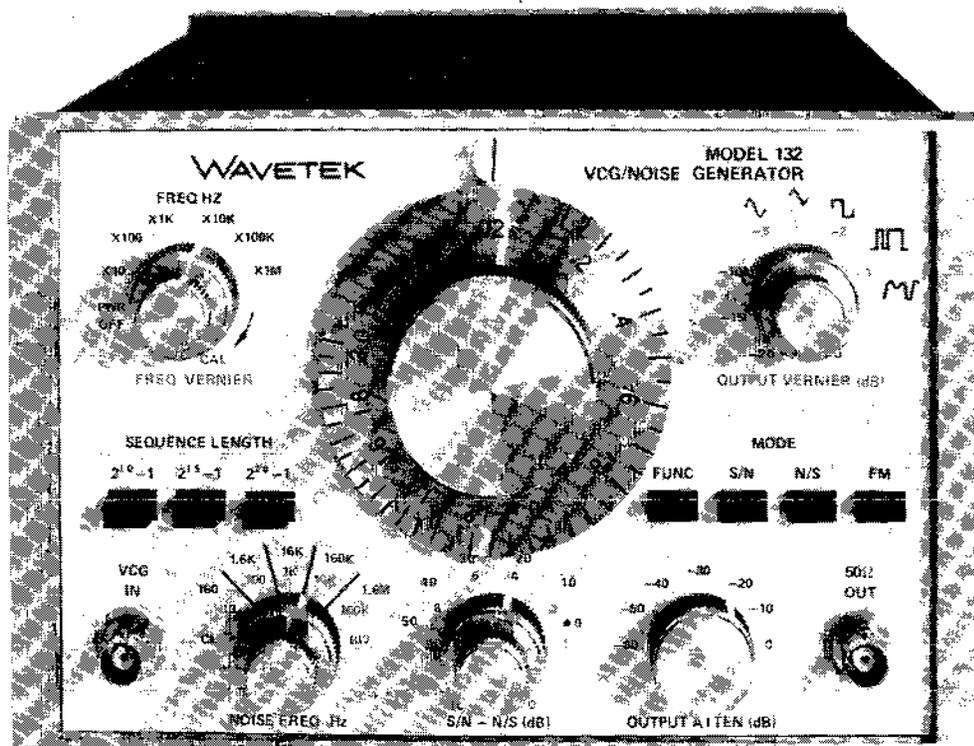


INSTRUCTION MANUAL

MODEL 132

VCG/NOISE GENERATOR



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SCOPE OF MANUAL

This manual contains instructions for operating, testing, and maintaining the Wavetek Model 132 VCG/ Noise Generator. The Wavetek product-improvement program ensures that the latest electronic developments are incorporated into the Wavetek instruments by the addition of circuit and component changes as rapidly as development and testing permit. Due to the time required to document and print this manual, it is not always possible to incorporate these changes into the manual. In this case, data will be found on engineering change sheets at the back of the manual. If there are no change sheets, the manual is correct as printed.

SCOPE OF EQUIPMENT

The Model 132 is a source of analog and digital noise, as well as a precision source of sine, triangle and square waveforms. Noise outputs, or waveforms can be used individually, or combined to provide selectable, calibrated signal-to-noise and noise-to-signal ratios to +60 dB. Waveforms can be varied over a frequency range of 0.2 Hz to 2 MHz. Length of the digital sequence is selectable to a maximum of $2^{20} - 1$ bits. Clock rates, variable from 160 Hz through 1.6 MHz, give added versatility to the noise generator. These clock rates allow selectable noise bandwidths variable from 10 Hz to 100 kHz.

SECTION 1

SPECIFICATIONS

VERSATILITY

Waveforms

Sine , square , triangle  waveforms and analog noise , or digital noise 

Frequency Range of Signal

0.2 Hz to 2 MHz in 6 decade ranges

Ranges

X10	0.2 Hz to 20 Hz
X100	2 Hz to 200 Hz
X1K	20 Hz to 2 kHz
X10K	200 Hz to 20 kHz
X100K	2 kHz to 200 kHz
X1M	20 kHz to 2 MHz

Function Outputs

Sine , square , and triangle  selectable, with 60 dB step attenuator in 10 dB steps and overlapping calibrated vernier; 50Ω output impedance, 20 V p-p into open circuit and 10 V p-p into 50Ω load from 50Ω source impedance.

Sync Output

Greater than 1 V p-p square wave into open circuit at 600Ω output impedance.

DC Offset

± 5 V offset (± 2.5 V offset into 50Ω load) controlled from rear panel; peak amplitude limited by the dynamic range of the amplifier output.

VCG – Voltage Controlled Generator

Frequency of the generator may be dc-programmed, or ac-modulated by external 0 to ± 5 V signal. Voltage control circuitry is capable of 1000:1 deviation. The VCG amplifier has a 100 kHz bandwidth and a slew rate of 0.1 V/ μ s. The instantaneous frequency is the result of the sum of the dial setting and the externally applied voltage.

Stability

Short term $\pm 0.05\%$ for 10 minutes
 Long term $\pm 0.25\%$ for 24 hours
 Percentages apply to amplitude, frequency, and dc offset.

HORIZONTAL PRECISION

Dial Accuracy

$\pm 2\%$ of full scale, 1 Hz to 2 MHz

Frequency Vernier

One turn equals 1% of full scale.

Time Symmetry

$\pm 1\%$ through X100K range

VERTICAL PRECISION

Sine Wave Frequency Response

Amplitude change with frequency less than:
 0.1 dB from 0.2 Hz to 200 kHz
 0.5 dB from 0.2 Hz to 2 MHz

PURITY

Sine Wave Distortion

Less than:
 0.5% on X10, X100, X1K, X10K ranges
 1.0% on X100K range
 All harmonics 30 dB down on X1 MHz range

Square Wave Rise and Fall Time

Less than 50 ns terminated into 50Ω

NOISE

Outputs

Pseudo-random analog or digital noise with a maximum of 20 V p-p excursion (open circuit) with 60 dB step attenuator in 10 dB steps and overlapping calibrated vernier.

Sequence Lengths

Push buttons on the front panel provide a sequence length of $2^{10} - 1$, $2^{15} - 1$, or $2^{20} - 1$.

Noise Clock Frequency

Switch selectable noise frequencies are listed below.

Clock Frequency	Analog Noise Bandwidth
160 Hz	10 Hz
1.6 kHz	100 Hz
16 kHz	1 kHz
160 kHz	10 kHz
1.6 MHz	100 kHz

OPERATIONAL MODES

FUNC Function Mode — Provides the selected waveform at the main output.

S/N Signal-to-Noise operation adds noise to a selected signal of constant amplitude. The signal-to-noise ratio is variable from 0 to +60 dB.

N/S Noise-to-Signal operation adds a selected signal to a constant amplitude noise. The noise-to-signal ratio is variable from 0 to +60 dB.

FM Frequency Modulation — Provides random modulation of the frequency of the generator. The S/N - N/S (dB) ratio control also controls the amount of frequency deviation.

NOTE

When noise is added to the signal output, specifications apply up to 200 kHz and the square wave rise time is derated by a factor of 10. In the clock range of 1.6 MHz, the maximum calibrated signal-to-noise ratio is 30 dB.

ENVIRONMENTAL**Temperature**

All specifications listed, except stability, are for 25°C ±5°C. For operation from 0°C to 55°C, derate all specifications by factor of 2.

MECHANICAL**Dimensions**

8½ inches wide, 5¼ inches high, 11½ inches deep

Weight

8 lbs net, 12 lbs shipping

Power

105 V to 125 V or 200 V to 250 V, 50 Hz to 400 Hz.
Less than 15 watts.

NOTE

All specifications apply for frequencies obtained when dial is between 0.1 and 2.0 and at 10 V p-p into a 50 ohm load.

It is possible to stop the generator from oscillating by applying a negative VCG voltage when the dial is already set at minimum frequency. VCG inputs up to 30 V will not permanently damage the instrument.

INSPECTION

The following procedures should be performed to assure the user that the instrument has arrived at its destination in satisfactory operating condition. Complete calibration and checkout instructions are provided in Section 4 to determine compliance with electrical specifications.

Checking Visually

After carefully unpacking the instrument, visually inspect the external parts for damage to knobs, dials, indicators, surface areas, etc. If damage is discovered, file a claim with the carrier who transported the instrument. Retain the shipping container and packing material for use in case reshipment is required.

Checking Electrically**NOTE**

Instruments are normally shipped connected for 115 V power unless 230 V power is ordered. Refer to the end of this section for conversion instructions.

The steps in this paragraph provide a quick checkout of the instrument operation. If electrical deficiencies exist, refer to the WARRANTY in the front of this manual. The following test equipment is recommended for performing this electrical inspection:

Name	Required Characteristics
Oscilloscope	To 30 MHz
Plug-In	Dual channel
Plug-In	Peak mV measuring capability
Counter-Timer	To 2 MHz with 5-digit resolution

1. Turn **FREQ HZ** selector to the **X1K** position. (This connects ac power to the unit and establishes the frequency multiplier.)
2. Depress **MODE – FUNC** push button.
3. Connect oscilloscope to the **50Ω OUT** connector with a **50Ω** terminator.
4. Set frequency dial to the **1.0** mark and **FREQ VERNIER** to **CAL** position.
5. Set function selector to the  position.
6. Set **OUTPUT ATTEN (dB)** and **OUTPUT VERNIER (dB)** to maximum clockwise (cw) position (no attenuation).
7. Check for **1 kHz** sine wave with at least **10 V** p-p amplitude on oscilloscope.
8. Select  and  with function selector and check for **10 V** p-p amplitude on oscilloscope.
9. Turn frequency dial from maximum counter-clockwise (ccw) to maximum cw position and check for frequency change.
10. Step **OUTPUT ATTEN (dB)** selector through its range and verify attenuation at each step.
11. Rotate **OUTPUT VERNIER (dB)** control from maximum cw to maximum ccw position and check for decreasing amplitude.
12. Rotate **FREQ VERNIER** control and check for frequency change.
13. Set **FREQ VERNIER** control at maximum cw and frequency dial at **0.02**. Set frequency to **20 Hz** with counter. Connect a **0** to **+5 Vdc** input to the **VCG IN** connector. Slowly increase voltage input from **0** to **+5 V** and check that frequency of output waveform increases from approximately **20 Hz** to **2 kHz**.
14. Depress **SEQUENCE LENGTH 2¹⁰ – 1** push button.
15. Set **NOISE FREQ HZ** selector to the **16K/160K** position and vernier control fully cw.
16. Connect a **BNC** cable from the **NOISE SYNC** connector (rear panel) to the external trigger input of the oscilloscope.
17. Rotate the function selector to  and check to assure oscilloscope displays digital noise.
18. Check to assure **SEQUENCE LENGTH** push buttons vary the bits in the sequence length.
19. Step **NOISE FREQ HZ** selector through its range and check to assure clock frequency changes. (Use **NOISE CLOCK** connector on rear panel.)

20. Verify that NOISE FREQ HZ vernier control provides approximately 10:1 variation in clock frequency at the NOISE CLOCK connector (rear panel).
21. Rotate function selector to  position and check to assure oscilloscope displays analog noise.
22. Check to assure SEQUENCE LENGTH push buttons vary the length of the sequence of analog noise. (Use NOISE SYNC connector on rear panel.)
23. Connect oscilloscope external trigger cable to FUNCTION SYNC connector (rear panel) and set function selector to  position.
24. Set S/N – N/S (dB) selector to –10 position and vernier control fully ccw.
25. Depress MODE – FM push button and check to assure square waveforms are frequency modulated by analog noise.
26. Release MODE – FM push button and depress MODE – S/N push button. Check to assure square wave and analog noise are mixed.
27. Depress MODE – N/S push button and rotate S/N – N/S (dB) selector ccw through each position, checking for reduction in signal level.
28. Verify that the S/N – N/S (dB) vernier attenuates the signal approximately 10 dB between each step of the S/N – N/S (dB) selector.

OPERATING CONTROLS

The operating controls and electrical connections for the Model 132 are shown in Figures 2-1 and 2-2. Each of the following paragraph numbers corresponds to a number appearing in Figure 2-1, front panel, or Figure 2-2, rear panel. The listing below discusses each control and its function.

FRONT PANEL

1. **FREQ HZ/PWR OFF** – Selects one of six decade ranges from X10 to X1M for generator frequency. This value multiplied by the frequency dial setting (3) gives the output frequency of the generator. Extreme ccw rotation will place the switch in the PWR OFF position, turning off all power to the function and noise generators. This control has no affect on the noise frequency.
2. **FREQ VERNIER** – Allows precision electronic control of the signal output frequency. A full turn of the control is approximately equal to 1%

of full scale. When turned to the full cw position (CAL), settings on the main dial will be calibrated.

3. **Frequency Dial** – Allows coarse control of the signal output frequency.
4. **Frequency Index** – Indicates the frequency dial setting (3) by reading the dial position opposite the scribe line on the frequency index. The index is illuminated when power to the unit is on.
5. **Function Selector** – Selects the desired function or noise output. To select , , or  waveforms, or  or  noise, the FUNC push button (7) must be depressed.
6. **OUTPUT VERNIER (dB)** – Provides vernier control of 0 through –20 dB from the OUTPUT ATTEN (dB) setting (12). This is the fine adjustment for the output signal and will attenuate signal and noise.

MODE

7. **FUNC** – When depressed, this control allows the selected waveform or noise, as determined by the position of the function selector (5), to be present at the 50Ω OUT connector (11). This push button must also be in the depressed position for the frequency modulation mode (10).
8. **S/N** – Depressing this push button allows a calibrated amount of analog noise to be added to the selected signal, either , , or  wave. The signal-to-noise ratio (S/N) is determined by the S/N – N/S (dB) attenuator control (13). When in this mode, the peak to peak signal amplitude is reduced internally, since adding noise to the signal would overdrive the output amplifier.
9. **N/S** – Depressing this push button allows a calibrated amount of the selected signal, either , , or  wave, to be added to the analog noise. The noise-to-signal ratio (N/S) is determined by the S/N – N/S (dB) attenuator control (13). When in this mode, the peak to peak signal amplitude is reduced internally, since adding the signal to the noise would overdrive the output amplifier.

amplitude remains constant, thus giving calibrated 0 to -50 dB signal-to-noise ratios. In the N/S mode, the signal is attenuated with the noise remaining unchanged, thus giving noise-to-signal ratios from 0 to -50 dB. The steps for this control are indicated in black numerals on the front panel.

14. **S/N – N/S (dB) Vernier** – Allows a calibrated fine adjustment of the S/N – N/S (dB) step attenuator (13). This control is continuously variable over at least a 10 dB range. When added to the coarse control (13), this amount equals the total S/N or N/S ratio. Approximate values of attenuation are indicated in red numerals on the front panel.
15. **NOISE FREQ HZ** – This range control selects the clock frequency, or bandwidth for the digital, or analog noise, respectively. When using the digital noise function, clock frequencies from 160 Hz through 1.6 MHz (indicated in black numerals and letters on the front panel) are available. When using analog noise or the S/N, N/S modes, the bandwidth of the analog noise may be selected from 10 Hz to 100 kHz (indicated in red numerals and letters on the front panel). In the FM mode, this control establishes the bandwidth of the analog noise used for frequency modulation. There are four detent positions with an overlapping vernier control (16). With the vernier in the full cw position, the clock frequency, or bandwidth, is equal to the value printed to the right of the detent mark.
16. **NOISE FREQ HZ Vernier** – As mentioned in number 15, this control provides a continuous, fine control between the detent positions of the coarse control. When in the full cw position, the clock frequency, or bandwidth, is equal to the value appearing at the right of the detent mark. As the knob is rotated ccw, the clock frequency, or bandwidth, is decreased. In the full ccw position, the actual value will be at least 10:1 (and as much as 100:1) lower than the value to the right of the detent mark.
17. **VCG IN** – This connector allows external voltage control of function generator frequency. Up to 1000:1 frequency change may be obtained. A positive voltage increases frequency and a negative voltage decreases frequency. Refer to "Operation as a Voltage Controlled Generator."

SEQUENCE LENGTH

18. **2¹⁰ – 1** – Depressing this push button will provide 1,023 counts of the selected clock frequency, or bandwidth, determined by the NOISE FREQ HZ controls (15 and 16), for generation of a digital, or analog noise pattern. At the end of each sequence, the pattern is automatically repeated.
19. **2¹⁵ – 1** – Depressing this push button will provide 32,767 counts of the selected clock frequency, or bandwidth, determined by the NOISE FREQ HZ controls (15 and 16), for generation of a digital, or analog noise pattern. At the end of each sequence, the pattern is automatically repeated.
20. **2²⁰ – 1** – Depressing this push button will provide 1,048,575 counts of the selected clock frequency, or bandwidth, determined by the NOISE FREQ HZ controls (15 and 16), for generation of a digital, or analog noise pattern. At the end of each sequence, the pattern is automatically repeated.

REAR PANEL

21. **DC OFFSET** – This control adjusts the ± 5 V base line above or below ground (± 2.5 V offset into 50Ω load). The OFF position gives normal vertical symmetry. Peak amplitude is limited by the dynamic range of the amplifier output.
22. **FUNCTION SYNC** – This connector provides a synchronizing signal output at the same frequency of the main generator; that is, at the same frequency as the sine, triangle or square wave. The amplitude is greater than 1 V peak to peak square wave into open circuit at 600Ω output impedance.
23. **NOISE SYNC** – This connector provides a synchronizing output signal for monitoring the digital or analog noise. A sync signal is generated at the beginning of each repetitive cycle for the selected sequence length of digital or analog noise.
24. **NOISE CLOCK** – This connector provides an external output of the basic clock frequency used to generate the digital sequence and analog noise.

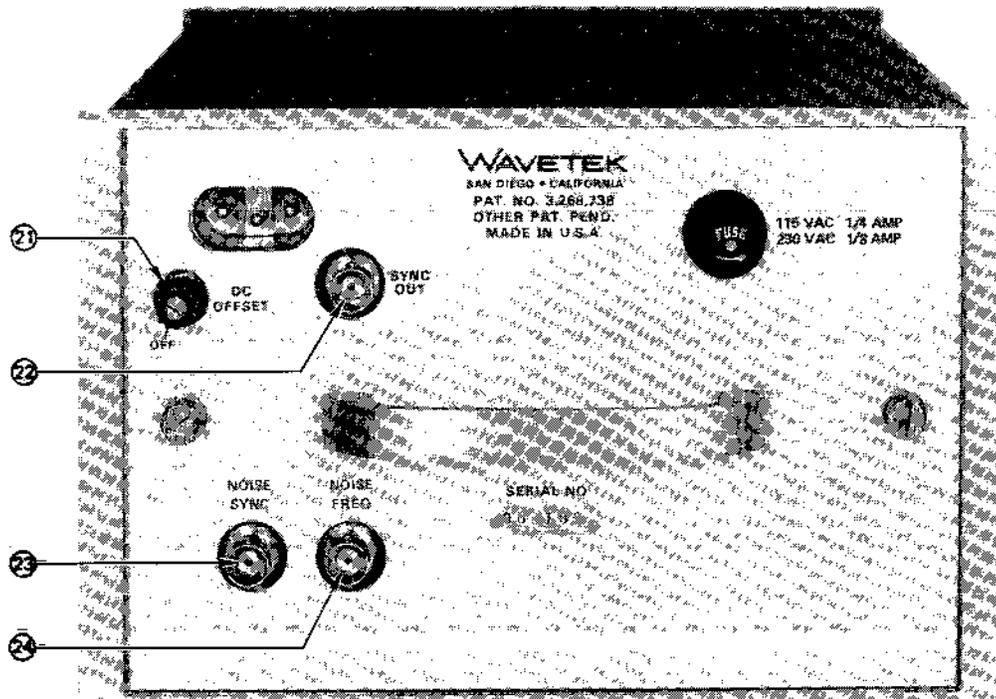


Figure 2-2. Operating Controls, Rear Panel

OPERATION

No preparation for operation is required beyond completion of the initial installation previously stated in this section. It is recommended that a one-half hour warm-up period be allowed for the associated equipment to reach a stabilized operating temperature and for the Model 132 to attain stated accuracies.

Operation as a Function Generator

1. Terminate 50Ω OUT connector with $50\Omega \pm 1\%$, 2 watt termination.
2. Select the desired waveform by setting function selector to \sim , \wedge , or \square .
3. Set frequency dial and FREQ HZ range multiplier for desired output frequency.
4. Depress MODE – FUNC push button.
5. Select output signal amplitude by setting OUTPUT ATTEN (dB) control to appropriate attenuation position and fine adjusting signal to desired amplitude with OUTPUT VERNIER (dB) control.
6. A positive or negative dc offset may be applied to the waveform by setting the DC OFFSET (Rear Panel) to the desired level. The peak signal value plus the offset cannot exceed ± 5.0 V into 50 ohms.

Operation as a Voltage Controlled Generator

The VCG input connector can be used to externally control the frequency of the generator. If a positive voltage is applied to the VCG input terminal, the frequency will increase from the dial setting. A negative voltage will cause the frequency to decrease from the dial setting. The VCG range of the Model 132 is 1000:1.

1. Terminate 50Ω OUT connector with 50 ohm $\pm 1\%$, 2 watt termination.
2. Select the desired waveform by setting function selector to \sim , \wedge , or \square .
3. Set FREQ HZ selector to desired multiplier.
4. Connect external voltage source (dc programming or wideband ac signal) to VCG IN connector.

NOTE

VCG input requires 0 to ± 5 volts for operation over full-scale range, but can withstand many times maximum input.

5. Set frequency dial as follows:
 - a. For frequency modulation with ac input, set dial for center frequency.

- b. For increasing frequency sweep with positive dc input, set dial to lower frequency limit.
 - c. For decreasing frequency sweep with negative dc input, set dial to upper frequency limit.
6. To sweep the audio range from 20 Hz to 20 kHz, set the controls to 20 Hz as follows:
- a. Set the main dial to 0.02.
 - b. Set the frequency vernier to the full ccw position.
 - c. Introduce a 0 to +5 V ramp into the VCG input connector.

The maximum frequency which may be obtained, when using the VCG input, is the range multiplier times the value at the top of the dial (2.0). The minimum frequency is the range multiplier times the value at the bottom of the dial (0.002 – frequency vernier must be in ccw position). Verify this using the nomograph in Figure 2-3.

