

LAG-120B
AUDIO GENERATOR
SERVICE MANUAL

NOTE

These servicing instructions are for use by qualified personnel only. To avoid electrical shock, do not perform any servicing other than that contained in the service manual unless you are qualified.

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1. SPECIFICATIONS

Frequency Range	10Hz to 1MHz in five decade bands.
Frequency Accuracy	Dial calibration within $\pm(3\% + 1\text{Hz})$.
Output Flatness	$\pm 0.5\text{dB}$ across 600Ω .
Output Waveforms	
Sine Wave	Output: Over $3V_{\text{rms}}$ into 600Ω . Distortion: 0.05% : 500Hz – 20kHz. 0.4% : 50Hz – 200kHz. 0.8% : 20Hz – 500kHz. 1.5% : 10Hz – 1MHz.
Square Wave	Output: Over $3V_{\text{p-p}}$ into 600Ω . Rise Time: 200ns. Sag: 5% Overshoot: 2% at maximum output.
Output Impedance	$600\Omega \pm 10\%$.
Output Attenuator	6 step-attenuation and continuously adjustable.
Sync Signal Terminal	Input Impedance: Approx. $10k\Omega$. Control Range: $\pm 1\%/V$
Power Supply	50/60Hz 100V $\pm 10\%$ (Can be set at 120, 220 and 240V by changing the transformer taps) ; approx 6.5 VA
Size and Weight	170(H) x 132(W) x 305(D) mm; (Approx. 6-3/4" x 5-1/4" x 12") approx. 3 kg (6.5 lbs.)
Accessory	LT-2044 (600Ω terminator)

2. TEST EQUIPMENT REQUIRED

The following test equipment is required for calibration and servicing of the Model LAG-120B. The suggested specifications are the minimum necessary for proper calibration of this instrument.

<u>Test Equipment</u>	<u>Minimum Spec</u>
- Multimeter	0 - 50V Accuracy < 1%
- Oscilloscope	10mV sensitivity 10MHz bandwidth Low capacitance probe
- Frequency Counter	20mV sensitivity 1 MHz bandwidth Accuracy < 0.1%

3. CALIBRATION PROCEDURE

3.1 General

- (1) Calibration should be performed after a 30 minute warm-up period. It should also be confirmed that the unit is connected to the rated power line voltage.
- (2) All adjustment should be completed in the given order, because some adjustments interact with others.
- (3) During the adjustment procedure, remove the case only when necessary and replace immediately after making an adjustment. This will maintain all circuit at constant operating temperature.

3.2 Initial Control Settings

The initial control settings to be used for each check and adjustment are listed below. Any variations from these settings are stated in the applicable procedure.

Frequency Dial	1
FREQ RANGE	x1k
OUTPUT	
ATTENUATION dB	0
VARIABLE	Fully clockwise
Waveform	Sine wave

3.3 Power Supply

- (1) Connect the DC voltmeter between test point and chassis.
- (2) Check the voltage according to Table 3-1.

<u>Test point</u>	<u>Voltage</u>	<u>Tolerance</u>
TP3	+24V	+23V to +25V
TP4	-24v	-23V to -25V

Table 3-1

(4) 1MHz Adjustment

- Set: Frequency Dial 10
 FREQ RANGE x100k
- adjust VC2 for a frequency reading of 1.00MHz.

3.6 Square Wave Adjustment

(1) Symmetry Adjustment

- Set: Frequency Dial 1
 FREQ RANGE x1k
 Waveform Square wave
 VARIABLE Fully clockwise

- Connect the oscilloscope to OUTPUT terminal.
- Adjust VR4 for a symmetrical square wave.

