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25 watt Marine R/T

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3 db gain Marine antenna

Marine/Gain-100
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10 watt output, rotary channel selector

GTX-2
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marine division

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Genave®

MAINTENANCE MANUAL

Marine/Mate-10

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Warranty

General Aviation Electronics, Inc., warrants this product to be free from material defects for a period of 90 days from the date of purchase.

Our obligation under this warranty is to replace any parts (except service items such as bulbs, fuses, etc.) which upon our examination appear to us to be defective in materials or workmanship, with any labor charges involved at the cost of the owner, provided the unit is delivered to the Factory within the specified time period.

The owner may elect to have the unit repaired at an authorized Genave dealer, in which case Genave will replace only those defective parts returned shipping pre-paid to the Factory, and will not be responsible in any way for payment of any labor or other charges incurred therein.

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, or due to abuse, misuse, tampering, submersion in water or willful destruction of the unit.

The Company offers no other guarantees or warranties expressed or implied.

Your Marine/Mate-10 was under strict quality control during its fabrication and was thoroughly checked by skilled technicians prior to shipment. With reasonable care and handling it will provide years of satisfactory operation.

Marine/Mate-10 comes ready to be installed and does not require installation by a licensed FCC technician. The Marine/Mate-10 was designed with the installation simplicity which makes it a "natural" for do-it-yourself installation.

Specifications:

GENERAL:

Front Panel Size:	6½″ x 2½″
Over-all Dimensions:	9″ deep x 6½″ wide x 2½″ high
Number of Transistors:	10 all silicon transistors, 5 diodes, 5 FETs, 3 integrated circuits
Power Supply:	12 VDC System, negative ground
Current Drain:	Receive: .09 amps Transmit: High 1.5 amps Low 0.8 amps
Frequency Range:	156 to 162 MHz
Number of Channels:	10 (Includes Weather Monitor, 6, 16. Remaining channels factory installed at nominal charge each).
Weight:	5 lbs. (approx.)

RECEIVE:

Sensitivity:	Less than 1 microvolt for 20 db quieting
Image:	More than 45 db
Spurious:	More than 50 db
Selectivity:	±8 KHz
Receiver Circuit:	Dual conversion, superheterodyne, crystal controlled
Audio Output:	1.5 watts at less than 15% distortion
Modulation Acceptance:	More than 5 KHz
Squelch Threshold:	0.5 microvolt max.

TRANSMIT:

Frequency Range:	156 to 158 MHz
Power Output:	10 watts, nom.
Output Impedance:	Matches standard VHF-FM marine antennas

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ABOUT VHF-FM

Your Marine/Mate-10 is designed to replace the old Medium Frequency (2 to 3 Megahertz) radiotelephone system and make the privileges enjoyed by licensees of the older system available to even the most modest of users.

The Marine/Mate-10 operates within the VHF-FM Marine Band (156 to 162 Megahertz). This system is not susceptible to the "skip" phenomenon which created channel crowding in the old MF system. Communications within the VHF-FM Band are "line-of-sight" . . . the higher the antenna: the greater the range (i.q. The taller the tower: the farther you can see.). This characteristic is effectively utilized within the VHF-FM marine service to maximize channel utilizaiton. The tall antenna towers of the coastal stations allow them to communicate with ships far at sea, while the relative low antenna height of the ships serves to reduce the number of signals creating interference with the desired station.

An added feature of the VHF-FM Marine Band is the increased number of channels. The old MF system provided only a limited number of operating channels while the VHF-FM system provides over twice as many channels including 3 weather monitor channels.

VHF-FM is relatively free from static and other forms of noise interference. While static and ignition noise will cause some reduction in the receive efficiency of the VHF-FM system, it will not completely block the communications. Ignition noise from the ship's engine(s), which causes a very slight reduction in receive efficiency, can be relatively inexpensively reduced by the installation of noise suppression equipment. Noise suppression equipment is not mandatory, although it may be desirable. Noise suppression information and kits can be obtained through marine and electronic suppliers.

Another point favoring VHF-FM is the increased antenna effectiveness which can be achieved. The old MF system, which needs long antennas for best performance, usually underwent a compromise in antenna effectiveness through the use of coils and various other loading and matching devices. Due to the frequency of VHF-FM, high efficiency antennas can be built of reasonable size. For example, there are two antenna models being offered with your Marine/Mate-10. These antennas can multiply the effective output of your radiotelephone without any modification whatsoever to the unit.

The Marine/Gain-50 technically is rated at 3db gain. In reality this antenna makes your Marine/Mate-10 equivalent to 20 watts effective transmit power.

The Marine/Gain-100, which is rated at 6 db of antenna gain, makes your Marine/Mate-10 equivalent to 40 watts effective transmit power.

INSTALLATION

INSTALLATION PLANNING

NOTE: The Marine/Mate-10 does **not** require a metallic ground plate be installed on the ship's hull surface.

Check your ship for a convenient location from which to operate your Marine/Mate-10. Consider the following points:

1. Locate the unit in a well protected site.
2. Try not to mount the unit within 1 foot of the ship's compass.
3. Try to prevent extremely long power or antenna cable lengths.

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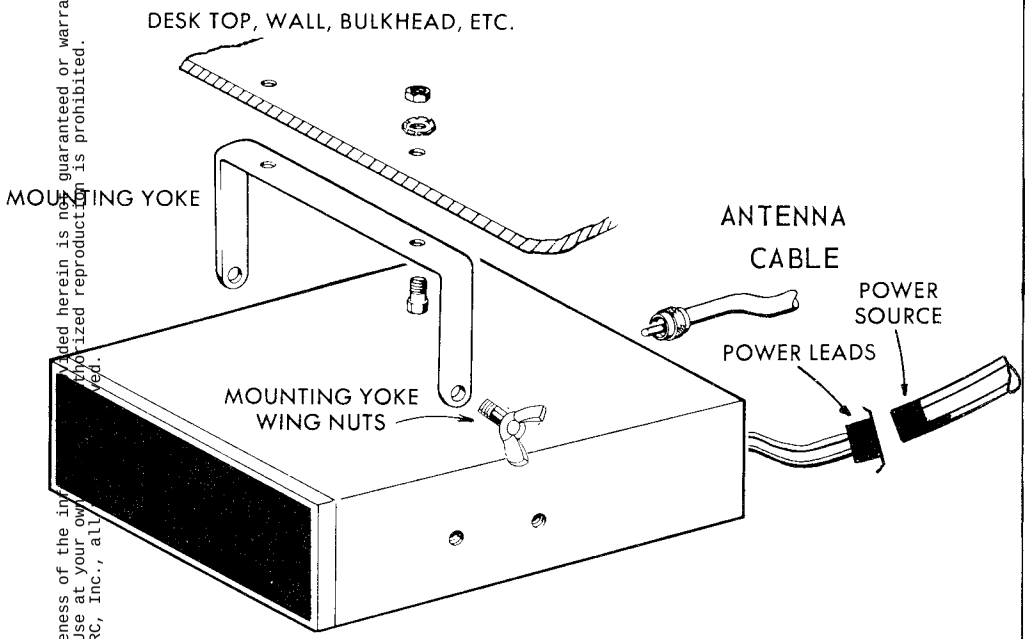


UNIT INSTALLATION

1. Remove the Marine/Mate-10 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 if feasible) Unit performance is not affected by mounting position.
3. Replace unit in mounting yoke and tighten wing nuts.
4. Connect the color-coded power leads to the power source. Take care to use RED for positive and BLACK for negative. Unit will only operate on a supply with negative ground. 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 2-amp, type 3AG fuse only. The fuse is located inside the unit, underneath the circuit board and against the back wall.
5. Attach the microphone mounting clip to the desired mounting surface using two small screws or bolts.
6. The Marine/Mate-10 installation is now complete except for installing and connecting the antenna.

ANTENNA INSTALLATION

The Marine/Gain-50 and the Marine/Gain-100 antennas are designed for operation with the Marine/Mate-10. Both of these antennas can be mounted on either a vertical or a horizontal surface. A few considerations to make when planning the antenna location are as follows:

A. Antenna height is very important. The higher the antenna is installed, the greater the range.

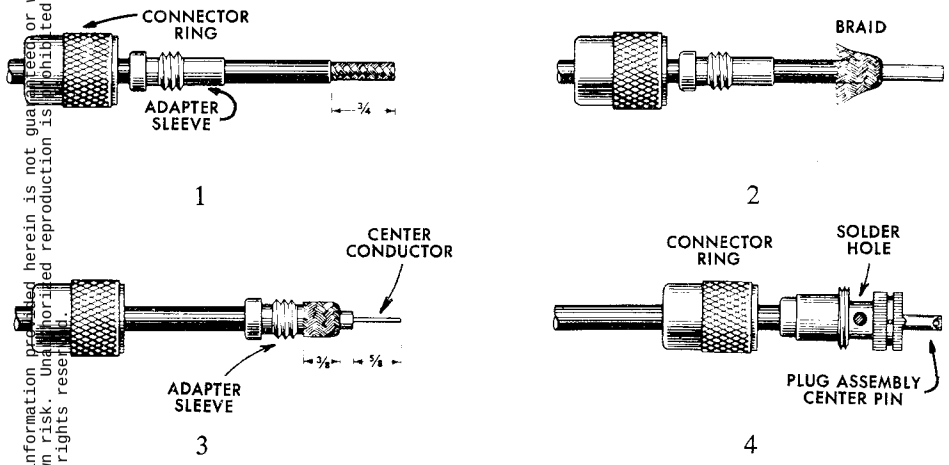
B. Do not mount the antenna too near a source of electrical noise (ship's engine, electrical motors, etc.) or in the radiation path of the ship's radar antenna.

