BEFORE PROCEEDING WITH COMPLETE UNPACKING AND SETUP, CONSULT UNPACKING AND INSPECTION INSTRUCTIONS ON PAGE 4

model 512 F

SINE WAVE GENERATOR

"SERIAL NO. 82-001S AND SUBSEQUENT."

United Recording Electronics Industries

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Printed in U.S.A.

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SECTION I

INTRODUCTION

1.1 DESCRIPTION

The MODEL 512 F SINE WAVE GENERATOR was designed with the versatility required for use in modern test facilities. The all solid state circuitry provides the instrument with high output capability, wide frequency range, low distortion, and low output impedance.

The vernier driven 5-inch dial allows accurate setting of the desired frequency with long term stability from 0.5 Hz to 500 kHz in 6 decades.

The maximum voltage output is 50 V rms, and can be adjusted with a step attenuator and a variable vernier over a range of 80 dB.

Due to its low output impedance, the instrument approaches a constant voltage source, extending the application to test problems encountered with variable impedance loads.

1.2 ELECTRICAL SPECIFICATIONS

FREQUENCY RANGE :	0.5 Hz to 500 kHz, in six overlapping decades.
FREQUENCY ACCURACY :	±2% (0.1 Hz) of dial reading.
FREQUENCY STABILITY:	±0.5%, 0 to +50°C, 105-130 V or 210-260 V.
OUTPUT VOLTAGE:	50 V rms max. into 1200 ohm; 34.6 V into 600 ohm,(33 dBm, Ref. 0.775 V rms).
OUTPUT POWER:	2 W into 600 ohms at 1000 Hz; 1 W into 600 ohms at frequency extremes.
OUTPUT IMPEDANCE:	6 ohms, output attenuator ranges 50, 5, 0.05 V. 60 ohms, output attenuator range 0.5 V.
ATTENUATOR RANGES:	50, 5, 0.5, 0.05 V, plus calibrated fine control.
FREQUENCY RESPONSE:	±0.5 dB, 5 Hz to 500 kHz, ±2 dB below 5 Hz.
HARMONIC DISTORTION:	<0.2%, @ 50 V rms, 1 kHz, no load; <0.3%, @ 35 V rms, 1 kHz, 600 ohm load; <0.3%, @ 25 V rms, 25 Hz, 600 ohm load.
NOISE:	70 dB below full output at all attenuator settings, (1 MHz low pass filter).
POWER REQUIREMENTS:	100 - 125 VAC, or 200 - 250 VAC, 50/60 Hz, strappable, 30 W, ±10%.

ENVIRONMENT: Operating 0°C - +50°C,
Storage -20°C - +60°C.

1.3 PHYSICAL SPECIFICATIONS

CONNECTIONS: Five-way binding posts on front panel; BNC connector on back of chassis.

DIMENSIONS: 225.4 mm height X 165.1 mm width front panel; 279.4 mm depth behind front panel; (8-7/8" height X 7-1/2" width X 11" depth).

WEIGHT: 5.44 kg (12 pounds).

1.4 CONTROLS

FREQUENCY RANGE SWITCH: Selects the frequency range in six positions. The inscription on the front panel indicates the multiplier necessary to read the frequency adjusted with the dial.

FREQUENCY DIAL: Adjusts the frequency within the selected range. Rotation of the dial will vary the frequency over a tuning range of more than 10 : 1. The dial knob is mechanically coupled through a 6.3 : 1 vernier drive. Dial setting multiplied by the range switch position indicates the output frequency.

OUTPUT: This is a continuously variable potentiometer which serves as a fine adjustment for the output signal level over a 20 dB range.

OUTPUT RANGE SWITCH: This is a four position step attenuator. It provides 60 dB of attenuation in calibrated 20 dB steps.

OUTPUT TERMINALS: There are two five-way binding posts on the front panel for the output signal. The ground symbol indicates which of the two posts is connected to the chassis.

The output signal is also available through a BNC connector at the rear of the chassis.

POWER: Toggle switch with LED to indicate when the Model 512 F is turned on.

FUSE CONNECTOR: The fuse is accessible at the rear panel. Recommended value for the 100 - 125 VAC operation is 3/8 A slow blow. The value for 200 - 250 VAC is 3/16 A slow blow.

SECTION II

INSPECTION AND INSTALLATION

2.1 UNPACKING AND INSPECTION

Your Model 512 F was carefully packed at the factory, and the container was designed to protect the unit from rough handling. Nevertheless, we recommend careful examination of the shipping carton and its contents for any sign of physical damage which could have occurred in transit.

If damage is evident, do not destroy any of the packing material or the carton, and immediately notify the carrier of a possible claim for damage. Shipping claims must be made by the consignee.

2.2 ENVIRONMENTAL CONSIDERATIONS

The system will operate satisfactorily over a range of ambient temperatures from 0°C to +50°C (+32°F to 122°F), and up to 80% non-condensing relative humidity.

If the system is installed in an equipment rack with high heat producing equipment (such as power amplifiers), adequate ventilation should be provided in order to assure longest component life. Also, while circuitry susceptible to hum pick-up is sufficiently shielded from moderate electromagnetic fields, installation should be planned to avoid mounting the system immediately adjacent to large power transformers, motors, etc.

2.3 POWERING

The 512 F may be operated from either 100 to 125 VAC or 200 to 250 VAC mains (50 Hz or 60 Hz, single phase.) As indicated on the schematic the nominal line voltage is selected with jumpers for the transformer primary windings across a terminal strip inside the chassis. Unless a tag on the line cord specifies otherwise, the instrument was shipped ready for operation with nominal 115 VAC power mains, and will have the following jumpers:

1) Joining the solid black and solid gray transformer leads,
2) Joining the striped black/white and striped gray/white transformer leads.

For 230 VAC power mains, remove the two jumpers and connect a single jumper between the striped black/white and solid gray wires of the transformer's primary windings.

Recommended fuse size: 115 VAC operation = 3/8 A slow blow,
230 VAC operation = 3/16 A slow blow.

SECTION III

OPERATING INSTRUCTIONS

3.0 GENERAL

Although the Model 512 F Oscillator is a very reliable instrument, it is good practice to check its performance and verify the specifications. This is recommended before its first application, and at intervals as may be required for calibrated test equipment. Should the instrument fail any of the following specifications, proceed with the appropriate calibration procedure in Section V, Maintenance.

3.1.0 PERFORMANCE CHECK

3.1.1 CONTROL SETTINGS

Frequency Control:	Approximately middle of dial
Frequency Multiplier:	X 100
Output Level:	0 (Counterclockwise)
Output Range:	0.05 V
Output Terminals:	Binding posts and BNC connector unterminated.

3.1.2 Turn power on and allow the instument to warm up for about ten minutes. Connect suitable test equipment to either of the two outputs, such as an AC voltmeter, oscilloscope, and frequency counter.

3.1.3 Turn the Output Level control clockwise and observe the output signal. The sine wave should be free of clipping and other visible distortion.

3.1.4 Check all Output Range switch positions, changing the sensitivity of the monitoring test equipment accordingly.

3.1.5 Check the function of the Output Level control throughout its range. This should result in a smooth and a continuous attenuation of the signal level between the numbers 5 and 0.5 on its front panel marking.

3.1.6 Test all positions of the Frequency Multiplier switch, and turn the Frequency Dial though its range. The frequency of the output signal should change accordingly.

Note: The very low frequencies can only be observed with a DC-coupled oscilloscope.

3.2.0 VERIFICATION OF SPECIFICATIONS

NOTE: Some of the following measurements may be performed simultaneously (for example, the amplitude and frequency accuracy of the output signal). However this section of the performance check was written in sequence to simplify the description of each step.

3.2.1 FREQUENCY RANGE AND ACCURACY

Tune the oscillator to 1 kHz and adjust the output level to read 5 V rms (5 V Output Range). Frequencies are checked at the major calibration points of the dial in all six multiplier ranges.

