

AMPEX

AUDIO-VIDEO
SYSTEMS DIVISION

VS-10
VARIABLE SPEED
OSCILLATOR ASSEMBLY

FOR MM-1100
AND AG-440 SERIES
RECORDER/REPRODUCERS

OPERATION
AND
MAINTENANCE

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VS-10
VARIABLE SPEED OSCILLATOR ACCESSORY

**OPERATION
AND
MAINTENANCE**

**AMPEX CORPORATION
AUDIO-VIDEO SYSTEMS DIVISION**

Prepared by
AVSD Technical Publications
Ampex Corporation
401 Broadway
Redwood City, CA 94063

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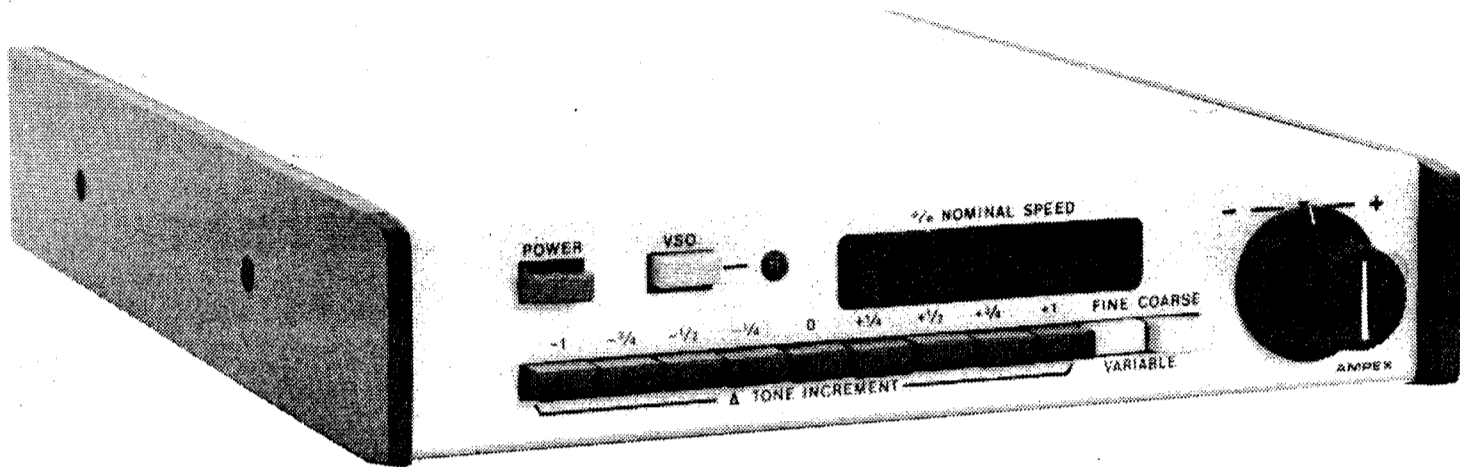
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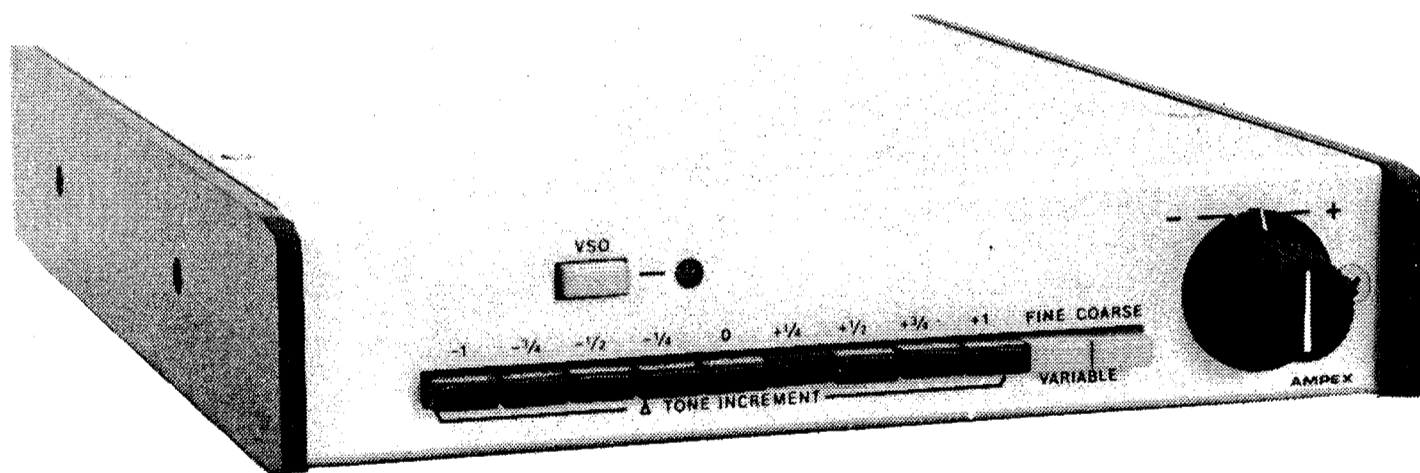
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VS-10 Variable Speed Oscillator With Readout Display



VS-10 Variable Speed Oscillator Without Display

GENERAL INFORMATION

This manual provides general information, installation and operation instructions, theory of operation, and maintenance information for the VS-10 Variable Speed Oscillator accessory, Ampex Part No. 4010217-01 (without readout display) and -02 (with readout display). The accessory is designed for use with Ampex models AG-440 and MM-1100 series recorder/reproducers equipped with a capstan servo.

The VS-10 generates variable or preset frequencies to control the speed of the capstan of an associated tape recorder. This results in increments or decrements of tone over a controlled range to permit signals recorded on different machines to be matched in pitch. Front panel switches permit selection of ± 1 tone of control in nine preset steps. In addition, there is a variable tone control which permits ± 2.5 octaves of control.

The VS-10 is available in two versions: with or without a four digit readout display. The display model indicates normal speed as 100.0% and displays the tone increments or decrements as a percentage of normal speed. If desired, the VS-10 may be easily converted to indicate 50 or 60 Hertz as the indication of normal speed.

PHYSICAL DESCRIPTION

The two versions of the VS-10 are identical in size, and may be either shelf or rack mounted. A single cable connects the VS-10 to the associated

tape recorder. The display model includes its own power supply which requires an external source of ac power.

ACCESSORIES

There are two optional accessories available for the VS-10. Installation instructions are provided in the Installation section of this manual.

Rack Mount Kit

The rack mount kit provides hardware to mount the VS-10 in a standard 19-inch rack or in the overhead rack mount of an AG-440 or MM-1100. The hardware permits mounting a single VS-10 or two VS-10's side-by-side. Two kits are available: Ampex Part No. 4010232-01 single mount, or 4010232-02 twin mount.

"Y" Cable

The "Y" cable accessory Ampex Part No. 4050753-01, enables a single VS-10 to control two tape machines simultaneously. The two machines may be either AG-440's or MM-1100's or one of each.

SPECIFICATIONS

Specifications of the VS-10 are given in Table 1.

Table 1. VS-10 General Specifications

<p>Input Power:</p> <p>Non-display model:</p> <p style="padding-left: 40px;">+12 to +15 Vdc, 0.065 A (from tape recorder)</p> <p>Display model:</p> <p style="padding-left: 40px;">+12 to +15 Vdc, 0.08 A (from tape recorder)</p> <p style="padding-left: 40px;">115 Vac, 50/60 Hz, 0.03 A or</p> <p style="padding-left: 40px;">230 Vac, 50/60 Hz, 0.015 A</p> <p>Tone Accuracy:</p> <p style="padding-left: 40px;">±0.5%</p> <p>Input Signal:</p> <p style="padding-left: 40px;">9,600 Hz</p>	<p>Output Signal:</p> <p style="padding-left: 40px;">Nominally 9,600 Hz 5.0 Vp-p square wave</p> <p>Environmental:</p> <p style="padding-left: 40px;">Temperature: 0-55°C</p> <p style="padding-left: 40px;">Humidity: 0-95%</p> <p>Weight:</p> <p style="padding-left: 40px;">Display model: 2.5 lb Non-display: 1.5 lb</p> <p>Dimensions:</p> <p style="padding-left: 40px;">Height: 1-3/4 inches</p> <p style="padding-left: 40px;">Width: 8-5/8 inches</p> <p style="padding-left: 40px;">Depth: 10-1/2 inches</p>
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INSTALLATION

Locate the VS-10 on any flat vibration free surface close enough to the recorder for the 24-foot interconnect cable to reach from the VS-10 to the back of the recorder. Allow sufficient space at the rear of the VS-10 for the connection of the plug-in interconnect cable. Separate installation instructions are given for the AG-440 and MM-1100 series recorder/reproducers.

The display version of the VS-10 has a built-in power supply connected for 115-Vac operation as delivered from the factory. The unit may be easily converted to 230-Vac operation as described below:

230-VAC POWER-INPUT CONVERSION

To convert the VS-10 display model from 115-Vac operation to 230-Vac operation, proceed as follows:

1. Disconnect power from the VS-10.
2. Remove the top cover (four screws) from the VS-10.
3. Remove the power printed wiring assembly, part number 4050736, from the VS-10 housing (five screws).
4. Unsolder the two 115-Vac jumpers as shown in Figure 1A.
5. Solder in a single new jumper for 230-Vac operation as shown in Figure 1B.
6. Replace power printed wiring assembly and top cover.

DISPLAY CONVERSION

As shipped from the factory, the display model is connected for a 100.0% reading at normal speed. For a display of either 50 or 60 Hertz, the position of two integrated circuits (IC's) on the circuit board is changed. To change the display reading, proceed as follows:

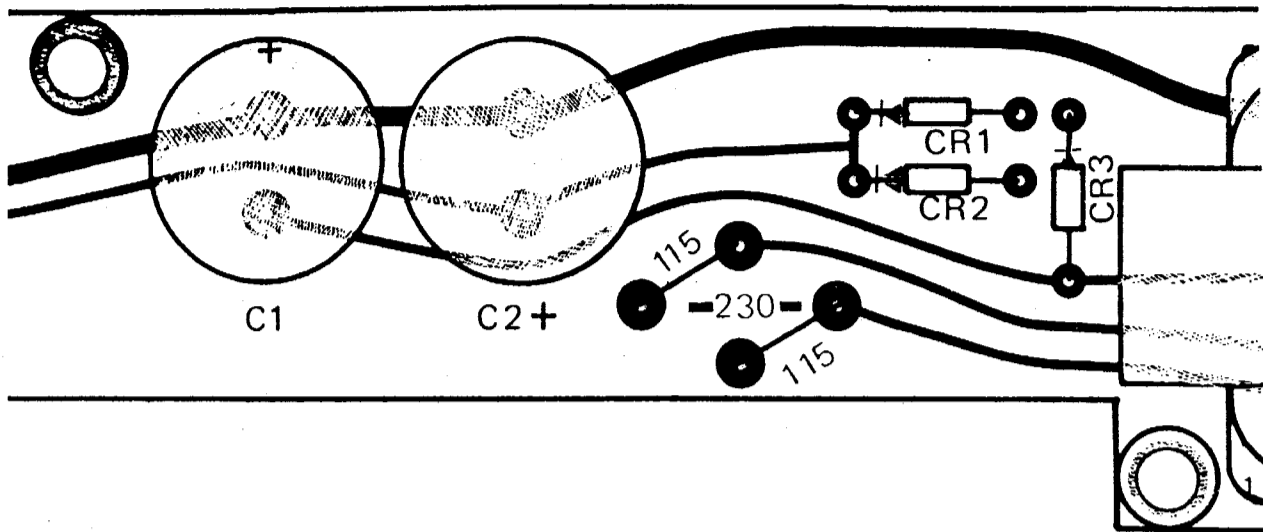
CAUTION

REMOVE POWER BEFORE UNPLUGGING IC'S.

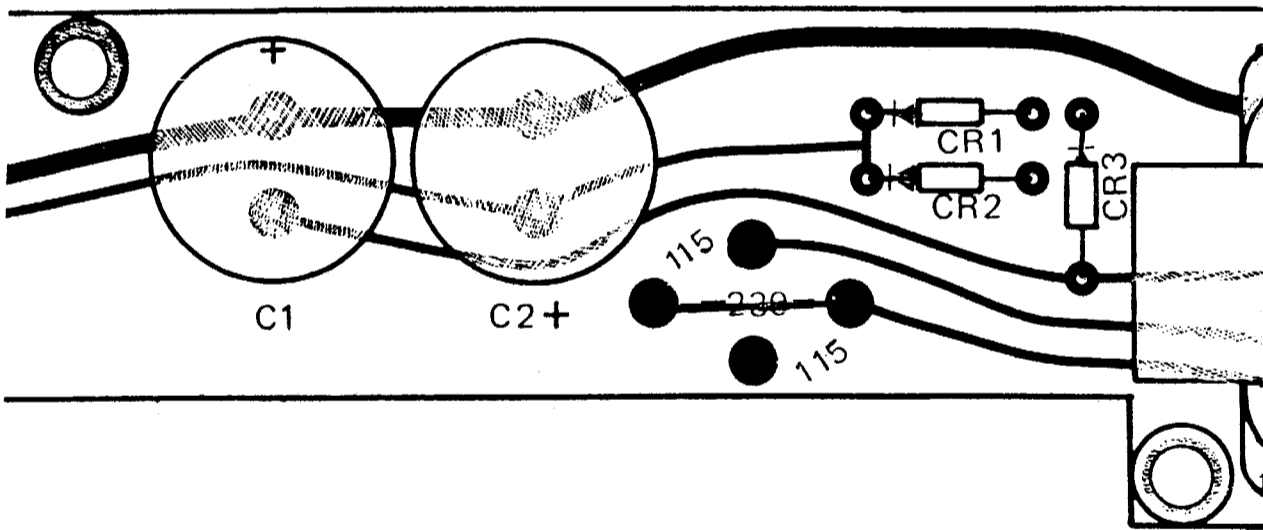
1. Remove the top cover (four screws) from the VS-10.
2. Note IC locations A4, A5, A7 and A8.
3. Refer to Table 2 for the new IC's (7430 and 7493) location corresponding to the desired normal speed display indication.
4. Carefully unplug the IC(s) by grasping the ends and pulling straight up. Reinstall the IC(s) as per Table 2 taking care not to bend the pins.
5. Reinstall cover.

SYSTEM INTERCONNECTION

The VS-10 is connected to an AG-440 or MM-1100 series recorder/reproducer by means of the supplied 24-foot interconnect cable (4050738). If it is desired to control two tape machines with one VS-10, an optional "Y" cable



A. 115 Vac Jumper Connections



B. 230 Vac Jumper Connections

Figure 1. AC Power Input Conversion

Table 2. Display Conversion Table

NORMAL SPEED DISPLAY	LOCATION/IC TYPE			
	A4	A5	A7	A8
100.0%	None	7430	None	7493
60.0 Hertz	7430	None	None	7493
50.0 Hertz	None	7430	7493	None

(4050753) is connected in series with the supplied cable.

Figure 2 is an interconnection diagram illustrating two-machine operation. Machine number 1 supplies a 9600-Hz reference signal and dc power to the VS-10. Machine number 1 must be turned on with tape threaded or the tape tension arm safety switch in the "on" position for machine number 2 to operate.

To install the VS-10, follow the separate instructions for the AG-440 or MM-1100 given below for single-machine operation. If two-machine operation is desired, follow the general instructions for single-machine operation and add the "Y" cable shown in Figure 2. If both machines are MM-1100's and both have not been modified for use with a sync lock accessory, it is necessary to add the two wires to machine number 1 only, as described in the MM-1100 installation procedure.

AG-440 Installation

Connect the VS-10 to an AG-440 series recorder as follows:

1. Connect P4 of the interconnect cable to J4 of the AG-440 servo chassis. Connect the other end of the cable P1 to connector J1 on the rear panel of the VS-10.

CAUTION

BEFORE CONNECTING POWER CORD TO 230 VAC, CHECK THAT THE POWER

SUPPLY JUMPER ON THE VS-10 POWER SUPPLY IS IN THE 230-VAC POSITION.

2. If the VS-10 is a display model, connect the power cord to the appropriate (115 or 230 Vac) power source.

MM-1100 Installation

If the MM-1100 has been modified for use with the sync lock accessory, no modification to the recorder is required. If this has not been accomplished, then it is necessary to add two wires within the MM-1100 as described in step 1 below to provide 15 Vdc to operate the VS-10. Proceed as follows:

1. See Figure 3. Add two number 22 AWG wires to pins 3 and 5 of the VARIABLE SPEED connector J1 located on the power connector panel. Connect the other ends to pins 6 and 4 of plug P4 cable harness which connects to the 15/27 volt power supply.
2. Connect P4 of the interconnect cable to VARIABLE SPEED connector J1 at the rear of the MM-1100. Connect the other end of the cable P1 to connector J1 on the rear panel of the VS-10.

CAUTION

BEFORE CONNECTING POWER CORD TO 230 VAC, CHECK THAT THE POWER SUPPLY JUMPER ON THE VS-10 POWER SUPPLY IS IN THE 230-VAC POSITION.

3. If the VS-10 is a display model, connect the power cord to the appropriate (115 or 230 Vac) power source.

RACK MOUNT INSTALLATION

Use rack mount kit No. 4010232-01 to mount a single VS-10 in a 19-inch rack and kit No. 4010232-02 to mount two VS-10's side-by-side. The installation procedure consists of attaching a bracket to the side panels of the VS-10 using the

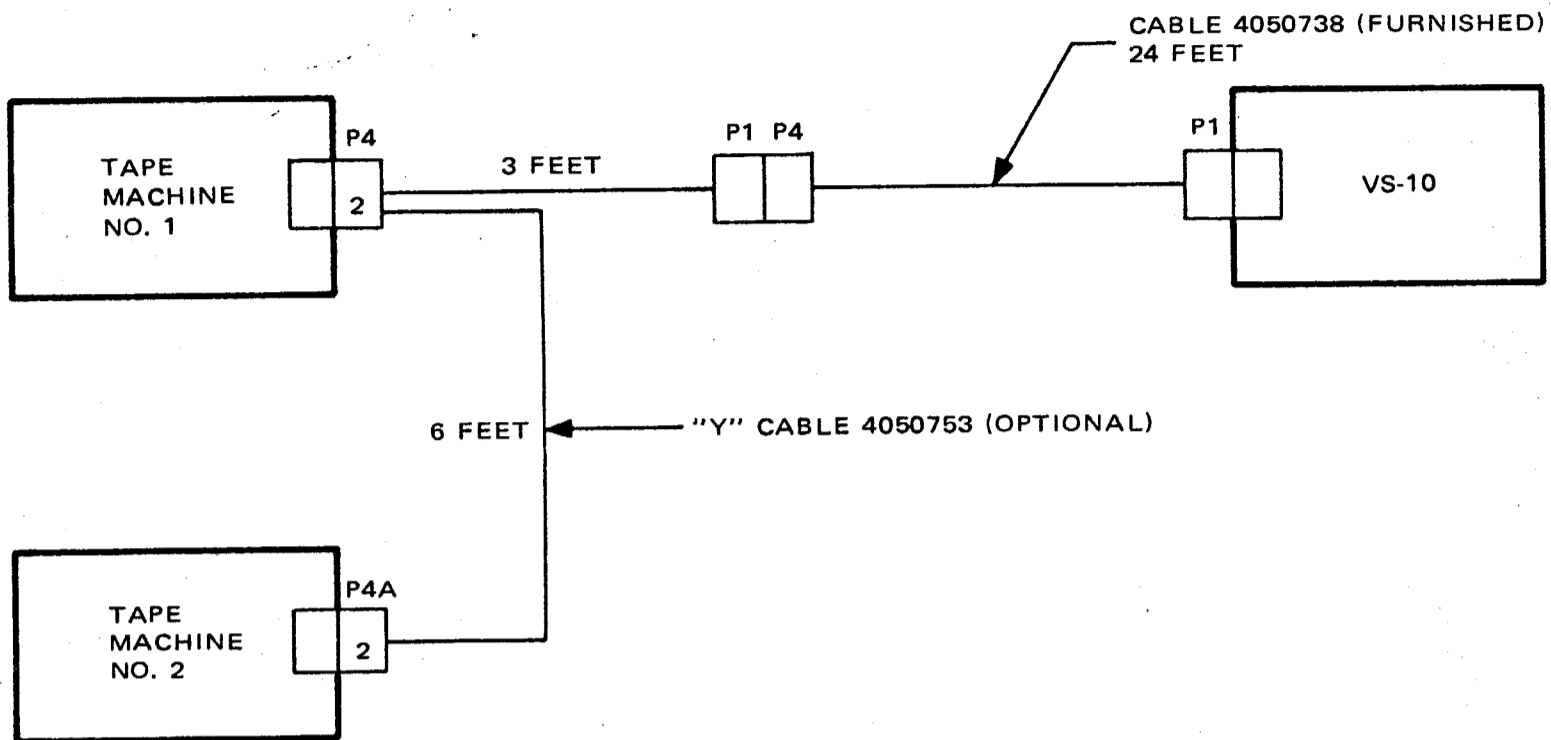


Figure 2. System Interconnection Diagram

existing holes located in the side panel (Figure 4), and installing the assembled unit in a 19-inch rack space.