C. For maximum performance, try to prevent excessive antenna cable lengths.

To install the antenna proceed as follows:

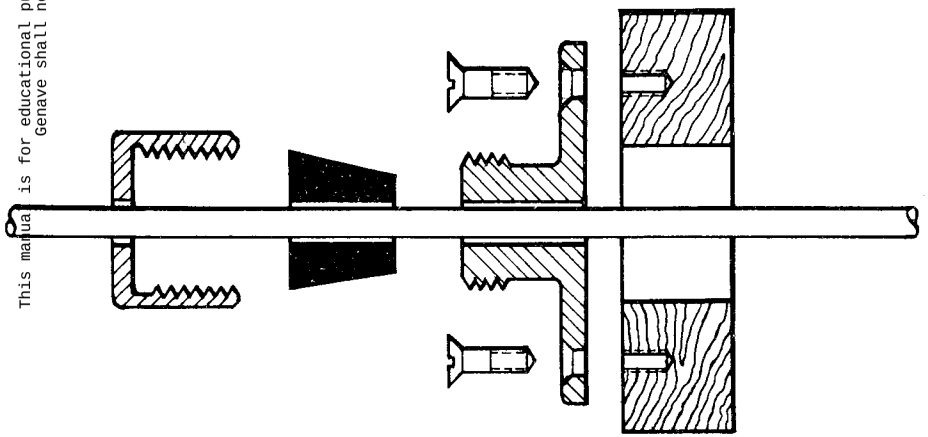
1. Mount the antenna to the selected surface using bolts or screws.
2. Route the antenna cable to the Marine/Mate-10. If it is necessary to route the antenna cable through hull sides, decks, or bulkheads and still maintain a waterproof seal use a waterproof bulkhead fitting as illustrated on the next page. These fittings are available from your local marine supplier.
3. Secure the antenna cable with heavy staples or tacks. Be careful not to kink or pull the coaxial cable around corners or sharp edges. It is more desirable to have some "extra" cable than not enough.
4. Install coaxial antenna connector (See illustration on next page) and connect securely to the coaxial receptacle at the rear of the Marine/Mate-10.
5. Your Marine/Mate-10 is now ready to operate.

CABLE CONNECTOR ASSEMBLY



1. Trim end of cable even. Remove outer jacket on cable to dimension shown. Place connector ring and adapter sleeve on cable.
2. Fan out braid and fold back as shown.
3. Remove insulation from the first ⅝" of center conductor as shown. Tin inner conductor with solder. Press braid over adapter sleeve and trim to dimension shown.
4. Screw plug assembly onto adapter sleeve and solder braid to plug assembly through solder holes in side. Solder center conductor to plug assembly center pin. To finish assembly screw connector ring over plug assembly.

WATERPROOF BULKHEAD FITTING



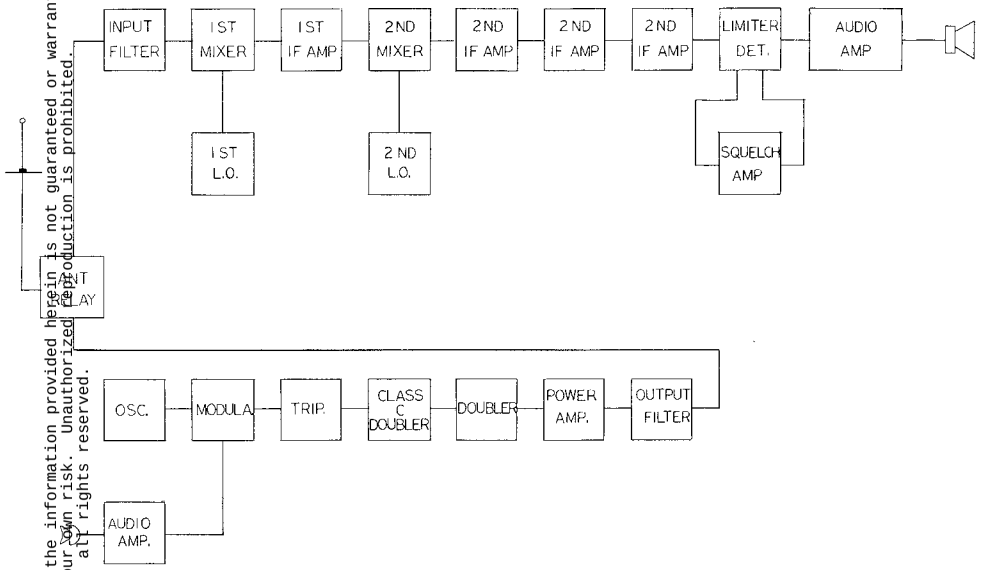
OPERATING INSTRUCTIONS

1. Turn volume (#1) and squelch control (#2) knobs completely counterclockwise.
2. Move the Off/1W/High switch (#3) to the 1W position.
3. Turn the volume control clockwise to adjust volume of the receiver to the desired level.
4. Turn squelch control clockwise until background sounds just disappear. Do not adjust squelch while signal is being received.
5. Select the desired channel by rotating the channel selector knob (#4).*
6. To transmit: depress button on microphone, hold microphone 4 to 6 inches from mouth, and talk in a normal voice.
7. Release the microphone button to listen.

*The Marine/Mate-10 comes with 2 factory installed and tuned channels. They are 6 and 16. (Mandatory channels: 16 for Distress, Safety and Calling; 6 for Intership Safety).

MAINTENANCE

Keep the unit dry and check electrical connections regularly for satisfactory operation under most normal conditions.



Block Diagram

THEORY OF OPERATION

INTRODUCTION

The Genave Marine/Mate-10 is a VHF FM transceiver intended for use in the marine radio services. It transmits and receives 16F3 emission in the frequency range from 156 to 162 MHz on any one of ten possible channels. The unit provides a nominal 10 watts of output power into a 50 ohm load.

RECEIVER

The receiver is basically a dual conversion superheterodyne type utilizing a single integrated circuit to perform the limiting and detection functions.

The received signal is applied from the antenna connector to the three pole low pass filter compirsed of C270, L213, and C254. This filter also functions as a low pass filter for the transmit function. The signal from the low pass filter is applied to pin 15 of K201, the T/R relay. In the receive mode the signal is fed to the input filter of the receiver via pin 14 of the T/R relay.

The receiver input filter consists of L101, L102, and L103 and their associated tuning and coupling capacitors. The output of the input filter is capacitively coupled to the base of Q101, the first mixer.

The first local oscillator consists of Q107 and associated circuitry. The desired crystal in the 47.7250 to 50.0583 MHz range is selected by means of the frequency selection switch, SW202. The collector circuit of Q107 is tuned to the third harmonic of the crystal frequency and the 143.175 to 150.175 MHz output is capacitively coupled to the base of Q101.

The 13.1 MHz difference signal produced in the first mixer is coupled to the first IF amplifier consisting of Q102 and associated circuitry. The output of the first IF amplifier is fed to Q103, a dual gate FET which together with its associated circuitry functions as the second mixer.

The second local oscillator consists of Q111 and associated circuitry. The second local oscillator operates at the srystal controlled frequency of 12.645 MHz. This 12.645 MHz signal produced is mixed with the 13.1 MHz signal from the first IF in the second mixer. The 455 KHz difference frequency produced by the second mixer is applied to the second IF amplifiers of Q104, Q105, Q106, and their associated circuitry.

The 455 KHz second IF signal is applied to pins 1 and 2 of IC101. IC101 performs the limiting and detection functions in the receiver. C130 sets the de-emphasis level in the detection circuitry. T111, R136, and C132 form the quadrature detector transformer circuit. Detected audio is fed from pin 8 of IC101 through C133 and R121 to the audio amplification circuits via pin 14. Detected audio from pin 8 is also fed to the noise amplifier consisting of Q109 and associated circuitry. The amplified noise from Q109 is fed to the voltage doubling detector of CR101, CR102, and C137. The detected noise level is fed to the base of Q110. R127, the squelch control, controls the authority of the detected noise level on the base of Q110. As Q110 begins to turn on, the audio level at the output (pin 12) of IC101 is reduced.

R129, the volume control, sets the level of audio fed to IC102, the audio amplifier. R130 and C140, and R131 and C141 perform the frequency response shaping of the audio amplifier while C143, C144, and C147 provide feedback to various stages within IC102. Output audio from IC102 is applied from pin 12 through C146 to the speaker.

TRANSMITTER

The modulator audio amplifier in the unit is built around a single integrated circuit, IC201. This IC is a dual operational amplifier and is shown on the schematic diagram as IC201A and IC201B. The audio output of the ceramic microphone is amplified by IC 201A. A 6 db/octave rising characteristic is given to the audio frequencies by loading the 1500 pfd microphone capacitance with the bias resistors R231 and R232. IC201 also provides the clipping function required for limiting the modulation by saturating symmetrically against the supply voltage and ground. The regulated supply voltage for the modulator is obtained by applying 13.75 VDC primary power through R253 and across a 6.8 volt zener diode, CR206.

