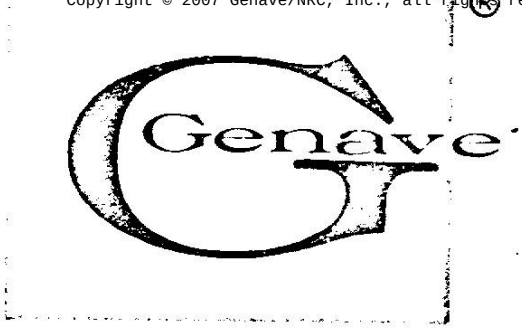

GSB-1000
SSB TRANSCEIVER

MAINTENANCE MANUAL

CONTENTS

General Aviation
Electronics, Inc.
4141 Kingman Drive
Indianapolis, In 46226
Area (317) 546-1111

Tech. Pub. No. 0540046

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SECTION I

GENERAL INFORMATION

1-1. INTRODUCTION

This service manual contains all the information normally required to install, operate, and maintain the Genave GSB-1000 SSB Transceiver.

1-2. DESCRIPTION

The GSB-1000 single-sideband transceiver is capable of fixed or mobile operation in Marine, Public Safety, and Industrial Radio Services.

The transceiver has provisions for a maximum of 10 channels within the frequency range from 2 MHz to 9 MHz. The operating frequency is selected by a front-panel rotary switch, which also selects the mode of operation, and provides programming for the ETA/4 Remote Antenna Coupler, if used. The transceiver is capable of transmitting and receiving in any of three modes: single sideband A3J; single sideband reduced carrier A3A; or compatible AM A3H. An internal crystal oven insures excellent transmitter-frequency stability.

The unit features a front-panel mounted speaker, and a standard high-impedance ceramic microphone. Output is available for a remote speaker, and provisions have been made to utilize a carbon microphone, if desired. "Aircraft-style" backlighting affords high-visibility night display of the operating controls. The unit is designed to operate on 13.6 volts DC; however, operation on 24 to 32 volt power is possible using an optional power converter.

The transceiver is designed to feed a standard 50-ohm antenna system. For fixed-station operation conducted on a single frequency, a 50-ohm resonant antenna, such as a half-wave dipole or a commercially-made loaded-vertical antenna, can be connected directly to the 50-ohm output jack on the transceiver rear panel. In multiple-frequency installations, the ETA/4 antenna coupler should be employed to tune the antenna to the various operating frequencies. The GSB-1000 Installation Manual and the ETA/4 Service Manual each contain recommendations for antenna installation and matching. Note that in all cases a good earth ground is required for optimum performance.

The unit is completely solid-state to provide long, trouble-free operation. The transceiver meets or exceeds applicable FCC regulations, and when properly installed and adjusted, use of the front-panel operating controls cannot result in unauthorized modes or frequencies of operation.

NOTE: Work involved in adding or changing operating frequencies, or changing modes of operation, must be performed by an FCC-licensed technician, holding either a 1st or 2nd Class Radiotelephone or Radiotelegraph license.

1-3. SPECIFICATIONS

GENERAL

Over-all Dimensions:	11.5" deep x 6.5" wide x 2.5" high (29.21 cm x 16.51 cm x 6.35 cm)
Input Voltage:	13.75 VDC: minimum 11.2 VDC
Current Drain:	0.65 Amps receive (nominal) - after warm-up 15 Amps transmit (Maximum)
Number of Channels:	1 - 10
Frequency Range:	2 MHz to 9 MHz
Injection Oscillator:	10.7 MHz
Accuracy:	±10 Hz
F.C.C. Type Accepted:	Part 81 Maritime Land Part 83 Maritime Shipboard Part 87 Aviation Part 89 Public Safety Radio Part 91 Industrial Radio Service
Type Acceptance Model No.	T-7092100
Weight:	6 Lbs. (2.72 kg)

RECEIVER

Sensitivity:	0.5 µV for 10 dB S + N/N
Selectivity:	2.4 kHz @ 6 dB; 4.8 kHz @ 60 dB
Image:	50 dB
Clarify:	±100 Hz of Center Frequency
AGC:	Fast attack - slow release. Less than 6 dB audio change from 4µV to 0.1 volts
Audio Output:	5 watts; 4 watts min. @ 15% distortion

TRANSMITTER

Power Output:	60 watts PEP nominal, 50 watts minimum
Emission:	A3A - Reduced carrier (1.5 watt carrier - 16 dB) A3H - Compatible AM (15 watt carrier - 6 dB) A3J - Suppressed carrier, USB (Carrier - 40 dB)
Carrier Suppression:	Better than 50 dB
Unwanted Sideband:	Better than 50 dB
Harmonic Suppression:	Better than 60 dB
Intermod. Distortion:	Better than 25 dB
Stability:	±20 Hz
Output Impedance:	50-ohms

1-4. EQUIPMENT

Section 2 of this manual contains lists of equipment normally supplied with each transceiver, equipment required but NOT supplied, as well as optional equipment available for use with the GSB-1000.

1-5. LICENSING INFORMATION

Locations of F.C.C. Field Engineering Offices are given in Section 3-3, as well as technical information needed for the F.C.C station-authorization application.

SECTION II

INSTALLATION MANUAL

The following Section

is reproduced

and included with every

GSB-1000

It is made a part of

this manual

for your permanent

reference

Model: GSB-1000

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GSB-1000

SSB COMMUNICATIONS TRANSCEIVER

INSTALLATION MANUAL

LIMITED

Genave WARRANTY Genave

General Aviation Electronics, Inc. (Genave), warrants this product to be free from material defects for a period of 90 days from the date of purchase, provided the warranty registration card properly filled out is returned by the purchaser to Genave within 10 days after purchase. This warranty is limited to the original retail purchaser and is not extended to second owners of the product.

Our obligation under this warranty is limited to replacement of any parts (except periodic maintenance items such as bulbs, fuses, etc.) which upon our examination, appear to us to be defective in materials or workmanship. The parts will be replaced within 45 days after receipt of the unit, provided the unit is delivered to the Factory (Customer Service Dept., General Aviation Electronics, 4141 Kingman Drive, Indianapolis, Indiana 46226) within 90 days after the date of purchase, shipping prepaid. All shipping costs and labor charges shall be born by the purchaser.

The owner may elect to have the unit repaired at an authorized Genave repair facility in which case Genave, within 45 days after receipt of the unit, will replace only those defective parts returned shipping prepaid to the Factory (Customer Service Dept., General Aviation Electronics, 4141 Kingman Drive, Indianapolis, Indiana 46226). Purchaser shall bear any and all other costs including but not limited to labor, transportation and freight.

This warranty does not apply to defects, malfunction, or breakage due to improper installation or to the servicing thereof by other than an authorized Genave dealer nor to units that have been damaged by lightning or other acts of God, excess current, or any units that have had serial number altered or removed. Abuse, misuse, tampering, submersion in water or willful destruction of the unit will also void this warranty.

This warranty gives you specific legal rights. You also have implied warranty rights. In the event of a problem with warranty service or performance, you may be able to go to a small claims court, a State court, or a Federal District court.

Genave offers this warranty in lieu of any and all other guarantees or warranties, either EXPRESSED or IMPLIED, including but not limited to warranties of merchantibility and/or fitness for a particular purpose. Any implied warranties are specifically and expressly limited to the 90-day period specified herein. Damages for breach of any warranties, either expressed or implied are limited to replacement of any defective parts as specified herein and any other incidental or consequential damages are expressly excluded.

General Aviation Electronics, 4141 Kingman Drive, Indianapolis, Indiana 46226 – Area 317 - 546-1111

General Aviation Electronics, Inc., 4141 Kingman Drive, Indianapolis, Indiana 46226

Specifications subject to change without notice.

TECH. PUB. NO. 0830029 Printed in U.S.A. 1976

VISUALLY INSPECT the unit for any obvious external damage, such as dents, loose wires, etc. Any damage not related to shipping should be reported to General Aviation Electronics, Inc., 4141 Kingman Drive, Indianapolis, Indiana 46226, Phone (317) 546-1111, as soon as possible.

Damage due to shipping should be reported to and a claim should be filed promptly with the transportation company.

All units are shipped in perfect operating condition. A pre-installation electrical test may be performed to assure that the unit has suffered no internal damage during shipment. DO NOT ATTEMPT to bench test the unit without the proper equipment as specified in the Maintenance Manual.

NOTICE

Frequency or Emission Mode Changes

This unit is shipped from the factory preprogrammed and aligned to transmit and receive on those frequency channels and emission modes specified in the original equipment order. If additional frequencies are to be installed in the unit, or the frequency or emission mode of presently installed channels are to be changed, the procedures for programming and alignment of the transceiver must be performed. These procedures are outlined in the maintenance manual. It is suggested that these procedures, if required, be performed prior to installation of the unit.

The Genave GSB-1000 single sideband transceiver is designed to provide high quality long range communications at a moderate price. The GSB-1000 transceiver is capable of fixed or mobile operation in the Marine, Public Safety, and Industrial Radio Services.

The GSB-1000 can be operated on any one of 10 channels within the frequency range from 2 to 9 MHz. It is capable of transmitting and receiving in any of three modes: single sideband, single sideband reduced carrier, or compatible AM. The GSB-1000 utilizes an internal crystal oven to insure high transmitter stability. Aircraft style backlighting provides a high visibility night display. The unit features a front panel mounted speaker and uses a standard high impedance ceramic microphone. Simple adaption to utilize a carbon microphone is provided.

The unit is designed to operate using a standard 50 ohm antenna system or feed a random length antenna using the optional ETA-4 remote antenna coupler. The GSB-1000 operates on 12 VDC power. An optional power converter, the PSI-50, is available to allow operation on 24 to 32 volt power sources.

For complete technical specifications on the transceiver, consult the GSB-1000 maintenance manual or brochure.

Equipment Supplied

A. GSB-1000 Single Sideband Transceiver.
B. Mounting Bracket with hardware.
C. Hand Microphone with hang-up clip.
D. Mounting lock.
E. Accessory plug, 12-pin male.
F. Power Cable Mating Socket, 2-pin Female

Equipment Required, But Not Supplied

A. Vehicle or Base Antenna (see appropriate catalog sheets).
B. Antenna Cable, RG-8 A/U or RG-58 A/U (for runs of 50 feet or less), as required.
C. Cabling for Power and Signal Harness, as required.

Optional Equipment

A. ETA-4, Remote Antenna Coupler.
B. Cabling, 12 conductor, for interconnecting transceiver and ETA-4, as required.
C. Random Length Antenna.
D. PSI-50 Power Converter, for 24 to 32 VDC operation.
E. G-10 Desk Microphone, for fixed operation.

INSTALLATION PROCEDURES

FIXED OPERATION

Antennas

Fixed station operation is normally conducted on a single frequency, which makes antenna requirements less complex than other installations. Usually a 50 ohm resonant antenna will be employed by the fixed station. This can be either in the form of a dipole antenna as shown in Figure 1, a commercially made loaded vertical antenna as shown in Figure 4, or a simple construction base loaded antenna as shown in Figure 3.

Grounding

The transceiver grounding system is just as important as the antenna system, as it forms the other half of the antenna. The better the grounding system, the more efficient the signal radiating system will be. The best grounding can be achieved by driving an 8 foot copper rod into the ground outside the building, as close to the transceiver location as possible. In addition, the ground should be tied to the cold water plumbing system and the electrical system ground inside the building.

Installation Procedure

1. Select the position where the transceiver is to be located. It is important to select a location where the unit can be easily grounded. The unit should be located as near the antenna as possible, in order to keep the antenna cable run as short as possible. The power cable run should also be kept as short as possible.
2. Remove the mounting yoke from the top of the unit and reposition it on the bottom side of the unit to function as a supporting stand.
3. Connect the ground wire to the grounding terminal located on the rear of the unit.
4. Install the AC power supply in accordance with the manufacturer's recommendations. The power supply should be a well regulated type capable of 20 amps. If it is necessary to extend the power leads, use #12 gauge or heavier insulated copper wire for runs of less than 15 feet. For longer runs, use a larger conductor.
5. Connect the color-coded power leads to the power supply. Take care to use RED for positive and BLACK for negative. The unit will only operate on a supply with negative ground. If polarity is reversed, the unit will be inoperative. If this occurs check wiring polarity (RED to positive and BLACK to negative) and the protective fuse. The fuse is located in the transceiver power lead. A blown fuse should be replaced with a type SFE 20, 20 amp fuse only.

6. If a 50 ohm resonant antenna system is to be used, the 12-pin socket at the rear of the unit will not be used. Connect the antenna cable to the antenna connector at the rear of the unit.
7. If a nonresonant antenna is to be used, install the antenna and the antenna coupler according to the instructions supplied with the unit.
8. If the nonresonant antenna system is used, fabricate the coupler switching cable using the 12-pin accessory socket supplied. Connect the coupler switching cable to the coupler socket at the rear of the unit. Perform the coupler set-up procedure outlined in the coupler installation instructions.

