CHAPTER 3

COMPUTER MODE AND TIME SCALE CONTROL SYSTEM

3.1 INTRODUCTION

The modes of the analog computer are manually controlled by pushbuttons on the keyboard (see Figure 3.1) or by patching logic signals to the proper patch terminals on the 0.12.1607 Control Tray (see Figure 3.2). This chapter describes the analog mode portion of the keyboard and the 0.12.1607 Control Tray.

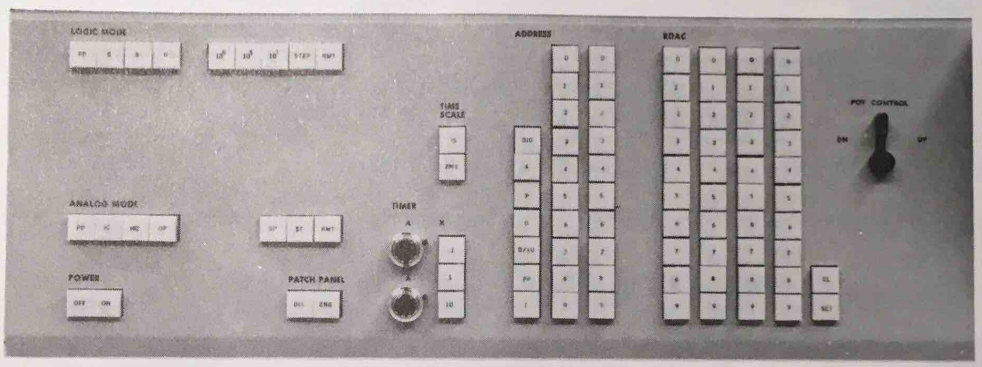


Figure 3.1. Mode Control Keyboard

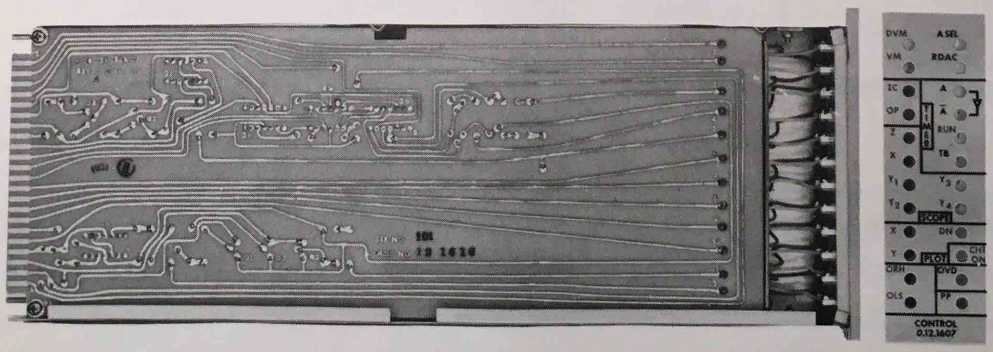


Figure 3.2. Control Tray, Model 0.12.1607

3.2 ANALOG OPERATING AND SETUP MODES

The analog portion of the computer can be placed in any one of three operating modes and any one of three setup modes. These modes, and the corresponding computer functions are summarized in Tables 3.1 and 3.2.

Several alternate methods of controlling the computer modes are also available. For example, if two or more computers are slaved together, the mode selection pushbuttons on the keyboard of *any* computer can be used to control the modes of *all* computers. If the PP pushbutton is depressed, the appropriate computer operating modes are controlled by inputs patched to the 0.12.1607 Control Tray. Other methods of controlling the computer can be provided as required. The linkage equipment, added to the computer to provide full hybrid computation with a digital computer, is described in the manual provided with that equipment.

Table 3.1. Definitions of Computer Operating Modes

Mode	Function
OPERATE *(OP)*	Integrators operate; Computer produces a dynamic solution to a patched problem.
HOLD *(HD)*	Integrators do not operate; all values present at the time the *hold* mode is selected are retained.
INITIAL CONDITION *(IC)*	Integrators are set to initial values.

Table 3.2. Definition of Computer Setup Modes

Mode	Function
STATIC TEST *(ST)*	Similar to *initial condition*. Static test voltages can be applied to integrators not normally provided with initial condition voltages, to permit checking computed levels at other parts of the program via Function Relays. All INT and T/S are forced to *IC* mode.
SET POT *(SP)*	All amplifiers provided with low impedance feedback to provide correct attenuator loading. Reference voltage applied to high end of any pot selected for readout, so that the pot coefficient may be read out. The servo amplifier is connected to the motor of an addressed pot, permitting the pot to be set.
PROGRAM PANEL *(PP)*	When this button is depressed the *IC*, *HOLD*, and *OPERATE* modes may be controlled by logic signals applied to the 0.12.1607 Control Tray patch block. This mode also causes the internal timer to automatically start operation.

3.3 ANALOG MODE AND TIME SCALE CONTROL

Figure 3.3 is a simplified block diagram showing the analog mode and time scale control circuits. The keyboard mode select inputs (or mode selection inputs from an external control device) are connected through a binary coder to a three-bit storage register. The flip-flops in the registers are set into a different code for mode selection. A decoder circuit following the

register provides an output for each mode, and includes drive circuits that light the pushbutton for the selected mode. The appropriate keyboard pushbutton lights, even when the mode is selected remotely.

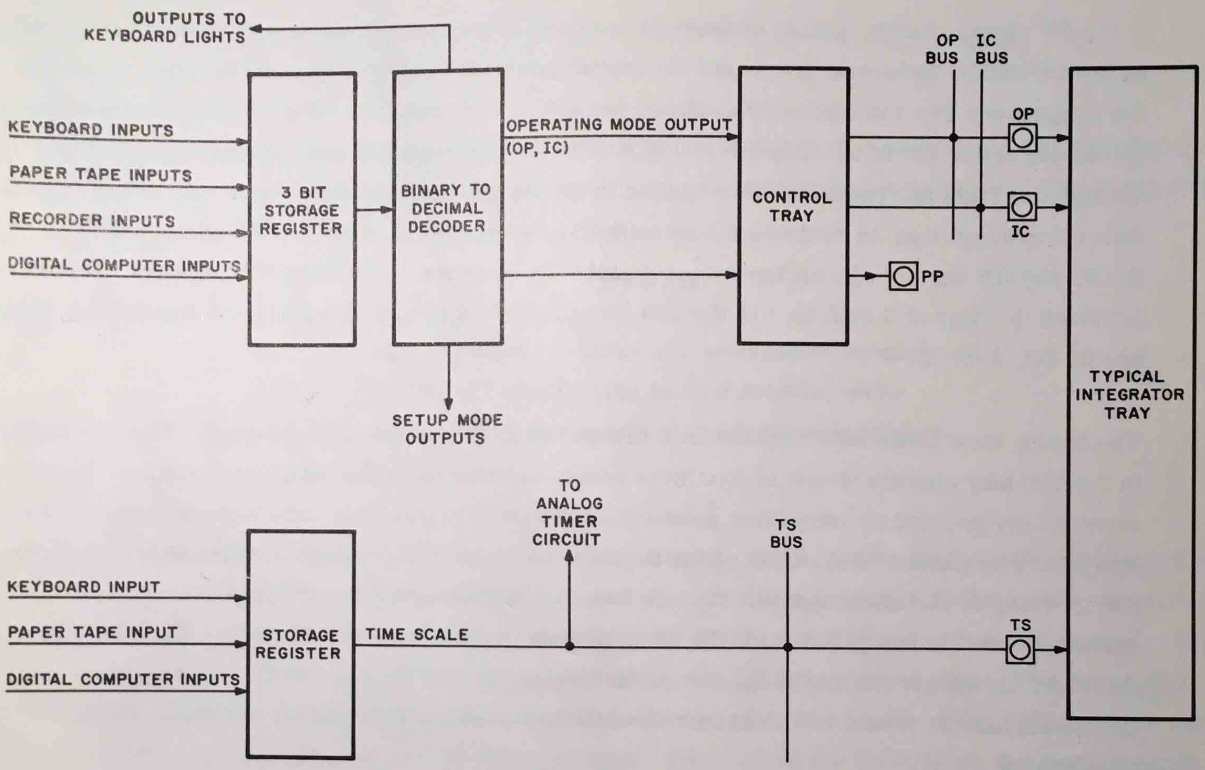


Figure 3.3. Analog Mode and Time Scale Control Circuits, Block Diagram

The outputs representing the setup modes (SP and ST) are connected to various points in the computer requiring setup control. The signals for the operating modes (OP and IC) and the patch panel control enable signal (PP) are connected to the control tray. The *hold* select signal is not required by any computer circuits, since the absense of both OP and IC signals is recognized as a *hold* selection, according to the following truth table:

		Mode Selected			
		OP	IC	IC	H
Signals	OP	1	0	1	0
	IC	0	1	1	0

Consequently, when neither the *operate* nor the *initial condition* modes are selected, the combination amplifier control circuits select the *hold* mode. Also note from the truth table that the IC signal overrides the OP signal; if the OP signal is held at binary ONE, the integrators may be switched between the OP and IC modes by switching only the IC signal.

If the PP signal is high, gating circuits in the control tray permit mode selection signals patched to the OP and IC terminals to control the integrators. If nothing is patched to these terminals, the integrators are automatically switched between the IC and OP modes at a rate determined by the analog timer circuits. The OP and IC output signals from the control tray are connected through bus bars and patching terminations to the integrator control circuits. However, individual integrators may be controlled independently by applying a signal (external to the tray) to the IC and OP control circuit inputs. A detailed description of the integrator control circuits is provided in Chapter 3 Section 1 of the 580 Computing Components Manual (EAI Publication Number 00 800.2057-0).

The analog time scale selection circuits are shown at the bottom of Figure 3.3. The integrators in the 580 may operate at one of four time scales as selected by keyboard pushbuttons, by an external device, and by integrator patching as shown in Figure 3.3. The selection signals are stored in a register. The output of the register is connected to the TS bus line which controls the TS relay in the integrator circuit. In the de-energized state the integrator is in the 1 sec mode. In the energized state the integrator is in the 2 millisecond mode. By patching the FAST terminals (on the integrator patch block) together the four different time scales can be accomplished. Table 3.3 indicates the different combinations and the resulting integrator time scales.

Table 3.3. Integrator Time Scales

Selection Signal	Integrator Fast Terminals Patched Together	Integrator Time Scale	Gain With Gain 1 Input
1 SEC	YES	1.0 SEC	1
1 SEC	NO	0.1 SEC	10
2 MS	YES	2.0 MS	500
2 MS	NO	0.2 MS	5000

These time scales refer to a standard integrator, with an input of 100K ohms. For example, if the 1 SEC pushbutton is depressed and the fast terminals on the integrator are patched together the output of the integrator changes by 1 volt per second per volt input.

3.4 THEORY OF OPERATION

The following paragraphs describe the analog mode selection and analog timer portions of the keyboard, and the 0.12.1607 Control Tray. For ease of description these circuits are described separately.

3.4.1 Analog Mode Selection

The circuitry for the analog mode selection system is shown in Figure 3.4. The table at the bottom of Figure 3.4 specifies the proper input and output logic levels of each flip-flop for the different modes.

NOTE

Since the mode switches are momentary contact, they must be held in the pushed position while checking the logic levels at the input side of each flip-flop.

The selection of a mode is initiated by depressing one of the analog mode pushbuttons on the keyboard. If two or more computers are slaved together, any computer in the group can control the modes of the other computers if their remote (RMT) pushbutton has been depressed. Once a particular mode pushbutton has been activated, the OR gates set or clear their respective flip-flops. A combination of flip-flop outputs forces all of the inputs of the AND gate for the mode selected to go low and its output is high. Since all of the circuits on the mode control card are similar, only the IC mode is discussed in detail. When the IC mode pushbutton is depressed, the input (pin 14) of gate 3a/4a and its output (pin 2) both go high. The clear input of FF1 goes high forcing its 0 output terminal to go low. The high output of the IC switch is also connected to inputs on gates 2a/4a and 1a/4a. The outputs of these gates force the set output (1) of FF2 and FF3 to a low. The low signal from the set outputs of FF2 and FF3 and the low signal from the clear output of FF1 are connected to pins 2, 1, and 14 respectively of AND gate 7a. The three low level inputs on this gate forces its output and the IC output line high. The output of gate 7a is also connected to inverter 5c. When the IC output goes high the output (pin 5) of inverter 5c goes low, effectively grounding the input end of R5. The -20 volts through R6 to the base of Q2 turns the transistor on grounding DS2 through the collector emitter path and the lamp lights.

All of the mode control signals (except for the hold signal) are connected to the 0.12.1607 Control Tray. (Although a hold signal is generated it is not used since the lack of an IC and OP signal automatically places the computer in the hold mode.)

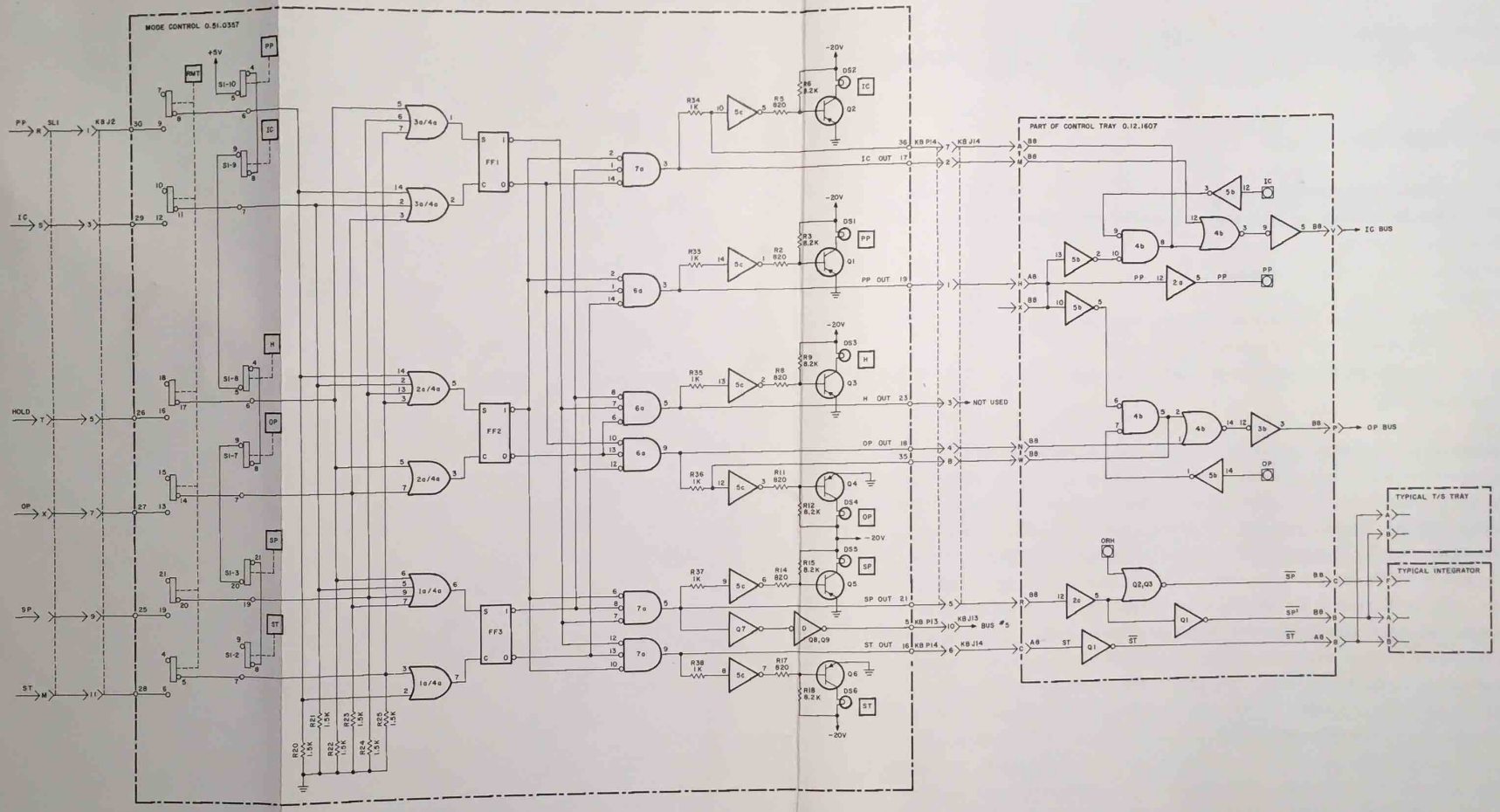


Figure 3.4.
Analog Mode Selection System, Simplified Schematic

The static test (ST) signal is inverted by Q1 in the control tray and is applied as an $\overline{ST}$ signal to the integrator and track/store trays.