The output from IC201A is applied to IC201B which acts as an active, 2-pole, Chebyshev low pass filter with a cutoff frequency of 3 KHz. R238 and C266 add a third pole to the filter which gives the required — 18 db/octave 3 KHz.

R239 controls the audio level applied to the modulator varactor diode, CR202. R207 and C215 convert the audio signal to the modulation diode to the form required to produce phase modulation.

DC bias for the modulation diode is provided by IC201B through R232, R239, and R207. The audio return from R239 is provided by C267.

Q201 is the oscillator transistor and accordingly generates the required RF signal. Power for the oscillator is derived from a separate voltage regulator. (R201 and CR210). The oscillator is a basic Colpitts or Clapp crystal circuit. Variable capacitors are used in series with each crystal to allow exact setting of the generated frequency. Output from the oscillator is from 13.00416 to 13.11875 MHz. The oscillator output is multiplied by 12 in the multiplier stages resulting in a final output frequency from 156.025 to 157.425 MHz.

Frequency modulation of the carrier signal is accomplished by CR202. A signal from Q201, the oscillator transistor, is applied to CR202 by a tuned transformer, T201. As an audio signal is applied to the varactor diode, CR202, from the modulation audio amplifier; the capacitance of the diode changes thus varying the resonant frequency of the tuned transformer, T201. This results in phase modulation of the carrier signal. The audio signal is de-emphasized before application to CR202, however, resulting in frequency modulation of the carrier rather than phase modulation.

The output of the modulator is first applied to Q202, an RF tripler. In this stage the input frequency of 13.1 MHz is multiplied to 39.3 MHz. Other harmonics and subharmonics are filtered out by a double-tuned transformer, T202.

The output of T202 is fed to Q203, a Class C doubler, which increases the signal frequency to 78.6 MHz. The undesired signals generated in this stage are removed by the tuned transformer, T203.

The output of T203 is applied to the base of Q204, the last multiplier stage. Q204 doubles the signal frequency to 157.2 MHz. The output of Q204 is matched to the input of Q205 by a resonant "L" section consisting of L201 and C230. This circuit also provides some degree of subharmonic suppression.

The power amplifier in the transmitter consists of Q205, Q206, and associated circuitry. The complement of devices increases the output from Q204, nominally 50 milliwatts, to the rated output of the transmitter, 10 watts. Frequency selective matching networks are used between each of the stages to effectively couple power between devices and to reject the unwanted spurious responses from the desired signal.

SW201A switches R224 into a series connection between the collector supply and Q206 when the switch is in the "1W" position. This reduces the output power of the transmitter to 1 watt for short distance, low power drain operation.

A relatively complex filter is used in the unit to remove subharmonic spurious outputs and harmonic radiations from the RF signal prior to transmission. C239, L205, and C248 comprise a resonant matching network which matches the output of Q206 to the 50 ohm antenna impedance. The remainder of the components up to the output connector form an eliptic function, filter which reduces the level of all spurious outputs to less than −13 dbm.

PRIMARY POWER

Power to operate the unit is supplied from the 13.75 VDC external power source via the input connector, F201, and SW201B. The 13.75 VDC line supplies power to operate the relay, K201; and the transmitter and receiver circuitry, via Pins 11, 12, and 13 of K201.

The transceiver is protected against a reversed polarity input voltage by means of CR203 and CR205. CR204 prevents the feedback of induced voltage spikes generated by K201, on the 13.75 VDC line. C268 acts as a filter on the 13.75 VDC line. C268 acts as a filter on the 13.75 VDC line.

ALIGNMENT PROCEDURE

is set exactly to 156.3 MHz. Set the FM signal generator RF attenuator for minimum output.

2. Check that the transceiver is set on channel 6. Adjust the transceiver volume control so that the receiver background noise indicates −10 db on the AC VTVM.

NEVER attempt to realign the circuitry of the unit unless the test equipment specified for each section is available.

RECEIVER ALIGNMENT

PREPARATION

To properly align the receiver the following test equipment or its equivalent is required:

a. Oscilloscope, DC—8MHz, DC coupled, Calibrated vertical attenuator, (Heathkit 10-14, or equivalent).
b. RF Signal Generator, 13.1 MHz, 156 MHz, and 163.5 MHz.
c. Sweep Signal Generator, Must be capable of sweeping the frequency range 156 to 158 MHz.
d. FM Signal Generator, Must cover the frequency range 156 to 163.5 MHz with a deviation of at least 5 KHz at 1000 Hz.
e. Frequency Counter, DC—150 MHz.
f. AC VTVM, any accurate instrument.
g. DC Power Supply, low ripple.

To facilitate test-equipment connections to the receiver during alignment, short pieces of wire can be soldered to the bottom of the receiver board at the following points:

Secondary pins of T110 (455 KHz output transformer)
Pin 3 of T102 (13.1 MHz output coil)
Tap of L103 (RF filter output coil)
Emitter of Q101 (1st mixer transistor)

Select Channel 6 and turn the volume and squelch controls fully counterclockwise. Connect the transceiver to a 13.75 VDC, filtered power supply.

455 KHz IF ALIGNMENT

1. Connect the scope vertical input to the secondary of T110 with a length co-ax cable. Set the scope vertical attenuation for maximum sensitivity.
2. Connect the RF output of the RF signal generator to the frequency counter and set the frequency to exactly 13.1 MHz, unmodulated.
3. Disconnect the frequency counter, and connect the RF output of the Signal Generator between Pin 3 of T102 and receiver ground.
4. Turn the transceiver power switch on, and adjust the Signal Generator RF attenuator and scope controls to give a usable pattern of the 455 KHz IF signal.

   NOTE: Small changes in the amplitude of the IF signal are more easily seen if the attenuator on the signal generator is kept set so that the IF signal covers about ¾ of the scope screen vertically, and the scope internal sweep is set slow enough to display a large number of IF cycles.

5. Tune the cores of 455 KHZ IF transformers T110, T109, T108, T107, T106, T105, T104, and T103 (in that order) for maximum amplitude on the scope. Reduce signal generator attenuator as necessary to keep a usable presentation on the scope.
6. Turn the transceiver power switch OFF, and disconnect the RF cable of the signal generator from Pin 3 of T102. Check that the signal generator is still set exactly to 13.100 MHz.

13.1 MHz IF ALIGNMENT

1. Connect the RF cable of the signal generator between the tap of L103 and ground. Leave oscilloscope connected as above.
2. Turn the transceiver power switch on, and reduce the setting of the signal generator RF attenuator to keep a useable presentation on the scope screen.
3. Adjust the bottom core of T102 for maximum amplitude. Adjust bottom and top cores of T101 for maximum amplitude.
4. Adjust all four cores in this manner, until no further increase in amplitude can be obtained.

5. Turn the transceiver power switch OFF, and disconnect the oscilloscope and the signal generator from the transceiver.

transformer, T201. As an audio signal is applied to the varactor diode, CR202, from the modulation audio amplifier; the capacitance of the diode changes thus varying the resonant frequency of the tuned transformer, T201. This results in phase modulation of the carrier signal. The audio signal is de-emphasized before application to CR202, however, resulting in frequency modulation of the carrier.

2. Set the sweep generator to sweep from 156 MHz to 163.5 MHz. Use the RF signal generator as a marker generator to produce 156 and 163.5 MHz markers.
3. Turn the transceiver power switch on.
4. Set the scope vertical attenuator to the most sensitive position, and set the RF output of the sweep generator low enough to prevent over driving the RF input filter.
5. Adjust C101, C103, and C105 to give a 4 MHz bandpass similar to that shown in figure 1.
6. Turn the transceiver power switch off, and disconnect the test equipment from the transceiver.

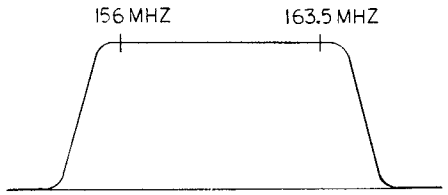
OSCILLATOR COIL ADJUSTMENT

CAUTION: *Never* depress the microphone push-to-talk button while a signal generator is connected to the ANTENNA connector, as the transmitter power would damage the RF attenuator.

1. Using the frequency counter, set the FM signal generator exactly to 156.3 MHz. Disconnect the frequency counter from the FM signal generator RF cable and connect the RF cable to the transceiver ANTENNA connector. The FM signal generator RF attenuator should be set to the minimum position, and the modulation should be off.
2. Set the AC VTVM, or other DB meter, to a convenient range, such as −10 db, and connect the meter leads across the speaker voice coil.
3. The transceiver frequency selector should still be set to channel 6, the squelch and volume controls turned fully counterclockwise.
4. Turn the transceiver power switch on.
5. Adjust the volume control clockwise until the receiver background noise indicates −10 db on the AC VTVM. Increase the setting of the FM signal generator RF attenuator until the receiver background noise drops to approximately −27 db (17 db quieting).
6. Adjust the RF filter capacitor, C105, for maximum quieting (minimum indication on the AC VTVM).
7. Tune the core of tthe oscillator coil, L104, for maximum quieting. If necessary, reduce the output of the signal generator, to keep a readable indication on the DB meter.
8. Turn the transceiver power switch off, but leave the FM signal generator and DB meter connected to the transceiver.

