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GENERAL AVIATION ELECTRONICS, INC.

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GLH-100 Loud Hailer

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Specifications:

Front Panel Size: 6½″ x 2½″ (16.51 cm x 6.35 cm)

Over-all Dimensions: 9″ deep, 6½″ wide, 2½″ high (22.86 cm x 16.51 cm x 6.35 cm)

Weight: 4 lbs. (1.82 kgs) Approx.

Number of Transistors: 20 all silicon transistors, 1 SCR, 19 diodes, 1 zener, 4 integrated circuits.

Power Supply: 13.75 VDC, Negative Ground

Current Drain: 7 Amp. Max. Alarm Standby—less than 300 ma.

Number of Aux. Inputs: 2

Number of Remote Stations: Up to

Power Output: Horn and Siren, Approx. 70 Watts Peak, into 8 ohms
Aux and Hail, Approx. 60 Watts Peak, into 8 ohms

External Speaker Ouput: 10 Watts Peak, into 8 ohm listen speaker

Alarm Switching: Series, Normally Closed, Self-Latching

INSTALLATION

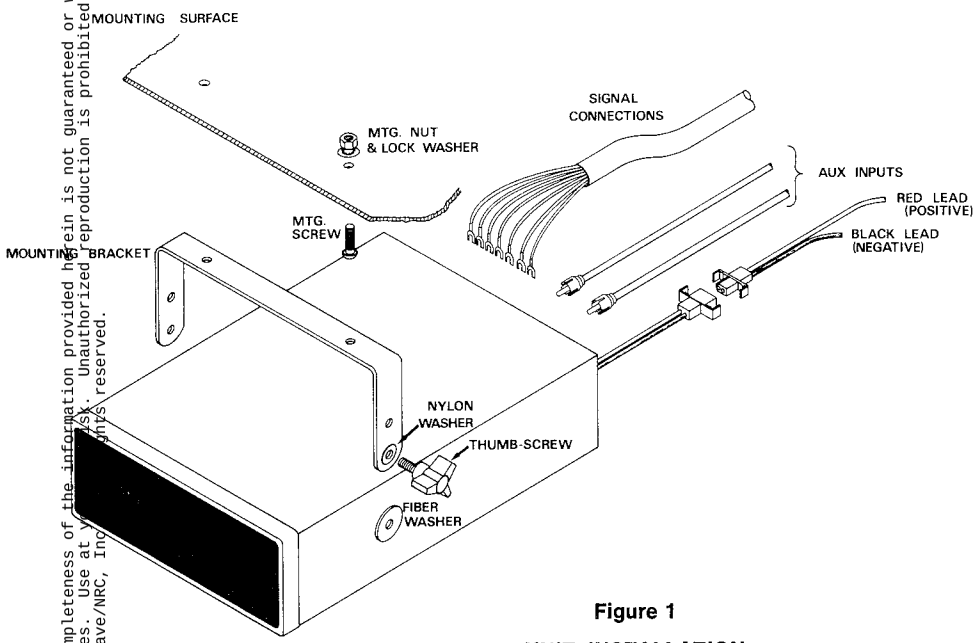

Figure 1

UNIT INSTALLATION

INSTALLATION PLANNING

When selecting a position for your unit attempt to locate a position which will allow convenient operation. Locate the unit in a position which is well protected from the elements and try to prevent extremely long power cable runs.

UNIT INSTALLATION

1. Remove the unit from the mounting yoke.
2. With screws or bolts securely fasten the yoke in the desired location (desk top, under dash, vertical wall or bulkhead, or overhead). Unit performance is not affected by mounting position.
3. Replace unit in mounting yoke and tighten wing bolts.
4. Connect the color-coded power leads to the power source. Take care to use RED for positive and BLACK for negative. Unit will operate on a supply with negative ground only. If it is necessary to lengthen power leads, use #14 gauge or heavier insulated copper wire. If leads are reversed the unit will not work. If this occurs check wiring polarity (RED to positive and BLACK to negative) and the protective fuse. A blown fuse should be replaced with a 10-amp type 3AG/AGC fuse only. The fuse is located inside the unit and positioned on the chassis side rail.
5. Attach the microphone mounting clip to the desired mounting surface using three small screws or bolts.
6. The GLH-100 installation is now complete except for installation of the external speakers and alarm switches.

MOUNTING LOCK INSTALLATION

The mounting lock can be used to secure the unit to the mounting bracket when the unit is mounted in a desk-top, bulkhead, overhead, or under-panel configuration. The mounting lock can be used when the unit is secured through either the top or bottom mounting holes of the mounting bracket, however the bottom mounting position will assist to conceal the heads of the screws used to mount the bracket to the mounting surface. To install the mounting lock proceed as follows:

1. Remove the mounting screws and nylon washer from the side of the unit mounting bracket to which the mounting lock is to be attached.
2. Position the mounting lock so that the hole in the lock and the locking tab are aligned with the holes in the mounting bracket.
3. Secure the mounting lock to the unit using one of the hex head mounting screws supplied. Be sure that the screw passes through the correct hole in the mounting bracket (See Figure 2).

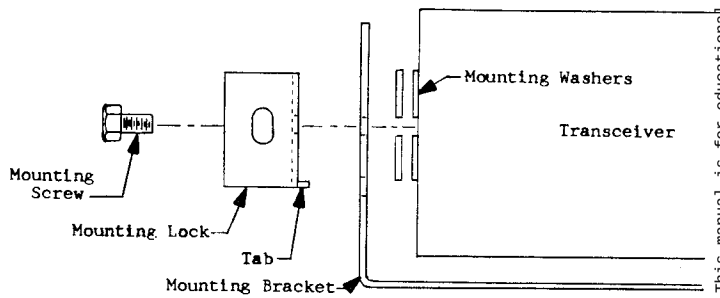

Figure 2

LOCKING BRACKET INSTALLATION

4. Attach padlock through the holes in side of mounting lock. Latch padlock to prevent removal of unit from mounting bracket (See Figure 3).

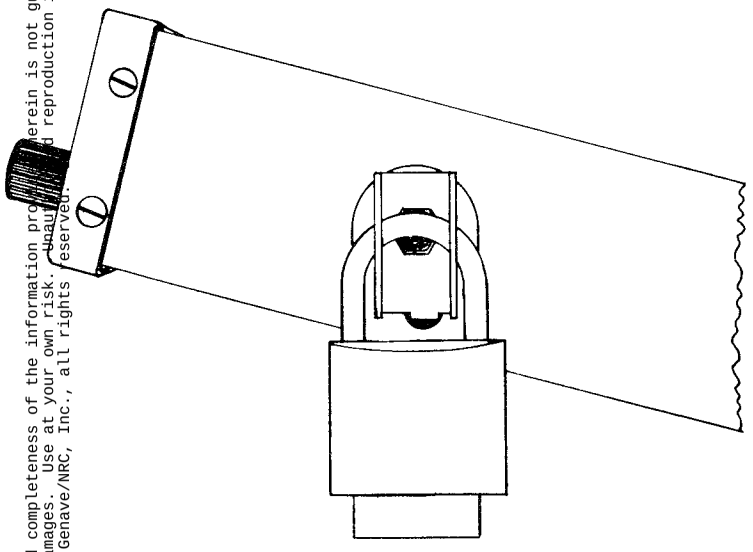

Figure 3

MOUNTING LOCK

SPEAKER INSTALLATION

High Power Horn

The high power horn speaker should be mounted as far from the amplifier unit as possible and facing away from it. This will reduce audio feedback problems and allow the gain controls to be set at a higher level. To install the high power horn speakers proceed as follows:

1. Mount the speaker to the selected surface using bolts or screws.
2. Route the speaker cable to the amplifier unit.
3. Secure the speaker cable with heavy staples or tacks. It is better to have some extra cable than not enough.
4. Connect one lead to the Station 1 terminal on the rear of the unit. The other lead is connected to the chassis ground thumbscrew located above the station terminals (See Figure 4).

Remote Speakers

If remote speakers are desired for intercom, paging, etc. these speakers can be installed as follows:

1. Mount the speaker to the selected surface using bolts or screws.
2. Route the speaker cable to the GLH-100.
3. Secure the speaker cable in place.
4. When low power rating speakers are used, a series resistor should be used in conjunction with these speakers to prevent destruction of these speakers by overpowering. To determine the series resistance necessary for the power rating of the speaker consult the graph of Figure 5.