The $\overline{SP'}$ output used in the integrator and track/store trays is generated by applying the SP signal through buffer 2C and inverter Q1. The $\overline{SP}$ signal used in the integrator is generated by applying the output of buffer 2C to the OR gate comprised of transistors Q2 and Q3. The second input to the OR gate is applied through the override hold (ORH), patch terminal on the control tray. A high at either input to the OR gate forces its output and the $\overline{SP}$ line low.

Since the OP and IC circuits in the control tray are identical in operation, only the IC circuit is described. When the IC output from the mode control unit goes high the output of OR gate 4b (pin 3) is forced low. The low is then applied to the input of inverter 3b. The high output from the inverter drives the IC bus. Control of the IC and OP modes from patching terminals on the control tray is possible if the PP mode on the keyboard is selected. The high PP output from the mode control tray is inverted by 5b and applied as a low to pin 10 of AND gate 4b. A logic high patched to the IC input is also inverted by another section of 5b and a low is also applied to pin 9 of AND gate 4b. The two lows on the input of this gate force its output to go high. The output of the AND gate (pin 8) is connected to the lamp circuit and the input (pin 13) of OR gate 4b. The high level at this point turns the IC lamp on and forces the output of OR gate 4b to go low. Inverter 3b inverts the low output from the OR gate and drives the IC bus.

3.4.2 Analog Timer

The analog timer circuit provides a means of generating precise time intervals. The intervals generated have time durations determined by the COMPUTER TIME SCALE switches and the TIMER potentiometer and switches located on the keyboard. The time intervals established by these controls may be used to control the analog modes of the computer for iterative or repetitive operation.

Figure 3.5 is a simplified schematic showing the major components of the timer. Refer to this schematic for the following description.

Depending on whether or not the RMT switch has been activated, the time scale signal is generated by an external device or by depressing either the 1S or 2MS pushbutton on the keyboard.

For purposes of description, assume that the time scale signal is to be generated from the keyboard. When the 1S pushbutton is depressed, the set input of the flip-flop, located on the 0.51.0363 Rep-Op Time Scale Card, goes high, the 1 output of the flip-flop goes low and the 0 output goes high. The low at the 1 output is inverted by Q3 to the coil of relay K1 and the relay is retained in the non-energized state. The high from the 0 output of the flip-flop is inverted, essentially grounding the base of Q2 through R11, the base goes negative and the transistor conducts causing the 1S lamp to light.

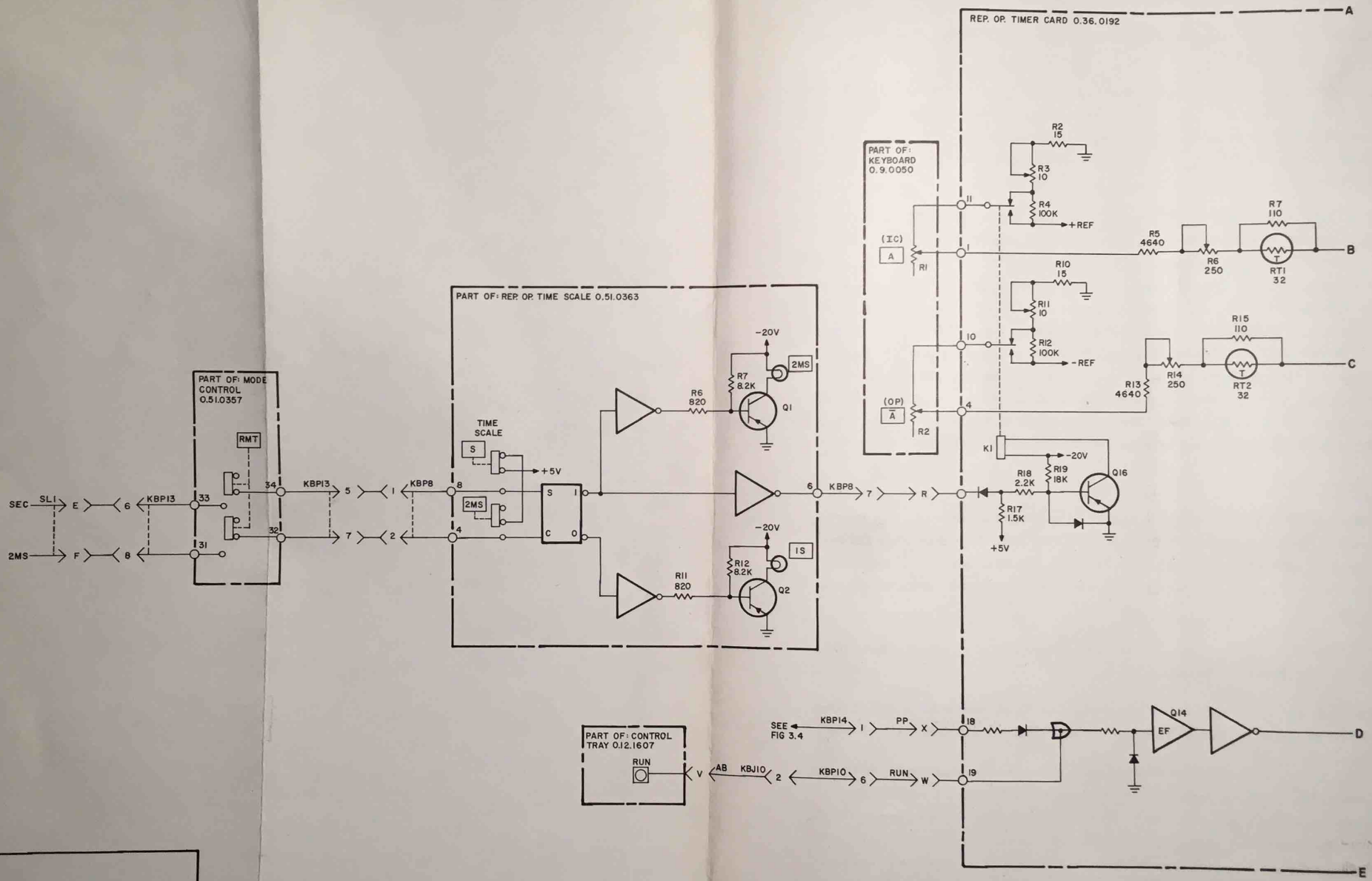


Figure 3.5.
Analog Timer
Simplified Schematic (Sheet 1 of 2)

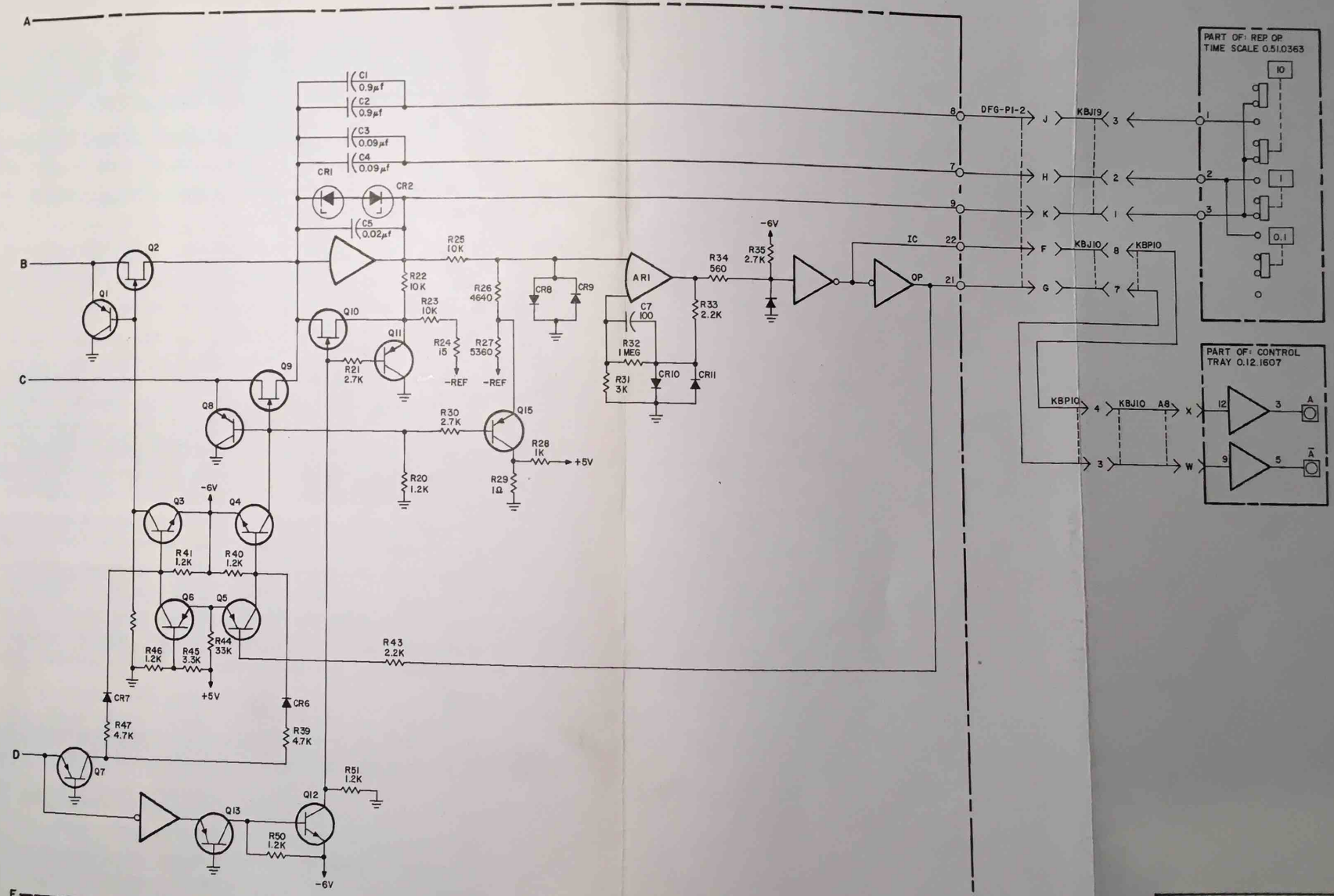


Figure 3.5.
Analog Timer
Simplified Schematic (Sheet 2 of 2)

When the 2MS pushbutton is depressed, the 0 output goes low and the 1 output goes high, the 2MS lamp circuit is activated and the lamp lights. Transistor Q3 inverts the high level from the 1 output, the input and output of the driver are both low, and the relay is energized.

The condition of relay K1 determines the amount of reference voltage to be applied to the A and $\overline{A}$ potentiometers. In the 1S mode the reference voltage is applied through 100K resistors. In the 2MS mode the reference voltage is applied directly, through the relay contacts, to the top of the A and $\overline{A}$ potentiometers.

This voltage, picked off the pots at the wiper, is fed through a series of resistors and field effect transistors (FET) Q2 or Q9 to the input of the integrator. The integrator rate is determined by feedback capacitors (C1 through C5) which are selected by the 0.1, 1.0, and 10X pushbuttons, shown at the upper right of Figure 3.5.

Prior to operating the analog timer it is necessary to patch a high to the Run terminal on the Control Tray or to activate the PP pushbutton on the keyboard. If neither the RUN or PP inputs (located at the bottom center of Figure 3.5) are high, the input and output of emitter follower Q14 are low. The inverter in series with Q14 has a high output and forward biases Q7 which is connected as a diode. The high at the collector of Q7 also forward biases CR6 and CR7 connecting a positive voltage to the base of transistors Q3 and Q4. With the base of Q3 and Q4 negative the transistors conduct and the gates of FET Q2 and Q9 are negative, pinching off the FET's. The negative voltage at the gate of each FET also serves to saturate Q1 and Q8, grounding the IC and OP input lines. The high at the emitter of Q7 is also applied to the inverter in series with Q13. The low output of the inverter back biases Q13 (connected as a diode) and its output is at zero volt. The base of Q12 is more positive than the emitter (-6 volts), the transistor conducts, pinching off FET Q10 and saturates transistor Q11. With this circuit configuration, the integrator input is grounded and the feedback capacitors are replaced by a 10K feedback resistor (R22).

When the RUN and PP lines are high the feedback resistor is removed from the integrator and the IC and OP FET's are controlled by internal circuitry as described below.

In the OP mode, reference is applied through FET Q9 to the integrator input. The output of the integrator (positive current) is applied to the input of amplifier AR1. Negative current is also applied to the amplifier input from -Ref through resistors R26 and R27. When the integrator output current nulls with the negative current (approximately 1 ma) the output of amplifier AR1 goes low, and the OP line applies a low to pin 21 of the rep-op timer card. The low at pin 21 is buffered and the $\overline{A}$ patch terminal on the control tray is low. With the AR1 output

low, the IC line, which is complementary to the OP line, goes high (patch terminal A on the control tray is high). The low OP signal turns on transistor Q5, its collector goes positive turning on Q4. When Q4 is saturated its collector goes negative, pinching off the OP FET Q9 and grounds the FET input by saturating transistor Q8. The negative voltage used to pinch off FET Q9 is also applied to the base of Q15, turning the transistor on and grounding the reference through R27 and R29.

When the OP line goes low and transistor Q5 conducts, the emitter of Q6 becomes less positive than its base and cuts off. With the drive voltage removed from Q3 it is in turn cut off, the gate of the IC FET (Q2) is biased positive and conducts, putting the integrator in the IC mode. The slight positive on the gate of the FET also cuts off transistor Q1 and the IC input line is lifted off ground.

In the IC mode, the integrator feedback capacitors charge to a point that the comparator output again changes state and goes high. The output of AR1 is inverted and the IC line goes low (patch terminal A on the control tray goes low). The low on the IC line is inverted and the OP line goes high (patch terminal $\overline{A}$ on the control tray goes high). The low on the OP line cuts off Q5 which in turn cuts off Q4 removing the negative voltage from the gate of Q9. FET Q9 is turned on by a slight positive bias, Q8 and Q15 are turned off. When Q5 is cut off, Q6 and Q3 conduct and the IC FET (Q2) is pinched off and Q1 conducts grounding the IC input signal.

3.4.3 Control Tray, Model 0.12.1607

The 0.12.1607 Control Tray contains control circuits used with the mode control operation of the 580 Computer and control circuits for peripheral equipment. The following paragraphs contain the theory of operation for those control circuits associated with peripheral equipment. The circuits associated with the mode control of the computer are described in Paragraph 3.4.1.

3.4.3.1 *Pen Control Circuit.* The pen control circuit consists of a jumper from the DN patch terminal to pin N of connector A8 (P2). Cabling from that point connects the logic control signal to the pen down circuit located in the plotter. A high (+5 volts) causes the pen to be lowered to the plotting surface while a low (0 volt) causes the pen to remain in the up position. For a description of the pen down circuit see the handbook accompanying the plotting board.

3.4.3.2 *Chart Control Circuit.* This circuit is designed to give the computer operator remote control of a strip chart recorder connected to the 580 Computer. See Figure 3.6 and Schematic D00 012 1615 0S for the description below. To activate the recorder it is necessary to patch a high to the CHT ON terminal. The high at the patch terminal turns tran-

sistor Q4 on and its collector goes positive. Resistors R8 and R14 act as a voltage divider and reduce the -20 volts making the base of Q3 less negative than its emitter. Under these conditions Q3 conducts and -20 volts is applied, through cabling, to the control circuits in the recorder.

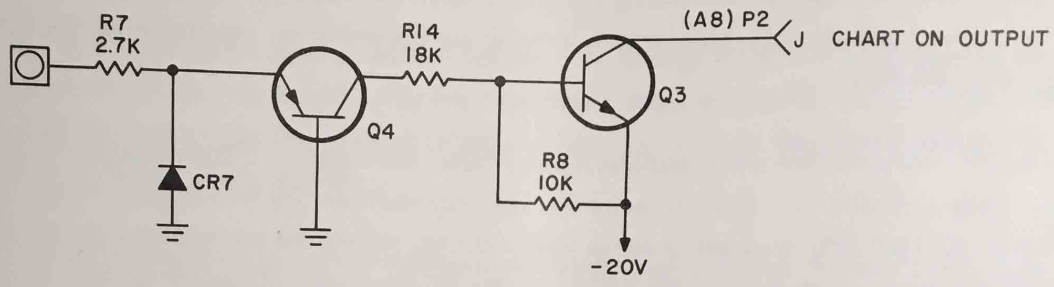


Figure 3.6. Chart Control Circuit

A low at CHT ON patch terminal cuts off Q3 and no current flows through the voltage divider. Under these conditions, the emitter and base of Q3 are at approximately the same voltage and the transistor is cut off, removing the -20 volts from the recorder control circuit.

