INSTRUCTION MANUAL

MODEL 182
2 MHz FUNCTION GENERATOR

WAVETEK®

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2 MHz
FUNCTION GENERATOR

WAVETEK®
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WARRANTY

All Wavetek instruments are warranteed against defects in material and workmanship for a period of one year after date of manufacture. Wavetek agrees to repair or replace any assembly or component (except batteries) found to be defective, under normal use, during this period. Wavetek's obligation under this warranty is limited solely to repairing any such instrument which in Wavetek's sole opinion proves to be defective within the scope of the warranty when returned to the factory or to an authorized service center. Transportation to the factory or service center is to be prepaid by purchaser. Shipment should not be made without prior authorization by Wavetek.

This warranty does not apply to any products repaired or altered by persons not authorized by Wavetek, or not in accordance with instructions furnished by Wavetek. If the instrument is defective as a result of misuse, improper repair, or abnormal conditions or operations, repairs will be billed at cost.

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CONTENTS

SAFETY

This instrument is wired for earth grounding via the facility power wiring. Do not bypass earth grounding with two wire extension cords, plug adapters, etc.

BEFORE PLUGGING IN the instrument, comply with installation instructions.

MAINTENANCE may require power on with the instrument covers removed. This should be done only by qualified personnel aware of the electrical hazards.

WARNING notes call attention to possible injury or death hazards in subsequent operations.

CAUTION notes call attention to possible equipment damage in subsequent operations.

SECTION 1
GENERAL DESCRIPTION

1.1 THE MODEL 182

Wavetek Model 182 Two MHz Function Generator is a precision source of sine, triangle and square waveforms plus dc voltage. All are front panel variable from 0.002 Hz to 2 MHz and can be externally modulated or swept over a 1000:1 range. Output can be continuous or the generator can be triggered or gated by an external signal or a front panel switch. Amplitude of the waveforms is variable from 10V peak-to-peak into 50Ω down to 30 mV p-p. DC reference of the waveforms can be offset positively or negatively.

The main waveform output is 20V peak-to-peak maximum and can be varied over a 30 dB range. A second waveform at 2V peak-to-peak maximum (20 dB attenuation) and a TTL level square at generator frequency are auxiliary outputs. Inputs are provided for external voltage controlled generator frequency (VCG) and for triggering and gating the generator.

1.2 SPECIFICATIONS

1.2.1 Versatility

Waveforms
Sine ∿, triangle ∿, square ⊓⊔, TTL pulse ⊓ and dc.

Operational Modes
Continuous: Generator runs continuously at selected frequency.

Triggered: Generator is quiescent until triggered by external signal or manual trigger, then generates one complete waveform cycle at selected frequency.

Gated: As triggered mode, except output continues for duration of gate signal. Last waveform started is completed.

Frequency Range
0.002 Hz to 2 MHz in 7 overlapping decade ranges:

×1	0.002 Hz to 2 Hz
×10	0.02 Hz to 20 Hz
×100	0.2 Hz to 200 Hz
×1K	2 Hz to 2 kHz
×10K	20 Hz to 20 kHz
×100K	200 Hz to 200 kHz
×1M	2 kHz to 2 MHz

Function Output
∿, ∿, ⊓⊔ selectable and variable to 20V p-p (10V p-p into 50Ω) HI output, and to 2V p-p (1V p-p into 50Ω) LO output. Both outputs varied with a 30 dB vernier. Peak output current is 100 mA maximum (HI output) into 50Ω (200 mA peak into a short circuit). Source impedance is 50Ω.

DC Offset and DC Output
Waveform offset and dc output selectable and variable thru HI and LO BNC outputs. DC output selectable by not selecting a waveform function. HI output is ±10V max (±5V into 50Ω) as offset or Vdc output. Signal-peak plus offset limited to ±10V (±5V into 50Ω). LO output is ±1V max (±0.5V into 50Ω) as is signal-peak plus offset limit. DC offset plus waveform attenuated proportionately at LO (−20 dB) output.

TTL Pulse Output
TTL pulse (50% duty cycle) at generator frequency. Drives up to 20 TTL loads.

VCG — Voltage Controlled Generator
Up to 1000:1 frequency change with external 0 to ±2V signal. Upper and lower frequencies limited to maximum and minimum of selected range.
Slew Rate: 2% of range per μs.
Linearity:
±0.5% thru ×100K range; ±2% on ×1M range.
Input Impedance: 2 kΩ.

Trigger and Gate
Input: TTL compatible levels.
Pulse Width: 50 ns minimum.
Repetition Rate: 2 MHz maximum.

1.2.2 Frequency Precision

Dial Accuracy
±5% of full scale.

Time Symmetry
Square wave variation from 0.1 to 2.0 on dial less than: ±1% to 100 kHz; ±5% to 2 MHz.

1.2.3 Amplitude Precision

Sine variation with frequency less than:
±0.2 dB on all ranges thru ×100K; ±0.5 dB on ×1M range, referenced to 1 kHz.

1.2.4 Waveform Characteristics

Sine Distortion
Less than:
0.5% on ×1K and ×10K ranges; 1% on ×1, ×10, ×100 and ×100K ranges. All harmonics 30 dB below fundamental on ×1M range.

Triangle Linearity
Greater than 99% to 200 kHz.

Square Wave Rise and Fall Time
At HI output, less than 75 ns for 10V p-p output into 50Ω termination.

1.2.5 General

Environmental
Specifications apply at 25°C ±5°C. Instrument will operate from 0°C to 50°C ambient temperatures.

Dimensions
28.6 cm (11¼ in.) wide; 8.9 cm (3½ in.) high; 26.7 (10½ in.) deep.

Weight
2.7 kg (6 lb) net; 4.5 kg (10 lb) shipping.

Power
90 to 126V or 198 to 252V (specify); 48 to 66 Hz; less than 15 watts.

NOTE

All specifications apply for dial between 0.1 and 2.0; amplitude at 10V p-p from HI output into 50Ω termination.

SECTION 2
INSTALLATION

2.1 MECHANICAL INSTALLATION

After unpacking the instrument, visually inspect all external parts for possible damage to connectors, surface areas, etc. If damage is discovered, file a claim with the carrier who transported the unit. The shipping container and packing material should be saved in case reshipment is required.

2.2 ELECTRICAL INSTALLATION

2.2.1 Power Connection

WARNING

To preclude injury or death due to shock, the third wire earth ground must be continuous to the facility power outlet. Before connecting to the facility power outlet, examine extension cords, autotransformers, etc., between the instrument and the facility power outlet for a continuous earth ground path. The earth ground path can be identified at the plug on the instrument power cord; of the three terminals, the earth ground terminal is the nonmatching shape, usually cylindrical.

CAUTION

To prevent damage to the instrument, check for proper match of line and instrument voltage and proper fuse type and rating.

NOTE

Unless otherwise specified at the time of purchase, this instrument was shipped from the factory with the power transformer configured for operation on a 90 to 126 Vac line supply and with a 1/4 amp slow blow fuse. Instruments configured for 198 to 252 Vac have a 1/8 amp slow blow fuse. (See figure 2-1.)

2.2.2 Signal Connections

Use 3 foot RG58U 50Ω shielded cables equipped with female BNC connectors to distribute all input and output signals.

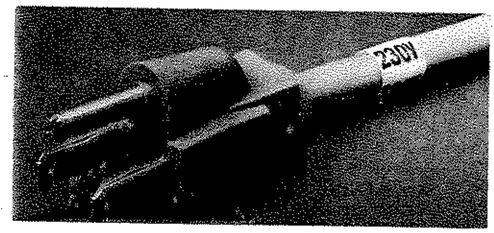


Figure 2-1. Instrument Configured for 198 to 252 Vac Operation

2.3 ELECTRICAL ACCEPTANCE CHECK

This checkout procedure is a general verification of generator operation. Should a malfunction be found, refer to the warranty in the front of this manual.

A two channel oscilloscope, four 3 foot 50Ω coax cables with female BNC connectors, a coax tee connector and an additional function generator are required for this procedure.

Preset the generator front panel controls as follows:

Control	Position
Dial	1.0
MODE	CONT (released)
FUNCTION	⊓⊔
DC OFFSET	OFF (ccw)
AMPLITUDE	MAX (cw)
FREQUENCY MULTIPLIER	×1K

Set up the oscilloscope, Model 182 and external function generator as shown in figure 2-2 and perform the steps in table 2-1.

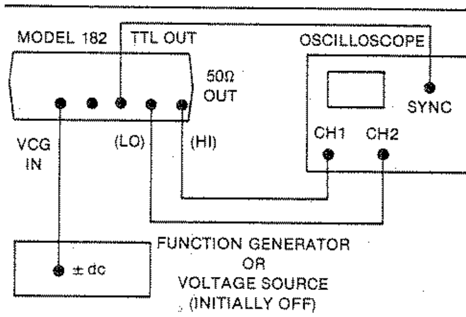


Figure 2-2. First Setup

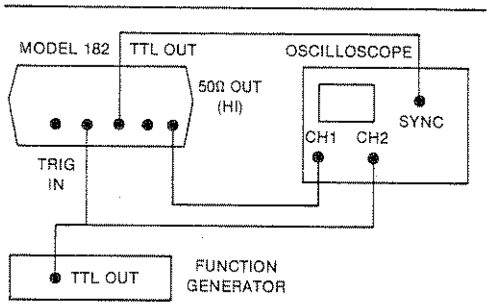


Figure 2-3. Second Setup

2.4 CHANGING THE OUTPUT IMPEDANCE

The output impedance is normally:

HI 10V p-p (50Ω source) into 50Ω.
LO 1V p-p (50Ω source) into 50Ω.

Amplitude is normally variable over 30 dB with −50 dB lowest possible amplitude.

If simultaneous 600Ω and 50Ω output impedances are desired:

1. Change value of R116 from 499Ω to 604Ω.
2. Remove R117.

The result is:

HI 10V p-p (50Ω source) into 50Ω.
LO 10V p-p (600Ω source) into 600Ω.

Amplitude is variable over 30 dB with −30 dB lowest possible amplitude. Square wave rise and fall time is less than 150 ns. Any value greater than 600Ω may also be substituted for the value of R116 for other output impedances.

To increase the range of the variable amplitude control in a modified unit beyond 30 dB, decrease the value of R92 as necessary. Waveform quality relative to the standard unit is not guaranteed below −30 dB and above 20 kHz.

Table 2-1. Initial Checkout

Step	Control	Position/Operation	Observation
1	POWER	ON.	±10V square wave on CH1 and ±1V on CH2. Return to CH1 only.
2	Dial	Rotate either direction. Return to 1.0.	Rotation ccw increases frequency of ⊓⊔ ; rotation cw decreases frequency.
3	FREQUENCY MULTIPLIER	Press each switch sequentially; return to X 1K.	Frequency increases in decade steps, left to right.
4	AMPLITUDE	Rotate ccw.	Amplitude decreases.
5	DC OFFSET	Rotate cw. Return to OFF.	Output immediately offset negative, then moves positive. OFF returns it to original level.
6	AMPLITUDE	Rotate cw.	Square returns to original amplitude.
7	Function Generator or DC Voltage Source	Vary input dc voltage; then disconnect VCG IN input.	Frequency increases with positive voltage and decreases with negative voltage.
8	FUNCTION	Press ∿, ⊓⊔, /\.	Observe ∿, ⊓⊔, /\ waveforms.
9	MODE	Gate (CONT depressed, TRIG/GATE released).	A dc level near zero volts (except ⊓⊔ function).
10	MAN TRIG	Press and hold.	Continuous /\ .
Set up trigger source as shown in figure 2-3. Set trigger source for 100 Hz TTL signal.			
11	————	————	/\ gated on during positive portion of TTL signal on CH2.
12	Trigger/Gate	Trigger (depressed).	One ∿ cycle per trigger cycle.

SECTION 3
OPERATION

3.1 CONTROLS AND CONNECTIONS

The generator front panel controls and connectors are shown in figure 3-1 and keyed to the following descriptions.

1 **Frequency Dial** — Settings under the dial index mark summed with **14** and multiplied by **3** determine the output signal frequency.

