedures).

Alignment.

If the test pattern is not straight horizontally, it may be necessary to rotate the crt shield. To straighten the display, perform the following procedures.

(a) Place a piece of masking tape under, and even with, a horizontal row of symbols.

(b) Turn off the Display Console.

(c) Loosen the crt shield retaining straps so the crt and shield can be rotated as one assembly.

(d) Rotate the crt shield until the masking tape placed below the horizontal row of symbols is parallel with the desk top.

(e) Tighten the crt shield retaining straps and reassemble the Display Console.

The shield around the crt is designed to prevent stray magnetic and electric fields from causing jitter. A display which jitters in some locations but not in others may be reacting to field-caused jitter.

Soldering.

It is necessary to observe different rules when soldering within the high-voltage section than while soldering in other circuits. It is essential that no pips be left on a solder joint, ie, little sharp points drawn up toward the hot iron from a cool joint. Just before the iron is withdrawn, touch it with solder again giving it a coating of flux allowing completion of a smooth, rounded joint.

DIAGNOSTIC PROCEDURES.

Digital computer trouble-shooting techniques apply for most troubles. Constant or solid failures may be easily diagnosed, while it may be necessary to use voltage margins, frequency margins, temperature variations, and vibration (applied with caution) in isolating intermittent conditions.

WARNING

The high-voltage system uses lethal voltages. Use extreme caution when checking voltages and components within the high-voltage system.

General.

One condition that is not usually attributable to a logic fault is degradation of the display image in the form of jitter. The most frequent cause of jitter is

amplifier unbalance in the crt circuitry; ripple in the regualted 20-volt power supplies is another possible cause, as is the presence of excessive subharmonic frequency components in the 400-Hz power. In addition, any noise source near the d/a converters causes jitter; an oscilloscope probe on a d/a converter card tp is an example.

A typical failure of a deflection amplifier or preamplifier manifests itself in shrinkage or nonlinearity of the raster and poor symbol formation. The complete failure of an X amplifier or preamplifier results in a vertical line only, while failure of a Y amplifier or preamplifier causes a horizontal line only. Extraneous lines among the symbols or absence of a display on the crt generally indicates a failure in the unblank circuitry or its driving logic. Complete lack of display with the INTENSITY controls at maximum usually indicates failure of the crt high-voltage supply.

CAUTION

Should only a bright spot appear on the crt, immediately turn down the INTENSITY control, otherwise, the electron beam will burn through the phosphor.

High-Voltage System.

A systematic analysis of trouble in the high-voltage system usually results in quick isolation. If no voltage is present, turn power off and check the high-voltage supply fuse.

CAUTION

DO NOT, under any circumstance, overfuse this supply. If the fuse is blown, replace it with an identical fuse and continue with the analysis.

Turn the power on. If the second fuse blows immediately, there may be trouble in the high-voltage supply or a short circuit in the high-voltage system. Disconnect the power supply from the voltage divider, install a new fuse, and turn the power supply on. If the fuse blows, the power supply is defective and must be replaced.

WARNING

Discharge outputs of the high-voltage supply before touching it.

If the fuse does not blow, a secondary fault has occurred and the trouble lies in the voltage divider of filter. It is possible, in high-voltage circuits, for a short circuit to occur which cannot be measured with a multimeter. It may be necessary to reconnect the equipment, place it in a dark area, install a new fuse, turn

on the power and watch the high-voltage system for arcs. Since a high-voltage short circuit usually creates a visible arc, the eye and ear can easily detect breakdowns that otherwise are difficult and time-consuming to pinpoint with a multimeter or an oscilloscope.

Voltages indicated on schematic prints of the equipment are averages and do not represent the exact voltages of a specific Display Console. Recording voltages when the Display Console is operating properly, and noting these voltages in the individual logs and on the diagrams serves as a valuable maintenance guide.

PERFORMANCE STANDARDS.

Performance standards in tables 4-3 through 4-8 present sample waveshapes, signals, and levels for electrical parts and assemblies in the Display Console. All photographs were taken during the display of a full raster of symbols, figure 4-1. Following is the oscilloscope preparation procedure which is the same for all tables unless otherwise noted:

(a) Use a Tektronix Type 543A oscilloscope with a Type CA dual-trace preamplifier. The probe is a Tektronix X 10.

(b) The oscilloscope settings are:

TIME BASE: TRIGGERING MODE/TRIGGER SLOPE - AC INT +
HORIZONTAL DISPLAY: NORMAL (X 1)
POWER ON: ON
VARIABLE TIME/CM: (as noted in table)

(c) The preamplifier settings are:

AC/DC: AC
MODE: ALTERNATE
CHANNEL A: VARIABLE VOLTS/CM: (as noted in table)
POLARITY: NORMAL (+)

NOTE

There may be some slight difference between waveshapes viewed on different equipments. The photographs in this section are based on inputs from a dd 51A Display Equipment.

TABLE 4-3. D/A CONVERTER PERFORMANCE STANDARDS

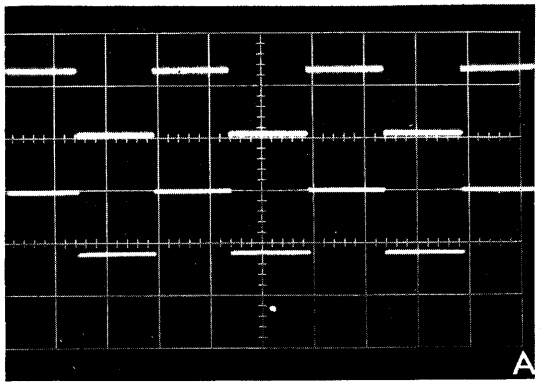
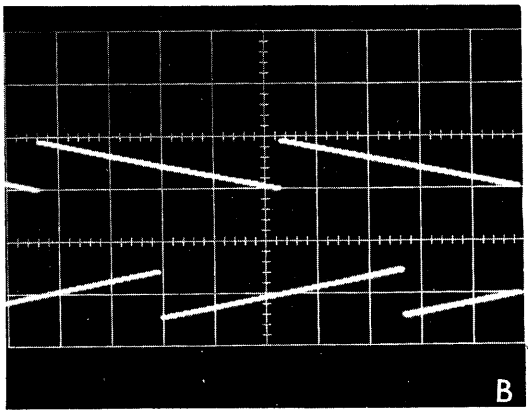
STEP	OPERATION OF TEST EQUIPMENT	POINT OF TEST	PERFORMANCE STANDARDS
1	Adjust TIME BASE STABILITY and TRIGGERING LEVEL as necessary TIME/CM .1 mSEC	Probe A to 1A6, card jack A01, pin 7 Probe B to pin 11 (002C card in/out)	
2	TIME/CM to 2 mSEC	Probe A to 1A6, card location B10, tp A Probe B to card location B09, tp A (003 card outputs)	

TABLE 4-4. SYMBOLS D/A PERFORMANCE STANDARD

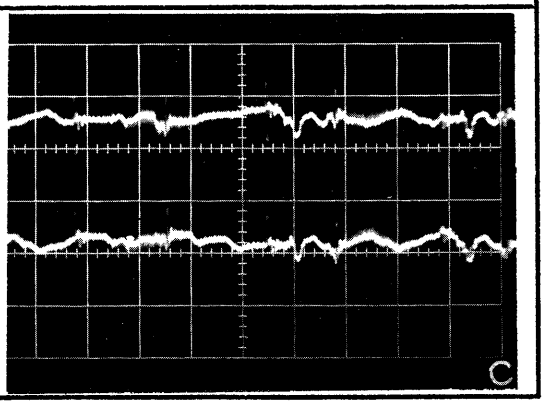
STEP	OPERATION OF TEST EQUIPMENT	POINT OF TEST	PERFORMANCE STANDARD
1	TIME/CM to 2 μSEC VOLTS/CM to .05 (using a X10 probe)	Probe A to 1A6, card jack B20, pin 5 Probe B to card jack B20, pin 11 (C19 card outputs)	

TABLE 4-5. LINE DRIVER PERFORMANCE STANDARDS

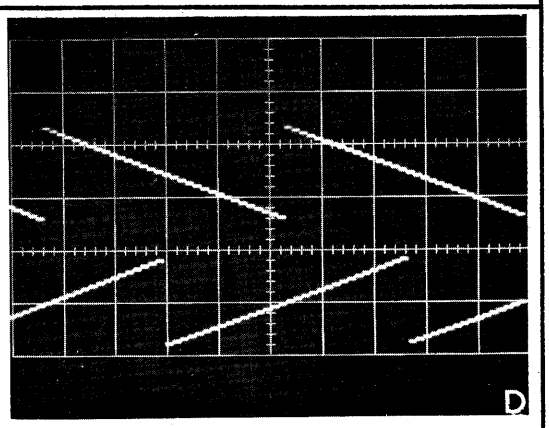
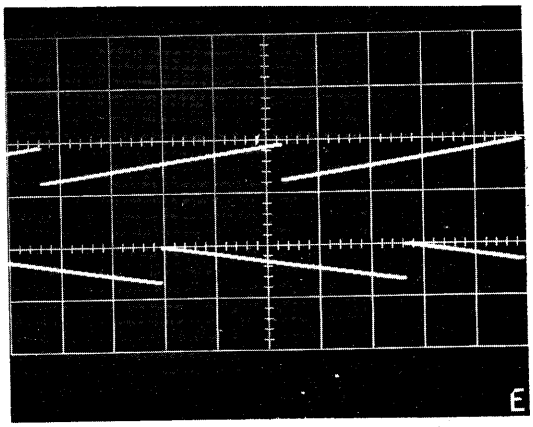
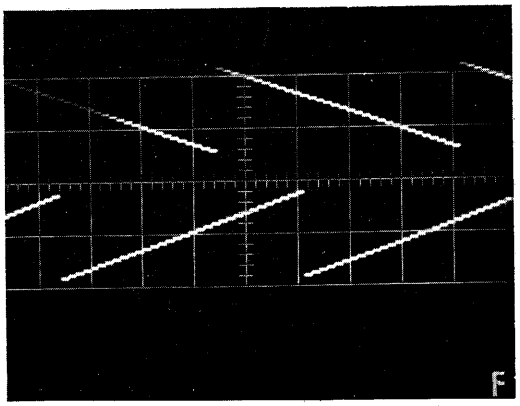
STEP	OPERATION OF TEST EQUIPMENT	POINT OF TEST	PERFORMANCE STANDARDS
1	TIME/CM to 2 mSEC VOLTS/CM to .5	Probe A to 1A6, card location B05, tp C Probe B to card location B05, tp D (015 vertical output)	
2	TIME/CM to 10 µSEC VOLTS/CM to 2	Probe A to 1A6, card location B05, tp B Probe B to card location B05, tp A (015 horizontal output)	
3	TIME/CM to 2 mSEC	Probe A to 1A6, card location B11, tp D Probe B to card location B11, tp C (015A vertical deflection out)	

TABLE 4-5. LINE DRIVER PERFORMANCE STANDARDS (CONT)

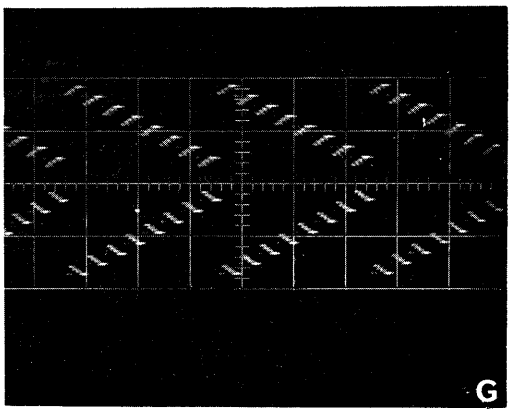
STEP	OPERATION OF TEST EQUIPMENT	POINT OF TEST	PERFORMANCE STANDARDS
4	TIME/CM to .1 mSEC VOLTS/CM to 2	Probe A to 1A6, card location B11, tp B Probe B to card location B11, tp A (015A horizontal deflection out)	

TABLE 4-6. FOCUS AND ASTIGMATISM PERFORMANCE STANDARDS

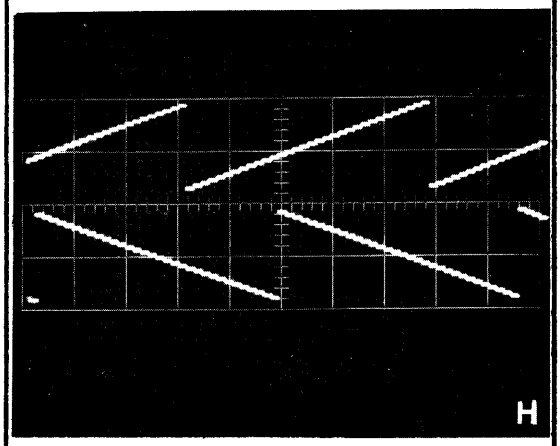
STEP	OPERATION OF TEST EQUIPMENT	POINT OF TEST	PERFORMANCE STANDARDS
1	TIME/CM to 2 mSEC VOLTS/CM to 2	Probe A to 1A6, card location C12, tp C, 019 card Probe B to 1A6, card location C12, tp D, 019 card (019 output 429A input)	

TABLE 4-6. FOCUS AND ASTIGMATISM PERFORMANCE STANDARDS (CONT)

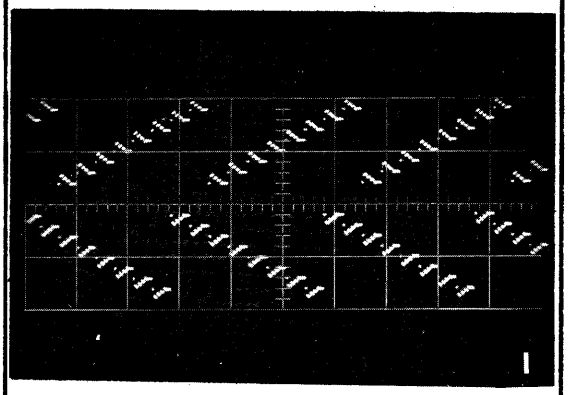
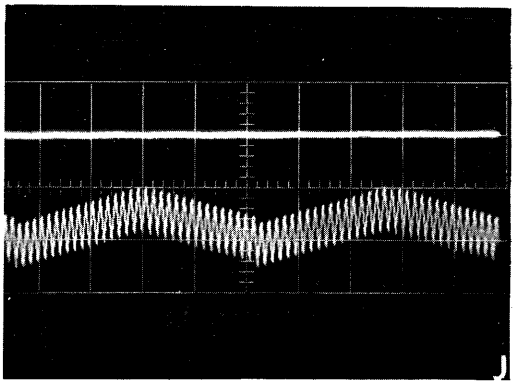
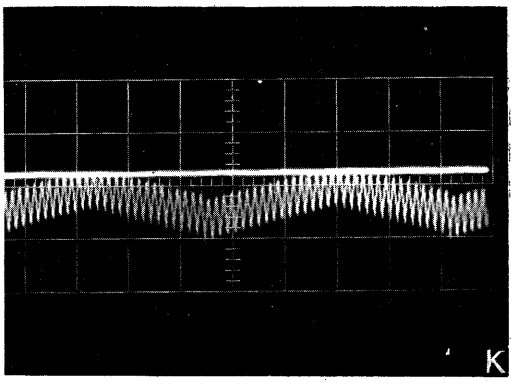
STEP	OPERATION OF TEST EQUIPMENT	POINT OF TEST	PERFORMANCE STANDARDS
2	TIME/CM to .1 mSEC	Probe A to 1A6, card location C12, tp A, 019 card Probe B to 1A6, card location C12, tp B, 019 card (019 output 429A input)	
3	TIME/CM to 2 mSEC VOLTS/CM to 0.5	Probe A to 1A6, card location C13, tp A (429A out)	
4		Probe A to 1A6, card location B12, tp A (015A card)	

TABLE 4-6. FOCUS AND ASTIGMATISM PERFORMANCE STANDARDS (CONT)

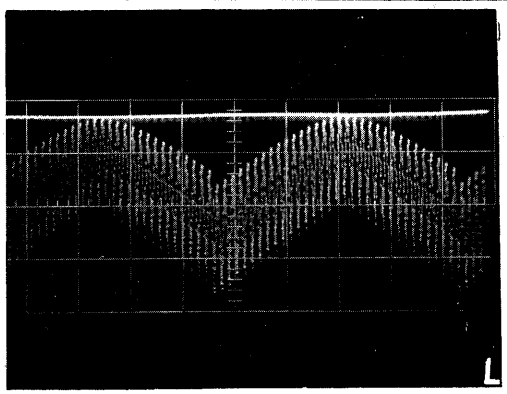
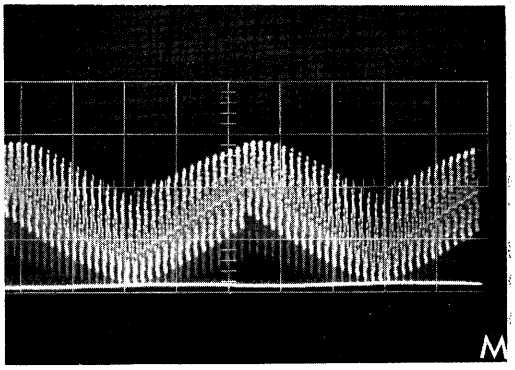
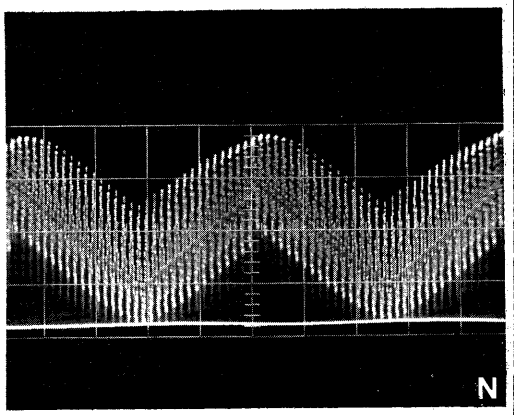
STEP	OPERATION OF TEST EQUIPMENT	POINT OF TEST	PERFORMANCE STANDARDS
5	VOLTS/CM to 1	Probe A to 1A7, card location 05, tp A (452A output)	
6		Probe A to 1A4, TB1-1 (astigmatism output)	
7	VOLTS/CM to 10	Probe A to 1A4, TB1-2 (focus output)	

TABLE 4-7. DEFLECTION AMPLIFIER PERFORMANCE STANDARDS

WARNING

The following steps require testing with high voltage present.

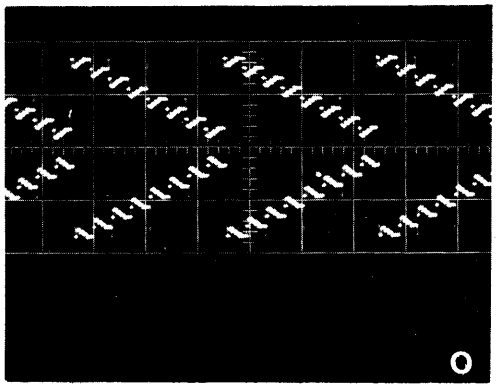
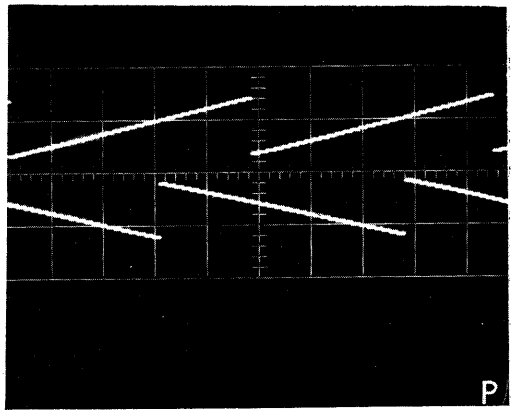
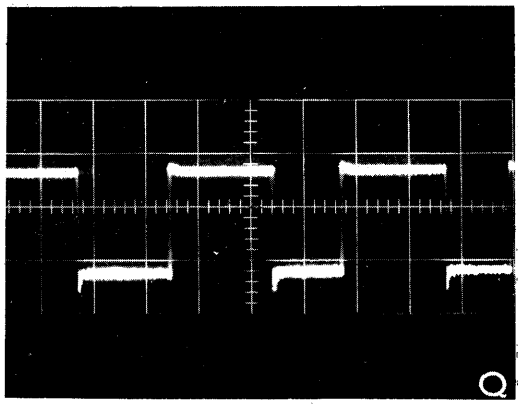
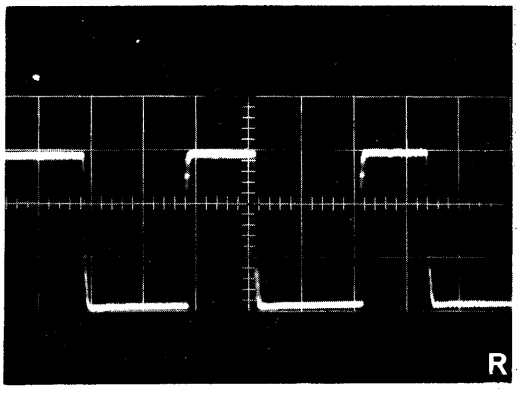
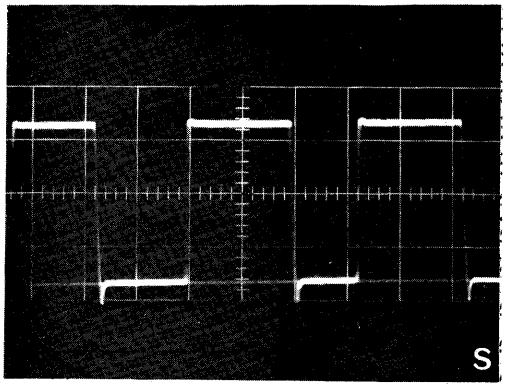
STEP	OPERATION OF TEST EQUIPMENT	POINT OF TEST	PERFORMANCE STANDARDS
1	TIME/CM .1 mSEC VOLTS/CM to 5 Attach a 2-kv probe	Connect Probe A to 1A2, terminal E2	
2	TIME/CM 2 mSEC	Connect Probe A to 1A2, terminal E3 Connect Probe B to 1A2, terminal E4	

TABLE 4-8. UNBLANK PERFORMANCE STANDARDS

STEP	OPERATION OF TEST EQUIPMENT	POINT OF TEST	PERFORMANCE STANDARDS
1	TIME/CM to 2 μSEC VOLTS/CM to 0.5	Connect Probe A to 1A7, card location 06, tp A (S45 card)	
2	VOLTS/CM to 1	Connect Probe A to 1A7, card location 07, tp A (205 card)	
3	VOLTS/CM to 5	Connect Probe A to 1A3, TB1-6	

SECTION V

MAINTENANCE AIDS

This section contains data necessary to support maintenance of the Display Console. Fuse locations and ratings and analog chassis wire tabulations are listed. The remainder of this section contains the card placement charts and schematic diagrams of printed circuit card assemblies (cards). Section IV explains normal operation and maintenance procedures. Section VII, figure 7-1, shows reference designations for the assemblies.

FUSES.

Table 5-1, fuse specifications, lists the Display Console fuse numbers, ratings, types, and locations.

TABLE 5-1. FUSE SPECIFICATIONS

FUSE	RATING (Amperes)	TYPE	LOCATION
F1	6-1/4	Slo blo	A6
F2	6-1/4	Slo blo	A6
F3	6-1/4	Slo blo	A6
F4	4	Slo blo	A6
F1	0.75	Regular	A5
F2	1.5	Regular	A5
F1	0.75	Slo blo	A10

CABLING.

Tables 5-2 and 5-3 list the individual wiring connections between the card jack pins and the connector plug pins by numerical and alphabetical designations.

TABLE 5-2. ANALOG CHASSIS (1A6) POWER WIRING

ORIGIN				DESTINATION			
CARD JACK		CONNECTOR		CARD JACK		CONNECTOR	
LOCATION	PIN NUMBER	NUMBER	JACK	LOCATION	PIN NUMBER	NUMBER	JACK
(Ground)		J04	A	All jacks	14		
				C8	6		
				C8	8		
				C9	6		
				C9	8		
				C13	9		
				C18	2		
				C18	8		
				C19	2		
				C19	8		
				C21	2		
				C21	8		
				C22	2		
				C22	8		
All jacks	14			(Ground)		J04	A
(-20 V)		J04	B	All jacks	13	J04	
All jacks	13			(-20 V)		J04	B
(+20 V)		J04	C	All jacks	15		
All jacks	15			(+20 V)		J04	C

J01 and J02 are special connectors, eg, they are plugs with the center or insulating portion removed. A multiple coaxial cable containing 18 individual coaxial lines passes through these plugs. Since these lines pass through the plugs, the plug pin numbers are not on the wiring chart but the lines are color-coded and identified by these codes. The destination column gives the line internal chassis connection, ie, card jack location number and card jack pin number.

TABLE 5-3. ANALOG CHASSIS (1A6) COAXIAL LINE WIRING

ORIGIN		DESTINATION CARD JACK		ORIGIN		DESTINATION CARD JACK	
CONN NO.	LINE COLOR CODE	LOCATION	PIN NO.	CONN NO.	LINE COLOR CODE	LOCATION	PIN NO.
J01	90	A16	9	J02	98	B21	1
	91		6		99		6
	92		1		900	B22	6
	93	A20	9		901		1
	94		6		903	B24	1
	95		1		904		9
	96	A24	9		905	B23	1
	97		6		906		9
	98		1				
	99	A04	9		Shield	B23	5
	900		6			B23	7
	901		1			B24	5
	902	A08	9			B24	7
	903		6		908	B22	9
	904		1				
	905	A12	9				
	906		6				
	907		1				
	908	B22	9				

CARD PLACEMENT CHARTS.

Card placement charts are a sequential tabulation of jack numbers. Their primary function is indicating the type of card in each jack location (if any) and, when possible, giving the logical equation term of each logical element on the card and logical element test point (tp).

The card placement charts (tables 5-4 and 5-5) contain the card locations for the analog chassis (1A6) and the analog preamplifier (1A7).

TABLE 5-4. ANALOG CHASSIS (1A6) CARD PLACEMENT CHART

JACK NUMBER	ROW A				ROW B				ROW C				ROW				JACK NUMBER
	CARD TYPE	TEST POINT A	TEST POINT B	TEST POINT C	CARD TYPE	TEST POINT A	TEST POINT B	TEST POINT C	CARD TYPE	TEST POINT A	TEST POINT B	TEST POINT C	CARD TYPE	TEST POINT A	TEST POINT B	TEST POINT C	
01	002C-1		Y117		401		Y119		C1	TRIMMER							01
02	002C-3		Y116		443		Y118		C2								02
03	002C-3		Y115														03
04	619	Y015	Y116	Y017	456A	Y520	Y521			CAPACITORS							04
05	002C-5		Y114		015		Y404										05
06	002C-5		Y113		031A		Y400		1021	J018		J019					06
07	002C-7		Y112		027		Y203										07
08	619	Y012	Y013	Y014	027		Y202		456A		Y512						08
09	002C-7		Y111		003		Y303		456A		Y510						09
10	002C-9		Y110		003		Y302		457A		Y511						10
11	002C-9		Y109		015A		Y401		457A		Y513						11
12	619	Y009	Y010	Y011	015A		Y405		019		Y402						12
13	002C-1		Y108		003		Y301		429A		Y403						13
14	002C-3		Y107		003		Y300		1222RS	J002		J003					14
15	002C-3		Y106		027		Y201		1222RS	J000		J001					15
16	619	Y006	Y007	Y008	027		Y200		1222RS	J006		J007					16
17	002C-5		Y105		016	Y507		Y506	1222RS	J004		J005					17
18	002C-5		Y104		016	J505		J504	1222RS	J009		J008					18
19	002C-7		Y103		C19		Y509		1222RS	J010		J011					19
20	619	Y003	Y004	Y005	C19		Y508		456B		Y515						20
21	002C-7		Y102		619	Y022	Y023		1222RS	J013		J012					21
22	002C-9		Y101		619	Y020	Y021	Y024	1222RS	J014		J015					22
23	002C-9		Y100		620		Y018		456B		Y514						23
24	619	Y000	Y001	Y002	620		Y019		019	Y517		Y516					24
25																	25

61004000

TABLE 5-5. ANALOG PREAMPLIFIER (1A7) CARD PLACEMENT CHART

JACK NUMBER	ROW A				ROW				ROW				ROW				JACK NUMBER
	CARD TYPE	TEST POINT A	TEST POINT B	TEST POINT C	CARD TYPE	TEST POINT A	TEST POINT B	TEST POINT C	CARD TYPE	TEST POINT A	TEST POINT B	TEST POINT C	CARD TYPE	TEST POINT A	TEST POINT B	TEST POINT C	
01	029																01
02	039																02
03	029																03
04	040																04
05	452A																05
06	S45																06
07	205																07
08	S45																08
09	205																09
10	040																10

61008700

CARD SCHEMATICS.

Schematic diagrams and assembly layouts of card types are shown in figures 5-2 through 5-34. The assembly layout shows where each component is physically located on the card. Each figure gives the part number of the card assembly. Use this number and the card type when referring to parts data or when ordering a replacement card.

Figure 5-1 shows a typical card schematic and associated card layout. Item 1 points out resistor R1, both on the schematic and the card drawings. Item 2 points out diode CR1 in a similar manner.

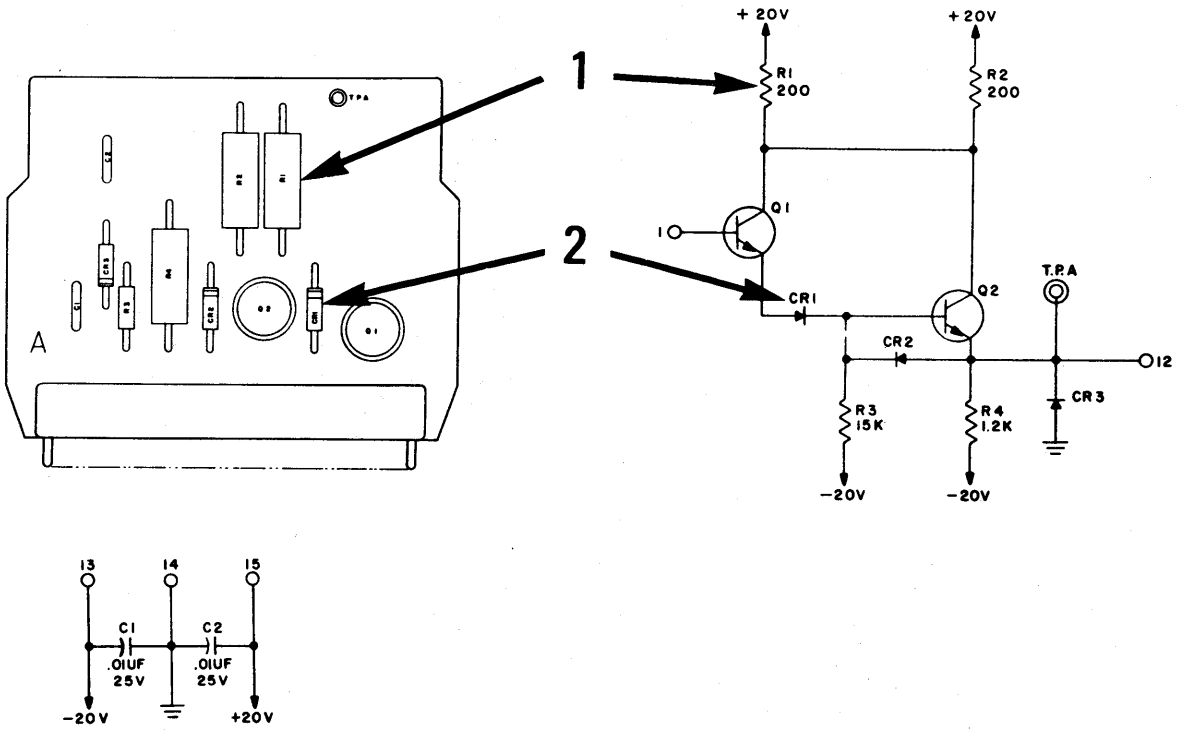
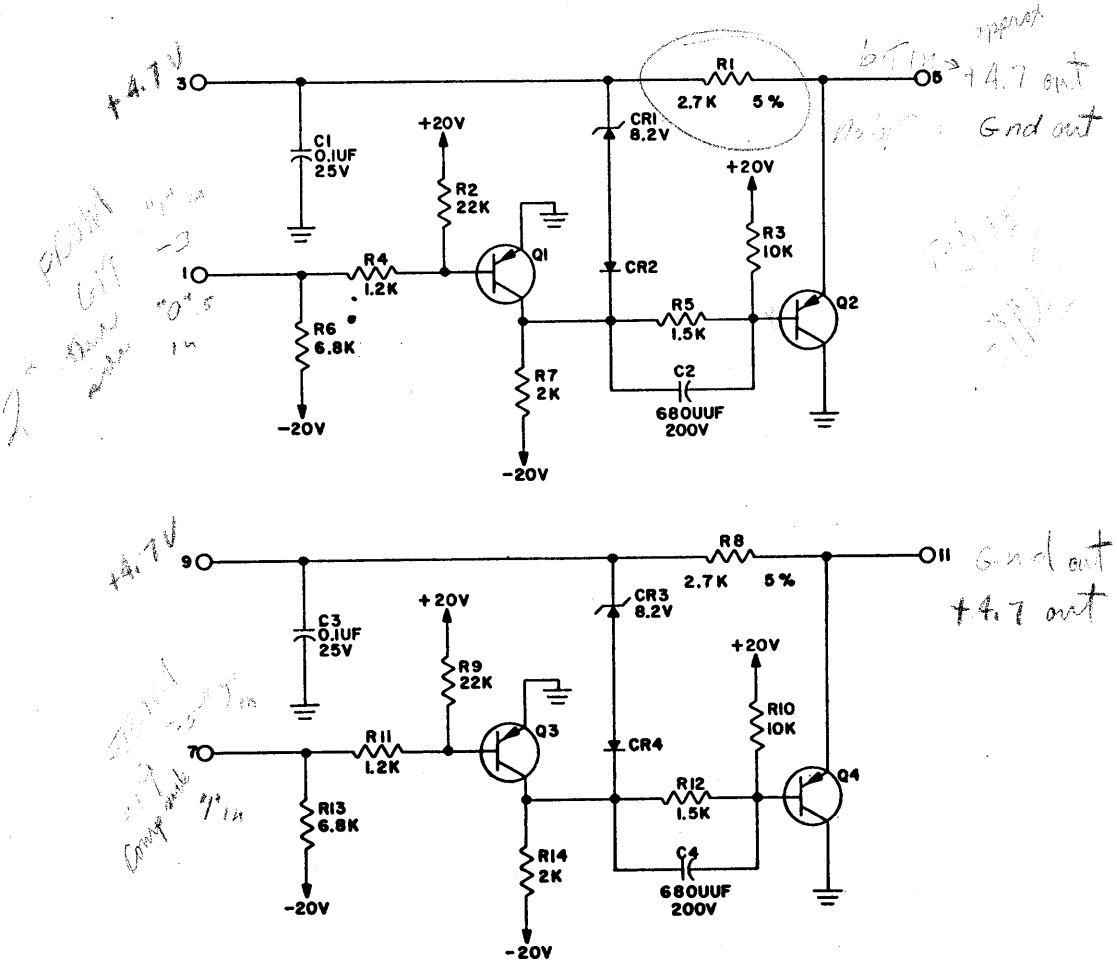
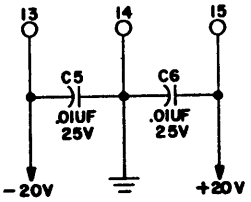
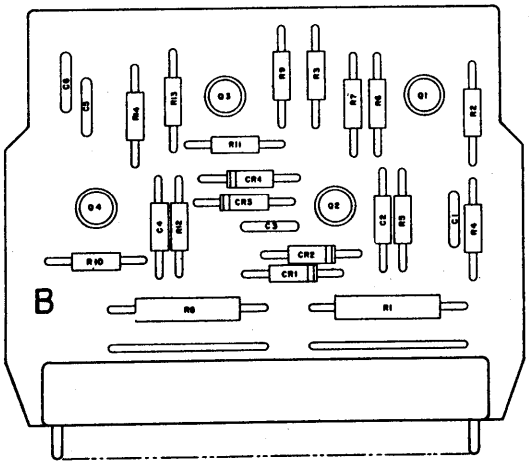


Figure 5-1. Card Identification



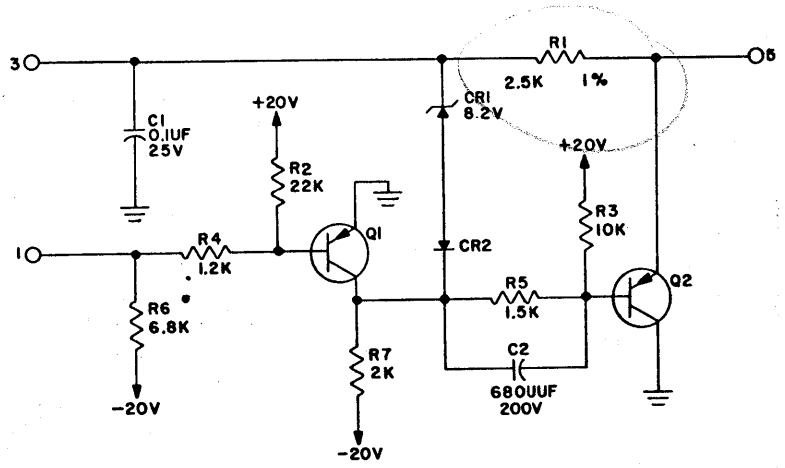


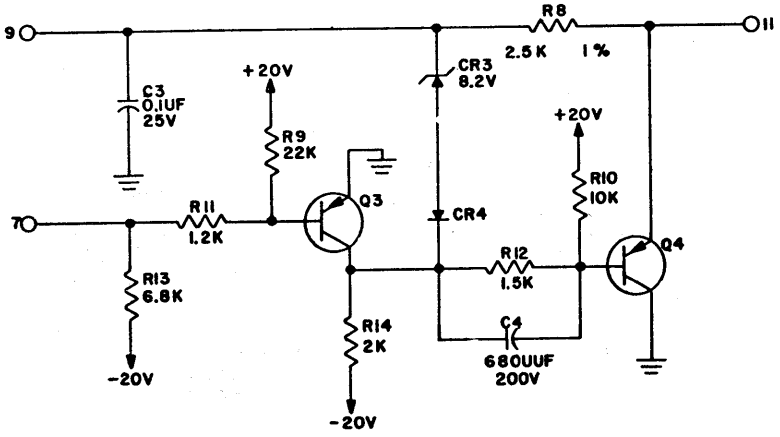


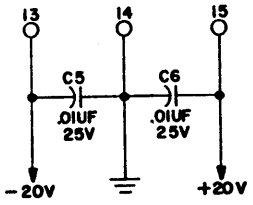
D/A Converter, Positioning
5 Volts

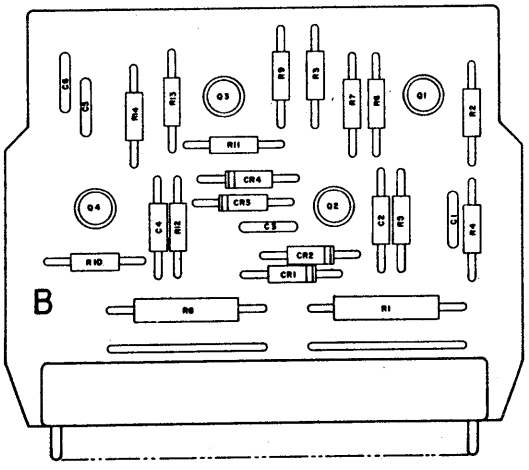
REV. D/C
PART NO. 82198065
CARD TYPE **002C-1**

Figure 5-2





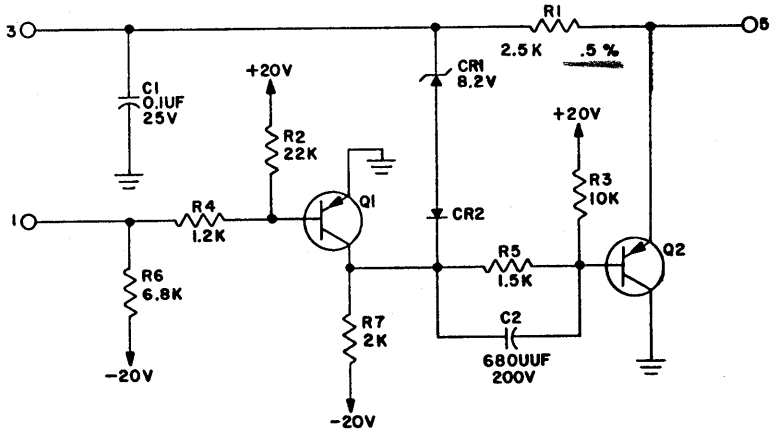


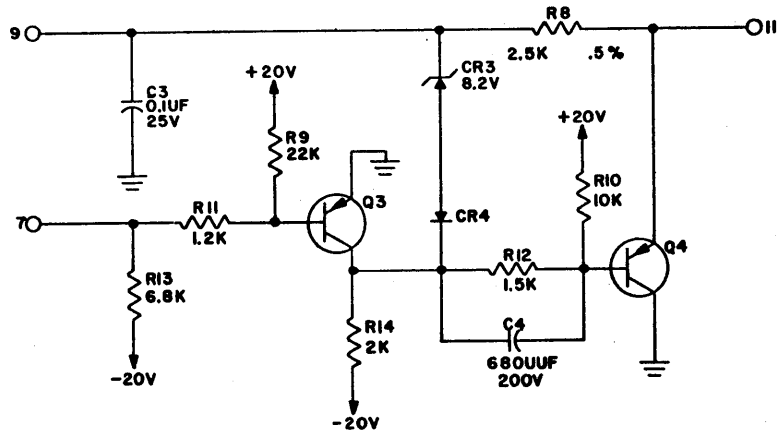


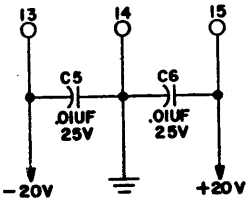
D/A Converter, Positioning
5 Volts

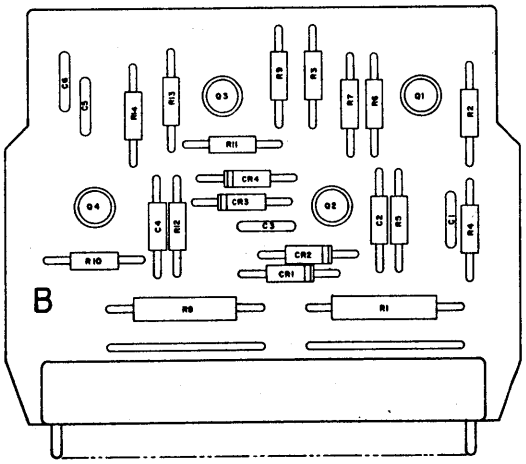
REV. D/C
PART NO. 82198452
CARD TYPE **002C-3**