4. TROUBLESHOOTING PROCEDURE

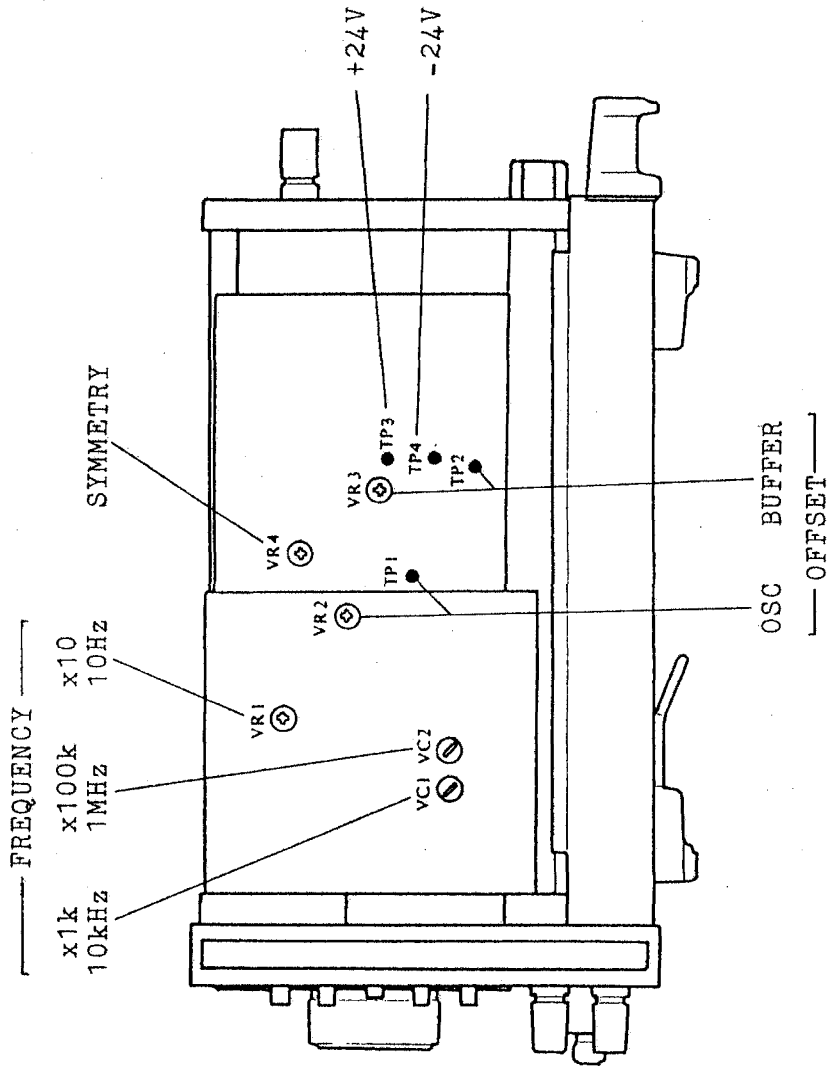
4.1 Troubleshooting aid-1

- (1) Confirm that the any equipment used with the LAG-120B is operating correctly.
- (2) Check all control settings, because an incorrect setting can make a good unit appear defective. If there is any question about the function, see the INSTRUCTION MANUAL for a correct operation.
- (3) Check all circuit for visual defects such as broken component, loose connection, open wire, poor soldering etc.
- (4) Some trouble can be solved with proper adjustment.
- (5) Check voltage and waveform as shown in the "8. SCHEMATIC DIAGRAM" to locate the defective circuit. Start with the power supply.
Typical voltage and waveform are obtained under the same conditions as "3.2 Initial Control Settings".