2 **POWER Button** — Turns generator ON and OFF.

3 **FREQUENCY MULTIPLIER Controls** — Selects one of seven frequency multipliers for dial **1** setting.

4, 5 **Generator MODE Controls** — Selects one of following three modes:

CONT — **4** released. Continuous output at 50Ω OUT **10** and **11** and SYNC OUT (TTL) **12** connectors.

TRIG — **4** and **5** depressed. DC level output until generator triggered by the MAN TRIG **6** or with a signal at the TRIG IN connector **13**. When triggered, the generator output is one cycle of waveform followed by a dc level.

GATE — **4** depressed and **5** released. As for TRIG except the output is continuous for the duration of the manual or external trigger signal. The last cycle started is always completed.

6 **Manual Trigger Button** — Triggers or gates the output signals when generator mode is TRIG or GATE (**4** depressed). In trigger mode, one waveform cycle is output when the button is pushed. In gate mode, waveform cycles are continuously output as long as the button is held in.

7 **FUNCTION Selector** — Selects one of three waveforms or when all three buttons are released, a dc level.

8 **DC OFFSET Control** — Offsets the 50Ω OUT waveforms or gives dc levels from −10V to +10V (−5V to +5V into 50Ω) at **10** and from −1V to +1V (−0.5V to +0.5V into 50Ω) at **11**. An OFF position ensures no offset.

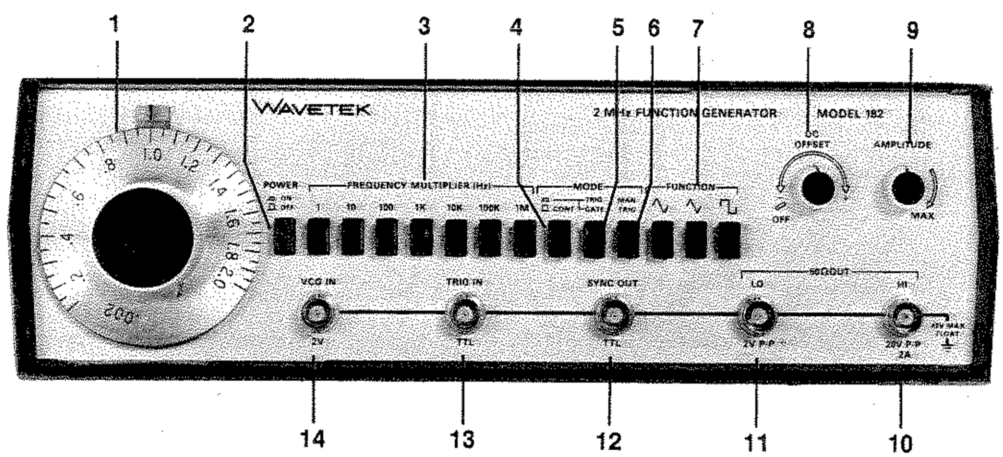


Figure 3.1 Controls and Connectors

9 AMPLITUDE Control — Ccw rotation reduces waveform amplitudes at **10** and **11** by 30 dB. DC and offset voltages are not affected by this control.

10 50Ω OUT HI Connector — The main output of the generator at the function selected. Maximum 20V p-p (10V p-p into 50Ω) with 30 dB continuous amplitude control. 50Ω source impedance.

11 50Ω OUT LO Connector — Same as **10** except 20 dB (1/10) lower in amplitude.

12 TTL OUT Connector — A TTL square for each cycle of the generator. To be used for synchronization or as a TTL signal capable of driving 20 TTL loads.

13 TRIG IN Connector — Accepts a TTL signal to trigger or gate the generator. Triggers on the rising (low to high) transition and gates during the positive (high) portion of the triggering signal.

14 VCG IN Connector — Accepts ac or dc voltages to proportionately control frequency within the range determined by the FREQUENCY MULTIPLIER **3**. Positive voltage increases the frequency set by the dial **1**; negative voltage decreases the frequency. The VCG IN will not drive the generator frequency beyond the normal dial limits of a range. Input impedance is 2 kΩ.

3.2 OPERATION

Perform the initial checkout in Section 2 for the feel of the instrument. Any questions concerning individual controls and connectors may be answered in paragraph 3.1.

3.2.1 Signal Termination

Proper signal termination, or loading, of the generator connectors is necessary for its specified operation. For example, the proper termination of either of the 50Ω OUT connectors is shown in figure 3-2. Placing the 50 ohm terminator, or 50 ohm resistance, in parallel with a higher impedance, matches the receiving instrument input impedance to the coax characteristic and generator output impedance, thereby minimizing signal reflection or power loss on the line due to impedance mismatch.

The input and output impedances of the generator connectors are listed below.

Connector	Impedance
50Ω OUT (HI)	50Ω
50Ω OUT (LO)	50Ω
SYNC OUT (TTL)	*
TRIG IN	*
VCG IN	2 kΩ

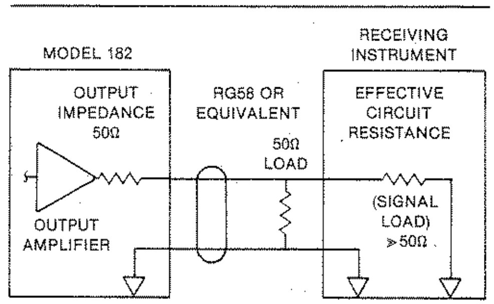


Figure 3-2. Signal Termination

*The TTL OUT connector is diode protected and can drive up to 20 Transistor-Transistor-Logic (TTL) loads (low level between 0V and 0.4V, and high level between 2.4V and 5V). It should not be connected to a resistive load less than 600Ω. The TRIG IN connector accepts TTL logic levels, is diode protected, and requires 500 μA drive from a high level output.

3.2.2 Manual Function Generator Operation

For basic operation, select the waveform frequency and amplitude. The following steps demonstrate manual control of the function generator. (Bold numbers are keys to figure 3-1.)

Step	Control/Connector	Setting
1	50Ω OUT **10**, **11**	Connect circuit to either output (refer to paragraph 3.2.1).
2	FREQUENCY MULTIPLIER **3**	Set to desired range of frequency.
3	Frequency Dial **1**	Set to desired frequency within the range.
4	FUNCTION **7**	Set to desired waveform.
5	DC OFFSET **8**	Set as desired. Limit waveform amplitude to prevent clipping (see figure 3-3).
6	AMPLITUDE **9**	Select for desired amplitude.

3.2.3 Voltage Controlled Function Generator Operation

Operation as a voltage controlled function generator (VCG) is as for a manually controlled function generator, only the frequency within particular ranges is additionally controlled by an external voltage (±2V excursions) injected at the VCG IN connector. Perform the steps given in paragraph 3.2.2, only set the frequency dial to determine a reference from which the frequency is to be voltage controlled.

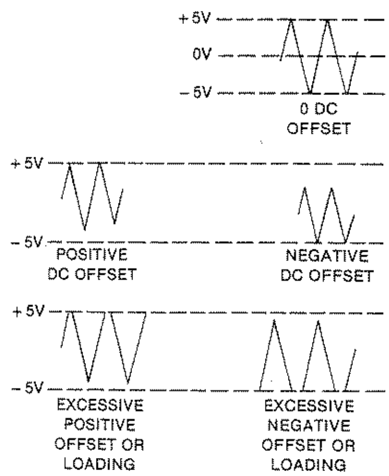


Figure 3-3. DC OFFSET Control

1. For frequency control with positive dc inputs at VCG IN, set the dial for a lower frequency limit.
2. For frequency control with negative dc inputs at VCG IN, set the dial for an upper frequency limit.
3. For modulation with an ac input at VCG IN, set the dial at the desired center frequency. Do not exceed the maximum dial range of the selected frequency range.

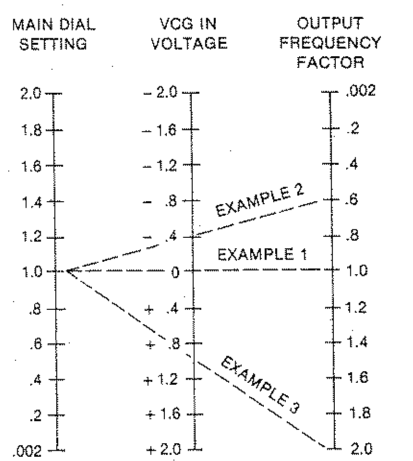


Figure 3-4. VCG Voltage-to-Frequency Nomograph

Figure 3-4 is a nomograph with examples of dial and voltage effects. Example 1 shows that with 0V VCG input, frequency is determined by the main dial setting, 1.0 in this example. Example 2 shows that with a positive VCG input, output frequency is increased. Example 3 shows that with a negative VCG input, output frequency is decreased. (Note that the Output Frequency Factor column value must be multiplied by a frequency range multiplier to give the actual output frequency.)

NOTE

Nonlinear operation may result when the VCG input voltage is excessive; that is, when the attempted generator frequency exceeds the range limits. The upper limit is twice the multiplier setting, and the lower limit is 1/1000th of the upper limit.

The up to 1000:1 VCG sweep of the generator frequencies available in each range results from a 2V excursion at the VCG IN connector. With the frequency dial set to 2.0, excursions between -2V and 0V at VCG IN provide the up to 1000:1 frequency sweep. With the dial set to .002, excursions between 0V and +2V at VCG IN provide the up to 1000:1 sweep within the set frequency range.

3.2.4 Waveforms

See figure 3-5 for definition of controllable waveform characteristics.