Diode CR7 protects transistor Q4 from any negative voltage that may be inadvertently patched to the CHT ON terminal.

3.4.3.3 *Blanking Circuit.* The blanking circuit consisting of an inverter, Q5, and an emitter-follower, Q6, is used to blank the Rep-Op Scope when the IC or the Z patch terminals go high. Refer to Figure 3.7 and Schematic D00 012 1616 0S for the following description.

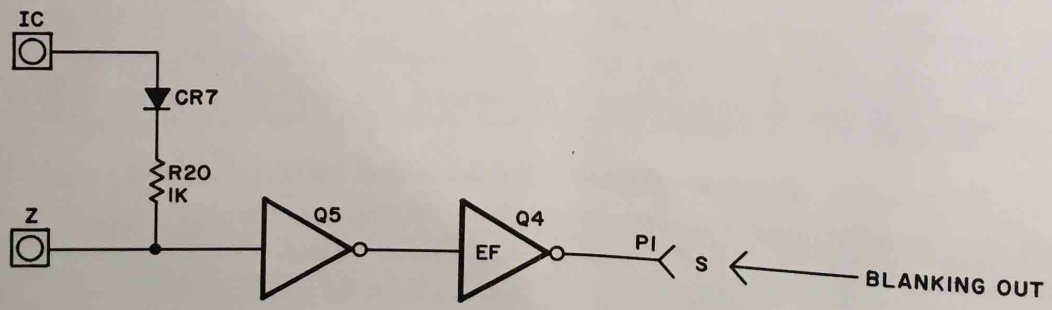


Figure 3.7. Blanking Circuit

If the signal at either the IC or Z terminal goes high the output of Q5 is low and the output of the emitter-follower is low (-15 volts). This output is connected through the scope connector on the 580 computer to the blanking circuits in the Rep-Op Display Unit.

3.4.3.4 *Trunk Circuits.* Many of the patch terminations on the control tray are used to give convenient inputs or output to readout devices or circuits not otherwise terminated on the patch panel. The trunk circuits, which consist of straight-through wiring, and the associated patching terminations are described in the sections or manuals dealing with their function. Figure 3.8 shows the patch terminals and their ultimate destinations.

3.5 MAINTENANCE AND TROUBLESHOOTING

3.5.1 Maintenance

The mode control components require no routine maintenance or adjustments.

3.5.2 Troubleshooting

The problems that may develop in the mode control circuits are usually due to the failure of a diode, transistor, or an integrated circuit element; rarely due to the failure of a resistor,

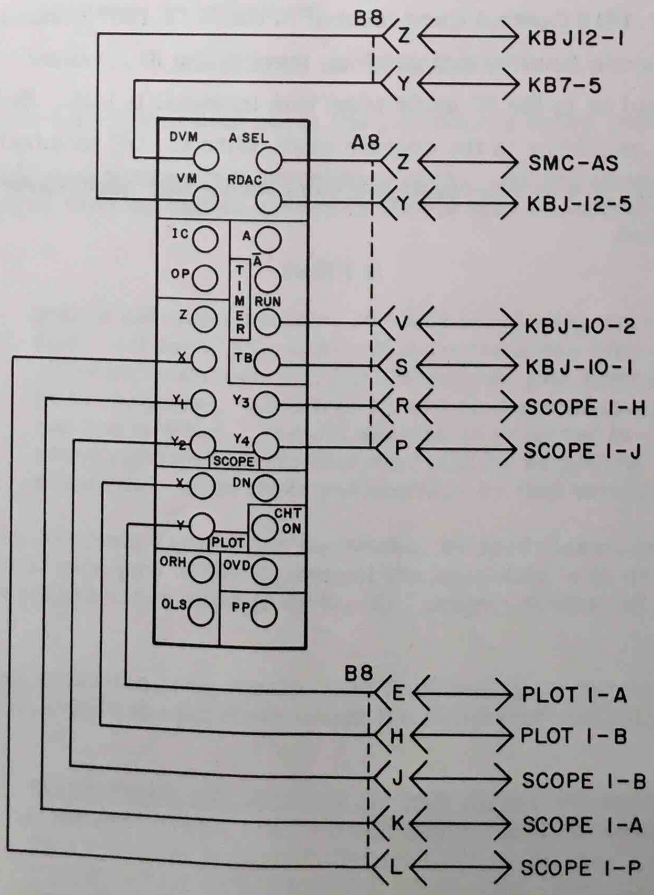


Figure 3.8. Trunk Wiring on Control Tray

capacitor or other passive component. Often, a problem can be isolated to a single component or group of components simply by depressing the mode selection pushbuttons and observing the symptoms, then referring to Figures 3.4 through 3.7. If the problem is more difficult to isolate, a direct-coupled oscilloscope may be used to check point-to-point waveforms or voltage levels.

The 0.12.1607 Control Tray may be installed on a service shelf (EAI Part Number 0.51.0382) to perform these checks.

Several points that may be useful in evaluating symptoms are summarized below:

1. The lights beneath the keyboard registers are driven from the outputs of the mode or time scale registers. If the correct pushbutton for a selected mode is illuminated, it can be assumed that this register is functioning properly.
2. If the analog mode registers appear to be operating properly, but none of the integrators respond to the mode selection, the trouble is probably in the 0.12.1616 Control Card located in the 0.12.1607 Control Tray. Select the PP mode (analog) and patch an input to the IC terminal. The integrators should be in the IC mode when this terminal is high. Similarly the integrators should be in the operate mode when the OP terminal is high. Refer to Figure 3.4 to determine the components that could cause the symptoms observed.

APPENDIX 1

REPLACEABLE PARTS LISTS

This appendix contains Replaceable Parts Lists for the equipment described in this chapter. In each case, a brief description of the part, the EAI part number and, where applicable, a reference symbol (schematic designation) is included. To enable a particular sheet to be readily located, an index precedes the individual replaceable parts lists.

The category column indicates the availability of each part so that a replacement can be obtained as quickly as possible.

Category "A" - The parts in category "A" are standard electronic items that are usually available from any commercial electronic supplier.

Category "B" - The parts in category "B" are proprietary items that are available only from EAI.

CAUTION

If proprietary items are replaced with items obtained from other sources, EAI cannot assume responsibility for a unit not operating within its published specifications.

ORDERING INFORMATION

To expedite your order for replacement parts the procedures below should be followed:

1. Specify the EAI part number and description of the part required. The model number and serial number of the next higher assembly should also be included.

NOTE

EAI is currently revising the part numbering system. All parts effected by this revision are identified using the new and the old number (the number in parenthesis). All parts should be ordered using the new number. The old number is provided to cross reference parts that may still be identified physically, or in other publications by that number.

2. When ordering complete assemblies (networks, printed circuit cards, etc.), specify the model and serial numbers of the equipment the assembly is to be used with. If possible, include the purchase order number or the EAI project number of the original equipment purchased.

3. When ordering expansion components, note if mounting hardware is required. If hardware is needed, add to the purchase order the statement "INCLUDING MOUNTING HARDWARE".

NOTE THAT EAI RESERVES THE RIGHT TO MAKE PART SUBSTITUTIONS WHEN REQUIRED. EAI GUARANTEES THAT THESE SUBSTITUTIONS ARE ELECTRICALLY AND PHYSICALLY COMPATIBLE WITH THE ORIGINAL COMPONENT.

PARTS LIST INDEX

ITEM	REF. DESIG.	DESCRIPTION	EAI NO.	*CAT.
1	K2J-4, JPJ-6	Connector, Receptacle: 12 Contacts; Female (Amp 480087-1 or equal)	00 542.1058-0	A
2	KBP-7,9,15, 17,18,19	Connector, Plug: 12 Contacts; Male (Amp 480088-1 or equal)	00 542.1059-0	A
3	R1,2	Potentiometer	00 642.0780-0	B
4	R3	Potentiometer	00 642.0723-0	B
5		Resistor, Precision: Matched Set of 8 R1 - 4,000 ohms R2 - 5,000 ohms R3 - 10,000 ohms R4 - 20,000 ohms R5 - 40,000 ohms Above Resistors used on 0.51.0361 DAS Control Card. R6 - 50,000 ohms R7 -100,000 ohms R8 -200,000 ohms Above Resistors used on 0.51.0361 DAC w/Amplifier Card.	00 642.0780-0	B

*NOTE: THE CATEGORY COLUMN IS DESIGNED TO INDICATE AVAILABILITY OF PARTS.
A - INDICATES PARTS THAT SHOULD BE PURCHASED LOCALLY.
B - INDICATES PARTS THAT SHOULD BE PURCHASED FROM EAI.

UNIT TITLE
KEYBOARD PANEL

MODEL NO.
0.9.0050 Sh.1 of 1 Sh.

ITEM	REF. DESIG.	DESCRIPTION	EAI NO.	*CAT.
1	J1	Connector Block: Yellow	00 542.1545-1	B
2	R1,2	Resistor, Fixed, Composition: 820 ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0821-0	A
3		Connector Block: Lettered (CONTROL 0.12.1607)	00 542.1551-3	B
		0.12.1615 CONTROL CARD #1		
1	1a,2a,2c	Integrated Circuitry: Dual Buffer	00 592.0090-0	B
2	1c	Integrated Circuitry: Hex Inverter	00 592.0100-0	B
3	C1,4	Capacitor	00 516.0255-0	B
4	C2	Capacitor, Fixed, Electrolytic: 6.8 uf ±10%, 35V (Sprague 150D or equal)	00 516.0277-0	A
5	CR1	Rectifier (Solitron Devices, Inc. CER68 or equal)	00 614.0110-0	A
6	CR3	Diode	00 614.0007-0	B
7	CR8,9	Diode: 1N4004	00 614.0209-0	A
8	CR7,10,11	Diode	00 614.0293-0	B
9	P2	Connector, Plug: 22 Contacts; Male (Amphenol 133-022-43 or equal)	00 542.0488-0	A
10	Q1,3	Transistor	00 686.0229-0	B
11	Q2	Transistor (GE 4JX1C1286 or equal)	00 686.0091-0	A
12	Q4	Transistor	00 686.0377-0	B
13	R1	Resistor, Fixed, Composition: 5.6K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0562-0	A
14	R2,4	Resistor, Fixed, Composition: 1.5K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0152-0	A

*NOTE: THE CATEGORY COLUMN IS DESIGNED TO INDICATE AVAILABILITY OF PARTS.
A - INDICATES PARTS THAT SHOULD BE PURCHASED LOCALLY.
B - INDICATES PARTS THAT SHOULD BE PURCHASED FROM EAI.

UNIT TITLE: CONTROL PANEL

MODEL NO.: 0.12.1607 Sh. 1 of 3 Sh.

ITEM	REF. DESIG.	DESCRIPTION	EAI NO.	*CAT.
15	R3	Resistor, Fixed, Composition: 33 ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0330-0	A
16	R5	Resistor, Fixed, Composition: 3.9K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0392-0	A
17	R7	Resistor, Fixed, Composition: 2.7K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0272-0	A
18	R8	Resistor, Fixed, Composition: 18K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0183-0	A
19	R14	Resistor, Fixed, Composition: 10K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0103-0	A
20	R18,19,20, 21	Resistor, Fixed, Composition: 100 ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0101-0	A
21	R22	Resistor, Fixed, Composition: 1.2K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0102-0	A
		0.12.1616 CONTROL CARD #2		
1	1a,2c,3b	Integrated Circuitry: Dual Buffer	00 592.0090-0	B
2	4b	Integrated Circuitry: 2 Input Gate	00 592.0096-0	B
3	5b	Integrated Circuitry: Hex Inverter Pack	00 592.0100-0	B
4	C1	Capacitor, Fixed, Ceramic: 10 nf +60% -40%, 150V (Centralab DDM-103 or equal)	00 515.0151-0	A
5	CR1 thru 7	Diode	00 614.0293-0	B
6	CR10	Stabistor	00 648.0004-0	B
7	Q1,2,3	Transistor	00 686.0229-0	B
8	Q4	Transistor: 2N3638	00 686.0250-0	A
9	Q5	Transistor: 2N3644	00 686.0325-0	A

*NOTE: THE CATEGORY COLUMN IS DESIGNED TO INDICATE AVAILABILITY OF PARTS.
A - INDICATES PARTS THAT SHOULD BE PURCHASED LOCALLY.
B - INDICATES PARTS THAT SHOULD BE PURCHASED FROM EAI.

UNIT TITLE

CONTROL TRAY

MODEL NO.

0.12.1607 Sh. 2 of 3 Sh.

4

DATE 4 /25 68

ITEM	REF. DESIG.	DESCRIPTION	EAI NO.	*CAT.
10	R1,2,10,11, 12	Resistor, Fixed, Composition: 5.6K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0562-0	A
11	R4,7,8,15, 18,23,24	Resistor, Fixed, Composition: 1.5K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0152-0	A
12	R5,6	Resistor, Fixed, Composition: 390 ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0391-0	A
13	R9,14,20	Resistor, Fixed, Composition: 1K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0102-0	A
14	R13	Resistor, Fixed, Composition: 27K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0273-0	A
15	R14,20	Resistor, Fixed, Composition: 1.8K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0182-0	A
16	R19	Resistor, Fixed, Composition: 1.2K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0122-0	A
17	R21,22	Resistor, Fixed, Composition: 1.5K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0152-0	A

*NOTE: THE CATEGORY COLUMN IS DESIGNED TO INDICATE AVAILABILITY OF PARTS.
A - INDICATES PARTS THAT SHOULD BE PURCHASED LOCALLY.
B - INDICATES PARTS THAT SHOULD BE PURCHASED FROM EAI.

UNIT TITLE
CONTROL TRAY

MODEL NO.
0.12.1607 Sh. 3 of 3 Sh.

4 DATE 4 / 25 / 68

M446

ITEM	REF. DESIG.	DESCRIPTION	EAI NO.	*CAT.
1	1cP1	Integrated Circuitry: Quad 2-Input Gate	00 592.0096-0	B
2	AR1	Integrated Circuitry: Amplifier, Wide Panel	00 592.0059-0	B
3	C1,2	Capacitor (Matched Pair)	00 525.0019-0	B
4	C3,4	Capacitor (Matched Pair)	00 525.0020-0	B
5	C5	Capacitor	00 521.0146-0	B
6	C6,7	Capacitor, Fixed, Ceramic: 100 pf ±10%, 1000V (Cornell-Dubilier JBZ601YP101K or equal)	00 515.0019-0	A
7	C8,10,11,14	Capacitor, Fixed, Ceramic: 10 nf +60% -40%, 150V (Centralab DDM-103 or equal)	00 515.0151-0	A
8	C9,12,13,15	Capacitor	00 516.0387-0	B
9	CR1,2	Diode	00 614.0238-0	B
10	CR3,4,5,6,7	Diode	00 614.0293-0	B
11	CR8 thru 12	Diode: 1N916	00 614.0148-0	A
12	CR13	Diode, Zener: 1N748A	00 614.0289-0	A
13	CR14	Diode, Zener (Motorola 1/4M6.2AZ10 or equal)	00 614.0214-0	A
14	CR15	Diode	00 614.0110-0	A
15	K1	Relay: 18VDC, 520 ohms Coil; 4 Form C Contacts (Allied Control T-154-4C-520 or equal)	00 618.0171-0	A
16	Q1,5,6,7, 8,11,13	Transistor: 2N3640	00 686.0258-0	A
17	Q2,9,10	Transistor	00 686.0246-0	B
18	Q3,4,12,14	Transistor: 2N3646	00 686.0230-0	A
19	Q15	Transistor	00 686.0270-0	B
20	Q16	Transistor: 2N3638A	00 686.0305-0	A
21	R2,10	Resistor, Fixed, Wirewound: 15 ohms ±5%, 3W (Ward Leonard 3X15WL or equal)	00 636.0264-0	A

*NOTE: THE CATEGORY COLUMN IS DESIGNED TO INDICATE AVAILABILITY OF PARTS.
A - INDICATES PARTS THAT SHOULD BE PURCHASED LOCALLY.
B - INDICATES PARTS THAT SHOULD BE PURCHASED FROM EAI.

UNIT TITLE
REP-OP TIMER CARD

MODEL NO.
0.36.0192 Sh. 1 of 3 Sh.