Single-Mount Installation

To mount a single VS-10, proceed as follows:

1. Remove the top cover (four screws) from the VS-10.
2. Remove the two screws that secure each side panel to the VS-10.
3. Fasten the long and short bracket to the side panel of the VS-10 housing using the No. 6 screws and nuts, furnished in the kit. See Figure 5. If desired, the VS-10 may be mounted in the left-hand position by

reversing the position of the long and short bracket from that shown in Figure 5.

Twin-Mount Installation

To mount two VS-10's side-by-side, proceed as follows:

1. Remove the top cover (four screws) from each VS-10.
2. Remove the two screws that secure each side panel to the VS-10.
3. Use one side panel and fasten the two VS-10's together as shown in Figure 6.
4. Fasten the two short brackets to the side panels of each VS-10 as shown in Figure 6 using the No. 6 screws and nuts furnished in the kit.

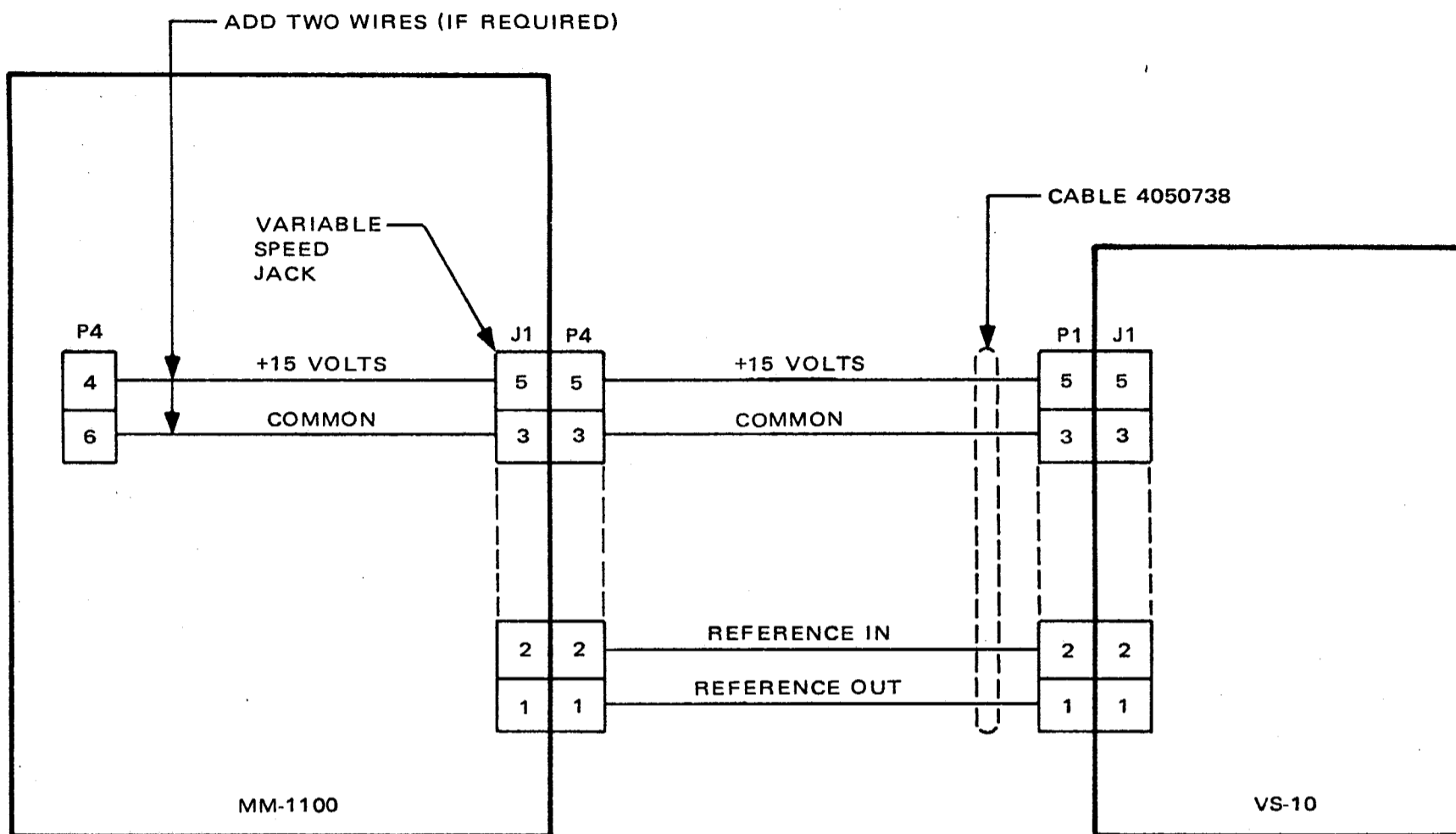


Figure 3. MM-1100 Interconnect Diagram

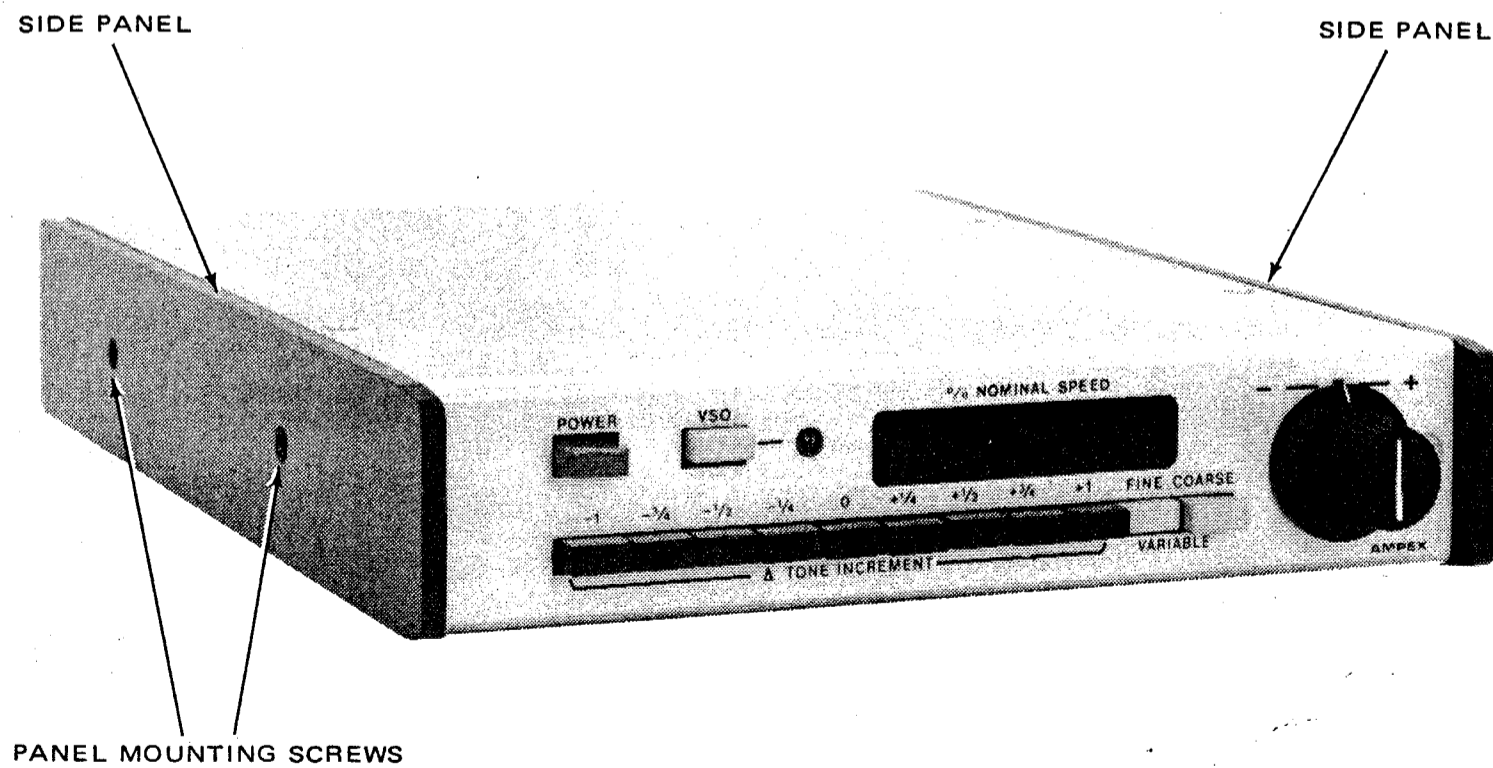


Figure 4. VS-10 Side Panels

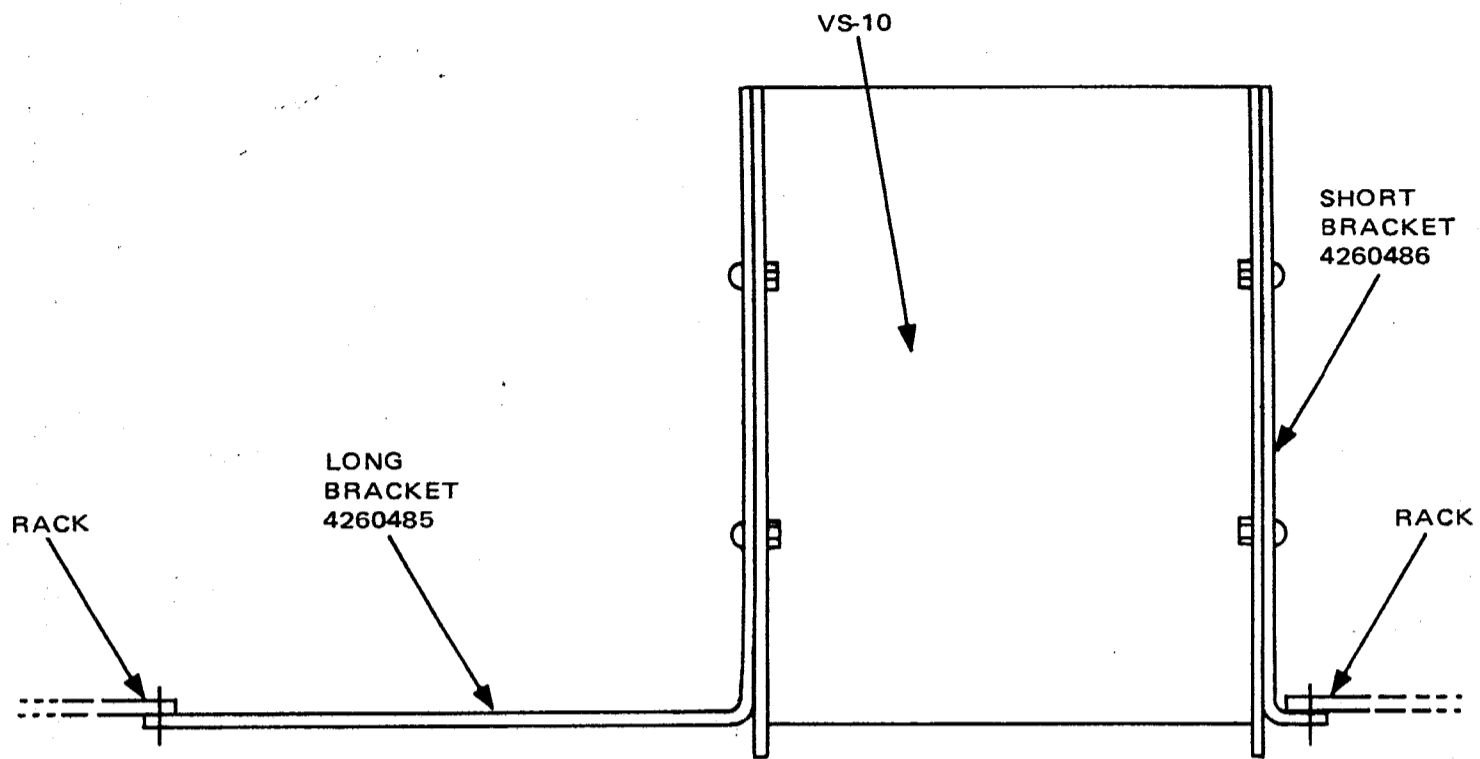


Figure 5. Single-Mount Installation, Top View

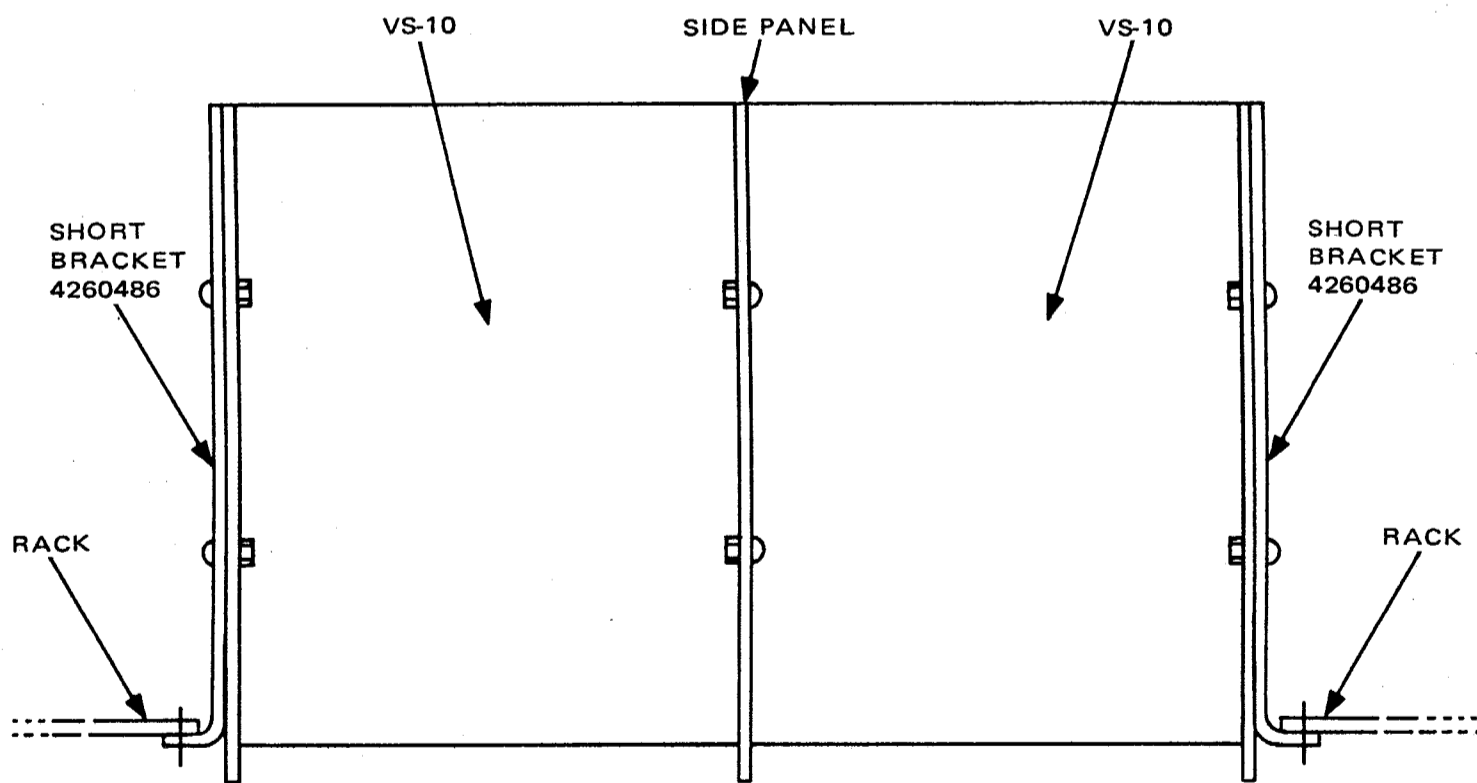


Figure 6. Twin-Mount Installation, Top View

OPERATION

This section of the manual provides a description of the VS-10 operating controls and indicators, a preoperational checkout procedure, and an operating procedure. The operating controls and their functions are shown in Table 3.

PREOPERATIONAL PROCEDURE

Use these instructions to checkout the system after installation and for familiarization with the VS-10 controls. Before starting, the operator should be familiar with the function of the operating controls and indicators described previously. The following procedure describes operation of the display version and non-display version as noted. Proceed as follows:

1. Thread a tape with a pre-recorded test tone on the recorder/reproducer.
2. Press the 0 Δ TONE INCREMENT pushbutton.
3. Place recorder/reproducer in play mode.
4. Press the POWER pushbutton to the "in" position to apply power to the display portion of the VS-10. Display should illuminate (display model only).
5. Press VSO pushbutton to the "in" position to route the VS-10 output frequency to the recorder/reproducer. The indicator light should illuminate and display should indicate 100.0%. There should be no noticeable change in playback speed or tone as heard on the monitor.
6. Alternately press each Δ TONE INCREMENT pushbutton. The display should indicate percentage of tone deviations from

normal (100.0%) as shown in Table 4. Tolerance is 0.2%.

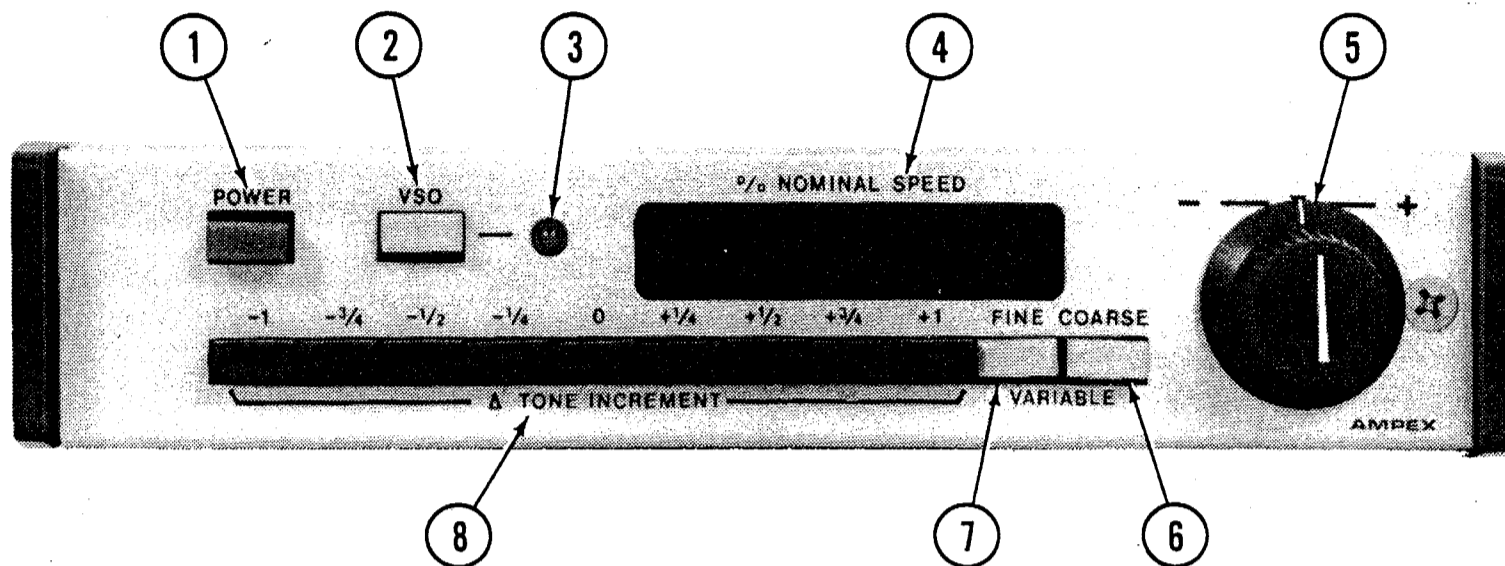
7. Depress the FINE pushbutton. Variable control should provide approximately $\pm 1/9$ octave of control and display should indicate a minimum range of 94 to 107%.
8. Depress the COARSE pushbutton. Variable control should provide approximately ± 2.5 octaves of control and display should indicate a minimum range of from 50.0 to 250.0 percent.
9. With no buttons pressed, tone will be -1 corresponding to 89.1 percent on the display.