Use the chart below to record the readings and deviations. Maximum deviations are:

±2% (±0.1 Hz) from 0.5 Hz - 10 Hz,
±2% from 10 Hz - 500 kHz.

Note: Lower frequencies are measured more accurately using the "Period" capability of the counter.

	DIAL INDICATION			
RANGE	5	10	20	50
0.1				
1				
10				
100				
1 K				
10 K				

3.2.2 FREQUENCY RESPONSE (AMPLITUDE)

The output level is checked in all frequency ranges at spot frequencies, for example: 5, 10, 20 and 50 on the dial. Amplitude flatness versus frequency should be within the following tolerances with the output level control, turned fully clockwise:

±2 dB from 0.5 Hz - 5 Hz,
±0.5 dB from 5 Hz - 500 kHz

Note: Frequencies below 10 Hz may be measured with an oscilloscope and the peak-peak amplitude converted to rms.

3.2.3 OUTPUT POWER

Set the Oscillator to 1 kHz, 50 V rms output. Connect a 1.2 kohm resistor across the output terminals. The level should remain within 0.5 dB of the nominal output, and the sine wave should be free of clipping and other visible distortion.

Reduce the output level to 35 V rms (3 dB below maximum) and connect a 600 ohm resistor across the output terminals. The signal should remain free of distortion. Reduce the voltage across the load resistor to 25 V rms and check that the signal at frequency extremes remains free of distortion.

3.2.4 HARMONIC DISTORTION*

Tune the Oscillator to 1 kHz and adjust for maximum output level (no load resistor used). The THD should be less than 0.2%. Reduce the output level to 35 V rms. Connect a 600 ohm load resistor across the output terminals. The measured THD should be less than 0.3%. Tune the Oscillator to 25 Hz and adjust the output level to read 25 V across the 600 ohm load. The measured THD should be less than 0.3%.

* A filter of 15.7 kHz bandwidth is used to measure THD.

3.2.5 OUTPUT AMP STABILITY

Set the Oscillator to 1 kHz, 50 V rms output level. Apply a 0.1 µF capacitor across the output terminal. The signal must remain free of spurious oscillation at any output level.

SECTION IV

THEORY OF OPERATION

4.1 OSCILLATOR

The oscillator design is a state-variable filter with controlled positive feedback. This feedback is derived from phase two (IC 103) to the X-input of a four quadrant multiplier (IC 101) which in turn is connected to the input of summing amplifier (IC 102). An additional feedback to IC 102 is derived from the output of phase three (IC 104).

The output of summing amplifier IC 102 is connected to one section of the frequency control potentiometer (R 1A) and from there through a FET switching network to the input of the phase two integrator (IC 103). In addition to its function as an integrator, associated diode circuitry prevents latching of the oscillator. The output of IC 103 connects to the second section of the frequency control potentiometer (R 1B) and through FET switching network to the phase three integrator (IC 104).

The previously mentioned multiplier (IC 101) has an additional control input Y. The control voltage is derived through the semi-integrator (IC 105) which compares the outputs from phase one and three through rectifying diodes CR 101 and CR 124. A reference is established through zener diode CR 105 which develops an opposing current to the average current from the phase outputs. The time constant of the semi-integrator (IC 105) is changed according to the settling time necessary for the selected frequency range of the oscillator. The result is a compromise of low signal distortion versus fast amplitude control.

The frequency ranges are selected using a single-pole six-position switch which activates a diode decoding matrix. The diodes control FET switches, changing the frequency determining resistor-capacitor combinations associated with integrators IC 103 and IC 104. The loading of the FET switches on the frequency control elements is constant since the resistors are either switched in the path or grounded. Therefore, in any frequency range, the loading on the potentiometer sections is kept the same.

In the ranges where the 215 k resistors are effective, the resulting offset voltage has to be reduced. This is achieved by inserting an equivalent resistance at the non-inverting input of each integrator. The two FET switches (Q 115 and Q 116) shunt this resistance in the ranges where the correction is not required.

The output level of the oscillator circuit is adjusted with potentiometer R 2. Subsequent AC coupling avoids feeding any accumulated offset voltage to the power amplifier stage. A second amplifier stage (IC 106) provides additional gain and a means of isolating the oscillator circuitry from the output stage.

4.2.0 FREQUENCY CALIBRATION

Note: The frequency accuracy is determined by several factors, i.e. resistor matching, capacitor trimming, tracking of tuning potentiometer sections, series impedance of FET switches, and mechanical calibration of the dial assembly. Initial calibration is performed during production testing at the factory (see also Section V Maintenance).

4.2.1 CONTROL SETTINGS

Frequency Range Switch: X 1

Tuning Dial: 50

Output Level Control: Counterclockwise "0"

Output Range Switch: 0.05 V

X 10 kHz Trim Potentiometer: (R 156) Clockwise

Temporarily unsolder the wires to the tuning potentiometer and, in its place, insert two 10 kohm, 1% precision resistors between the following wires:

white/brown plus white/red and white/orange; also white/yellow plus white/green and white/blue.

4.2.2 TUNING STOP

Connect an ohm-meter between terminals #2 and #3 of the tuning potentiometer. Turn the shaft CCW until the meter reads 10.0 kohm. Secure the mechanical stop on the shaft to prevent further CCW turn.

4.2.3 CALIBRATION OF LOW FREQUENCY CAPACITORS

Connect a frequency counter to the output of the oscillator board, J 2, or R 148 and measure the frequency. Select a capacitor approximately 0.01 µF, parallel to C 125 (0.125, 1%) until the frequency reads 55.0 Hz (±0.1 Hz), period 18181.8 µs,(frequency exceeds the range of the dial to make mechanical calibration easier).

4.2.4 CALIBRATION OF HIGH FREQUENCY CAPACITORS

Switch the Oscillator to the X 1 kHz range. Turn trimcap C 133 until the frequency reads exactly 1000 times the frequency measured previously in the X 1 range. (This concludes calibration of all capacitors.)

4.2.5 CALIBRATION OF RESISTOR PAIRS

4.2.5.1 X 1K range versus X 10 (23.7 kohms and 2.15 kohms). Note the frequency in the X 1K range. Switch to X 10 range and parallel resistor R 142 until the frequency measurements match, i.e., frequency ratio 100:1.

4.2.5.2 X 1K range versus X 100 (23.7 kohms and 215 kohms). Note the frequency in the X 1K range. Switch to X 100 range and parallel resistors R 123 or R 135,i.e., frequency ratio 10:1. Note: if the parallel resistor required is larger than 1% of the value to be adjusted the single resistor should be divided into 2 and soldered into spaces provided for both R 123 and R 135. For example instead of 10 Meg, use two 20 Meg resistors, or an 18 Meg and a 22 Meg.

This concludes the calibration of all frequency determining resistors. Solder tuning potentiometer into the circuit.

4.2.6 DIAL CALIBRATION

4.2.6.1 LOW END
Switch to X 10 range. Turn the shaft of the tuning potentionmeter until the counter reads 50.0 Hz, period 20,000 µs. Turn the dial assembly until the number 5 is below the index. Secure dial assembly to the shaft.

4.2.6.2 HIGH END
Set the dial to 50 so the counter reads 500.0 Hz. Make small correction of the calibration using the two screws (behind the tuning knob) holding the dial plate to the shaft assembly. Check the low end of the dial to remain within 2% accuracy. Spot check various positions of the dial.

Note: If it is necessary to change the spread of the dial the high end should be used as reference. Stop resistors R 121 and R 132 may be changed. Smaller values result in a lower frequency at the low end of the dial.

Secure all screws of the tuning assembly with Locktite or similar lacquer. Recheck entire dial through all ranges for frequency accuracy.

4.2.7 CALIBRATION OF X 10 kHz RANGE

Set the dial to 50, and trim R 156 until the counter reads 500.0 kHz.

4.3 OUTPUT AMPLIFIER

The output amplifier is of conventional design with special attention given to its ability to deliver high power bandwidth.