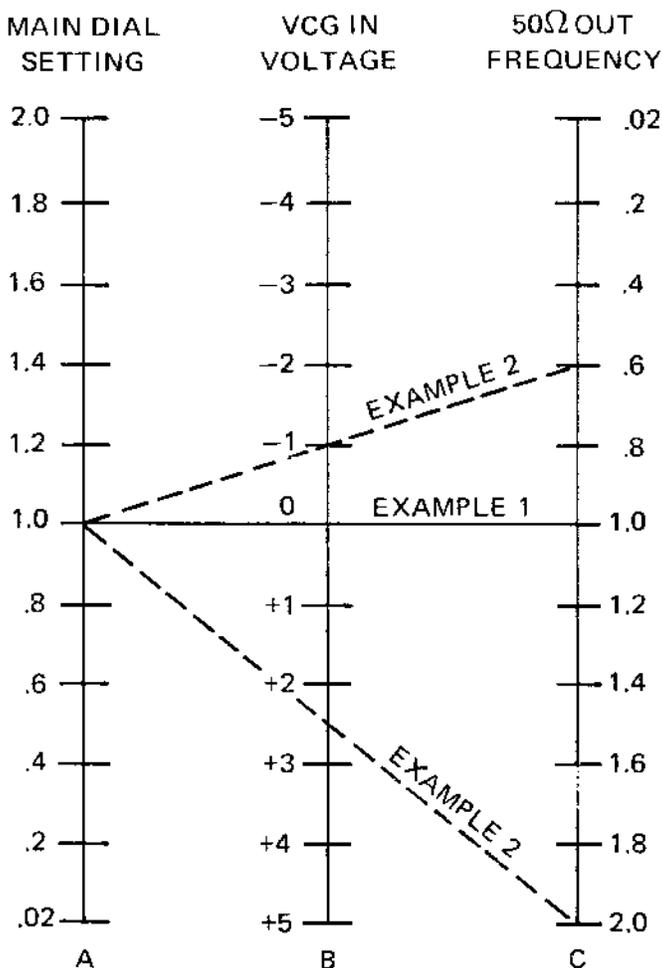


Figure 2-3 - VCG Voltage-to-Frequency Nomograph

In example 1, the dial is set at 1.0 and 0 voltage is applied to the VCG input. Extend a straight line from 1.0 (dial setting) through 0 voltage (VCG voltage) and obtain a dial frequency of 1.0. For the total output frequency, multiply the range by 1 with the same dial setting. Example 2 shows the results of using a ramp from -1 volt to +2.5 volts for the VCG voltage. This results in a swept output from 0.6 to 2.0 on the dial. Remember to multiply the dial times the range.

Operation as a Calibrated Signal-to-Noise Source

1. Select the desired signal waveform by setting function selector to \sim , \wedge , or \square .
2. Set frequency dial and FREQ HZ range multiplier for desired signal output frequency.
3. Depress MODE – S/N push button.
4. Select noise bandwidth by setting NOISE FREQ HZ control to desired range and fine adjusting bandwidth by turning the noise frequency Hz vernier control.
5. Select desired SEQUENCE LENGTH by depressing appropriate push button.
6. Select signal-to-noise ratio by setting S/N – N/S (dB) control to appropriate attenuation position and fine adjusting attenuation to desired value with S/N – N/S vernier control.
7. Select total output amplitude by setting OUTPUT ATTEN (dB) control to appropriate attenuation position and fine adjusting signal to desired amplitude with OUTPUT VERNIER (dB) control.

Operation as a Calibrated Noise-to-Signal Source

1. Select the desired signal waveform by setting function selector to \sim , \wedge , or \square .
2. Set frequency dial and FREQ HZ range multiplier for desired signal output frequency.
3. Depress MODE – N/S push button.
4. Select noise bandwidth by setting NOISE FREQ HZ control to desired range and fine adjusting bandwidth by turning the noise frequency Hz vernier control.
5. Select desired SEQUENCE LENGTH by depressing appropriate push button.
6. Select noise-to-signal ratio by setting S/N – N/S (dB) control to appropriate attenuation position and fine adjusting attenuation to desired value with S/N – N/S vernier control.
7. Select total output amplitude by setting OUTPUT ATTEN (dB) control to appropriate attenuation position and fine adjusting signal to de-

sired amplitude with OUTPUT VERNIER (dB) control.

Operation as a Random FM Source

Before using the generator as a random FM source, please note the following.

The frequency of the generator is being varied or modulated by a changing voltage in the same way as described in "Operation as a Voltage Controlled Generator." However, instead of using a dc ramp, or ac signal, a random analog voltage is used. When the FM push button is depressed, the analog noise is injected internally into the VCG circuit; therefore, the modulation is created by random noise. The S/N – N/S (dB) knob controls the maximum amount of frequency deviation, since it controls the amplitude of the noise. Bandwidth of the FM signal is controlled by the NOISE FREQ HZ control. Using the generator in the FM mode may be accomplished as follows:

1. Select the desired signal waveform by setting function selector to \sim , \wedge , or \square .
2. Set frequency dial and FREQ HZ range multiplier for desired center output frequency.
3. Depress MODE – FUNC and FM push buttons.
4. Select the bandwidth by setting NOISE FREQ HZ control to desired range and fine adjusting frequency by turning the noise frequency Hz vernier control.
5. Select desired SEQUENCE LENGTH by depressing appropriate push button.
6. Select signal frequency deviation by setting S/N – N/S (dB) control to appropriate attenuation position and fine adjusting attenuation to desired deviation with S/N – N/S vernier control.
7. Select output signal amplitude by setting OUTPUT ATTEN (dB) control to appropriate attenuation position and fine adjusting signal to desired amplitude with OUTPUT VERNIER (dB) control.

Operation as a Digital or Analog Noise Source

1. Set function selector to digital or analog noise position.
2. Depress MODE – FUNC push button.
3. Select clock frequency for digital or bandwidth for analog noise by setting NOISE FREQ HZ control to desired range and fine adjusting frequency by turning the noise frequency Hz vernier control.

4. Select desired SEQUENCE LENGTH by depressing appropriate push button.
5. Select noise amplitude by setting OUTPUT ATTEN (dB) control to appropriate attenuation position and fine adjusting noise to desired amplitude with OUTPUT VERNIER (dB) control.

Connect Signal and Chassis Grounds

The instrument is shipped from the factory with the signal ground floating above chassis ground, unless otherwise specified. A common signal/chassis ground can be obtained as follows:

1. Remove power cord.
2. Loosen two captive thumb screws on rear panel and remove panel.
3. Solder a jumper wire between the ground lugs (green wires) of the SYNC OUT connector and the power connector (Figure 2-4).

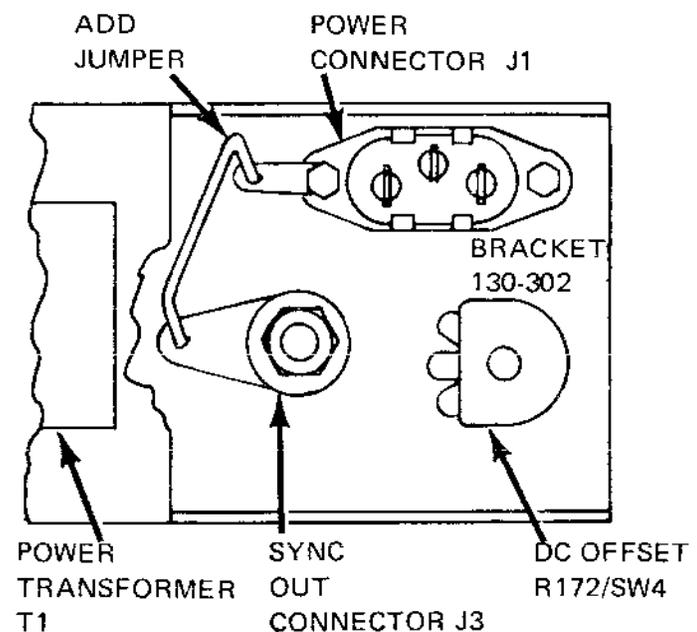


Figure 2-2. Common Ground Connection Diagram

Converting Output Impedance to 600 Ohms

Unless otherwise specified, this instrument was shipped with 50 ohm output impedance, but can be converted to 600 ohm output if needed. Place a 550Ω resistor in series with the wire leading from the center tap of the 50Ω OUT BNC and the attenuator control.

Converting to 230-Volt Line Power

Instruments are shipped from the factory with the power transformer connected for 115-volt line power, unless ordered for 230-volt use. Converting a 115-volt unit for 230-volt operation is a simple matter.

1. Remove power cord.
2. Loosen two captive thumb screws on rear panel and remove panel.
3. The conversion switch is located on the chassis. Use a thin-bladed screwdriver to move the 115-230 switch to the 230 position.
4. Replace 1/4-ampere fuse with a 1/8-ampere fuse of the same type.

SECTION 3

CIRCUIT DESCRIPTION

GENERAL DESCRIPTION

Refer to the block diagram of the Model 132 VCG/ Noise Generator, Figure 3-1.

Basically, a square wave is applied to the input of an integrator composed of a wide-band differential dc amplifier, integrating resistor and capacitor. Output

of the integrator is fed into the hysteresis switch. The hysteresis and output switches function like a Schmitt trigger with the limit points set at the waveform extremes, firing when the triangle wave reaches +1.25 volts and -1.25 volts. When firing occurs, the hysteresis and output switches are set, reversing the square wave fed into the integrator. Reversal of the square wave causes the triangle wave to reverse direc-

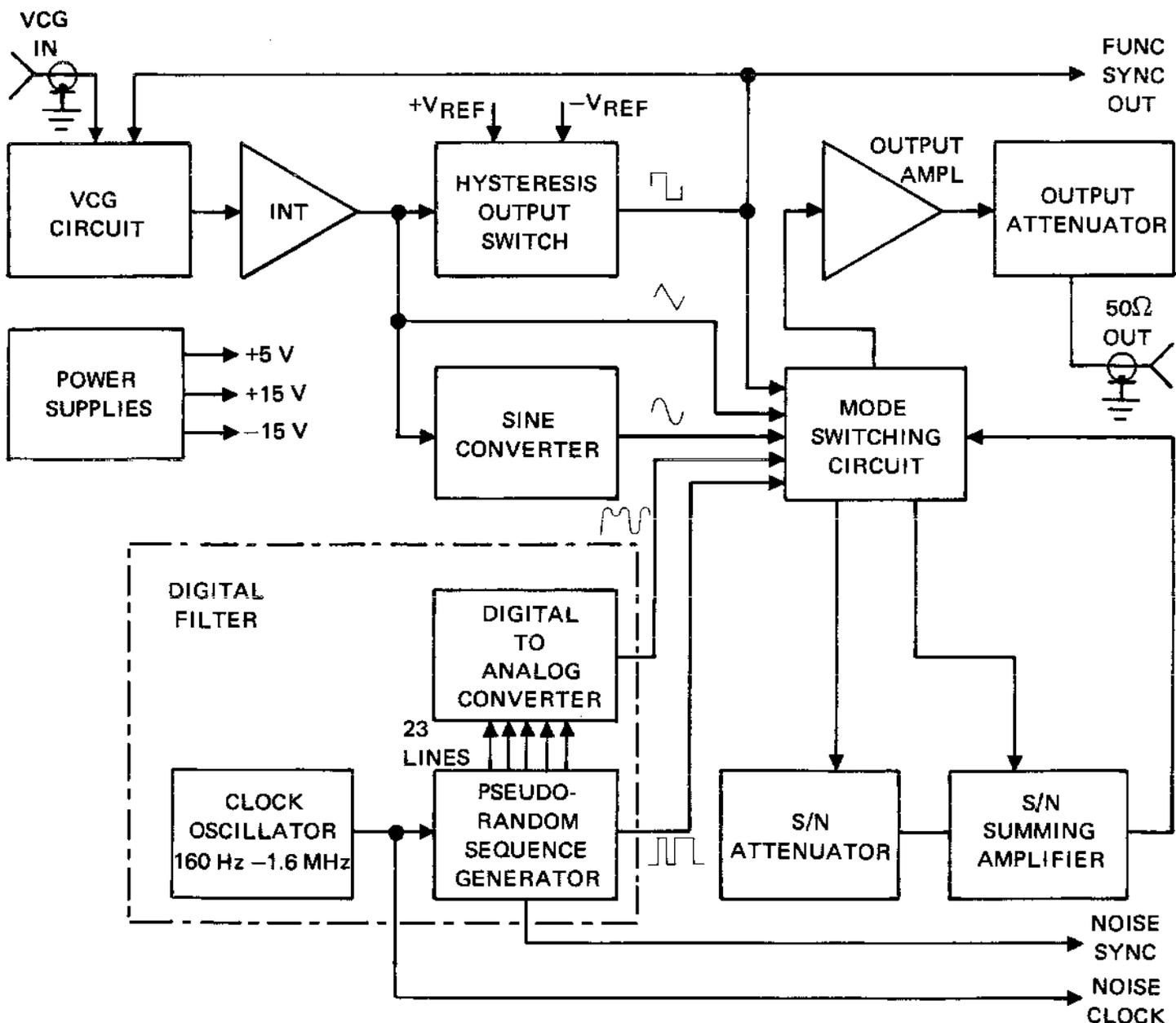


Figure 3-1. Functional Block Diagram

tion. The result is simultaneous generation of a square wave and triangle wave of the same frequency with the positive half cycle of the square wave coincident with the negative slope of the triangle wave.

The magnitude of the capacitor across the integrator and amplitude of the current into the integrator determine the frequency of oscillation. Capacitance across the integrator is changed by rotating the frequency Hz selector. Amplitude of the current into the integrator is determined by four parameters which are summed in the VCG circuit: (1) hysteresis switch output, (2) the frequency dial voltage, (3) the frequency vernier voltage, (4) the VCG analog voltage input and (5) the analog noise when in the FM mode.

The sine wave is produced by feeding the triangle wave into a shaping network composed of resistors and diodes. As the triangle wave voltage passes through zero, loading of the triangle wave is minimal and thus the slope is maximum. As the triangle voltage increases, diodes with current limiting resistors conduct and successively cause the slope of the output to be reduced.

Since the diode break points are mathematically computed and fitted to the true sine shape, the resultant waveform resembles a pure sine wave. Using a complementary pair of diodes on each break point, the circuitry is completely symmetrical about ground. The sine wave, produced by shaping, is considerably less in amplitude than the triangle wave input and is thus amplified to be equal to the triangle wave.

Either square, triangle, or sine waveforms can be selected as a signal source. The noise source is derived from a digital filter. A clock oscillator of 160 Hz to 1.6 MHz range functions as a trigger source for the digital pseudo-random sequence generator (PRSG). Output of the PRSG is a random binary signal that can function as digital noise. The number of bits in each sequence can be selected by the SEQUENCE LENGTH controls. Parallel data is fed from the PRSG to the digital-to-analog converter where the information is summed and filtered to provide a random analog noise signal.

The selected sine, triangle, square, analog noise, or digital noise signal is routed to the mode control circuitry where one of the following modes of operation is selected: Function (FUNC); frequency modulation (FM); signal-to-noise (S/N); or noise-to-signal (N/S). In the signal-to-noise and noise-to-signal modes, one signal is fed to the S/N attenuator and then mixed with the other signal in the S/N summing amplifier in a known dB ratio selected by the S/N attenuator. Output of the mode switching circuit is coupled to the output amplifier. From the output amplifier the signal is fed to the precision output attenuator and finally to a 50Ω output connector.

All circuits, except for the hysteresis switch, output amplifier, and PRSG, operate from ± 15 volt supplies. The hysteresis switch and power amplifier require ± 6 volts and ± 22 volts, respectively. Operation of the PRSG requires a +5 V supply.

SECTION 4

MAINTENANCE

INTRODUCTION

This section provides instructions for testing, calibrating, troubleshooting, and repairing the Model 132. The instructions are concise and for the experienced electronics technician or field engineer. 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 calibration or repair, a detailed description of the specific problem should be attached to facilitate the turn around time. Test point and adjustment locations are illustrated in Section 5.

RECOMMENDED TEST EQUIPMENT

Table 4-1 contains a list of recommended test equipment. Any test equipment having equivalent accuracies may be substituted for those listed.

Table 4-1. TEST EQUIPMENT

Name	Required Characteristics
Oscilloscope	To 30 MHz
Plug-in	Dual Channel
Plug-in	Peak mV measuring capability
Distortion Analyzer	To 600 kHz
Spectrum Analyzer	To 50 MHz
Display	
IF Section	
RF Section	
Voltmeter	Millivolt dc measurement (10 millivolt resolution)
Counter	To 10 MHz
Scope Probe	X1 Attenuation

CHECKOUT AND CALIBRATION

The following paragraphs provide complete sequential calibration procedures for the Model 132. Instrument checkout procedures are indicated by a check mark

(✓) following the procedure title. A quick checkout of the instrument can be performed by comparing the indicated parameters with the tolerances given in the Specifications of Section 1.

NOTE

The entire calibration procedure must be read first to determine initial control settings and test equipment connections before attempting checkout.

Preliminary Procedures

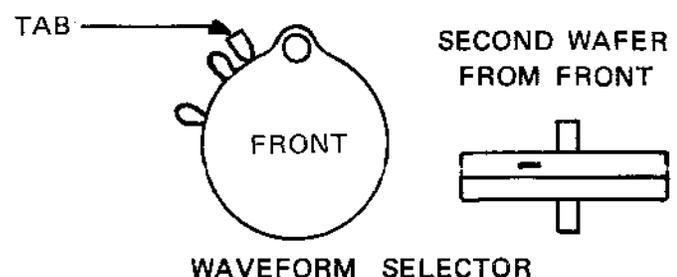
1. Set FREQ HZ selector to X1K position.
2. Depress MODE – FUNC push button.
3. Set OUTPUT ATTEN (dB) selector to 0 position.
4. Allow one-half hour for warm-up.
5. DC OFFSET C.C.W. (DETENT) *0.2* *9-15*

Power Supply Regulation

1. Connect voltmeter between TP1 (common) and TP2 (+) on main board. Adjust R104 for +15 Vdc \pm 100 mV.
2. Connect voltmeter between TP1 (common) and TP3 (-). Since the negative supply is referenced to the +15 V supply, the voltmeter should indicate -15 Vdc \pm 100 mV.
3. Connect voltmeter between +5 V and location DG on *ASSY LOGIC* board. Verify that voltage is +4.75 to +5.25 volts.

Square Wave Amplitude Symmetry

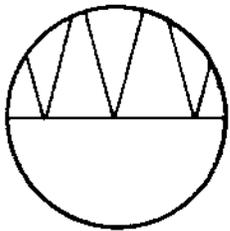
1. Set function selector to .
2. Connect oscilloscope, with peak mV plug-in, to tab of switch SW3B, as illustrated below.



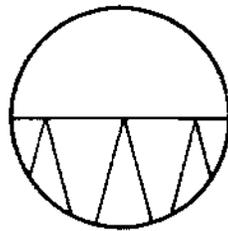
- Using a comparator, set the positive peak to the center of the scope. Switch the comparator to the negative peak and adjust R121 so that the negative peak equals the positive peak.

Triangle Amplitude

- Set frequency dial for 2.0 (X1K range) and function selector to ∇ .
- Connect oscilloscope, with peak mV plug-in, to tab of switch SW3B, as illustrated under "Square Wave Amplitude Symmetry."
- Adjust R56 on main board for positive peak at ± 1.25 volts ± 5 mV (see sketch).
- Adjust R59 for negative peak at -1.25 V ± 5 mV.



Negative Peak



Positive Peak

Output Amplifier ✓

- Connect oscilloscope to 50Ω OUT connector with 50Ω terminator loaded at oscilloscope (\square function).
- Set FREQ HZ selector for X1K (FREQ VERNIER fully cw) and frequency dial at 2.0.
- Turn OUTPUT VERNIER (dB) fully ccw.
- Adjust R150 for amplitude symmetry about ground.
- Set FREQ HZ selector for X1M (2.0 dial setting).
- Turn OUTPUT VERNIER (dB) fully cw.
- Adjust C64 to provide a flat square wave with 100 nanosecond rise time.

First VCG Null ✓

- Connect oscilloscope to 50Ω OUT connector.
- Set FREQ HZ selector to X1K. Set frequency dial to 0.02 and turn FREQ VERNIER to CAL position.
- Short and open VCG IN to signal ground (outside of BNC connector) while monitoring output frequency variation. Adjust R11 for minimum frequency change using X20 horizontal magnification on oscilloscope.

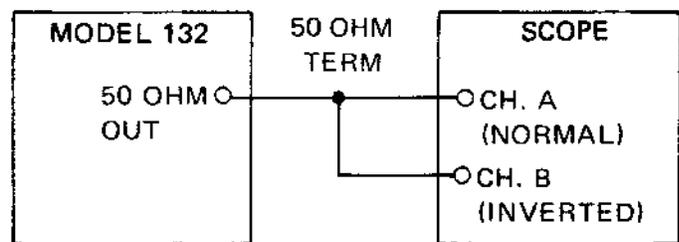
Time Symmetry ✓

- Connect unit and oscilloscope, with dual channel plug-in set for alternate display, as shown in Figure 4-1.
- Set FREQ HZ selector for X100K with FREQ VERNIER in CAL position (\square function).
- Set frequency dial to 0.02 to provide 2 kHz display on oscilloscope.
- Adjust R28 for time symmetry with frequency dial set to 0.02.
- Turn FREQ VERNIER fully ccw and adjust R22 for time symmetry.

NOTE

Interaction occurs between R28 and R22. Repeat steps 4 and 5 until 1% symmetry accuracy is met. (On oscilloscope 1% – 1 cm at 0.1 μsec with X10 horizontal magnification.)

- Check for waveform time symmetry at the 0.2 and 2 frequency dial settings.
- Check to assure FREQ HZ selector is set to X100K position with FREQ VERNIER turned fully ccw.
- Turn frequency dial fully cw.
- Check frequency ratio from top range setting to 1/1000 of range (not dial setting).
- Adjust R8, if necessary, for slightly greater than 1000:1 ratio.



Trigger: Internal Time Base: 50 microseconds/cm for 1/100 of 200 kHz
 Display: Alternate 500 microseconds/cm for 1/1000 of 200 kHz

Figure 4-1.

Time Symmetry Measurement for Test Setup

Frequency Calibration ✓

1. Connect counter to 50Ω OUT connector.
2. Set FREQ HZ selector to X10K and FREQ VERNIER fully cw.
3. Align 2.0 dial mark with the dial indicator index and alternately switch from X10K to X1K range while adjusting R4 for a balanced error between the two positions of less than 2%.
4. Set FREQ HZ selector to X100K and dial at 2.0.
5. Adjust C16 to obtain 200.0 kHz on counter display.
6. Set FREQ HZ selector to X1M. Adjust C12 to obtain 2.00 MHz on counter display.
7. Dial alignment – No alignment is necessary if the dial is the push-on type. If it has a set screw, consult the factory for CAL procedure.

Sine Distortion, Amplitude, and Balance ✓

1. Set FREQ HZ selector for X1K, FREQ VERNIER fully cw, function selector to , and frequency dial at 2.0.
2. Connect oscilloscope, with peak mV plug-in, to orange wire on function switch.
3. Adjust R133 to obtain 2.5 V p-p ± 25 mV output.
4. Adjust R128 to balance output.
5. Connect the unit, distortion analyzer, and oscilloscope as shown in Figure 4-2.
6. Adjust R126 and R127 for less than 0.5% sine distortion (see photo).
7. Set FREQ HZ selector to X10K.

