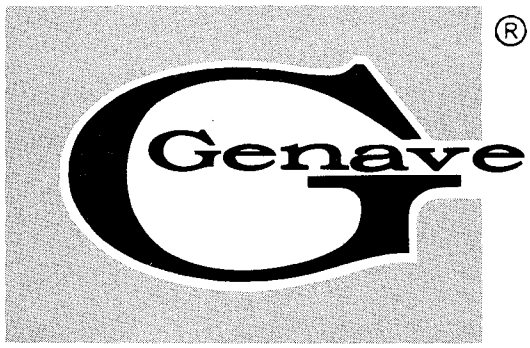


Mobiline II
VHF FM COMMUNICATIONS
TRANSCEIVER MAINTENANCE MANUAL

CONTENTS

(Note: All figures are printed on white within their appropriate sections.)

Published by: **General Aviation Electronics, Inc.**
4141 Kingman Drive
Indianapolis, Indiana 46226
Area (317) 546-1111

Price: Single Copy $20.00

GENERAL
AVIATION
ELECTRONICS
INC.

4141 KINGMAN DRIVE
INDIANAPOLIS, IND. 46226
AREA 317 • 546-1111

TB 7405 — 28 August 1974

SUBJECT: Mobiline I, Mobiline II and Mobiline III Maintenance Manual Update

The information contained here is intended to update the data published in the Mobiline I, Mobiline II and Mobiline III Maintenance Manuals.

1) Change the Mobiline I Parts List to read as follows:

R122 Selected Value (Nominal P/N 4700037, 10K, 10%, 1/2W)

2) Change the Mobiline II Parts List to read as follows:

R118 Selected Value (Nominal P/N 4700037, 10K, 10%, 1/2W)

3) Change the Mobiline III Parts List to read as follows:

R120 Selected Value (Nominal P/N 4700037, 10K, 10%, 1/2W)

GENERAL AVIATION ELECTRONICS INC.

4141 KINGMAN DRIVE
INDIANAPOLIS, IND. 46226
AREA 317 • 546-1111

Correction Bulletin

CB7501 February 13, 1975

SUBJECT: MOBILINE II MAINTENANCE MANUAL CORRECTIONS

Before attempting to utilize the Mobiline II Maintenence Manual, the following changes should be made where indicated.

Page 3, Installation Manual--paragraph 4, line 4, change to read:

"frequency is in excess of 1.5 MHz for Mobiline I and .5 MHz for Mobiline II from the factory alignment frequency."

Section IV, Page 11--First Local Oscillator Alignment, after step 2 add:

NOTE: Check for proper oscillator starting on the secondary transmit frequency, if unit is so equipped. If necessary readjust the slug of L106 slightly to insure starting on both frequencies.

Section IV, Page 12--10.7 MHz and 455 KHz IF Alignment, step 9, change to read:

"9. Remove the snap plug for T109. Adjust T101, C112, T102, T103, (Note: Rotate T103's slug fully counterclockwise and then set it at the first peak encountered rotating it back clockwise.) T104, T105, and T109; in that order....."

Section IV, Page 13--Frequency and Power Alignment, step 2, Note, last line should read:

".7 volts."

Section IV, Page 13--Frequency and Power Alignment, step 3, last line should read:

" at approximately 0.3 volts."

Section IV, Page 14--Frequency and Power Alignment, step 4, last line should read:

"The signal should peak at approximately .7 volts."

(over)

Section IV, Page 15--Subaudible Decoding Sensitivity Adjustment, delete step 4 and add:

"4. Adjust the audio generator and the FM signal generator to produce ± 500 Hz deviation of the carrier at the desired receive frequency.

5. Set the FM signal generator attenuator to produce an output level of 1 microvolt.

6. Turn-on the receiver, set the front panel squelch control fully counter-clockwise, and adjust the volume control to a midrange setting.

7. Adjust R408, the Input Level Adjustment on the subaudible tone circuit board until the receiver audio just quiets.

8. Adjust the audio generator and the FM signal generator to produce ± 600 Hz deviation of the FM signal generator output. This should cause the subaudible squelch to open. If not, go back to Step 4 and repeat the procedure."

Section IV, Page 15--Voice Modulation Deviation Adjustment, following step 3 add:

"(Maximum position is with R235 rotated fully toward the T/R relay.)"

Section IV, Page 16--Voice Modulation Deviation Adjustment, add the following after step 13:

"14. R235, the microphone gain adjustment, may now be readjusted to produce the desired voice audio clipping level for the microphone used.

Figure 4-5-5, TROUBLESHOOTING HINTS--Transmitter Inoperative, first paragraph, last sentence should read:

"The voltage levels should be approximately .7 volts, .3 volts, and 1.5 volts for Q203, Q204, and Q205 respectively."

Figure 4-5-5, TROUBLESHOOTING HINTS--Unstable Modulation, step 3, last line should read:

".....on the emitter of Q203."

Section V, Page 12, Type C and D receivers, Crystal Frequency should read:

" Operating Frequency + 10.7 MHz "

SECTION I

GENERAL INFORMATION

1-1. INTRODUCTION

This service manual contains all of the information normally required to install, operate, and maintain the Genave Mobiline II VHF-FM transceiver.

1-2. DESCRIPTION

The Genave Mobiline II is a solid state VHF-FM transceiver intended for use in the VHF bands from 143.9 MHz to 173.4 MHz. The Mobiline II is designed to be utilized in the following services: maritime land, mobile or utility stations; Civil Air Patrol stations; industrial radio service stations; land transportation radio service stations; remote pickup broadcast stations; and domestic public radio service stations.

The Mobiline II transmits and receives 16F3 emission on one of two possible transmit/receive frequency pairs. A front panel selector provides selection of the desired transmit/receive frequencies in addition to functioning as the main power switch. In single frequency pair installations the channel selector is so wired that the single receive and transmit crystal will be selected in either switch position.

The Mobiline II has two additional front panel controls which can be activated by the operator. These are the squelch and volume controls. The Mobiline II is also equipped with a transmit indicator lamp which illuminates when the transmitter is activated.

The Mobiline II is designed to operate on +13.75 VDC primary power. The Genave PSI/10 power supply can be utilized to operate the unit from a 117 VAC 50-60 Hz input. The transmitter and receiver are designed to operate using a standard 52 ohm antenna system. Provisions are made within the transceiver for the addition of the RFA-10 receiver preamplifier and the ED-33 MobilGuard CTCSS subaudible tone encoder-decoder. An external speaker jack is provided along with an accessory plug on the rear panel of the unit. The microphone jack is mounted on the side of the unit and can be utilized with a variety of optional microphones.

The entire unit is enclosed in a vinyl-clad, wrap-around steel case with a mounting handle which can be used for under panel, desk top, or bulkhead mounting.

1-3. SPECIFICATIONS

GENERAL

Front Panel Size:	6-1/2" x 2-1/2" (16.51 cm x 6.35 cm)
Over All Dimension:	6-1/2" x 2-1/2" x 9" (16.51 cm x 6.35 cm x 22.86 cm)
Components:	14 Transistors, 13 Diodes, 4 FETs, 7 ICs, 1 Xtal Filter.
Power Supply:	12 VDC, Negative Ground
Frequency Range:	143.9--173.4 MHz (Maximum Frequency Separation of Installed Channels - 1 MHz)
Number of Channels:	2
Weight:	Approximately 5 lbs. (2.27 Kg)

RECEIVE

Sensitivity:	.35 microvolt for 20 db quieting
Image Rejection:	More than -85 db.
Spurious Rejection:	More than -85 db.
Selectivity:	± 7 KHz @ 6 db
Circuit Configuration:	Dual Conversion, Superheterodyne, Crystal Controlled, with Crystal Filter in First IF.
Audio Output:	1.5 watts at less than 15% distortion
Modulation Acceptance:	More than 5 KHz
Squelch Threshold:	.25 microvolt max.
Adjacent Channel Rejection:	± 25 KHz, more than 70 db
Current Drain:	.3 amps.

TRANSMIT

Frequency Range:	143.9--173.4 MHz (Maximum Frequency Separation of Installed Channels - 1 MHz)
Power Output:	25 watts, Nom.
Output Impedance:	Standard 50 ohm
Current Drain:	5.2 amps.

1-4. EQUIPMENT SUPPLIED

a. 1--Mobiline II VHF-FM Transceiver
b. 1--Mounting Bracket
c. 1--Mounting Lock, with hardware
d. 1--DC Power Connector, with 14" lead
e. 1--Accessory Plug, 12 pin male
f. 1--G/5, Hand Microphone, with mounting bracket

1-5. EQUIPMENT REQUIRED, BUT NOT SUPPLIED

a. Antenna, VHF-FM Communications (See Catalog Sheet for Suggestions)
b. Cabling for Power and Signal Harness, as required.

SECTION II

INSTALLATION MANUAL

The following Section

is reproduced

and included with every

Mobiline II

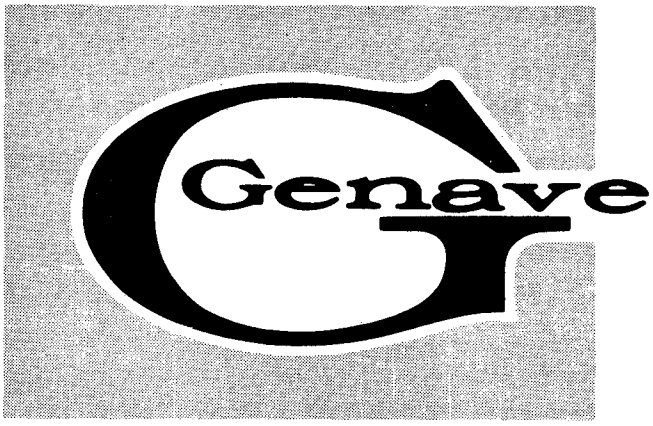
It is made a part of

this manual

for your permanent

reference

This manual is for educational purposes only. The accuracy and completeness of the information provided herein is not guaranteed or warranted.
Genave shall not be liable for any loss or damages. Use at your own risk. Unauthorized reproduction is prohibited.
Copyright © 2007 Genave/NRC, Inc. All rights reserved.



Mobiline I / Mobiline II

VHF-FM COMMUNICATIONS TRANSCEIVER INSTALLATION MANUAL

Warranty

Products bearing the trademark "GENAVE" or the trade name "GENERAL AVIATION ELECTRONICS, INC" have been fabricated by skillful technicians, under the strictest quality control conditions, using the finest materials and component parts available.

When properly installed, adjusted and competently operated according to factory specifications and instructions, General Aviation Electronics, Inc. unconditionally guarantees and warrants all parts and bench service labor for 90 days from the date of the original installation.

This warranty shall not apply to malfunction, which in the opinion of General Aviation Electronics, Inc. is the result of abusive use, accident, willful destruction, improper or unauthorized repair or installation. All service under this warranty must be performed by an Authorized Genave Sales and Service Center, or by returning the unit or units, freight pre-paid, to the factory at Indianapolis, Indiana.

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

GENERAL AVIATION ELECTRONICS, INC.

Proper Installation Will Assure Quality

The unit you are installing is a high quality, rugged, complex piece of electronic equipment. It has been manufactured under rigid quality control and has been fully tested and operated at high temperatures to stabilize the component parts.

Proper installation of the unit is essential to complete the quality assurance program under which the unit was manufactured.

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

Specifications subject to change without notice.

TECH. PUB. NO. 0830002B

Printed in U.S.A. Jan., 1975

The Mobiline I and Mobiline II are VHF-FM communications transceivers designed to produce quality two-way communications at a moderate price. The Mobiline I and Mobiline II are capable of fixed, mobile, or portable operation and can be equipped with a number of available options to custom tailor your communications system. The Mobiline I and Mobiline II are fully compatible with all other VHF-FM communications systems, including the tone squelch option.

Equipment Supplied

a. Mobiline I or Mobiline II Communications Transceiver

b. Mounting Bracket with hardware

c. Hand Microphone with plug and hang-up clip

d. Mounting Lock

e. Accessory Plug, 12-pin Male

f. Power Cable Mating Socket, 2-pin Female

c. Cabling for Power and Signal Harness, as required.

Equipment Required, But Not Supplied

a. Vehicle or Base Antenna: LAMBDA/4, LAMBDA/5, LAMBDA/6, LAMBDA/17, LAMBDA/45 or LAMBDA/90

b. Antenna Cable, RG-8 A/U or RG-58 A/U, as required

Optional Equipment

a. MobilGuard, Sub-Audible Tone Squelch

b. MobilPack, Portable Operation Package

c. PSI/10, AC Power Supply

d. Desk Microphone, Standard or Split Bar

e. Telephone-Style Handset

f. RFA-10, High Gain Receiver Preamplifier (Mobiline I Only)

g. Remote Speakers: SP-4, SP-5, or SP-6

Specifications:

Mobiline I

GENERAL:

Front Panel Size: 6½" x 2½"
Over-all Dimensions: 6½" x 2½" x 9"
Components: 14 transistors, 8 diodes, 6 FETSs, 3 ICs
Power Supply: 12v DC, neg. ground
Frequency Range: 143.9-173.4 MHz
*maximum frequency separation of installed channels 3 MHz
Number of Channels: 2
Weight: approx. 5 lbs.

RECEIVE:

Sensitivity: .5 microvolt for 20 db quieting
Image: more than 45 db
Spurious: more than 50 db
Selectivity: ± 8 kHz
Circuit: dual conversion, superheterodyne, crystal controlled
Audio Output: 1.5 watts at less than 15% distortion
Modulation Acceptance: more than 5 kHz
Squelch Threshold: .5 microvolt max.
Adjacent Channel Rejection: ± 30 kHz, more than 65 db
Current Drain: .3 amps

TRANSMIT:

Frequency Range: 143.9-173.4 MHz
*maximum frequency separation of installed channels 3 MHz
Power Output: 25 watts, nom.
Output Impedance: standard 50 ohms
Current Drain: 5.2 amps

Mobiline II

GENERAL:

Front Panel Size: 6½" x 2½"
Over-all Dimensions: 6½" x 2½" x 9"
Components: 14 transistors, 13 diodes, 4 FETs, 7 ICs, 1 Xtal filter
Power Supply: 12v DC, neg. ground
Frequency Range: 143.9-173.4 MHz
*maximum frequency separation of installed channels 3 MHz
Number of Channels: 2
Weight: approx. 5 lbs.

RECEIVE:

Sensitivity: .35 microvolt for 20 db quieting
Image: more than 85 db
Spurious: more than 85 db
Selectivity: ± 7 kHz
Circuit: dual conversion, superheterodyne, crystal controlled, with crystal filter
Audio Output: 1.5 watts at less than 15% distortion
Modulation Acceptance: more than 5 kHz
Squelch Threshold: .25 microvolt max.
Adjacent Channel Rejection: ± 25 kHz, more than 70 db
Current Drain: .3 amps

TRANSMIT:

Frequency Range: 143.9-173.4 MHz
*maximum frequency separation of installed channels 3 MHz
Power Output: 25 watts, nom.
Output Impedance: standard 50 ohms
Current Drain: 4.2 amps

Pre-Installation Check

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

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

All units are shipped in perfect operating condition. However, a pre-installation electrical test may be performed to assure that the unit has suffered no internal damage during shipment. For a detailed test procedure, refer to the Maintenance Section of the Service Manual. DO NOT ATTEMPT to bench test the unit without proper equipment as specified in the Service Manual.

The unit has been prealigned at the factory on the transmit and receive frequency(ies) listed on the tag attached to the unit. If a change in the transmit and receive frequency(ies) must be made and this change in frequency is in excess of 1.5 MHz from the factory alignment frequency, the transceiver will have to be realigned to accomodate the new frequency. The realignment process is outlined in the Maintenance Manual and should only be performed by an authorized technician using the proper test equipment.

If this unit is equipped with the MobilGuard Sub-Audible Tone Squelch, the sub-audible tone frequency will be listed on the tag attached to the unit and also on a label affixed to the frequency adjustment potentiometer on the sub-audible tone squelch board. The sub-audible tone squelch board is located at the right front corner of the transceiver circuit board. If it should be necessary to readjust the sub-audible tone squelch frequency from the factory set frequency, refer to Figure E.

INSTALLATION

FIXED OPERATION

1. Remove the mounting yoke from the top of the unit and reposition it on the bottom side of the unit to function as a supporting stand.
2. Connect the color coded power leads to the AC power supply. The power supply should be a well regulated type (1.5 V max. ripple at 6 Amp.) such as the Genave Model PSI/10. The unit will only operate on a supply with negative ground. If it is necessary to extend the power leads, use #14 gauge or heavier insulated copper wire. If polarity is reversed, the unit will be inoperative. If this occurs, check wiring polarity (RED to positive, BLACK to negative) and the protective fuse. The fuse is located inside the transceiver case, near the relay at the right rear of the chassis. A blown fuse should be replaced with a 10 Amp. type 3 AG fuse only.
3. Attach the microphone mounting clip to the selected mounting surface if the standard hand microphone is to be used. If the standard hand microphone is to be used with the MobilGuard sub-audible tone squelch, the microphone mounting clip must be electrically grounded in order to provide hang-up squelching.
4. If either the telephone-type handset or the desk microphone is to be used, consult the wiring diagrams of Figures C and D for proper microphone wiring. Connect the microphone to the unit.
5. If the hang-up bracket with the telephone-type handset is to be used, or a 1 + 1 or 2 + 2 tone encoder is to be added, rewire the accessory plug as shown in Figure C.
6. Insert the accessory plug into the accessory socket at the rear of the unit.
7. Connect the antenna to the antenna connector located on the rear panel. The unit is designed to match standard 50 ohm VHF communications antennas. In the interest of maximum efficiency, the antenna system should exhibit a low VSWR.

MOBILE OPERATION

1. Remove the unit from the mounting yoke.
2. With screws or bolts securely fasten the yoke in the desired location

(under dash, on console, overhead, etc.). Unit performance is not affected by mounting position.

3. Replace the unit in the mounting yoke and tighten the thumbscrews.
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 extend power leads, use #14 gauge or heavier insulated copper wire. If polarity is reversed the unit will be inoperative. If this occurs check wiring polarity (RED to positive and BLACK to negative) and the protective fuse. The fuse is located inside the transceiver case, near the relay at the right rear of the chassis. A blown fuse should be replaced with a 10 amp, type 3 AG fuse only.
5. Attach the microphone mounting clip to the selected mounting surface if the standard hand microphone is to be used. If the standard hand microphone is to be used with the MobilGuard sub-audible tone squelch, the microphone mounting clip must be electrically grounded in order to provide hang-up squelching.
6. If the telphone-type handset is to be used consult the wiring diagrams of Figures C and D for proper microphone wiring. Connect the microphone to the unit.
7. If the hang-up bracket with the telephone-type handset is to be used, or a 1 + 1 or 2 + 2 tone encoder is to be added, rewire the accessory plug as shown in Figure C.
8. Insert the accessory plug into the accessory socket at the rear of the unit.
9. Connect the antenna to the antenna connector located on the rear panel. The unit is designed to match standard 50 ohm VHF communications antennas. In the interest of maximum efficiency, the antenna system should exhibit a low VSWR.

PORTABLE OPERATION

The easiest method of portable operation is to utilize the Genave MobilPack Portable Power Case. For instructions on utilization of the MobilPack see the instruction sheet supplied with the MobilPack.

Portable operation of the unit requires the same considerations as fixed and mobile operations (power supply, antenna, etc.).