OPERATING PROCEDURE

The VS-10 may be used with the recorder/reproducer in either play or record mode as determined by the particular requirements of the user. Proceed as follows:

1. With tape threaded, place the recorder/reproducer in the desired mode of operation, record or play.
2. Press the POWER pushbutton to the "in" position (display model only) to apply power to the display readout.
3. Press the VSO pushbutton to the "in" position to route the VS-10 output frequency to the recorder/reproducer.
4. Select the desired VS-10 mode of operation: TONE INCREMENT, VARIABLE FINE, or VARIABLE COARSE. Display will indicate percent of tone deviation from normal (100.0%).

Table 3. VS-10 Display Model Controls and Indicators



REF NO.	CONTROL OR INDICATOR	FUNCTION
1	POWER pushbutton switch	Applies power to the display portion of the VS-10. "In" position: power is on "Out" position: power is off
2	VSO pushbutton switch	Selects reference frequency to recorder. "In" position: VS-10 output fed to recorder "Out" position: Recorder reference frequency fed back to recorder.
3	Light emitting diode indicator	Lights when this VSO pushbutton is in the "In" position to indicate the VS-10 is active and supplying an output to the associated tape recorder/reproducer.
4	% NOMINAL SPEED display	Indicates tone increment or decrement from normal speed.
5	FINE/COARSE VARIABLE potentiometer control	Used in conjunction with the FINE/COARSE VARIABLE pushbuttons: FINE mode provides $\pm 1/9$ octave of control from nominal. COARSE mode provides ± 2.5 octaves of control from nominal.
6	COARSE pushbutton switch	Enables COARSE variable control.

Table 3. VS-10 Display Model Controls and Indicators (Continued)

REF NO.	CONTROL OR INDICATOR	FUNCTION
7	FINE pushbutton switch	Enables FINE variable control.
8	Δ TONE INCREMENT pushbutton switches	Pushed to select preset tone increments or decrements: -1, -3/4, -1/2, -1/4, 0, +1/4, +1/2, +3/4, or +1.
		NOTE
		If no buttons are pressed, tone will be -1 decrement.

Table 4. Tone Deviation Percentage

Δ TONE	DISPLAY PERCENT
+1	112.2
+3/4	109.1
+1/2	105.9
+1/4	102.9
0	100.0
-1/4	97.1
-1/2	94.3
-3/4	91.7
-1	89.1

THEORY OF OPERATION

This section of the manual provides theory of operation of the VS-10 Variable Speed Oscillator. A simplified block diagram (Figure 7) and the schematics found in the final section of the manual support the text to aid understanding of the VS-10 circuitry.

OSCILLATOR CIRCUIT DESCRIPTION

The display and non-display versions of the VS-10 contain identical circuitry to generate the preset or variable frequency used to control the capstan servo of the associated recorder. As shown in schematic diagram 4840324 (non-display) or 4840295 (display), the oscillator consists of voltage comparator A1-7 and associated components in a feedback path consisting of inverter A3-2, timing capacitor C1, and fixed or variable resistors depending on whether a preset or variable frequency is to be generated.

When the positive pin 2 input of A1-7 is more positive than the negative pin 3 input, the output at pin 7 is high. Initially the positive terminal is low and the output is low and inverted by A3-2. The high from A3-2 starts to charge C1. When the level on C1 crosses the reference level established at the negative terminal, A1-7 output switches high. This output is inverted by A3-2 and causes C1 to discharge through the divider chain until the level crosses the reference level (pin 3) and A1-7 switches low. This cycle is repeated and generates a sawtooth waveform which is shaped by A3-6 to a 0 to +5 Vdc square wave. The oscillator operates at twice the VS-10 output frequency and therefore the signal is fed through divide-by-two JK flip-flop A10-12. From here the signal is converted to a 0 to +4 Vdc level square wave by Q6 and routed through switch S12 (in the VSO mode position) to the associated tape recorder.

Oscillator Power Supply

Power to operate the oscillator portion of the VS-10 is furnished from the associated recorder/reproducer. This power is applied to the oscillator whenever the recorder/reproducer is turned on. Plus 15 Vdc (MM-1100) or +12 Vdc (AG-440) from the recorder/reproducer enters the VS-10 at J1 pin 5 and is filtered by R32, C6, C7 to provide the +12 Vdc supply. This +12 Vdc is also routed through R31 to regulator VR1 to provide the +5 Vdc "A" supply.

A negative voltage supply for the operation of A1-4 is developed from the +12 Vdc supply. The 9,600-Hz reference frequency from the recorder/reproducer is applied to switching transistor Q1 which applies a 0 to +8 Vdc square wave to CR1 and CR2. Diode CR1 conducts the positive portion of the square wave to ground, and the negative portion is conducted by CR2 and filtered by C3. This results in a -8 ± 2 Vdc supply which is connected to pin 4 of A1.

DISPLAY UNIT CIRCUIT DESCRIPTION

The display circuitry of the VS-10 accepts the output from the oscillator and converts the output frequency to a binary-coded decimal (BCD) which is counted and stored to be displayed as a percentage of normal speed.

The main components of the display unit are a four digit display driver (A2), four single-digit seven-segment light-emitting-diode (LED) numeric displays, display timer, and hysteresis circuit. Figure 7 is a simplified block diagram of the display unit.

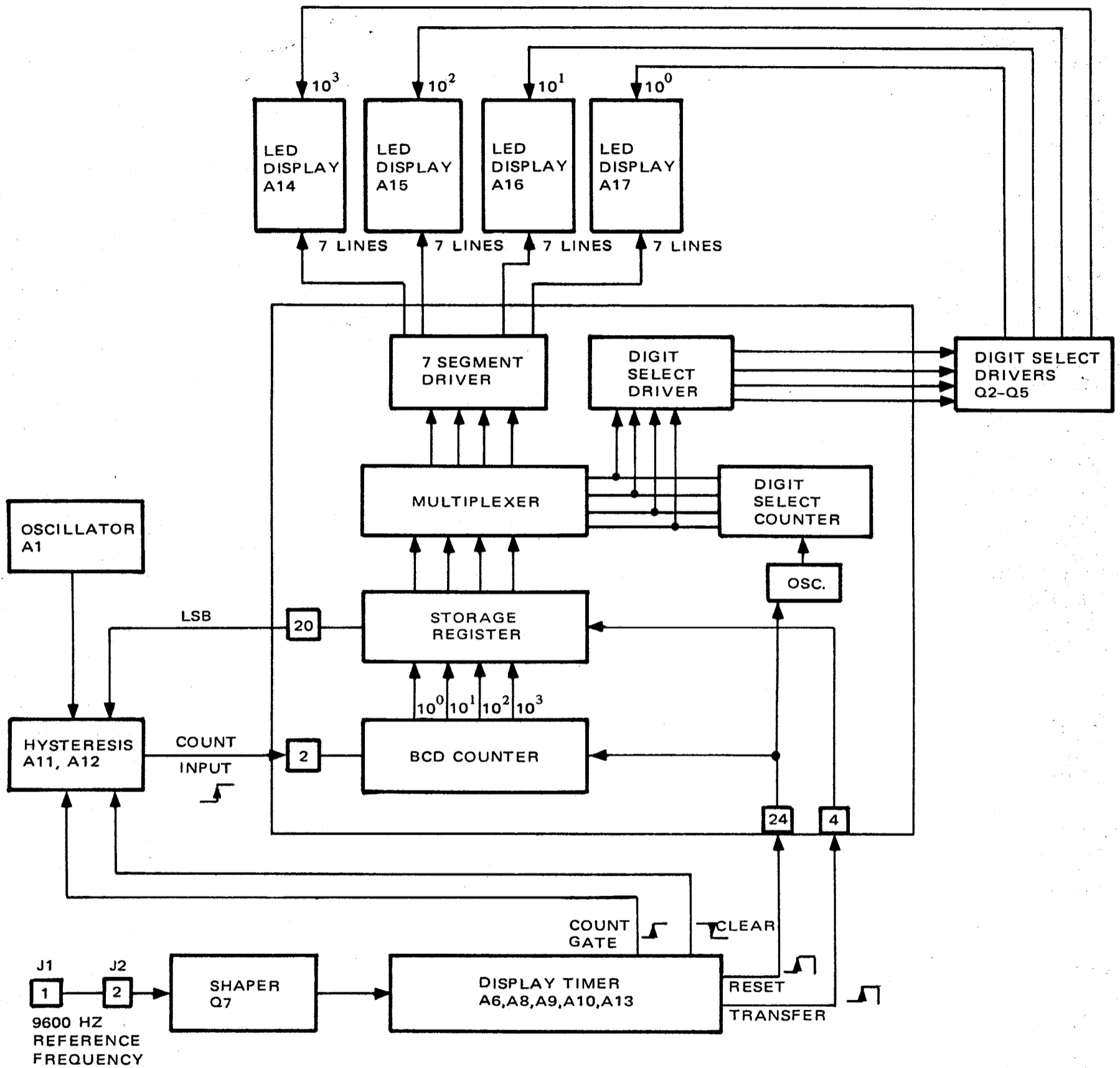


Figure 7. Display Unit, Simplified Block Diagram

Four Digit Display Driver A2

Integrated circuit A2 is a four digit, seven-segment-output, display driver. It contains four synchronous decade BCD counters, a storage register, multiplexing circuits, internal oscillator for digit selection, and a seven-segment decoder driver.

The signal generated by the VS-10 oscillator is applied through a hysteresis circuit (described later) to the count input of the four digit display driver A2. The period of time that the BCD counter is permitted to count is controlled by a display timer (described later). A transfer pulse from the display timer causes the numbers that have been stored in the BCD counters to transfer to the storage register where the count is held until the next count is achieved. While the BCD counter is storing the next count, the count in the storage register is being displayed. A count gate from the display timer starts and stops the count taking place in the BCD counters and a reset pulse (from the display timer) applied to the BCD counter resets the counter to zero so a new count can be started. Approximately every 0.1 second, a new count is obtained.

An oscillator within A2 drives a digit select counter. This counter controls the multiplexer to route count information from the storage register to the seven-segment decoder driver and to the digit select driver. The digit select counter scans from the most significant digit (10^3) to the least significant digit (10^0) and is forced to the most significant digit by the reset input. Each of the four seven-segment displays is sequentially activated by an output from the digit select driver which switches on a digit driver (Q2 through Q5).

Display Timer

The display timer utilizes the precise 9,600-Hz crystal-controlled reference signal from the associated tape recorder to determine the length of time the BCD counter is permitted to count. The display timer counts 1000 cycles of the reference signal for a 100% display at nominal speed. If display option of 50 Hertz or 60 Hertz is selected, the timer counts 500 cycles for a 50 Hertz display or 600 cycles for a 60 Hertz

display. At the end of the time period a count gate, transfer pulse, reset pulse and clear pulse are generated.

The display timer consists of elements A8, A9, A6 and A5. Elements A8, A9, and A6 are JK flip-flops connected in series with outputs brought out at counts 2^3 , 2^5 , 2^6 , 2^7 , 2^8 , and 2^9 . When the count equals 1,000, A5-8 is enabled for eight counts and the low at pin 8 is inverted by A13-8 to provide a high count gate which inhibits the input to the BCD counter. Four counts after the count gate occurs, a high transfer pulse is generated for four counts to transfer the BCD count into the storage register. After the expiration of the transfer pulse, it goes low, clocking A10-9 to provide a high reset pulse to the reset input of A2 and to the clear inputs of the display timer. This resets all outputs low and the count starts over.

Hysteresis Circuit

Under conditions described below, the count gate is effectively shortened for one count by the hysteresis circuit to eliminate flickering in the display readout. The high count gate from pin 8 of A13 is applied to pin 11 of NAND-gate A12-8. If the other two inputs to A12-8 are high, then a low from pin 8 of A12-8 inhibits A11-12 for the duration of the count gate. If at the count time the least significant bit (LSB) at pin 20 of A2 and the output at pin 9 of A11-9 are in a different state and pin 12 of A11-12 is high, then an additional count from oscillator A1 is clocked through A11-13 to pin 2 of A2. This action is summarized in Table 5.

The signal at pin 20 is the previous LSB count being stored while a new count is being entered into the BCD counter.

Display Power Supply

The display model has a separate power supply to operate the display unit. The supply may be strapped for 115- or 230-Vac operation as described in the Installation section of this manual. The supply furnishes full-wave rectified +5 Vdc and half-wave rectified -12 Vdc.

Table 5. Hysteresis Circuit Logic States

A11-12	A11-9	A11-8	A12-12		A12-6		REMARKS
			LSB=0	LSB=1	LSB=0	LSB=1	
0	0	1	1	1	1	1	
1	0	1	1	1	1	0	Extra Count
0	1	0	1	1	1	1	
1	1	0	0	1	1	1	Extra Count

MAINTENANCE

This section of the manual provides maintenance information for the VS-10 Variable Speed Oscillator. If necessary to repair the VS-10, use the *Electrical Tests* as an aid in isolating a trouble area and the *Calibration* procedure after a repair has been accomplished. Before proceeding with trouble analysis, verify that the VS-10 has been connected correctly to the associated recorder/reproducer according to the instructions in the Installation section of the manual. For the tests that apply to the display version, program the VS-10 for 100.0% normal speed display (see Installation section). The use of a frequency counter is necessary for the non-display version and is optional for the display model. Figure 8 shows the locations of the test points referred to in the *Electrical Tests* and *Calibration* procedures.

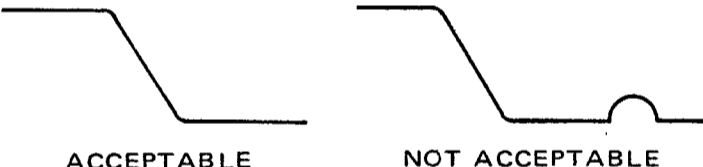
TEST EQUIPMENT

Test equipment required for testing and alignment is shown in Table 6. Equivalent equipment can be substituted for the equipment suggested in the table.

ELECTRICAL TESTS

Verify that the following voltages and signals are present at the specified test points within the VS-10. For all tests place the associated recorder in PLAY mode. Note that it is not necessary to run tape but that masking tape can be used to secure the tension arm to allow the recorder to be placed in PLAY.

1. +5 Vdc Regulated "A" Power Supply. Check that the voltage at the cathode of VR-1 is 5.1 ± 0.5 Vdc.
2. Negative Power Supply. Check that the voltage at C3 is -8.0 ± 2.0 Vdc with less than 0.1 Vac ripple.
3. VS-10 Internal Power Supply (display version only). Check that the voltage at J2 pin 13 is $+5.0 \pm 0.5$ Vdc. Check that J2 pin 15 is -12.0 ± 1.0 Vdc.
4. Connect scope probe to the junction of R23 and A1 pin 7. Observe the waveform for absence of a bump as shown.



ACCEPTABLE
NOT ACCEPTABLE
5. On the display version only, use a dual trace scope and connect one probe to A8 pin 11. Connect the other probe to A10 pin 6. Sync the scope to the signal at A8 pin 11. Check that the positive going transition at A10 pin 6 rises before either a positive or negative transition occurs at A8 pin 11. The transitions are approximately 100 nsec apart.
6. On the display version only, connect scope to the collector of Q7. Check that the rise and fall times of the signal should be between 100 and 400 nsec. There should be no oscillations.

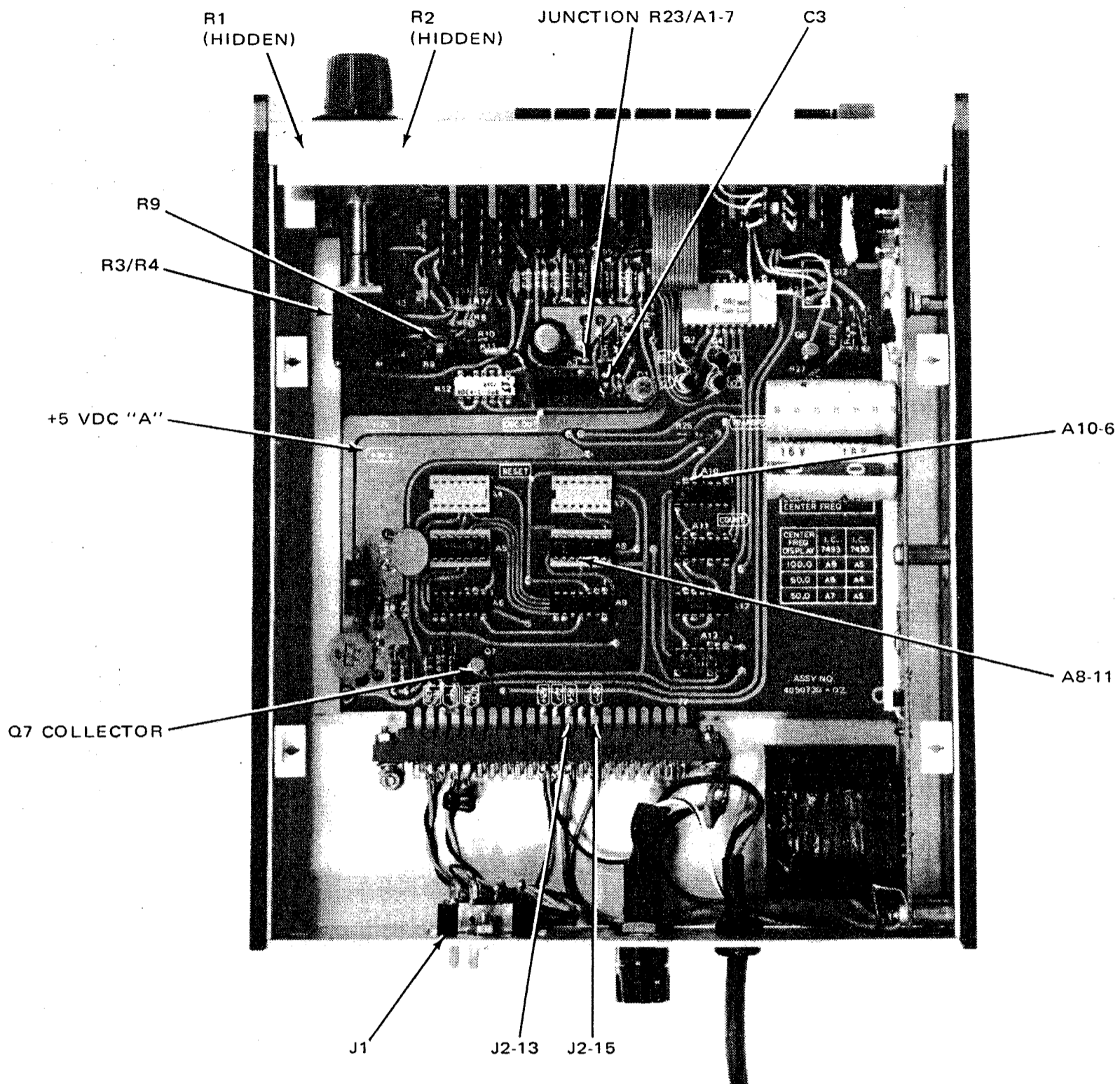


Figure 8. Test Point Locations

CALIBRATION

If a component is changed in the oscillator circuit or if the calibration has changed due to component aging, perform a calibration procedure as follows.