0 DATE 5 / 17 / 68

ITEM	REF. DESIG.	DESCRIPTION	EAI NO.	*CAT.
22	R3,11	Potentiometer	00 642.0731-0	B
23	R4,12,22, 23,25	Resistor, Fixed, Film: 10K ohms ±0.1%, 50-ppm/°C,1/4W (Int. Resistance Co. CEA or equal)	00 632.1002-8	A
24	R5,13,26	Resistor, Fixed, Film: 4640 ohms ±0.1%, 50ppm/°C, 1/4W (Int. Resistance Co. CEA or equal)	00 632.4641-8	A
25	R6,14	Potentiometer	00 642.0696-0	B
26	R7,15	Resistor, Fixed, Composition: 110 ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0111-0	A
27	R8,16,21, 30,35,49	Resistor, Fixed, Composition: 2.7K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0272-0	A
28	R17	Resistor, Fixed, Composition: 1.5K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0152-0	A
29	R18,33,36, 37,43,53	Resistor, Fixed, Composition: 2.2K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0222-0	A
30	R19	Resistor, Fixed, Composition 18K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0183-0	A
31	R20,40,41, 42,46,50,51	Resistor, Fixed, Composition: 1.2K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0122-0	A
32	R24	Resistor, Fixed, Composition: 15 ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0150-0	A
33	R27	Resistor, Fixed, Film: 5630 ohms ±0.1%, 50 ppm/°C, 1/4W (Int. Resistance Co. CEA or equal)	00 632.5361-8	A
34	R28	Resistor, Fixed, Composition: 1K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0102-0	A
35	R29	Resistor, Fixed, Composition: 1 ohm ±5%, 1/2W (Allen-Bradley EB or equal)	00 626.0109-0	A

*NOTE: THE CATEGORY COLUMN IS DESIGNED TO INDICATE AVAILABILITY OF PARTS.
A - INDICATES PARTS THAT SHOULD BE PURCHASED LOCALLY.
B - INDICATES PARTS THAT SHOULD BE PURCHASED FROM EAI.

UNIT TITLE: REP-OP TIMER CARD

0

DATE 5 / 17 / 68

MODEL NO. 0.36.0192

ITEM	REF. DESIG.	DESCRIPTION	EAI NO.	*CAT.
36	R31	Resistor, Fixed, Composition: 3K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0302-0	A
37	R32	Resistor, Fixed, Composition: 1 megohm ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0105-0	A
38	R34	Resistor, Fixed, Composition: 560 ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0561-0	A
39	R38,48	Resistor, Fixed, Composition: 470 ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0471-0	A
40	R39,47	Resistor, Fixed, Composition: 4.7K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0472-0	A
41	R44,45	Resistor, Fixed, Composition: 3.3K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0332-0	A
42	R52	Resistor, Fixed, Composition: 470 ohms ±5%, 1/2W (Allen-Bradley EB or equal)	00 626.0471-0	A
43	RT1,2	Thermistor	00 646.0116-0	B
44	XK1	Socket, Relay: 16 Contacts (Allied Control 300554 or equal)	00 650.0133-0	A

*NOTE: THE CATEGORY COLUMN IS DESIGNED TO INDICATE AVAILABILITY OF PARTS.
A - INDICATES PARTS THAT SHOULD BE PURCHASED LOCALLY.
B - INDICATES PARTS THAT SHOULD BE PURCHASED FROM EAI.

UNIT TITLE
REP-OP TIMER CARD

MODEL NO.
0.36.0192 Sh. 3 of 3 Sh.

0 DATE 5 / 17 / 68

M446

ITEM	REF. DESIG.	DESCRIPTION	EAI NO.	*CAT.
1	1a,2a,3a	Integrated Circuitry: Dual 4 Input Gate	00 592.0095-0	B
2	4a,5c	Integrated Circuitry: Hex Inverter Pack	00 592.0100-0	B
3	5a,5b	Integrated Circuitry: Quad 2 Input Gate	00 592.0096-0	B
4	6a,7a	Integrated Circuitry: Triple 3 Input Gate	00 592.0098-0	B
5	C1,3	Capacitor, Fixed, Electrolytic: 6.8 uf ±20%, 35V (Kemet K6R8C35 or equal)	00 516.0387-0	A
6	C2,4	Capacitor, Fixed, Ceramic: 10 nf +60% -40%, 150V (Centralab DDM-103 or equal)	00 515.0151-0	A
7	C5	Capacitor, Fixed, Ceramic: 0.47 nf ±20%, 25V (Sprague 3C15 or equal)	00 511.5473-4 (00 515.0234-0)	A
8	KBJ-3	Connector, Receptacle: 12 Contacts; Female (Amp 480087-1 or equal)	00 542.1058-0	A
9	Q1 thru 8	Transistor: 2N3638A	00 686.0305-0	A
10	Q9	Transistor	00 686.0381-0	B
11	R2,5,8,11, 14,17,43	Resistor, Fixed, Composition: 820 ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0821-0	A
12	R3,6,9,12, 15,18	Resistor, Fixed, Composition: 8.2K ohms ±5%, 1/4W (Allen -Bradley CB or equal)	00 625.0822-0	A
13	R4,7,10,13, 16,19,41,42	Resistor, Fixed, Composition: 4.7K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0472-0	A
14	R20 thru 25, 27 thru 32, 39	Resistor, Fixed, Composition: 1.5K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0152-0	A
15	R26,44	Resistor, Fixed, Composition: 100 ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0101-0	A
16	R33 thru 38	Resistor, Fixed, Composition: 1K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0102-0	A

*NOTE: THE CATEGORY COLUMN IS DESIGNED TO INDICATE AVAILABILITY OF PARTS.
A - INDICATES PARTS THAT SHOULD BE PURCHASED LOCALLY.
B - INDICATES PARTS THAT SHOULD BE PURCHASED FROM EAI.

UNIT TITLE: MODE CONTROL CARD

MODEL NO.: 0.51.0357-1 Sh. 1 of 2 Sh.

ITEM	REF. DESIG.	DESCRIPTION	EAI NO.	*CAT.
17	R40	Resistor, Fixed, Composition: 18K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0183-0	A
18	S1	Switch	00 656.0178-3	B
19		Lamp, Incandescent: 28V, 40 MA, Clear T-1-3/4 Bulb (Hudson 369 or equal)	00 578.0089-0	A

*NOTE: THE CATEGORY COLUMN IS DESIGNED TO INDICATE AVAILABILITY OF PARTS.
A - INDICATES PARTS THAT SHOULD BE PURCHASED LOCALLY.
B - INDICATES PARTS THAT SHOULD BE PURCHASED FROM EAI.

UNIT TITLE

MODE CONTROL CARD

MODEL NO.

0.51.0357-1 Sh. 2 of 2 Sh.

4

DATE 10/ 9 /67

M446

ITEM	REF. DESIG.	DESCRIPTION	EAI NO.	*CAT.
1	1a	Integrated Circuitry: Quad 2 Input Gate	00 592.0096-0	B
2	C1,3	Capacitor	00 516.0387-0	B
3	C2,4	Capacitor, Fixed, Ceramic: 10 nf ±10%, 1000V (Erie 811000Z5V0-103K or equal)	00 515.0189-0	A
4	DS1,2	Lamp, Incandescent: 28V, 4 MA; Clear T1-3/4 Bulb (Hudson 369 or equal)	00 578.0089-0	A
5	KBP-8,19	Connector, Plug: 12 Contacts; Female (Amp 480088-1 or equal)	00 542.1059-0	A
6	Q1,2	Transistor: 2N3638	00 686.0250-0	A
7	Q3	Transistor	00 686.0229-0	B
8	R1	Resistor, Fixed, Composition: 100 ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0101-0	A
9	R2,3,9,10	Resistor, Fixed, Composition: 1.5K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0152-0	A
10	R4	Resistor, Fixed, Composition: 470 ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0471-0	A
11	R5	Resistor, Fixed, Composition: 5.6K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0562-0	A
12	R6,11	Resistor, Fixed, Composition: 820 ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0821-0	A
13	R7,12	Resistor, Fixed, Composition: 8.2K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0822-0	A
14	R8,13	Resistor, Fixed, Composition: 4.7K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0472-0	A
15	S1	Switch, Pushbutton	00 656.0179-0	B

*NOTE: THE CATEGORY COLUMN IS DESIGNED TO INDICATE AVAILABILITY OF PARTS.
A - INDICATES PARTS THAT SHOULD BE PURCHASED LOCALLY.
B - INDICATES PARTS THAT SHOULD BE PURCHASED FROM EAI.

UNIT TITLE: TIME SCALE REP-OP CARD

MODEL NO.: 0.51.0363-1 Sh. 1 of 1 Sh.

0

DATE 10 / 9 / 67

APPENDIX 2

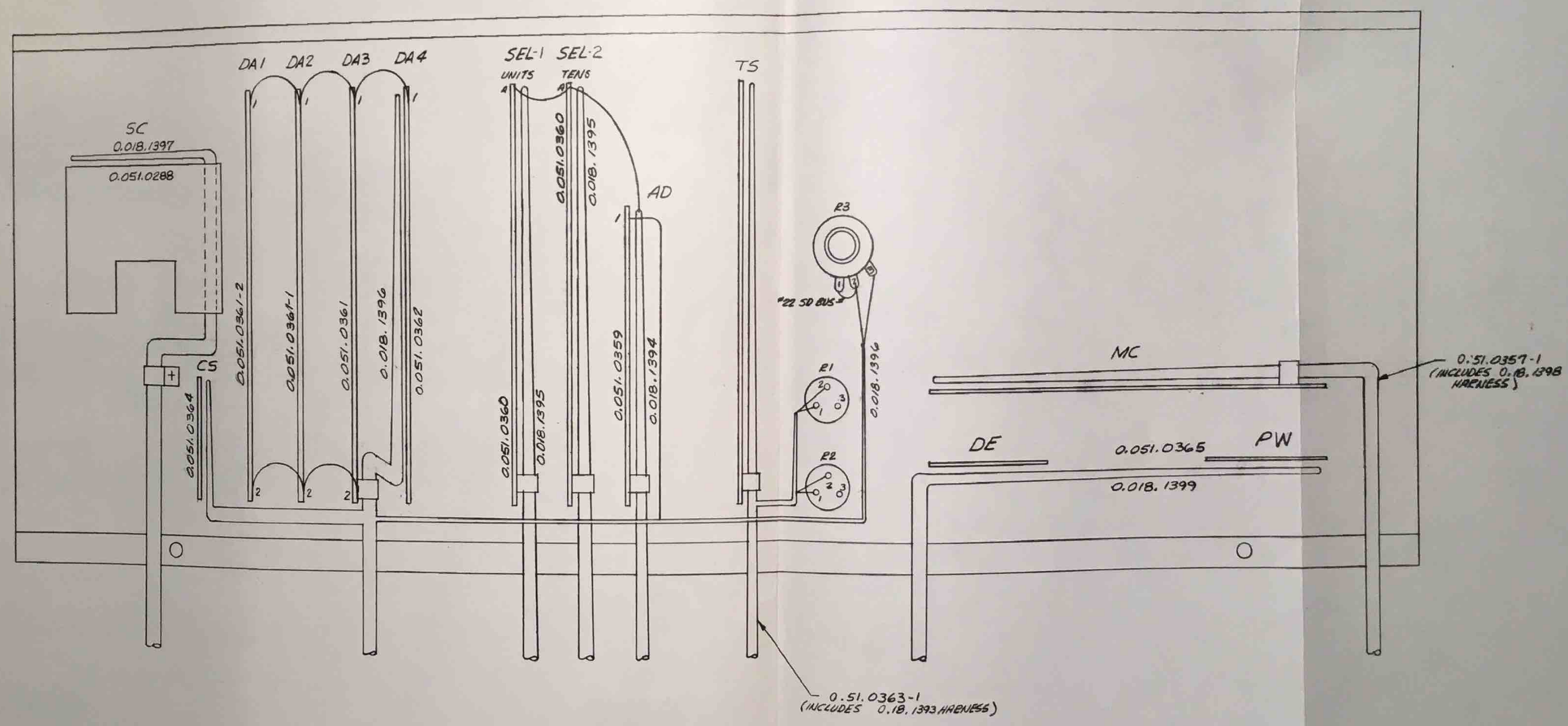
DRAWINGS

This appendix contains necessary schematics and wiring diagrams of equipment described in this manual. To facilitate locating a particular sheet, an index is provided that lists the model number of each unit or component, the type of drawings, and the associated drawing number. The drawings are bound into the manual in the order listed under the index Drawing Number column.

EAI drawings are prepared in accordance with standard drafting practices for electro-mechanical and electronic equipment. All symbols are in accordance with current government standards.

INDEX

Unit or Component	Type of Drawing	Drawing Number
0.9.0050 Keyboard Panel	Wiring	D00 009 0050 0W (Sheets 1 through 4, 7 and 8)
0.12.1607 Control Tray	Assembly W/ Wiring	D00 012 1607 0A
0.12.1615 Control Card 1	Schematic	D00 012 1615 0S
0.12.1616 Control Card 2	Schematic	D00 012 1616 0S
0.36.0192 Rep-Op Timer Card	Schematic	D00 036 0192 0S
0.51.0357 Mode Control	Schematic	D00 051 0357 0S
0.51.0363 Time Scale Rep-Operate	Schematic	C00 051 0363 0S



MATERIAL: SEE PARTS LIST A00 009 0050 OP

FINISH:

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
CAPACITANCE IS IN µF
RESISTANCE IS IN OHMS

USED ON: A00 009 0050 OP

DRAWN: 3 MAY 67

CHKD: 10 MAY 67

EAI

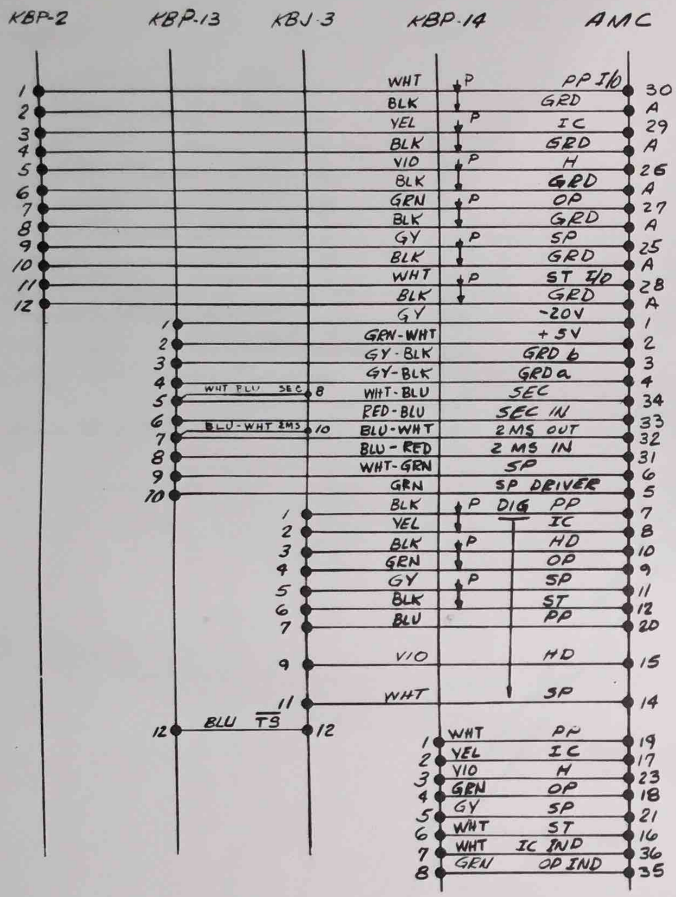
WIRING
KEYBOARD PANEL
(TR-Y)

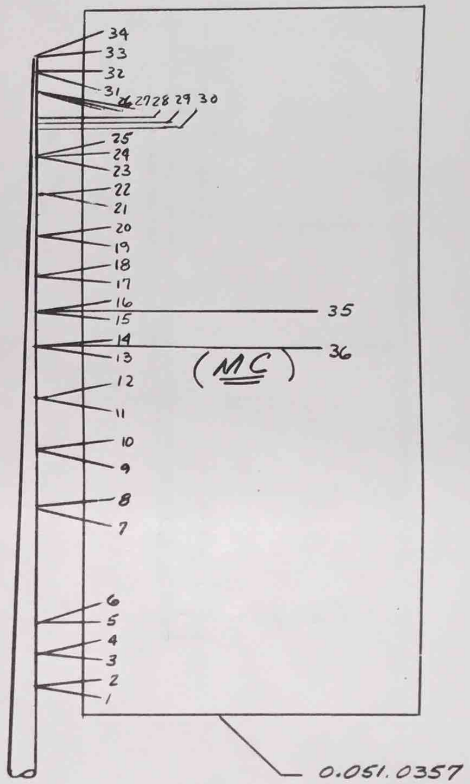
SHT. NO.	2	3	4	5	6	7	8
SIZE	C	C	C	C	C	C	C

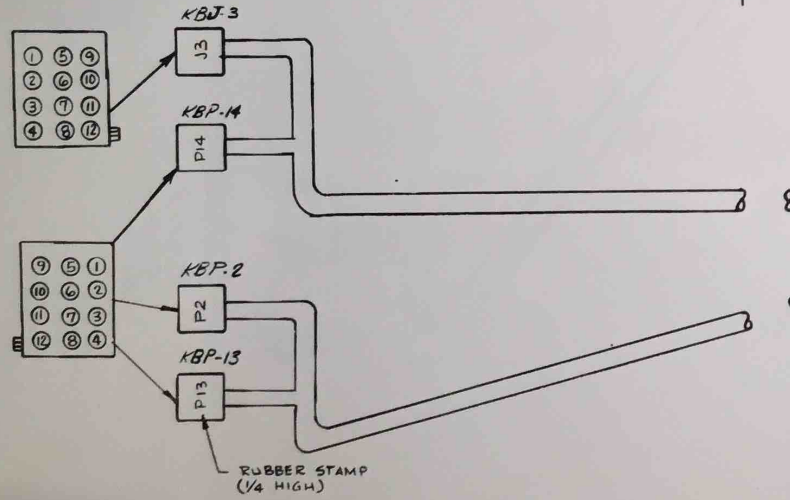
PROJECT 19330 D00 009 0050 OW

SHEET 1 OF 8 SHEETS

NOTE :
1. UNLESS OTHERWISE SPECIFIED:
a WIRES ARE # 22 PHV.