COAXIAL ANTENNA CONNECTOR ASSEMBLY

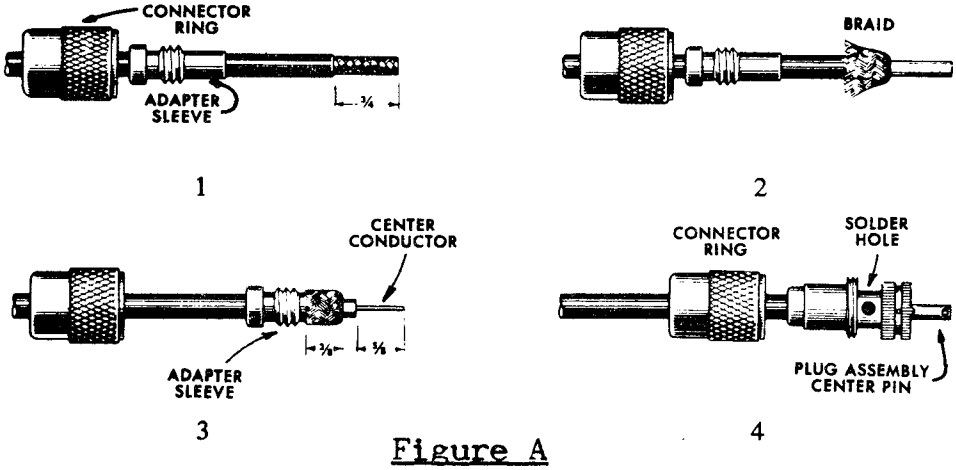


Figure A

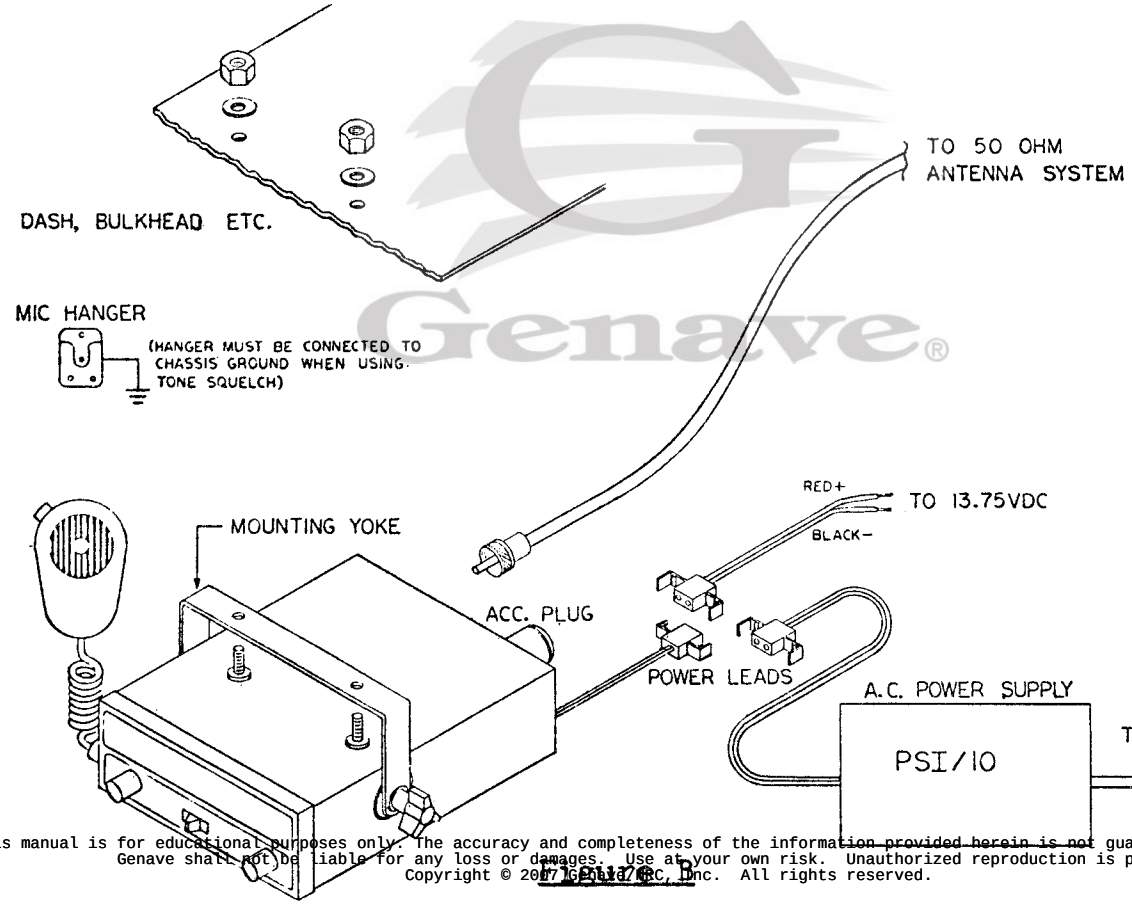
1. Trim end of cable even. Remove outer jacket on cable to dimension shown. Place connector ring and adapter sleeve on cable.

2. Fan out braid and fold back as shown.

3. Remove insulation from the first 5/8" of center conductor as shown. Tin center 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 complete assembly screw connector ring over plug assembly.

INSTALLATION ILLUSTRATION



DESCRIPTION OF ACCESSORY PLUG

The plug on the rear of the Mobiline is a 12 pin male connector which is designated the accessory plug. This plug inserts into J403, a female connector which is mounted on the rear panel of the Mobiline transceiver. The following is a description of the various pin connections and their utilization.

PIN 1

Pin 1 carries the switched 13.75 VDC from the transceiver. This can be used to power associated accessory equipment such as a sequential tone encoder/decoder. This output could also be used to supply power to any other 13.75 VDC device used in conjunction with the Mobiline transceiver, provided the power limitations of the transceiver internal wiring are not exceeded.

PIN 2

Pin 2 provides high level audio output from the audio amplifier of the transceiver. In order for the speaker within the Mobiline transceiver or the external speaker jack at the rear of the Mobiline to be operational, a connection must be made between Pin 2 and Pin 10 on P403. When one of the telephone-style handset hang-up brackets is used, the connection from Pin 2 to Pin 10 is opened, cutting-off the audio from the unit's speaker. Since the telephone-style handset has an internal speaker (earphone) which is wired through the microphone plug, cutting off the Mobiline's internal speaker allows the operator the convenience of private communications.

The connection between Pin 2 and Pin 10 can also be broken by the circuitry of an accessory sequential tone decoder and used as a means of squelching the receiver.

PIN 3

Pin 3 carries the squelch control signal from the subaudible tone decoder, if so equipped. This control output can be sent to additional accessory decoders, if these are employed, or directly to Pin 4, the tone squelch control input, if accessory decoders are not employed.

PIN 4

Pin 4 is the tone squelch control input. Once the decoder circuitry has determined that the proper tones have been received, a positive input signal from Pin 4 must be applied to this input to "turn-on" the audio squelch. When the audio squelch circuits "turn-on" audio will be fed to the receiver's audio amplifier. For additional information, see the discussion of Pin 3.

PIN 5

Pin 5 is an audio input to the transmitter modulator of the Mobiline transceiver. This input can be used to feed audio from an accessory, to the mobiline transceiver. Such a use would be the application of audio from a phone patch unit, a 1 + 1 tone encoder, or 2 + 2 tone encoder. This input is designed to accept a high impedance input (100 K ohms, typical) at a nominal input level of 10 millivolts over a frequency range of 300 Hz to 3 KHz.

PIN 6

Pin 6 carries the low level audio output from the detector of the receiver. When the MobilGuard Tone Encoder/Decoder is not used, this audio output must be connected to Pin 11, the input of the audio amplifier, in order that receiver audio will be applied to the amplifier and then to the speaker. When the MobilGuard system is employed, the circuitry of the MobilGuard will automatically apply the receiver audio to the audio amplifier after the proper subaudible tone has been decoded, therefore the external connection of Pin 6 and 11 is not required. Pin 6 also functions as the sudio source for an accessory decoder when this decoder required a low level audio input.

PIN 7

Pin 7 functions as the electrical chassis ground and umst be connected to the chassis ground of any other accessory equipment employed. Do not rely upon unit mechanical mounting to provide the chassis ground.

PIN 8

Pin 8 carries the tone squelch enable signal from the microphone jack, J202, on the side of the unit. When the standard hand microphone is used this line will be held at ground potential when the microphone is in the hanger bracket. When the microphone is removed from the hanger bracket this line will be ungrounded. When the desk-style microphone is used the operation of this line is identical to when the hand microphone is used. The only exception is that the monitor switch on the desk-style microphone is used to open and close the ground circuit.

Pin 8 is also used to connect the hang-up bracket switching signal of the telephone-style handset (See Accessory Plug Wiring Illustrations). If accessory decoders are employed, the signal from Pin 8 can also be used to disable the accessory decoders when the pretransmission monitoring function is activated.

PIN 9

Pin 9 is the tone squelch enable input. The control signal from Pin 8, described above, is applied to this pin when the MobilGuard system is employed. When this line is ungrounded the MobilGuard squelch "opens-up" allowing the received signal to be heard over the speaker.

PIN 10

Pin 10 is the audio input to the internal speaker of the Mobiline transceiver. This input also goes to the External Speaker Jack, therefore when an audio signal is applied to this pin it may be heard over either the internal speaker of the external speaker connected to J101. This pin is normally jumpered to Pin 2 (See description of Pin 2 for additional details).

Pin 11

Pin 11 is the audio input to the audio amplifier of the Mobiline transceiver. When the MobilGuard system is not used this Pin is normally jumpered to Pin 6, so that receiver audio will be applied to the audio amplifier (For further details see discription of Pin 6.).

PIN 12

Pin 12 is a spare connection.

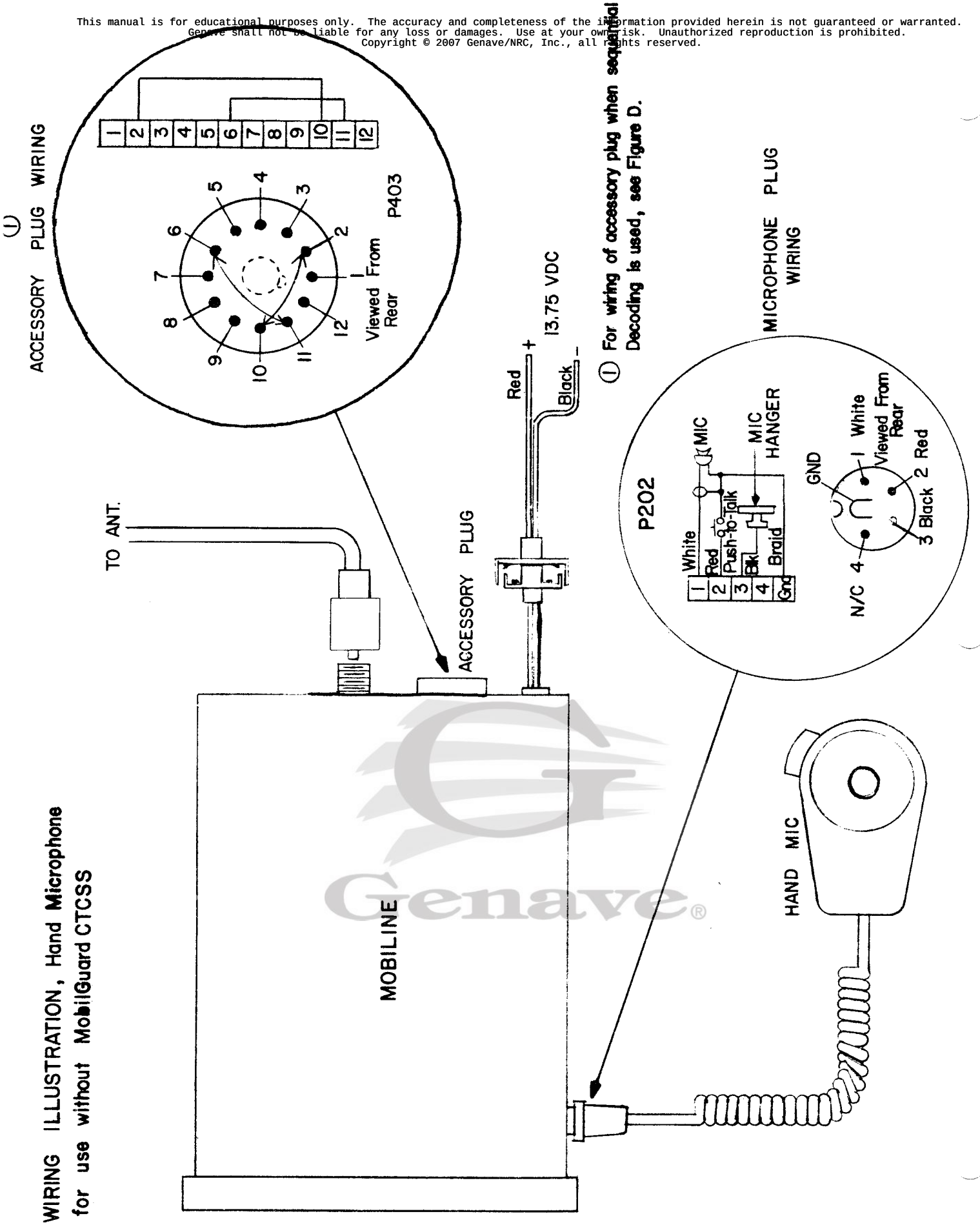


Figure C-1

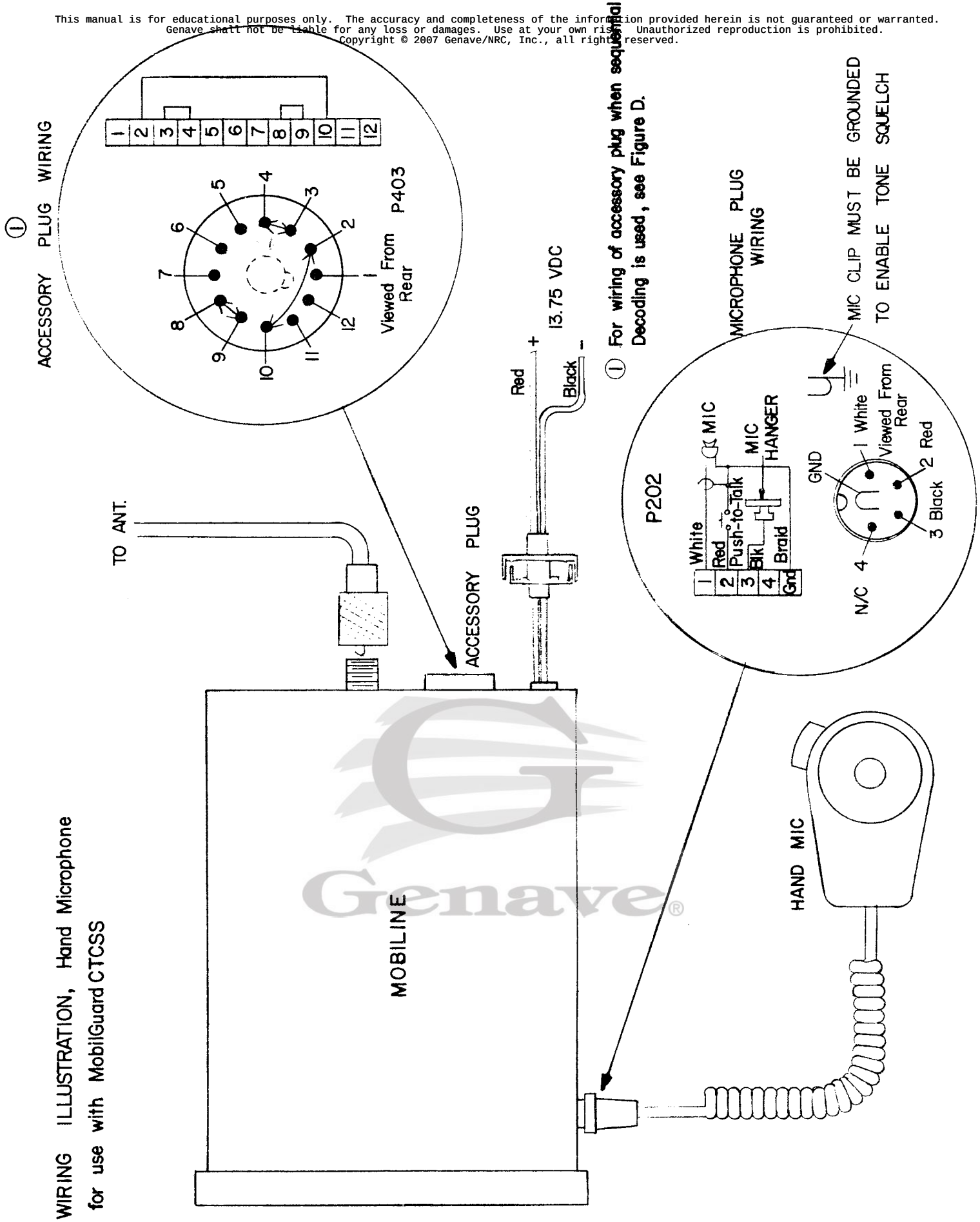


Figure C-2

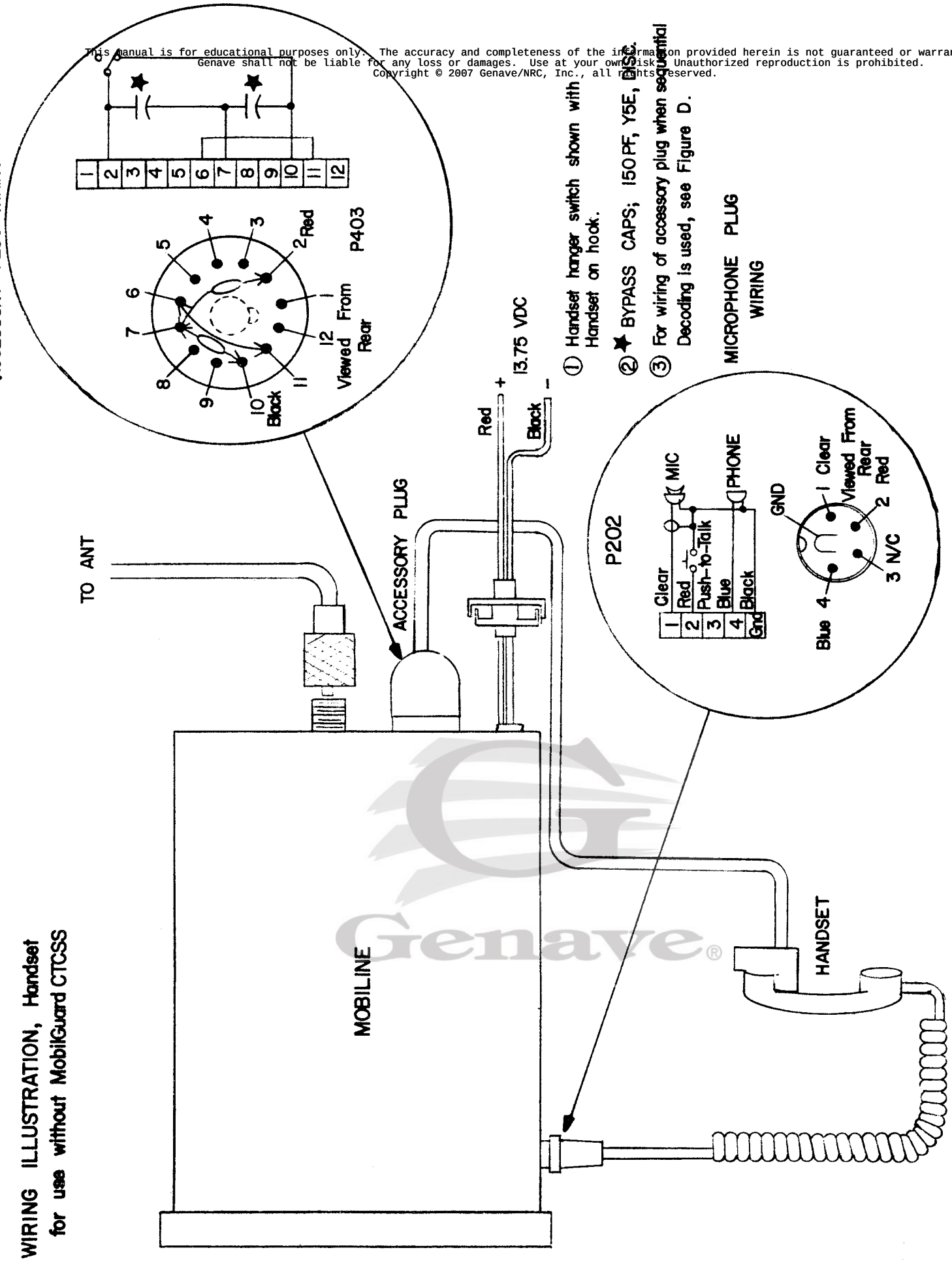


Figure C-3

WIRING ILLUSTRATION, Handset for use with MobilGuard CTCSS

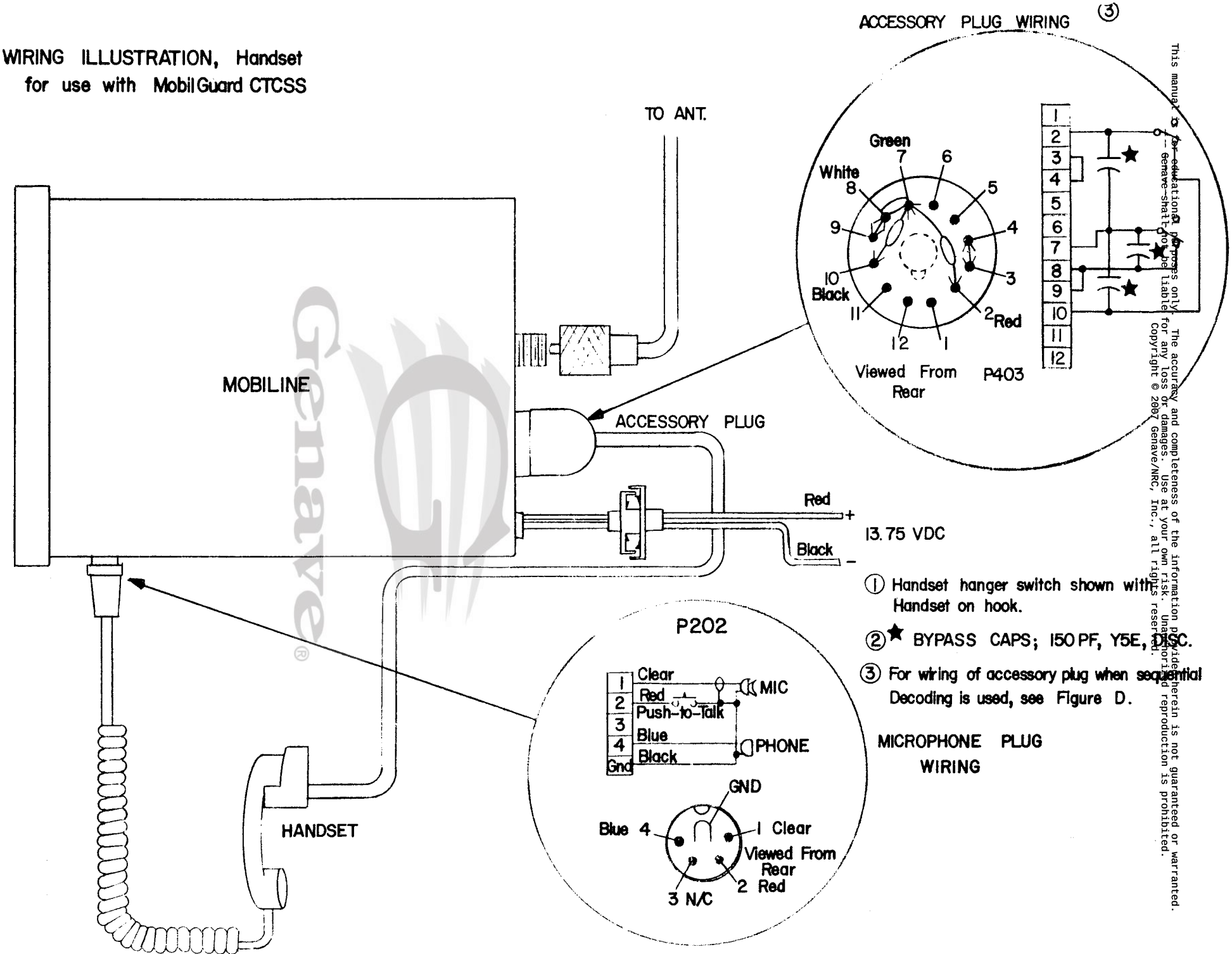


Figure C-4

This manual is for educational purposes only. The accuracy and completeness of the information provided herein is not guaranteed or warranted. Genave shall not be liable for any loss or damages. Use at your own risk. Unauthorized reproduction is prohibited.
Copyright © 2007 Genave/NRC, Inc., all rights reserved.