Figure 5-3





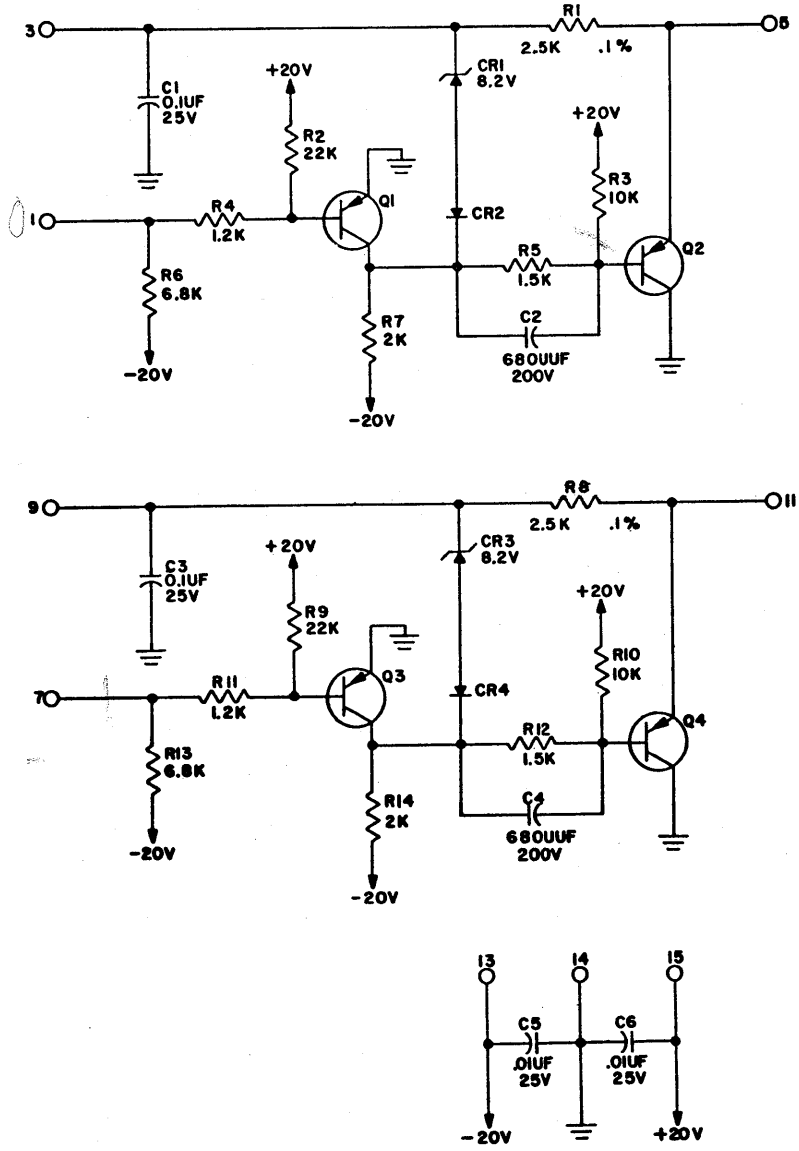


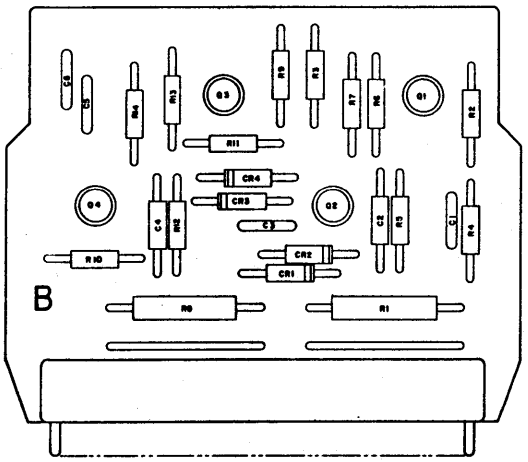


D/A Converter, Positioning
5 Volts

REV. D/C
PART NO. 82198453
CARD TYPE **002C-5**

Figure 5-4

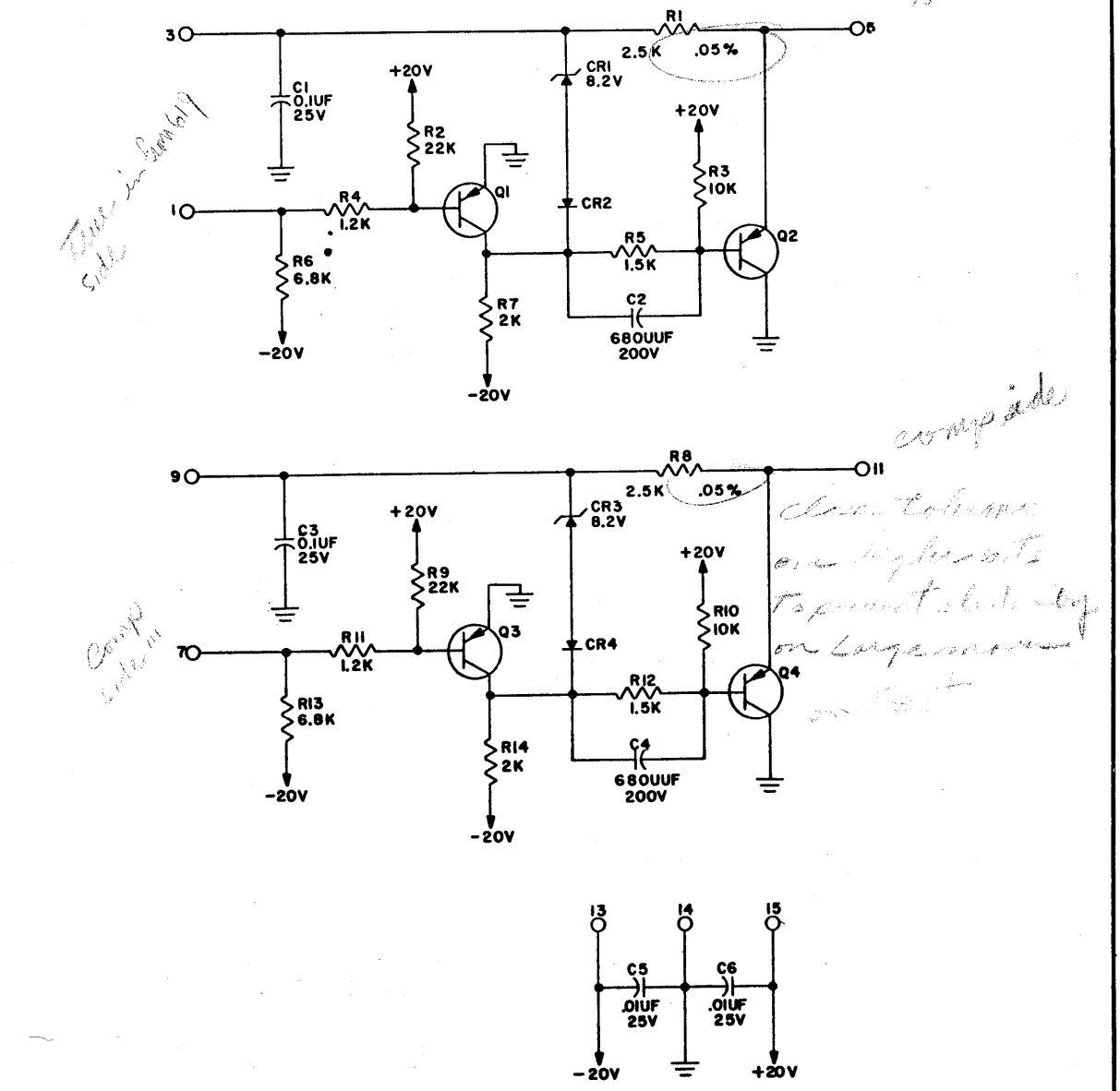


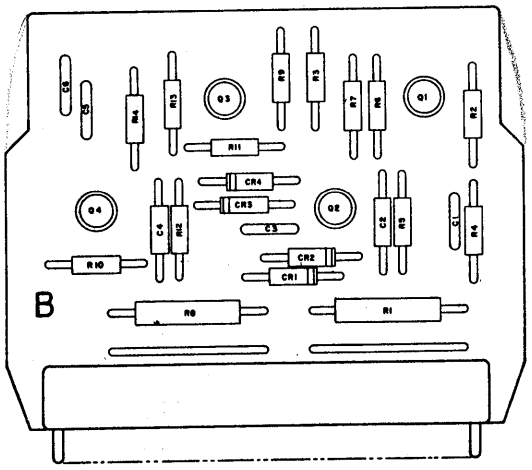


D/A Converter, Positioning
5 Volts

REV. D/C
PART NO. 82198454
CARD TYPE **002C-7**

Figure 5-5

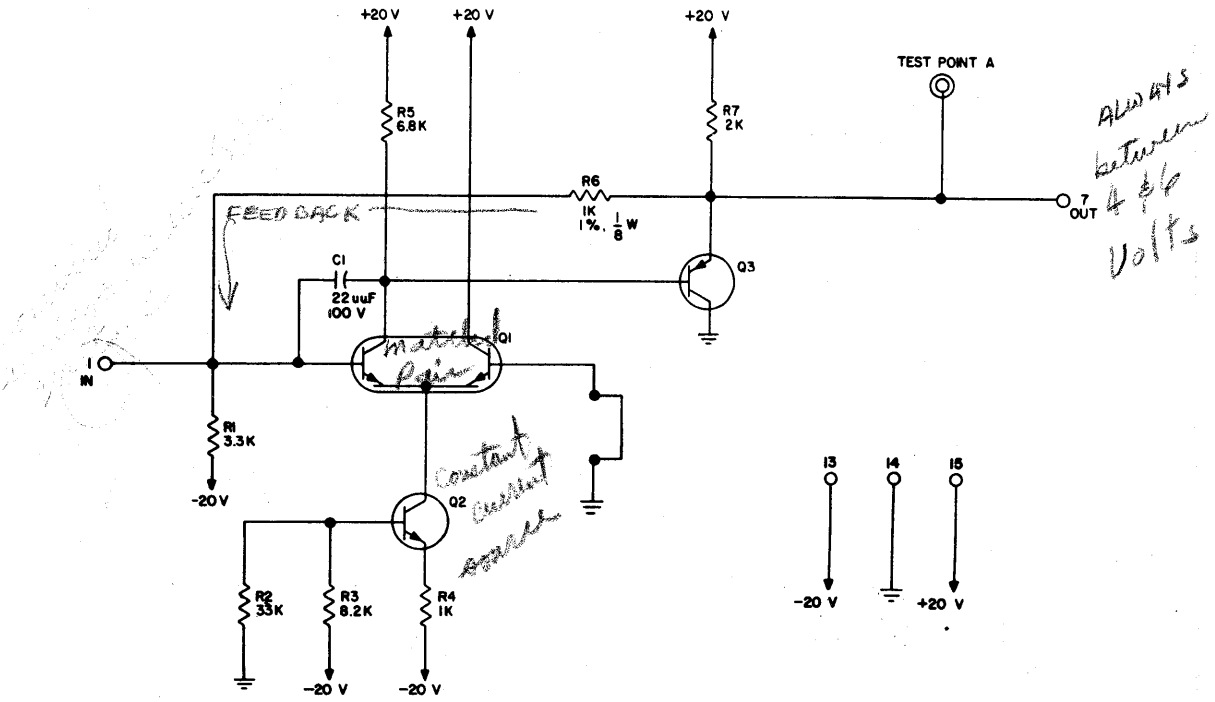


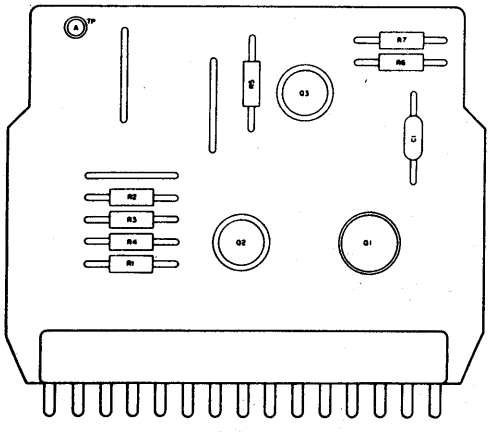


D/A Converter, Positioning
5 Volts

REV. D/C
PART NO. 82198455
CARD TYPE **002C-9**

Figure 5-6

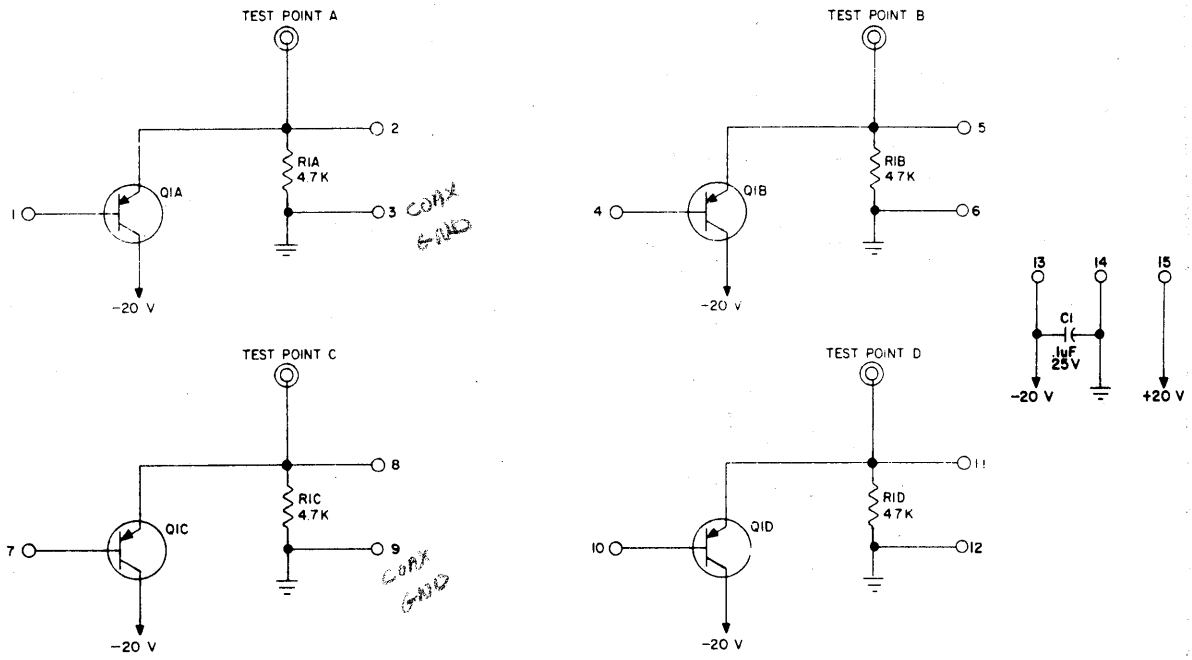


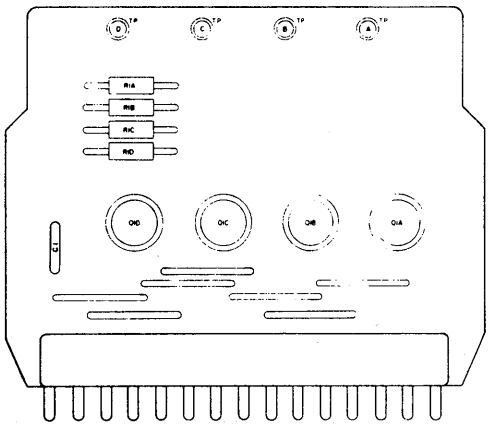


D/A Current Summing Amplifier

REV. A/A
PART NO. 82199864
CARD TYPE **003**

Figure 5-7

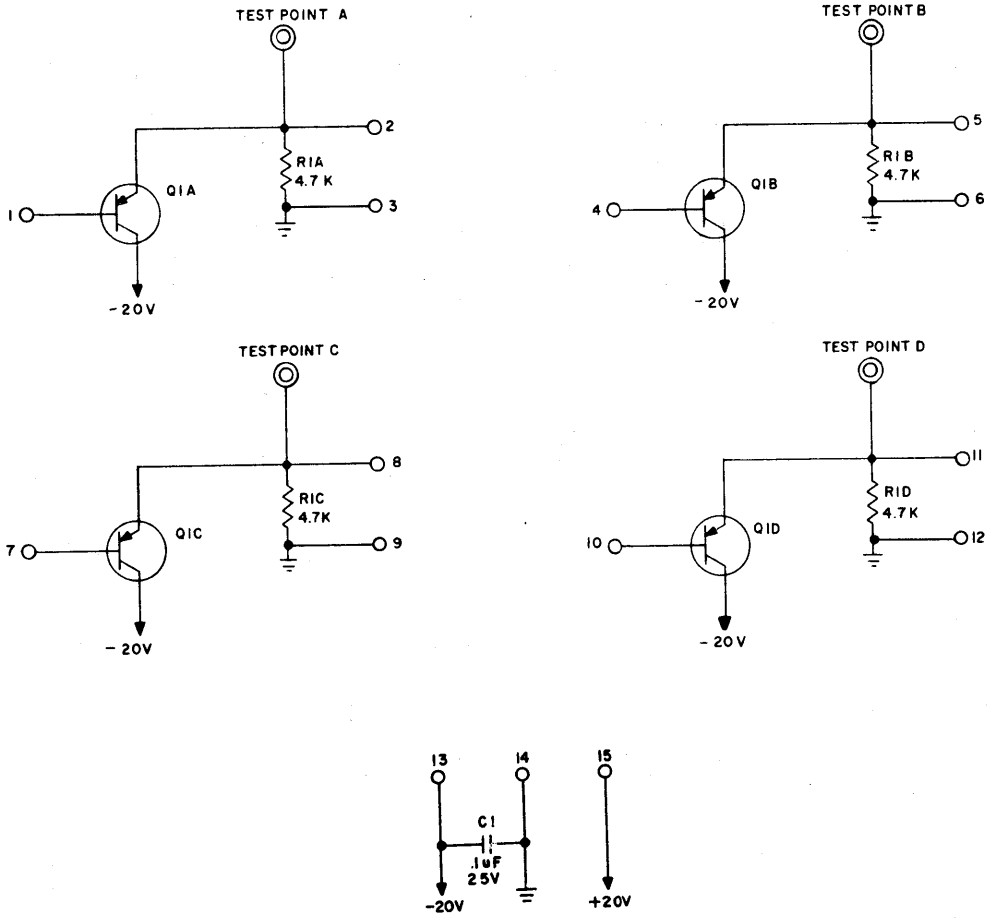


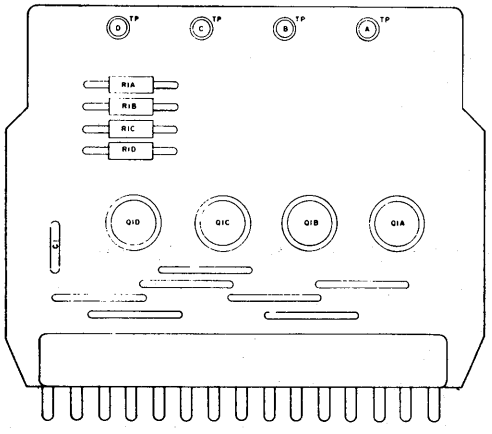


Emitter-Follower, Line Driver
100 Milliwatts

REV. **A/B**
PART NO. 82199849
CARD TYPE **015**

Figure 5-8

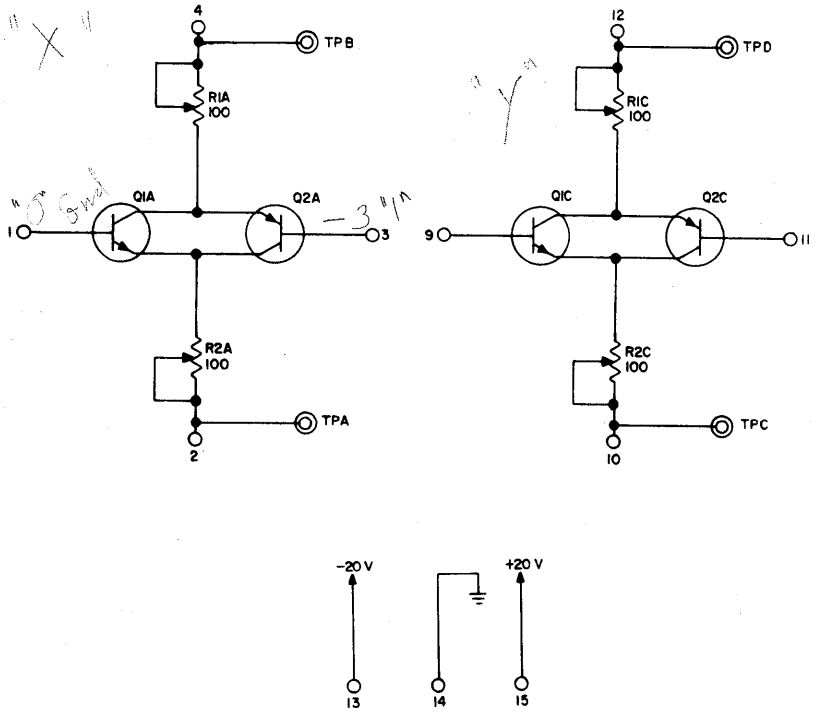


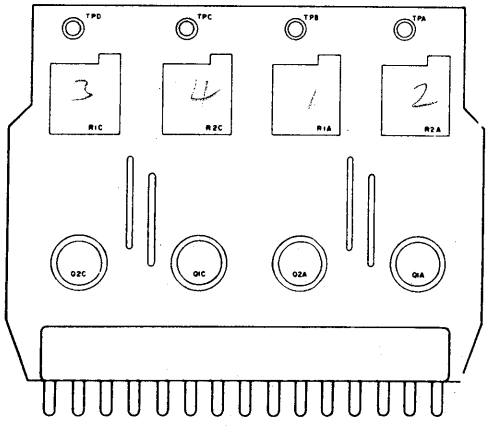


Emitter-Follower, Line Driver
400 Milliwatts

REV. A/B
PART NO. 82199852
CARD TYPE **015A**

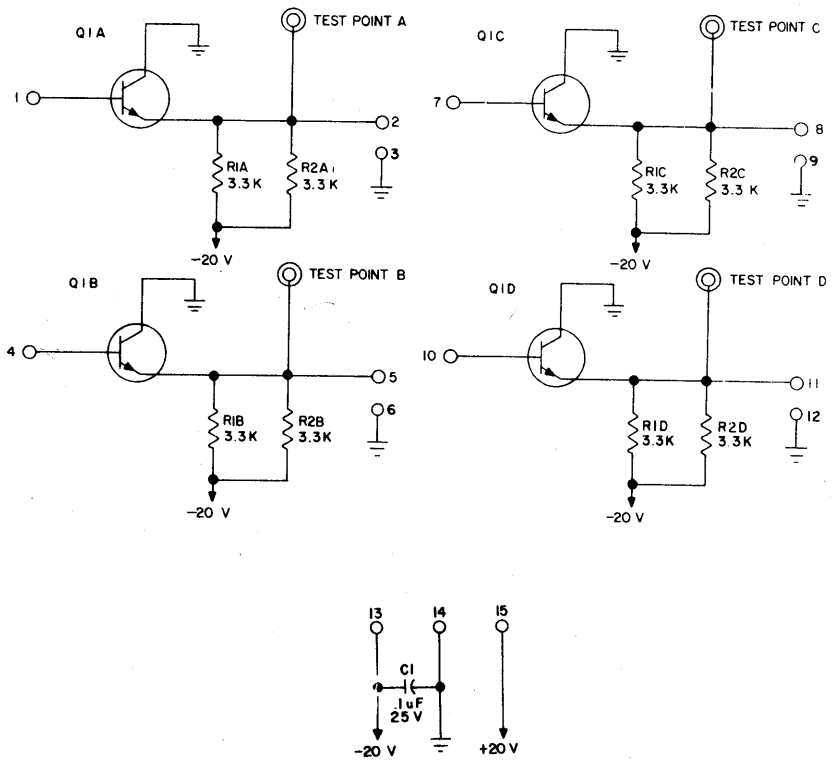
Figure 5-9

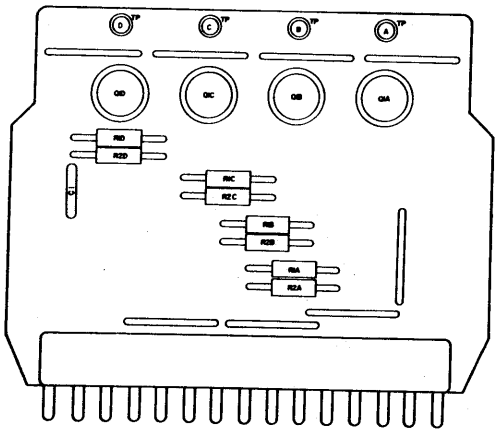




Symbol Size Control, Attenuator

REV. A/A
PART NO. 82199960
CARD TYPE **016**





Emitter-Follower, Line Driver

REV. B/B
PART NO. 82199858
CARD TYPE 019

Figure 5-11

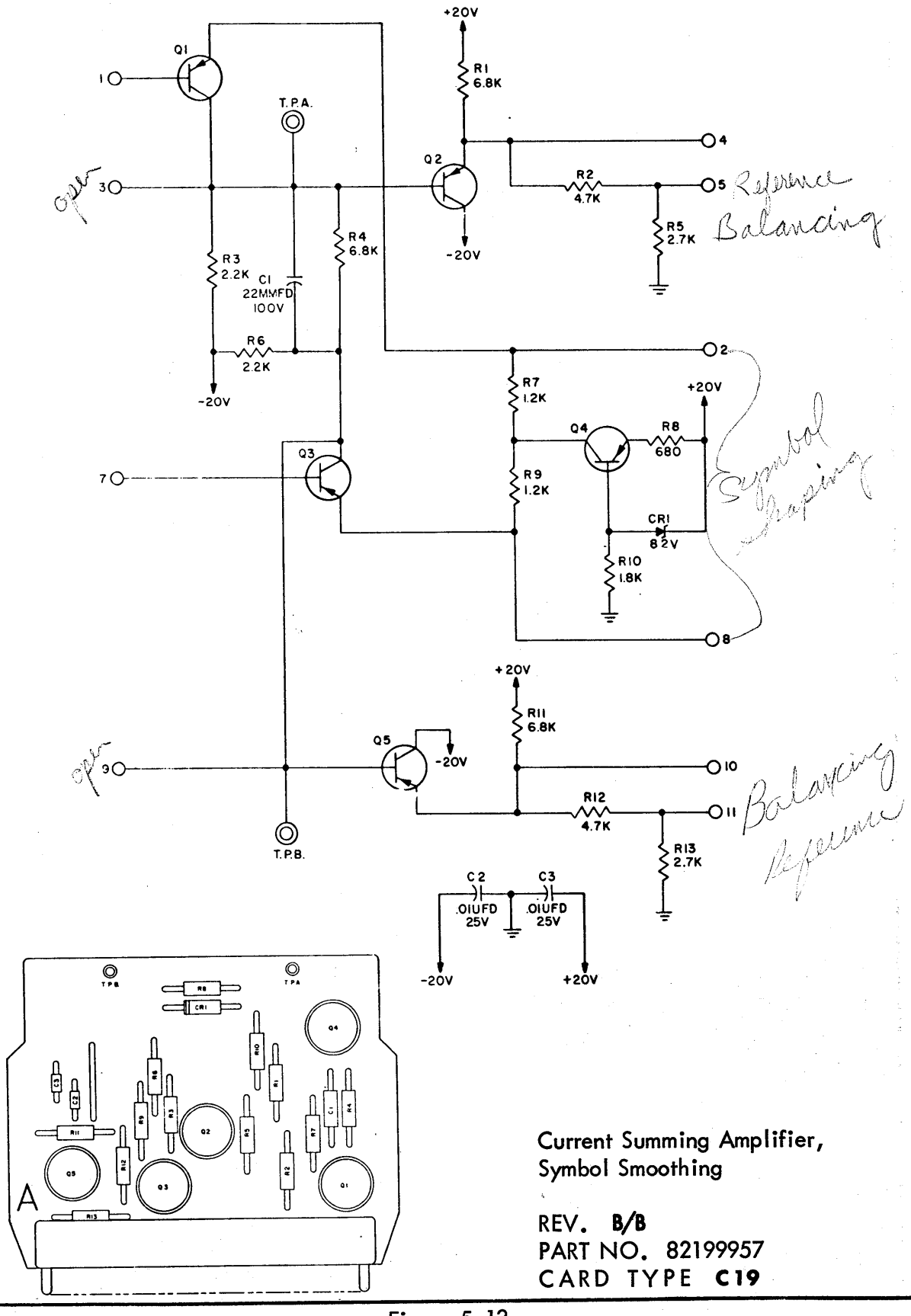
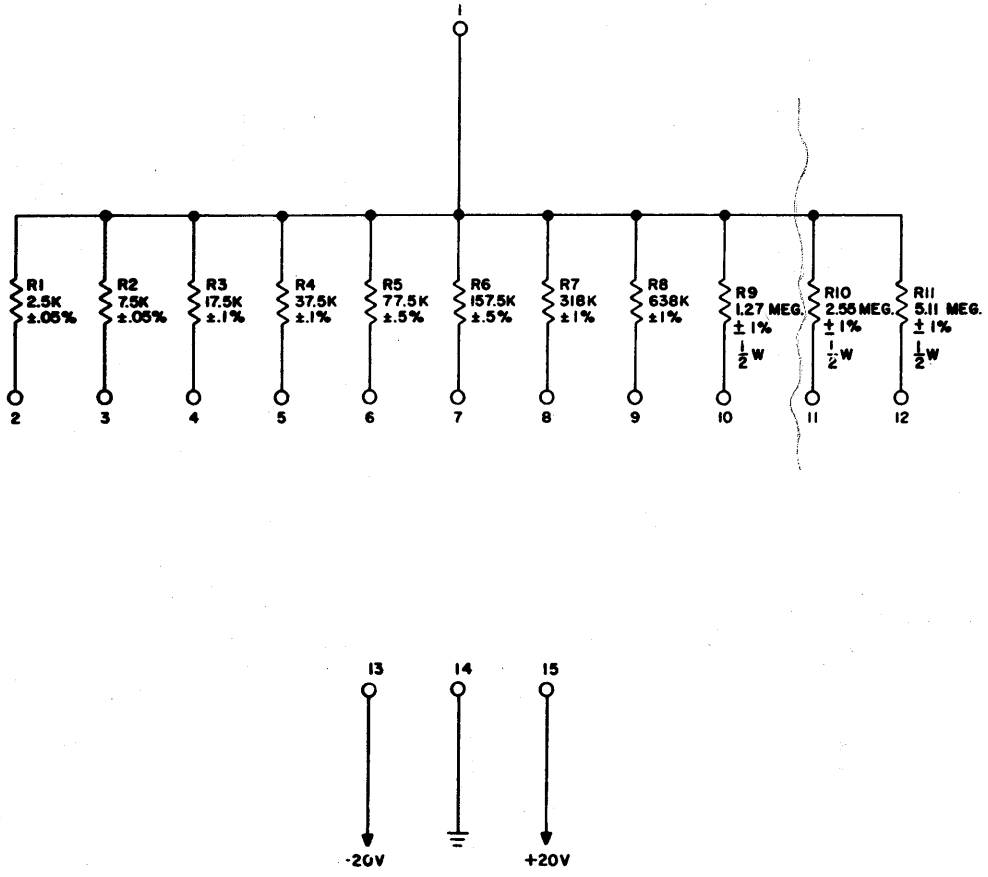
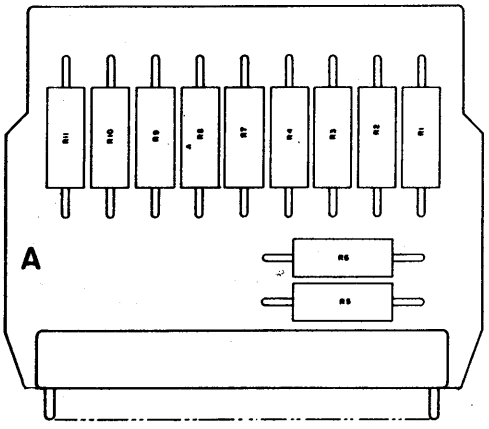

+20V
Q1
1
R1
6.8K
T.P.A.
4
Q2
3
R2
4.7K
5
Reference
Balancing
R5
2.7K
R4
6.8K
-20V
R3
2.2K
C1
22MMFD
100V
R6
2.2K
2
R7
1.2K
+20V
Q4
R8
680
Q3
7
R9
1.2K
CR1
8.2V
R10
1.8K
Symbol
Shaping
8
+20V
R11
6.8K
Q5
-20V
9
10
R12
4.7K
11
Balancing
Reference
T.P.B.
R13
2.7K
C2
.01UFD
25V
C3
.01UFD
25V
-20V
+20V
A
Current Summing Amplifier,
Symbol Smoothing
REV. B/B
PART NO. 82199957
CARD TYPE C19

Figure 5-12

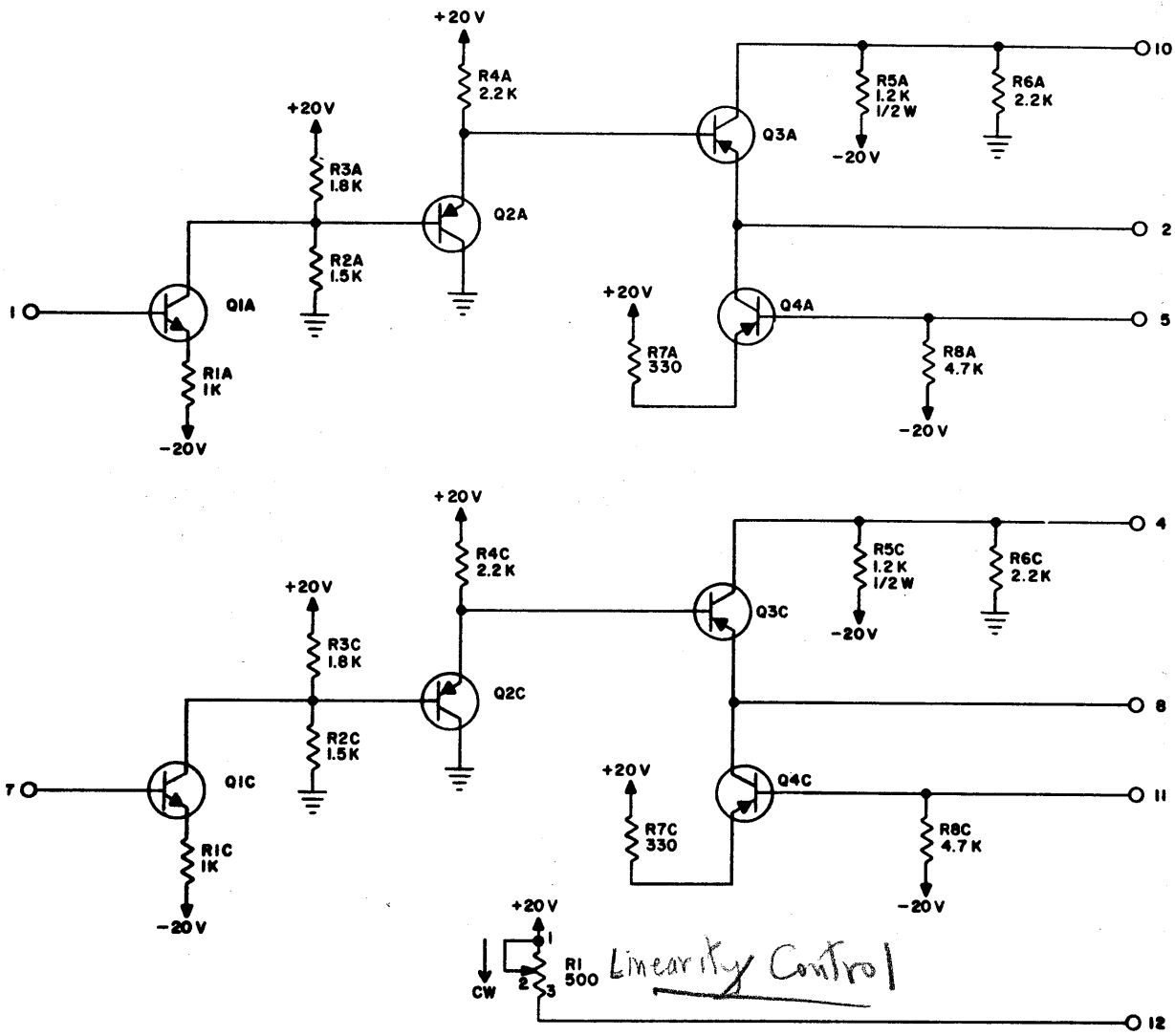


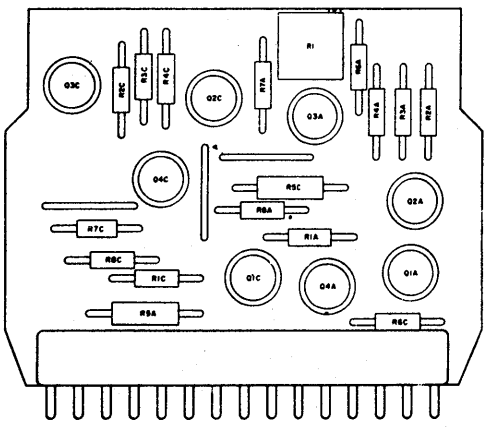


D/A Resistor Network

REV. C/C
PART NO. 82199867
CARD TYPE **027**

Figure 5-13

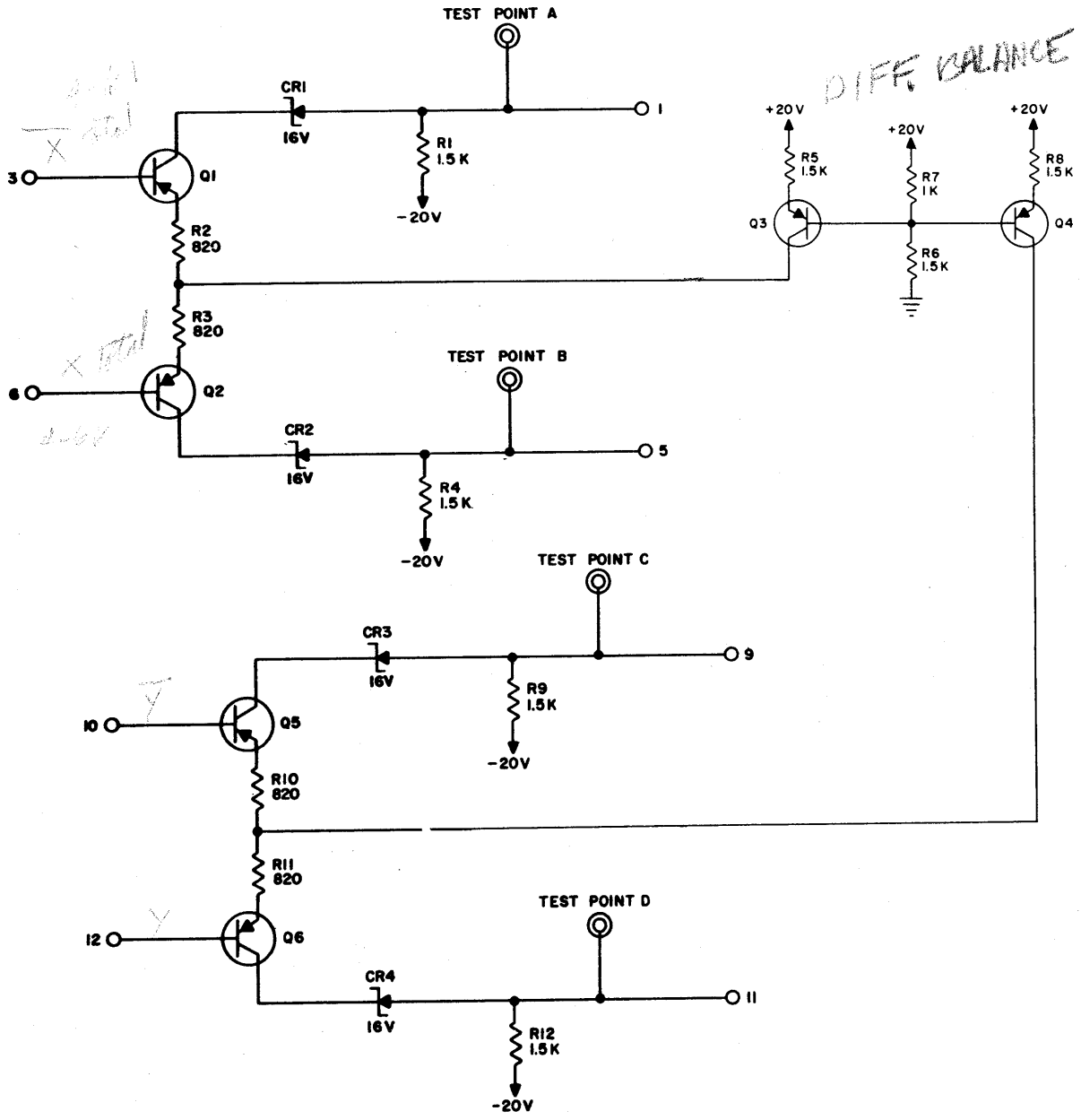


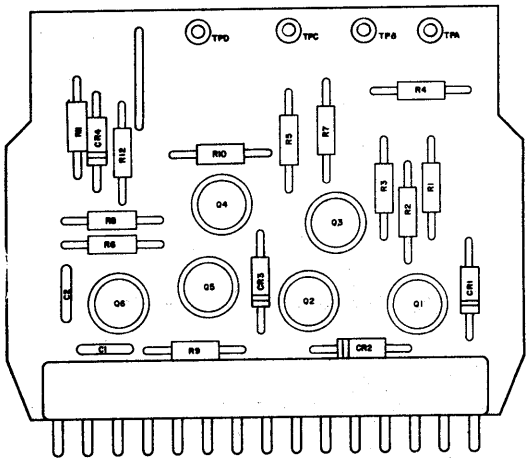


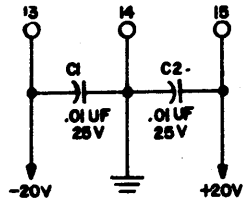
Deflection Preamplifier

REV. B/A
PART NO. 82198032
CARD TYPE **029**

Figure 5-14



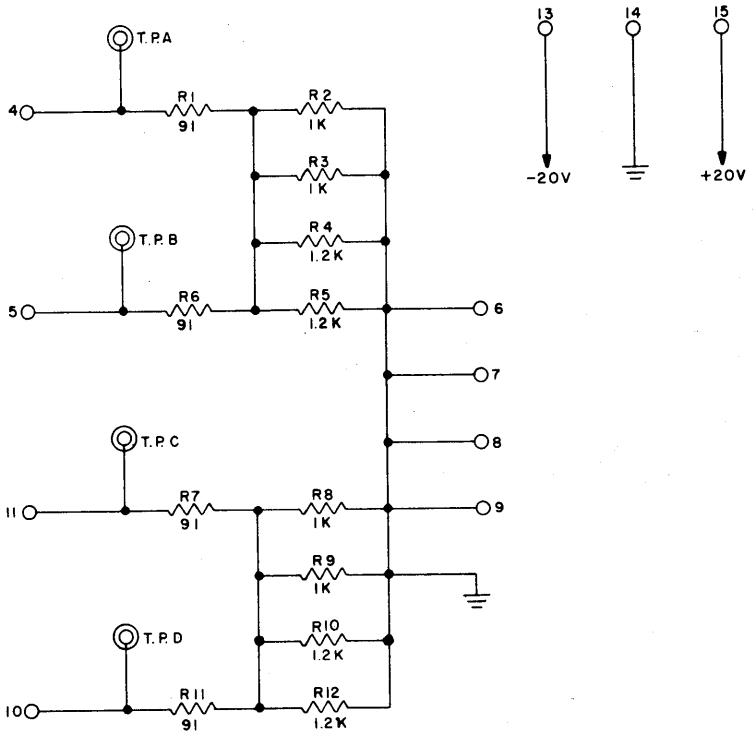


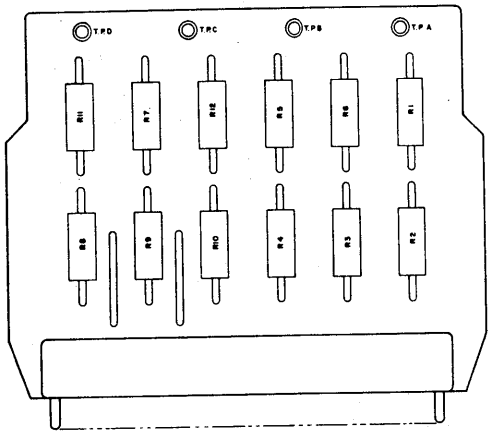


Level-Shift Differential Amplifier

REV. B/B
PART NO. 82199969
CARD TYPE **031A**

Figure 5-15

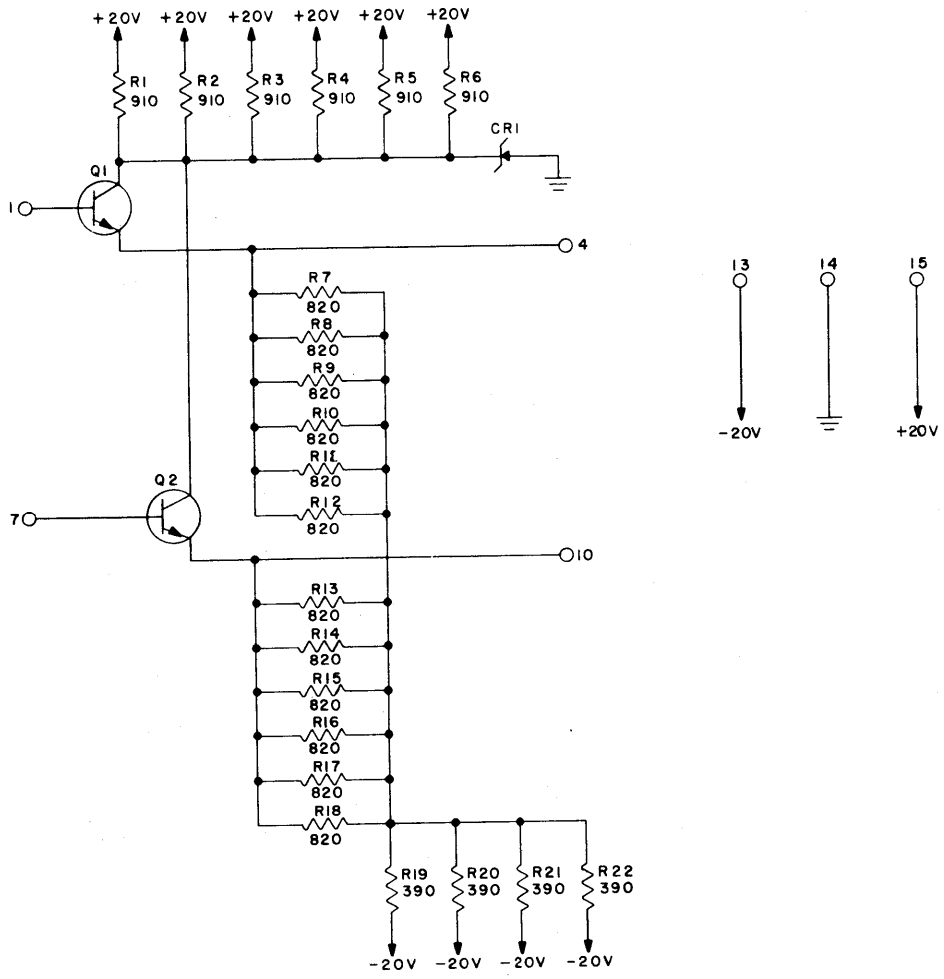


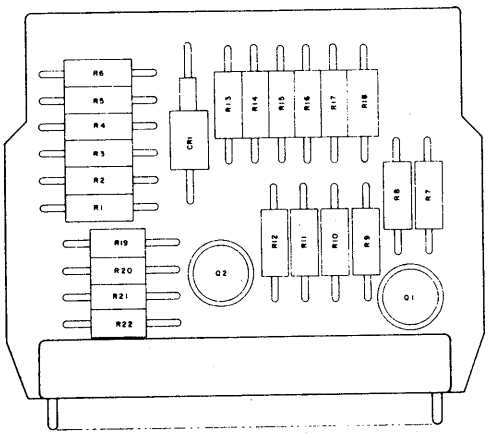


Resistor Network, Deflection

REV. A/A
PART NO. 82198044
CARD TYPE **039**

Figure 5-16

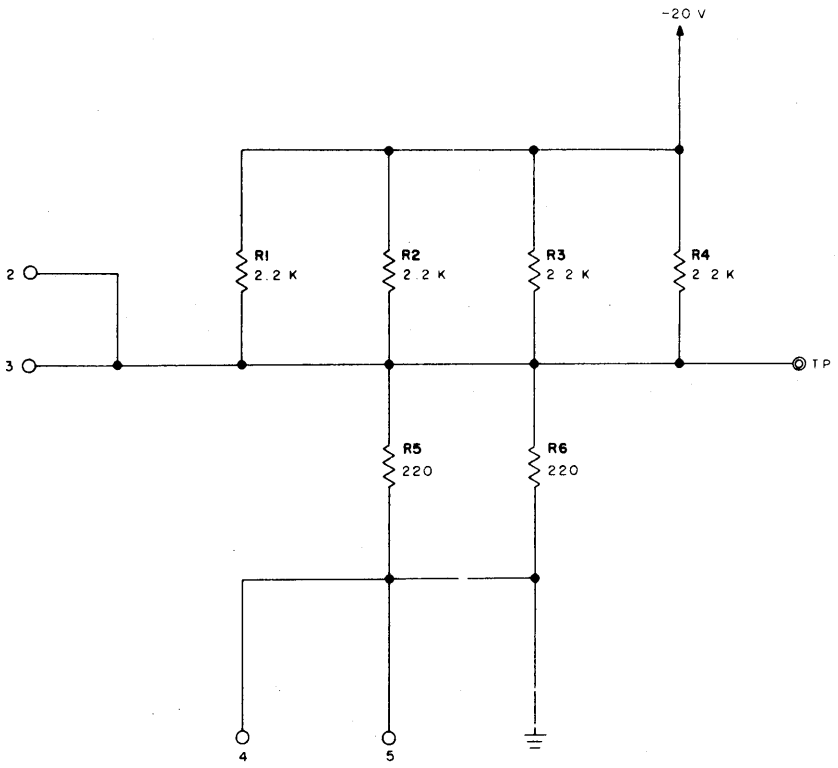


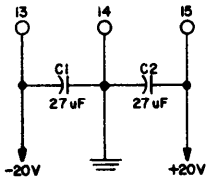


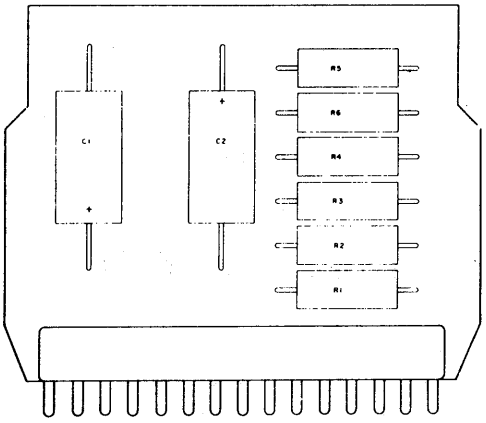
Buffer Amplifier, Deflection

REV. A/A
PART NO. 82198092
CARD TYPE **040**

Figure 5-17



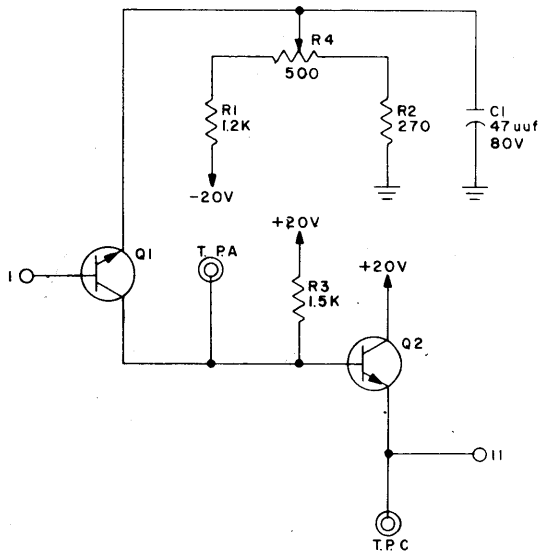


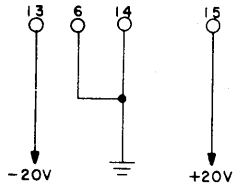


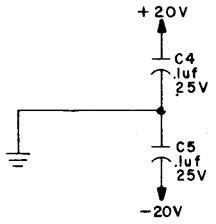
Line Terminator

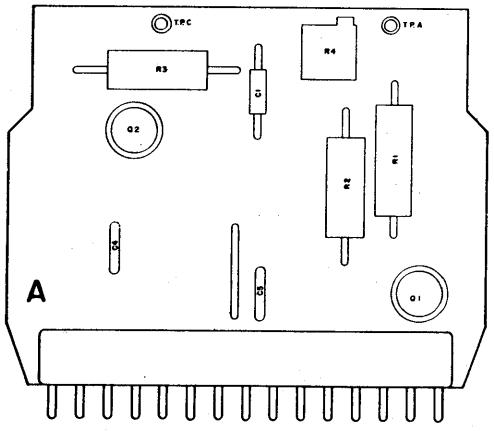
REV. A/A
PART NO. 82199919
CARD TYPE **S45**