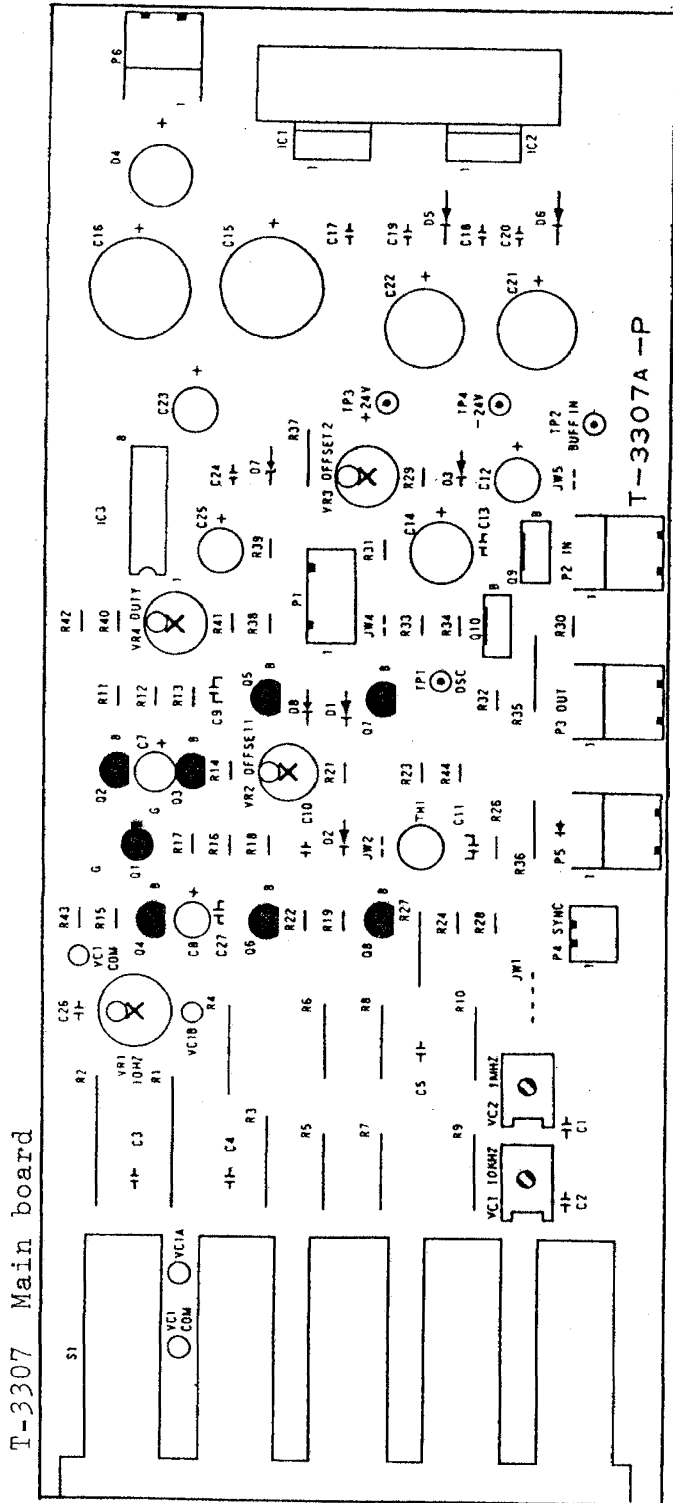
4.2 Troubleshooting Aid-2

<u>Symptom</u>	<u>Probable cause</u>
No sine wave output	Check voltage of Power Supply. TP3: +24V TP4: -24V If the voltages are improper, check F1, T1, Regulator and associated circuit. TP1 voltage cannot be adjusted to 0V. Check DC levels of Oscillator Circuit. No sine wave present at TP1. Check Oscillator circuit. If no sine wave present on emitter of Q9, check S1 and Buffer amplifier If sine wave present on emitter of Q9, check Attenuator
Distorted square wave comes out even Waveform switch at Sine Wave.	Check TH1 for open.
No square wave output	Check waveform at pin 4 of P1 for square wave. If not, check S1 and Square wave generator.