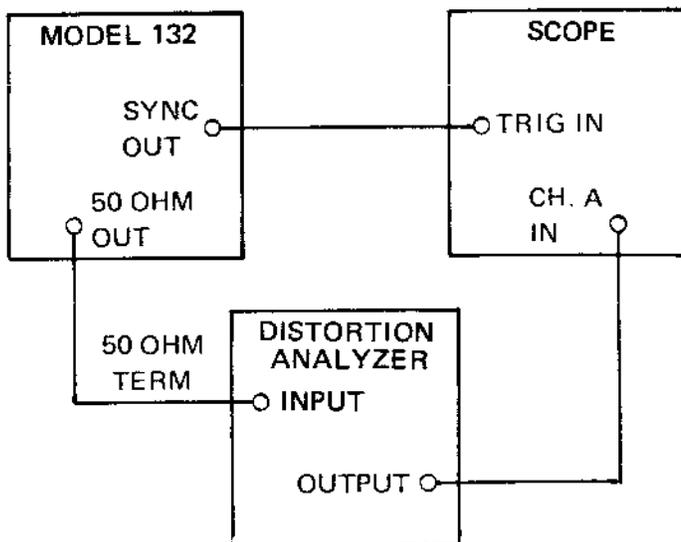
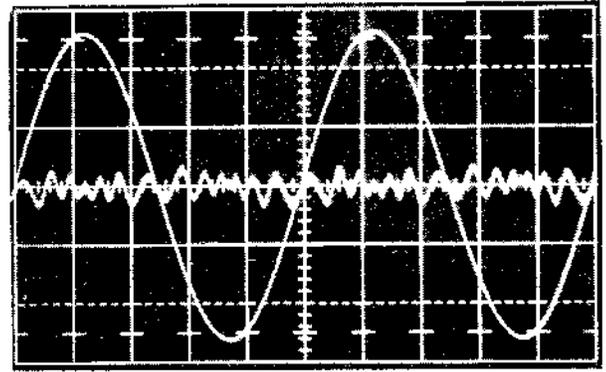


Figure 4-2. Distortion Analysis Test Setup



8. Repeat step 6 for steps 1 and 7 to obtain less than 0.5% distortion at both X1K and X10K ranges.
9. Repeat steps 2, 3 and 4.
10. Connect spectrum analyzer and check sine distortion at 2 MHz.

Clock Frequency Calibration ✓

1. Remove power from unit.
2. Remove two Phillips head screws from logic board (one from left side of board, one from right side).
3. Remove two 2½" standoff screws at rear of logic board.
4. Lift front edge of logic board until board is standing upright. (Right rear edge of logic board will now be resting on sine module.)
5. Place at least ¼" of styrofoam, or other suitable insulating material, between BNC connectors and main board. (BNC connectors are located near left rear edge of logic board.)

CAUTION

Failure to adequately insulate BNC connectors from main board may result in electrical damage.

6. Apply power to unit.
7. Set function selector to  position.
8. Set NOISE FREQ HZ selector to 1.6M position and NOISE FREQ HZ vernier fully cw.
9. Connect counter to NOISE CLOCK connector (rear panel).
10. Adjust C6 on digital board for 1.6 MHz (ideally 1.62 MHz).
11. Turn NOISE FREQ HZ vernier fully ccw and adjust R2 for 150 kHz ± 1 kHz.

Digital Noise Amplitude Symmetry ✓

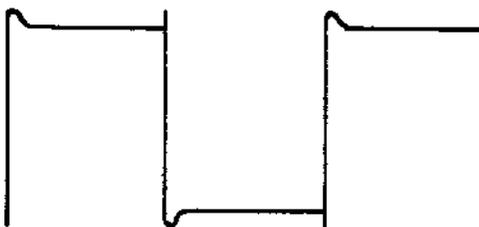
1. Set function selector to , NOISE FREQ HZ selector to 160 kHz, and depress SEQUENCE LENGTH – 2¹⁵ – 1 push button.
2. Connect oscilloscope, with peak mV plug-in, to location DN on digital board.
3. Adjust R36, using comparator, to provide a positive peak of +1.25 V ±10 mV.
4. Adjust R39, using comparator, to provide a negative peak of –1.25 V ±10 mV.

Analog Noise Amplitude Symmetry

1. Connect BNC cable to NOISE SYNC connector (rear panel) and sync connector on oscilloscope.
2. Depress SEQUENCE LENGTH – 2¹⁵ – 1 push button.
3. Connect oscilloscope to location AN on digital board.
4. Adjust R22 (gain) and R23 (balance) to provide a 2.5 V p-p signal centered about ground.

S/N Frequency Compensation ✓

1. Set function selector to .
2. Depress MODE – S/N push button.
3. Set frequency dial to 1.0 and FREQ HZ selector to X100K (100 kHz).
4. Set S/N – N/S (dB) selector to +50 position and turn vernier to +9 position to provide approximately +59 dB.
5. Turn OUTPUT VERNIER (dB) full cw.
6. Connect oscilloscope to 50Ω OUT connector with 50Ω terminator ( function).
7. Adjust C5 on analog board for a slightly peaked square wave response, as illustrated below.



8. Remove power from unit.
9. Remove material insulating BNC connectors from main board.
10. Lower logic board and align holes in side of board with screw holes.
11. Install two side screws to secure logic board.
12. Install both 2½" standoff screws at rear of logic board.
13. Install cover on unit.

TROUBLESHOOTING

Basic Techniques

Troubleshooting the Model 132 requires no special technique. Listed below are a few reminders of basic electronics fault isolation.

1. Check control settings carefully. Many times an incorrect control setting, or a knob that has loosened on its shaft, will cause a false indication of a malfunction.
2. Check associated equipment connections. Make sure that all connections are securely connected to the correct connector.
3. Perform the checkout procedure. Many out-of-specification indications can be corrected by performing specific calibration procedures.
4. Visually check the interior of the instrument. Look for such indications as broken wires, charred components, loose leads, etc.

Troubleshooting Chart

Table 4-2 provides a list of possible malfunction symptoms, their probable causes, and the prescribed remedies. Also listed in this table are the test points at which measurements are to be made and the parameter tolerances at these points. To use the troubleshooting chart, locate the symptom listed in Column 1 and follow the corresponding procedures. Localize the fault to a specific stage by checking the parameters given for the major test points. Then check the dc operating voltages at the pins of solid-state devices. Check associated passive elements with a high input impedance ohmmeter (power off) before replacing a suspected semiconductor element.

Troubleshooting Hints

The interactive nature of a closed loop presents a somewhat special problem when approached from a troubleshooting standpoint. The simplest way to reduce problem complexity is to open the loop, thereby removing the interaction. The basic units of the loop can then be tested individually. The following step-by-step procedure describes how this is done. (The generator loop is all contained on the main board.) Consult the next paragraph for removal of cover and panels.

1. Set instrument controls for 20 V p-p, 2 kHz sine-wave output.

Table 4-2. TROUBLESHOOTING CHART

Symptom	Probable Cause	Corrective Procedures
No outputs at 50 Ω OUT connector	Blown Fuse	Replace F1. a. 1/4A – 115 Vac b. 1/8A – 220 Vac
	Power Supply	Check TP1/TP2 for +15 V; +5 V/DG for +5 V; TP1/TP3 for –15 V; TP1/TP5 for +6 V; TP1/TP6 for –6 V. Troubleshoot associated regulator.
	Output Amplifier	Check at PH for waveform as selected by position of waveform switch. a. If waveform is present, troubleshoot output amplifier. b. If no waveforms are present, refer to Troubleshooting Hints.
	50 Ω Attenuator	Check to see that output is present at switch. If it is, the switch is defective.
No sine wave output	Sine Amplifier	Check for 260 mV p-p sine wave at pin 4 of IC8. a. If present, check IC8 circuit. <i>NOTE: Triangle wave must be present at pin 2 of A1 to obtain sine wave output.</i> b. If not present, check A1 circuit.
No triangle, sine, or square wave	Generator Loop	Refer to Troubleshooting Hints.
No 	Power Supply	Check for correct voltages.
	Clock Oscillator	Check Q1 – Q8 circuit.
	Faulty IC	Refer to Troubleshooting Hints.
	Shaping Amplifier	Check Q12 – Q14 circuit.
	No 	(See above.)
No 	Faulty Summing Amplifier	Check Q9 – Q11 circuit.
	Faulty Low Pass Filter	Check IC1 circuit.
	No output in S/N or N/S	Faulty Summing Amplifier
No noise in S/N mode	Faulty Attenuator	Check Test Point AW for noise. If not present and controllable by S/N – N/S (dB) switch, the switch is defective. If present, check IC1 and IC2 circuits.

Table 4-2. TROUBLESHOOTING CHART (Continued)

Symptom	Probable Cause	Corrective Procedures
All waveforms low in amplitude	Power Amplifier	a. Check front panel amplitude control. b. Perform balance adjustment for power amplifier.
	Power Supply	Check for correct voltages.
All waveforms low in amplitude	Power Amplifier	a. Check front panel amplitude control. b. Perform balance adjustment for power amplifier.
	Power Supply	Check for correct voltages.
Frequency out of tolerance	Power Supply	Check for correct power supply voltage as stated above.
	Maladjustment	Perform calibration procedure.
Sine wave not in spec	Maladjustment	Perform sine distortion, amplitude, and balance adjustments.
	Sine Converter	Check for 260 mV p-p sine wave at pin 4 of IC8. a. If normal, check sine amplifier IC8. b. If normal, check A1 circuit.
Time symmetry of waveforms not correct	Maladjustment	Perform time symmetry and frequency adjustments.

2. Check at coaxial-wire lug of function selector switch for a 2.5 V p-p square wave. If normal, check output amplifier (Q34 – Q40).
3. Unsolder and lift the end of R51 (TP7). This is the output of the integrator and input to the hysteresis switch. The generator loop has now been opened.
4. Inject a 2.5 V p-p triangle waveform into the hysteresis switch input lead (TP7).
5. Check at the coaxial-wire lug of the function selector switch for a 2.5 V p-p square wave at the injected frequency.
 - a. If present, hysteresis and output switches are functioning normally. Proceed to Step 6.
 - b. If abnormal, check Q6 – Q16 stages.
6. Vary frequency dial from ccw to cw while observing TP11 with a scope. Voltage at this point should remain at 0 volts throughout dial rotation. If a voltage variation is observed, check IC1 stage.
7. Vary frequency dial from ccw to cw while observing TP4. Voltage reading should vary from 0 to approximately –6 volts. If voltage does not vary, check IC2 stage and IC1 stage.
8. Vary frequency dial from ccw to cw while observing TP9. Voltage reading should remain at 0 volts. If voltage varies, check IC3 stage.
9. Vary frequency dial from ccw to cw while observing TP10. Voltage should vary from 0 V to approximately +6 V. If voltage does not vary, check IC2 stage and IC3 stage.
10. Vary frequency dial from ccw to cw while observing TP8. Voltage reading should remain at 0 volts. If voltage varies, check IC4 and IC5 stages.
11. Reinstall R51.

DIGITAL BOARD

If a fault in the logic circuit of the digital filter is sus-

pected, the following procedure may be used to isolate the bad IC.

1. Set clock frequency to 1.0 MHz.
2. Verify that a clock pulse appears at pins 9 and 12 of IC2 through IC13.
3. Short circuit test point RT to DG. (This opens the digital feedback loop.)
4. Check for logic "zero" at pins 3 and 5 of IC2 through IC13.
5. Check for logic "one" at pins 2 and 6 of IC2 through IC13.
6. Check logic states of all gates using the known states of the register.

REMOVAL OF DUST COVERS AND PANELS

1. To gain access for calibration or maintenance, proceed as follows:
 - a. Remove power cord.
 - b. Loosen the two knurled captive screws on the rear panel.
 - c. Pull off the rear panel.
 - d. Remove the cover.
2. To gain access to the digital board, proceed as follows:
 - a. Remove the four screws holding the digital board.
 - b. Rotate the board upward using the rear of the instrument as a pivot point.
3. To gain access to the analog board and/or the main board, proceed as follows:
 - a. Remove digital board.
 - b. Remove one screw and shoulder washer holding 5 V regulator to side plate.
 - c. Remove all knobs below the push button switches.
 - d. Remove two nuts, washers, and insulators holding the switch assembly to the front panel.
 - e. Remove two screws holding rear bracket to chassis.
 - f. Disconnect all AMP pin connections between main board and analog board.
 - g. Unsolder two wires from 50 Ω OUT connector.
 - h. Unsolder coaxial cable from main board to 50 Ω attenuator.
 - i. Remove four screws holding analog board to side plates.
 - j. Carefully lift rear of analog board to clear the sine converter and side analog board,

rear bracket and digital board away from the front panel.

4. To gain access to any part mounted on upper rear bracket, proceed as follows:
 - a. Remove digital board.
 - b. Remove two screws holding lower and upper rear brackets to chassis.
 - c. Remove one heat sink mounting screw.
 - d. Remove bottom transformer mounting block screw.
 - e. Remove the two screws, lock washers and hex nuts holding two wafers of FREQ HZ switch to bracket assembly.
 - f. Remove two screws holding bracket assembly to main board.
 - g. Carefully pull bracket assembly to rear to obtain working room. Enough slack is available in the wiring for all normal operations.
5. To remove front panel, proceed as follows:
 - a. Remove rear panel and dust cover as previously described.
 - b. Remove all knobs, except frequency dial.
 - c. Unsolder BNC connections.
 - d. Tag and unsolder frequency-dial potentiometer leads.
 - e. Pull light bulb from indicator lens.
 - f. Remove four front panel retaining screws.
 - g. Remove two hex nuts, lock washers, and shoulder washers holding switch bracket assembly to front panel.
 - h. Carefully pull off front panel with frequency dial/potentiometer still attached.

REPLACEMENT OF SWITCH WAFERS AND POTENTIOMETERS

1. To replace FREQ HZ switch wafer C or D or the FREQ VERNIER potentiometer, proceed as follows:
 - a. Remove rear panel and dust cover as previously described.
 - b. Separate bracket assembly from chassis as previously described.
 - c. Tag and unsolder leads to part being replaced.
 - d. Pull defective part off shaft and repair or replace with recommended replacement part.
2. To replace FREQ HZ switch wafer A or B, proceed as follows:
 - a. Remove rear panel and dust cover as previously described.
 - b. Remove front panel as previously described.

- c. Tag and unsolder wires to switch wafers A and B.
 - d. Remove digital and analog boards as previously described.
 - e. Unsolder wafer B PC-tabs from printed circuit boards.
 - f. Lift switch shaft slightly to free PC-tabs, rotate switch shaft so wafers clear board parts, and pull shaft end free of rear-mounted wafers C and D.
 - g. Repair or replace defective part.
3. To repair or replace function selector wafers or OUTPUT VERNIER (dB) potentiometer, proceed as follows:
- a. Remove rear panel and dust cover as previously described.
 - b. Tag and unsolder wires to defective part.
 - c. Remove digital and analog boards as previously described.
 - d. Unsolder potentiometer PC-tabs, lift shaft slightly to free tabs, rotate switch shaft so

wafers clear board parts, and pull switch/potentiometer assembly out of front panel hole.

- e. Repair or replace defective part.

REPLACEMENT OF SINE CONVERTER

1. Remove rear panel and dust cover as previously described.
2. Remove digital board as previously described.
3. Unsolder the five pins of sine converter A1 from top of the printed circuit board, using a solder syringe.
4. Lift assembly from bottom of the board; a thin pencil-type soldering iron can be used, if necessary, to apply temporary heat during removal.
5. Replace sine converter.

INTRODUCTION

This section contains data packages for the Model 132. Each data package is a quick-access document, containing maintenance data arranged for convenient viewing of the schematic diagram and all supporting data. Each data package includes a parts-location illustration, a replaceable parts list, voltage/waveform data, and a schematic diagram. Voltage and waveform

data are provided on the diagrams at indicated test points as an aid to troubleshooting.

RECOMMENDED SPARE PARTS LIST

Information is provided to maintain the instrument on a component level. Price and delivery information should be obtained from the Wavetek representative in your area or directly from the factory.

DESCRIPTION	MANUFACTURER	PART NO.	QTY
DIODE	FAIRCHILD	FD6666	2
DIODE	SEMTECH	SCE-1	2
DIODE	WAVETEK	130-506	1
FUSE 1/8A 250 V	BUSSMAN	MDL 1/8	1
FUSE 1/4A 115 V	LITTELFUSE	313-250	1
IC	RCA	*CA3039 (-18)	1
IC	RCA	*CA3030 (-15)	1
IC	RCA	*CA3030 (-16)	1
IC	RCA	*CA3036 (-17)	1
IC	SIGNETICS	SG310	1
IC	NATIONAL SEMICONDUCTOR	NS7400	1
IC	NATIONAL SEMICONDUCTOR	NS7402	1
IC	NATIONAL SEMICONDUCTOR	NS7404	1
IC	NATIONAL SEMICONDUCTOR	NS7410	1
IC	NATIONAL SEMICONDUCTOR	NS7420	1
IC	NATIONAL SEMICONDUCTOR	NS7430	1
IC	NATIONAL SEMICONDUCTOR	NS7486	1
IC	NATIONAL SEMICONDUCTOR	NS74107	1
IC	NATIONAL SEMICONDUCTOR	LM301A	1
IC	FAIRCHILD	7805393	1
IC	FAIRCHILD	* μ A 709C (-14)	1
IC	FAIRCHILD	* μ A 709C (-13)	1
LAMP	MURA	L28/40	1
SINE MODULE	WAVETEK	130-011	1
TRANSISTOR	FAIRCHILD	2N2905A	1
TRANSISTOR	FAIRCHILD	2N2905	1
TRANSISTOR	FAIRCHILD	2N3299	1
TRANSISTOR	FAIRCHILD	2N3646	2
TRANSISTOR	FAIRCHILD	2N3638	1

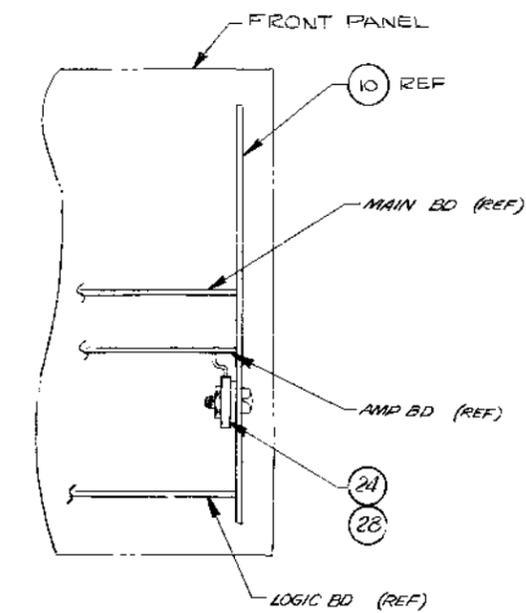
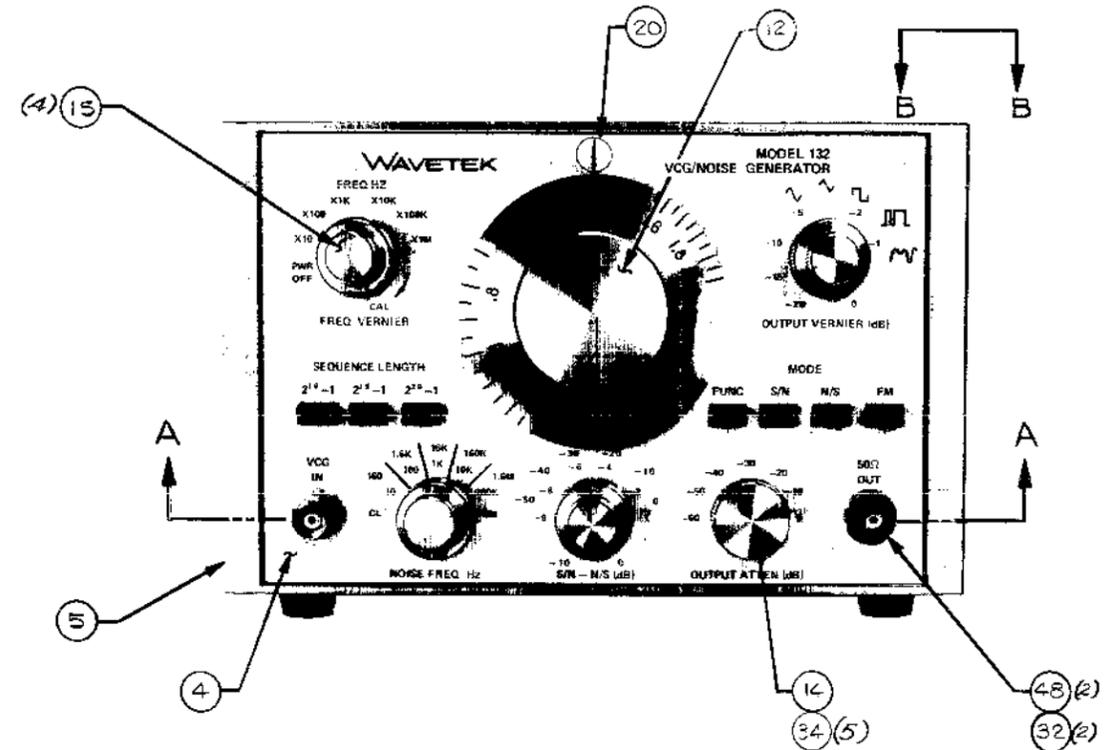
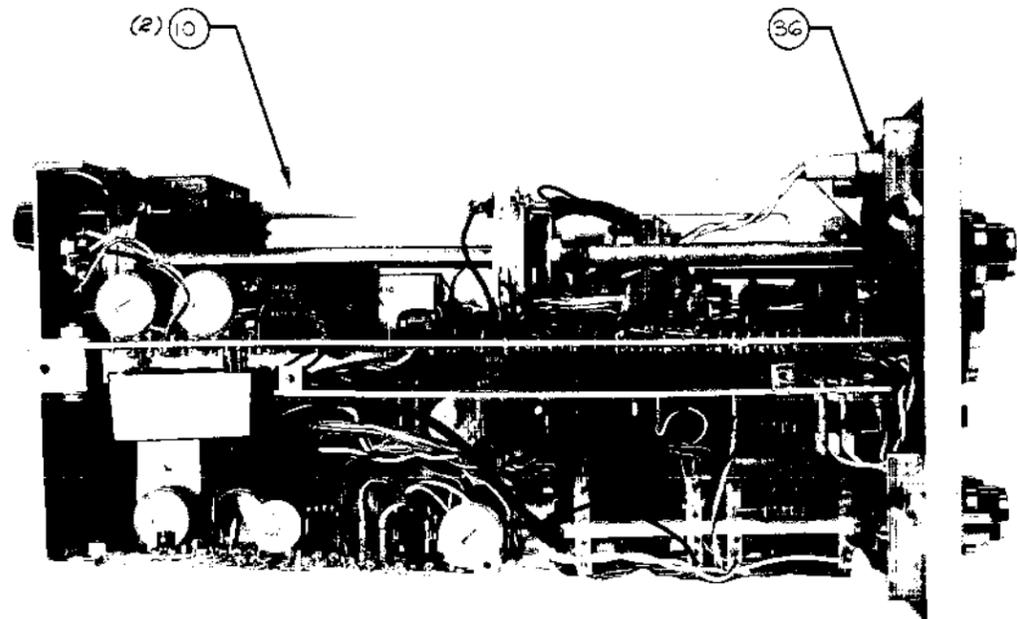
DESCRIPTION	MANUFACTURER	PART NO.	QTY
TRANSISTOR	FAIRCHILD	2N3638A	1
TRANSISTOR	FAIRCHILD	2N3642	1
TRANSISTOR	FAIRCHILD	L08	1
TRANSISTOR	FAIRCHILD, MOTOROLA	2N3640	1
TRANSISTOR	FAIRCHILD	MPS L08	1
TRANSISTOR	FAIRCHILD	2N2369	1
MATCHED			
TRANSISTOR	FAIRCHILD	*2N2905 (-8)	2
MATCHED			
TRANSISTOR	FAIRCHILD	*2N3646 (-11)	2
MATCHED			
TRANSISTOR	FAIRCHILD	*2N3638 (-9)	2
MATCHED			
TRANSISTOR	MOTOROLA	*2N3640 (-10)	2
TRANSISTOR	MOTOROLA	MPS3640	1
TRANSISTOR	MOTOROLA	2N3903	1
TRANSISTOR	MOTOROLA	2N3905	1
TRANSISTOR	SPRAGUE	TD101	1
TRANSISTOR	TEXAS INST	*TIP 29	1
TRANSISTOR	TEXAS INST	*TIP 30	1

* Denotes special parts that should be ordered from Wavetek. These parts have been tested or selected by Wavetek for optimum performance.