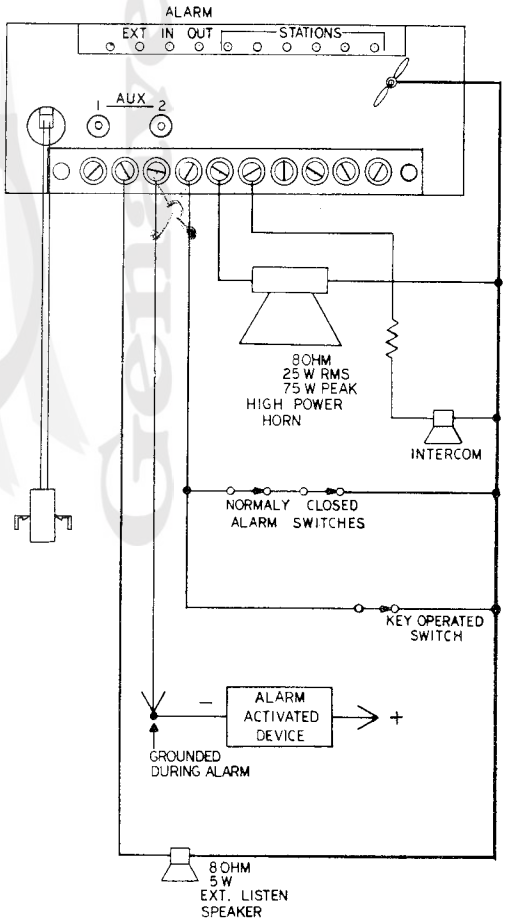

Figure 4

TYPICAL INSTALLATION

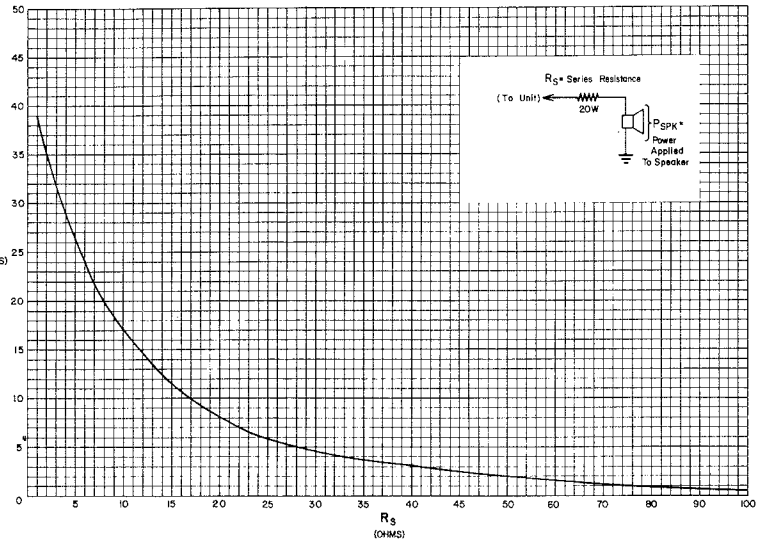

Figure 5
LOAD RESISTANCE SELECTION CHART

ALARM INSTALLATION

1. Mount a switch at each point that is to be protected.
2. Route the cable from the GLH-100 to all switches.
3. Secure the alarm cabling at the appropriate points.
4. Connect all switches in series with the "Alarm In" terminal and ground (See Figure 1).
5. Connect the "Alarm Out" to an extra alarm indicator, if so desired. The "Alarm Out" terminal will provide a ground signal when the alarm is triggered. This ground connection is capable of handling up to 14 VDC at 2 amperes. This output is intended to be utilized as a means of switching an alarm indicator such as an external light used to identify the ship, vehicle, etc. from which the alarm is sounding.

TESTING ALARM INSTALLATION

1. Close all alarm switches.
2. Set the function switch to "Alarm".
3. Apply power to the unit by turning the listen volume control clockwise.
4. Open and close each switch to make sure it is operating properly. The alarm should be activated and latched when the switches are opened.

NOTE: See Options Section of this manual for switches, speakers, etc.

5. To reset the alarm rotate the function selector to one of the other positions and back to the "Alarm" position.

OPERATING CONTROLS

1. LISTEN VOLUME/ON-OFF

This control varies the audio level of the internal listen speaker or external listen speaker (if used). To turn the unit on and increase the listen volume, rotate this control clockwise.

2. HAIL VOLUME

This control is used to vary the audio output level to the selected station in the Hail function. Full output will be attained when this control is at nearly full clockwise rotation. Always speak in a normal voice level at a distance of approximately 1 inch from the microphone.

3. STATION SWITCH

This control is used to select the desired remote speaker station for paging, intercom, etc.

4. FUNCTION SWITCH

This control is used to select any one of the eight modes of operation.

Auto-Horn — In this mode of operation, the foghorn automatically sounds for a fixed interval of time and then returns to a listen mode for another fixed interval of time. The time intervals are preset at the factory for a rate (number of horn blasts per minute) of approximately 4 per minute and a duration (length of time that the horn sounds) of approximately 2 to 3 seconds. The rate and duration can be varied by making internal adjustments to the unit. Refer to Figure 6 for the location of the controls.

Manual-Horn — In this mode, the horn is activated by depressing the microphone push-to-talk switch. When this switch is released the unit returns to the listen mode.

AUX 1 & AUX 2 — These two functions are provided for additional audio inputs (i.e. AM and FM radios, tapeplayer, weather monitor, transceivers, etc.). Audio level adjustments for the aux inputs are located on the circuit board. Their locations are indicated in Figure 6.

HAIL — In the Hail mode, when the push-to-talk switch is depressed, voice audio is applied to the station speaker selected. The level of this audio is controlled by the Hail Volume Control. When the switch is released, the selected station speaker acts as a microphone and audio is provided by the unit's internal (or external) listen speaker.

WAIL — A slowly rising and falling siren tone is applied to the selected station speaker in this mode. The siren can be overridden by depressing the push-to-talk switch. When the push-to-talk switch is depressed any audio applied to the microphone will be amplified and fed to the selected station speaker.

YELP — A rapidly rising and falling siren tone is applied to the station speaker selected in this mode. This siren can also be overridden by depressing the microphone push-to-talk switch.

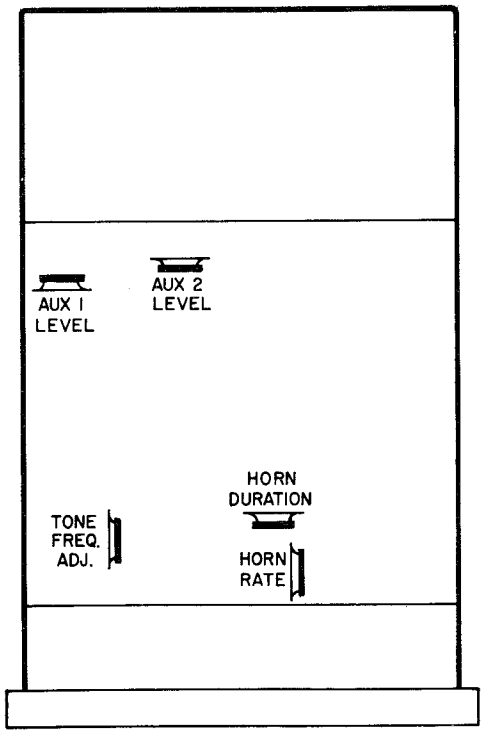

Figure 6

INTERNAL ADJUSTMENTS

ALARM — In this mode, the unit will serve to protect an area by functioning as a burglar alarm. The alarm is set by closing all of the sensing switches in the alarm circuit and turning on the unit. See Figure 1 for a typical installation. If the circuit is broken by an opened switch, the alarm circuitry will latch and the alarm siren (yelp) will sound until the unit is turned off and the sensing switch reset.

The ALARM OUT terminal on the rear panel connects to the relay within the unit and provides control of a remote alarm indicating device such as a lamp. When the alarm is activated the relay within the unit will connect the ALARM OUT terminal to ground (See Figure 4). The relay contacts have a rating of 14 VDC at 2 amperes.

MAINTENANCE

Keep the unit dry and check electrical connections regularly to insure satisfactory operation under normal conditions.

INTERNAL ADJUSTMENTS

1. **AUX 1—R101** is provided to adjust the audio output level when the Function Switch is in the AUX 1 position.
2. **AUX 2—R107** adjusts the audio output level when the Function Switch is in the AUX 2 position.
3. **TONE FREQ.—R119** is provided to adjust the pitch of the horn and also vary the pitch range of the wail and yelp sirens.
4. **DURATION—R172** is provided to adjust the length of time the horn sounds in the Auto Horn function.
5. **RATE—R168** adjusts the rate at which the horn blasts will be repeated in the Auto Horn mode.

THEORY OF OPERATION

INTRODUCTION

To aid in understanding the operation of the GLH-100, the circuit descriptions of the unit are arranged in order of operating functions. Through this approach a clearer understanding of the interrelationship of the various circuits can be achieved. The Block Diagram of Figure 7 and the Schematic Diagram of Figure 12 should prove helpful in following the circuit descriptions.