1. Remove the potentiometer knob on the front panel to gain access to controls R1 and R2.
2. Connect a frequency counter to pin 2 of the rear connector J1. With the VSO pushbutton in the "out" position, counter should read 9,600 Hz \pm 2 Hz.
3. Push the 0 Δ TONE INCREMENT pushbutton and press VSO pushbutton to the "in" position. Adjust R2 for an output frequency of 9,600 Hz.

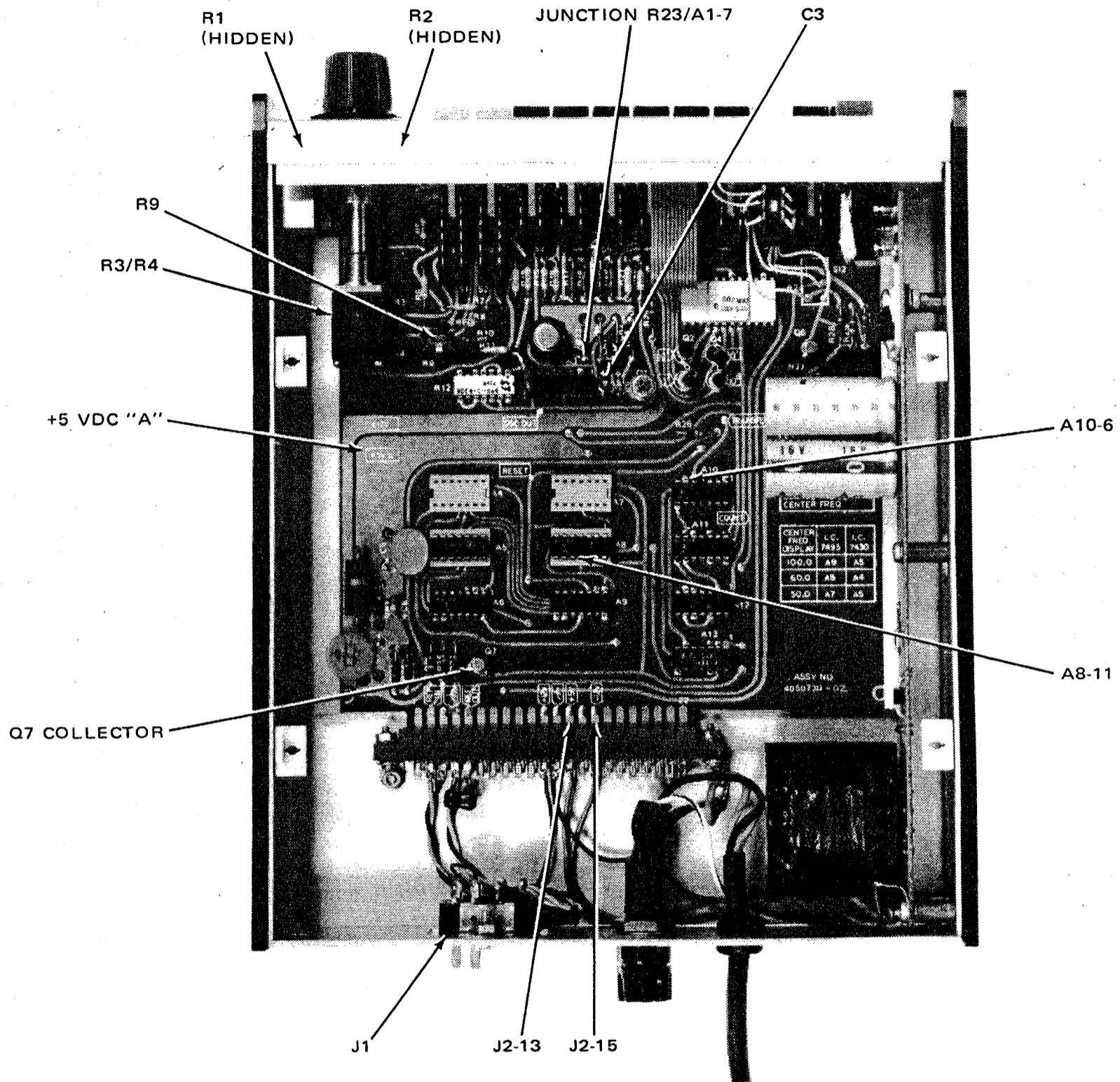


Figure 8. Test Point Locations

CALIBRATION

If a component is changed in the oscillator circuit or if the calibration has changed due to component aging, perform a calibration procedure as follows.

1. Remove the potentiometer knob on the front panel to gain access to controls R1 and R2.
2. Connect a frequency counter to pin 2 of the rear connector J1. With the VSO pushbutton in the "out" position, counter should read 9,600 Hz \pm 2 Hz.
3. Push the 0 Δ TONE INCREMENT pushbutton and press VSO pushbutton to the "in" position. Adjust R2 for an output frequency of 9,600 Hz.

Table 6. Test Equipment

EQUIPMENT TYPE	SUGGESTED MODEL
DC Voltmeter — 20,000-ohm/volt	Any
Oscilloscope	Tektronix 453
Frequency Counter (for non-display model VS-10)	Hewlett-Packard 5221A
Test clip for integrated circuit DIP package	Any

4. Press the +1 Δ TONE INCREMENT pushbutton. Adjust R1 for an output frequency of 10,776 Hz.
5. Repeat steps 3 and 4 until the readings are within ± 2.0 Hz of each other.
6. Individually press the Δ TONE INCREMENT pushbuttons and compare readings with Table 7.
7. Press the FINE pushbutton. Adjust the front panel potentiometer (shaft of R3 and R4) for a frequency of 9,600 Hz or 100.0 on the display counter.

Table 7. Tone vs. Frequency and Display, Comparison Chart

TONE	FREQUENCY HZ ± 10 HZ	DISPLAY % $\pm 0.2\%$
+1	10,776	112.2
+3/4	10,469	109.1
+1/2	10,171	105.9
+1/4	9,881	102.9
0	9,600	100.0
-1/4	9,327	97.1
-1/2	9,061	94.3
-3/4	8,803	91.7
-1	8,553	89.1

8. Press the COARSE pushbutton. Adjust R9 for a frequency of 9,600 ± 20 Hz or 100.0 ± 0.2 on the display.
9. Reinstall the knob removed in step 1 with the pointer lined up with the index mark on the front panel.
10. Check the minimum range of control provided by the FINE and COARSE VARIABLE controls. The control ranges should be:

FINE	9,024 to 10,272 Hz 94.0 to 107.0% display
COARSE	4,800 to 24,000 Hz 50.0 to 250.0% display

PARTS LISTS AND SCHEMATICS

This section contains assembly parts lists and schematic diagrams. Three indexes list the drawings as follows:

- Manual sequence
- Numerical sequence by assembly part number
- Numerical sequence by schematic diagram number

INDENTURED LIST OF ASSEMBLIES

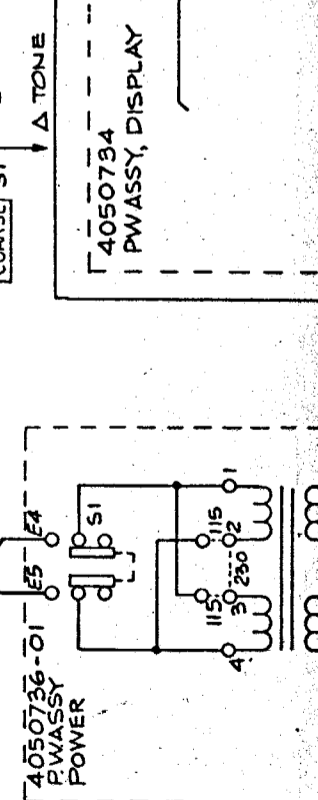
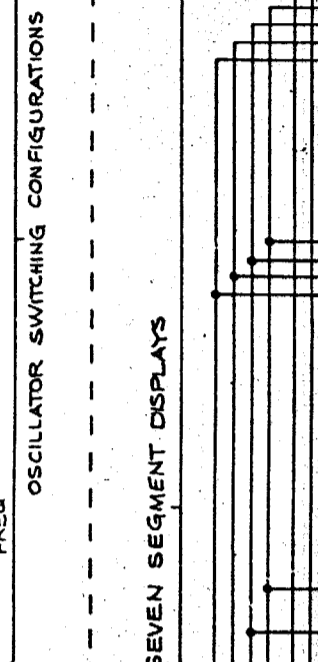
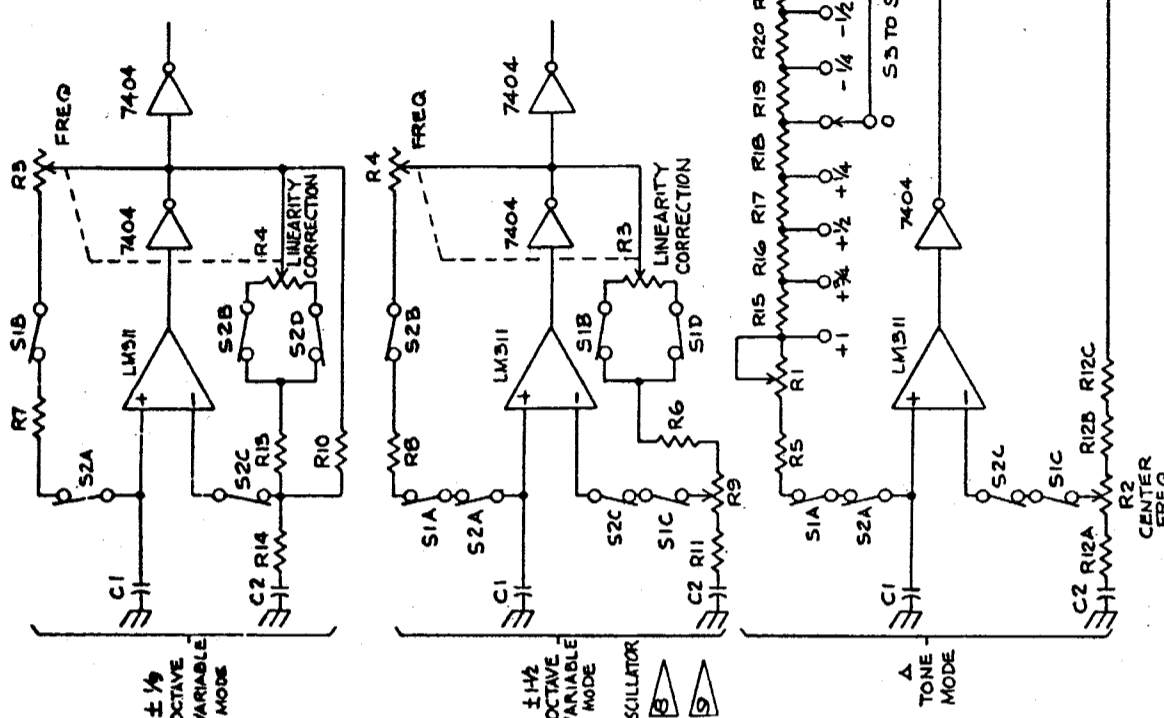
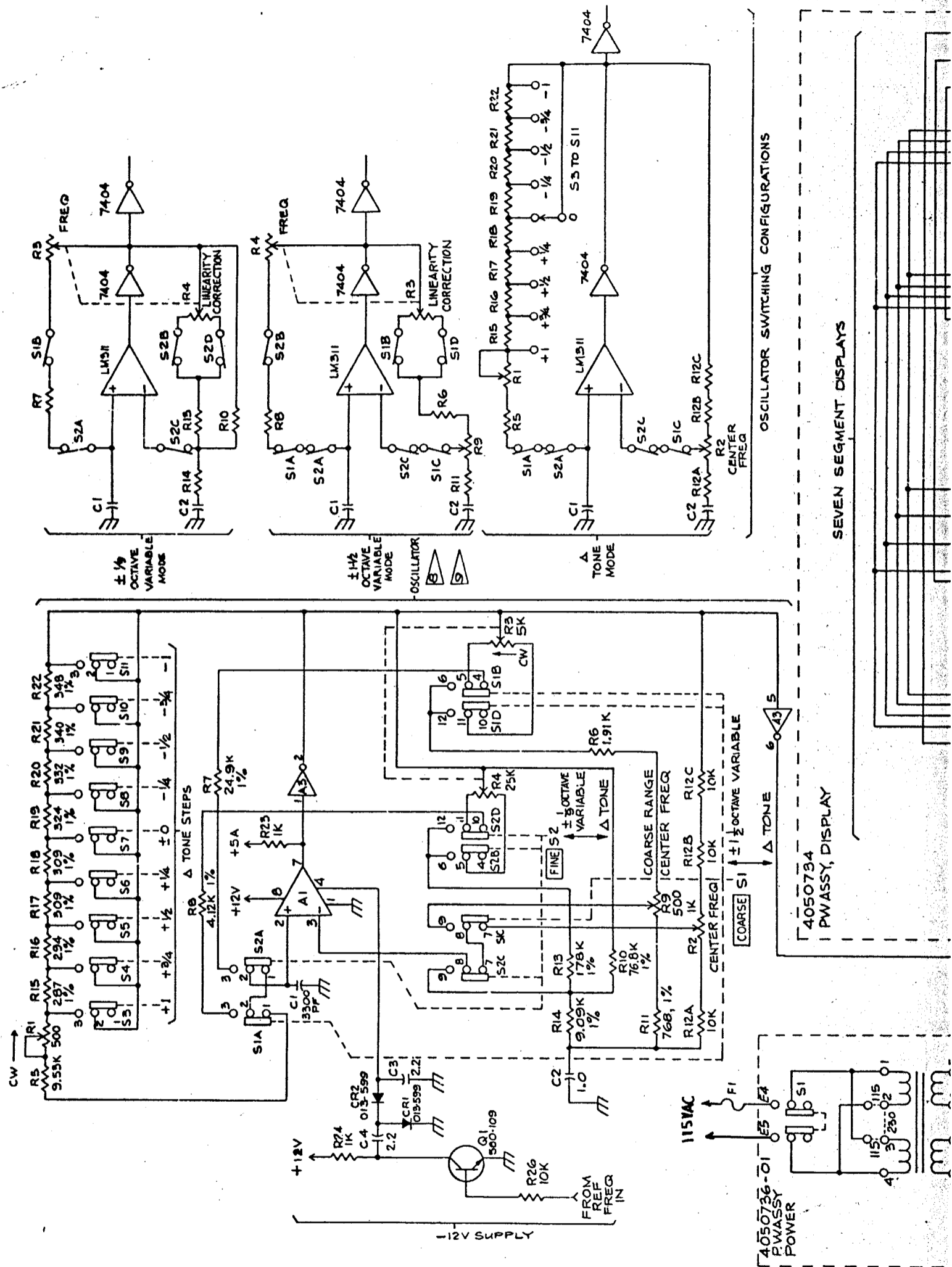
Title	Assembly No.	Page No.
Variable Speed Oscillator, VS-10	4010217	25
Housing Assembly	4030348	31
Power PWA	4050736	33
Front Panel Electronics Assembly	4050735	35
Variable Speed Oscillator and Display Assembly	4050737	37
Variable Speed Oscillator PWA, Without Display	4050730	38
Variable Speed Oscillator PWA, With Display	4050730	41
Display PWA	4050734	45
Interconnect Cable Assembly	4050738	47
"Y" Cable Assembly (Accessory)	4050753	49
Rack Mount Kit (Accessory)	4010232	51

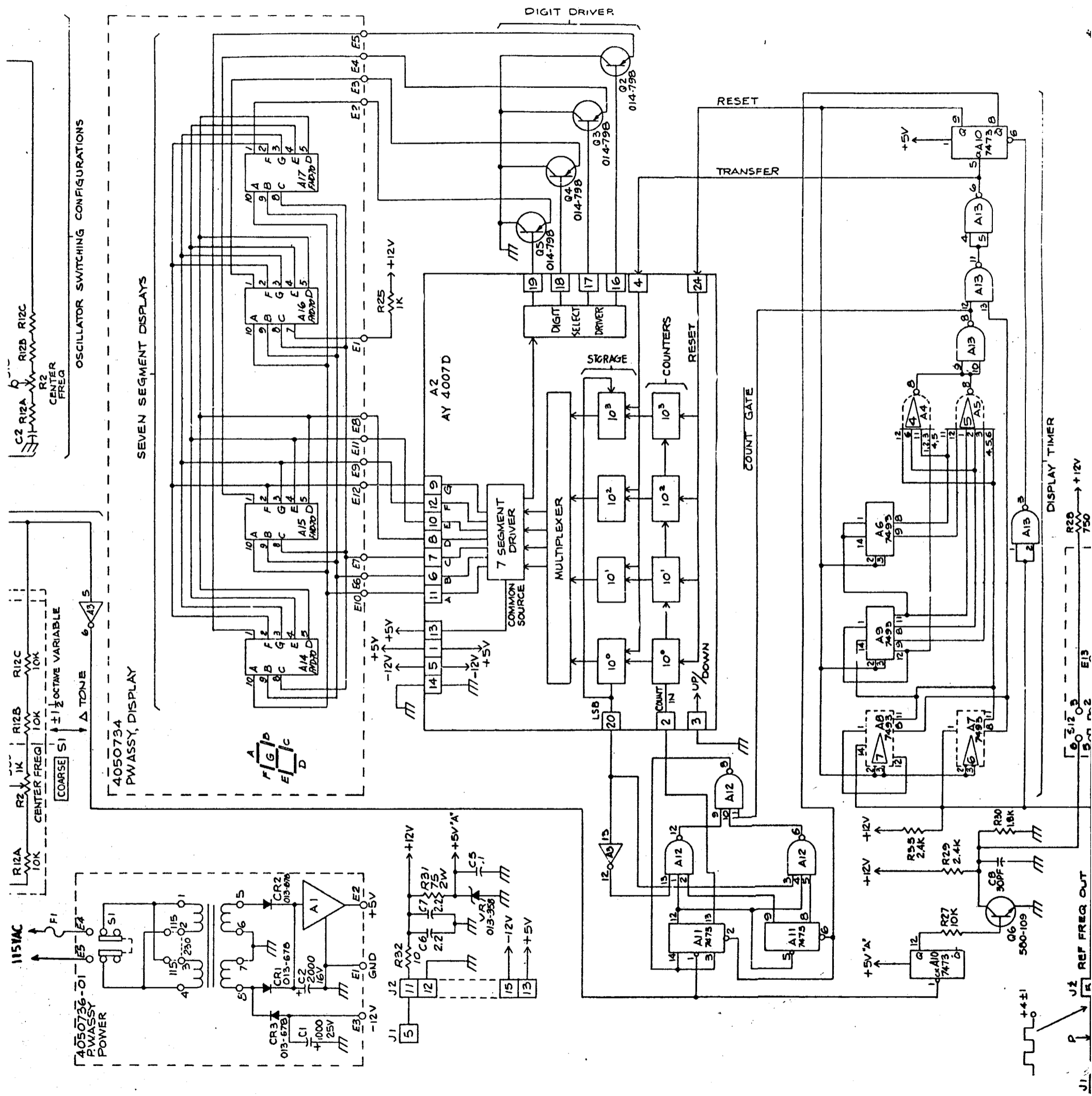
NUMERICAL INDEX TO PARTS LISTS

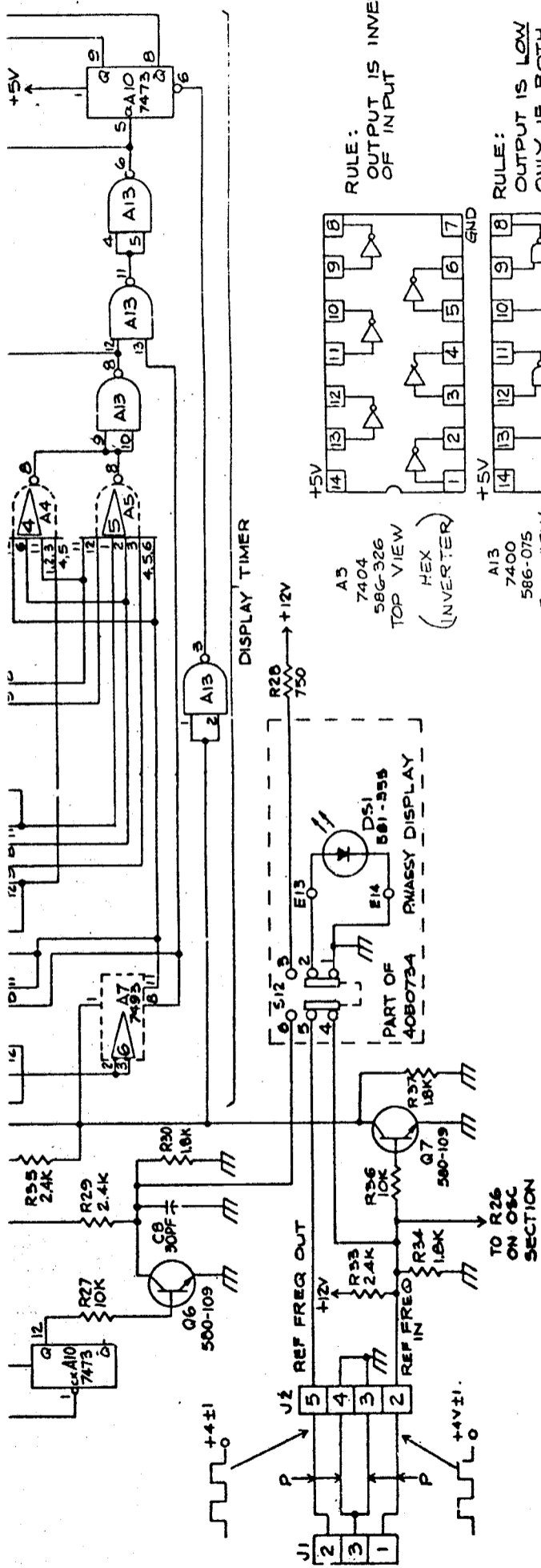
Assembly No.	Rev	Title	Page No.
4010217	A	Variable Speed Oscillator, VS-10	25
4010232	—	Rack Mount Kit	51
4030348	—	Housing Assembly	31
4050730	—	Variable Speed Oscillator PWA, without Display	38
4050730	—	Variable Speed Oscillator PWA, With Display	41
4050734	—	Display PWA	45
4050735	—	Front Panel Electronics Assembly	35
4050736	—	Power PWA	33
4050737	—	Variable Speed Oscillator and Display Assembly	37
4050738	—	Interconnect Cable Assembly	47
4050753	—	"Y" Cable Assembly	51