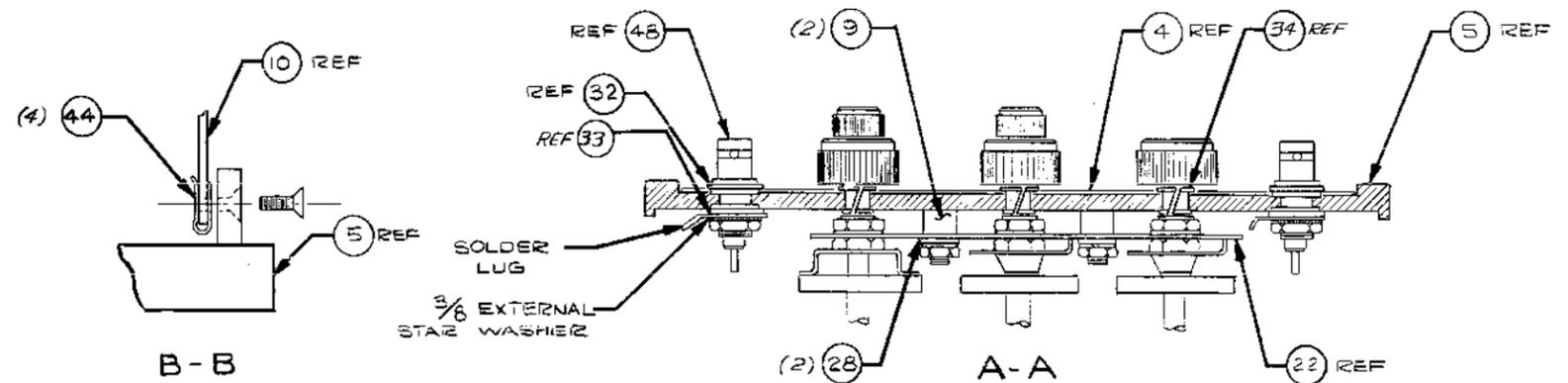
CROSS REFERENCE FOR DRAWING NUMBERS

Drawings	Old Number	New Number	Drawings	Old Number	New Number
Chassis Assembly	132-000	0102-00-0281	Logic Assembly	132-013	0101-00-0041
Chassis Schematic	132-200	0004-00-0022	Logic Schematic	132-213	0103-00-0041
Chassis Parts List	*	1101-00-0022	Logic Parts List	*	1100-00-0041
Bracket Assembly	130-001	0102-00-0324	Output Attenuator Assembly	142-003	1202-00-0008
Bracket Parts List	*	1101-00-0065	Output Attenuator Schematic	142-203	*
			Output Attenuator Parts List	*	*
Main Board Assembly	132-010	0101-00-0039	S/N - N/S (dB) Attenuator		
Main Board Schematic	132-210	0103-00-0039	Assembly	132-001	1202-00-0003
Main Board Parts List	*	1101-00-0039	S/N - N/S (dB) Attenuator		
			Parts List	*	*
Amplifier Assembly	132-012	0101-00-0040	Freq Sw Assembly	132-002	1202-00-0004
Amplifier Schematic	132-212	0103-00-0040	Freq Sw Parts List	*	*
Amplifier Parts List	*	1100-00-0040			

*Same as Assembly Number



IC3 INSTALLATION
(VIEWED FROM FRONT PANEL)

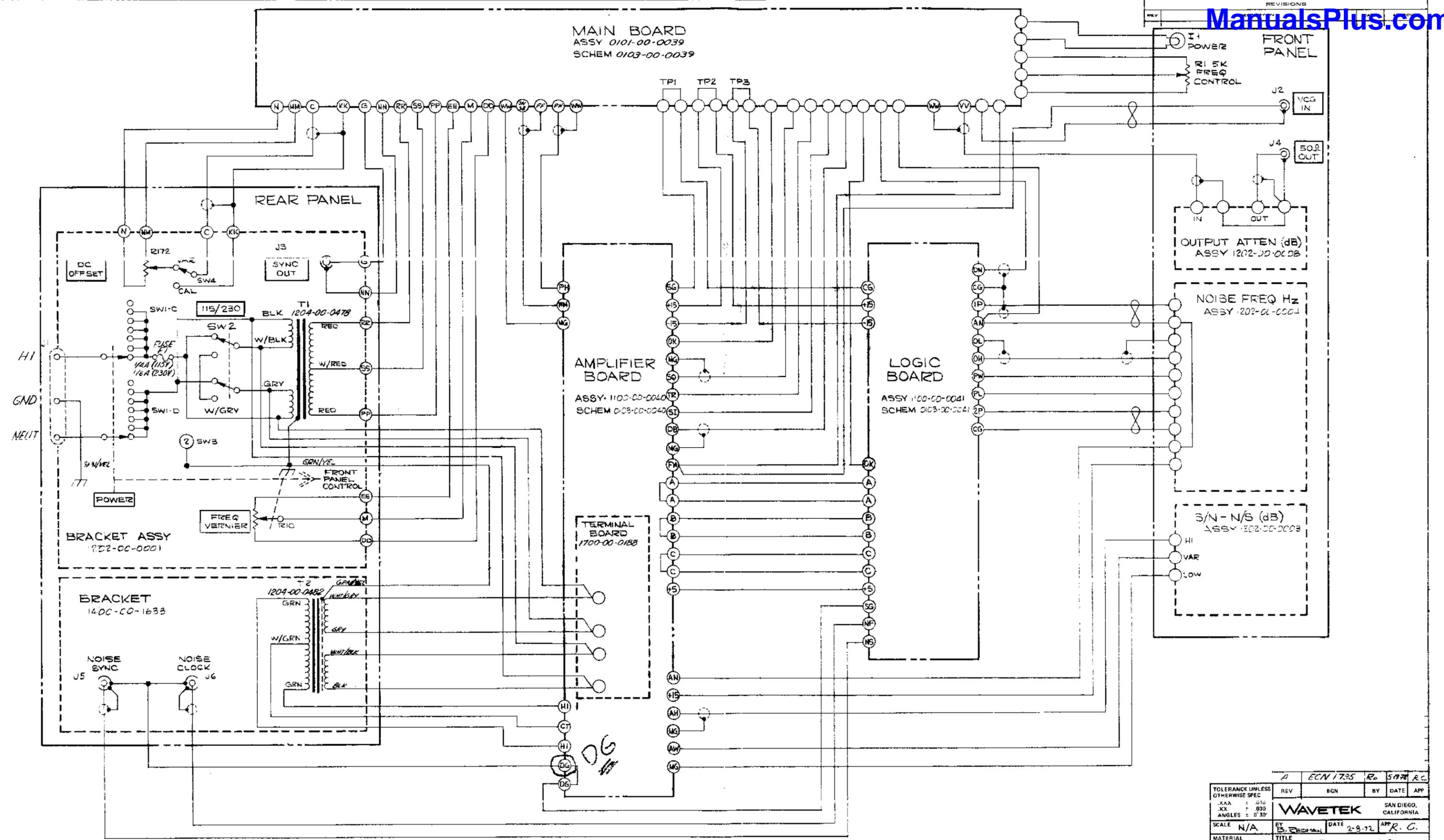


F	ECN 1482	RO	10-21-76
E	ECN 1112	32	5-21-76
D	ECN 5714	160	8-19-76
C	ECN 4291	160	7-17-76
B	ECN 4411	160	7-12-76
A	ECN #422	B.R.	4-20-76

tolerance unless otherwise specified	rev	scr	by	date	app.
.XXX ± .010 .XX ± .030					
scale N/A	by B. REDMAN		date 23 FEB 78	app. E. C.	
material	title				
N/A	CHASSIS ASSY				
finish	model no.	dwg no.	rev		
N/A	132	0102-00-0231	F		

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MAIN BOARD
 ASSY 0101-00-0039
 SCHEM 0103-00-0039



REV	ECN	BY	DATE	APP
A	ECN 1735	Rc	5/78	R.C.
TOLERANCE UNLESS OTHERWISE SPEC				
.XXX	± .010			
.XX	± .030			
ANGLES	± 0°30'			
SCALE	N/A	BY B. Redman	DATE 2-9-72	APP R. C.
MATERIAL	N/A	TITLE SCHEMATIC - INSTRUMENT		
FINISH	N/A	MODEL NO. 132	DWG NO. 0004-00-0022	REV A
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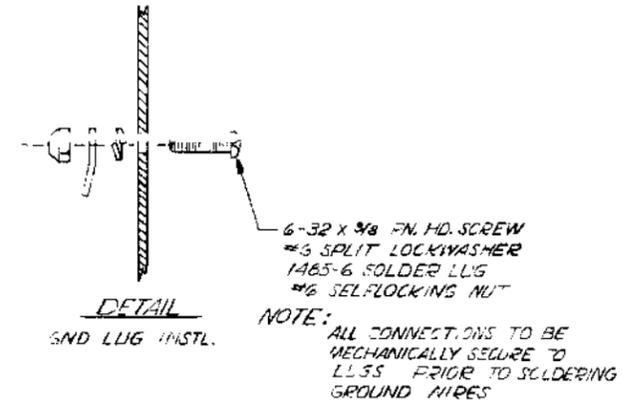
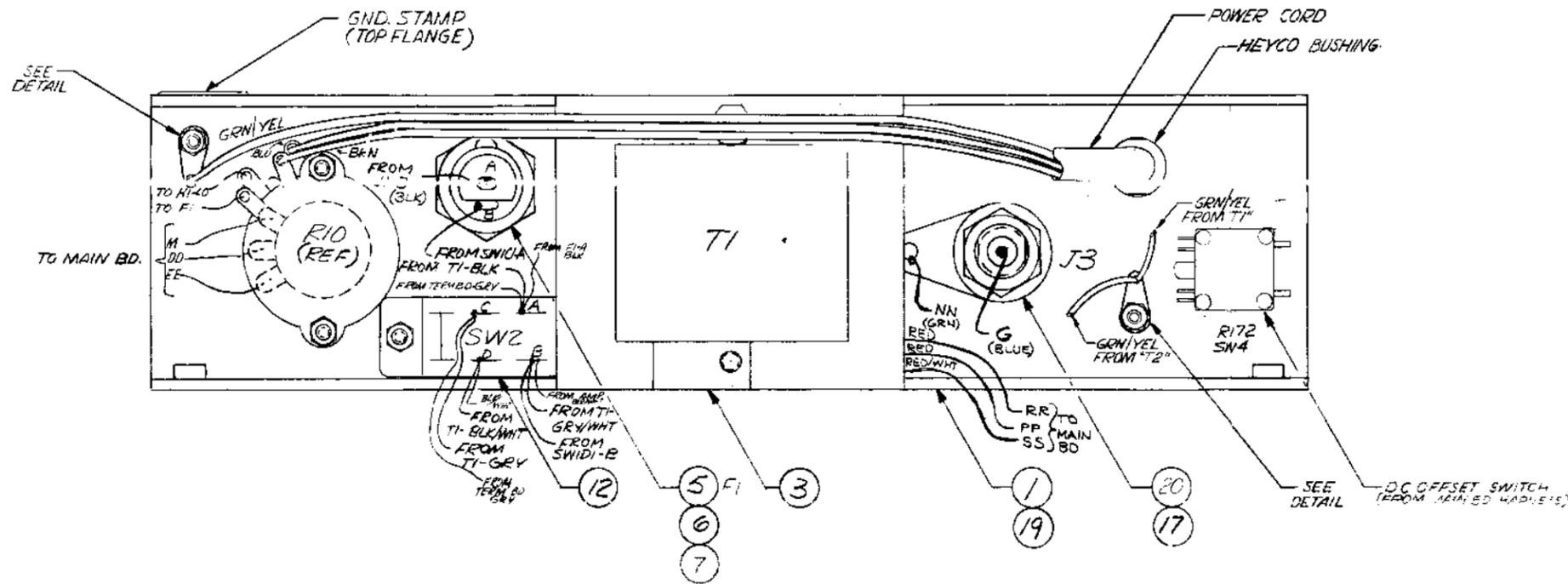
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REFERENCE DESIGNATORS	PART DESCRIPTION	QTY-REF-UNIT	REF	ASSEMBLY NO.	REV
1	WHEEL ASSEMBLY	0102-00-0201	AVTK	1101-00-0022	1
2	WHEEL	150-355-00	AVTK	1101-00-0022	1
3	COVER ASST	150-355-01	AVTK	1101-00-0022	1
4	PANEL REAR FRUP:11400-00-102c	152-303	AVTK	1101-00-0022	1
5	RAIL, SIDE	150-304	AVTK	1101-00-0022	2
6	PANEL, F1	152-300	AVTK	1101-00-0022	1
7	SPACER	152-306	AVTK	1101-00-0022	2
8	CASING, FRONT FRUP:11400-00-1001	152-301	AVTK	1101-00-0022	1
9	CASING, REAR FRUP:11400-00-1001	152-304	AVTK	1101-00-0022	1
10	SCREW	155-002	AVTK	1101-00-0022	2
11	INDICATOR, VIAL	141-317	AVTK	1101-00-0022	1
12	INDICATOR, MICRA	142-311	AVTK	1101-00-0022	1
13	LABEL, 100	1400-00-0070	AVTK	1101-00-0022	1
14	WALW				
15	WALW				
16	WALW				
17	WALW				
18	WALW				
19	WALW				
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96	WALW				
97	WALW				
98	WALW				
99	WALW				
100	WALW				
WAVETEK PARTS LIST		TITLE STD CHASSIS	ASSEMBLY NO. 1101-00-0022	REV 1	PAGE: 1

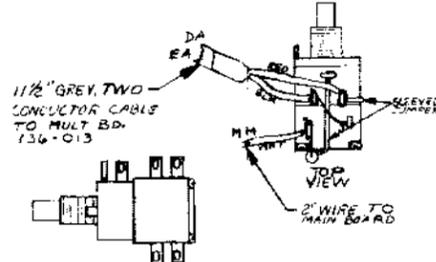
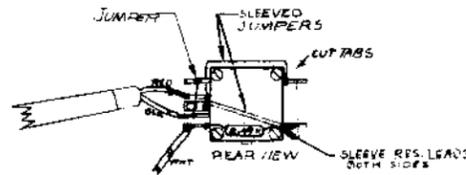
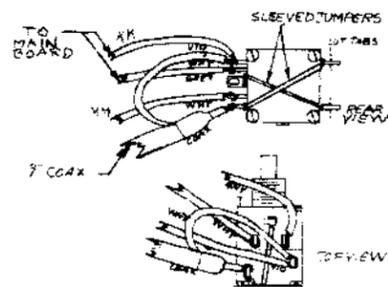
REFERENCE DESIGNATORS	PART DESCRIPTION	QTY-REF-UNIT	REF	ASSEMBLY NO.	REV
10	COAX KNOB SET	4B-07-2-55-0-M-9	ROGKN	2000-01-0004	1
34	BUSHING NYLON	4LEF	TRKRC	2000-01-0006	3
44	SPEEDNUT, TYP "U"	60691-032-4	TRKRN	2000-04-0004	4
45	PRESS BOLT	PB-0-32-58-10	ROGKN	2000-04-0004	2
47	PLUG BUTTON	PL47241	ORLAK	2000-04-0010	2
52	FAST, CHASSIS	1541-011	ORLAK	2000-04-0021	4
57	WASHER, SCREW	LA1570-10-5-9	TRKRN	2000-20-0001	2
60	WASHER, SHOULDER	2000	SHITR	2000-20-0001	3
62	WASHER, SHOULDER	2000	SHITR	2000-27-0004	2
65	NYLON FLAT WASHER	2000-1-355	SHITR	2000-20-0005	2
66	RETAINING RING	5300-31	TRKRC	2000-30-0002	1
WAVETEK PARTS LIST		TITLE STD CHASSIS	ASSEMBLY NO. 1101-00-0022	REV 1	PAGE: 2

NOTE: UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE		
MATERIAL	PROJECTOR			
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED .XX .010 ANGLES 1:1 XX .030		TITLE STD CHASSIS	
DO NOT SCALE DWG	MODEL NO.	DWG NO.	REV	
SCALE	32	1101-00-0022	3	
DATE	23338	SHEET	OF	



USE THIS WIRING FOR 130 SERIES (NOT NECESSARILY MODEL 136)



*J INDICATES JUMPER
 USE #24 GAUGE BUSS WIRE / SLEEVING
 SLEEVE RESISTOR LEADS WITH 24GA TEFLON
SWITCH WIRING FOR MODEL 136

K	ECN 1735	Ro	5/678	EC
J	DDC 41462	DL	4/66	
H	ECN 1346	RU	10/77	(u)
G	ECN 1242	ED	11/75	(u)
F	ECN 878	BA	5/74	EC
E	ECN 501	SL	7/72	(u)
D	J1 was AC3-G	SL	2/72	(u)
C	ECN 341	NG	1/72	(u)
B	COP 29	NG	2/72	(u)
A	ECN 283	SL	11/71	(u)

tolerance unless otherwise specified		rev	ecn	by	date	app.
.xxx ± .010 .xx ± .030						
scale	N/A	BY BOCHKHIO		date	7-21-69	app. J. G. J.
material	N/A	title ASSY BRACKET				
finish	N/A	model no.	130-136	dwg no.	0102-00-0324	TPV K
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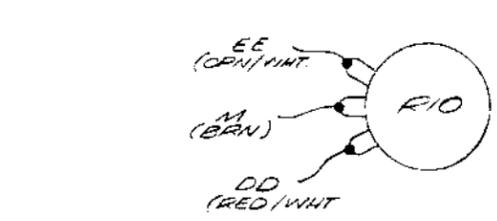
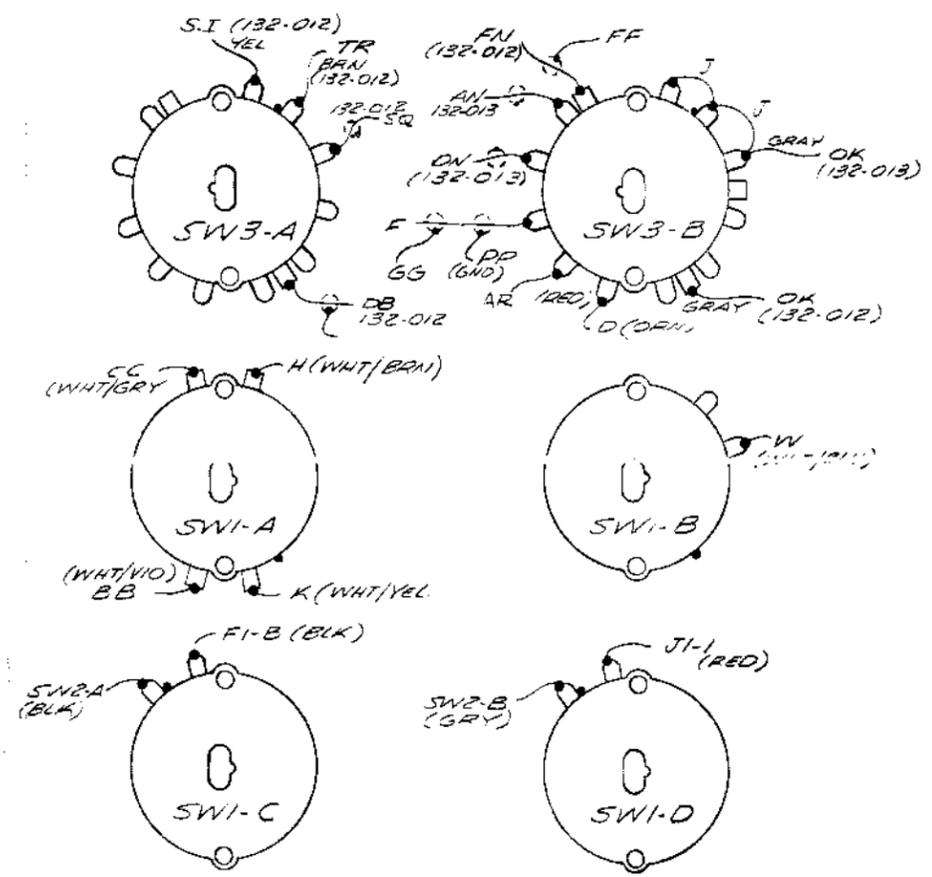
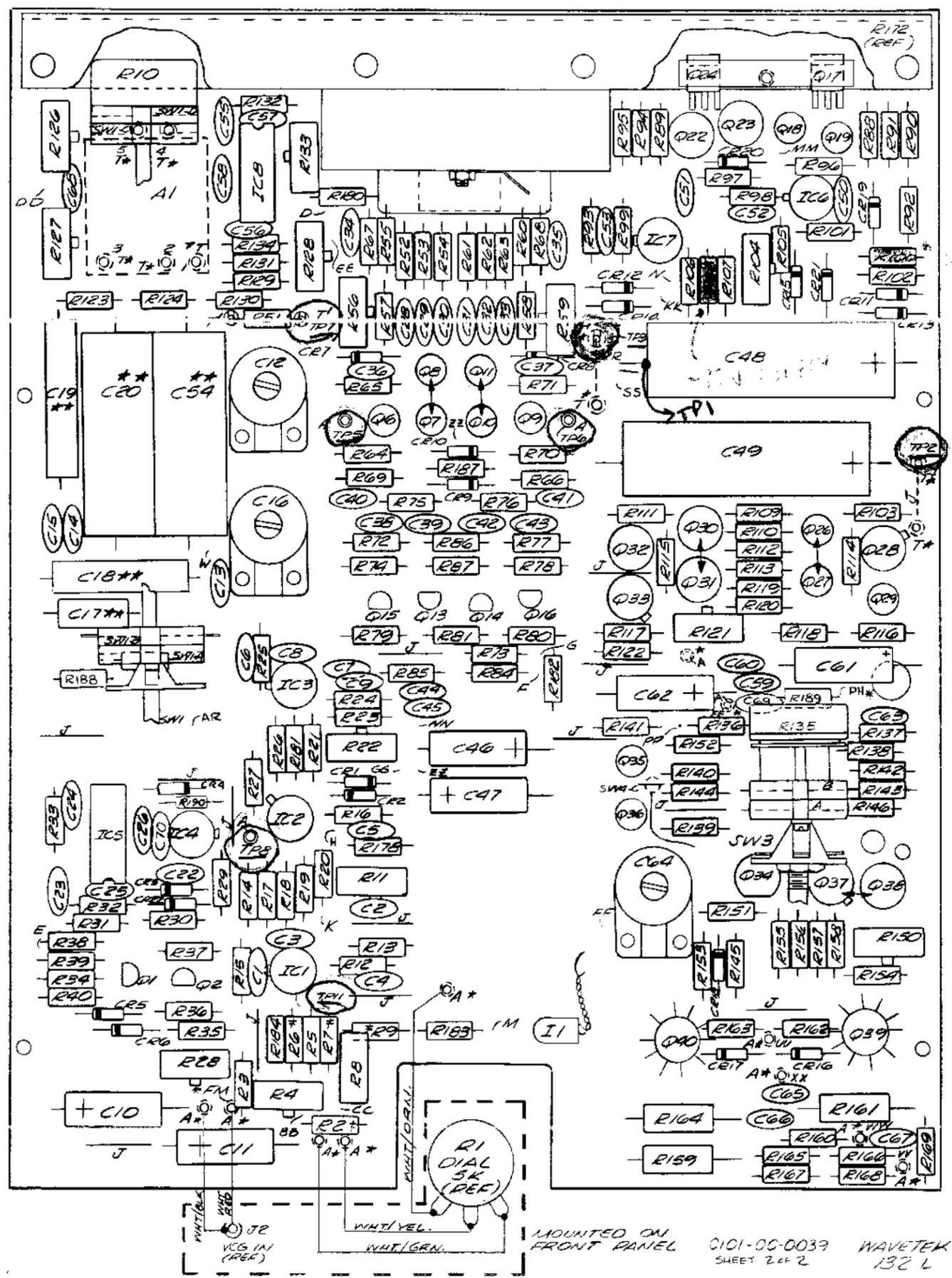
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REFERENCE DESIGNATORS	PART DESCRIPTION	ORIGINAL PART NO.	QTY	REVISION NO.	QTY REQD
NONE	ASST BRACKET ASSEMBLY	1101-00-0065	1	0102-00-0024	1
13	TRANSFORMER	150-500	1	1404-00-0470	1
5	BRKT	150-506	1	1400-00-1093	1
15	HEAT SINK	150-511	1	1400-00-1105	1
14	REGULATOR	160-507	1	1400-00-0740	1
1	BRKT/HEAT SINK/REG	140-00-8815	1	1400-00-8815	1
15	DIODE LAMP	50-7945	1	2100-01-0032	1
20	SOLDER LUG	1447	1	2100-04-0012	1
21	SOLDER LUG	1405-0	2	2100-04-0025	2
3	FUSE, 250V, 1/8A, 50	102L 170	1	2400-05-0001	1
4	FUSE, 250V, 1/8A, 50	513-250	1	2400-05-0008	1
7	FUSE HOLDER	245001	1	2400-05-0012	1
24	INSERT P 0	74-11-100-13	4	2800-04-0017	4
17	WASHER/SHOULDER	2600	2	2800-27-0004	2
NONE	STRAIN RELIEF BRKT	5000-1	1	2800-37-0005	1
12	SHIELD BRKT BRIDGE	40250-1F	1	5100-06-0002	1
16	SOLDER BRIDGE	40250-1F-00	1	5100-06-0002	1
21	PHS BRKT	0-7709-00000*	1	5001-00-0004	1