AUX 1/AUX 2

The GLH-100 features two auxiliary inputs which can be employed to allow the unit to function as a high power audio amplifier. The first auxiliary input (AUX 1) can be applied to the unit via J101, while the second auxiliary input (AUX 2) can be applied to the unit via J102. The AUX 1 and AUX 2 inputs are applied to the clamping circuits of Q101 and Q102 respectively. These clamping circuits are used to electronically select the desired auxiliary input signal or delete both auxiliary inputs in the remaining functions. The desired auxiliary input is selected by means of pins 3 and 4 of SW101A, which applies a ground to either CR101 or CR102. When the cathode of either diode is grounded, the associated clamping circuit will be defeated; allowing audio to pass to the summing amplifier of IC103B and associated circuitry.

The summing amplifier is used as a mixer for the various inputs to the power amplifier stages. The summing amplifier output is applied to the phase splitter circuitry of IC104. IC104A and associated circuitry form the non-inverting portion of the phase splitter, while IC104B and associated circuitry form the inverting portion of the phase splitter. The phase splitter provides the two out-of-phase outputs necessary to drive the power amplifier stages.

Q109, Q110, and associated circuitry comprise the non-inverting driver stage, while Q111, Q112, and associated circuitry comprise the inverting driver stage. Q113 and Q114 function as an AC coupled push-pull Class B audio power amplifier.

The audio transformer, T101, is used to match impedance of the audio amplifier output to the 8 ohm speaker impedance. R166 provides negative feedback to produce high gain in the power amplifier stages. The audio output proceeds to the speaker connections via pins 6 and 7 of the audio switching relay, K101, and the station switch, SW102.

HAIL

In the HAIL function the audio amplifier circuitry operates in a manner similar to that described for AUX 1/AUX 2 operation. The auxiliary inputs will be clamped to ground by Q101 and Q102 in the HAIL function.

The microphone audio input is amplified by IC103C and associated circuitry which comprise the microphone amplifier. The microphone amplifier output is applied across R144, the HAIL VOLUME control. The signal from R144 is applied to Q108 and associated circuitry which form the microphone audio clamping circuit. This circuit will "pull" the microphone audio to ground until it receives a "clamp defeat" signal. When the microphone push-to-talk button is depressed, the cathode of CR107 is grounded via the microphone switch and pin 5 of SW101B. Grounding the cathode causes the diode to remove forward bias from the base of Q108. This action turns-off Q108. When Q108 is turned-off, the microphone amplifier output line is opened allowing the microphone audio signal to the coupled through C117 to the input of the summing amplifier. The summing amplifier and audio power amplifier circuitry function in the same manner discussed for AUX 1/AUX 2 operation.

When the microphone push-to-talk switch is released, the amplifier will return to the listen mode. When a reply is received from the selected external speaker, the signal will be routed to the listen amplifier via SW102; pins 5 and 6 of K101; C111; and R132. IC103A and associated circuitry comprise the listen amplifier. The level of the amplified reply audio is adjusted by R134, the listen volume control. The desired level of reply audio is coupled by means of R135 and C114 to the input of the summing amplifier circuitry of IC103B.

The signal is then amplified by the remaining audio amplifier circuitry as described in the AUX 1/AUX 2 section. The output of the power amplifier is applied to the internal listen speaker via pins 14 and 15 of K101, R182, and R183. Resistors R182 and R183 dissipate part of the high level audio signal to protect the internal listen speaker.

WAIL & YELP

In the WAIL or YELP function the audio amplifier stages operate in the same manner as described for AUX 1/AUX 2 operation. Internal tone generators are used to produce the various tones.

The sweep circuit consisting of IC101 and associated components generates a sawtooth voltage for controlling the current supplied to the tone generator, IC102. C106 controls the sweep rate of the sweep generator in the YELP mode. Q105, Q106, and C107 are used to decrease the sweep rate of the generator when the unit is in the wail mode. Diodes CR103 and CR104 are used to disable the sweep generator when a swept tone is not desired (e.g. AUTO HORN and MANUAL HORN). The sawtooth voltage from IC101 is applied to Q103, which functions as a current modulator. The current modulator is used to control the current available from the current source comprised of Q104 and associated components.

The tone generator circuitry of IC102 will generate an audio tone of increasing frequency, as the current applied by the current source increases. The band of audio frequencies generated can be adjusted to contain higher or lower audio frequencies by R119, the WAIL/HORN adjustment. When operating in the WAIL or YELP mode, the circuitry of CR105 is used to disable the tone generating circuit if the microphone push-to-talk button is depressed.

Q107 and associated circuitry function as a clamp on the tone generator output. This clamping circuit is used to insure that no tone will be applied to the amplifier circuitry in the AUX 1, AUX 2, and HAIL functions. This circuitry also cuts-off the tone generator output during the listen portion of the AUTO HORN and MANUAL HORN functions. The output of the tone generator is amplified by IC103D and its associated circuitry. This amplified output is applied to the summing amplifier, IC103B. From the summing amplifier the amplified tone is applied to the power amplifier stages. Refer to the AUX 1/AUX 2 section for detailed theory of operation of the audio power amplifier circuitry.

MANUAL HORN

In the MANUAL and AUTO HORN function the power amplifier circuitry again operates in the same manner as described for the AUX 1/AUX 2 function. When the microphone push-to-talk button is depressed it applies ground to CR113 and CR106. The ground on CR113 causes the relay to close while the ground on CR106 turns-on the tone generator. In the MANUAL HORN function CR103 is held at ground potential via SW101A which disables the sweep generator. By disabling the sweep circuit a constant current is supplied to the current source resulting in a fixed-frequency tone output from the tone generator. R119, the WAIL and HORN frequency adjustment, controls the output frequency of the tone generating circuitry. The output of the tone generator is applied to IC103D where it is amplified prior to being fed to the summing amplifier circuitry. The summing amplifier applies the horn signal to the power amplifier circuitry.

When the microphone push-to-talk button is released, the relay returns to the listen position and switches the selected station speaker to the listen amplifier, IC103A. The listen amplifier circuitry increases the signal level from the selected station speaker and applies it to the summing amplifier circuitry. The summing amplifier feeds the power

amplifier stages as previously described. When in the listen portion of the HORN cycle, K101 will switch the amplified signal to the internal speaker (and/or the optional external listen speaker).

AUTO HORN

In the AUTO HORN function, operation of the system is the same as for MANUAL HORN with the exception of the relay control. For AUTO HORN operation the microphone push-to-talk button need not be depressed to produce the horn output. The switching is done electronically by means of Q115, Q116, Q117, Q118, and associated circuitry, which function as a switching generator circuit. Q115 and associated circuitry creates the initial sawtooth voltage used. The frequency of the sawtooth voltage is determined by R168, the Rate adjustment, and the charging time of C130. Q116 does the initial switching and sets the switching threshold. Q117 amplifies the regenerative feedback to reinforce the switching action of Q116. Q118 is the current switching transistor that applies bias to CR113 and controls the relay circuit.

ALARM

In the alarm mode the YELP siren operates when the alarm is triggered. The operation of the tone generating and power amplifying circuits of the unit are identical to operation in the YELP mode.

The only additional circuitry employed is that of the alarm latching circuit. The silicon control rectifier of Q121, R187, and R181 form the latching circuitry. When in the alarm function with all of the alarm switches closed, the gate voltage on Q121 will be held at ground potential and the SCR will be shut-off. When one of the alarm switches is opened the gate of Q121 will be pulled to A+ potential by R181 causing the SCR to latch. When the SCR latches, current will flow through the anode to cathode path activating the YELP siren.

If the alarm switches are once again closed, the YELP siren will continue to operate since the SCR has latched. To reset the alarm the ground path through Q121 must be broken by rotating the function selector to one of the other function positions.

When the YELP function is activated, K101, the speaker transfer relay, closes placing a ground connection at the ALARM OUT terminal of TS101. This ground connection is capable of switching 14 VDC at up to 2 amperes of current. This output is intended to be utilized as a means of switching an alarm indicator such as an external light used to identify the ship, vehicle, etc. from which the alarm is sounding.

POWER SUPPLY

Input power to the unit is applied via P103. F101 is a 10 ampere, type 3AG/AGC fuse provided for the protection of the GLH-100 circuitry. SW103 switches the power to the unit. CR118 is a reverse polarity protection diode. If the polarity of the supply voltage is reversed, CR118 will be biased to conduct, causing F101 to open. The normal source voltage of 13.75 VDC is applied to the audio power amplifier and the relay circuit. The circuitry of R184, R186, and C133 is utilized to perform AC decoupling and provide 13.0 volts D.C. to the Norton current differencing operational amplifier, IC103. C131 provides filtering for the 13.0 VDC that powers the horn switching and phase splitting circuitry. C132 provides filtering for the 10 volt source derived from R185 and CR119. This source is used to supply the sweep and tone circuitry.