DETECTOR TRANSFORMER ADJUSTMENT

1. Connect the oscilloscope vertical input cable across the speaker voice coil, paralleling the AC VTVM leads.
2. Check to insure that the FM signal generator is still set to 156.3 MHz. Set the signal generator modulation for 5 KHz deviation at 1 KHz. The signal generator RF attenuator should be set in the vicinity of 2 microvolts.
3. Turn the transceiver power switch on, and adjust the scope controls to give a readable display of the 1 KHz modulation.
4. Adjust the core in the discriminator transformer, T111, for best linearity of the 1KHz signal. The AC VTVM and the scope will show maximum amplitude of the 1 KHz modulation at this point.
5. The receiver is correctly aligned now, and the sensitivity for 20 db quieting may be checked. Leave the test equipment connected to the transceiver.



Swept Input Filter
Figure 1

RF INPUT FOR 20 DB QUIETING

1. Turn the FM signal generator modulation off, and ascertain that the generator is set exactly to 156.3 MHz. Set the FM signal generator RF attenuator for minimum output.
2. Check that the transceiver is set on channel 6. Adjust the transceiver volume control so that the receiver background noise indicates −10 db on the AC VTVM.
3. Slowly increase the setting of the FM signal generator RF attenuator, until the AC VTVM indicates −30 db. Note the RF level shown on the FM signal generator attenuator. This is the RF input required to produce 20 db receiver quieting. Normally, an input of −109 dbm (0.8 uvolt) to −112 dbm (0.55 uvolt) will quiet the receiver 20 db.
4. Check the receiver quieting with the transceiver and signal generator on each additional frequency installed in the unit. On each frequency the receiver should quiet 20 db with an input of −109 dbm (0.8 uvolt) to −112 dbm (0.55 uvolt).

SQUELCH OPERATION

1. Set the signal generator on 156.3 MHz, and set the modulation for 5 MHz deviation at 1 KHz. Set the RF attenuator for minimum RF output.
2. Set the transceiver on channel 6, and turn the squelch control fully clockwise. The receiver audio control should be set for maximum volume. The receiver is now fully squelched, and should be completely silent.
3. Reduce the DC input voltage to approximately 11 volts, and note that the receiver is still fully squelched. Return DC input to 13.75 VDC, and set volume control at midrange.
4. Increase the setting of the signal generator RF attenuator until the squelch just fully opens. The RF attenuator should show — 111 dbm (0.6 uvolt) or better.
5. Repeat the above steps for each additional frequency installed in the unit. On each frequency, the squelch should open at approximately −110 dbm or better.

AUDIO OUTPUT POWER

1. Set the FM signal generator on 156.3 MHz, and set the modulation for KHz deviation at 1 KHz. Set the RF attenuator in the vicinity of 5 microvolts.
2. Set the transceiver on channel 6 and turn the volume control fully clockwise. The AC VTVM should indicate not less than 2.83 volts (1 watt).
3. Set the signal generator for 5 KHz deviation at 400 Hz, and note that the AC VTVM indicates at least 2.83 volts with the transceiver volume control fully clockwise.
4. Set the signal generator for 5 KHz deviation at 3 KHz. Again the AC VTVM should indicate at least 2.83 volts at maximum setting of the transceiver volume control.
5. Turn off the transceiver power switch, and disconnect the AC VTVM and oscilloscope from the transceiver.

FREQUENCY MEASUREMENT

To insure that the receiver will operate on the correct frequency, each high frequency oscillator crystal frequency should be measured. The frequency should be within plus or minus .001% of the frequency found in the table on page 24. which corresponds to the frequency stamped on the crystal case divided by 3.

Tolerance = ± (.001%) × Stamped Table Frequency

Example: for Ch. 6 (156.3 MHz)

Example: for Ch. 6 (156.3 MHz)

Tolerance = ± (.001) × 156.3 MHz
= 1.563 KHz

Connect the frequency counter to the transceiver with a short length of coax cable. The braid should be connected to the transceiver chassis, and the inner-conductor should be connected to the tap (pin 3) of the oscillator coil, L104.

1. Turn the transceiver power switch on.
2. Select channel 6 on the frequency selector, and read the crystal frequency, which should fall within the range listed above.
3. Repeat these steps for each receive frequency installed in the unit.
4. Turn off power switch, and disconnect frequency counter.

TRANSMITTER ALIGNMENT

PREPARATION

To properly align the transmitter of the unit the following test equipment or its equivalent is required:

a. Power Meter, 35 watts @ 163 MHz, or relative output indicating device, (See figure 4.) with 50 ohm dummy load.
b. Frequency Counter, DC—165 MHz, or other accurate frequency measuring device.
c. Deviation Meter, to read ∓ 7.5 KHz.
d. Power Supply, 13.75 VDC at 8 amp minimum, filtered.
e. VTVM, Any accurate instrument.
f. Audio Generator, 1700 Hz.

To prepare the unit for alignment perform the following steps:

1. Attach a 50 ohm dummy load to the RF output connector through a power meter or relative output indicating device (figure 4).
2. Set the OFF/1W/HIGH switch to the HIGH position.
3. Preset the deviation potentiometer to its lowest setting (potentiometer rotated toward the receiver 3-pole input filter capacitor trimmers).
4. Connect the unit to a 13.75 VDC power source.

FREQUENCY AND POWER ALIGNMENT

1. Set the frequency selector to channel 6.
   NOTE: The signal peak voltage measurements in the following steps of this section were made with a VTVM and DC probe. Key the transmitter *only* when adjustments are being made.
2. Connect the DC probe to the emitter of Q202, key the transmitter and adjust the single slug of T201 for a peak at 13.025 MHz. Adjust the VTVM attenuator for an on-scale reading.
   NOTE: T201's slug will peak in two places . . . the peak with the slug closest to the printed circuit board is correct. The peak should reach about 1.4 volts.
3. Move the DC probe to the emitter of Q203. Key the transmitter and adjust the 2 slugs of T202 for a peak, centered on 39.075 MHz. Each slug should adjust between the winding and the outside end of the coil form. The signal should peak at about 0.38 volts.
4. Adjust T203 by connecting the Dc probe to the emitter of Q204, keying the transmitter, and adjusting the 2 slugs of T203 for a peak centered on 78. 150 MHz. Each slug should adjust between its winding and the outside end of the coil form. The signal should peak at about 1.2 volts.
5. If the relative output indicating device of figure 4 is used, connect the VTVM DC probe to the relative output terminal. Otherwise, observe the wattmeter or other relative output indicator.
6. Preset C235 by tightening the adjustment screw down firmly and backing it off ½ turn.
7. Key the transmitter and adjust C230, C234, C235, C239, and C248 for maximum relative output indication on 156.300 MHz. This step may be repeated if necessary.
8. With Channel 6 still selected and the OFF/LO/HIGH switch in the HIGH position, key the transmitter and adjust C203, the channel 6 crystal netting trimmer, for a frequency reading of 156.300 MHz on the frequency measuring device.
9. Repeat the above procedure for each transmit crystal installed in the unit, adjust its respective netting trimmer for the frequency stamped on the top of the crystal case.

POWER MEASUREMENT PROCEDURE

1. Set the frequency selector to Channel 6.
2. Key the transmitter and note the transmitter power reading on Channel 6. It should be no less than 8 watts.
3. Repeat the above step for each transmit frequency installed.
4. Set the OFF/1W/HIGH switch to the 1W position.
5. Key the transmitter and note the transmitter power reading on Channel 6. The power level on the 1W position is factory adjusted to approximately 1 watt, the maximum FCC limit, by changing the value of R224.
6. Repeat the above step for each transmit frequency installed.

CARRIER DEVIATION ADJUSTMENT

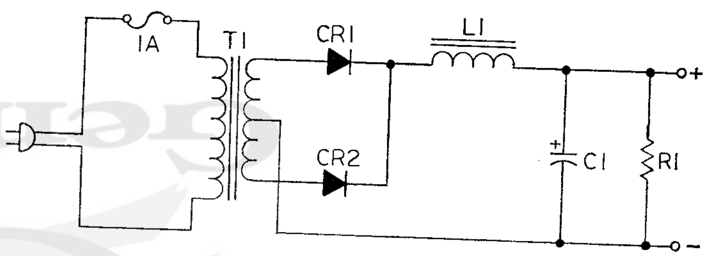
1. Set the frequency selector to Channel 6.
2. Set the OFF/1W/HIGH switch to the 1W position.
3. Connect the deviation meter to the frequency measuring output of the relative output indicating device.
4. Feed an audio signal of 1700 Hz into the transceiver microphone.
5. Key the transmitter, observe the frequency deviation meter, and increase the microphone audio input until no further increase in deviation is indicated. The modulator stage is now saturated.
6. With the frequency deviation meter set to either + or − deviation, key the transmitter and adjust the slug of T201 for a peak reading. The deviation potentiometer, R239, can be adjusted for an on-scale reading of the deviation meter.
7. Set the deviation potentiometer, R239 for a deviation reading of 5 KHz. Switch the deviation meter to the + and − positions and check the amount of deviation in each position.
8. If a difference exists between + and − deviation levels adjust T201 by rocking the slug slightly until the two levels are brought into balance. The difference in deviation levels should not exceed 0.4 KHz.

FREQUENCY CHANGES

Installation of additional channels in this unit can be easily accomplished by performing the following steps.

1. Remove the unit from its protective cover.
2. Install the new transmit and receive crystals into their appropriate socket.
3. Select the newly installed frequencies on the frequency selector and perform steps 8 and 9 of the Transmitter Frequency and Power Alignment procedure outlined on the preceding page.
4. Remove the frequency card from the front panel of the unit and type the new channel number on the card.
5. Replace the frequency card.