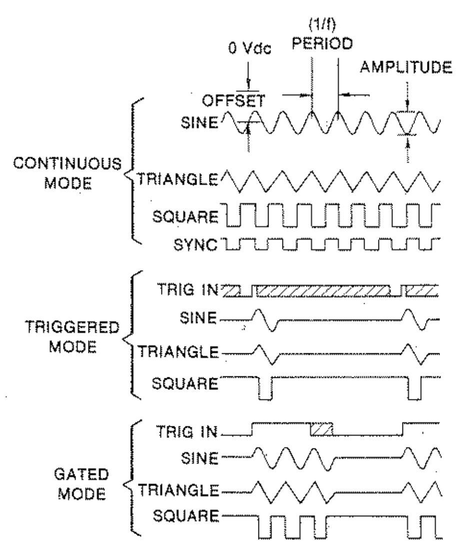


Figure 3-5. Waveform Characteristics

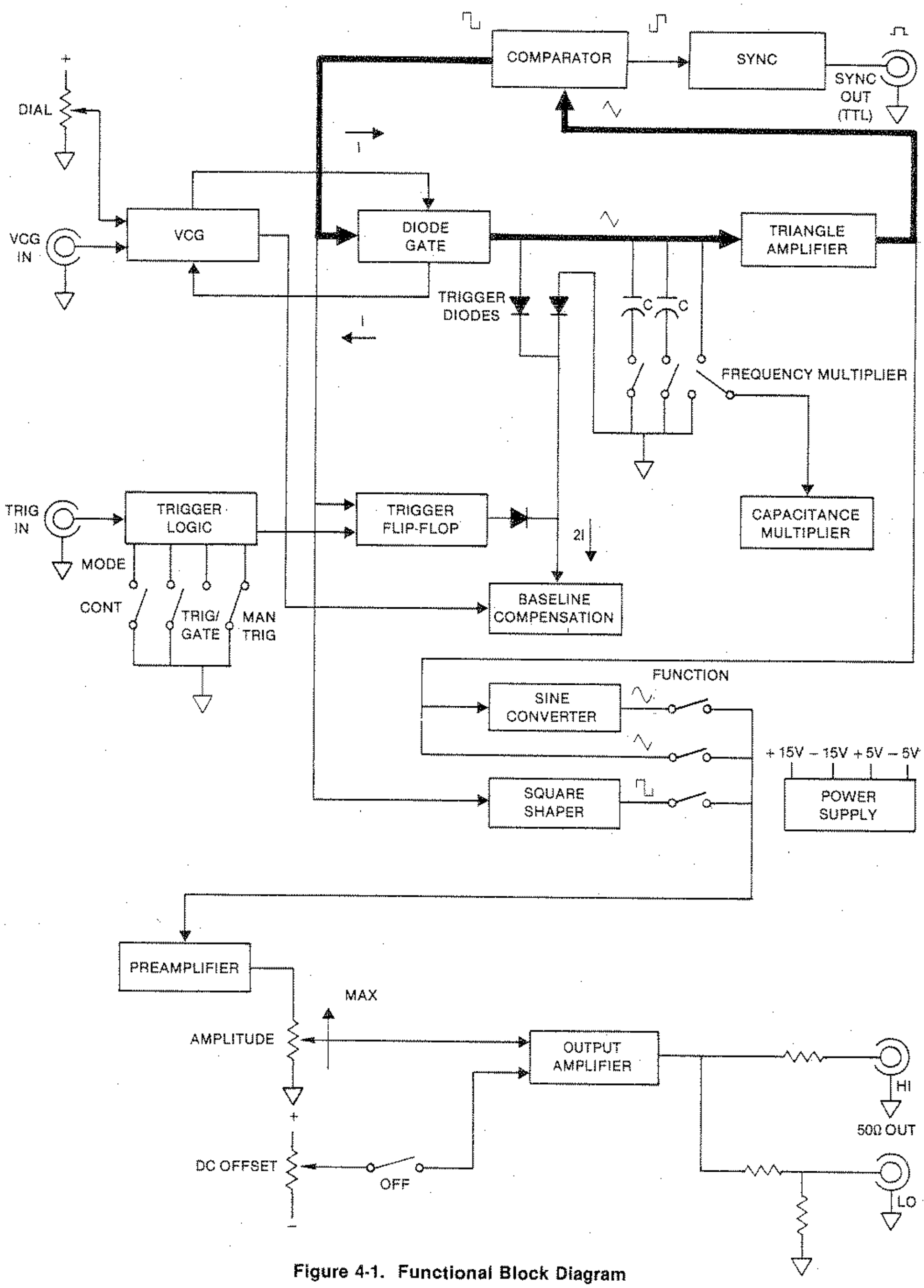


Figure 4-1. Functional Block Diagram

SECTION 4
CIRCUIT DESCRIPTION

4.1 FUNCTIONAL BLOCK DIAGRAM ANALYSIS

This section describes the functions of major circuit elements and their relationships to one another as shown in figure 4-1, functional block diagram. The following sections in this manual provide more detailed information for maintaining the instrument.

As shown in figure 4-1, the VCG sums voltage inputs from the frequency dial and the VCG IN connector. This sum voltage controls the magnitude of a complementary current source and current sink. This current variesleariliy from 1 mA to 1 μA and over the 1000:1 (2.0 to .002) range of each frequency multiplier. The VCG also controls the trigger baseline compensation circuit, which consists of another current sink at twice the current magnitude.

The diode gate, controlled by the comparator output, connects either the current source or the current sink to the timing capacitor selected by the frequency multiplier. When the current source is switched in, the charge on the timing capacitor will rise linearily, producing the positive-going triangle slope. Likewise, the current sink produces the negative-going triangle slope.

The triangle amplifier is a unity gain amplifier whose output is fed to the comparator and to the output circuits. The comparator operates as a window detector with limit points set to the triangle peaks. The ±2V output is sent back to the diode gate and to the output circuits. When the output is +2V, the triangle is positive-going until the +1.25V limit is reached and the comparator output switches to −2V. When the output is −2V, the triangle is negative-going until the −1.25V limit is reached and the comparator output switches back to +2V, repeating the process. In this manner, the basic function generator loop, the bold path in figure 4-1, produces simultaneous generation of triangle and square waves at the same frequency.

The output frequency is determined by the magnitude of the timing capacitor selected by the frequency multiplier switches and by the magnitude of the currents supplied to and removed from it. Since the currents are linearily proportional to the sum of the VCG inputs, so will be the output frequency.

To extend the lower frequency capability of the generator, a capacitance multiplier circuit divides VCG currents by 10 (effectively multiplying the timing capacitor by 10) for each of the lower 3 multiplier ranges.

The TTL square from one side of the comparator is buffered and sent to the SYNC OUT TTL connector. The other side is sent to the trigger flip-flop and to a level shifter to produce the ±2V bipolar square for the diode gate and the square shaper circuits. The square shaper converts the square into a current signal and applies it to the ⊓⊔ FUNCTION switch. The buffered tringle is applied to the ⋀⋁ FUNCTION switch and to the sine converter input. The sine converter, using the nonlinear characteristics of its diodes, converts the triangle into a sinusoidal current for the ∿ FUNCTION switch.

The selected function is sent to the preamplifier, where it is inverted and buffered. The preamplifier output goes to the output amplifier through the AMPLITUDE control where it is summed with offset voltage from the DC OFFSET control. Here, waveform and offset are inverted and amplified to a 10V peak signal which can drive a 50Ω termination from a 50Ω source impedance. The output amplifier drives the 50Ω OUT HI connector and a resistor divider producing the 50Ω OUT LO output.

Noncontinuous modes of operation (trigger and gate) result from allowing or preventing the VCG current source from charging the timing capacitor. Whenever the trigger flip-flop output is low, each of the two trigger diodes conduct a current I, sourcing 2I to the baseline compensation circuit. This removes the current I from the VCG current source and forces a 0V baseline at the triangle amplifier input.

When the CONT switch is released, trigger logic is inhibited from passing any trigger signals and the trigger flip-flop output is held high. This prevents the trigger diodes from conducting and the generator loop operates continuously.

When the CONT switch is depressed, the generator loop is held at the 0V baseline. Depressing the TRIG/GATE switch puts the instrument in triggered mode and any external or manual trigger signals at the trigger logic input will be transformed into a narrow pulse corresponding to the low-to-high transition of the trigger input. This pulse sets the trigger flip-flop high and allows the generator loop to run. When the triangle negative peak is reached, the comparator low-to-high transition clocks the trigger flip-flop low and, when the 0V baseline level is reached, the generator loop again stops. The result is a single waveform generated after the triggering signal corresponding to 0 to 360° of phase. Successive triggered waveforms always start at the same 0° point.

Releasing the TRIG/GATE switch puts the instrument in the gated mode. This is identical to the triggered mode, except the trigger flip-flop is held high for the full duration of the triggering signal. The generator produces continuous waveforms during the time the external signal is high or the manual trigger switch is held in. The last triggered cycle started is always completed and successive gated bursts always start at the 0° point.

SECTION 5 ALIGNMENT

5.1 FACTORY REPAIR

Wavetek maintains a factory repair department for those customers not possessing the necessary personnel or test equipment to maintain the instrument. If an instrument is returned to the factory for alignment or repair, a detailed description of the specific problem should be attached to minimize turnaround time.

5.2 REQUIRED TEST EQUIPMENT

Voltmeter . Millivolt dc measurement (1% accuracy)
Oscilloscope . . . . $\geq$60 MHz bandwidth
Counter . . . . 2 MHz (0.1% accuracy)
50Ω Feedthru . . . . ±1% accuracy, 2W
Distortion Analyzer . . . . To 200 kHz
RG58U Coax Cable . . . 3 ft length BNC male contacts

5.3 REMOVING GENERATOR COVERS

1. Invert the instrument and remove the four screws in the bottom cover.
2. Turn the instrument upright; remove the top cover for access to generator alignment controls.
3. When alignment is complete, secure the bottom cover with four screws.

NOTE

Remove the cover only when it is necessary to make adjustments or measurements.

5.4 ALIGNMENT

After referring to the following preliminary data, perform alignment, as necessary, per table 5-1. If performing partial alignment, check previous settings and adjustments for applicability. See figure 5-1 for alignment control location.

1. All measurements made at the FUNCTION OUT connector must be terminated into a 50Ω (±1%) load.
2. Start the alignment by connecting the unit to an appropriate ac power source and setting the front panel switches as follows.

   POWER . . . . ON
   Frequency Dial 2.0
   FREQ MULT (Hz) . . . . ×1K
   MODE . . . . CONT
   FUNCTION . . . . ⊓⊔
   DC OFFSET . . . . OFF
   AMPLITUDE . . . . MAX

3. Allow the unit to warm up at least 30 minutes for final alignment. Keep the instrument cover on to maintain heat. Remove cover only to make adjustments or measurements.

Table 5-1. Model 182 Alignment

Step	Check	Tester	Test Point	Control Setting	Adjust	Result	Remark
1	Power Supply	Voltmeter	C5 +	Paragraph 5.4, step 2		+15V ±5%	Verify.
2			C7 −			−15V ±5%	
3			C14 +			+5V ±5%	
4			C15 −			−5V ±5%	
5	Capacitance Multiplier Zero		TP1		R120	0V ±10 mV	

Table 5-1. Model 182 Alignment (Continued)

Step	Check	Tester	Test Point	Control Setting	Adjust	Result	Remark
6	VCG Null	Scope	50Ω OUT HI (terminate into 50Ω)	DIAL: .002 FREQ MULT: 10K	R9	Minimum frequency shift	Set scope for 1 or 2 cycles. Observe shift in trailing edge of cycle as VCG IN is alternately shorted and opened.
7	Bottom of Dial Symmetry				R14	Equalize + and − half cycles.	Steps 7 and 8 interact.
8	Bottom of Dial Frequency	Counter			R4	50 ms	
9	Top of Dial Frequency (1 kHz to 100 kHz)			DIAL: 2.0	R6	20 kHz	
10				FREQ MULT: 1K		2 kHz	
11				FREQ MULT: 100K		200 kHz	If necessary, trim 200 kHz with C20.
12	×1 MHz Frequency			FREQ MULT: 1M	R5	2 MHz	
13	Capacitance Multiplier Frequency			FREQ MULT: 100	R47	200 Hz	
14				FREQ MULT: 10		50 ms	
15				FREQ MULT: 1		500 ms	
16	Sine Distortion	Distortion Analyzer	50Ω OUT HI (terminate into 50Ω)	FUNCTION: Sine FREQ MULT: 1K	R59, R81	Minimum distortion	It may be necessary to reduce amplitude to 5V peak.
17	Sine Amplitude	Scope			R88	10V p-p $^{+.3V}_{-.0V}$	
18	Output Offset	Voltmeter			R78	0V ±20 mV	
19	Baseline Zero	Scope		MODE: TRIG	R73	0V ±100 mV	If necessary, trim with R25.