The signal from the oscillator output is buffered in IC 201 and coupled to a series of complementary-symmetry output amplifier stages. Any DC offset voltage at the output is detected and continuously corrected through IC 202. The bias for the output transistors is provided by Q 208 and adjusted with R 224.

Transistors Q 214 and Q 215 sense the output current in the load. If the safe operating area of the output devices is exceeded, the signal to transistors Q 210, 211 and Q 212, 213 is reduced.

4.4 ATTENUATOR SWITCH

The attenuator switch consists of two separate switch sections. One section is at the output of the oscillator circuit (ahead of the power amplifier) and the second section attenuates the signal output from the power stage. This division guarantees the optimum signal to noise ratio at all attenuator settings.

4.5 POWER SUPPLY

Although dimensioned very conservatively to provide sufficient reserve power, the design is conventional. High voltage DC constitutes the rails of the output stage, while a lower supply voltage of ±15 V for the op-amp circuitry is isolated and fully regulated. The transformer primary is fused and its two windings are strappable for various line voltages (refer to paragraph 2.3).

SECTION V

MAINTENANCE

5.1 GENERAL

The Model 512 F is an all solid-state unit, ruggedly constructed with only the highest quality components. As such, it should provide years of trouble free use with normal care. All parts used are conservatively rated for their application, and workmanship meets the rigid standards you have learned to expect in UREI products.

NO SPECIAL PREVENTIVE MAINTENANCE IS REQUIRED.

5.2 REPAIRS AND WARRANTY

This product is factory warranted to the original purchaser against defects in material and workmanship for one year after initial purchase. This limited warranty must be activated at the time of purchase by returning the registry portion of the Warranty Card to the factory. Should a malfunction ever occur, the dealer from whom the unit was purchased will be glad to handle return for factory repair. Please call or write to the factory for a Return Authorization Number which must accompany all repairs. For prompt service, ship the unit prepaid directly to the factory with the RA Number visible on the shipping label. Use the original factory carton; if necessary, call the factory to secure a new carton at a nominal charge. The instrument is heavy, and shipping to the factory is at the customer's risk; do not take a chance with inadequate packing materials. Tape a note to the top of the unit describing the malfunction, and instructions for return. We will pay one-way return shipping costs on any in-warranty repair.

Because of specially selected components in this product, field repairs are not authorized during the warranty period, and attempts to perform repairs may invalidate the warranty.

Even if your unit is out of warranty, we recommend that you return it to the factory for repairs. Our experienced personnel, supported by special test equipment, will be able to find and eliminate any problem in the most efficient way.

> WARNING: The full AC line voltage is present at several points inside the chassis. Be careful to avoid personal shock if you remove the cover.

5.3. BIAS ADJUSTMENT

This trimmer has been carefully set at the factory and should not require adjustments except after service work.

CAUTION: Only qualified service technicians should attempt this adjustment.

Before turning the instrument on, set the bias control (R 224) fully CW (when viewed from the plastic knob side of the trimmer). Turn the output level control CCW. Connect a DC meter across the power supply filter capacitor C 1. Switch the AC power on and note the voltage (nominal 100 volt, ±5 volt).

Turn the bias trim potentiometer CCW until the DC voltage has dropped by 1.0 volt. The negative side of the supply across C 2 should have dropped similarly.

5.4 SIGNAL LEVEL

The following amplitude adjustments affect the output level.

5.4.1 OSCILLATOR OUTPUT LEVEL.

Tune the Oscillator to 1 kHz. Switch the Output Range to 50 V rms and turn the Output Level fully CW. Connnect an AC meter across the Output terminal of the 512 F and adjust the trim potentiometerR 159 on the oscillator PC board for a reading of 50 V rms.

This concludes all field adjustments. Frequency calibrations should not be necessary unless components in the oscillator circuit have been changed or set screws of the mechanical dial assembly have loosened; (see Section 4.2.2, 4.2.6).

SECTION VI

PARTS LIST AND DIAGRAMS

6.1 PARTS LISTS

10-13711 Sine Wave Generator Assembly

10-13712 Chassis Assembly

10-13650 Oscillator PC Board Assembly

10-13651 Output Amplifier PC Board Assembly

10-13714 Output Amplifier Assembly

10-13715 Frequency Control Assembly

10-13716 Attenuator Switch Assembly

10-13764 Wire Assembly

6.2 ASSEMBLY DRAWING: OSCILLATOR PC BOARD #13648B

6.3 ASSEMBLY DRAWING: POWER AMPLIFIER PC BOARD #13649B

6.4 SCHEMATIC DIAGRAM #13666B

UREI BILL OF MATERIALS

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ASSY. NO. 10-13711

REV.

DATE 12/2/81 | PREPARED BY: J.W. | APPROVED BY: | ASSEMBLY NAME: FINAL ASSEMBLY-SINE WAVE GENERATOR | USED ON MODEL: 512F (2686293)

ITEM	ASSY. QTY.	UREI PART NO.	MFR AND PART NO.	DESCRIPTION	REFERENCE DESIGNATOR	ISSUE	UNIT PRICE	EXT.
1.	REF	10-13711		FINAL ASSEMBLY				
2.	1	10-13712		CHASSIS ASSEMBLY				
3.	1	10-13764		WIRE ASSEMBLY				
4.	1	25-13645	D13645	ENCLOSURE, PERFORATED				
5.	1							
6.	1	25-13713	C13713	IDENTIFICATION PLATE, (Sperry#2686283)				
7.	1	25-11352	B11352	SERIAL TAG, (UREI)				
8	1			WARRANTY CARD				
9.	1			MANUAL/W SCH. R13666				
10	2		MS 51957-3	SCREW, P H 2-56 x 1/4, PHILLIPS				
11	2		MS 35649-24	NUT, HEX 2-56				
12	2			SCREW, P.H. SEMS 8-32 x 3/8" PHILLIPS				
13	4			SCREW, P.H. 6-32 x 1/4" PHILLIPS				
14	1	15-0099		FUSE, S.B. 3/8 AMP				
15	2		MS 35338-77	WASHER, LOCK #2				
16	2		MS 15795-802	WASHER, FLAT #2				

BILL OF MATERIALS

UREI

PAGE 1 OF 4 | ASSY. NO. 10-13712 | REV.

DATE: 12/2/81 | PREPARED BY: J.W. | APPROVED BY: | ASSEMBLY NAME: CHASSIS ASSEMBLY | USED ON MODEL: 512F (2686293)

ITEM	ASSY. QTY.	UREI PART NO.	MFR AND PART NO.	DESCRIPTION	REFERENCE DESIGNATOR	ISSUE	UNIT PRICE	EXT.
1	REF	10-13712		CHASSIS ASSEMBLY				
2	1	10-13650		PCBA, OSCILLATOR				
3	1	10-13714		OUTPUT AMPLIFIER ASSEMBLY				
4	1	10-13715		FREQUENCY CONTROL ASSEMBLY				
5	1	10-13716		ATTENUATOR SWITCH ASSEMBLY				
6								
7	1	25-13644	C13644	CHASSIS				
8	1	25-13647	C13647	SUBPANEL				
9	1	25-13640	C13640	FRONT PANEL				
10								
11	1	16-13654	B13654	TRANSFORMER	T1			
12	1	36-13I79		CORD, POWER				
13	1	36-0030		STRAIN RELIEF				
14	1	15-0101		FUSE HOLDER				
15	1	15-0099		FUSE, 3/8 A S.B.				
16								

UREI BILL OF MATERIALS

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DATE 12/2/81 | PREPARED BY: J.W. | APPROVED BY: | ASSEMBLY NAME CHASSIS ASSEMBLY | USED ON MODEL 512 F (2686293)