Figure 5-18





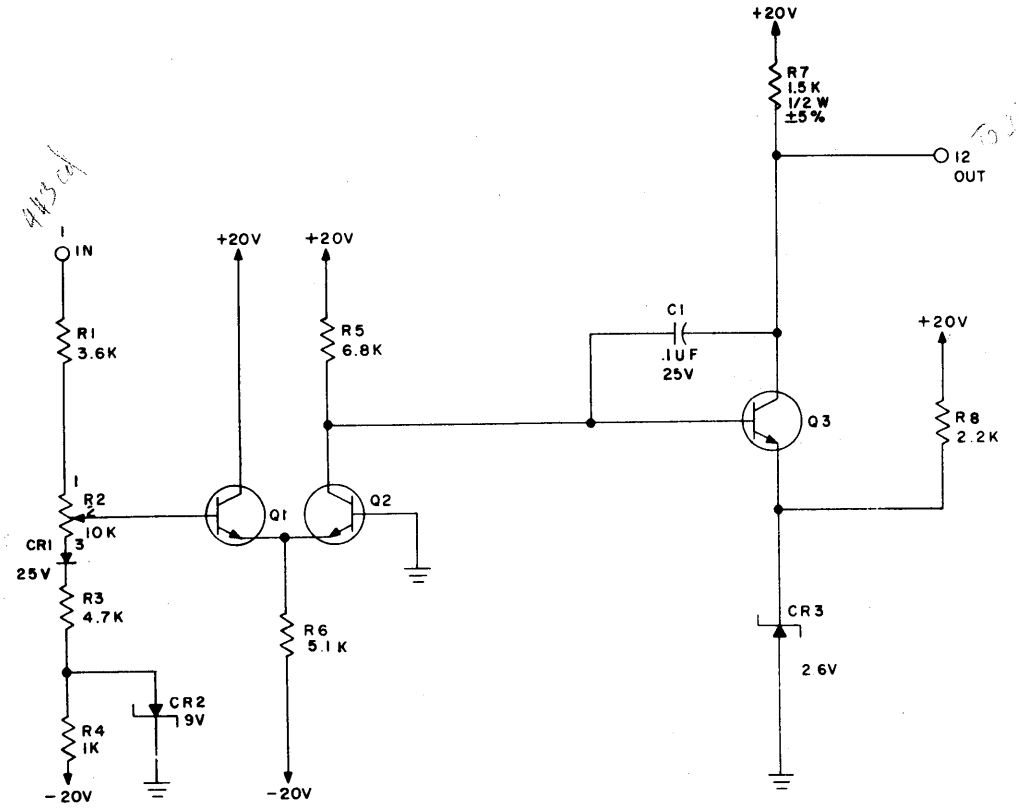


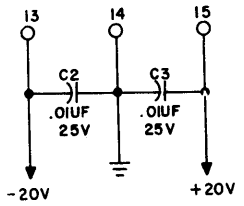


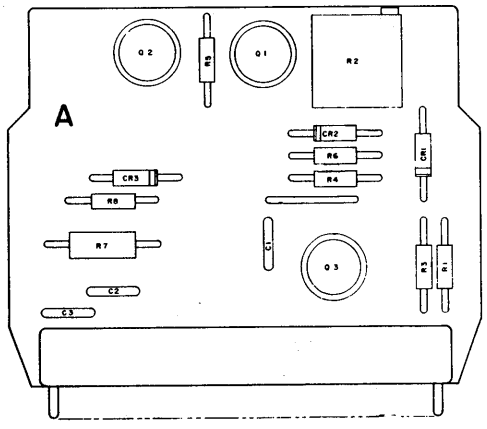
Unblank Preamplifier

REV. **B/B**
PART NO. 82199978
CARD TYPE **205**

Figure 5-19



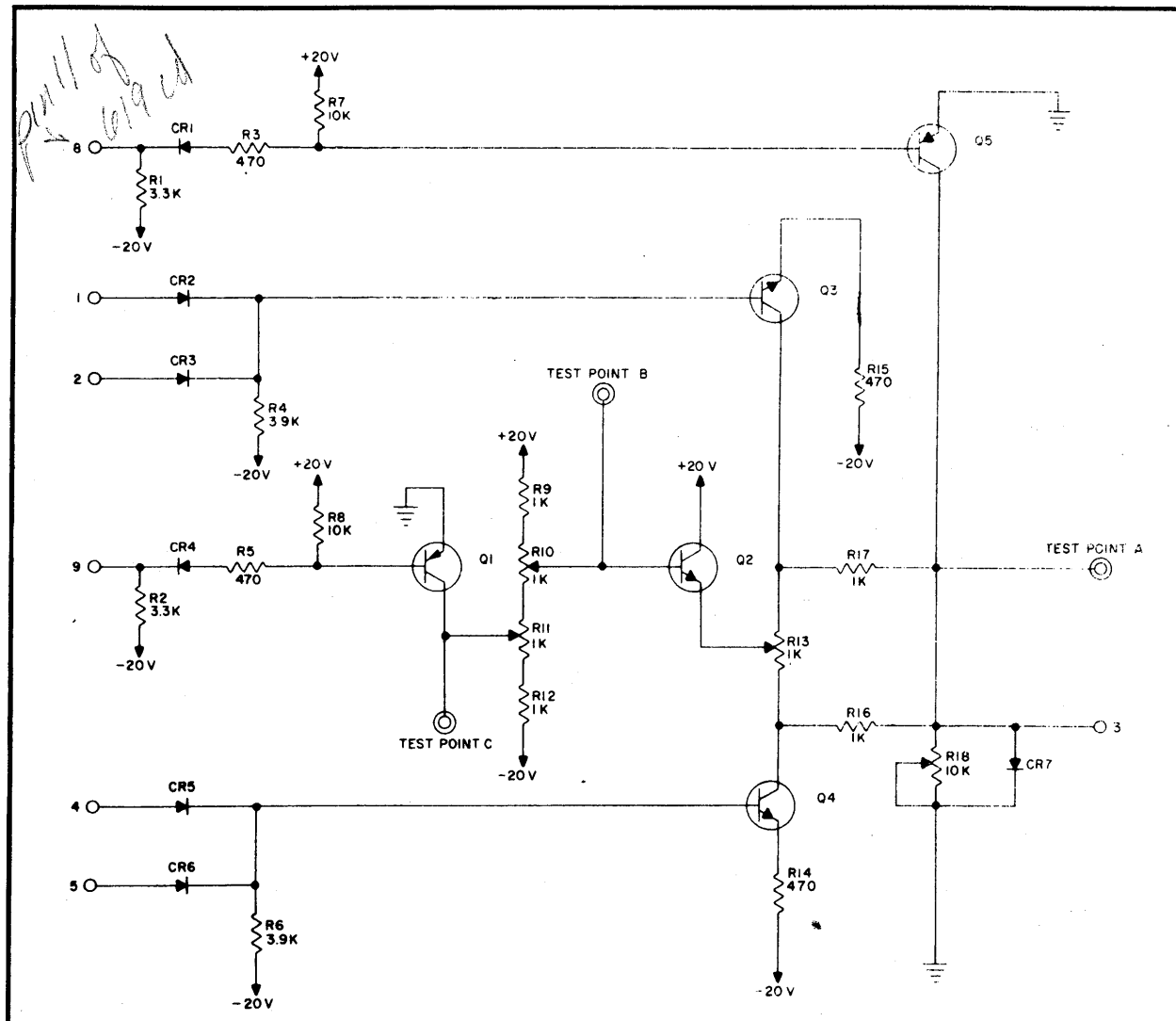


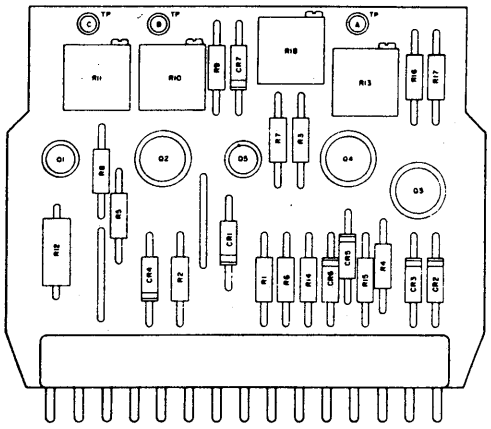


DC Regulator - Amplifier

REV. B/B
PART NO. 82199870
CARD TYPE **401**

Figure 5-20

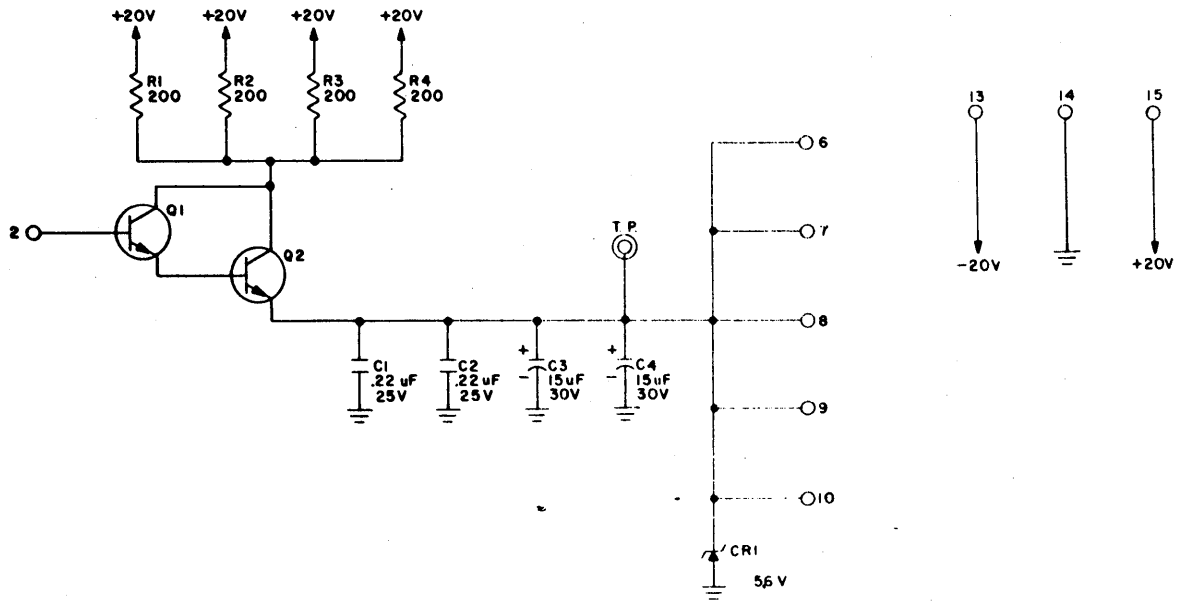


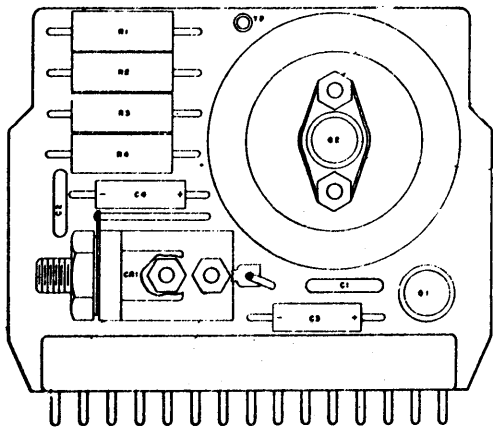


X, Y Mixer, Focus and Astigmatism

REV. A/A
PART NO. 82199966
CARD TYPE **429A**

Figure 5-21

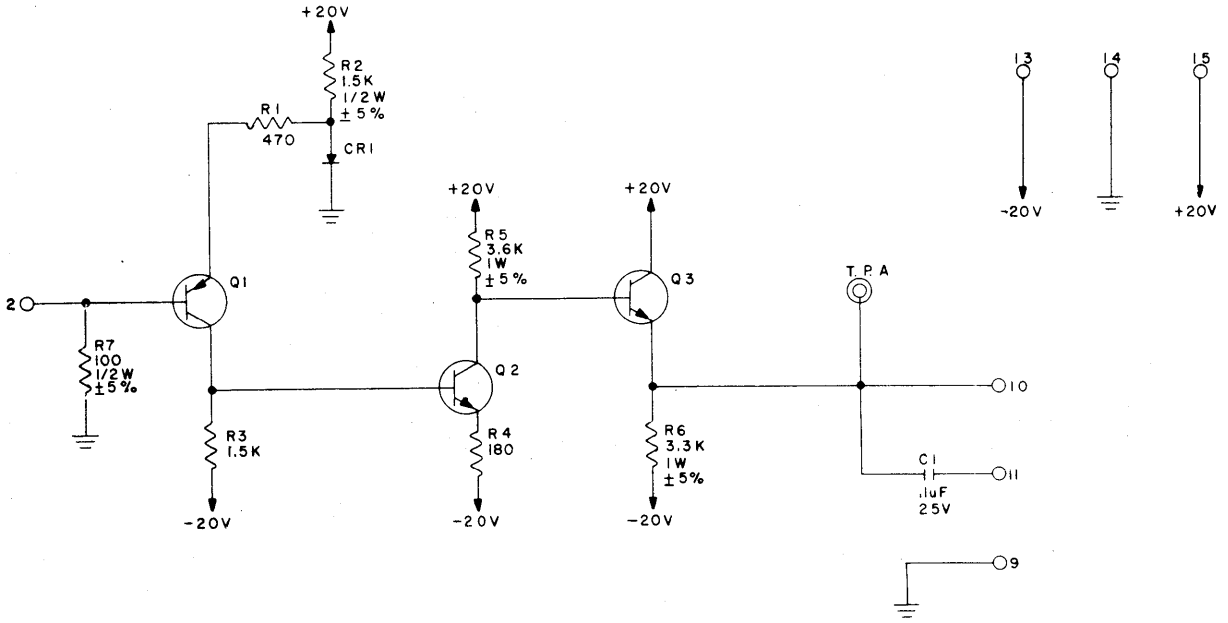


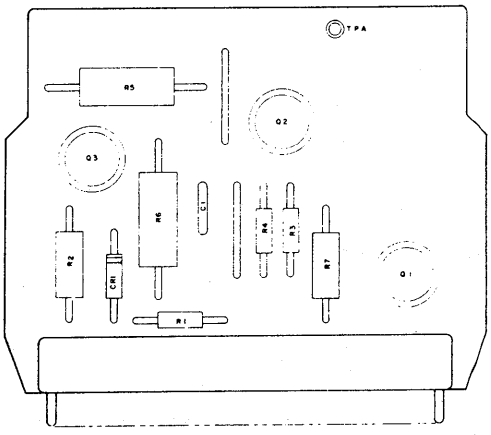


Series Regulator
5 Volts

REV. A/A
PART NO. 82199873
CARD TYPE 443

Figure 5-22

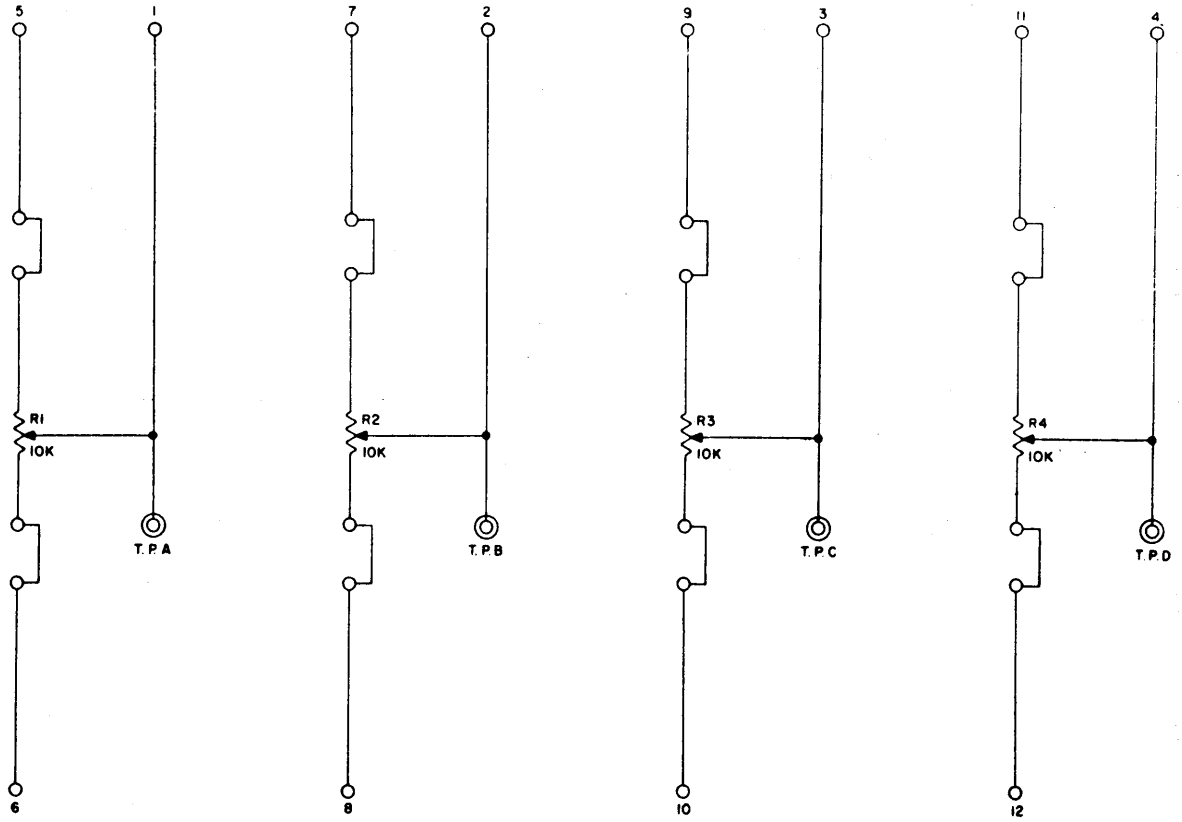


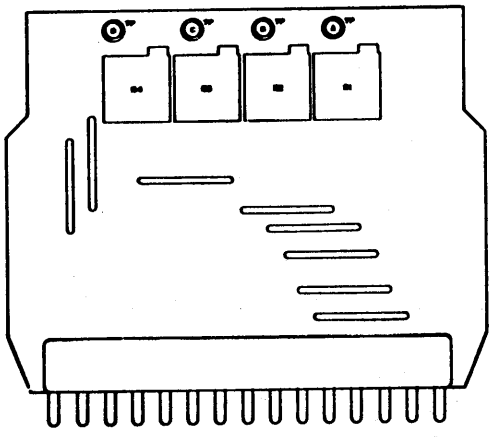


Focus and Astigmatism Amplifier

REV. A/A
PART NO. 82197789
CARD TYPE **452A**

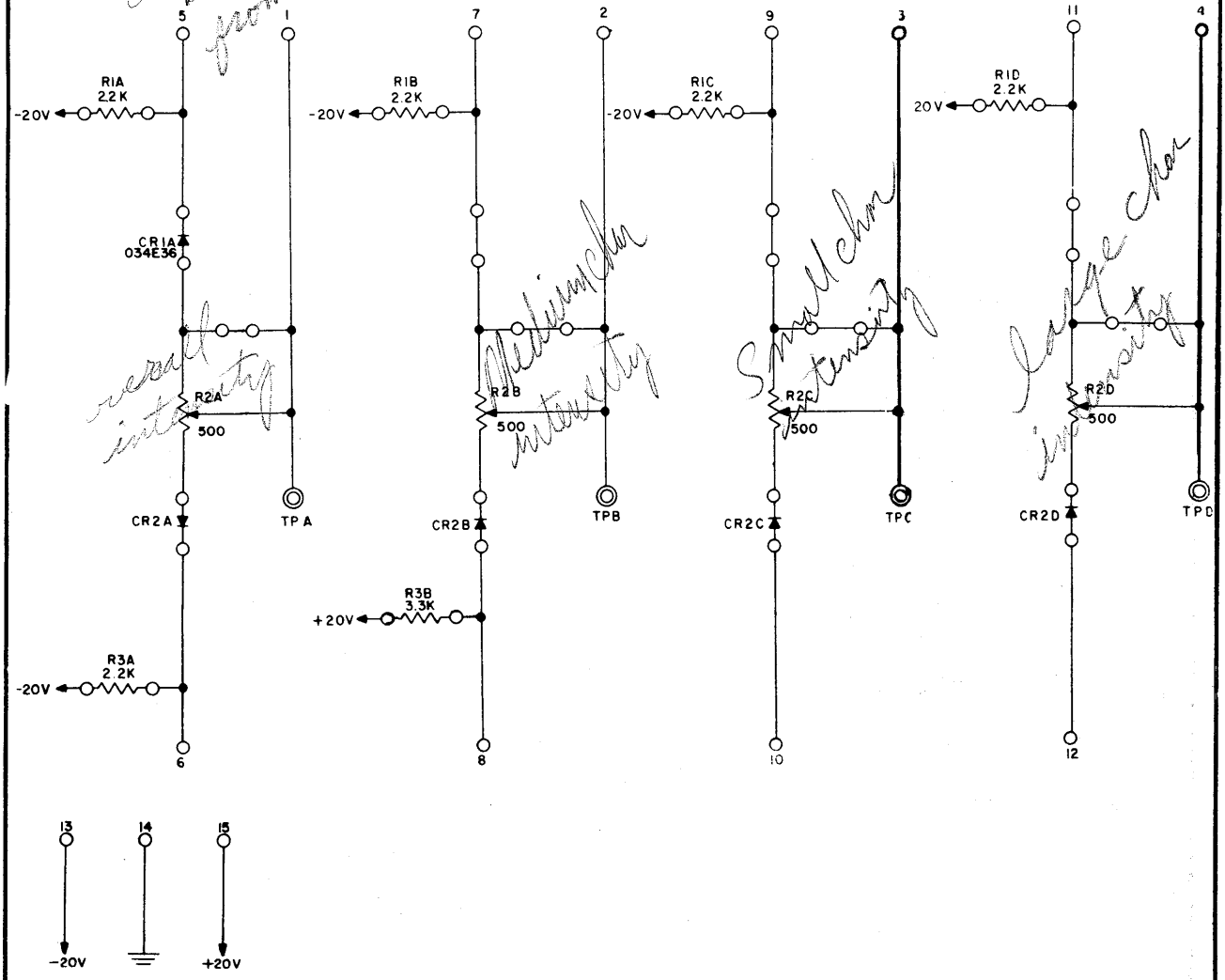
Figure 5-23

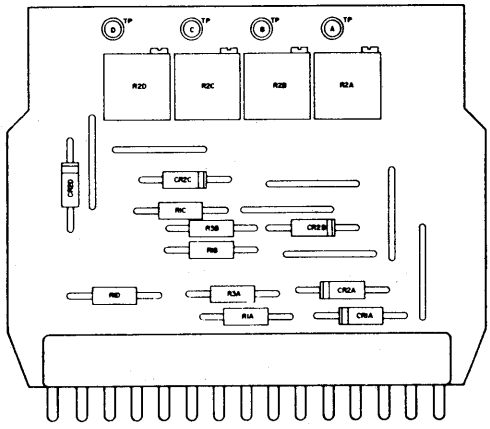




Potentiometer Circuit

REV. A/A
PART NO. 82199910
CARD TYPE **456A**

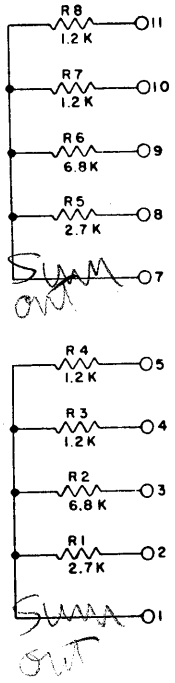


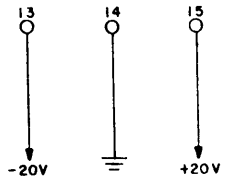


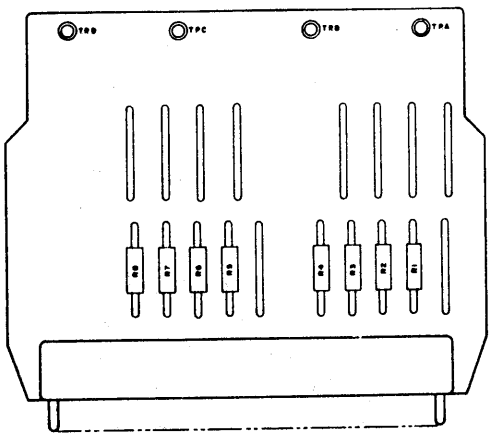
Potentiometer Circuit

REV. A/A
PART NO. 82199913
CARD TYPE **456B**

Figure 5-25



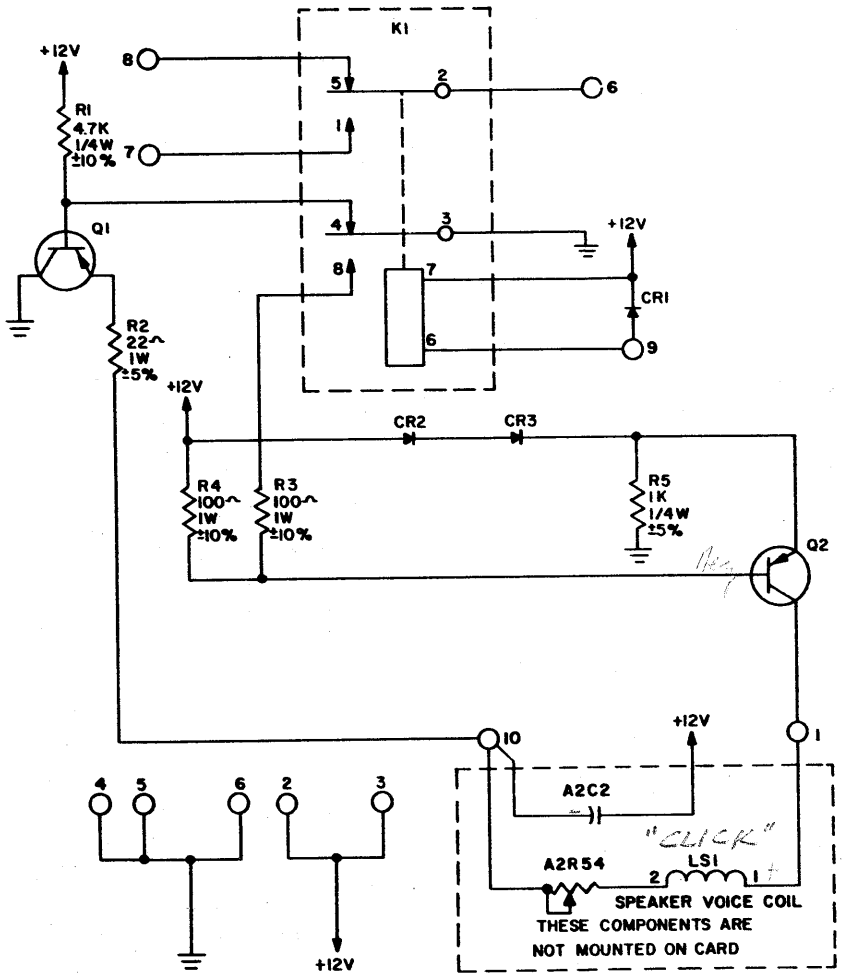


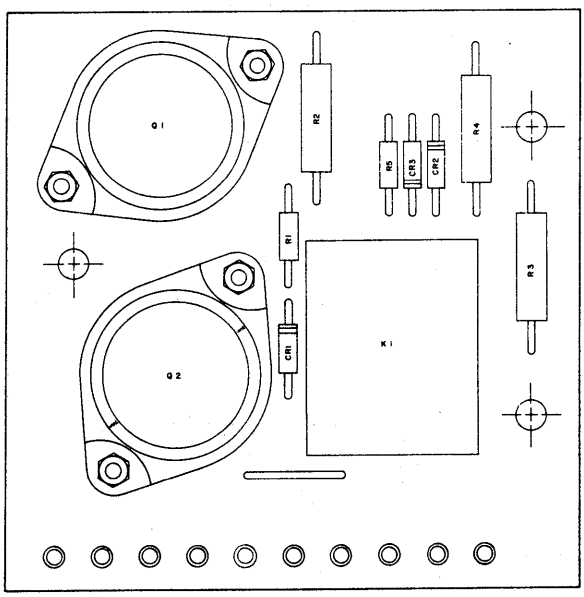


Resistor Network

REV. A/A
PART NO. 82199948
CARD TYPE **457A**

Figure 5-26

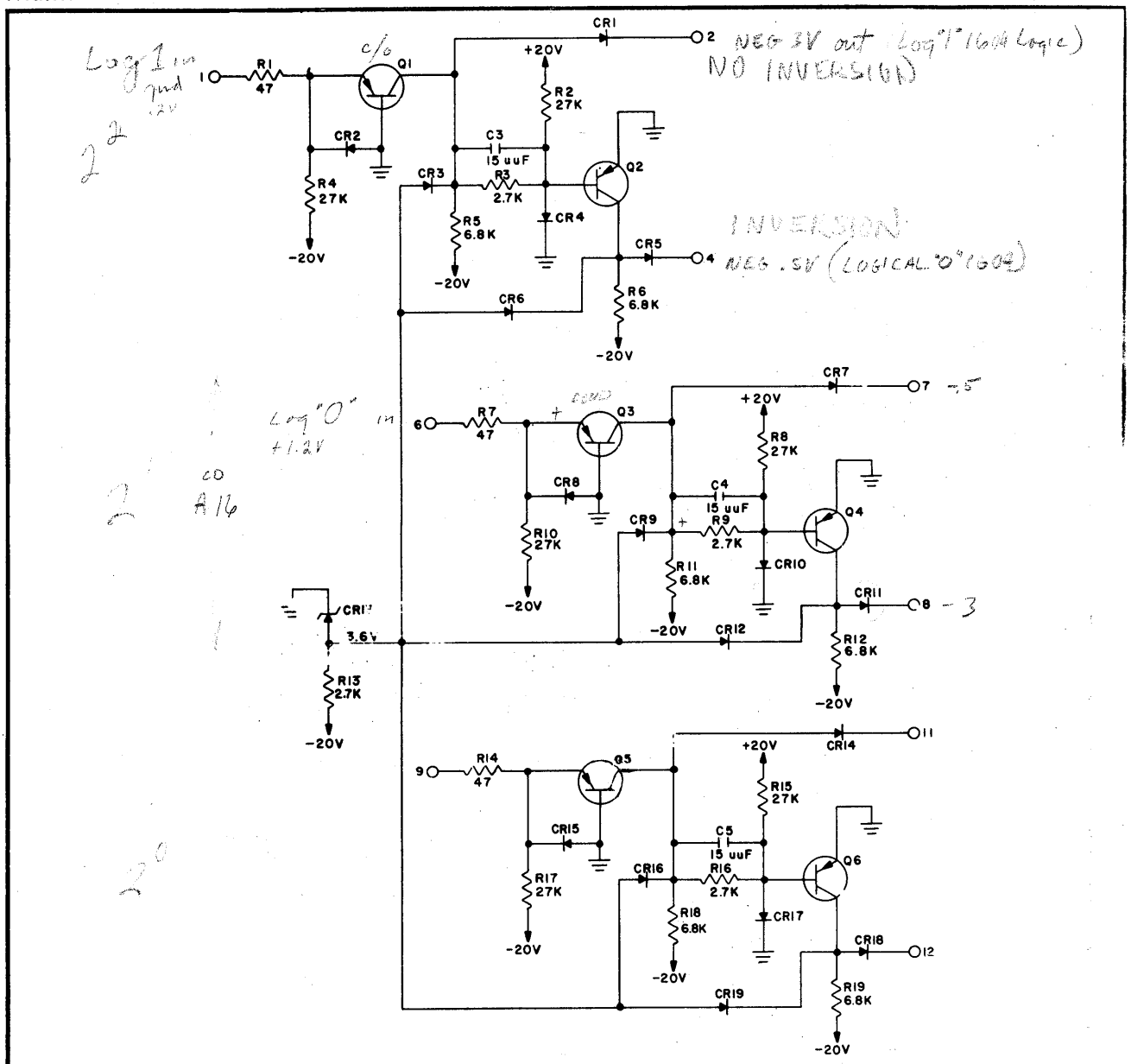


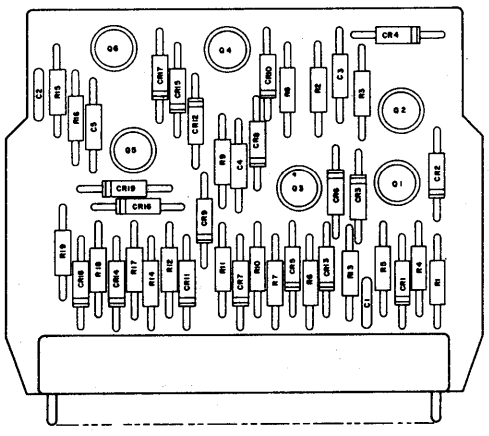


Speaker Driver

REV. C/B
PART NO. 82198368
CARD TYPE **478**

Figure 5-27

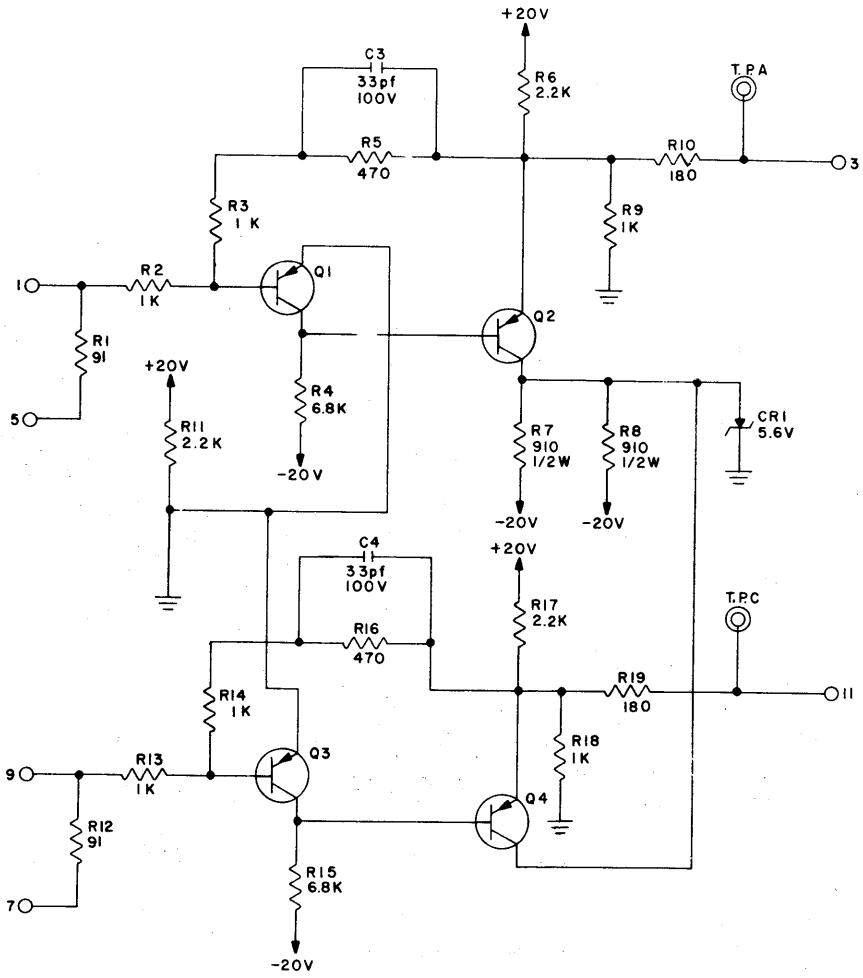


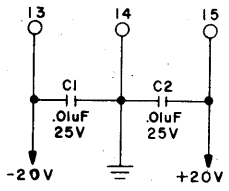


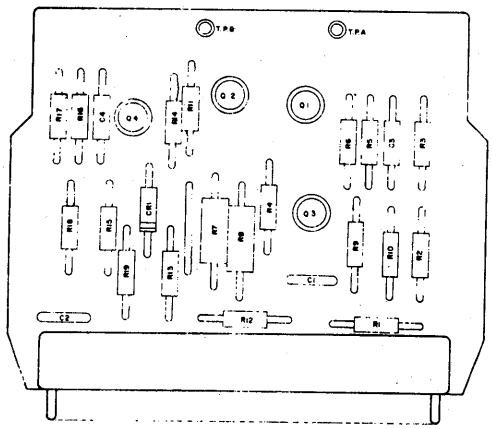
Logic Terminator (CDC 6600)