NUMERICAL INDEX TO SCHEMATICS

Schematic No.	Rev	Title	Page No.
4840295	—	Variable Speed Oscillator and Display	27
4840324	—	Variable Speed Oscillator	29







NOTES: UNLESS OTHERWISE SPECIFIED

- 1 ALL CAPACITOR VALUES ARE IN MICROFARADS
- 2 ALL RESISTOR VALUES ARE IN OHMS, 1/4W, 10%
- 3 ALL 1% RESISTORS ARE 1/4W
- 4 FOR DISPLAY OF 60.0 AT NORMAL SPEED, 7430 IS INSTALLED IN POSITION A4 (NONE IN A5)
- 5 FOR DISPLAY OF 100.0 OR 500 AT NORMAL SPEED, 7430 IS INSTALLED IN POSITION A4
- 6 FOR DISPLAY OF 50.0 AT NORMAL SPEED, INSTALL 7493 IN POSITION A7 (NONE IN A8)
- 7 FOR DISPLAY OF 100.0 OR 500 AT NORMAL SPEED, INSTALL 7493 IN POSITION A8 (NONE IN A7)

8 OSCILLATOR READOUTS (±0.2)

- +1 = 112.2
- +3/4 = 109.1
- +1/2 = 105.9
- +1/4 = 102.9
- ±0 = 100.0
- 1/4 = 97.1
- 1/2 = 94.3
- 3/4 = 91.7
- 1 = 89.1

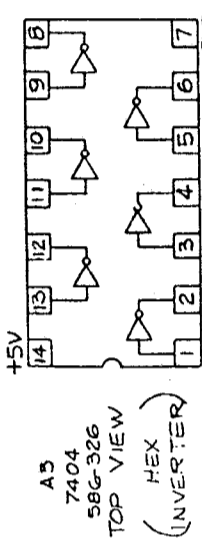
9 OSCILLATOR CALIBRATION:

- 1 R1 FOR 100.0 AT +0 TONE
- 2 R2 FOR PROPER RANGE AT +1 AND -1 TONE
- 3 REPEAT 1 AND 2 UNTIL ALL Δ TONES CORRECT
- 4 TRIM R1 AND R2 FOR BEST Δ TONE ERROR
- 5 INSTALL KNOB AT CENTER REF MARK WHEN DISPLAY READS 100.0 IN FINE VARIABLE MODE
- 6 TRIM R9 FOR 100.0 READING IN COARSE VARIABLE MODE, KNOB STILL ON CENTER REF. MARK

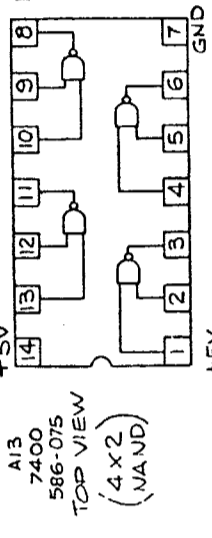
4010217	
4050736	V5-10
4050734	
4050730	
NEXT ASSEMBLY	USED ON

IC LIST		
PWA USED ON	DESIGN	AMPEX P/N COMM'L EQ
4050736	A1	587-433 78M05C
4050730	A2	587-434 AY4007D
4050734	A4, A5, A6, A7	581-321 FND-70

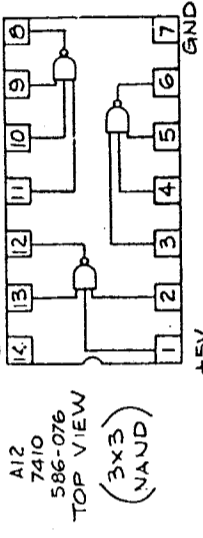
RULE:
OUTPUT IS INVERSE
OF INPUT



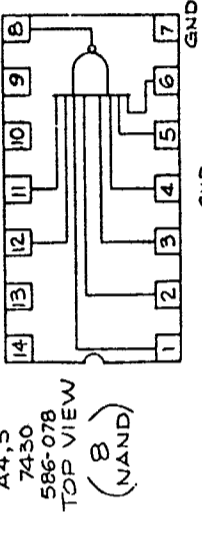
RULE:
OUTPUT IS LOW
ONLY IF BOTH
INPUTS HIGH.
OUTPUT HIGH
OTHERWISE.



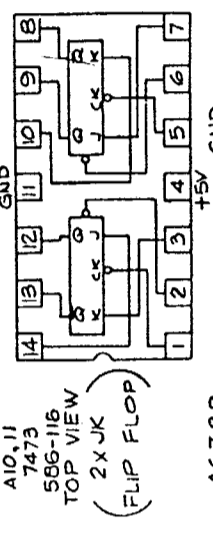
RULE:
OUTPUT IS LOW
ONLY IF ALL 3
INPUTS HIGH.
OUTPUT HIGH
OTHERWISE



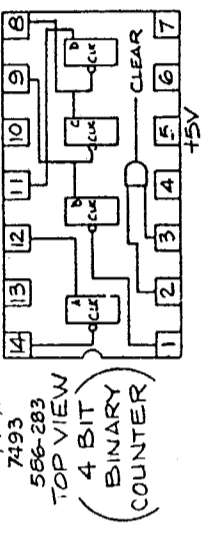
RULE:
OUTPUT IS LOW
ONLY IF ALL 8
INPUTS HIGH
OUTPUT HIGH
OTHERWISE



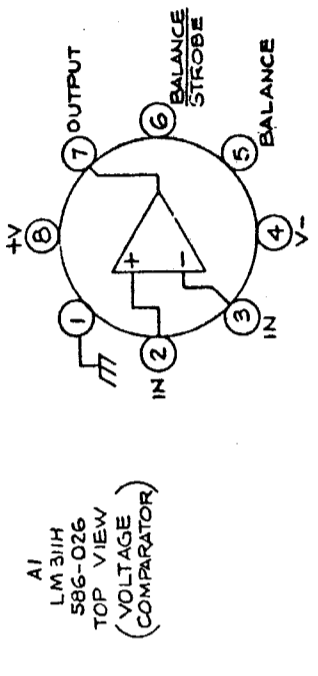
RULE: (SIMPLIFIED)
Q ALWAYS OPPOSITE Q
Q AND Q WILL CHANGE STATES
WHEN CLK(CLOCK) GOES FROM
HIGH TO LOW IF J AND K ARE
HIGH. IF J & K LOW, NO CHANGE
IN Q & Q. Q GOES LOW, Q
HIGH WHEN CLR(CLEAR) LOW



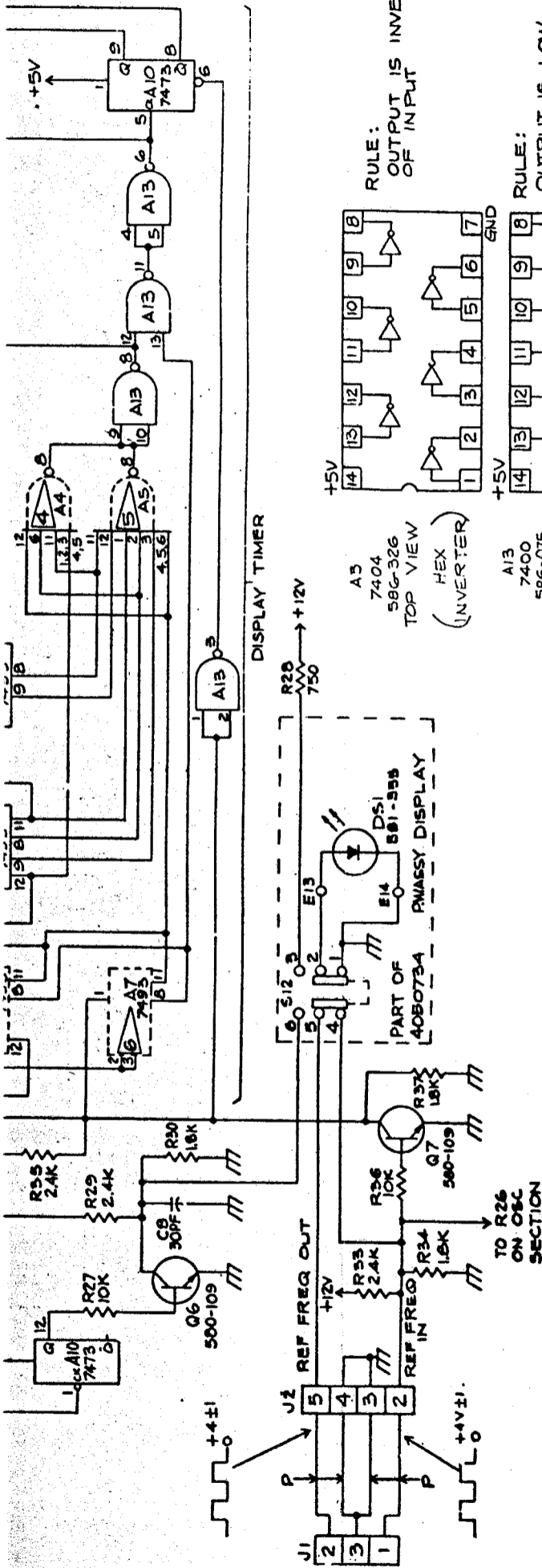
RULE:
EACH FLIP FLOP CHANGES
STATE WHEN CLK(CLOCK)
GOES LOW.
ALL FLIP FLOPS ARE LOW
WHEN BOTH CLR(CLEAR)
INPUTS ARE HIGH



RULE:
OUTPUT HIGH IF
PIN 2 HIGHER
THAN PIN 3



Variable Speed Oscillator and Display
Schematic No. 4840295



NOTES: UNLESS OTHERWISE SPECIFIED

- 1 ALL CAPACITOR VALUES ARE IN MICROFARADS
- 2 ALL RESISTOR VALUES ARE IN OHMS, 1/4W, 10%
- 3 ALL 1% RESISTORS ARE 1/4W
- 4 FOR DISPLAY OF 60.0 AT NORMAL SPEED, 7430 IS INSTALLED IN POSITION A4 (NONE IN A5)
- 5 FOR DISPLAY OF 100.0 OR 500 AT NORMAL SPEED, 7430 IS INSTALLED IN POSITION A4
- 6 FOR DISPLAY OF 50.0 (NONE IN A4)
- 7 FOR DISPLAY OF 100.0 OR 500 AT NORMAL SPEED, INSTALL 7493 IN POSITION AB (NONE IN A7)

8 OSCILLATOR READOUTS (±0.2)

- +1 = 112.2
- +3/4 = 109.1
- +1/2 = 105.9
- +1/4 = 102.9
- ±0 = 100.0
- 1/4 = 97.1
- 1/2 = 94.3
- 3/4 = 91.7
- 1 = 89.1

9 OSCILLATOR CALIBRATION:

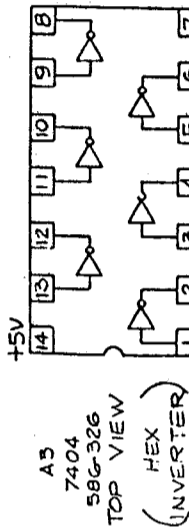
- 1 R1 FOR 100.0 AT +0 TONE
- 2 R2 FOR PROPER RANGE AT +1 AND -1 TONE
- 3 REPEAT 1) AND 2) UNTIL ALL Δ TONES CORRECT
- 4 TRIM R1 AND R2 FOR BEST Δ TONE ERROR
- 5 INSTALL KNOB AT CENTER REF MARK WHEN DISPLAY READS 100.0 IN FINE VARIABLE MODE
- 6 TRIM R9 FOR :00.0 READING IN COARSE VARIABLE MODE, KNOB STILL ON CENTER REF. MARK

4010217	
4050736	VS-10
4050734	
4050730	
NEXT ASSEMBLY USED ON	

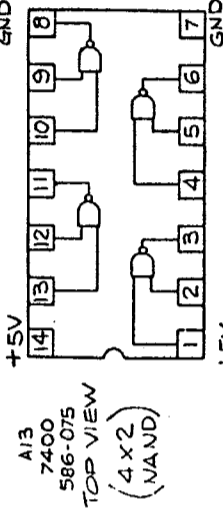
PWA USED ON	DESIG	AMPEX P/N	COMM'L EQ
4050736	A1	587-433	78M05C
4050730	A2	587-434	AY4007D
4050734	A1A151617	581-321	FND-70

DISPLAY TIMER

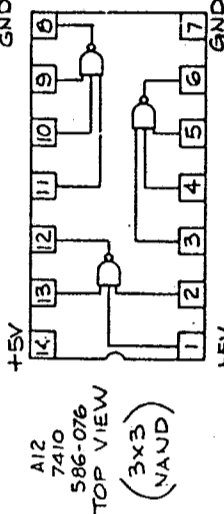
RULE:
OUTPUT IS INVERSE
OF INPUT



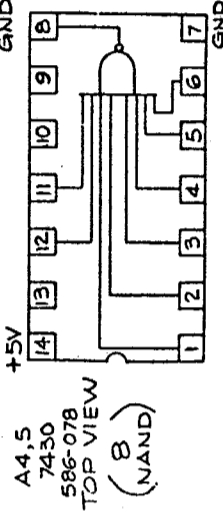
RULE:
OUTPUT IS LOW
ONLY IF BOTH
INPUTS HIGH.
OUTPUT HIGH
OTHERWISE.



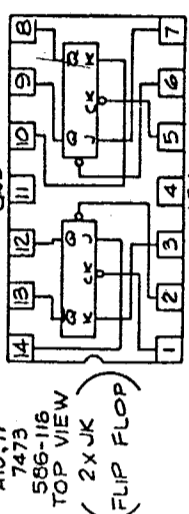
RULE:
OUTPUT IS LOW
ONLY IF ALL 3
INPUTS HIGH.
OUTPUT HIGH
OTHERWISE



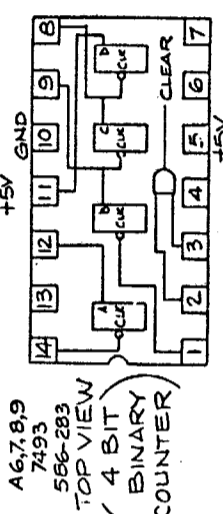
RULE:
OUTPUT IS LOW
ONLY IF ALL 8
INPUTS HIGH
OUTPUT HIGH
OTHERWISE



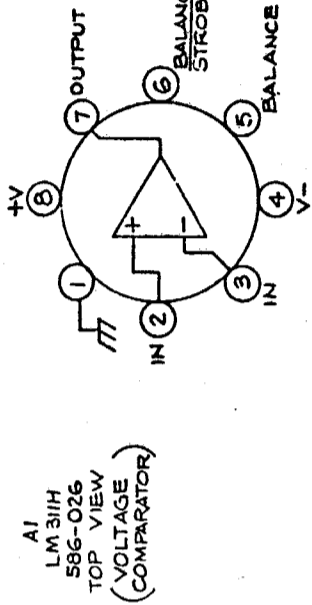
RULE: (SIMPLIFIED)
Q ALWAYS OPPOSITE Q̄
Q AND Q̄ WILL CHANGE STATES
WHEN CLK(CLOCK) GOES FROM
HIGH TO LOW IF J AND K ARE
HIGH. IF J & K LOW, NO CHANGE
IN Q & Q̄. Q GOES LOW, Q̄
HIGH WHEN CLR(CLEAR) LOW