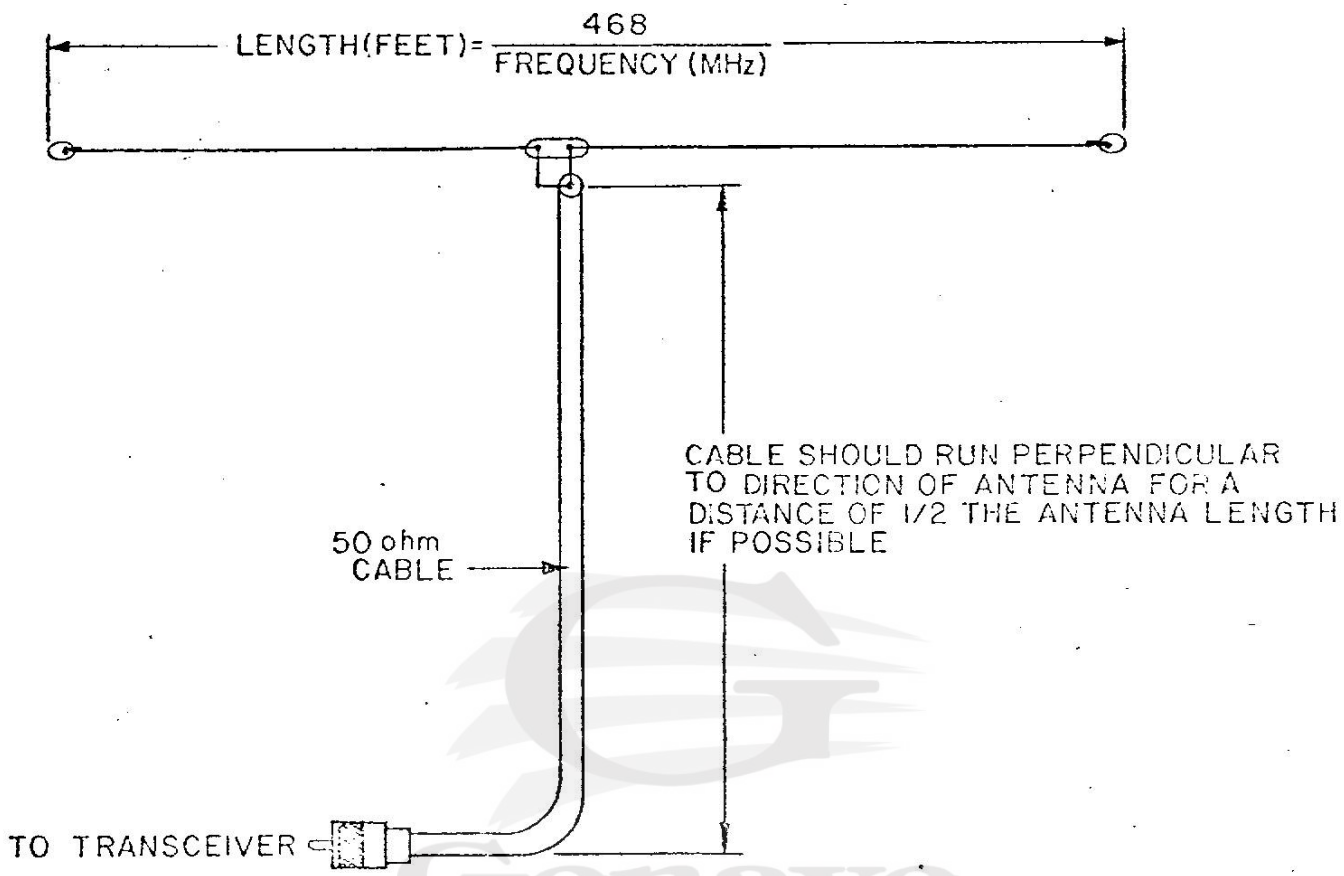


Figure 1

Dipole Antenna

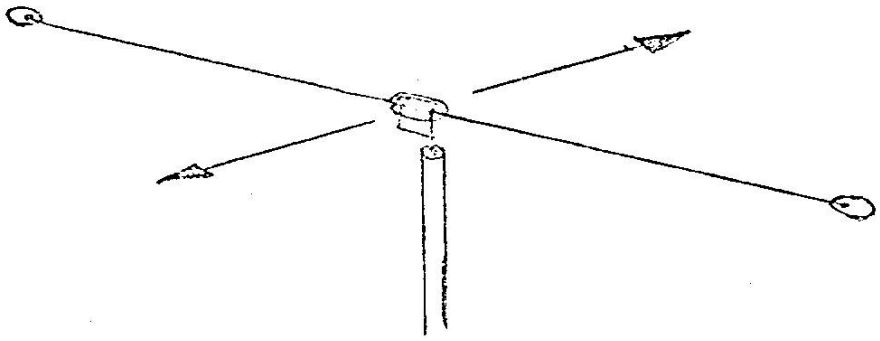


Figure 2

Dipole Radiation Pattern

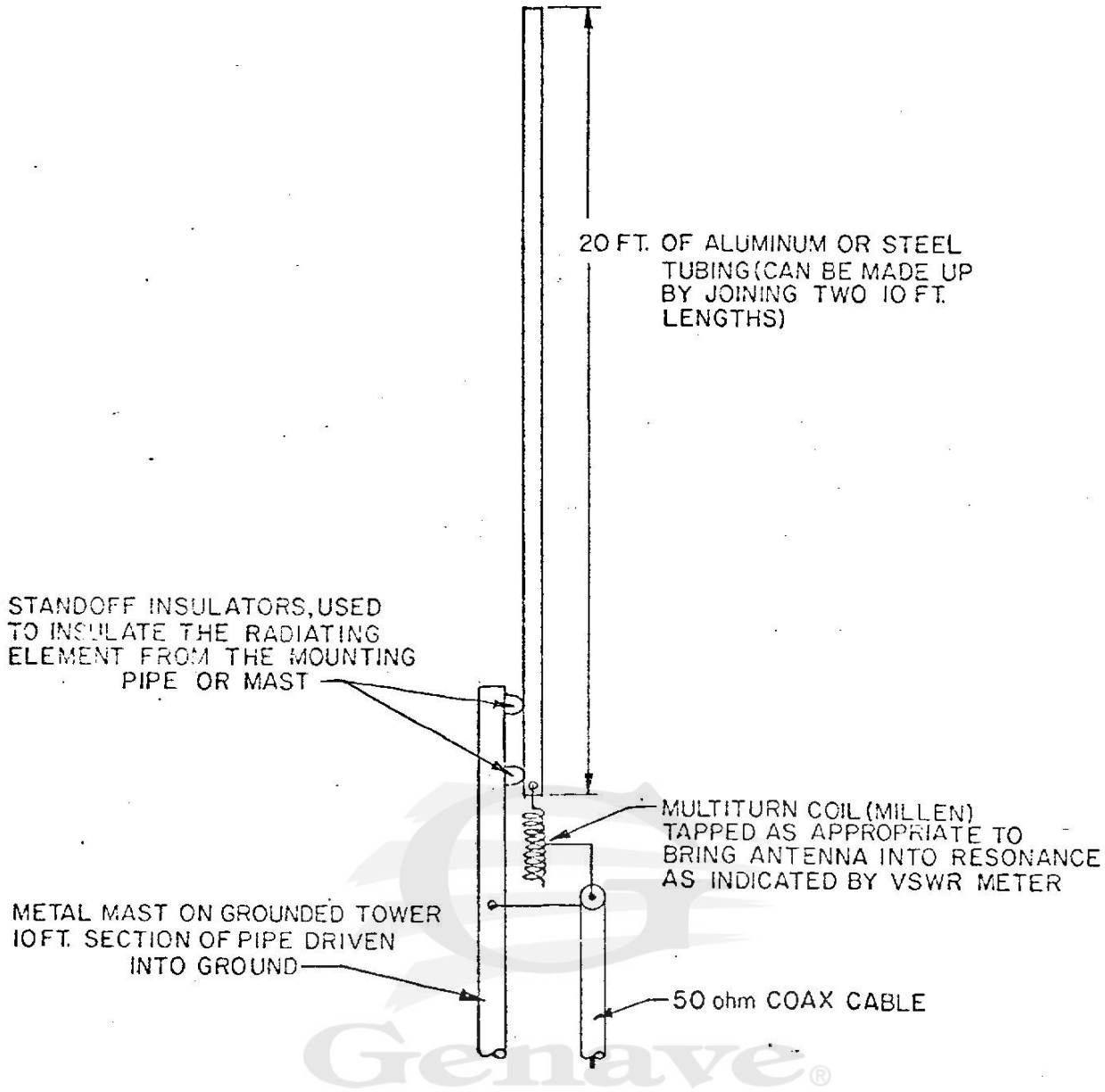


Figure 3

Simple Construction Base Loaded Vertical Antenna

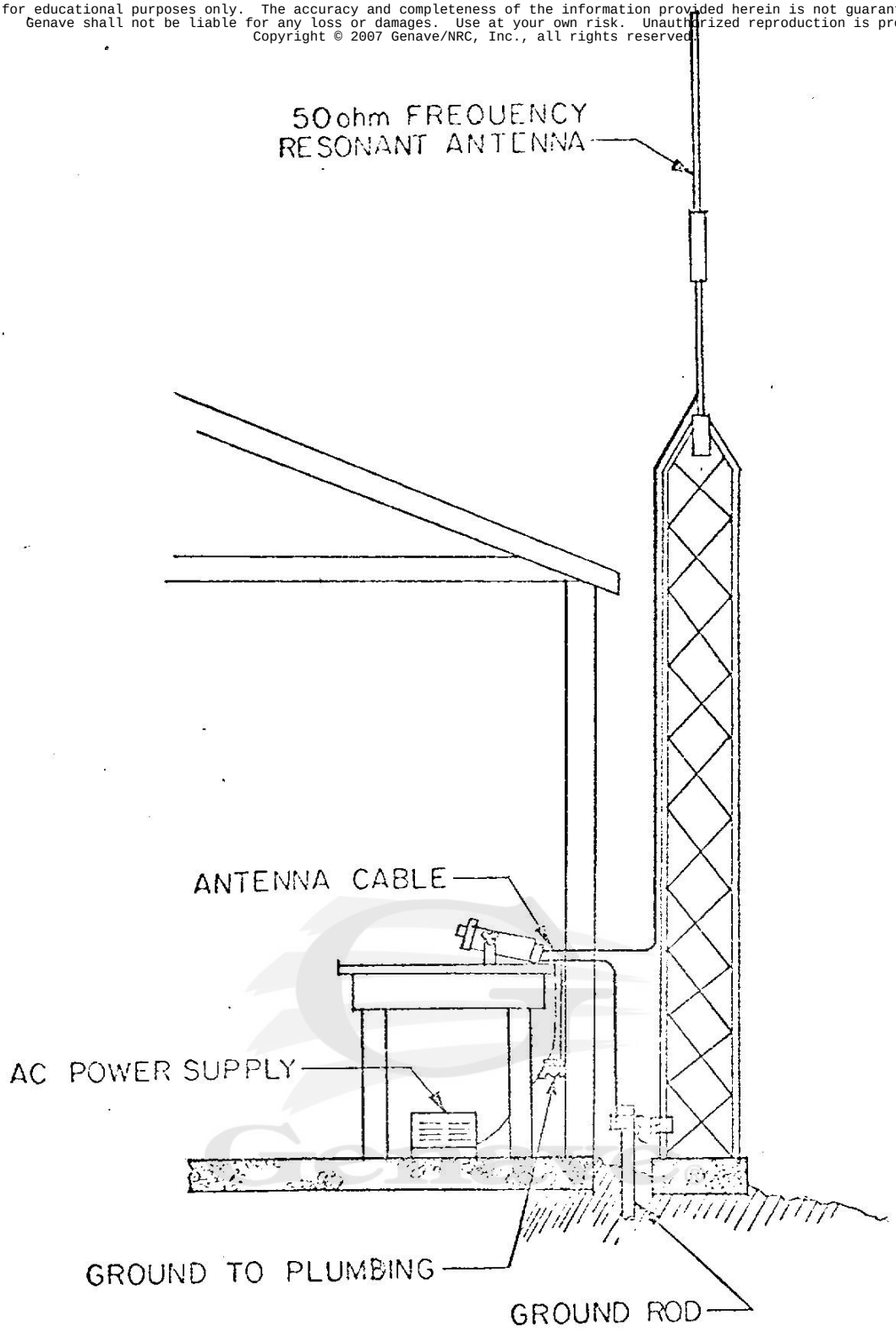


Figure 4

50 Ohm Resonant Fixed Antenna

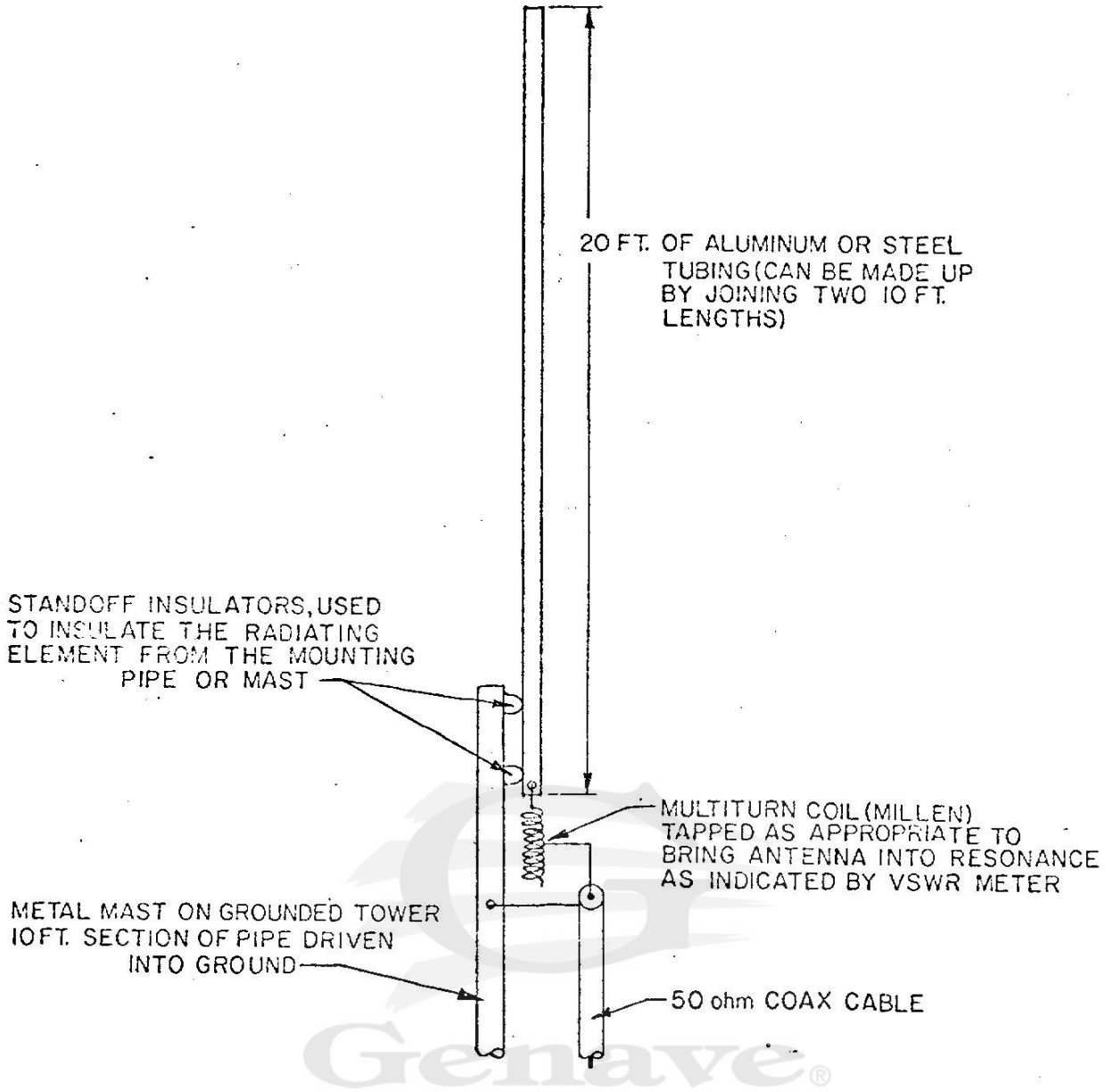


Figure 3

Simple Construction Base Loaded Vertical Antenna

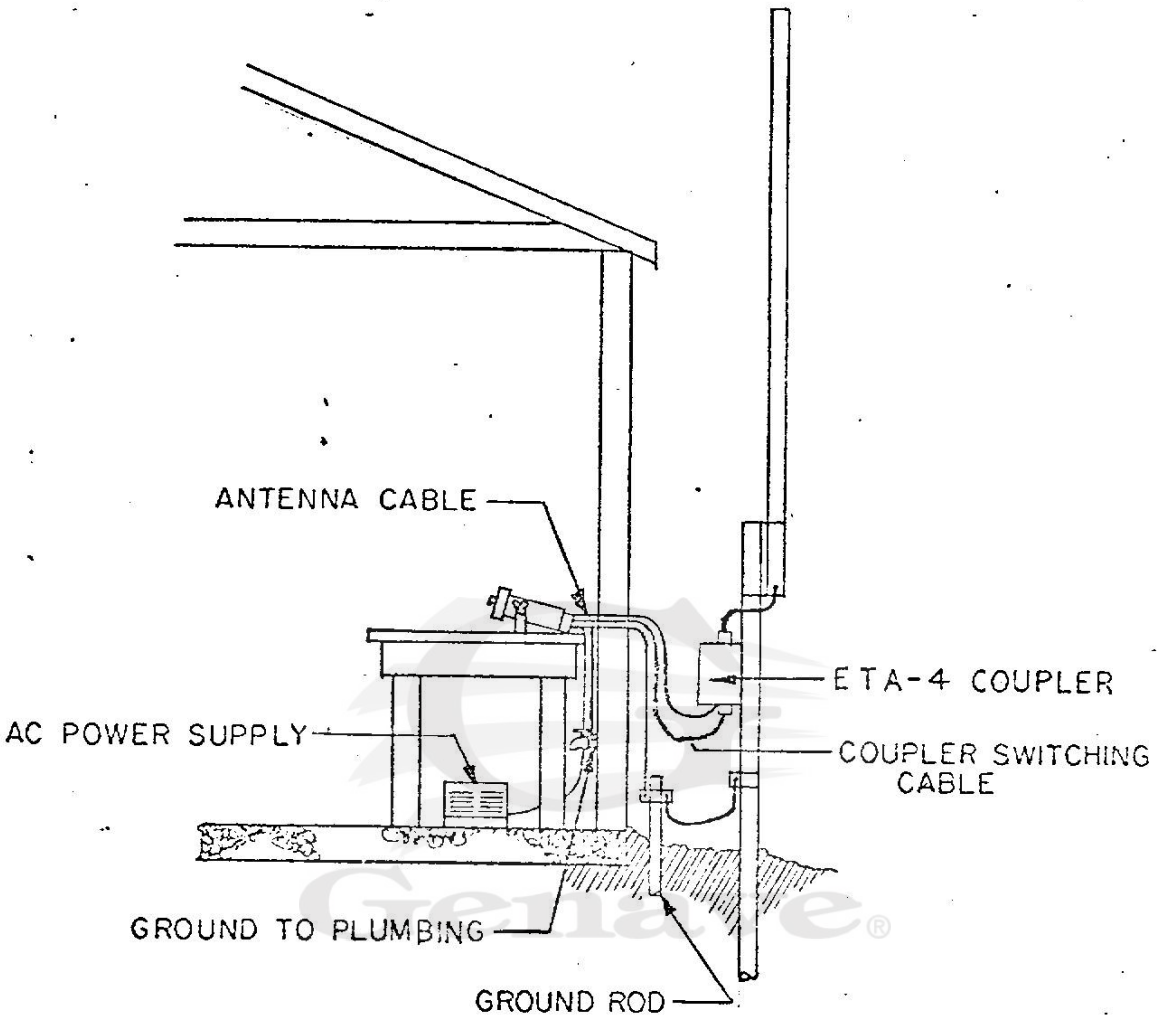


Figure 5

Multiple Frequency Fixed Antenna

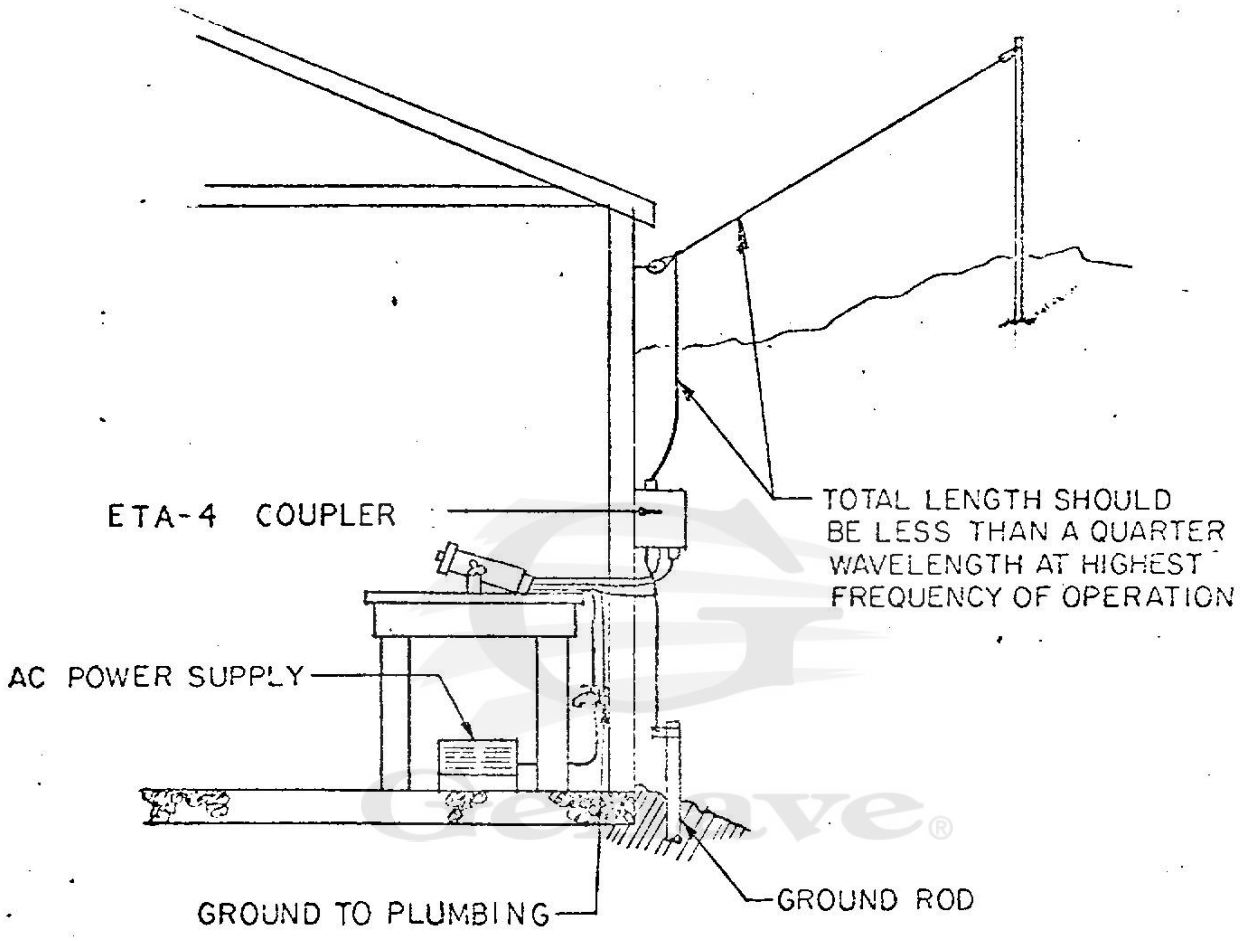


Figure 7

End Fed Antenna Installation

Grounding

HF communications systems require a vessel grounding system. If the ship is of metal construction all grounding can be to the structure of the ship itself. This will require the electrical bonding of all metal objects to the vessel's metal structure. All metal objects should be bonded by their mounting, however corrosion and painted surfaces can prevent good electrical connection. If in doubt clean the mounting surfaces or connect a grounding strap.

If the ship is of wood or plastic construction, a grounding system will have to be constructed. This can be done by installing a ground plate on the outside of the vessel's hull. The ground plate itself should be constructed of no less than 3 square feet of copper sheeting. Connection to the ground plate should be made using 1/16 inch by 3 inch copper strap (3 inch copper flashing). All connections should be soldered using a torch to supply adequate heat. The connection from the ground plate to the transceiver should be kept as short as possible. The ground strap to the transceiver should be connected to all metal components of the ship (engine, transmission, fuel tanks, water tanks, bilge pumps, cooling lines, etc.) and to the electrical grounds of the ship's electrical and ignition systems, using 3 inch wide straps. All equipment and instruments in the vicinity of the transceiver should also be connected to the grounding system.

If an external ground plate is not practical, an alternate method is possible. It consists of installing no less than 9 square feet of metallic (preferably copper or brass) screen on the inside of the hull, as near the keel as possible. (See Figure 10.) The screen should run as near the full length of the keel as possible, below the water line. The screen(s) should be connected to the transceiver and all other metal parts by means of 3 inch copper strapping in the same manner as an external ground plate. The hull ground screen should be installed so that it is as close to the water as possible (only the thickness of the hull material separating the screen and the water outside). The larger the area of this hull screen the better the transceiver performance. Be sure to connect all other metal objects, equipment, and the electrical and ignition grounds to the ground strap, as would be done when an external hull plate is used.

Noise Reduction

The HF communications system by nature is susceptible to RF noise. To reduce this noise to a minimum it is suggested that noise suppression equipment be installed on the ship's ignition system, alternator or generator, and regulator. In severe cases shielded ignition wiring may have to be added.

Another source of RF noise can be the metal-to-metal contact between stays, fittings, lead-in cables, and other metal contacts and connections. Many times these possible problem spots can be located by visual inspection. Insulators should be used to prevent unwanted antenna lead-in movement. Metal fittings and connectors can be cleaned and/or bonded to prevent noise.

Installation Procedure

1. Select the transceiver operating location. It is important to select a position which will allow ease of operation, short grounding connections, and short antenna lead-in connections.
2. Remove the unit from the mounting yoke.
3. With screws or bolts, securely fasten the yoke in the desired mounting location (under panel, on console, bulkhead, or overhead). Unit performance is not affected by mounting location.
4. Connect the color-coded power leads to the power source. Take care to use RED for positive and BLACK for negative. The unit will only operate on a supply with negative ground. An optional power converter is available for operation on primary voltages from 24 to 32 VDC. If it is necessary to extend the power leads, use #12 gauge or heavier insulated copper wire. If polarity is reversed the unit will be inoperative. If this occurs, check the wiring polarity (RED to positive and BLACK to negative) and the protective fuse. The fuse is located in the transceiver power lead. A blown fuse should be replaced with a Type SFE 20, 20 amp fuse only.
5. Attach the microphone-mounting clip to the selected mounting surface.
6. Install the antenna in accordance with the manufacturer's instructions. If a single frequency 50-ohm resonant antenna is used, connect it directly to the antenna connector at the rear of the transceiver. If multiple single-band antennas are to be used, an antenna switching device will have to be installed. If a nonresonant antenna or a combination of a nonresonant and resonant antennas is used, the ETA-4 coupler will be required. For instructions on using the ETA-4 refer to the ETA-4 installation manual. The best method of rigging a nonresonant antenna is to utilize the backstay with appropriate insulators to isolate it from the vessel structure. Be sure to properly ground the ETA-4 if it is used.
7. Mount the transceiver in the mounting yoke and tighten the thumbscrews.
8. Tune the various antennas to resonance or perform the antenna coupler set-up procedure for nonresonant antennas.