REV. A/A
PART NO. 82199922
CARD TYPE **619**

Figure 5-28



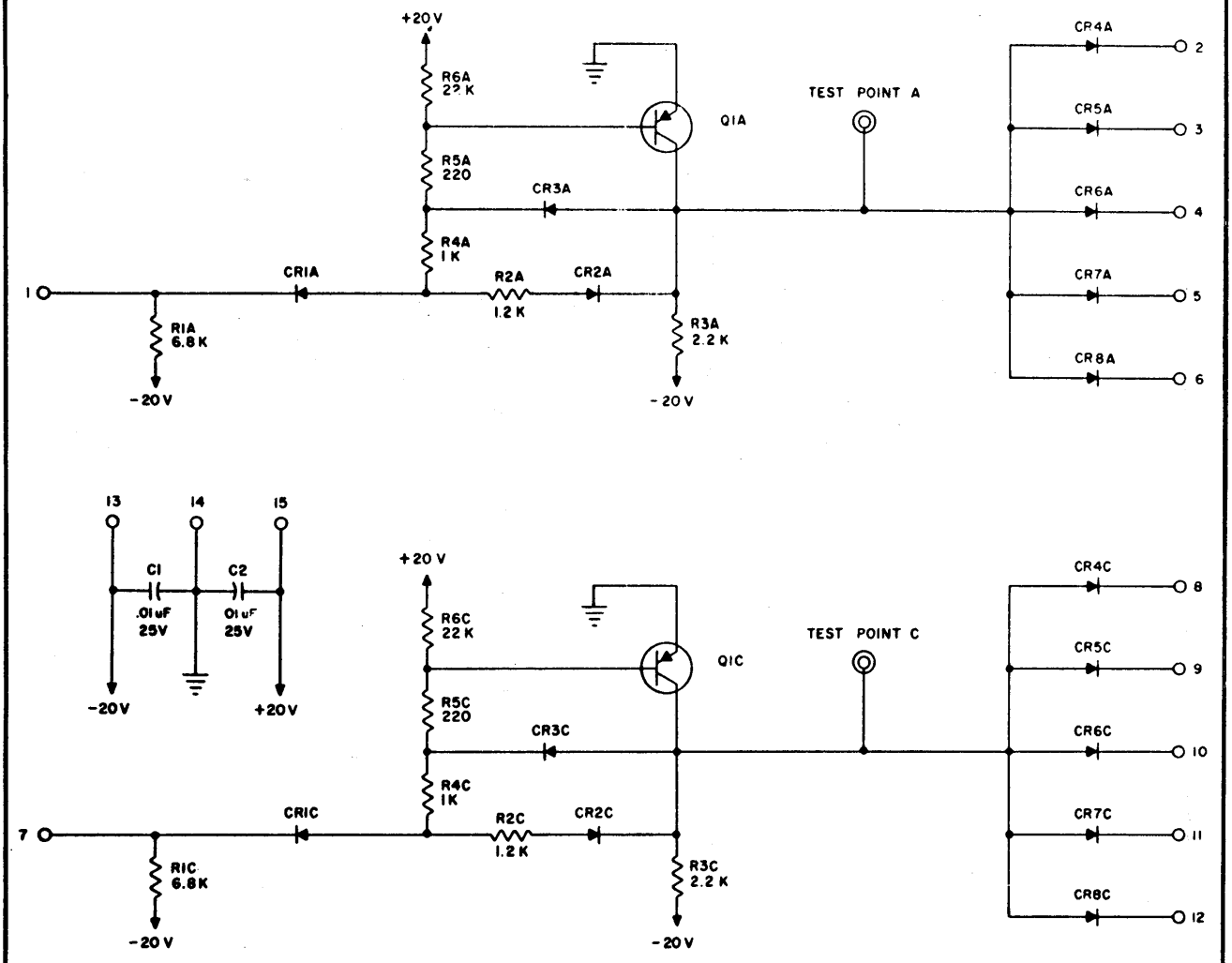


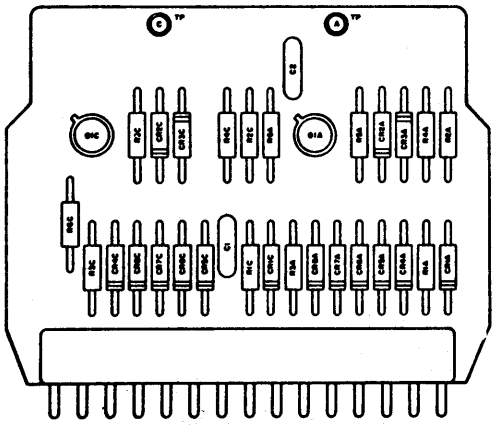


Symbol Signal Terminator (CDC 6600)

REV. C/C
PART NO. 82199925
CARD TYPE **620**

Figure 5-29

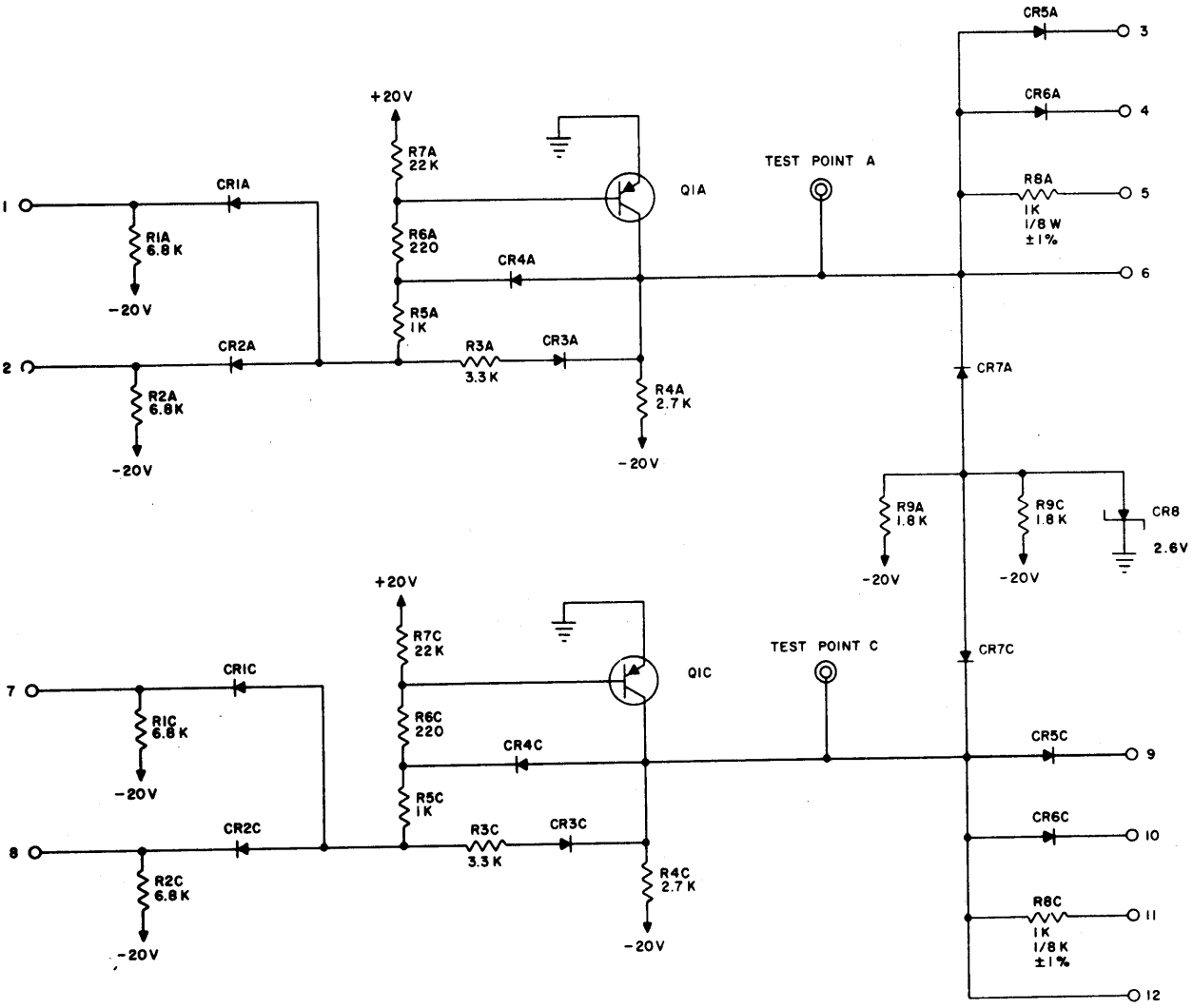


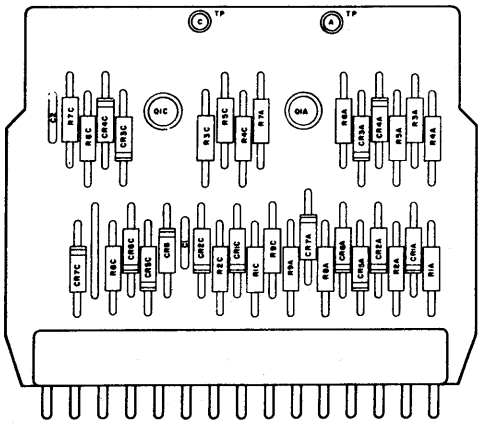


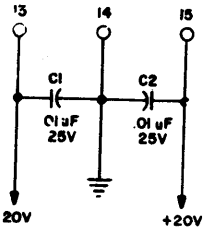
Standard Inverter

REV. A/A
PART NO. 82199813
CARD TYPE **1021**

Figure 5-30



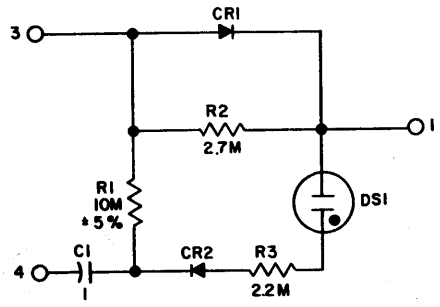


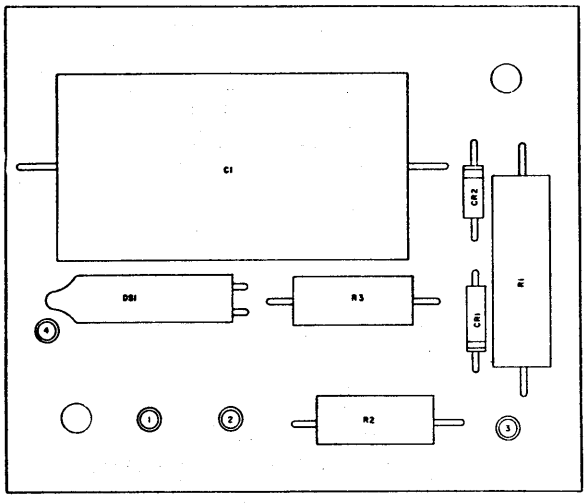


Special-Purpose Inverter

REV. A/A
PART NO. 82199951
CARD TYPE **1222RS**

Figure 5-31

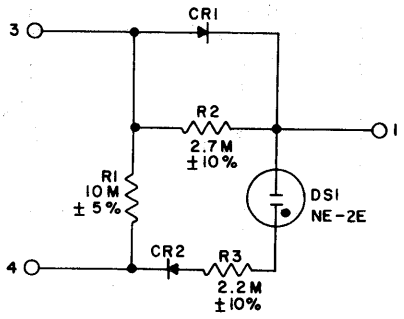


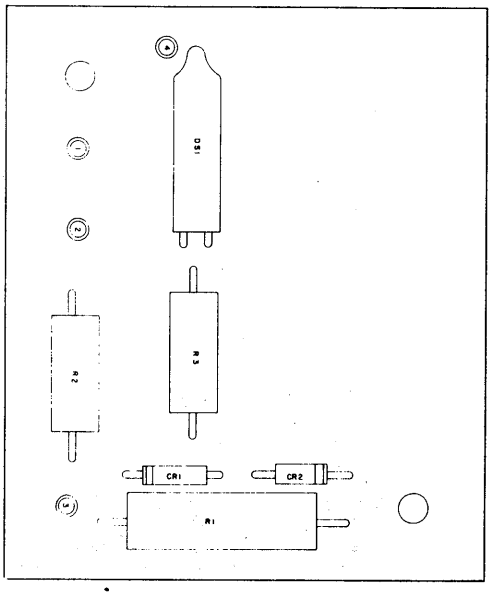


Tube Saver

REV. B/B
PART NO. 82199475
CARD TYPE **TS1**

Figure 5-32

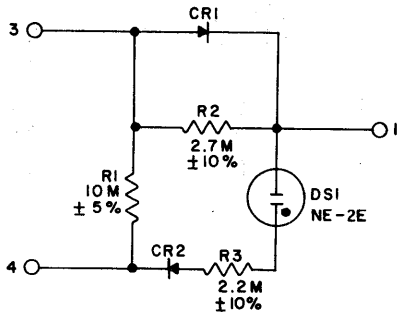




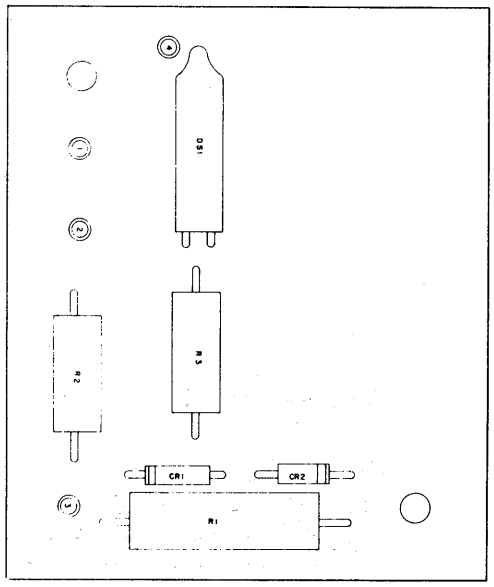
Tube Saver

REV. B/A
PART NO. 82199990
CARD TYPE **TS1B**

Figure 5-33



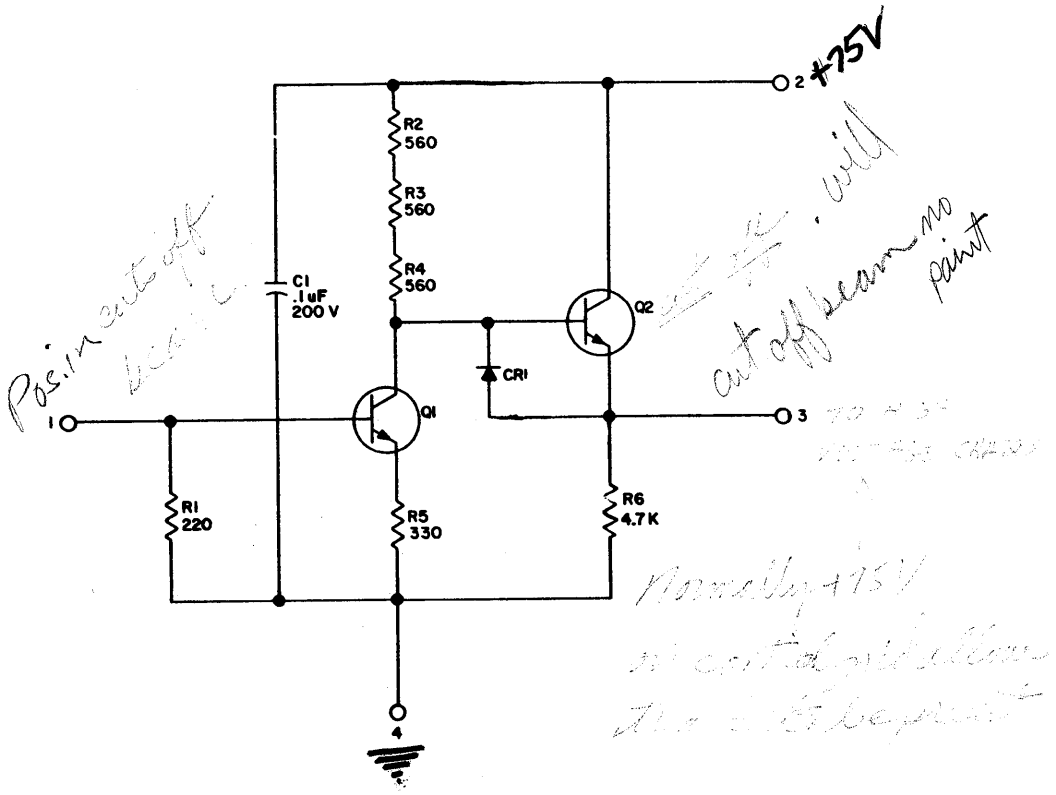
Purpose; to indicate power supplies are up (HIGH VOLTAGE)

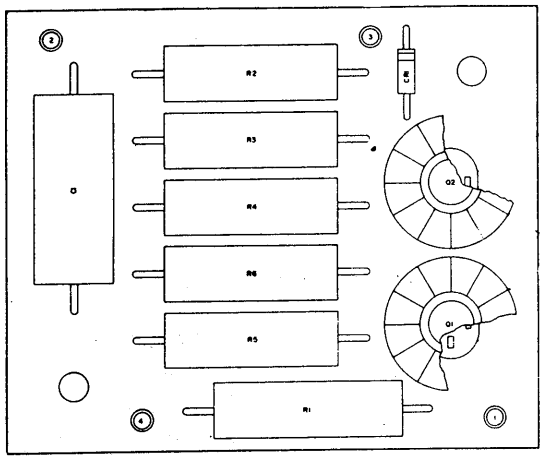


Tube Saver

REV. B/A
PART NO. 82199990
CARD TYPE **TS1B**

Figure 5-33

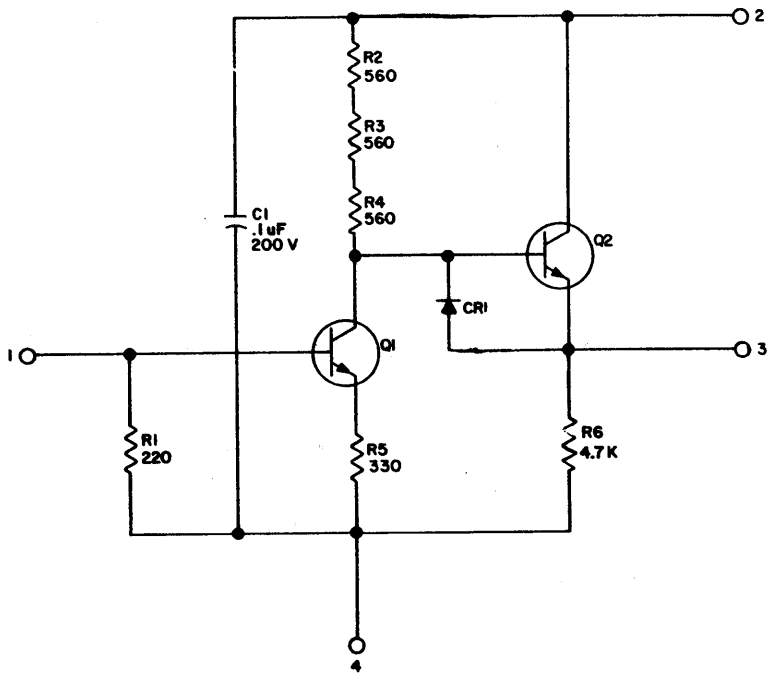


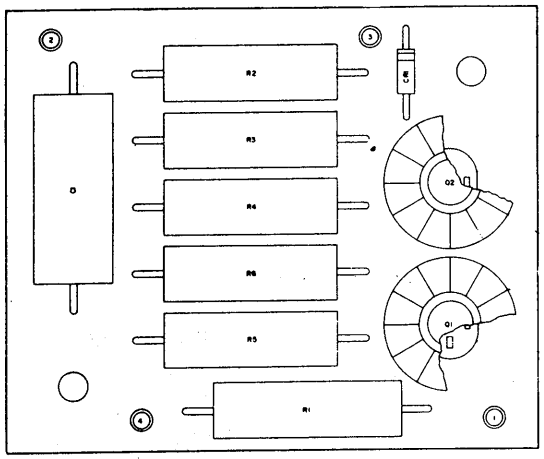


Unblank Amplifier

REV. B/A
PART NO. 82199907
CARD TYPE **UA2A**

Figure 5-34





Unblank Amplifier

REV. B/A
PART NO. 82199907
CARD TYPE **UA2A**

Figure 5-34

SECTION VI

DIAGRAMS

Diagrams of circuits used in the Display Console graphically portray cable connections, logic connections, and component electrical connections. Figure 6-1 is a system diagram in block form.

Logical diagrams indicate the connections between the cards in block diagram form, with each block representing a card or a section of a card. Section III explains the use and terminology of logical symbols.

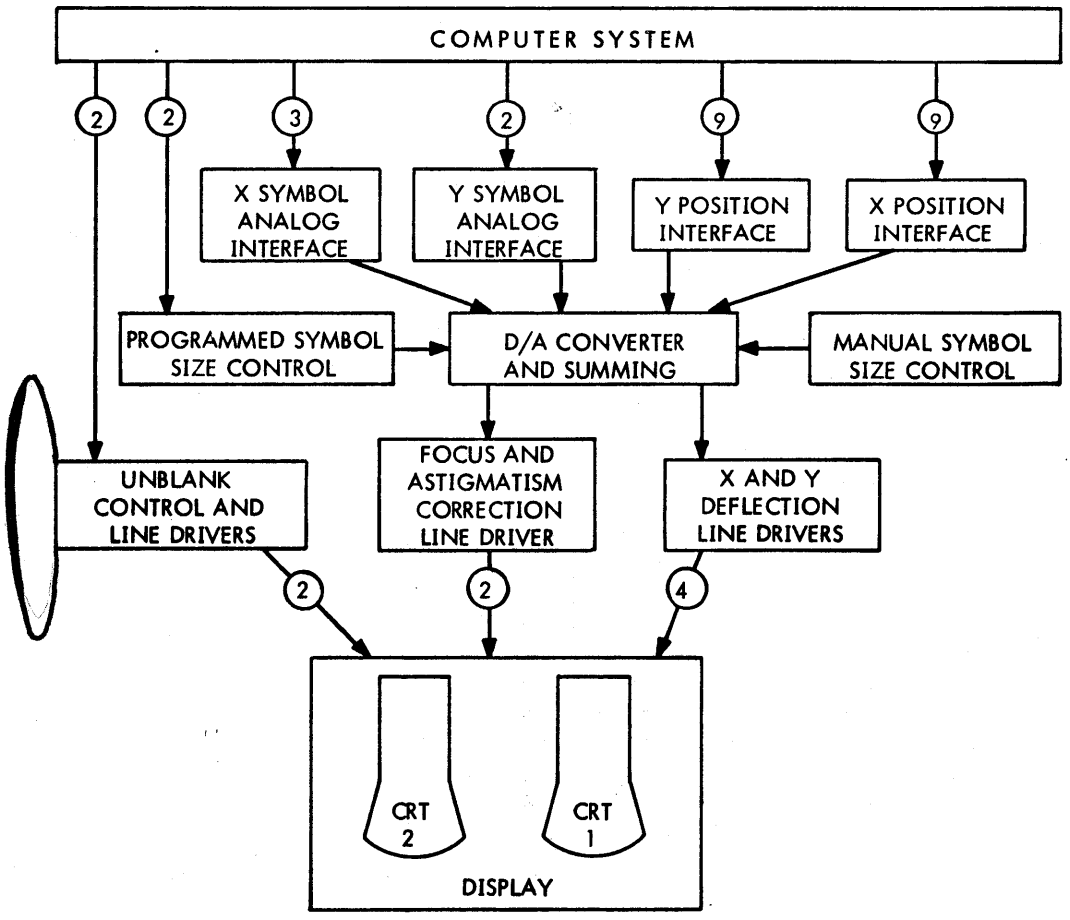


Figure 6-1. System Block Diagram

REVISIONS					
REV.	E.C.O.	DESCRIPTION	DATE	CHK'D	APP'D

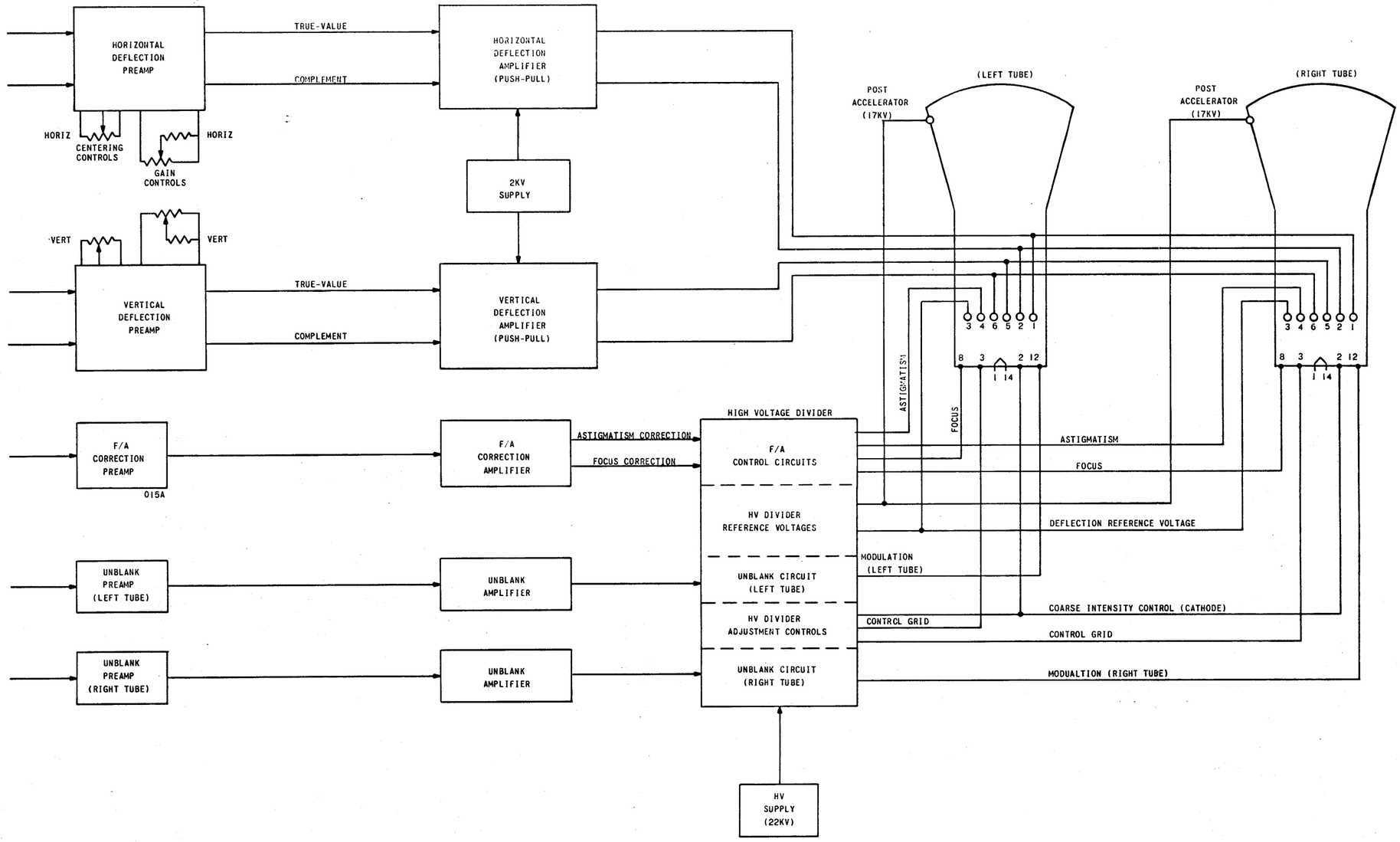


Figure 6-2
MONITOR BLOCK DIAGRAM

REVISIONS					
REV.	E.C.O.	DESCRIPTION	DATE	CHK'D	APP'D

6602

X COORDINATE DATA — 9 — DIGITAL RECEIVERS (HORIZ) 619 — X 9 / X̄ 9 — HORIZONTAL D/A CONVERTERS (− / +) 002C — HORIZ CURRENT SUMMING AMPLIFIER (×2)

Y COORDINATE DATA — 9 — DIGITAL RECEIVERS (VERT) 619 — Y 9 / Ȳ 9 — VERTICAL D/A CONVERTERS (− / +) 002C — VERT CURRENT SUMMING AMPLIFIER 003 CO

DIFFERENTIAL AMPLIFIER — TO HORIZONTAL DEFLECTION PREAMP (−, +) — TO VERTICAL DEFLECTION PREAMP (−, +)

CHARACTER ANALOG (RIGHT) — CHARACTER ANALOG RECEIVERS (HORIZ) 620 — CHARACTER SIZE ATTENUATOR — HORIZ CHAR SIZE CONTROL

CHARACTER ANALOG (LEFT)

CHATACTER ANALOG (UP) — CHARACTER ANALOG RECEIVERS (VERT) 620 — CHARACTER SIZE ATTENUATOR — VERT CHAR SIZE CONTROL

CHARACTER ANALOG (DOWN)

MIXER 429A — TO F/A CORRECTION AMPLIFIER 015A

UNBLANK (RIGHT TUBE) — UNBLANK RECEIVER

CHARACTER SIZE SMALL — CHARACTER SIZE RECEIVERS

CHARACTER SIZE MEDIUM

UNBLANK LEVEL CIRCUIT (RIGHT TUBE): UNBLANK / SMALL / MEDIUM — UNBLANK LINE DRIVER — TO UNBLANK PREAMP (RIGHT TUBE)

UNBLANK LEVEL CIRCUIT (LEFT TUBE): SMALL / MEDIUM / UNBLANK 4568 — UNBLANK LINE DRIVER 019 — TO UNBLANK PREAMP (LEFT TUBE)

UNBLANK (LEFT TUBE) — UNBLANK RECEIVER

F/A CORRECTION — F/A CORRECTION RECEIVER 619

KEY UP, DATA, KEYDOWN — 6 — KEYBOARD

Figure 6-3
D/A BLOCK DIAGRAM

82207100

REVISIONS				
REV	E.C.O.	DESCRIPTION	DATE	CHK'D / APP'D
E	1563	REDRAWN PER ECO INCLUDES ECO 1119, 1445 & 1584	5-5-67	JL

HOR. GAIN
VERT GAIN
HOR CENT
VERT CENT
both tubes

R1 CW CCW R7 180
R2 R8 180
R3
R4

FOCUS/ASTIGMATISM
TB1
1A4

ANALOG CHASSIS
FEED THRU 3
FEED THRU 4
FEED THRU 1
FEED THRU 2
1A6

ANALOG PREAMPLIFIER
FOCUS/ASTIGMATISM
HORIZ
VERT
UNBLANK LEFT
UNBLANK RIGHT
J10-15
1A7

DEFLECTION AMPLIFIER
TB1
TB2
1A2

2KV
TB1
TB2
GRD BUS
1A1

Y1
Y2 RIGHT

NO
NC
S3
DEAD START
S2
EMERGENCY OFF
TB2
FROM COMPUTER
COMPUTER
FEED THRU TO COMPUTER
PART OF TB1

YOKE
A2A1S2

CONNECTOR PANEL
J1
400~ 3Ø 208V
1A11F1 6-1/4ASB
1A11F2 6-1/4ASB
1A11F3 6-1/4ASB
1A11F4 4ASB
ON OFF SWITCH S1
J2 60~ 1Ø 115V
C D B E A

M1
TIME METER

F1 3/4ASB
R9 180 50W
HV SUPPLY 22KV PS1

R10 75K INTENSITY LEFT
R11 1.5M FOCUS LEFT
R12 2M ASTIGMATISM LEFT
R13 75K INTENSITY RIGHT
R14 1.5M FOCUS RIGHT
R15 2M ASTIGMATISM RIGHT
HV
(UPPER)PIN 3,TS1
(LOWER)PIN 3,TS1
PIN 4 OF TS1
GRD BUS
TB1
1A3

KEYBOARD
PART OF TB2
TB1
GRD BUS
COAX GRDS

+20V -20V GRD
POWER PANEL
+20VDC PS1
-20VDC PS2
1A5
BLOWER B1
1A8
BLOWER B1
1A13

UNBLANK AMPLIFIER
TB1
1A10

NOTE:
1. FOR ADDITIONAL INTERCONNECTION WIRING INFORMATION SEE 82204900 D/A LOGIC DIAGRAM, AND 82194005 ANALOG PREAMPLIFIER LOGIC DIAGRAM.

UNLESS OTHERWISE NOTED ALL CIRCUITS ARE LOCATED ON PARTIAL REF DES ARE SHOWN; FOR COMPLETE DES PREFIX WITH UNIT NUMBER OR SUBASSEMBLY DES.

FIGURE 6-4

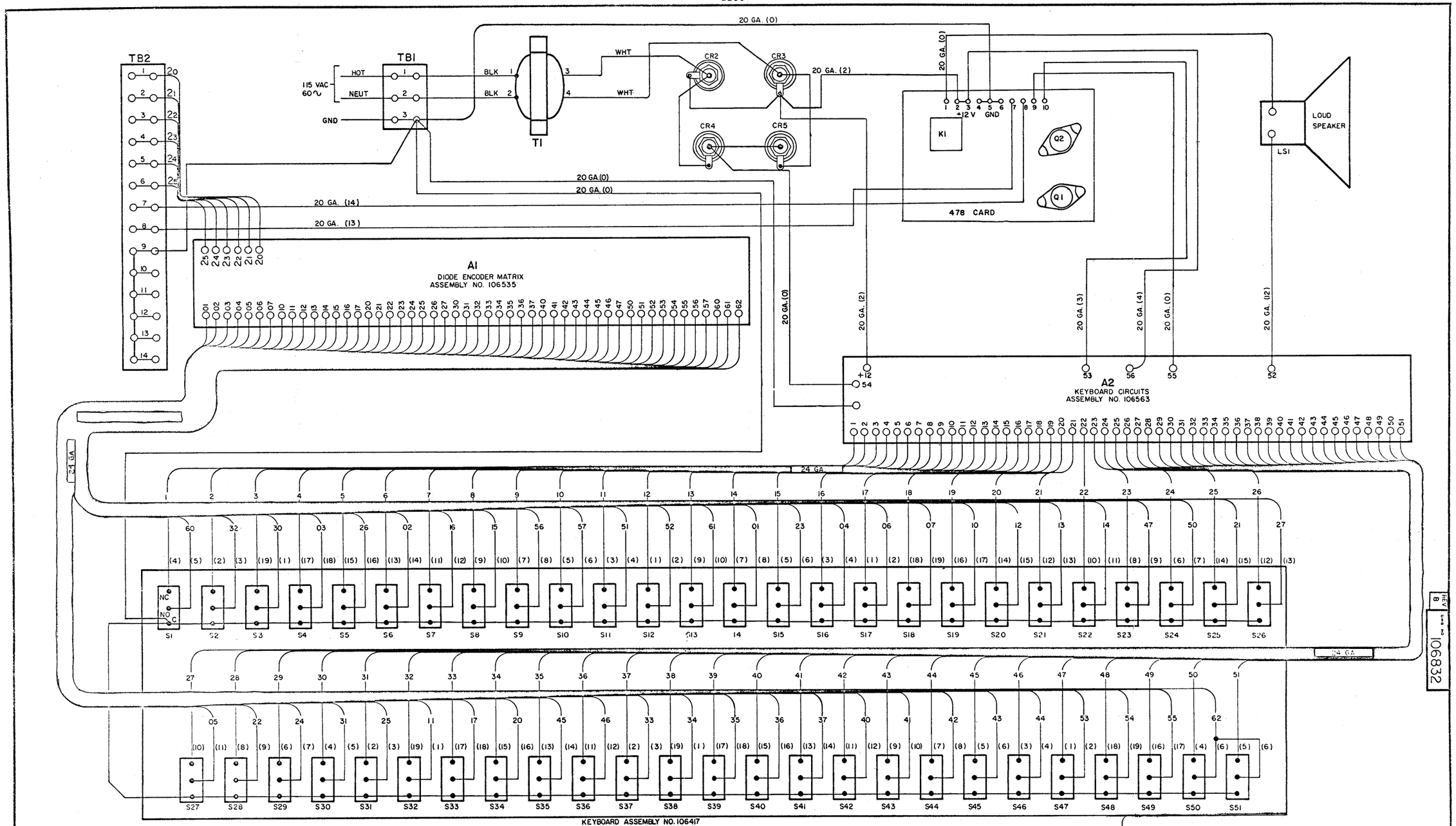
REFERENCE DRAWING	DRAFTSMAN	DATE
	M.M. JENSEN	4-28-67
COMPONENTS EXCEPT AS NOTED	CHECKER	
TOL / VALUE / SIZE	ENGINEER	
RES. OHMS	APPROVAL J.T. McMAHON	4-1-66
CAP.		

CONRAC DATA
DATA DISPLAY DIVISION

INTERCONNECTION DIAGRAM, POWER AND SIGNAL

PRODUCT 6602C | SIZE D | DRAWING NUMBER 82207100 | REV E
PAGE | SHEET OF

6-7/8



NOTE:

1. ALL LEADS #22AWG BARE TINNED COPPER WIRE UNLESS OTHERWISE SPECIFIED.

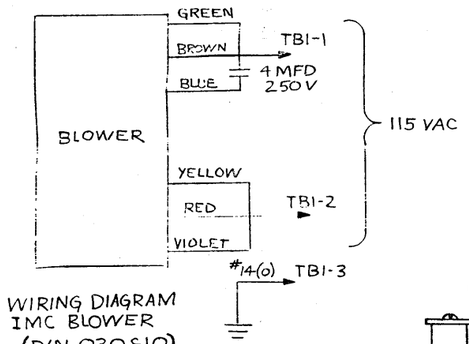
REV B DWG NO 106832

Figure 6-5
WIRING DIAGRAM, KEYBOARD

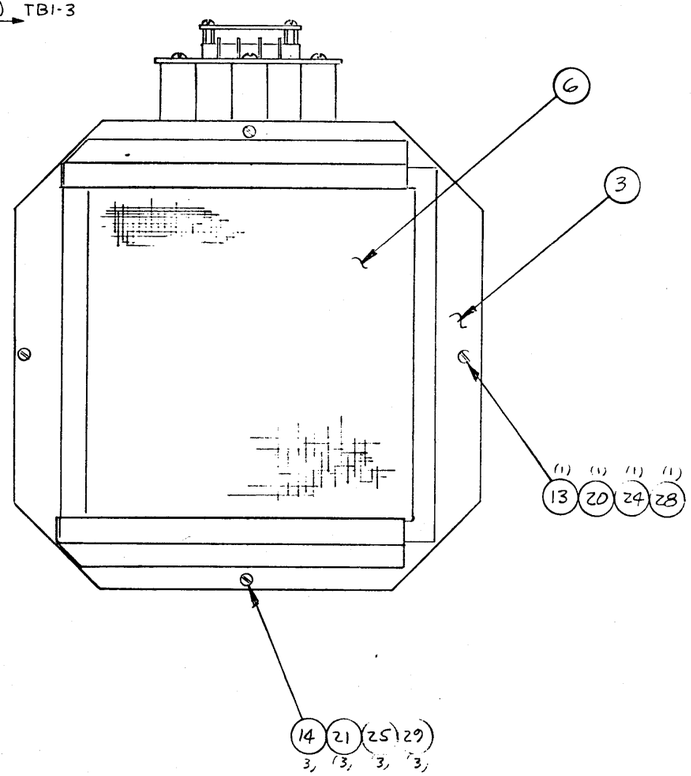
A9

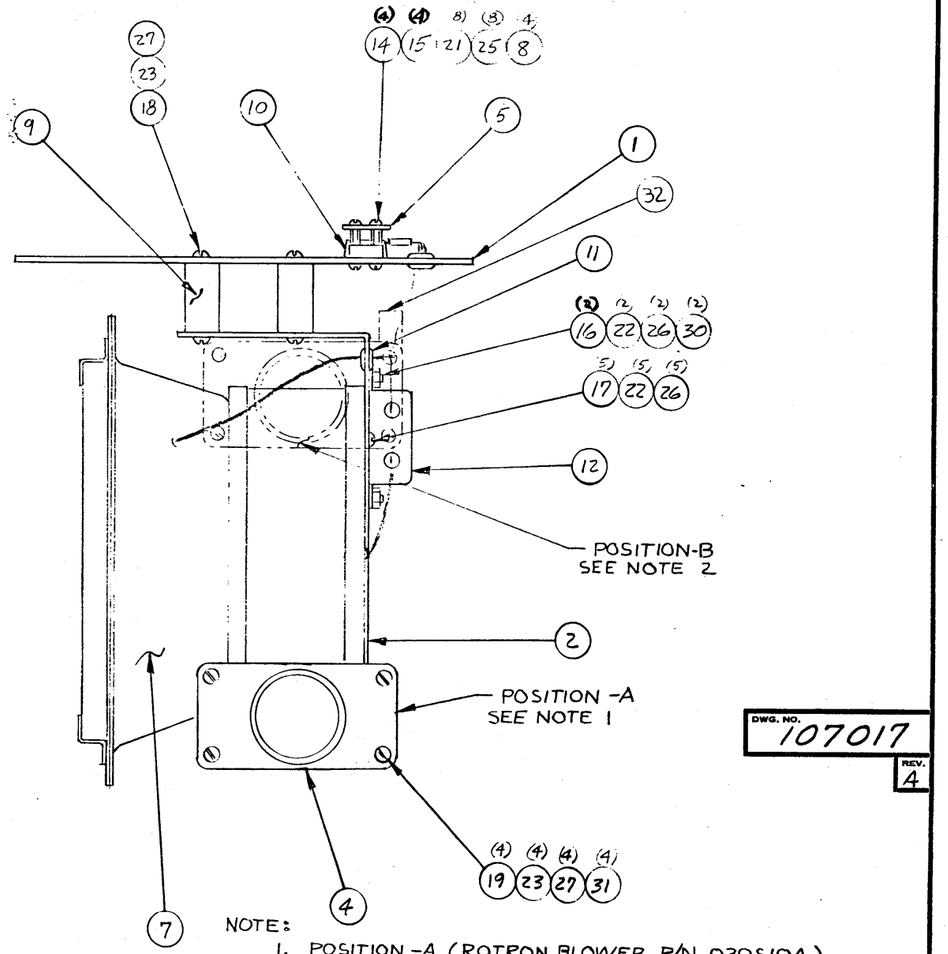
HARCO ST PAUL, MN 1984 6-85

REVISIONS				
SYM.	E.C.O.	DESCRIPTION	DATE	APPROVAL
A	~	ADDED SCHEMATIC FOR IMC BLOWER	4/9/65	YN



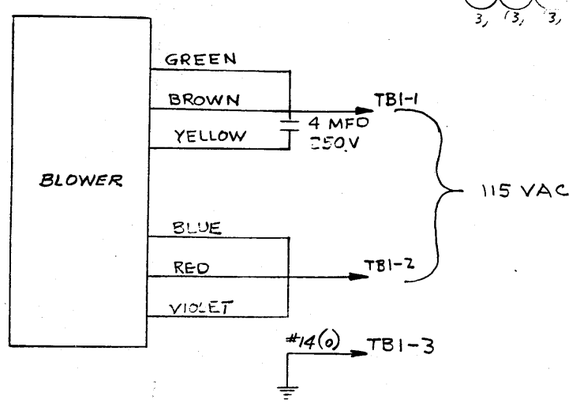
WIRING DIAGRAM
IMC BLOWER
(P/N 030510)





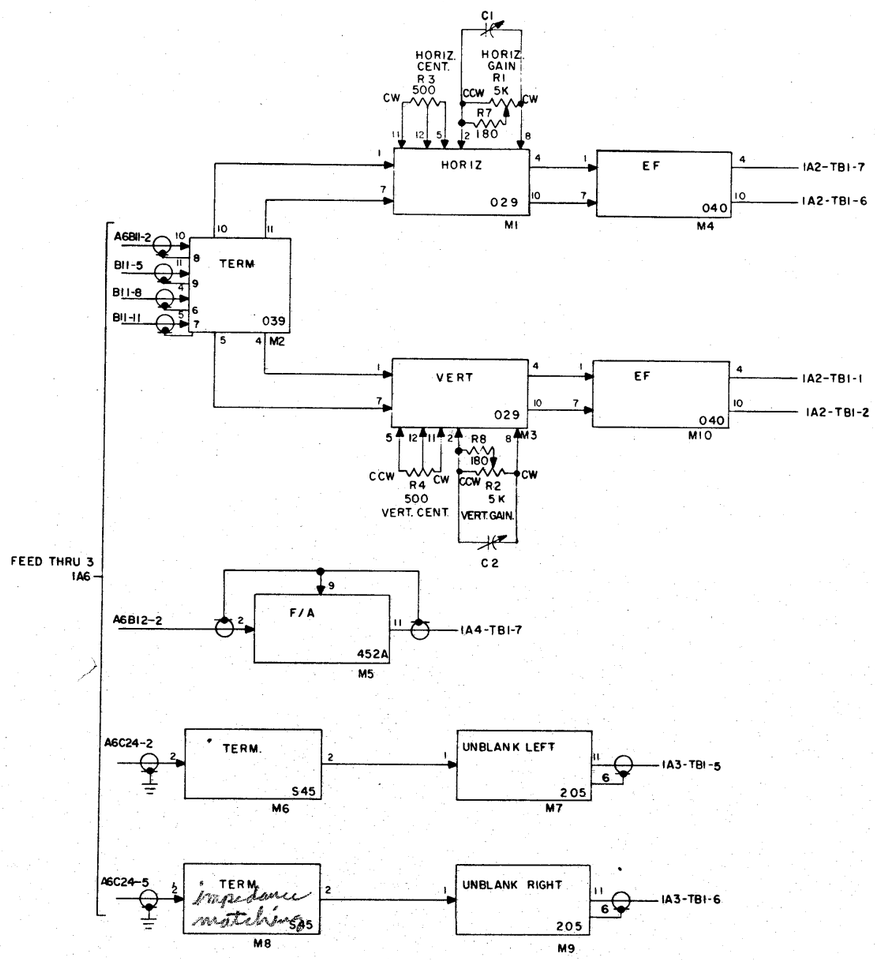
NOTE:
1. POSITION -A (ROTRON BLOWER, P/N 030510A) ASSEMBLE ALL PARTS AS SHOWN.
2. POSITION-B (IMC BLOWER, P/N 030510) ASSEMBLE AS SHOWN. DO NOT USE ITEM 11 (GROMMET), REPLACE WITH ITEM 32 (CABLE CLAMP) AS SHOWN IN POSITION-B.

DWG. NO. 107017
REV. 4



WIRING DIAGRAM
ROTRON BLOWER
(P/N 030510A)

Figure 6-6
WIRING DIAGRAM, BLOWER



REV C
DWG. NO. 107211

Figure 6-7
WIRING DIAGRAM,
ANALOG PREAMPLIFIER

A7

dd60

REV	E.C.O.	ZONE	DESCRIPTION	DATE	CHK'D	APP'D.
-			DRAWING RELEASE	4-1-66		TPA
B	1322		REVISED PER ECO	8-25-66	QL	TPA

Y (VERTICAL) DEF. FROM 6600

X (HORIZONTAL) DEF. FROM 6600

LARGE (VERT)

LARGE (HORIZ)

Y CHAR ANALOG

X CHAR ANALOG

TO PREAMP (UNBLANK FOR LEFT) A7M6-2

TO PREAMP (UNBLANK FOR RIGHT) A7M8-2

UNBLANK FOR LEFT TUBE

UNBLANK FOR RIGHT TUBE

SELECT MEDIUM SIZE

SELECT SMALL SIZE

F/A CORR GATE FROM 6600

F/A CORR A7M5-2

A7M2-10 X DEF.