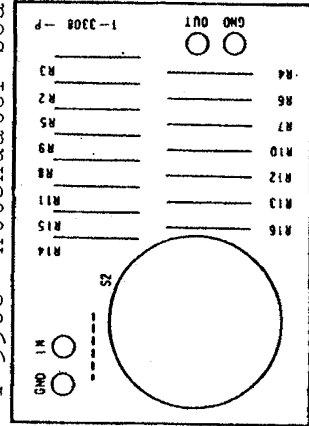
5. ADJUSTMENT LOCATIONS



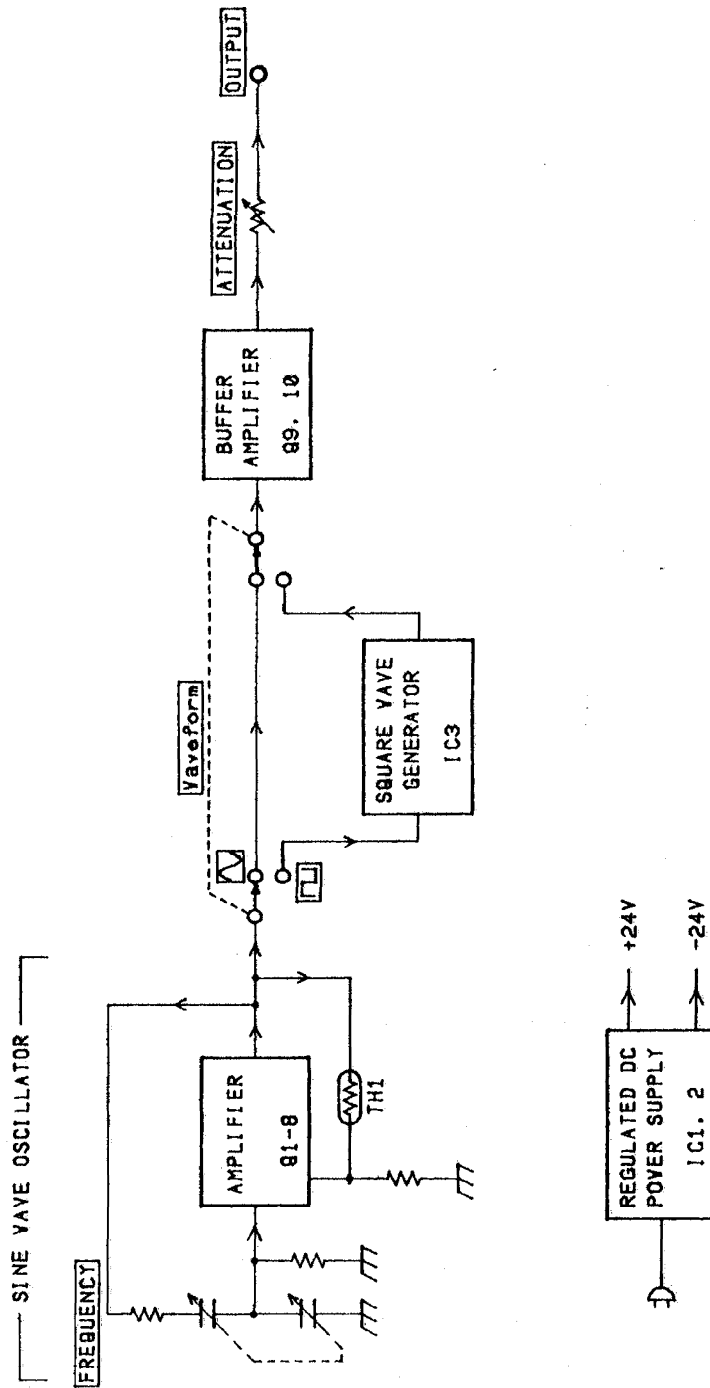
6. PRINTED CIRCUIT BOARD



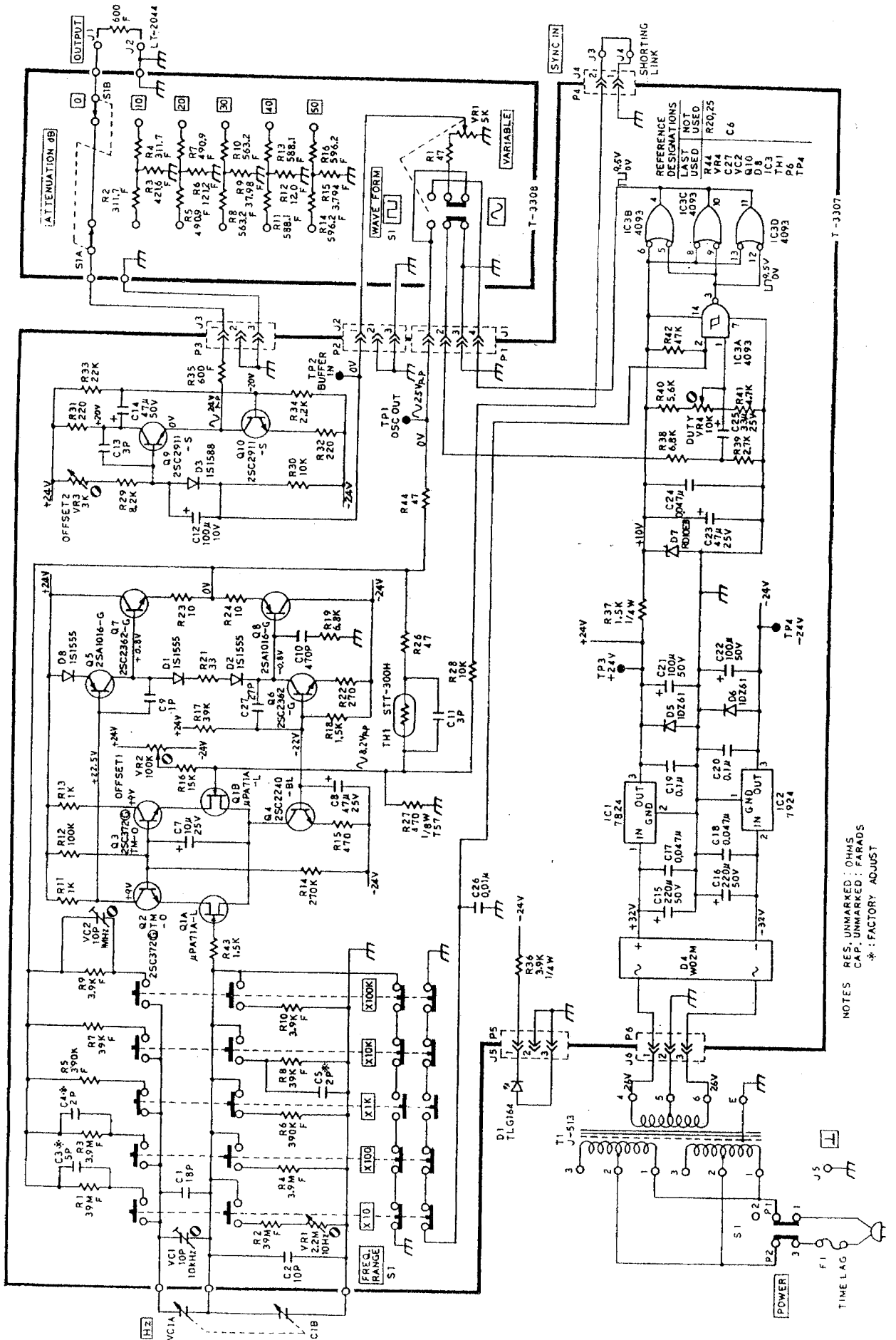
T-3308 Attenuator board



7. BLOCK DIAGRAM



8. SCHEMATIC DIAGRAM



NOTES
 RES. UNMARKED : OHMS
 CAP. UNMARKED : FARADS
 * : FACTORY ADJUST

9. PARTS LIST

No.	LDR PT No.	DESCRIPTION	No.	LDR PT No.	DESCRIPTION
*** MAIN FRAME ***					
-VARIABLE CAPACITOR-					
VC1	2911026001	PLASTIC FILM	(T-3307 CONT'D)		
-DIODE-					
D1	3130063000	LED		600 OHM	1% 1/4W
-TRANSFORMER-					
T1	3800513000	TRANSFORMER		3.9K OHM	5% 1/4W
-SWITCH-					
S1	4020138009	PUSH		1.5K OHM	5% 1/4W
-FUSE-					
F1	4363715001	TIME LAG		6.8K OHM	5% 1/6W
F1	4363730007	TIME LAG		5.6K OHM	5% 1/6W
-MISCELLANEOUS-					
	4371003003	FUSE HOLDER		4.7K OHM	5% 1/6W
*** MAIN BOARD ***					
-RESISTORS-					
R1	1143905018	METAL FILM		47 OHM	5% 1/6W
R2	1143905018	METAL FILM		39 OHM	1% 1W
R3	1333904006	METAL FILM		3.9M OHM	1% 1/6W
R4	1333904006	METAL FILM		3.9M OHM	1% 1/6W
R5	1313903000	METAL FILM		390K OHM	1% 1/4W
R6	1313903000	METAL FILM		390K OHM	1% 1/4W
R7	1313902008	METAL FILM		39K OHM	1% 1/4W
R8	1313902008	METAL FILM		39K OHM	1% 1/4W
R9	1313901006	METAL FILM		3.9K OHM	1% 1/4W