ITEM	ASSY. QTY.	UREI PART NO.	MFR AND PART NO.	DESCRIPTION	REFERENCE DESIGNATOR	ISSUE	UNIT PRICE	EXT.
17	1	27-0250	BURNDY MS3116F8-4S	CONNECTOR, AC				
18	1"	32-0193	MS 1-631 TYPE F CL 1 YEL #1	SLEEVING, PVC 5/16 DIA. "P1" YELLOW (SILKSCREEN PER A/W13761)				
19	1	27-0220	ITT POMONA 3778-370-5	CONNECTOR, BNC				
20	2	36-0365	SPRAGUE #4586-97A	MOUNTING CLAMP, CAPACITOR				
21	2	14-0528	MALLORY CG5851U100R2C	CAPACITOR, 850 uF 100 VDS	C1, C2			
22	2	187-00018-00		RESISTOR, 5 K, 10%, 5 W	R7,8			
23	1	36-0352		TERMINAL STRIP, 6 LUG				
24	2	36-0267	HHS 3007	" " 7 LUG				
25	4	42-0031		SOLDER LUG, No. 10				
26	1	36-0143		GROMMET, RUBBER 3/8"				
27	2	36-0367	H.H. SMITH #3023	STANDOFF, SWIVEL 6-32 x 3/4"				
28	2	43-0047		SPACERS, HEX #6 x 3/4"				
29	4	43-0026		SPACERS, HEX #6 x 1/2"				
30	2	36-0181	PANDUIT	TYWRAP HOLDER, ADHESIVE				
31	2	14-0449	FRAKO	CAPACITOR, ELECTROLYTIC 2200uF/50V	C3,4			
32								

UREI **BILL OF MATERIALS**

ASSY. NO. 10-13712

REV.

DATE 12/2/81 | PREPARED BY: J.W. | APPROVED BY: | ASSEMBLY NAME: CHASSIS ASSEMBLY | USED ON MODEL: 512 F (2686293)

ITEM	ASSY. QTY.	UREI PART NO.	MFR AND PART NO.	DESCRIPTION	REFERENCE DESIGNATOR	ISSUE	UNIT PRICE	EXT.
33	4	31-0014		RIVETS				
34	1	182-01002-00		RESISTOR, 10 K ± 5% 1/2 W	R9			
35	1	15-13643	CTS X5P12122	SWITCH, 1 POLE, 6 POSITION	S2			
36	1	15-0354	ALLEN BRADLEY 70C1N48P103M	POTENTIOMETER, LINEAR, 10 K	R2			
37	1	15-0355	C & K 7101TZQ	SWITCH, SPST, TOGGLE, SATIN CHROME	S1			
38	3	24-0105	KURZ-KASCH 2923L	KNOB				
39	1	24-0106	DAKA-WARE 1122- STYLE C	KNOB FOR DIAL				
40	1	25-13641	B13641A	DIAL, ALUMINUM				
41	1	25-11651	A11651	PLEXIGLAS INDEX				
42	2	43-0063		SPACER , 4 x .185				
43	2	30-0139		SCREW, R.H. 4-40 x I/2 SLOT, NICKEL PLATED				
44	1	13-0057-2		LENS, RED	FOR PILOT LED			
45	1	13-0151	MV 5023	LED, RED	DS1			
46	2	27-0222		BINDING POST, BLACK				
47	4	31-0015	SOUTHCO 82-11-260-20	FASTNER, TURNBUTTON				
48	8	31-0016	SOUTHCO 82-32-101-20	RETAINING RING, TURNBUTTON				

UREI **BILL OF MATERIALS**

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DATE 12/2/81 | PREPARED BY: J.W. | APPROVED BY: | ASSEMBLY NAME CHASSIS ASSEMBLY | USED ON MODEL 512 F (2686293)

ITEM	ASSY. QTY.	UREI PART NO.	MFR AND PART NO.	DESCRIPTION	REFERENCE DESIGNATOR	ISSUE	UNIT PRICE	EXT.
49								
50	2			SCREWS, P.H. 8-32 x 1/4 PHILLIPS				
51	4			NUTS, KEPS 8-32				
52	12			SCREWS, P.H. 6-32 x 1/4 PHILLIPS				
53	4			SCREWS, P.H. 4-40 x 1/2 PHILLIPS				
54	2			NUT, KEPS 4-40				
55	2			SCREWS, F.H. 6-32 x 1/2 82%				
56	1			SCREWS, F.H. 6-32 x 3/8 82%				
57	2			SPACERS, #6 x 1/8 L CLEARANCE HOLE				
58	2			WASHER, #6 LOCK				
59	2			NUTS, #6-32				
60	4			WASHER, #6 W/INT. STAR				
61	1	42-0034		SOLDER LUG, .#6 W/INT. STAR				
62	4			WASHER, #6				
63	4			SCREW, P.H. 6-32 x 3/8 PHILLIPS				
64								

REV. C ECO-0512F-004 2/18/82

REV. B ECO-0512F-002 2/16/82

REV.A ECO-0512F-001 2/11/82

UREI BILL OF MATERIALS

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DATE	PREPARED BY:	APPROVED BY:	ASSEMBLY NAME	USED ON MODEL
12/2/81	J.W.		PCBA, OSCILLATOR	512 F (2686293)

ITEM	ASSY. QTY.	UREI PART NO.	MFR AND PART NO.	DESCRIPTION	REFERENCE DESIGNATOR	ISSUE	UNIT PRICE	EXT.
1	REF	10-13650		PCBA, OSCILLATOR				
2								
3	1	12-13648	C13648 REV.A	P.C. BOARD, OSCILLATOR				
4	1	13-0154	MOTOROLA MC1494L	I.C. 101 MULTIPLIER				
5	4	13-0156	LM 318	OP AMP	106 IC102,103,104,			
6	1	13-0213	LF 356	OP AMP	IC105			
7	1	13-0190	IN821A	DIODE, ZENER 6.2 V	CR105			
8	2	13-0317	IN750A	DIODE, ZENER 4.7 V	CR110,111			
9								
10								
11	18	13-0135	IN4148	DIODE, SIGNAL PURPLE	See Below			
12				117,118,120,121,124 CR101,102,103,104,106,107,108,109,112,113,114,115,116,				
13	3	13-0005	IN4003	DIODE	CR119,122,123			
14	3	13-0287	MPS 5172	TRANSISTOR, NPN	Q103,106,117			
15	14	13-0318	NATIONAL ORTI TIS 73	TRANSISTOR, FET, N-CHANNEL	See Below			
16				Q101,102,104,105,107,108,109,110,111,112,113,114, 115,116				

UREI **BILL OF MATERIALS**

PAGE 2 OF | ASSY. NO. 10-13650; | REV.

DATE 12/2/81 | PREPARED BY: J.W. | APPROVED BY: | ASSEMBLY NAME PCBA, OSCILLATOR | USED ON MODEL 512 F (2686293)

ITEM	ASSY. QTY.	UREI PART NO.	MFR AND PART NO.	DESCRIPTION	REFERENCE DESIGNATOR	ISSUE	UNIT PRICE	EXT.
17	5	27-0089		SOCKETS, IC, ROUND, 8 PIN				
18	1	27-0100		SOCKETS, IC, DIP, 16 PIN				
19								
20	1	27-0251	AMP-MTA-100 640456-2	POST HEADER, 2 PIN	J2			
21	1	27-0253	AMP-MTA-100 640-456-4	" " 4 PIN	J4			
22	1	27-0254	AMP-MTA-100 640456-7	" " 7 PIN	J1			
23	1	27-0252	AMP-MTA-100 640456-3	" " 3 PIN	J3			
24								
25								
26	1	14-0344		CAPACITOR, CERAMIC DISC. 3.3 pF 1000V 10%	C112			
27	1	14-0347		" " " 5 pF " "	C129			
28	1			" SILVER MICA 120 pF 1% Select from 14-0402	C126			
29	1	14-0529		" SILVER MICA 130 pF 1%	C118			
30	1	14-0420		CAPACITOR, CERAMIC DISC 470 pF	C134			
31	1	14-0237		" SILVER MICA 820 pF 5%	C106			
32	1	14-0338		CAPACITOR, MYLAR 0.068 uF 100V 10%	C105			

BILL OF MATERIALS

UREI

PAGE 3 OF | ASSY. NO. 10-13650 | REV.