RELEASED FOR PRODUCTION:	ENGR	DATE

NO.	REVISIONS	APP'D
1	THE ALL WIRE WIRING WAS CHANGED KBP-13 AMC 7 BLU P DIG PP 20, 8 BLK P IC 24, 9 BLK P HD 15, 10 VIO CP 22, 11 BLK P SP 14, 12 WHT LIO ST 13. DELETED KBP-13-12 TO AMC-13. KBJ-3-8 TO KBP-13-5 & KBJ3-10 TO KBP-13-7 WERE NOT SPEC'D. 24 JUL 67 ERN 11,247	
2	ADDED CONN LETTERING DELETED CABLE BANDS ITEM 29 IDENTIFIED (J3), (J14), (J2), & (J13) RESP. 18 AUG 67 ERN 11,295	
3	KBP-2 WAS KBJ-2 IN AREA B, 1-3 P13 CONFIG CALLOUT WAS TO TOP VIEW. 18 SEP 67 ERN 11,355	
4	KBP-13-12 TO KBJ-3-12 WAS NOT SPEC'D 2 FEB 68, ERN 11,644	

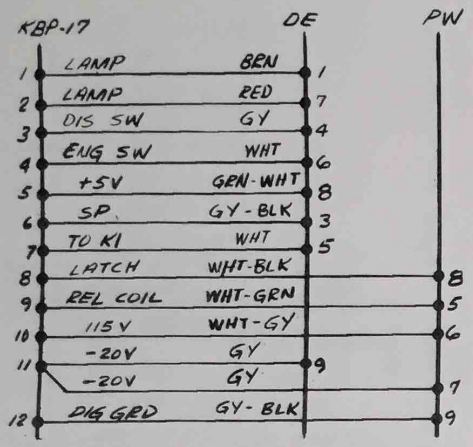
EAI ELECTRONIC ASSOCIATES, INC.

MATERIAL:						
FINISH:		DWG. NO. WAS:				
UNLESS OTHERWISE SPECIFIED	SCALE NS	USED ON:				
DIMENSIONS ARE IN INCHES CAPACITANCE IS IN pf RESISTANCE IS IN OHMS TOLERANCE OF: .X = ± .03 .XX = ± .03 .XXX = ± .015 .XXX = ± .005 ∠ = ± 1° * TOL. OF MATERIAL SUPPLIED	DRAWN X KBJ	DATE 11 APR 67	RCDR	DATE	SHT. NO.	
	CHKD	DATE	REVWD	DATE	SIZE	
	DSGR	DATE	APPVD	DATE	REV. NO.	
					PROJECT 19330	C00009005 0W
					SHEET 2 OF SHEETS	

EAI 999-3274-0 D & M BLUEPRINT CO. 25775-11

NOTE :
1. UNLESS OTHERWISE SPECIFIED:
a WIRES ARE #22 PHU

NO.	REVISIONS	APPVD
1	ADDED CONN. LETT. DELETED BAND ITEM 29 (J17) 18 AUG 67 ERN 11295	



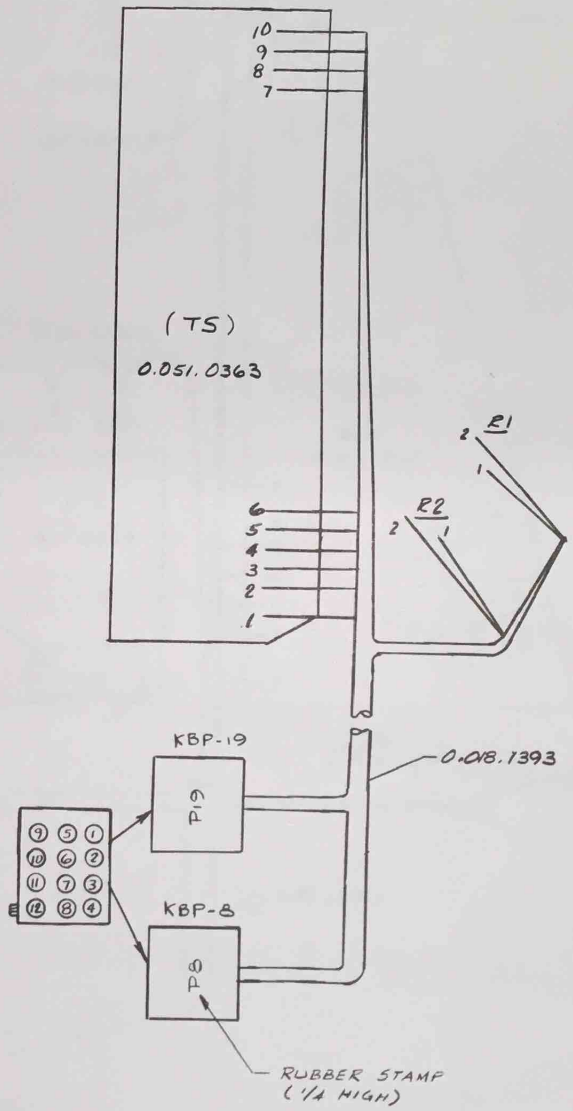
MATERIAL:					
FINISH:		DWG. NO. WAS:			
UNLESS OTHERWISE SPECIFIED	SCALE	USED ON:			
DIMENSIONS ARE IN INCHES CAPACITANCE IS IN pf RESISTANCE IS IN OHMS	DRAWN K KAN	DATE 3 MAY 67	RCDR	DATE	SHT. NO.
TOLERANCE OF: .X = ± .03 .XX = ± .02 .XXX = ± .015 .XXX = ± .005 ∠ = ± 1°	CHKD	DATE	REVWD	DATE	SIZE
* TOL. OF MATERIAL SUPPLIED	DSGR	DATE	APPVD	DATE	REV. NO.
					PROJECT 9330
					C00 009 0050 0W
					SHEET 3 OF SHEETS

EAI ELECTRONIC ASSOCIATES, INC. West Long Branch, N.J.

EAI 999-3274-0 D & M BLUEPRINT CO. 25078-11

NOTE :
1. UNLESS OTHERWISE SPECIFIED
a. WIRES ARE #22 PHU.

KBP-8		KBP-19		TS	R1	R2
1	RED-BLU		S	8		
2	BLU-RED		2MS	4		
3	GY-BLK		DIG. GRD a	10		
4	GY-BLK		DIG. GRD b	7		
5	GRN-WHT		+5V	5		
6	GY		-20V	9		
7	BLU		TIME SCALE	6		
		1	BLU-WHT	3	TIMER AMP OUTPUT	
		2	BLU-YEL	2	2 X 1 [.18μf]	
		3	YEL-BLU	1	1 X10 [1.8μf]	
		4	WHT-VIO		IC HI	1
		5	VIO		IC CONTROL	2
		6	WHT-RED		OP HI	1
		7	RED		OP CONTROL	2



RELEASED FOR PRODUCTION:	ENGR	DATE

NO.	REVISIONS	APPVD
1	ADDED CONN LETT DELETED BANDS ITEM 29 (J19) FOR KBP-19 (J8) FOR KBP-8 7/15 AUG 67 ERN 11295	

MATERIAL:
FINISH:
DWG. NO. WAS:
USED ON:

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
CAPACITANCE IS IN pf
RESISTANCE IS IN OHMS
TOLERANCE OF: .X = ± .03 .XX = ± .02 .XXX = ± .015 .XXX = ± .005 ∠ = ± 1°
*TOL. OF MATERIAL SUPPLIED

SCALE

DRAWN	RKAN	DATE 10APR67	RCDR DATE
CHKD		DATE	REVWD DATE
DSGN		DATE	APPVD DATE

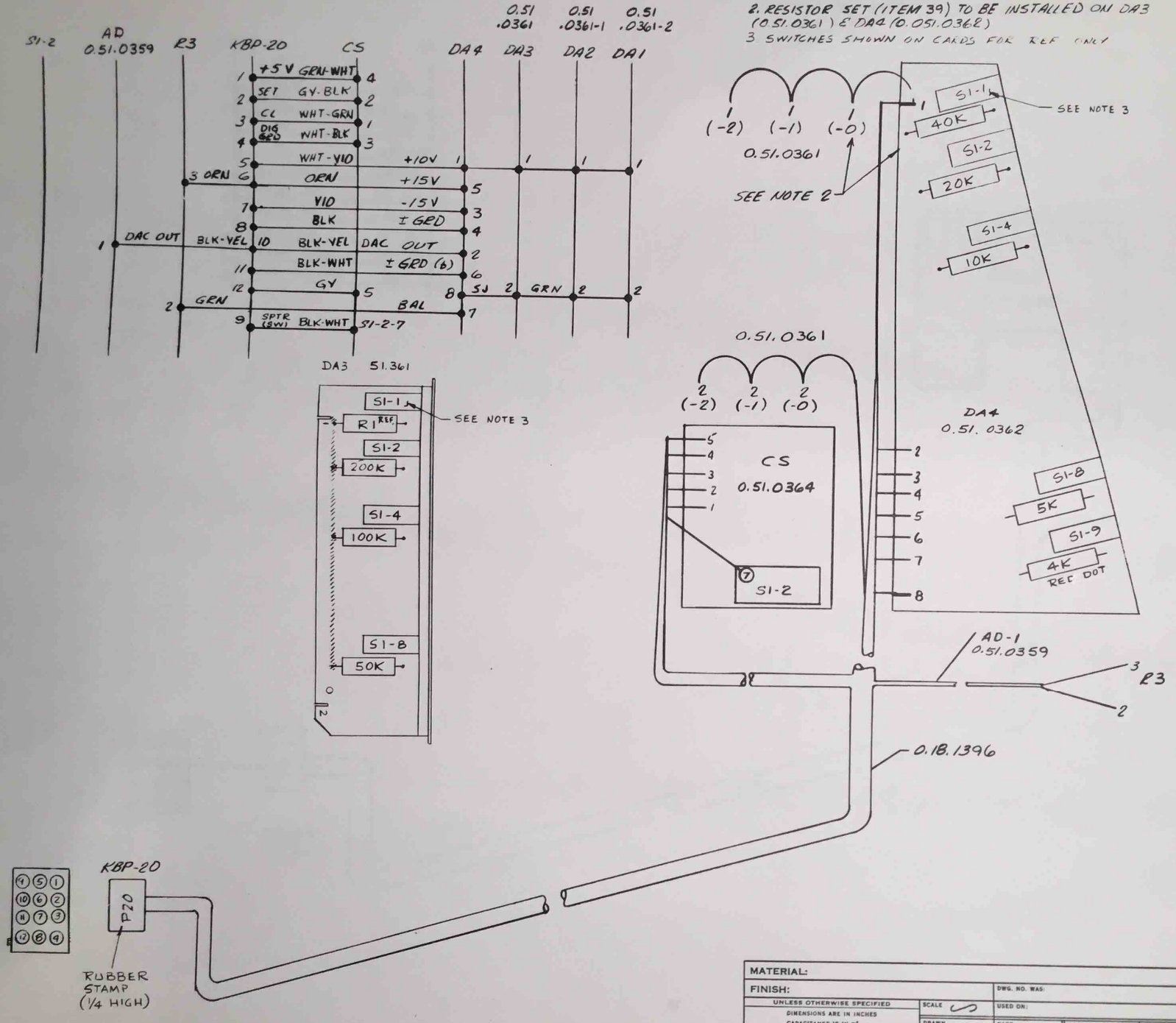
EAI ELECTRONIC ASSOCIATES, INC.

SHT. NO.
SIZE
REV. NO.
PROJECT 19330
C00009 00500 CW1
SHEET 4 OF SHEETS

EAI 999-3274-0 B & W BLUEPRINT CO. 25276-11

NOTES:
1. UNLESS OTHERWISE SPECIFIED:
a. WIRES ARE #22 PHU.
2. RESISTOR SET (ITEM 39) TO BE INSTALLED ON DA3 (0.51.0361) & DA4 (0.051.0362)
3 SWITCHES SHOWN ON CARDS FOR REF ONLY

RELEASED FOR PRODUCTION:	ENGR	DATE
NO.	REVISIONS	APP'D
1	ADDED CONNECTS TO DA4 & DETAIL OF DA3 IN NOTE 2 DELETED SEE REM DWG FOR REGISTER LOCATIONS ADDED P20 LETTERING AND DELETED CABLE BAND ITEM 29 (J20) IN AREA B-2 18 AUG 67 ERN 11,295	
2	AREA F-4 S1-2-7 & BREAKOUT FROM HARNESS WERE NOT SPEC'D. 2 FEB 68 RE ERN 11677	



MATERIAL:						
FINISH:		DWG. NO. WAS:				SHT. NO.
UNLESS OTHERWISE SPECIFIED	SCALE	USED ON:				SIZE
DIMENSIONS ARE IN INCHES CAPACITANCE IS IN pf RESISTANCE IS IN OHMS	DRAWN K KAJ	DATE 4 MAY 67	RCDR	DATE		REV. NO.
TOLERANCE OF: .X = ±.03 .XX = ±.02 .XXX = ±.015 .XXX = ±.005 ∠ = ±1° * TOL. OF MATERIAL SUPPLIED	CHKD	DATE	REVWD	DATE		PROJECT 19330
	DSGR	DATE	APPVD	DATE		C00 009 0050 0W

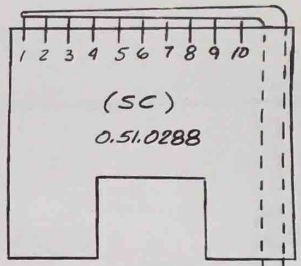
EAI ELECTRONIC ASSOCIATES, INC.

SHEET 7 OF SHEETS

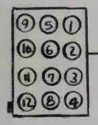
EAI 999-3274-0 D & M BLUEPRINT CO. 28078-11

NOTE :
1. UNLESS OTHERWISE SPECIFIED:
a. WIRES ARE #22 PHV.
b. COAX IS LOW "R" (00 916 0012 0)

KBP-9		SC
1	±GRD	BLK 1
2	SERVO J3 OUT	COAX 2
3	AC	BRN 3
4	AC	WHT-BRN 4
5	-BV COMM	BLK-RED 5
6	SERVO DR.	WHT-BLU 6
7	SERVO DR.	BLU 7
8	DIG. GRD.	GRY-BLK 8
9	SERVO NULL	WHT-RED 9
10	SERVO NULL IND.	RED 10



0.18.1397



RELEASED FOR PRODUCTION	ENGR	DATE
NO.	REVISIONS	APP'VD
1	ADDED CONN. LETT. DELETED BAND ITEM 29 (J9) 18 AUG 67 ECN 11295	

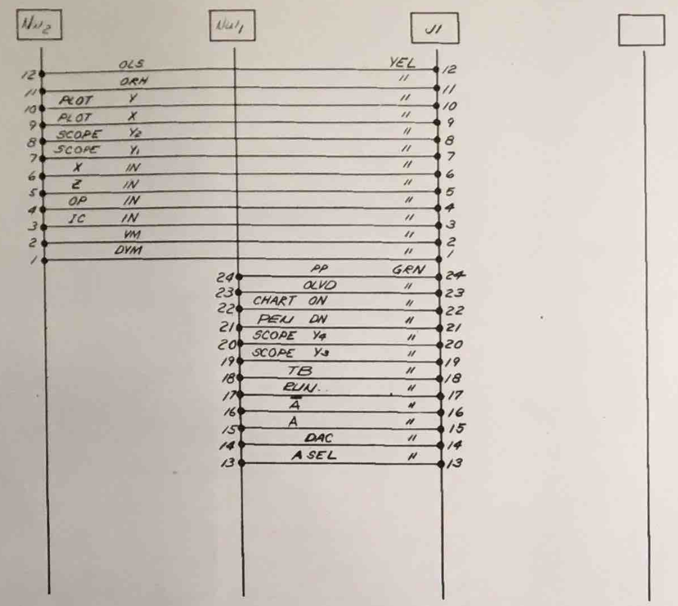
EAI ELECTRONIC ASSOCIATES, INC.

