SECTION 1
GENERAL INFORMATION

1-1. INTRODUCTION

This service manual contains all the information normally required to install, operate, and maintain the Genave Model Marine/Master-202 VHF-FM Marine Transceiver.

1-2. DESCRIPTION

The Marine/Master-202 is a VHF-FM transceiver designed to provide high reliability marine communications. The unit is capable of transmitting and receiving 16F3 (Frequency Modulated) radio signals on any of twenty-two possible channels within the VHF-FM Marine Band.

The Marine/Master-202 employs a transmitter circuit capable of transmitting a nominal 25 watts of radio frequency power within the VHF-FM Marine Band. The transmitter employs a low power provision for reducing the transmitter power to less than 1 watt when operating within harbors, marinas, basins, etc.

The unit is complete with an attached hand microphone and internally mounted speaker. All circuitry employed within the unit is the latest state-of-the-art design employing the very latest in semiconductor and integrated circuit technology.

The unit is enclosed in a vinyl-clad steel wrap-around cover designed to provide maximum protection to the unit from physical damage.

1-3. SPECIFICATIONS

GENERAL

Front Panel Size:	6-1/2" x 2-1/2" (16.51 cm x 6.35 cm).
Over-all Dimensions:	10.5"deep x 6-1/2" wide x 2-1/2" high (26.67 cm x 16/51 cm x 6.35 cm).
Number of Transistors:	13 all silicon transistors, 14 diodes, 6 FET's, 4 integrated circuits

Power Supply:	
Current Drain:	Receive: .09 amps Transmit: High 5.0 amps; Low 1.7 amps
Frequency Range:	156 MHz to 163 MHz
Number of Channels:	22. (Includes Weather Monitor, 6, 16. Remaining channels factory installed at nominal charge each).
Weight:	6 lbs. (approx.)

RECEIVE

Sensitivity:	Less than 0.25 microvolt for 12 db SINAD.
Image:	More than 70 db.
Spurious:	More than 70 db.
Selectivity:	±7.5 kHz.
Receiver Circuit:	Dual conversion superheterodyne, crystal controlled.
Audio Output:	5 watts, 4 watts min. @ 15% distortion
Modulation Acceptance:	More than 7.5 kHz.
Squelch Threshold:	0.25 microvolt max.
Intermod Response:	More than 70 db
Adj. Channel Rejection:	More than 70 db

TRANSMIT

Frequency Range:	156 MHz to 158 MHz.
Output Impedance:	Matches standard VHF-FM marine antennas.
Power Output:	25 watts, nom.

1-4. ABOUT VHF-FM

The Marine/Master is designed to replace the old Medium Frequency (2 to 3 MHz) radiotelephone system and make the privileges enjoyed by licensees of the old system available to even the most modest of users.

The Marine/Master operates within the VHF-FM Marine Band (156 to 163) MHz). 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.e. The taller the tower, the farther you can see.) This characteristic is effectively utilized within the VHF-FM marine service to maximize channel utilization. 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 cause 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 effeciency antennas can be built of reasonable size. For example, there are two antenna models being offered with your Marine/Master. 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 3 db gain. In reality this antenna makes your Marine/Master-202 equivalent to 50 watts of effective transmit power.

The Marine/Gain-100, which is rated at 6 db of antenna gain, makes your Marine/Master-202 equivalent to 100 watts of effective transmit power.

SECTION II

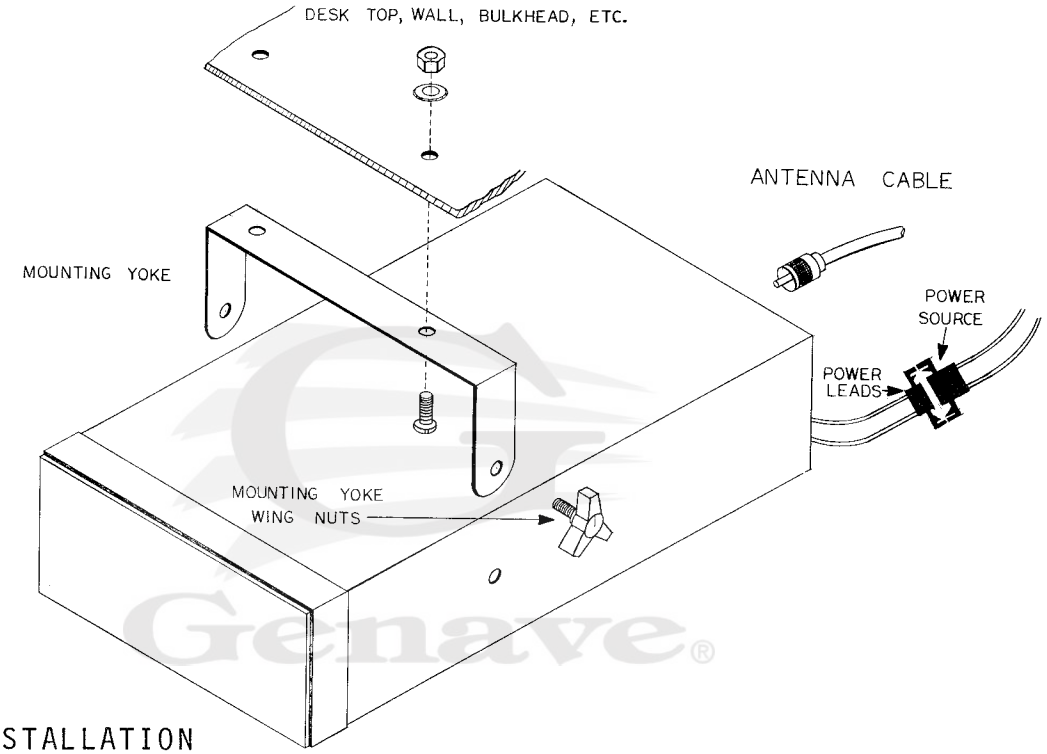
INSTALLATION MANUAL

2-1. INSTALLATION PLANNING

NOTE: The Marine/Master 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/Master. 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.



2-2. UNIT INSTALLATION

1. Remove the Marine/Master 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 only with a 10 amp, type 3 AG fuse in the Marine/Master-202. 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 unit installation is now complete except for installing and connecting the antenna.

2-3. ANTENNA INSTALLATION

The Marine/Gain-50 and the Marine/Gain-100 antennas are designed for operation with the Marine/Master. 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.

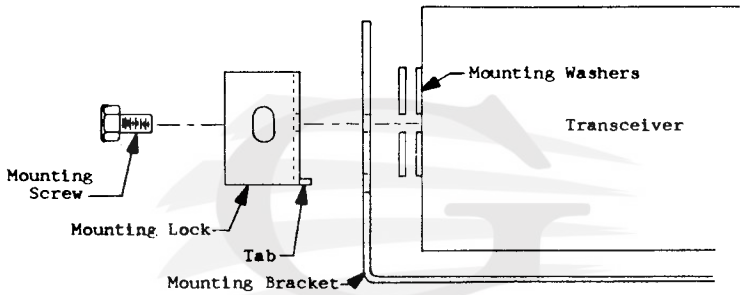
To install the antenna, proceed as follows:

1. Mount the antenna to the selected surface using bolts or screws.
2. Route the antenna cable to the Marine/Master unit. 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 the coaxial antenna connector (see illustration on next page) and connect securely to the coaxial receptacle at the rear of the Marine/Master unit.
5. Your Marine/Master is now ready to operate.

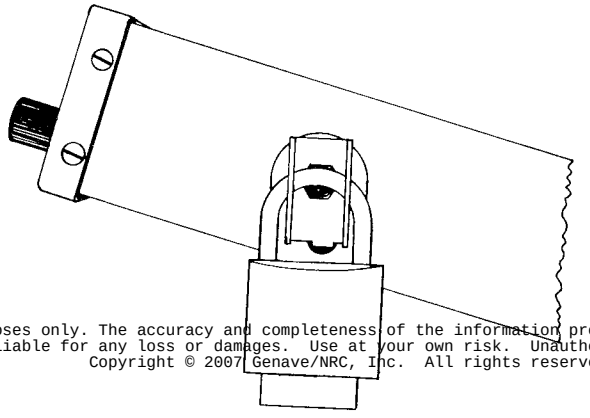
2-4. MOUNTING LOCK INSTALLATION

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

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

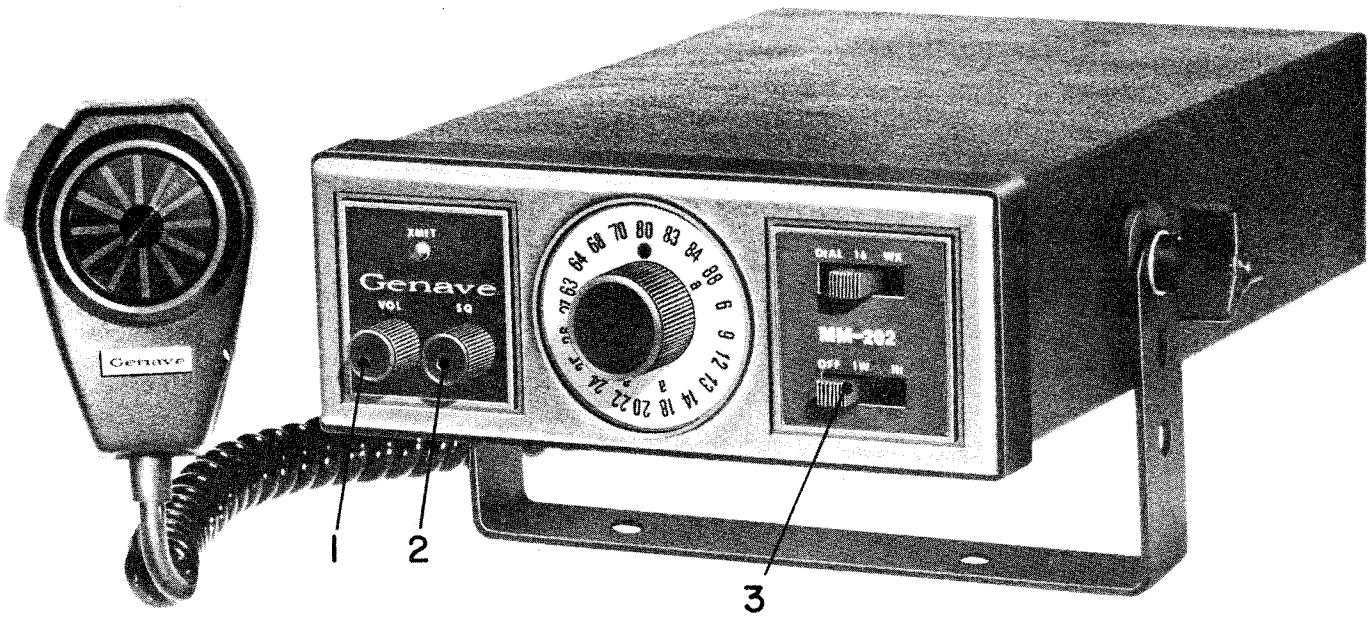


4. Attach padlock through the holes in the side of the mounting lock. Latch padlock to prevent removal of the unit from mounting bracket (See Figure 2).