A7M2-11

A7M2-4 Y DEF.

A7M2-5

NOTES;
IF NEITHER MEDIUM OR SMALL SIZE IS SELECTED LARGE SIZE IS SELECTED AUTOMATICALLY.

82204900

Figure 6-8
LOGIC DIAGRAM, D/A

A6

6-15/16

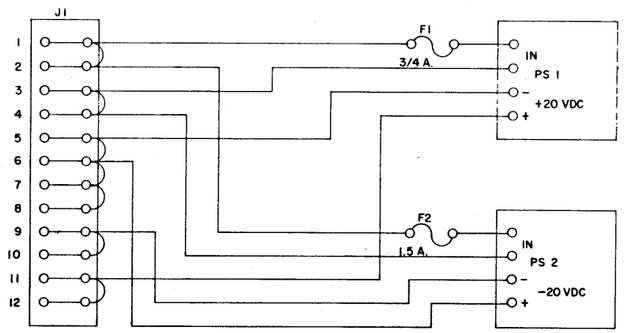
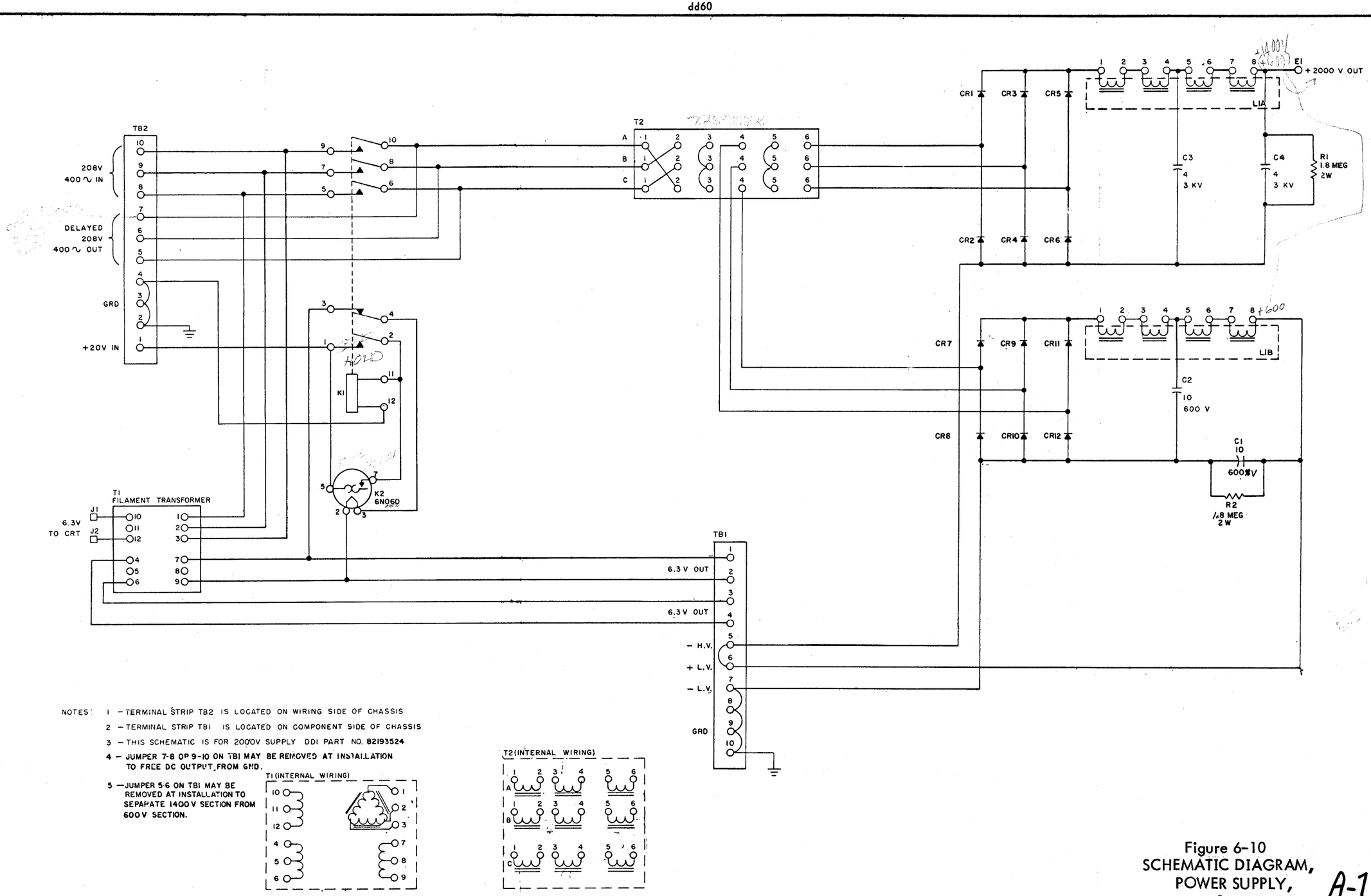


Figure 6-9
SCHEMATIC DIAGRAM,
±20-VOLT
POWER SUPPLY



NOTES:

1 – TERMINAL STRIP TB2 IS LOCATED ON WIRING SIDE OF CHASSIS

2 – TERMINAL STRIP TB1 IS LOCATED ON COMPONENT SIDE OF CHASSIS

3 – THIS SCHEMATIC IS FOR 2000V SUPPLY DDI PART NO. 82193524

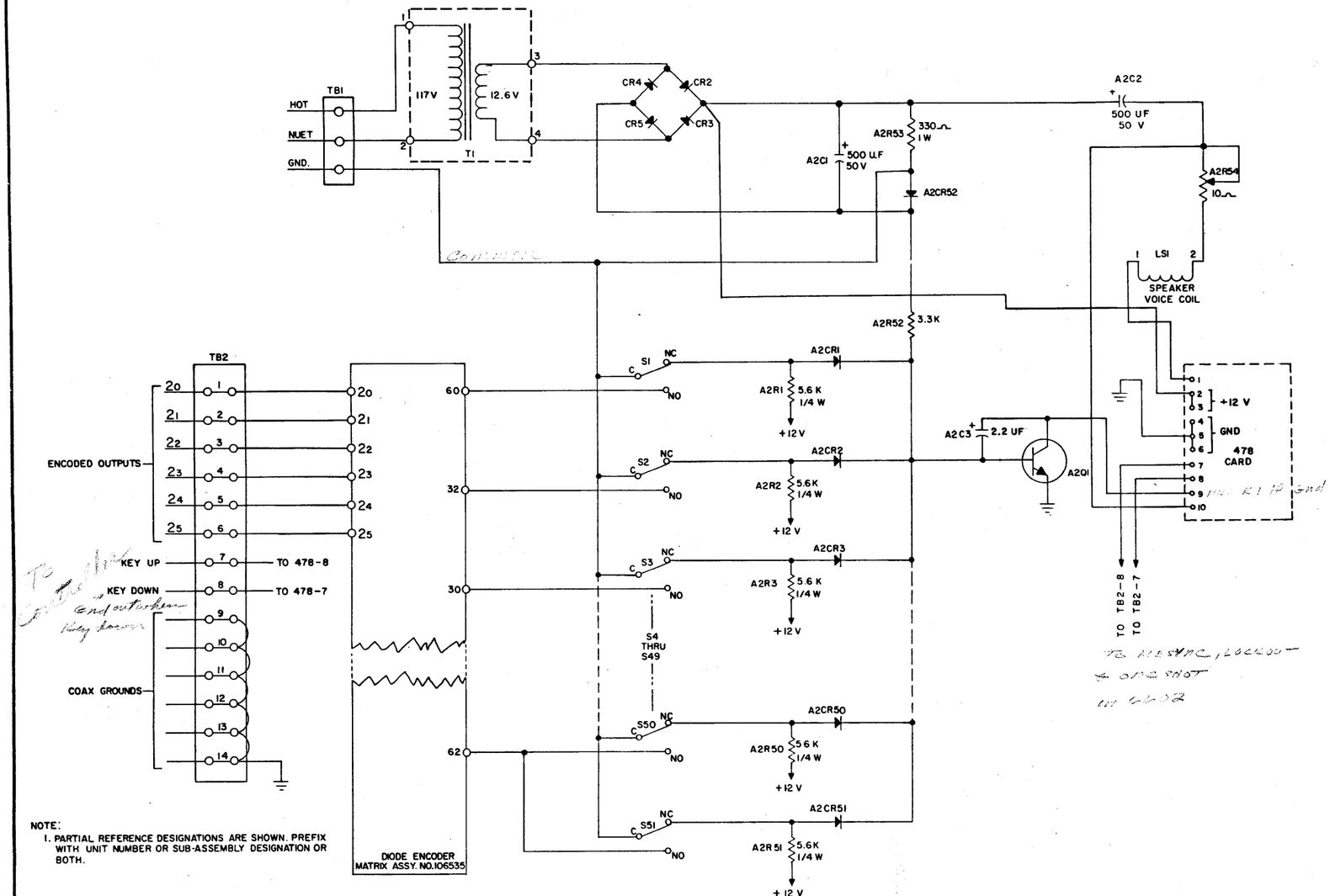
4 – JUMPER 7-8 OR 9-10 ON TB1 MAY BE REMOVED AT INSTALLATION TO FREE DC OUTPUT FROM GND.

5 – JUMPER 5-6 ON TB1 MAY BE REMOVED AT INSTALLATION TO SEPARATE 1400 V SECTION FROM 600 V SECTION.

A 82193530

Figure 6-10
SCHEMATIC DIAGRAM, POWER SUPPLY, 2 KV

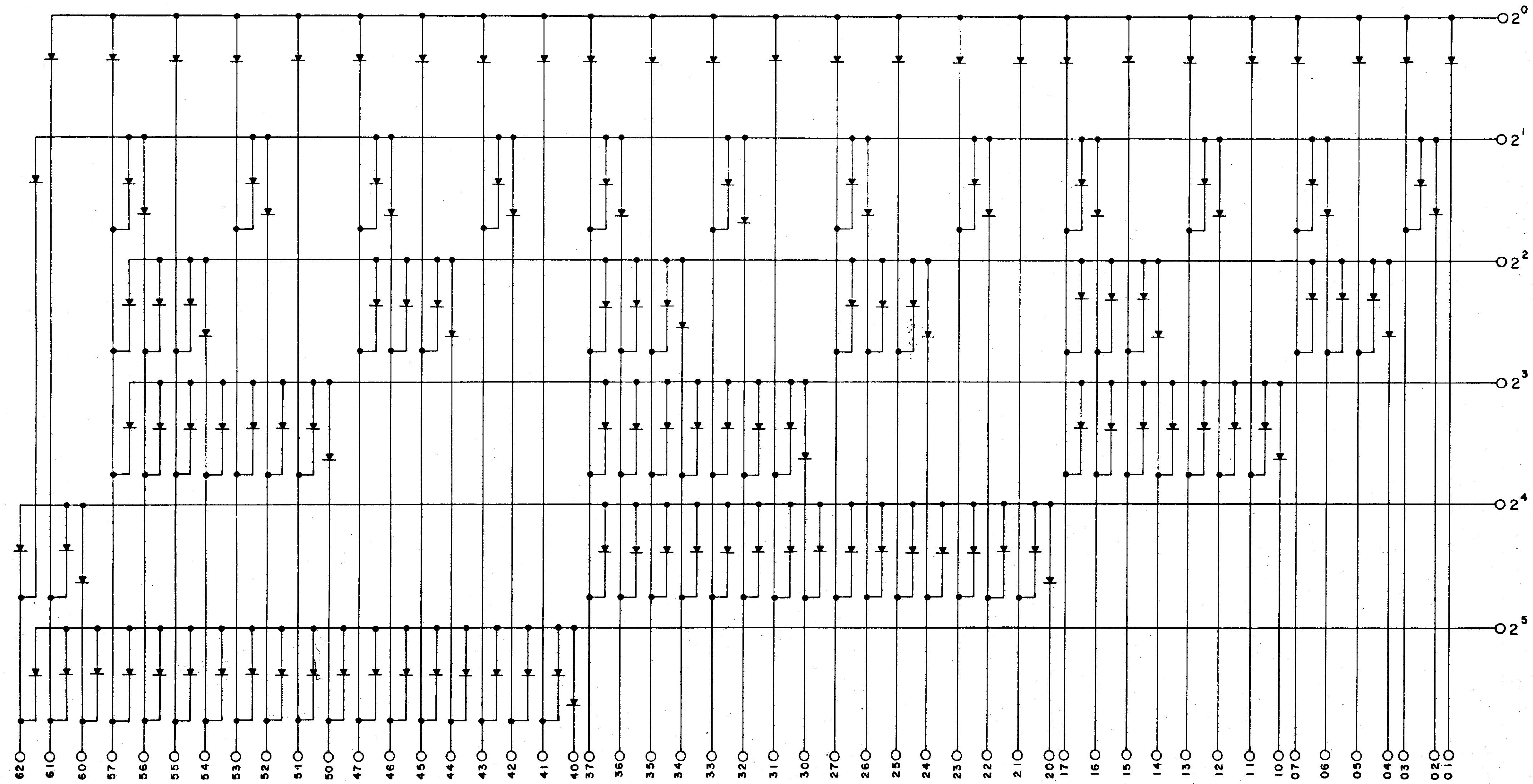
A-1



NOTE:
1. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN. PREFIX WITH UNIT NUMBER OR SUB-ASSEMBLY DESIGNATION OR BOTH.

DWG. NO. 107401

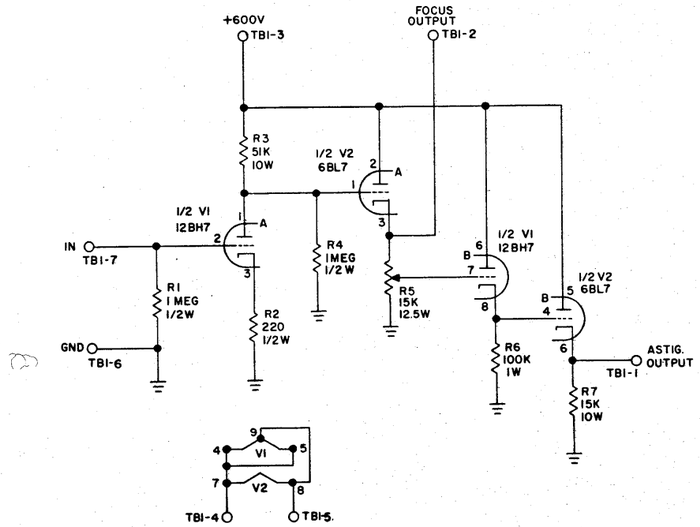
Figure 6-11
SCHEMATIC DIAGRAM,
KEYBOARD



UNLESS NOTED ALL DIODES ARE 034E91 CR1-CR138

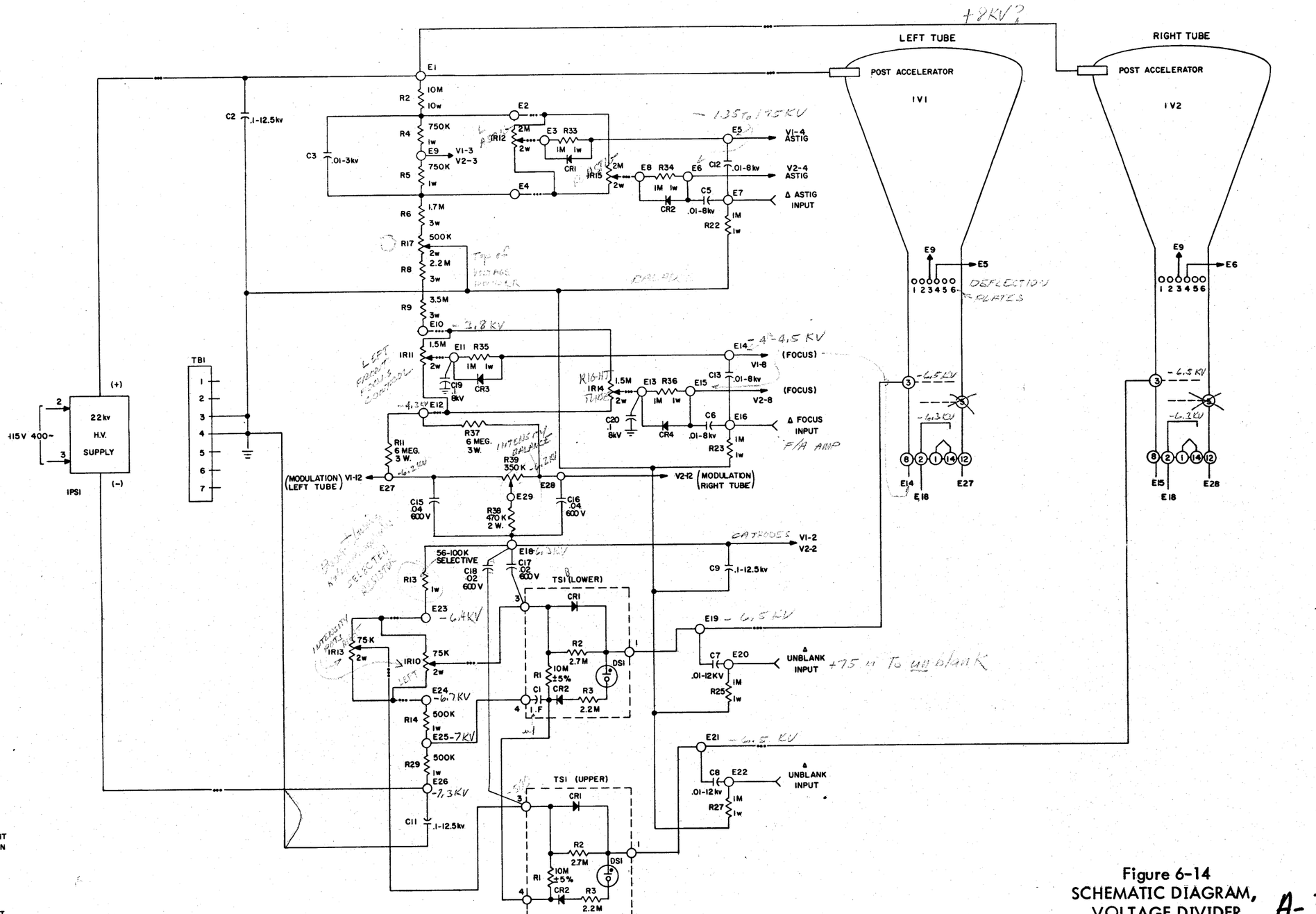
106533

Figure 6-12
SCHEMATIC DIAGRAM,
DIODE ENCODER

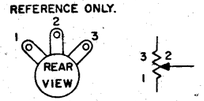


NOTE:
ALL GROUNDS ARE COMMON.

Figure 6-13
SCHEMATIC DIAGRAM,
FOCUS AND ASTIGMATISM
CORRECTION AMPLIFIER



4. IRI2, RI7, IRII, IRI4, IRIO, IRI3, IRI5 TERMINAL NO'S. FOR WIRING REFERENCE ONLY.



3. —•••— DENOTES WIRE TO COMPONENT WHICH DOES NOT LIE PHYSICALLY ON THIS ASSEMBLY.

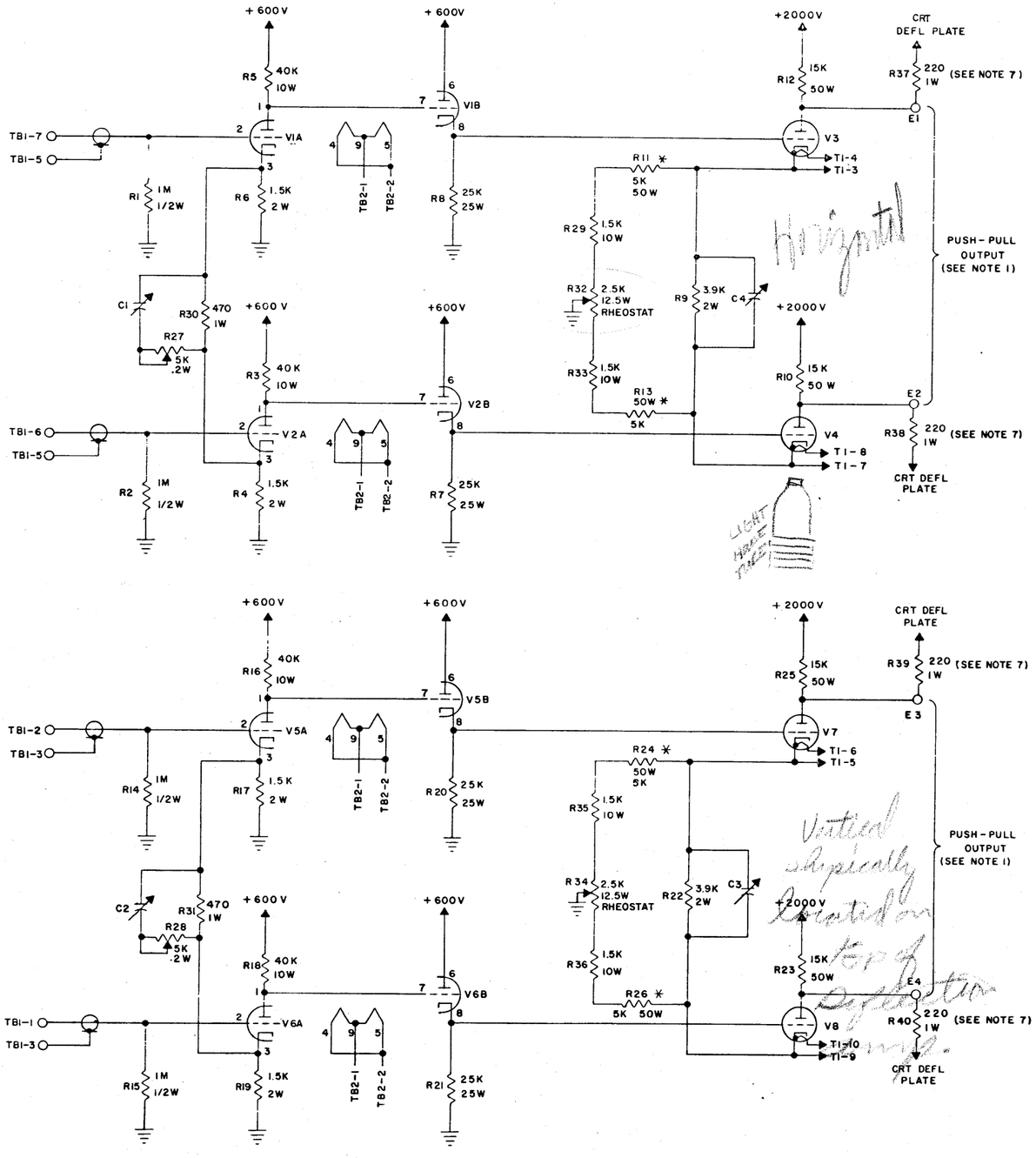
2. CRT AND POWER SUPPLY ARE NOT PART OF THIS ASSEMBLY, SHOWN FOR CONNECTIONS ONLY.

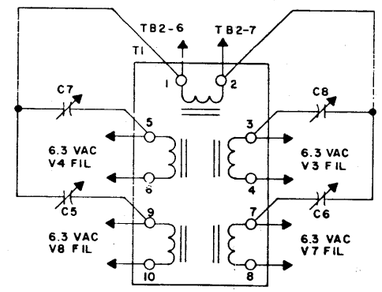
1. IRIO, IRII, IRI2, IRI3, IRI4, IRI5 DO NOT LIE PHYSICALLY ON THIS ASSEMBLY.

Figure 6-14
SCHEMATIC DIAGRAM, VOLTAGE DIVIDER A-3

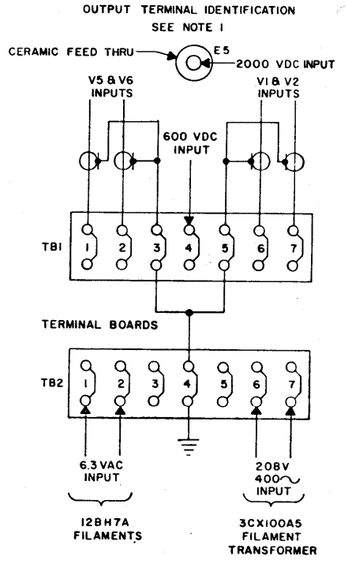
E 106202

6-27/28





TYPICAL ELECTRICAL CONNECTION OF TRIMMER CAPACITORS



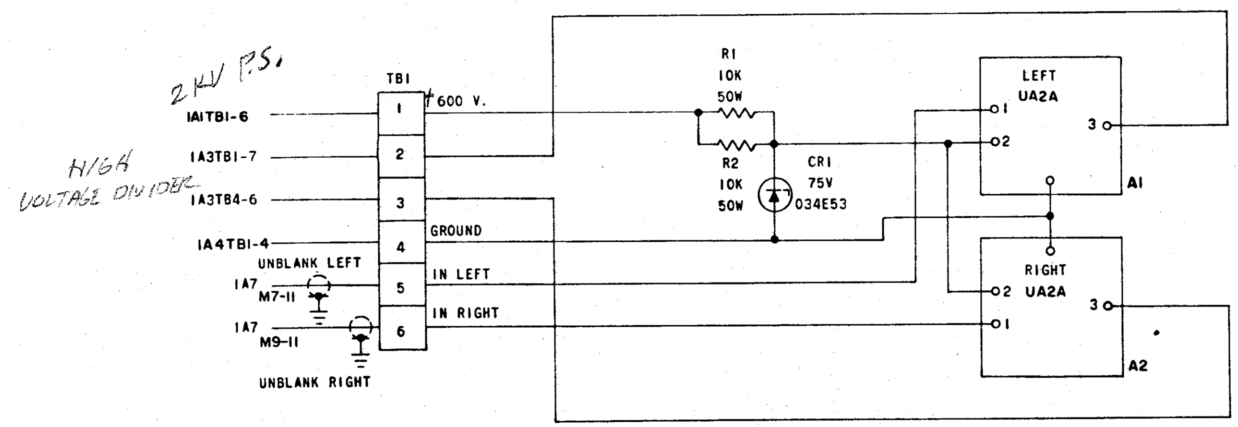
TUBE TYPE	V-NUMBERS
12 BH7A	1, 2, 5, 6
3CX100A5	3, 4, 7, 8

NOTE:
1. THE OUTPUT TERMINALS E1-E4 OF THE DEFLECTION AMPLIFIER ARE THE SCREWS ON THE COOLING HOODS OF THE 3CX100A5'S.
2. TRIMMERS C1 & C2 ARE 1400MMF TO 3055MMF.
3. TRIMMERS C3 & C4 ARE 55MMF TO 300MMF.
4. TRIMMERS C5, C6, C7, & C8 ARE .8MMF TO 13MMF PISTON CAPS.
5. TIMES ** MI1193 COAX (4 PLACES).
6. * NON-IND. TYPE
7. R37 THRU R40 ARE PARASITIC SUPPRESSOR RESISTORS IN SERIES WITH THE LEADS TO THE CRT DEFLECTION PLATES.

REV A
SPEC. NO. 106589

Figure 6-15
SCHEMATIC DIAGRAM,
DEFLECTION AMPLIFIER

SYM.	E.C.O.	DESCRIPTION	DATE	APPROVAL
A	581	CHANGED PER ECO 581	3-13-?	



107991

Figure 6-16
SCHEMATIC DIAGRAM,
UNBLANK AMPLIFIER A10

SECTION VII

PARTS DATA

This section contains reference designations, the provisioning parts list, vendors listing, and illustrated parts breakdown for the Display Console. All repairable and replaceable electrical assemblies and parts are listed.

REFERENCE DESIGNATIONS.

Figure 7-1 is a block diagram showing each assembly in the Display Console by alphanumerical reference. Reference designations shown are partial and should be prefixed by the unit number.

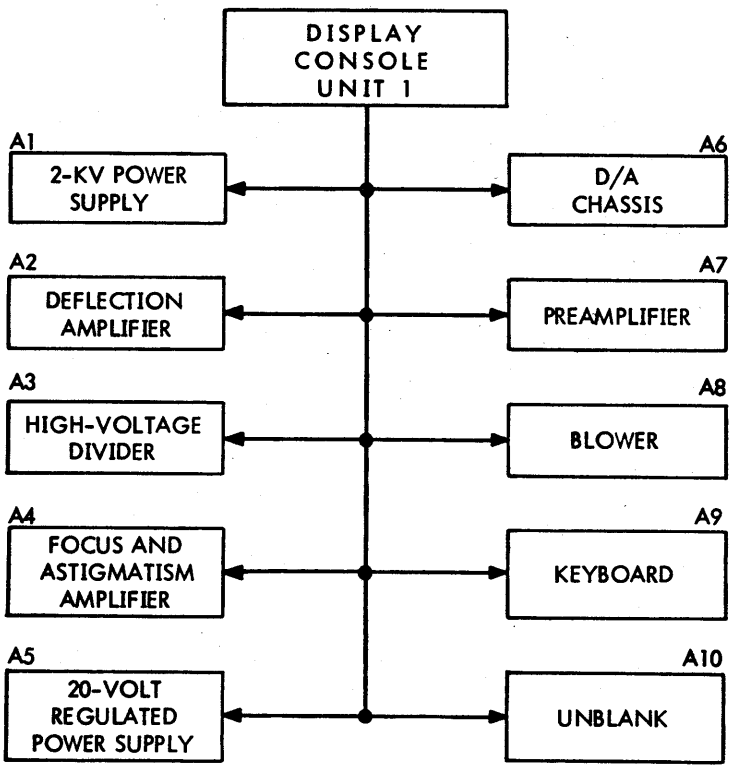
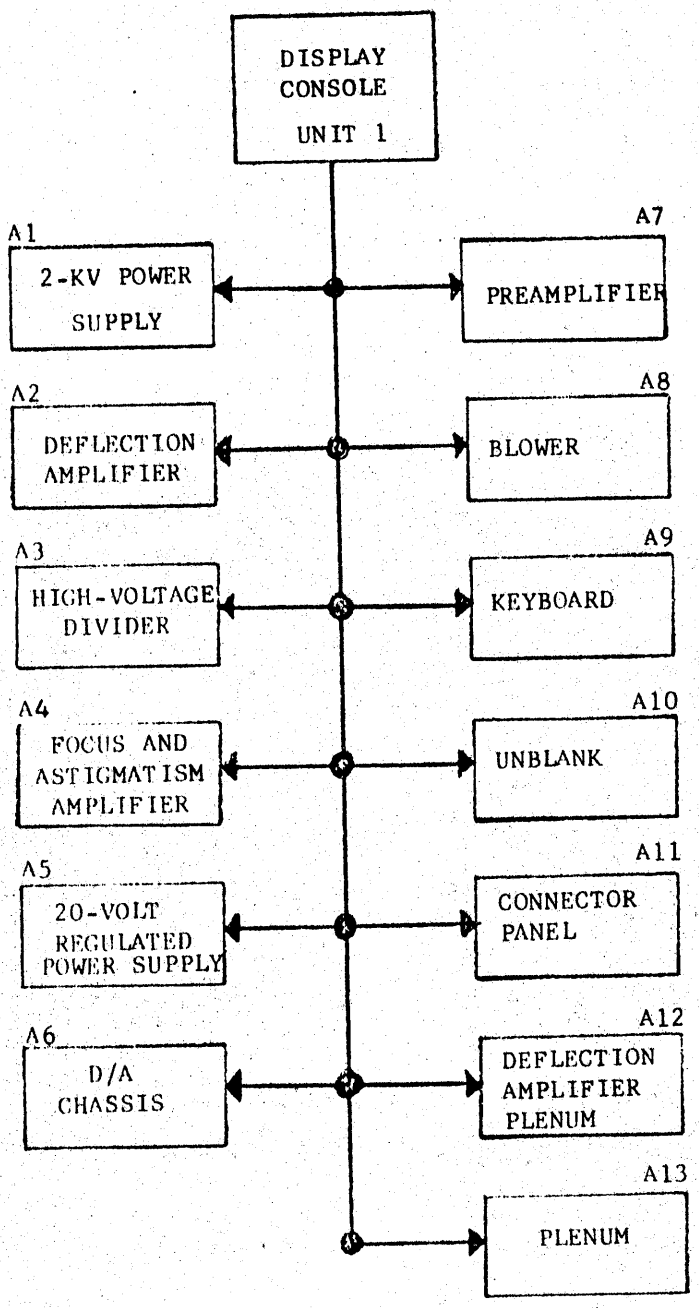


Figure 7-1. Reference Designations



Change to Reference Designations shown on page 7-1.

PROVISIONING PARTS LIST.

The provisioning parts list gives all replaceable parts in the Display Console listed in order by reference designation. Refer to the illustrated parts breakdown for a graphic representation of the parts locations. Meanings of columns on the provisioning parts list are as follows.

(a) Assembly Reference — lists each assembly and subassembly by reference designation in alphanumeric order.

(b) Symbol — schematic symbol for parts located on a unit or subassembly.

(c) Mfrs. Part Number — lists the part number given to a part by the controlling manufacturer.

(d) Description — contains a brief description and gives important details of each electrical part.

(e) Mfrs. Code — lists the 5-digit federal manufacturer's code assigned to each manufacturer supplying the government. Table 7-1 cross-references all manufacturers' codes to the manufacturers.

(f) Unit Quantity — gives the total quantity of each part per next higher order assembly.

(g) DDI P/N — lists the Data Display part number for each part. Use this number when ordering replacement or spare parts from Data Display.

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PROVISIONING PARTS LIST

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Assembly Reference	Symbol	Mfrs. Part Number (or FSN)	Description	Mfrs. Code	Unit Quantity	DDI P/N
	1	14004000	CONSOLE ASSEMBLY dd 60B	15920	1	14004000

CONTROL DATA

Prepared by P. Schoenack Date 6/1/67
Checked S. Lund 6/1/67
Approved DMP 6-2-67

PROVISIONING PARTS LIST

PPL 14004000 Rev .

Sheet 1 of 3 Sheets

Customer
Contract No.

Assembly Reference	Symbol	Mfrs Part Number (or FSN)	Description	Mfrs Code	Unit Qty	Qty Recm		Unit Price $	Extended Unit Price $	CDC No
	1	14004000	CONSOLE ASSEMBLY dd 60B	15920	1					14004000

7-3

DD 155

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Assembly Reference	Symbol	Mfrs. Part Number (or FSN)	Description	Mfrs. Code	Unit Quantity	DDI P/N
1	A1	82193524	POWER SUPPLY ASSEMBLY, 2000 Volt-wired	15920	1	82193524
A1	C1	TJU6100	CAP., FXD, PAPER; 10uf 600 vdcw	14655	2	51000966
A1	C2		SAME AS A1C1			
A1	C3	LK30-405	CAP., FXD, P DIELECTRIC; 4uf 3K vdcw	99120	2	51504700
A1	C4		SAME AS A1C3			
A1	CR1	E-721	SEMICONDUCTOR DEVICE, DIODE: 2kv Si	13327	12	51505000
A1	CR2		SAME AS A1CR1			
A1	CR3		SAME AS A1CR1			
A1	CR4		SAME AS A1CR1			
A1	CR5		SAME AS A1CR1			
A1	CR6		SAME AS A1CR1			
A1	CR7		SAME AS A1CR1			
A1	CR8		SAME AS A1CR1			
A1	CR9		SAME AS A1CR1			
A1	CR10		SAME AS A1CR1			
A1	CR11		SAME AS A1CR1			
A1	CR12		SAME AS A1CR1			
A1	J1	718S21	CONNECTOR, RECP, ELEC; Black 5 amp 1 soc	74545	2	51002070
A1	J2		SAME AS A1J1			
A1	K1	22CPX-108	RELAY, ARMATURE; 5 spst, 24vdc coil	94696	1	51001730
A1	K2	6N060	RELAY, THERMAL; Octal 6V, no 60 sec dly	70563	1	51001720
A1	L1	S3256A	REACTOR; 4 sect. filter choke 75mh .25A	80023	2	51002960
A1	L2		SAME AS A1L1			
A1	R1	MVX-2	RESISTOR, FIXED, FILM; 1.8 megohms 5% 2W	75042	1	51000173

5A999

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Assembly Reference	Symbol	Mfrs. Part Number (or FSN)	Description	Mfrs. Code	Unit Quantity	DDI P/N
A1	R2	MVX-2	RESISTOR, FIXED, FILM; 800K 5% 2W	75042	1	51000533
A1	T1	S2839A	TRANSFORMER, STEP-DN; 208/6.3V ct 3 sec	80023	1	51001449
A1	T2	S3514	XFMER, STEP-UP & STEP-DN; 208V/mult out	80023	1	51001451
A1	TB1	10-141	TERMINAL BOARD; 10 terminals #6-32 screw	75173	2	51001857
A1	TB2		SAME AS A1TB1			
A1	XK1	77MIP12	SOCKET, ELECTRON TUBE; Bakelite 12 pin	02660	1	51001770
A1	XK2	338PHSPTD	SOCKET, ELECTRON TUBE; Ceramic octal sdl	91662	1	51001765

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Assembly Reference	Symbol	Mfrs. Part Number (or FSN)	Description	Mfrs. Code	Unit Quantity	DDI P/N
1	A2	82193728	DEFLECTION AMPLIFIER ASSY, WIRED	15920	1	82193728
A2	A1	82192451	PLENUM ASSY DEFL. AMPL.	15920	1	82192451
A2A1	S1	2A	SWITCH, AIRFLOW; Spdt, 5 amps @ 250 vac	82877	1	51001499
A2	C1	315	CAP., VAR, MICA; 1400-3055 uuf 250 vdcw	84171	2	51001087
A2	C2		SAME AS A2C1			
A2	C3	427	CAP., VAR, MICA; 55 to 300 uuf 175 vdcw	84171	2	51001071
A2	C4		SAME AS A2C3			
A2	C5	VC54G	CAP., VAR, GLASS; 0.8-13 uuf 2500 vdcw	73899	4	51001206
A2	C6		SAME AS A2C5			
A2	C7		SAME AS A2C5			
A2	C8		SAME AS A2C5			
A2	R1	EB1051	RESISTOR, FXD, COMP; 1 megohm 10% 1/2W	01121	4	51000367
A2	R2		SAME AS A2R1			
A2	R3	1770	RESISTOR, FIXED, WIREWOUND; 40K 10% 10W	44655	4	51000157
A2	R4	HB1521	RESISTOR, FXD, COMPOSITION; 1.5K 10% 2W	01121	4	51000365
A2	R5		SAME AS A2R3			
A2	R6		SAME AS A2R4			
A2	R7	0219	RESISTOR, FIXED, WIREWOUND; 25K 5% 25W	44655	4	51000357
A2	R8		SAME AS A2R7			
A2	R9	HB3921	RESISTOR, FXD, COMPOSITION; 3.9K 10% 2W	01121	2	51000366
A2	R10	0416	RESISTOR, FIXED, WIREWOUND; 15K 5% 50W	44655	4	51000161
A2	R11	2018	RESISTOR, FIXED, WIREWOUND; 5K 5% 50W	44655	4	51000604
A2	R12		SAME AS A2R10			
A2	R13		SAME AS A2R11			

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Assembly Reference	Symbol	Mfrs. Part Number (or FSN)	Description	Mfrs. Code	Unit Quantity	DDI P/N
A2	R14		SAME AS A2R1			
A2	R15		SAME AS A2R1			
A2	R16		SAME AS A2R3			
A2	R17		SAME AS A2R4			
A2	R18		SAME AS A2R3			
A2	R19		SAME AS A2R4			
A2	R20		SAME AS A2R7			
A2	R21		SAME AS A2R7			
A2	R22		SAME AS A2R9			
A2	R23		SAME AS A2R10			
A2	R24		SAME AS A2R11			
A2	R25		SAME AS A2R10			
A2	R26		SAME AS A2R11			
A2	R27	48M-9-5000	RESISTOR, VARIABLE; Comp 1kg 5K 10% 1/5W	12697	2	51001386
A2	R28		SAME AS A2R27			
A2	R29	1740	RESISTOR, FIXED, WIREWOUND; 1.5K 5% 10W	44655	4	51000620
A2	R30	GB4711	RESISTOR, FIXED, COMP; 470 ohms 10% 1W	01121	2	51000315
A2	R31		SAME AS A2R30			
A2	R32	W0121	RHEOSTAT; WW, 2.5K, 12.5 Watts 0.071 amp	44655	2	51001431
A2	R33		SAME AS A2R29			
A2	R34		SAME AS A2R32			
A2	R35		SAME AS A2R29			
A2	R36		SAME AS A2R29			
A2	R37	EB2211	RESISTOR, FXD, COMP; 220 ohms 10% 1/2W	01121	4	51000426

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Assembly Reference	Symbol	Mfrs. Part Number (or FSN)	Description	Mfrs. Code	Unit Quantity	DDI P/N
A2	R38		SAME AS A2R37			
A2	R39		SAME AS A2R37			
A2	R40		SAME AS A2R37			
A2	T1	S3874	XFMER, PWR, STEP-DN; Fil 208/6 V	80023	1	51001455
A2	TB1	604-3	TERMINAL BOARD; 3 terminals #12-32 screw	75382	2	51001878
A2	TB2		SAME AS A2TB1			
A2	TB3	82192506	COMPONENT BOARD ASSEMBLY, DEFLECTION AMPLIFIER	15920	2	82192506
A2	TB4		SAME AS A2TB3			
A2	TB5	82192507	COMPONENT BOARD ASSEMBLY, DEFLECTION AMPLIFIER	15920	1	82192507
A2	V1	12BH7A	ELECTRON TUBE; Med-mu twin-triode 9-pin	86684	4	51001919
A2	V2		SAME AS A2V1			
A2	V3	3CX100A5	ELECTRON TUBE; Pwr grid triode, clip mtg	08594	4	51001899
A2	V4		SAME AS A2V3			
A2	V5		SAME AS A2V1			
A2	V6		SAME AS A2V1			
A2	V7		SAME AS A2V3			
A2	V8		SAME AS A2V3			
A2	XV1	176PHSPTD	SOCKET, ELECTRON TUBE; Cer 9 pin w/shld	91662	4	51001767
A2	XV2		SAME AS A2XV1			
A2	XV3		NOT USED IN THIS EQUIPMENT			
A2	XV4		NOT USED IN THIS EQUIPMENT			
A2	XV5		SAME AS A2XV1			
A2	XV6		SAME AS A2XV1			
A2	XV7		NOT USED IN THIS EQUIPMENT			
A2	XV8		NOT USED IN THIS EQUIPMENT			

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Assembly Reference	Symbol	Mfrs. Part Number (or FSN)	Description	Mfrs. Code	Unit Quantity	DDI P/N
1	A3	82193635	VOLTAGE DIVIDER ASSY, WIRED	15920	1	82193635
A3	A1	82199475	CIRCUIT CARD ASSEMBLY; Type TS1	15920	1	82199475
A3A1	C1	5GA-T15	CAP., FXD, CERAMIC; 150 uuf 1000 vdcw	00656	1	51000987
A3A1	CR1	D1-46	SEMICONDUCTOR DEVICE, DIODE; 600V rect.	12060	2	51001250
A3A1	CR2		SAME AS A3A1CR1			
A3A1	DS1	NE2E	LAMP, GLOW; Neon, 65V 1/10W	71744	1	51003335
A3A1	R1	MVX-1	RESISTOR, FXD, FILM; 10 mego 5% 1W	75042	1	51000482
A3A1	R2	GB2751	RESISTOR, FXD, COMP; 2.7 mego 10% 1W	01121	1	51000371
A3A1	R3	GB2251	RESISTOR, FXD, COMP; 2.2 mego 10% 1W	01121	1	51000545
A3	A2	82199990	CIRCUIT CARD ASSEMBLY; Type TS1B	15920	1	82199990
A3A2	CR1	D1-46	SEMICONDUCTOR DEVICE, DIODE; 600V rect.	12060	2	51001250
A3A2	CR2		SAME AS A3A2CR1			
A3A2	DS1	NE2E	LAMP, GLOW; Neon, 65V 1/10W	71744	1	51003335
A3A2	R1	MVX-1	RESISTOR, FXD, FILM; 10 mego 5% 1W	75042	1	51000482
A3A2	R2	GB2751	RESISTOR, FXD, COMP; 2.7 mego 10% 1W	01121	1	51000371
A3A2	R3	GB2251	RESISTOR, FXD, COMP; 2.2 mego 10% 1W	01121	1	51000545
A3	C1		ITEM DELETED			
A3	C2	X0C12.5C01	CAP., FXD, PAPER; .1 uf 12500 vdcw	16727	3	51001035
A3	C3	B161Y	CAP., FXD, PAPER; .01 uf 3000 vdcw	00656	1	51001196
A3	C4		ITEM DELETED			
A3	C5	82192158	CAPACITOR AND MOUNT ASSY, 8 KVDC	15920	4	82192158
A3	C6		SAME AS A3C5			
A3	C7	82192159	CAPACITOR AND MOUNT ASSY, 15 KVDC	15920	2	82192159
A3	C8		SAME AS A3C7			