MATERIAL:
FINISH:
UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
CAPACITANCE IS IN pf
RESISTANCE IS IN OHMS
TOLERANCE OF: .X = ±.03 .XX = ±.02 .XXX = ±.015 .XXX = ±.005 ∠ = ±1°
*TOL. OF MATERIAL SUPPLIED

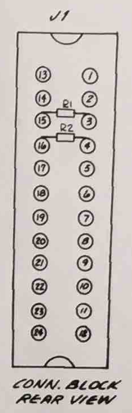
SCALE NONE
DRAWN KAJ DATE 4 MAY 67
CHKD DATE
DSGR DATE
DWG. NO. WAS:
USED ON:
RCDR DATE
REVWD DATE
APPVD DATE

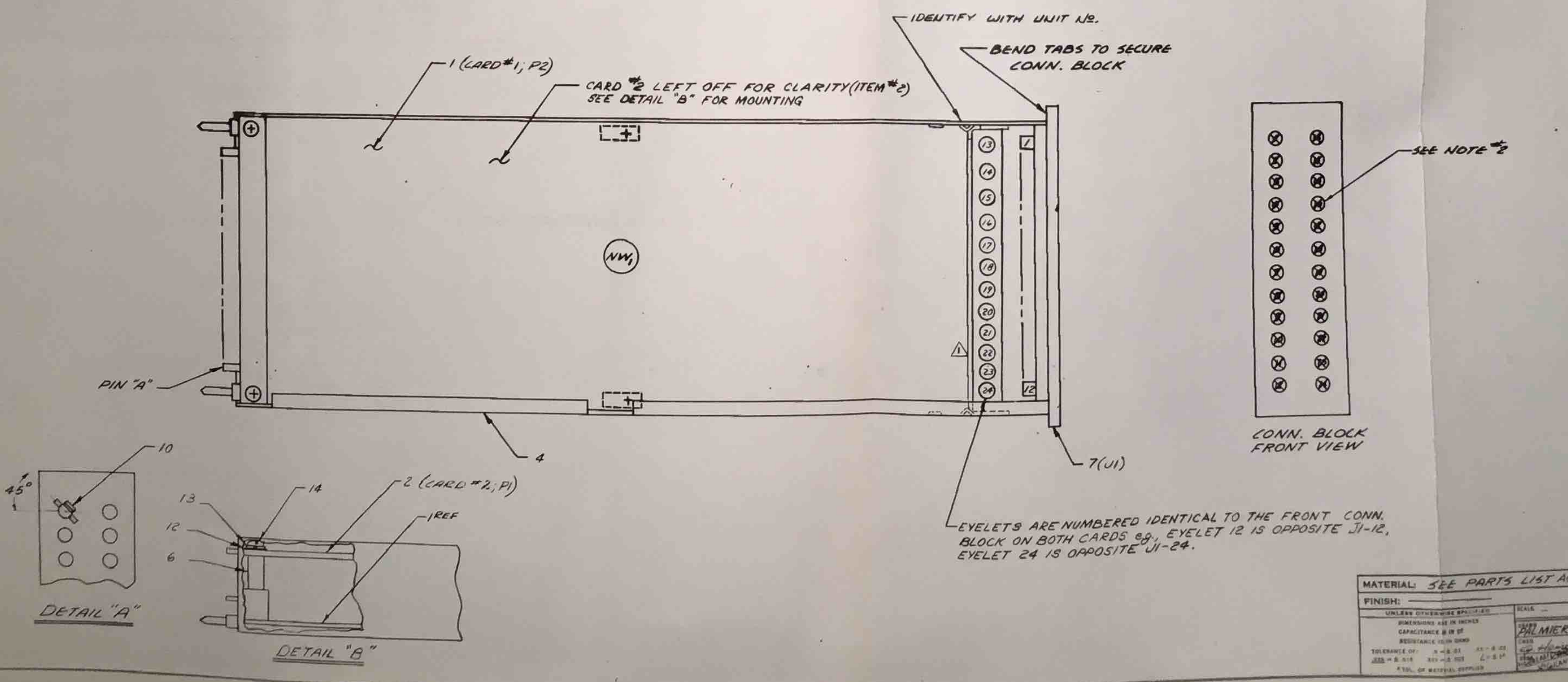
SHT. NO.
SIZE
REV. NO.
PROJECT 19330 C00 009 0050 0W
SHEET 8 OF SHEETS

EAI 999-9274-0 D & W BLUEPRINT CO. 25775-11



NOTES:
1. UNLESS OTHERWISE SPECIFIED:
a) WIRES TO BE #22 P.H.U.
2. ⊗ DENOTES LOCATION OF CONTACTS (ITEM #10) PER DETAIL "A".





MATERIAL: SEE PARTS LIST A00 012 1607 OP

FINISH:

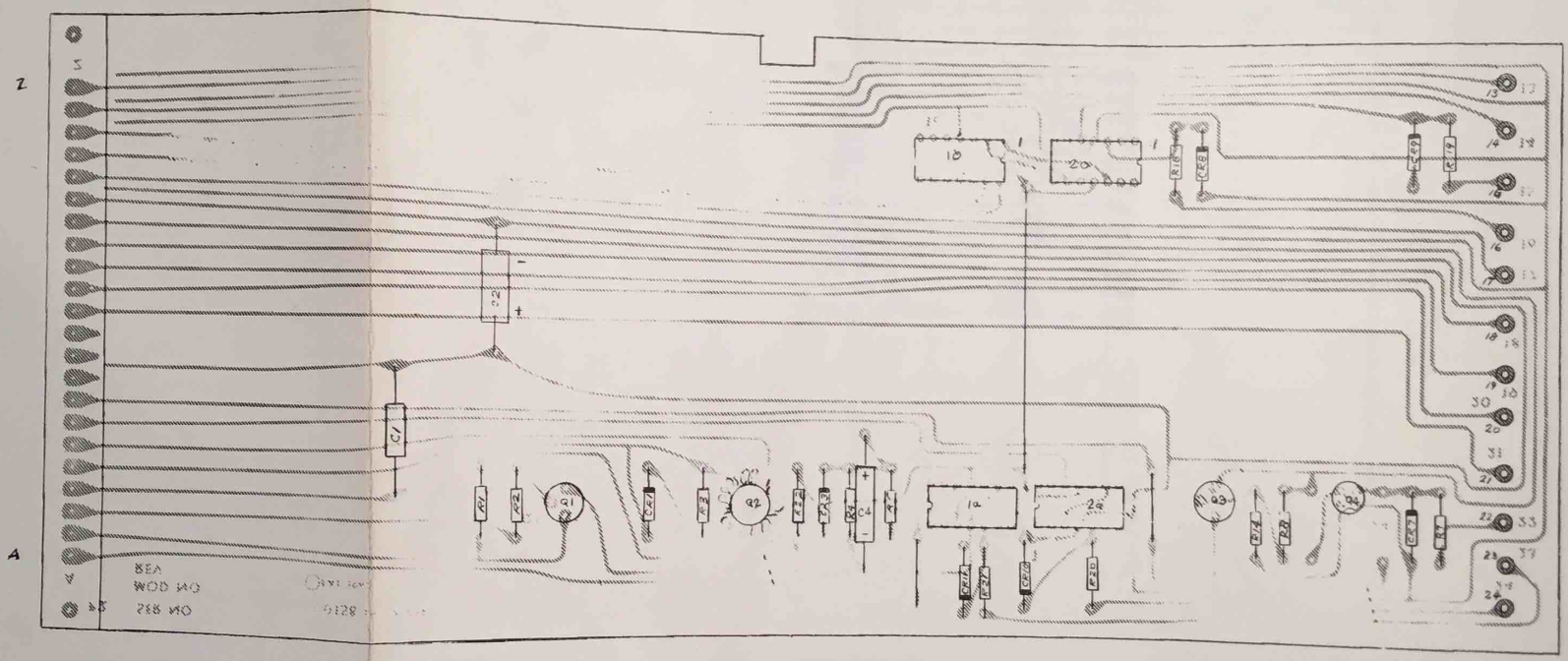
A00 012 1607 OP

MIERI 30 JAN 67

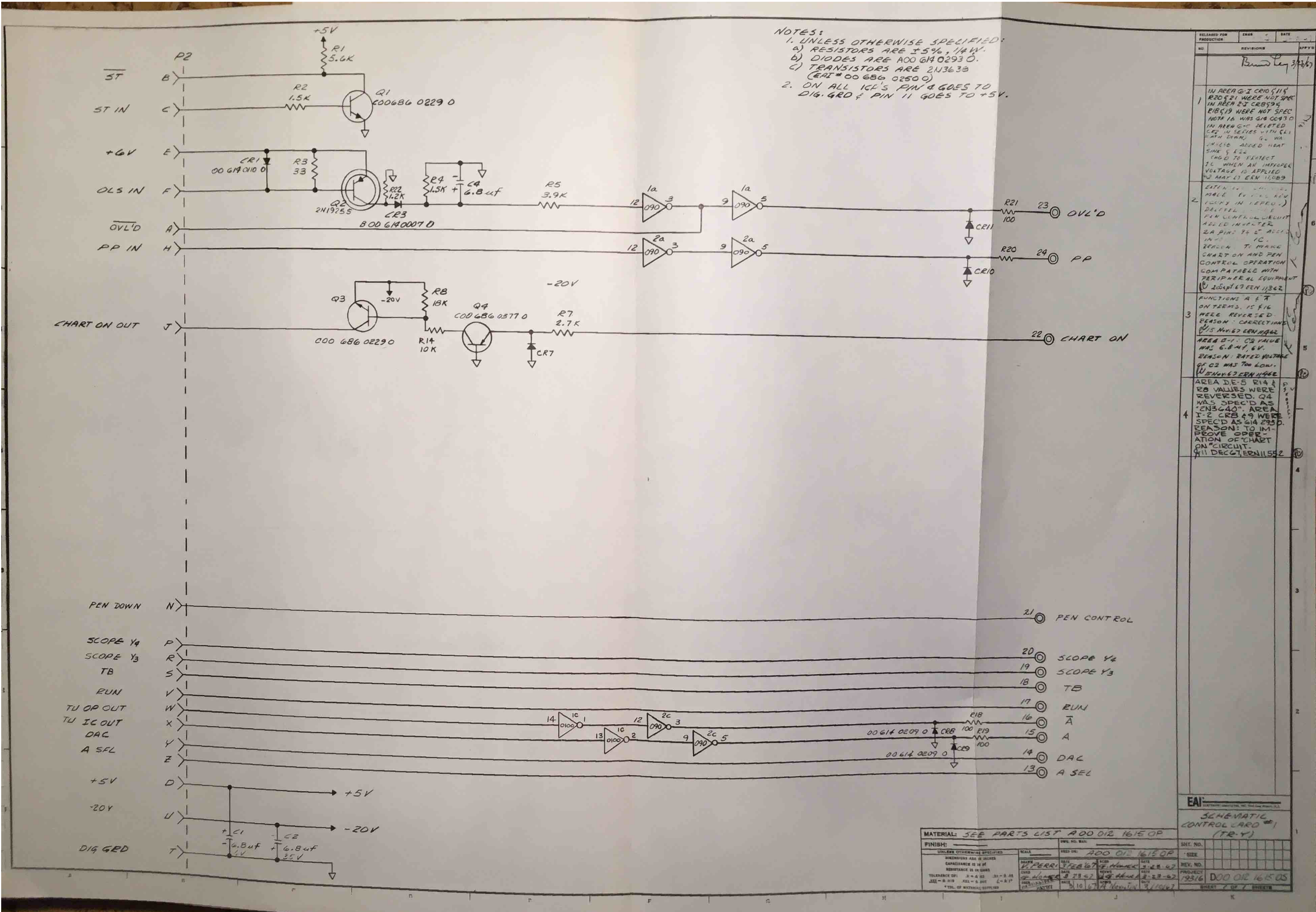
EAI

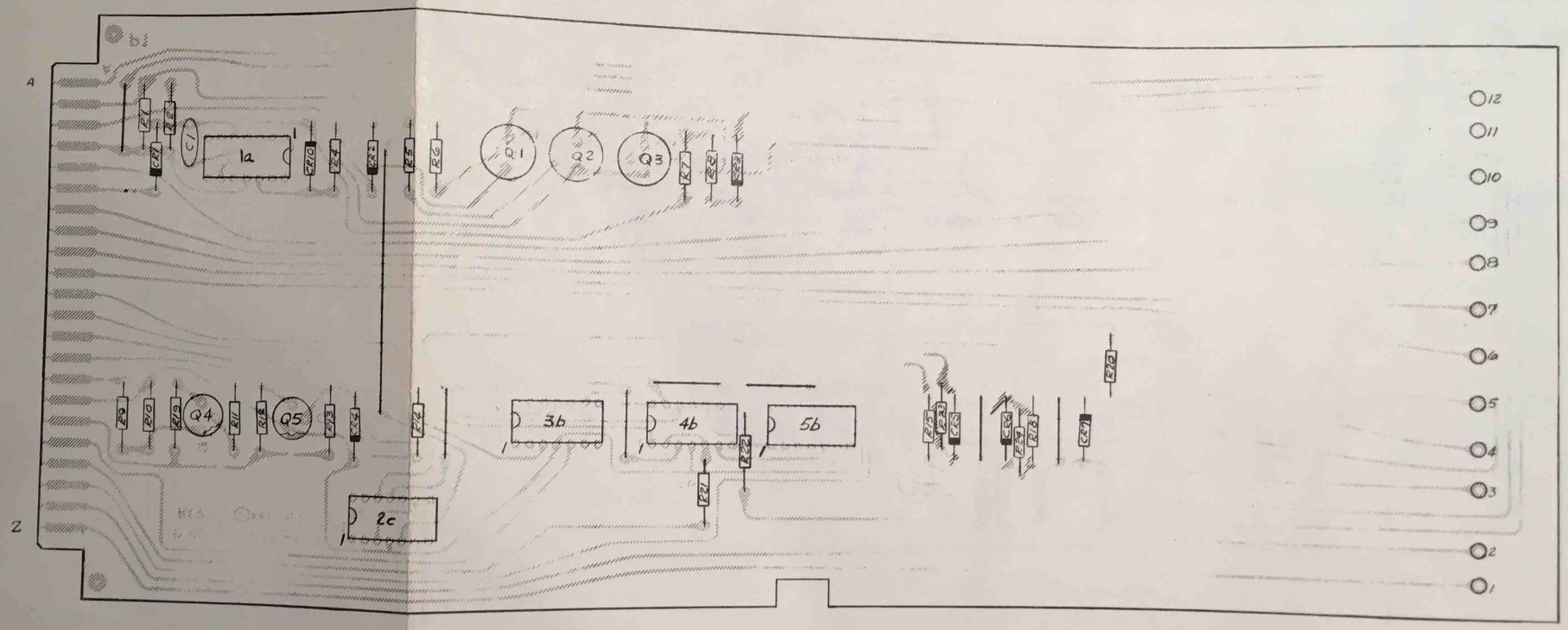
ASSEMBLY W/WIRING INFO CONTROL TRAY (TR-Y)