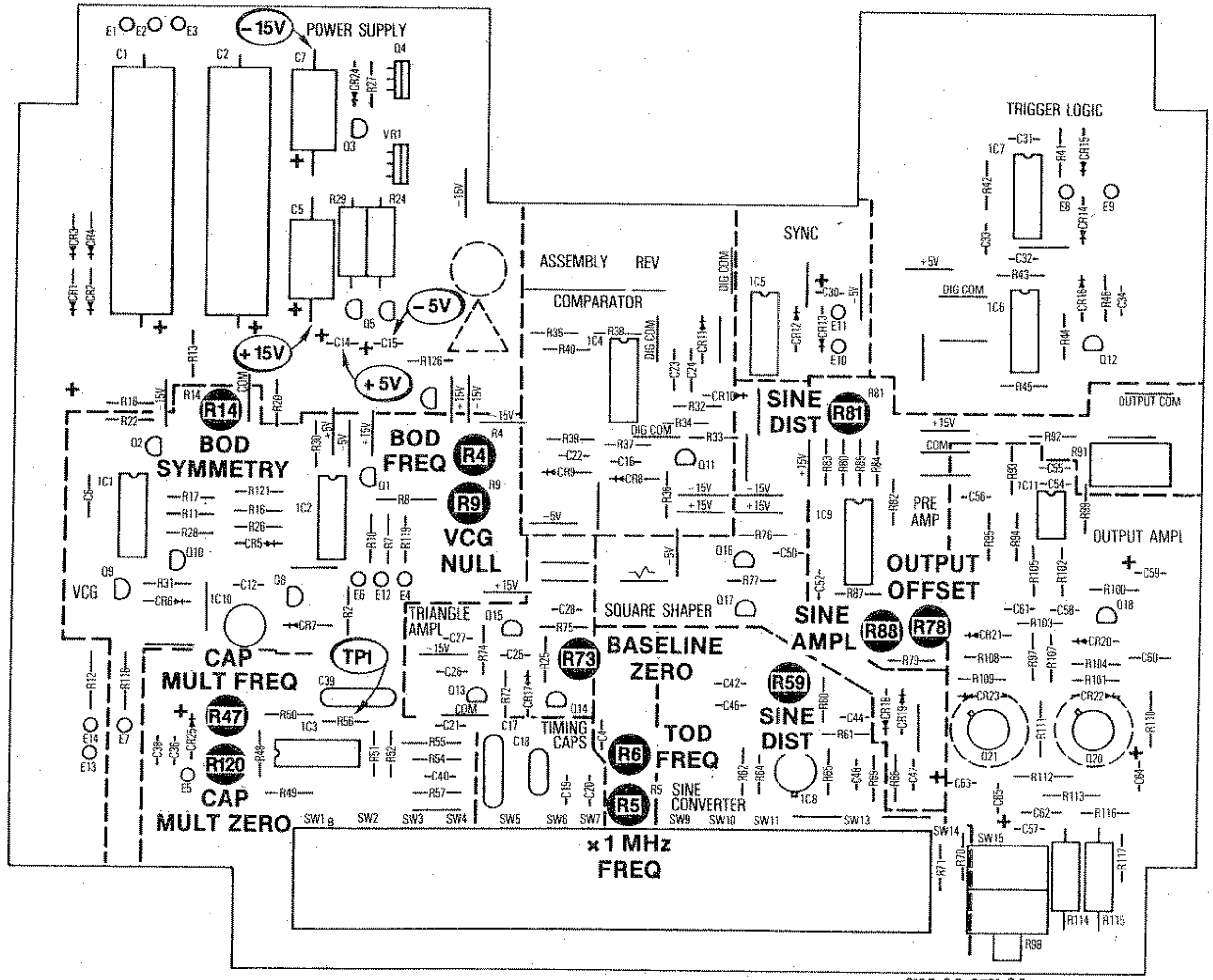


Figure 5-1. Alignment Point Location

0100-00-0731-2 E

SECTION 6
TROUBLESHOOTING

6.1 FACTORY REPAIR

Wavetek maintains a factory repair department for those customers not possessing the necessary personnel or test equipment to maintain the instrument. If an instrument is returned to the factory for alignment or repair, a detailed description of the specific problem should be attached to minimize turnaround time.

6.2 TROUBLESHOOTING TABLES

Table 6-1 gives an index of the troubleshooting tables by indications of common problems. The tables do not cover every possible trouble, but, when used in conjunction with circuit descriptions and schematics, will be an aid in systematically isolating faulty components.

6.3 TROUBLESHOOTING INDIVIDUAL COMPONENTS

6.3.1 Transistor

1. A transistor is defective if more than one volt is measured across its base-emitter junction in the forward direction.

2. A transistor when used as a switch may have a few volts reverse bias voltage across base-emitter junction.

3. If the collector and emitter voltages are the same, but the base emitter voltage is less than 500 mV forward voltage (or reversed bias), the transistor is defective.

4. A transistor is defective if its base current is larger than 10% of its emitter current (calculate currents from voltage across the base and emitter series resistors).

5. In a transistor differential pair (common emitter stages), either their base voltages are the same in normal operating condition, or the one with less forward voltage across its base emitter junction should be off (no collector current); otherwise, one of the transistors is defective.

6.3.2 Diode

A diode (except a zener) is defective if there is greater than one volt (typically 0.7 volt) forward voltage across it.

6.3.3 Operational Amplifier

1. The "+" and "−" inputs of an operational amplifier will have less than 15 mV voltage difference when operating under normal conditions.

2. When the output of the amplifier is connected to the "−" input (voltage follower connection), the output should be the same voltage as the "+" input voltage; otherwise, the operational amplifier is defective.

3. If the output voltage stays at maximum positive, the "+" input voltage should be more positive than the "−" input voltage, or vice versa; otherwise, the operational amplifier is defective.

6.3.4 FET Transistor

1. No gate current should be drawn by the gate of an FET transistor. If so, the transistor is defective.

2. The gate-to-source voltage is always reverse biased under a normal operating condition; e.g., the source voltage is more positive than the gate voltage for 2N5485, and the source voltage is more negative than gate voltage for a 2N5462. Otherwise, the FET is defective.

3. If the device supplying gate voltage to an FET saturates, the FET has too large a Vgs (pinch off) for the circuit and should be replaced.

6.3.5 Capacitor

1. Shorted capacitors have zero volts across their terminals.

2. Opened capacitor can be located (but not always) by using a good capacitor connected in parallel with the capacitor under test and observing the resulting effect.

6.4 GENERAL INSTRUCTIONS

When encountering a problem, it is advisable to return as many of the front panel controls as possible to their initial settings and still retain the problem. The troubleshooting tables in this section generally begin at these initial settings and specify all subsequent setups. Preset the front panel controls as follows.

Control	Position
Frequency Dial	2.0
POWER	ON
FREQ MULT (Hz)	1K
FUNCTION	⊓⊔
DC OFFSET	OFF
AMPLITUDE	MAX

CAUTION

To prevent damage to components, turn unit off while removing or replacing components, connectors or pc boards.

The suspected malfunctioning condition should be double checked to eliminate the possibility of improper settings or connections. Before attempting fault isolation, the unit should be checked for proper line voltage selection (refer to Section 2). A good visual inspection of the boards and chassis wires for damage or overheating often saves much time.

Once the malfunction is defined, begin the isolation procedure by selecting an indication in table 6-1 which best describes the malfunction and proceed to the referenced troubleshooting table.

Follow through the checks in the troubleshooting table, using schematics and assemblies as a guide. When positive results are not obtained, perform the indicated corrective procedure.

Table 6-1. Fault Isolation

Indication	Table
1. Fuse blown, no power indication or no outputs.	6-2
2. Function outputs missing or clipped when TTL sync OK. Triangle problem.	6-3
3. Sine waveform problem.	6-4
4. Square waveform problem.	6-5
5. TTL sync output problem.	6-6
6. Generator frequency does not respond correctly to dial and VCG input.	6-7
7. Waveform symmetry problem.	6-8
8. Problem on bottom three ranges only.	6-9
9. Generator trigger and gate mode problem.	6-10

Table 6-2. Power Supplies and Generator Loop

Indication: Fuse blown, no power indication or no outputs.

Check	If Faulty, Check
1. Set all controls in their initial positions (refer to paragraph 6.4).	
2. Ensure line voltage matches instrument configuration (refer to Section 2). Check fuse.	Replace fuse; check for normal operation.
3. Check C1 (+) and C2 (−) for ±20 to 26V unregulated dc.	a. CR1 - CR4. b. C1, C2. c. SW1. d. T1, RV1, F1 (bracket assembly).
4. Check indicator lamp.	DS1 and E13, E14 wiring.
5. Check C5 (+) for +15 Vdc.	a. VR1. b. Excessive loading; use board jumpers to isolate cause.
6. Check C7 (−) for −15 Vdc.	a. Q4. b. IC1, Q3. c. Excessive loading; use board jumpers to isolate cause.

Table 6-2. Power Supplies and Generator Loop (Continued)

Indication: Fuse blown, no power indication or no outputs.

Check	If Faulty, Check
7. Check IC4 pin 14 for +5 Vdc and IC4 pin 13 for −5 Vdc.	a. Q5, Q6, IC2. b. Excessive loading; use board jumpers to isolate cause.
8. Check IC2 pin 6 for a dc shift from approximately +3 to +8.5V as the frequency dial is rotated from 2.0 to .002. Check IC1 pin 9 for a dc shift from −3 to −8.5V as the dial is rotated from 2.0 to .002.	Go to table 6-7.
9. Check anode CR7 for approximately +3.5 Vdc.	Go to table 6-10.
10. If emitter Q15 has a 2 kHz, ±1.25V triangle, go to table 6-3.	
11. Check for the same voltage at the gate of Q13 as at the emitter of Q15, within saturation limits of the amplifier.	Q13 - Q15 and associated circuitry.
12. If the voltage at the emitter of Q15 is ≥ +1.25V, check cathode CR11 for approximately −2.5V. If the voltage at the emitter of Q15 is ≤ −1.25V, check cathode CR11 for approximately +2.5V.	IC4, Q11 and associated circuitry.
13. Check IC10.	

Table 6-3. Output Circuits

Indication: Function outputs missing or clipped when TTL sync output OK. Problem with triangle waveform.

Check	If Faulty, Check
1. Set controls to initial positions (refer to paragraph 6.4).	Check for normal operation.
2. Check emitter Q15 for a 2 kHz, ±1.25V triangle.	Go to table 6-2.
3. Select triangle function, rotate AMPLITUDE ccw, and check IC9 pin 10 for a ±1.25V triangle.	a. R78, R81 adjustments. b. IC9. c. SW13.
4. Rotate AMPLITUDE cw (MAX), DC OFFSET to OFF, and check 50Ω OUT (HI) for a 20V p-p (open circuit) triangle.	a. Output amplifier circuit. b. E15, E16 wiring.
5. Check for excessive discontinuities at the triangle peaks near the bottom of a frequency range (other than ×1 to ×100).	a. IC10. b. SQR signal at cathode CR11 not ±2.5V.
6. Check for nonlinearities in the triangle slopes near the bottom of a frequency range (other than ×1 to ×100).	a. Associated timing capacitor or C21. b. IC10, CR7. c. Q13, Q14.
7. Check for a waveform symmetry problem.	Go to table 6-8.

Table 6-4. Sine Conversion

Indication: Sine waveform problem.

Check	If Faulty, Check
1. Set controls to initial positions (refer to paragraph 6.4).	Check for normal operation.
2. Check emitter Q15 for a 2 kHz, ±1.25V triangle.	Go to table 6-2.
3. Verify that the ±1.25V triangle peaks at the emitter of Q15 agree within 3%.	a. R36, R37, R39, R40. b. CR8, CR9, IC4. c. ±15V supplies.
4. Select triangle function; check for ±1.25V triangle at IC9 pin 10.	Go to table 6-3, step 3.
5. Select sine function; check for ±1.25V sine at IC9 pin 10.	a. IC8 circuitry. b. SW12.
6. Check sine distortion 50Ω OUT (HI) per calibration procedure (refer to table 5.1).	a. R59, R81 adjustments. b. Waveform symmetry, R14 adjustment and table 6-8. c. IC8 circuitry.
7. Check sine amplitude vs frequency per specifications (refer to section 1).	C42, C44, C52, C56.

Table 6-5. Square Function

Indication: Square waveform problem.

Check	If Faulty, Check
1. Set controls to initial positions (refer to paragraph 6.4).	Check for normal operation.
2. Check CR11 cathode for a 2 kHz, approximately ±2V square wave.	Go to table 6-2.
3. Select a triangle function; check IC9 pin 10 for a ±1.25V triangle.	Go to table 6-3.
4. Select square function; check IC9 pin 10 for a ±1.25V square.	a. Q16, Q17 circuitry. b. SW14.
5. Check square wave at 50Ω OUT (HI) for the same 20V p-p (open circuit) amplitude as the triangle and sine.	R68, R76, R77.
6. Check rise/fall times of 2 MHz square (50Ω terminated) for <75 ns.	C47, C52, C56.

Table 6-6. TTL Sync Output

Indication: TTL sync output problem.

Check	If Faulty, Check
1. Set controls to initial positions (refer to paragraph 6.4).	Check for normal operation.
2. Check IC5 pin 1 for a TTL level, 2 kHz square.	Go to table 6-2.
3. Check IC5 pin 8 for a TTL level, 2 kHz square.	a. IC5. b. CR12, CR13.
4. Check SYNC OUT TTL.	E10, E19 wiring.
5. Check SYNC OUT waveform at 2 MHz, using a TTL load termination or a ≥600Ω resistive termination and ≤3 foot RG58U coax.	a. IC5. b. E19 ground connection.