DATE 12/2/81 | PREPARED BY: J.W. | APPROVED BY: | ASSEMBLY NAME PCBA, OSCILLATOR | USED ON MODEL 512-F (2686293)

ITEM	ASSY. QTY.	UREI PART NO.	MFR AND PART NO.	DESCRIPTION	REFERENCE DESIGNATOR	ISSUE	UNIT PRICE	EXT.
33	6	14-0426		CAPACITOR, MYLAR 0.1 uF 100V 10%	C101,107,108 119,124,102			
34	1	14-0217		" " 0.22 uF 100V 10%	C104			
35	1	14-0417		" " 0.68 uF 100V 10%	C103			
36	2	14-0418		" " 1.5 uF 100 V 10%	C110,109			
37	1	14-0425		CAPACITOR, TANTALUM ELECTROLYTIC 1.0 uF 50 V 20%	C115			
38	6	14-0189		" " " 4.7 uF 25 V 20%	C113,114,120, 121,122,123			
39	5	14-0486		CAPACITOR, LYTIC RADIAL 100 uF 25 V	C127,128,131 132,130			
40								
41								
42	2		CENTURY	CAPACITOR, MYLAR 0.125 100V 1% Select from 14-0388	C116,125			
43	1			" " 0.01 100V 1% Select from 14-0363	C117			
44								
45	2	14-0530	10 TRICO 33	TRIMCAP, (7 to 25 pF of Enhancement is Optional, C111)	C111,133			
46								
47	2	16-0110	DALE	INDUCTOR, 22 uHy	L101,102			
48								

UREI **BILL OF MATERIALS**

PAGE 4 OF | ASSY. NO. 10-13650 | REV.

DATE 12/2/81 | PREPARED BY: J.W. | APPROVED BY: | ASSEMBLY NAME PCBA, OSCILLATOR | USED ON MODEL 512 F (2686293)

ITEM	ASSY. QTY.	UREI PART NO.	MFR AND PART NO.	DESCRIPTION	REFERENCE DESIGNATOR	ISSUE	UNIT PRICE	EXT.
49	3	182-01000-00		RESISTOR, 100 ohm ± 5% 1/2 W	R109,148,118			
50	1	182-02200-00		" 220 ohm " "	R101			
51	2	182-01001-00		" 1 K ± 5% 1/2 W	R104,144			
52	2	182-02001-00		" 2 K " "	R115,133			
53	1	182-02701-00		" 2.7K " "	R146			
54	5	182-04701-00		" 4.7 K " "	R117,155,141, 138,134			
55	2	182-05101-00		" 5.1 K " "	R119,120			
56								
57								
58	3	182-01002-00		RESISTOR, 10 K ± 5% 1/2 W	R151,147, 102			
59	1	182-01502-00		" 15 K " "	R105			
60	16	182-02202-00		" 22 K " "	See Below			
61				R112,114,124,125,126,128,129,130,137,149,143, 150,152,153,154,139				
62	1	182-03002-00		RESISTOR, 30 K ± 5% 1/2 W	R116			
63	1	182-06202-00		" 62 K " "	R111			
64	1	182-03902-00		" 39 K " "	R103			

UREI **BILL OF MATERIALS**

PAGE 5 OF | ASSY. NO. 10-13650 | REV.

DATE 12/2/81 | PREPARED BY: J.W. | APPROVED BY: | ASSEMBLY NAME PCBA, OSCILLATOR | USED ON MODEL 512 F (2686293)

ITEM	ASSY. QTY.	UREI PART NO.	MFR AND PART NO.	DESCRIPTION	REFERENCE DESIGNATOR	ISSUE	UNIT PRICE	EXT.
65	2	182-01003-00		RESISTOR, 100 K ± 5% 1/2 W	R108,145			
66	2	182-02003-00		" 200 K " "	R131,140			
67	1	182-03303-00		" 330 K " "	R107			
68	1	182-03903-00		" 390 K " "	R110			
69	1	182-03304-00		" 3.3 M " "	R113			
70	1	182-01004-00		" 1 M " "	R106			
71								
72								
73	2	184-01401-00	RN60D	RESISTOR, 1.4 K ± 1% 1/4 W	R121, 132			
74	2	184-02151-00		" 2.15 K " "	R127,142			
75	2	184-02372-00		" 23.7 K " "	R122,136			
76	2	184-02153-00		" 215 K " "	R123,135			
77	1	184-01021-00		" 1.02 K " "	R158			
78	1	184-08151-00		" 8.15 K " "	R157			
79	1	15-0329	CTSx201 R502B	TRIMPOT, LINEAR 5 K	R159			
80	1	15-0223	MULTI TRIM	TRIMPOT, LINEAR 50 K	R156			

REV. A. ECO-512F-005 8/24/82

UREI BILL OF MATERIALS

PAGE 1 OF 3 | ASSY. NO. 10-13651 | REV. A

DATE 8/18/82 | PREPARED BY: J.W. | APPROVED BY: | ASSEMBLY NAME PCBA, OUTPUT AMP | USED ON MODEL 512 F (2686293)

ITEM	ASSY. QTY.	UREI PART NO.	MFR AND PART NO.	DESCRIPTION	REFERENCE DESIGNATOR	ISSUE	UNIT PRICE	EXT.
1	REF	10-13651		PCBA, OUTPUT AMP.				
2								
3	1	12-13649	C13649B	P.C. BOARD				
4	2	13-0156	LM 318	OP AMP	IC201,202			
5	4	13-0288	MJE 340 OR 2SC 2592	TRANSISTOR, NPN	Q201,202,203, 207			
6	4	13-0289	MJE 350 OR 2SA 1112	" PNP	Q204,205,206, 209			
7	1	13-0327	MPS U10	" NPN	Q214			
8	1	13-0328	MPS U60	" PNP	Q215			
9	16	13-0005	IN 4003	DIODE				
10				CR201,202,203,204,205,206,207,208,211,212,213,214, 215,216,217,218				
11	1	13-0194	MC 7815	REGULATOR	VR201			
12	1	13-0195	MC 7915	"	VR202			
13	2	27-0089		IC SOCKET, 8 PIN ROUND				
14	3	14-0170		CAPACITOR, CERAMIC DISK, 10pF	C207,201,215			
15								
16	2	14-0233		" MYLAR 0.01uF/100V	C208.209			

UREI **BILL OF MATERIALS**

PAGE 2 OF 3 | ASSY. NO. 10-13651 | REV.

DATE 8/18/82 | PREPARED BY: J.W. | APPROVED BY: | ASSEMBLY NAME PCBA, OUTPUT AMP | USED ON MODEL 512 F (2686293)

ITEM	ASSY. QTY.	UREI PART NO.	MFR AND PART NO.	DESCRIPTION	REFERENCE DESIGNATOR	ISSUE	UNIT PRICE	EXT.
17	2	14-0426	EVOX	CAPACITOR, MYLAR, 0.1uF/100V, 10%	C202,210			
18	2	14-0189		" TANTALUM 4.7uF/35V	C203,204			
19	2	14-0309		" " 6.8uF/35V	C213,214			
20	2	14-0422		" " 47uF/15V	C205,206			
21	2	14-0523		" LYTIC 1000/40V	C211,212			
22								
23								
24								
25	1	15-0253		POTENTIOMETER, TRIM 500 OHM	R224			
26	4	182-23300-00		RESISTOR, CARBON, 3.3 OHM ± 5% 1/2W	R227,228,230,231			
27	6	182-11500-00		" " 15 OHM "	R207,208,212,213,216,218			
28	2	182-11800-00		" " 18 OHM "	R209,211			
29	2	182-12200-00		" " 22 OHM "	R222,223			
30	1	182-14700-00		" " 47 OHM "	R226			
31	1	182-16200-00		" " 62 OHM "	R225			
32	1	182-04700-00		" " 470 OHM "	R220			

UREI **BILL OF MATERIALS**

PAGE 3 OF 3 | ASSY. NO. 10-13651 | REV.