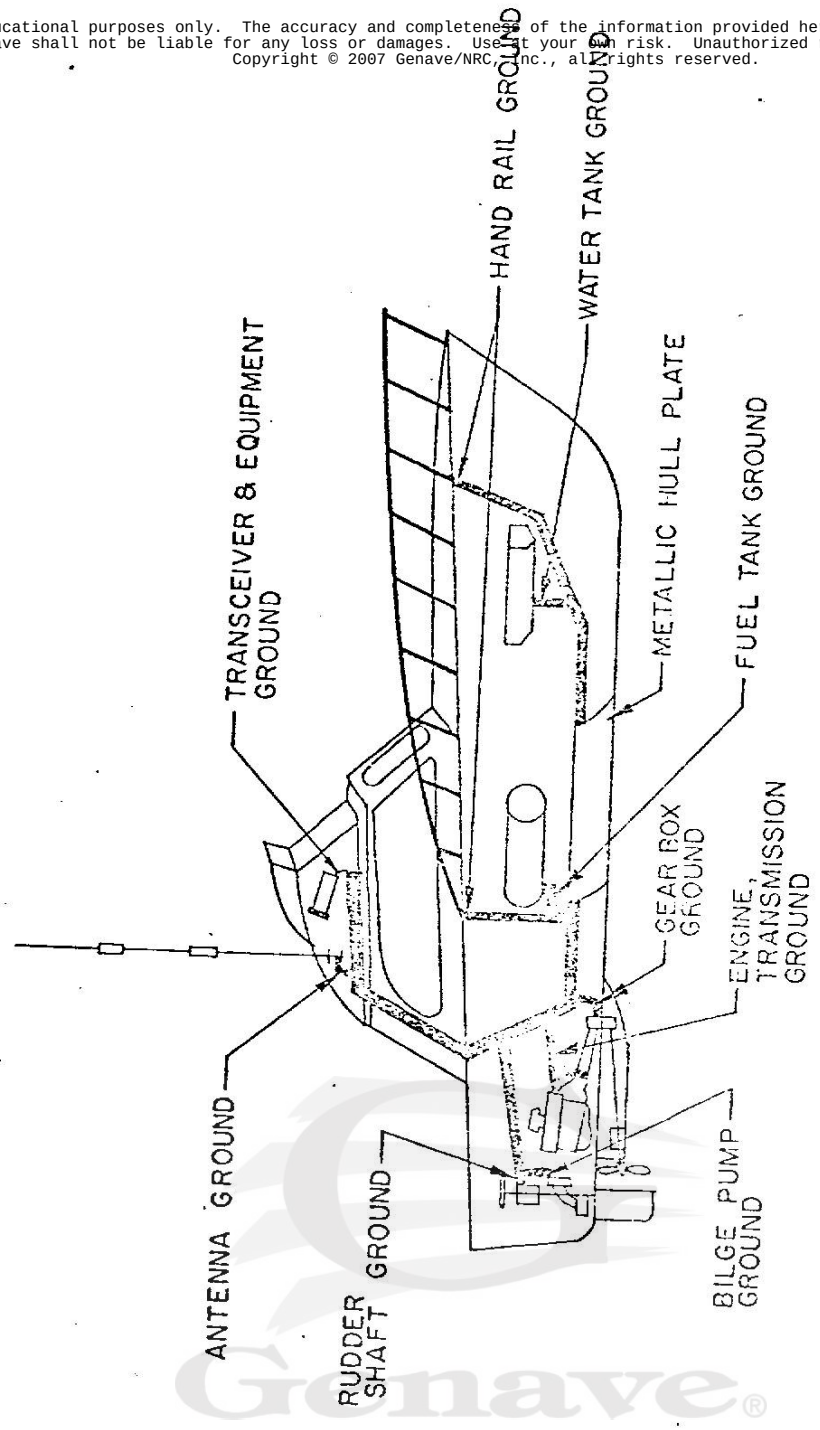


Figure 8

Motorboat Installation and Grounding

Installation Procedure

1. Select the transceiver operating location. It is important to select a position which will allow ease of operation, short grounding connections, and short antenna lead-in connections.
2. Remove the unit from the mounting yoke.
3. With screws or bolts, securely fasten the yoke in the desired mounting location (under panel, on console, bulkhead, or overhead). Unit performance is not affected by mounting location.
4. Connect the color-coded power leads to the power source. Take care to use RED for positive and BLACK for negative. The unit will only operate on a supply with negative ground. An optional power converter is available for operation on primary voltages from 24 to 32 VDC. If it is necessary to extend the power leads, use #12 gauge or heavier insulated copper wire. If polarity is reversed the unit will be inoperative. If this occurs, check the wiring polarity (RED to positive and BLACK to negative) and the protective fuse. The fuse is located in the transceiver power lead. A blown fuse should be replaced with a Type SFE 20, 20 amp fuse only.
5. Attach the microphone-mounting clip to the selected mounting surface.
6. Install the antenna in accordance with the manufacturer's instructions. If a single frequency 50-ohm resonant antenna is used, connect it directly to the antenna connector at the rear of the transceiver. If multiple single-band antennas are to be used, an antenna switching device will have to be installed. If a nonresonant antenna or a combination of a nonresonant and resonant antennas is used, the ETA-4 coupler will be required. For instructions on using the ETA-4 refer to the ETA-4 installation manual. The best method of rigging a nonresonant antenna is to utilize the backstay with appropriate insulators to isolate it from the vessel structure. Be sure to properly ground the ETA-4 if it is used.
7. Mount the transceiver in the mounting yoke and tighten the thumbscrews.
8. Tune the various antennas to resonance or perform the antenna coupler set-up procedure for nonresonant antennas.

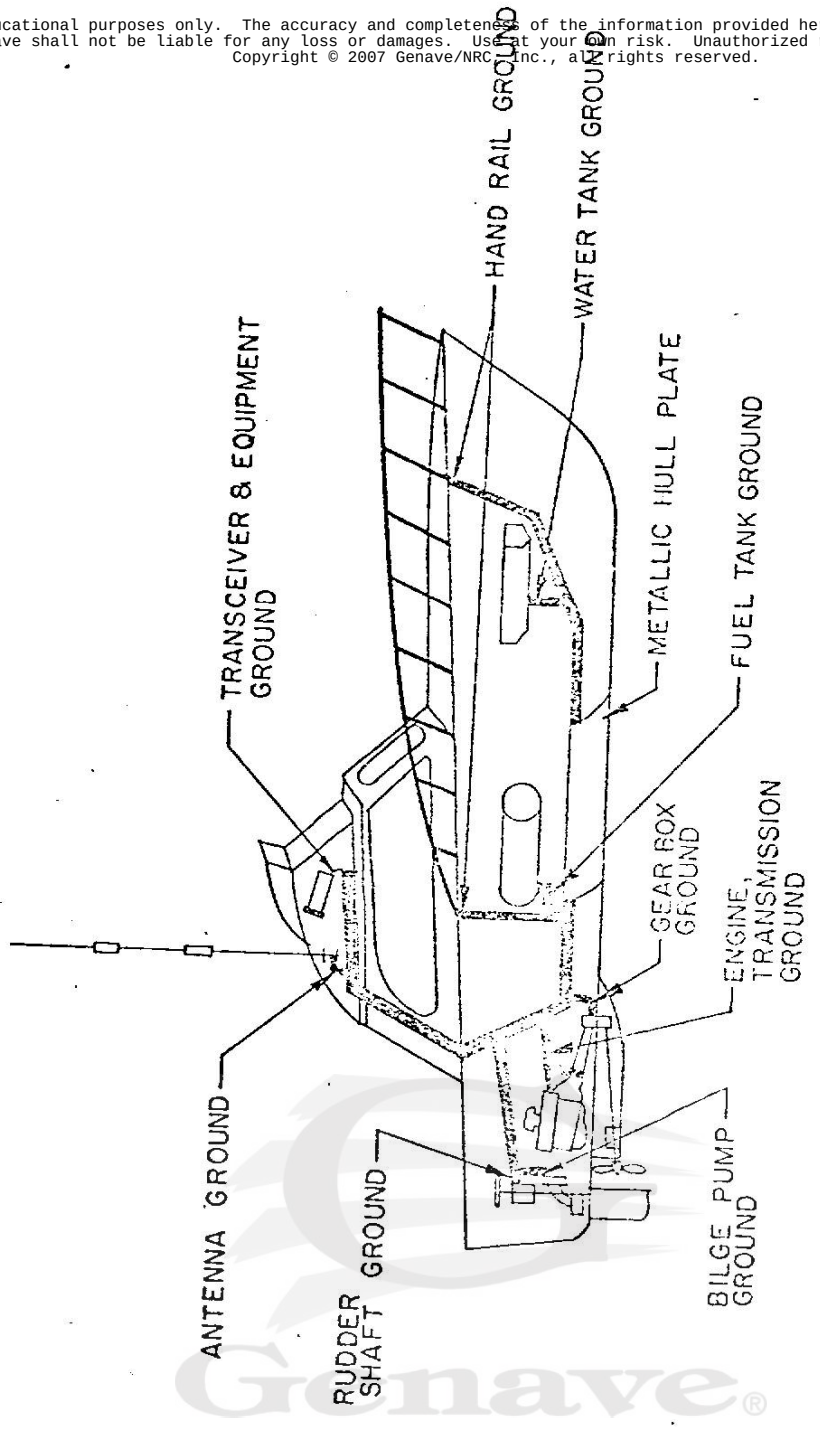


Figure 8

Motorboat Installation and Grounding

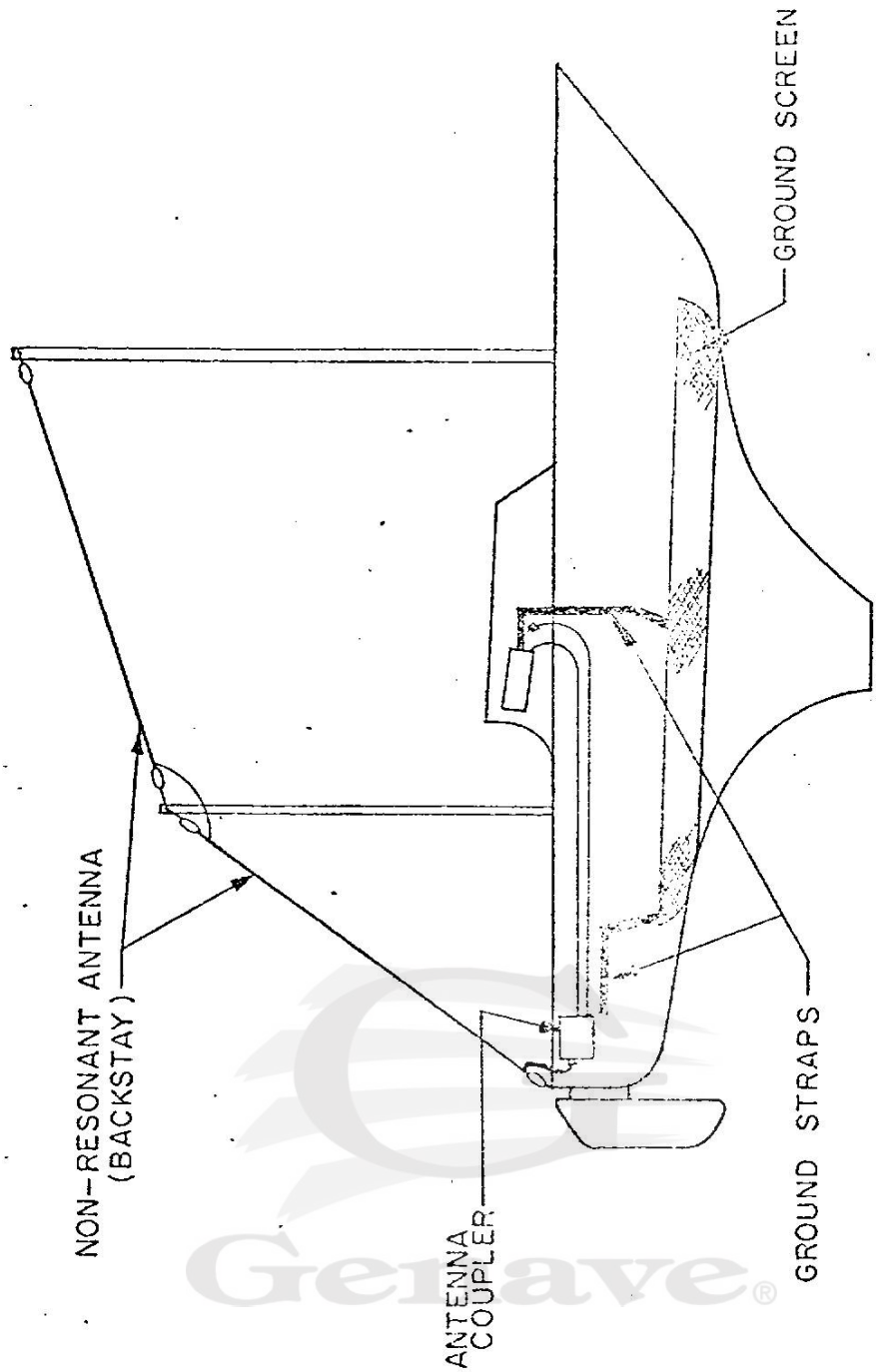


Figure 9

Sailboat Installation and Grounding

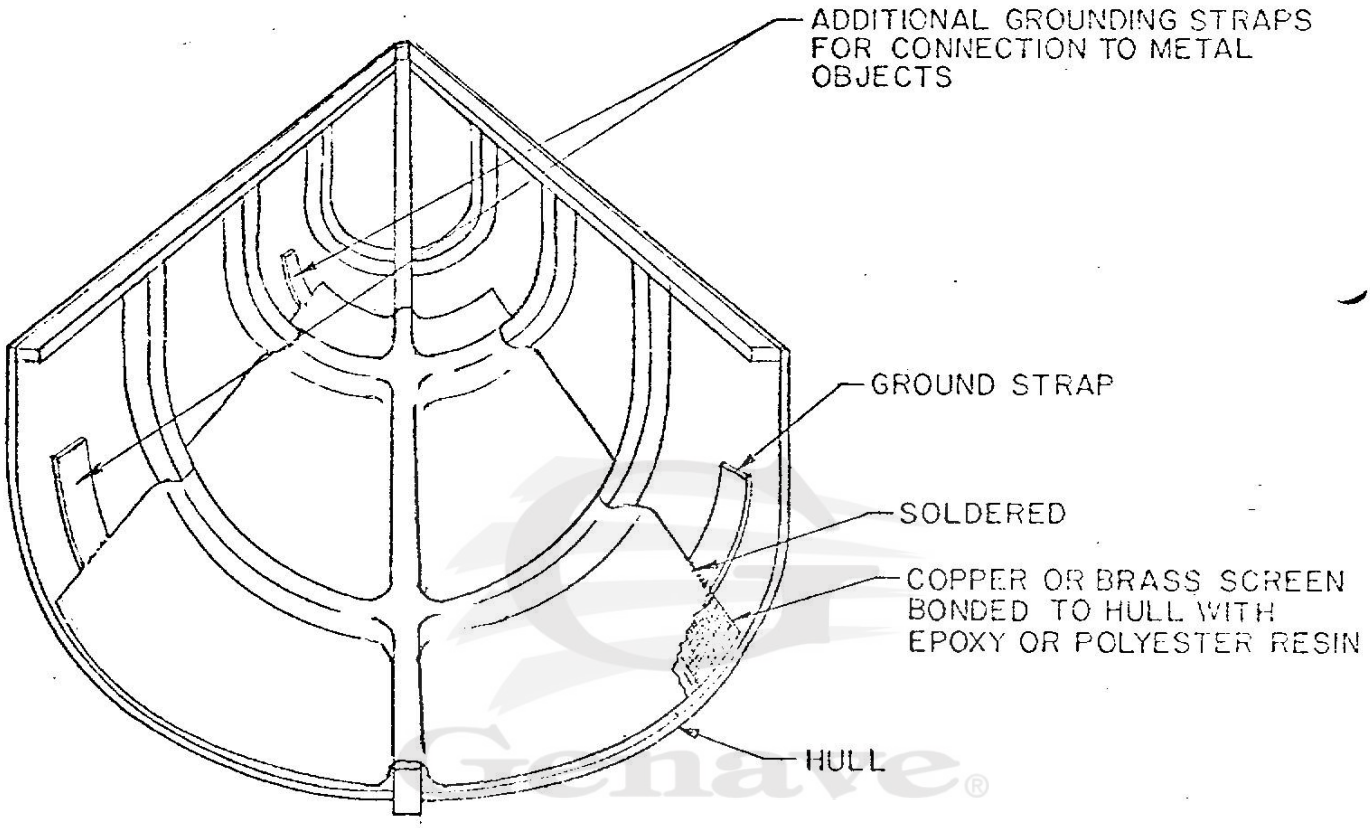


Figure 10

Internal Hull Grounding Screen

1. Select the mounting location for the transceiver. The primary consideration should be that of operator accessibility. Typically, the unit will be installed in an overhead or under-dash configuration.
2. Remove the unit from the mounting yoke.
3. With screws or bolts, securely fasten the yoke in the desired mounting location (under dash, on console, overhead, etc).
4. Connect the color-coded power leads to the power source. Take care to use RED for positive and BLACK for negative. The unit will only operate on a supply with negative ground. An optional power converter is available for operation on primary voltages from 24 to 32 VDC. If it is necessary to extend the power leads, use #12 gauge or heavier insulated copper wire. If polarity is reversed the unit will be inoperative. If this occurs, check the wiring polarity (RED to positive and BLACK to negative) and the protective fuse. The fuse is located in the transceiver power lead. A blown fuse should be replaced with a type SFE20, 20 amp fuse only.
5. Attach the microphone-mounting clip to the selected mounting surface.
6. Install the antenna in accordance with the manufacturer's instructions. There are two normal configurations with respect to antennas. For single-frequency installations, a single-frequency resonant antenna is normally used. This antenna represents a 50-ohm load, and is fed directly by the transceiver. In multiple-frequency installations a single-frequency antenna resonant at the highest operating frequency can be used, with the ETA-4 antenna coupler employed to tune the antenna to the lower operating frequencies.
7. Ground the antenna mounting and the antenna cable shield to the vehicle chassis in resonant antenna installations. Ground the antenna coupler to the vehicle chassis in multiple frequency installations and fabricate the antenna coupler switching cable (see Figure 14).
8. Connect a short ground strap between the ground terminal on the rear of the transceiver and the vehicle chassis.
9. Connect the antenna cable connector to the antenna jack on the rear of the transceiver.
10. Mount the transceiver in the mounting yoke and tighten the thumbscrews.
11. Tune the single frequency antenna to resonance or perform the antenna coupler set up procedure for multiple frequency installations.
12. To reduce noise interference, noise suppression devices should be installed in the vehicle. These devices are used to filter the alternator or generator output, suppress ignition noise from the spark plugs, and bypass noise generated by regulator contacts. In severe noise cases, shielded engine wiring may be required.

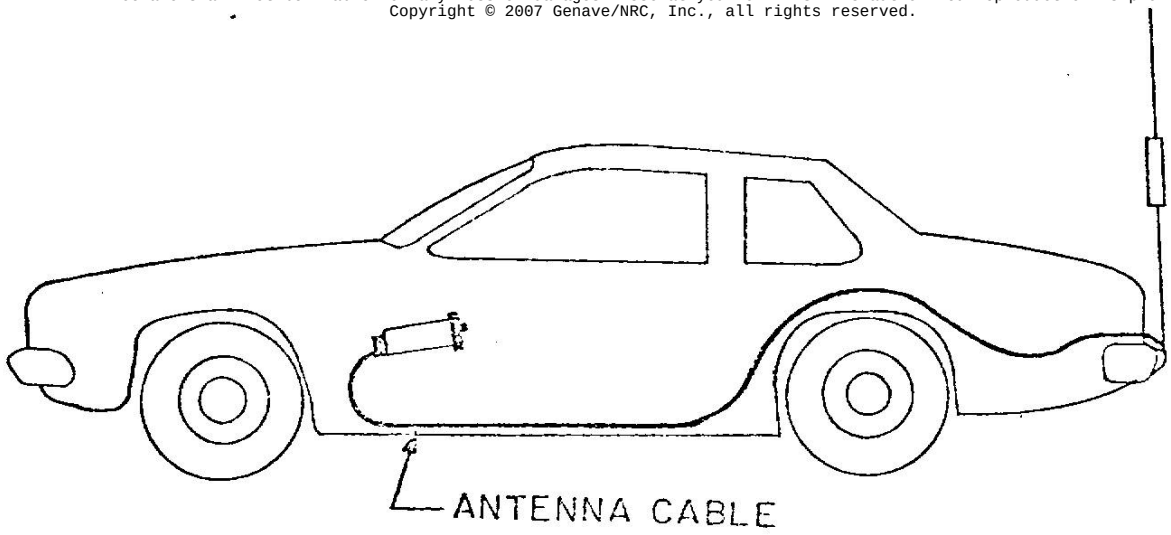


Figure 11

50 Ohm Resonant Antenna Installation

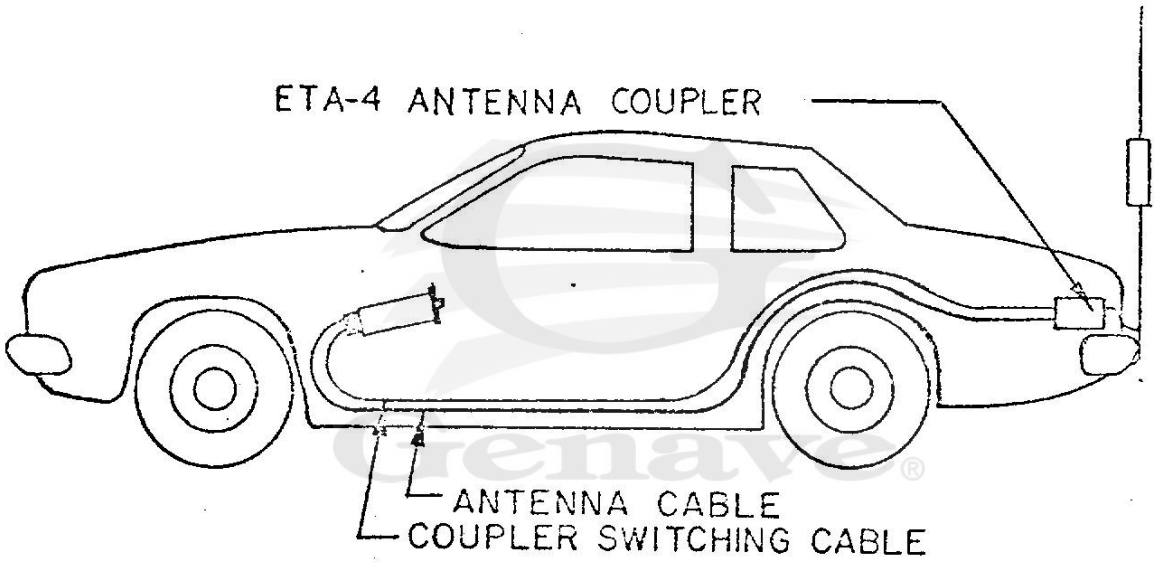
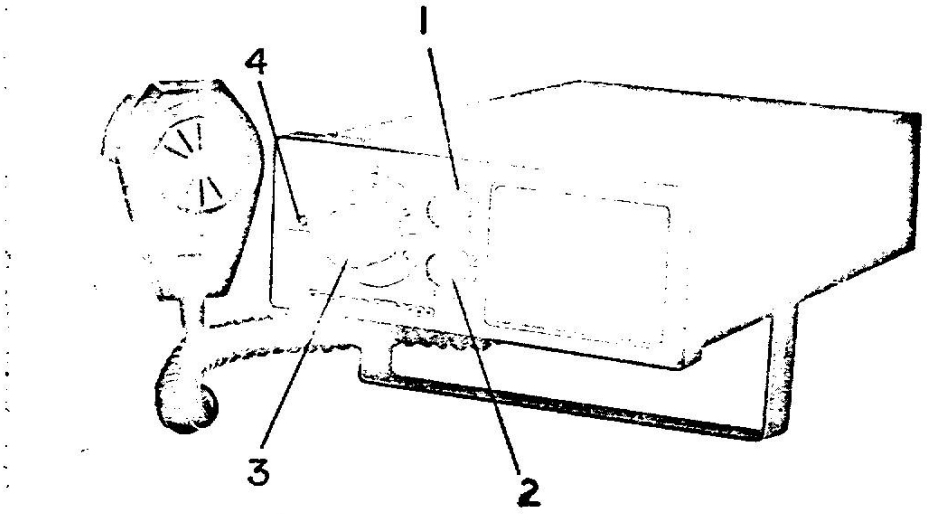


Figure 12

Multiple Frequency Installation

SECTION III
OPERATING MANUAL



3-1. OPERATING CONTROLS

For reliability and operating convenience, the GSB-1000 SSB transceiver employs a minimum of front-panel operating controls. These controls are as follows:

1. Volume Control/Power Switch
2. Clarify Control
3. Channel-Selector Switch
4. Transmit-Indicator Lamp

The push-to-talk button on the microphone also functions as an operating control. Unit operation is quite simple, as shown by the following operating instructions.