SECTION III

OPERATING MANUAL



3-1. OPERATING INSTRUCTIONS

1. Turn volume (#1) and squelch control (#2) knobs completely counterclockwise.

2. Move the Off/W/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 the squelch control clockwise until background sounds just disappear. Do not adjust squelch while a signal is being received.

5. If you wish to operate on a channel other than 16 or Wx, move the selector switch to the dial position and rotate the dial to the proper channel.

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.

SECTION IV

MAINTENANCE MANUAL

4-1. THEORY OF OPERATION

INTRODUCTION

The Marine/Master-202 is a VHF-FM transmitter intended for use in the marine radio services. It transmits and receives 16F3 emission in the frequency range from 156.0 to 157.5 MHz on any one of 22 possible crystal controlled channels. The MM-202 provides a maximum power output of 25 watts into a 52 ohm load with provision to reduce the output power to a level between .75 watt and 1 watt using a front panel mounted switch.

RECEIVER

Low Pass Filter

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

The received signal is applied from the antenna connector to the three-pole low pass filter comprised of C387, L315 and C286. 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. On the receive mode, the signal is fed to the input filter of the receiver via pin 14 of the T/R relay.

Input Filter and RF Amplifier

The receiver input filter consists of a double tuned section, L101, L102, C102 and C103. The output tap is coupled to the RF amplifier Q101. The output of the RF amplifier is fed through another double tuned circuit, L103, L104, C106, and C109. The tap on L104 is coupled to another RF amplifier Q102. The output of Q102 is coupled through another double tuned circuit consisting of L105, L106, C111, and C112. The output tap on L106 is coupled to Q103, the first mixer.

First Local Oscillator and Tripler

The first local oscillator consists of Q109 and associated circuitry. The desired crystal in the 48.545 to 50.858 MHz range is selected by means of the frequency selection switch SW302A. The collector circuit Q109 is tuned to the crystal frequency and the output is coupled to the base of Q110, a tripler. The output of Q110 is tuned by the primary of T109 and C155 to cover

145.575 to 152.575 MHz. The secondary of T109 is coupled to the Gate 2 of the first mixer Q103.

First Mixer and First IF

The 10.7 MHz difference signal produced in the first mixer is coupled to first 4-pole monolythic crystal filter FL101 and FL102 by T101. The output of the filter is transformer coupled to the first IF amplifier Q104 by T104. The output of Q104 is coupled by T103 to the second 4-pole monolythic crystal filter FL103, and FL104. The output of second filter is coupled by T104 to the second IF amplifier comprised of Q104 and Q105.

Second Mixer/Autodyne Converter

The output of Q105 is coupled to the second mixer Q105 which operates as an autodyne converter with crystal Y123 oscillating at 10.245 MHz.

Second IF Amplifier

The resultant 455 kHz difference frequency is coupled by T106 to IC101 which functions as a high gain 455 kHz IF amplifier.

Audio Limiter, Detector and Squelch

The output of IC101 is coupled by T107 to IC102 pins 1 and 2. IC102 performs the limiting and detection functions in the receiver. C130 sets the de-emphasis level in the detection circuitry. T108, R121, and C131 form the quadrature detector transformer circuit. Detected audio is fed from pin 8 of IC102 through C132 and R122 to the audio amplification circuits via pin 14. Detected audio from pin 8 is also fed to the noise amplifier consisting of Q107 and associated circuitry. The amplified noise from Q107 is fed to the voltage doubling detectors of CR103, CR104, and C137. The detected noise level is fed to the base of Q108. R127, the squelch control, controls the authority of the detected noise level on the base of Q108. As Q108 begins to turn on, the audio level at the output (pin 12) of IC102 is reduced. Q108 also pulls pin 6 of IC103 to ground via CR105. This action turns IC103 off and improves squelching.

Audio Amplifier

R131, the volume control sets the level of audio fed to IC103, the audio amplifier. R132 and C142 perform the frequency response shaping of the audio amplifier while C144, C145, and C147 provide feedback to the various stages within IC103. Output audio from IC103 is applied from pin 12 through C149 to the speaker. Relay K201 grounds pin 6 of IC103, in the transmit mode, and squelches receiver audio during transmit.

TRANSMITTER

Modulator Audio Amplifier

The modulator audio amplifier in the unit is built around a single integrated circuit, IC301. This IC is a dual operational amplifier and is shown on the schematic diagram as IC301A and IC301B. The audio output of the ceramic microphone is amplified by IC301A. A 6 db per octave rising characteristic is given to the audio frequencies by loading the 1500 pfd microphone capacitance with the bias resistor, R331. IC301 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 R332 and across a 6.8 volt zener diode, CR305.

The output from IC301A is applied to IC301B which acts as an active, 2-pole Chebyshev low pass filter with a cutoff frequency of 3 kHz. R338 and C400 add a third pole to the filter which controls the audio level applied to the modulator varactor diode. C401 forms the audio return from R339.

Phase Modulator

CR302 functions as the phase modulator. R340 and C346 perform pre-emphasis of the audio applied to the phase modulator. DC bias for the modulation diode is provided by IC301B through R238, R339, and R340.

The 13 MHz signal from the transmit oscillator is applied to CR302 by the tuned transformer, T301. As an audio signal is applied to the varactor diode, CR302, from the modulation audio amplifier; the capacitance of the diode changes thus varying the resonant frequency of the tuned transformer, T301. This results in phase modulation of the carrier signal.

Transmit Oscillator

Q301 and associated circuitry form the transmit oscillator. The oscillator is a basic Colpitts crystal circuit. Variable capacitors are used in series with each crystal to allow exact setting of the generated frequency. Crystal selection is performed by means of SW302B and SW303B. SW302B is a rotary dial switch. SW303B is a "priority" selector. The unit will be equipped with two priority channels which can be selected by means of SW303B. If neither of the "priority" channels are selected, SW303B will be in the "Dial" position which will allow selection of the transmit crystal by means of SW302B. The oscillator output frequency is generated directly from the basic

crystal frequencies of 13.000 MHz to 13.125 MHz.

Buffer

Q302 is a P-channel JFET which functions as a buffer to isolate the transmit oscillator circuitry from the phase modulator.

Tripler

The output from the modulator is applied via C347 to the base of Q303, which functions as an RF tripler. In this stage the modulated 13 MHz signal is multiplied to 39 MHz. The double tuned transformer, T302, functions as a filter to reduce all harmonics and subharmonics of the desired 39 MHz output.

First Doubler

The filtered 39 MHz output from the secondary of T302 is applied to the base of Q304, the first doubler. This stage multiplies the modulated 39 MHz output signal from the tripler, to a frequency in the 78 MHz range. The output circuit of this Class C doubler is tuned by means of T303, which functions as a double tuned transformer to filter all undesired harmonics and subharmonics from the 78 MHz first doubler output.

Second Doubler

The 78 MHz signal from the first doubler is applied to the base of Q305, which functions as a Class C doubler. The modulated 78 MHz RF signal from the first doubler is multiplied to the final output frequency in the 156.0 to 157.5 MHz range. The output of Q305 is matched to the following amplifier stages by a resonant "L" section consisting of L302 and C360. This circuit also provides suppression of any subharmonics of the desired output signal.

RF Predriver

The 156.0 to 157.5 MHz signal from the final multiplier stage is amplified to the base of Q306 which functions as the first RF power amplifier. This Class C amplifier increases the RF signal from 50 milliwatts to approximately 500 milliwatts at its output. The predriver output is coupled to the following driver stage by means of the filter network formed by L303, C365, C366, and L304. This circuit provides both filtering of any undesired spurious responses and impedance matching into the driver stage.

RF Driver

Q307 and associated circuitry functions as the RF driver in a Class C configuration. SW301A switches R324 into a series connection between the collector supply and Q307 when the transmitter power switch is in the less than 1 watt position. This reduces the output power of the transmitter to a level between 1 watt and .75 watt by reducing the drive to the final power amplifier. This feature is employed for short distance, low current drain operations. The transmitter output in the less than 1 watt operating condition is set by the value of R324 which is selected to insure the proper output level. L305, C368, L306, C369 and C370 for a frequency selective matching network which also reduces any undesired outputs.

Final Power Amplifier

Q308 functions as the final power amplifier. Q308 develops 25 watts of RF output power when full drive is applied from Q307. When the drive from Q307 is reduced by means of SW301A, Q308 will provide from .75 to 1 watt of transmit power. C373, C374, L309 and C402 comprise a resonant matching network which matches the output from Q308 to the 52 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.

Power Supply

Power to operate the unit is supplied from the 13.75 VDC external power source (ships power buss) via the input connector, F301, and SW301B. The 13.75 VDC line supplies power to operate the relay, K301; the transmitter oscillator, via R301; and the remaining transmitter and receiver circuitry, via Pins 12 and 13 of K301. The power to operate the transmit oscillator is regulated to 6.8 VDC prior to application to the oscillator circuit. The zener diode, CR301, performs this function.

The transceiver is protected against a reversed polarity input voltage by means of CR304 and CR307. CR306 prevents the feedback of induced voltage spokes generated by K301, on the 13.75 VDC line. C385 acts as a filter on the 13.75 VDC line.

4-2. ALIGNMENT PROCEDURE

GENERAL

The unit comes prealigned from the factory and realignment should never be necessary during the normal life of the unit unless components within the unit have been replaced due to damage.