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Assembly Reference	Symbol	Mfrs. Part Number (or FSN)	Description	Mfrs. Code	Unit Quantity	DDI P/N
A3	C9		SAME AS A3C2			
A3	C10		ITEM DELETED			
A3	C11		SAME AS A3C2			
A3	C12		SAME AS A3C5			
A3	C13		SAME AS A3C5			
A3	C14		ITEM DELETED			
A3	C15	DD-403	CAP., FXD, CERAMIC; .04 uf 600 vdcw	71590	2	51001115
A3	C16		SAME AS A3C15			
A3	C17	DD-203	CAP., FXD, CERAMIC; .02 uf 600 vdcw	71590	2	51001089
A3	C18		SAME AS A3C17			
A3	CR1	D1-46	SEMICONDUCTOR DEVICE, DIODE; 600V rect.	12060	4	51001250
A3	CR2		SAME AS A3CR1			
A3	CR3		SAME AS A3CR1			
A3	CR4		SAME AS A3CR1			
A3	R1		ITEM DELETED			
A3	R2	MVD-15	RESISTOR, FIXED, FILM; 10 mego 10W 5%	75042	1	51007629
A3	R3		ITEM DELETED			
A3	R4	GB7541	RESISTOR, FIXED, COMP; 750K 10% 1W	01121	2	51000624
A3	R5		SAME AS A3R4			
A3	R6	MVX-3	RESISTOR, FIXED, FILM; 1.7 megohm 5% 3W	75042	1	51000215
A3	R7		ITEM DELETED			
A3	R8	MVX-3	RESISTOR, FIXED, FILM; 2.2 megohms 5% 3W	75042	1	51000185
A3	R9	MVX-3	RESISTOR, FIXED, FILM; 3.5 megohms 5% 3W	75042	1	51000190
A3	R10		ITEM DELETED			

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Assembly Reference	Symbol	Mfrs. Part Number (or FSN)	Description	Mfrs. Code	Unit Quantity	DDI P/N
A3	R11	MVX-2	RESISTOR, FIXED, FILM; 6.0 megohms 5% 2W	75042	2	51000179
A3	R12		ITEM DELETED			
A3	R13	GB5635	RESISTOR, FIXED, COMP; 56K 5% 1W	01121	1	51000539
A3	R14	MVX-1	RESISTOR, FIXED, FILM; 500 kilohms 5% 1W	75042	2	51000164
A3	R15		ITEM DELETED			
A3	R16		ITEM DELETED			
A3	R17	CU5041	RESISTOR, VARIABLE; Comp 1in 500K 10% 2W	44655	1	51001378
A3	R18		ITEM DELETED			
A3	R19		ITEM DELETED			
A3	R20		ITEM DELETED			
A3	R21		ITEM DELETED			
A3	R22	GB1051	RESISTOR, FIXED, COMP; 1 megohm 10% 1W	01121	8	51000219
A3	R23		SAME AS A3R22			
A3	R24		ITEM DELETED			
A3	R25		SAME AS A3R22			
A3	R26		ITEM DELETED			
A3	R27		SAME AS A3R22			
A3	R28		ITEM DELETED			
A3	R29		SAME AS A3R14			
A3	R30		ITEM DELETED			
A3	R31		ITEM DELETED			
A3	R32		ITEM DELETED			
A3	R33		SAME AS A3R22			
A3	R34		SAME AS A3R22			

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A3	R11	MVX-2	RESISTOR, FIXED, FILM; 6.0 megohms 5% 2W	75042	2	51000179
A3	R12		ITEM DELETED			
A3	R13	GB5635	RESISTOR, FIXED, COMP; 56K 5% 1W	01121	1	51000539
A3	R14	MVX-1	RESISTOR, FIXED, FILM; 500 kilohms 5% 1W	75042	2	51000164
A3	R15		ITEM DELETED			
A3	R16		ITEM DELETED			
A3	R17	CU5041	RESISTOR, VARIABLE; Comp lin 500K 10% 2W	44655	1	51001378
A3	R18		ITEM DELETED			
A3	R19		ITEM DELETED			
A3	R20		ITEM DELETED			
A3	R21		ITEM DELETED			
A3	R22	GB1051	RESISTOR, FIXED, COMP; 1 megohm 10% 1W	01121	8	51000219
A3	R23		SAME AS A3R22			
A3	R24		ITEM DELETED			
A3	R25		SAME AS A3R22			
A3	R26		ITEM DELETED			
A3	R27		SAME AS A3R22			
A3	R28		ITEM DELETED			
A3	R29		SAME AS A3R14			
A3	R30		ITEM DELETED			
A3	R31		ITEM DELETED			
A3	R32		ITEM DELETED			
A3	R33		SAME AS A3R22			
A3	R34		SAME AS A3R22			

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A3	R35		SAME AS A3R22			
A3	R36		SAME AS A3R22			
A3	R37		SAME AS A3R11			
A3	R38	HB4741	RESISTOR, FIXED, COMP; 470K 10% 2W	01121	1	51000630
A3	R39	CU3541	RESISTOR, VARIABLE; Comp lin 350K 10% 2W	44655	1	51001351
A3	TB1	GFT-7	TERMINAL BOARD; 7 terminals, feedthru	73631	1	51001868

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A3	R35		SAME AS A3R22			
A3	R36		SAME AS A3R22			
A3	R37		SAME AS A3R11			
A3	R38	HB4741	RESISTOR, FIXED, COMP; 470K 10% 2W	01121	1	51000630
A3	R39	CU3541	RESISTOR, VARIABLE; Comp lin 350K 10% 2W	44655	1	51001351
A3	TB1	GFT-7	TERMINAL BOARD; 7 terminals, feedthru	73631	1	51001868

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1	A4	82192464	FOCUS AND ASTIGMATISM CORR AMPL ASSY	15920	1	82192464
A4	R1	EB1051	RESISTOR, FIXED, COMP; 1 megohm 10% 1/2W	01121	2	51000367
A4	R2	EB2211	RESISTOR, FIXED, COMP; 220 ohms 10% 1/2W	01121	1	51000426
A4	R3	3843	RESISTOR, FIXED, WIRE WOUND; 51K 5% 10W	44655	1	51000600
A4	R4		SAME AS A4R1			
A4	R5	4193	RHEOSTAT; Ww, 15 kilohms 12.5W 0.026A	44655	1	51001434
A4	R6	GB1041	RESISTOR, FIXED, COMP; 100K 10% 1W	01121	1	51000508
A4	R7	3830	RESISTOR, FIXED, WIRE WOUND; 15K 5% 10W	44655	1	51000599
A4	TB1	GFT-7	TERMINAL BOARD; 7 terminals, feedthru	73631	1	51001868
A4	V1	12BH7A	ELECTRON TUBE; Med-mu twin triode, 9 pin	86684	1	51001919
A4	V2	6BL7	ELECTRON TUBE; Med-mu twin triode, octal	86684	1	51001902
A4	XV1	176PHSPTD	SOCKET, ELECTRON TUBE; Cer 9 pin w/shld	91662	1	51001767
A4	XV2	338PHSPTD	SOCKET, ELECTRON TUBE; Ceramic octal sdl	91662	1	51001765

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1	A5	82193745	CHASSIS 20 VOLT REG. P.S. ASSEMBLY	15920	1	82193745
A5	F1	31301.5	FUSE, CARTRIDGE; 1.5A @ 125V, 3AG SB	75915	1	51001808
A5	F2	313.750	FUSE, CARTRIDGE; .75A @ 125V, 3AG SB	75915	1	51001833
A5	PS1	M-21.2-3.0A	POWER SUPPLY: Reg 21.2 vdc @ 3 amps	13850	2	51003645
A5	PS2		SAME AS A5PS1			
A5	TB1	14-141	TERMINAL BOARD; 14 terminals #6-32 screw	75173	1	51001855
A5	XF1	HKL-X	FUSEHOLDER; Neon ind clr lens 90-300V	71400	2	51002783
A5	XF2		SAME AS A5XF1			

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1	A6	61004000	D/A CHASSIS ASSY WIRED	15920	1	61004000
A6	C1	823-BN	CAP., VAR, CERAMIC; 10-100 uuf 500 vdcw	71590	2	51001006
A6	C2		SAME AS A6C1			
A6	J1	A2259	CONN, RECP, ELEC; Ckt card, blk 2x15 soc	16512	29	51000118
A6	J2	M200-5500	CONN, RECP, ELEC; Ckt card, blk 2x15 soc	16512	8	51006126
A6	J3		SAME AS A6J1			
A6	J4		SAME AS A6J2			
A6	J5		SAME AS A6J1			
A6	J6		SAME AS A6J2			
A6	J7		SAME AS A6J1			
A6	J8		SAME AS A6J2			
A6	J9		SAME AS A6J1			
A6	J10		SAME AS A6J2			
A6	J11		SAME AS A6J1			
A6	J12		SAME AS A6J2			
A6	J13		SAME AS A6J1			
A6	J14		SAME AS A6J1			
A6	J15		SAME AS A6J1			
A6	J16		SAME AS A6J1			
A6	J17		SAME AS A6J1			
A6	J18		SAME AS A6J1			
A6	J19		SAME AS A6J1			
A6	J20		SAME AS A6J1			
A6	J21		SAME AS A6J1			
A6	J22		SAME AS A6J1			

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A6	J23		SAME AS A6J1			
A6	J24		SAME AS A6J1			
A6	J25		SAME AS A6J2			
A6	J26		SAME AS A6J2			
A6	J27		SAME AS A6J1			
A6	J28		SAME AS A6J1			
A6	J29		SAME AS A6J1			
A6	J30		SAME AS A6J1			
A6	J31		SAME AS A6J1			
A6	J32		SAME AS A6J1			
A6	J33		SAME AS A6J1			
A6	J34		SAME AS A6J1			
A6	J35		SAME AS A6J1			
A6	J36		SAME AS A6J1			
A6	J37		SAME AS A6J1			

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A6	J23		SAME AS A6J1			
A6	J24		SAME AS A6J1			
A6	J25		SAME AS A6J2			
A6	J26		SAME AS A6J2			
A6	J27		SAME AS A6J1			
A6	J28		SAME AS A6J1			
A6	J29		SAME AS A6J1			
A6	J30		SAME AS A6J1			
A6	J31		SAME AS A6J1			
A6	J32		SAME AS A6J1			
A6	J33		SAME AS A6J1			
A6	J34		SAME AS A6J1			
A6	J35		SAME AS A6J1			
A6	J36		SAME AS A6J1			
A6	J37		SAME AS A6J1			
A6	R5	EB1511	RESISTOR, FIXED, COMP; 150ohms 10% 1/2W	01121	2	51000344
A6	R6		SAME AS A6R5			
A6	C3	MC80V470AM	CAP., FXD, CERAMIC; 47uuf 100vdcw	00656	2	51000996
A6	C4		SAME AS A6C3			

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1	A7	61008700	PREAMP ASSY	15920	1	61008700
A7	C1	467	CAP., VAR, MICA; 110 to 580 uuf 175 vdcw	84171	2	51001077
A7	C2		SAME AS A7C1			
A7	J1	2340-4	CONN, RECP, ELEC; Ckt card, blk 2x15 soc	16512	6	51003148
A7	J2		SAME AS A7J1			
A7	J3		SAME AS A7J1			
A7	J4		SAME AS A7J1			
A7	J5		SAME AS A7J1			
A7	J6		SAME AS A7J1			

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1	A8	61001036	BLOWER ASSY	15920	1	61001036
A8	B1	BC2918B-11	FAN, CENT.; 115/230V 50/60 cy 1.1/5.5A	92702	1	51007330
A8	C1	P30ZN19	CAP., FXD, MET. PAPER; 40F 600 vdcw	00656	1	51000902
A8	TB1	3-141	TERMINAL BOARD; 3 terminals #6-32 screw	75173	1	51001862

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1	A9	61004200	KEYBOARD ASSEMBLY, WIRED	15920	1	61004200
A9	A1	82193600	CARD ASSEMBLY, DIODE ENCODER	15920	1	82193600
A9A1	CR1	GD460	SEMICONDUCTOR DEVICE, DIODE; 10V Ge	11711	136	51001277
A9A1	CR2		SAME AS A9A1CR1			
A9A1	CR3		SAME AS A9A1CR1			
A9A1	CR4		SAME AS A9A1CR1			
A9A1	CR5		SAME AS A9A1CR1			
A9A1	CR6		SAME AS A9A1CR1			
A9A1	CR7		SAME AS A9A1CR1			
A9A1	CR8		SAME AS A9A1CR1			
A9A1	CR9		SAME AS A9A1CR1			
A9A1	CR10		SAME AS A9A1CR1			
A9A1	CR11		SAME AS A9A1CR1			
A9A1	CR12		SAME AS A9A1CR1			
A9A1	CR13		SAME AS A9A1CR1			
A9A1	CR14		SAME AS A9A1CR1			
A9A1	CR15		SAME AS A9A1CR1			
A9A1	CR16		SAME AS A9A1CR1			
A9A1	CR17		SAME AS A9A1CR1			
A9A1	CR18		SAME AS A9A1CR1			
A9A1	CR19		SAME AS A9A1CR1			
A9A1	CR20		SAME AS A9A1CR1			
A9A1	CR21		SAME AS A9A1CR1			
A9A1	CR22		SAME AS A9A1CR1			
A9A1	CR23		SAME AS A9A1CR1			

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A9A1	CR24		SAME AS A9A1CR1			
A9A1	CR25		SAME AS A9A1CR1			
A9A1	CR26		SAME AS A9A1CR1			
A9A1	CR27		SAME AS A9A1CR1			
A9A1	CR28		SAME AS A9A1CR1			
A9A1	CR29		SAME AS A9A1CR1			
A9A1	CR30		SAME AS A9A1CR1			
A9A1	CR31		SAME AS A9A1CR1			
A9A1	CR32		SAME AS A9A1CR1			
A9A1	CR33		SAME AS A9A1CR1			
A9A1	CR34		SAME AS A9A1CR1			
A9A1	CR35		SAME AS A9A1CR1			
A9A1	CR36		SAME AS A9A1CR1			
A9A1	CR37		SAME AS A9A1CR1			
A9A1	CR38		SAME AS A9A1CR1			
A9A1	CR39		SAME AS A9A1CR1			
A9A1	CR40		SAME AS A9A1CR1			
A9A1	CR41		SAME AS A9A1CR1			
A9A1	CR42		SAME AS A9A1CR1			
A9A1	CR43		SAME AS A9A1CR1			
A9A1	CR44		SAME AS A9A1CR1			
A9A1	CR45		SAME AS A9A1CR1			
A9A1	CR46		SAME AS A9A1CR1			
A9A1	CR47		SAME AS A9A1CR1			
A9A1	CR48		SAME AS A9A1CR1			

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A9A1	CR49		SAME AS A9A1CR1			
A9A1	CR50		SAME AS A9A1CR1			
A9A1	CR51		SAME AS A9A1CR1			
A9A1	CR52		SAME AS A9A1CR1			
A9A1	CR53		SAME AS A9A1CR1			
A9A1	CR54		SAME AS A9A1CR1			
A9A1	CR55		SAME AS A9A1CR1			
A9A1	CR56		SAME AS A9A1CR1			
A9A1	CR57		SAME AS A9A1CR1			
A9A1	CR58		SAME AS A9A1CR1			
A9A1	CR59		SAME AS A9A1CR1			
A9A1	CR60		SAME AS A9A1CR1			
A9A1	CR61		SAME AS A9A1CR1			
A9A1	CR62		SAME AS A9A1CR1			
A9A1	CR63		SAME AS A9A1CR1			
A9A1	CR64		SAME AS A9A1CR1			
A9A1	CR65		SAME AS A9A1CR1			
A9A1	CR66		SAME AS A9A1CR1			
A9A1	CR67		SAME AS A9A1CR1			
A9A1	CR68		SAME AS A9A1CR1			
A9A1	CR69		SAME AS A9A1CR1			
A9A1	CR70		SAME AS A9A1CR1			
A9A1	CR71		SAME AS A9A1CR1			
A9A1	CR72		SAME AS A9A1CR1			
A9A1	CR73		SAME AS A9A1CR1			

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A9A1	CR74		SAME AS A9A1CR1			
A9A1	CR75		SAME AS A9A1CR1			
A9A1	CR76		SAME AS A9A1CR1			
A9A1	CR77		SAME AS A9A1CR1			
A9A1	CR78		SAME AS A9A1CR1			
A9A1	CR79		SAME AS A9A1CR1			
A9A1	CR80		SAME AS A9A1CR1			
A9A1	CR81		SAME AS A9A1CR1			
A9A1	CR82		SAME AS A9A1CR1			
A9A1	CR83		SAME AS A9A1CR1			
A9A1	CR84		SAME AS A9A1CR1			
A9A1	CR85		SAME AS A9A1CR1			
A9A1	CR86		SAME AS A9A1CR1			
A9A1	CR87		SAME AS A9A1CR1			
A9A1	CR88		SAME AS A9A1CR1			
A9A1	CR89		SAME AS A9A1CR1			
A9A1	CR90		SAME AS A9A1CR1			
A9A1	CR91		SAME AS A9A1CR1			
A9A1	CR92		SAME AS A9A1CR1			
A9A1	CR93		SAME AS A9A1CR1			
A9A1	CR94		SAME AS A9A1CR1			
A9A1	CR95		SAME AS A9A1CR1			
A9A1	CR96		SAME AS A9A1CR1			
A9A1	CR97		SAME AS A9A1CR1			
A9A1	CR98		SAME AS A9A1CR1			

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A9A1	CR99		SAME AS A9A1CR1			
A9A1	CR100		SAME AS A9A1CR1			
A9A1	CR101		SAME AS A9A1CR1			
A9A1	CR102		SAME AS A9A1CR1			
A9A1	CR103		SAME AS A9A1CR1			
A9A1	CR104		SAME AS A9A1CR1			
A9A1	CR105		SAME AS A9A1CR1			
A9A1	CR106		SAME AS A9A1CR1			
A9A1	CR107		SAME AS A9A1CR1			
A9A1	CR108		SAME AS A9A1CR1			
A9A1	CR109		SAME AS A9A1CR1			
A9A1	CR110		SAME AS A9A1CR1			
A9A1	CR111		SAME AS A9A1CR1			
A9A1	CR112		SAME AS A9A1CR1			
A9A1	CR113		SAME AS A9A1CR1			
A9A1	CR114		SAME AS A9A1CR1			
A9A1	CR115		SAME AS A9A1CR1			
A9A1	CR116		SAME AS A9A1CR1			
A9A1	CR117		SAME AS A9A1CR1			
A9A1	CR118		SAME AS A9A1CR1			
A9A1	CR119		SAME AS A9A1CR1			
A9A1	CR120		SAME AS A9A1CR1			
A9A1	CR121		SAME AS A9A1CR1			
A9A1	CR122		SAME AS A9A1CR1			
A9A1	CR123		SAME AS A9A1CR1			

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A9A1	CR124		SAME AS A9A1CR1			
A9A1	CR125		SAME AS A9A1CR1			
A9A1	CR126		SAME AS A9A1CR1			
A9A1	CR127		SAME AS A9A1CR1			
A9A1	CR128		SAME AS A9A1CR1			
A9A1	CR129		SAME AS A9A1CR1			
A9A1	CR130		SAME AS A9A1CR1			
A9A1	CR131		SAME AS A9A1CR1			
A9A1	CR132		SAME AS A9A1CR1			
A9A1	CR133		SAME AS A9A1CR1			
A9A1	CR134		SAME AS A9A1CR1			
A9A1	CR135		SAME AS A9A1CR1			
A9A1	CR136		SAME AS A9A1CR1			
1A9	A2	82193611	CARD ASSY, KEYBOARD CIRCUIT	15920	1	82193611
A9A2	C1	TVA-1162	CAP., FXD, ELECT.; 500 uf 15 vdcw	56289	2	51001117
A9A2	C2		SAME AS A9A2C1			
A9A2	C3	150D225X9020A0	CAP., FXD, ELECT.; 2.2 uf 20 vdcw	56289	1	51001155
A9A2	CR1	GD460	SEMICONDUCTOR DEVICE, DIODE; 10V Ge	11711	51	51001277
A9A2	CR2		SAME AS A9A2CR1			
A9A2	CR3		SAME AS A9A2CR1			
A9A2	CR4		SAME AS A9A2CR1			
A9A2	CR5		SAME AS A9A2CR1			
A9A2	CR6		SAME AS A9A2CR1			
A9A2	CR7		SAME AS A9A2CR1			
A9A2	CR8		SAME AS A9A2CR1			

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A9A2	CR9		SAME AS A9A2CR1			
A9A2	CR10		SAME AS A9A2CR1			
A9A2	CR11		SAME AS A9A2CR1			
A9A2	CR12		SAME AS A9A2CR1			
A9A2	CR13		SAME AS A9A2CR1			
A9A2	CR14		SAME AS A9A2CR1			
A9A2	CR15		SAME AS A9A2CR1			
A9A2	CR16		SAME AS A9A2CR1			
A9A2	CR17		SAME AS A9A2CR1			
A9A2	CR18		SAME AS A9A2CR1			
A9A2	CR19		SAME AS A9A2CR1			
A9A2	CR20		SAME AS A9A2CR1			
A9A2	CR21		SAME AS A9A2CR1			
A9A2	CR22		SAME AS A9A2CR1			
A9A2	CR23		SAME AS A9A2CR1			
A9A2	CR24		SAME AS A9A2CR1			
A9A2	CR25		SAME AS A9A2CR1			
A9A2	CR26		SAME AS A9A2CR1			
A9A2	CR27		SAME AS A9A2CR1			
A9A2	CR28		SAME AS A9A2CR1			
A9A2	CR29		SAME AS A9A2CR1			
A9A2	CR30		SAME AS A9A2CR1			
A9A2	CR31		SAME AS A9A2CR1			
A9A2	CR32		SAME AS A9A2CR1			

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CONTRACTOR: DATA DISPLAY, INC.
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Assembly Reference	Symbol	Mfrs. Part Number (or FSN)	Description	Mfrs. Code	Unit Quantity	DDI P/N
A9A2	CR33		SAME AS A9A2CR1			
A9A2	CR34		SAME AS A9A2CR1			
A9A2	CR35		SAME AS A9A2CR1			
A9A2	CR36		SAME AS A9A2CR1			
A9A2	CR37		SAME AS A9A2CR1			
A9A2	CR38		SAME AS A9A2CR1			
A9A2	CR39		SAME AS A9A2CR1			
A9A2	CR40		SAME AS A9A2CR1			
A9A2	CR41		SAME AS A9A2CR1			
A9A2	CR42		SAME AS A9A2CR1			
A9A2	CR43		SAME AS A9A2CR1			
A9A2	CR44		SAME AS A9A2CR1			
A9A2	CR45		SAME AS A9A2CR1			
A9A2	CR46		SAME AS A9A2CR1			
A9A2	CR47		SAME AS A9A2CR1			
A9A2	CR48		SAME AS A9A2CR1			
A9A2	CR49		SAME AS A9A2CR1			
A9A2	CR50		SAME AS A9A2CR1			
A9A2	CR51		SAME AS A9A2CR1			
A9A2	CR52	D1-410/1N3752	SEMICONDUCTOR DEVICE, DIODE; 1kv Si	12060	1	51001269
A9A2	Q1	2N3053	TRANSISTOR; NPN Si TO5 case, High power	02735	1	51509101
A9A2	R1	CB5625	RESISTOR, FIXED, COMP; 5.6K 5% 1/4W	01121	51	51000402
A9A2	R2		SAME AS A9A2R1			
A9A2	R3		SAME AS A9A2R1			
A9A2	R4		SAME AS A9A2R1			

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Assembly Reference	Symbol	Mfrs. Part Number (or FSN)	Description	Mfrs. Code	Unit Quantity	DDI P/N
A9A2	R5		SAME AS A9A2R1			
A9A2	R6		SAME AS A9A2R1			
A9A2	R7		SAME AS A9A2R1			
A9A2	R8		SAME AS A9A2R1			
A9A2	R9		SAME AS A9A2R1			
A9A2	R10		SAME AS A9A2R1			
A9A2	R11		SAME AS A9A2R1			
A9A2	R12		SAME AS A9A2R1			
A9A2	R13		SAME AS A9A2R1			
A9A2	R14		SAME AS A9A2R1			
A9A2	R15		SAME AS A9A2R1			
A9A2	R16		SAME AS A9A2R1			
A9A2	R17		SAME AS A9A2R1			
A9A2	R18		SAME AS A9A2R1			
A9A2	R19		SAME AS A9A2R1			
A9A2	R20		SAME AS A9A2R1			
A9A2	R21		SAME AS A9A2R1			
A9A2	R22		SAME AS A9A2R1			
A9A2	R23		SAME AS A9A2R1			
A9A2	R24		SAME AS A9A2R1			
A9A2	R25		SAME AS A9A2R1			
A9A2	R26		SAME AS A9A2R1			
A9A2	R27		SAME AS A9A2R1			
A9A2	R28		SAME AS A9A2R1			
A9A2	R29		SAME AS A9A2R1			

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A9A2	R30		SAME AS A9A2R1			
A9A2	R31		SAME AS A9A2R1			
A9A2	R32		SAME AS A9A2R1			
A9A2	R33		SAME AS A9A2R1			
A9A2	R34		SAME AS A9A2R1			
A9A2	R35		SAME AS A9A2R1			
A9A2	R36		SAME AS A9A2R1			
A9A2	R37		SAME AS A9A2R1			
A9A2	R38		SAME AS A9A2R1			
A9A2	R39		SAME AS A9A2R1			
A9A2	R40		SAME AS A9A2R1			
A9A2	R41		SAME AS A9A2R1			
A9A2	R42		SAME AS A9A2R1			
A9A2	R43		SAME AS A9A2R1			
A9A2	R44		SAME AS A9A2R1			
A9A2	R45		SAME AS A9A2R1			
A9A2	R46		SAME AS A9A2R1			
A9A2	R47		SAME AS A9A2R1			
A9A2	R48		SAME AS A9A2R1			
A9A2	R49		SAME AS A9A2R1			
A9A2	R50		SAME AS A9A2R1			
A9A2	R51		SAME AS A9A2R1			
A9A2	R52	EB3321	RESISTOR, FIXED, COMP; 3.3K 10% 1/2W	01121	1	51000310
A9A2	R53	GB3311	RESISTOR, FIXED, COMP; 330 ohms 10% 1W	01121	1	51000507
A9A2	R54	WN-100	RESISTOR, VAR; Lin taper ww 10 ohm 5W	71590	1	51001375

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Assembly Reference	Symbol	Mfrs. Part Number (or FSN)	Description	Mfrs. Code	Unit Quantity	DDI P/N
1A9	A3	82198368	CARD ASSEMBLY, 478	15920	1	82198368
A9A3	CR1	GD460	SEMICONDUCTOR DEVICE, DIODE; 10V Ge	11711	1	51001277
A9A3	CR2	D1-410/1N3752	SEMICONDUCTOR DEVICE, DIODE; 1kv Si	12060	2	51001269
A9A3	CR3		SAME AS A9A3CR2			
A9A3	K1	FC11D	RELAY, ARMATURE; Dpdt 12V P.C. Board	77342	1	51001756
A9A3	Q1	2N1529	TRANSISTOR; PNP Ge TO3 case, high power	04713	2	51003102
A9A3	Q2		SAME AS A9A3Q1			
A9A3	R1	CB4721	RESISTOR, FXD, COMP; 4.7K 10% 1/4W	01121	1	51000341
A9A3	R2	GB2205	RESISTOR, FXD, COMP; 22 ohms 5% 1W	01121	1	51000785
A9A3	R3	GB1011	RESISTOR, FXD, COMP; 100 ohms 10% 1W	01121	2	51000425
A9A3	R4		SAME AS A9A3R3			
A9A3	R5	CB1025	RESISTOR, FXD, COMP; 1.0K 5% 1/4W	01121	1	51000262
1A9	CR1		ITEM DELETED			
A9	CR2	1N608	SEMICONDUCTOR DEVICE, DIODE; 100V Si	03508	4	51001280
A9	CR3		SAME AS A9CR2			
A9	CR4		SAME AS A9CR2			
A9	CR5		SAME AS A9CR2			
A9	LS1	25A07	LOUDSPEAKER, PERMANENT MAGNET; 1.5W	74199	1	51002825
A9	S1	1PB833-T2	SWITCH, PUSH; Keyboard type, gold cont	91929	49	51001646
A9	S2		SAME AS A9S1			
A9	S3		SAME AS A9S1			
A9	S4		SAME AS A9S1			
A9	S5		SAME AS A9S1			
A9	S6		SAME AS A9S1			
A9	S7		SAME AS A9S1			

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A9	S8		SAME AS A9S1			
A9	S9		SAME AS A9S1			
A9	S10		SAME AS A9S1			
A9	S11		SAME AS A9S1			
A9	S12		SAME AS A9S1			
A9	S13		SAME AS A9S1			
A9	S14		SAME AS A9S1			
A9	S15		SAME AS A9S1			
A9	S16		SAME AS A9S1			
A9	S17		SAME AS A9S1			
A9	S18		SAME AS A9S1			
A9	S19		SAME AS A9S1			
A9	S20		SAME AS A9S1			
A9	S21		SAME AS A9S1			
A9	S22		SAME AS A9S1			
A9	S23		SAME AS A9S1			
A9	S24		SAME AS A9S1			
A9	S25		SAME AS A9S1			
A9	S26		SAME AS A9S1			
A9	S27		SAME AS A9S1			
A9	S28		SAME AS A9S1			
A9	S29		SAME AS A9S1			
A9	S30		SAME AS A9S1			
A9	S31		SAME AS A9S1			
A9	S32		SAME AS A9S1			

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Assembly Reference	Symbol	Mfrs. Part Number (or FSN)	Description	Mfrs. Code	Unit Quantity	DDI P/N
A9	S33		SAME AS A9S1			
A9	S34		SAME AS A9S1			
A9	S35		SAME AS A9S1			
A9	S36		SAME AS A9S1			
A9	S37		SAME AS A9S1			
A9	S38		SAME AS A9S1			
A9	S39		SAME AS A9S1			
A9	S40		SAME AS A9S1			
A9	S41		SAME AS A9S1			
A9	S42		SAME AS A9S1			
A9	S43		SAME AS A9S1			
A9	S44		SAME AS A9S1			
A9	S45		SAME AS A9S1			
A9	S46		SAME AS A9S1			
A9	S47		SAME AS A9S1			
A9	S48		SAME AS A9S1			
A9	S49		SAME AS A9S1			
A9	T1	P8130	XFMER, PWR, STEP-DN; 115/126V ct	97965	1	51001473
A9	TB1	3-141	TERMINAL BOARD; 3 terminals, #6-32 screw	75173	1	51001862
A9	TB2	14-141	TERMINAL BOARD; 14 terminals #6-32 screw	75173	1	51001855

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Assembly Reference	Symbol	Mfrs. Part Number (or FSN)	Description	Mfrs. Code	Unit Quantity	DDI P/N
1	A10	61004300	UNBLANK ASSEMBLY	15920	1	61004300
A10	A1	82199907	CIRCUIT CARD ASSEMBLY; Type UA2A	15920	1	82199907
A10A1	C1	CP08A1EC104K	CAP., FXD, PAPER; .1 uf 200 vdcw	56289	1	51001052
A10A1	CR1	1N3064	SEMICONDUCTOR DEVICE, DIODE; 75V Si	01295	1	51001239
A10A1	Q1	2N2405	TRANSISTOR; NPN Si TO5 case, high power	02735	2	51003095
A10A1	Q2		SAME AS A10A1Q1			
A10A1	R1	EB2425	RESISTOR, FIXED, COMP; 2.4K 5% 1/2W	01121	1	51007182
A10A1	R2	C20	RESISTOR, FIXED, FILM; 100 ohms 5% 1/2W	16299	3	51000832
A10A1	R3		SAME AS A10A1R2			
A10A1	R4		SAME AS A10A1R2			
A10A1	R5	HB3315	RESISTOR, FIXED, COMP; 330 ohms 5% 2W	01121	1	51007183
A10A1	R6	HB4725	RESISTOR, FIXED, COMP; 4.7K 5% 2W	01121	1	51000613
A10A1	XQ1	3304	SOCKET, SEMICONDUCTOR DEVICE; tstr 4 pin	91662	2	51001772
A10A1	XQ2		SAME AS A10A1XQ1			
1A10	A2	82199907	CIRCUIT CARD ASSEMBLY; Type UA2A	15920	1	82199907
A10A2	C1	CP08A1EC104K	CAP., FXD, PAPER; .1 uf 200 vdcw	56289	1	51001052
A10A2	CR1	1N3064	SEMICONDUCTOR DEVICE, DIODE; 75V Si	01295	1	51001239
A10A2	Q1	2N2405	TRANSISTOR; NPN Si TO5 case, high power	02735	2	51003095
A10A2	Q2		SAME AS A10A2Q1			
A10A2	R1	EB2425	RESISTOR, FIXED, COMP; 2.4K 5% 1/2W	01121	1	51007182
A10A2	R2	C20	RESISTOR, FIXED, FILM; 100 ohms 5% 1/2W	16299	3	51000832
A10A2	R3		SAME AS A10A2R2			
A10A2	R4		SAME AS A10A2R2			
A10A2	R5	HB3315	RESISTOR, FIXED, COMP; 330 ohms 5% 2W	01121	1	51007183

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Assembly Reference	Symbol	Mfrs. Part Number (or FSN)	Description	Mfrs. Code	Unit Quantity	DDI P/N
A10A2	R6	HB4725	RESISTOR, FIXED, COMP; 4.7K 5% 2W	01121	1	51000613
A10A2	XQ1	3304	SOCKET, SEMICONDUCTOR DEVICE; Tstr 4 pin	91662	2	51001772
A10A2	XQ2		SAME AS A10A2XQ1			
1A10	CR1	1N3002B	SEMICONDUCTOR DEVICE, DIODE; Zener 75V	04713	1	51001283
A10	F1		ITEM DELETED			
A10	F2		ITEM DELETED			
A10	F3		ITEM DELETED			
A10	F4		ITEM DELETED			
A10	F5	313.750	FUSE, CARTRIDGE; 0.75A @ 125V 3AG SB	75915	1	51001833
A10	R1	RH50	RESISTOR, FXD; WW, 10K 1% 50W	91637	2	51000377
A10	R2		SAME AS A10R1			
A10	R3		ITEM DELETED			
A10	R4		ITEM DELETED			
A10	R5		ITEM DELETED			
A10	R6		ITEM DELETED			
A10	R7		ITEM DELETED			
A10	R8		ITEM DELETED			
A10	R9	RH50	RESISTOR, FXD; WW, 180 ohms 1% 50W	91637	1	51000740
A10	TB1	6-141	TERMINAL BOARD; 6 Terminals, #6-32 screw	75173	1	51001860
A10	XF1		ITEM DELETED			
A10	XF2		ITEM DELETED			
A10	XF3		ITEM DELETED			
A10	XF4		ITEM DELETED			
A10	XF5	HKL-X	FUSEHOLDER; Neon Ind clr lens 90-300V	71400	1	51002783

CONTROL DATA CORPORATION

DATA DISPLAY DIVISION
[illegible] AVENUE
SAINT PAUL, MINNESOTA [illegible]

Prepared by P. Schoenack Date 6/1/67
Checked S. Lund 6/1/67
Approved DMP 6-2-67

PROVISIONING PARTS LIST

PPL 61001039

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Contract No.

Assembly Reference	Symbol	Mfrs. Part Number (or FSN)	Description	Mfrs Code	Unit Qty	Qty Recm		Unit Price $	Extended Unit Price $	CDC No.
	A11	61001039	CONNECTOR PANEL ASSEMBLY	15920	1					61001039
A11	F1	MDX-6 1/4	FUSE, CARTRIDGE; 6.25A @ 125V type MDX	71400	3					51001802
A11	F2		SAME AS A11F1							
A11	F3		SAME AS A11F1							
A11	F4	MDX-4	FUSE, CARTRIDGE; 4.00A @ 125V type MDX	71400	1					51001801
A11	J1	MS3102A-18-11PX	CONNECTOR, RECP, ELEC; Solid shell 5 pin	02660	1					51002055
A11	J2	MS3102A-18-11P	CONNECTOR, RECP, ELEC; Solid shell 5 pin	02660	1					51002054
A11	M1	632T100-A0008A	METER, TIME TOTALIZING; 99999 hr 60cy	14907	1					51003634
A11	TB1	14-141	TERMINAL BOARD; 14 terminals #6-32 screw	71785	1					51001855
A11	TB2	24501605	TERMINAL BD; 6 term. mtg tck 10-32 screw	15920	1					24501605
A11	XF1	HKL-X	FUSEHOLDER; Neon ind clr lens 90-300V	71400	4					51002783
A11	XF2		SAME AS A11XF1							
A11	XF3		SAME AS A11XF1							
A11	XF4		SAME AS A11XF1							

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CONTROL DATA CORPORATION

DATA DISPLAY DIVISION
[illegible] NORTH FAIRVIEW AVENUE
SAINT PAUL, MINNESOTA 55113
612 [illegible]

Prepared by R. Schoenack Date 6/1/67
Checked S. Lund 6/1/67
Approved DMPW 6-2-67

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Contract No.

Assembly Reference	Symbol	Mfrs Part Number (or FSN)	Description	Mfrs Code	Unit Qty	Qty Recm		Unit Price $	Extended Unit Price $	CDC No.
	A12	82192451	PLENUM ASSY, DEFLECTION AMPLIFIER	15920	1	0				82192451
A12	J1	411B40	CONNECTOR, RECP, ELEC; Minat 5 amp 1 soc	74545	1	0				51002065
A12	P1	480B10	CONNECTOR, PLUG, ELEC; Minat 5 amp 1 pin	74545	1	0				51002064
A12	S1	2A	SWITCH, AIRFLOW; Spdt, 5 amps, 250 vac	82877	1	1				51001499

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CONTROL DATA CORPORATION

DATA DISPLAY DIVISION
[illegible] NORTH FAIR BOULEVARD
SAINT PAUL, MINNESOTA [illegible]
612 [illegible]

Prepared by P. Schoenack Date 6/1/67
Checked S. Lund 6/1/67
Approved DMP 6-2-67

PROVISIONING PARTS LIST

PPL 61004100

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Customer

Contract No.

Assembly Reference	Symbol	Mfrs Part Number (or FSN)	Description	Mfrs Code	Unit Qty	Qty Recm		Unit Price $	Extended Unit Price $	CDC No.
	A13	61004100	PLENUM ASSEMBLY	15920	1					61004100
A13	B1	2NB408	FAN, CENT.; 115V 50/60cy 1400rpm 320cfm	03522	1					51007312
A13	TB1	3-141	TERMINAL BOARD; 3 terminals, #6-32 screw	71785	1					51001862

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Assembly Reference	Symbol	Mfrs. Part Number (or FSN)	Description	Mfrs. Code	Unit Quantity	DDI P/N
1	B1	2MB408	FAN, CENT.; 115V50/60 cy 1400 RPM 320 CFM	03522	1	51007312
1	F1	MDX-6 1/4	FUSE, CARTRIDGE; 6.25A @ 125V Type MDX	71400	3	51001802
1	F2		SAME AS 1F1			
1	F3		SAME AS 1F1			
1	F4	MDX-4	FUSE, CARTRIDGE; 4.00A @ 125V Type MDX	71400	1	51001801
1	J1	MS3102A-18-11PX	CONNECTOR, RECP, ELEC; Solid shell 5 pin	02660	1	51002055
1	J2	MS3102A-18-11P	CONNECTOR, RECP, ELEC; Solid shell 5 pin	02660	1	51002054
1	J3	411B40	CONN, RECP, ELEC; Minat, 5 amp, 1 soc	74545	2	51002065
1	J4		SAME AS 1J3			
1	M1	632T100-A0008A	METER, TIME TOTALIZING; 99999 hr 115 vac	14907	1	51003634
1	P1	4B0B10	CONN, PLUG, ELEC; Minat 5 amp, 1 pin	74545	2	51002064
1	P2		SAME AS 1P1			
1	P3	716S19	CONN, PLUG, ELEC; Black, 5 amp, 1 pin	74545	2	51002069
1	P4		SAME AS 1P3			
1	PS1	BPE22-1.5	POWER SUPPLY; HV, 17,000-22,000 vdc @ 1.5MA	14225	1	51502800
1	R1	830 (5K)	RES., VAR, LIN PRECISION; 5K 3% 4.75W	02111	2	51001361
1	R2		SAME AS 1R1			
1	R3	830C	RESISTOR, VAR; Ww 500 ohms 3% 4.75W	02111	2	51001364
1	R4		SAME AS 1R3			
1	R5		ITEM DELETED			
1	R6		ITEM DELETED			
1	R7	CB1811	RESISTOR, FIXED, COMP; 180 ohms 10% 1/4W	01121	2	51000326
1	R8		SAME AS 1R7			
1	R9	RH-50	RESISTOR, FXD, WW; 180 ohms 1% 50W	91637	1	51000740

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DATA DISPLAY DIVISION
3601 NORTH FAIRVIEW AVENUE
SAINT PAUL, MINNESOTA 55113
612 631-7556

PROVISIONING PARTS LIST

PPL 14004000

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Assembly Reference	Symbol	Mfrs. Part Number (or FSN)	Description	Mfrs Code	Unit Qty	Qty Recm		Unit Price $	Extended Unit Price $	CDC No.
1	J3	411E40	CONN, RECP, ELEC; Minat, 5 amp, 1 soc	74545	2					51002065
1	J4		SAME AS 1J3							
1	P1	4B0B10	CONN, PLUG, ELEC; Minat 5 amp, 1 pin	74545	2					51002064
1	P2		SAME AS 1P1							
1	P3	716S19	CONN, PLUG, ELEC; Black, 5 amp, 1 pin	74545	2					51002069
1	P4		SAME AS 1P3							
1	PS1	BPE22-1.5	POWER SUPPLY; HV, 17,000-22,000vdc @1.5MA	14225	1					51502800
1	R1	830 (5K)	RES., VAR, LIN PRECISION; 5K 3% 4.75W	02111	2					51001361
1	R2		SAME AS 1R1							
1	R3	830C	RESISTOR, VAR; WW 500 ohms 3% 4.75W	02111	2					51001364
1	R4		SAME AS 1R3							
1	R5		ITEM DELETED							
1	R6		ITEM DELETED							
1	R7	CB1811	RESISTOR, FIXED, COMP; 180 ohms 10% 1/4W	01121	2					51000326
1	R8		SAME AS 1R7							
1	R9		ITEM DELETED							
1	R10	CU7531	RESISTOR, VARIABLE; Comp lin, 75K 10% 2W	44655	2					51001348
1	R11	CU1552	RESISTOR, VARIABLE; Comp 1.5 mego 20% 2W	44655	2					51001354
1	R12	CU2052	RESISTOR, VARIABLE; Comp 2 megohm 20% 2W	44655	2					51001369
1	R13		SAME AS 1R10							
1	R14		SAME AS 1R11							
1	R15		SAME AS 1R12							

DD 155A

CONTRACT NO:
CONTRACTOR: DATA DISPLAY, INC.
ISSUE NO:

PROVISIONING PARTS LIST

DATE
PAGE OF

Assembly Reference	Symbol	Mfrs. Part Number (or FSN)	Description	Mfrs. Code	Unit Quantity	DDI P/N
1	R10	CU7531	RESISTOR, VARIABLE; Comp lin, 75K 10% 2W	44655	2	51001348
1	R11	CU1552	RESISTOR, VARIABLE; Comp 1.5 mego 20% 2W	44655	2	51001354
1	R12	CU2052	RESISTOR, VARIABLE; Comp 2 megohm 20% 2W	44655	2	51001369
1	R13		SAME AS 1R10			
1	R14		SAME AS 1R11			
1	R15		SAME AS 1R12			
1	S1	4TP1-2	SWITCH, TOGGLE; 4pst 15A 115V 2-pos rkr	91929	1	51001498
1	TB1	3-141	TERMINAL BOARD; 3 Terminals, #6-32 screw	75173	1	51001862
1	TB2	14-141	TERMINAL BOARD; 14 Terminals, #6-32 screw	75173	1	51001855
1	V1	KC2588P31	ELECTRON TUBE; CRT 12" P31 static defl	82170	2	51500301
1	V2		SAME AS 1V1			
1	XF1	HKL-X	FUSEHOLDER; Neon ind clr lens 90-300V	71400	4	51002783
1	XF2		SAME AS 1XF1			
1	XF3		SAME AS 1XF1			
1	XF4		SAME AS 1XF1			
1	XV1	3M14	SOCKET, ELECTRON TUBE; Bakelite diheptal	75173	2	51001764
1	XV2		SAME AS 1XV1			

CONTROL DATA CORPORATION

DATA DISPLAY DIVISION
[illegible] NORTH FAIRVIEW AVENUE
SAINT PAUL, MINNESOTA 55113
612 [illegible]

PROVISIONING PARTS LIST

PPL 14004000

Sheet 3 of 3 Sheets

Rev

Assembly Reference	Symbol	Mfrs. Part Number (or FSN)	Description	Mfrs Code	Unit Qty	Qty Recm		Unit Price $	Extended Unit Price $	CDC No.
1	S1	4TP1-2	SWITCH, TOGGLE; 4pst 15A 115V 2-pos rkr	91929	1					51001498
1	S2	17981300	SWITCH, DELAY; Pb spdt 15A @300V, Adj dly	15920	1					17981300
1	S3	24523001	SWITCH, PUSH; Spst no 1A @ 115vac	15920	1					24523001
1	V1	KC2588P31	ELECTRON TUBE; CRT 12" P31 static defl	82170	2					51500301
1	V2		SAME AS 1V1							
1	XV1	3N14	SOCKET, ELECTRON TUBE; Bakelite diheptal	75173	2					51001764
1	XV2		SAME AS 1XV1							

7-35

DD 1 55A

CONTRACT NO:
CONTRACTOR: DATA DISPLAY, INC.
ISSUE NO:

PROVISIONING PARTS LIST

DATE

PAGE OF

Assembly Reference	Symbol	Mfrs. Part Number (or FSN)	Description	Mfrs. Code	Unit Quantity	DDI P/N
			The following is a list of Circuit Card Types used in the dd 60B			
		82198065	CIRCUIT CARD ASSEMBLY; Type 002C-1	15920	2	82198065
		82198452	CIRCUIT CARD ASSEMBLY; Type 002C-3	15920	4	82198452
		82198453	CIRCUIT CARD ASSEMBLY; Type 002C-5	15920	4	82198453
		82198454	CIRCUIT CARD ASSEMBLY; Type 002C-7	15920	4	82198454
		82198455	CIRCUIT CARD ASSEMBLY; Type 002C-9	15920	4	82198455
		82199864	CIRCUIT CARD ASSEMBLY; Type 003	15920	4	82199864
		82199849	CIRCUIT CARD ASSEMBLY; Type 015	15920	1	82199849
		82199852	CIRCUIT CARD ASSEMBLY; Type 015A	15920	2	82199852
		82199960	CIRCUIT CARD ASSEMBLY; Type 016	15920	2	82199960
		82199858	CIRCUIT CARD ASSEMBLY; Type 019	15920	2	82199858
		82199957	CIRCUIT CARD ASSEMBLY; Type C19	15920	2	82199957
		82199867	CIRCUIT CARD ASSEMBLY; Type 027	15920	4	82199867
		82198032	CIRCUIT CARD ASSEMBLY; Type 029	15920	2	82198032
		82199969	CIRCUIT CARD ASSEMBLY; Type 031A	15920	1	82199969
		82198044	CIRCUIT CARD ASSEMBLY; Type 039	15920	1	82198044
		82198092	CIRCUIT CARD ASSEMBLY; Type 040	15920	2	82198092
		82199919	CIRCUIT CARD ASSEMBLY; Type S45	15920	2	82199919
		82199978	CIRCUIT CARD ASSEMBLY; Type 205	15920	2	82199978
		82199870	CIRCUIT CARD ASSEMBLY; Type 401	15920	1	82199870
		82199966	CIRCUIT CARD ASSEMBLY; Type 429A	15920	1	82199966
		82199873	CIRCUIT CARD ASSEMBLY; Type 443	15920	1	82199873

CONTRACT NO:
CONTRACTOR: DATA DISPLAY, INC.
ISSUE NO:

PROVISIONING PARTS LIST

DATE
PAGE OF

Assembly Reference	Symbol	Mfrs. Part Number (or FSN)	Description	Mfrs. Code	Unit Quantity	DDI P/N
		82197789	CIRCUIT CARD ASSEMBLY; Type 452A	15920	1	82197789
		82199910	CIRCUIT CARD ASSEMBLY; Type 456A	15920	3	82199910
		82199913	CIRCUIT CARD ASSEMBLY; Type 456B	15920	2	82199913
		82199948	CIRCUIT CARD ASSEMBLY; Type 457A	15920	2	82199948
		82199922	CIRCUIT CARD ASSEMBLY; Type 619	15920	8	82199922
		82199925	CIRCUIT CARD ASSEMBLY; Type 620	15920	2	82199925
		82199813	CIRCUIT CARD ASSEMBLY; Type 1021	15920	1	82199813
		82199951	CIRCUIT CARD ASSEMBLY; Type 1222RS	15920	8	82199951

VENDORS LISTING.