RULE:
EACH FLIP FLOP CHANGES
STATE WHEN CLK(CLOCK)
GOES LOW.
ALL FLIP FLOPS ARE LOW
WHEN BOTH CLR(CLEAR)
INPUTS ARE HIGH

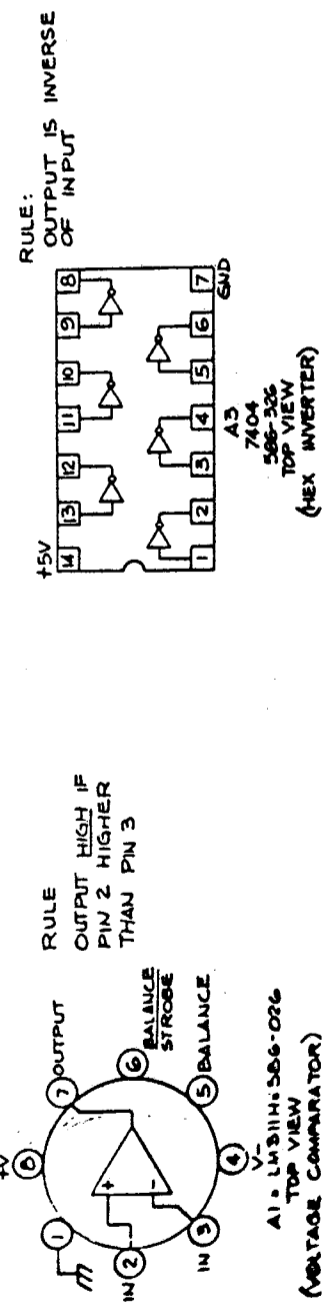
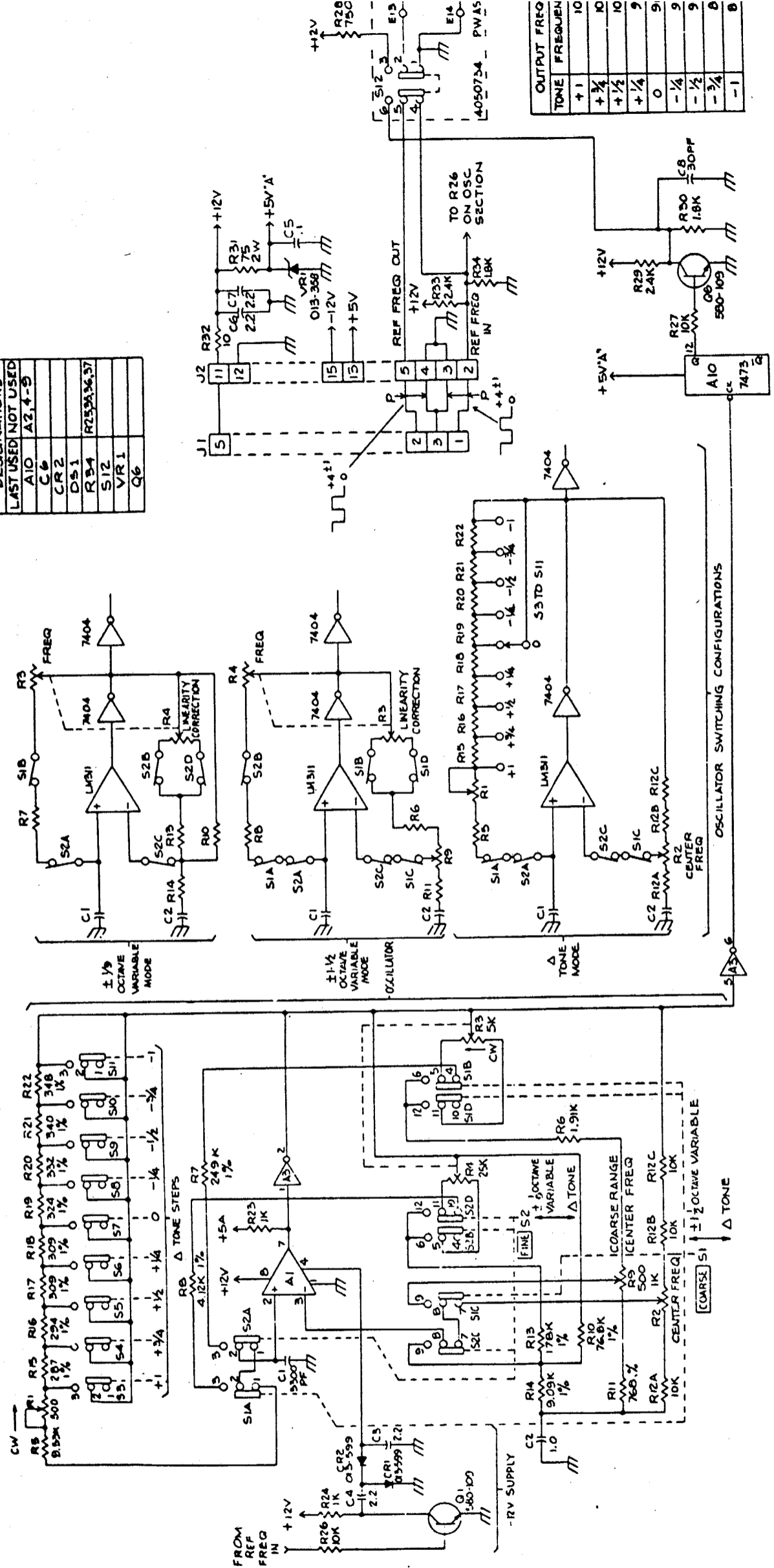


RULE:
OUTPUT HIGH IF
PIN 2 HIGHER
THAN PIN 3

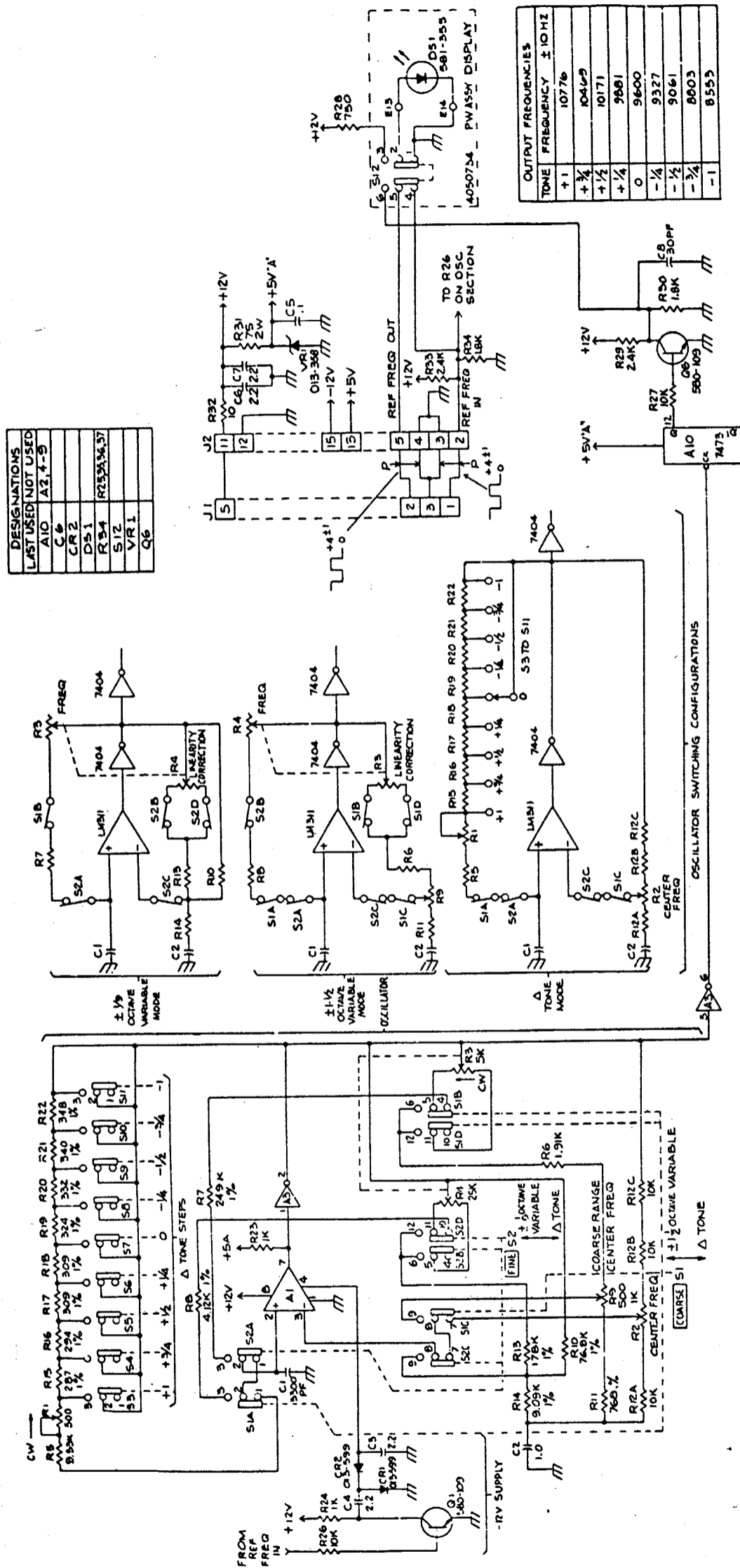


DESIGNATIONS	LAST USED NOT USED
A10	A2, 4-5
C6	
CR2	
R34	R2, 3, 34, 37
S12	
VR1	
Q6	

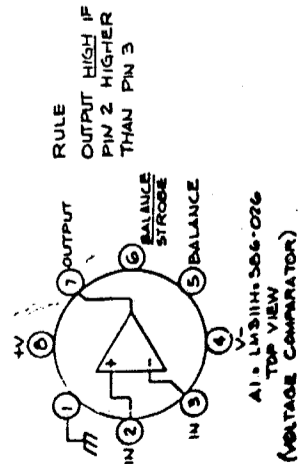
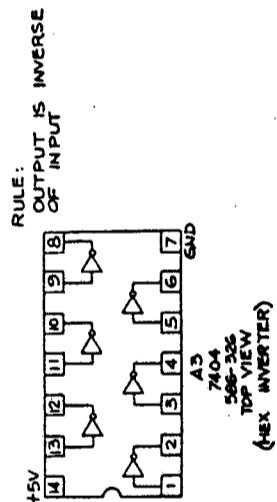
OUTPUT FREQ	TONE	FREQUEN
	+1	10
	+3/4	10
	+1/2	10
	+1/4	9
	0	9
	-1/4	9
	-1/2	9
	-3/4	8
	-1	8



Variable Speed Oscillator Schematic No. 48403

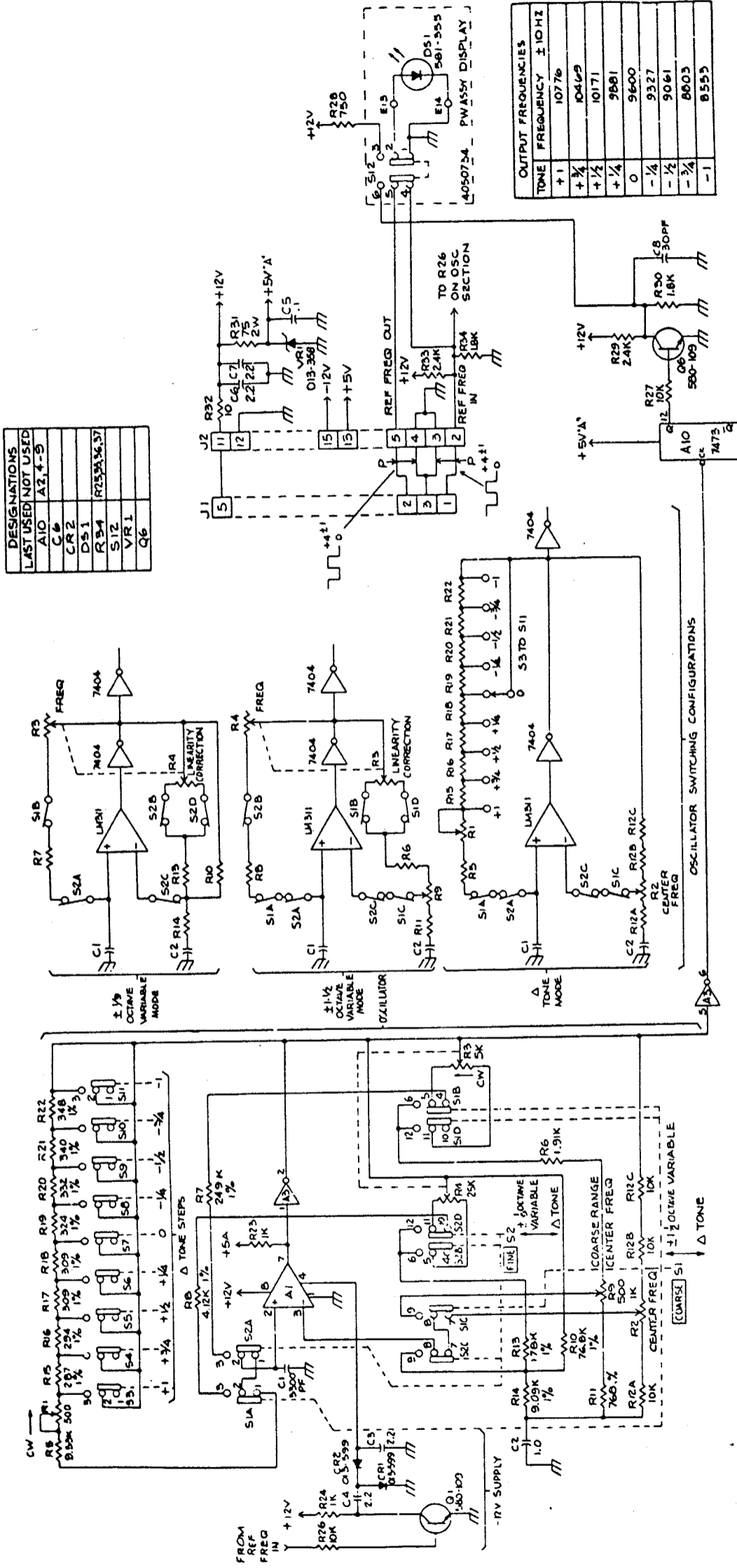


DESIGNATIONS	LAST USED NOT USED
A10	A2, 4-9
C6	
CR2	
D5-1	
R5-4	R25, 26, 37
S12	
VR1	
Q6	

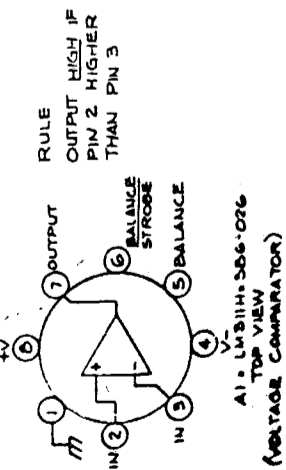
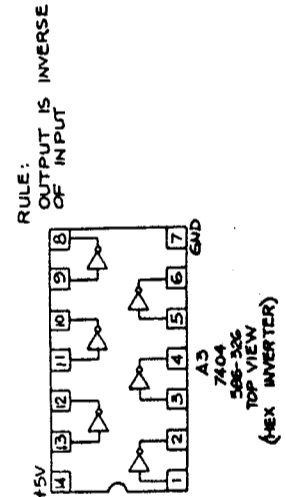


Variable Speed Oscillator Schematic No. 4840324

DESIGNATIONS	LAST USED	NOT USED
A10	A3, 4-5	
C6		
C8, 2		
D5, 1		
R3, 4	R25, 36, 37	
S1, 2		
V1, 1		
Q6		



TONE	FREQUENCY	±10 HZ
+1	10776	
+3/4	10469	
+1/2	10171	
+1/4	9881	
0	9600	
-1/4	9327	
-1/2	9061	
-3/4	8803	
-1	8553	

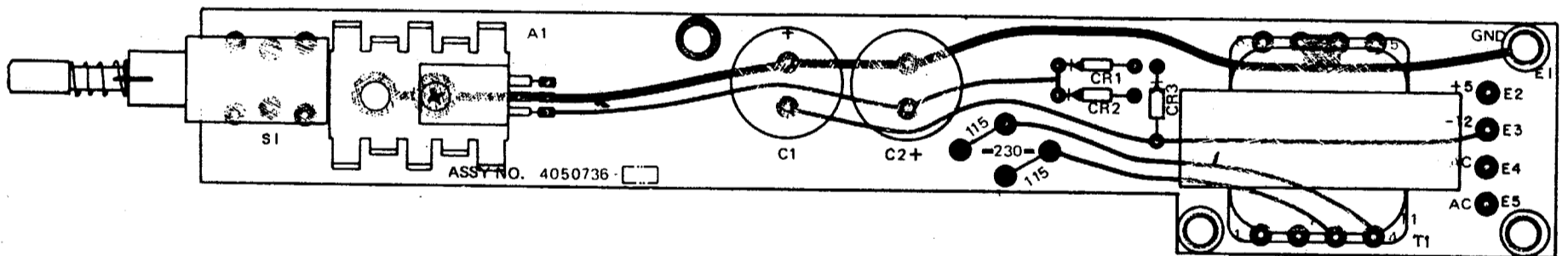


Variable Speed Oscillator Schematic No. 4840324

ITEM NO.	AMPEX PART NO.	REFERENCE NUMBER	DESCRIPTION	JEDEC NO. OR MFR PART NO.
1	4050736-02		POWER PWA, W/POWER SUPPLY	
2	4220275-01		BLOCK, MOUNTING, FRONT PANEL	
3	4290743-02		CHASSIS	
4	4290752-01		COVER	
5	4290753-01		PANEL REAR, WITHOUT POWER SUPPLY	
6	4290753-02		PANEL REAR, WITH POWER SUPPLY	
7	4290754-01		PANEL SIDE	
8	4230274-01		GUIDE, PC CARD	
9	084-038		CORD POWER, 3WIRE, WITH POWER SUPPLY	
10	070-996	F1	FUSE, SLO BLO, 0.100A, WITH POWER SUPPLY	
11	085-005	XF1	FUSEHOLDER, WITH POWER SUPPLY	
12	139-294	J2	CONNECTOR, RECP, PC, 22 DUAL CONT	
13	147-006	J1	CONNECTOR, RECP, RECT, 8 PINS	
14	173-003		TERMINAL, STUD, TURRET, INT THD, 6-32	
15	250-114		BUMPER, PAD PLASTIC	
16	264-014		BUSHING, STRAIN RELIEF, WITH POWER SUPPLY	
17	280-040		SPACER, THD, PLAIN 6-32 X 0.250 AF, 0.750 LG, WITH POWER SUPPLY	
18	172-003		TERMINAL LUG, SOLDER, NO. 6	
19	290-009		BRACKET ANGLE, 90°	
21	471-064		SCREW, PAN HD, XREC, 4-40 X 0.500 LG	
22	471-067		SCREW, PAN HD, 6-32 X 0.250 LG	
23	471-334		SCREW, FLAT HD, XREC, 6-32 X 0.250 LG	
24	471-336		SCREW, FLAT HD, XREC, 6-32 X 0.375 LG	
25	473-045		SCREW, FLAT HD, XREC, 6-32 X 0.375 LG, BLK	
26	496-004		NUT, HEX CAPTIVE WASHER, 4-40	
27	496-005		NUT, HEX, CAPTIVE WASHER, 6-32	
29	501-009		WASHER, PLAIN, NO. 6	
30	502-025		WASHER, LOCK, INT TOOTH, NO. 6	
			VERSIONS: 4030348-01 WITHOUT POWER SUPPLY -02 WITH POWER SUPPLY	

Housing Assembly
Assy No. 4030348

ITEM NO.	AMPEX PART NO.	REFERENCE NUMBER	DESCRIPTION	JEDEC NO. OR MFR PART NO.	
3	4840295		SCHEMATIC		
5	013-678	CR1,2,3	DIODE	1N4385	
7	063-266	C2	CAPACITOR, ALUM, 2200 UF, 16V		
8	063-267	C1	CAPACITOR, ALUM, 1000 UF, 25V		
10	119-229	S1	SWITCH, PUSHBUTTON, 2 PDT		
11	121-209		ACTUATOR, LEVER, PUSHBUTTON, RED		
12	560-405	T1	TRANSFORMER, POWER 115/230V = 16/8V		
13	580-479	X1	HEATSINK		
14	587-433	A1	INTEGRATED CIRCUIT, VOLTAGE REG. 5V, 500 MA, TO-220		
			VERSION: 4050736-02		



ITEM NO.	AMPEX PART NO.	REFERENCE NUMBER	DESCRIPTION	JEDEC NO. OR MFR PART NO.
1	4050737-01		VARIABLE SPEED OSCILLATOR AND DISPLAY ASSEMBLY	
2	4050737-02		VARIABLE SPEED OSCILLATOR AND DISPLAY ASSEMBLY	
3	4290742-01		PANEL FRONT, FACING, WITHOUT DISPLAY READOUT	
4	4290742-02		PANEL FRONT, FACING, WITH DISPLAY READOUT	
5	6000008-20		KNOB	
6	121-207	S1,2,12	ACTUATOR, LEVER, PUSHBUTTON, GREY	
7	121-208	S3-11	ACTUATOR, LEVER, PUSHBUTTON, BLK	
8	4260449-01		BRACKET, SWITCH SUPPORT	
10	265-077		BUSHING, PANEL, THD, FLG, 0.252 ID	
11	471-402		SCREW, FLAT HD, 8-32 X 1.00 LG	
12	471-328		SCREW, FLAT HD, 4-40 X 0.375 LG	
15	493-007		NUT, NYLON STOP, NO. 8	
16	496-004		NUT, CATIVE WASHER, NO. 4	
18	503-013		WASHER, SHOULDER, FIBER, NO. 8	
			VERSIONS: 4050735-01 WITHOUT DISPLAY READOUT -02 WITH DISPLAY READOUT	