The charts on pages 24 and 25 of this manual will aid in selection of the desired frequencies to be installed. When ordering crystals from Genave be sure to specify the channel desired, the type of crystal desired (receive, transmit, or both), and the Model Designation: Marine/Mate-10.



C1 —29,000 MFD, 25 VDC, MALLORY CGS293U025V4C3PH OR EQUIVALENT — GENAVE PART NO. 1550014 — PRICE $5.45

D1,D2—6.0A, 50 PRV, SILICON — IN3491, IN1314, 20F10, ETC. — GENAVE PART NO. 4812111 — PRICE $1.22 EACH

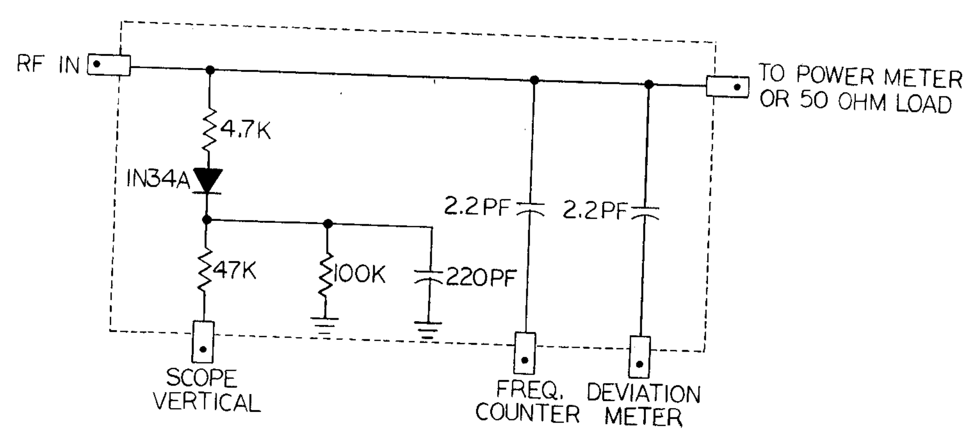
T1— 120 VAC PRI: 34 V C.T. SEC @ 6A — GENAVE PART NO. 5600037 — PRICE $15.48

L1— SAT. CORE REACTOR, .25 MHY, 100 MILLIOHM — GENAVE PART NO. 1800210 — PRICE $8.04

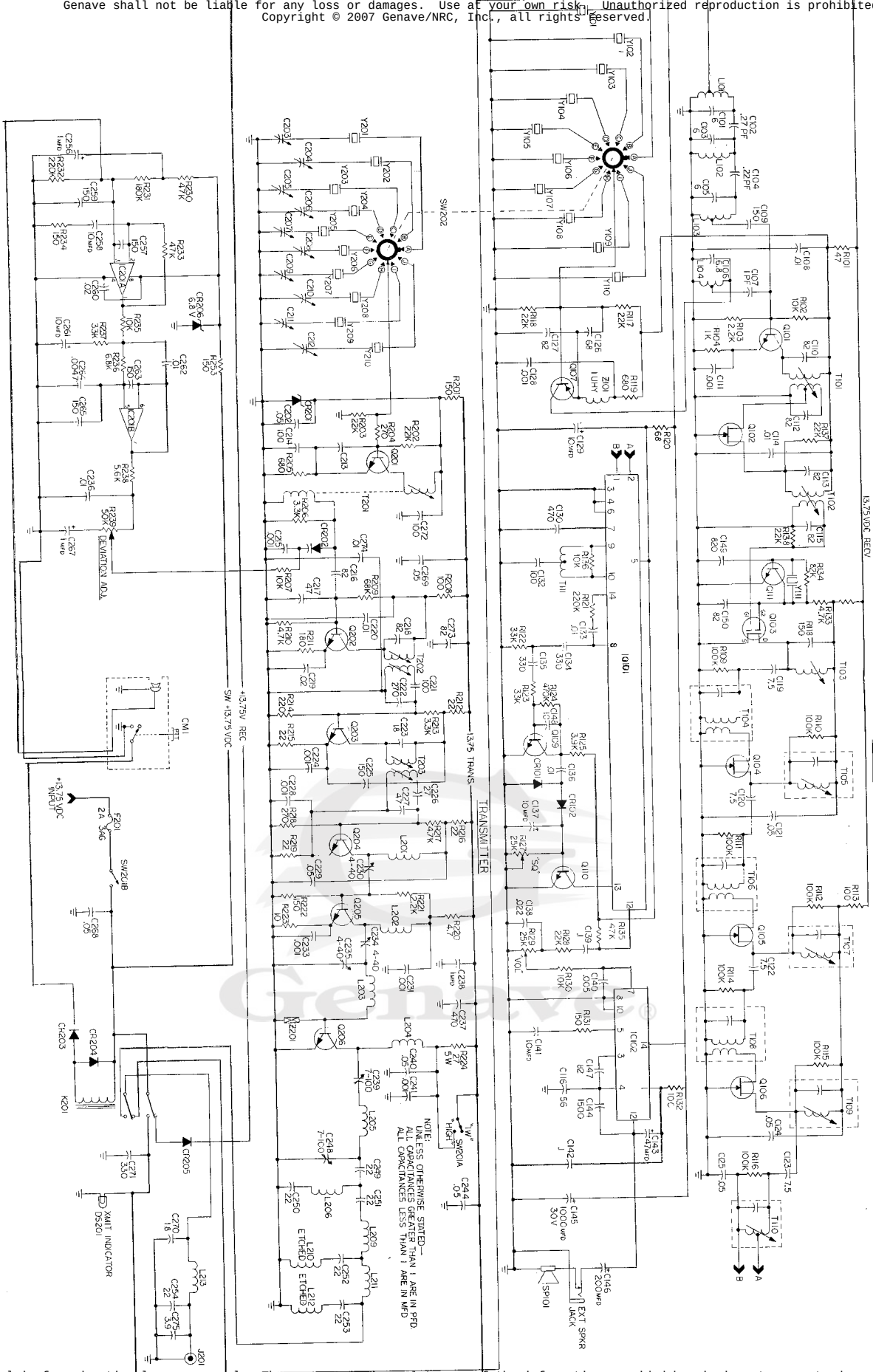
R1 — 47 OHM, 10W, WIREWOUND — GENAVE PART NO. 4740028— PRICE $.36

THE ABOVE PARTS ARE AVAILABLE FROM GENAVE BY MAILING CHECK OR MONEY ORDER ALONG WITH GENAVE PART NUMBER OF DESIRED PARTS.