This part contains a listing of all vendors supplying replaceable parts for the Display Console. Table 7-1 lists each vendor by federal 5-digit code identification, name, and address. The manufacturer's code column in the provisioning parts list contains the 5-digit code for each vendor.

TABLE 7-1. LIST OF VENDORS

CODE	NAME	ADDRESS
00656	Aerovox Corp	New Bedford, Massachusetts
01121	Allen-Bradley Co	Milwaukee, Wisconsin
01295	Texas Instruments, Inc Semiconductor-Components Division	Dallas, Texas
02111	Spectrol Electronics Corp	San Gabriel, California
02660	Amphenol-Borg Electronics Corp	Broadview, Chicago, Illinois
02735	Radio Corp of America Commercial Receiving Tube and Semiconductor Division	Somerville, New Jersey
03508	Semi-Conductor Products Dept GECO	Syracuse, New York
03522	McLean Engineering Laboratories	Princeton, New Jersey
04713	Motorola, Inc Semiconductor Products Division	Phoenix, Arizona
08594	Eitel-McCullough, Inc	Salt Lake City, Utah
11711	General Instrument Corp Semi-Conductor Products Group Rectifier Division	Newark, New Jersey
12060	Diode, Inc	Chatsworth, California
12697	Clarostat Mfg Co, Inc	Dove, New Hampshire
13327	Solitron Devices Inc	Tappan, New York
13850	Technipower, Inc	South Norwalk, Connecticut

TABLE 7-1. LIST OF VENDORS (CONT)

CODE	NAME	ADDRESS
14225	Universal Voltronic Corp	White Plains, New York
14655	Cornell-Dubilier Electric Corp	Newark, New Jersey
14907	Cramer Division of Giannini Control Corp	Old Saybrook, Connecticut
15920	Data Display, Inc	St. Paul, Minnesota
16299	Corning Glass Works Electronic Components Division	Raleigh, North Carolina
16512	National Connector Corp	Minneapolis, Minnesota
44655	Ohmite Manufacturing Co	Skokie, Illinois
56289	Sprague Electric Co	North Adams, Massachusetts
70563	Amperite Co	Union City, New Jersey
71400	Bussmann Mfg Division of McGraw Edison Co	St. Louis, Missouri
71590	Central Lab Division of Globe-Union Inc	Milwaukee, Wisconsin
71744	Chicago Miniature Lamp Works	Chicago, Illinois
73631	Curtis Development and Mfg Co	Milwaukee, Wisconsin
73899	J F D Electronics Corp	Brooklyn, New York
74199	Quam Nichols Co	Chicago, Illinois
74545	Hubbel Harvey, Inc	Bridgeport, Connecticut
75042	International Resistance Co	Philadelphia, Pennsylvania
75173	Jones Howard B. Division of Cinch Mfg Co	Chicago, Illinois
75382	Kulka Electric Corp	Mt. Vernon, New York
75915	Littelfuse, Inc	Des Plains, Illinois
77342	American Machine and Foundry Co Potter and Brumfield Division	Princeton, Indiana
80023	Schott Oscar A. Co, Inc	Minneapolis, Minnesota

TABLE 7-1. LIST OF VENDORS (CONT)

CODE	NAME	ADDRESS
82170	Fairchild Camera and Instrument Corp, Defense Products Division	Clifton, New Jersey
82877	Rotron Mfg Co, Inc	Woodstock, New York
84171	Arco Electronics, Inc	Great Neck, New York
86684	Radio Corp of America Electronics Components and Devices	Harrison, New Jersey
91637	Dale Electronics, Inc	Columbus, Nebraska
91662	Elco Corp	Willow Grove, Pennsylvania
91929	Honeywell Inc Micro Switch Division	Freeport, Illinois
92702	IMC Magnetics Corp Eastern Division	Westbury, Long Island, New York
94696	Magnecraft Electric Co	Chicago, Illinois
97965	Stancor Electronics, Inc	Chicago, Illinois
99120	Plastic Capacitors, Inc	Chicago, Illinois

ILLUSTRATED PARTS BREAKDOWN.

This part contains figures 7-2 through 7-12, which illustrate the location of all replaceable electrical parts. Figure 7-2 shows the locations of Display Console assemblies. The number under each drawing title specifies the individual assembly shown. For example, figure 7-3, 2-Kv Power Supply, is assembly 1. Electrical reference designations are given, where applicable. Callout numbers on the drawings refer to nonreplaceable mechanical parts.

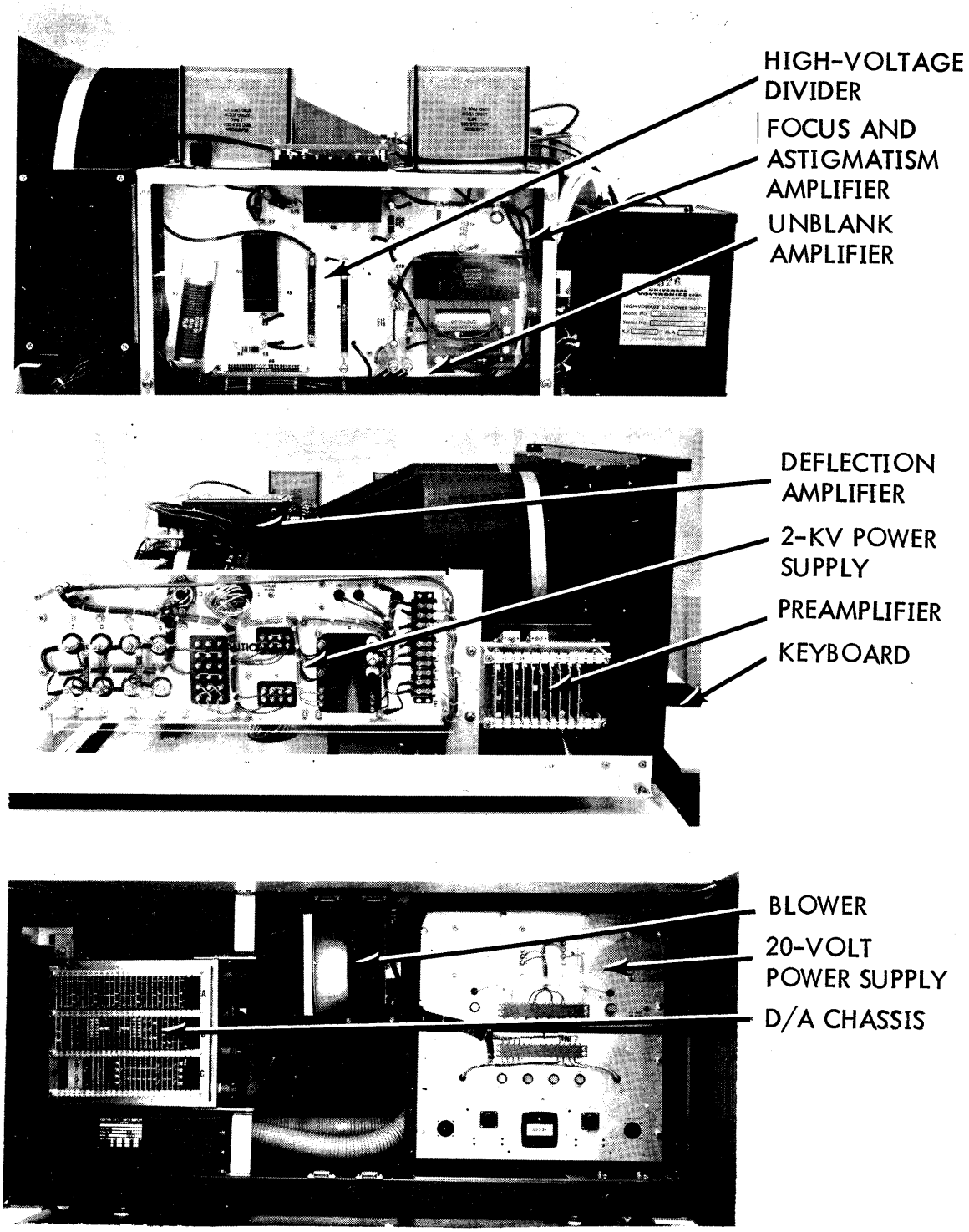
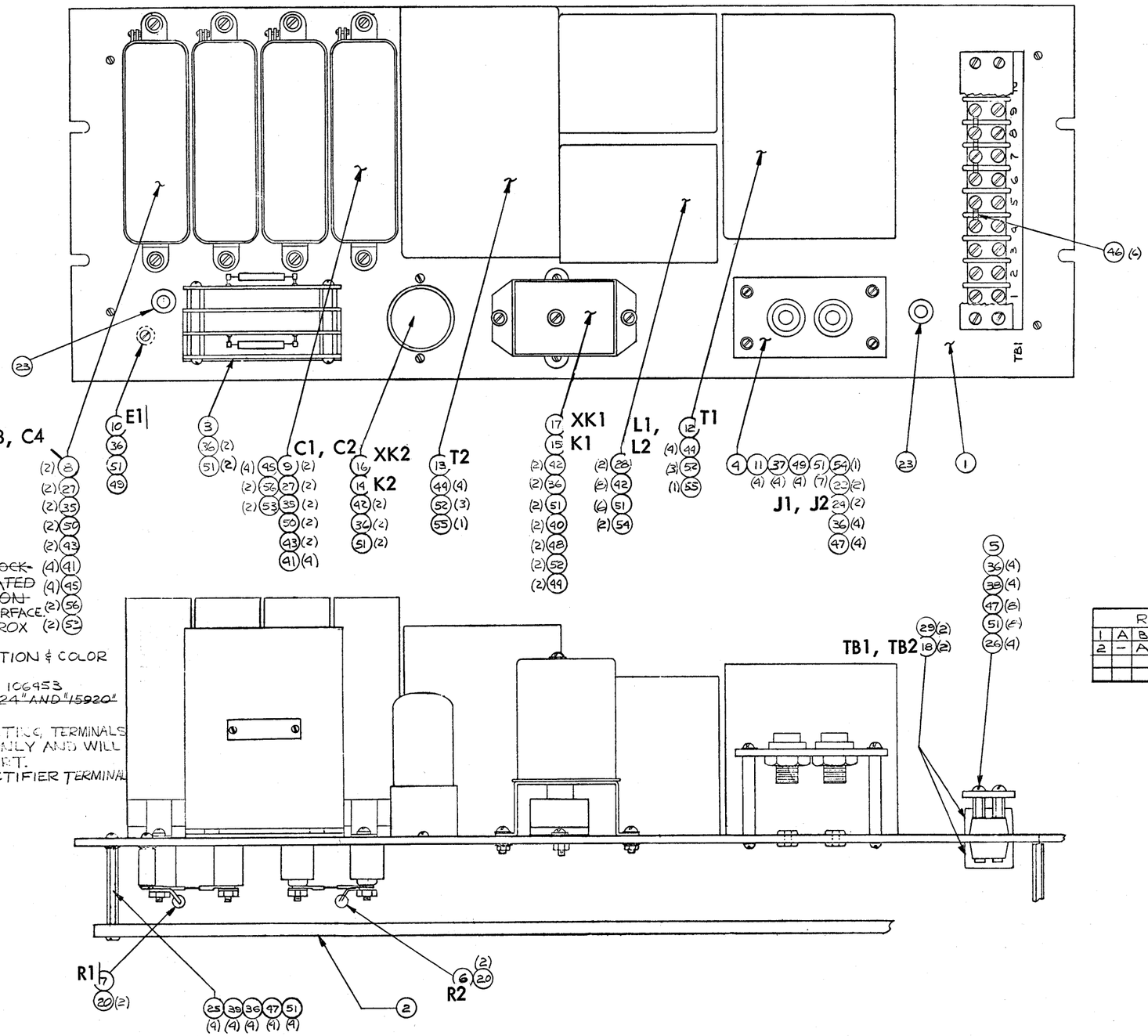


Figure 7-2. Display Console, Unit 1

REVISIONS				
SYM.	E.C.O.	DESCRIPTION	DATE	APPROVAL
A	~	REVISED LIST OF MATERIAL	[illegible]	[illegible]
B	760	REVISED ALL CALL CUTS DWG.# WAS 106496 CORRECT PICTURE	9/21/65	[illegible]
C	1099	SIGNED APPROVAL BLOCK	[illegible]	[illegible]
D	1281	DELETE NOTE 1, CHANGE SHEET 2	7-15-66	[illegible]



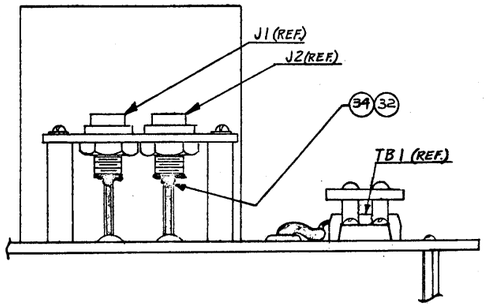
NOTES:

1. ~~INTERNAL TOOTH LOCK WASHERS ARE LOCATED NEXT TO CHASSIS ON ALL SPOTFACED SURFACE.~~
2. LACE CABLE AT APPROX 5/8" INTERVALS
3. FOR WIRE SIZE, LOCATION & COLOR SEE W/T 106447.
4. FOR SCHEMATIC SEE 106453
5. ~~APPLY "ASSY 6219524" AND "15920" IN AREA SHOWN.~~
6. NUMBERS DESIGNATING TERMINALS ARE FOR WIRING ONLY AND WILL NOT APPEAR ON PART.
7. SEE 106451 FOR RECTIFIER TERMINAL DESIGNATIONS.

REV. STATUS									
1	A	B	C	D					
2	–	A	B	C					

Figure 7-3
2-KV POWER SUPPLY
(SHEET 1 OF 2)
A1

REVISIONS				
SYM.	E.C.O.	DESCRIPTION	DATE	APPROVAL
A	760	REVISED ALL CALL OUTS ADDED SHEET 2 TO DWG 4 CORRECT PICTURE MOVE NOTE'S TO SHT 1	9/2/65	
B	1099	SIGNED APPROVAL BLOCK		
C	1281	XK1 & XK2 WAS K1 & K2	7/15/66	



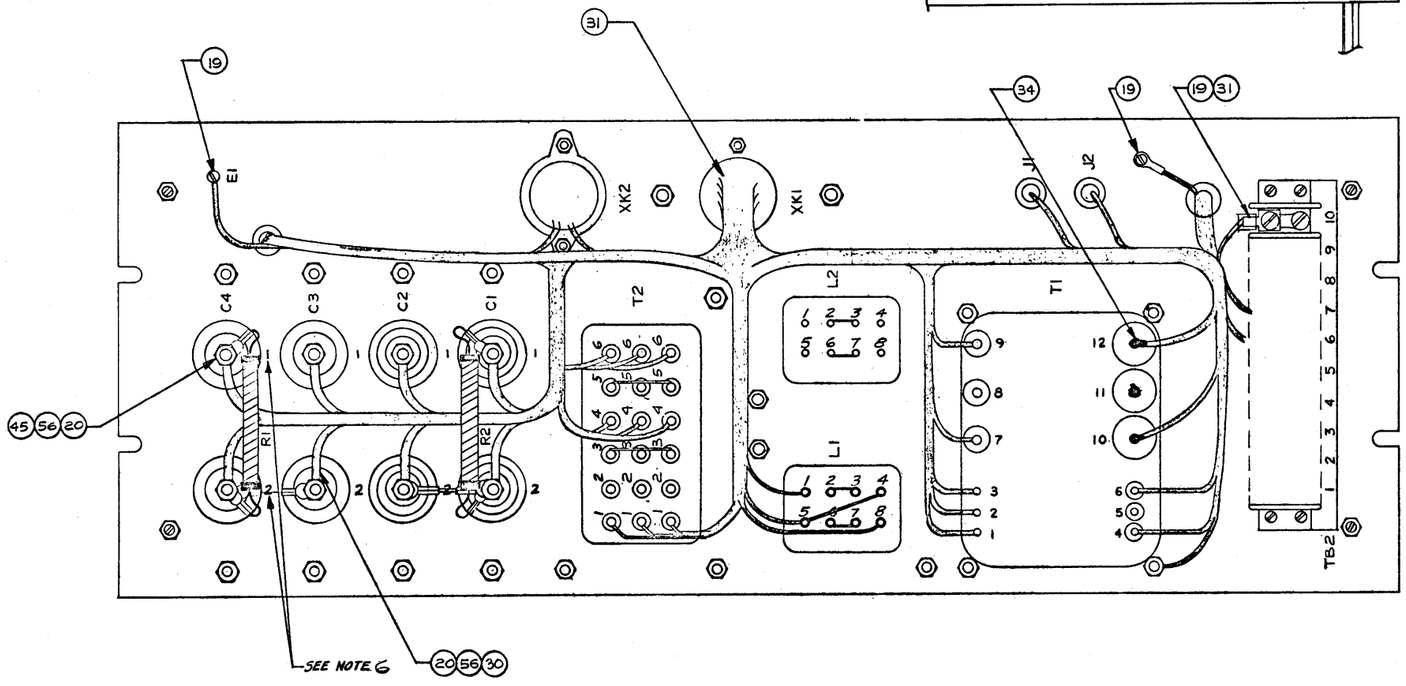
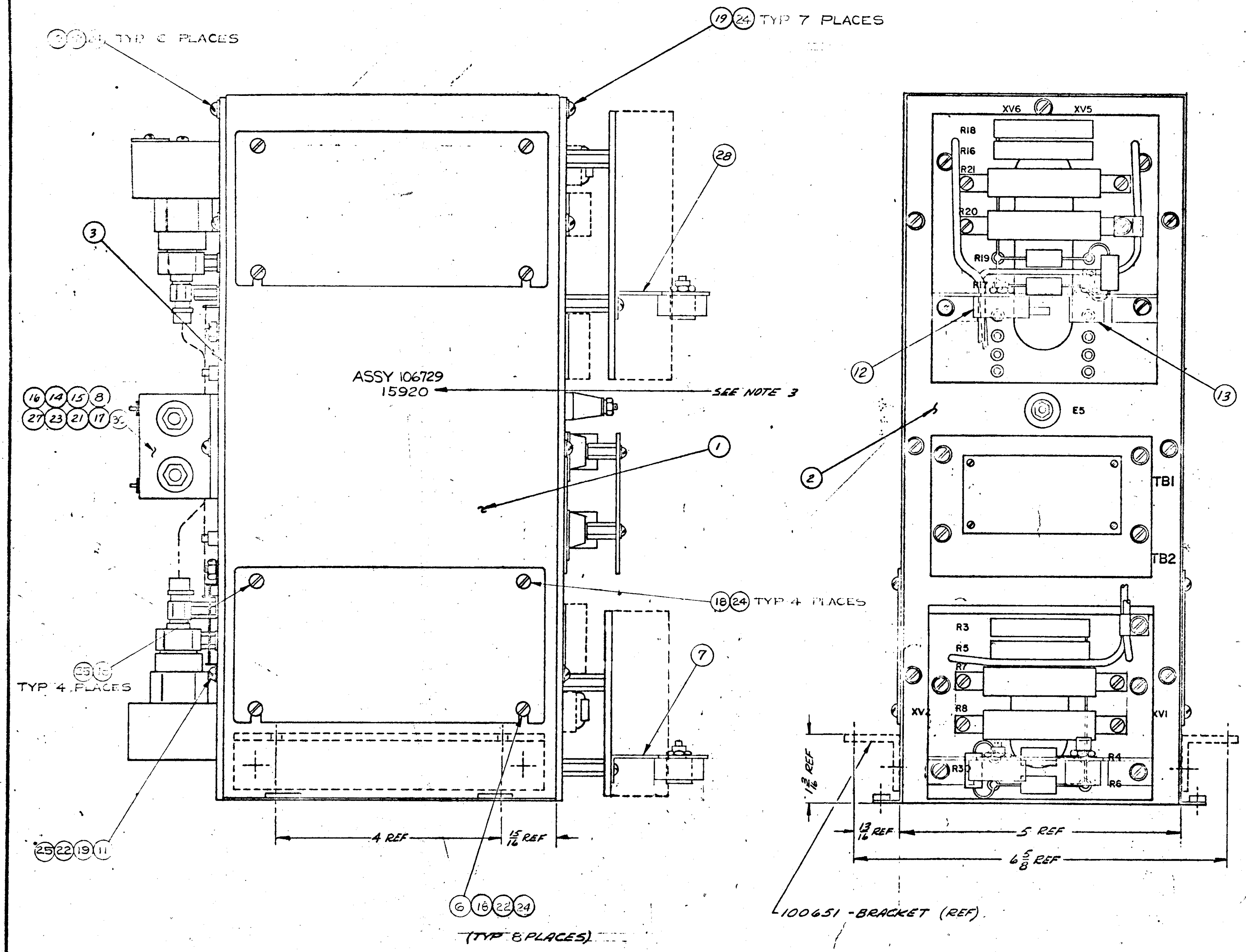


Figure 7-3
2-KV POWER SUPPLY
(SHEET 2 OF 2)
A1

REVISIONS				
SYM.	E.C.O.	DESCRIPTION	DATE	APPROVAL
A	721	DELETED ITEMS 4 & 5; ITEM 15 WAS [illegible]; REVISED QTY'S OF ITEMS [illegible] DELETED ITEM 26		
B	500	REVISED HARDWARE CALL-OUTS; DELETE ITEMS 9, 10, 26 & 29, ADDED ITEM 30, REVISED QTY OF ITEMS 22, 24 & 25. REVISED NOTE 3	[illegible]	



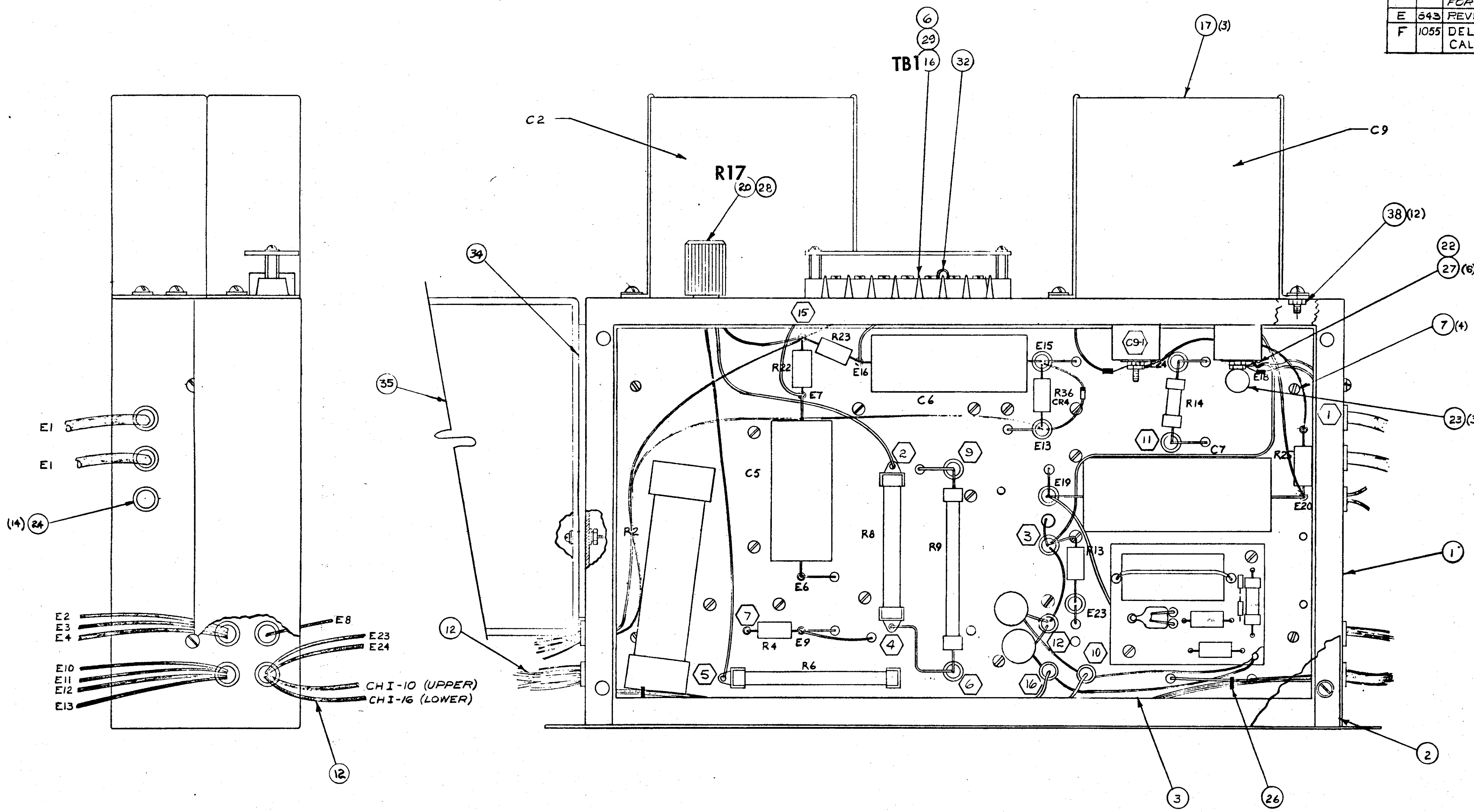
NOTE:
1. FOR SCHEMATIC, SEE DWG. 106589
2. FOR WIRE SIZE & COLOR, SEE W/T
3. APPLY "ASSY 106729" AND "15920" IN AREA SHOWN

REQD	ITEM NO.	REF. DESIG.	PART NO.	DESCRIPTION	MATERIAL	MATERIAL SPEC.	UNIT WT.	SYM
4	30		239S17	1/4" FLAT WASHER				
1	28		106590-2	BRACKET, LETTERED				
4	27		067M26	NUT, HEX #0-80				
5	25			LOCK WASHER, INT. TOOTH #6				
	24		068M23	LOCK WASHER, SPRING #6				
4	23		068M31	LOCK WASHER, SPRING #0				
15	22		072M10	FLAT WASHER #6				
4	21		072M24	FLAT WASHER #0				
~~4~~	~~20~~		~~066M40~~	~~SCREW, RD. HD. #4-40 x 1/4~~				
14	19		066M54	SCREW, RD. HD. #6-32 x 1/2				
16	18		066M51	SCREW, RD. HD. #6-32 x 3/8				
4	17		066M162	SCREW, RD. HD. #0-80 x 1/2				
4	16		047E45	SOLDER LUG				
4	15	C5 THRU C8	033E329	PISTON CAPACITOR				
2	14	C3 C4	033E193	TRIMMER CAPACITOR				
2	13	R27 R28	036E74	POT - 5K, .2W				
2	12	C1 C2	033E209	TRIMMER CAPACITOR				
1	11		047E20	SOLDER LUG #6				
	~~10~~		~~047E21~~	~~SOLDER LUG #8~~				
~~AS REQD~~	~~9~~			~~JUMPER WIRE - #18 BLK~~				
1	8		104687	CAPACITOR MTG BKT, LETTERED				
7	7		106590-1	BRACKET, LETTERED				
4	6		100652	SIDE ACCESS COVER				
~~1~~	~~5~~		~~064M138~~	~~PLATE "CAUTION HIGH VOLTAGE"~~				
~~1~~	~~4~~		~~100650~~	~~TOP ACCESS COVER~~				
1	3		104654	FRONT PLATE ASSY				
1	2		104663	BACK PLATE ASSY				
1	1		104788	HOUSING				

DWG. NO. 106729

Figure 7-4
DEFLECTION AMPLIFIER
A2

REVISIONS				
SYM.	E.C.O.	DESCRIPTION	DATE	APPROVAL
A	~	REVISED	4-19-64	
B	~	ADDED REF. DESIGNATIONS	6-28-64	
C	~	REMOVED HARDWARE CALL OUTS & ADDED ITEMS 36, 37, & 38	6-18-65	[illegible]
D	822	CHANGED POSITIONING OF CR4 ADDED CONNECTING INFO FOR ITEM 12.	11-3-65	[illegible]
E	643	REVISED WIRE ROUTING	10-27-65	[illegible]
F	1055	DELETED ITEM 11, ADDED CALLOUT OF ITEM 38	4/1/66	[illegible]



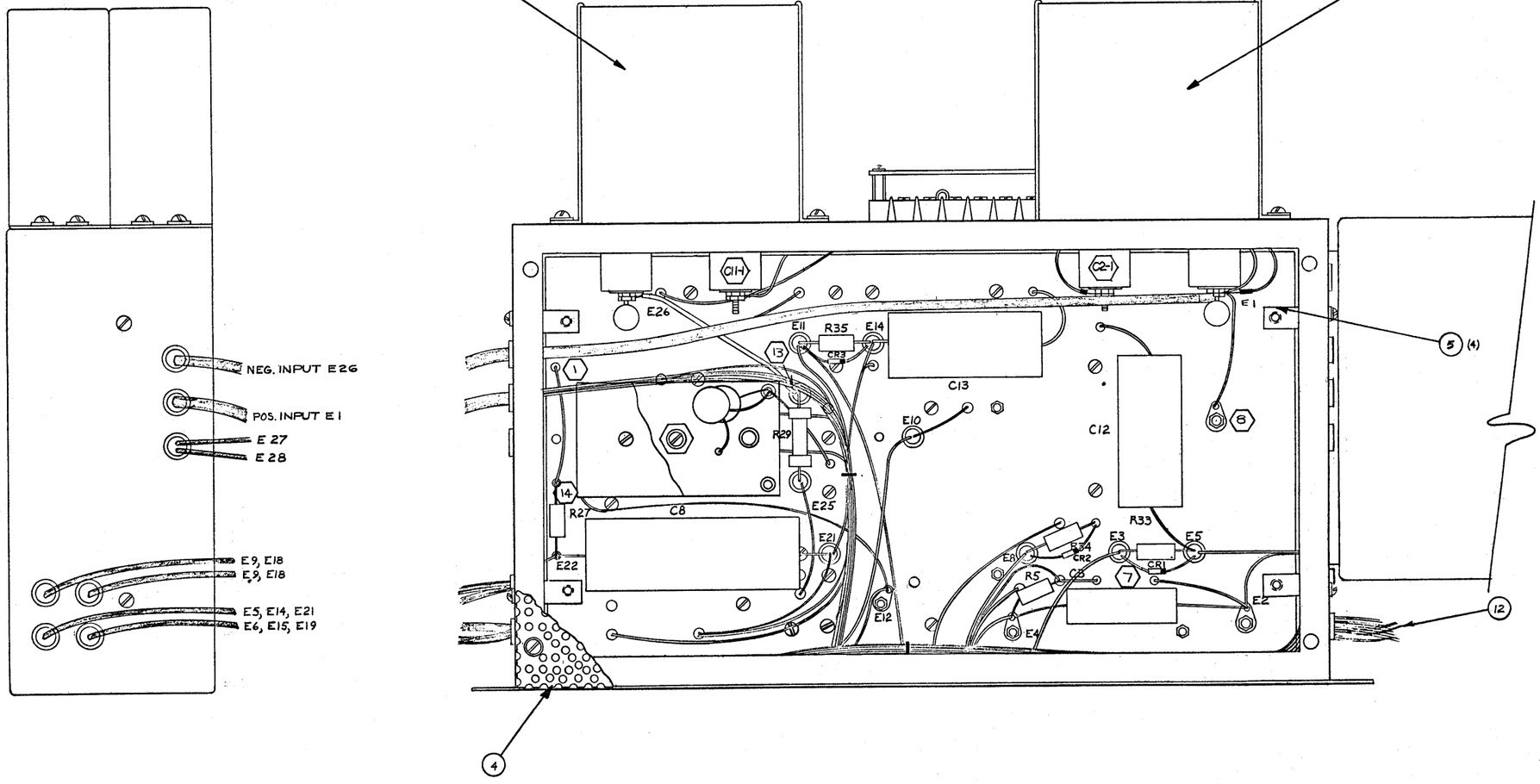
RECORD OF REV STATUS OF EACH SHT.						
SHEET	REV					
1	A	B	C	D	E	F
2	A	B	B	C	D	D

(1). REFERENCE DESIGNATION ONLY DOES NOT APPEAR ON PART.

F DWG NO 106593

Figure 7-5
HIGH-VOLTAGE DIVIDER
(SHEET 1 OF 2)
A3

REVISIONS				
SYM.	E.C.O.	DESCRIPTION	DATE	APPROVAL
A	~	REVISED	4-19-64	
B	~	ADDED REF. DESIGNATIONS	6-29-64	
C	822	REPOSITIONED CR1, CR2, CR3 REVISED SIDE VIEW SHOWING WIRE TERMINALS.	11-3-65	
D	843	REVISED WIRE ROUTING	10-27-65	

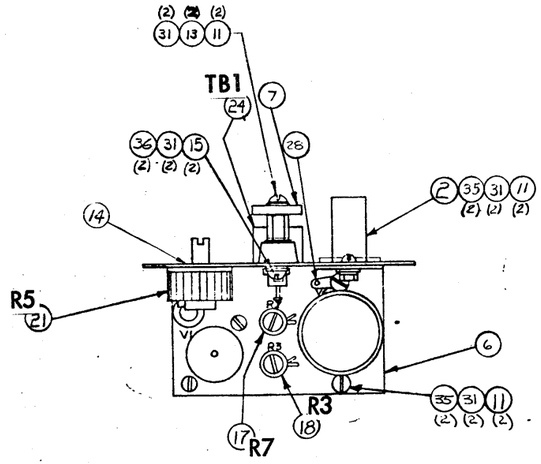


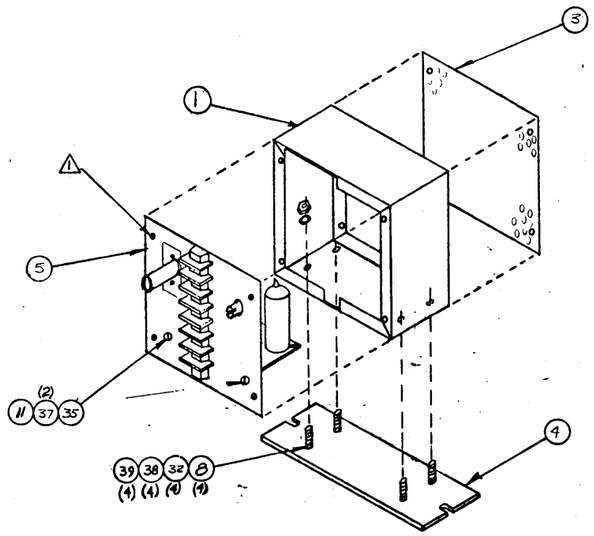
1. FOR REFERENCE DESIGNATION ONLY DOES NOT APPEAR ON PART.

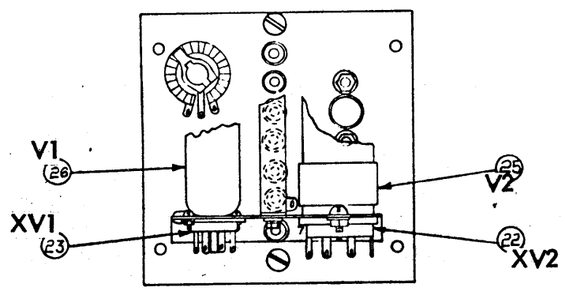
Figure 7-5
HIGH-VOLTAGE DIVIDER
(SHEET 2 OF 2)
A3

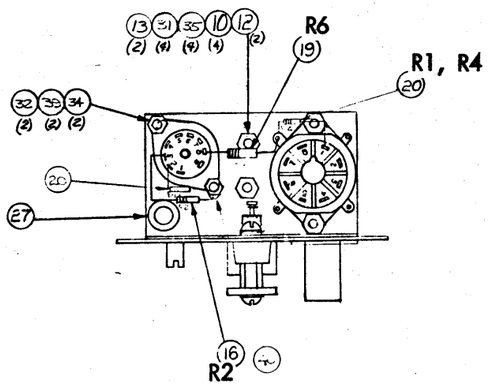
DWG. NO. 106593

REVISIONS				
SYM.	E.C.O.	DESCRIPTION	DATE	APPROVAL
A	—	ADDED ITEM "35" & 36; ADDED 2 to ITEM 1	1-3-62	[illegible]
B	—	REVISE HARDWARE TYPE AND QUANTITY.	2-4-63	RCC
C	—	MADE DETACHED LIST OF MATERIALS; ITEM NO'S 3,4,5,6 & 7 (NOW 28,32), 33,34 & 35 WERE INTERCHANGED	5-8-64	
D	673	REVISED HARDWARE QTYS; REMOVED ITEMS 9, 33, 40, AND ITEM 40.	7-17-65	[illegible]
E	965	RELOCATE ITEM 14 CHANGE QUANTITIES OF ITEMS.	1-31-66	[illegible]





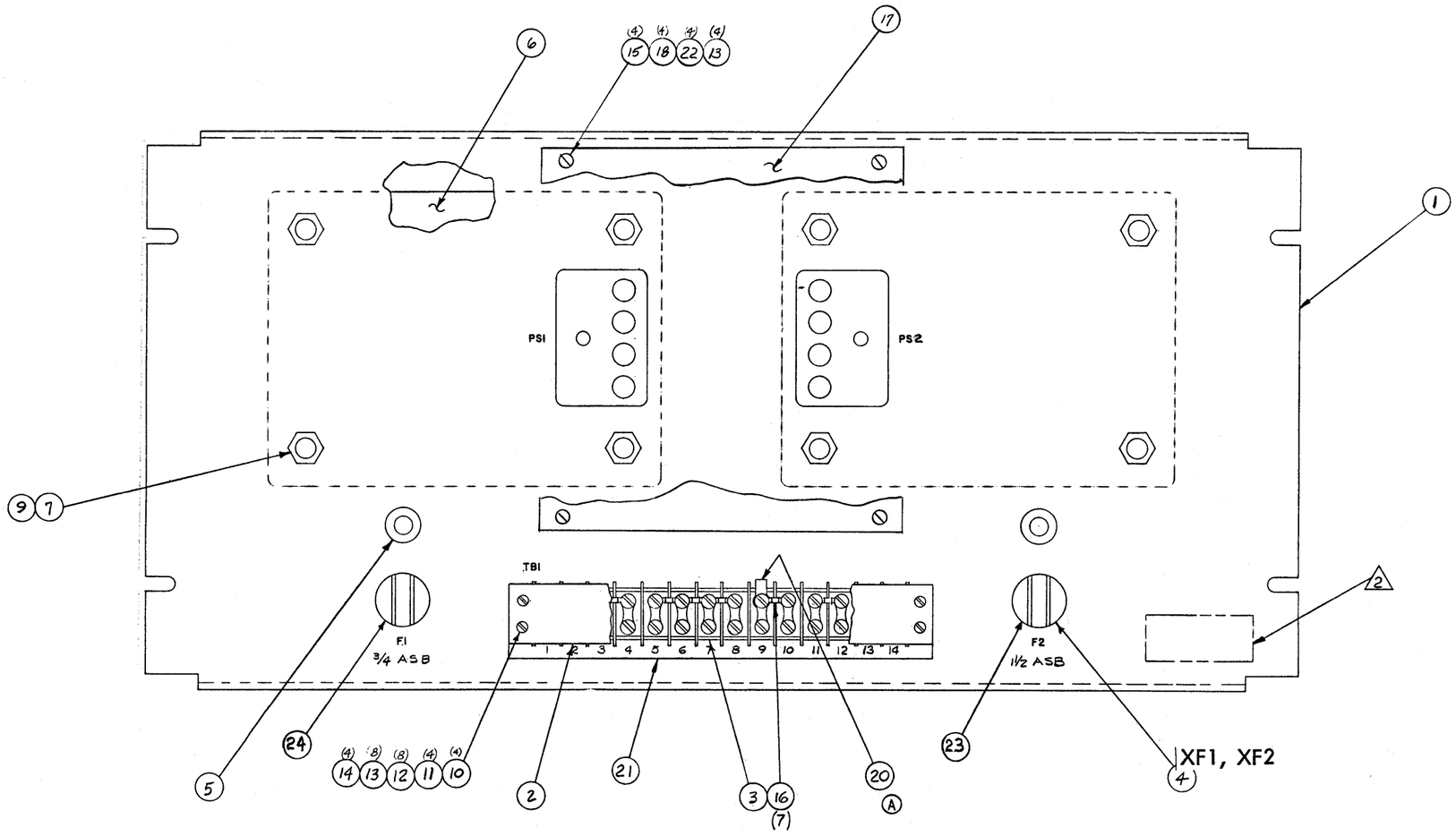




2- FOR WIRING SEE SCHEMATIC DWG. 104607 AND W/T 104590.
⚠-(6) SELF TAPPING SCREWS SUPPLIED WITH ITEM 1.