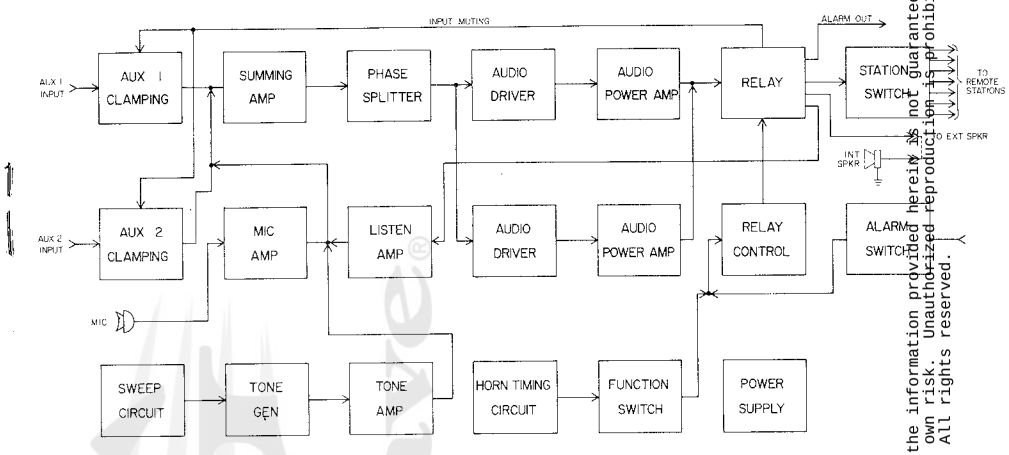

Figure 7

GLH-100 BLOCK DIAGRAM

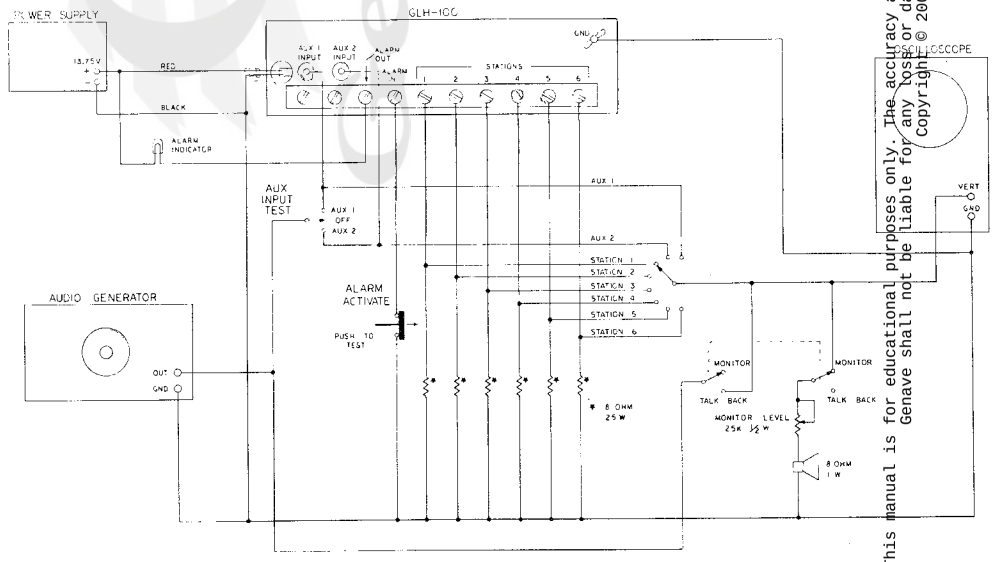

Figure 8

TEST SETUP

TEST PROCEDURES

AUX 1/AUX 2 Input Sensitivity

1. Connect the GLH-100 to the Test Setup shown in Figure 8.
2. Set the GLH-100 Function Switch, Signal Generator, and oscilloscope to AUX 1 and turn the Hail Volume control fully clockwise.
3. With a generator output of 150 mv at 1 KHz, adjust the AUX 1 Input Sensitivity control, R101, for a maximum output indication on the oscilloscope (approximately 50 Vp-p).
4. Set the GLH-100 Function Switch, Signal Generator, and Oscilloscope to AUX 2.
5. With a generator output of 150 mv at 1 KHz, adjust the AUX 2 Input Sensitivity control (R107) for a maximum output indication on the oscilloscope (approximately 50 Vp-p).

Manual Horn Adjustment

1. Set the Function Switch to MAN HORN and set the AUX Input Test Switch to OFF.
2. Depress the microphone button and set the horn frequency between 400 and 600 Hz by adjusting R119. This control also sets the overall range of the WAIL and YELP sirens.
3. Check for proper tone generator operation by depressing the microphone button while listening for an instantaneous output of the correct frequency and power level (approximately 50 Vp-p).

Auto Horn Adjustment

1. Set the GLH-100 Function Switch to the AUTO HORN position.
2. The repetition RATE of the AUTO HORN cycle can be varied from a rate of around 1 repetition per 2.5 seconds to 1 repetition per 65 seconds by adjusting R168. The normal factory setting is for a rate of 1 repetition per 15 seconds.
3. The DURATION of the horn blasts can be varied from about .1 seconds to 35 seconds by adjusting R172. The normal factory setting is for a duration of 2 to 3 seconds.
4. There is some interaction between the RATE and DURATION adjustments therefore it will be necessary to recheck each to insure that the desired settings have been retained. Minimum interaction will be encountered if the RATE adjustment is performed first.

HAIL ADJUSTMENT

1. Set the GLH-100 Function Switch to the HAIL position.
2. Depress the microphone button and speak across the face of the microphone while observing the output level on the oscilloscope. Full output should be obtained when talking in a normal voice (full output = approximately 50 Vp-p). The HAIL output can be varied by adjusting the HAIL Volume Control.
3. The listen portion of the HAIL function can be tested by setting THE MONITOR-TALK BACK Switch of the Test Setup to the TALK BACK position and feeding a 1 KHz, 25 mv signal to the selected station. The 25 mv signal should give more than adequate gain for the internal listen speaker.

WAIL SIREN ADJUSTMENT

1. Return the MONITOR-TALK BACK Switch to the MONITOR position and set the GLH-100 Function Switch to WAIL.
2. The siren should slowly rise and fall in frequency and have an output of approximately 50 Vp-p. The over-all frequency range can be changed slightly by readjusting R119. This control is common with the tone generator circuitry of the HORN, WAIL, and HAIL functions, therefore changing its setting will affect the others also.

YELP SIREN CHECK

1. Set the GLH-100 Function Switch to YELP.
2. The siren frequency should rise and fall at a rapid rate and have an output of approximately 50 Vp-p.

ALARM CHECK

1. Set the GLH-100 Function Switch to the ALARM position.
2. Pushing the ALARM ACTIVATE switch on the test setup will remove ground from the ALARM IN terminal of the unit causing the yelp siren to be activated and latched. The ALARM Indicator Lamp should illuminate to indicate that the ALARM OUT terminal is receiving the correct grounding signal.
3. Release the ALARM ACTIVATE switch and rotate the Function Selector of the unit to one of the other functions and then back to ALARM. This should deactivate the alarm.

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OPTIONS

SPEAKERS

(See speaker illustrations, page 25.)

SP-4 Auxiliary Speaker; surface mount; black steel case; 8 ohm; 2 Watt.

SP-5 Auxiliary Speaker; gimbal mount; black steel case; 8 ohm; 2 Watt.

SP-6 Auxiliary Speaker; horn type; external mounting; white fiberglass; 8 ohm; 5 Watt.

PA-30 High Power Horn Speaker; external mounting; white fiberglass; 8 ohm; 30 Watt.

SWITCHES

Magnetic Proximity Switch for use with alarm. Genave Part No. 5100081

Keylock Switch; SPST; 15 amp @ 24 VDC; 2 keys supplied. Mounts on panels up to ¾ inch thick. Genave Part No. 5100082