19316 D00 012 1607 OA

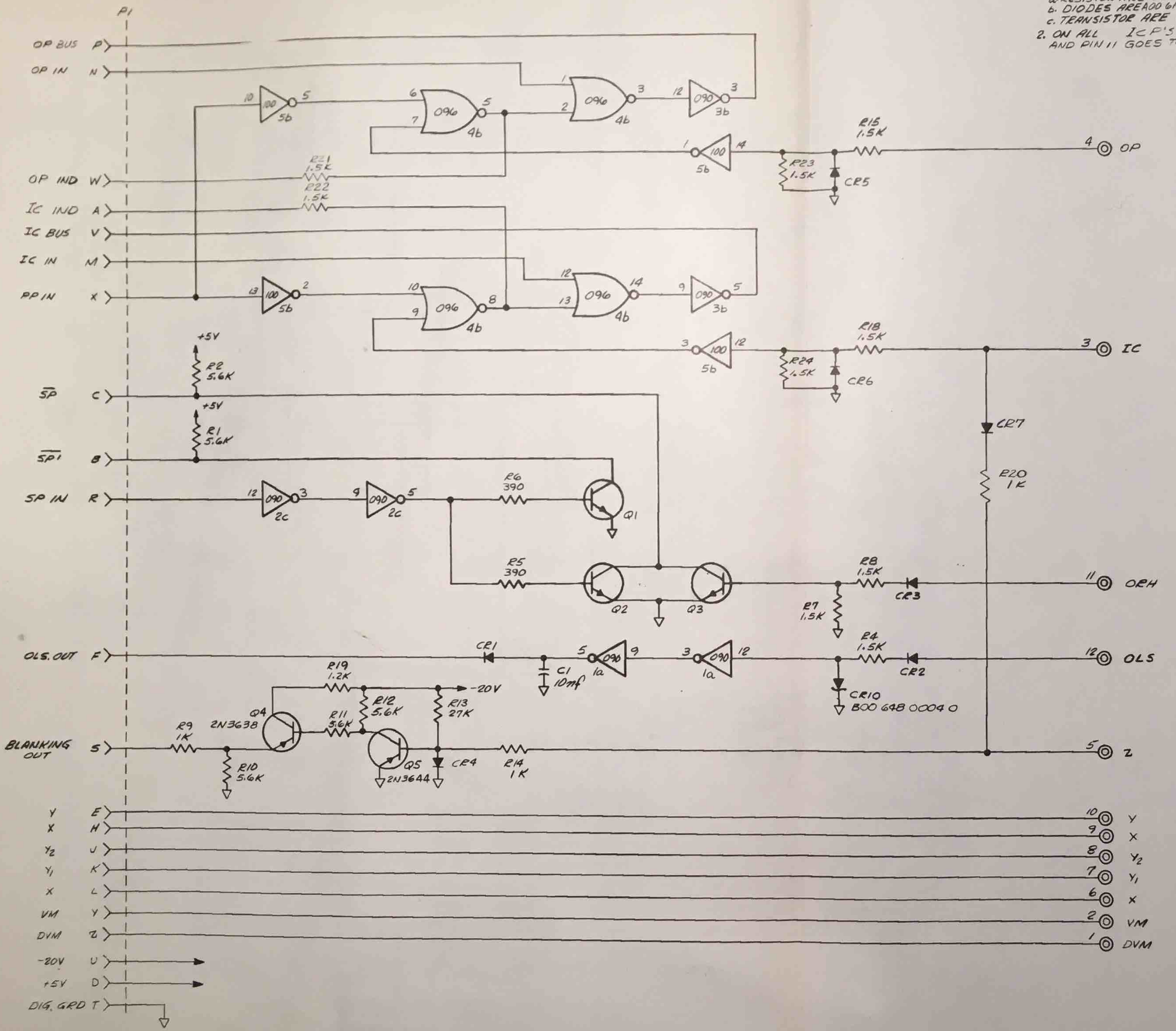


0.12.1615 Control Card 1


NOTES:
1. UNLESS OTHERWISE SPECIFIED:
a) RESISTORS ARE ±5%, 1/4 W.
b) DIODES ARE A00 614 0293 0.
c) TRANSISTORS ARE 2N3638 (EAI # 00 686 0250 0)
2. ON ALL IC'S PIN 4 GOES TO DIG. GRD & PIN 11 GOES TO +5V.
P2
ST
ST IN
+6V
OLS IN
OVL'D
PP IN
CHART ON OUT
PEN DOWN
SCOPE 1/4
SCOPE 1/3
TB
RUN
TU OP OUT
TU IC OUT
DAC
A SEL
+5V
-20V
DIG GRD
R1 5.6K
R2 1.5K
Q1 C00686 0229 0
CR1 00 614 0110 0
R3 33
Q2 2N1925S
R22 1.2K
CR3 B00 6140007 0
R4 1.5K
C4 6.8uf
R5 3.9K
Q3
R8 18K
Q4 C00 686 0377 0
C00 686 0229 0
R14 10K
R7 2.7K
CR7
-20V
R21 100
R20 100
CR11
CR10
R18 100
R19 100
CR8
CR9
00 614 0209 0
C1 6.8uf 6V
C2 6.8uf 35V
23 OVL'D
24 PP
22 CHART ON
21 PEN CONTROL
20 SCOPE 1/4
19 SCOPE 1/3
18 TB
17 RUN
16 A
15 A
14 DAC
13 A SEL
REVISIONS
1 IN AREA G-I CR10 & 11 & R20 & 21 WERE NOT SPEC. IN AREA 2-I CR8 & 9 & R18 & 19 WERE NOT SPEC. 2 MAY 67 ERN 11,089
2 REASON: TO MAKE CHART ON AND PEN CONTROL OPERATION COMPATABLE WITH PERIPHERAL EQUIPMENT. 26 Sept 67 ERN 11,342
3 FUNCTIONS A & A ON TERMS. 15 & 16 WERE REVERSED. REASON: CORRECTIONS. 15 Nov 67 ERN 11,462
AREA D-1: C2 VALUE WAS 6.8 MF, 6V. REASON: RATED VOLTAGE OF C2 WAS TOO LOW. 15 Nov 67 ERN 11,462
4 AREA D,E-5 R14 & R8 VALUES WERE REVERSED. Q4 WAS SPEC'D AS "2N3640". AREA I-2 CR8 & 9 WERE SPEC'D AS 614 293 0. REASON: TO IMPROVE OPERATION OF "CHART ON" CIRCUIT. 11 DEC 67, ERN 11,552
MATERIAL: SEE PARTS LIST A00 012 1615 0P
FINISH:
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES CAPACITANCE IS IN pf RESISTANCE IS IN OHMS
USED ON: A00 012 1615 0P
V. PERRI
EAI
SCHEMATIC CONTROL CARD #1 (TR-Y)
PROJECT 19316
D00 012 1615 0S
SHEET 1 OF 1 SHEETS



0.12.1616 Control Card 2

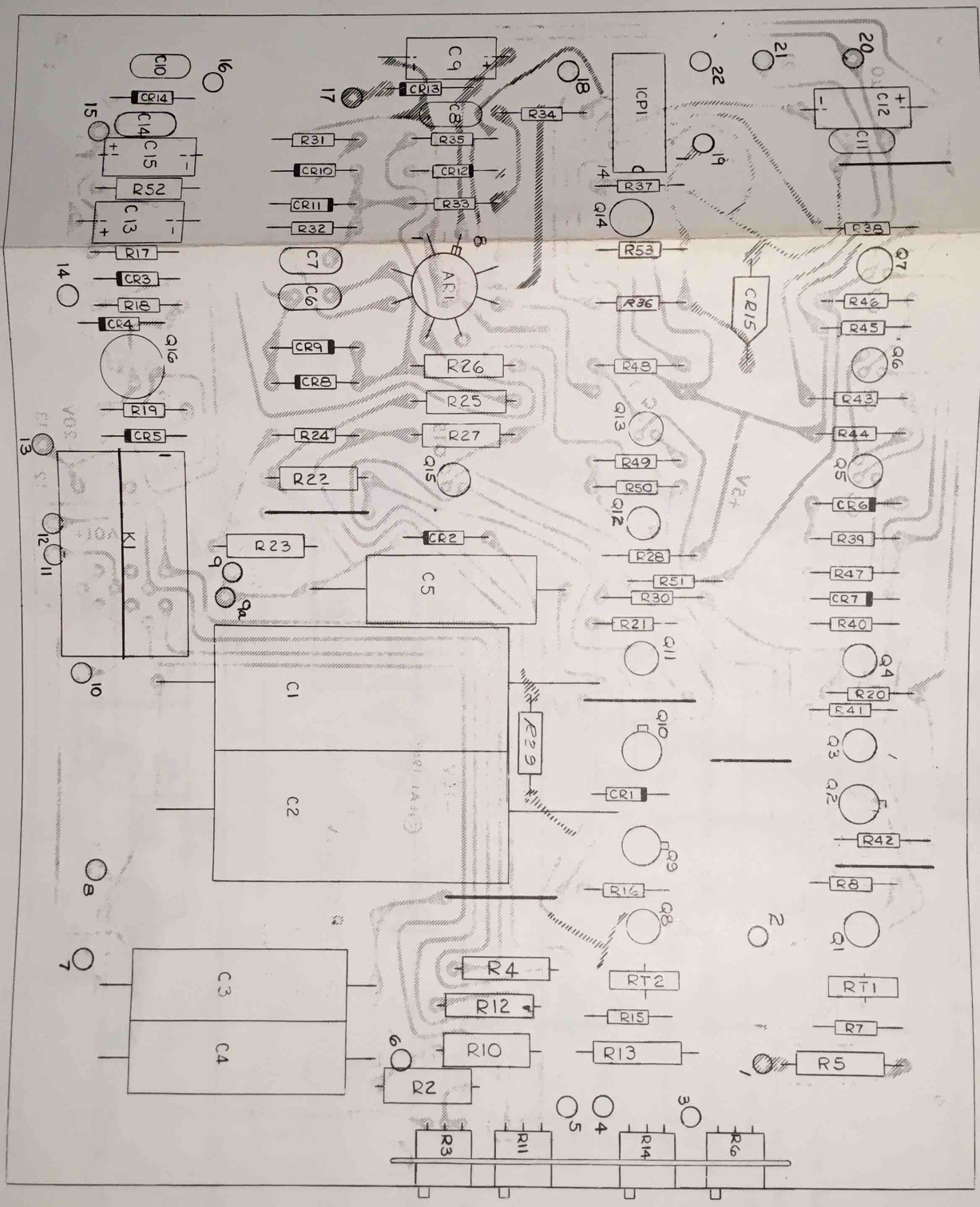


NOTES:
1. UNLESS OTHERWISE SPECIFIED;
a. RESISTOR ARE ±5%, 1/4 W.
b. DIODES ARE A00 614 0253 0.
c. TRANSISTOR ARE EAI # C00 634 0220 0
2. ON ALL IC P'S PIN 4 GOES TO DIG GRD AND PIN 11 GOES TO +5V.

NO.	REVISIONS
1	IN AREA F CR8,9,10 ARE R16, R17 & R3, 1.5K WERE ... WAS C48 0043 0 [illegible]
2	AREA F-5 & 6 R23 & 24 WERE NOT CHECKED. REASON: TO ELIMINATE THE [illegible] 17 JUNE 67 ERN 11,1?3
3	AREA C,D 3 Q5 WAS 2N3638 & R14 WAS 1.8K. AREA G4 R20 WAS 1.8K. REASON: TO IMPROVE OPERATION OF THE BLANKING CIRCUIT. 28 NOV 67 ERN 11,458
4	AREA F,G-5 "CR6" WAS "CR9" (C48 004 0) CR6 WAS LOC'D BETWEEN R18 & PIN 3 (CATH TO R18). AREA F,G-6, CR5 WAS CR8 (C48 004 0) CR5 WAS LOC'D BETWEEN R15 & PIN 4 (CATH TO R15). (CR8,9 CATH TO ...) REASON: TO IMPROVE OPERATION OF BLANKING CIRCUIT IC & OP BUSS DRIVERS. 9/11 DEC 67 ERN 11,552

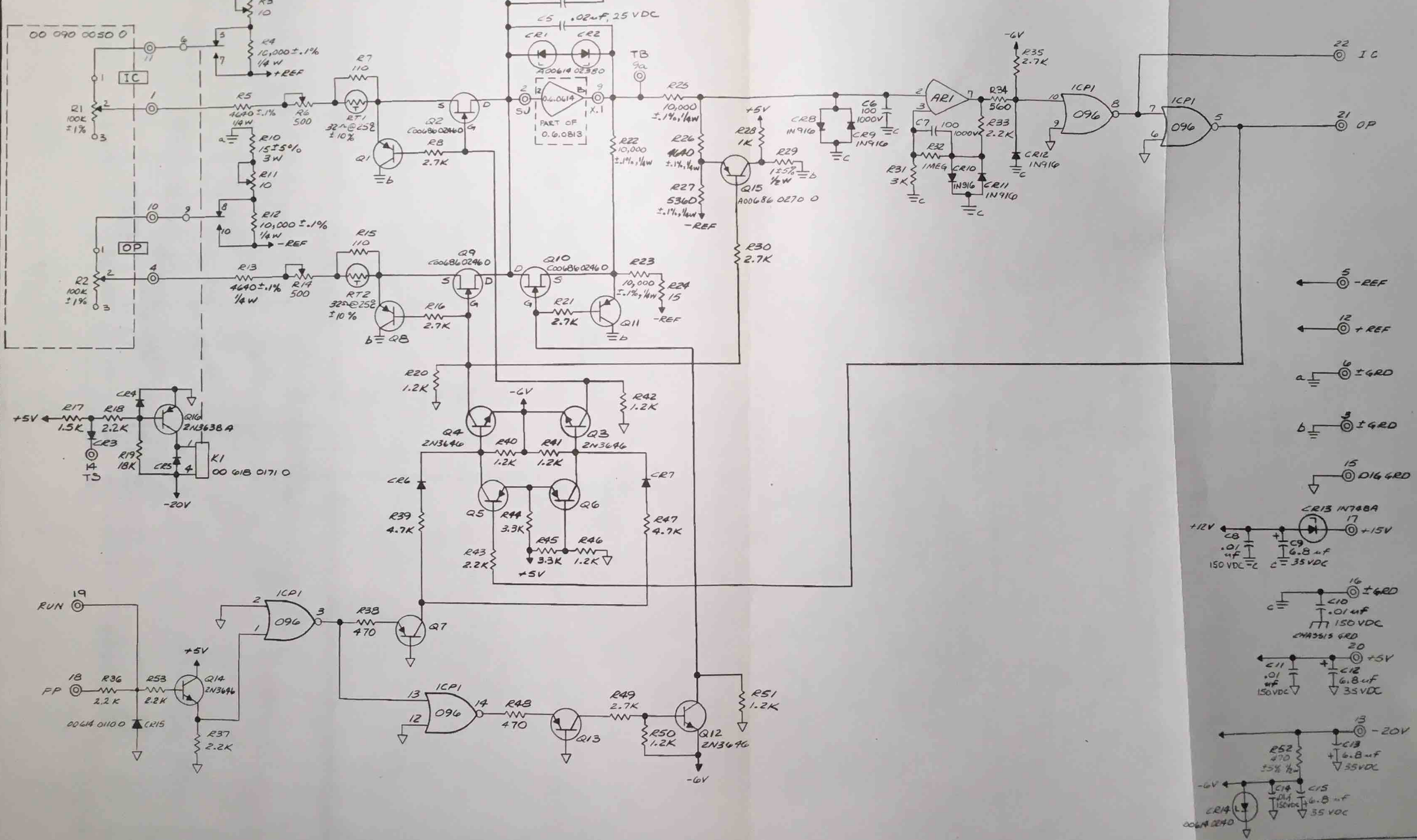
EAI
SCHEMATIC
CONTROL CARD #2
(TR-Y)

MATERIAL: SEE PARTS LIST A00 012 1616 OP
FINISH: —
USED ON: A00 012 1616 OP
DRAWN: R.KAJ 9 FEB 66
DWG. NO.: D00 012 1616 05
PROJECT: 19316
SHEET 1 OF 1 SHEETS