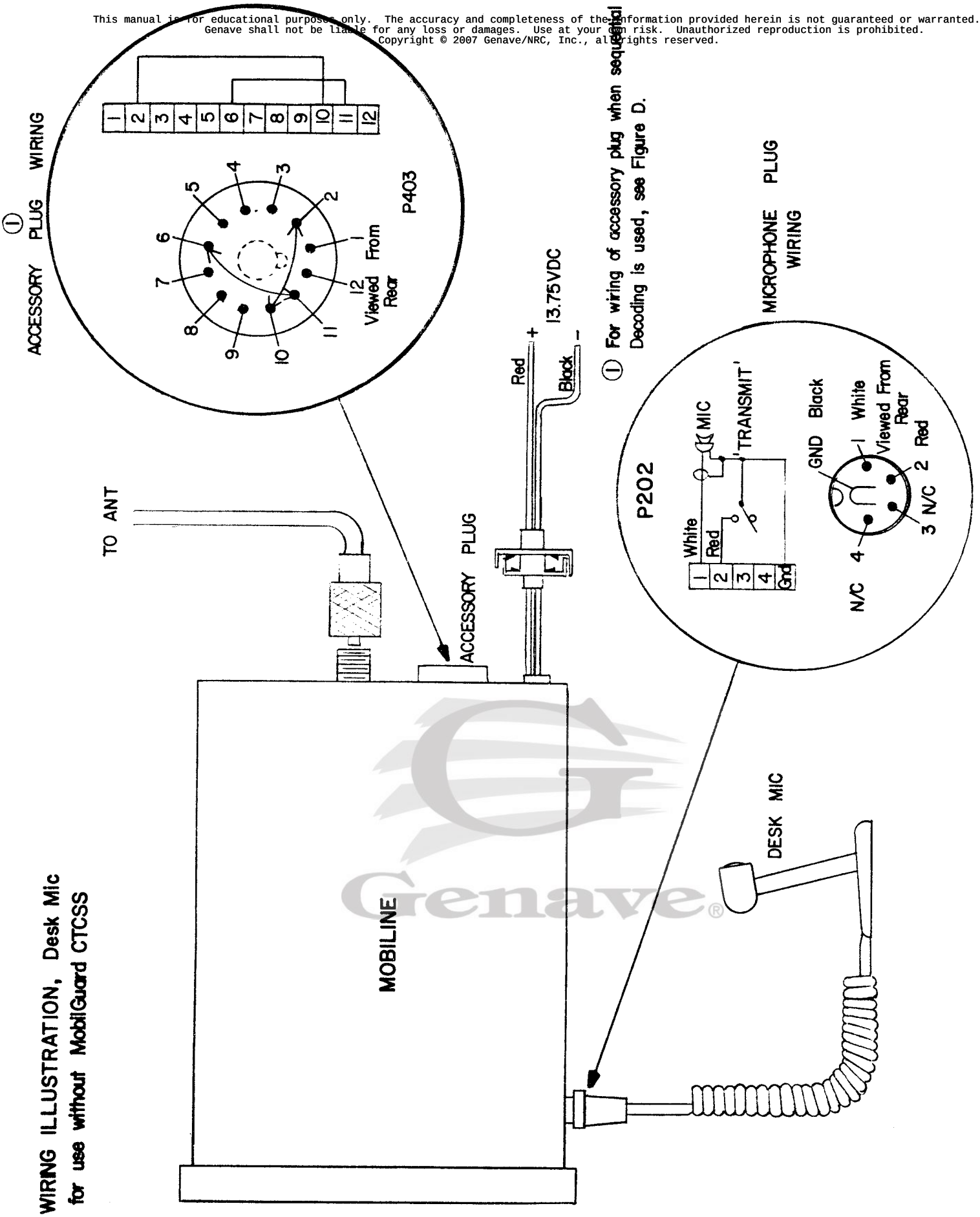


Figure C-5

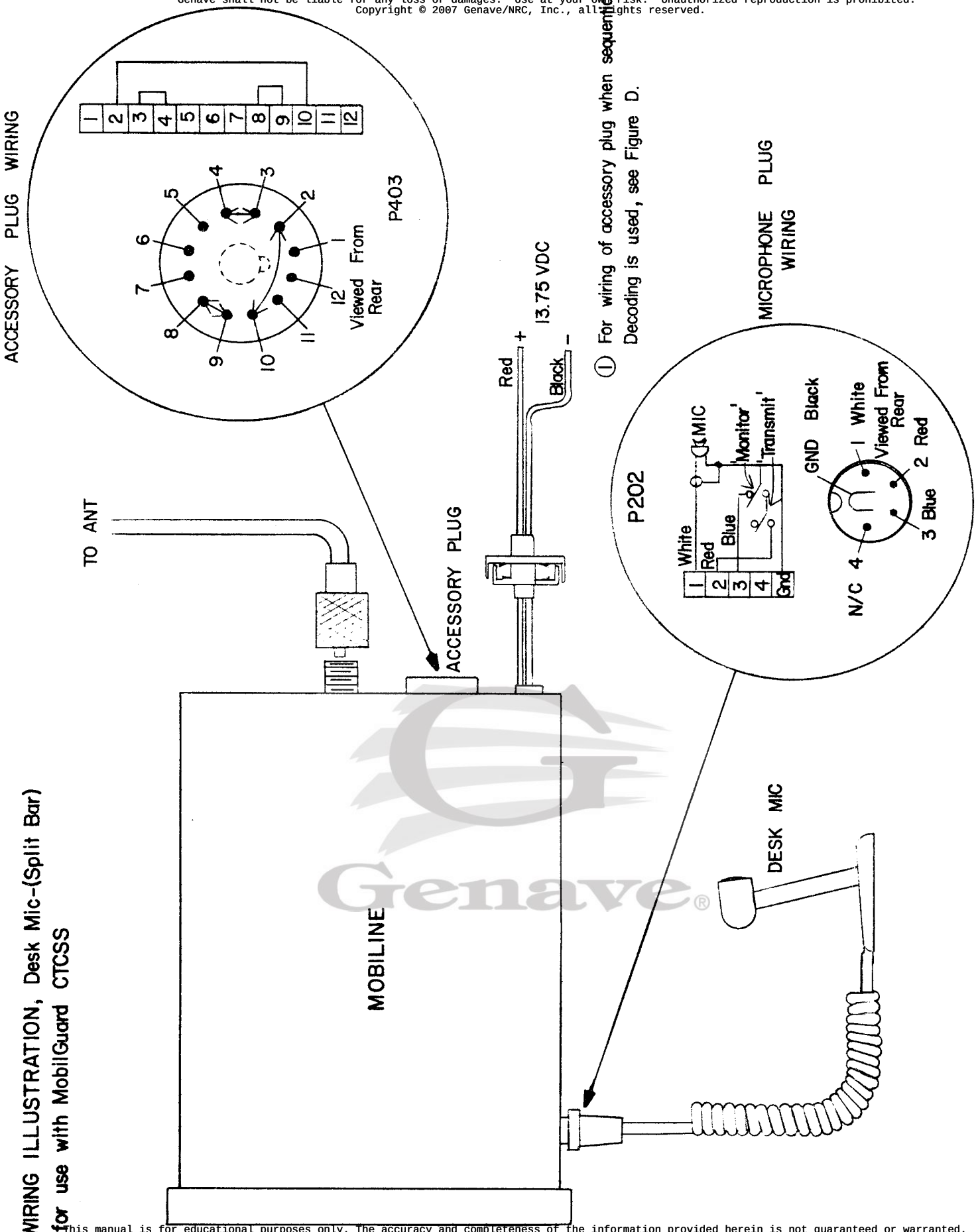


Figure C-6

Accessory Plug Wiring, For Use with COMMUNICATIONS SPECIALISTS INC. Sequential Decoders

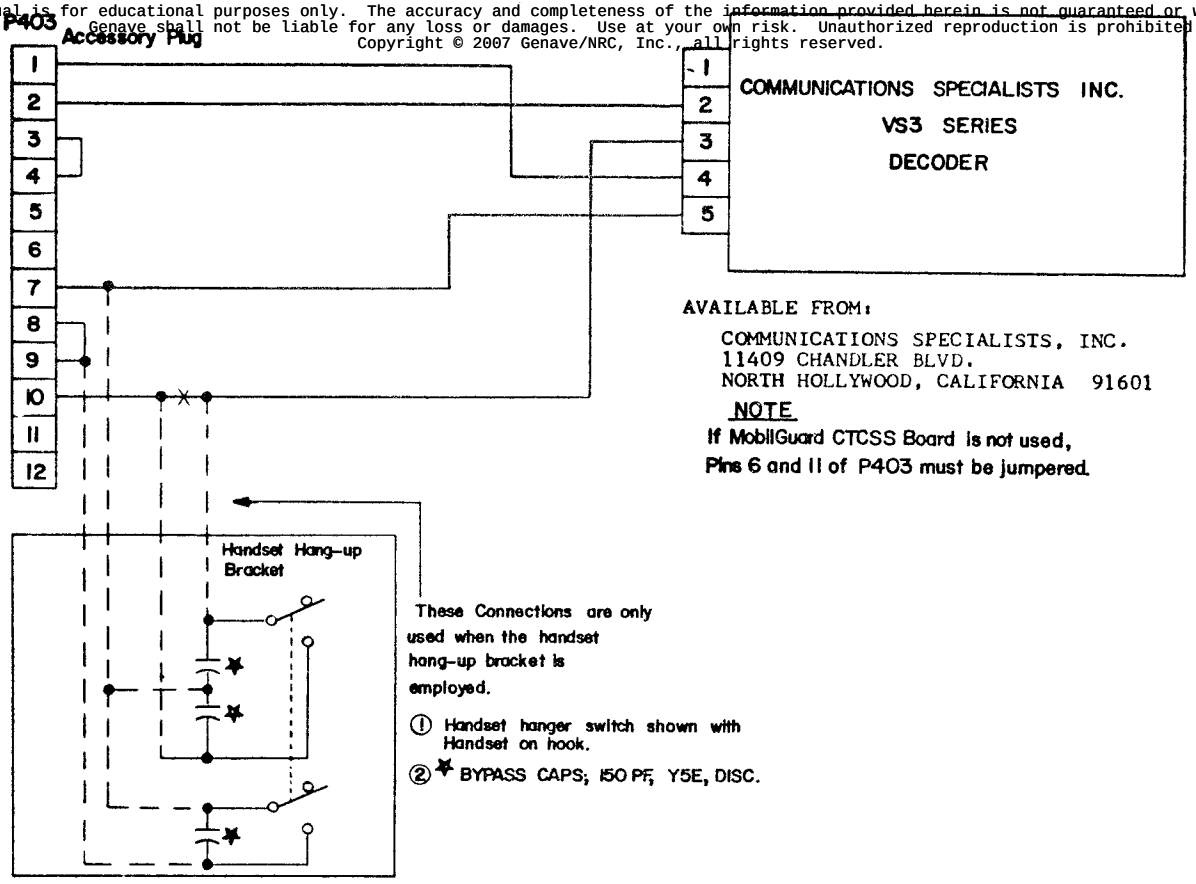


Figure D-1

Accessory Plug Wiring, For Use with SECODE Electronics Sequential Decoders

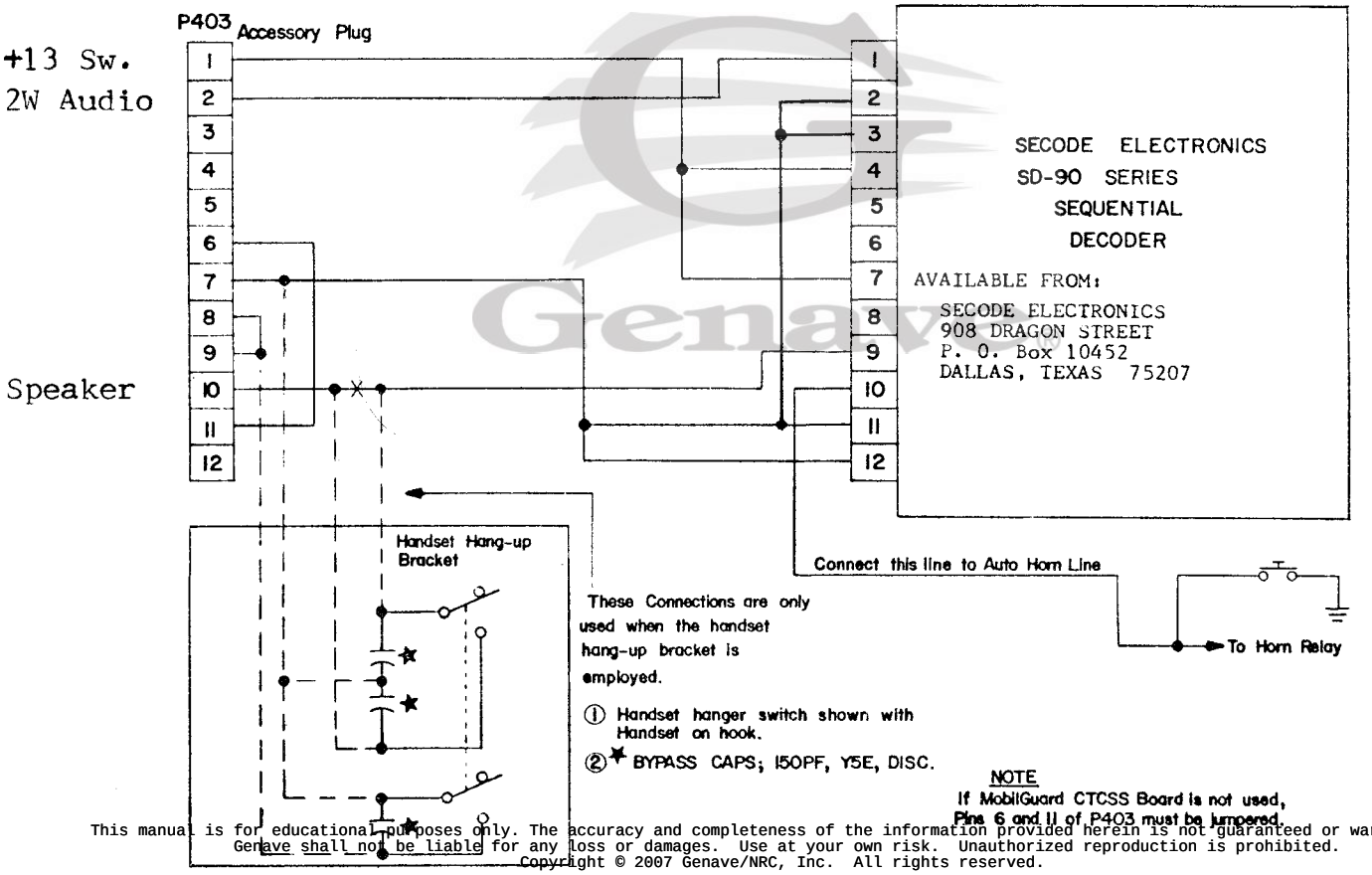
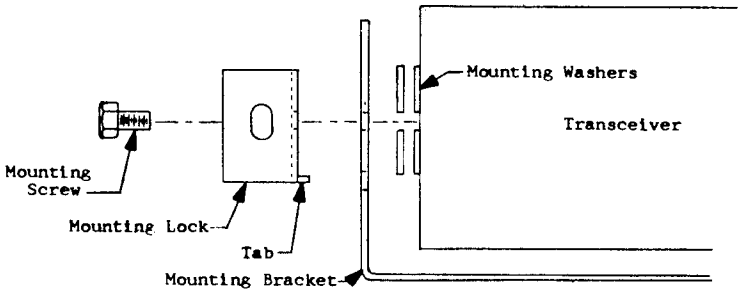


Figure D-2



General

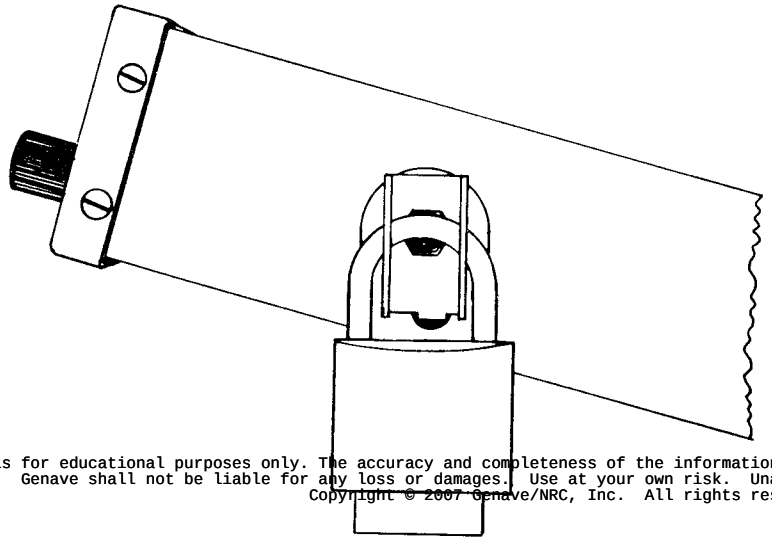
The mounting lock can be used to secure the transceiver to the mounting bracket when the transceiver is mounted in a desk-top, bulkhead, or under-panel configuration. The mounting lock can be used when the transceiver is secured through either the top or bottom mounting holes of the mounting bracket, 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:

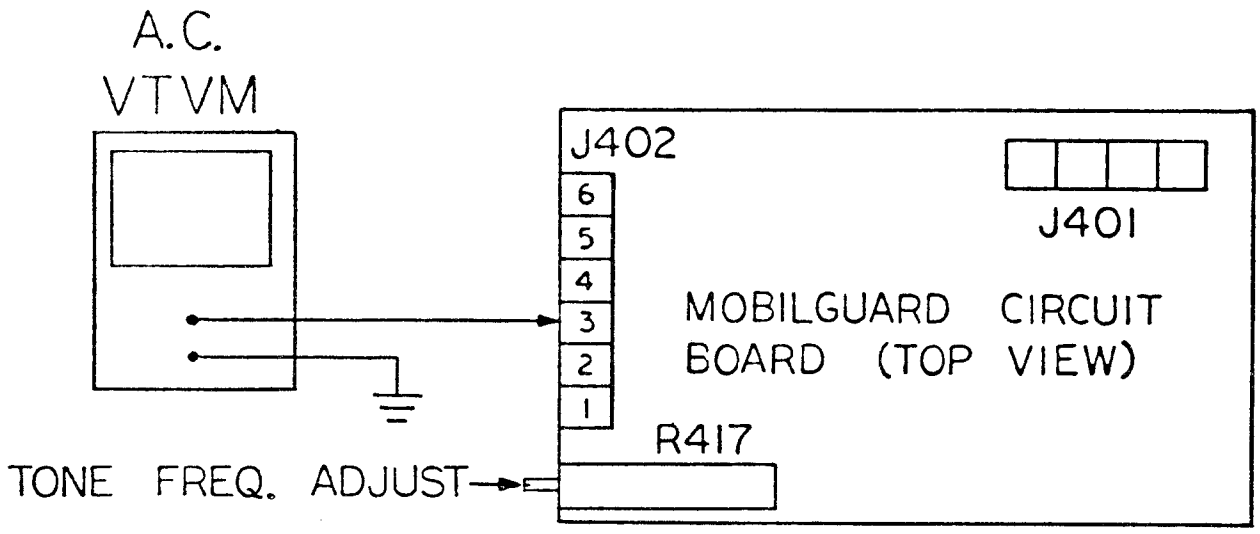
1. Remove the mounting screw and nylon washer from the side of the transceiver mounting bracket to which the mounting lock is to be attached.