DATE	PREPARED BY:	APPROVED BY:	ASSEMBLY NAME	USED ON MODEL
8/18/82	J.W.		PCBA, OUTPUT AMP	512 F (2686293)

ITEM	ASSY. QTY.	UREI PART NO.	MFR AND PART NO.	DESCRIPTION	REFERENCE DESIGNATOR	ISSUE	UNIT PRICE	EXT.
33	2	182-02201-00		RESISTOR, CARBON, 2.2 K ± 5% 1/2W	R210,214			
34	1	182-03301-00		" " 3.3 K "	R235			
35	2	182-04700-00		" " 4.7 K "	R201,202			
36	2	182-01002-00		" " 10 K "	R203,204			
37	2	182-03302-00		" " 33 K "	R215,217			
38	1	182-06802-00		" " 68 K "	R206			
39	1	182-01003-00		" " 100 K "	R205			
40	1	183-04701-00		" " 4.7 K ± 5% 1W	R219			
41	1	187-00039-00	REIDON UT-2A	" " 6.04 OHM ± 1% 2W	R221			
42	1	25-13652	D13652	HEATSINK				
43	4			SCREW, R.H. 4-40 x 3/8" PHILLIPS				
44	4			NUT, HEX KEPS 4-40				

UREI BILL OF MATERIALS

REV. A ECO-0512F-002 2/16/82

PAGE 1 OF 2 | ASSY. NO. 10-13714 | REV.

DATE	PREPARED BY:	APPROVED BY:	ASSEMBLY NAME	USED ON MODEL
12/2/81	J.W.		OUTPUT AMPLIFIER ASSEMBLY	512F (2686293)

ITEM	ASSY. QTY.	UREI PART NO.	MFR AND PART NO.	DESCRIPTION	REFERENCE DESIGNATOR	ISSUE	UNIT PRICE	EXT.
1	REF	10-13714		OUTPUT AMPLIFIER ASSEMBLY				
2	1	10-13651		PCBA, OUTPUT AMPLIFIER				
3								
4	3	13-0288	MJE 340 OR 2SC 2592	TRANSISTOR, NPN	Q208,210,211			
5	2	13-0289	MJE 350 OR 2SA 1112	" PNP	Q212,213			
6								
7								
8	4	36-0275	#371	HEATSINK				
9								
10	2	36-0367	H.H. SMITH 3023	STANDOFF, SWIVEL 6-32 3/4				
11	5	13-0307		WASHERS, MICA				
12	2	43-0047		SPACERS, HEX 6-32 3/4				
13	4			SCREWS, P.H. 6-32 1/4 PHILLIPS				
14	4			SCREWS, P.H. 6-32 1/2 PHILLIPS				
15	4			WASHERS, #4 W/INT. STARS				
16								

UREI **BILL OF MATERIALS**

PAGE 2 OF | ASSY. NO. 10-13714 | REV.

DATE 12/2/81 | PREPARED BY: J.W. | APPROVED BY: | ASSEMBLY NAME OUTPUT AMPLIFIER ASSEMBLY | USED ON MODEL 512 F (2686293)

ITEM	ASSY. QTY.	UREI PART NO.	MFR AND PART NO.	DESCRIPTION	REFERENCE DESIGNATOR	ISSUE	UNIT PRICE	EXT.
17	5			SCREWS, P.H., 4-40 3/8", PHILLIPS				
18								
19								
20	5			WIRES, 22 GA, TEFLON, 1" BROWN				
21	5			" " " " ORANGE				
22	5			" " " " YELLOW				
23								
24								
25								
26								
27								
28								
29								
30								
31								
32								

BILL OF MATERIALS

UREI

PAGE 1 OF 1	ASSY. NO. 10-13715	REV.

DATE	PREPARED BY:	APPROVED BY:	ASSEMBLY NAME	USED ON MODEL
12/2/81	J.W.		FREQUENCY CONTROL ASSEMBLY	512F (2686293)

ITEM	ASSY. QTY.	UREI PART NO.	MFR AND PART NO.	DESCRIPTION	REFERENCE DESIGNATOR	ISSUE	UNIT PRICE	EXT.
1	REF	10-13715		FREQUENCY CONTROL ASSEMBLY				
2								
3	1	15-0349	SPECTROL 100-12103	POTENTIOMETER, DUAL, 10 K	R1			
4	1	15-0357	RDL-61	COUPLING, RATIO DRIVE 6.3:1				
5	1	36-0366	APEX	TUNING STOP, 1/4" DIA.				
6	1			NUT, HEX, 3/8"				
7	1	25-13642	A13642	BRACKET, MOUNTING				
8								
9								
10	1			WASHER, INT. STAR, 3/8"				
11	1	30-0022		SCREW, SLOTTED, P.H. 4-40 x 1/4				
12	1			NUT, KEPS 4-40				
13								
14								
15								
16								

BILL OF MATERIALS

UREI

PAGE 1 OF 1 | ASSY. NO. 10-13716 | REV.

DATE	PREPARED BY:	APPROVED BY:	ASSEMBLY NAME	USED ON MODEL
12/2/81	J.W.		ATTENUATOR SWITCH ASSEMBLY	512 F (2686293)

ITEM	ASSY. QTY.	UREI PART NO.	MFR AND PART NO.	DESCRIPTION	REFERENCE DESIGNATOR	ISSUE	UNIT PRICE	EXT.
1	REF	10-13716		ATTENUATOR SWITCH ASSEMBLY				
2								
3	1	15-12903	A12903 CTS	SWITCH, 2 POLE, 4 POSITION	S3			
4	1	187-00039-00	REIDEN UT-2A	RESISTOR, CARBON, 6.04 ohm 1% 2 W	R6			
5	1.		RN60D	" " 53.6 ohm 1% 1/4 W	R5			
6	2	187-00038-00	RG ALLEN RGA SQ5	RESISTOR, CERAMIC, WIREWOUND 1.2 K ± 5% 5W	R4 See Note			
7				Note: Select 2 on bridge to make 1 res. 604 ohm 1%				
8								
9								
10								
11								
12								
13								
14								
15								
16								

		REV.A ECO-0512F-003 2/18/82

UREI BILL OF MATERIALS

PAGE 1 OF 4 | ASSY. NO. 10-13764 | REV. A

DATE	PREPARED BY:	APPROVED BY:	ASSEMBLY NAME	USED ON MODEL
12/2/81	J.W.		WIRE ASSEMBLY	512F (2686293)

ITEM	ASSY. QTY.	UREI PART NO.	MFR AND PART NO.	DESCRIPTION	REFERENCE DESIGNATOR	ISSUE	UNIT PRICE	EXT.
1	11	10-13764		WIRE ASSEMBLY				
2								
3	1		THERMAX Mil-W-16878D	CABLE, SHIELDED, SINGLE CONDUCTOR 20 AWG, 15"				
4	1			WIRES, 22 GA, TEFLON, 7 1/2", TWISTED GRAY				
5	1			" " " 7 1/2 TWISTED WHITE				
6	1			" " " 14" BLACK				
7								
8	1			" " " 2 1/2 WHITE/BLUE				
9	1		THERMAX Mil-W-16878D	CABLE, SHIELDED, SINGLE CONDUCTOR 20 AWG, 8"				
10	4			JUMPER, 1" YELLOW				
11	1			JUMPER, 2" YELLOW				
12	1			WIRES, 22 GA, TEFLON, 9" ORANGE				
13	1			" " " 17 TWISTED BLACK				
14	1			" " " 17 TWISTED WHITE				
15	1			" " " 3 1/2 BLACK				
16	1			" " " 4 1/4 BLACK				

UREI **BILL OF MATERIALS**

PAGE 2 OF | ASSY. NO. 10-13764 | REV.