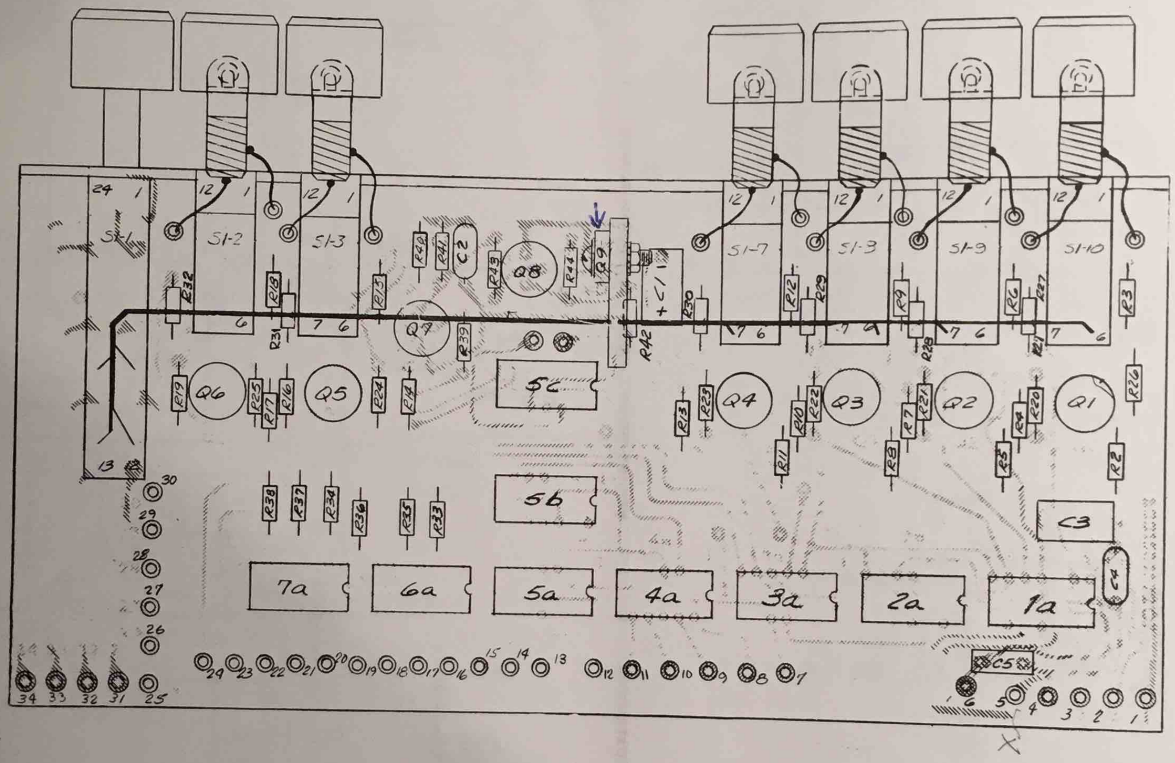
0.36.0192 Rep Op Timer Card

NOTES:
1. UNLESS OTHERWISE SPECIFIED:
A) RESISTORS ARE ±5%, 1/4 W.
B) TRANSISTORS ARE 2N3640 (EAI # 00686 0258 0)
C) THERMISTORS ARE B00646 0116 0.
D) DIODES ARE A00614 0293 C.
2. C1 & C2 ARE 0.9 MFD. CAPACITORS MATCHED TO 1.8 MFD ±0.1%, 25V
3. C3 & C4 ARE 0.09 MFD. CAPACITORS MATCHED TO 0.18 MFD ±0.1%, 25V
4. AR1 - PIN 1, GRD C. PIN 4, -6V. PIN 8, +12V.
5 ICP1 - PIN 4, DIG GRD. PIN 11, +5V.

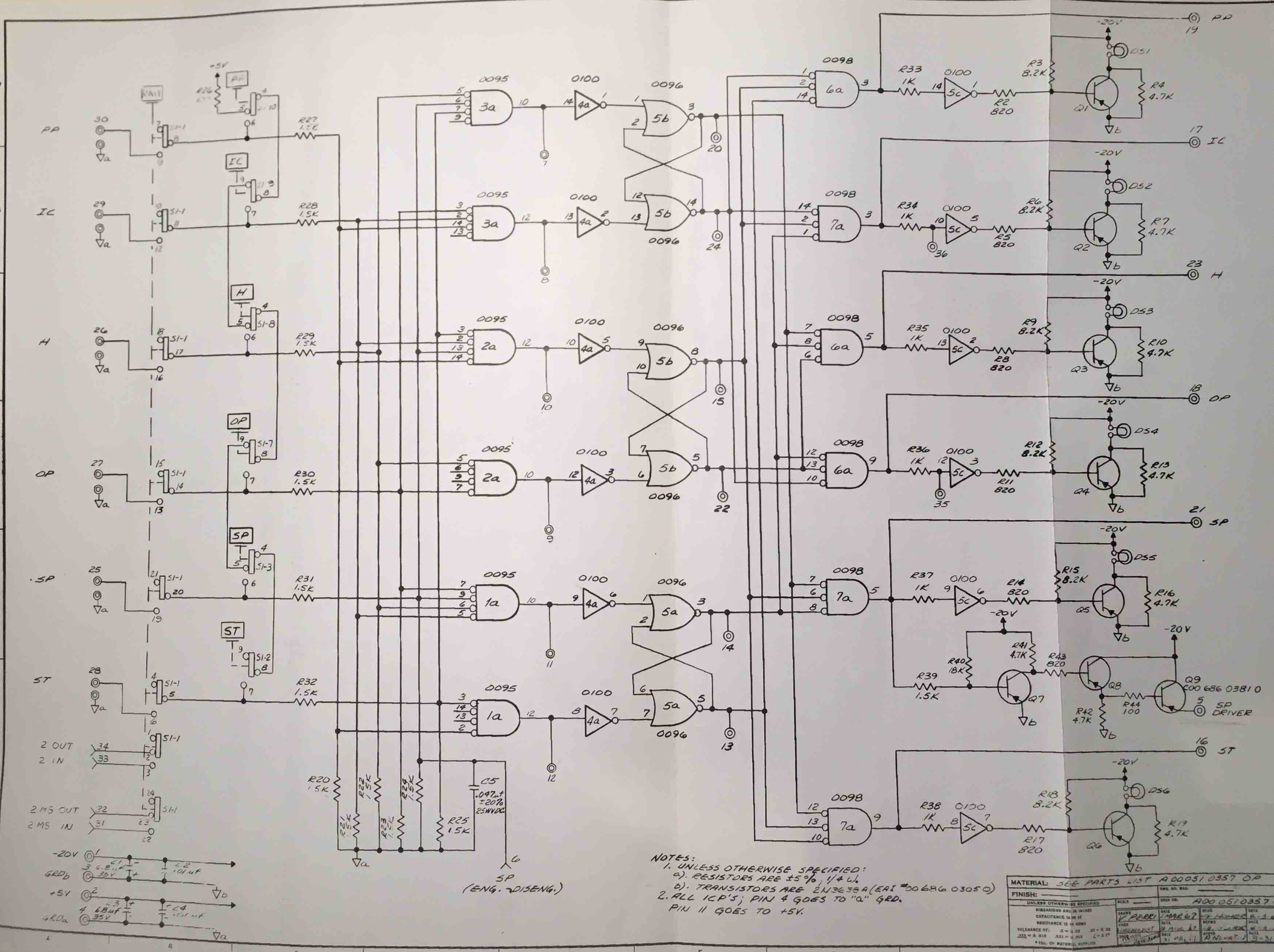


MATERIAL: SEE PARTS LIST A000360192 0P

EAI
SCHEMATIC
REF. OP TIMER CARD
(TR-4)
D00036 0192 05



0.51.0357 Mode Control



NOTES:
1. UNLESS OTHERWISE SPECIFIED:
a). RESISTORS ARE ±5%, 1/4 W.
b). TRANSISTORS ARE 2N3638A (EAI #00 686 0305 0)
2. ALL ICP'S; PIN 4 GOES TO "a" GRD.
PIN 11 GOES TO +5V.

NO.	REVISIONS
1	AREA D2 C5 WAS NOT SPEC'D. R24 -3K TO PREVENT MODE CHANGES DUE TO LINE TRANSIENTS. 6 SEPT 67 RC ERN 11330
2	[illegible]
3	IN AREA I-2, ADDED R44 IN SERIES TO Q9 BASE. ADDED TO PREVENT Q8 FROM SHORTING UNDER FULL SET PDT LOAD. 15 DEC 67 ERN 11,560
4	AREA I 2, R43 WAS LOC'D BETWEEN THE COLLECTOR OF Q8 & -20V, (R43 WAS 100Ω). REASON: TO IMPROVE THE PERFORMANCE OF THE SP DRIVER CIRCUIT. 31 JAN 68, ERN 11,635
5	0095 LOGICS WERE SHOWN THUS: 0096 LOGICS WERE SHOWN THUS: 0098 LOGICS WERE SHOWN THUS: REASON: DWG. ERROR. 10 MAY 68 ERN 115'61

EAI

SCHEMATIC MODE CONTROL (TR-4)

MATERIAL: SEE PARTS LIST A00051 0357 OP

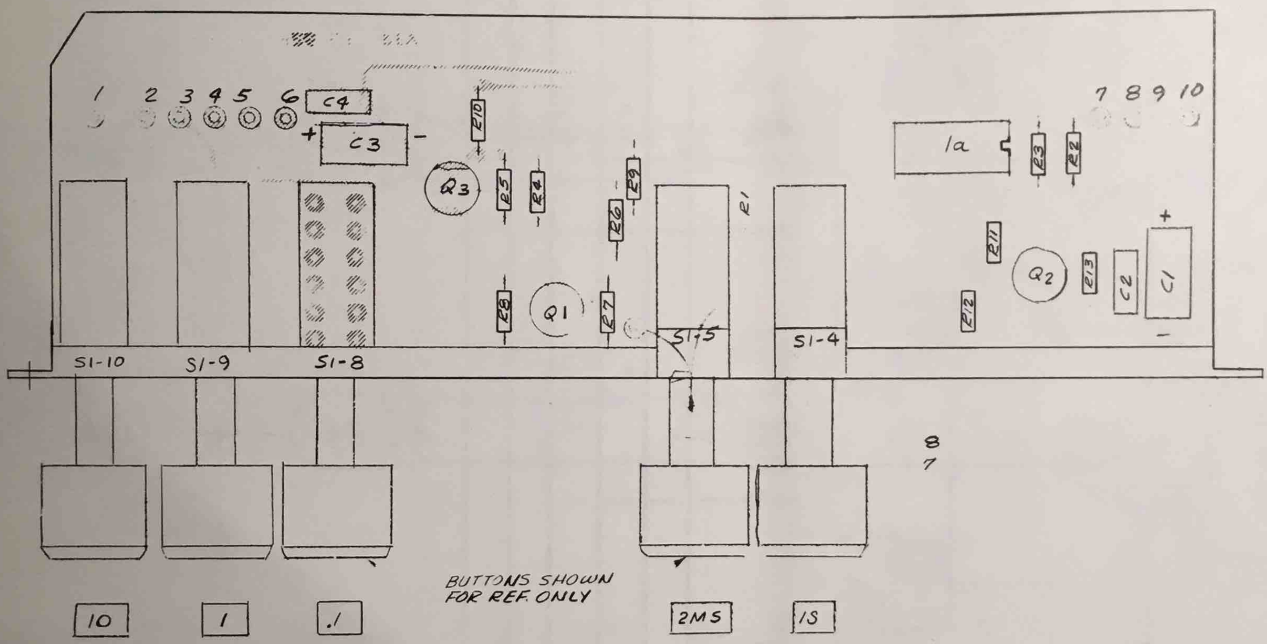
FINISH:

USED ON: A00 051 0357 0P

DRAWN: V. PERRI 1 MAR 67

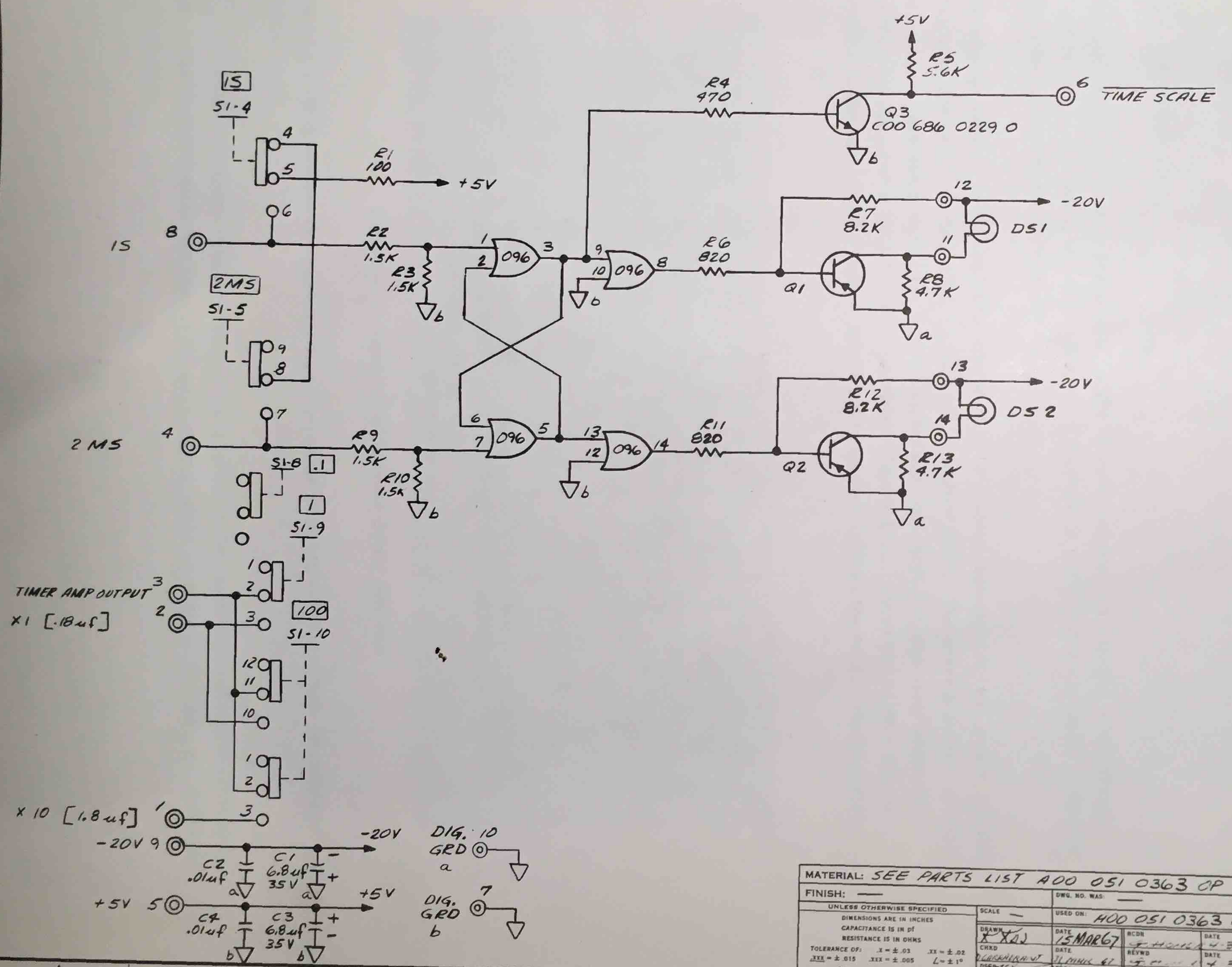
D00051 0357 0S

SHEET 1 OF 1 SHEETS



0.51.0363 Time Scale Rep Operate

NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   a. RESISTORS ARE ±5%, 1/4 W.
   b. TRANSISTORS ARE 2N3638. (EAI 00686 0250 0)
2. ON ICP'S PIN 4 GOES TO "ℓ" GRD, PIN 11 TO +5V.



RELEASED FOR PRODUCTION	ENGR	DATE

NO.	REVISIONS	APP'D
	Bernd Le, 9/1/67	
1	AREA A-B 1 THRU 7 "X0 & X1" WERE "X100 & X10" RESP'LY; "S1-8" WAS NOT SPEC'D; "10" ABOVE S1-10 WAS "100"; "1" ABOVE S1-9 WAS "10"; "1S" WAS "5" (2 PLACES). REASON: TO CORRECT & UPDATE PRINT. 4 DEC 67, ERN 11,518	

MATERIAL: SEE PARTS LIST A00 051 0363 OP

FINISH: —

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
CAPACITANCE IS IN pf
RESISTANCE IS IN OHMS
TOLERANCE OF: .X = ±.03 .XX = ±.02 .XXX = ±.015 .XXX = ±.005 ∠ = ±1°
* TOL. OF MATERIAL SUPPLIED

SCALE —
DWG. NO. WAS: —
USED ON: A00 051 0363 OP
DRAWN X. XDJ — DATE 15 MAR 67
CHKD — DATE 31 MAR 67
RCDN — DATE 4-3-67
REVWD — DATE 4-2-67
APP'D — DATE 3-2-67

EAI ELECTRONIC ASSOCIATES, INC.

SCHEMATIC
TIME SCALE REP. OPERATE (TR-Y)

SHT. NO.
SIZE
REV. NO.
PROJECT 19330
C00 051 0363 0S
SHEET 1 OF 1 SHEETS

EAI 999.3274 G · B & M BLUEPRINT CO. 28779-11