	TITLE BRACKET ASSY	ASSEMBLY NO. 1101-00-0065	REV K
	PAGE 1		

NOTE: UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	
MATERIAL	PROJENGR	TITLE	
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX - .010 ANGLES .1"		BRACKET ASSY
	DO NOT SCALE DWG		
	SCALE	MODEL NO. 32	
CODE IDENT. 23338		SHEET	REV K



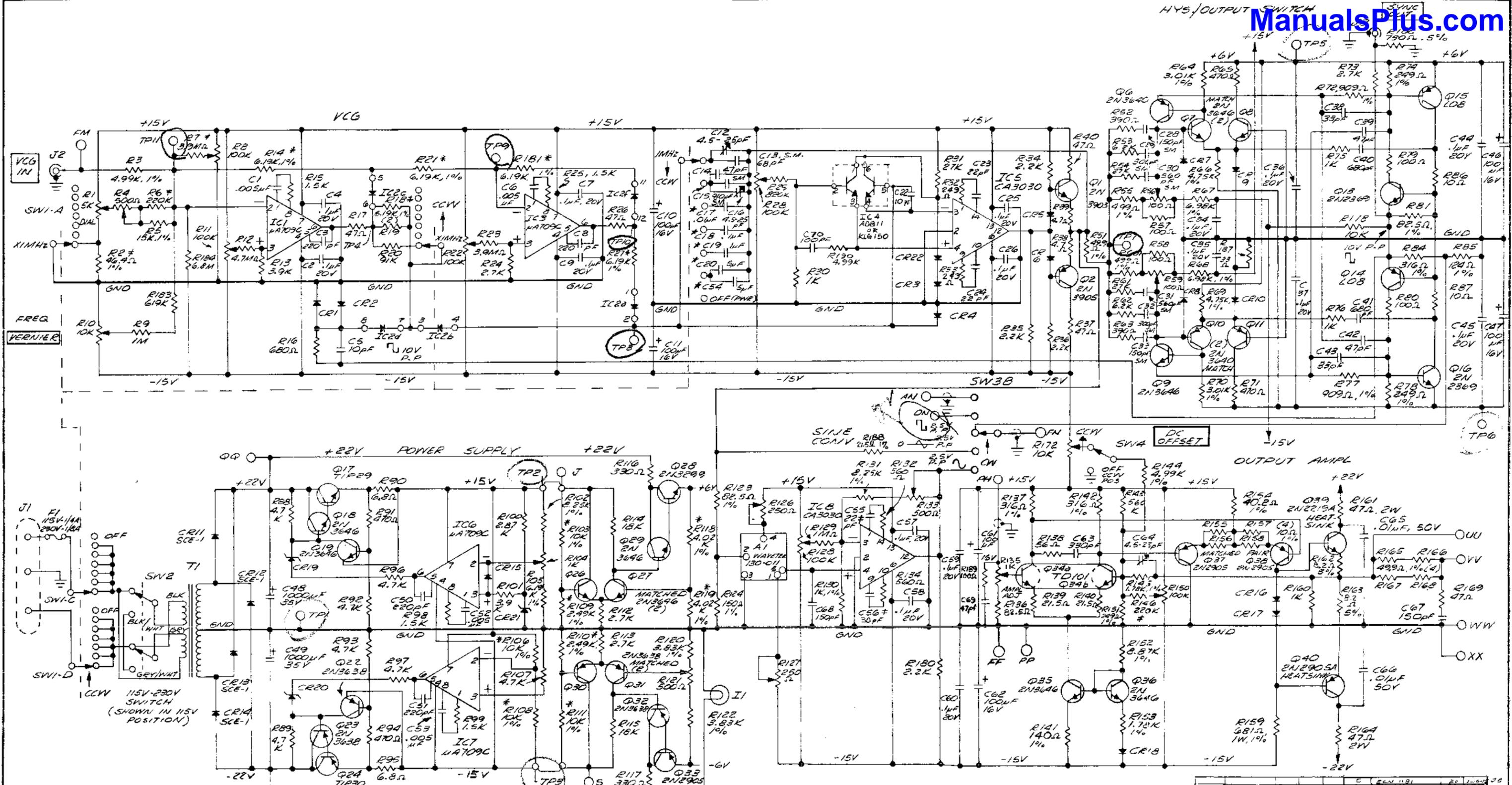
NOTES FOR SW1
SWITCH APPEARS AS VIEWED FROM FRONT OF BOARD. THE FRONT OR NEAREST WAFER IS "A"

- 8. ← → = MATCHED TRANSISTORS
 - 7. ** = MATCHED SET
 - 6. † = SELECTED VALUE
 - 5. PH, FM, ** = FARSIDE
 - 4. A = AMP PINS NEARSIDE
 - 3. A* = AMP PINS FARSIDE
 - 2. T*, T† = TERMINALS FARSIDE
 - 1. T = TERMINALS NEARSIDE
- NOTES

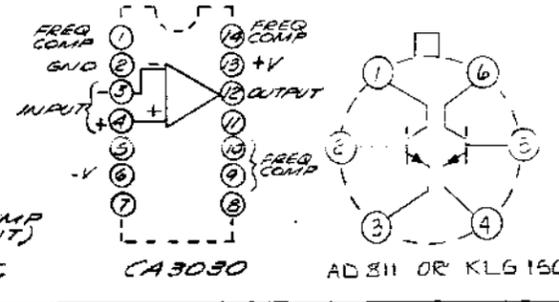
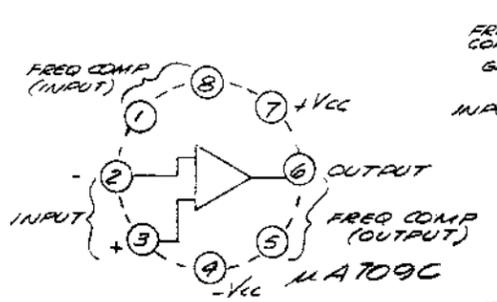
MOUNTED ON FRONT PANEL
0101-00-0039 WAVE TEK
SHEET 2 OF 2 132 L

L	ECN 1347	26	8/78	T
K	ECN 1231	26	6/78	T
J	ECN 1223	26	4/78	T
H	ECN 1216	26	2/78	T
G	ECN 1181	26	1/77	T
F	ECN 744	26	1/77	T
E	ECN 77	26	1/77	T
D	ECN 726	26	1/77	T
C	ECN 685	26	1/77	T
B	ECN 441	26	1/77	T
A	ECN 421	26	1/77	T

TOLERANCE UNLESS OTHERWISE SPEC	XXX = .010	XX = .030	ANGLES = 0/30
SCALE N/A	BY GRAY	DATE 2/14/72	APP R. C.
MATERIAL N/A	TITLE ASSY MAIN BOARD		
FINISH N/A	MODEL NO. 132	DWG NO. 0101-00-0039	REV L
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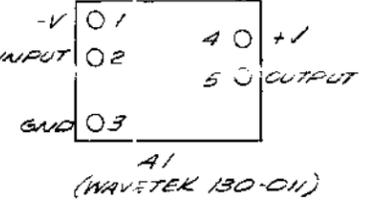


NOTES UNLESS OTHERWISE SPECIFIED
 1. * INDICATES MATCHED SET (R14, R18, R19, R21, R181, R21), (R18, R19), (R109, R10), (R103, R111), (R106, R108)
 2. DIODES ARE FD66GG
 3. RESISTORS ARE 1/4W, 1%
 4. * C17, C18, C19, C20, C59 ARE A MATCHED SET
 5. IC2: CA3039
 6. IC2, IC5 ARE SELECTED.
 7. * INDICATES SELECTED VALUE; NOMINAL VALUE AS SHOWN.



LAST REF DESIG.
 A1 IC8
 C70 IC9
 CR22 T1
 Z1 Q40

rev	ecn	by	date	app
1	1	ECN 181	10-1-76	J
2	2	ECN 223	10-1-76	J
3	3	ECN 223	10-1-76	J
4	4	ECN 223	10-1-76	J
5	5	ECN 223	10-1-76	J
6	6	ECN 223	10-1-76	J
7	7	ECN 223	10-1-76	J
8	8	ECN 223	10-1-76	J
9	9	ECN 223	10-1-76	J
10	10	ECN 223	10-1-76	J
11	11	ECN 223	10-1-76	J
12	12	ECN 223	10-1-76	J
13	13	ECN 223	10-1-76	J
14	14	ECN 223	10-1-76	J
15	15	ECN 223	10-1-76	J
16	16	ECN 223	10-1-76	J
17	17	ECN 223	10-1-76	J
18	18	ECN 223	10-1-76	J
19	19	ECN 223	10-1-76	J
20	20	ECN 223	10-1-76	J
21	21	ECN 223	10-1-76	J
22	22	ECN 223	10-1-76	J
23	23	ECN 223	10-1-76	J
24	24	ECN 223	10-1-76	J
25	25	ECN 223	10-1-76	J
26	26	ECN 223	10-1-76	J
27	27	ECN 223	10-1-76	J
28	28	ECN 223	10-1-76	J
29	29	ECN 223	10-1-76	J
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35	35	ECN 223	10-1-76	J
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37	37	ECN 223	10-1-76	J
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42	42	ECN 223	10-1-76	J
43	43	ECN 223	10-1-76	J
44	44	ECN 223	10-1-76	J
45	45	ECN 223	10-1-76	J
46	46	ECN 223	10-1-76	J
47	47	ECN 223	10-1-76	J
48	48	ECN 223	10-1-76	J
49	49	ECN 223	10-1-76	J
50	50	ECN 223	10-1-76	J



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REFERENCE DESIGNATIONS	PART DESCRIPTION	ORIG-PFGR-PART-NO	AFAM	WAVETEK NO.	QTY/PKT
NONE	RESS, UNDR, 141X	5181-00-0039	AVTK	0100-00-0039	1
NONE	SCHEMATIC, 141X	5183-00-0039	AVTK	0100-00-0039	1
A1	SIXE 100	120-011	AVTK	1200-00-0001	1
NONE	SLUCR, MOUNTING	130-315	AVTK	1400-00-1083	2
101	SLUCR, SUPPLMT	130-328	AVTK	1400-00-1283	1
005 022	CAP, CER, 100PF, 10V	00-100	DPL	1500-01-0011	2
070	CAP, CER, 100PF, 10V	00-100	DNL	1500-01-0111	1
065 066	CAP, CER, 0.01MF, 50V	00-103	DPL	1500-01-0310	2
07 025 026 034 035 036 037 04 044 045 057 058 059 060 07 09	CAP, CER, 1MF, 20V	00-104-004	A-00	1500-01-0413	16
057 067	CAP, CER, 150PF, 10V	00-105	C-01	1500-01-0511	2
024 024 035	CAP, CER, 22PF, 10V	00-120	C-01	1500-02-2011	3
048 05 051 051	CAP, CER, 220PF, 10V	00-121	C-01	1500-02-2111	4
056	CAP, CER, 50PF, 10V	00-130	C-01	1500-03-0001	1
056 043	CAP, CER, 55PF, 10V	00-130	C-01	1500-03-3011	2
065	CAP, CER, 330PF, 10V	00-131	C-01	1500-03-3111	1
034 042 064	CAP, CER, 1MF, 10V	00-171	D-01	1500-04-7011	3
031 006 052 054	CAP, CER, 1000PF, 10V	00-182	C-01	1500-05-0210	4

REFERENCE DESIGNATIONS	PART DESCRIPTION	ORIG-PFGR-PART-NO	AFAM	WAVETEK NO.	QTY/PKT
	CAP, SET, POLYIC CONSIST: 1509-90-0001 TAKL: 0004			1509-00-0005	
C19	CAP, POLYIC, 1MF, 50V PART OF 1509-90-0005 QTY: 01: 1500-41-0504				
C20 C54	CAP, POLYIC, 5MF, 100V PART OF 1509-90-0005 QTY: 02: 1500-45-0509				
NONE	MAIN	150-110	AVTK	1700-00-0037	1
152	TERM	200001	US:CO	2100-05-0009	6
151	TERM	201061	US:CO	2100-05-0011	5
153	PIG, MALE	01182-2	APP	2100-05-0020	12
NONE	KNIFE	021-222	ELCA	2400-01-0001	1
11	LAMP	017-7676	CHMIN	2400-02-0013	1
146	HEAT SINK	017-267	MAAE	2400-11-0001	2
144	TRANSIPAD	10123A	NETRS	2600-11-0003	9
150	TRANSIPAD	10160	NETRS	2600-11-0004	2
456 459	POT, TRIM, 100	914-100	TECK	4600-01-0103	2
R104	POT, TRIM, 1K	914-114	TELA	4600-01-0209	1
R10	POT, L0WT, 10K	150-114	AVTK	4600-01-0305	1

REFERENCE DESIGNATIONS	PART DESCRIPTION	ORIG-PFGR-PART-NO	AFAM	WAVETEK NO.	QTY/PKT
R086 R087 R155 R156 R197 R198	RES, MF, 1/8W, 14, 10	R4550-1000F	TKA	4701-03-1004	6
R15	RES, MF, 1/8W, 14, 124	R4550-1200F	TKA	4701-03-1240	1
R141	RES, MF, 1/8W, 14, 140	R4550-1400F	TKA	4701-03-1400	1
R124	RES, MF, 1/8W, 14, 150	R4550-1500F	TKA	4701-03-1500	1
R15 R25 R98 R99	RES, MF, 1/8W, 14, 1.5K	R4550-1500F	TKA	4701-03-1501	4
R5	RES, MF, 1/8W, 14, 15K	R4550-1500F	TKA	4701-03-1502	1
R145 R153	RES, MF, 1/8W, 14, 1.75K	R4550-1750F	TKA	4701-03-1751	2
R114 R115	RES, MF, 1/8W, 14, 18.2K	R4550-1820F	TKA	4701-03-1820	2
R134 R140 R166	RES, MF, 1/8W, 14, 21.5	R4550-2150F	TKA	4701-03-2154	3
R034 R035 R180 R35	RES, MF, 1/8W, 14, 2.21K	R4550-2210F	TKA	4701-03-2211	4
R064 R184	RES, MF, 1/8W, 14, 20.5K	R4550-2050F	TKA	4701-03-2054	2
R033 R074 R076 R151 R52	RES, MF, 1/8W, 14, 24V	R4550-2400F	TKA	4701-03-2498	5
R51 R54 R61	RES, MF, 1/8W, 14, 27.4K	R4550-2740F	TKA	4701-03-2742	3
R024 R073 R100 R112 R113	RES, MF, 1/8W, 14, 2.47K	R4550-2470F	TKA	4701-03-2471	5
R64 R70	RES, MF, 1/8W, 14, 3.01K	R4550-3010F	TKA	4701-03-3011	2
R004 R137 R142	RES, MF, 1/8W, 14, 31K	R4550-3100F	TKA	4701-03-3160	3

REFERENCE DESIGNATIONS	PART DESCRIPTION	ORIG-PFGR-PART-NO	AFAM	WAVETEK NO.	QTY/PKT
040 041	CAP, CER, 50PF, 10V	00-160	C-01	1500-06-0111	2
066 033	CAP, CER, 150PF, 50V	00-161-010	A-00	1500-11-0100	2
029 036	CAP, CER, 100PF, 10V	00-163-010	A-00	1500-13-0100	2
0107	CAP, CER, 100PF, 50V	00-165-010	A-00	1500-13-0000	1
036 031	CAP, CER, 500PF, 100V	00-165-010	A-00	1500-13-0100	2
015	CAP, CER, 100PF, 50V	00-165-010	A-00	1500-13-0000	1
015	CAP, CER, 100PF, 50V	00-165-010	A-00	1500-13-0100	1
010 011 046 047 061 062	CAP, ELECT, 1000PF, 10V	00-170-010-010	A-00	1500-31-0101	6
048 049	CAP, ELECT, 1000PF, 50V	00-170-030-010	A-00	1500-31-0212	2
012 016 064	VAR, 14.5-20PF, 50V	00-170-010	C-01	1500-32-0001	3
	CAP, SET, POLYIC CONSIST: 1509-90-0001 TAKL: 0004			1509-00-0005	1
017	CAP, POLYIC, 0.01MF, 50V PART OF 1509-90-0005 QTY: 01: 1500-41-0504				
016	CAP, POLYIC, 1MF, 100V PART OF 1509-90-0005 QTY: 01: 1500-45-0509				

REFERENCE DESIGNATIONS	PART DESCRIPTION	ORIG-PFGR-PART-NO	AFAM	WAVETEK NO.	QTY/PKT
R192	POT, TRIM, 10K	914-100-0100	TE	4600-01-0111	1
R008 R011 R022 R026 R126 R150	POT, TRIM, 10K	914-100	TELA	4600-01-0402	6
R126 R127	POT, TRIM, 20K	914-100	TECK	4600-02-0101	2
R004 R161 R165	POT, TRIM, 50K	914-100	TECK	4600-03-0104	3
R36 R39	RES, C, 1/2W, 5K, 5.0	40200F-047	STAPL	4700-25-0474	2
R40 R45	RES, C, 1/2W, 5K, 5.0	40200F-047	STAPL	4700-25-0604	2
R162 R163	RES, C, 1/2W, 5K, 5.0	40200F-047	STAPL	4700-25-0929	2
R07 R23	RES, C, 1/2W, 5K, 3.9K	40200F-345	STAPL	4700-25-3904	2
R12	RES, C, 1/2W, 10K, 4.7K	40200F-475	STAPL	4700-25-4704	1
R143	RES, C, 1/2W, 10K, 5.0K	40200F-501	STAPL	4700-25-5013	1
R184	RES, C, 1/2W, 10K, 6.8K	40200F-681	STAPL	4700-25-6804	1
R29	RES, C, 1/2W, 20K, 2.2K	40200F-624	STAPL	4700-25-8203	1
R161 R164	RES, C, 2W, 5K, 4.7	40200F-470	STAPL	4700-45-0070	2
R057 R058 R079 R080 R189	RES, MF, 1/8W, 14, 100	R4550-1000F	TKA	4701-03-1000	5
R030 R073 R076 R135 R160	RES, MF, 1/8W, 14, 1K	R4550-1000F	TKA	4701-03-1001	5
R178	RES, MF, 1/8W, 14, 15K	R4550-1000F	TKA	4701-03-1092	1

REFERENCE DESIGNATIONS	PART DESCRIPTION	ORIG-PFGR-PART-NO	AFAM	WAVETEK NO.	QTY/PKT
R187	RES, MF, 1/8W, 14, 25.0	R4550-2500F	TKA	4701-03-2509	1
R120 R122	RES, MF, 1/8W, 14, 3.05K	R4550-3050F	TKA	4701-03-3051	2
R52 R65	RES, MF, 1/8W, 14, 3.9K	R4550-3900F	TKA	4701-03-3926	2
R013 R101	RES, MF, 1/8W, 14, 3.42K	R4550-3420F	TKA	4701-03-3421	2
R65 R71 R91 R94	RES, MF, 1/8W, 14, 4.0K	R4550-4000F	TKA	4701-03-4040	4
R002 R017 R066 R037 R095 R169	RES, MF, 1/8W, 14, 4.7K	R4550-4700F	TKA	4701-03-4744	5
R066 R064 R086 R084 R092 R093 R096 R197 R197	RES, MF, 1/8W, 14, 4.75K	R4550-4750F	TKA	4701-03-4751	4
R55 R60	RES, MF, 1/8W, 14, 4.7K	R4550-4750F	TKA	4701-03-4790	2
R003 R104 R190	RES, MF, 1/8W, 14, 4.75K	R4550-4750F	TKA	4701-03-4791	3
R168	RES, MF, 1/8W, 14, 5.0K	R4550-5000F	TKA	4701-03-5023	1
R132 R134	RES, MF, 1/8W, 14, 5.0K	R4550-5000F	TKA	4701-03-5076	2
R053 R062 R105	RES, MF, 1/8W, 14, 5.1K	R4550-5100F	TKA	4701-03-5141	3
R16	RES, MF, 1/8W, 14, 5.1K	R4550-5100F	TKA	4701-03-5100	1
R67 R68	RES, MF, 1/8W, 14, 5.1K	R4550-5100F	TKA	4701-03-5151	2
R182	RES, MF, 1/8W, 14, 5.1K	R4550-5100F	TKA	4701-03-5150	1
R102 R131	RES, MF, 1/8W, 14, 4.75K	R4550-4750F	TKA	4701-03-4751	2