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.

4. Attach the padlock through the holes in the side of the mounting lock. Latch the padlock to prevent removal of unit from mounting bracket.





If this unit is equipped with the MobilGuard Sub-Audible Tone Squelch, the sub-audible tone frequency will be listed on the tag attached to the unit and also on a label affixed to the frequency adjustment potentiometer on the sub-audible tone squelch board. The sub-audible tone squelch board is located at the right front corner of the transceiver circuit board. If it should be necessary to readjust the sub-audible tone frequency from the factory set frequency proceed as follows:

1. Connect the transceiver to the power supply.
2. If another unit with the correct sub-audible tone frequency is available, it may be used for on-the-air alignment or a signal generator set for a 10 microvolt signal on the appropriate operating frequency with ±1 KHz deviation of the desired sub-audible tone frequency.
3. Connect the transceiver being adjusted to either the antenna, if on-the-air alignment is to be performed, or to the generator.

   NOTE: It is unnecessary to change any of the level adjustments on the MobilGuard board unless the MobilGuard has not been previously aligned in the transceiver. All MobilGuards shipped from the factory with the unit have been aligned with the transceiver and the level settings will not need adjustment. If a MobilGuard board is removed from one transceiver and placed into another, it must be realigned. For realignment procedures, refer to the Mobiline Maintenance Manual.
4. Connect an AC VTVM to pin 3 of J402.
5. Adjust R417, the frequency Adjustment, for maximum AC voltage as indicated on the VTVM. R417 is accessable using a screwdriver through the opening in the chassis side panel.

SECTION III

OPERATING MANUAL

3-1. OPERATING CONTROLS

The Mobiline II has four front panel operating controls and indicators. These are as follows:

1. Volume Control
2. Squelch Control
3. Function Selector
4. Transmit Indicator

The push-to-talk button on the microphone also functions as an operating control. Unit operation is quite simple and the operating instructions that follow will apply to both those units ewuipped with MobilGuard CTCSS and those without.

3-2. OPERATING INSTRUCTIONS

1. Turn the VOLUME control (#1) and the SQUELCH control (#2) fully counterclockwise.

2. Move the FUNCTION SELECTOR (#3) to the desired operating channel. This will turn-on the transceiver.

3. If the unit is equipped with the MobilGuard tone squelch system, it will be necessary to deactivate the tone squelch. To deactivate the tone squelch, remove the microphone or handset from its hanger or depress the MONITOR

button on the desk-style microphone.

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

5. Turn the SQUELCH control clockwise until the background sounds just disappear. Do not adjust the SQUELCH control while a signal is being received.

6. To transmit, depress the microphone transmit button. If the unit is equipped with the MobilGuard tone squelch system it is important to first monitor the channel to insure that it is clear. The hand microphone and the handset were designed in such a manner that, provided the respective hang-up brackets are used, the receiver squelching will be deactivated when the microphone or handset are picked-up prior to transmitting. The G-11 desk-style microphone is designed so that the TRANSMIT button will not function unless the MONITOR switch has also been depressed. The TRANSMIT INDICATOR LAMP (#4) will illuminate when the transmitter is operating.

7. Hold the microphone 3 to 6 inches (8 to 15 cm) from your mouth and talk in a normal voice.

8. Release the TRANSMIT button to listen.

3-3. LICENSING INFORMATION

Licensing requirements vary with the application for which this unit will be used. All services require that the station transmitter be licensed. The Mobiline II is approved for use in the services provided by F.C.C. Rules and Regulations, Parts 81, 87 (Civil Air Patrol Stations), 89, 91, 93 and 21. Some services require station operators to hold a radio operator's license also.

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

Stations on Land in the Maritime Services - F.C.C. Rules and Regulations, Volume IV, Part 81
- Public Coast Stations
- Marine Utility Stations
- Fixed Stations Associated with the Maritime Mobile Service
- Stations Operated In the Land Mobile Service for Maritime Purposes

Aviation Services - F.C.C. Rules and Regulations, Volume V, Part 87
- Civil Air Patrol Stations

Public Safety Radio Services - F.C.C. Rules and Regulations, Volume V, Part 89
- Local Government Radio Service
- Police Radio Service
- Fire Radio Service
- Highway Maintenance Radio Service
- Forestry-Conservation Radio Service
- Special Emergency Radio Service

Industrial Radio Services - F.C.C. Rules and Regulations, Volume V, Part 91
- Power Radio Service
- Petroleum Radio Service
- Forest Products Radio Service
- Motion Picture Radio Service
- Relay Press Radio Service
- Special Industrial Radio Service
- Business Radio Service
- Manufacturers Radio Service
- Telephone Maintenance Radio Service

Land Transportation Radio Services - F.C.C. Rules and Regulations, Volume V, Part 93
- Motor Carrier Radio Service
- Railroad Radio Service
- Taxicab Radio Service
- Automobile Emergency Radio Service

Domestic Public Radio Services (Other than Maritime Mobile) - F.C.C. Rules and Regulations, Volume VII, Part 21
Domestic Public Land Mobile Radio Service
Rural Radio Service

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

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

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

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

California, Los Angeles 90012
U.S. Courthouse, Rm. 1758
312 North Spring St.

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

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

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

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

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

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

Florida, Tampa 33602
738 Federal Office Bldg.
500 Zack Street

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

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

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

Illinois , Chicago 60604
1872 Everett McKinley Dirksen Bldg.
219 So. Dearborn Street

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

Maryland, Baltimore 21201
819 Federal Bldg.
31 Hopkins Plaza

Massachusetts, Boston 02109
1600 Custom House

Michigan, Detroit 48226
1054 New Federal Building

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

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

New York, Buffalo 14203
328 Federal Building

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

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

Pennsylvania, Philadelphia, 19106
1005 U.S. Custom House

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

Texas, Beaumont 77701
323 Federal Bldg.
300 Willow Street

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

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

Virginia, Norfolk 23502
Military Circle
870 No. Military Highway

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

The following pages are designed to aid Mobiline II users in making license application. Only the technical data pertaining to the Mobiline II transceiver is shown on these sample forms. All other station particulars must be furnished by the licensee.

For additional information on filling out the appropriate application forms, consult the F.C.C. instruction sheet provided for that form. The normal forms used to apply for a license for the Mobiline II are F.C.C. Forms 425 or 400, depending upon the usage and/or geographic location of the proposed station. To determine which form is required, contact the nearest F.C.C. Field Engineering Office as listed previously. They will also be able to supply you with the appropriate forms.

Certain data for the completion of Section III on Form 425 depend upon calculations from the technical data relating to other equipment used in conjunction with the Mobiline I, such as the antenna, feedline, etc. Consult the antenna and cable manufacturers data sheet for these specifications.

SAMPLE LICENSE APPLICATION FORM

FCC FORM 425
OCTOBER 1971

UNITED STATES OF AMERICA
FEDERAL COMMUNICATIONS COMMISSION
WASHINGTON, D. C. 20554

APPLICATION FOR RADIO STATION AUTHORIZATION

SECTION III
FINAL ENGINEERING DATA

1 NAME OF APPLICANT:

2 LICENSE NUMBER:

3 ENTER TOTAL NUMBER OF SECTION III PAGES .....

ENTER PAGE NUMBER OF THIS SECTION III SHEET .....

ENTER PAGE NUMBER OF PERTINENT SECTION II SHEET .....

ENTER THE FOLLOWING INFORMATION FOR ALL NON-MOBILE EQUIPMENTS. USE ADDITIONAL PAGES OF SECTION III AS NECESSARY.

4	TRANSMITTER INPUT POWER (WATTS)	50	6	EFFECTIVE RADIATED POWER (WATTS)	
5	TRANSMITTER RF OUTPUT POWER (WATTS)	25	7	IS TRANSMITTER TYPE ACCEPTED? (YES OR NO)	Yes
8	LOCATION OF CONTROL POINTS				CONTROL POINT TELEPHONE NO. (INCLUDING AREA CODE)
	POINT NO. 1				
	POINT NO. 2				
	POINT NO. 3				

9	TYPE OF UNIT (E.G., TRANSMITTER OR RECEIVER)		Transceiver		
10	SITE NUMBER				
11	ASSIGNED FREQUENCY (MEGAHERTZ)				
12	EMISSION DESIGNATOR (UP TO TWO ENTRIES PER RADIO UNIT)		16F3		
13	EQUIPMENT MANUFACTURER'S NAME		General Aviation Electronics, Inc.		
14	FCC TYPE ACCEPTANCE/MODEL NUMBER		Mobiline II		
15	ANCILLARY EQUIPMENT GIVE REQUIRED INFORMATION FOR EQUIPMENTS, ELECTRICALLY CONNECTED BETWEEN THE TRANSMITTER OR RECEIVER AND ITS ANTENNA. (UP TO TWO ENTRIES PER RADIO UNIT. USE ADDITIONAL PAGES OF SECTION III AS NECESSARY.)	MANUFACTURER'S NAME			
		MODEL NUMBER			
		TYPE OF DEVICE			
		MANUFACTURER'S NAME			
		MODEL NUMBER			
		TYPE OF DEVICE			
16	TONE SQUELCH FREQUENCY (IF USED) (HERTZ)		(Insert Tone Squelch Frequency here if ED-33 equipped.)		
17	ANTENNA MANUFACTURER'S NAME				
18	ANTENNA MANUFACTURER'S MODEL NUMBER				
19	ANTENNA GAIN OVER HALF-WAVE DIPOLE (DB)				
20	ANTENNA POLARIZATION				
21	AZIMUTH OF MAIN LOBE (DEGREES EAST OF TRUE NORTH)				
22	IF MOUNTED ON GROUND, DOES OR WILL THE ANTENNA STRUCTURE EXTEND MORE THAN 20' ABOVE GROUND?				
23	IF MOUNTED ON A BUILDING, DOES OR WILL ANTENNA STRUCTURE EXTEND MORE THAN 20' ABOVE BUILDING?				
24	GIVE NAME AND LOCATION OF NEAREST AIRCRAFT LANDING AREA. IF WITHIN FIVE MILES OF ANTENNA ANSWER ITEMS 25 AND 26 BELOW:	NAME			
		LOCATION			
25	DISTANCE, IN FEET, FROM ANTENNA TO NEAREST POINT OF NEAREST RUNWAY.				
26	BEARING IN DEGREES EAST OF TRUE NORTH FROM ANTENNA SITE TO NEAREST POINT OF NEAREST RUNWAY.				
27	HEIGHT IN FEET ABOVE GROUND OF SUPPORTING STRUCTURE AT ANTENNA SITE.				
28	TYPE OF ANTENNA SUPPORTING STRUCTURE (WATER TOWER, BUILDING, CHIMNEY, POLE, ETC.)				
29	OVERALL HEIGHT OF ANTENNA IN FEET ABOVE GROUND.				
30	HAS NOTICE OF CONSTRUCTION BEEN FILED WITH THE FAA? (ON FAA FORM 7460-1)				
31	IF ANSWER TO ITEM 30 IS 'YES', COMPLETE THIS ITEM.	DATE FILED			
		NAME UNDER WHICH FILED			
		FAA OFFICE WHERE FILED			
32	IF USING AN EXISTING ANTENNA STRUCTURE, GIVE ITS CURRENT PAINTING AND LIGHTING SPECIFICATIONS.				

ENTER THE FOLLOWING INFORMATION FOR MOBILE UNITS:

33	NUMBER OF UNITS				
34	EMISSION DESIGNATOR		16F3		
35	OUTPUT POWER (WATTS)		25		
36	ASSIGNED FREQUENCY (MEGAHERTZ)				
37	TONE SQUELCH FREQUENCY (IF USED) (HERTZ)		(Insert Tone Squelch Frequency here if ED-33 equipped.)		
38	EQUIPMENT MANUFACTURER'S NAME		General Aviation Electronics, Inc.		
39	FCC TYPE ACCEPTANCE/MODEL NUMBER		Mobiline II		

SAMPLE LICENSE APPLICATION FORM

FCC Form 400
AUGUST 1973

United States of America
Federal Communications Commission

Form Approved
Budget Bureau No. 52-R0132

COMMISSION FILE COPY

DO NOT WRITE IN THIS BLOCK

Call Sign _____ File No. _____

1(a). Frequencies MHz	1(b). No. of transmitters: Base-Land-Fixed	Mobile	Other	1(c). Emission	1(d). Input Power Watts
				20F3	50

1(e). Show No. of mobile units in each of following

categories: Land vehicle _____, aircraft _____, paging _____.

hand carried _____, marine _____, receivers _____.

2. Location of transmitter(s) at a fixed location

Number and street (or other indication of location)

City | County | State

Latitude ° ' " N | Longitude ° ' " W

3. Location of control point(s)

4. If mobile units, or other class of station at temporary locations, are included in this authorization, show area of operation.

5(a). Overall height above ground of

(1) tip of antenna ft. | (2) antenna supporting structure ft.

(b). Elevation of ground above mean sea level at antenna site ft.

Antenna pointing and lighting specifications:

Special Conditions:

This authorization effective _____

and will expire 3:00 AM EST. _____

and is subject to further conditions as set forth on reverse side. If the station authorized herein is not placed in operation within eight months this authorization becomes invalid and must be returned to the Commission for cancellation unless an extension of completion date has been authorized.

Federal Communications Commission

Chief, Safety & Special Radio Services Bureau

6(a) Name of Radio Service

(b) Class of station:

Base ☐ Mobile ☐ Other ☐

7(a) Name *(see instructions)*

(b) Mailing address *(number, street, city, state & zip code)*

FOLD HERE

8. Is applicant a representative of any alien or of any foreign government? If answer is "Yes", explain on the reverse of this page. Yes ☐ No ☐

9. State whether applicant is (Check one)

Individual ☐ Partnership ☐ Association ☐ Corporation ☐ Governmental Entity ☐

(If applicant is a non-governmental corporation fill out Item 19; if an unincorporated association fill out Item 20, on the reverse side of this page.)

10. If applicant is an individual or a partnership, are you or any of the partners an alien? If the answer is "Yes", do not file this application because you are not eligible for a license. Yes ☐ No ☐

11. Is communication service to be received from or rendered to another person (see instructions)? If "Yes", name of person is . . . . . Yes ☐ No ☐

12.(a)(1) Will applicant own the radio equipment? Yes ☐ No ☐

If answer is "No", give name of owner

(a)(2) If not the owner of the radio equipment, is applicant a party to a lease or other agreement under which control will be exercised in the same manner as if the equipment were owned by the applicant? Yes ☐ No ☐

(b) Will applicant have unlimited access to the equipment and will effective measures be taken to prevent use of the radio equipment by unauthorized persons? Yes ☐ No ☐

13. Attach functional system diagram showing details of proposed radio system and include such other supplementary data as required by specific rules.

14. If it is proposed to use a transmitter which does not appear on the Commission's "Radio Equipment List," or if the transmitter is listed but not designated for use in the particular radio service named in Item 6(a) of this application, describe such transmitter in detail. (See instructions)

15. Statement of eligibility

(Use space on the reverse of this page)

16. (a) Application for: (Check one)

New station ☐ Assignment of authorization ☐ Reinstatement of expired authorization ☐

Modification ☐

(b) If for modification, state modification proposed

(c) If this application refers to a presently authorized station, give call sign

(d) Give points of communication (call signs)

(e) Are you presently authorized for any other stations in the service indicated in Item 6(a)? Yes ☐ No ☐

17. If antenna will be mounted on an existing antenna structure, (a) Give name of a licensee using this structure, his call sign and radio service and the current painting and lighting specifications required by the Commission for this antenna structure.

(b) If your proposed antenna will increase the height of the existing structure, give overall height above ground of the tip of the proposed antenna structure.

18(a) Will the antenna extend more than 20 feet above the ground, or more than 20 feet above the tree, natural formation or existing man-made structure (other than an antenna structure) on which it is mounted? If "Yes", answer (b), (c), (d) and (e). Yes ☐ No ☐

(b) Give height above ground for each component of the antenna structure (antenna, pole, tower, water tower, mast, building, chimney, etc., or combination of these). ft.

(c) Distance and direction to nearest runway of nearest aircraft landing area.

(d) Name of landing area

(e) Has notice of the proposed construction of the antenna structure been filed with the FAA? If "Yes", state when and the name under which it was filed and the FAA regional office where it was filed. Use space on the reverse of this page. Yes ☐ No ☐

All the statements made in the application and attached exhibits (to inclusive) are considered material representations, and all the exhibits are a material part hereof and are incorporated herein as if set out in full in the application. The applicant certifies that he has a current copy of the Commission's Rules governing the radio service named in Item 6(a) above. The applicant waives any claim to the use of any particular frequency or of the ether as against the regulatory power of the United States because of the previous use of the same, whether by license or otherwise, and requests an authorization in accordance with this application.

I CERTIFY that the statements in this application are true, complete, and correct to the best of my knowledge and belief and are made in good faith.

SIGNATURE: _____ DATE: _____

(Designate appropriate classification below)

DO NOT WRITE IN THIS BLOCK

☐ INDIVIDUAL APPLICANT ☐ MEMBER OF APPLICANT PARTNERSHIP ☐ OFFICER OF APPLICANT CORPORATION ☐ OFFICER WHO IS ALSO A MEMBER OF THE APPLICANT ASSOCIATION

☐ OFFICIAL OF GOVERNMENTAL ENTITY

WILLFUL FALSE STATEMENTS MADE ON THIS FORM ARE PUNISHABLE BY FINE AND IMPRISONMENT, U.S. CODE, TITLE 18, SECTION 1001.

(OVER)

SECTION IV
MAINTENANCE MANUAL

4-1. INTRODUCTION

This section provides the basic information required to electronically test, align, and repair the Mobiline II VHF-FM transceiver. It is assumed that the technician working on the unit has a reasonable familiarity with the principles and terminology of communications electronics and the use of all of the test equipment normally found in field service facilities.

4-2. THEORY OF OPERATION

I. GENERAL

The circuitry of the Mobiline II consists of three major circuit groups; receiver circuitry, transmitter circuitry, and shared receiver/transmitter circuitry. The various functional circuit blocks within each of these major groups are as follows (See also Figure 4-4-1):

Shared Circuitry

A. Crystal Oven
B. Input Filter
C. T/R Relay

Receiver Circuitry

A. Receiver RF Preamplifier
B. First RF Amplifier
C. First Local Oscillator
D. First Multiplier
E. Oscillator Buffer Amplifier
F. First Mixer
G. Crystal Filter
H. First IF Amplifier
I. Autodyne Converter
J. Second IF Amplifier
K. Limiter
L. Detector
M. Audio Preamplifier
N. Noise Amplifier
O. Squelch Amplifier
P. Audio Amplifier

Transmitter Circuitry

A. Transmit Oscillator
B. Subaudible Tone Modulator
C. Buffer
D. Microphone Amplifier/Limiter
E. Voice Modulator
F. Tripler
G. First Doubler
H. Second Doubler
I. Predriver
J. Driver
K. Final Power Amplifier
L. Output Filter

All of the above circuitry is located on the main circuit board of the Mobiline II. The circuitry of the crystal oven is located at the front of the main circuit board within its own shielded enclosure. The transmitter circuitry

is located on the left side of the unit and the receiver circuitry is located on the right side of the unit (as viewed from the front).

The entire unit is enclosed within a wrap-around, vinyl-clad, aluminum case.