DATE	PREPARED BY:	APPROVED BY:	ASSEMBLY NAME	USED ON MODEL
12/2/81	J.W.		WIRE ASSEMBLY	512 F (2686293)

ITEM	ASSY. QTY.	UREI PART NO.	MFR AND PART NO.	DESCRIPTION	REFERENCE DESIGNATOR	ISSUE	UNIT PRICE	EXT.
17	1			WIRES, 22 GA, TEFLON, 14" GREEN				
18	1			" " " 12" GREEN				
19	1			" " " 12" BLACK				
20	1			" " " 13" RED				
21	1			" " " 12-1/2" RED				
22	1			" " " 10" BROWN				
23	1			" " " 4-1/2" W/GREEN				
24								
25								
26								
27								
28								
29								
30								
31								
32								

UREI **BILL OF MATERIALS**

PAGE 3 OF | ASSY. NO. 10-13764 | REV.

DATE	PREPARED BY:	APPROVED BY:	ASSEMBLY NAME	USED ON MODEL
12/2/81	J.W.		WIRE ASSEMBLY	512F (2686293)

ITEM	ASSY. QTY.	UREI PART NO.	MFR AND PART NO.	DESCRIPTION	REFERENCE DESIGNATOR	ISSUE	UNIT PRICE	EXT.
33								
34	2			SCREW, F.H. 8-32 x 3/8 PHILLIPS				
35	2	43-0050		SPACER, 4-40 x 1 3/4"				
36	1			WIRES, 24 GA, TEFLON, 12 3/4" BROWN				
37	1			" " " 14 RED				
38	1			" " " 13 1/2 ORANGE				
39	1			" " " 14 YELLOW				
40	1			" " " 13 3/4 GREEN				
41	1			" " " 13 3/4 BLUE				
42	1			" " " 13 1/2 PURPLE				
43								
44	1							
45								
46	1			WIRES, 22 GA, TEFLON, 12" BLACK				
47	1	32-0076		" " " 12 BLUE				
48	1	32-0075		" " " 12 PURPLE				

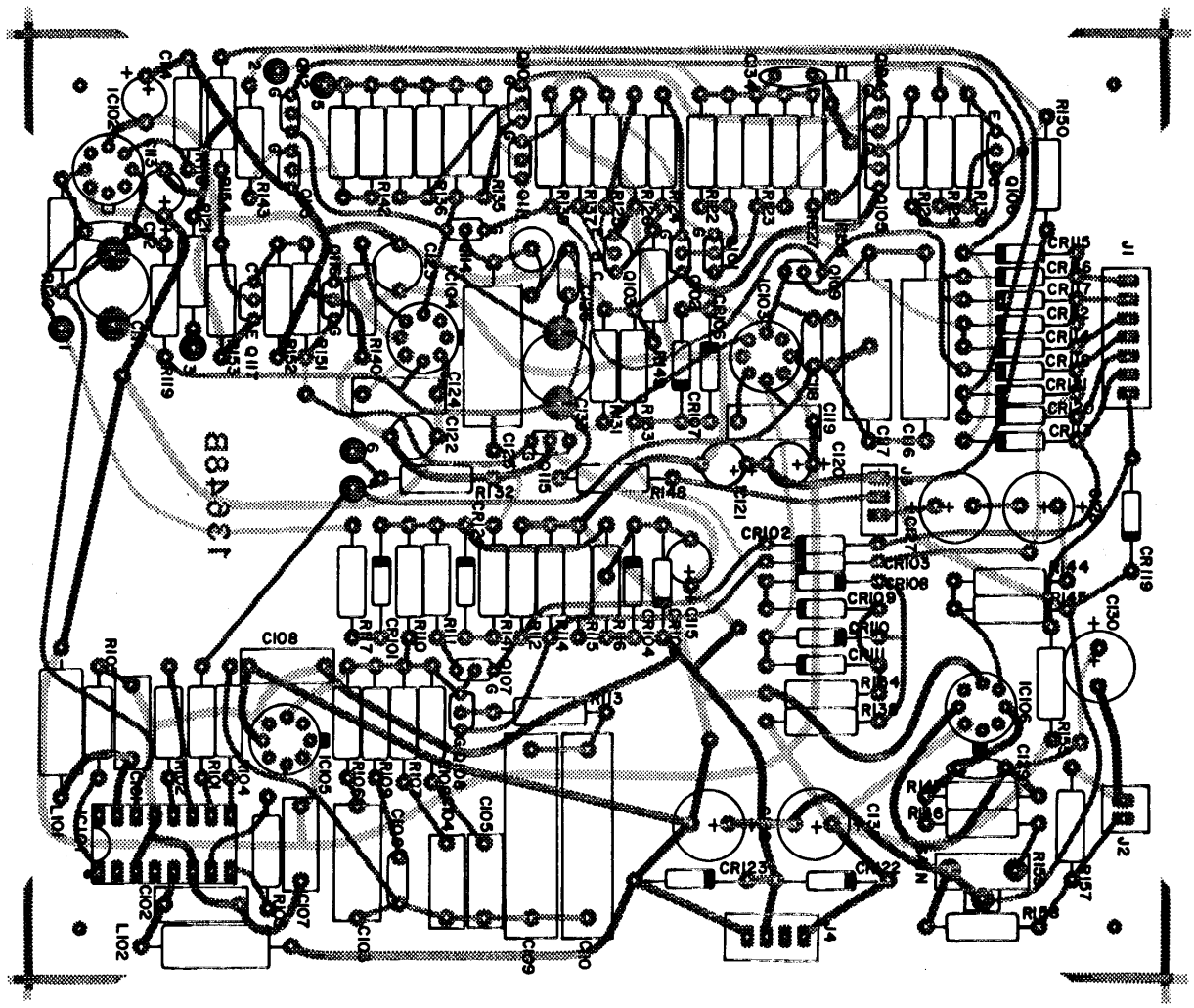
UREI **BILL OF MATERIALS**

PAGE 4 OF | ASSY. NO. 10-13764 | REV.

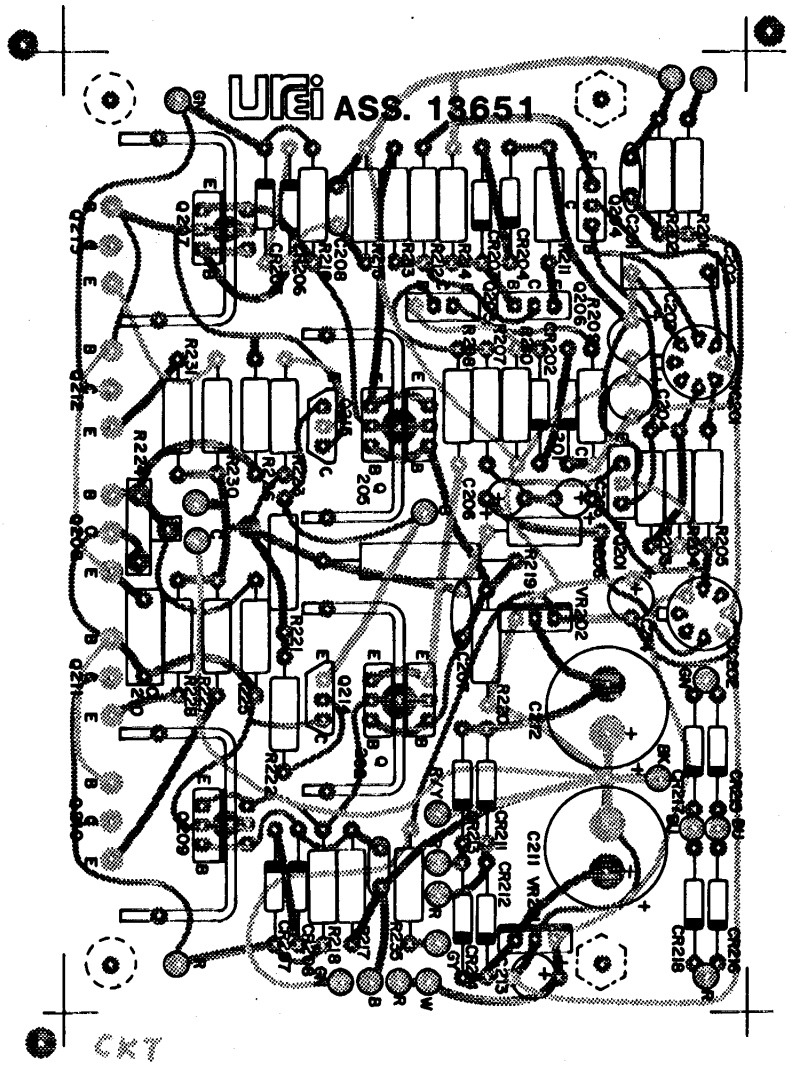
DATE 12/2/81 | PREPARED BY: J.W. | APPROVED BY: | ASSEMBLY NAME WIRE ASSEMBLY | USED ON MODEL 512F (2686293)