NOTE, UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO, CALIFORNIA	
MATERIAL	PROJ ENGR		TITLE	
	RELEASE APPROV		MAIN BOARD	
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED			
	XXX ±.010 ANGLES :1			
	.XX ±.030			
	DO NOT SCALE DIMS	MODEL NO	DWG NO	REV
	SCALE	132	1100-00-0039	L
		CODE	23338	SHEET 1 OF 2

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REFERENCE DESIGNATORS	PART DESCRIPTION	QTY	WAVETEK NO.	QTY/PK	
R081 R123 R136	RES,RF,1/8W,1%,62.5	4N550-82K9F	TRK	4701-03-8259	3
R152	RES,RF,1/8W,1%,62.5	4N550-6871F	TRK	4701-03-6871	1
R72 R77	RES,RF,1/8W,1%,409	4N550-904F	TRK	4701-03-9050	2
R20	RES,RF,1/8W,1%,40.9K	4N550-9092F	TRK	4701-03-9092	1
R039 R129	RES,RF,1/8W,1%,14	4N550-1004F	TRK	4701-13-1004	2
R116 R117	RES,RF,1/4W,1%,532	4N550-3320F	TRK	4701-13-3320	2
R134	RES,RF,1/4W,1%,40.2	4N550-402F	TRK	4701-13-4029	1
R051 R103 R100 R107 R108	RES,RF,1/4W,1%,40.2	4N550-402F	TRK	4701-13-4999	5
R105	RES,RF,1/4W,1%,619K	4N550-6193F	TRK	4701-13-6193	1
R159	RES,RF,1/8W,1%,601	4N700-6010F	TRK	4701-33-6010	1
R109 R110	RES,SET,2-2.47K,1/4W QTY:2:4701-03-2091	130-501-1	AVTA	4789-30-0010	1
R116 R119	RES,SET,2-4.02K,1/4W QTY:2:4701-03-2091	130-501-2	AVTA	4789-30-0010	1
R014 R016 R019 R021 R027 R101	RES,SET,6-6.19K,1/4W QTY:6:4701-03-6191	130-501-3	AVTA	4789-30-0015	1
R103 R100 R107 R111	RES,SET,4-10K,1/4W QTY:4:4701-03-1002	130-501-4	AVTA	4789-30-0017	1
CR19 CR21 R020	DIODE	1N4541	ICR	4701-01-4541	3

WAVETEK PARTS LIST
 TITLE MAIN
 ASSEMBLY NO. 1100-00-0039
 PAGE 7
 REV L

REFERENCE DESIGNATORS	PART DESCRIPTION	QTY	WAVETEK NO.	QTY/PK	
G30 G31	TRANS,MP,2N3636 QTY:2:14901-03-6500	130-501-9	AVTA	4996-00-0012	1
Q10 Q11	TRANS,MP,2N3636 QTY:2:14901-03-6500	130-501-10	AVTA	4996-00-0013	1
Q07 Q08 Q26 Q27	TRANS,MP,2N3636 QTY:2:14901-03-6500	130-501-11	AVTA	4996-00-0014	2
SWS	SWITCH,85T,NOVUM	132-501	AVTA	5104-00-0015	1
SW1A	SWITCH	T-12b	CTB	5104-02-3002	1
SW1C SW1D	SWITCH	130-501-5	AVTA	5104-02-0007	2
SW1b	SWITCH	133-501-1	AVTA	5104-02-0009	1
NDNC	SWITCH STOP	212-50-000	CTB	5104-07-0002	1
SW1	GETENC,MOJ FROM:5104-01-0010	5104-99-0045	AVTA	5104-99-0045	1
IC4	IC	40 611	AVTA	7200-00-1100	1
IC5	IC,CLASS 2,CA=5036 QTY:1:17000-30-5000	130-501-15	AVTA	7200-00-0001	1
IC6	IC,CLASS 11,CA=3036 QTY:1:17000-30-5000	130-501-16	AVTA	7200-00-0002	1
IC2	IC,CLASS 1,CA=3039 QTY:1:17000-30-5900	130-501-18	AVTA	7200-00-0004	1
IC1 IC3	IC,CLASS 1,CA=704 QTY:1:17000-07-0900	130-501-13	AVTA	7200-00-0005	2

WAVETEK PARTS LIST
 TITLE MAIN
 ASSEMBLY NO. 1100-00-0039
 PAGE 8
 REV L

REFERENCE DESIGNATORS	PART DESCRIPTION	QTY	WAVETEK NO.	QTY/PK	
CR11 CR12 CR13 CR14	DIODE	5C1-1	ICR	4801-02-0001	4
CR01 CR02 CR03 CR04 CR05 CR06 CR07 CR08 CR09 CR10 CR15 CR16 CR17 CR18 CR22	DIODE	FU-6666	FAJR	4807-02-6666	15
Q59	TRANS	2N2619A	FAJR	4901-02-2191	1
Q55 Q60	TRANS	2N2615A	FAJR	4901-02-9051	2
Q26	TRANS	2N3299	FAJR	4901-03-2990	1
Q22 Q23 Q32	TRANS	2N3638	FAJR	4901-03-6380	3
Q6	TRANS	2N3640	FAJR	4901-03-6400	1
Q10 Q19 Q29 Q35 Q36 Q9	TRANS	2N3646	FAJR	4901-03-6460	6
Q1	TRANS	2N3903	FAJR	4901-03-9030	1
Q2	TRANS	2N3905	FAJR	4901-03-9050	1
Q14 Q15	TRANS	4N550-100	FAJR	4902-00-0080	2
Q17	TRANS	11-429	FAJR	4902-00-0290	1
Q24	TRANS	11K-36	FAJR	4902-00-0300	1
Q54	TRANS	11-101	FAJR	4902-00-1010	1
Q13 Q16	TRANS	12b-2304	FAJR	4902-02-3690	2
Q57 Q58	TRANS,MP,2N3636 QTY:2:14901-03-6500	130-501-9	AVTA	4996-00-0011	1

WAVETEK PARTS LIST
 TITLE MAIN
 ASSEMBLY NO. 1100-00-0039
 PAGE 9
 REV L

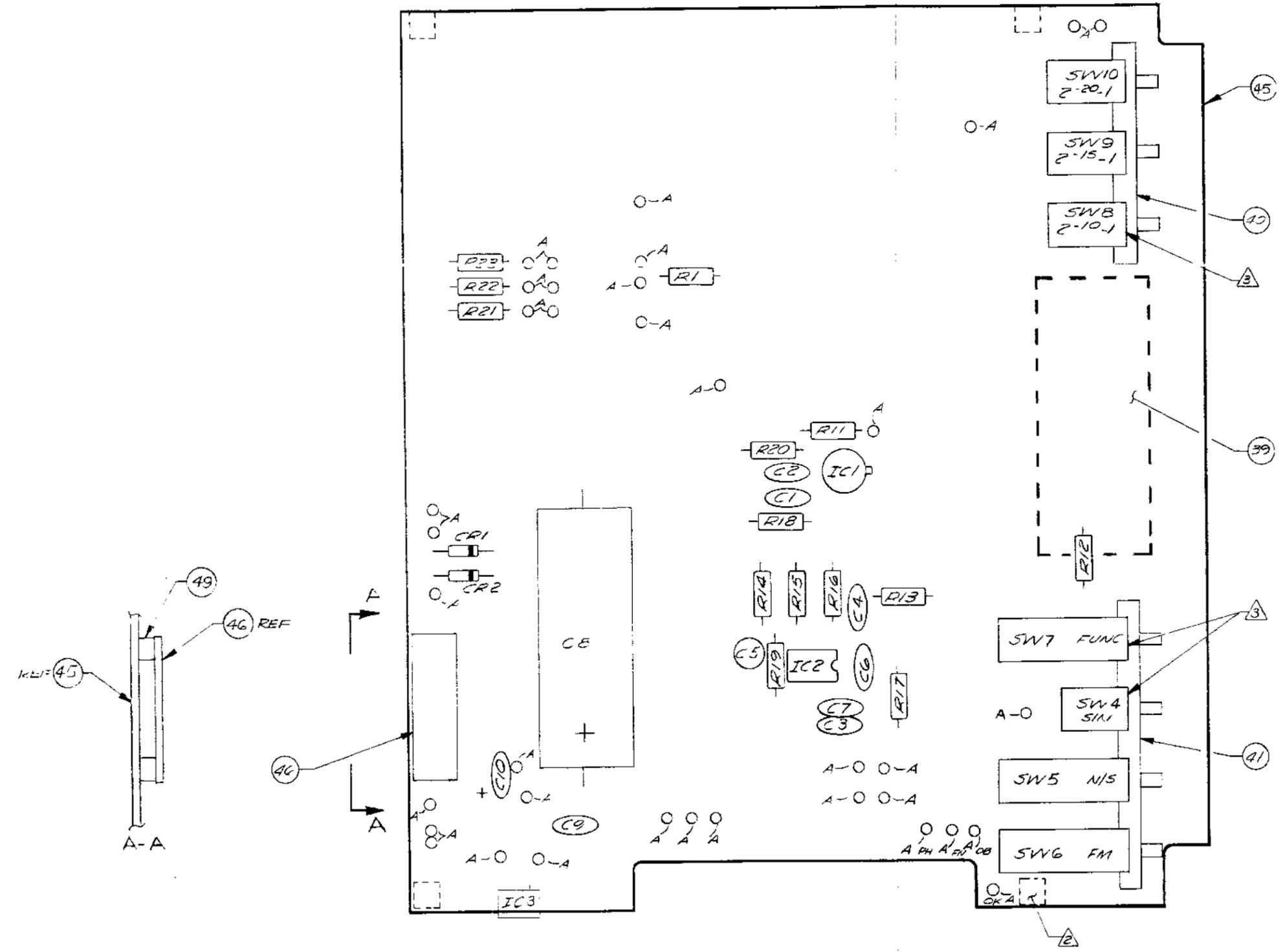
REFERENCE DESIGNATORS	PART DESCRIPTION	QTY	WAVETEK NO.	QTY/PK	
IC6 IC7	IC,CLASS 11,CA=704 QTY:1:17000-07-0900	130-501-14	AVTA	7200-00-0006	2

WAVETEK PARTS LIST
 TITLE MAIN
 ASSEMBLY NO. 1100-00-0039
 PAGE 10
 REV L

NOTE: UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR	TITLE	
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ±.010 ANGLES .1 XX ±.030		MAIN BOARD
DO NOT SCALE DWG		MODEL NO. 132	
SCALE		DWG NO. 1100-00-0039	REV L
CDD IDENT 23338		SHEET 2 OF 2	

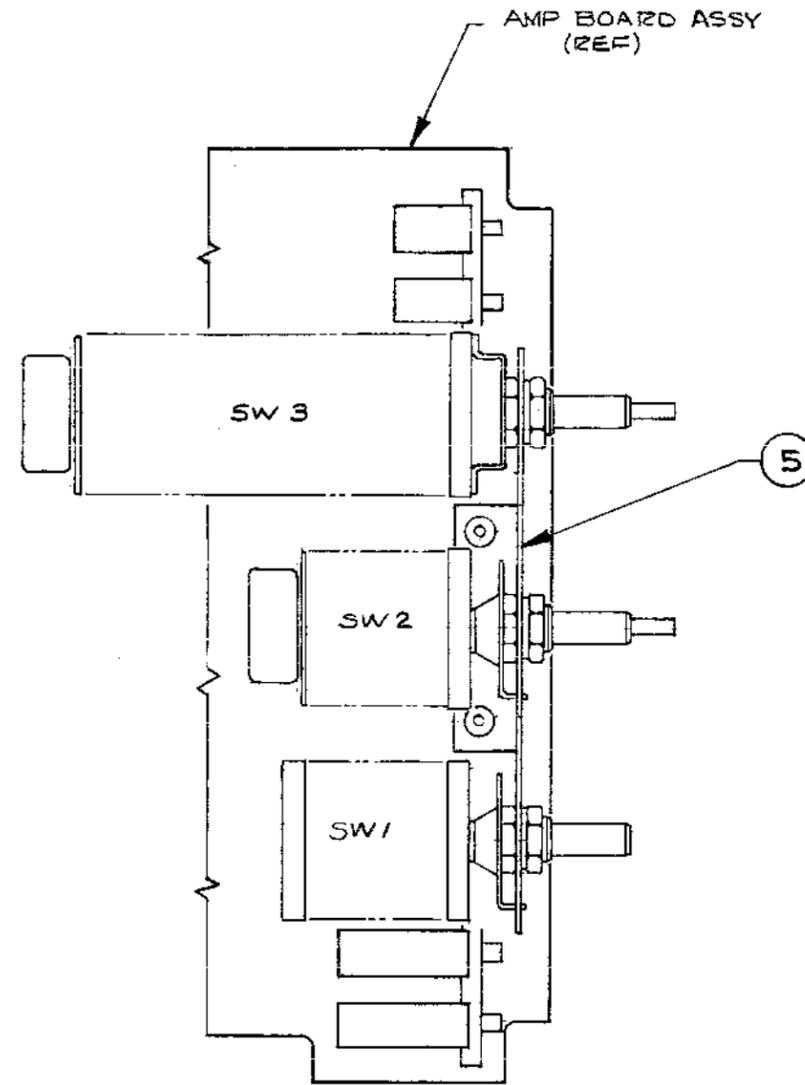
REVISIONS			
REV	DESCRIPTION	DATE	APPROVED



- NOTES:
- 3 CUT AC. PINS OFF NEAR COMPONENT BODY (TOP SIDE) ON SWITCHES SW4, SW7 & SW8
 - 2 USE CO BLOCK, SWAGE IN BOARD (FAR SIDE)
 - 1 A = INSERT AMP PINS (NEAR SIDE)

TOLERANCE UNLESS OTHERWISE SPEC	REV	ECN	BY	DATE	APP
XXX ± .010					
XX ± .030					
ANGLES = 0°30'					
SCALE N/A	BY GRAY	DATE 2-18-72	APP R. C.		
MATERIAL N/A	TITLE ASSY, AMP BOARD				
FINISH N/A	MODEL NO. 132	DWG NO. 0101-00-0340	REV F		

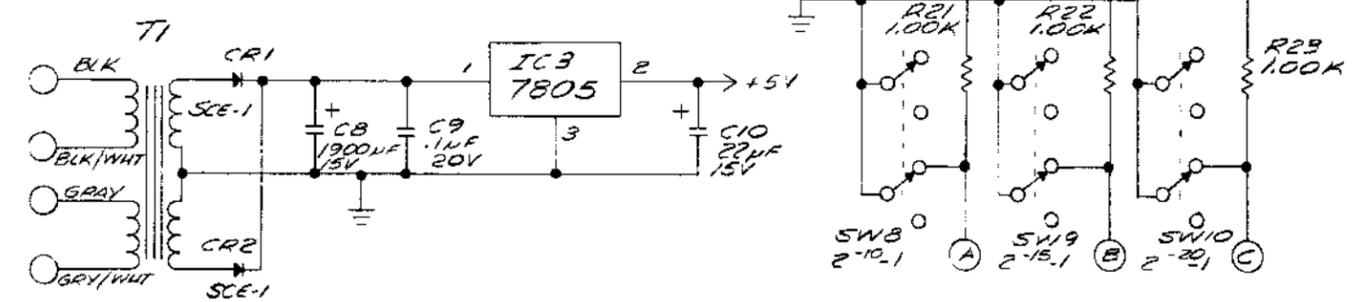
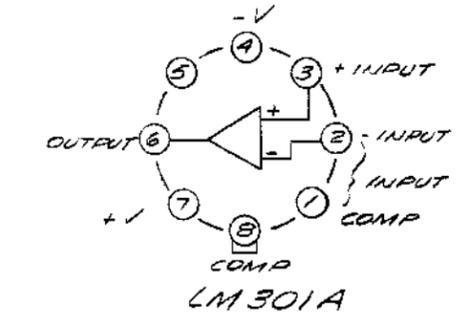
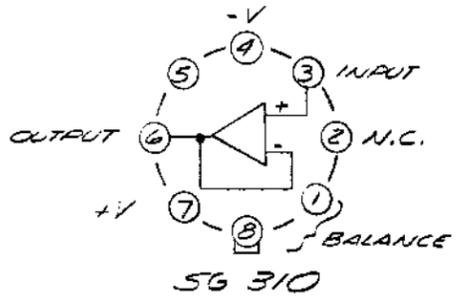
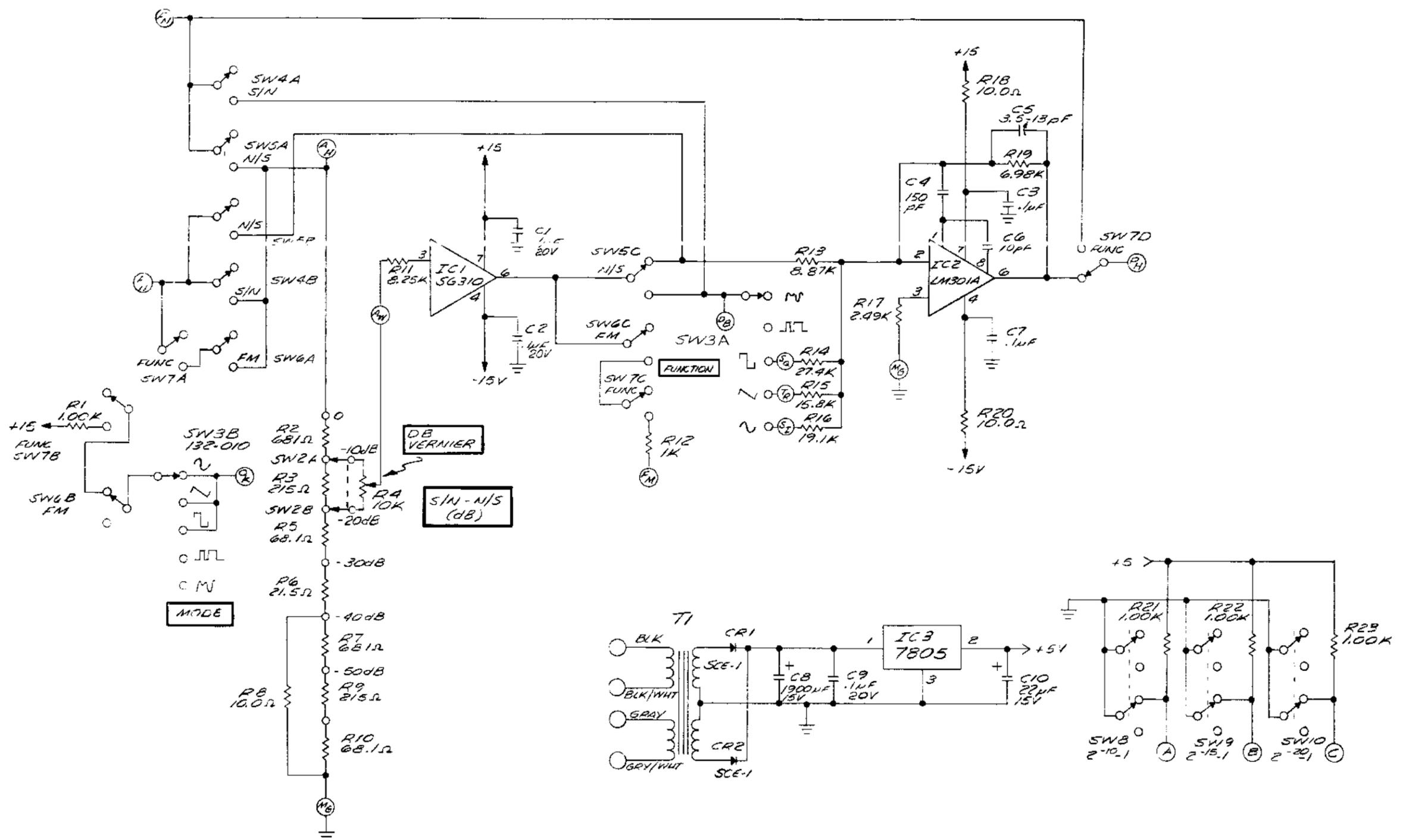
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SWITCH INSTALLATION
(SW1, SW2, SW3)

SEE SHEET 1

	WAVE			
FULL	B. REDMAN	2-15-72	R. C.	
N/A	SWITCH BRACKET, SUB-ASSY AMP BOARD			
		SHT 2 OF 2		
N/A	132	0101-00-0040	F	



5 ALL PUSHBUTTON SWITCHES SHOWN IN "OUT" POSITION
 4. ALL RESISTORS ARE METAL FILM, 1/8W, 1%
 3. ATTENUATOR RESISTORS MOUNTED ON SWITCH
 2. FM PUSH ON, PUSH OFF
 1. FM, SIN, N/S INTERLOCKING PUSHBUTTON SWITCHES
 NOTES: UNLESS OTHERWISE SPECIFIED