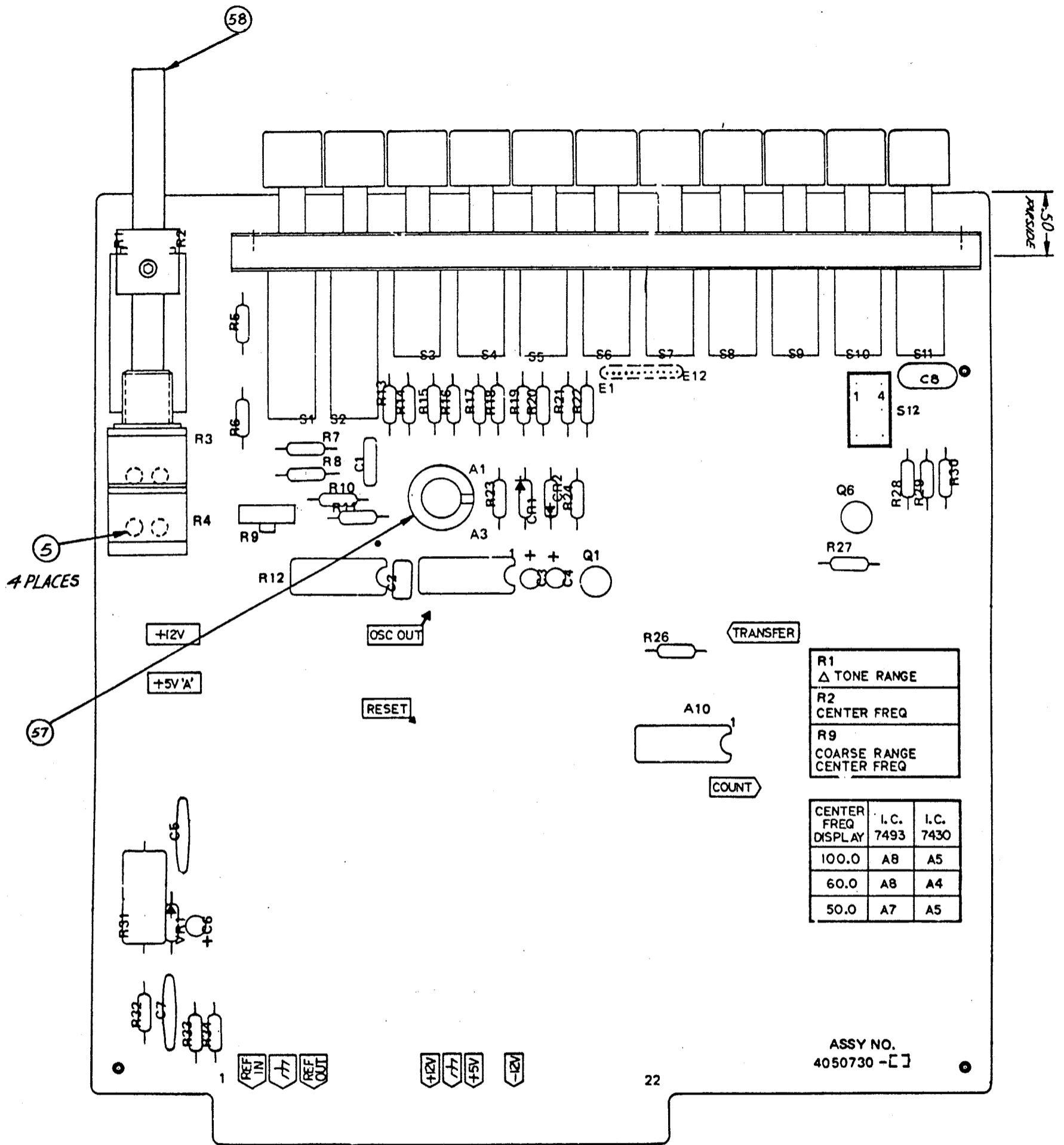
Front Panel Electronics Assembly
Assy No. 4050735

ITEM NO.	AMPEX PART NO.	REFERENCE NUMBER	DESCRIPTION	JEDEC NO. OR MFR PART NO.
1	4050730-01		VARIABLE SPEED OSCILLATOR PWA, WITHOUT DISPLAY	
2	4050730-02		VARIABLE SPEED OSCILLATOR PWA, WITH DISPLAY	
3	4050734-01		DISPLAY PWA, WITHOUT READOUT	
4	4050734-02		DISPLAY PWA, WITH READOUT	
5	4050740-01		CABLE ASSY, VSO BD TO DISPLAY BD WITH DISPLAY	
6	4840324		SCHEMATIC, WITHOUT DISPLAY	
7	4840295		SCHEMATIC, WITH DISPLAY	
9	119-300	S12	SWITCH, PUSHBUTTON, DPDT	
13	471-061		SCREW, PAN HD, XREC, 4-40 X 0.312 LG	
14	496-004		NUT, HEX, CAPTIVE WASHER, NO. 40-40	
15	501-186		WASHER, PLAIN, SMALL PATTERN NO. 4	
18	119-297		SWITCH, PUSHBUTTON, 2 PDT, POS 3-11	
19	119-298		SWITCH, PUSHBUTTON, 4 DPT, POS 1 + 2	
			VERSIONS: 4050737-01 WITHOUT DISPLAY READOUT -02 WITH DISPLAY READOUT	

Variable Speed Oscillator and Display Assembly
Assy No. 4050737

ITEM NO.	AMPEX PART NO.	REFERENCE NUMBER	DESCRIPTION	JEDEC NO. OR MFR PART NO.
4	4840324		SCHEMATIC	
5	103307-01		STANDOFF	
6	013-358	VR1	DIODE, ZENER	IN751A
7	013-599	CR1,2	DIODE	IN914
11	580-109	Q1,6	TRANSISTOR	2N3903
12	034-208	C8	CAPACITOR, MICA, 30 PF, 500V, 5%	
14	041-633	R26,27	RESISTOR, COMP, 10K, 1/4W, 10%	
15	041-979	R23,24	RESISTOR, COMP, 1K, 1/4W, 10%	
16	049-752	R28	RESISTOR, COMP, 750 OHMS, 1/4W, 10%	
17	049-753	R29,33	RESISTOR, COMP, 2.4K, 1/4W, 10%	
18	049-751	R31	RESISTOR, COMP, 75 OHMS, 2W, 10%	
20	066-209	R10	RESISTOR, METAL FILM, 76.8K, 1/4W, 1%	
22	044-792	R1	RESISTOR, VAR, CERMET, 500 OHMS, 1W, 10%	
23	044-873	R2	RESISTOR, VAR, CERMET, 1K, 1W, 10%	
25	049-335	R30,34	RESISTOR, COMP, 1.8K, 1/4W, 10%	
26	049-394	R32	RESISTOR, COMP, 10 OHMS, 1/4W, 10%	
28	058-812	R9	RESISTOR, VAR, COMP, 500 OHMS, 0.2W, 20%	
30	062-883	R15	RESISTOR, METAL FILM, 287 OHMS, 1/4W, 1%	
31	062-885	R17,18	RESISTOR, METAL FILM, 309 OHMS, 1/4W, 1%	
32	062-887	R20	RESISTOR, METAL FILM, 332 OHMS, 1/4W, 1%	
33	062-888	R22	RESISTOR, METAL FILM, 348 OHMS, 1/4W, 1%	
34	066-454	R6	RESISTOR, METAL FILM, 1.91K, 1/4W, 1%	
35	062-982	R14	RESISTOR, METAL FILM, 9.09K, 1/4W, 1%	
37	066-171	R21	RESISTOR, METAL FILM, 340 OHMS, 1/4W, 1%	
38	066-021	R13	RESISTOR, METAL FILM, 178K, 1/4W, 1%	
39	066-194	R19	RESISTOR, METAL FILM, 324 OHMS, 1/4W, 1%	
40	066-436	R8	RESISTOR, METAL FILM, 4.12K, 1/4W, 1%	
41	042-332	R7	RESISTOR, METAL FILM, 24.9K, 1/4W, 1%	
42	062-917	R11	RESISTOR, METAL FILM, 768 OHMS, 1/4W, 1%	
43	066-921	R16	RESISTOR, METAL FILM, 294 OHMS, 1/4W, 1%	
44	066-736	R5	RESISTOR, METAL FILM, 9.53K, 1/4W, 1%	
46	058-928	R3-4	RESISTOR, VAR, CERMET DUAL, 5K/25K, 1W, 10%	
47	039-067	R12	RESISTOR, NETWORK, DISCRETE, 20K, 0.15W, 2%	
49	037-790	C3,4,6	CAPACITOR, TA, PLZD, 2.2 UF, 20V, ±20%	
50	064-115	C5,7	CAPACITOR, CER, DISC, 0.1 UF, 50V, +80%, -20%	
51	064-231	C1	CAPACITOR, CER, MONLY, NPO, 3300 PF, 100V, ±5%	
52	064-314	C2	CAPACITOR, CER, MONLY, 1.0 UF, 50V, ±20%	
55	121-210	S1-11	SWITCH, ASSEMBLY, 11 POS, 2 OF 4PDT 9 OF 2PDT	
56	280-130		PAD MOUNTING, TRANSISTOR, TO-18	
57	280-173		SPACER, INTEGRATED CIRCUIT 8 PIN	
58	281-221		SHAFT, EXTENSION 1.250 LG	
62	586-116	A10	INTEGRATED CIRCUIT	7473
64	586-326	A3	INTEGRATED CIRCUIT	7404
65	587-026	A1	INTEGRATED CIRCUIT	LM311H
VERSION: 4050730-01 WITHOUT DISPLAY READOUT				

Variable Speed Oscillator PWA, Without Display
Assy No. 4050730



R1	Δ TONE RANGE	
R2	CENTER FREQ	
R9	COARSE RANGE CENTER FREQ	

CENTER FREQ DISPLAY	I.C. 7493	I.C. 7430
100.0	A8	A5
60.0	A8	A4
50.0	A7	A5

ASSY NO.
4050730 - []

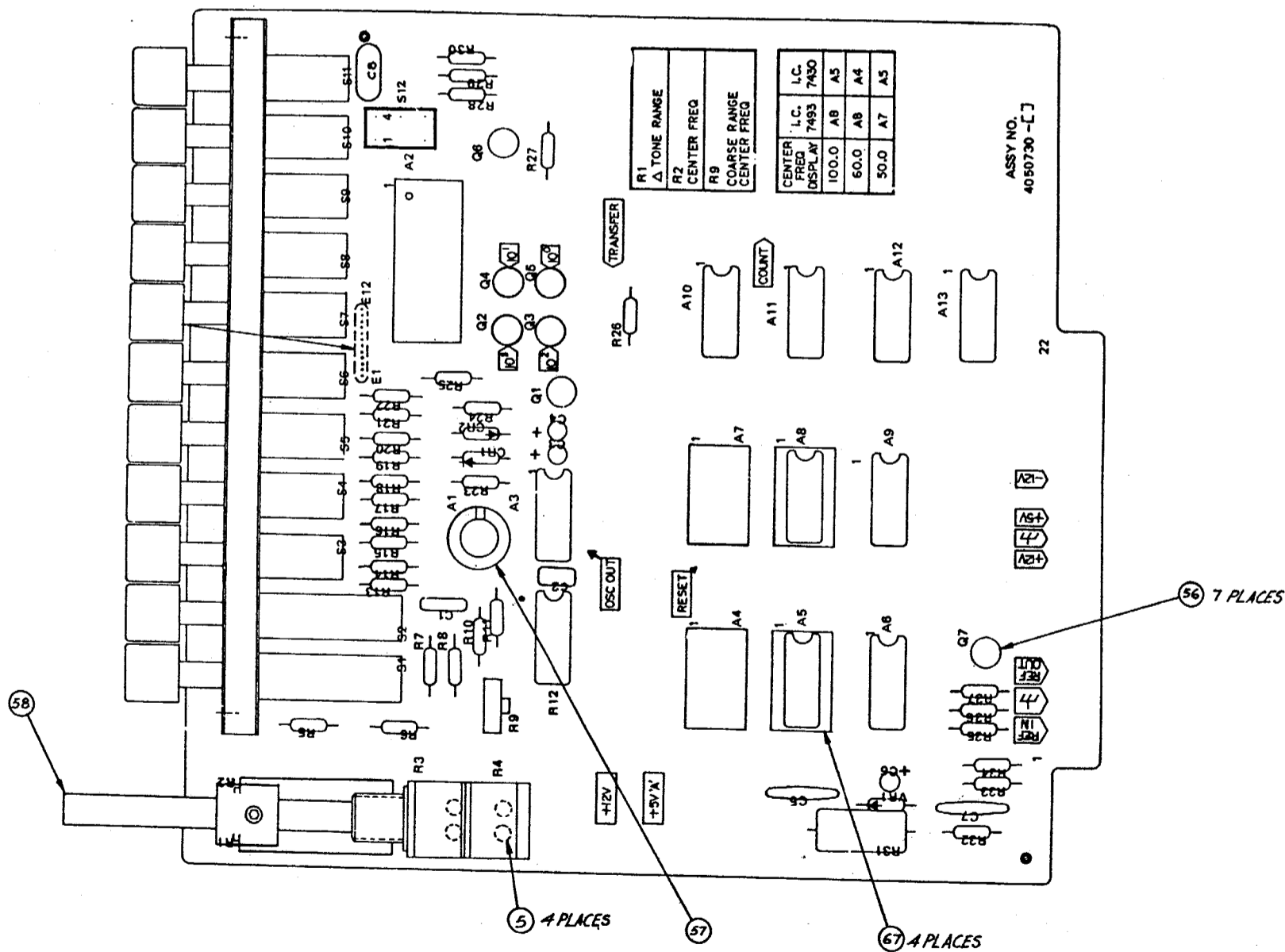
Variable Speed Oscillator PWA, Without Display
Assy No. 4050730

ITEM NO.	AMPEX PART NO.	REFERENCE NUMBER	DESCRIPTION	JEDEC NO. OR MFR PART NO.
3	4840295		SCHEMATIC	
5	103307-01		STANDOFF	
6	013-358	VR1	DIODE, ZENER	IN751A
7	013-599	CR1,2	DIODE	IN914
10	014-798	Q2,3,4,5	TRANSISTOR	2N3905
11	580-109	A1,6,7	TRANSISTOR	2N3903
12	034-208	C8	CAPACITOR, MICA, 30 PF, 500V, 5%	
14	041-633	R26,27,36	RESISTOR, COMP, 10K, 1/4W, 10%	
15	041-979	R23,24,25	RESISTOR, COMP, 1K, 1/4W, 10%	
16	049-752	R28	RESISTOR, COMP, 750 OHMS, 1/4W, 10%	
17	049-753	R29,33,35	RESISTOR, COMP, 2.4K, 1/4W, 10%	
18	049-751	R31	RESISTOR, COMP, 75 OHMS, 2W, 10%	
20	066-209	R10	RESISTOR, METAL FILM, 76.8K, 1/4W, 1%	
22	044-792	R1	RESISTOR, VAR, CERMET, 500 OHMS, 1W, 10%	
23	044-873	R2	RESISTOR, VAR, CERMET, 1K, 1W, 10%	
25	049-335	R30,34,37	RESISTOR, COMP, 1.8K, 1/4W, 10%	
26	049-394	R32	RESISTOR, COMP, 10 OHMS, 1/4W, 10%	
28	058-812	R9	RESISTOR, VAR, COMP, 500 OHMS, 0.2W, 20%	
30	062-883	R15	RESISTOR, METAL FILM, 287 OHMS, 1/4W, 1%	
31	062-885	R17,18	RESISTOR, METAL FILM, 309 OHMS, 1/4W, 1%	
32	062-887	R20	RESISTOR, METAL FILM, 332 OHMS, 1/4W, 1%	
33	062-888	R22	RESISTOR, METAL FILM, 348 OHMS, 1/4W, 1%	
34	066-454	R6	RESISTOR, METAL FILM, 1.91K, 1/4W, 1%	
35	062-982	R14	RESISTOR, METAL FILM, 9.09K, 1/4W, 1%	
37	066-171	R21	RESISTOR, METAL FILM, 340 OHMS, 1/4 W, 1%	
38	066-021	R13	RESISTOR, METAL FILM, 178K, 1/4W, 1%	
39	066-194	R19	RESISTOR, METAL FILM, 324 OHMS, 1/4W, 1%	
40	066-436	R8	RESISTOR, METAL FILM, 4.12K, 1/4W, 1%	
41	042-332	R7	RESISTOR, METAL FILM, 24.9K, 1/4W, 1%	
42	062-917	R11	RESISTOR, METAL FILM, 768 OHMS, 1/4W, 1%	
43	066-921	R16	RESISTOR, METAL FILM, 294 OHMS, 1/4W, 1%	
44	066-736	R5	RESISTOR, METAL FILM, 9.53K, 1/4W, 1%	
46	058-928	R3-4	RESISTOR, VAR, CERMET DUAL, 5K/25K, 1W, 10%	
47	039-067	R12	RESISTOR, NETWORK, DISCRETE, 20K, 0.15W, 2%	
49	037-790	C3,4,6	CAPACITOR, TA, PLZD, 2.2 UF, $\pm 20\%$, 20V	
50	064-115	C5,7	CAPACITOR, CER, DISC, 0.1 UF, -20%, 50V, +80%	
51	064-231	C1	CAPACITOR, CER, MONLY, NPO, 3300 PF, 100V, $\pm 5\%$	
52	064-314	C2	CAPACITOR, CER, MONLY, 1.0 UF, 50V, $\pm 20\%$	
55	121-210	S1-11	SWITCH, ASSEMBLY, 11 POS, 2 OF 4PDT 9 OF 2PDT	
56	280-130		PAD MOUNTING, TRANSISTOR, TO-18	

Variable Speed Oscillator PWA, With Display
Assy No. 4050730 (Sheet 1 of 2)

ITEM NO.	AMPEX PART NO.	REFERENCE NUMBER	DESCRIPTION	JEDEC NO. OR MFR PART NO.
57	280-173		SPACER, INTEGRATED CIRCUIT, 8 PIN	
58	281-221		SHAFT, EXTERNSION, 1.250 LG	
59	586-075	A13	INTEGRATED CIRCUIT	7400
60	586-076	A12	INTEGRATED CIRCUIT	7410
61	586-078	A5	INTEGRATED CIRCUIT	7430
62	586-116	A10,11	INTEGRATED CIRCUIT	7473
63	586-326	A6,8,9	INTEGRATED CIRCUIT	7493
64	586-326	A3	INTEGRATED CIRCUIT	7404
65	587-026	A1	INTEGRATED CIRCUIT	LM311H
66	587-434	A2	INTEGRATED CIRCUIT	A&-5-4007D
67	586-859	XA4,5,7,8	SOCKET, INTEGRATED CIRCUIT, 14 PINS	