AC Power Supply
Figure 3

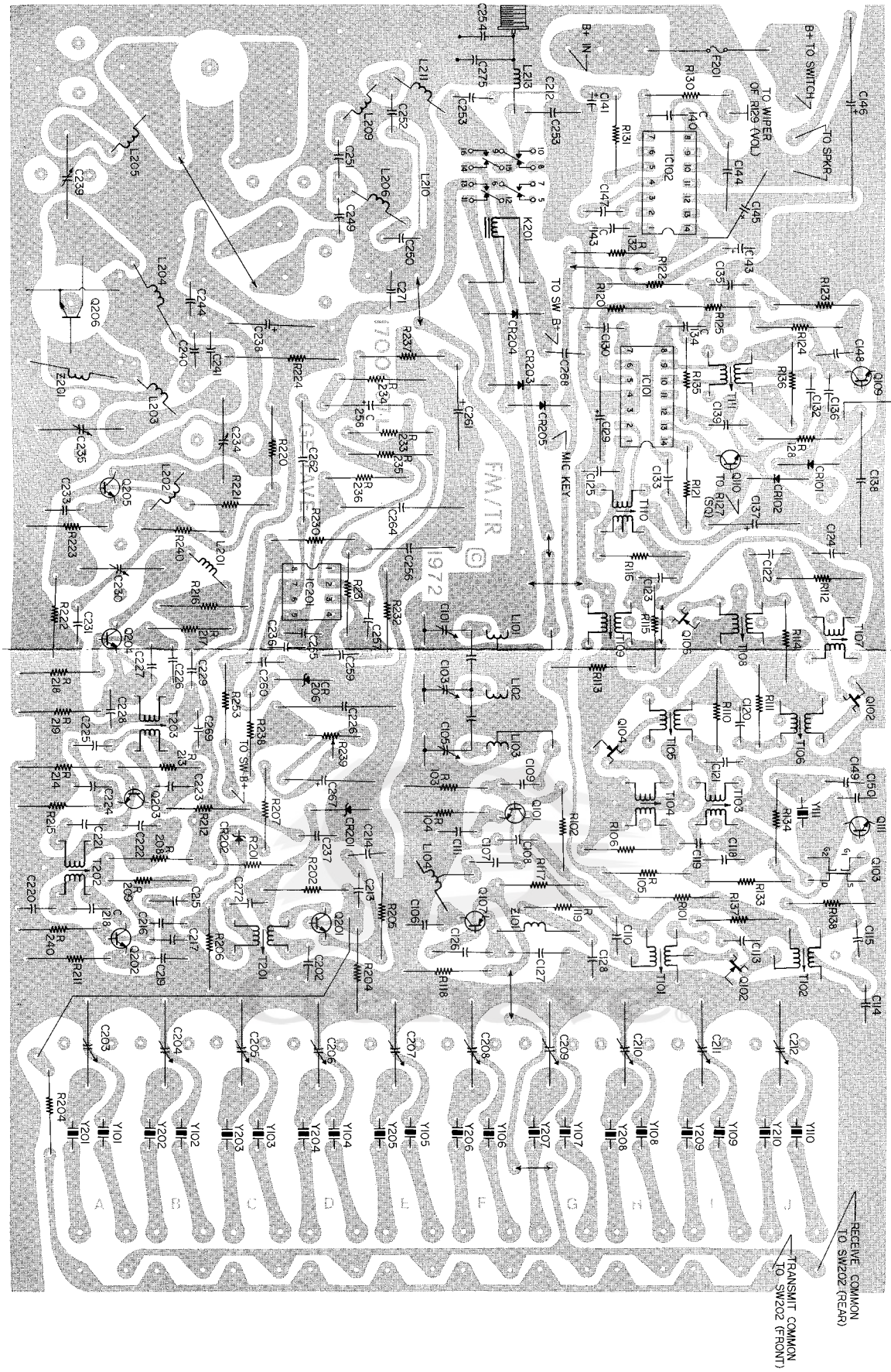


Relative Output Indicator
Figure 4



Schematic
Figure 5

Parts/Track Map
Figure 6



MARINE/MATE-10 PARTS LIST

Ref. No.	Genave Part No.	Description
		CAPACITORS
C101	1570120	Trimmer, 1-6 pf
C102	1510004	NPO Gimmick, .27 pf
C103	1570120	Trimmer, 1-6 pf
C104	1510003	NPO Gimmick, .22 pf
C105	1570120	Trimmer, 1-6 pf
C106	1520005	NPO Disc, 6.8 pf, 10%
C107	1510011	NPO Gimmick, 1.0 pf, 10%
C108	1520051	Y5U, Disc, .01 mfd, 25V, 10%
C109		Unassigned
C110	1520176	N330, Disc, 82 pf, 10%
C111	1520048	Z5P, Disc, .001 mfd, 10%
C112	1520176	N330,Disc, 82 pf, 10%
C113	1520176	N330, Disc, 82 pf, 10%
C114	1520051	Y5U, Disc, .01 mfd, 25V, 10%
C115	1520176	N330, Disc, 82 pf, 10%
C116		Unassigned
C117	1520027	N750, Disc, 150 pf, 10%
C118	1520027	N750, Disc, 150 pf, 10%
C119	1520175	NPO, Disc, 7.5 pf, 5%
C120	1520175	NPO, Disc, 7.5 pf, 5%
C121	1520054	M25, Disc, .05 mfd, 25V, +80 – 20%
C122	1520175	NPO, Disc, 7.5 pf, 5%
C123	1520054	M25, Disc, .05 mfd, 25V, +80 – 20%
C125	1520054	M25, Disc, .05 mfd, 25V, +80 – 20%
C126	1520019	NPO,Disc, 68 pf, 10%
C127	1520176	N330, Disc, 82 pf, 10%
C128	1520048	Z5P, Disc, .001 mfd, 10%
C129	1540014	Aluminum Electrolytic, 10 mfd, 16V
C130	1520047	Y5E, Disc, 820 pf, 10%
C131	1520022	N220, Disc, 100 pf, 10%
C132	1520022	N220, Disc, 100 pf, 10%
C133	1520051	Y5U, Disc, .01 mfd, 25V, 10%
C134	1520037	Y5E, Disc, 330 pf, 10%
C135	1520037	Y5E, Disc, 330 pf, 10%
C136	1520051	Y5U, Disc, .01 mfd, 25V, 10%
C137	1540014	Aluminum Electrolytic, 10 mfd, 16V
C138	1500024	Mylar, .022 mfd, 10%, 100V
C139	1520055	Disc, 1 mfd, +80 – 20%, 12V
C140	1520048	Z5P, Disc, .001 mfd, 10%
C141	1500004	Tant, 10 mfd, 25V, 10%
C142	1520055	Disc, 1 mfd, +80 – 20%, 12V
C143	1550005	Tant, 47 mfd, 10%, 15V
C144	1500004	Polyethyle, .0015 mfd, 10%, 250V
C145	1540038	Aluminum Electrolytic, 1000 mfd, 30V
C146	1540212	Aluminum Electrolytic, 200 mfd, 12V
C147	1520176	N330, Disc, 82 pf, 10%
C148	1520007	NPO, Disc, 10 pf, 10%
C149	1520047	Y5E, Disc, 820 pf, 10%
C150	1520176	N330, Disc, 82 pf, 10%
C202	1520054	M25, Disc, .05 mfd, +80 – 20%, 25V
C203	1560403	Trimmer, 40 pf
C204	1560403	Trimmer, 40 pf
C205	1560403	Trimmer, 40 pf
C206	1560403	Trimmer, 40 pf
C207	1560403	Trimmer, 40 pf
C208	1560403	Trimmer, 40 pf
C209	1560403	Trimmer, 40 pf
C210	1560403	Trimmer, 40 pf
C211	1560403	Trimmer, 40 pf
C212	1560403	Trimmer, 40 pf
C213	1520018	N220, Disc, 56 pf, 10%
C214	1520176	N330, Disc, 82 pf, 10%
C215	1520048	Z5P, Disc, .001 mfd, 10%
C216	1520014	NPO, Disc, 39 pf, 10%
C217	1520022	N220, Disc, 100 pf, 10%
C218	1520176	N330, Disc, 82 pf, 10%
C219	1520053	M25, Disc, .02 mfd, 10%
C220	1520051	Y5U, Disc, .01 mfd, 10%, 25V
C221	1520022	N220, Disc, 100 pf, 10%
C222	1520038	N1500, Disc, 270 pf, 10%
C223	1520010	NPO, Disc, 18 pf, 10%
C224	1520048	Z5P, Disc, .001 mfd, 10%
C225	1520027	N750, Disc, 150 pf, 10%
C226	1520012	NPO, Disc, 27 pf, 10%
C227	1520015	N1500, Disc, 47 pf, 10%
C228	1520048	Z5P, Disc, .001 mfd, 10%

Ref. No.	Part No. Genave	Description
C229	1520054	M25, Disc, .05 mfd, +80 – 20%, 25V
C230	1560403	Trimmer, 40 pf
C231	1520048	Z5P, Disc, .001 mfd, 10%
C232		Unassigned
C233	1520048	Z5P, Disc, .001 mfd, 10%
C234	1560403	Trimmer, 40 pf
C235	1560403	Trimmer, 40 pf
C236		Unassigned
C237	1520042	Y5E. Disc, 470 pf, 10%
C238	1540002	Aluminum Electrolytic, 1 mfd, 40V
C239	1560406	Trimmer, 115 pf
C240	1520054	M25, Disc, .05 mfd, +80 – 20%, 25V
C241	1520048	Z5P, Disc, .001 mfd, 10%
C242		Unassigned
C243		Unassigned
C244	1520054	M25. Disc, 0.5 mfd, +80 – 20%, 25V
C245		Unassigned
C246		Unassigned
C247		Unassigned
C248	1560406	Trimmer, 115 pf
C249	1520011	NPO, Disc, 22 pf, 10%
C250	1520011	NPO, Disc, 22 pf, 10%
C251	1520011	NPO, Disc, 22 pf, 10%
C252	1520011	NPO, Disc, 22 pf, 10%
C253	1520011	NPO, Disc, 22 pf, 10%
C254	1520011	NPO. Disc. 22 pf, 10%
C255		Unassigned
C256	1540002	Aluminum Electrolytic, 1 mfd, 40V
C257	1520028	Y5E, Disc, 150 pf, 10%
C258	1540014	Aluminum Electrolytic, 10 mfd, 16V
C259	1520028	Y5E. Disc, 150 pf, 10%
C260	1520053	M25, Disc, .02 mfd, 10%, 25V
C261	1540014	Aluminum Electrolytic. 10 mfd, 16V
C262	1500018	Mylar, .01 mfd, 10%, 100V
C263	1520028	Y5E, Disc, 150 pf, 10%
C264	1500013	Mylar. 5 mfd. 10%. 100V
C265	1520028	Y5E. Disc, 150 pf, 10%
C266	1500018	Mylar, .01 mfd. 10%, 100V
C267	1540002	Aluminum Electrolytic. 1 mfd, 40V
C268	1520054	M25, Disc, .05 mfd, +80 – 20%, 25V
C269	1520054	M25. Disc, .05 mfd, +80 – 20%, 25V
C270		Unassigned
C271	1520037	Y5E. Disc, 330 pf, 10%
C272	1520022	N220, Disc, 100 pf,10%
C273	1520176	N330, Disc, 82 pf, 10%
C274	1520051	Y5U. Disc, .01 mfd, 25V, 10%
C272	1520022	N220, Disc, 100 pf, 10%z
C273	1520176	N330, Disc, 82 pfd, 10%
C274	1520051	Y5U, Disc, .01 mfd. 25V, 10%
C275	1520003	NPO, 3.9 pfd, 10%
		DIODE
CR101	4810021	IN34A, Germanium
CR102	4810021	IN34A, Germanium
CR201	4810007	Zener, 6.8V, +10%
CR202	4812109	Varicap, MV2109 or SKV1638
CR203	4810013	Gen. Purpose, 100V @ 1 amp
CR204	4810013	Gen. Purpose, 100V @ 1 amp
CR205	4810013	Gen. Purpose, 100V @ 1 amp
CR206	4810007	Zener, 6.8V, ±10%
		LAMPS
DS201	3900025	Clear—14.4V #53
		COILS
L101	1800109	Coil, Input
L102	1800107	Coil, Center Pole Input Filter
L103	1800108	Coil, Output
L104	1800200	Coil, Osc.
L201	1800201	Coil, Transmitter
L202	1800201	Coil, Transmitter
L203	1800201	Coil, Transmitter
L204	1800202	Coil. Transmitter
L205	1800201	Coil, Transmitter
L206	1800204	Coil. Transmitter
L207		Unassigned
L208		Unassigned
L209	1800201	Coil. Transmitter
L210		Etched on Circuit Board
L211	1800203	Coil. Transmitter
L212		Etched on Circuit Board
L213	1800205	Coil. Transmitter
		TRANSISTORS
Q101	4800024	Silicon. NPN, Blue. MPS 3563
Q102	4805484	JFET, N. Channel, 2N5484