3-2. OPERATING INSTRUCTIONS

Noise encountered in the frequency range from 2 to 9 MHz is normally much more severe than that found in the VHF range and, particularly in the vicinity of a marine vessel, may impair communications capability severely. The 2, 4, 6, and 8 MHz marine-frequency bands are severely affected by atmospheric noise, which sometimes can blot out radio traffic. Atmospheric noise generated by electrical storms occurs most frequently during summer months, and tends to be most severe in the regions near the equator. This atmospheric noise is a natural phenomena, and should not be construed as a short-coming of the transceiver.

Operator expertise is most important; learn to know and anticipate what various frequencies do at different times of day and night in different seasons.

Remember, on channels employing single-sideband (A3J) emission, no carrier is being transmitted - and further, no signal is emitted except while speaking into the microphone; thus, you cannot acknowledge reception by merely "clicking" the microphone button.

1. Rotate VOLUME control (#1) clockwise until switch clicks; this applies operating power to the transceiver - no warmup time is required.

2. Rotate the channel-selector knob until the letter at the top of the knob corresponds to the desired operating channel. The transceiver can accomodate a maximum of ten operating channels. When the channel selector is switched, a number of circuits are selected: The desired transmit/receive crystals are selected; one wafer selects the mode of operation (A3A, A3H, or A3J); two more wafers select the proper transmitter low-pass filter; and one wafer provides programming for the Genave remote antenna coupler

   CAUTION: Do NOT rotate the channel-selector knob while the microphone button is depressed.

3. Rotate VOLUME control (#1) clockwise to adjust receiver volume to the desired level.

4. If the received signal has a distorted, hollow metallic quality, rotate CLARIFY control (#2) in either direction until a normal voice tone is restored. The CLARIFY control adjusts the receiver local oscillator to allow for receiving stations that may be slightly "off frequency."

5. To transmit, depress the microphone "transmit" pushbutton; then, hold microphone 3 to 6 inches from your mouth, and talk in a normal voice.

   CAUTION: Do NOT depress microphone pushbutton while turning channel-selector knob.

6. The Transmit-Indicator Lamp (#4) will blink bright red with each transmitted syllable. If it does not blink, the transceiver is NOT delivering power to the antenna.

7. Release the "transmit" pushbutton to listen.

3-3. LICENSING INFORMATION

Licensing requirements vary with the service for which this unit will be used, however, all services require that the station transmitter be licensed. Further, most services require the operators to hold either a valid commercial radio operator license or permit - the minimum class of radio operator authorization required for operation of each specific classification of station is set forth in the appropriate F.C.C. rule part.

The Genave GSB-1000 transceiver is approved for use in the services provided by F.C.C. Rules and Regulations Parts 81, 83, 87, 89, and 91.

The procedures for obtaining the necessary licenses are found in the Federal Communications Commission Rules and Regulations, and vary with the service and rule part under which the intended operation is authorized. The services and their corresponding F.C.C. rule part numbers, under which the GSB-1000 can be used, are as follows:

Stations on Land in the Maritime Services - F.C.C. Rules and Regulations, Volume IV, Part 81

Public Coast Stations
Marine Utility Stations
Fixed Stations Associated with the Maritime Mobile Service
Stations Operated in the Land Mobile Service for Maritime Purposes

Stations on Shipboard in the Maritime Services - F.C.C. Rules and Regulations, Volume IV, Part 83

Aviation Services - F.C.C. Rules and Regulations, Volume V, Part 87

Airborne Stations
Flight Test Stations
Civil Air Patrol Stations

Public Safety Radio Services - F.C.C. Rules and Regulations, Volume V, Part 89

Local Government Radio Service
Police Radio Service
Fire Radio Service
Highway Maintenance Radio Service
Forestry-Conservation Radio Service
Special Emergency Radio Service

Industrial Radio Services - F.C.C. Rules and Regulations, Volume V, Part 91

Power Radio Service
Petroleum Radio Service
Forest Products Radio Service
Motion Picture Radio Service
Relay Press Radio Service
Special Industrial Radio Service
Business Radio Service
Manufacturers Radio Service
Telephone Maintenance Radio Service

Any of the above volumes may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Answers to specific licensing questions can be answered by the Engineer in Charge at any Federal Communications Commission Field Engineering Office. The locations of these offices are given here for your convenience..

Alabama, Mobile 36602
439 U.S. Courthouse & Custom House

Alaska, Anchorage 99501
54 U.S. Post Office and Courthouse
Bldg., Box 644

California, Los Angeles 90012
U.S. Courthouse, RM. 1758
312 Norht Spring St.

California, San Diego 92101
Fox Theatre Bldg.
1245 - 7th Avenue

California, San Francisco 94111
323 - A Custom House
555 Battery Street

California, San Pedro 90731
300 So. Ferry St., Rm. 2525,
PO Box 3009, Terminal Island

Colorado, Denver 80202
504 New Custom House
19th between California & Stout Sts.

District of Columbia, Wash. 20554
Room 216
1919 M St., N.W.

Florida, Miami 33130
51 S.W. First Ave., RM. 919

Florida, Tampa 33602
809 Barnett Office Bldg.
1000 Ashley Drive

Georgia, Atlanta 30303
1602 Gas Light Tower
235 Peachtree Street, N.E.

Georgia, Savannah 31402
238 Post Office Bldg., PO Box 8004

Hawaii, Honolulu, 96808
502 Federal Bldg., PO Box 1021

Illinois, Chicago 60604
3935 New Federal Bldg.
230 So. Dearborn Street

Louisiana, New Orleans 70130
829 Federal Office Bldg.
600 South Street

Maryland, Baltimore 21201
819 Federal Bldg.
31 Hopkins Plaza

Massachusetts, Boston 02109
1600 Custom House

Michigan, Detroit 48226
1054 New Federal Building

Minnesota, St. Paul 55101
691 Federal Bldg & U.S. Courthouse
4th & Robert St.

Missouri, Kansas City 64106
1703 Federal Building
601 East 12th Street

New York, Buffalo 14203
328 Federal Building

New York, New York 10014
748 Federal Building
641 Washington Street

Oregon, Portland 97204
341 Multnomah Bldg.
319 S.W. Pine St.

Pennsylvania, Philadelphia 19106
1005 U.S. Custom House

Puerto Rico, San Juan 00903
322-323 Federal Bldg, PO Box 2987

Texas, Beaumont 77701
323 Federal Bldg.
300 Willow Street

Texas, Dallas 75202
Federal Courthouse & Office Bldg.
1100 Commerce St., Room 13E7

Texas, Houston 77002
New Federal Office Bldg.
515 Rusk Avenue Room 5636

Virginia, Norfolk 23502
Military Circle
870 No. Military Highway

Washington, Seattle 98104
8012 Federal Office Bldg.
1st Avenue and Marion

The following technical information is intended to aid GSB-1000 transceiver users in completing the application for radio-station authorization. Only technical data pertaining to the transceiver are shown below; all other station particulars must be furnished by the licensee.

For additional information on filling out the appropriate application forms, consult the F.C.C. instruction sheet provided for that form. Note that some forms may be completed either by printing in ink, or by typing; whereas, typing is mandatory for certain F.C.C. application forms. To determine what form is required, contact the nearest F.C.C. Field Engineering Office as listed previously - they will also supply the appropriate forms.

F.C.C. Type Acceptance Data for the SSB Transceiver

Transmitter Output Power (Watts):	50
Type of Unit:	Transceiver
Emission Designator:	2.8A3J
	2.8A3A
	2.8A3H
Type Acceptance Grantee:	General Aviation Electronics, Inc.
Type Accepted:	Yes
Type Acceptance/Model Number:	T-7092100
Frequency Tolerance:	20 Hz
Frequency Range:	2 MHz to 9 MHz

SECTION IV
MAINTENANCE MANUAL

4-1. INTRODUCTION

The GSB-1000 HF transceiver is a 10-channel radio. Basically, the unit consists of the receiver/exciter circuits and the transmitter power amplifier. One channel-selector knob switches the transmit/receive circuits as follows: One transmit and one receive crystal are selected; the mode of operation (A3A, A3H, or A3J) is selected; the proper transmitter low-pass filter is selected; and the programming is provided for a remote antenna coupler, if used.

All transmit crystals are mounted in a temperature-controlled oven, which insures good transmitter-frequency stability.

4-2. THEORY OF OPERATION - RECEIVER

The receiver consists of a single conversion, high-side injection unit, employing a crystal filter for selectivity. The input signal from the antenna passes through a 2 to 9 MHz bandpass filter, thereby providing good rejection of any signals outside the desired band of operation. The filter output is transformer coupled into double-balanced mixer IC101; the other mixer input is the output from the receiver local oscillator, which consists of FET oscillator Q105 and emitter-follower buffer Q106. Diode CR104 is a voltage-variable capacitor which pulls the crystal frequency when R150, the CLARIFY control, is varied. This allows for receiving stations that may be slightly "off frequency." See Block Diagram, Figure 4-1.

The output of mixer IC101 is tuned to 10.7 MHz; then, the 10.7 MHz signal is fed through emitter-follower Q101 to match the low impedance of crystal filter, FL101. The output from FL101 is amplified by IC102, which provides most of the 10.7 MHz IF-amplifier gain, and is the AGC element for the receiver. The output of IC102 is tuned and transformer coupled to Q102 to provide the remaining gain needed in the IF amplifier.

The output of Q102 is transformer coupled to AGC detector CR106 and, to product detector IC103. The AGC detector network contains C131 which, when operated with Q103, provides a fast attack/slow release AGC signal. AGC control R121 allows precise setting of the AGC voltage on IC102 for optimum performance.

Product detector IC103 combines the 10.7 MHz SSB signal from the IF amplifier with 10.7 MHz signal from the carrier oscillator. The carrier oscillator consists of 10.7 MHz crystal Y111, FET Q104, and buffer amplifier, Q107. The 10.7 MHz crystal is located in the oven to maintain proper frequency.

The resultant audio output from IC103 is coupled to IC104, and amplified to provide up to 5 watts of audio (4 watts minimum @ 15% distortion).

4-3. THEORY OF OPERATION - TRANSMITTER

In the transmit mode, audio from the microphone is amplified by Q204; Q205 is an emitter follower to drive balanced-modulator IC201. The balanced modulator is

used to generate a double-sideband signal by modulating the 10.7 MHz carrier oscillator with the microphone audio. The resultant output is a double-sideband signal, with the carrier typically reduced 25 dB.

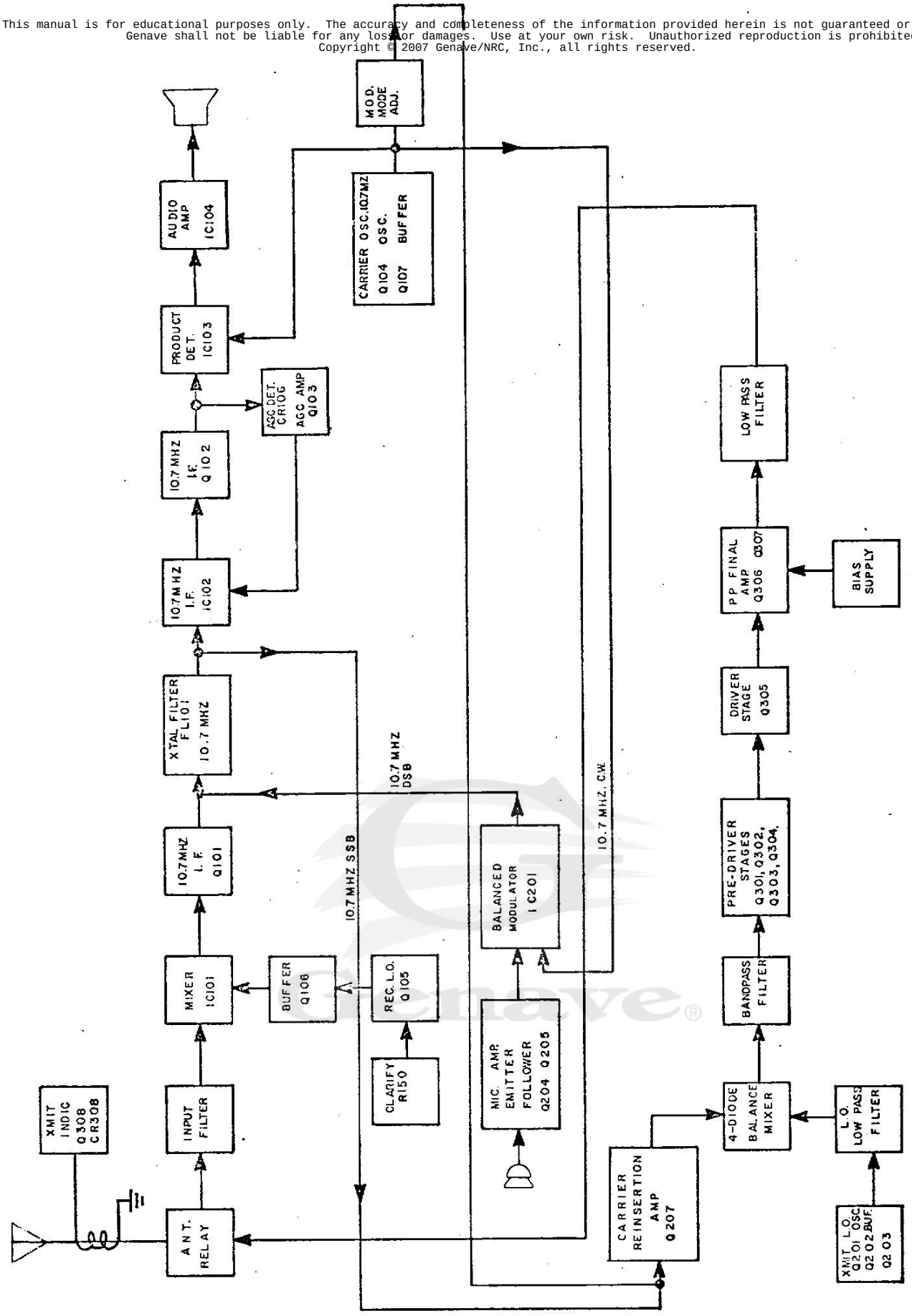
The output from balanced modulator IC201 is fed through crystal filter FL101. The crystal filter eliminates the undesired sideband, and also attenuates the carrier significantly. The output is now the desired single-sideband signal; thus, all that remains is converting from 10.7 MHz to the desired 2 to 9 MHz band. The output from the crystal filter is amplified by Q207 - this stage also provides a means of reinserting a carrier for the AME and reduced-carrier modes. Variable resistors, R166 through R170, adjust the amount of 10.7 MHz carrier which is injected into the base of Q207. The output of Q207 is coupled to a 4-diode, double-balanced mixer. The "transmit" local oscillator output is also coupled into the mixer, and the resultant output after filtering is the transmit signal.

The "transmit" local oscillator consists of Q201, Q202, and Q203. Q201 is an FET oscillator, Q202 acts as a buffer amplifier, while emitter-follower Q203 is used to drive the low-impedance, low-pass filter. The output of the low-pass filter is coupled into the transmit balanced mixer. All crystals in the transmit local oscillator are mounted in a temperature-controlled oven. Thermistor R233 is mounted on the 10.7 MHz crystal, and controls oven temperature by changing current drawn by Q206 through heater resistors R234, R235, and R236.

The output of the "transmit" balanced mixer is coupled to a double-tuned bandpass filter to insure that drive signal is free of any undesired mixer products. The double-tuned filter is tuned with two voltage-variable capacitor diodes, CR219 and CR220. The filter is tuned to the frequency selected by the channel selector with one of ten potentiometers, R237 through R246. The filter normally tunes the 2, 4, and 6 MHz bands, but must have Q208 and Q209 turned "on" for the 8 MHz band. The radio, as presently wired, has the upper four channel positions assigned to the 8 MHz band; however, this can be changed as desired. After the signal passes through this filter, the signal may be amplified.

Transistors Q301, Q302, Q303, and Q304 provide sufficient output to drive the driver stage Q305. The output of Q305 drives the push-pull power-amplifier stage, Q306 and Q307. The output power is coupled through T304 to the low-pass filters, and then to the antenna coupler. A resistive divider, R315 and R316, taps off a sample of the output signal. This signal is rectified by CR303 and CR304, and the filtered DC is used to vary the conductance of Q207 in such manner as to maintain a 50-watt PEP output from the linear amplifier.

The output stage transistors are biased so as to draw approximately 50 ma per transistor. A variable-bias power supply is incorporated to provide this capability. An integrated-circuit voltage regulator IC301 provides an output voltage range of approximately 0.5 to 0.9 V as R322 is varied. Diode CR306 serves as a reference element for the regulator, and also acts as thermal compensation for the power-output devices. As the output devices heat up, the base to emitter resistance drops, causing them to draw more current and approach thermal runaway; but if the bias is lowered to counteract the increasing collector current, the devices will remain in a linear operating region and thus not suffer thermal runaway. Diode CR306 and the IC regulator are designed to maintain proper bias and thermal equalibrium. Transistor Q308 is used to drive the LED "transmitter-indicator" on the front panel.



Model: GSB-1000

Figure 4-1. Block Diagram

4-4. TRANSCEIVER PROGRAMMING

This Section provides information required when adding or changing frequencies, or when changing operating modes. To change transceiver programming, follow steps listed below:

4-4-1. Installing Transmit and/or Receive Crystals

1. Remove outer cover from instrument by removing two Thumbscrews from sides of unit; then, slide cover off rear of chassis.

2. Remove transmitter module from unit chassis by disconnecting J302, P301, P304, and P305 from left side of module, and removing 15-pin J303 from front of transmitter module. Remove three screws securing module to chassis - two in right side, one in left side. Lift module out of chassis.

3. Remove transmitter crystal-oven cover by removing two 4-40 screws.

4. Insert transmitter crystal(s) into appropriate socket(s). Crystal locations are shown on oven-cover label.

5. Replace cover on crystal oven.

6. Insert receiver crystal(s) into appropriate socket(s). Crystal sockets are located on main PC board, approximately in line with the microphone connector - socket "A" is nearest the chassis left sidewall, while socket "J" is adjacent to the "Clarify" control. Refer to Figure 4-4.

7. Adjust "receive" crystal(s) "on Frequency" (net the crystals) by performing steps in Section 4-5-2, Netting Receiver Oscillator.

8. Adjust (net) "transmit" oscillator crystal(s) by referring to Section 4-6-1, Netting Transmitter Oscillator.

9. Program transmitter exciter filter by following steps listed in Section 4-4-2.

10. Program low-pass filters by referring to Section 4-4-3.

11. Program "mode of operation" by following steps in Section 4-4-4.

4-4-2. Programming Transmitter Exciter Filter

NOTE: Depending upon the frequencies initially ordered with the transceiver, the exciter filter may be pre-programmed at the factory for channels A, B, C, D, E, and F to operate on low frequencies (2.0 to 6.7 MHz), and channels G, H, I, and J to operate on high frequencies (6.7 to 9.0 MHz). This programming can be easily changed as desired. As shown on page 2 of the Power Amp. schematic, CR217, CR216, CR215, and CR214 are installed to program channels A, B, C, and D, respectively, for operation on frequencies between 6.7 and 9.0 MHz.

1. With transmitter module removed from unit chassis, refer to Figure 4-2 for exciter-filter "programming diode" locations.

2. Determine operating frequency of each channel installed in unit, starting with channel "A." Operating frequency is equal to the "transmit" crystal frequency minus 10.7 MHz.

3. For each channel having an operating frequency below 6.0 MHz, ascertain that a programming diode is NOT installed in that channel. See Figures 4-2 and 4-3.

4. For each channel having an operating frequency above 6.0 MHz, install an FD1936, or equivalent, programming diode in the location shown in Figure 4-2. Position diode(s) so that cathode(s) are connected to the common bus, and anode(s) connect to the appropriate potentiometer.

   NOTE: A unit can be programmed for low-frequency operation on all channels by unsoldering and removing any programming diodes installed (CR214 through CR217 and CR225 through CR230). A unit can also be programmed for high-frequency operation (6.0 to 9.0 MHz) on all channels by installing all ten programming diodes, CR214 through CR217 and CR225 through CR230.