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

RECEIVER ALIGNMENT

RF & Input Filter Alignment

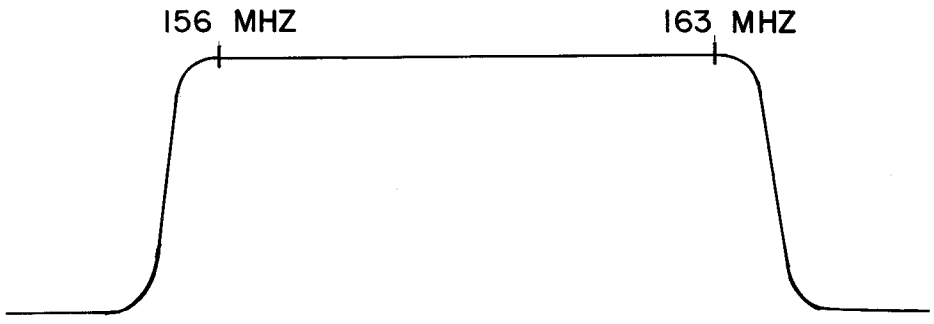
1. With the transceiver off, connect the RF output cable of the sweep generator to the transceiver antenna connector, J301. Connect a coaxial cable from the vertical input of the oscilloscope to the source of Q103.

2. Short the secondary winding of T109 to ground using a short jumper wire.

3. Set the sweep generator to sweep a band from 156 MHz to 163.5 MHz. Use the RF signal generator as a marker generator to produce 156 and 163.5 MHz markers.

4. Turn the transceiver power switch on. Set the scope vertical attenuator to the most sensitive position, and set the RF output of the sweep generator low enough to prevent overdriving the RF amplifier.

5. Adjust C102, C103, C106, C109, C111 and C114 to give a 7.5 MHz bandpass similar to that shown in the figure below:



SWEPT INPUT FILTER

6. Turn the transceiver power switch off and disconnect the test equipment. Remove the short from the secondary of T109.

First Local Oscillator Alignment

1. Rotate the channel selector know to channel #6. Move the Dial/Wx1/Wx2 switch to the Dial position.

2. Preset L107 by setting top of slug even with top of coil form and then turning slug four turns into form.

3. Connect a VTVM RF probe to gate 2 of Q103.

4. Turn the transceiver power switch on and adjust the slug in T109 for a maximum reading on the VTVM. NOTE: This is a preliminary adjustment. T109 will be touched up later for best quieting.

5. Turn the transceiver power switch off and disconnect the VTVM probe.

6. Connect the frequency counter to gate 2 of Q102.

7. Turn the transceiver power switch on and note the reading on the frequency counter. This reading should be within ±.001% of the LO injection frequency. The injection frequency can be found by subtracting 10.7 MHz from the channel or operating frequency.

   EXAMPLE: for channel 6 (156.3 MHz)

   LO Frequency = 156.3 MHz - 10.7 MHz = 156.6 MHz
   LO Frequency = 156.6 MHz ±.001%

8. Repeat step 7 for each receive channel installed in the transceiver.

9. Turn the transceiver power switch off and remove the frequency counter.

10.7 MHz and 455 kHz IF Alignment

1. Connect an AC voltmeter across the speaker terminals.

2. Turn the transceiver squelch and volume controls fully counterclockwise.

3. There are two methods of generating the 10.7 MHz alignment frequency. The first (and preferred) is to inject an accurate 10.7 MHz CW signal into gate 1 of Q103 through a 39 pf capacitor. If this method is used, short the secondary

of T109 to ground during the alignment procedure.

The second method is to set the channel selector dial to channel 6, the Dial/Wx1/Wx2 switch to the Dial position and injecting a frequency counter to pin 1 of IC101. Turn the transceiver power switch on and increase the level of the 156.3 MHz generator until the second IF frequency is read on the frequency counter. Fine tune the 156.3 MHz generator until the second IF frequency reads 455 kHz.

4. Disconnect the RF generator from the transceiver and with the transceiver power switch on, adjust the volume control for a .5 volt noise level on the AC voltmeter.

5. Reconnect the signal generator and increase the unmodulated signal from the signal generator until the noise level drops to .25 volts.

6. Adjust T101, T102, T103, T104, T106 and T107, in that order, for maximum quieting as indicated on the AC voltmeter.

   If using method #2, also adjust the slug in T109 for maximum quieting. Decrease the RF input to maintain a useable reading on the AC voltmeter during alignment. Repeat this step until no further quieting is obtained.

7. Turn the transceiver off and disconnect the AC voltmeter.

8. Connect an oscilloscope across the speaker terminals and turn the transceiver power switch on.

9. FM modulate the signal generator RF output with a 1 kHz tone at ±5 kHz deviation. Adjust the RF generator output to a 10 microvolt level and adjust the scope input sensitivity to cover about 3/4 of the scope screen vertically with the 1 kHz tone.

10. Adjust T108 for maximum amplitude of the 1 kHz tone. Adjust T101, T102, T103 and T104 for minimum distortion of the 1 kHz tone as indicated on the oscilloscope. Repeat this step adjusting for a maximum undistorted 1 kHz tone.

11. Slowly increase the FM generators deviation to ±8 kHz while adjusting T101, T102, T103 and T104 for minimum distortion. NOTE: A point will occur between ±6 kHz to ±8 kHz where distortion will be quite high. This is normal and further adjustment is not necessary.

12. If method #1 was used for alignment, remove the short from the secondary of T109. Connect the transceiver as in steps 4 & 5 and adjust the slug in T109 for maximum quieting.

13. Turn the transceiver off and disconnect all test equipment.

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 RF 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 the 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 1 kHz 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.

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 RF 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 (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 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.

Audio Output Power

1. Set the FM signal generator on 156.3 MHz, and set the modulation for 5 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 4 volts (4 watts).

3. Set the signal generator for 5 kHz deviation at 500 kHz, and note that the AC VTVM indicates at least 4 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 4 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 minus 10.7 MHz divided by 3.

Tolerance = ±(.001%) X Stamped Table Frequency
Example: for Ch. 6 (156.3 MHz)
Tolerance = ±(.001) X 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 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 @ 158 MHz, or relative out indicating device, (see Figure 1) with 50 ohm dummy load.

b. Frequency Counter, DC-165 MHz, or other accurate frequency measuring device.

c. Deviation Meter, to read ±5 kHz.

d. Power Supply, 13.75 VDC at 8 amp minimum, filtered.

e. VTVM, any accurate instrument.

f. Audio Generator, 1700 Hz.

g. Oscilloscope, DC - 5 MHz.

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 1).

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 side of mainboard).

4. Connect the unit to a 13.75 VDC power source.

Frequency and Power Alignment

1. Rotate dial (SW302) to channel 6 position (156.3 MHz). Move DIAL/16/Wx selector (SW303) to the "DIAL" position.

   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 Q303, key the transmitter and adjust the slug of T301 for a peak at 13.025 MHz. Adjust the VTVM attenuator for an on-scale reading.

The peak should reach approximately 1.4 volts.

3. Move the DC probe to the emitter of Q304. Key the transmitter and adjust the 2 slugs of T302 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 1.0 volts.

4. Adjust T303 by connecting the DC probe to the emitter of Q305, keying the transmitter, and adjusting the 2 slugs of T303 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 2.3 volts.

5. If the relative output indicating device of Figure 1 is used, connect the VTVM DC probe to the relative output terminal. Otherwise, observe the wattmeter or other relative output indicator.

6. Preset C366 by tightening the adjustment screw down firmly and backing it off 1/2 turn.

7. Key the transmitter and adjust C360, C365, C366, C368, C370, C374, and C402 for maximum relative output indication on 156.300 MHz. This step may be repeated if necessary.

8. With the OFF/1W/HIGH switch in the "HIGH" position, key the transmitter and adjust 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 transmitter, adjusting its respective netting trimmer for the correct output frequency.

Power Measurement Procedure

1. Rotate the channel selector dial to the channel 6 position. Move the DIAL/16/Wx switch to the DIAL position.

2. Key the transmitter and note the transmitter power reading on channel 6. It should be no less than 25 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 should read between .75 watts and 1 watt. If the power does not read within this range, change the value of R324 until the proper output power is indicated.

6. Repeat the above step for each transmit frequency installed to insure that the power output remains within the proper limits for all channels.

Carrier Deviation Adjustment

1. Rotate the channel selector dial to the channel 6 position. Select the "DIAL" position on the DIAL/16/Wx switch (SW303).

2. Set the OFF/1W/HIGH switch (SW301) to the 1W position.

NOTE: Do not key the transmitter for step #3:

3. Feed an audio signal of 1700 Hz into the transceiver microphone. Set the Mic. Gain potentiometer, R333, to maximum resistance (Max. gain) by rotating the wiper toward the receiver side of the main circuit board. Connect the vertical input lead of the oscilloscope to pin 1 of IC301 and adjust R331, the symmetry adjustments, until the displayed waveform limits symmetrically on both the top and bottom of the waveform.

4. Connect the deviation meter to the frequency measuring output of the relative output indicating device.

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 T301 for a peak reading. The deviation potentiometer, R339, can be adjusted for an on-scale reading of the deviation meter.

7. Set the deviation potentiometer, R339, 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 T301 by rocking the slug slightly until the two levels are brought into balance. The difference in deviation levels should not exceed 0.4 kHz.

9. For normal operation, the mic. gain potentiometer is set at maximum gain. If the unit is going to be operating in an area having a high accoustic noise level, the mic. gain can be reduced by rotating the gain pot away from the maximum gain position. This will help reduce the amount of noise being transmitted along with the desirable voice transmissions.

4-3. 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.