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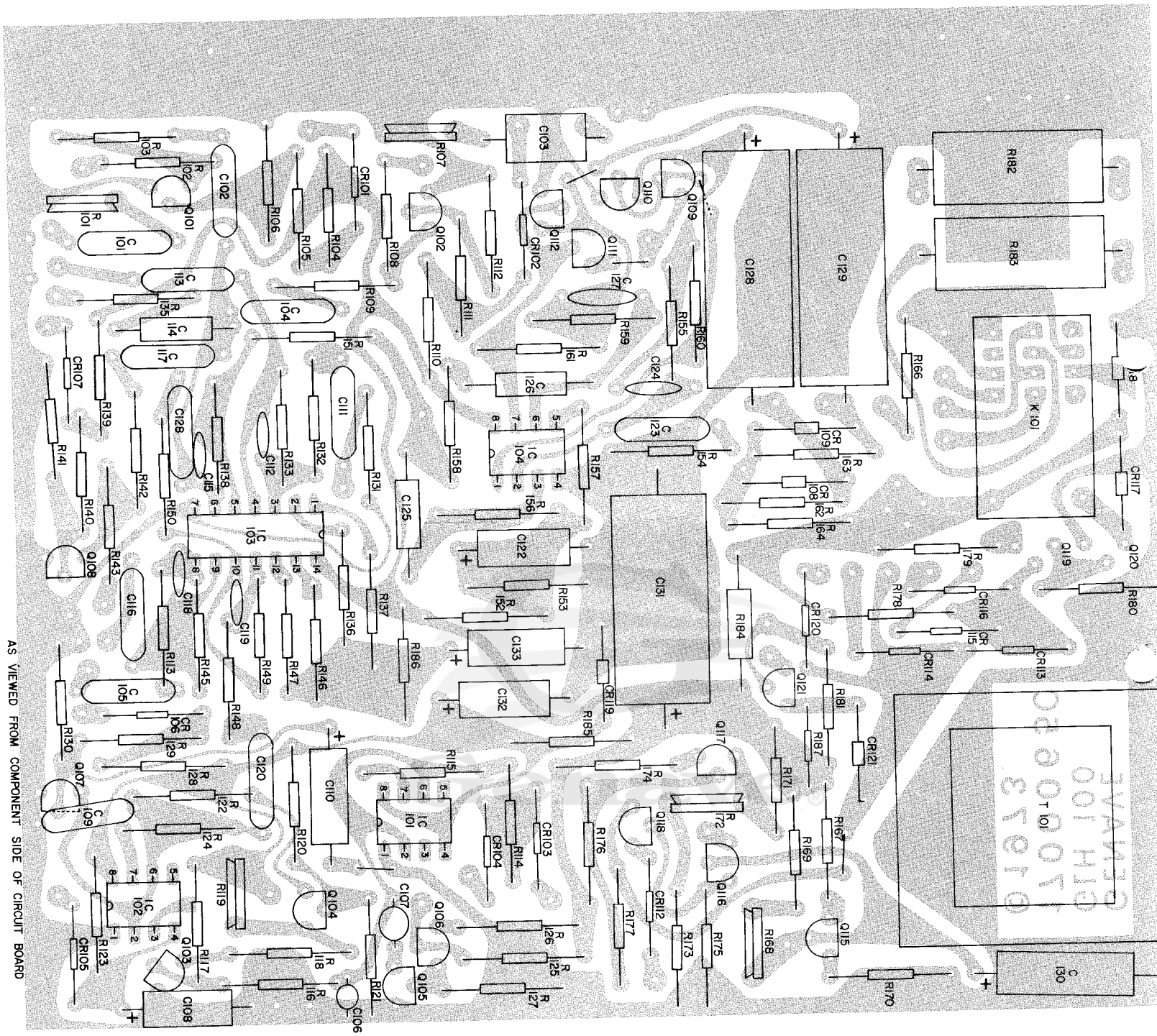
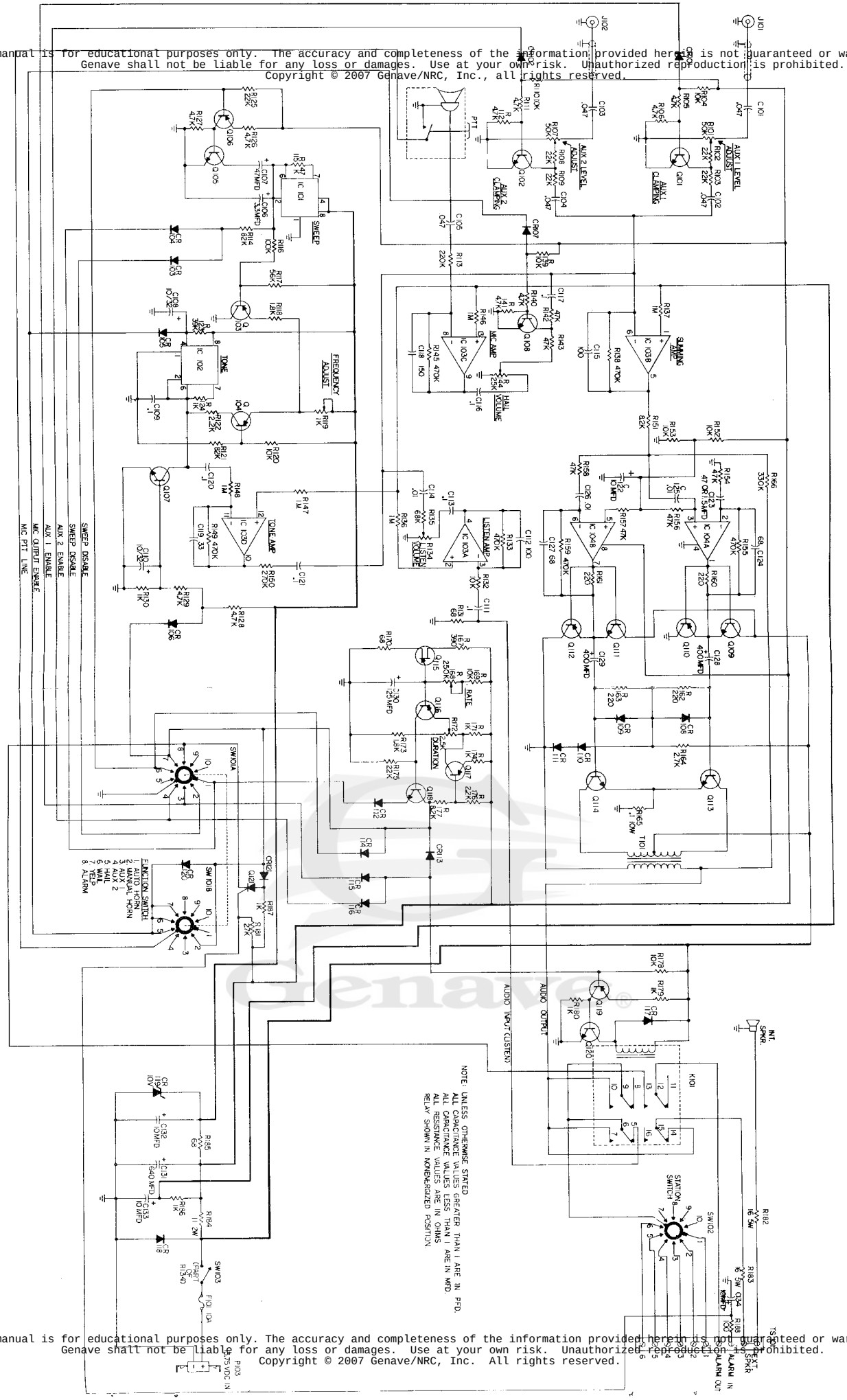


Figure 9
COMPONENT LOCATION DIAGRAM

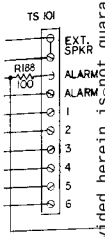
Figure 12

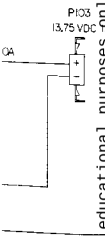
SCHEMATIC DIAGRAM



GLH-100 PARTS LIST

Ref. No.	Genave Part No.	Description
		CAPACITORS
C101	1500028	Polyester, .047 mfd, 10%, 100V
C102	1500028	Polyester, .047 mfd, 10%, 100V
C103	1500028	Polyester, .047 mfd, 10%, 100V
C104	1500029	Polyester, .047 mfd, 10%, 200V
C105	1500028	Polyester, .047 mfd, 10%, 100V
C106	1550003	Tantalum, 3.3 mfd, 35V
C107	1550055	Tantalum, 47 mfd, 20V
C108	1540014	Electrolytic, 10 mfd, 25V
C109	1500031	Polyester, .1 mfd, 10%, 100V
C110	1540014	Electrolytic, 10 mfd, 25V
C111	1500031	Polyester, .1 mfd, 10%, 100V
C112	1520024	N1500 Disc, 100 pf, 10%
C113	1500031	Polyester, .1 mfd, 10%, 100V
C114	1500019	Polyester, .01 mfd, 10%, 100V
C115	1520024	N1500 Disc, 100 pf, 10%
C116	1500031	Polyester, .1 mfd, 10%, 100V
C117	1500031	Polyester, .1 mfd, 10%, 100V
C118	1520029	N1500 Disc, 150 pf, 10%
C119	1520013	NPO Disc, 33 pf, 10%
C120	1500031	Polyester, .1 mfd, 10%, 100V
C121	1500031	Polyester, .1 mfd, 10%, 100V
C122	1540014	Electrolytic, 10 mfd, 25V
C123	1500043	Polyester, .47 mfd, 10%, 75V
C124	1520019	NPO Disc, 68 pf, 10%
C125	1500019	Polyester, .01 mfd, 10%, 100V
C126	1500019	Polyester, .01 mfd, 10%, 100V
C127	1520019	NPO Disc, 68 pf, 10%
C128	1540031	Electrolytic, 400 mfd, 10V
C129	1540031	Electrolytic, 400 mfd, 10V
C130	1540023	Electrolytic, 150 mfd, 16V
C131	1540036	Electrolytic, 680 mfd, 16V
C132	1540014	Electrolytic, 10 mfd, 25V
C133	1540014	Electrolytic, 10 mfd, 25V
C134	1540014	Electrolytic, 10 mfd, 25V
		DIODES
CR101	4810017	Silicon, High Speed Switching, FD1936
CR102	4810017	Silicon, High Speed Switching, FD1936
CR103	4810017	Silicon, High Speed Switching, FD1936
CR104	4810017	Silicon, High Speed Switching, FD1936
CR105	4810017	Silicon, High Speed Switching, FD1936
CR106	4810017	Silicon, High Speed Switching, FD1936
CR107	4810017	Silicon, High Speed Switching, FD1936
CR108	4810013	Silicon, Gen. Pur. 100PRV, 1A SD-1
CR109	4810013	Silicon, Gen. Pur. 100PRV, 1A SD-1
CR110	4810013	Silicon, Gen. Pur. 100PRV, 1A SD-1
CR111	4810013	Silicon, Gen. Pur. 100PRV, 1A SD-1
CR112	4810017	Silicon, High Speed Switching, FD1936
CR113	4810017	Silicon, High Speed Switching, FD1936
CR114	4810017	Silicon, High Speed Switching, FD1936
CR115	4810017	Silicon, High Speed Switching, FD1936
CR116	4810017	Silicon, High Speed Switching, FD1936
CR117	4810013	Silicon, Gen. Pur. 100PRV, 1A SD-1
CR118	4810013	Silicon, Gen. Pur. 100PRV, 1A SD-1