R10	1313901006	METAL FILM		3.9K OHM	1% 1/4W
R11	1000102007	CARBON FILM		1K OHM	5% 1/6W
R12	1000104001	CARBON FILM		100K OHM	5% 1/6W
R13	1000102007	CARBON FILM		1K OHM	5% 1/6W
R14	1000274006	CARBON FILM		270K OHM	5% 1/6W
R15	1000471008	CARBON FILM		470 OHM	5% 1/6W
R16	1000153004	CARBON FILM		15K OHM	5% 1/6W
R17	1000353004	CARBON FILM		39K OHM	5% 1/6W
R18	1000152002	CARBON FILM		1.5K OHM	5% 1/6W
R19	1000682001	CARBON FILM		6.8K OHM	5% 1/6W
R21	1000330000	CARBON FILM		33 OHM	5% 1/6W
R22	1000271000	CARBON FILM		270 OHM	5% 1/6W
R23	1000100003	CARBON FILM		10 OHM	5% 1/6W
R24	1000100003	CARBON FILM		10 OHM	5% 1/6W
R26	1000470006	CARBON FILM		47 OHM	5% 1/6W
R27	1390404000	METAL FILM		470 OHM	5% 1/8W TCR
R28	1000103009	CARBON FILM		10K OHM	5% 1/6W
R29	1000822001	CARBON FILM		8.2K OHM	5% 1/6W
R30	1000103009	CARBON FILM		10K OHM	5% 1/6W
R31	1000221005	CARBON FILM		220 OHM	5% 1/6W
R32	1000221005	CARBON FILM		220 OHM	5% 1/6W
R33	1000223009	CARBON FILM		22K OHM	5% 1/6W
R34	1000222007	CARBON FILM		2.2K OHM	5% 1/6W
-VARIABLE RESISTORS-					
VR1	1712019005	METAL FILM		2.2M OHM	25% 1/2W
VR2	1711004107	CERMET		100K OHM	20% 1/3W
VR3	1711004060	CERMET		3K OHM	20% 1/3W
VR4	1711004079	CERMET		10K OHM	20% 1/3W
-CAPACITORS-					
C1	2120180008	MICA		18PF	10% 500V