LAST REF DESIG
 C10 R23
 CR2 T1
 IC3 SW10

REV	8	*771	BA	10/28/71	R.C.
REV	A	*425	B.R.	4/25/72	R.C.
TOLERANCE UNLESS OTHERWISE SPEC	REV	ECN	BY	DATE	APP
.XXX ± .010 .XX ± .030 ANGLES ± 0°30'	WAVETEK SAN DIEGO, CALIFORNIA				
SCALE	BY	DATE	APP		
MATERIAL	TITLE SCHEMATIC				
	AMP BOARD				
FINISH	MODEL NO.	DWG NO.	REV		
	132	0103-00-0040	B		
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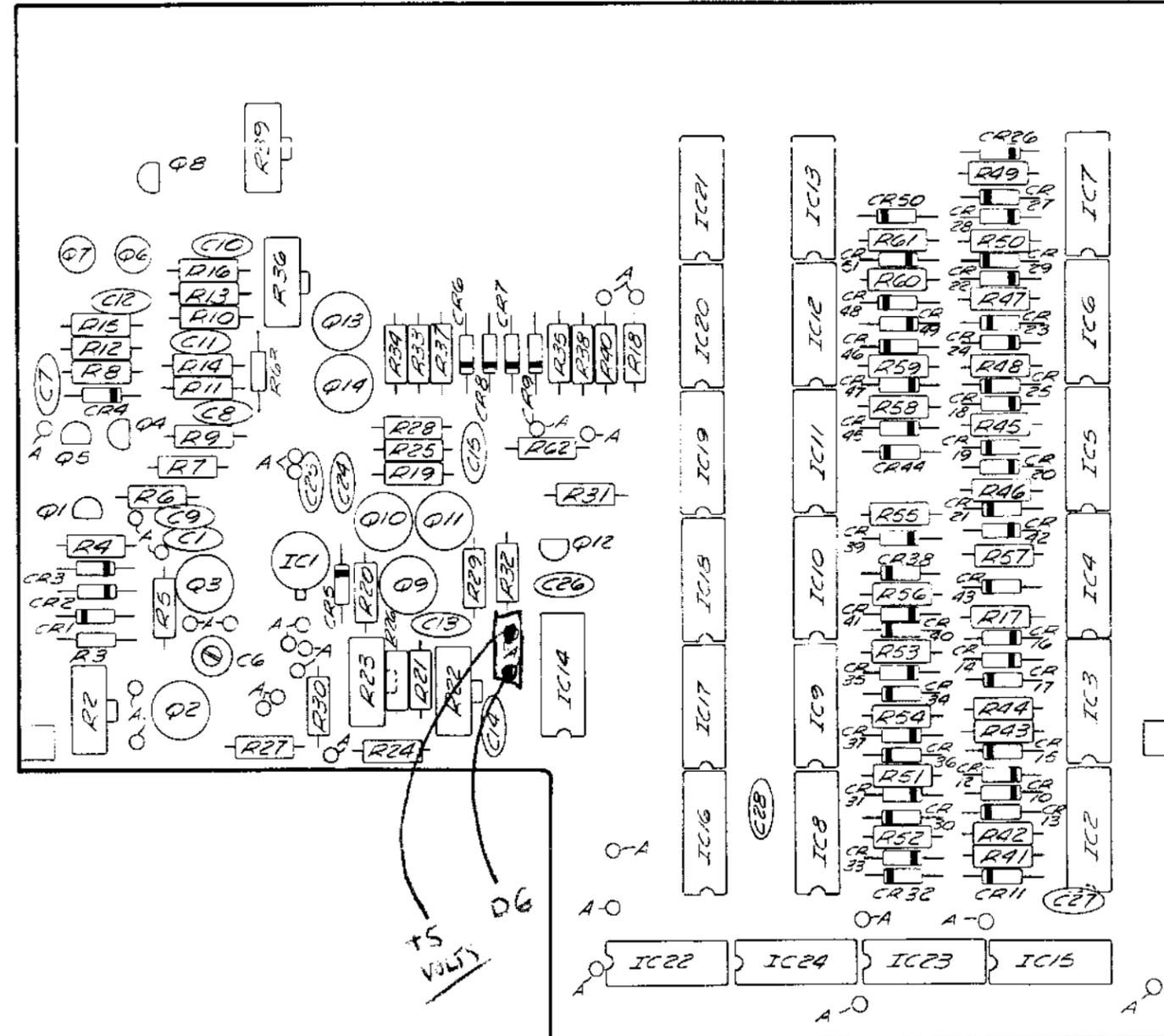
REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFG#-PART-NO	MFR	WAVETEK NO.	QTY/PT
NDNE	ASSY DRAG, AMP	0101-00-0040	AVTK	0101-00-0040	1
NDNE	SCHEMATIC, AMP	0103-00-0040	AVTK	0103-00-0040	1
SW2	ATTEN SW ASSY	132-001	AVTK	1202-00-0003	1
SW3	FREQ SW ASSY	152-002	AVTK	1202-00-0004	1
SW1	ATTEN SW ASSY	142-003	AVTK	1202-00-0006	1
09	SPACER	0480	AVTK	1400-00-0653	2
39	BRKT	132-309	AVTK	1400-00-1653	1
C6	CAP, CER, 10PF, 1KV	DU-100	CML	1500-01-0011	1
C1 C2 C3 C7 C9	CAP, CER, 1MP, 20V	UK20-104	AMCO	1500-01-0413	5
C4	CAP, CER, 150PF, 1KV	DD-151	CRL	1500-01-5111	1
C8	CAP, ELECT, 1400MF, 15V	39D1980015GL4	SPHAG	1500-31-9201	1
C5	VARL, 3.5-15PF, 250V	7S-TRIKO-02 3.5/15PF	TRIKO	1500-31-3000	1
C10	CAP, TANT, 22MF, 15V	196J226X4015KA1	SPHAG	1500-72-2601	1
05	AMP	132-112	AVTK	1700-00-0040	1
06	TERMINAL	135-113	AVTK	1700-00-0188	1
50	PIN, MALE	61162-2	AMP	2100-05-0020	37
51	INSERT # 6	74-11-106-13	SUTCO	2800-09-0017	2
38	FAST, CHASSIS	1591-B11	USECC	2800-09-0021	4
WAVETEK PARTS LIST		TITLE AMPLIFIER	ASSEMBLY NO. 1100-00-0040 PAGE: 1		REV F

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFG#-PART-NO	MFR	WAVETEK NO.	QTY/PT
R01 R12 R21 R22 R23	RES, MF, 1/8W, 1%, 1K	KA550-1001F	TRW	4701-03-1001	5
R10 R20	RES, MF, 1/8W, 1%, 10	KA550-1004F	TRW	4701-03-1009	2
R15	RES, MF, 1/8W, 1%, 15.8K	KA550-1582F	TRW	4701-03-1582	1
R16	RES, MF, 1/8W, 1%, 19.1K	KA550-1912F	TRW	4701-03-1912	1
R17	RES, MF, 1/8W, 1%, 2.49K	KA550-2491F	TRW	4701-03-2491	1
R14	RES, MF, 1/8W, 1%, 27.4K	KA550-2742F	TRW	4701-03-2742	1
R19	RES, MF, 1/8W, 1%, 6.98K	KA550-6981F	TRW	4701-03-6981	1
R11	RES, MF, 1/8W, 1%, 8.25K	KA550-8251F	TRW	4701-03-8251	1
R13	RES, MF, 1/8W, 1%, 8.27K	KA550-8271F	TRW	4701-03-8271	1
CR1 CR2	DIODE	SCB-1	SE-TC	4801-02-0001	2
41	SWITCH ASSY Pb	132-400	AVTK	5105-00-0004	1
40	SWITCH ASSY Pd	132-401	AVTK	5105-00-0005	1
52	BUTTON	0-52205-BL-RCK	LML	5105-04-0003	7
IC2	IC	LM 301AN	NSC	7000-03-0160	1
IC1	IC	7000-03-1000	AVTK	7000-03-1000	1
IC3	VOLTAGE REGULATOR	7805353	FAIR	8000-76-0500	1
WAVETEK PARTS LIST		TITLE AMPLIFIER	ASSEMBLY NO. 1100-00-0040 PAGE: 2		REV F

BR
OK

NOTE: UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO • CALIFORNIA	
MATERIAL	PROJ ENGR		TITLE AMPLIFIER	
	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ±.010 ANGLES .1° XX ±.030			
FINISH WAVETEK PROCESS	DO NOT SCALE DWG	MODEL NO. 132	DWG NO. 1100-00-0040	REV F
	SCALE	CODE IDENT 23338		SHEET OF



2. USECO BLOCK, SWAGE IN BOARD (NEAR SIDE)

1. A- INSERT AMP PINS (NEAR SIDE)

NOTES:

REV	ECN	BY	DATE	APP
1	424	EC	5/78	EL
2	425	B	7/78	EL

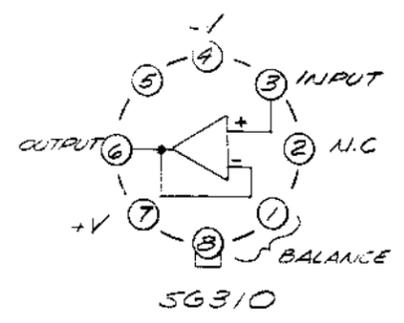
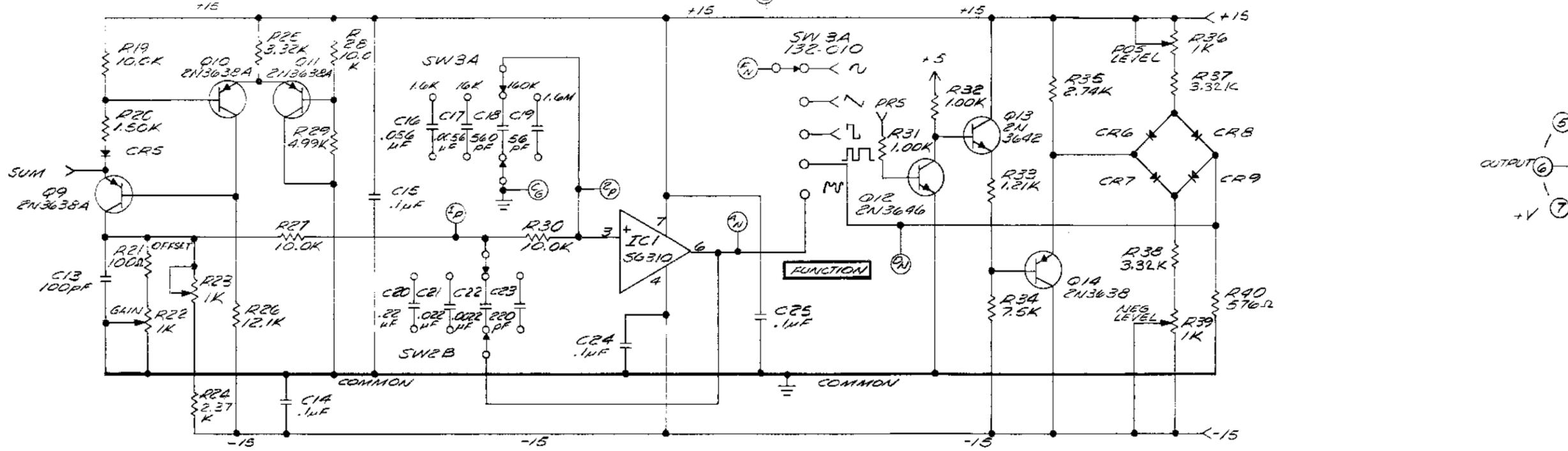
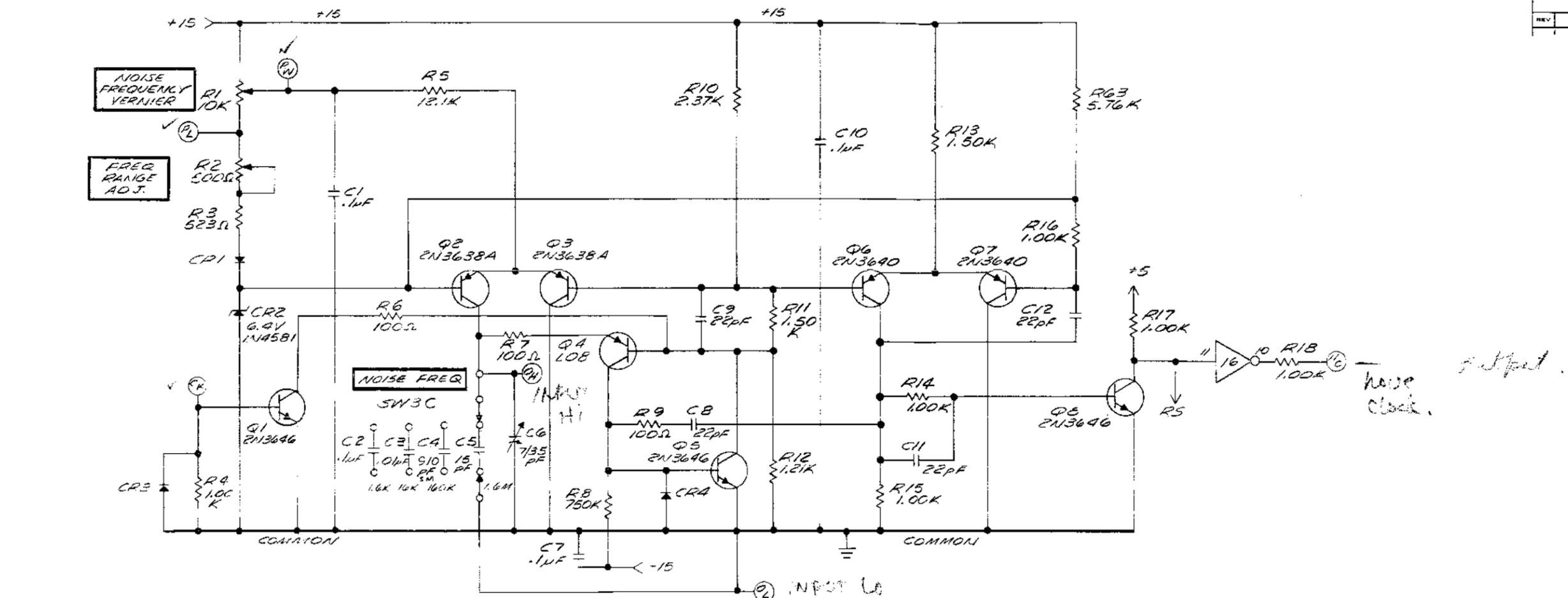
TOLERANCE UNLESS OTHERWISE SPEC
 .XXX = .010
 .XX = .030
 ANGLES = 0°30'

SCALE N/A BY GRAY DATE 2-10-78 APP R.S.

MATERIAL N/A TITLE ASSY LOGIC BOARD

FINISH N/A MODEL NO. 132 DWG NO. 2101-00-0041 REV C

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2. ALL RESISTORS ARE METAL FILM, 1/8W, 1%
 1. ALL DIODES ARE FD6666
 NOTES: UNLESS OTHERWISE SPECIFIED



LAST REF DESIG
 R63 IC28
 C28 Q14
 CR51 SWE

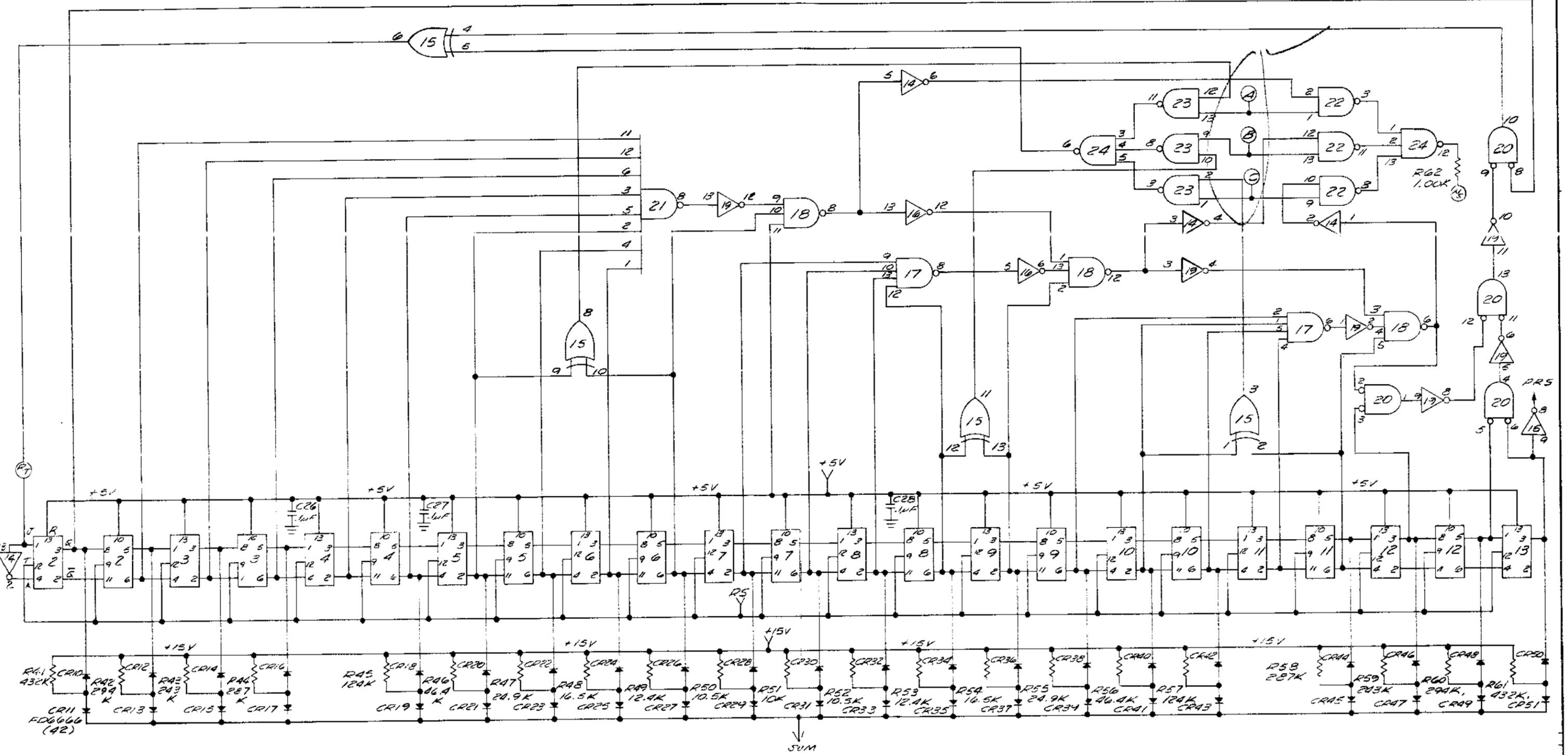
REV	ECN	BY	DATE	APP
A	ECN 1628	ED	11-29-71	
B	ECN 1548	EU	6-8-71	
C	425	BR	4-29-71	P.C.

TOLERANCE UNLESS OTHERWISE SPEC.
 .XXX = .010
 .XX = .030
 ANGLES = 0°30'

SCALE - BY GRAY DATE 12-17-71 APP R.G.
 MATERIAL TITLE SCHEMATIC, LOGIC BOARD

MODEL NO. 132 DWS NO. 3007107 REV C
 DWG NO. 0103-00-0041 C

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- IC 2 - 13 SN74107
- IC 14, 16, 19 SN7404
- IC 22, 23 SN7400
- IC 21 SN7430
- IC 20 SN7402
- IC 15 SN7486
- IC 17 SN7420
- IC 18, 24 SN7410

+5 TO PIN 14 ALL IC'S
 GND TO PIN 7 ALL IC'S
 NOTES: UNLESS OTHERWISE SPECIFIED

REVISIONS				
REV	ECN	BY	DATE	APP
A	#425	B.R.	4-25-72	R.G.
TOLERANCE UNLESS OTHERWISE SPEC. XXX = .010 XX = .030 ANGLES = 0°30'				
SCALE -		BY GRAY DATE 7-21-71 APP R.G.		
MATERIAL		TITLE SCHEMATIC, LOGIC BOARD		
FINISH		MODEL NO. DWG NO. SHEET 2 OF 2 REV 132 0103-00-0041 C		
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REFERENCE DESIGNATORS	PART DESCRIPTION	QWIG-MFG-PART-NO	MFG	WAVETEK NO.	QTY/PT
404E	ASSY DRWG, LOGIC	0101-00-0041	WVTK	0101-00-0041	1
404E	SCHEMATIC, LOGIC	0103-00-0041	WVTK	0103-00-0041	1
12	TRANSFORMER	132-500	AVTK	1204-00-0482	1
404E	BMKT	130-506	AVTK	1400-00-1095	1
26	BMKT	132-502	AVTK	1400-00-1633	1
C13	CAP, CER, 100PF, 1KV	00-101	CRK	1500-01-0111	1
C01 C07 C10 C14 C15 C24 C25 C26 C27 C28	CAP, CER, 1MF, 20V	UK20-104	AMCO	1500-01-0413	10
C08 C09 C11 C12	CAP, CER, 22MF, 1KV	30-220	CHL	1500-02-2015	4
C6	VARI, 1-35PF, 250V	78-TWIKU-02 7/35 PF	TRIND	1500-53-5000	1
75	LOGIC	132-113	WVTK	1700-00-0041	1
J5 J6	BNC LOAN	KC-1946	SING	2100-01-0002	2
75	SKT, IC, 14PIN	14-01F	LINCH	2100-03-0011	23
71	SOLDER JOG	1497	SMITH	2100-04-0012	2
76	PIN, MALE	61122-2	AMP	2100-05-0020	27
77	INSERT # 6	74-11-100-13	SCICO	2800-09-0017	2
78	FAST, CHASSIS	1541-011	USECC	2800-09-0021	2
79	WASHER, SHOULDER	2668	SMITH	2800-27-0004	4

WAVETEK
PARTS LIST

TITLE
LOGIC

ASSEMBLY NO.
1100-00-0041

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REV
C

REFERENCE DESIGNATORS	PART DESCRIPTION	QWIG-MFG-PART-NO	MFG	WAVETEK NO.	QTY/PT
R42 R60	RES, MF, 1/8W, 1%, 294K	KA550-2943F	TKR	4701-03-2943	2
R25 R37 R38	RES, MF, 1/8W, 1%, 3.32K	KA550-3321F	TKR	4701-03-3321	3
R46 R56	RES, MF, 1/8W, 1%, 46.4K	KA550-4642F	TKR	4701-03-4642	2
R29	RES, MF, 1/8W, 1%, 4.99K	KA550-4991F	TKR	4701-03-4991	1
R3	RES, MF, 1/8W, 1%, 523	KA550-5230F	TKR	4701-03-5230	1
R40	RES, MF, 1/8W, 1%, 576	KA550-5760F	TKR	4701-03-5760	1
R65	RES, MF, 1/8W, 1%, 5.76K	KA550-5761F	TKR	4701-03-5761	1
R34	RES, MF, 1/8W, 1%, 7.5K	KA550-7501F	TKR	4701-03-7501	1
R41 R61	RES, MF, 1/4W, 1%, 432K	KA600-4323F	TKR	4701-13-4323	2
R8	RES, MF, 1/4W, 1%, 750K	KA600-7503F	TKR	4701-13-7503	1
CR2	DIODE	1N4581	MICRO	4801-01-4581	1
CR03 CR04 CR05 CR06 CR07 CR08 CR09 CR1 CR10 CR11 CR12 CR13 CR14 CR15 CR16 CR17 CR18 CR19 CR20 CR21 CR22 CR23 CR24 CR25 CR26 CR27 CR28 CR29 CR30 CR31 CR32 CR33 CR34 CR35 CR36 CR37 CR38 CR39 CR40 CR41 CR42 CR43 CR44 CR45 CR46 CR47 CR48 CR49 CR50 CR51	DIODE	FD-6666	FAIR	4807-02-6666	50

WAVETEK
PARTS LIST

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LOGIC

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REV
C

REFERENCE DESIGNATORS	PART DESCRIPTION	QWIG-MFG-PART-NO	MFG	WAVETEK NO.	QTY/PT
R22 R23 R26 R34	POT, 10K, 1K	91AR1K	DELTA	4800-01-0209	4
R2	POT, TRIM, 500	Y1R450J	DELTA	4800-05-0104	1
R06 R07 R04 R21	RES, MF, 1/8W, 1%, 100	KA550-1000F	TKR	4701-03-1000	4
R04 R14 R15 R16 R17 R18 R31 R32 R33	RES, MF, 1/8W, 1%, 1K	KA550-1001F	TKR	4701-03-1001	9
R14 R27 R20 R30 R31	RES, MF, 1/8W, 1%, 10K	KA550-1002F	TKR	4701-03-1002	5
R50 R52	RES, MF, 1/8W, 1%, 10.5K	KA550-1052F	TKR	4701-03-1052	2
R12 R33	RES, MF, 1/8W, 1%, 1.21K	KA550-1211F	TKR	4701-03-1211	2
R65 R66	RES, MF, 1/8W, 1%, 12.1K	KA550-1212F	TKR	4701-03-1212	2
R49 R55	RES, MF, 1/8W, 1%, 12.4K	KA550-1242F	TKR	4701-03-1242	2
R45 R57	RES, MF, 1/8W, 1%, 12.4K	KA550-1243F	TKR	4701-03-1243	2
R11 R13 R20	RES, MF, 1/8W, 1%, 1.5K	KA550-1501F	TKR	4701-03-1501	3
R48 R54	RES, MF, 1/8W, 1%, 1.5K	KA550-1552F	TKR	4701-03-1552	2
R10 R24	RES, MF, 1/8W, 1%, 2.37K	KA550-2371F	TKR	4701-03-2371	2
R43 R59	RES, MF, 1/8W, 1%, 2.43K	KA550-2433F	TKR	4701-03-2433	2
R47 R55	RES, MF, 1/8W, 1%, 2.49K	KA550-2492F	TKR	4701-03-2492	2
R35	RES, MF, 1/8W, 1%, 2.74K	KA550-2741F	TKR	4701-03-2741	1
R44 R53	RES, MF, 1/8W, 1%, 2.87K	KA550-2873F	TKR	4701-03-2873	2