Ref. No.	Genave Part No.	Description
Q103	4800122	MOSFET, N. Channel, Dual Gate, MPF 122
Q104	4805458	JFET, N. Channel, 2N5458
Q105	4805458	JFET, N. Channel, 2N5458
Q106	4805458	JFET, N. Channel. 2N5458
Q107	4800043	Silicon, PNP, 2N5227
Q108		Unassigned
Q109	4800028	Silicon, NPN, Red, MPS 6513S
Q110	4800028	Silicon, NPN, Red, MPS 6513S
Q111	4800033	Silicon, NPN, MPS 5172
Q201	4800033	Silicon, NPN, MPS 5172
Q202	4800026	Silicon, NPN, White, MPS 3693S
Q203	4800026	Silicon, NPN, White, MPS 3693S
Q204	4804427	Silicon, NPN, 2N4427
Q205	4804427	Silicon, NPN, 2N4427
Q206	4806080	Silicon, NPN, 2N6080
		RESISTORS
R101	4700009	10 ohm, ±10%, ½ W
R102	4700037	10K ohm, ±10%, ½ W
R103	4700029	2.2K ohm, +10%, ½ W
R104	4700025	1K ohm, ±10%, ½ W
R105	4700013	100 ohm, ±10%, ½ W
R106		Unassigned
R107		Unassigned
R108		Unassigned
R109	4700049	100K ohm, ±10%, ½ W
R110	4700049	100K ohm, ±10%, ½ W
R111	4700049	100K ohm, ±10%, ½ W
R112	4700049	100K ohm, +10%, ½ W
R113	4700013	100 ohm, +10%, ½ W
R114	4700049	100K ohm, ±10%, ½ W
R115	4700049	100K ohm, ±10%, ½ W
R116	4700049	100K ohm, ±10%, ½ W
R117	4700033	4.7K ohm, +10%, ½ W
R118	4700041	22K ohm, ±10%, ½ W
R119	4700023	680 ohm, ±10%, ½ W
R120	4700009	47 ohm, ±10%, ½ W
R121	4700053	220K ohm, ±10%, ½ W
R122	4700043	33K ohm, ±10%, ½ W
R123	4700043	33K ohm, ±10%, ½ W
R124	4700057	470K ohm, ±10%, ½ W
R125	4700037	10K ohm, ±10%, ½ W
R126		Unassigned
R127	4760024	Variable, Linear Taper, 25K, +20% (SQ)
R128		Unassigned
R129	4760025	Variable, Audio Taper, 25K, ±20%, (Vol)
R130	4700037	10K ohm, ±10%, ½ W
R131	4700015	150 ohm, ±10%, ½ W
R132	4700013	100 ohm, ±10%, ½ W
R133	4700033	4.7K ohm, +10%, ½ W
R134	4700048	82K ohm, ±10%, ½ W
R135	4700045	47K ohm, ±10%, ½ W
R136	4700037	10K ohm, ±10%, ½ W
R137	4700041	22K ohm, ±10%, ½ W
R138	4700041	22K ohm, ±10%, ½ W
R201	4700015	150 ohm, ±10%, ½ W
R202	4700041	22K ohm, ±10%, ½ W
R203	4700041	22K ohm, ±10%, ½ W
R204	4700018	270 ohm, ±10%, ½ W
R205	4700023	680 ohm, ±10%, ½ W
R206	4700031	3.3K ohm, ±10%, ½ W
R207	4700037	10K ohm, ±10%, ½ W
R208	4700013	100 ohm, ±10%, ½ W
R209	4700047	68K ohm, ±10%, ½ W
R210	4100033	4.7K ohm, +10%, ½ W
R211	4700016	180 ohm, ±10%, ½ W
R212	4700006	22 ohm, ±10%, ½ W
R213	4700031	3.3K ohm, ±10%, ½ W
R214	4700017	220 ohm, ±10%, ½ W
R215	4700006	22 ohm, ±10%, ½ W
R216	4700006	22 ohm, ±10%, ½ W
R217	4700033	4.7K ohm, +10%, ½ W
R218	4700017	220 ohm, ±10%, ½ W
R219	4700006	22 ohm, ±10%, ½ W
R220	4700003	10 ohm, ±10%, ½ W
R221	4700029	2.2K ohm, +10%, ½ W
R222	4700015	150 ohm, ±10%, ½ W

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Ref. No.	Genave Part No.	Description
R223	4700003	10 ohm, ±10%, ½ W
R224	4740021	27 ohm, Wire Wound, ±10%, 5 W
R225		Unassigned
R226		Unassigned
R227		Unassigned
R228		Unassigned
R229		Unassigned
R230	4700045	47 ohm, ±10%, ½ W
R231	4700052	180K ohm, ±10%, ½ W
R232	4700053	220K ohm, ±10%, ½ W
R233	4700045	47K ohm, ±10%, ½ W
R234	4700015	150 ohm, ±10%, ½ W
R235	4700037	10K ohm, ±10%, ½ W
R236	4700035	6.8K ohm, ±10%, ½ W
R237	4700043	33K ohm, ±10%, ½ W
R238	4700034	5.6K ohm, ±10%, ½ W
R239	4760021	50K ohm, Variable Minipot, 20%
		IC's
TC101	3136666	Silicon, TISN76666N
TC102	3136001	Silicon, Audio Output, 5N7600IN
TC201	3130012	Op. Amp., N5558V
		TRANSFORMERS
T101	5600080	Input, 1st IF
T102	5600080	Input, 1st IF
T103	5600076	455kHz
T104	5600012	455 kHz IF, White Core
T105	5600012	455 kHz IF, White Core
T106	5600012	455 kHz IF, White Core
T107	5600012	455 kHz IF, White Core
T108	5600012	455 kHz IF, White Core
T109	5600012	455 kHz IF, White Core
T110	5600012	455 kHz IF, White Core
T111	5600012	455 kHz IF, White Core
T201	5600081	Osc
T202	5600082	Tripler
T203	5600083	1st Doubler
		CRYSTALS
Y111	2300251	12.645 MHz
Y201	2300423	146.940 MHz, Xmit
Y202	2300422	146.940 MHz, RCV
		CHOKES
Z101	1800035	1 microhenry, 200 series
Z201	1800063	Ferrox Cube Core
		MISCELLANEOUS
K201	4500007	Relay, 4PDT, R10-E2-X4-V185 PB
SW201	5100051	Switch, Slide
SW202	5100073	Switch, Rotary
	2502311	Panel Front
	2508201	Panel Trim
	2508221	Knob, Freq. Sel.
	2508231	Knob, Vol. & Sq.
	2508072	Bracket Sub-Panel
	2502292	Bracket Mtg. (Handle)
	2502321	Cover
	1325069	Microphone (ceramic)
	1340408	Speaker, 1.5 W, 8 ohm

MARINE/MATE-10
CHANNEL RECOMMENDATION CHART

INSTRUCTIONS

Your Marine/Mate-10 automatically includes 2 channels. These channels are: Channel 6 (Intership Safety) and Channel 16 (Distress, Safety and Calling). All channels other than 6 and 16 which are in your Marine/Mate-10 are called "working channels" (with the exception of Weather Monitor, which is receive only).

In the event you wish to have additional channels installed in your Marine/Mate-10, utilize the following steps to determine which channels are recommended:

1. Determine the total number of working channels that you will have in your Marine/Mate-10 after you have installed the new channels.
   A. Count any old working channels that are presently installed.
   B. Do not include channels 6 and 16.
   C. Add to this count the number of new working channels (including Weather Monitor) which you desire to install. This number determines the Total Number of Working Channels.
2. If your ship is a recreational vessel locate the Total Number of Working Channels in column "A".
3. If your ship is a commercial vessel locate the Total Number of Working Channels in column "B".
4. Proceed down the column titled "Total Number of Working Channels" for your vessel and read across at each "x" for description of communications recommended and the channel designation.
5. Where more than one channel designation is listed, select the channel used in your boating area.