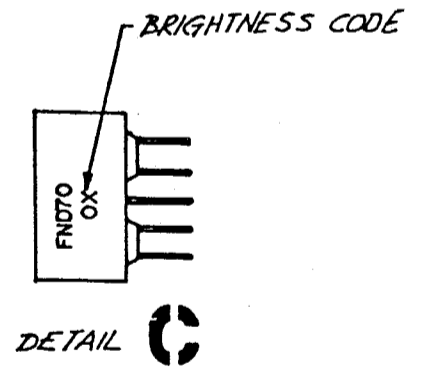
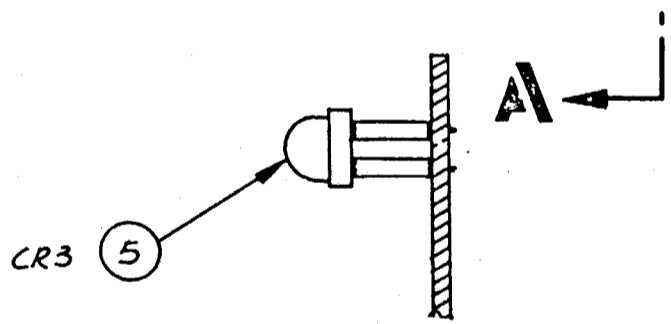
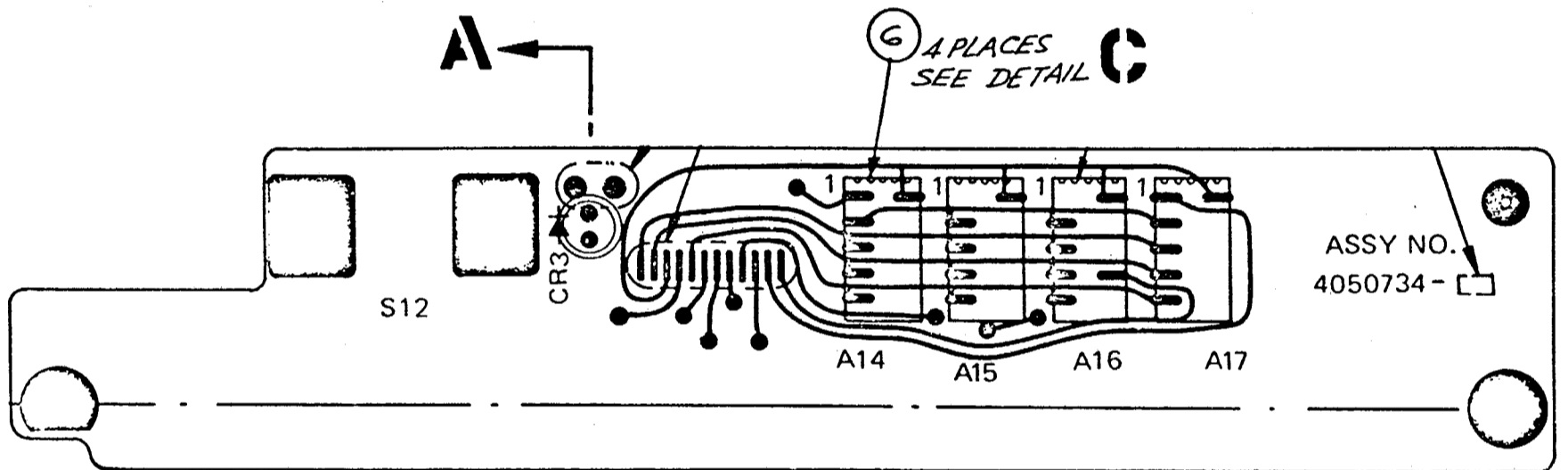
VERSION: 4050730-02 WITH DISPLAY READOUT



Variable Speed Oscillator PWA, With Display
Assy No. 4050730 (Sheet 2 of 2)

ITEM NO.	AMPEX PART NO.	REFERENCE NUMBER	DESCRIPTION	JEDEC NO. OR MFR PART NO.
2	4840324		SCHMATIC, WITHOUT DISPLAY READOUT	
3	4840295		SCHMATIC, WITH DISPLAY READOUT	
5	581-355	CR3	DIODE, LIGHT EMITTING	
6	581-321	A14,15,16,17	READOUT DEVICE MODULAR, LED-7 SEGMENT, NUMERIC, BCD INPUT	

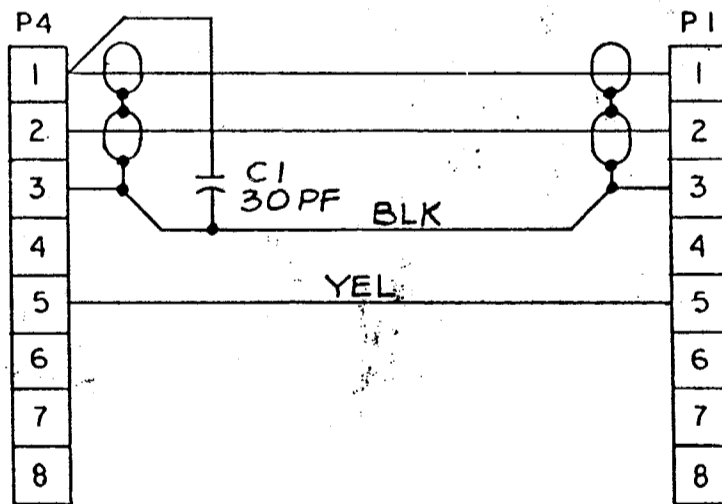
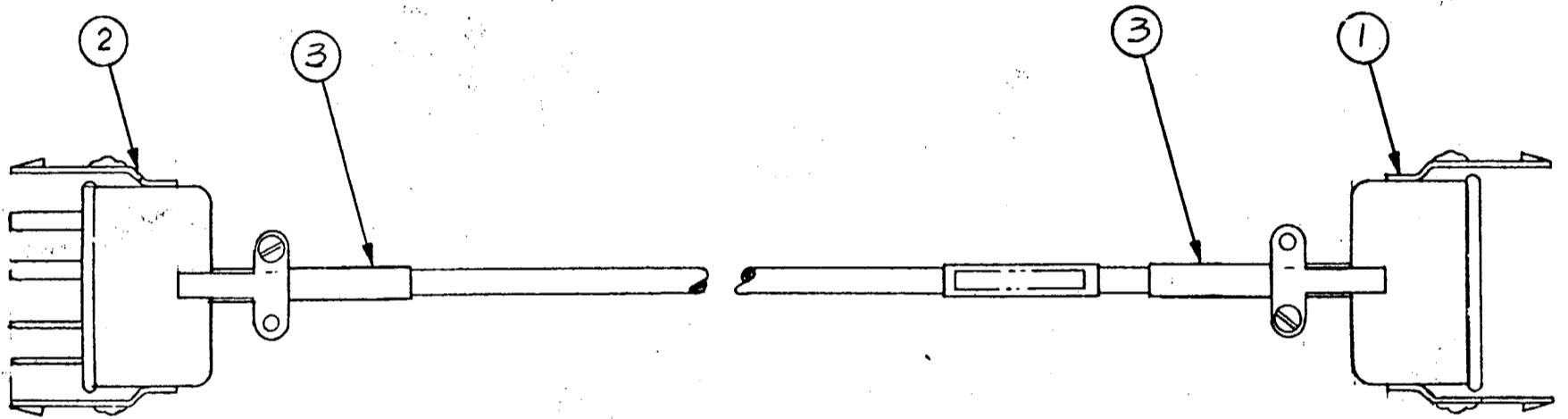
VERSIONS: 4050734-01 WITHOUT DISPLAY READOUT
-02 WITH DISPLAY READOUT



SECTION A-A

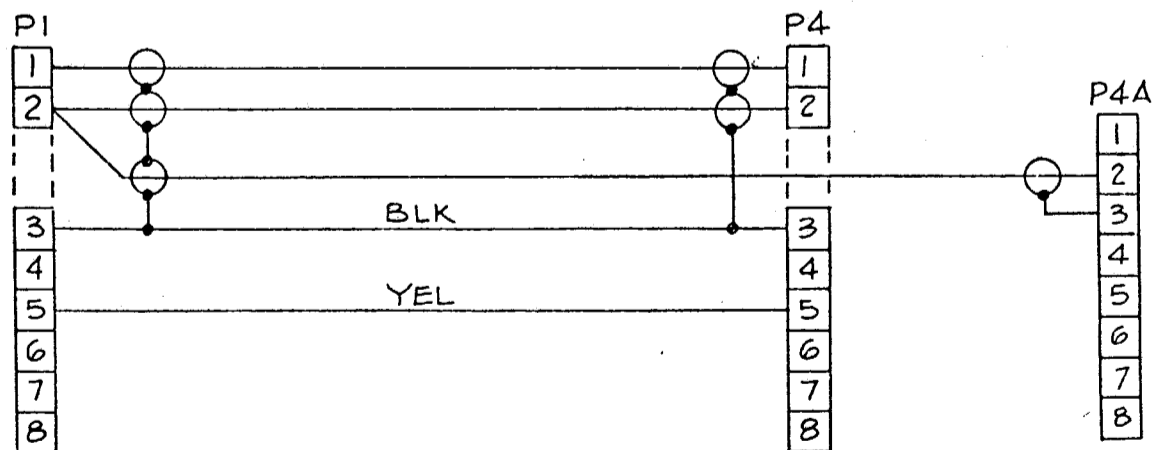
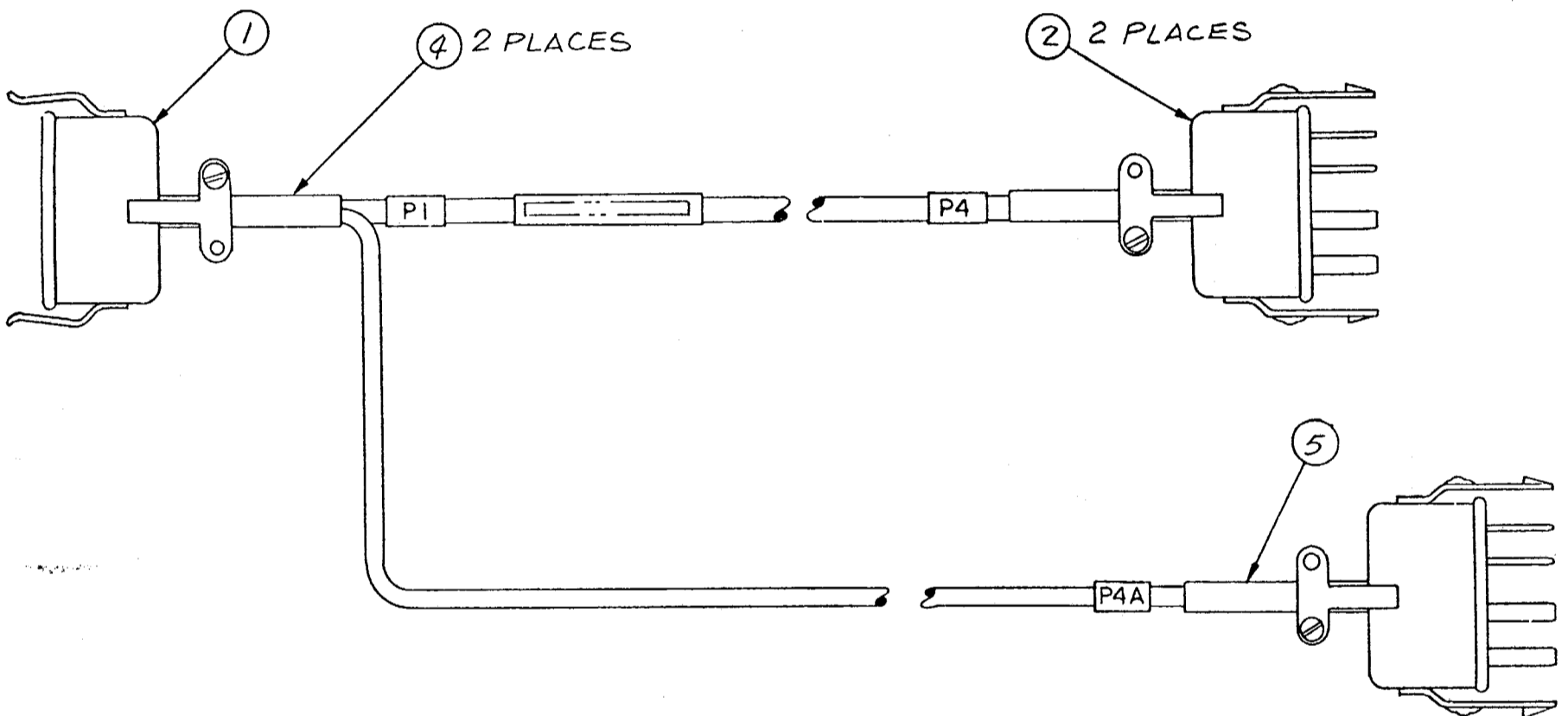
Display PWA
Assy No. 4050734

ITEM NO.	AMPEX PART NO.	REFERENCE NUMBER	DESCRIPTION	JEDEC NO. OR MFR PART NO.
1	144-023	P1	CONNECTOR, SIG CIR, PLUG, RECT, 8 SOC	
2	145-013	P4	CONNECTOR, SIG CIR, PLUG, RECT, 8 PIN	
3	262-003		BUSHING, SLEEVE, FLG, 0.312 ID X 0.427 OD	
9	034-208	C1	CAPACITOR, MICA, 30 PF, 500V, ±5%	
VERSION: 4050738-01				



Interconnect Cable Assembly
Assy No. 4050738

ITEM NO.	AMPEX PART NO.	REFERENCE NUMBER	DESCRIPTION	JEDEC NO. OR MFR PART NO.
1	144-019	P1	CONNECTOR, RECPT, RECT, 8 SOC	
2	145-013	P4,P4A	CONNECTOR, PLUG, RECT, 8 PINS	
4	262-003		BUSHING, SLEEVE, FLG, 0.312 ID, .427 OD	
5	262-002		BUSHING, SLEEVE, FLG, 0.220 ID, 0.302 OD	
VERSION: 4050753-01				



"Y" Cable Assembly Accessory
 Assy No. 4050753

ITEM NO.	AMPEX PART NO.	REFERENCE NUMBER	DESCRIPTION	JEDEC NO. OR MFR PART NO.
1	4260486-01		BRACKET, SHORT, RACK MOUNTING	
2	4260485-01		BRACKET, LONG, RACK MOUNTING (SINGLE VS-10 MTG)	
5	471-072		SCREW, PAN HD, XREC 6-32 X 5/8 LG	
6	471-073		SCREW, PAN HD, XREC 6-32 X 3/4 LG (DOUBLED VS-10 MTG)	
7	473-319		SCREW, OVAL 82°, XREC 12-24 X 1/2 LG	
10	496-005		NUT, CAPTIVE WASHER, 6-32, KEP	
13	503-087		WASHER, FINISHING, CSK, NON-MET NO. 12, WHT	
NOTES:			<p>1. TO MOUNT 2 VS-10'S IN THE AG-440 CONSOLE REMOVE 1 OF THE 2 CENTER SIDE PANELS.</p>	
VERSIONS:			<p>4010232-01 (SINGLE VS-10 MTG) -02 (DOUBLE VS-10 MTG)</p>	

Rack Mount Kit Accessory
 Assy No. 4010232

ITEM NO.	AMPEX PART NO.	REFERENCE NUMBER	DESCRIPTION	JEDEC NO. OR MFR PART NO.
1	4030348-01		HOUSING ASSY, W/OUT DISPLAY READOUT	
2	4050735-01		PANEL, FRONT, ELECTRONICS ASSY, W/OUT DISPLAY READOUT	
3	4050738-01		CABLE ASSY, INTERCONNECT TO TAPE TRANSPORT	
4	4030348-02		HOUSING ASSEMBLY, W/DISPLAY READOUT	
5	4050735-02		FRONT PANEL ELECTRONICS ASSY, W/DISPLAY READOUT	
6	6000035-02		LABEL	
7	4890351-01		INSTRUCTION MANUAL	
34	4840295		SCHEMATIC, W/DISPLAY READOUT	
35	4840324		SCHEMATIC, W/OUT DISPLAY READOUT	
<p>VERSIONS: 4010217-01 W/O DISPLAY READOUT 4010217-02 WITH DISPLAY READOUT</p>				

Variable Speed Oscillator, VS-10
Assy No. 4010217

FIELD ENGINEERING BULLETIN

TITLE: Modification of VS-10 for ATR-100 Use.

DATE OF ISSUE 2/78

I. APPLICABILITY

ATR-100

II. PURPOSE

This modification allows the owner of a VS-10 used with an MM-1200, MM-1100 and AG-440 to also use it with the ATR-100.

III. DISCUSSION

By the addition of two diodes and a resistor the VS-10 assembly, with or without read out, will be completely inter-changeable between machines. The only other requirement for ATR-100 use is the ATR-100 interconnect cable harness, P/N 4050852-01. This is used with the VS-10 harness, P/N 4050738-02.

IV. PARTS LIST AND TOOLS REQUIRED

1 each Diode IN4385, P/N 013-678.

1 each Zener IN5350B-(13V-5W), P/N 581-273.

1 each Resistor W.W. 50 OHMS, 1% 5W, P/N 059-131.

V. PROCEDURE

Remove top cover exposing PWA and 8 Pin Jones Conn. J-1. Install 3 components on back of J-1 per fig. 1. Verify proper operation and re-install top cover. Mark VS-10 schematic per fig. 1 drawing.

This completes the modification.

FIELD ENGINEERING BULLETIN

TITLE: Modification of VS-10 for ATR-100 Use.

DATE OF ISSUE 2/78

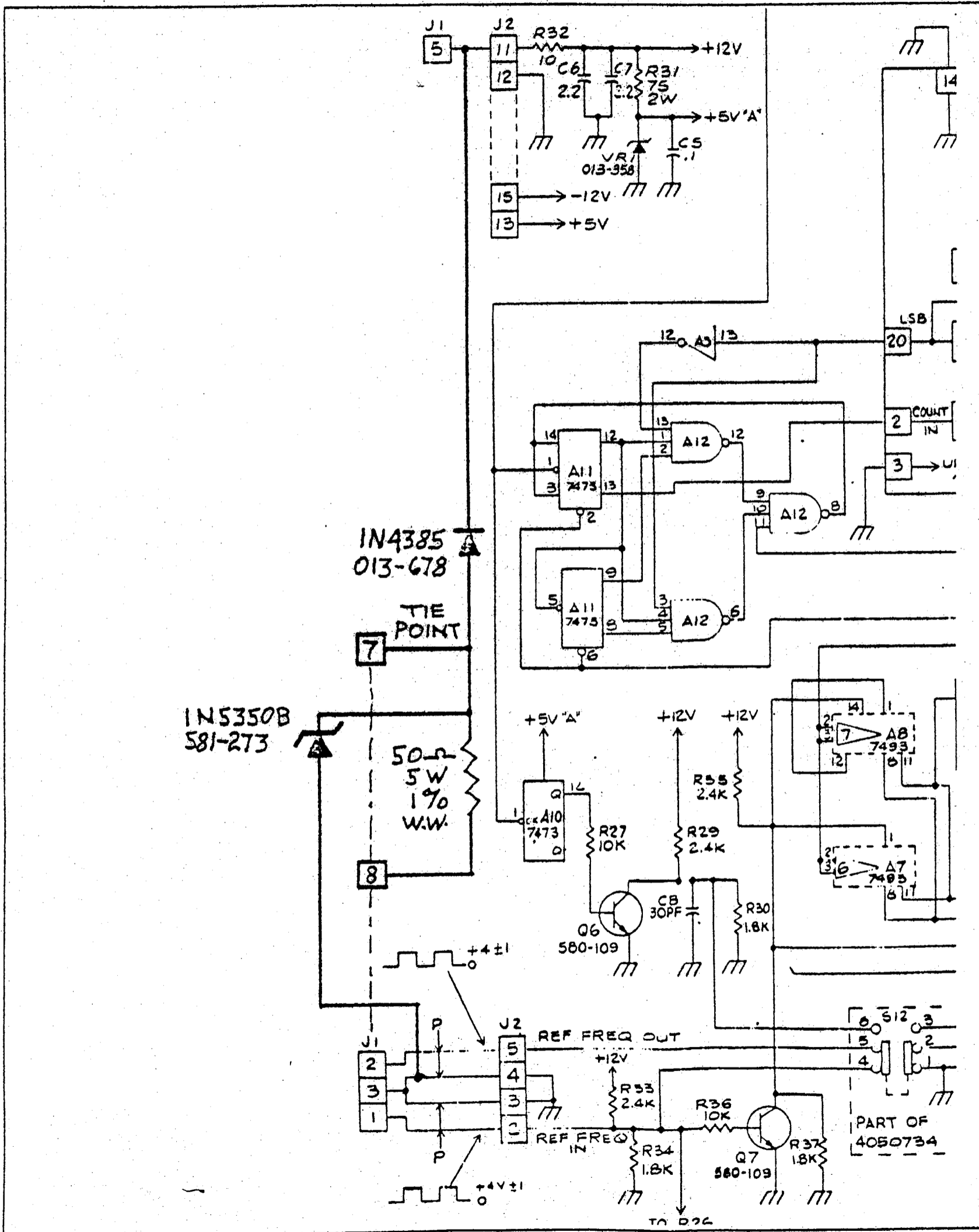


FIG. I