C2	2120180004	MICA		18PF	10% 500V
C3	2120050005	MICA		5PF	500V
C4	2120020006	MICA		2PF	500V
C5	2120020006	MICA		2PF	500V
C7	2240100006	ELECTROLYTIC		10UF	25V
C8	2240470009	ELECTROLYTIC		47UF	25V
C9	2120010003	MICA		1PF	500V
C10	2130471006	PLASTIC FILM		470PF	10% 50V
C11	2120030009	MICA		3PF	500V
C12	2220101004	ELECTROLYTIC		100UF	10V
C13	2120030009	MICA		3PF	500V
C14	2250470006	ELECTROLYTIC		47UF	20% 50V
C15	2250221005	ELECTROLYTIC		220UF	20% 50V
C16	2250221005	ELECTROLYTIC		220UF	20% 50V
C17	2010473008	CERAMIC		0.047UF	50V
C18	2010473008	CERAMIC		0.047UF	50V
C19	2010104007	CERAMIC		0.1UF	50V
C20	2010104007	CERAMIC		0.1UF	50V
C21	2250101005	ELECTROLYTIC		100UF	20% 50V
C22	2250101005	ELECTROLYTIC		100UF	20% 50V
C23	2240470009	ELECTROLYTIC		47UF	20% 25V
C24	2010473008	CERAMIC		0.047UF	50V
C25	2240330003	ELECTROLYTIC		0.047UF	50V
C26	2010103005	CERAMIC		0.01UF	25V
C27	2120270009	MICA		27PF	50V
-VARIABLE CAPACITORS-					
VC1	2910030006	CERAMIC		2-10PF	250V
VC2	2910030006	CERAMIC		2-10PF	250V
-TRANSISTORS-					
Q1	3030026008	FET DUAL		UPA71A-L	
Q2	3030372005	NPN		2SC372(G)TM-0	
Q3	3030372005	NPN		2SC372(G)TM-0	
Q4	3032240000	NPN		2SC2240-BL	
Q5	3011016005	PNP		2SA1016-G	
Q6	3032362004	NPN		2SC2362-G	
Q7	3032362004	NPN		2SC2362-G	