TOTAL NUMBER OF WORKING CHANNELS "A" Recreational Vessels							"B" Commercial Vessels							TYPE OF COMMUNICATION	CHANNEL DESIGNATION
1	2	3	4	5	6	7	1	2	3	4	5	6	7		
		x	x	x	x	x				x	x	x	x	PORT OPERATIONS Ship/Ship & Ship/Coast	12
												x	x	PORT OPERATIONS Ship/Ship & Ship/Coast	65, 66, 73, 14, 74, 20
					x	x				x	x	x	x	NAVIGATIONAL Ship/Ship & Ship/Coast	13
				x	x	x							x	ENVIRONMENTAL & WEATHER Ship Receive Only	15, WX_1, WX_2
							x	x	x	x	x	x	x	COMMERCIAL Ship/Ship & Ship/Coast	7, 9, 10, 11, 18, 19, 79, 80
												x	x	COMMERCIAL Ship/Ship	67, 8, 77, 88
x	x	x	x	x	x	x								NON-COMMERCIAL Ship/Ship & Ship/Coast	68
			x	x	x	x								NON-COMMERCIAL Ship/Coast	9, 69, 71, 78
						x								NON-COMMERCIAL Ship/Ship	70, 72
	x	x	x	x	x	x		x	x	x	x	x	x	PUBLIC CORRESPONDENCE Ship/Public Coast	24, 84, 25, 85, 26, 86, 27, 87, 28

NUMERICAL LISTING OF VHF MARINE RADIOTELEPHONE CHANNELS

CHANNEL	XMIT FREQUENCY (Mhz) SHIP	COAST	AUTHORIZED TRAFFIC	POINTS OF COMMUNICATION
1	156.050	160.650	International Only	Ship/Shore
2	156.100	160.700	International Only	Ship/Shore
3	156.150	160.750	International Only	Ship/Shore
4	156.200	160.800	International Only	Ship/Shore
5	156.250	160.850	International Only	Ship/Shore
6	156.300	——	INTERSHIP SAFETY	Ship/Ship
7	156.350	160.950	International Only	Ship/Shore
7A	156.350	156.350	Commercial	Ship/Ship, Ship/Shore
8	156.400	——	Commercial	Ship/Ship
9	156.450	156.450	Commercial, Non-Commercial	Ship/Ship, Ship/Shore
10	156.500	156.500	Commercial	Ship/Ship, Ship/Shore
11	156.550	156.550	Commercial	Ship/Ship, Ship/Shore
12	156.600	156.600	Port Operations, USCG	Ship/Ship, Ship/Shore
13	156.650	156.650	Canals, Locks, Pilots	Ship/Ship, Ship/Shore
14	156.700	156.700	Port Operations, USCG	Ship/Ship, Ship/Shore
15	——	156.750	Environmental, Hydrographic	Ship Receive Only
16	156.800	156.800	DISTRESS, SAFETY, & CALLING	Ship/Ship, Ship/Shore
17	156.850	156.850	Restricted, State Control	Ship/Shore
18	156.900	161.500	International Only	Ship/Ship, Ship/Shore
18A	156.900	156.900	Commercial	Ship/Ship, Ship/Shore
19	156.950	161.550	International Only	Ship/Ship, Ship/Shore
19A	156.950	156.950	Commercial	Ship/Ship, Ship/Shore
20	157.000	161.600	Port Operations	Ship/Ship, Ship/Shore
21	157.050	161.650	International Only	Ship/Shore
21CG	157,050	157.050	Restricted, USCG	Ship/Ship, Ship/Shore
22	157.100	161.700	International Only	Ship/Shore
22CG	157.100	157.100	Restricted, USCG	Ship/Ship, Ship/Shore
23	157.150	161.750	International Only	Ship/Shore
23CG	157.150	157.150	Restricted, USCG	Ship/Ship, Ship/Shore
24	157.200	161.800	Public Correspondence	Ship/Shore
25	157.250	161.850	Public Correspondence	Ship/Shore
26	157.300	161.900	Public Correspondence	Ship/Shore
27	157.350	161.950	Public Correspondence	Ship/Shore
28	157.400	162.000	Public Correspondence	Ship/Shore
60	156.025	160.625	International Only	Ship/Ship, Ship/Shore
61	156.075	160.675	International Only	Ship/Ship, Ship/Shore
62	156.125	160.725	International Only	Ship/Ship, Ship/Shore
63	156.175	160.775	International Only	Ship/Ship, Ship/Shore
64	156.225	160.825	International Only	Ship/Ship, Ship/Shore
65	156.275	160.875	International Only	Ship/Ship, Ship/Shore
65A	156.275	156.275	Port Operations	Ship/Ship, Ship/Shore
66	156.325	160.925	International Only	Ship/Ship, Ship/Shore
66A	156.325	156.325	Port Operations	Ship/Ship, Ship/Shore
67	156.375	——	Commercial	Ship/Ship
68	156.425	156.425	Non Commercial	Ship/Ship, Ship/Shore
69	156.475	156.475	Non Commercial	Ship/Shore
70	156.525	——	Non Commercial	Ship/Ship
71	156.575	156.575	Non Commercial	Ship/Shore
72	156.625	——	Non Commercial	Ship/Ship
73	156.675	156.675	Port Operations	Ship/Ship, Ship/Shore
74	156.725	156.725	Port Operations	Ship/Ship, Ship/Shore
75	——	——	GUARD CHANNEL, unuseable	——
76	——	——	GUARD CHANNEL, unuseable	——
77	156.875	——	Commercial	Ship/Ship
78	156.925	161.525	International Only	Ship/Ship, Ship/Shore
78A	156.925	156.925	Non-Commercial	Ship/Shore
79	156.975	161.575	International Only	Ship/Ship, Ship/Shore
79A	156.975	156.975	Commercial	Ship/Ship, Ship/Shore
80	157.025	161.625	International Only	Ship/Ship, Ship/Shore
80A	157.025	157.025	Commercial	Ship/Ship, Ship/Shore
81	157.075	161.675	International Only	Ship/Ship, Ship/Shore
82	157.125	161.725	International Only	Ship/Shore
83	157.175	161.775	International Only	Ship/Shore
83CG	157.175	157.175	USCG Auxillary Only	Ship/Ship, Ship/Shore
84	157.225	161.825	Public Correspondence	Ship/Shore
85	157.275	161.875	Public Correspondence	Ship/Shore
86	157.325	161.925	Public Correspondence	Ship/Shore
87	157.375	161.975	Public Correspondence	Ship/Shore
88	157.425	162.025	International Only	Ship/Ship, Ship/Shore
88A	157.425	——	Commercial	Ship/Ship
WX	——	162.550	Weather Broadcasts	Selected Coastal Stations
WX_1	——	163.275	Weather Broadcasts	Selected Coastal Stations
WX_2	——	162.400	Weather Broadcasts	Selected Coastal Stations

NOTE: Authorization and channels used may vary with locality. Check with local authorities for verification.

Figure 7

DC VOLTAGE MEASUREMENTS

All voltages shown in this table were measured with a VTVM from chassis ground. The DC input to the radio should be set to 13.75 VDC. The squelch control should be in the full off position and the volume control in the minimum position. No signal should be applied. The receiver A+ line should measure 13.75 VDC. A variation of ±20% of the measured voltages from those listed may be considered normal.

Ref. No.	E	B	C	or	D	S	G	G
Q101	1.8	2.4	12.4					
Q101								
Q102					12.4	0	0	
Q103					11.0	0	0	5.8
Q104					11.0	0	0	
Q105					11.6	0	0	
Q106					11.6	0	0	
Q107	6.8	6.2	0					
Q109	0	0.6	2.8					
Q110	0	0.47	5.8					
Q111	0	0.42	5.8					
Q201 (Recv)	6.5	7.2	6.8					
Q201 (Xmit)	2.5	3.2	6.8					

Pin	1	2	3	4	5	6	7	8	9	10	11	12	13	14
IC101	2.0	2.0	0	0	11.5	—	5.6	4.8	4.1	4.1	—	5.4	5.8	1.6
IC102	12.8	—	7.7	0.8	0.6	—	0	0	—	0	—	6.5	—	12.9

RECEIVER SENSITIVITY & GAIN MEASUREMENTS

Frequency	Input Point	Measurement Point	Measured Value
156.3 MHz	Ant. Conn.	Across Speaker	−109 dbm or better for 20 db quieting
13.1 MHz	Tap L103	Sec. T110	500 uv or less for 0.3 V P-P (Scope)
13.1 MHz	Pin 3 T102	Pri. T104	45 mv for 0.3 V P-P (Scope)
13.1 MHz	Pin 3 T102	Source Q104	70 mv for 0.3 V P-P (Scope)
13.1 MHz	Pin 3 T102	Drain Q104	11 mv for 0.3 V P-P (Scope)
13.1 MHz	Pin 3 T102	Pri. T106	13 mv for 0.3 V P-P (Scope)
13.1 MHz	Pin 3 T102	Source Q105	23 mv for 0.3 V P-P (Scope)
13.1 MHz	Pin 3 T102	Drain Q105	3.4 mv for 0.3 V P-P (Scope)
13.1 MHz	Pin 3 T102	Pri. T108	5.5 mv for 0.3 V P-P (Scope)
13.1 MHz	Pin 3 T102	Source Q106	10 mv for 0.3 V P-P (Scope)
13.1 MHz	Pin 3 T102	Drain Q106	1.5 mv for 0.3 V P-P (Scope)
13.1 MHz	Pin 3 T102	Pri. T110	1.5 mv for 0.3 V P-P (Scope)
13.1 MHz	Pin 3 T102	Sec. T110	3 mv for 0.3 V P-P (Scope)
156.3 MHz	Ant. Conn.	Across Speaker	2 uv or better for 1 watt output, 400 to 3000 Hz.