WAVETEK
PARTS LIST

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LOGIC

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REV
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REFERENCE DESIGNATORS	PART DESCRIPTION	QWIG-MFG-PART-NO	MFG	WAVETEK NO.	QTY/PT
J10 J11 J14 J2 J3 J9	TRANS	2K3638A	FAIR	4901-03-6381	6
W6 W7	TRANS	2K3640	FAIR	4901-03-6400	2
Q13	TRANS	2K3642	FAIR	4901-03-6420	1
W1 J12 W5 W8	TRANS	2K3646	FAIR	4901-03-6460	4
Q4	TRANS	WYS-L06	FAIR	4902-00-0080	1
IC1	IC	7000-03-1000	AVTN	7000-03-1000	1
IC22 IC23	IC	7460	TI	8000-74-0030	2
IC20	IC	7402	TI	8000-74-0200	1
IC14 IC16 IC19	IC	7494	TI	8000-74-0400	5
IC18 IC24	IC	7410	TI	8000-74-1000	2
IC17	IC	7420	TI	8000-74-2000	1
IC21	IC	7430	TI	8000-74-3000	1
IC15	IC	7456	TI	8000-74-5600	1
IC02 IC03 IC04 IC05 IC06 IC07 IC08 IC09 IC10 IC11 IC12 IC13	IC	74107	TI	8007-01-0700	12

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PARTS LIST

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LOGIC

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1100-00-0041

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REV
C

NOTE: UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO • CALIFORNIA	
MATERIAL	PROJECTOR		TITLE LOGIC	
	TOLERANCE UNLESS OTHERWISE SPECIFIED XX .010 ANGLES .1 XX .030		MODEL NO. 132	DWG NO. 1100-00-0041
FINISH WAVETEK PROCESS	DO NOT SCALE DWG		SCALE	REV C
	CODE DELTA	23338	SHEET	OF

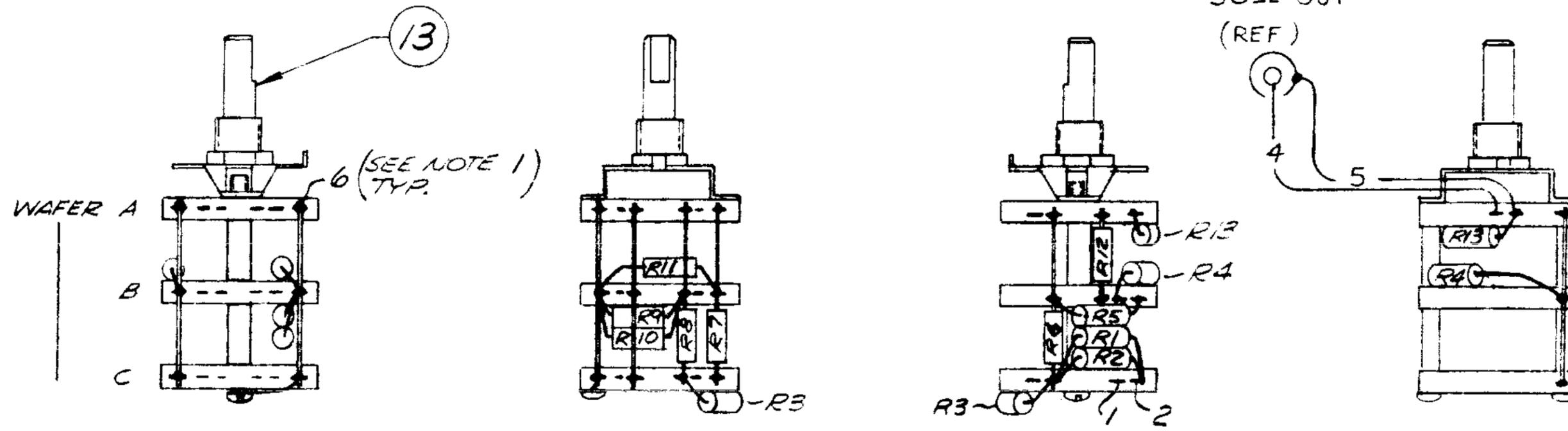
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REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-FOR-PART-YR	VFUP	WAVETEK NO.	QTY/PT
R7	RES, MF, 1/8W, 1%, 200	RA550-2440F	TRN	4701-03-2490	1
R3	RES, MF, 1/8W, 1%, 27.4	RA550-27R4F	TRN	4701-03-2749	1
R4	RES, MF, 1/8W, 1%, 54.9	RA550-54R9F	TRN	4701-03-5499	1
R13 R5	RES, MF, 1/8W, 1%, 59	RA550-59R0F	TRN	4701-03-5909	2
R11	RES, MF, 1/8W, 1%, 61.4	RA550-61R4F	TRN	4701-03-6149	1
R06 R12	RES, MF, 1/8W, 1%, 825	RA550-8250F	TRN	4701-03-8250	2
R1 R10 R2 R9	RES, MF, 1/4W, 1%, 190	RA600-1960F	TRN	4701-13-1960	4
R8	RES, MF, 1/4W, 1%, 71.5	RA600-7145F	TRN	4701-13-7159	1
13	SWITCH ASSY ROTARY	130-8W16	AVTK	2104-70-0016	1

WAVETEK PARTS LIST	TITLE ATTEN SW ASSY	ASSEMBLY NO. 1202-00-0008	REV 5
	PAGE 1		

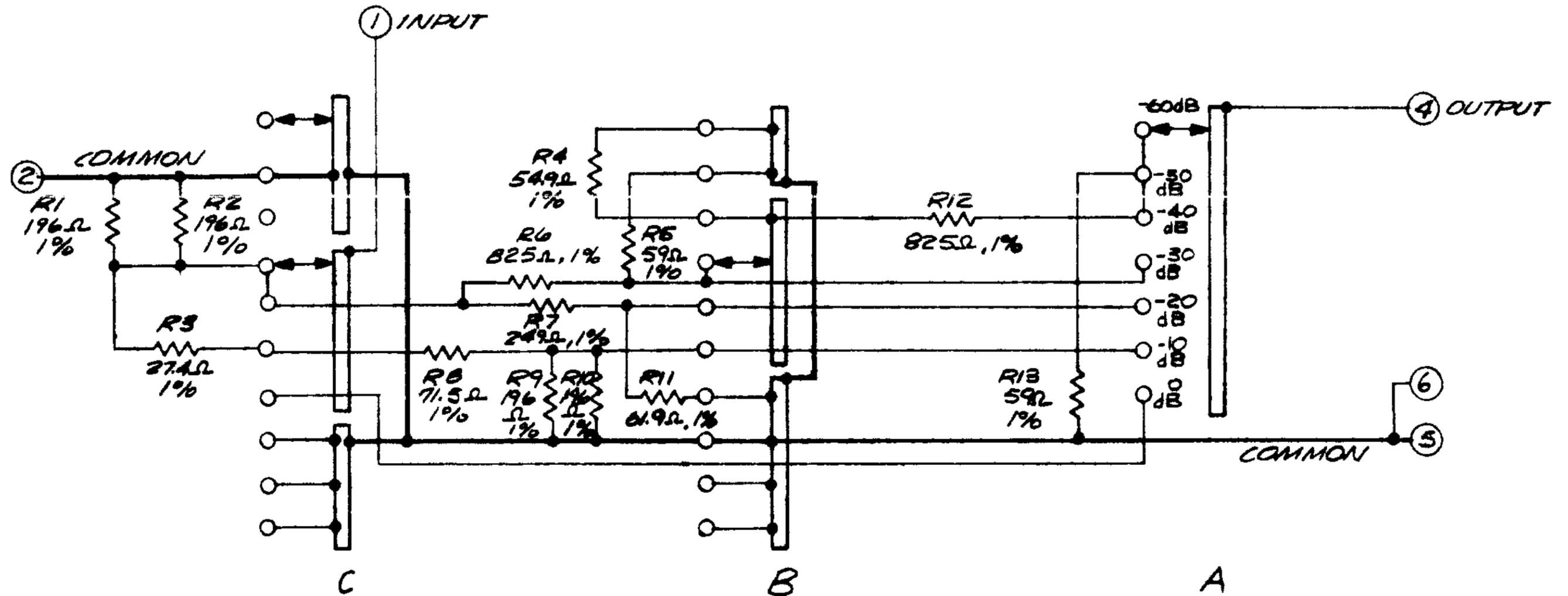
NOTE: UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO • CALIFORNIA	
MATERIAL	PROV ENGR		TITLE OUTPUT ATTEN SW ASSY	
FINISH WAVETEK PROCESS	RELEASE APPROV		TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ± 0.10 ANGLES ± 1° XX ± 0.30	
	DO NOT SCALE DWG	MODEL NO.	DWG NO.	REV
	SCALE	132	1202-00-0008	B
	EDGE IDENT	23338	SHEET	OF 3



NOTES: UNLESS OTHERWISE SPECIFIED
 1) NUMBERS INDICATE WIRE TERMINATION POINTS.

	B	LEN 018	S	1/2	1/2	S
	A	ECN 32	N	6	1/2	N
TOLERANCE UNITS (DIMENSIONAL)	REF.	ECN	BY	DATE	APP.	
EXC.						
ANG.						
SCALE	N/A	DATE	5-20	APP.	K.S.	
MATERIAL	N/A	ASSEMBLY, ATTENUATOR 50Ω				
FINISH	N/A	MODEL NO.	1202-00-0008	TRAC NO.	8	
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NOTES: UNLESS OTHERWISE SPECIFIED

1. CIRCLED NUMBERS, I.E. (1) ETC, INDICATE WIRING INTERCONNECTIONS.

	B	UPGRADE TO COMPUTER SYS	B1	1%	1/77
	A	ECN 321	1%	1/78	1/78
TOLERANCE UNLESS OTHERWISE SPEC	REV	100	BY	DATE	APP
BY	WAVETEK ANDREW CALF				
SCALE	BY B. J. [Signature] 1/78				
MATERIAL	TITLE				
FINISH	SCHEMATIC ATTENUATOR				
	PART NO. 6202-00-0008				
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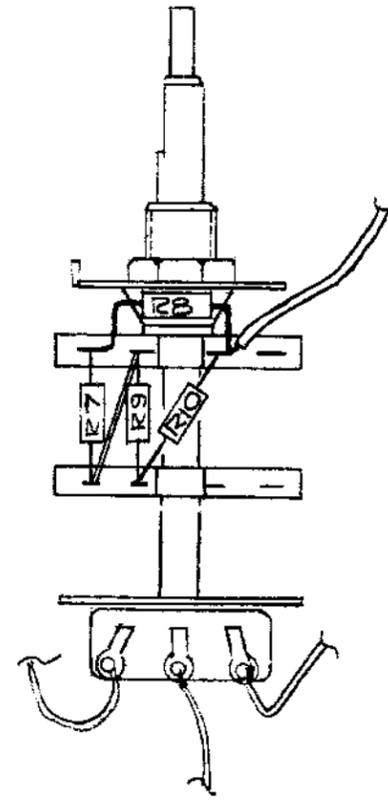
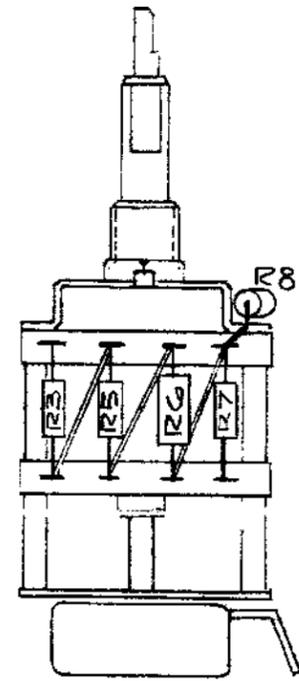
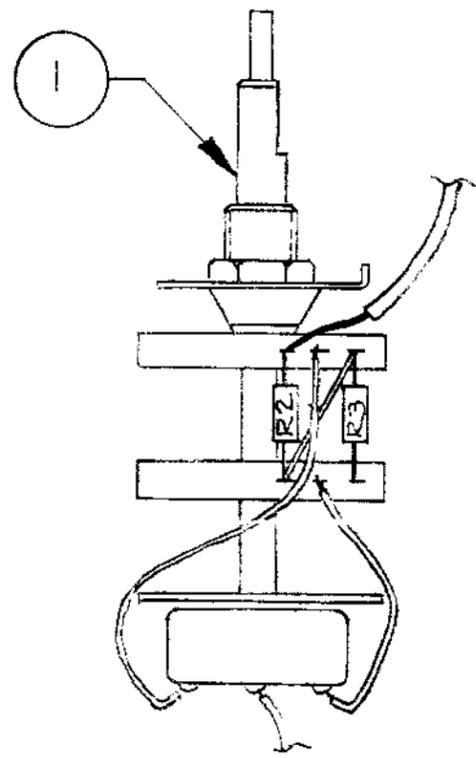
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REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFR-PART-NO	MFR	WAVETEK NO.	QTY/PCT
R5	RES, MF, 1/8W, 1%, 10	RN550-10K0F	TRN	4701-03-1009	1
R1 R4	RES, MF, 1/8W, 1%, 215	RN550-2150F	TRN	4701-03-2150	2
R6	RES, MF, 1/8W, 1%, 21.5	RN550-2155F	TRN	4701-03-2159	1
R2 R7	RES, MF, 1/8W, 1%, 681	RN550-6810F	TRN	4701-03-6810	2
R05 R10	RES, MF, 1/8W, 1%, 68.1	RN550-6815F	TRN	4701-03-6814	2
1	SWITCH ASSY ROTARY	132-SA2	AVTK	5104-00-0014	1
3	SWITCH STOP	212-33-006	CTS	5104-07-0002	1

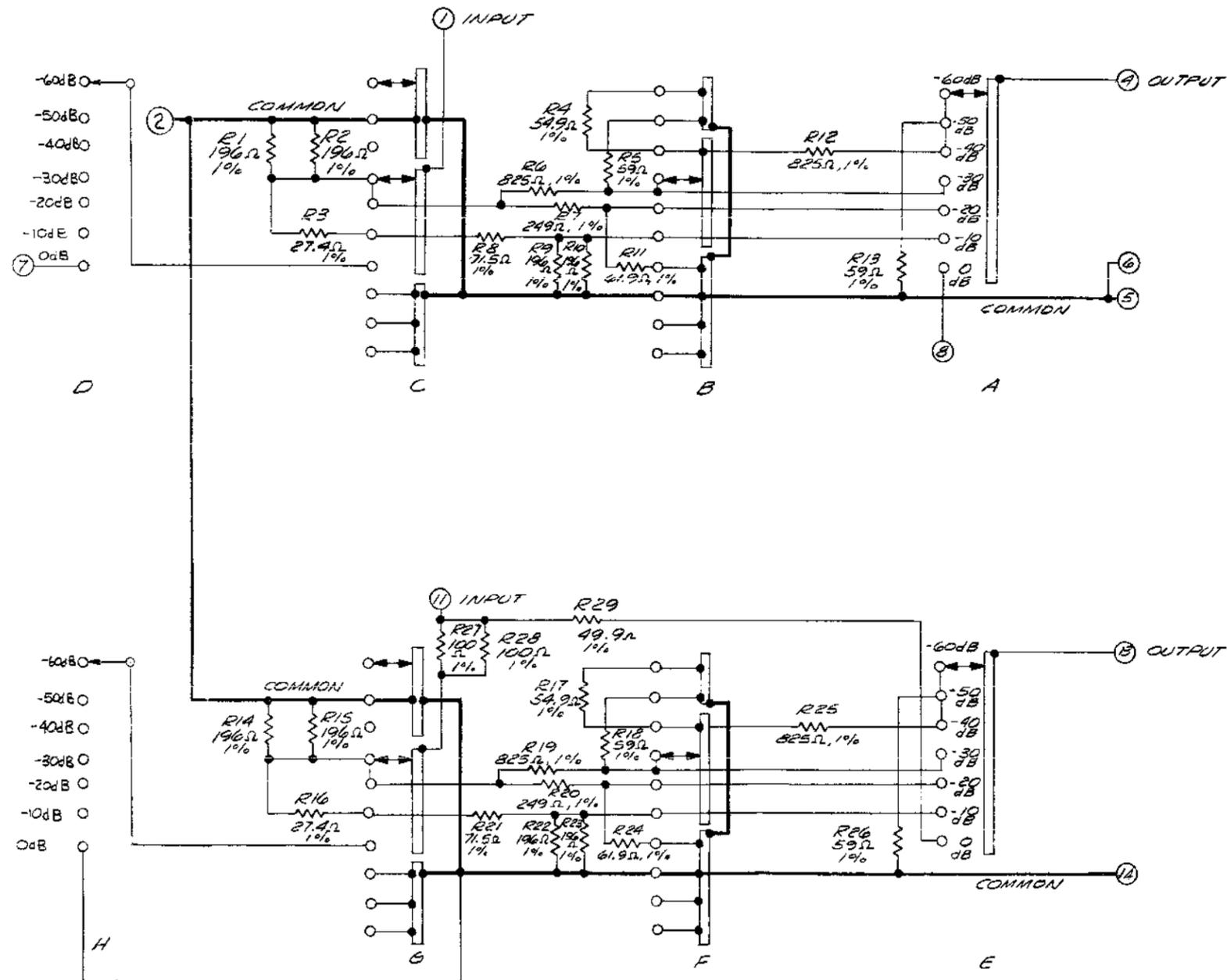
WAVETEK PARTS LIST	TITLE ATTEN SW ASSY	ASSEMBLY NO. 1202-00-0003	REV
	PAGE 1		

NOTE: UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO • CALIFORNIA	
MATERIAL	DESIGNER		TITLE S/W - N/S ATTEN SW ASSY	
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ±.010 ANGLES 1° XX ±.030		MODEL NO.	DWG NO.
	DO NOT SCALE DWG		132	1202-00-0003
SCALE		CODE IDENT	23338	SHEET 1 OF 3



N/A	B. REZMAN 2-2-72 R.C.
N/A	SWITCH ASSY, S/N ATTN 273
N/A	132 1202-00-C003



NOTES: UNLESS OTHERWISE SPECIFIED

1. CIRCLED NUMBERS, I.E. ① ETC, INDICATE WIRING INTERCONNECTIONS.

2. SEE SCHEMATIC 131A-200

				WAVEMETER
N/A	GRAY	2-12-71	5/1/72	
N/A		SCHEMATIC ATTENUATOR		
N/A	131A	202-00-5003		

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REV	ECN	BY	DATE	APP
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REFERENCE DESIGNATORS	PART DESCRIPTION	UNIC-PFG#-PART-NO	REFR	WAVETEK NO.	QTY/PT
NONE	SCHEMATIC, LOGIC	0103-00-0041	AVTK	0103-00-0041	1
C5	CAP, MICA, 15PF, 500V	DM15-150J	AKCO	1500-11-5000	1
C23	CAP, MICA, 220PF, 500V	DM15-221J	AKCO	1500-12-2100	1
C19	CAP, MICA, 56PF, 500V	DM15-560J	AKCO	1500-15-6000	1
C18	CAP, MICA, 560PF, 500V	DM15-561J	AKCO	1500-15-6100	1
C4	CAP, MICA, 410PF, 500V	DM15-411F	AKCO	1500-19-1101	1
C3	CAP, POLY, .01MF, 100V	PA20103F	AMB	1500-41-0304	1
C2	CAP, POLY, .1MF, 100V	PA20104F	AMB	1500-41-0404	1
C22	POLY, .0022MF, 200V	192P22292	SPRAG	1500-42-2204	1
C24	POLY, .0022MF, 200V	192P22292	SPRAG	1500-42-2204	1
C20	CAP, POLY, .22MF, 50V	192P22498	SPRAG	1500-42-2403	1
C17	POLY, .0056MF, 200V	192P56292	SPRAG	1500-45-6204	1
C16	POLY, .0056MF, 200V	192P56392	SPRAG	1500-45-6304	1
1	SWITCH ASSY ROTARY	132-863	AVTK	5104-00-0015	1
3	SWITCH STOP	212-33-006	CIS	5104-07-0002	1

WAVETEK
PARTS LIST

TITLE
FREQ SW ASSY

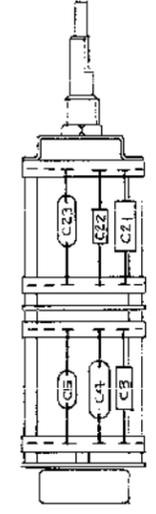
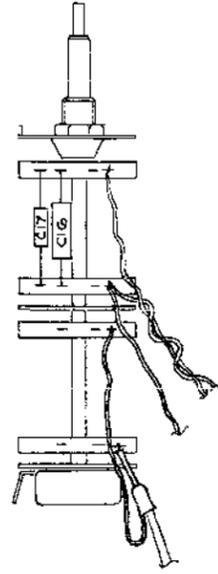
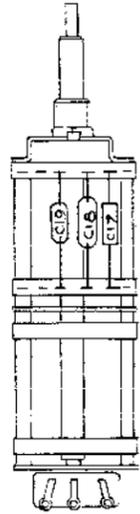
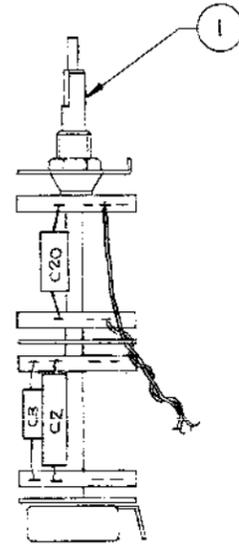
ASSEMBLY NO.
1202-00-0004

Sheet 1

REV
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NOTE: UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO • CALIFORNIA	
MATERIAL	PROJ ENGR		TITLE FREQ SW ASSY	
	RELEASE APPROV			
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED .XXX ± .010 ANGLES : 1° .XX ± .030		MODEL NO.	REV
	DO NOT SCALE DWG		132	B
	SCALE		DWG NO. 1202-00-0004	
	CODE IDENT	23338	SHEET	OF



TOLERANCE UNLESS OTHERWISE SPEC		3		ECN 15-B		100 5-3-7	
XXX	.010	REV	425	BY	BR	DATE	5-2-76
XX	.030	WAVETEK SAN DIEGO, CALIFORNIA					
ANGLES	0°30'						
SCALE	N/A	BY	B. REEDMAN	DATE	2-2-72	APP	R. G.
MATERIAL	N/A	TITLE SWITCH ASSY, FREQ RG					
FINISH	N/A	MODEL NO.	132	DWG NO.	1202-00-000-	REV	5
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