Table 6-7. VCG Circuit

Indication: Generator frequency does not respond correctly to dial and VCG input.

Check	If Faulty, Check
1. Set controls to initial positions (refer to paragraph 6.4).	Check for normal operation.
2. Check for approximately +9V at IC2 pin 10.	a. E5 - E7. b. CR25. c. Dial potentiometer.
3. Check for the same voltage at IC2 pin 8 and at the junction of R6 and C4.	a. IC2. b. SW8-B.
4. Check for 0V ±5 mV at IC2 pin 13.	a. R9 adjustment. b. IC2. c. Q1, R11, CR6.
5. Ensure that as the dial is rotated to .002, the voltage at IC2 pin 14 does not saturate at near +15V and stop varying with the dial.	Q1.
6. Check that as the dial is rotated from 2.0 to .002, IC1 pins 12 and 13 vary from approximately −3 to −8.5V.	a. IC1, Q2. b. CR5, CR6. c. R16, R17.
7. Ensure that as the dial is rotated from 2.0 to .002, the voltage at IC1 pin 14 does not saturate at near −15V and stop varying with the dial.	Q2.
8. Check that as the dial is rotated from 2.0 to .002, IC1 pins 9 and 10 vary from approximately −3 to −8.5V.	a. IC1, Q10. b. R28. c. IC10, Q11 circuit.
9. Ensure that as the dial is rotated from 2.0 to .002, the voltage at IC1 pin 8 does not saturate at near −15V and stop varying with the dial.	Q10.
10. Check that as the dial is rotated from 2.0 to .002, IC2 pins 5 and 6 vary from approximately +3 to +8.5V.	a. IC2, Q8. b. R26. c. IC10, Q11 circuit.
11. Ensure that as the dial is rotated from 2.0 to .002, the voltage at IC2 pin 7 does not saturate at near +15V and stop varying with the dial.	Q8.
12. Check for nonlinearity in the ±1.25V triangle at the emitter of Q15 near the bottom of the ×1K through ×1M ranges.	a. Associated timing capacitors or C21. b. IC10, CR7. c. Q13, Q14.
13. Check frequencies of ×1K, ×10K and ×100K ranges.	a. R6 adjustment. b. C17-C19 (trimmed by C20).
14. Check frequency and linearity of ×1M range.	a. R5 adjustment. b. C21 (nominal value). c. C16, C22 trims.
15. Check frequencies of ×1, ×10, ×100 ranges.	R47 adjustment and table 6-9.

Table 6-8. Symmetry

Indication: Waveform symmetry problem.

Check	If Faulty, Check
1. Set controls to initial positions (refer to paragraph 6.4).	Check for normal operation.
2. If symmetry problem appears on ×1, ×10, ×100 ranges only, problem may be R120 adjustment or go to table 6-9.	
3. Perform steps 5 through 12 of table 6-7, then return to this table.	a. R14 adjustment. b. R16, R17, R26, R28 matching.
4. Verify RUN signal at cathode CR7 is approximately +3.5V.	Go to table 6-10.
5. Verify IC1 pin 6 varies from approximately −3 to −8.5V as dial is rotated from 2.0 to .002.	IC1, Q9, R31.
6. Verify amplitude of SQR signal at cathode CR11 is approximately ±2V.	a. Q11 circuit. b. IC4 circuit. c. +5V supply.
7. Check IC10, CR7.	

Table 6-9. Capacitance Multiplier

Indication: Problem on bottom frequency ranges only.

Check	If Faulty, Check
1. Set controls to initial positions (refer to paragraph 6.4).	Check for normal operation on ×1K range.
2. Check for 0 Vdc at IC3 pins 2 and 6.	SW2 - SW4.
3. Check for approximately 0 Vdc at IC3 pin 12.	IC3 circuitry.
4. Check for 0 Vdc ±5 mV at IC3 pin 10.	a. R120 adjustment. b. IC3 circuitry.
5. Select ×100 range; check IC3 pin 10 for heavy oscillations.	C40, IC3.
6. Check that the signal at IC3 pin 2 is amplified by approximately 6 at pin 12 (within saturation limits).	IC3 circuitry.
7. Check for the same signal at IC3 pins 6 and 7 as at the emitter of Q15.	SW4, IC3 circuitry.
8. Ensure that R54 and R55 are shorted in the ×100 range.	SW4.
9. Check 200 Hz frequency (2.0×100).	a. R47 adjustment. b. R52, R57, C39.
10. Check 20 Hz frequency (2.0×10).	R54, SW3.
11. Check 2 Hz frequency (2.0×1).	R55.
12. Check symmetry at 0.1×100; ensure triangle is linear.	a. R120 adjustment. b. IC3. c. Leaky C17, C21, C39, C40, CR7, IC10, Q13.

Table 6-10. Trigger Logic

Indication: Generator trigger and gate mode problems.

Check	If Faulty, Check
1. Set controls to initial positions (refer to paragraph 6.4).	Check for normal continuous operation.
2. If generator operates normally in continuous mode, go to step 7.	
3. Check for 0V at IC7 pins 2 and 5.	SW9.
4. Check for a TTL low at IC6 pin 10.	IC7, +5V supply.
5. Check for +5V at IC6 pin 9.	a. IC6. b. CR7, CR16, Q12. c. Q9.
6. Check for approximately +3.5V at anode CR7. Check for normal continuous mode operation.	a. CR7, Q9, Q12. b. Go to table 6-2.
7. Check that IC1 pin 6 varies from approximately −3 to −8.5V as dial is rotated from 2.0 to .002.	a. IC1, Q9, R31. b. Go to table 6-7.
8. Go to gated mode (CONT depressed, TRIG/GATE released). Check IC7 pin 2 for a TTL high.	a. IC6. b. SW9, SW11, +5V supply.
9. Check IC7 pin 1 for a TTL high.	a. IC7. b. R41, −5V supply.
10. Check IC6 pin 10 for a TTL high.	a. IC7. b. IC6.
11. Check IC6 pin 9 for TTL low.	a. IC6. b. Q12.
12. Check anode CR7 for approximately −1.5V.	a. CR16, Q12, R46. b. CR7.
13. Check cathode CR7 for approximately −0.7V.	a. IC10. b. Q9.
14. Check emitter Q15 for 0 Vdc ±100 mV.	a. R73 adjustment. b. Q13 - Q15 circuitry.
15. Connect an external TTL signal to TRIG IN connector; check for the inverse of that signal at IC6 pin 10.	a. E8, E9. b. CR14, CR15. c. IC7, SW10.
16. Depress TRIG/GATE switch and check for an approximate 20 ns negative pulse at IC6 pin 10 following the low-to-high transition of the external signal (increasing the frequency of the external generator makes this pulse more visible).	a. IC7, SW10. b. C33.
17. Remove the external signal and verify that IC6 pin 5 goes from high to low when the MAN TRIG switch is held depressed.	a. SW11. b. IC6.
18. Release the TRIG/GATE switch (gated) and check that IC6 pin 10 goes from high to low when the MAN TRIG switch is pressed.	SW9.
19. Monitor 50Ω OUT, triangle function, for 0 Vdc baseline.	R73, R78 adjustments.
20. Depress MAN TRIG switch and check 50Ω OUT for a continuous triangle while the switch is held. Depress TRIG/GATE switch (triggered) and verify a single cycle output each time the MAN TRIG switch is depressed.	a. IC6 or clock signal to IC6 from IC4. b. C33 (pulse too narrow).

SECTION 7
PARTS AND SCHEMATICS

7.1 DRAWINGS

The following assembly drawings (with parts lists) and schematics are in the arrangement shown below.

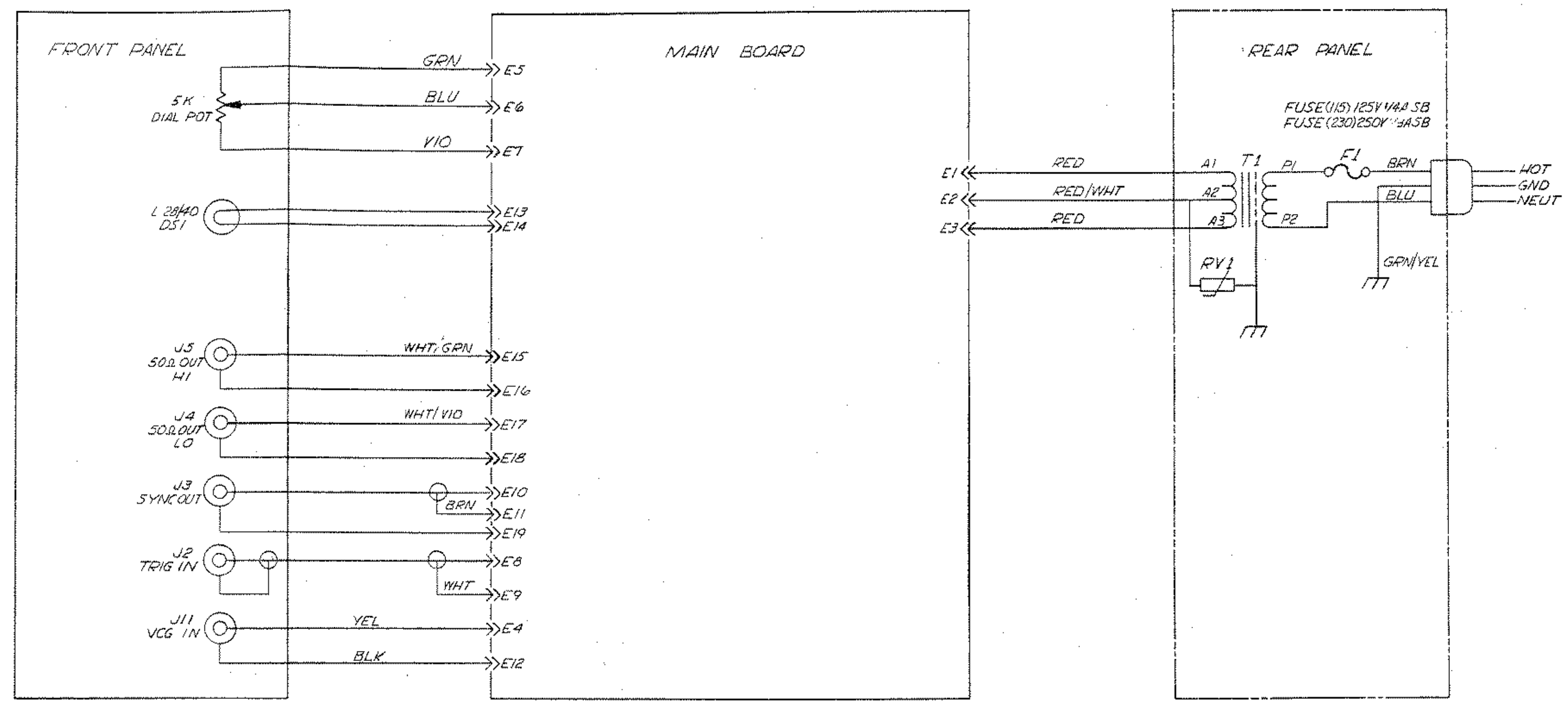
7.2 ORDERING PARTS

When ordering spare parts, please specify part number, circuit reference, board, serial number of unit, and, if applicable, the function performed.