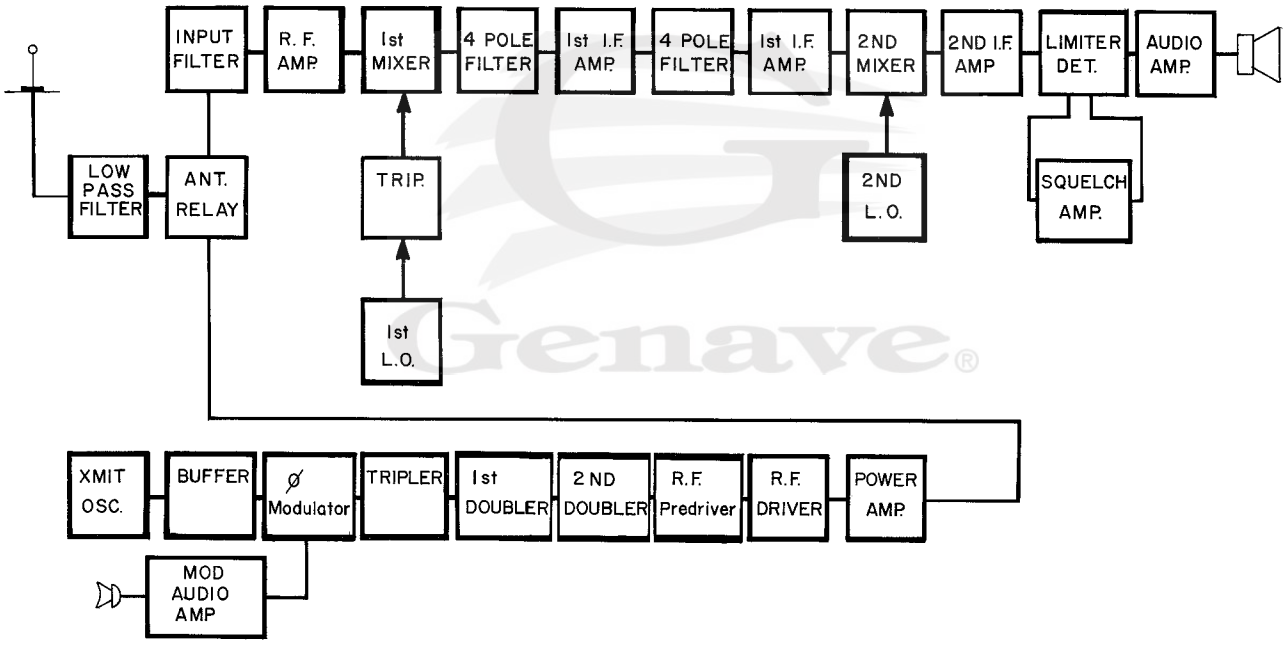
2. Install the new transmit and receive crystals into their appropriate socket.

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 dial from the front panel of the unit and apply the new frequency on the dial.

5. Replace the frequency dial.

The charts of Figure 11 and Figure 14 will aid in the selection of the desired frequencies to be installed.



MARINE/MASTER-202
BLOCK DIAGRAM

CHANNEL RECOMMENDATION CHART

INSTRUCTIONS

Your Marine/Master automatically includes 3 channels. These channels are: Channel 6 (Intership Safety), Channel 16 (Distress, Safety and Calling), and Weather Monitor (Receive Only). All channels other than 6 and 16 which are in your Marine/Master are called "working channels" (with the exception of Weather Monitor).

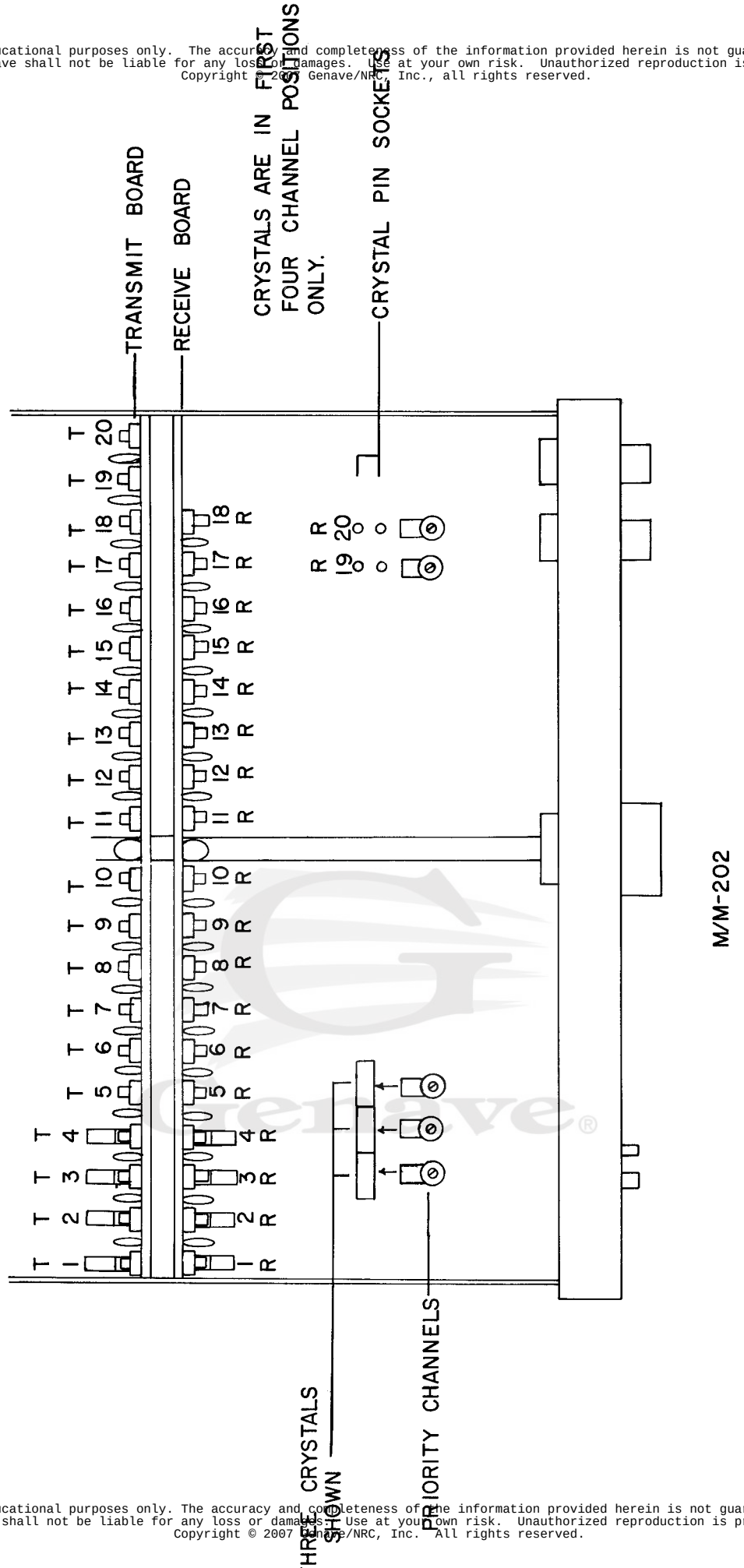
In the event you wish to have additional channels installed in your Marine/Master, utilize the following steps to determine which channels are recommended:

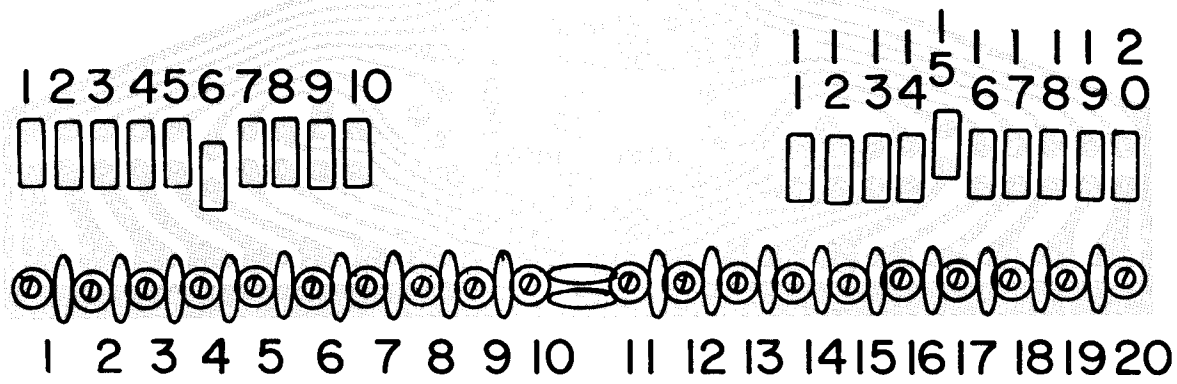
1. Determine the total number of working channels that you will have in your Marine/Master after you have installed the new channels.

   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.

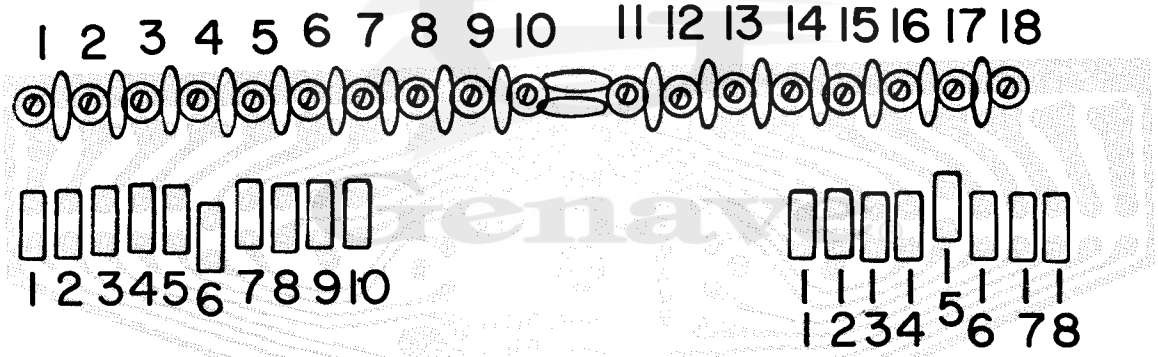
2. If yourship is a recreational vessel, locate the Total Number of Working Channels in Column "A".
3. If your ship is a commercial vessel locate the Total Number of Working Channels in Column "B".
4. Proceed down the column titled "Total Number of Working Channels" for your vessel and read across at 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	TOTAL NUMBER OF WORKING CHANNELS "B" COMMERCIAL VESSELS	TYPE OF COMMUNICATION	CHANNEL DESIGNATION
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19		
X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X	PORT OPERATIONS SHIP/SHIP & SHIP/COAST	22A
X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X	PORT OPERATIONS SHIP/SHIP & SHIP/COAST	12,65A,66A,73, 14,74,20
X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X	NAVIGATIONAL SHIP/SHIP & SHIP/COAST	13
X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X	ENVIRONMENTAL & WEATHER SHIP RECEIVE ONLY	15,WX1,WX2
X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X	COMMERCIAL SHIP/SHIP & SHIP/COAST	7A,9,10,11,18A, 80A,19A,79A
X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X	COMMERCIAL SHIP/SHIP	8,67,77,88A
X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X	NON-COMMERCIAL SHIP/SHIP & SHIP/COAST	68
X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X	NON-COMMERCIAL SHIP/COAST	69,71,78A
X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X	NON-COMMERCIAL SHIP/SHIP	70,72
X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X	PUBLIC CORRESPONDENCE SHIP/PUBLIC COAST	24,25,26,27,28, 84,85,86,87