Figure 7-6
FOCUS AND ASTIGMATISM
CORRECTION AMPLIFIER
A4

REVISIONS				
SYM.	E.C.O.	DESCRIPTION	DATE	APPROVAL
A	~	ADDED ITEMS 19 & 20 TO L/M AND DRAWING.	9-11-64	RCC
B	850	ADDED NOTE 2 & ITEM 21	11-8-65	[illegible]



NOTES:

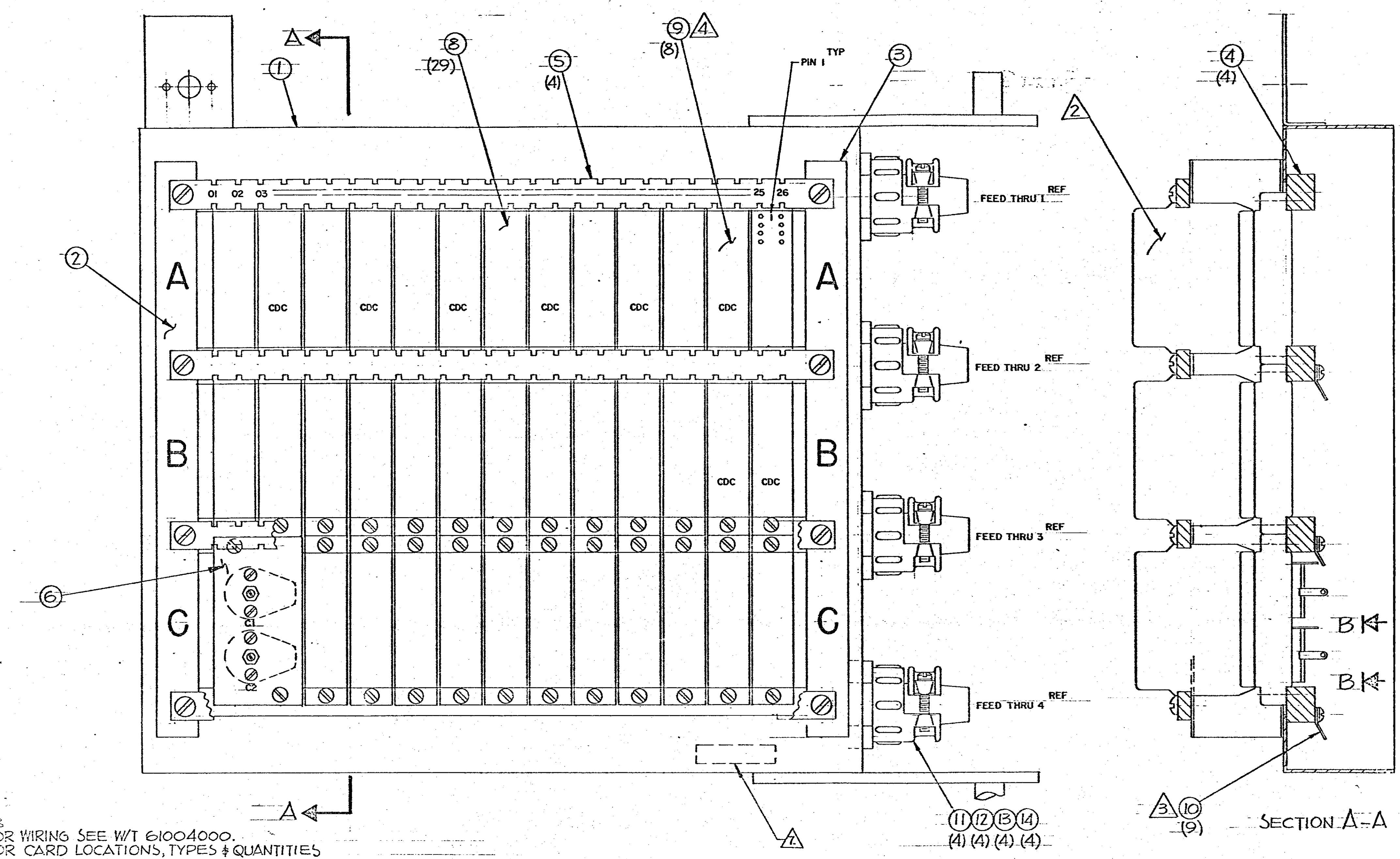
1 FOR WIRING SEE WIRING DIAGRAM 106821

△2 APPLY "ASS'Y 106805" & "15920" IN AREA SHOWN

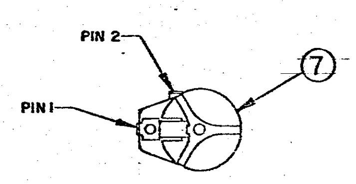
Figure 7-7
20-VOLT REGULATED
POWER SUPPLY
A5

REV. B DWG. NO. 106805

REV.	E.C.O.	ZONE	DESCRIPTION	DATE	CHK'D	APPD.
A	1810		ADDED NOTE 8			



NOTES:
1. FOR WIRING SEE W/T 61004000.
2. FOR CARD LOCATIONS, TYPES & QUANTITIES SEE C/P 61004000.
3. ITEM 10 (SOLDER LUGS) TO BE LOCATED AT POSITIONS 07-08, 15-16 & 23-24 ON 3 LOWER CONNECTOR MTG. BARS.
4. ITEM 9 (CONNECTORS) TO BE SUPPLIED BY CDC, DESIGNATED BY CDC & LOCATED AS SHOWN.
5. HARDWARE TO MEET THE REQUIREMENTS OF THE APPLICABLE STANDARDS.
6. PARTIAL REF. DESIGNATIONS ARE SHOWN; FOR COMPLETE DESIG. PREFIX WITH UNIT NO. OR SUB ASSY DESIG, OR BOTH.
7. APPY "ASSY 61004000" & "15920" IN AREA SHOWN.
8. CAPACITORS C3, C4 (ITEM 15) & RESISTORS R5, R6 (ITEM 16) ARE INSTALLED WITH THE BACK BOARD WIRING.



VIEW B-B
TYP PIN ORIENTATION FOR C1 & C2

A6

Figure 7-8

FOR LIST OF MATERIAL SEE L/M 61004000

DO NOT SCALE THIS PRINT
REMOVE ALL BURRS AND SHARP EDGES

NEXT ASSY	USED ON
14004000	151

APPLICATION

LAYOUT J.MARTY
DRAFTSMAN J.MARTY

TITLE: D/A CHASSIS ASSEMBLY

PROJECT OR PRODUCT: DD 60 B

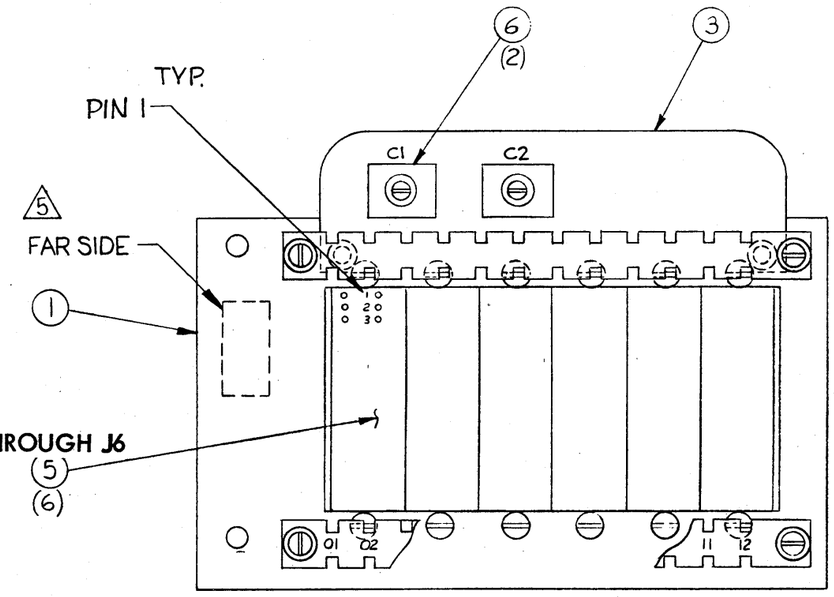
SIZE: D

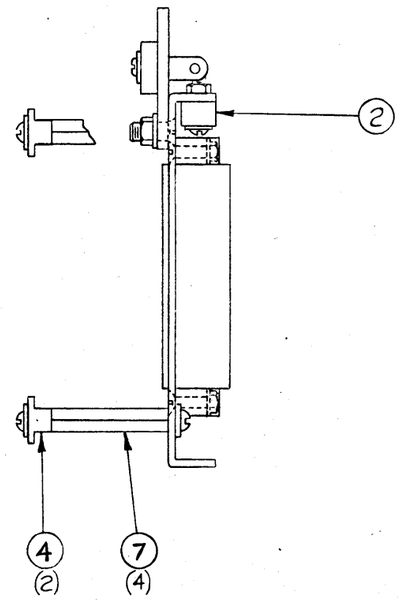
CODE IDENT 15920

DRAWING NUMBER: 61004000

7-57/58

REVISIONS						
REV	E. C. O.	ZONE	DESCRIPTION	DATE	CHK'D	APP'D.



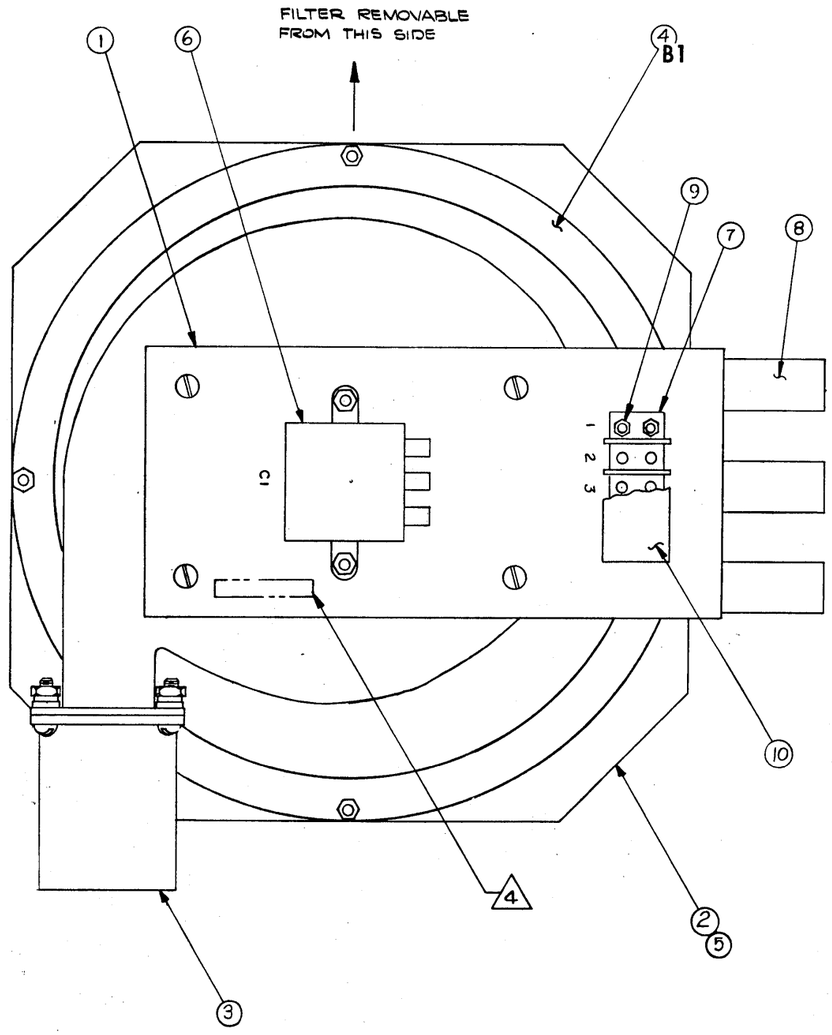


NOTE:
1. HARDWARE TO MEET THE REQUIREMENTS OF THE APPLICABLE STANDARDS
2. FOR CARD LOCATION, TYPES, QUANTITIES, SEE C/P 61008700
3. FOR WIRING SEE W/T 61008700
4. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN: FOR COMPLETE DESIGNATION, PREFIX WITH UNIT NO. OR SUB ASSEMBLY DESIGNATION OR BOTH
5. APPLY "ASSY 61008700" & "15920" IN AREA SHOWN, ON FAR SIDE.

DWG. NO. 61008700
REV.

Figure 7-9
PREAMPLIFIER
A7

REVISIONS						
REV.	E.C.O.	ZONE	DESCRIPTION	DATE	CHK'D	APP'D.
A	—	—	82200055 WAS 82193889	2-8-66	[illegible]	[illegible]



NOTE:

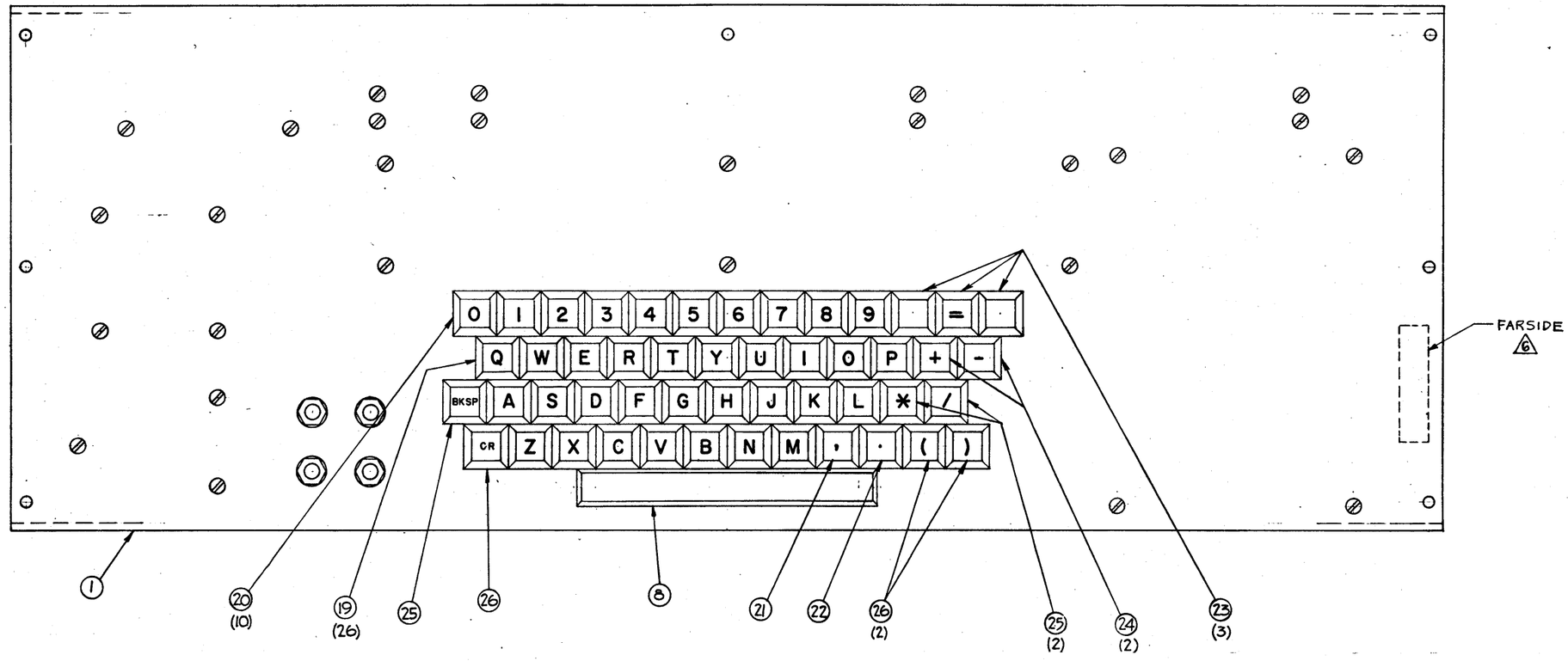
1. HARDWARE TO MEET THE REQ OF THE APPLICABLE STANDARDS.
2. FOR WIRING REF. SEE 82200055
3. PARTIAL REF DESIGNATIONS ARE SHOWN; FOR COMPLETE DESIGNATION PREFIX WITH UNIT NO OR SUBASSEMBLY DESIGNATION OR BOTH.
4. APPLY "ASSY 61001036" & "15920" IN AREA SHOWN.

A 61001036

Figure 7-10
BLOWER
A8

dd60

REVISIONS						
REV.	E.C.O.	ZONE	DESCRIPTION	DATE	CHK'D	APP'D.
A			ADD NOTE 5	7/12/65		
B			NOTE 6 ADDED	5/27/66	KCB	

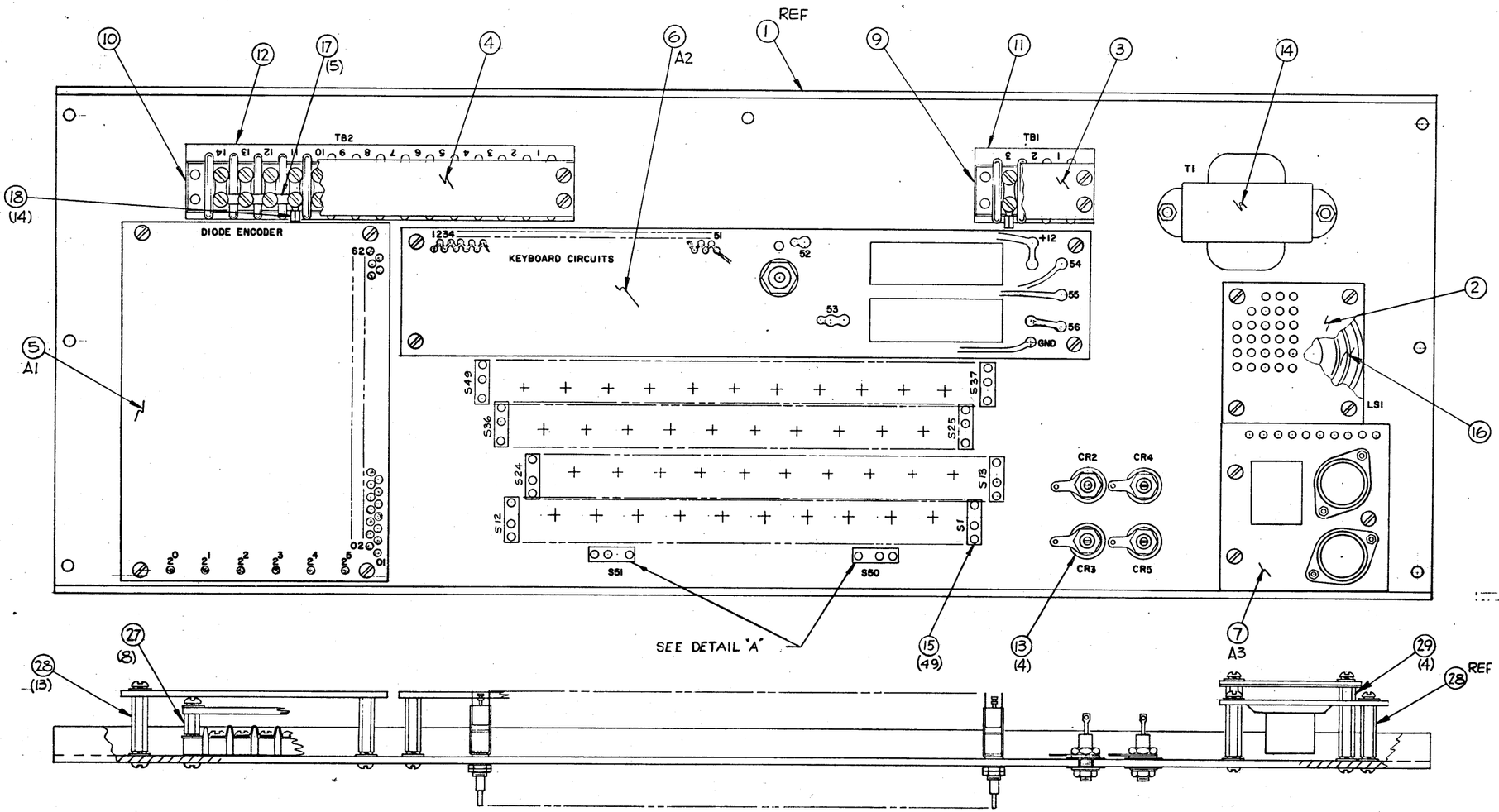


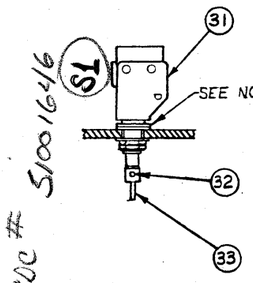
NOTE:
1. HARDWARE TO MEET THE REQUIREMENTS OF THE APPLICABLE STANDARDS.
2. COAT BOTH SIDES OF MICA GASKETS (8) AT CR1-CR4 LOCATIONS WITH AN APPLICATION OF ITEM NO. 30 (SILICONE COMPOUND).
3. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN; FOR COMPLETE DESIG. PREFIX WITH UNIT NO. OR SUB ASSEMBLY DESIG. OR BOTH
4. FOR WIRING REF. SEE SCHEMATIC DIAGRAM 82194095.
5. USE 2 #12 FLAT WASHERS ON EACH SWITCH AT POSITIONS S50 + S51 ONLY
6. APPLY "ASSY G1004200" & "15920" IN AREA SHOWN, ON FAR SIDE.

G1004200 REV. B

Figure 7-11
KEYBOARD
(SHEET 1 OF 2)
A9

REVISIONS						
REV.	E.C.O.	ZONE	DESCRIPTION	DATE	CHK'D	APPD.
A			ADD DETAIL "A"	7/15/65		





DETAIL "A"

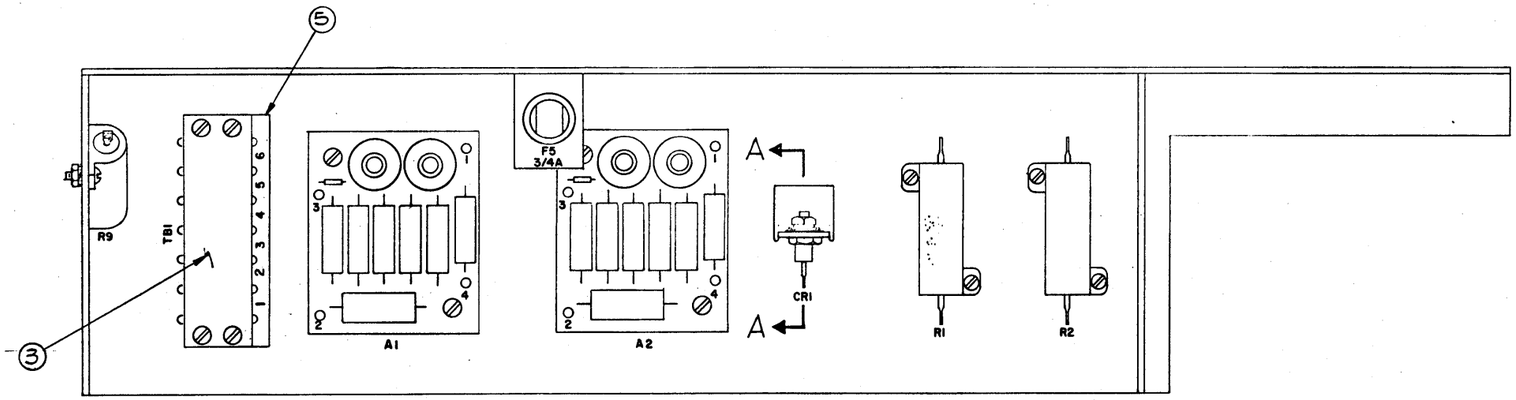
CDC # 51001646

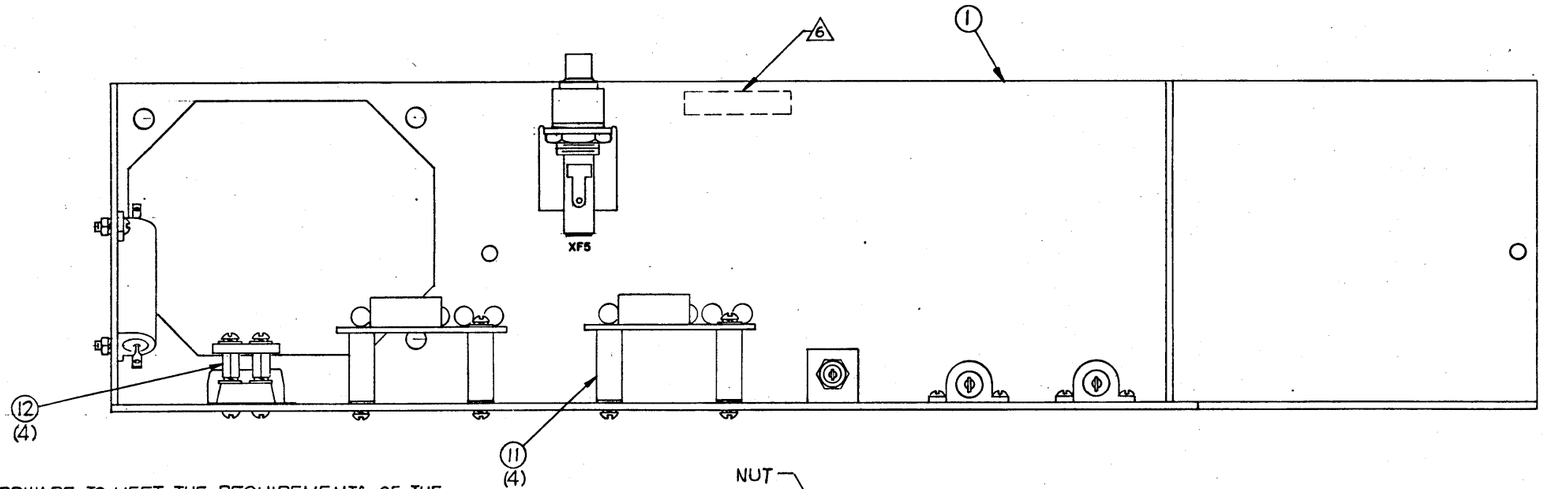
61004200 A

Figure 7-11
KEYBOARD
(SHEET 2 OF 2)
A9

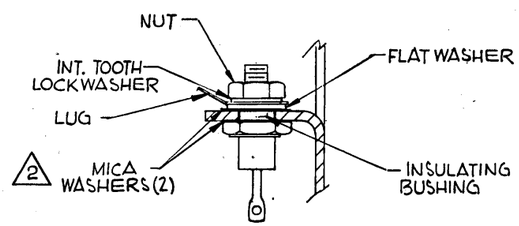
7-65/66

REVISIONS						
REV.	E.C.O.	ZONE	DESCRIPTION	DATE	CHK'D	APP'D
A	—	—	REVISED CR1 MOUNTING, SECT A-A	12-5-67	JM	JM





NOTES:
1. HARDWARE TO MEET THE REQUIREMENTS OF THE APPLICABLE STANDARDS.
2. COAT BOTH SIDES OF MICA WASHERS (2) WITH AN APPLICATION OF ITEM NO. 13 (SILICONE COMPOUND).
3. FOR WIRING REF. SEE SCHEMATIC DIAGRAM 82194561.
4. PARTIAL REF. DESIG. ARE SHOWN; FOR COMPLETE DESIG., PREFIX WITH UNIT NO. OR SUB ASSY. DESIG. OR BOTH.
5. FOR WIRE SIZE, COLOR, & LOCATION, SEE WT 61004300.
6. APPLY ASSY 61004300 IN AREA SHOWN.

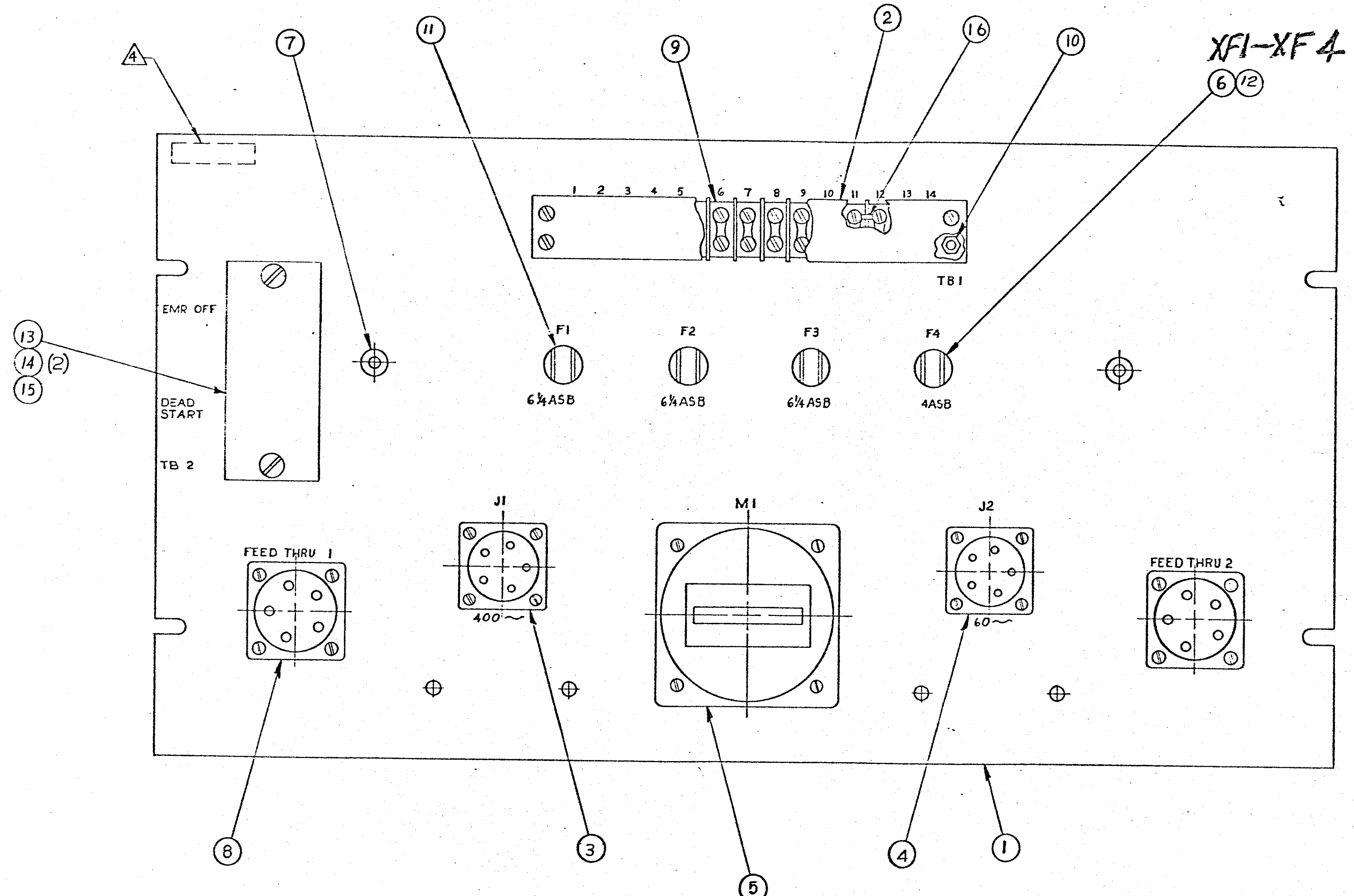


SECTION A-A
SCALE: 2/1

ASSY 61004300 REV A

Figure 7-12
UNBLANK
A10

REV.	E.C.O.	ZONE	DESCRIPTION	DATE	CHK'D	APP'D
A	1446		ADDED ITEMS 13, 14, & 15			
B	1979		INTERCHANGED ITEMS 3 & 4, ADDED LETTERING.			
C	2035		ADDED JUMPER BETWEEN TB1-11 & TB 1-12 (ITEM 16)			



NOTE:

1. FOR WIRING REF. SEE INTERCONNECTION DIAGRAM, POWER & SIGNAL 82200700.
2. UNLESS OTHERWISE SPECIFIED, ALL HARDWARE IS TO MEET THE REQUIREMENTS OF THE APPLICABLE STANDARDS.
3. PARTIAL REF DESIG ARE SHOWN; FOR COMPLETE DESIG PREFIX WITH UNIT NO. OR SUB ASSY DESIG OR BOTH.
4. APPLY "ASSY 61001039 WITH REV" & 15920" IN AREA SHOWN.

All

SEE DETACHED L/M 61001039.

DO NOT SCALE THIS PRINT
REMOVE ALL BURRS AND SHARP EDGES

NEXT ASSY	USED ON
14004000	151

APPLICATION

UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS IN INCHES

LAYOUT	L. KELLER	9-1-66
DRAFTSMAN	D MAGNUSON	9-3-65
CHECKER		
ENGINEER		
APPROVAL		

TITLE: CONNECTOR PANEL ASSEMBLY

PROJECT OR PRODUCT: DD 60 B

SIZE: D

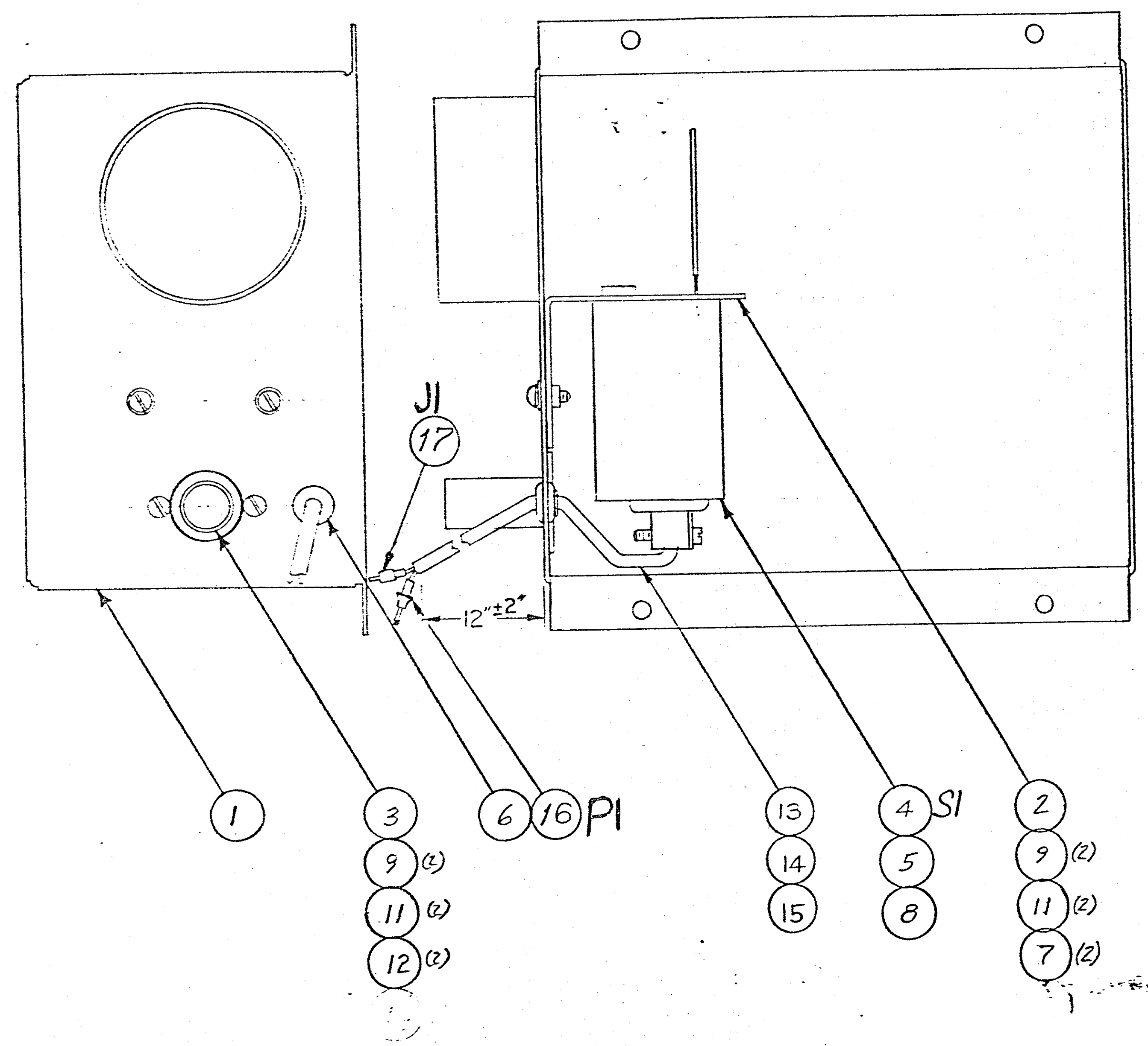
SCALE: 1/1

DRAWING NUMBER: 61001039

7-67A/68A

REVISIONS

SYM.	E.C.O.	DESCRIPTION	DATE	APPROVAL
A	~	MADE DETAILED LIST OF [illegible]	[illegible]	
B	770	ADDED ITEMS 3, 4, 5 REMOVED ITEM 2	[illegible]	[illegible]
C	095	ADDED ITEMS [illegible] 17	4.21.66	[illegible]



DWG. NO. 104572

REV. C

A12

FOR LIST OF MATERIALS SEE L/M 104572

REQD	ITEM NO.	REF. DESIG.	PART NUMBER	DESCRIPTION	MATERIAL	MATERIAL SPEC.	UNIT WT.	SYM.

LIST OF MATERIAL

NEXT ASSY	USED ON
107705	86
[illegible]	

APPLICATION

UNLESS OTHERWISE SPECIFIED
ALL DIMENSIONS IN INCHES
TOLERANCE ON
FRACTIONS DECIMALS ANGLES

MATERIAL

HEAT TREATMENT

FINISH

		DATE
LAYOUT		
DRAFTSMAN	HENRIKSEN	4/26/63
CHECKER		
ENGINEER	[illegible]	[illegible]
APPROVAL		

TITLE: PLENUM ASS'Y., DEFLECTION AMPLIFIER

CONTROL

PROJECT OR PRODUCT: 82, 96

SCALE: FULL

WEIGHT

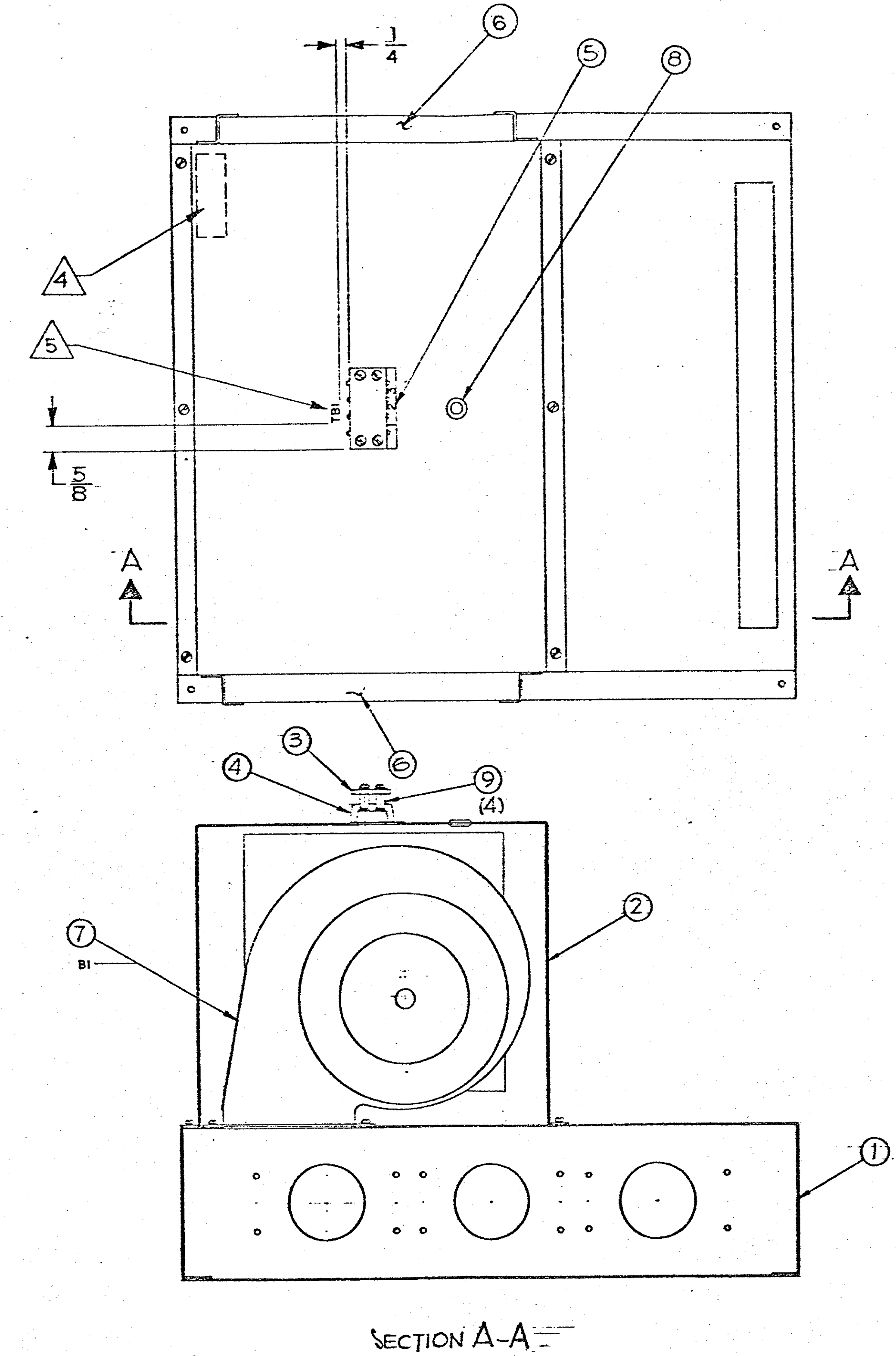
DATA DISPLAY, INCORPORATED
SAINT PAUL, MINNESOTA

DRAWING NUMBER: 104572

7-67B/68B

REVISIONS

REV.	E.C.O.	ZONE	DESCRIPTION	DATE	CHK'D	APPD.
A	—	—	ITEM 5 MOVED			
B	1296	—	ADDED NOTE 5 & LOCATED REF DESIGNATIONS FOR TB1			



NOTES:
1. HARDWARE TO MEET THE REQUIREMENTS OF THE APPLICABLE STANDARDS.
2. PARTIAL REF. DESIG. ARE SHOWN; FOR COMPLETE DESIG., PREFIX WITH UNIT NO. OR SUB ASSY DESIG. OR BOTH.
3. FOR WIRE SIZE, COLOR, & LOCATION, SEE WT 61004100.
4. APPLY "ASSY 61004100" & "15920" IN AREA.
5. LETTERING TO BE 3/16 HIGH, BLACK, VERTICAL, GOTHIC, OVERCOATED WITH CLEAR VARNISH & LOCATED APPROXIMATELY AS SHOWN.

A13

FOR LIST OF MATERIAL SEE L/M 61004100

DO NOT SCALE THIS PRINT
REMOVE ALL BURRS AND SHARP EDGES
HOLE DIAMETER TOLERANCE UNLESS OTHERWISE SPECIFIED

NEXT ASSY | USED ON
APPLICATION

UNLESS OTHERWISE SPECIFIED
ALL DIMENSIONS IN INCHES
TOLERANCE ON FRACTIONS ± DECIMALS ± ANGLES ±
MATERIAL
HEAT TREATMENT
FINISH

LAYOUT
DRAFTSMAN
CHECKER
ENGINEER
APPROVAL

TITLE: PLENUM ASSEMBLY

CODE IDENT 15922

PROJECT OR PRODUCT: DD 60B

SIZE: D

DRAWING NUMBER: 61004100

SCALE

61004100

7-670/680

GLOSSARY OF TERMS AND DEFINITIONS

Term		Definition
AND	——	A logical function which determines a true or false answer for a combination of statements such as A and B according to the following table.

A	B	A and B
False	False	False
False	True	False
True	False	False
True	True	True

AND circuit	——	A circuit which has two or more inputs and an output which results in an output signal only if all the inputs receive signals.
Bit	——	A contraction of binary digit.
Blanking	——	Extinguishing the crt electron beam.
D/a	——	Digital-to-analog.
Data	——	A plural term used to designate a group of numeric or alphabetic material.
Information	——	A collection of data.
Input	——	The data that is transferred into the display unit from an external device.
Matrix	——	The area used for formation of a symbol centered on a base positioning point.
Monitor	——	A crt assembly including all associated power and driving circuits.

GLOSSARY OF TERMS AND DEFINITIONS (CONT)

Term		Definition
OR	——	A logical function which determines a true or false answer for a combination of statements such as A or B according to the following table.

A	B	A or B
False	False	False
False	True	True
True	False	True
True	True	True

OR circuit	——	A circuit which has two or more inputs and an output which results in an output signal if any input receives a signal.
Painting	——	The action of the electron beam in forming a symbol on the crt.
Pot., Pot's.	——	Potentiometer(s).
Raster	——	Display area on the crt screen.
Symbol	——	Characters, numbers, letters, punctuation marks, or specially formed figures.
Trimmers	——	Variable capacitors.
Unblanking	——	Intensifying the crt electron beam.
X	——	Horizontal.
Y	——	Vertical.

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