II. DETAILED THEORY

Shared Circuitry

A. Crystal Oven - All components of the receiver first local oscillator, the receiver first multiplier, and the receive and transmit crystals are mounted within the crystal oven enclosure. Q301 and RT303 make up the temperature controlling circuitry of the crystal oven. RT303 is a temperature sensing thermistor. RT303 senses the temperature within the oven and sets the bias level on the base of Q301. Q301 is used to control the current flowing through R304, which functions as the heating element within the oven. R304 provides the heating required for the transmit and receive crystals by direct conduction of the heat produced. CR302 provides reversed polarity protection for the oven circuitry.

B. Input Filter - The input filter is comprised of L213, C249, and C250. These components form a pi-configuration low pass filter. In the transmit function this filter eliminates all transmitter spurious products above 1 GHz. In the receive mode this filter will provide some low pass characteristics thereby eliminating some UHF noise entering the receiver.

C. Transmit/Receive Relay - K201 functions as the transmit/receive relay. When the microphone push-to-talk button is depressed pin 2 of the microphone jack is grounded thereby causing current to flow through CR205 and the relay windings. When current flows through the relay windings, the relay will change states. This will remove the ground connection from the transmitter output circuits via pins 8, 9, and 10; remove the 13.75 VDC power from the receiver circuits and apply it to the transmitter circuits via pins 11, 12, and 13; and disconnect the input filter from the receiver circuits and connect it to the transmitter output via pins 14, 15, and 16. When power is applied to the transmitter, DS201, the transmit indicator, will illuminate. CR206 is used to eliminate the overvoltage spike generated by K201 when the relay is de-energized.

Power to the unit is switched off and on by means of SW201A. C269, Z204, and C270 form a noise filter for the A+ input line. CR108 and CR205 prevent damage to the Mobiline II if the supply voltage is of the incorrect polarity.

Receiver Circuitry

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

NOTE

The receiver of the Mobiline II may be built in any of eight possible configurations. There is one normal configuration in which nearly all units

will be built. The normal configuration is with a 10.7 MHz first IF frequency, low side injection of the first local oscillator signal (local oscillator operating 10.7 MHz below the desired receive frequency), 3 times multiplication of the first local oscillator crystal frequency, and a 10.245 MHz second local oscillator frequency.

As previously mentioned, the one normal receiver configuration will cover most units. A few units will be built in different configurations to provide optimum rejection of the spurious signals in a given geographic area. Each possible configuration will be designated by a receiver type, with Type A being the normal configuration. A listing of the various configurations can be found in Figure 4-4-14.

The following receiver description is written for the normal, type A, configuration with an asterisk (*) indicating data which is subject to change with receiver configuration.

All units are marked with a label indicating the receiver type designation. This label is affixed to the side of the chassis within the wrap-around vinyl cover. A sample of this label is shown in Figure 4-4-13. To determine the configuration of any specific receiver locate this label and note the designated type configuration.

A. Receiver RF Preamplifier

In the receive mode, the signal from pin 14 of the T/R relay is capacitively coupled by C101 to L101, the input coil of the RF preamplifier. The RF preamplifier consists of Q101 and associated circuitry. The dual gate MOSFET, Q101, amplifies the signal from the antenna and develops its output across the tuned drain circuit of C106 and L102. The output of the RF preamplifier is capacitively coupled to the RF amplifier by C166.

B. First RF Amplifier

The first RF amplifier is made up of Q102 and its associated circuitry. Q102 is a field effect transistor operated in a common gate configuration. The output of the first RF amplifier is developed across its tuned drain C109 and L104. The output of Q102 is capacitively coupled to the first mixer by C167.

C. Receiver First Local Oscillator

The receiver first local oscillator consists of Q107 and associated circuitry. The desired receive crystal is selected by means of SW201B, which selects the desired crystal through the corresponding series resistor, R144 or R145. CR106 and CR107 function as switching diodes for the receive crystals. The normal crystals utilized will operate in the 55.5 MHz to 54.233 MHz range (*). The collector circuit of Q107 is capacitively coupled to the first multiplier by C147. L106 provides the necessary phase shift to sustain oscillation. C151 and C149 are used to set the receive oscillator to the exact frequency for channels 1 and 2.

D. Receiver First Multiplier

Q108 and its associated circuitry make up the First Multiplier. The collector circuitry of Q108 is tuned to the desired multiple (*) of the crystal frequency by means of the tuned primary of T108. The tuned secondary of T108 inductively couples the first multiplier output to the source of the buffer amplifier.

E. Receiver Oscillator Buffer Amplifier

The oscillator buffer amplifier consists of Q109 and its associated circuitry. Q109 is a field effect transistor operated in a common gate configuration. The drain circuit of Q109 is tuned to the desired frequency by means of the tuned primary of T109. The tuned secondary of T109 couples the output of the buffer amplifier to the first mixer by means of C161.

F. First Mixer

The first mixer is comprised of Q103 and its associated circuitry. The dual gate MOSFET, Q103, develops its output across the primary of T101. The 10.7 MHz IF signal developed in Q103 is taken off the center tap pf T101 and is capacitively coupled to the crystal filter by C112, which is adjusted to provide proper impedance matching into the crystal filter.

G. Crystal Filter

The crystal filter is a fixed, 8-pole, 10.7 MHz filter with a shape factor of approximately 1.75. The 6 db bandwidth is approximately 13.7 KHz and the 60 db bandwidth is approximately 24 KHz. The 10.7 MHz output from the crystal filter is taken from pin 3 of the filter and fed to the tuned primary of T102 where it develops the input for the first IF amplifier. R109 functions as an output load on the crystal filter to reduce ripple in the output response.

H. First IF Amplifier

IC101 and its associated circuitry make up the first IF amplifier. IC101 is an operational amplifier with limiting of the output performed by CR101. The output of the first IF amplifier is inductively coupled by means of T103 to the second mixer.

I. Autodyne Converter

Q104, Y111, and associated circuitry form the autodyne converter (second mixer/oscillator). The oscillator section of the autodyne converter is crystal controlled at 10.245 MHz (*) by means of Y111. The 10.245 MHz (*) signal beats against the 10.7 MHz input signal from the first IF and produces a 455 KHz difference signal. The 455 KHz difference signal from the mixer is developed across the primary of T104 and is inductively coupled to the second IF amplifier.

J. Second IF Amplifier

IC102 and its associated circuitry form the second IF amplifier.

The output of the amplifier stage is tuned by means of the primary of T105. The 455 KHz output signal is taken from the secondary of T105 and fed to the limiter circuit.

K. Limiter

Pins 1 and 2 of IC103 (points A and B on the Schematic Diagram) are the inputs to the limiter circuitry. The limiter function is performed internally within the integrated circuit, IC103.

L. Detector

The primary FM detector circuitry is contained within the integrated circuit, IC103. The quadrature detector circuit consisting of T107, R118, and C124 is located external to the integrated circuit. C169 sets the frequency at which deemphasis begins in the detection circuit.

M. Audio Preamplifier

The output from the detector is applied via pin 8 of IC103, C125, and R119 to the audio preamplifier section of IC103. Pin 13 of IC103 functions as the squelch control input. If pin 13 of IC103 is grounded, the audio preamplifier is disabled. The audio output from the audio preamplifier is disabled. The audio output from the audio preamplifier is applied to the audio input connector of the ED-33, MobilGuard CTCSS circuit board via P401, pin 4. This audio is also applied to pin 6 of J403, the accessory connector. Unless an auxiliary system requiring the low level receiver output is utilized, pin 6 of the accessory plug is jumpered to pin 11. This connection applies the audio preamplifier output to the audio amplifier.

N. Noise Amplifier

Detected audio noise from pin 8 of IC103 is applied to the noise amplifier of IC104A and its associated circuitry. R121, R122, C127, and C128 form an active bandpass bilter, selected to pass 12 KHz noise and prevent 3 KHz and lower audio signals from being amplified in IC104A. IC104A amplifies the 12 KHz noise level and applies it to a voltage doubling detector comprised of CR102, CR103, and C130. The D.C. level developed in this circuit is applied to the squelch control, R123.

O. Squelch Amplifier

IC104B, Q105, and their associated circuitry make up the squelch amplifier. IC104B inverts the D.C. level developed by the noise amplifier circuit and provides sufficient gain to drive Q105, the squelch control transistor. Q105 controls pin 13 of IC103. R123, the squelch control, adjusts the authority of the D.C. noise voltage applied to the input of IC104B. When no signal is received, noise is amplified in the noise amplifier and a negative D.C. voltage is developed in the doubling detector circuit. This negative voltage is fed to the inverting input of IC104B. The positive output of IC104B is resistively coupled to the base of Q105. R125 couples the output of IC104B back to the positive input to provide positive feedback. This causes a regenerative switching action in IC104B which generates a sampling function. When Q105 turns-on

The audio output from pin 12 of IC103 is turned off. When a signal is being received, the 12 KHz noise level at the input of IC104A is removed by the normal quieting action of the receiver and audio is restored.

P. Audio Amplifier

The audio amplifier is comprised of IC102 and associated circuitry. R132, the volume control, sets the level of the audio applied to IC105. R131 and C134, and R133 and C135 perform the frequency response shaping of the audio amplifier while C137, C138, and C139 provide feedback to various stages within the integrated circuit. Output audio from IC105 is applied from pin 12 through C140 to pin 2 of J403, the accessory plug. The audio output is also applied to pin 4 of J202, the microphone jack, through R135. This connection is used to provide earphone output for the telephone-style handsets. If the telephone-style handset or connection to auxiliary equipment (through the accessory plug) are not utilized, a jumper must be connected between pins 2 and 10 of P403. This connection applies the audio amplifier output to J101, the external speaker jack and SP101, the internal speaker. If an external speaker is connected via J101, the contacts on the external jack disable the internal speaker.

Transmitter Circuitry

A. Transmit Oscillator

Q201 and associated circuitry function as the transmit oscillator in a Clapp oscillator configuration. The oscillator frequency is quartz crystal controlled by either Y201 of Y202, depending upon the position of SW201C. Varible capacitors, C202 and C204, are used in series with each crystal to allow exact setting of the generated frequency. The varible capacitors are paralleled by a fixed capacitance in order to reduce the authority of the trimmer capacitor. The output of the oscillator will be in the range from 11.99 MHz to 14.45 MHz, depending upon the crystal used. This output is multiplied by 12 in the multiplier stages to produce an output frequency within the 143.9 MHz to 173.4 MHz range. The transmit crystals are contained within the crystal oven. The A+ applied to the transmit oscillator is regulated to 6.8 VDC by CR202. The output of the transmit oscillator is applied to the buffer, Q202.

ERRATA

In the first 100 units produced, Y201 and Y202 are located on the ground side of the netting capacitors C201, C202, C203, and C204. In all other units produced, Y201 and Y202 are located between the netting capacitors and the selector switch SW201C.

B. Subaudible Tone Modulator

The circuitry of C205, R205, R204, C274, CR201, Z206, and C206 is used to frequency modulate the oscillator when the subaudible tone encoder is employed. The amount of frequency modulation that results from

the subaudible tone input is limited by the level of the tone applied. R204 is used to change the conduction angle of CR201 and therefore the symmetry of the subaudible tone modulation. This subaudible tone modulator circuitry is normally only utilized when the MobilGuard CTCSS circuit board is installed.

C. Buffer

Q202 functions as a buffer in the common gate configuration and accordingly isolates the transmit oscillator from the voice modulator circuitry.

D. Microphone Amplifier/Limiter

The microphone amplifier/limiter in the Mobiline II 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 IC201A. A 6 db per octave rising characteristic is given to the audio frequencies by loading the microphone capacitance with the resistance of R232. IC201 also provides the clipping function required for limiting the voice modulation by saturating symmetrically against the supply voltage and ground. R235 controls the gain of the amplifier/limiter by setting the level of feedback applied to the inverting input. This control allows adjustment of the amplifier gain to correspond with various microphone output levels.

The regulated supply voltage for the microphone amplifier/limiter is obtained by applying the +13.75 VDC primary power to the voltage regulator formed by R239 and the 6.8 volt zener diode, CR204.

The output from IC201A is applied to IC201B which acts as an active 3-pole Chebyshev low-pass filter with a cutoff frequency of 3 KHz. This filter provides the required -18 db per octave rolloff above 3 KHz.

R241 controls the audio level applied to the voice modulator. The audio return for R241 is provided by C263. The audio from the deviation adjustment, R241, is fed to the voice modulator.

E. Voice Modulator

The circuitry of R209, T201, CR203, and C210 function as the voice modulator. R211 and C210 convert the audio signal applied to the form required to produce frequency modulation in a phase modulator. That is, while the modulation technique employed in the voice modulator is actually phase modulation, the circuitry of R211 and C210 performs a preemphasis of the modulating audio, which tends to maintain the frequency deviation of the carrier at a nearly constant level with variations in the modulating frequency. This action makes the modulated signal appear as frequency modulated rather than phase modulated.

F. Tripler

The modulated RF output is applied to Q203, an RF tripler. In this stage an output signal from 35.97 MHz to 43.35 MHz is produced. Harmonics and subharmonics are filtered out by a double-tuned transformer, T202.

G. First Doubler

The output of T202 is fed to Q204 which functions as a Class C doubler. This doubler increases the 35.97 MHz to 43.35 MHz input signal to an output frequency in the 71.94 MHz to 86.70 MHz range. The undesired signals generated in this stage are removed by the tuned transformer, T203.

H. Second Doubler

The output of T203 is applied to the base of Q205, the last multiplier stage. Q205 doubles the RF signal frequency to produce an output in the 143.9 MHz to 173.4 MHz range. The output of Q205 is matched to the input of the following stage by a resonant "L" section consisting of L201 and C225. This circuit also provides some degree of subharmonic suppression.

I. Predriver

Q206 functions as the first Class C power amplifier and receives the approximately 50 milliwatt input from the second doubler. Q206 amplifies the RF signal and couples it to the driver stage by means of the frequency selective matching network formed by L202, C230, C231, L203, and C233. This matching network effectively couples power to the driver stage and rejects any undesirable spurious responses.

J. Driver

Q207 functions as the second Class C power amplifier. Q207 amplifies the RF signal from Q206 and couples it to the final power amplifier stage. The matching network of L204, C235, L205 and C240 rejects any undesirable spurious signals.

K. Power Amplifier

Q208 functions as the final power amplifier. Q208 is a Class C power amplifier which produces the nominal 25 watts of transmitter output power. The final power amplifier output is coupled to the output filter by means of C242.

L. Output Filter

A somewhat complex filter is used to remove subharmonic spurious outputs and harmonic radiations from the RF signal prior to transmission. C272, C242, L207, and C243 form a resonant matching network which matches the output of the final power amplifier to the 50 ohm antenna impedance. The combination of this output filter and the antenna input filter reduce the level of all spurious outputs, above the output frequency, to less than -13 dbm.

4-3. ALIGNMENT PROCEDURES

GENERAL

The Mobiline II may be operated on one or two frequencies with up to 1 MHz separation between the transmit frequencies. The unit will be prealigned to the desired frequency, if stated when ordering from the factory.

If crystals are installed or changed in the field, realignment of the receiver input filter may be required as well as netting the transmit crystals to the exact operating frequency and realignment of the transmitter.

Detailed alignment procedures are given here should partial or complete realignment be desired. Never attempt to realign the circuitry of the Mobiline II unless the test equipment specified for each section is available.

DETAILED ALIGNMENT

A. Test Equipment Required

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

a. Oscilloscope; DC to 8 MHz, DC coupled, calibrated vertical attenuator, (Heathkit IO-14 or equivalent).

b. Distortion Analyzer; Audio frequency (Heathkit IM-58 or equivalent).

c. FM Signal Generator; Must cover the desired operating frequency with a deviation of at least ± 5 KHz at 1 KHz modulation, with provision for external modulation.

d. Sweep Signal Generator; must be capable of sweeping the frequencies from 140.0 MHz to 175.0 MHz.

e. Frequency Counter; DC to 175 MHz, 10K ohm or greater input impedance.

f. AC VTVM; Any accurate instrument.

g. DC VTVM; Any accurate instrument

h. DC Power Supply; 13.75 VDC at 8 amperes, regulated, filtered.

i. Resistor; Carbon, 47 ohm, 1/2 watt, 10%

To properly align the transmitter, the following test equipment in addition to that listed above will be required:

a. Power Meter, 35 watts @ 175 MHz, or relative output indicating device

b. Dummy Load, for above, 50 ohm, 35 watts.

c. Deviation Meter; to read ± 7.5 KHz.

d. Audio Generator, 1700 Hz.

If the transceiver to be aligned is equipped with the ED-33 MobilGuard subaudible tone controlled squelch system, the following additional equipment will be required to perform the subaudible tone squelch alignment:

a. Audio Generator, Capable of 20 Hz to 300 Hz, stable.

B. Receiver Alignment Procedure

Preparation

To facilitate test equipment connections to the receiver during alignment, short lengths of wire can be soldered to the bottom of the receiver board at the following points (Refer to Figure 4-4-12.):

TP-1 (Source of Q103)
TP-3 (Gate 2 of Q103)
TP-4 (Collector of Q106)
TP-5 (Collector of Q104)
TP-11 (Secondary Center Tap of T109)

10 Volt Regulator Adjustment

1. Turn the Volume and Squelch controls fully counterclockwise and turn the selector switch, SW201, to the "OFF" Position

2. Connect the DC VTVM leads between the collector tab of Q106 (TP-4) and ground.

3. Turn the transceiver on and adjust the 10 volt Regulator Adjustment, R137, for a 10.00 volt regulator output voltage as indicated on the VTVM.

4. Turn the transceiver off and remove the DC VTVM leads.

RF and Input Filter Alignment

1. With the transceiver off, connect the RF output cable of the sweep generator to the transceiver antenna connector, J201. Connect a coaxial cable from the vertical input of the oscilloscope to the source of Q103 (TP-1).

2. Short the secondary center tap of T109 (TP-11) to ground using a short jumper wire.

3. Turn the unit on and set the sweep generator to sweep a 6 MHz band centered on the receiver input frequency (single frequency installations only). For installations utilizing two receive frequencies, use markers for the two fre-

quencies and center them within the 6 MHz sweep.

NOTE: Maximum channel separation is 1 MHz.

4. Set the oscilloscope vertical attenuator to the most sensitive position, and set the RF output of the sweep generator low enough to prevent overdriving the input filter (approximately 2/3 of the oscilloscope scale with the scope attenuator at its most sensitive position).

5. Adjust C102, C106, C107, C109, and C110 for maximum overall response with an approximate 1 MHz bandpass similar to that shown in Figure 4-4-3.

6. Turn the transceiver off, remove the oscilloscope lead from the source of Q103, remove the short from TP-11 (Secondary tap of T109), and remove the RF output cable of the sweep generator from the transceiver antenna connector, J201.

First Local Oscillator Alignment

NOTE: To determine the proper values for C147, C152, C153, C154, C155, and C160 refer to Figure 4-4-15

1. With the transceiver still off, remove the crystal oven cover and connect the frequency counter to the collector of Q108 (TP-2, this test point is a wire jumper on the top of the oven/oscillator board, refer to Figure 4-4-11.) Set the frequency counter to maximum sensitivity.

2. Turn the transceiver on and rotate the slug of L106 counterclockwise several turns; then back clockwise until the oscillator starts. Rotate the slug an additional 1/4 turn clockwise from this point.

3. Turn the transceiver off, disconnect the frequency counter and replace the crystal oven cover.

4. Connect a VTVM RF probe to gate 2 of Q103 (TP-3), remove the snap plugs for T108 and T109, and turn the transceiver on.

5. Adjust the top and bottom slugs of T108 and T109 for a maximum reading on the VTVM.

NOTE: Keep the slugs toward the outer ends of the transformer windings.

6. Turn the transceiver off, remove the VTVM RF probe and connect the frequency counter to gate 2 of Q103 (TP-3). Remove the snap plugs in the crystal oven cover for C149 and C151. Turn the transceiver on and allow 10 minutes operating time for temperature stabilization.

7. Adjust trimmer C149 for channel 1 and trimmer C151 for channel 2 to obtain the proper frequency indication(s) on the frequency counter. The proper frequency indication for your transceiver can be determined from the receiver type configuration label and the information of Figure 4-4-14. This frequency will be either the operating frequency plus 10.7 MHz or the operating frequency minus 10.7 MHz.

8. Turn the transceiver off, remove the frequency counter from the gate of Q103 (TP-3) and replace the snap plugs for C149, C151, T108 and T109.

10.7 MHz and 455 KHz IF Alignment

1. With the transceiver still turned-off, connect an AC voltmeter across the speaker terminals.

2. Turn the transceiver squelch control fully counter-clockwise.

3. Connect the RF output of the FM signal generator to the frequency counter and set the unmodulated RF signal to the primary receive frequency (F1).

4. Remove the FM signal generator from the frequency counter and connect the frequency counter input to the collector of Q104 (TP-5). Solder a 47 ohm, carbon resistor (See Test Equipment Required) across Y111. Connect the RF output of the FM signal generator to the antenna input terminal, J201, and apply an unmodulated 20 microvolt RF signal.

5. Turn the selector switch, SW201, to the F1 position and allow the transceiver time to stabilize. Adjust the FM signal generator fine tuning for a 10.7 MHz indication on the frequency counter.