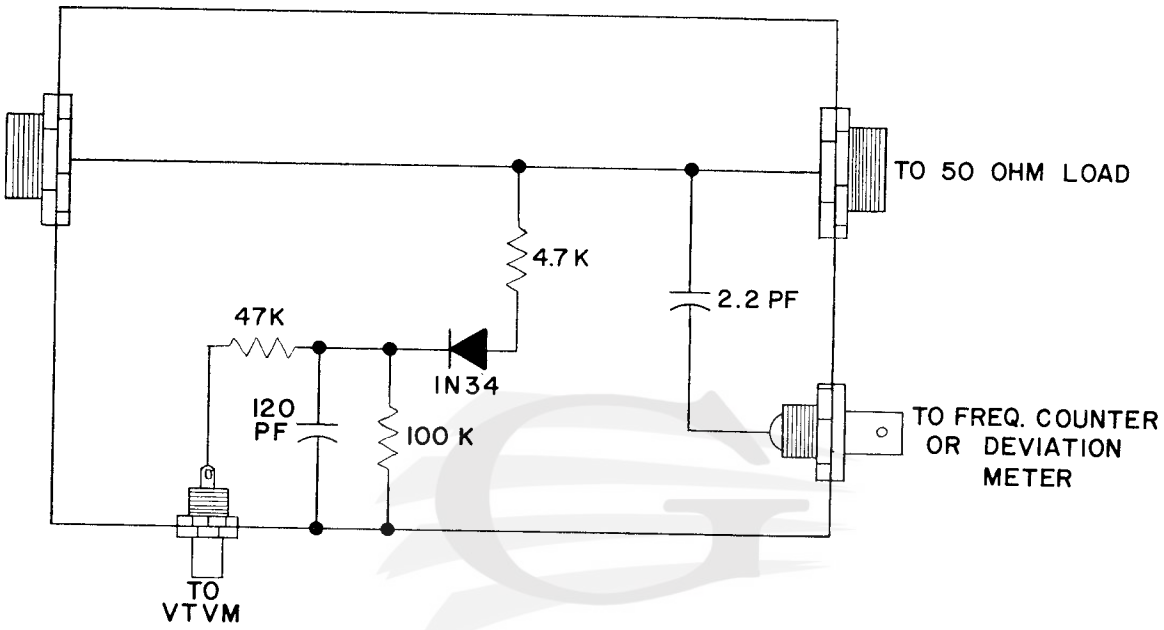




TRANSMITTER BD.
(REAR BD.)



RECIVER BD.
(FRONT BD.)



Model: M/M-202

Figure 2
Relative Output Indicator

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
10.7 MHz	Through 39 pf into Gate 1 of Q103	Pri T106	150 uv or less for 0.3 VP-P (Scope)
10.7 MHz	Through 39 pf into Gate 1 of Q103	Pin 4 IC101	40 mv 0.3 VP-P (Scope)
10.7 MHz	Through 39 pf into Gate 1 of Q103	Pin 1 IC101	50 uv for 3.0 VP-P (Scope)
10.7 MHz	Through 39 pf into Gate 1 of Q103	Pin 2 IC102	100 uv for 0.3 VP-P (Scope)

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 13.0 VDC. A variation of =20% of the measured voltages from those listed may be considered normal.

		E	B	C	OR	C	S	G	G^2
	Q101					10.5	.4	.0	3.5
	Q102					11.0	0	0	
	Q103					12.0	.6	.7	.9
	Q104					0	11	0	
	Q105					11	0	0	
	Q106	0	.5	2.6					
	Q107	0	.6	3.0					
	Q108	0	0	1.8					
(Xmit)	Q301	2.5	3.2	6.8					

PIN	1	2	3	4	5	6	7	8	9	10	11	12	13	14
IC101	13.0	13.0		6.0	7.0	6.0		13.0						
IC102	1.5	1.5	0	0	11.0	0	7.5	6.2	3	3		5.0		1.8
IC103	13.0			13.0	.7	1.2	7	0	0	0		6		
IC301	3.8	3.8	3.8	0	3.8	3.8	3.8	6.6						