5. When the exciter filter is fully programmed, replace transmitter module into transceiver chassis. Reconnect J302, P301, P304, P305, and J303.

4-4-3. Programming Low-Pass Filters

1. Locate low-pass filters at left-rear corner of unit between switch wafers SW201E and SW201F (see Figures 4-4 and 4-5).

   NOTE: Connections are made to the filters by soldering short jumper wires on the bottom of the main PC board. The input sides of the filters are labelled "LP1," "LP2," "LP3," and "LP4". The output sides of the filters are labelled "1," "2," "3," and "4."

2. Using the operating frequency of each channel as determined in step 2 of Section 4-4-2 above, refer to Table 1 for correct low-pass Filter to be used for each channel.

TABLE 4-1

Low-Pass Filter	Freq. Range MHz
LP1	2.0 to 3.0
LP2	3.0 to 4.0
LP3	4.0 to 6.0
LP4	6.0 to 9.0

3. Connect a short piece of #22 or #26 jumper wire from channel A terminal of SW201E to input of appropriate low-pass filter.

4. Next, connect a piece of #22 or #26 jumper wire from channel A terminal of SW201F to output of low-pass filter being used.

   EXAMPLE: Assume that channel A is being setup to operate on 5310 kHz. Table 1 indicates that LP3 is the proper low-pass filter to use at this frequency; therefore, a jumper must be installed between SW201E channel A terminal and main board terminal LP3, and another jumper must be installed between SW201F channel A terminal and main board filter terminal 3.

5. Rotate channel-selector switch to the next channel to be programmed, and follow steps 2 through 4 above.

   NOTE: If several adjacent channels require the same low-pass filter, appropriate pins at SW201E and at SW201F may be connected by a short piece of bare wire soldered to each of the pins.

4-4-4. A3A (Reduced Carrier) and A3H (AM Equivalent) Programming

NOTE: Channels C, D, E, F, and G are preprogrammed for A3J (SSB) operation, and cannot be setup for A3A or A3H modes; whereas, channels A, B, H, I, and J can be setup for A3A, A3H, or A3J.

1. Determine desired mode for each channel being programmed - keep in mind that channels C through G can only be used for A3J (SSB) operation.

2. For channels A, B, H, I, or J, if A3J mode is desired, run a jumper wire on top side of main PC board from mode Programming Terminal #1 to Programming Terminal #2 for appropriate channel. See Figure 4-4. If mode A3A or A3H is desired, run a jumper wire on top side of main PC board from Mode Programming Terminal #1 to Programming Terminal #3 for appropriate channel(s). Program each channel as necessary.

3. Connect transceiver to a regulated 13.75-volt DC supply. Connect one end of a co-axial TEE connector to the transceiver antenna receptacle with a short length of co-ax cable. Connect other end of TEE to an RF Probe and VTVM, such as an HP-410B; then, connect a 50-ohm, 50-watt load to the remaining connector on the TEE.

4. Rotate channel selector to a channel using A3A or A3H mode.

5. Turn unit ON, and key transmitter. Observe RF voltmeter across 50-ohm dummy load — and adjust appropriate carrier-level potentiometer (A - R166, B - R167, H - R168, I - R169, J - R170) for correct voltmeter reading:

   Mode A3A 7.9 VDC $^{+2.1\ V}_{-1.65\ V}$

   Mode A3H 25 VDC

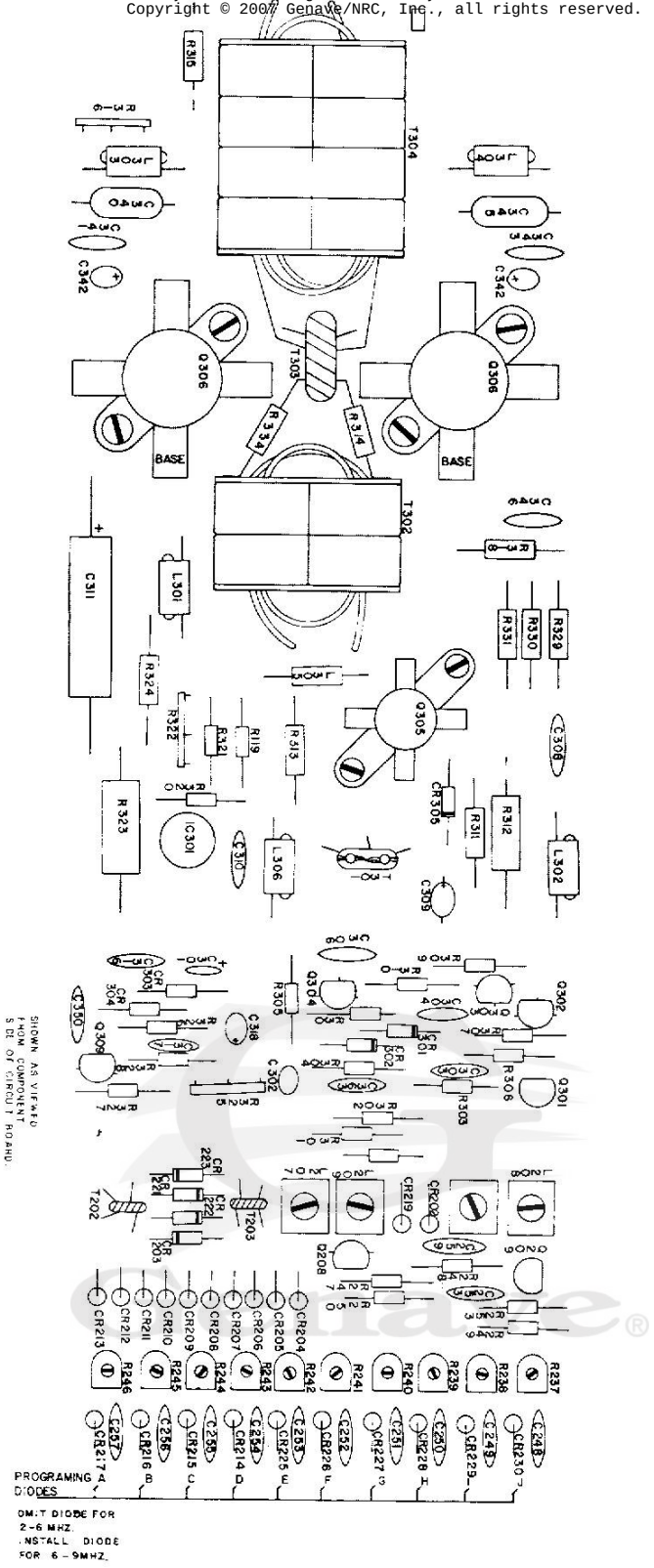


Figure 4-2. Transmitter Component Layout
(Top View)

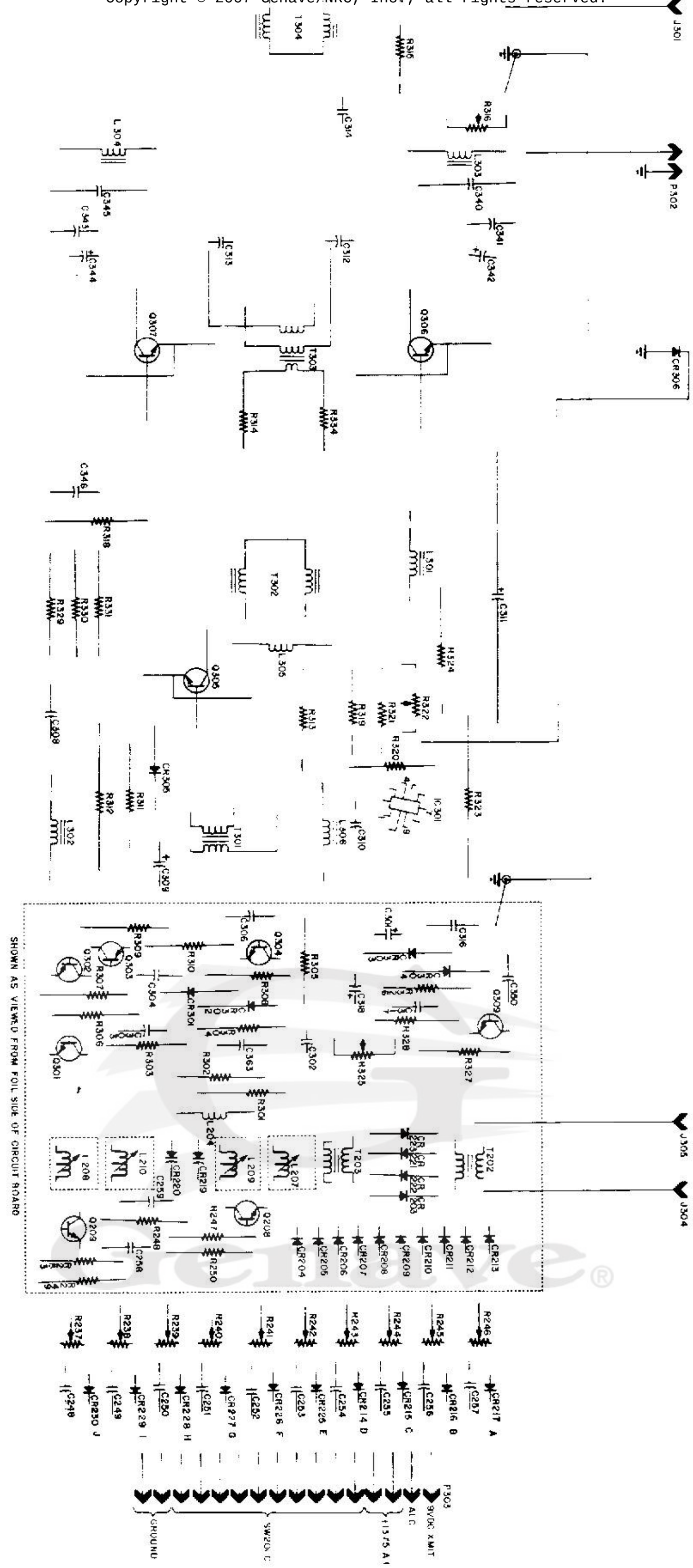
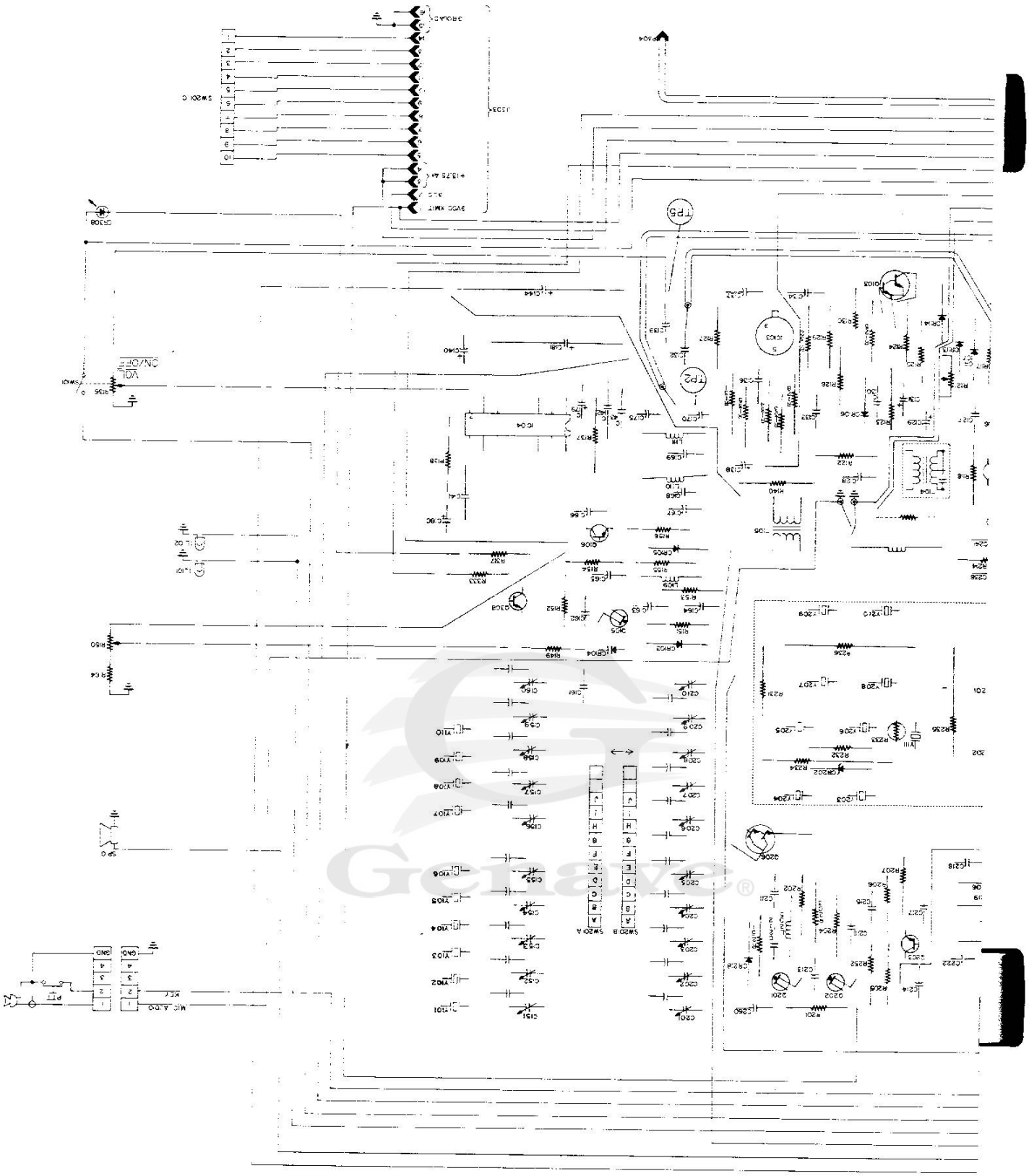


Figure 4-3. Transmitter Parts/Track Map
(Bottom View)



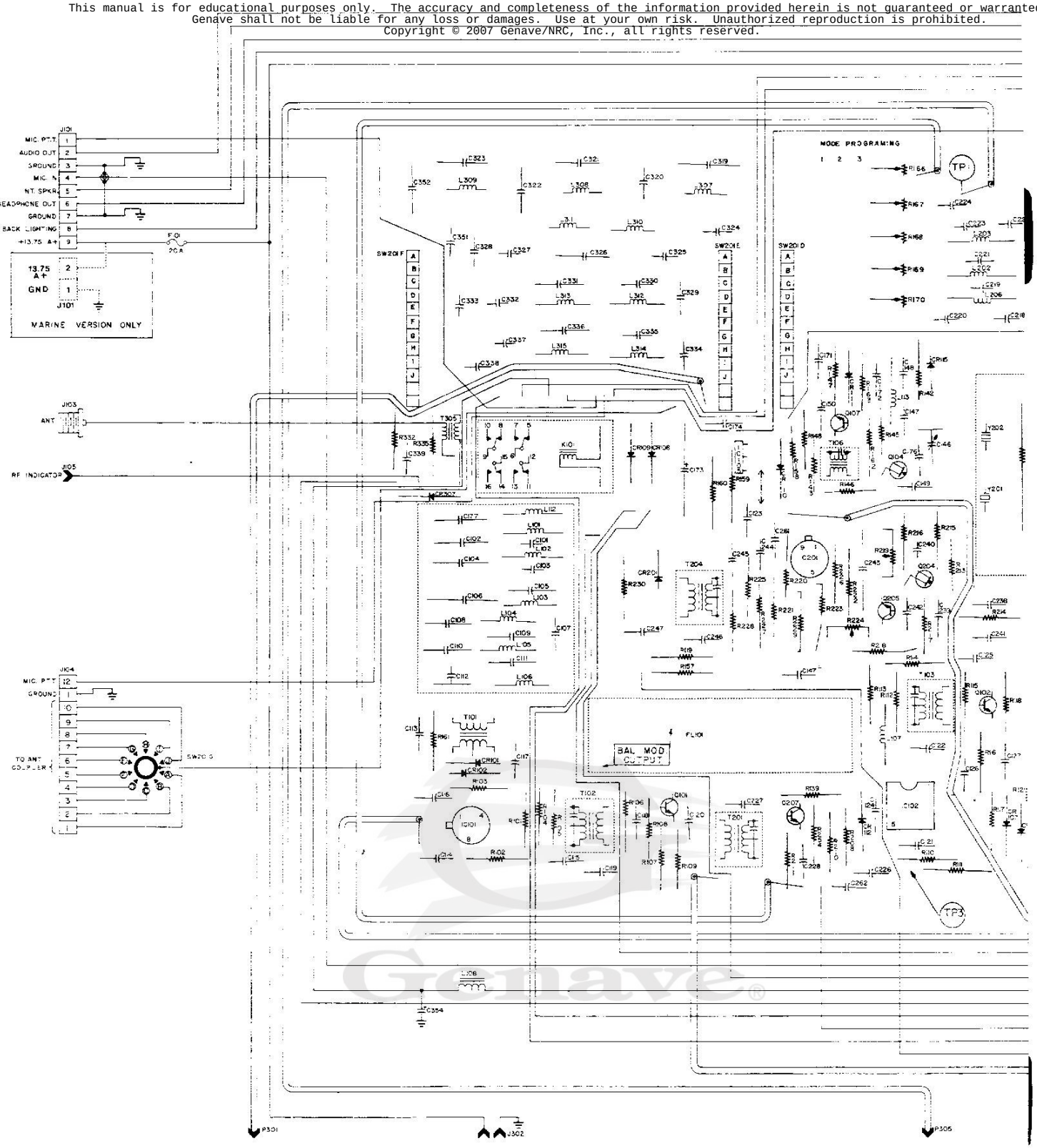


Figure 4-5. Main Board Parts/Track Map
(Bottom View)

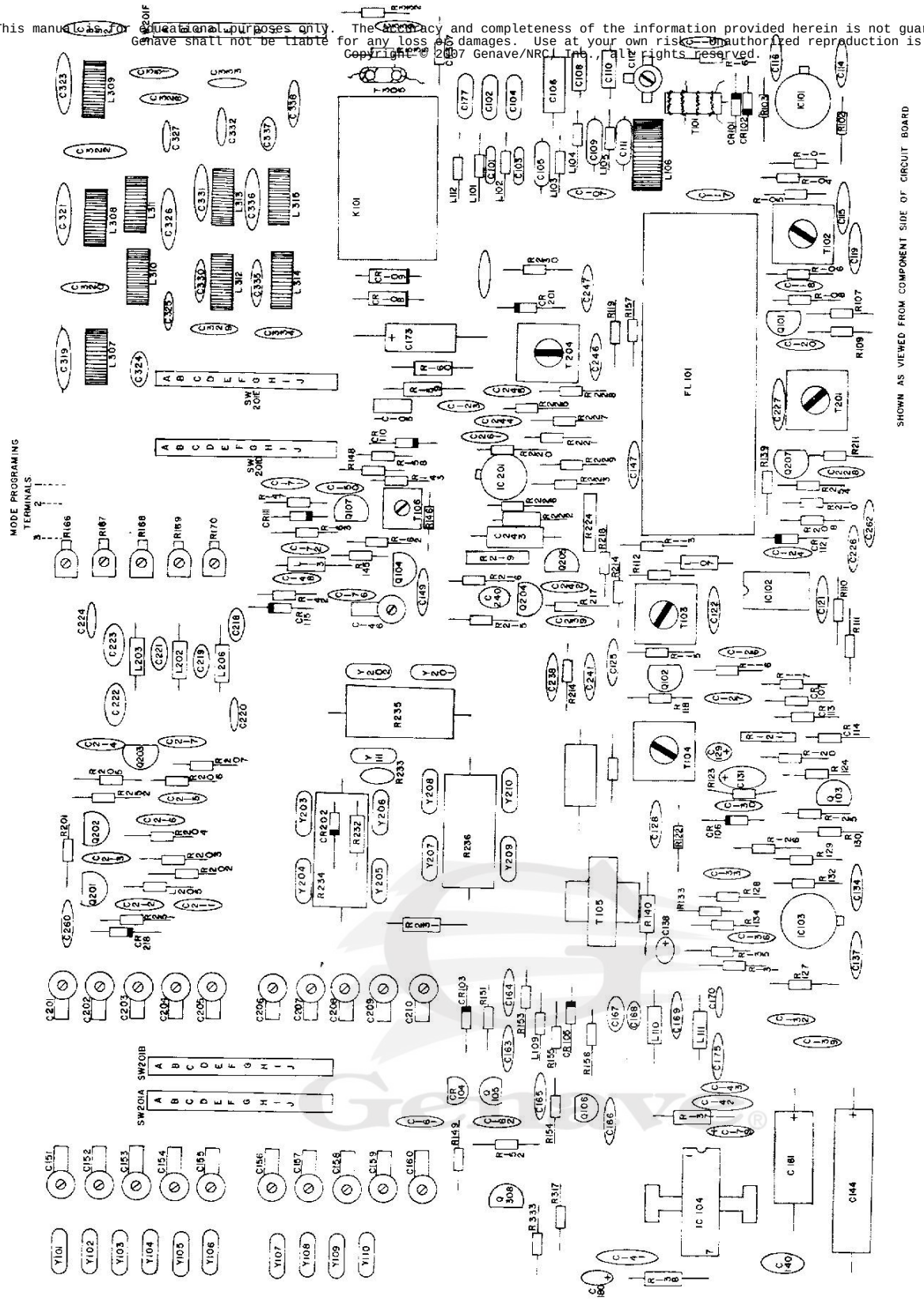


Figure 4-4. Main Board Component Layout
(Top View)

4-5. RECEIVER ALIGNMENT

4-5-1. Netting 10.7 MHz Injection Oscillator

1. Connect transceiver to a regulated 13.75-volt DC supply, and connect a frequency counter to TP5 on bottom of transceiver main PC board (see Figure 4-5).