6. Turn the transceiver selector switch, SW201, to the "OFF" position. Disconnect the 47 ohm resistor from Y111 and disconnect the frequency counter from the collector of Q104 (TP-5). Turn the selector switch, SW201, to the "F1" position.

7. Disconnect the FM signal generator from J201, the antenna connector. Adjust the volume control for a 0.5 Volt noise level as indicated on the AC voltmeter.

8. Reconnect the FM signal generator and apply an unmodulated RF signal and increase the generator output level until the noise level indicated on the AC voltmeter drops to 0.25 volts.

9. Turn the transceiver off, replace the snap plug for T109. Adjust T101, C112, T102, T103, T104, T105, and T109; in that order; for maximum quieting as indicated on the AC voltmeter, also readjust C110 slightly for best 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.

10. Turn the transceiver off, replace the snap plug for T109, and remove the AC voltmeter from the speaker terminals. Connect an oscilloscope across the speaker terminals.

11. Turn the transceiver on and modulate the FM signal generator RF output with a 1 KHz tone at $\pm$ 5 KHz deviation. The output of the FM signal generator should be adjusted to a 10 microvolt level. Adjust the scope input sensitivity to cover about 3/4 of the scope screen vertically with the 1000 Hz signal.

12. Adjust T107 for maximum amplitide of the 1 KHz tone, then adjust T101, C112, and T102; in that order; for minimum distortion as indicated on the oscilloscope. The harmonic distortion meter may be substituted for the oscilloscope in this procedure for a more exacting adjustment. Repeat this step

until no further decrease in distortion is indicated.

13. Turn the transceiver off and disconnect the FM signal generator and oscilloscope.

C. Transmitter Alignment Procedure

Preparation

1. Attach a 50 ohm dummy load to the RF output connector, J201, through a power meter or relative output indicating device (See Figure 4-4-4).

2. Preset the deviation potentiometer, R241, to its lowest setting (Potentiometer rotated toward the receiver 3-pole input filter capacitor trimmers).

3. Remove the subaudible tone squelch circuit board, if the unit is so equipped. This can be accomplished by removing the #6-32 screw which mounts the subaudible tone encoder/decoder board bracket to the transceiver side panel.

4. Connect the unit to the Power Measurement Setup shown in Figure 4-4-5.

   NOTE: The following alignment steps are designed to be performed in the order given. If to perform repairs or other maintenance only a few sections of the transmitter are affected, the alignment steps preceeding those alignment steps for the first transmitter section affected, need not be performed.

Frequency and Power Alignment

1. Select the primary operating frequency (F1).

   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 Q203 (TP-7), key the transmitter, and adjust the single slug of T201 for a peak voltage indication on the VTVM. 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 voltage should be 1.2 volts.

3. Move the DC probe to the emitter of Q204 (TP-8). Key the transmitter and adjust the two slugs of T202 for a peak voltage indication. The two slugs of T202 should adjust to opposite ends of the coil form. The final positioning of the slugs should occur with one slug located between the top end of the coil form and the top coul winding and the second slug located between the bottom coil winding and the bottom of the coil form. The signal should peak at approximately 0.6 volts.

4. Adjust T203 by connecting the DC probe to the emitter of Q205 (TP-9), keying

the transmitter, and adjusting the two slugs of T203 for a peak voltage indication. The two slugs of T203 should adjust to opposite ends of the coil form. The final positioning of the slugs should occur with one slug located between the top end of the coil form and the top coil winding and the second slug located between the bottom coil winding and the bottom of the coil form. The signal should peak at approximately 1.0 volts.

5. If the relative output indicating device of Figure 4-4-4 is used, connect the VTVM DC probe to the relative output indicator.

6. Preset C231 by tightening the adjustment screw down firmly and backing it off 1/2 turn.

7. Key the transmitter and adjust C225, C230, C231, C235, C240, C242, and C243 for maximum output indication.

8. Select the alternate transmit frequency and note the power output indication. If the power output vaties greatly, repeat Step 7, noting the original position of each tirmmer and the position necessary to produce maximum output. Set the trimmers half-way between the prior setting and the maximum setting.

9. Connect the unit to the frequency measurement setup of Figure 4-4-6.

10. Key the transmitter and adjust C204, the secondary frequency trimming capacitor until the correct output frequency is displayed on the frequency counter.

11. Select the primary transmit frequency, key the transmitter and adjust C202, the primary frequency crystal trimming capacitor until the correct frequency is displayed on the frequency counter.

Power Adjustment Procedure

1. Connect the unit to the power measurement setup of Figure 8.

2. Select the primary transmit frequency (F1).

3. Key the transmitter and note the transmitter power output on the RF power meter.

4. If it is necessary to reduce the output power of the unit in order to comply with the standards of the operating service, adjust C235 unitl the proper output power is indicated.

5. Check the power output level on the secondary transmit frequency.

Subaudible Tone Frequency Adjustment

NOTE: If this unit is not equipped with the subaudible tone swuelch system, proceed to the Voice Modulation Deviation Adjustment.

1. Reinstall the subaudible tone board removed in the transmitter alignament preparation steps and connect the transceiver to the subaudible tone alignment setup of Figure 4-4-8.

2. Connect a high impedance frequency counter to pin 1 of IC404 (TP-A, See Figure 4-4-16.).

3. Using the shortest path possible, connect a jumper between the base of Q203 (TP-10) and ground.

4. Key the transmitter, and adjust R417, the subaudible frequency adjustment, until the desired subaudible tone frequency is displayed on the frequency counter.

5. Remove the jumper wire from the base of Q203 (TP-10).

Subaudible Decoding Sensitivity Adjustment

1. Hang-up the hand microphone or handset on the hanger bracket (the hang-up button on the rear of the hand microphone must be grounded to the transceiver chassis through the hang-up clip). If using the desk microphone, check to insure that the monitor feature is not activated. This step places the subaudible tone squelch circuitry into operation.

2. Connect the transceiver to the subaudible tone decoder adjustment setup of Figure 4-4-9.

3. Adjust the audio generator to produce an output at the desired subaudible tone frequency as indicated on the frequency counter. This tone must be set within $\pm$ 0.1% tolerance.

4. Adjust the audio generator and the FM signal generator to produce $\pm$ 600 Hz deviation of the FM signal generator output. This should cause the subaudible squelch to open. If not, go back to Step 4 and repeat the procedure.

Subaudible Tone Deviation Adjustment

1. Connect the unit to the deviation measurement setup of Figure 4-4-7.

2. Key the transmitter and adjust R240, the subaudible tone deviation adjustment on the subaudible tone encoder board, to produce an output deviation of $\pm$ 1 KHz, as indicated on the deviation meter. R204, the subaudible symmetry adjustment should be adjusted simultaneously to produce identical + and - deviation.

Voice Modulation Deviation Adjustment

1. Connect the unit to the deviation measurement setup of Figure 4-4-7.

2. Connect the vertical input lead of the oscilloscope to pin 1 of IC201 (TP-12).

3. Preset the microphone gain adjustment, R235, to the maximum gain position.

4. Select the primary transmit frequency (F1).

5. Feed an audio signal of 1700 Hz into the transceiver microphone.

6. Do not key the transmitter! Adjust R232, the symmetry adjustment, until the top and bottom of the displayed audio waveform just begins to limit.

7. Adjust R232, the symmetry adjustment, until the displayed waveform limits symmetrically on both the top and bottom of the waveform.

8. Turn the transceiver off and disconnect the oscilloscope leads.

9. 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.

10. 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, R241, can be adjusted for an on-scale reading of the deviation meter.

11. Set the deviation potentiometer, R241, for ± 5 KHz deviation as indicated on the deviation meter. Switch the deviation meter to the + and - deviation positions and note the amount of deviation in each position.

12. 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 shall not exceed 0.4 KHz.