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D.C. VOLTAGE MEASUREMENTS

DEVICE	AUTO HORN			MANUAL HORN						AUX 2			AUX 1			HAIL						WAIL									ALARM					
				HORN			LISTEN			NO AUDIO			NO AUDIO			P.T.T. DEPRESSED			LISTEN			WAIL			HAIL			YELP			SET			ACTIVATED		
	E	B	C	E	B	C	E	B	C	E	B	C	E	B	C	E	B	C	E	B	C	E	B	C	E	B	C	E	B	C	E	B	C	E	B	C
Q101																																				
	0	.7	.06	0	.7	.06	0	.7	.06	0	.2	0	0	.7	.06	0	.7	.06	0	.7	.06	0	.7	.06	0	.7	.06	0	.7	.06	0	.7	.06	0	.7	.06
Q102																																				
	0	.7	.06	0	.7	.06	0	.7	.06	0	.7	.06	0	.3	0	0	.7	.06	0	.7	.06	0	.7	.06	0	.7	.06	0	.7	.06	0	.7	.06	0	.7	.06
Q103	8.0	7.68	0	8.0	7.7	0	8.0	7.7	0	8.2-8.4	7.6-7.8	0	8.2-8.4	7.6-7.8	0	8.2-8.4	7.6-7.8	0	8.2-8.4	7.6-7.8	0	8.0-8.5	7.2-8.0	0	8.0-8.5	7.2-8.0	0	8.1-8.3	7.5-7.7	0	8.1-8.3	7.5-7.7	0	8.1-8.3	7.5-7.7	0
Q104	8.8	8.2	4	8.8	8.2	5.0	8.8	8.2	4	8.8	8.2	.65-.8	8.8	8.2	.65-.8	8.8	8.2	.8-1.0	8.8	8.2	.65-.8	8.8	8.2	5.0-5.5	8.8	8.2	.4-1.4	8.8	8.2	5.1-5.3	8.8	8.2	.65-.8	8.8	8.2	5.1-5.3
Q105	0	0	.16	0	0	.16	0	0	.16	0	0	1.0-1.5	0	0	1.0-1.5	0	0	10 - 1.5	0	0	1.0-1.5	0	.66	.06	0	.66	.06	0	0	.6-1.1	0	0	.6-1.1	0	0	.6-1.1
Q106	12.7-12.3	12.8-12.4	0	12.3	12.4	0	12.7	12.8	0	12.7	12.8	0	12.7	12.8	0	12.7	12.8	0	12.7	12.8	0	.7	0	.66	.7	0	.66	12.4	12.1	0	12.8	12.5	0	12.4	12.2	0
Q107	0	.62-.26	.09-4.7	0	.1	4.7	0	.62	.09	0	.63	.11	0	.63	.11	0	.2	.25-.32	0	.63	.11	0	.2	4.8	0	.2	.15-4.8	0	.09	.48	0	.64	.11	0	.17	.48
Q108	0	.65	.07	0	.65	.07	0	.65	.07	0	.65	.07	0	.65	.07	0	.29	.07	0	.65	07	0	.65	.07	0	.29	.07	0	.29-.65	.07	0	.65	.07	0	.65	.07
Q109	6.2	6.2	6.2	5.9	6.2	13.1	6.1	6.2	13.5	6.1	6.2	13.5	6.1	6.2	13.5	6.1	6.2	13.5	6.1	6.2	13.5	5.9	6.2	13.1	6.1	6.2	13.5	5.9	6.2	13.5	6.1	6.2	13.5	5.9	6.2	13.5
Q110	6.2	6.2	0	5.9	6.2	0	6.1	6.2	0	6.1	6.2	0	6.1	6.1	0	6.1	6.2	0	6.1	6.2	0	5.9	6.2	0	6.1	6.2	0	5.9	6.2	0	6.1	6.2	0	5.9	6.2	0
Q111	6.1	6.2	13.5	5.9	6.2	13.1	6.1	6.2	13.5	6.1	6.2	13.5	6.1	6.2	13.5	6.1	6.2	13.5	6.1	6.2	13.5	5.9	6.2	13.1	6.1	6.2	13.5	5.9	6.2	13.5	6.1	6.2	13.5	5.9	6.2	13.5
Q112	6.1	6.2	0	5.9	6.2	0	6.1	6.2	0	6.1	6.2	0	6.1	6.2	0	6.1	6.2	0	6.1	6.2	0	5.9	6.2	0	6.1	6.2	0	5.9	6.2	0	6.1	6.2	0	5.9	6.2	0
Q113	.02-.66	1.1-.36	13.7-12.8	.66	.36	12.8	.02	1.1	13.7	.02	1.1	13.7	.02	1.1	13.7	.02	1.1	13.7	.02	1.1	13.7	.66-.80	.35-1.1	12.8	.02	1.1	13.7	7.6	.60-.68	12.8	.02	1.1	13.7	.76	.60-.68	12.8
Q114	.02-.66	1.1-.36	13.7-12.8	.66	.36	12.8	.02	1.1	13.7	.02	1.1	13.7	.02	1.1	13.7	.02	1.1	13.7	.02	1.1	13.7	.66-.80	.35-1.1	12.8	.02	1.1	13.7	7.6	.60-.68	12.8	.02	1.1	13.7	.76	.60-.68	12.8
Q115	5.4-3.8	9.9 - 3.8	0 - 1.4	5.6-3.8	9.9-4.2	0-2.2	5.4-4.5	9.9-4.2	0-4.5	5.4-4.4	9.9-4.2	0-4.5	5.4-4.4	9.9-4.2	0-4.5	5.8-3.8	9.9-4.2	0-1.3	5.4-4.4	9.9-4.2	0-1.3	5.7-3.8	9.4-3.2	0 - 1.3	5.8-3.8	9.8-3.4	0-4.0	5.7-3.8	9.4-3.4	0-.65	5.4-4.4	9.8-4.2	0-4.5	5.8-3.8	9.4-3.4	0-
Q116	10.6-12.7	10.1 - 12.7	10.1-10.6	10.9	10.1	10.7	12.7	12.7	10.1	12.7	12.7	10.1	12.7	12.7	10.1	11.3	10.6	11.0	12.7	12.7	10.1	10.9	10.0-10.3	10.7-10.2	11.2	10.4-10.6	11.0	10.9	10.0-10.3	10.7	12.7	12.7	10.1	10.9	10.0-10.3	10.
Q117	0 - .6	0 - 1.3	.8-12.9	.08-.02	0-4.5	.02	.08-4.2	0-4.5	12.9	.13-4.3	0-4.5	12.7	.13-4.3	0-4.5	12.7	.13-.7	0 - 1.3	.6	.03-4.3	0-4.5	12.9	.13-.6	0 - 1.3	.6	.13-.6	0 - 1.3	.6	0-.12	0-.6	0	.13-4.3	0-4.5	12.9	.13-.3	0 - 1.2	
Q118	1.1-.36	13.3-1.5	0 - .72	1.2	.6	.76	13.7	13.3	0	1.2	.55	.76	1.2	.55	.76	1.8	1.2	.76	13.7	13.4	0	1.8	1.2	.76	1.8	1.2	.76	1.2	.6	.76	13.7	13.4	0	1.6	1.0	.7
Q119	0	0-.72	.06-13.7	0	.76	.04	0	0	13.7	0	.76	.04	0	76	.04	0	.76	.04	0	0	13.7	0	.76	.04	0	.76	.04	0	.76	.04	0	0	13.7	0	.76	.04
Q120	12.5-1.5	0	.8-12.9	.26	0	.02	12.5	0	12.9	12.5	0	12.7	12.5	0	12.5	.9	0	.6	12.5	0	12.9	.9	0	.6	.9	0	.6	.24	0	0	0	0	12.9	0	.82	.5
Q121																																				