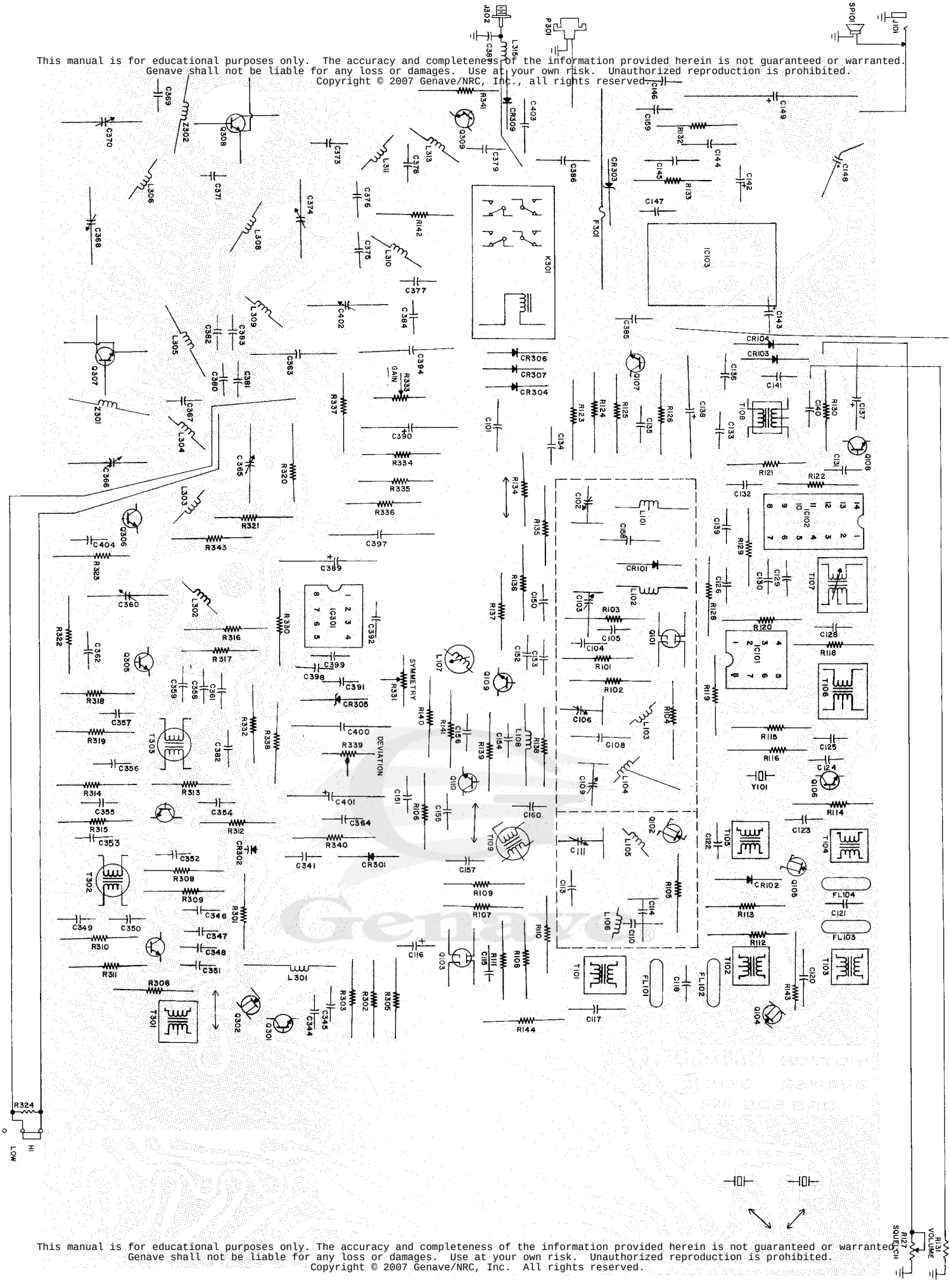


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Figure 4
PARTS TRACK MAP

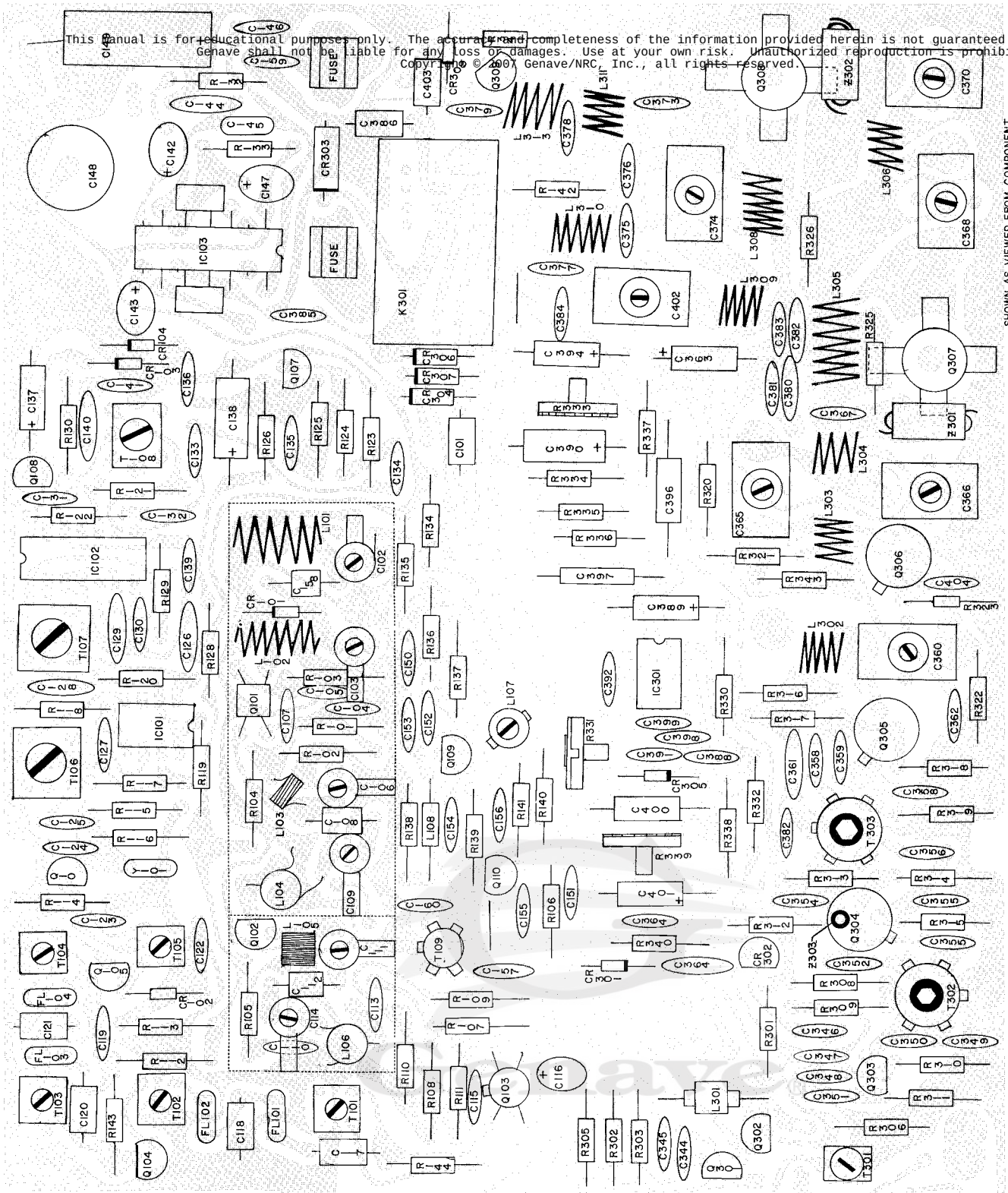
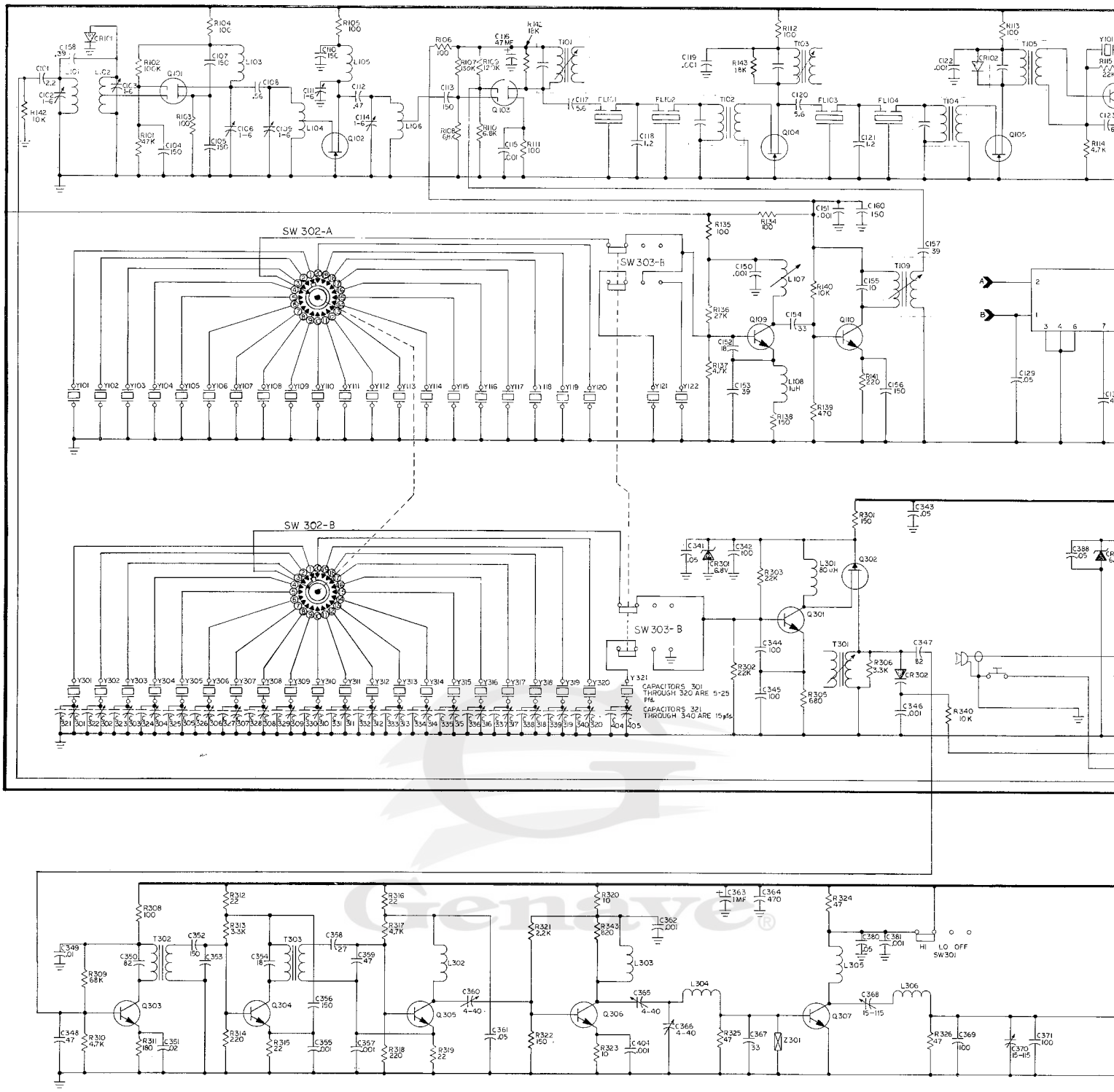