13. Key the transmitter and note the total deviation. Readjust R241 as necessary to produce ± 5 KHz total deviation.

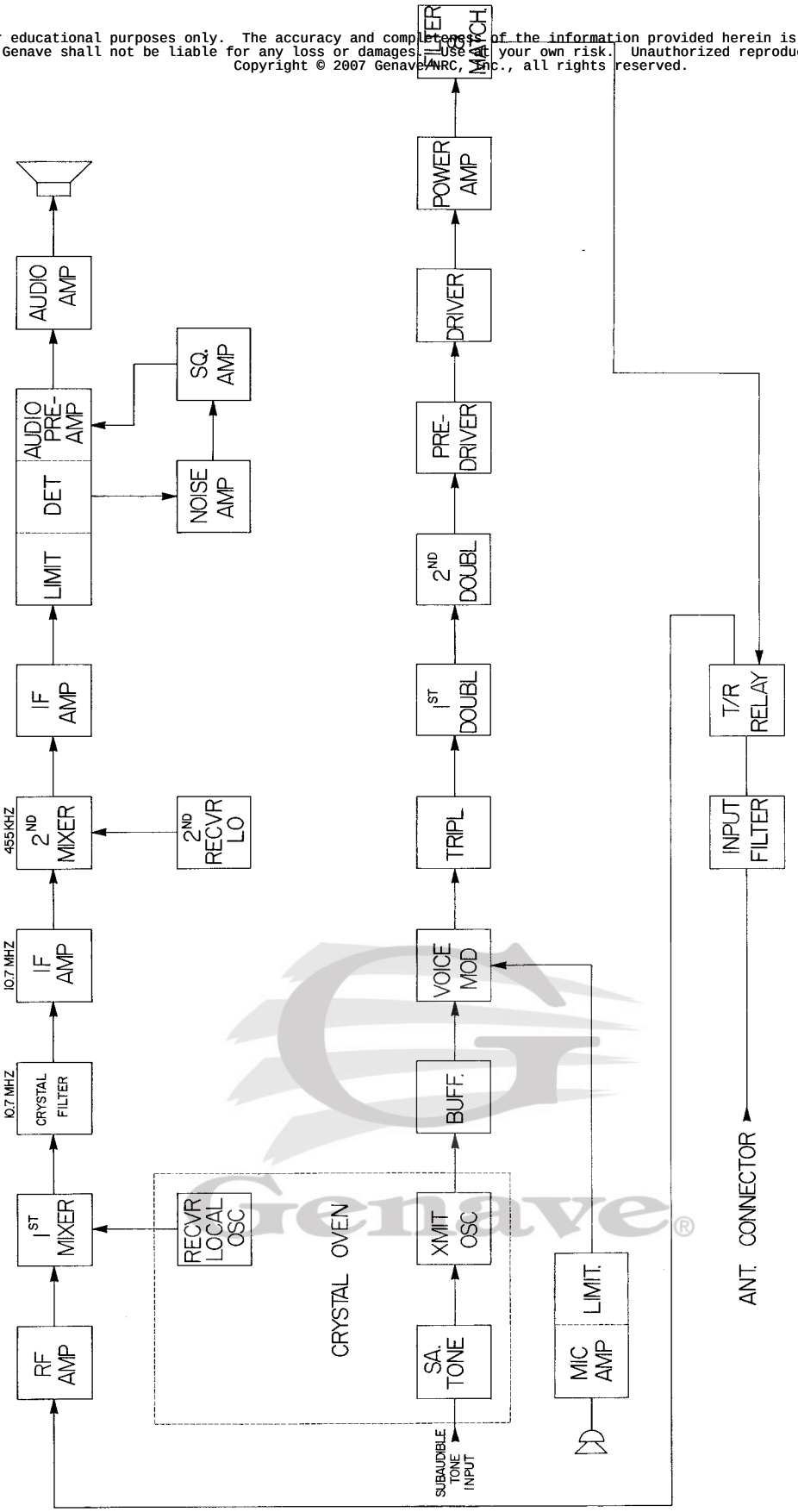


Figure 4-4-1
BLOCK DIAGRAM

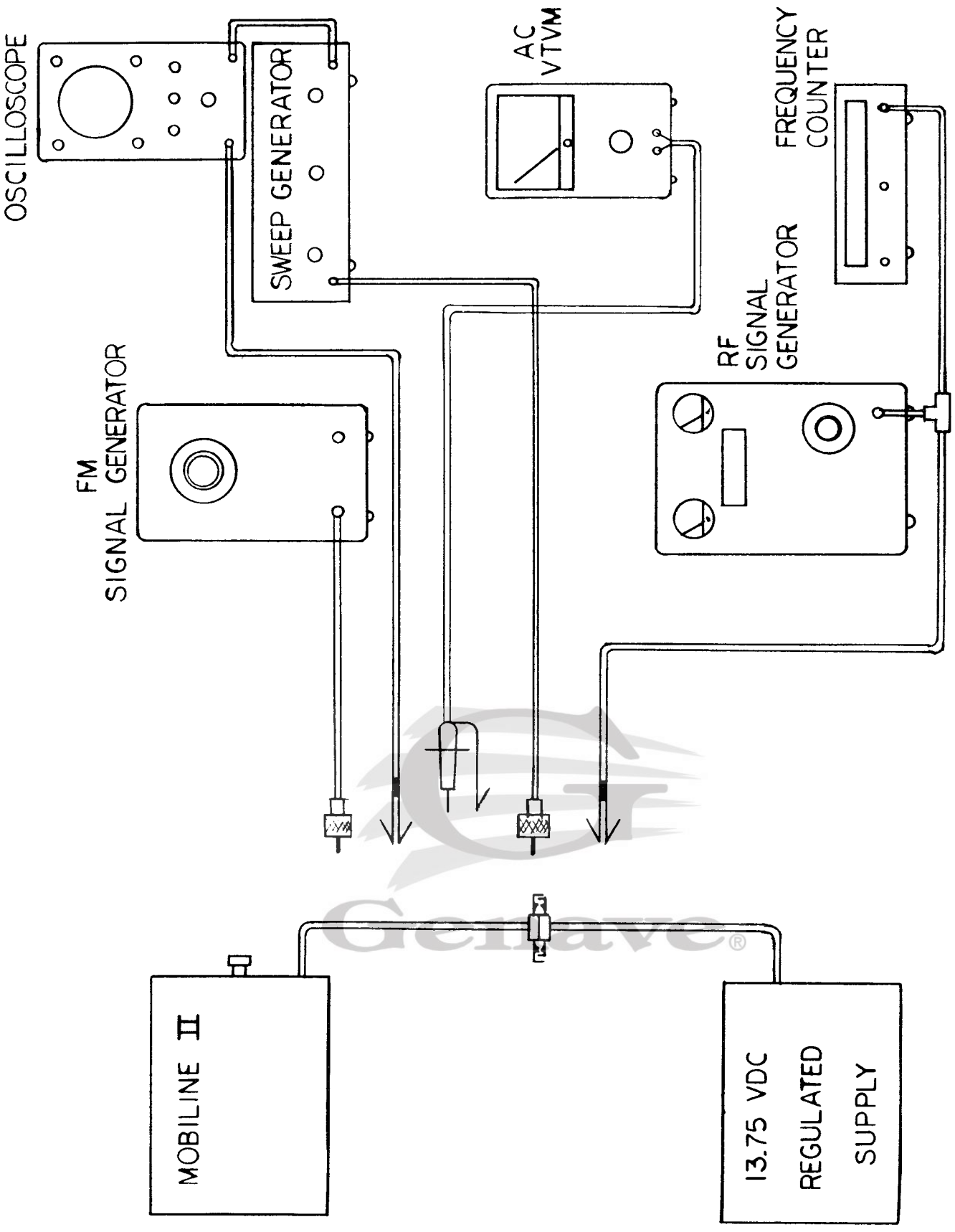


Figure 4-4-2
RECEIVER ALIGNMENT SETUP

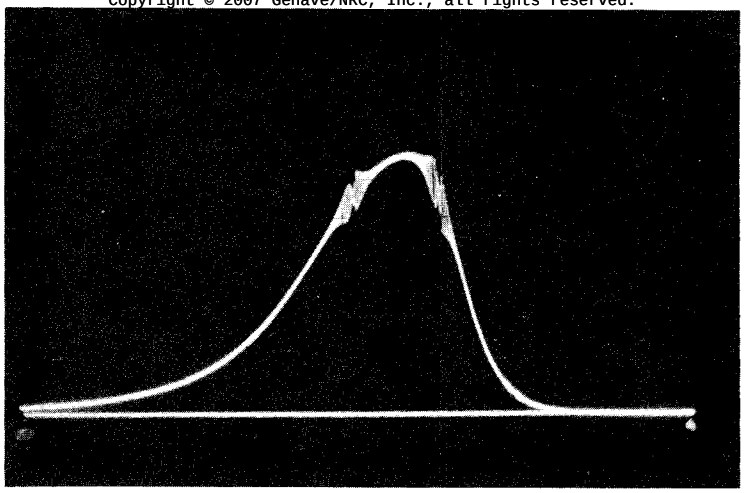


Figure 4-4-3
INPUT FILTER BANDPASS

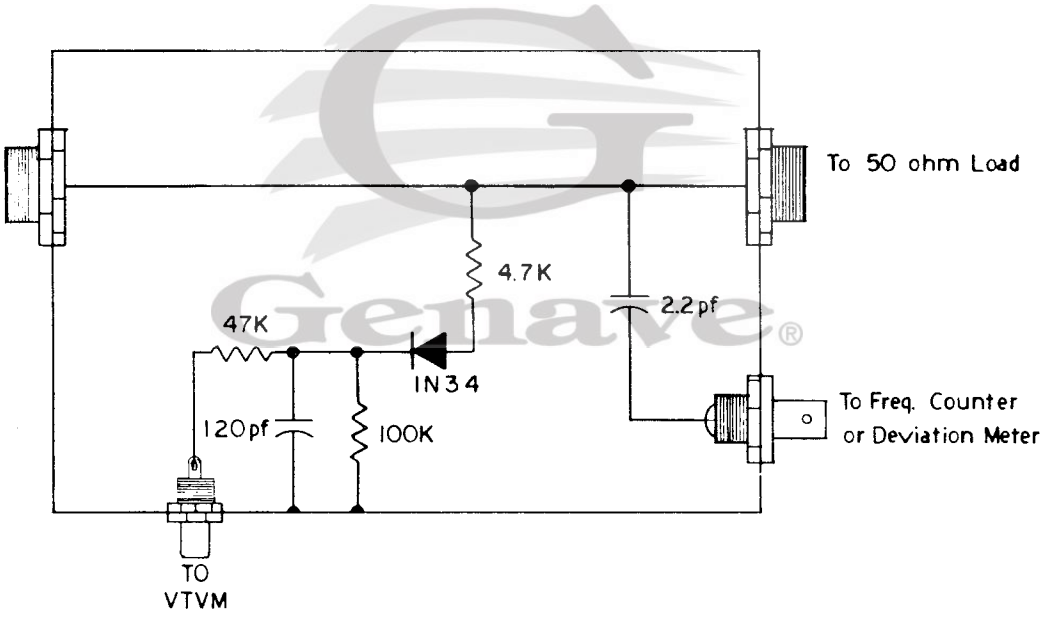


Figure 4-4-4
RELATIVE OUTPUT INDICATING DEVICE

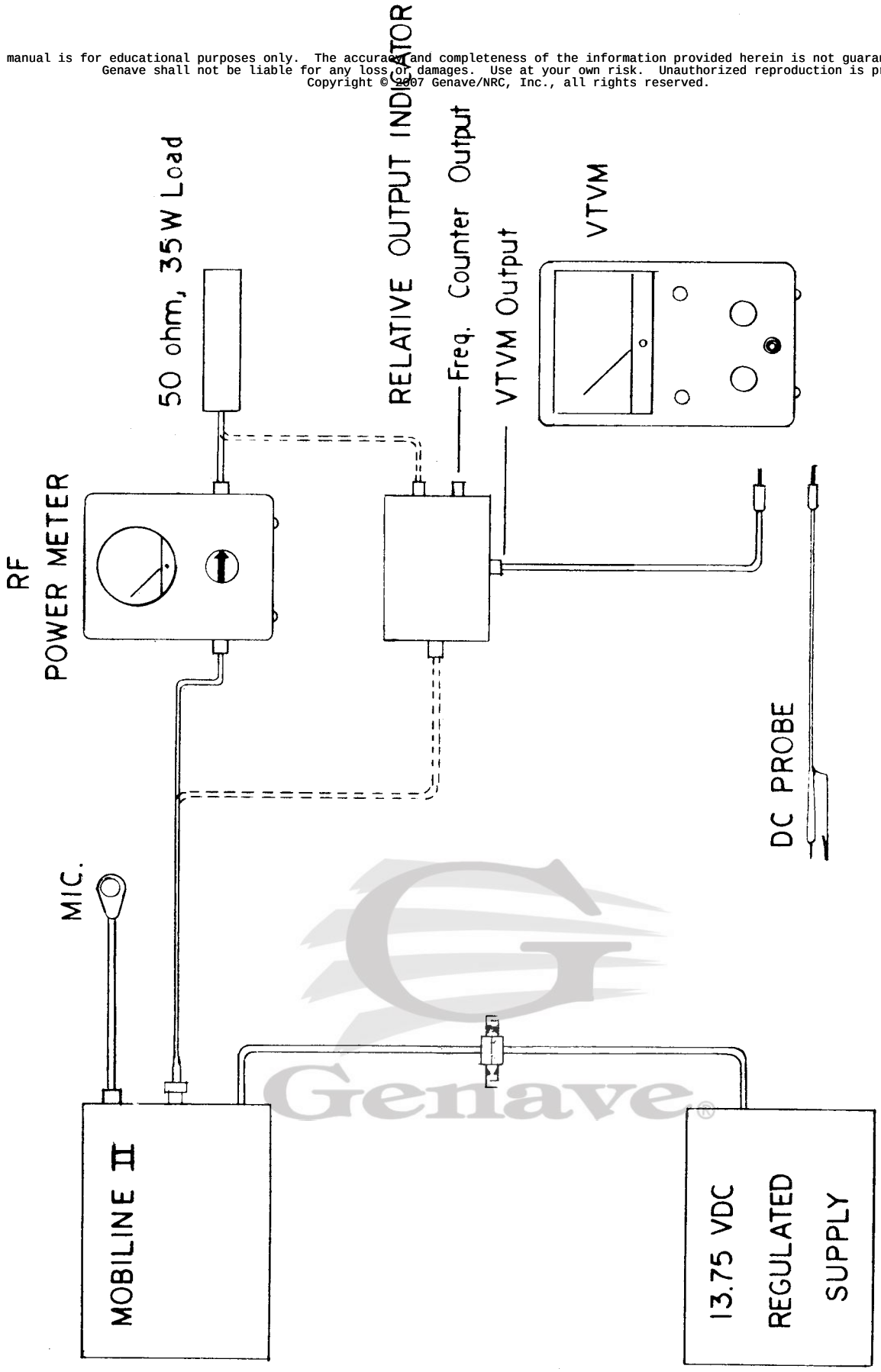


Figure 4-4-5
POWER MEASUREMENT SETUP

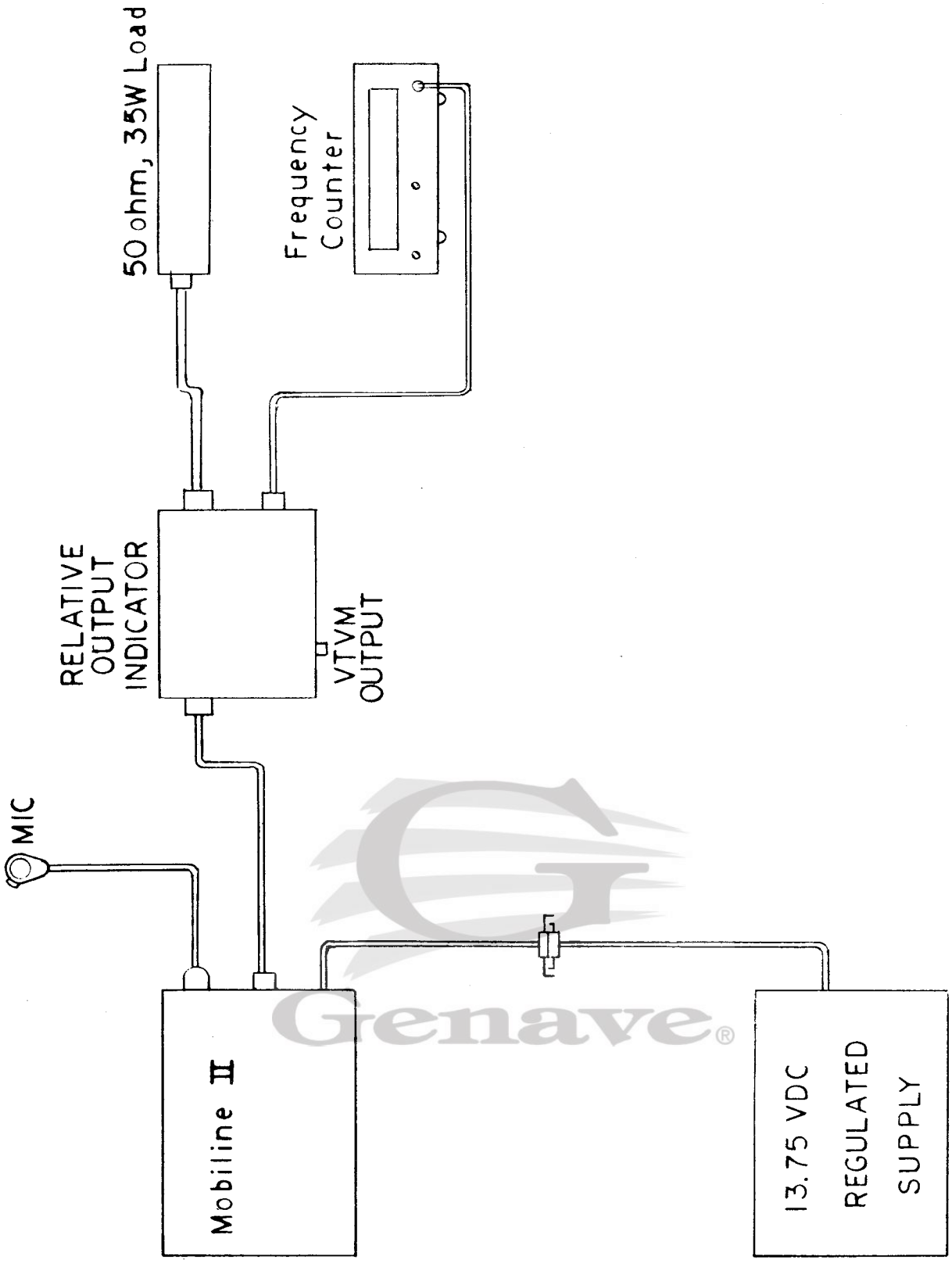


Figure 4-4-6
FREQUENCY MEASUREMENT SETUP

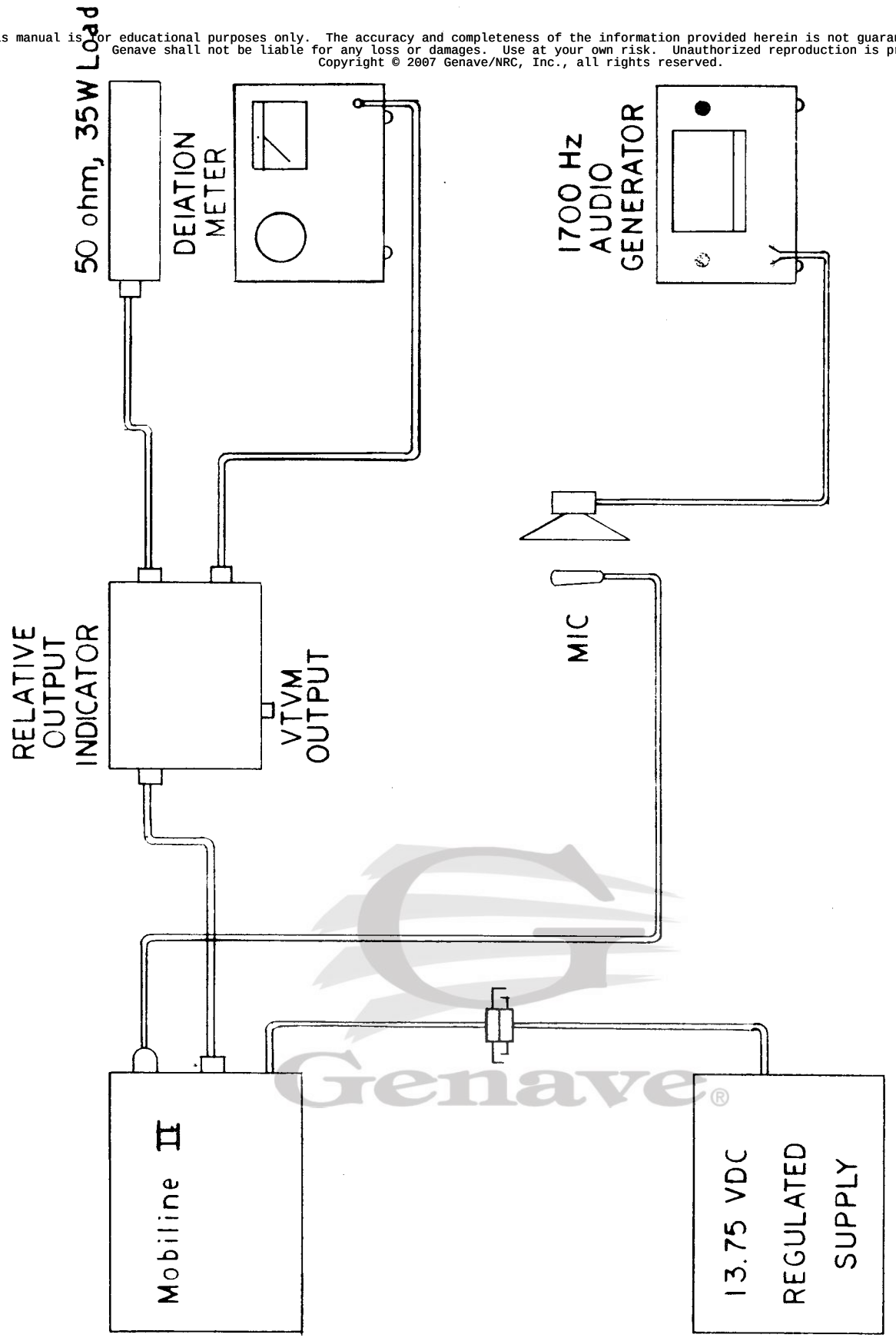


Figure 4-4-7
DEVIATION MEASUREMENT SETUP

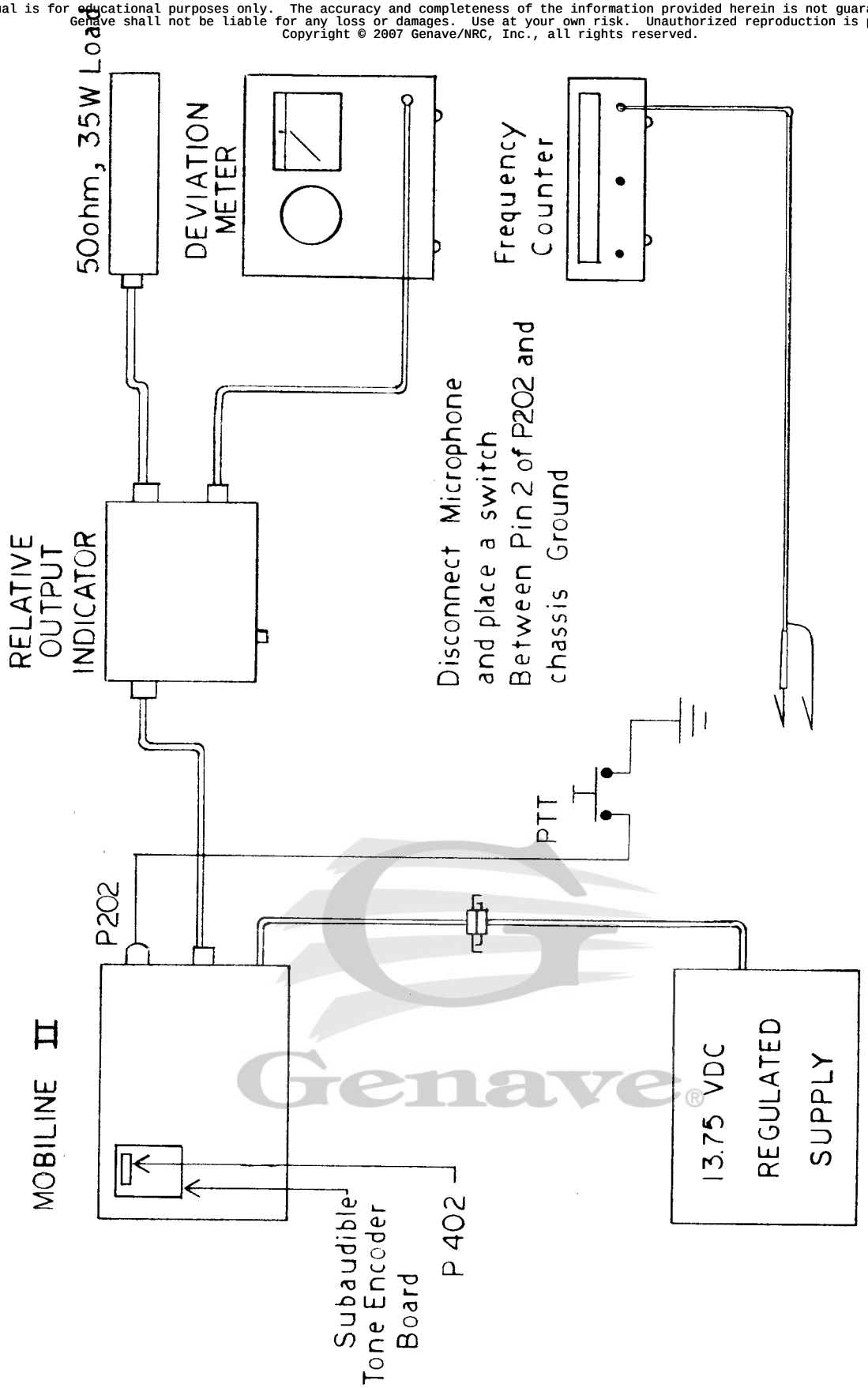


Figure 4-18
SUBAUDIBLE TONE ENCODER ADJUSTMENT SETUP

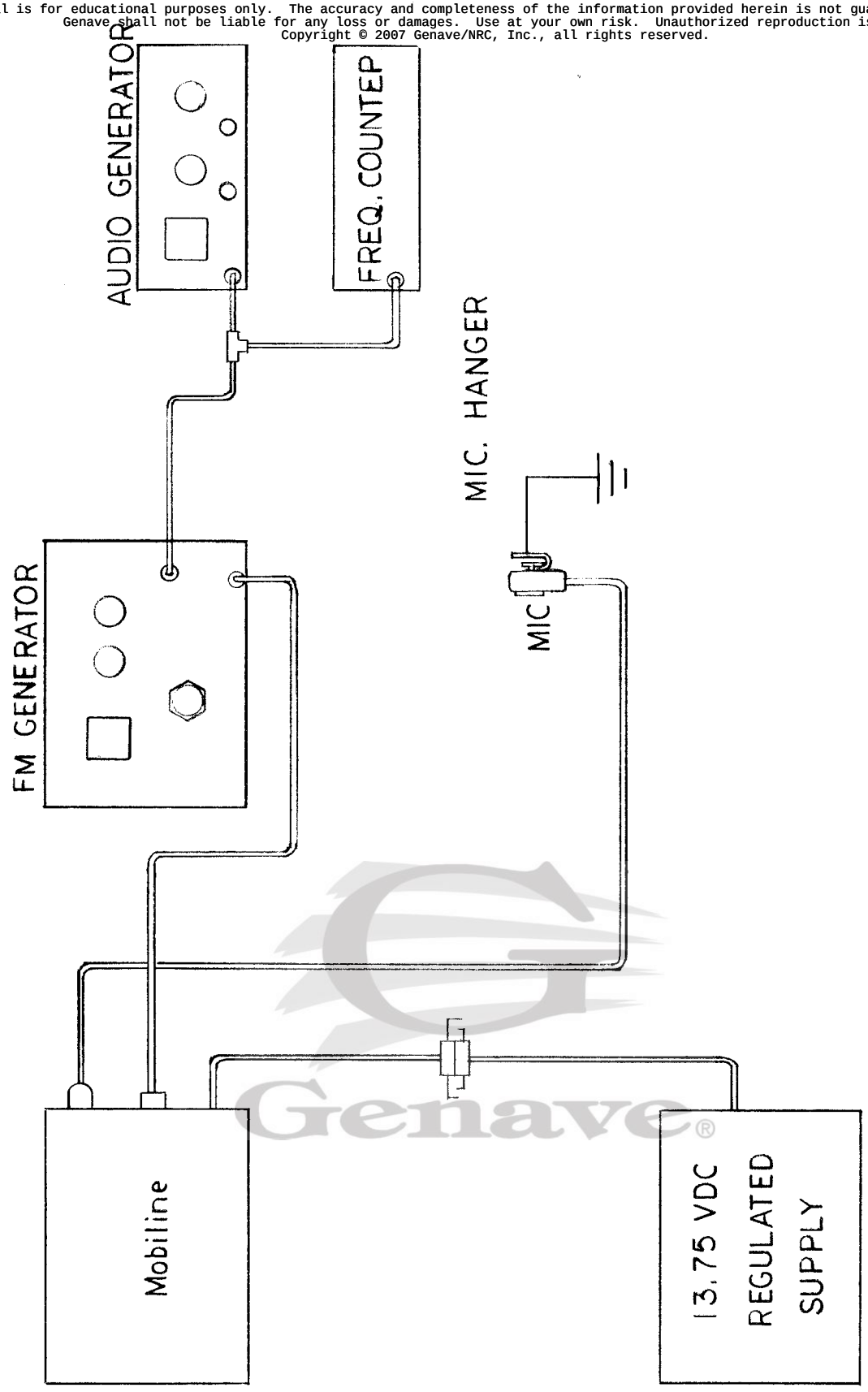


Figure 4-4-9

SUBAUDIBLE TONE DETECTOR ADJUSTMENT SETUP

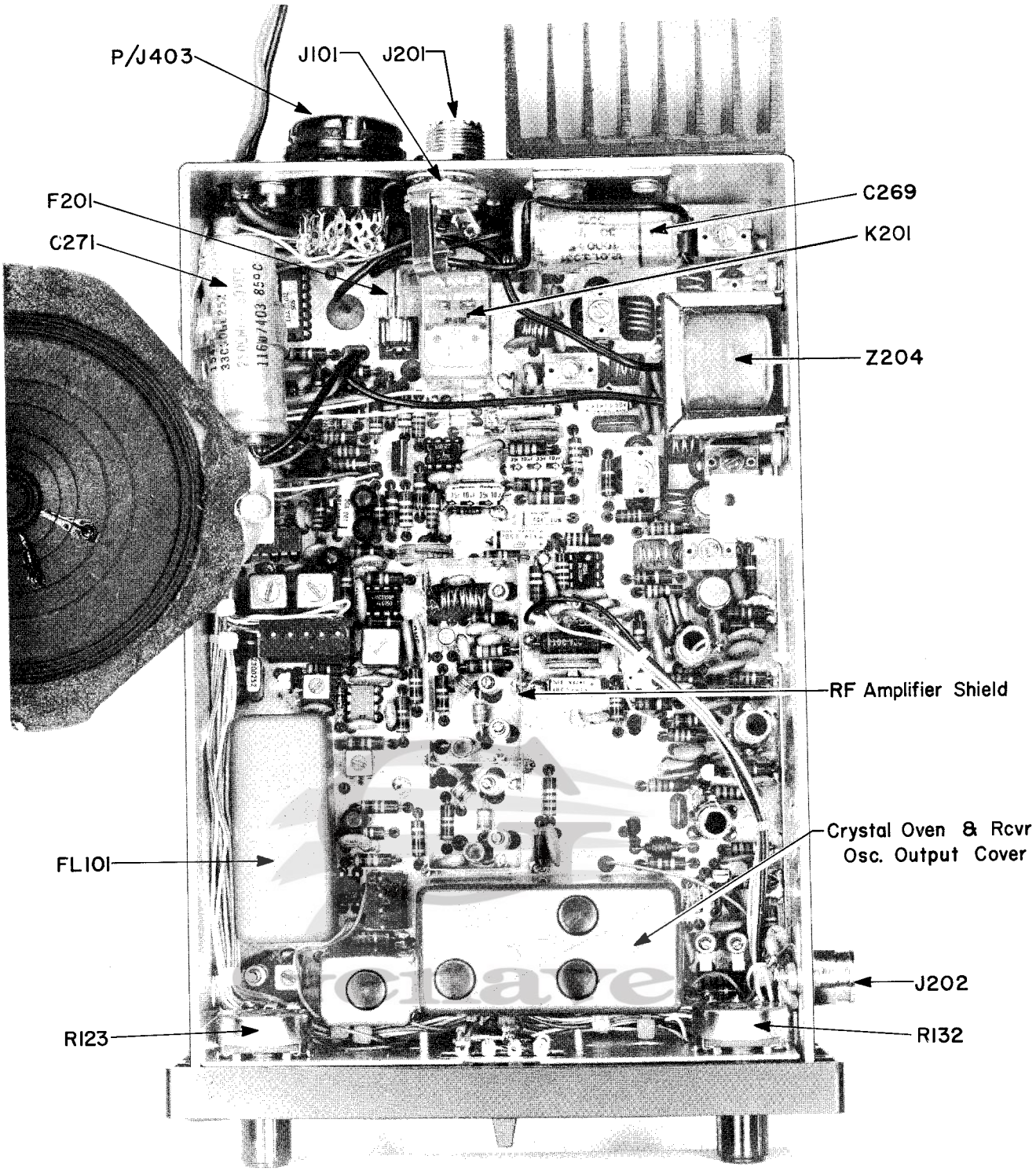


Figure 4-4-10
TOP VIEW

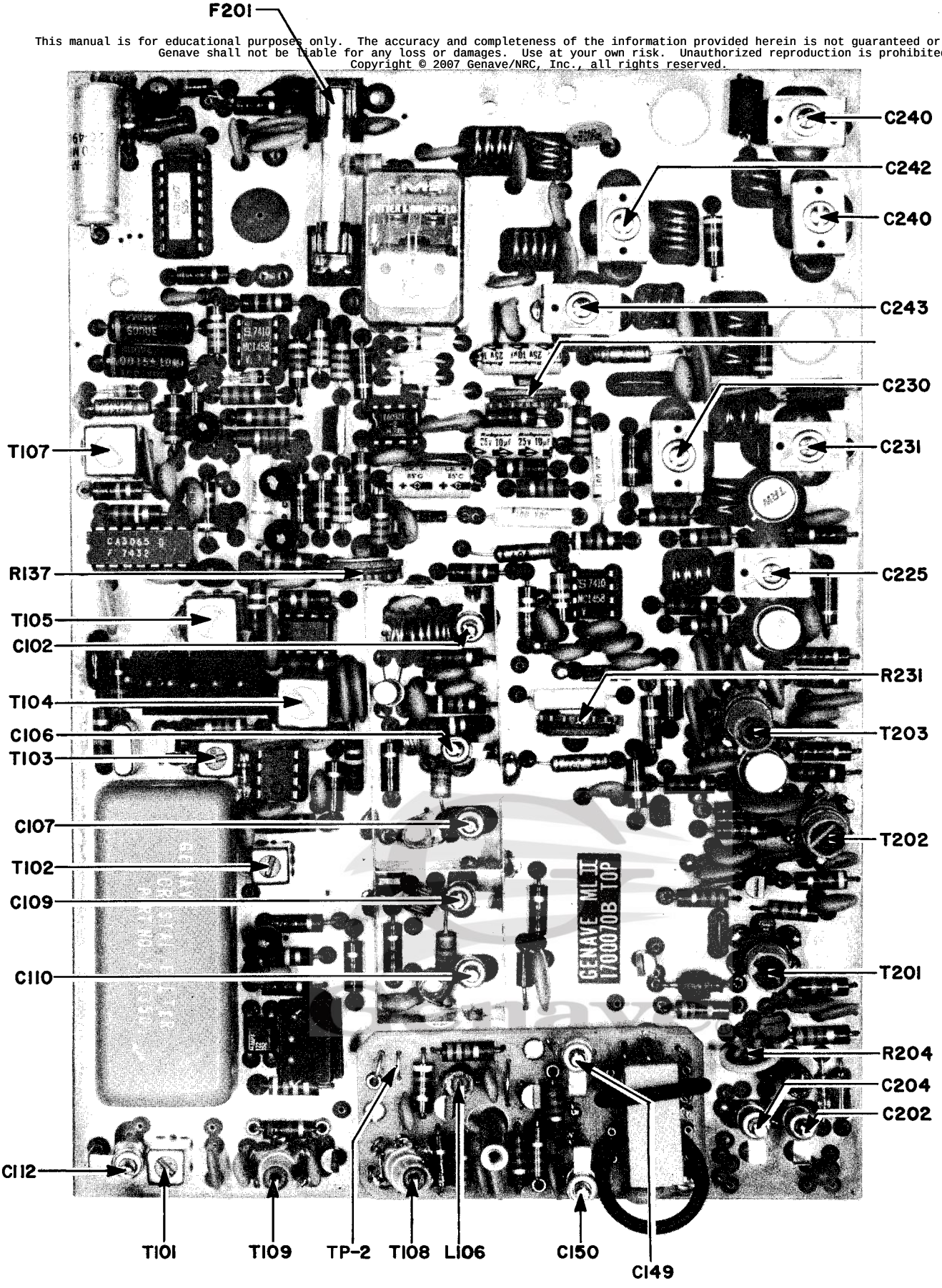


Figure 4-4-11

ALIGNMENT ADJUSTMENTS

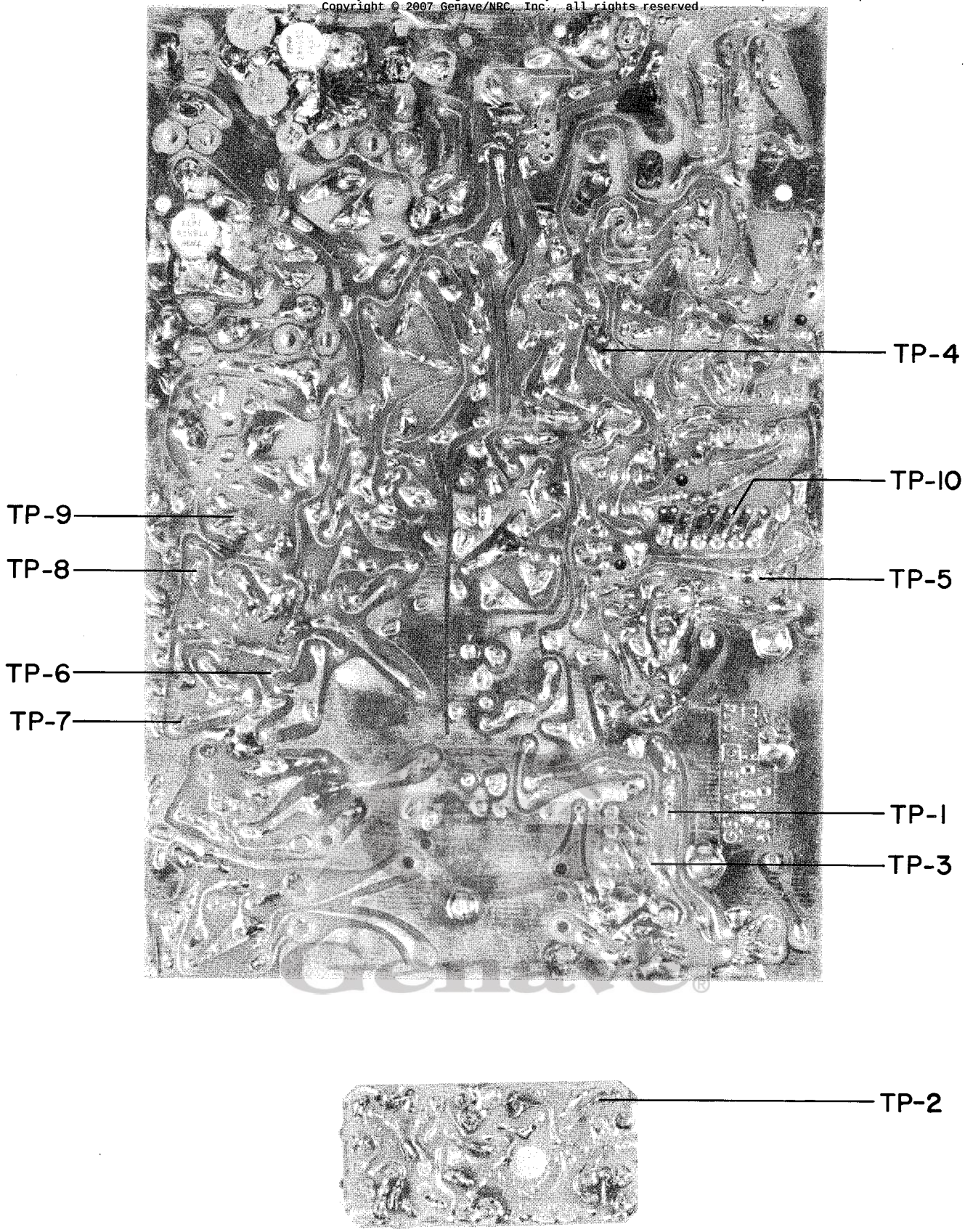


Figure 4-4-12
TEST POINTS

Figure 4-4-13
RECEIVER CONFIGURATIONS

The receiver of the Mobiline II may be built in any of eight possible configurations. There is one normal configuration in which nearly all units will be built. The normal configuration is with a 10.7 MHz first IF frequency, low side injection of the first local oscillator signal (local oscillator operating 10.7 MHz below the desired receive frequency), 3 times multiplication of the first local oscillator crystal frequency, and a 12.245 MHz second local oscillator frequency.

As previously mentioned, the one normal configuration will cover most units. A few units will be built in different configurations to provide optimum rejection of spurious signals. Each possible configuration will be designated by a receiver type, with Type A being the normal configuration. A listing of the various configurations can be found in Figure 4-4-14.

All units are marked with a label indicating the receiver type designation. This label is affixed to the side of the chassis near the rear of the unit. A sample of this label is shown here. To determine the configuration of any specific receiver locate this label and note the designated type configuration.

Figure 4-4-14
RECEIVER CONFIGURATION LISTING

Type Desig.	1st L. O. Inj. Mode	1st L.O. Xtal Freq. Range	1st L.O. Mult.	1st L.O. Output Freq. Range	1st I. F. Freq.	2nd L. O. Freq.	Remarks
A	Low Side	44.40-54.233 MHz	3X	133.20-162.70 MHz	10.70 MHz	10.245 MHz	Normal
B	Low Side	44.40-54.233 MHz	3X	133.20-162.70 MHz	10.70 MHz	11.155 MHz	
C	High Side	51.53-61.366 MHz	3X	154.60-184.10 MHz	10.70 MHz	10.245 MHz	
D	High Side	51.53-61.366 MHz	3X	154.60-184.10 MHz	10.70 MHz	11.155 MHz	
E	Low Side	66.60-81.350 MHz	2X	133.20-162.70 MHz	10.70 MHz	10.245 MHz	
F	Low Side	66.60-81.350 MHz	2X	133.20-162.70 MHz	10.70 MHz	11.155 MHz	
G	High Side	77.30-92.050 MHz	2X	154.60-184.10 MHz	10.70 MHz	10.245 MHz	
H	High Side	77.30-92.050 MHz	2X	154.60-184.10 MHz	10.70 MHz	11.155 MHz	

RCVR. TYPE DESIG.	OPERATING FREQUENCY	OSCILLATOR/MULTIPLIER PARTS VALUES SUBJECT TO CHANGE						First L.O. Crystal Drawing No.	2nd. L.O. Frequency (MHz)	2nd. L.O. Xtal Dwg. No.	Remarks
		C147	C152	C153	C155	C159	C160				
A	143.9 - 149.7 MHz	15 pfd.	22 pfd.	15 pfd.	15 pfd.	10 pfd.	12 pfd.	2300226	10.245	2300252	Normal