7.3 ADDENDA

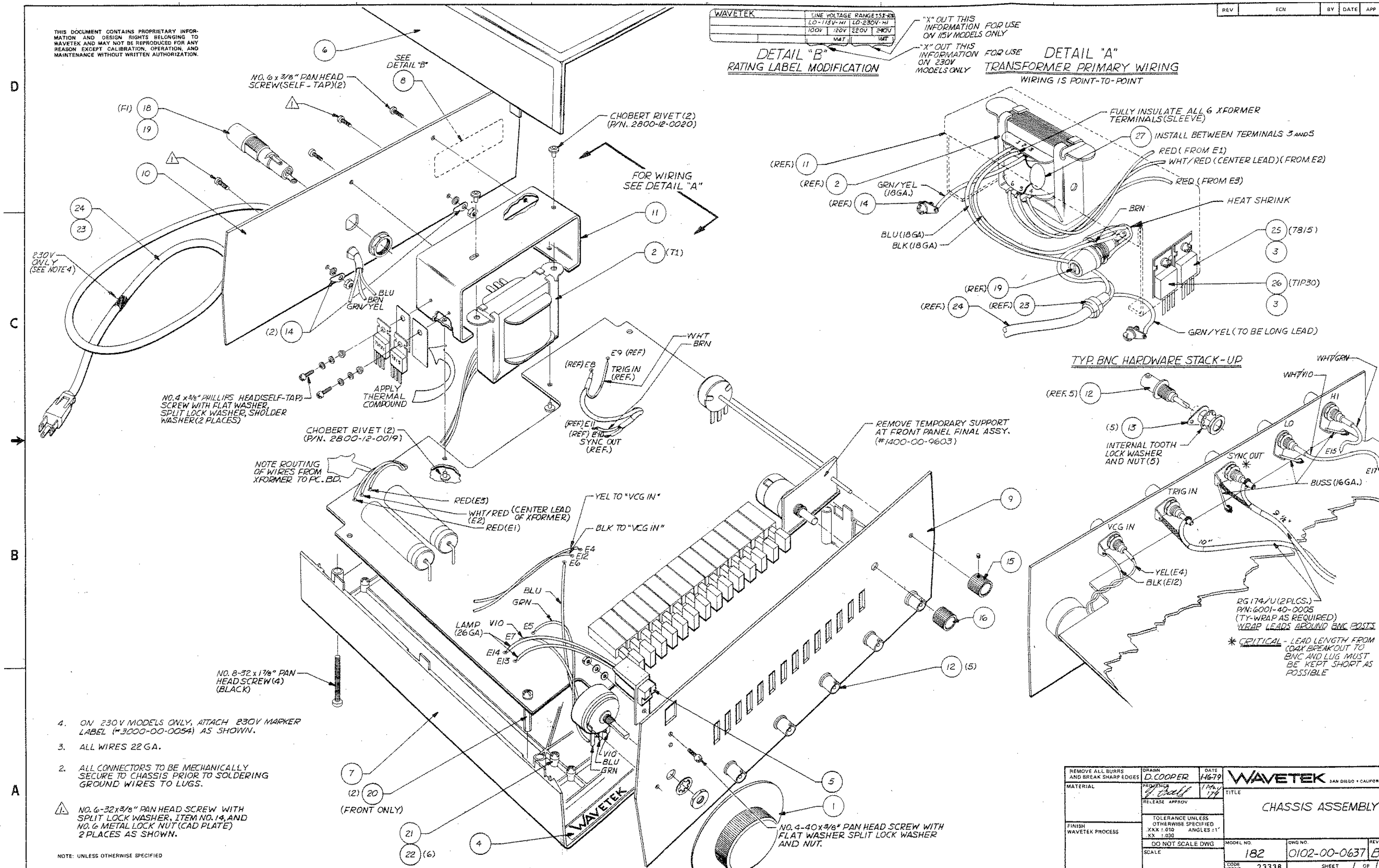
Under Wavetek's product improvement program, the latest electronic designs and circuits are incorporated into each Wavetek instrument as quickly as development and testing permit. Because of the time needed to compose and print instruction manuals, it is not always possible to include the most recent changes in the initial printing. Whenever this occurs, addendum pages are prepared to summarize the changes made and are inserted immediately inside the rear cover. If no such pages exist, the manual is correct as printed.

Drawing	**Drawing No.**
Instrument Schematic	0004-00-0148
Chassis Assembly	0102-00-0637
Chassis Parts List	1101-00-0637
Main Board Schematic	0103-00-0731
Main Board Assembly	0101-00-0731
Main Board Parts List	1100-00-0731



NOTE: UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN RO FIFER	DATE 1-30-79	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR	1 May 79	TITLE SCHEMATIC, INSTRUMENT
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED .XXX ±.010 .XX ±.020 ANGLES ±1°		
	DO NOT SCALE DWG		MODEL NO. 182 / DWG NO. 0004-00-0148 / REV A
	SCALE		CODE IDENT 23338 / SHEET 1 OF 1


THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION AND DESIGN RIGHTS BELONGING TO WAVETEK AND MAY NOT BE REPRODUCED FOR ANY REASON EXCEPT CALIBRATION, OPERATION, AND MAINTENANCE WITHOUT WRITTEN AUTHORIZATION.
DETAIL "B" RATING LABEL MODIFICATION
"X" OUT THIS INFORMATION FOR USE ON 115V MODELS ONLY
"X" OUT THIS INFORMATION FOR USE ON 230V MODELS ONLY
DETAIL "A" TRANSFORMER PRIMARY WIRING
WIRING IS POINT-TO-POINT
FULLY INSULATE ALL 6 XFORMER TERMINALS(SLEEVE)
INSTALL BETWEEN TERMINALS 3 AND 5
RED (FROM E1)
WHT/RED (CENTER LEAD)(FROM E2)
RED (FROM E3)
HEAT SHRINK
GRN/YEL (TO BE LONG LEAD)
TYP. BNC HARDWARE STACK-UP
INTERNAL TOOTH LOCK WASHER AND NUT(5)
CHOBERT RIVET (2) (P/N. 2800-12-0020)
FOR WIRING SEE DETAIL "A"
NO. 6 x 3/8" PAN HEAD SCREW(SELF-TAP)(2)
SEE DETAIL "B"
230V ONLY (SEE NOTE 4)
NO.4 x 3/8" PHILLIPS HEAD(SELF-TAP) SCREW WITH FLAT WASHER, SPLIT LOCK WASHER, SHOLDER WASHER(2 PLACES)
APPLY THERMAL COMPOUND
CHOBERT RIVET (2) (P/N. 2800-12-0019)
NOTE ROUTING OF WIRES FROM XFORMER TO PC. BD.
REMOVE TEMPORARY SUPPORT AT FRONT PANEL FINAL ASSY. (#1400-00-9603)
YEL TO "VCG IN"
BLK TO "VCG IN"
NO. 8-32 x 1 7/8" PAN HEAD SCREW(4) (BLACK)
NO. 4-40 x 3/8" PAN HEAD SCREW WITH FLAT WASHER SPLIT LOCK WASHER AND NUT.
RG 174/U(2PLCS.) P/N:6001-40-0005 (TY-WRAP AS REQUIRED) WRAP LEADS AROUND BNC POSTS
* CRITICAL - LEAD LENGTH FROM COAX BREAKOUT TO BNC AND LUG MUST BE KEPT SHORT AS POSSIBLE
4. ON 230V MODELS ONLY, ATTACH 230V MARKER LABEL (#3000-00-0054) AS SHOWN.
3. ALL WIRES 22 GA.
2. ALL CONNECTORS TO BE MECHANICALLY SECURE TO CHASSIS PRIOR TO SOLDERING GROUND WIRES TO LUGS.
1. NO. 6-32x3/8" PAN HEAD SCREW WITH SPLIT LOCK WASHER, ITEM NO. 14, AND NO. 6 METAL LOCK NUT(CAD PLATE) 2 PLACES AS SHOWN.
NOTE: UNLESS OTHERWISE SPECIFIED
WAVETEK SAN DIEGO • CALIFORNIA
CHASSIS ASSEMBLY
DRAWN D.COOPER
MODEL NO. 182
DWG NO. 0102-00-0637 REV B
CODE IDENT 23338
SHEET 1 OF 1

REV	ECN	BY	DATE	APP

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	ASSY DRWG,CHASSIS	0102-00-0637	WVTK	0102-00-0637	1
1	DIAL ASSY	180-027	WVTK	1201-00-0027	1
2	TRANSFORMER	1204-00-0027	WVTK	1204-00-0027	1
3	INSULATOR,MICA	142-311	WVTK	1400-00-2080	2
4	PLATE,NAME	139-305	WVTK	1400-00-2180	1
5	INDICATOR,DIAL	180-303	WVTK	1400-00-4970	1
6	COVER,TOP	180-300-1	WVTK	1400-00-5000	1
7	COVER,BUTTOM	180-300-2	WVTK	1400-00-5030	1
8	I.D. LABEL	1400-00-9110	WVTK	1400-00-9110	1
9	FRONT PANEL	1400-00-9450	WVTK	1400-00-9450	1
10	REAR PANEL	1400-00-9463	WVTK	1400-00-9463	1
11	BRACKET,AC SHIELD	1400-00-9473	WVTK	1400-00-9473	1
12	BNC CONN	KC-7946	KING	2100-01-0002	5
13	SOLDER LUG	1497	SMITH	2100-04-0012	5
14	SOLDER LUG	1485-6	SMITH	2100-04-0025	2
15	KNOB,SMALL	0-M-9	HOGAN	2400-01-0010	1
16	KNOB,1/4"BUSHING	RE-67-0-M-9	HOGAN	2400-01-0017	1
18	FUSE,125V,1/4A,SB	313.250	LITFU	2400-05-0008	1

WAVETEK PARTS LIST — TITLE: CHASSIS — ASSEMBLY NO. 1101-00-0637 — PAGE: 1 — REV B

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	ASSY DRWG,CHASSIS	0102-00-0637	WVTK	0102-00-0637	1
1	DIAL ASSY	180-027	WVTK	1201-00-0027	1
NONE	TRANSFORMER	182(230V)-0031	WVTK	1204-00-0031	1
3	INSULATOR,MICA	142-311	WVTK	1400-00-2080	2
4	PLATE,NAME	139-305	WVTK	1400-00-2180	1
5	INDICATOR,DIAL	180-303	WVTK	1400-00-4970	1
6	COVER,TOP	180-300-1	WVTK	1400-00-5000	1
7	COVER,BUTTOM	180-300-2	WVTK	1400-00-5030	1
8	I.D. LABEL	1400-00-9110	WVTK	1400-00-9110	1
9	FRONT PANEL	1400-00-9450	WVTK	1400-00-9450	1
10	REAR PANEL	1400-00-9463	WVTK	1400-00-9463	1
11	BRACKET,AC SHIELD	1400-00-9473	WVTK	1400-00-9473	1
12	BNC CONN	KC-7946	KING	2100-01-0002	5
13	SOLDER LUG	1497	SMITH	2100-04-0012	5
14	SOLDER LUG	1485-6	SMITH	2100-04-0025	2
15	KNOB,SMALL	0-M-9	HOGAN	2400-01-0010	1
16	KNOB,1/4"BUSHING	RB-67-0-M-9	HOGAN	2400-01-0017	1
18	FUSE,250V,1/8A,SB	MDL 1/8	BUSMN	2400-05-0001	1

WAVETEK PARTS LIST — TITLE: CHASSIS(230V) — ASSEMBLY NO. 1101-00-0749 — PAGE: 1 — REV

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
19	FUSE HOLD	031.1653/031.1666	SCHUR	2400-05-0012	1
20	STANDOFF,MALE/FEMALE .875 H,.250 HEX,4-40	1447-N03-F05-440	UNICP	2800-02-0027	2
21	BAIL ASSY W/FT	180-500	WVTK	2600-08-0010	1
22	SPEEDNUT,SELF RETAIN	C7494-632-4	TINN	2800-09-0003	6
23	STRAIN RELIEF BUSH	SR6W-1	HEYCO	2800-37-0003	1
27	VARISTOR	V562A8	GE	4799-00-0048	1
26	TRANS	TIP-30	TI	4902-00-0300	1
24	PWR CORD	0-7789-008-GY	PACRD	6001-80-0004	1
25	IC	MC78M15CT	MOT	8000-78-1500	1