   NOTE: Before adjusting the oscillator to frequency, permit unit to warm up for at least ten minutes.

2. Adjust trimmer C146 (Figure 4-4) to produce a frequency counter reading of 10.7000 MHz.

4-5-2. Netting Receiver Local Oscillator

1. With transceiver still connected to the 13.75-volt supply, connect frequency counter to output of local-oscillator filter (TP2) on bottom side of main PC board (Figure 4-5).

   NOTE: Before adjusting receiver oscillator to frequency, allow unit to warm up for at least ten minutes.

2. Rotate Clarify control fully clockwise.

3. Set channel-selector switch to channel to be adjusted. Note that crystal for channel A is nearest the chassis left sidewall, while crystal J is adjacent to the "Clarify" control (Figure 4-4).

4. The proper L.O. frequency is equal to the channel frequency plus 10.7 MHz.

   EXAMPLE: 2.182 MHz + 10.7 MHz = 12.882000 MHz

   With Clarifier fully clockwise, adjust appropriate crystal trimmer until frequency counter indicates at least 100 Hz BELOW the normal L.O. frequency.

5. Turn Clarify control fully counterclockwise, and check that L.O. frequency is at least 100 Hz ABOVE the normal L.O. frequency. It may be necessary to readjust the appropriate trimmer in order to satisfy both ends of the clarifier range.

   NOTE: It may be necessary to add a capacitor across netting trimmer if frequency is too high with trimmer adjusted to maximum capacitance. Start with a 15 pF NPO disc capacitor.

6. Repeat steps 2 through 5 for remaining channels.

4-5-3. Aligning Receiver

1. If not already removed, remove transmitter module as detailed in step 2 of Section 4-4-1.

2. Connect unit to a 13.75-volt supply, and connect a DC VTVM to TP3 on bottom side of main PC board (see Figure 4-5). Turn unit ON.

3. Locate AGC potentiometer R121 (Figure 4-4); adjust R121 for 4.00 VDC ±0.1 V.

4. Set channel selector to channel A, or to first channel to be setup.

5. Connect HF signal generator RF cable to transceiver antenna connector J103. Set signal generator to channel frequency + 1 kHz. For example, 2182 kHz + 1 kHz = 2183 kHz (Sig. Gen. freq.)

6. Adjust volume control to mid-range, and increase signal generator output until tone is heard in speaker.

7. With DC VTVM still connected to AGC test point TP3, adjust T102, T103, and T104 for maximum AGC voltage. See Figure 4-4 for transformer location. Reduce generator output while aligning receiver to avoid overloading receiver circuits.

8. Continue to adjust T102, T103, and T104 until no further increase is obtained.

   NOTE: T102, T103, and T104 are broad adjustments, but they affect receiver sensitivity measurably if not properly aligned.

9. Remove antenna-input signal from J103, and if necessary, adjust R121 for 4.00 VDC $\pm$0.1 V at TP3.

10. Connect AC VTVM across speaker leads, adjust signal generator to channel frequency plus 1 kHz, then adjust carrier-oscillator transformer T106 for maximum reading on the AC VTVM.

11. Check sensitivity to verify receiver alignment (0.5 µV for 10 dB S + N/N).

4-5-4. Setting 10.7 MHz Trap

1. With power supply, DC VTVM, AC VTVM, and Signal Generator connected to transceiver as in Section 4-5-3 above, set signal generator to 10.699 MHz.

2. Set signal generator attenuator for an output of 500 µV; then adjust transceiver volume control for a 0 dB reading on AC VTVM.

3. Adjust C112 (see Figure 4-4) for a null either in AC VTVM reading (audio), or in DC VTVM reading (AGC).

4-6. TRANSMITTER ALIGNMENT

4-6-1. Netting Transmitter Oscillator

1. Connect transceiver to a regulated 13.75-volt DC supply, and connect a microphone to unit.

2. Connect frequency counter to transmitter oscillator output (TP1). Refer to Figure 4-5.

3. Rotate channel-selector switch to channel A, or first channel to be adjusted.

4. Place transmitter module in position in the transceiver chassis, but do NOT connect cables (the presence or absence of transmitter affects oscillator frequency).

   NOTE: Turn transceiver ON, and permit unit to warm up for at least ten minutes before adjusting oscillator to frequency.

5. Refer to Figure 4-4 for location of transmitter oscillator trimmer capacitors. Channel A trimmer is next to chassis left sidewall, etc.

6. Key transmitter, and adjust appropriate trimmer capacitor for channel frequency +10.7 MHz within ±10 Hz.

   EXAMPLE: 2.182 + 10.7 = 12.882000 MHz ±10 Hz.

   NOTE: If frequency is too high with trimmer capacitor adjusted to maximum capacitance (adjustment screw turned all the way down), it may be necessary to add a capacitor across the trimmer. A suggested value is a 15 pF NPO ceramic disc.

7. Repeat steps 5 and 6 for remaining channels as necessary.

4-6-2. Set Carrier Balance and Align Balanced Modulator

1. Remove frequency counter from TP1. Remove microphone and install a SPST switch between Pin 11 of P104 and ground to key transmitter.

2. Again remove transmitter module from unit chassis, and connect an oscilloscope to output of Bal. Modulator (See Figure 4-5).

3. Set scope vertical sensitivity for 10 mV/cm, or equivalent.

4. Key transmitter, and rotate "Carrier Balance" potentiometer R224 (Figure 4-4) until an output indication is obtained on oscilloscope.

5. Adjust balanced modulator transformer T204 (Figure 4-4) for maximum output indication on oscilloscope.

6. With transmitter keyed, rotate potentiometer R224 for minimum output indication on oscilloscope.

4-6-3. Aligning Transmitter I.F.

1. Remove oscilloscope from output of balanced modulator. Connect microphone, or mic. substitute, to unit.

2. Lay transmitter module along right side of unit chassis, so that J303 can be connected to transmitter plug P303. P303 is the 15-pin plug. Do NOT connect any other connectors to transmitter at this time.

3. Connect DC VOM to blue wire (Pin 14) of P303 (ALC voltage).

4. Grasp edges of exciter shield cover, and carefully lift cover up and away from exciter. Locate "ALC Adjust" potentiometer R325 (refer to shield cover label and/or Figure 4-2).

   CAUTION: L207 through L210 are factory adjusted - do NOT change tuning adjustments.

5. Key transmitter, and adjust R325 for 1.75 V ±0.1 V on DC VOM.

6. Connect oscilloscope to P304 (10.7 MHz Input to transmitter module) by using a female phono connector. Refer to shield cover label.

7. Set scope vertical sensitivity to 0.2 V/cm.

8. Key transmitter, and whistle into microphone or use audio substitute; adjust T201 (Figure 4-4) for maximum output indication on oscilloscope.

9. Replace cover on exciter shield.

4-6-4. Power Amp and Exciter Stage Alignment

NOTE: Before the exciter and power amplifier stages can be aligned, the low-pass filters and exciter filter must be programmed as detailed in Section 4-4-2 (Programming Exciter Filter) and Section 4-4-3 (Programming Low-Pass Filters).

1. With low-pass filters and exciter filter programmed, rotate channel selector to channel A.

2. Replace transmitter module in main chassis, securing module to chassis with three screws removed in step 2 of Section 4-4-1. Connect J302, J303, P301, P304, and P305 to mating connectors on transmitter.

3. Connect transceiver to a regulated 13.75-volt DC supply, and connect a power meter or 50-ohm, 50-watt dummy load to ant. connector J103.

4. Connect DC VOM to base of either Q306 or Q307 Power Amp. transistors (see Figure 4-2).

5. Turn unit ON and key transmitter. Adjust "bias adjust" potentiometer R322 (Figure 4-2) for a DC voltage reading between 0.6 and 0.65 volts on base of power amp. transistors.

6. Connect DC VOM to antenna current-sensing terminal J105 (red binding post/jack on rear panel of unit). Set voltmeter to a low-voltage DC scale.

7. With channel selector still set to channel A, key transmitter and whistle into microphone or use dummy mic. Adjust channel A trimmer potentiometer R246 (see Figure 4-2) for maximum output indication on DC VOM.

   CAUTION: Adjust exciter filters ONLY by adjusting potentiometers R237 through R246. Inductors L207, L208, L209, and L210 are factory-tuned and should NOT be disturbed unless components in this area are changed.

8. Continue to next channel, and adjust exciter filter by adjusting appropriate trimmer potentiometer as shown above. Potentiometer locations for each channel are given on exciter shield cover label as well as in Figure 4-2.

4-6-5. ALC Adjustment

NOTE: "ALC Level" potentiometer R316 is properly adjusted at the factory, and normally should NOT be readjusted unless components are replaced in the ALC circuit. If it is necessary to reset the ALC for any reason, the following procedure may be used:

1. Connect a 50-ohm, 50-watt dummy load to the transceiver antenna connector J103 through an average-reading power meter, such as the Bird Model 43 Thruline, or equivalent.

2. Rotate channel selector to a channel programmed for a low-frequency, suppressed-carrier operation.

3. Remove exciter-shield cover by pulling cover up. Locate "ALC Adjust" potentiometer R325 (refer to shield-cover label and/or Figure 4-2).

4. Connect DC VOM to P303 pin 14 (blue wire).

5. Key transmitter, and adjust R325 for 1.75 volt $\pm$0.1 V reading on VOM (No transmitter output).

6. Locate "ALC Level" potentiometer R316 (Figure 4-2) - this control sets the operating level of the ALC.

7. Rotate R316 fully clockwise as viewed from back side of transceiver. This disables the Automatic Levelling Circuit.

8. If a "two-tone generator" is available, connect it to supply an audio signal to the microphone circuit. Key transmitter, and adjust generator output level until transmitter just reaches full output (approximately 50 watts).

   If a "two-tone generator" is NOT available, key transmitter and count into microphone in a normal voice.

9. While applying generator tone, or while counting into microphone, adjust R316 until average power indicated on power meter drops to approximately 20 - 21 watts (about 40.5% of the value read in step 8).

10. Unkey transmitter, and replace exciter-shield cover. Disconnect test equipment from unit.

SECTION V
PARTS LIST

Reference Number	Part Number	Description
		CAPACITORS
C101	1530017	Silver Mica 150 pf 5%
C102	1530023	Silver Mica 470 pf 5%
C103	1530016	Silver Mica 82 pf 5%
C104	1530021	Silver Mica 330 pf 5%
C105	1530004	Mylar 1500 pf 630V
C106	1500061	Mylar .01 µfd 100V 5%
C107	1520077	Z5P Disc, .002 F 10%
C108	1500009	Mylar .0033 µfd 200V
C109	1500004	Mylar 1500 pf 630V
C110	1500009	Mylar .0033 µfd 200V
C111	1500004	Mylar 1500 pf 630V
C112	1570008	Trimmer 35 pf
C113	1520051	Y5U disc .01 µfd 25V 20%
C114	1520051	Y5U disc..01 µfd 25V 20%
C115	1520051	Y5U disc .01 µfd 25V 20%
C116	1520051	Y5U disc .01 µfd 25V 20%
C117	1520051	Y5U disc .01 µfd 25V 20%
C118	1520051	Y5U disc .01 µfd 25V 20%
C119	1520051	Y5U disc .01 µfd 25V 20%
C120	1520051	Y5U disc .01 µfd 25V 20%
C121	1520051	Y5U disc .01 µfd 25V 20%
C122	1520051	Y5U disc .01 µfd 25V 20%
C123	1520051	Y5U disc .01 µfd 25V 20%
C124	1520051	Y5U disc .01 µfd 25V 20%
C125	1520051	Y5U disc .01 µfd 25V 20%
C126	1520051	Y5U disc .01 µfd 25V 20%
C127	1520051	Y5U disc .01 µfd 25V 20%
C128	1520051	Y5U disc .01 µfd 25V 20%
C129	1550007	Tant 10 µfd 35V 20%
C130	1520071	Z5P disc .001 µfd 10%
C131	1550005	Tant 47 µfd 15V 10%
C132	1520015	N1500 47 pf disc 10%
C133	1520015	N1500 47 pf disc 10%
C134	1520055	Disc .1 µfd +80-20% 12V
C135	1520051	Y5U disc .01 µfd 25V 20%
C136	1520051	Y5U disc .01 µfd 25V 20%
C137	1520071	Z5P disc 1000 pf 10%
C138	1550007	Tant 10 µfd 20% 35V
C139	1520055	Disc .1 µfd +80-20% 12V
C140	1550005	Tant 47 µfd 10% 15V
C141	1520057	Disc .22 µfd 12V
C142	1500004	Poly .0015 µfd 630V
C143	1520055	Disc .1 µfd +80-20% 12V

Reference Number	Part Number	Description
C144	1540049	Aluminum electrolytic 500 mfd 12V
C145	1520014	NPO 39 pf disc 10%
C146	1570121	Trimmer 25 pf
C147	1520178	N1500 disc 22 pf 10%
C148	1520192	N1500 39 pf disc 10%
C149	1520051	Y5U disc .01 µfd 25V 20%
C150	1520051	Y5U disc .01 µfd 25V 20%
C151	1570121	Trimmer 25 pf
C152	1570121	Trimmer 25 pf
C153	1570121	Trimmer 25 pf
C154	1570121	Trimmer 25 pf
C155	1570121	Trimmer 25 pf
C156	1570121	Trimmer 25 pf
C157	1570121	Trimmer 25 pf
C158	1570121	Trimmer 25 pf
C159	1570121	Trimmer 25 pf
C160	1570121	Trimmer 25 pf
C161	1520051	Y5U disc .01 µfd 25V 20%
C162	1520051	Y5U disc .01 µfd 25V 20%
C163	1520082	N1500 disc 18 pf 10%
C164	1520192	N1500 disc 39 pf 10%
C165	1520051	Y5U disc .01 µfd 25V 20%
C166	1520051	Y5U disc .01 µfd 25V 20%
C167	1530030	Silver Mica 270 pf 5%
C168	1530013	Silver Mica 56 pf 5%
C169	1530021	Silver Mica 330 pf 5%
C170	1530031	Silver Mica 180 pf 5%
C171	1520051	Y5U disc .01 µfd 25V 20%
C172	1520080	Y5E disc 180 pf 10%
C173	1540024	Aluminum electrolytic 150 µfd 25V
C174	1520054	Disc .05 µfd 25V 10%
C175	1530019	Silver Mica 220 pf 5%
C176	1520011	NPO disc 22 pf 10%
C177	1530023	Silver Mica 470 pf 5%
C178	1520055	Disc .1 µfd +80-20% 12V
C179	1550005	Tant. 47 µfd 10% 15V
C180	1550005	Tant. 47 µfd 10% 15V
C181	1540025	Aluminum electrolytic 150 µfd 25V
C182	1520204	N750 Disc, 75 pf 5%
C183	1520204	N750 Disc, 75 pf 5%
C201	1570121	Trimmer 25 pf
C202	1570121	Trimmer 25 pf
C203	1570121	Trimmer 25 pf
C204	1570121	Trimmer 25 pf
C205	1570121	Trimmer 25 pf
C206	1570121	Trimmer 25 pf
C207	1570121	Trimmer 25 pf
C208	1570121	Trimmer 25 pf
C209	1570121	Trimmer 25 pf
C210	1570121	Trimmer 25 pf
C211	1520192	N1500 disc 39 pf 10%

Reference Number	Part Number	Description
C212	1520082	N1500 Disc 18 pf 10%
C213	1520051	Y5U disc .01 µfd 25V 10%
C214	1520077	Z5P disc .002 µfd 10%
C215	1520051	Y5U disc .01 µfd 25V 20%
C216	1520051	Y5U disc .01 µfd 25V 20%
C217	1520051	Y5U disc .01 µfd 25V 20%
C218	1530031	Silver Mica 180 pf 5%
C219	1530012	Silver Mica 22 pf 5%
C220	1530020	Silver Mica 270 pf 5%
C221	1530001	Silver Mica 100 pf 5%
C222	1530005	Silver Mica 200 pf 5%
C223	1530015	Silver Mica 75 pf 5%
C224	1530017	Silver Mica 150 pf 5%
C225	1520028	Y5E Disc 150 pf 10%
C226	1520071	Z5P Disc 1000 pf 10%
C227	1520051	Y5U disc .01 µfd 25V 20%
C228	1520051	Y5U disc .01 µfd 25V 20%
C229	1520071	Z5P disc .001 µfd 10%
C230	1520071	Z5P disc .001 µfd 10%
C231		Not Assigned
C232		" "
C233		" "
C234		" "
C235		" "
C236		" "
C237	1520051	Y5U disc .01 µfd 25V 20%
C238	1520024	N1500 disc 100 pf 10%
C239	1520051	Y5U disc .01 µfd 20%
C240	1550003	Tant 3.3 µfd 35V 10%
C241	1520051	Y5U disc .01 µfd 25V 20%
C242	1520050	Disc .003 µfd 10%
C243	1500031	.1 µfd 100V Polyester 10%
C244	1520051	Y5U disc .01 µfd 25V 20%
C245	1520051	Y5U disc .01 µfd 25V 20%
C246	1520051	Y5U disc .01 µfd 25V 20%
C247	1520051	Y5U disc .01 µfd 25V 20%
C248	1520051	Y5U disc .01 µfd 25V 20%
C249	1520051	Y5U disc .01 µfd 25V 20%
C250	1520051	Y5U disc .01 µfd 25V 20%
C251	1520051	Y5U disc .01 µfd 25V 20%
C252	1520051	Y5U disc .01 µfd 25V 20%
C253	1520051	Y5U disc .01 µfd 25V 20%
C254	1520051	Y5U disc .01 µfd 25V 20%
C255	1520051	Y5U disc .01 µfd 25V 20%
C256	1520051	Y5U disc .01 µfd 25V 20%
C257	1520051	Y5U disc .01 µfd 25V 20%
C258	1520051	Y5U disc .01 µfd 25V 20%
C259	1520055	Disc .1 µfd +80-20% 12V
C260	1520077	Z5P disc .002 µfd 10%
C261	1520020	JK disc 82 pf 10%
C262	1520055	Disc .1 µfd +80-20% 12V

Reference Number	Part Number	Description
C212	1520082	N1500 Disc 18 pf 10%
C213	1520051	Y5U disc .01 µfd 25V 10%
C214	1520077	Z5P disc .002 µfd 10%
C215	1520051	Y5U disc .01 µfd 25V 20%
C216	1520051	Y5U disc .01 µfd 25V 20%
C217	1520051	Y5U disc .01 µfd 25V 20%
C218	1530031	Silver Mica 180 pf 5%
C219	1530012	Silver Mica 22 pf 5%
C220	1530020	Silver Mica 270 pf 5%
C221	1530001	Silver Mica 100 pf 5%
C222	1530005	Silver Mica 200 pf 5%
C223	1530015	Silver Mica 75 pf 5%
C224	1530017	Silver Mica 150 pf 5%
C225	1520028	Y5E Disc 150 pf 10%
C226	1520071	Z5P Disc 1000 pf 10%
C227	1520051	Y5U disc .01 µfd 25V 20%
C228	1520051	Y5U disc .01 µfd 25V 20%
C229	1520071	Z5P disc .001 µfd 10%
C230	1520071	Z5P disc .001 µfd 10%
C231		Not Assigned
C232		" "
C233		" "
C234		" "
C235		" "
C236		" "
C237	1520051	Y5U disc .01 µfd 25V 20%
C238	1520024	N1500 disc 100 pf 10%
C239	1520051	Y5U disc .01 µfd 20%
C240	1550003	Tant 3.3 µfd 35V 10%
C241	1520051	Y5U disc .01 µfd 25V 20%
C242	1520050	Disc .003 µfd 10%
C243	1500031	.1 µfd 100V Polyester 10%
C244	1520051	Y5U disc .01 µfd 25V 20%
C245	1520051	Y5U disc .01 µfd 25V 20%
C246	1520051	Y5U disc .01 µfd 25V 20%
C247	1520051	Y5U disc .01 µfd 25V 20%
C248	1520051	Y5U disc .01 µfd 25V 20%
C249	1520051	Y5U disc .01 µfd 25V 20%
C250	1520051	Y5U disc .01 µfd 25V 20%
C251	1520051	Y5U disc .01 µfd 25V 20%
C252	1520051	Y5U disc .01 µfd 25V 20%
C253	1520051	Y5U disc .01 µfd 25V 20%
C254	1520051	Y5U disc .01 µfd 25V 20%
C255	1520051	Y5U disc .01 µfd 25V 20%
C256	1520051	Y5U disc .01 µfd 25V 20%
C257	1520051	Y5U disc .01 µfd 25V 20%
C258	1520051	Y5U disc .01 µfd 25V 20%
C259	1520055	Disc .1 µfd +80-20% 12V
C260	1520077	Z5P disc .002 µfd 10%
C261	1520020	JK disc 82 pf 10%
C262	1520055	Disc .1 µfd +80-20% 12V