Figure 5
COMPONENT LOCATION DIAGRAM

Model: M/M-202



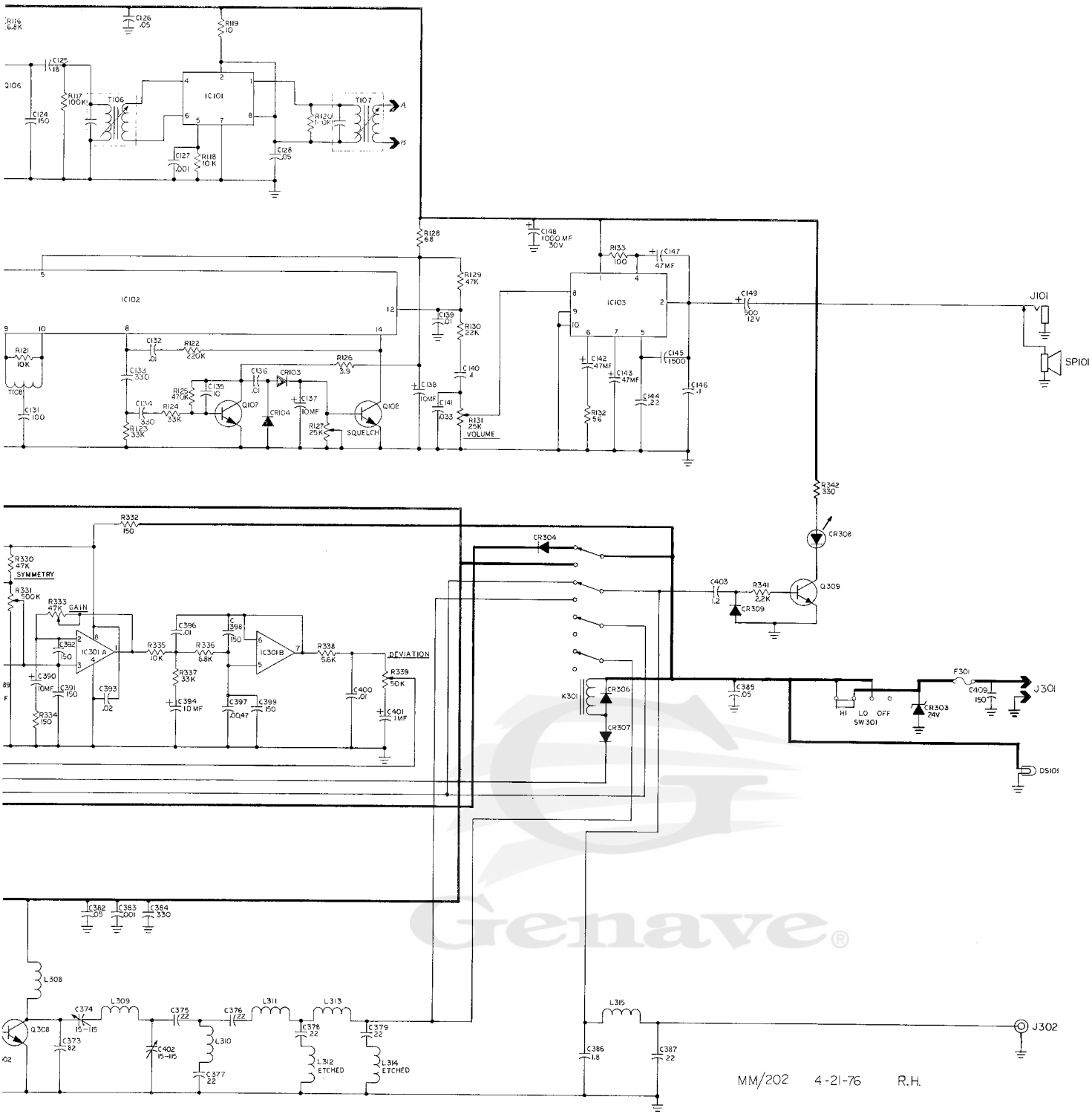


Figure 3
SCHEMATIC DIAGRAM

SECTION V
PARTS LIST

Reference Number	Part Number	Description
Capacitors		
C101	1510015	Gimmick, 2.2 pf, NPO, ±10%
C102	1570120	Trimmer, 1-6 pf
C103	1570120	Trimmer, 1-6 pf
C104	1520028	Y5E, Disc, 150 pf, ±10%
C105	1520028	Y5E, Disc, 150 pf, ±10%
C106	1570120	Trimmer, 1-6 pf
C107	1520028	Y5E, Disc, 150 pf, ±10%
C108	1510003	Gimmick, .22 pf, NPO
C109	1570120	Trimmer, 1-6 pf
C110	1520028	Y5E, Disc, 150 pf, ±10%
C111	1570120	Trimmer, 1-6 pf
C112	1510007	NPO, Gimmick, 0.47 pf
C113	1520028	Y5E, Disc, 150 pf, ±10%
C114	1570120	Trimmer, 1-6 pf
C115	1520071	Z5P, Disc, .001 mfd, ±10%
C116	1550005	Tant., 47 mfd, ±10%, 15V
C117	1510026	NPO, Gimmick, 5.6 pf, ±10%
C118	1510014	NPO, Gimmick, 1.8 pf, ±10%
C119	1520071	Z5P, Disc, .001 mfd, ±10%
C120	1510026	NPO, Gimmick, 5.6 pf, ±10%
C121	1510014	NPO, Gimmick, 1.8 pf, ±10%
C122	1520071	Z5P, Disc, .001 mfd, ±10%
C123	1530007	Silver Mica, 680 pf, ±10%
C124	1520028	Y5E, Disc, 150 pf, ±10%
C125	1520010	NPO, Disc, 18 pf, ±10%
C126	1520054	M25, Disc, .05 mfd, 25V, +80-20%
C127	1520071	Z5P, Disc, .001 mfd, ±10%
C128	1520054	M25, Disc, .05 mfd, 25V, +80-20%
C129	1520054	M25, Disc, .05 mfd, 25V, +80-20%
C130	1520042	Y5E, Disc, 470 pf, ±10%
C131	1520022	N220, Disc, 100 pf, ±10%
C132	1520051	Y5U, Disc, .01 mfd, 25V, ±20%
C133	1520037	Y5E, Disc, 330 pf, ±10%
C134	1520037	Y5E, Disc, 330 pf, ±10%
C135	1520007	NPO, Disc, 10 pf, ±10%
C136	1520051	Y5U, Disc, .01 mfd, 25V, ±20%
C137	1540014	Electrolytic, 10 mfd, 25V, ±10%
C138	1540014	Electrolytic, 10 mfd, 25V, ±10%
C139		Not Assigned
C140	1520055	Disc, .1 mfd, +80-20%, 12V
C141	1520083	Y5T, Disc, .033 mfd, ±20%
C142	1540024	150 MFD, Electro., ±10%
C143	1550005	Tant., 47 mfd, 15V, ±10%
C144	1520057	Disc, .22 mfd, +80-20%
C145	1500004	Mylar, .0015 mfd, ±10%
C146	1520055	Disc, .1 mfd, +80-20%, 12V
C147	1550005	Tant., 47 mfd, 15V, ±10%
C148	1540038	Electrolytic, 1000 mfd, 30V
C149	1540040	Electrolytic, 500 mfd, 12V, ±10%
C150	1520071	Z5P, Disc, .001 mfd, ±10%

C151	1520071	Z5P, Disc, .001 mfd, ±10%
C152	1520014	NPO , Disc, 39 pf, ±10%
C153	1520024	N1500, Disc, 100pf, ±10%
C154	1520013	NPO, Disc, 33 pf, ±10%
C155	1520007	NPO, Disc, 10 pf, ±10%
C156	1520028	Y5E, Disc, 150 pf, ±10%
C157	1520014	NPO, Disc, 39 pf, ±10%
C158	1510006	NPO, Gimmick, 0.39 pf, ±10%
C159	1520071	Z5P, Disc, .001 MFD, ±10%
C160	1520028	Y5E, Disc, 150 pf
C301	1570121	Trimmer, 5-25 pf
C302	1570121	Trimmer, 5-25 pf
C303	1570121	Trimmer, 5-25 pf
C304	1570121	Trimmer, 5-25 pf
C305	1570121	Trimmer, 5-25 pf
C306	1570121	Trimmer, 5-25 pf
C307	1570121	Trimmer, 5-25 pf
C308	1570121	Trimmer, 5-25 pf
C309	1570121	Trimmer, 5-25 pf
C310	1570121	Trimmer, 5-25 pf
C311	1570121	Trimmer, 5-25 pf
C312	5170121	Trimmer, 5-25 pf
C313	1570121	Trimmer, 5-25 pf
C314	1570121	Trimmer, 5-25 pf
C315	1570121	Trimmer, 5-25 pf
C316	1570121	Trimmer, 5-25 pf
C317	1570121	Trimmer, 5-25 pf
C318	1570121	Trimmer, 5-25 pf
C319	1570121	Trimmer, 5-25 pf
C320	1570121	Trimmer, 5-25 pf
C321	1520009	NPO, Disc, 15 pf, ±10%
C322	1520009	NPO, Disc, 15 pf, ±10%
C323	1520009	NPO, Disc, 15 pf, ±10%
C324	1520009	NPO, Disc, 15 pf, ±10%
C325	1520009	NPO, Disc, 15 pf, ±10%
C326	1520009	NPO, Disc, 15 pf, ±10%
C327	1520009	NPO, Disc, 15 pf, ±10%
C328	1520009	NPO, Disc, 15 pf, ±10%
C329	1520009	NPO, Disc, 15 pf, ±10%
C330	1520009	NPO, Disc, 15 pf, ±10%
C331	1520009	NPO, Disc, 15 pf, ±10%
C332	1520009	NPO, Disc, 15 pf, ±10%
C333	1520009	NPO, Disc, 15 pf, ±10%
C334	1520009	NPO, Disc, 15 pf, ±10%
C335	1520009	NPO, Disc, 15 pf, ±10%
C336	1520009	NPO, Disc, 15 pf, ±10%
C337	1520009	NPO, Disc, 15 pf, ±10%
C338	1520009	NPO, Disc, 15 pf, ±10%
C339	1520009	NPO, Disc, 15 pf, ±10%
C340	1520009	NPO, Disc, 15 pf, ±10%
C341	1520054	Disc, .05 mfd, +80-20, 12V
C342	1520022	N220, Disc, 100 pf, ±10%
C343	1520054	Disc, .05 mfd, +80-20T, 12V
C344	1520022	N220, Disc, 100 pf, ±10%
C345	1520022	N220, Disc, 100 pf, ±10%
C346	1520071	Z5P, Disc, .001 mfd, ±10%

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C347	1520176	N330, Disc, 82 pf, ±10%
C348	1520015	N1500, Disc, 47 pf, ±10%
C349	1520051	Y5U, Disc, .01 mfd, 25V, ±20%
C350	1520176	N330, Disc, 82 pf, ±10%
C351	1520053	M25, Disc, .02 mfd, 25V, ±10%
C352	1520027	N750, Disc, 150 pf, ±10%
C353	1520027	N750, Disc, 150 pf, ±10%
C354	1520009	NPO, Disc, 15 pf, ±10%
C355	1520071	Z5P, Disc, .001 mfd, ±10%
C356	1520027	N750, Disc, 150 pf, ±10%
C357	1520071	Z5P, Disc, .001 mfd, ±10%
C358	1520012	NPO, Disc, 27 pf, ±10%
C359	1520015	N1500 Disc, 47 pf, ±10%
C360	1560403	Trimmer, 40 pf
C361	1520054	M25, Disc, .05 mfd, +80-20%
C362	1520071	Z5P, Disc, .001 mfd, ±10%
C363	1540002	Electro., 1 mfd, 35V, 10%
C364	1520042	Y5E, Disc, 470 pf, ±10%
C365	1560403	Trimmer, 40 pf
C366	1560403	Trimmer, 40 pf
C367	1520013	NPO, Disc, 33 pf, ±10%
C368	1560406	Trimmer, 115 pf
C369	1520022	N220, Disc, 100 pf, ±10%
C370	1560406	Trimmer, 115 pf
C371	1520022	N220, Disc, 100 pf, ±10%
C372		Not Assigned
C373	1520176	N330, Disc, 82 pf, ±10%
C374	1560406	Trimmer, 115 pf
C375	1520011	NPO, Disc, 22 pf, ±10%
C376	1520011	NPO, Disc, 22 pf, ±10%
C377	1520011	NPO, Disc, 22 pf, ±10%
C378	1520011	NPO, Disc, 22 pf, ±10%
C379	1520011	NPO, Disc, 22 pf, ±10%
C380	1520054	M25, Disc, .05 mfd, +80-20%
C381	1520071	Z5P, Disc, .001 mfd, ±10%
C382	1520054	M25, Disc, .05 mfd, +80-20%
C383	1520071	Z5P, Disc, .001 mfd, ±10%
C384	1520037	Y5E, Disc, 330 pf, ±10%
C385	1520054	M25, Disc, .05 mfd, +80-20%
C386	1510014	NPO, Gimmick, 1.8 pf, ±10%
C387	1520011	NPO, Disc, 22 pf, ±10%
C388	1520054	M25, Disc, .05 mfd, +80-20%
C389	1540002	Electro., 1 mfd, 35V, ±10%
C390	1540014	Electrolytic, 10 mfd, 25V, ±10%
C391	1520028	Y5E, Disc, 150 pf, ±10%
C392	1520028	Y5E, Disc, 150 pf, ±10%
C393	1520053	M25, Disc, .02 mfd, 25V, ±10%
C394	1540014	Electrolytic, 10 mfd, 25V, ±10%
C395		Not Assigned
C396	1500018	Mylar, .01 mfd, 100V, ±10%
C397	1500013	Mylar, .0047 mfd, 100V, ±10%
C398	1520028	Y5E, Disc, 150 pf, ±10%
C399	1520028	Y5E, Disc, 150 pf, ±10%
C400	1500018	Mylar, .01 mfd, 100V, ±10%
C401	1540002	Electro., 1 fd, 35V, ±10%

C402	1520071	Z5P, Disc, .001 mfd, ±10%
C403	1510012	NPO, Gimmick, 1.2 pf, ±10%
C404	1520009	NPO, Disc, 15 pf, ±10%
C405	1570121	Trimmer, 5-25 pf
C406	1560406	Trimmer, 115 pf