DEVICE	E	B1	B2	E	B1	B2	E	B1	B2	E	B1	B2	E	B1	B2	E	B1	B2	E	B1	B2	E	B1	B2	E	B1	B2	E	B1	B2	E	B1	B2	E	B1	B2
Q115	9.9-3.8	.1	11.7-12.1	9.9-4.2	.1	11.8	9.9-4.2	.1	12.1-11.2	9.9-4.2	.1	12.1-11.2	9.9-4.2	.1	12.1-11.2	9.9-4.2	.1	12.1-11.2	9.9-4.2	.1	12.1-11.2	9.4-3.2	.1	11.5	9.8-3.4	.1	11.9	9.4-3.4	.1	11.5	9.8-4.2	.1	12.1	9.4-3.4	.1	11.9

PIN #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
IC102														
HORN	0	3.6	NC	9.7	NC	3.6	3.6	9.7						
WAIL	0	3.4-5.9	NC	9.2	NC	3.4-5.9	0-5.9	9.2						
YELP	0	4.5-5.0	NC	9.3	NC	4.5-5.0	2.5-3.8	9.3						
IC103														
HORN	0	4.8	NC	9.5	NC	4.8	4.8	9.3						
WAIL	0	4.8	NC	9.2	NC	4.8	4.4-4.7	9.6						
YELP	0	4.8	NC	9.2	NC	4.8	4.5-4.6	9.6						
IC103	.49	.49	.49	6.21	6.69	.49	0	.49	6.40	7.26	.50	.49	.49	12.97
IC104	6.44	6.40	6.36	0	6.36	6.40	6.43	12.97						

NOTES:

1. Measurements were made with a supply voltage of 13.75 V.D.C.
2. All measurements are D.C. volts.
3. Normal voltages may vary ±20% from those shown.
4. Two voltages indicate a normally varying voltage within the range shown.
5. Q121 measurements were made with "ALARM IN" terminal grounded, except in ALARM ACTIVATED position.
6. IC103 and IC104 measurements were made in "LISTEN" mode of MANUAL HORN.

Figure 10

D.C. VOLTAGE MEASUREMENTS

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STATIONS

ALARM

EXT SPKR

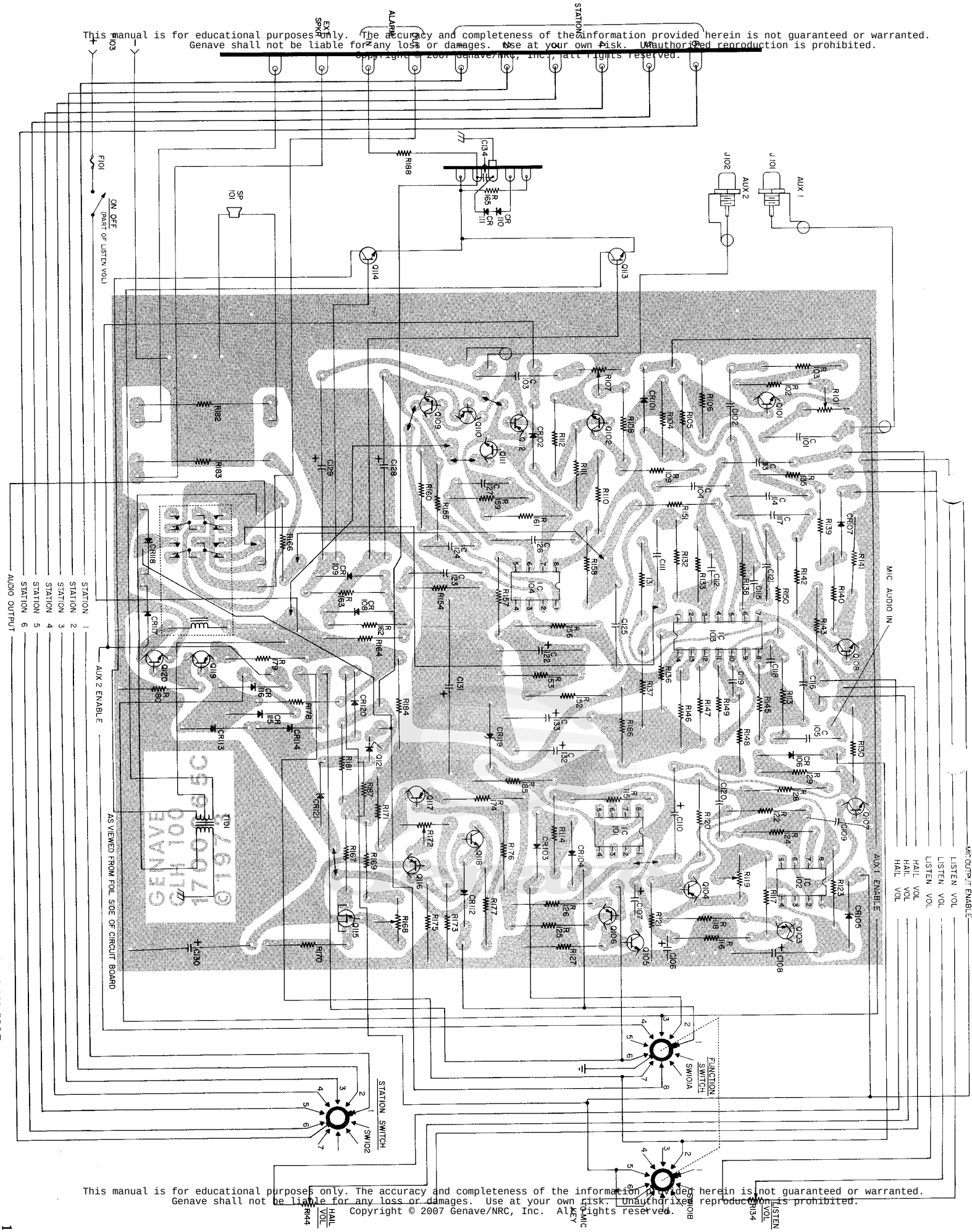

Figure 11 PARTS/TRACK MAP

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Ref. No.	Genave Part No.	Description
CR119	4810008	Zener, 10V, 10%, 1W, ZS10A
CR120	4810017	Silicon, High Speed Switching, FD1936
CR121	4810013	Silicon, Gen. Pur., 100PRV, 1A SD-1
		INTEGRATED CIRCUITS
IC101	3130355	Timer, NE555 or Equiv.
IC102	3130355	Timer, NE555 or Equiv.
IC103	3133401	Quad Op-Amp., LM3900 or Equiv.
IC104	3130012	Dual Op-Amp., MC1458CP1 or Equiv.
		RESISTORS
R101	4760021	Potentiometer, 50K, 20%, Linear
R102	4710041	220K, 10%, ½ W
R103	4700041	22K, 10%, ½ W
R104	4700037	10K, 10%, ½ W
R105	4700033	4.7K, 10%, ½ W
R106	4700033	4.7K, 10%, ½ W
R107	4760021	Potentiometer, 50K, 20%, Linear
R108	4710041	220K, 10%, ½ W
R109	4700041	22K, 10%, ½ W
R110	4700037	10K, 10%, ½ W
R111	4700033	4.7K, 10%, ½ W
R112	4700033	4.7K, 10%, ½ W
R113	4700053	220 K, 10%, ½ W
R114	4700048	82K, 10%, ½ W
R115	4700045	47K, 10%, ½ W
R116	4700049	100K, 10%, ½ W
R117	4700046	56K, 10%, ½ W
R118	4700028	1.8K, 10%, ½ W
R119	4760015	Potentiometer, 1K, 20%, Linear
R120	4700037	10K, 10%, ½ W
R121	4700048	82K, 10%, ½ W
R122	4700029	2.2K, 10%, ½ W
R123	4700044	39K, 10%, ½ W
R124	4700025	1K, 10%, ½ W
R125	4700041	22K, 10%, ½ W
R126	4700033	4.7K, 10%, ½ W
R127	4700033	4.7K, 10%, ½ W
R128	4700033	4.7K, 10%, ½ W
R129	4700033	4.7K, 10%, ½ W
R130	4700025	1K, 10%, ½ W
R131	4700011	68 ohm, 10%, ½ W
R132	4700037	10K, 10%, ½ W
R133	4700057	470K, 10%, ½ W
R134	4760026	Potentiometer, 25K, 20%, Audio taper, W/Switch
R135	4700047	68K, 10%, ½ W
R136	4700058	1M, 10%, ½ W
R137	4700058	1M, 10%, ½ W
R138	4700057	470K, 10%, ½ W
R139	4700037	10K, 10%, ½ W
R140	4700033	4.7K, 10%, ½ W
R141	4700031	4.7K, 10%, ½ W
R142	4700045	47K, 10%, ½ W
R143	4700045	47K, 10% ½ W
R144	4760025	Potentiometer, 25K, 30%, Audio Taper