Reference Number	Part Number	Description
C301	1550003	Tant 3.3 µfd 35V
C302	1540013	Tant 10 µfd 25V
C303	1520051	Y5U disc .01 µfd 25V 20%
C304	1520051	Y5U disc .01 µfd 25V 20%
C305	1520055	Disc .1 µfd +80-20% 12V
C306	1520051	Y5U disc .01 µfd 25V 20%
C307	1520180	Chip .1 µfd 50V 10%
C308	1520055	Disc .1 µfd +80-20% 12V
C309	1540013	Tant 10 µfd 25V
C310	1520071	Z5P disc .001 µfd 1000V 10%
C311	1540035	Aluminum Electrolytic 640 µfd 6.4V
C312	1520181	Chip .22 µfd 50V
C313	1520181	Chip .22 µfd 50V
C314	1520181	Chip .22 µfd 50V
C315		Not Assigned
C316	1520055	Disc .1 µfd +80-20% 12V
C317	1520071	Z5P disc .001 µfd 1000V 10%
C318	1540013	Tant 10 µfd 25V
C319	1530026	Silver Mica 820 pf 5%
C320	1530020	Silver Mica 270 pf 5%
C321	1530028	Silver Mica 1200 pf 5%
C322	1530027	Silver Mica 1000 pf 5%
C323	1530027	Silver Mica 1000 pf 5%
C324	1530024	Silver Mica 510 pf 5%
C325	1530013	Silver Mica 56 pf 5%
C326	1530027	Silver Mica 1000 pf 5%
C327	1530017	Silver Mica 150 pf 5%
C328	1530022	Silver Mica 390 pf 5%
C329	1530022	Silver Mica 390 pf 5%
C330	1530002	Silver Mica 120 pf 5%
C331	1530007	Silver Mica 680 pf 5%
C332	1530013	Silver Mica 56 pf 5%
C333	1530019	Silver Mica 220 pf 5%
C334	1530019	Silver Mica 220 pf 5%
C335	1530016	Silver Mica 82 pf 5%
C336	1530023	Silver Mica 470 pf 5%
C337	1530014	Silver Mica 68 pf 5%
C338	1530002	Silver Mica 120 pf 5%
C339	1520071	Z5P disc .001 µfd 1000V 10%
C340	1500031	Mylar .1 µfd 100V
C341	1520051	Y5U disc .01 µfd 25V 20%
C342	1540013	Tant 10 µfd 25V
C343	1520051	Y5U disc .01 µfd 25V 20%
C344	1540013	Tant 10 µfd 25V
C345	1500031	Mylar .1 µfd 100V
C346	1520055	Disc .1 µfd +80-20% 12V
C347	1520180	Chip .1 µfd 50V
C348	1520180	Chip .1 µfd 50V
C349		Not Assigned
C350	1520051	Y5U disc .01 µfd 25V 20%
C351	1530024	Silver Mica 510 pf 5%

Reference Number	Part Number	Description
C352	1530025	Silver Mica 620 pf 5%
C353	1520051	Y5U disc .01 µfd 25V 20%
C354	1540038	Aluminum electrolytic 1000 µfd 25V
		DIODES
CR101	4810017	High Frequency Switching FD 1936
CR102	4810017	High Frequency Switching FD 1936
CR103	4810017	High Frequency Switching FD 1936
CR104	4810027	Varicap MV 2201
CR105	4810017	High Frequency Switching FD 1936
CR106	4810022	IN 295
CR107	4810017	High Frequency Switching FD 1936
CR108	4810013	General purpose 100V @ 1A
CR109	4810013	General purpose 100V @ 1A
CR110	4810017	High Frequency switching FD 1936
CR111	4810017	High Frequency switching FD 1936
CR112	4810017	High Frequency switching FD 1936
CR113	4810017	High Frequency switching FD 1936
CR114	4810017	High Frequency switching FD 1936
CR115	4810017	High Frequency switching FD 1936
CR201	4810017	High Frequency switching FD 1936
CR202	4810005	Zener 5.6V 3/4w 5%
CR203	4810019	Hot carrier FH 1100
CR204	4810017	High Frequency switching FD 1936
CR205	4810017	High Frequency switching FD 1936
CR206	4810017	High Frequency switching FD 1936
CR207	4810017	High Frequency switching FD 1936
CR208	4810017	High Frequency switching FD 1936
CR209	4810017	High Frequency switching FD 1936
CR210	4810017	High Frequency switching FD 1936
CR211	4810017	High Frequency switching FD 1936
CR212	4810017	High Frequency switching FD 1936
CR213	4810017	High Frequency switching FD 1936
CR214	4810017	High Frequency switching FD 1936
CR215	4810017	High Frequency switching FD 1936
CR216	4810017	High Frequency switching FD 1936
CR217	4810017	High Frequency switching FD 1936
CR218	4810017	High Frequency switching FD 1936
CR219	4811115	Varicap SMV 1115 matched set of 2
CR220	4811115	Varicap SMV 1115 matched set of 2
CR221	4810019	Hot carrier FH 1100
CR222	4810019	Hot carrier FH 1100
CR223	4810019	Hot carrier FH 1100
CR224	4810028	Zener 18V 10W IN2982A
CR301	4810017	High Frequency switching FD 1936
CR302	4810017	High Frequency switching FD 1936
CR303	4810022	IN295
CR304	4810022	IN295
CR305	4810013	General Purpose 100V @ 1A
CR306	4812111	Stud mount 10A

Reference Number	Part Number	Description
CR307	4810019	IN295
CR308	3900030	Light emitting diode FLV 110
		INTEGRATED CIRCUITS
IC101	3130019	MC1496G
IC102	3130017	MC1350P IF AMP
IC103	3130019	MC1496G
IC104	3130020	RCA CA 810Q Audio Amp
IC105	3130021	MC 7808CP 8V regulator
IC201	3130019	MC1496G
IC301	3130022	MC1723G
		INDUCTORS
L101	1800350	Coil 1 µh choke ML10G
L102	1800350	Coil 1 µh choke ML10G
L103	1800329	Coil 3.3 µh choke ML33G
L104	1800330	Coil 4.7 µh choke ML47G
L105	1800330	Coil 4.7 µh choke ML47G
L106	1800362	Coil 8.2 µh ML82G
L107	1800332	Coil 56 µh choke MU560
L108	1800247	Coil 1 mh choke
L109	1800331	Coil 33 µh choke ML330
L110	1800334	Coil 0.34 µh choke ES2961
L111	1800333	Coil 0.24 µh choke 200-11
L112	1800350	Coil 1 µh choke ML10G
L113	1800331	Coil 33 µh choke ML330
L201		Not used
L202	1800338	Coil 0.47 µh choke 201-11
L203	1800335	Coil 0.39 µh choke ES2962
L204	1800331	Coil 33 µh choke ML330
L205	1800331	Coil 33 µh choke ML330
L206	1800338	Coil 0.47 choke 201-11
L207	1800336	Coil variable - tracking filter
L208	1800336	Coil variable - tracking filter
L209	1800337	Coil variable - tracking filter
L210	1800337	Coil variable - tracking filter
L211	1800354	Coil 1 mh choke ES2735
L301	1800339	Coil - wide band choke VK200 10/3B
L302	1800339	Coil - wide band choke VK200 10/3B
L303	1800339	Coil - wide band choke VK200 10/3B
L304	1800339	Coil - wide band choke VK200 10/3B
L305	1800338	Coil 0.47 µh choke
L306	1800339	Coil - wide band choke VK200 10/3B
L307	1800296	Coil 2.7 µh torroid
L308	1800297	Coil 1.6 µh torroid
L309	1800298	Coil 1.8 µh torroid
L310	1800290	Coil 2.58 µh torroid

Reference Number	Part Number	Description
L311	1800289	Coil 2.28 µh torroid
L312	1800288	Coil 1.5 µh torroid
L313	1800287	Coil 1.35 µh torroid
L314	1800286	Coil 1.14 µh torroid
L315	1800285	Coil 1.0 µh torroid
	TRANSISTORS	
Q101	4800026	Silicon NPN White MPS3693
Q102	4800026	Silicon NPN White MPS3693
Q103	4800051	Silicon NPN Darlington MPS A-13
Q104	4805484	J-FET N-Channel 2N5484
Q105	4805484	J-FET N-Channel 2N5484
Q106	4800026	Silicon NPN White MPS3693
Q107	4800026	Silicon NPN White MPS3693
Q201	4805485	J-FET N-Channel 2N5485
Q202	4805484	J-FET N-Channel 2N5484
Q203	4800026	Silicon NPN White MPS 3693
Q204	4805458	J-FET N-Channel 2N5458
Q205	4800028	Silicon NPN Red MPS6514
Q206	4800060	Silicon Power Darlington 2N6386
Q207	4800026	Silicon NPN White MPS3693
Q208	4800007	Silicon NPN Brown 2N4264
Q209	4800007	Silicon NPN Brown 2N4264
Q301	4800027	Silicon NPN MPS6511
Q302	4800027	Silicon NPN MPS6511
Q303	4806535	Silicon PNP MPS6535
Q304	4806532	Silicon NPN MPS6532
Q305	4800061	Silicon NPN RF Driver S10-12 or SD1288
Q306	4800062	Silicon NPN RF Output S30-12 or SD1289
Q307	4800062	Silicon NPN RF Output S30-12 or SD1289
Q308	4800028	Silicon NPN Red MPS6514
Q309	4800028	Silicon NPN Red MPS6514
	RESISTORS	
R101	4710017	1K +5% 1/4 W
R102	4710006	56 ohm +10% 1/4W
R103	4710008	100 +5% 1/4 W
R104	4710027	6.8K +5% 1/4 W
R105	4710017	1K +5% 1/4 W
R106	4710032	22K +5% 1/4 W
R107	4710032	22K +5% 1/4 W
R108	4710017	1K +5% 1/4 W
R109	4710017	1K +5% 1/4 W
R110	4710012	330 +5% 1/4 W
R111	4710017	1K +5% 1/4 W
R112	4710028	8.2 K +5% 1/4 W
R113	4710005	47 +5% 1/4 W
R114	4710005	47 +5% 1/4 W
R115	4710028	8.2K +5% 1/4 W
R116	4710032	2.2K +5% 1/4 W

Reference Number	Part Number	Description
R117	4710008	100 +5% 1/4 W
R118	4710011	220 +5% 1/4 W
R119	4710001	10 +10% 1/4 W
R120	4710035	47K +5% 1/4 W
R121	4760006	10K Variable 30%
R122	4710023	3.3 K +5% 1/4 W
R123	4710038	100K +10% 1/4 W
R124	4710017	1K +5% 1/4 W
R125	4710008	100 +5% 1/4 W
R126	4710016	820 +5% 1/4 W
R127	4710008	100 +5% 1/4 W
R128	4710046	27K +10% 1/4 W
R129	4710046	27K +10% 1/4 W
R130	4710017	1K +5% 1/4 W
R131	4710018	1.2K +5% 1/4 W
R132	4710008	100 +5% 1/4 W
R133	4710029	10K +5% 1/4 W
R134	4710022	2.7K +5% 1/4 W
R135	4710022	2.7K +5% 1/4 W
R136	4760032	25K Variable (Volume control with switch)
R137	4700013	100 +10% 1/2 W
R138	4710006	56 +10% 1/4 W
R139	4710021	2.2K +5% 1/4 W
R140	4700008	33 +10% 1/2 W - Aircraft model only
R141		Not used
R142	4710042	1 Meg +5% 1/4 W
R143	4710008	100 +5% 1/4 W
R144		Not used
R145	4710025	4.7K +5% 1/4 W
R146	4710011	220 +5% 1/4 W
R147	4710011	220 +5% 1/4 W
R148	4710011	220 +5% 1/4 W
R149	4710038	100K +5% 1/4 W
R150	4760031	25K Variable - Clarifier
R151	4710038	100K +5% 1/4 W
R152	4710008	100 +5% 1/4 W
R153	4710008	100 +5% 1/4 W
R154	4710032	22K +5% 1/4 W
R155	4710032	22K +5% 1/4 W
R156	4710013	470 +10% 1/4 W
R157	4710001	10 +10% 1/4 W
R158	4710021	2.2 K +5% 1/4 W
R159	4700021	470 +10% 1/2 W
R160	4700009	47 +10%
R161	4710045	390 +5% 1/4 W
R162	4710031	18K +5% 1/4 W
R163	4710025	4.7K +5% 1/4 W
R164	4710024	3.9K +10% 1/4 W
R165		Not used
R166	5760042	10K variable
R167	4760042	10K variable
R168	4760042	10K variable
R169	4760042	10K variable

Reference Number	Part Number	Description
R170	4760042	10K variable
R201	4710008	100 ±5% 1/4 W
R202	4710008	100 ±5% 1/4 W
R203	4710038	100K ±5% 1/4 W
R204	4710017	1K ±5% 1/4 W
R205	4710020	15K ±5% 1/4 W
R206	4710020	15K ±5% 1/4 W
R207	4710009	150 ±5% 1/4 W
R208	4710017	1K ±5% 1/4 W
R209		Not used
R210	4710020	2.2K ±5% 1/4 W
R211	4710011	220 ±5% 1/4 W
R212	4710017	1K used with carbon micro. only ±5% 1/4 W
R213	4710021	2.2K used with carbon micro. only ±10% 1/4 W
R214	4710034	39K ±10% 1/4W
R215	4710038	100K ±5% 1/4 W
R216	4710026	5.6K ±5% 1/4 W
R217	4710028	8.2K ±5% 1/4 W
R218	4710001	10 ±10% 1/4 W
R219	4760006	10K Variable 30%
R220	4710045	390 ±5% 1/4 W
R221	4710017	1K ±5% 1/4 W
R222	4720047	10K ±5% 1/4 W
R223	4720047	10K ±5% 1/4 W
R224	4760006	10K variable 30%
R225	4710006	56 ±10% 1/4 W
R226	4710008	100 ±10% 1/4 W
R227	4710017	1K ±5% 1/4 W
R228	4710001	10 ±10% 1/4 W
R229	4710027	6.8K ±5% 1/4 W
R230	4710015	680 ±10% 1/4 W
R231	4700024	820 ±10% 1/2 W
R232	4720008	11K 1% 1/4 W
R233	4760034	10K Thermistor
R234	4740016	4 ohm ±10% 5 W
R235	4740016	4 ohm ±10% 5 W
R236	4740016	4 ohm ±10% 5W
R237	4760043	50K Variable
R238	4760043	50K Variable
R239	4760043	50K Variable
R240	4760043	50K Variable
R241	4760043	50K Variable
R242	4760043	50K Variable
R243	4760043	50K Variable
R244	4760043	50K Variable
R245	4760043	50K Variable
R246	4760043	50K Variable
R247	4710013	470 ±10% 1/4 W
R248	4710013	470 ±10% 1/4 W
R249	4710021	2.2 K ±10% 1/4 W
R250	4710038	100K ±10% 1/4 W
R251	4710038	100K ±5% 1/4 W

Reference Number	Part Number	Description
R252	4710023	3.3K +5% 1/4 W
R253	4710037	82K +10% 1/4 W
R254	4710021	2.2K +5% 1/4 W
R301	4710012	330 +10% 1/4 W
R302	4710018	1.2K +10% 1/4 W
R303	4710027	6.8K +5% 1/4 W
R304	4710016	820 +10% 1/4 W
R305	4710009	150 +10% 1/4 W
R306	4710011	220 +10% 1/4 W
R307	4710045	390 +10% 1/4 W
R308	4710016	820 +10% 1/4 W
R309	4710023	3.3K +10% 1/4 W
R310	4710001	10 +10% 1/4 W
R311	4700003	10 +10% 1/2 W
R312	4740011	120 +10% 2 W
R313	4700017	220 +10% 1/2 W
R314	4700002	4.7 +10% 1/2 W
R315	4700030	2.7K +10% 1/2 W
R316	4740027	100 Variable 30%
R317	4710012	330 +5% 1/4 W
R318	4700013	100 +10% 1/2 W
R319	4710017	1K +5% 1/4 W
R320	4710031	18K +5% 1/4 W
R321	4710028	8.2K 10% 1/4 W
R322	4760005	1K Variable 30%
R323	4740031	39 10% 2W
R324	4740030	1 ohm 1% 2W
R325	4760005	1K Variable 30%
R326	4710038	100K +5% 1/4 W
R327	4710016	820 +10% 1/4 W
R328	4710017	1K +5% 1/4 W
R329	4700003	10 +10% 1/2 W
R330	4700003	10 +10% 1/2 W
R331	4700002	4.7 +10% 1/2 W
R332	4710013	470 +10% 1/4 W
R333	4710017	1K +5% 1/4 W
R334	4700002	4.7 +10% 1/2 W
R335	4710019	1.5K +10% 1/4 W
		TRANSFORMERS
T101	5600058	Input receiver
T102	5600057	10.7 MHz IF
T103	5600056	10.7 MHz IF
T104	5600057	10.7 MHz IF
T105	5600060	Audio headphones - aircraft version only
T106	5600046	10.7 MHz IF
T201	5600049	10.7 MHz IF
T202	5600059	Mixer - Xmtr
T203	5600059	Mixer - Xmtr

Reference Number	Part Number	Description
T204	5600056	10.7 MHz Balanced modulator
T301	5600064	input driver
T302	5600063	interstage
T303	5600065	Collector choke
T304	5600062	Output
T305	5600061	Monitor - ALC
	SWITCHES	
SW101	4760032	Power switch - ganged with R136
SW102	5100091	Receive crystal selector
SW201	5100091	Transmit crystal selector
SW203	5100091	Carrier Programming
SW301	5100092	Band switching
SW302	5100091	Output filter
SW303	5100092	Remote coupler switching
	CONNECTORS	
J101	2100096	Connector 9 pin power -aircraft version only
J101	2100246	Connector, 2 pin 13.6V - marine model
P101	2100245	Connector, 2 pin mate to J101 only
P101	2100097	Connector, 9 pin - mate to J101-Aircraft only
J102	2100077	Connector 4 pin (Female chassis mic. jack) Marine only
P102	2100076	Connector 4 pin (Male mic. plug) Marine only
J103	2100039	Receptacle SO239 (ant plug)
J104	2100098	Connector, 12 pin (remote antenna coupler)
P104	2100099	Connector, 12 pin, mate to J104
J105	2100201	Connector - terminal post (RF monitor out)
J301	2100021	Connector -phono, linear-amp output
P301	2100022	Connector, phone - mate to J301
J302	2100246	Connector, 2 pin, 13.6V to amp
P302	2100245	Connector, 2 pin, mate to J302
J303	2100240	Connector, pin, power & switching to amp.
P303	2100242	Connector, pin, mate to J303.
J304	2100019	Connector, phono, mixer input
P304	2100022	Connector, phono, mate to J304
J305	2100019	Connector, phono, L.O. input to mixer
P305	2100022	Connector, phono, mate to J305
	MISCELLANEOUS	
F101		Fuse 20A 3AG
K101	4500007	Relay 4PDT 12V
Y101	2300443	2182 KHz crystal marine model only
Y201	2300443	2182 KHz crystal
Y111	2300442	10.700 MHz crystal
FL101	2303505	Filter - crystal 10.7 MHz
----	5140004	Fuseholder, In Line (with 20A fuse)

Reference Number	Part Number	Description
	2510029	Panel front
	2502311	Panel trim
		Knob vol. & clarifier
		Knob channel selector
		Bracket - subpanel
	2502292	Bracket mtg. (handle)
	2510030	Cover
	1324069	Microphone
SP101	1320020	Speaker 4 ohm 4 W

5-1. CRYSTAL INFORMATION

To add or change a transmit and/or receive operating frequency in the SSB transceiver requires that a new transmit and/or receive crystal be installed in the unit. The transceiver may also require some realignment as specified in Section 4-4-1 to insure proper operation of the new frequency.