WAVETEK PARTS LIST — TITLE: CHASSIS — ASSEMBLY NO. 1101-00-0637 — PAGE: 2 — REV B

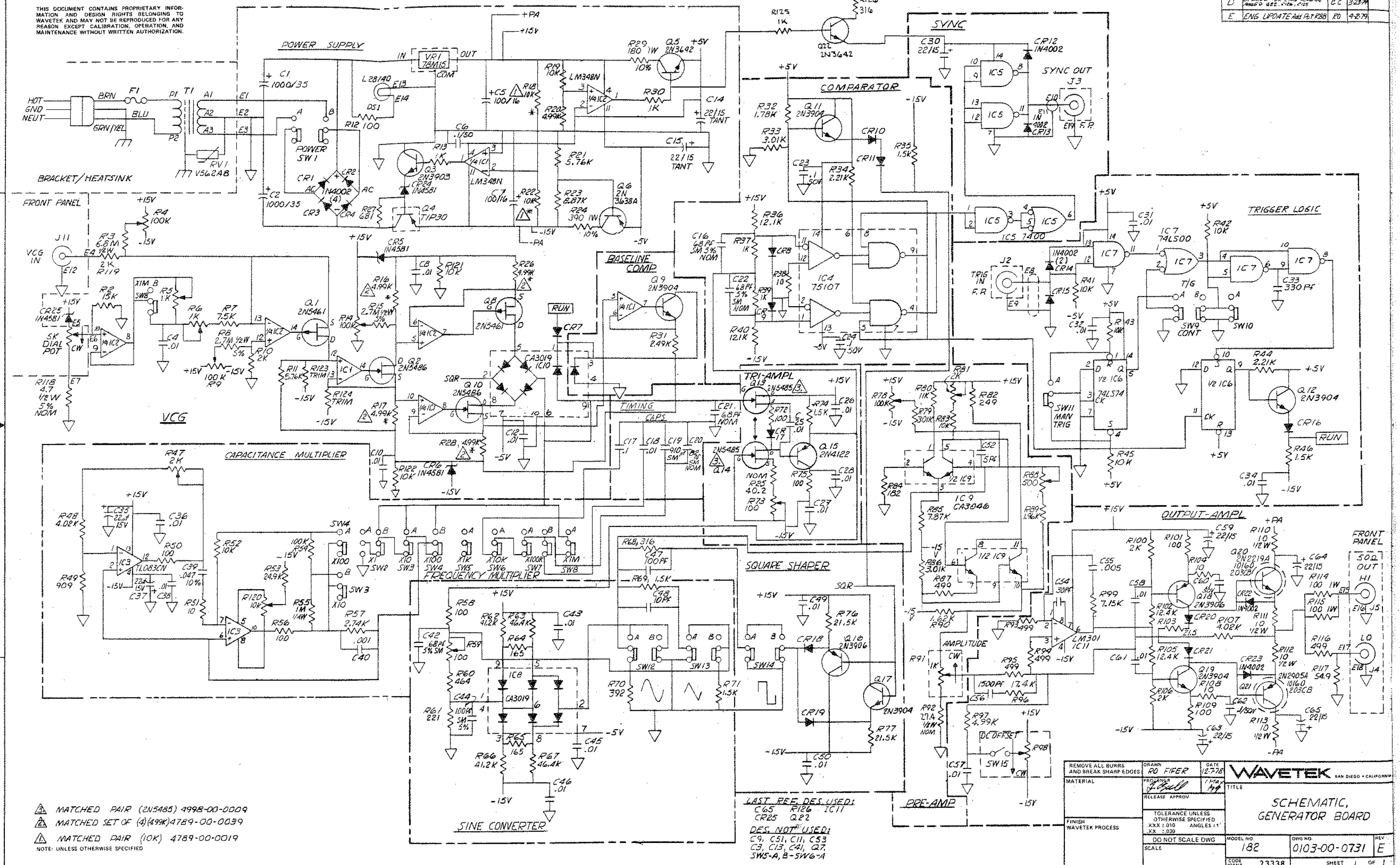
REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
19	FUSE HOLD	031.1653/031.1666	SCHUR	2400-05-0012	1
20	STANDOFF,MALE/FEMALE .875 H,.250 HEX,4-40	1447-N03-F05-440	UNICP	2800-02-0027	2
21	BAIL ASSY W/FT	180-500	WVTK	2600-08-0010	1
22	SPEEDNUT,SELF RETAIN	C7494-632-4	TINN	2800-09-0003	6
23	STRAIN RELIEF BUSH	SR6W-1	HEYCO	2800-37-0003	1
27	VARISTOR	V562A8	GE	4799-00-0048	1
26	TRANS	TIP-30	TI	4902-00-0300	1
24	PWR CORD	0-7789-008-GY	PACRD	6001-80-0004	1
25	IC	MC78M15CT	MOT	8000-78-1500	1

WAVETEK PARTS LIST — TITLE: CHASSIS(230V) — ASSEMBLY NO. 1101-00-0749 — PAGE: 2 — REV

NOTE: UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES
MATERIAL
FINISH WAVETEK PROCESS
DRAWN | DATE
PROJ ENGR
RELEASE APPROV
TOLERANCE UNLESS OTHERWISE SPECIFIED .XXX ±.010 ANGLES ±1° .XX ±.030
DO NOT SCALE DWG
SCALE

WAVETEK SAN DIEGO • CALIFORNIA
TITLE: PARTS LIST CHASSIS
MODEL NO. 182 | DWG NO. 1101-00-0637 | REV B
CODE IDENT 23338 | SHEET OF



REV	ECN	BY	DATE	APP
D	UPDATED PER ENG. ZENAME ADDED Q22, R126, R125	CC	3-23-79	
E	ENG UPDATE Add Pot R98	RO	4-2-79	

⚠2 MATCHED PAIR (2N5485) 4998-00-0009

⚠3 MATCHED SET OF (4)(499K) 4789-00-0039

⚠1 MATCHED PAIR (10K) 4789-00-0019

NOTE: UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES

DRAWN RO FIFER DATE 12-7-78

MATERIAL

FINISH WAVETEK PROCESS

TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ±.010 XX ±.030 ANGLES ±1°

DO NOT SCALE DWG

WAVETEK SAN DIEGO • CALIFORNIA

TITLE SCHEMATIC, GENERATOR BOARD

MODEL NO. 182 | DWG NO. 0103-00-0731 | REV E

CODE IDENT 23338 | SHEET 1 OF 1

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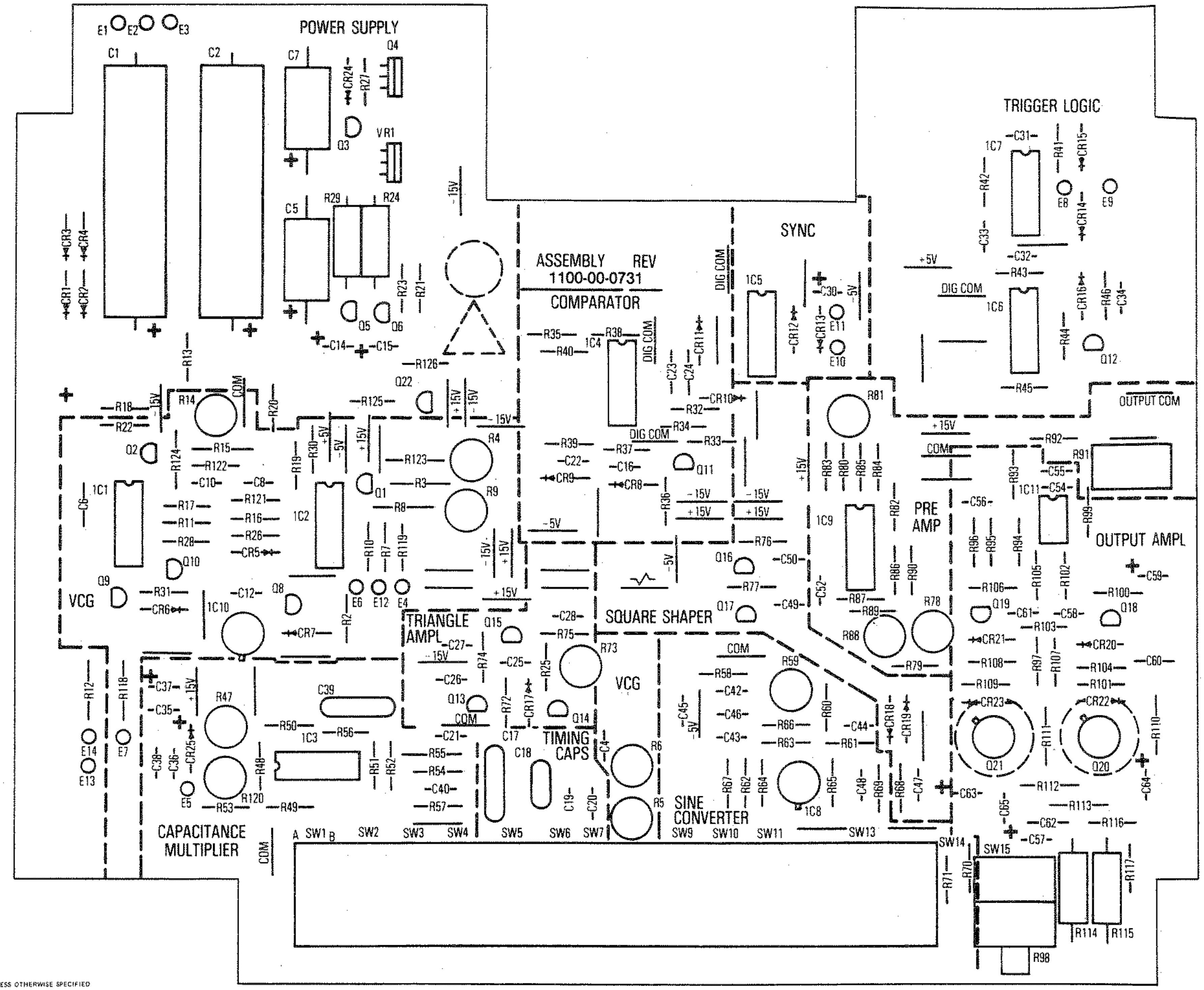

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REMOVE ALL BURRS AND BREAK SHARP EDGES	
MATERIAL	
FINISH WAVETEK PROCESS	
TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ±.010 XX ±.030 ANGLES ±1°	
DO NOT SCALE DWG	
WAVETEK SAN DIEGO • CALIFORNIA	
TITLE	ASSEMBLY MAIN BOARD
MODEL NO.	182
DWG NO.	0101-00-0731
REV	E
CODE IDENT	23338

REV	ECN	BY	DATE	APP

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	ASSY DRWG,MAINBOARD	0101-00-0731	WVTK	0101-00-0731	1
NONE	SCHEMATIC,MAINBOARD	0103-00-0731	WVTK	0103-00-0731	1
C52	CAP,CER,5PF,1KV	DC-050	CRL	1500-00-5011	1
C48	CAP,CER,10PF,1KV	DC-100	CRL	1500-01-0011	1
C47	CAP,CER,100PF,1KV	DC-101	CRL	1500-01-0111	1
C40	CAP,CER,.001MF,1KV	DC-102	ARCO	1500-01-0211	1
C10 C12 C25 C26 C27 C28 C31 C32 C34 C36 C38 C4 C43 C45 C46 C49 C50 C57 C58 C61 C8	CAP,CER,.01MF,50V	CK-103	CRL	1500-01-0310	21
C23 C24 C6 C60 C62	CAP,CER,.1MF,50V	CK-104	CRL	1500-01-0410	5
C56	CAP,CER,.0015MF,1KV	DC-152 LONG LEAD	ARCO	1500-01-5201	1
C54	CAP,CER,30PF,1KV	DD-300	CRL	1500-03-0001	1
C33	CAP,CER,330PF,1KV	DD-331	ARCO	1500-03-3111	1
C55	CAP,CER,.005MF,50V	CK-502	CRL	1500-05-0210	1
C44	CAP,MICA,100PF,500V	DM15-101J	ARCO	1500-11-0100	1
C16 C21T C22 C42	CAP,MICA,68PF,500V	DM15-680J	ARCO	1500-16-8000	4
C20T	CAP,MICA,82PF,500V	DM15-820J	ARCO	1500-18-2000	1
C19	CAP,910PF,100V,1%	DM15-911F	ARCO	1500-19-1101	1