Ref. No.	Genave Part No.	Description
R145	4700057	470K, 10%, ½ W
R146	4700058	1M, 10%, ½ W
R147	4700058	1M, 10%, ½ W
R148	4700058	1M, 10%, ½ W
R149	4700057	470K, 10%, ½ W
R150	4700054	270K, 10%, ½ W
R151	4700036	8.2K, 10%, ½ W
R152	4700037	10K, 10%, ½ W
R153	4700037	10K, 10%, ½ W
R154	4700045	470K, 10%, ½ W
R155	4700057	47K, 10%, ½ W
R156	4700045	47K, 10%, ½ W
R157	4700045	47K, 10%, ½ W
R158	4700045	47K, 10%, ½ W
R159	4700057	470K, 10%, ½ W
R160	4700017	220 Ohm, 10%, ½ W
R161	4700017	220 Ohm, 10%, ½ W
R162	4700017	220 Ohm, 10%, ½ W
R163	4700017	220 Ohm, 10%, ½ W
R164	4700030	2.7K, 10%, ½ W
R165	4740024	0.1 Ohm, 10%, 10 W Wire Wound
R166	4700020	330K, 10%, ½ W
R167	4700020	390 Ohm, 10%, ½ W
R168	4760022	Potentiometer, 250K, 30%, Linear
R169	4700037	10K, 10%, ½ W
R170	4700011	68 Ohm, 10%, ½ W
R171	4700025	1K, 10%, ½ W
R172	4760017	Potentiometer, 2.5K, 30%, Linear
R173	4700028	1.8K, 10%, ½ W
R174	4700025	1K, 10%, ½ W
R175	4700041	22K, 10%, ½ W
R176	4700029	2.2K, 10%, ½ W
R177	4700036	8.2K, 10%, ½ W
R178	4700037	10K, 10%, ½ W
R179	4700025	1K, 10%, ½ W
R180	4700025	1K, 10%, ½ W
R181	4700033	4.7K, 10%, ½ W
R182	4740018	16 Ohm, 10%, 5 W, Wire Wound
R183	4740018	16 Ohm, 10%, 5 W, Wire Wound
R184	4740004	11 Ohm, 10%, 2 W, Wire Wound
R185	4700011	68 Ohm, 10%, ½ W
R186	4700025	1K, 10%, ½ W
R187	4710017	1K, 10%, ½ W
R188	4700013	100, 10%, ½ W
		TRANSISTORS
Q101	4800015	Silicon, NPN, MPS 6531
Q102	4800015	Silicon, NPN, MPS 6531
Q103	4800043	Silicon, PNP, 2N5227
Q104	4800043	Silicon, PNP, 2N5227
Q105	4800015	Silicon, NPN, MPS A10
Q106	4800043	Silicon, PNP, 2N5227
Q107	4800015	Silicon, NPN, MPS A10
Q108	4800015	Silicon, NPN, MPS A10
Q109	4800002	Silicon, NPN, MPS 6531
Q110	4806535	Silicon, PNP, MPS 6535
Q111	4800002	Silicon, NPN, MPS 6531
Q112	4806535	Silicon, PNP, MPS 6535

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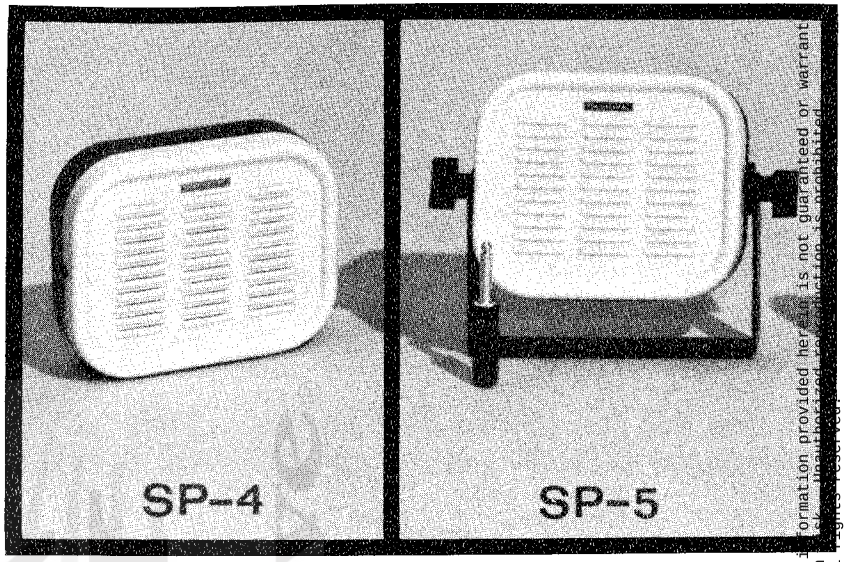
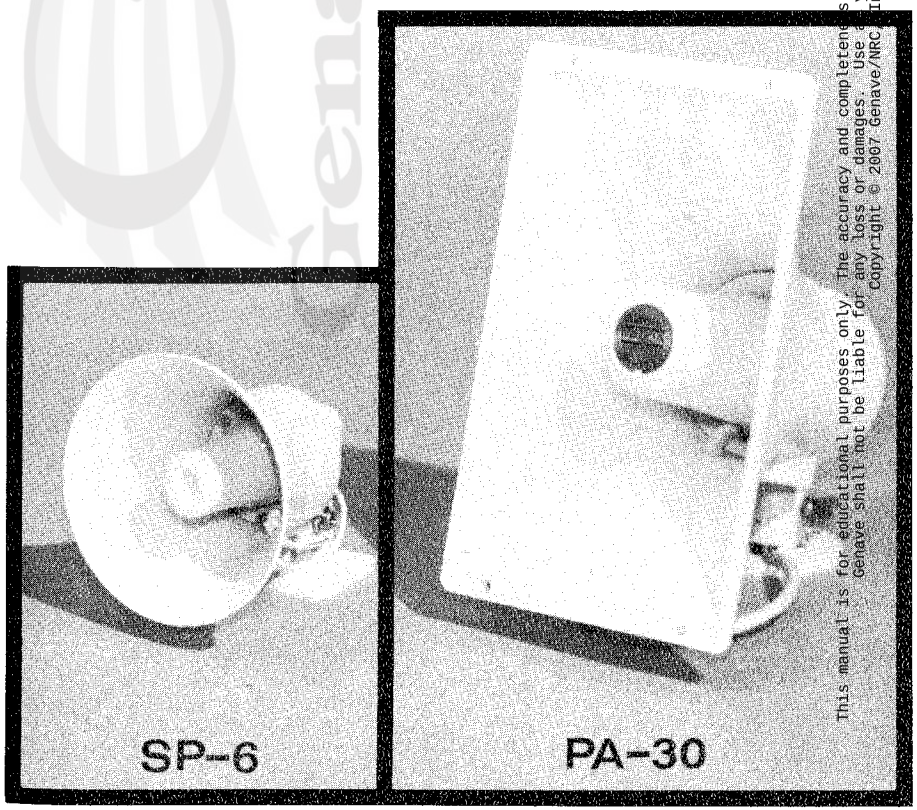
Ref. No.	Genave Part No.	Description
Q113	4800055	Silicon, NPN, Darlington Pair, 2N6057
Q114	4800055	Silicon, NPN, Darlington Pair, 2N6057
Q115	4800006	Silicon, PN, Unijunction Transistor, 2N4871
Q116	4800043	Silicon, PNP, 2N5227
Q117	4800043	Silicon, PNP, 2N5227
Q118	4800015	Silicon, NPN, MPS A10
Q119	4800043	Silicon, PNP, 2N5227
Q120	4800002	Silicon, NPN, MPS 6531
Q121	4800057	Silicon Controled Rectifier, 2N5060
		MISCELLANEOUS
SW101A	5100036	Switch, Rotary
SW101B	5100078	Switch, Rotary
SW102	5100037	Switch, Rotary
F101	5140021	Fuse, 10A 3AG
K101	4500008	Relay, 4PDT
Mic	1325069	Microphone, Ceramic
SP101	1320408	Speaker, 8 Ohm, 1.5 W
T101	5600038	Transformer, Audio Output
	2508401	Knob Volume
	2508211	Knob, Selector
	2502292	Bracket, Mounting
	2508902	Panel, Sub
	2508952	Heat Sink
	2508862	Extension, Shaft, for Selector Switches
	2509231	Panel, Trim
	2502311	Panel, Front
	2502621	Cover

Specifications Subject to Change
Without Notice.





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