No.	LDR PT No.	DESCRIPTION			

(T-3307 CONT'D)					
Q8	3011016005	PNP	29A1016-C		
Q9	3032911001	MPN	2SC2911-S		
Q10	3032911001	MPN	2SC2911-S		
-DIODES-					
D1	3110004000	DETECTOR	1S1555		
D2	3110004000	DETECTOR	1S1555		
D3	3110006004	DETECTOR	1S1588		
D4	3110042017	BRIDGE RECTIFIER	W-02M		
D5	3110019003	RECTIFIER	10Z61		
D6	3110019003	RECTIFIER	10Z61		
D7	3120064005	ZENER	RD10EB	10V	
D8	3110004000	DETECTOR	1S1555		
-INTEGRATED CIRCUITS-					
IC1	3217824998	REGULATOR	7924P	+24V 1A	
IC2	3217924992	REGULATOR	7924P	-24V 1A	
IC3	3310093065	CMOS	HD140938P		
-SWITCH-					
S1	4020043008	PUSH	S-5-22	"FREQ RANGE"	
-MISCELLANEOUS-					
TH1	3550005002	THERMISTOR	STT-300H		
*** ATTENUATOR BOARD					
-RESISTORS-					
R1	1000470006	CARBON FILM	47 OHM	5%	1/5W
R2	1363117004	METAL FILM	311.7 OHM	1%	1/4W
R3	1364215002	METAL FILM	421.6 OHM	1%	1/4W
R4	1363117004	METAL FILM	311.7 OHM	1%	1/4W
R5	1364909003	METAL FILM	490.9 OHM	1%	1/4W
R6	1361212015	METAL FILM	121.2 OHM	1%	1/4W
R7	1364909003	METAL FILM	490.9 OHM	1%	1/4W
R8	1365632002	METAL FILM	563.2 OHM	1%	1/4W
R9	1363798004	METAL FILM	37.98 OHM	1%	1/4W
R10	1365632002	METAL FILM	563.2 OHM	1%	1/4W
R11	1365881003	METAL FILM	588.1 OHM	1%	1/4W
R12	1321209009	METAL FILM	12.0 OHM	1%	1/4W
R13	1365881003	METAL FILM	588.1 OHM	1%	1/4W
R14	1365962003	METAL FILM	596.2 OHM	1%	1/4W
R15	1363794006	METAL FILM	3.794 OHM	1%	1/2W
R16	1365962003	METAL FILM	596.2 OHM	1%	1/4W
-VARIABLE RESISTOR-					
VR1/S1	1910070009	CARBON FILM	5K OHM	W/SW	"WAVEFORM/VAR"
-SWITCH-					
S2	4000525002	ROTARY	Q-S25	"ATTENUATION"	

10. CABINET REMOVAL

- Take 2 screws, holding cord wrapper, and 2 phillips screws off to remove the top cover.
- Take 2 screws, holding cord wrapper, to remove the bottom cover.