Diodes

CR101	4810017	High Frequency Switching, FD1936
CR102	4810017	High Frequency Switching, FD 1936
CR103	4810021	1N34A
CR104	4810021	1N34A
CR105	4810025	1N34A
CR301	4810007	Zener, 6.8V, 3/4W, ±5%
CR302	4812109	Varicap, MV2109
CR303	4810011	Zener, 24V, 1W, ±10%
CR304	4810013	General Purpose, 100V, 1A
CR305	4810007	Zener, 6.8V, 3/4W, ±5%
CR306	4810013	General Purpose, 100V, 1A
CR307	4810013	General Purpose, 100V, 1A
CR308	3900030	Light Emitting Diode, FLV 110
CR309	4810017	High Frequency Switching, FD 1936

Integrated Circuits

IC101	3130017	MC1350P, IF amplifier
IC102	3130024	CA3075, Quadrature detector
IC103	3130020	CA810Q, Audio amplifier
IC301	3130012	N5558, Dual op-amp

Inductors

L101	1800226	Coil Rcv, RF amp input
L102	1800225	Coil Rcv, RF amp
L103	1800116	Coil Rcv, RF amp
L104	1800117	Coil Rcv, RF amp
L105	1800118	Coil Rcv, RF amp
L106	1800119	Coil Rcv, RF amp
L107	1800308	Coil, Rec. osc.
L108	1800350	Coil, 1 uh choke, ML10G
L301	1800032	Coil, 80 uh choke
L302	1800203	Coil, 3 1/2 T, LHH
L303	1800201	Coil, 2 1/2 T, LHH
L304	1800201	Coil, 2 1/2 T, LHH
L305	1800202	Coil, 3 1/2 T, RHH
L306	1800201	Coil, 2 1/2 T, LHH
L307		Not Assigned
L308	1800204	Coil, 4 1/2 T, LHH
L309	1800201	Coil, 2 1/2 T, LHH
L310	1800204	Coil, 4 1/2 T, LHH
L311	1800201	Coil, 2 1/2 T, LHH

L312		Coil etched on PC board
L313	1800203	Coil, 3 1/2 T, LHH
L314		Coil etched on PC board
L315	1800205	Coil, 2 T, LHH

Transistors

Q101	4800054	MOSFET, DualGate MPF120
Q102	4805486	J-FET, N channel, 2N5486
Q103	4800068	MOSFET, DualGate 3N201 (SFE801)
Q104	4805484	J-FET, N channel, 2N5484
Q105	4805484	J-FET, N channel, 2N5484
Q106	4800026	Silicon, NPN, MPS 3693
Q107	4800028	Silicon, NPN Red Dot, MPS6514S
Q108	4800028	Silicon, NPN Red Dot, MPS6514S
Q109	4800026	NPN Silicon, MPS3693
Q110	4800024	NPN Silicon, Blue Dot, MPS3563
Q301	4800033	NPN Silicon, MPS5172
Q302	4805461	J-FET, P-channel 2N5461
Q303	4800026	NPN Silicon, MPS 3693
Q304	4804427	NPN Silicon, 2N4427
Q305	4804427	NPN Silicon, 2N4427
Q306	4804427	NPN Silicon, 2N4427
Q307	4806080	NPN Silicon, RF Power, 2N6080
Q308	4806082	NPN Silicon, RF Power, 2N6082
Q309	4800051	NPN Silicon, Darlington, MPSA13

Resistors

R101	4700045	47K, ±10%, 1/2 W
R102	4700049	100K, ±10% 1/2 W
R103	4700013	100 ohm, ±10%, 1/2W
R104	4700013	100 ohm, ±10%, 1/2W
R105	4700013	100 ohm, ±10%, 1/2W
R106	4700013	100 ohm, ±10%, 1/2W
R107	4700051	150 K, ±10%, 1/2 W
R108	4700035	6.8K, ±10%, 1/2 W
R109	4700050	120K, ±10%, 1/2 W
R110	4700035	6.8K, ±10%, 1/2 W
R111	4700013	100 ohm, ±10%, 1/2 W
R112	4700013	100 ohm, ±10%, 1/2 W
R113	4700013	100 ohm, ±10%, 1/2 W
R114	4700033	4.7K, ±10%, 1/2 W
R115	4700041	22K, ±10%, 1/2 W
R116	4700035	6.8K, ±10%, 1/2 W
R117	4700049	100K, ±10%, 1/2 W
R118	4700037	10K, ±10%, 1/2 W
R119	4700003	10 ohm, ±10%, 1/2 W
R120	4700049	100K, ±10%, 1/2 W
R121	4700037	10 K, ±10%, 1/2 W
R122	4700058	1 M, ±10%, 1/2 W
R123	4700043	33K, ±10%, 1/2 W
R124	4700043	33K, ±10%, 1/2 W
R125	4700045	47K, ±10%, 1/2 W

R126	4700032	3.9K ±10%, 1/2W
R127	4760049	25K, variable ±30% Linear
R128	4700011	68 ohm, ±10%, 1/2W
R129		Not Assigned
R130	4700041	22K, ±10% 1/2W
R131	4760050	25K, variable ±30%, audio taper
R132	4700010	56 ohm, ±10%, 1/2W
R133	4700013	100 ohm, ± 10%, 1/2 W
R134	4700013	100 ohm, ±10%, 1/2 W
R135	4700013	100 ohm, ±10%, 1/2 W
R136	4700041	22K, ±10%, 1/2 W
R137	4700041	22 K, ±10%, 1/2 W
R138	4700015	150 ohm, ±10%, 1/2 W
R139	4700021	470 ohm, ±10%, 1/2 W
R140	4700037	10K, ±10%, 1/2 W
R141	4700017	220 ohm, ±10%, 1/2 W
R142	4700037	10K, ±10%, 1/2 W
R143	4700040	18K, ±10%, 1/2 W
R144	4700040	18K, ±10%, 1/2 W

R301	4700015	150 ohm, ±10%, 1/2 W
R302	4700041	22K, ±10%, 1/2 W
R303	4700041	22K, ±10%, 1/2 W
R304		Not Assigned
R305	4700023	680 ohm, ±10%, 1/2 W
R306	4700031	3.3K, ±10%, 1/2 W
R307		Not Assigned
R308	4700013	100 ohm, ±10%, 1/2 W
R309	4700047	68K, ±10%, 1/2 W
R310	4700033	4.7K, ±10%, 1/2 W
R311	4700016	180 ohm, ±10%, 1/2 W
R312	4700006	22 ohm, ±10%, 1/2 W
R313	4700031	3.3K, ±10%, 1/2 W
R314	4700017	220 ohm, ±10%, 1/2 W
R315	4700006	22 ohm, ±10%, 1/2 W
R316	4700006	22 ohm, ±10%, 1/2 W
R317	4700033	4.7K, ±10%, 1/2 W
R318	4700017	220 ohm, ±10%, 1/2 W
R319	4700006	22 ohm, ±10%, 1/2 W
R320	4700003	10 ohm, ±10%, 1/2 W
R321	4700029	2.2K, ±10%, 1/2 W
R322	4700015	150 ohm, ±10%, 1/2 W
R323	4700003	10 ohm, ±10%, 1/2 W
R324	4720079	47 ohm, ±10%, 3 W
R325	4700009	47 ohm, ±10%, 1/2 W
R326	4700009	47 ohm, ±10%, 1/2 W
R327		Not Assigned
R328		Not Assigned
R329		Not Assigned
R330	4700045	47K, ±10%, 1/2 W
R331	4760039	500K, Variable, +20%
R332	4700015	150 Ohm, ±10%, 1/2 W
R333	4760021	50K, Variable, +20%
R334	4700015	150 ohm, ±10%, 1/2 W
R335	4700037	10K, ±10%, 1/2 W
R336	4700035	6.8K, ±10%, 1/2 W

R337	4700043	33K, ±10%, 1/2 W
R338	4700034	5.6K, ±10%, 1/2 W
R339	4760021	50K, Variable, ±20
R340	4700037	10K, ±10%, 1/2 W
R341	4700029	2.2K, ±10%, 1/2 W
R342	4700019	330 ohm, ±10%, 1/2 W
R343	4700024	820 ohm, ±10%, 1/2 W

Transformers

T101	5600098	10.7 MHz IF
T102	5600098	10.7 MHz IF
T103	5600098	10.7 MHz IF
T104	5600098	10.7 MHz IF
T105	5600046	10.7 MHz IF
T106	5600012	455 kHz IF
T107	5600012	455 kHz IF
T108	5600012	455 kHz IF
T109	5600068	Tripler - local oscillator
T301	5600072	Transmit oscillator
T302	5600082	Transmit Tripler
T303	5600083	Transmit First Doubler

Crystals

Y101	2300506	Channel 6 receive, 10.7 MHz IF
Y121	2300517	Channel 16 receive, 10.7 MHz IF
Y122	2300570	Channel Wx receive, 10.7 MHz IF
Y123	2300252	Second L.O., 10.245 MHz
Y301	2300167	Channel 6 transmit
Y321	2300185	Channel 16 transmit

Switches

SW301	5100103	Power Switch - Slide
SW302A	5100105	Rotary 20 position wafer
SW302B	5100106	Rotary 20 position wafer
SW303	5100102	Dial-Priority selector - Slide

Miscellaneous

FL101	2303504	Crystal Filter - matched to FL102
FL102	2303504	Crystal Filter - Matched to FL101
FL103	2303504	Crystal Filter - matched to FL104
FL104	2303504	Crystal Filter - matched to FL103

K301	4500008	Relay, 4PDT, 12 VDC
F301	5140008	Fuse, 3AG, 7 Amp
J101		Connector Molex 24
J301	2100239	Receptical - Amphenol SO239
DS101	3900025	Lamp, 14 VDC
SP101	1320024	Speaker, 3.2 ohm, 4 watt
P101		Connector Molex 24
	2510101	Knob, volume and squelch
	2510094	Knob, channel selector
	2510091	Panel front
	2502311	Panel trim
	2510049	Bracket - subpanel
	2502292	Bracket - mounting handle
	2502621	Cover
	1325069	Microphone
	2510095	Insert - Vol. & Sq.
	2510096	Insert - Power
	1091062	Prestype - Frequency

Specifications Subject to Change Without Notice