Crystals for the transceiver are available from the factory at nominal cost by calling the factory "Parts Department," and specifying the Model number of the unit, desired operating frequency, and whether for transmit or receive. Crystals may also be obtained from other sources; therefore, the information necessary for ordering these crystals is given below:

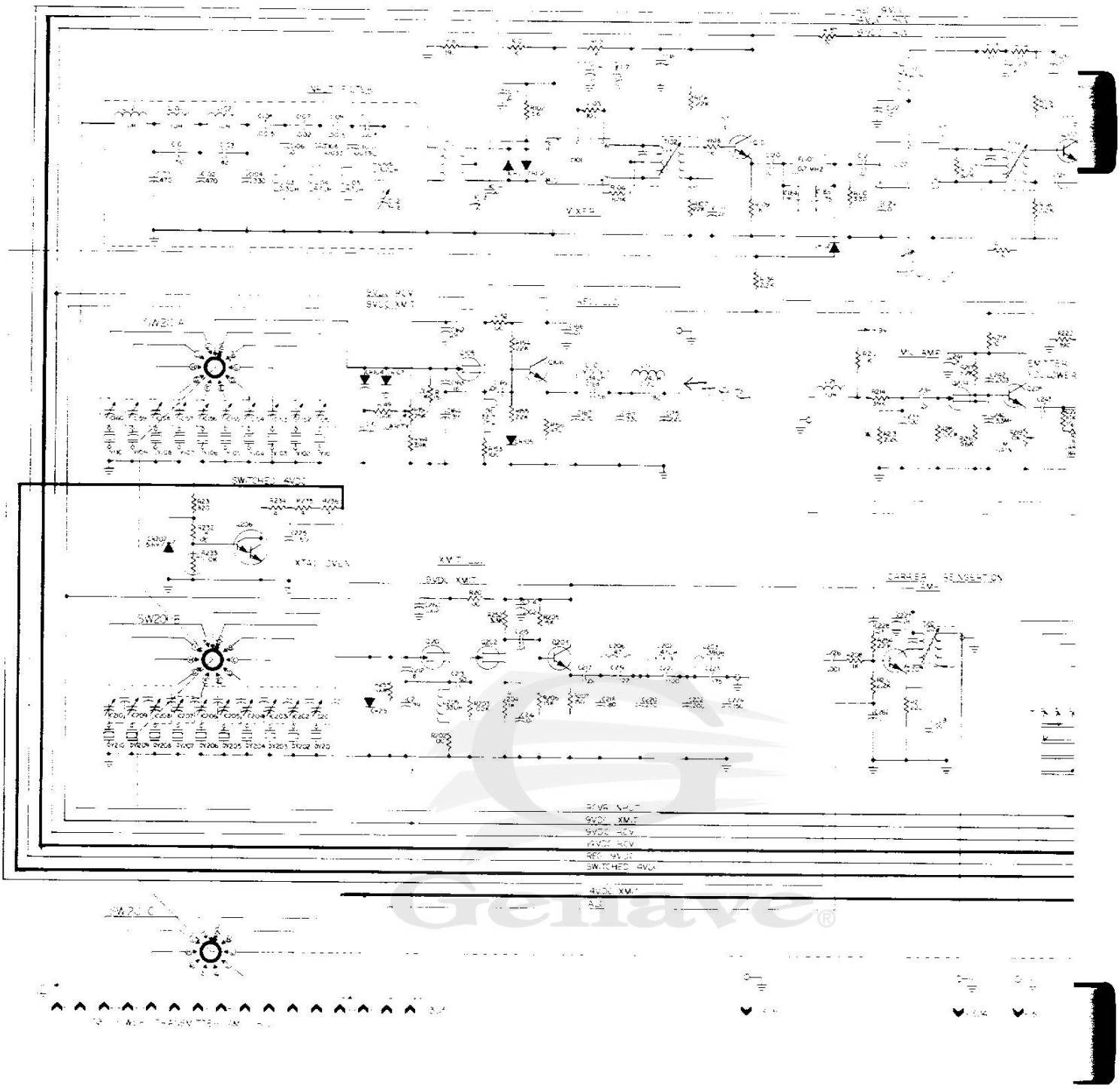
5-1-1. Transmit or Receive Crystals

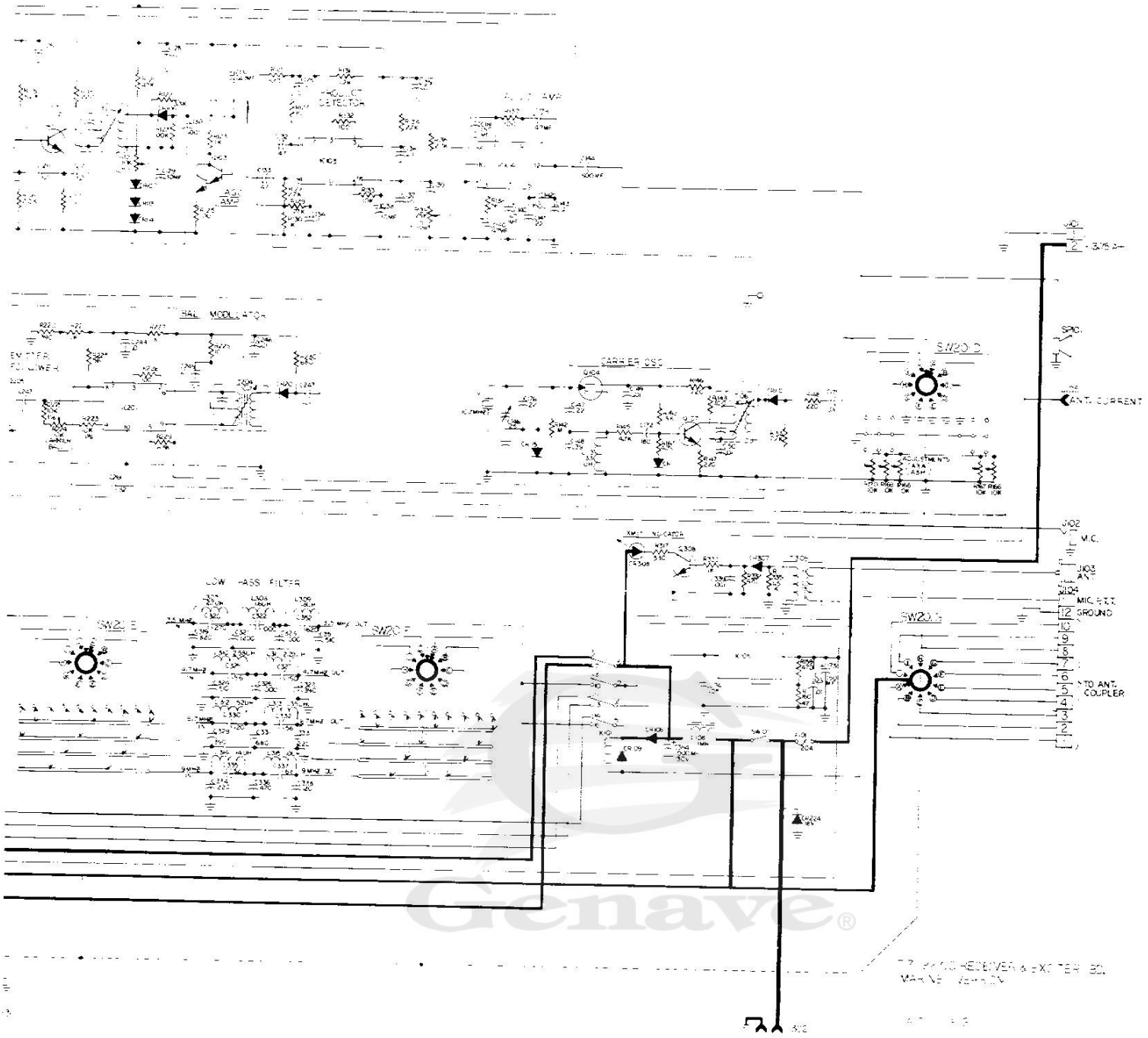
Parallel Mode:	C_p = 20 pf
Fundamental Cut.	
Tolerance:	±.001% max. calibration tolerance at 25°C ±1°C ±.001% max. drift over temperature range
Temperature Range:	-30°C to +60°C
Holder:	HC-25/U
Crystal Frequency:	F_c = Operating Frequency + 10.7 MHz
Series Resistance:	40 ohms maximum

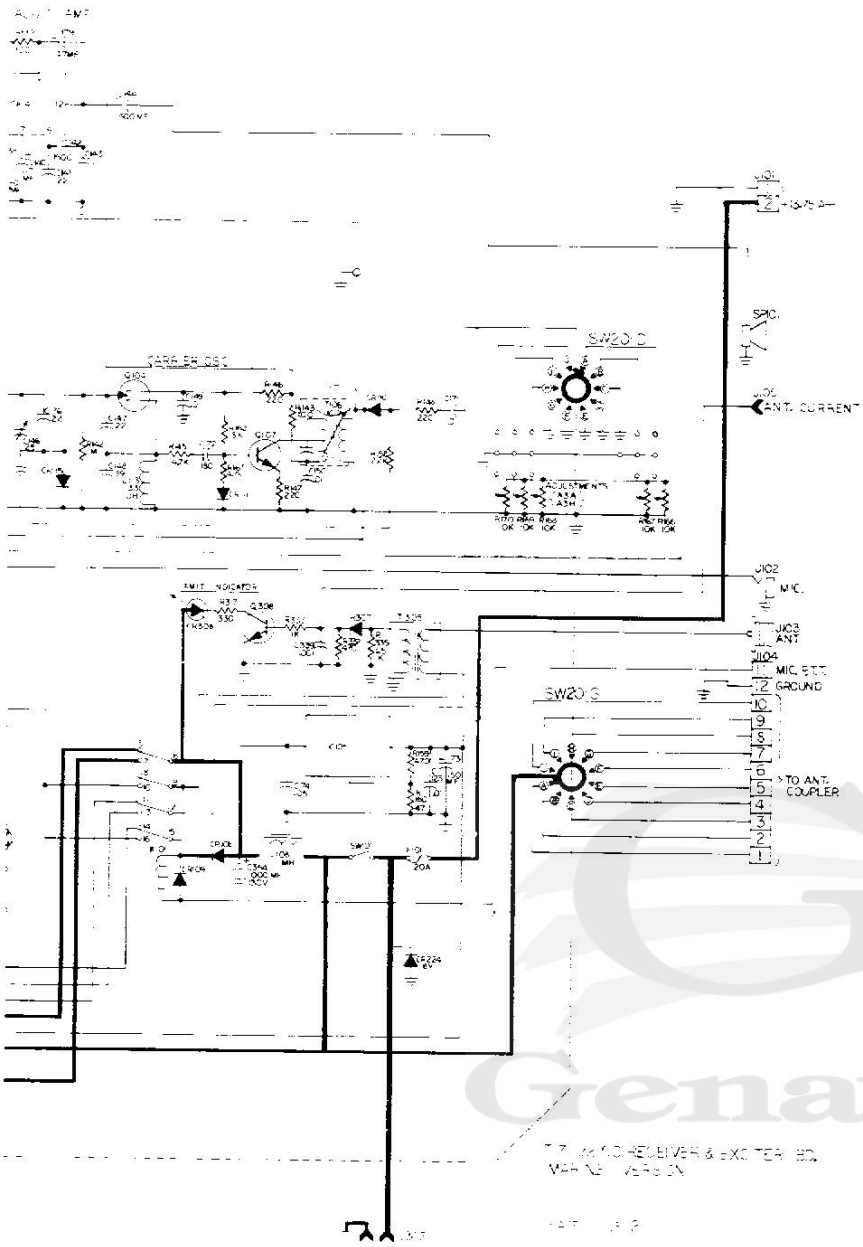
EXAMPLE: To transmit and receive on a frequency of 5310 kHz.

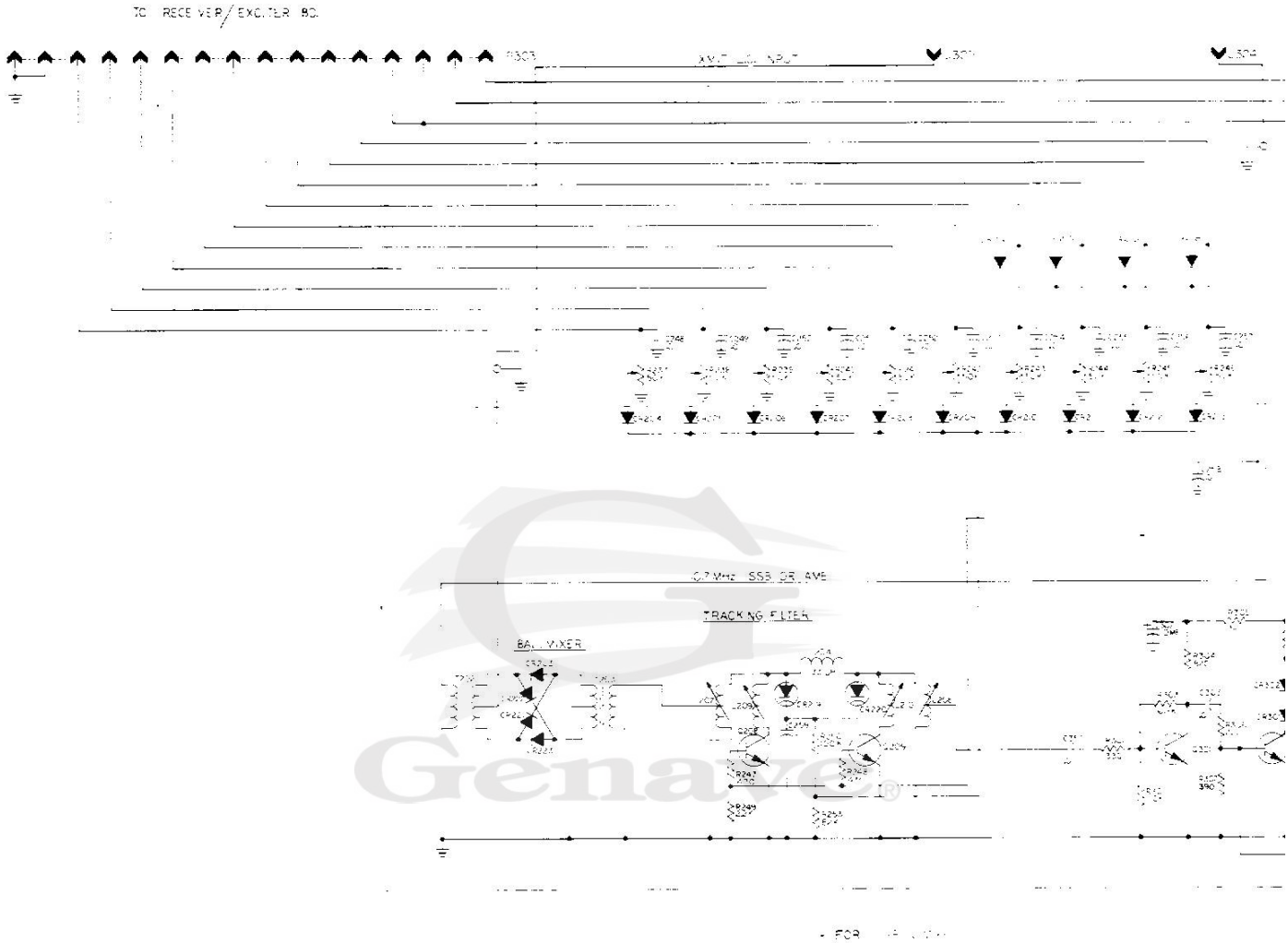
F_c = 5310 + 10.7 MHz
F_c = 16,010.000 kHz

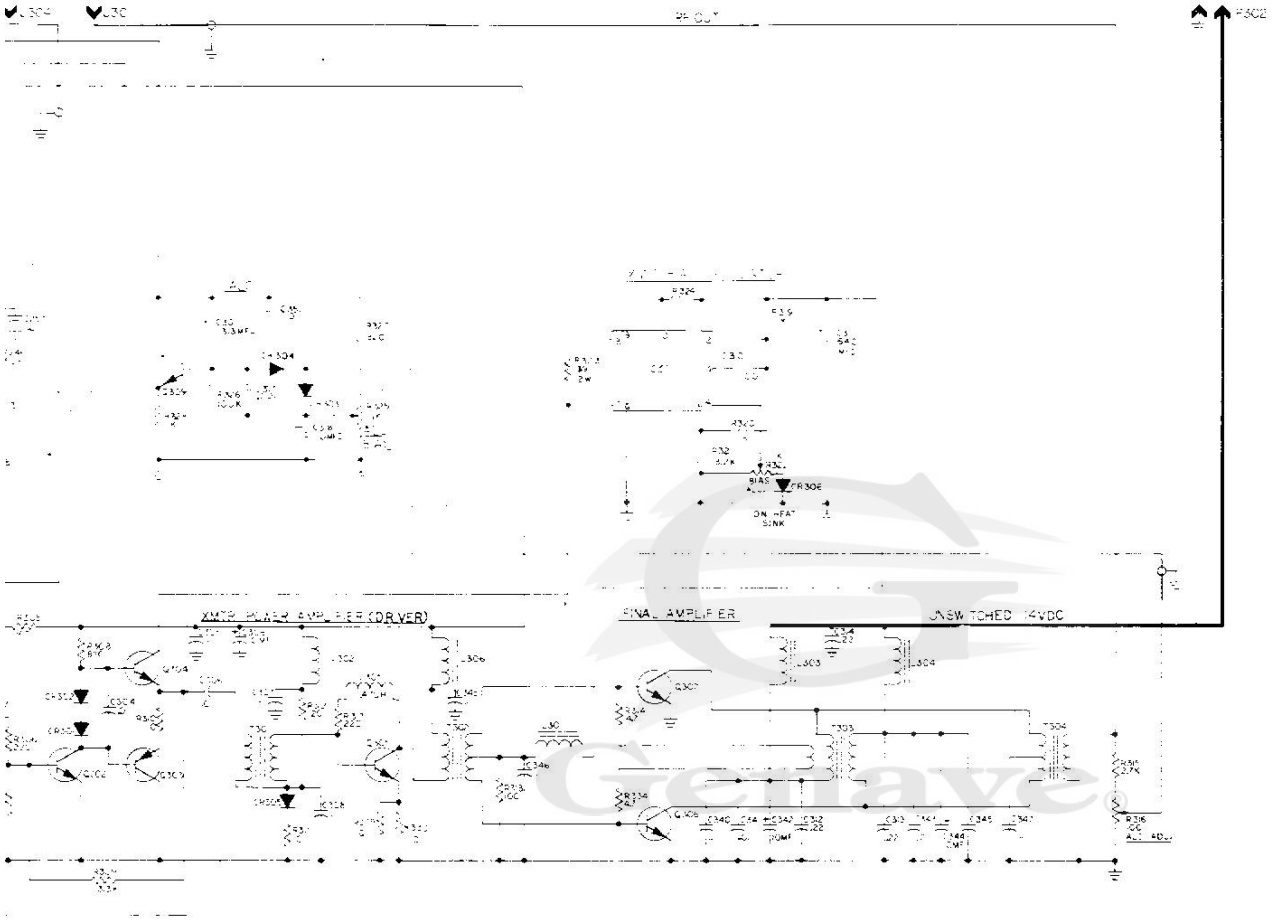
Thus, to transmit and receive on an operating frequency of 5310 kHz would require two crystals, each having a frequency of 16.010 MHz.









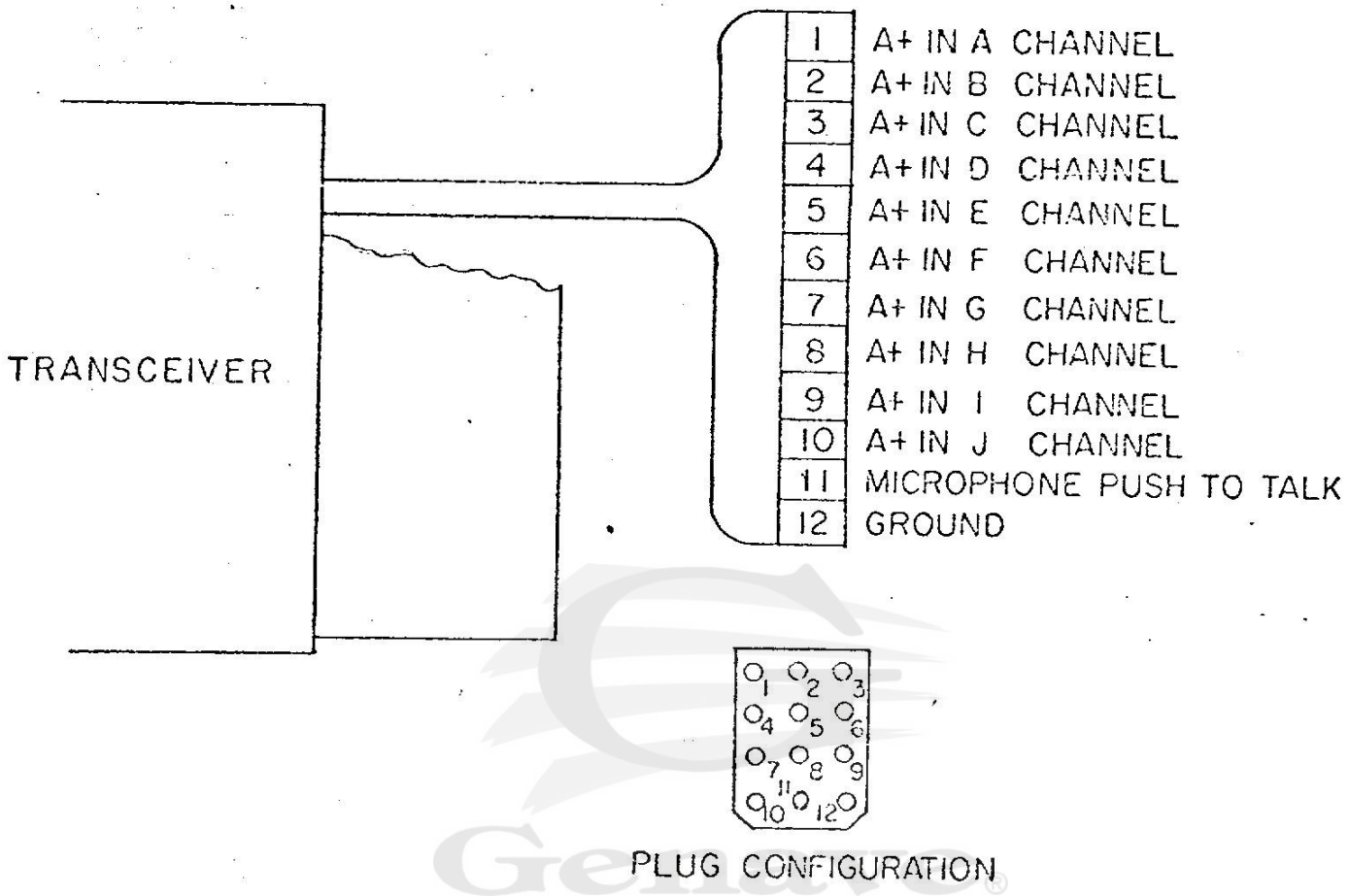


Note 1 - In the GSB-1000A (Aircraft Version), J101 is changed to a 9-pin receptacle, having the following pin assignments:

Pin 1	Microphone P.T.T.	Pin 8	Panel Backlighting (To A/C light Dim. Ckt)
2	Audio Output (To speaker)	Pin 9	+13.75 VDC Input
3	Ground		
4	Mic. Audio Input	NOTE:	To use Internal Speaker, jumper Pin 2 to pin 5.
5	To Internal Speaker		
6	Headphone Output		
7	Microphone Ground		

Figure 13

Transceiver Connections



PLUG CONFIGURATION

Figure 14

Antenna Coupler Connections