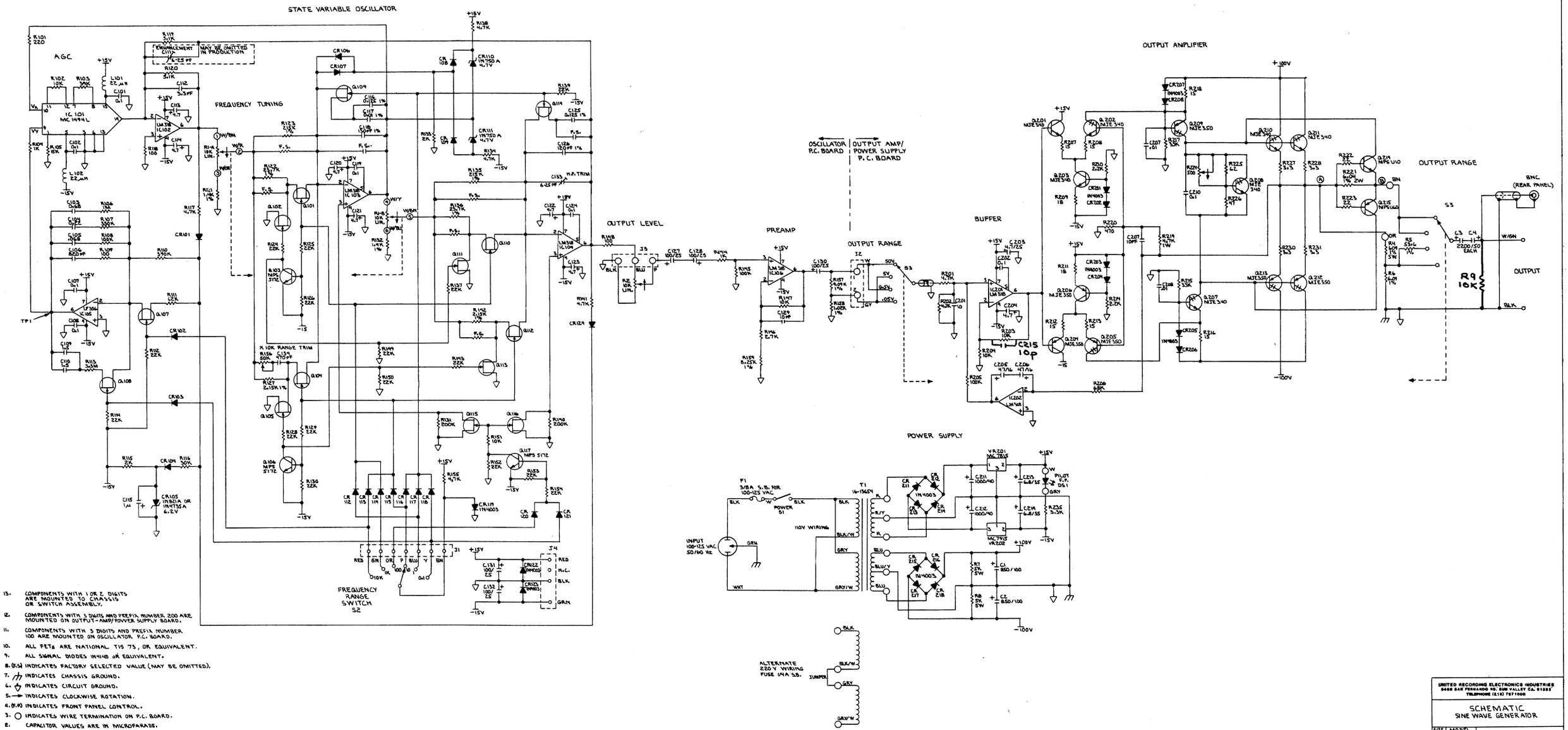
ITEM	ASSY. QTY.	UREI PART NO.	MFR AND PART NO.	DESCRIPTION	REFERENCE DESIGNATOR	ISSUE	UNIT PRICE	EXT.
49	1	32-0073		WIRES, 22 GA, TEFLON, 15" WHITE				
50	1			" " " 15 GRAY				
51	1			" " " 18 BLACK				
52	1	32-0074		" " " 18 RED				
53	1	32-0077		" " " 18 GREEN				
54	1	27-0255	AMP-MTA-100 640-441-7	CONNECTOR HOUSING	J1			
55	1	27-0256	AMP-MTA-100 640440-2	CONNECTOR HOUSING	J2			
56	1	27-0257	AMP-MTA-100 640440-3	" "	J3			
57	1	27-0258	AMP-MTA-100 640440-4	" "	J4			
58								
59	1			WIRES, 22 GA, TEFLON, 4 3/4" WHITE/BROWN				
60	1	32-0084		" " " 7 1/4 WHITE/RED				
61	1			" " " 4 1/2 WHITE/ORANGE				
62	1			" " " 6 WHITE/YELLOW				
63	1	32-0083		" " " 7 1/4 WHITE/GREEN				
64	1	32-0080		" " " 6 WHITE/BLUE				

OSCILLATOR PC BOARD #13648B



POWER AMPLIFIER PC BOARD #13649B





NOTES: UNLESS OTHERWISE SPECIFIED.

1. RESISTOR VALUES ARE IN OHMS ± 5% 1/2W
2. CAPACITOR VALUES ARE IN MICROFARADS.
3. ○ INDICATES WIRE TERMINATION ON P.C. BOARD.
4. (R.R) INDICATES FRONT PANEL CONTROL.
5. → INDICATES CLOCKWISE ROTATION.
6. ⏚ INDICATES CIRCUIT GROUND.
7. ⏥ INDICATES CHASSIS GROUND.
8. (R.S) INDICATES FACTORY SELECTED VALUE (MAY BE OMITTED).
9. ALL SIGNAL DIODES IN4148 OR EQUIVALENT.
10. ALL FETs ARE NATIONAL TIS 75, OR EQUIVALENT.
11. COMPONENTS WITH 3 DIGITS AND PREFIX NUMBER 100 ARE MOUNTED ON OSCILLATOR P.C. BOARD.
12. COMPONENTS WITH 3 DIGITS AND PREFIX NUMBER 200 ARE MOUNTED ON OUTPUT-AMP/POWER SUPPLY BOARD.
13. COMPONENTS WITH 1 OR 2 DIGITS ARE MOUNTED TO CHASSIS OR SWITCH ASSEMBLY.

REV. B PER ECO-0512 F/A-005 8-19-82
REV. A PER ECO-0512 F/A-001&002 5-6-82 EP

UNITED RECORDING ELECTRONICS INDUSTRIES
8460 SAN FERNANDO RD. SUN VALLEY CA. 91352
TELEPHONE (818) 767-1000

SCHEMATIC
SINE WAVE GENERATOR

SIZE	MODEL	
R	512 F/A	13666 B

DR. BY R.P. MARIN | DATE 8-19-81