WAVETEK PARTS LIST — TITLE: PCA,MAINBOARD — ASSEMBLY NO. 1100-00-0731 — PAGE: 1 — REV 0

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
R91	POT,CONT,1K FROM#4600-01-0207	4609-71-0201	WVTK	4609-71-0201	1
R110 R111 R112 R113	RES,C,1/2W,5%,10	RC20GF-100	STKPL	4700-25-0100	4
R118	RES,C,1/2W,5%,4.7	RC20GF-4R7	STKPL	4700-25-0479	1
R15 R8	RES,C,1/2W,5%,2.7M	RC20GF-275	STKPL	4700-25-2704	2
R3	RES,C,1/2W,10%,6.8M	RC20GF-685	STKPL	4700-25-6804	1
R29	RES,C,1W,10%,180	RC32GF181K	AB	4700-36-1800	1
R24	RES,C,1W,10%,390	RC32GF391K	AB	4700-36-3900	1
R101 R109 R12 R50 R56 R58 R72 R75	RES,MF,1/8W,1%,100	RN55D-1000F	TRW	4701-03-1000	8
R125 R13 R30 R37 R39	RES,MF,1/8W,1%,1K	RN55D-1001F	TRW	4701-03-1001	5
R121 R122 R19 R41 R42 R43 R45 R52 R63	RES,MF,1/8W,1%,10K	RN55D-1002F	TRW	4701-03-1002	9
R54	RES,MF,1/8W,1%,100K	RN55D-1003F	TRW	4701-03-1003	1
R104 R108 R38 R51	RES,MF,1/8W,1%,10	RN55D-10R0F	TRW	4701-03-1009	4
R80	RES,MF,1/8W,1%,11K	RN55D-1102F	TRW	4701-03-1102	1
R36 R40	RES,MF,1/8W,1%,12.1K	RN55D-1212F	TRW	4701-03-1212	2
R102 R105	RES,MF,1/8W,1%,12.4K	RN55D-1242F	TRW	4701-03-1242	2
R35 R46 R69 R71 R74	RES,MF,1/8W,1%,1.5K	RN55D-1501F	TRW	4701-03-1501	5

WAVETEK PARTS LIST — TITLE: PCA,MAINBOARD — ASSEMBLY NO. 1100-00-0731 — PAGE: 3 — REV 0

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
C5 C7	CAP,ELECT,100MF,16V	500D107G016DC7	SPRAG	1500-31-0101	2
C1 C2	CAP,ELECT,1000MF,35V	39D108G035GL6	SPRAG	1500-31-0212	2
C18	CAP,MYLR,01MF-50V,1%	287P1031R5A3	SPRAG	1500-41-0303	1
C17	CAP,MYLR,.1MF,50V,1%	287P1041R5A3	SPRAG	1500-41-0403	1
C39	CAP,MYLAR,.047MF100V	225P47391WD3	SPRAG	1500-44-7314	1
C14 C15 C30 C35 C37 C59 C63 C64 C65	CAP,TANT,22MF,15V	196D226X9015KA1	SPRAG	1500-72-2601	9
1	MAINBOARD	1700-00-0731	WVTK	1700-00-0731	1
DS1	LAMP	L28/40	MURA	2400-02-0017	1
NONE	HEAT SINK	NF-207	WAKE	2800-11-0001	2
NONE	TRANSIPAD	10160	METRS	2800-11-0004	2
R59 R73	POT,TRIM,100	91AR100	BECK	4600-01-0103	2
R5 R6	POT,TRIM,1K	91AR1K	BECK	4600-01-0209	2
R120	POT,TRIM,10K	91AR10K	BECK	4600-01-0315	1
R14 R4 R78 R9	POT,TRIM,100K	91AR100K	BECK	4600-01-0402	4
R47 R81	POT,TRIM,2K	91AR2K	BECK	4600-02-0201	2
R88	POT,TRIM,500	91AR500	BECK	4600-05-0104	1
R98	POT,SWITCH,10K	GF-1879	CTS	4602-01-0300	1

WAVETEK PARTS LIST — TITLE: PCA,MAINBOARD — ASSEMBLY NO. 1100-00-0731 — PAGE: 2 — REV 0

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
R2	RES,MF,1/8W,1%,15K	RN55D-1502F	TRW	4701-03-1502	1
R90	RES,MF,1/8W,1%,1.62K	RN55D-1621F	TRW	4701-03-1621	1
R64 R65	RES,MF,1/8W,1%,165	RN55D-1650F	TRW	4701-03-1650	2
R96	RES,MF,1/8W,1%,17.4K	RN55D-1742F	TRW	4701-03-1742	1
R32	RES,MF,1/8W,1%,1.78K	RN55D-1781F	TRW	4701-03-1781	1
R84	RES,MF,1/8W,1%,182	RN55D-1820F	TRW	4701-03-1820	1
R89	RES,MF,1/8W,1%,1.96K	RN55D-1961F	TRW	4701-03-1961	1
R10 R100 R106 R119	RES,MF,1/8W,1%,2K	RN55D-2001F	TRW	4701-03-2001	4
R76 R77	RES,MF,1/8W,1%,21.5K	RN55D-2152F	TRW	4701-03-2152	2
R103	RES,MF,1/8W,1%,21.5	RN55D-21R5F	TRW	4701-03-2159	1
R61	RES,MF,1/8W,1%,221	RN55D-2210F	TRW	4701-03-2210	1
R34 R44	RES,MF,1/8W,1%,2.21K	RN55D-2211F	TRW	4701-03-2211	2
R82	RES,MF,1/8W,1%,249	RN55D-2490F	TRW	4701-03-2490	1
R31	RES,MF,1/8W,1%,2.49K	RN55D-2491F	TRW	4701-03-2491	1
R53	RES,MF,1/8W,1%,24.9K	RN55D-2492F	TRW	4701-03-2492	1
R57	RES,MF,1/8W,1%,2.74K	RN55D-2741F	TRW	4701-03-2741	1
R92T	RES,MF,1/8W,1%,27.4	RN55D-27R4F	TRW	4701-03-2749	1

WAVETEK PARTS LIST — TITLE: PCA,MAINBOARD — ASSEMBLY NO. 1100-00-0731 — PAGE: 4 — REV 0

NOTE: UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE
MATERIAL	PROJ ENGR	
	RELEASE APPROV	
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED .XXX ±.010 ANGLES ±1° .XX ±.030	
	DO NOT SCALE DWG	
	SCALE	

WAVETEK SAN DIEGO • CALIFORNIA

TITLE: PARTS LIST MAIN BOARD

MODEL NO.	DWG NO.	REV
182	1100-00-0731	D
CODE IDENT 23338	SHEET 1 OF 2	

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REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
R33 R86	RES,MF,1/8W,1%,3.01K	RN55D-3011F	TRW	4701-03-3011	2
R79	RES,MF,1/8W,1%,301K	RN55D-3013F	TRW	4701-03-3013	1
R126 R68	RES,MF,1/8W,1%,316	RN55D-3160F	TRW	4701-03-3160	2
R70	RES,MF,1/8W,1%,392	RN55D-3920F	TRW	4701-03-3920	1
R107 R48	RES,MF,1/8W,1%,4.02K	RN55D-4021F	TRW	4701-03-4021	2
R25	RES,MF,1/8W,1%,40.2	RN55D-40R2F	TRW	4701-03-4029	1
R62 R66	RES,MF,1/8W,1%,41.2K	RN55D-4122F	TRW	4701-03-4122	2
R60	RES,MF,1/8W,1%,464	RN55D-4640F	TRW	4701-03-4640	1
R63 R67	RES,MF,1/8W,1%,46.4K	RN55D-4642F	TRW	4701-03-4642	2
R116 R87 R93 R94 R95	RES,MF,1/8,1%,499	RN55D-4990F	TRW	4701-03-4990	5
R20 R97	RES,MF,1/8W,1%,4.99K	RN55D-4991F	TRW	4701-03-4991	2
R117	RES,MF,1/8W,1%,54.9	RN55D-54R9F	TRW	4701-03-5499	1
R11 R21	RES,MF,1/8W,1%,5.76K	RN55D-5761F	TRW	4701-03-5761	2
R27	RES,MF,1/8W,1%,681	RN55D-6810F	TRW	4701-03-6810	1
R99	RES,MF,1/8W,1%,7.15K	RN55D-7151F	TRW	4701-03-7151	1
R7	RES,MF,1/8W,1%,7.5K	RN55D-7501F	TRW	4701-03-7501	1
R85	RES,MF,1/8W,1%,7.87K	RN55D-7871F	TRW	4701-03-7871	1

WAVETEK PARTS LIST — TITLE: PCA,MAINBOARD — ASSEMBLY NO. 1100-00-0731 — PAGE: 5 — REV D

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
R23	RES,MF,1/8W,1%,8.87K	RN55D-8871F	TRW	4701-03-8871	1
R49	RES,MF,1/8W,1%,909	RN55D-9090F	TRW	4701-03-9090	1
R55	RES,MF,1/4W,1%,1M	RN60D-1004F	TRW	4701-13-1004	1
R114 R115	RES,MF,1W,1%,100	RN70D-1000F	TRW	4701-33-1000	2
R18 R22	RES,SET,2-10K,1/8W QTY:2:4701-03-1002	142-501-64A	WVTK	4789-00-0019	1
R16 R17 R26 R28	RES,SET,4-4.99K,1/8W QTY:4:4701-03-4991	180-500-100A	WVTK	4789-00-0039	1
CR24 CR25 CR5 CR6	DIODE	1N4581	MICRO	4801-01-4581	4
CR1 CR12 CR13 CR14 CR15 CR2 CR22 CR23 CR3 CR4	DIODE	SCE-1	SEMT	4801-02-0001	10
CR10 CR11 CR16 CR17 CR18 CR19 CR20 CR21 CR7 CR8 CR9	DIODE	FC-6666	FAIR	4807-02-6666	11
Q20	TRANS	2N2219A	NSC	4901-02-2191	1
Q21	TRANS	2N2905A	NSC	4901-02-9051	1
Q6	TRANS	2N3638A	CARTH	4901-03-6381	1
Q22 Q5	TRANS	2N3642	FAIR	4901-03-6420	2
Q3	TRANS	2N3903	NSC	4901-03-9030	1

WAVETEK PARTS LIST — TITLE: PCA,MAINBOARD — ASSEMBLY NO. 1100-00-0731 — PAGE: 6 — REV D

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
Q11 Q12 Q17 Q19 Q9	TRANS	2N3904	FAIR	4901-03-9040	5
Q16 Q18	TRANS	2N3906	FAIR	4901-03-9060	2
Q15	TRANS	2N4122	NSC	4901-04-1220	1
Q1 Q8	TRANS	2N5461	INTSL	4901-05-4610	2
Q10 Q2	TRANS	2N5486	MOT	4901-05-4860	2
Q13 Q14	TRANS,M/PR,2N5485 QTY:2:4901-05-4850	142-501-53	WVTK	4998-00-0009	1
2	SWITCH ASSY FB	5103-00-0026	WVTK	5103-00-0026	1
IC3	IC	TL083CN	TI	7000-00-8300	1
IC11	IC	LM 301AA	NSC	7000-03-0100	1
IC1 IC2	IC	LM308N	NSC	7000-03-0800	2
IC10 IC8	IC	CA-3019	FAIR	7000-30-1900	2
IC9	IC	CA-3046	RCA	7000-30-4600	1
IC4	IC	SN75107AN	TI	7007-51-0700	1
IC5	IC	7400	TI	8000-74-0000	1
IC7	IC	74LS00	TI	8000-74-0010	1
IC6	IC	74LS74	TI	8000-74-7410	1

WAVETEK PARTS LIST — TITLE: PCA,MAINBOARD — ASSEMBLY NO. 1100-00-0731 — PAGE: 7 — REV D

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MATERIAL
FINISH WAVETEK PROCESS
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SCALE

WAVETEK SAN DIEGO • CALIFORNIA

TITLE: PARTS LIST MAIN BOARD

MODEL NO. 182 — DWG NO. 1100-00-0731 — REV D

CODE IDENT 23338 — SHEET 2 OF 2