	149.7 - 160.7 MHz			12 pfd.	12 pfd.	10 pfd.	12 pfd.				
	160.7 - 169.7 MHz			10 pfd.	12 pfd.	8.2 pfd.	10 pfd.				
	169.7 - 173.4 MHz			8.2 pfd.	12 pfd.	8.2 pfd.	8.2 pfd				
B	143.9 - 149.7 MHz	15 pfd.	22 pfd.	15 pfd.	15 pfd.	10 pfd.	12 pfd.	2300226	11.155	2300254	
	149.7 - 160.7 MHz			12 pfd.	12 pfd.	10 pfd.	12 pfd.				
	160.7 - 169.7 MHz			10 pfd.	12 pfd.	8.2 pfd.	10 pfd.				
	169.7 - 173.4 MHz			8.2 pfd.	12 pfd.	8.2 pfd.	8.2 pfd.				
C	143.9 - 149.7 MHz	15 pfd.	22 pfd.	10 pfd.	12 pfd.	8.2 pfd.	10 pfd.	2300227	10.245	2300252	
	149.7 - 156.3 MHz	15 pfd.	22 pfd.	8.2 pfd.	12 pfd.	8.2 pfd.	8.2 pfd.				
	156.3 - 158.5 MHz	15 pfd.	22 pfd.	6.8 pfd.	10 pfd.	8.2 pfd.	8.2 pfd.				
	158.5 - 161.3 MHz	10 pfd.	15 pfd.	6.8 pfd.	10 pfd.	8.2 pfd.	6.8 pfd.				
	161.3 - 165.3 MHz	10 pfd.	15 pfd.	4.7 pfd.	10 pfd.	6.8 pfd.	6.8 pfd.				
	165.3 - 173.4 MHz	10 pfd.	15 pfd.	4.7 pfd.	8.2 pfd.	6.8 pfd.	4.7 pfd.				
D	143.9 - 149.7 MHz	15 pfd.	22 pfd.	10 pfd.	12 pfd.	8.2 pfd.	10 pfd.	2300227	11.155	2300254	
	149.7 - 156.3 MHz	15 pfd.	22 pfd.	8.2 pfd.	12 pfd.	8.2 pfd.	8.2 pfd.				
	156.3 - 158.5 MHz	15 pfd.	22 pfd.	6.8 pfd.	10 pfd.	8.2 pfd.	8.2 pfd.				
	158.5 - 161.3 MHz	10 pfd.	15 pfd.	6.8 pfd.	10 pfd.	8.2 pfd.	6.8 pfd.				
	161.3 - 165.3 MHz	10 pfd.	15 pfd.	4.7 pfd.	10 pfd.	6.8 pfd.	6.8 pfd.				
	165.3 - 173.4 MHz	10 pfd.	15 pfd.	4.7 pfd.	8.2 pfd.	6.8 pfd.	4.7 pfd.				
E	143.9 - 149.7 MHz	10 pfd.	15 pfd.	15 pfd.	15 pfd.	10 pfd.	12 pfd.	2300228	10.245	2300252	
	149.7 - 154.7 MHz	10 pfd.	15 pfd.	12 pfd.	12 pfd.	10 pfd.	12 pfd.				
	154.7 - 160.7 MHz	6.8 pfd.	8.2 pfd.	12 pfd.	12 pfd.	10 pfd.	12 pfd.				
	160.7 - 169.7 MHz	6.8 pfd.	8.2 pfd.	10 pfd.	12 pfd.	8.2 pfd.	10 pfd.				
	169.7 - 173.4 MHz	6.8 pfd.	8.2 pfd.	8.2 pfd.	12 pfd.	8.2 pfd.	8.2 pfd.				
F	143.9 - 149.7 MHz	10 pfd.	15 pfd.	15 pfd.	15 pfd.	10 pfd.	12 pfd.	2300228	11.155	2300254	
	149.7 - 154.7 MHz	10 pfd.	15 pfd.	12 pfd.	12 pfd.	10 pfd.	12 pfd.				
	154.7 - 160.7 MHz	6.8 pfd.	8.2 pfd.	12 pfd.	12 pfd.	10 pfd.	12 pfd.				
	160.7 - 169.7 MHz	6.8 pfd.	8.2 pfd.	10 pfd.	12 pfd.	8.2 pfd.	10 pfd.				
	169.7 - 173.4 MHz	6.8 pfd.	8.2 pfd.	8.2 pfd.	12 pfd.	8.2 pfd.	8.2 pfd.				
G	143.9 - 148.3 MHz	6.8 pfd.	8.2 pfd.	10 pfd.	12 pfd.	8.2 pfd.	10 pfd.	2300229	10.245	2300252	
	148.3 - 156.3 MHz			8.2 pfd.	12 pfd.	8.2 pfd.	8.2 pfd.				
	156.3 - 158.5 MHz			6.8 pfd.	10 pfd.	8.2 pfd.	8.2 pfd.				
	158.5 - 161.3 MHz			6.8 pfd.	10 pfd.	8.2 pfd.	6.8 pfd.				
	161.3 - 165.3 MHz			4.7 pfd.	10 pfd.	6.8 pfd.	6.8 pfd.				
	165.3 - 173.4 MHz			4.7 pfd.	8.2 pfd.	6.8 pfd.	4.7 pfd.				
H	143.9 - 148.3 MHz	6.8 pfd.	8.2 pfd.	10 pfd.	12 pfd.	8.2 pfd.	10 pfd.	2300229	11.155	2300254	
	148.3 - 156.3 MHz			8.2 pfd.	12 pfd.	8.2 pfd.	8.2 pfd.				
	156.3 - 158.5 MHz			6.8 pfd.	10 pfd.	8.2 pfd.	8.2 pfd.				
	158.5 - 161.3 MHz			6.8 pfd.	10 pfd.	8.2 pfd.	6.8 pfd.				
	161.3 - 165.3 MHz			4.7 pfd.	10 pfd.	6.8 pfd.	6.8 pfd.				
	165.3 - 173.4 MHz			4.7 pfd.	8.2 pfd.	6.8 pfd.	4.7 pfd.				

Figure 4-4-15

Model: Mobiline II

This manual is for educational purposes only. The accuracy and completeness of the information provided herein is not guaranteed or warranted.
Genave shall not be liable for any loss or damages. Use at your own risk. Unauthorized reproduction is prohibited.
Copyright © 2007 Genave/NRC, Inc. All rights reserved.

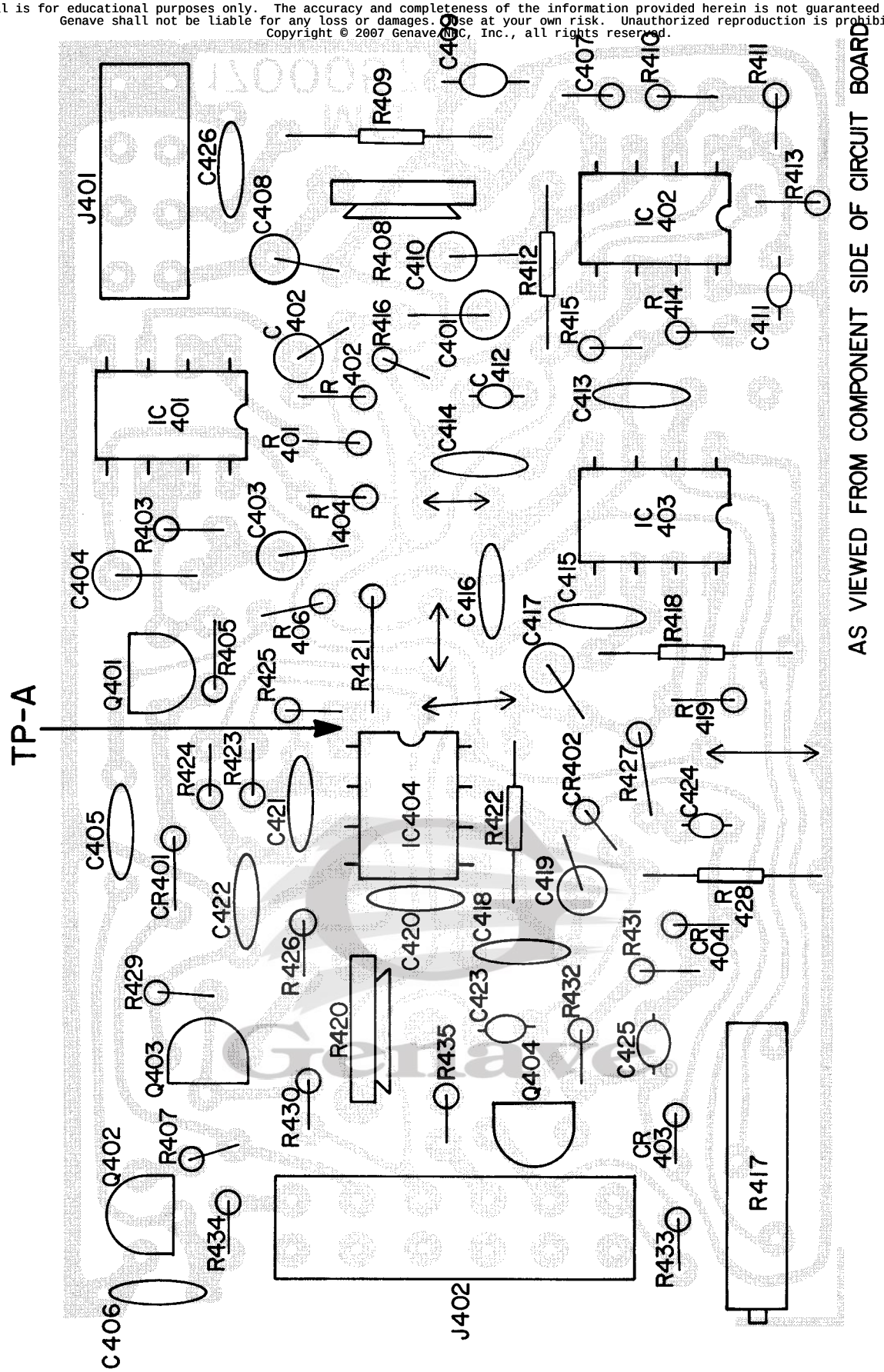


Figure 4-4-16
SUBAUDIBLE ENCODER/DECODER TEST POINTS

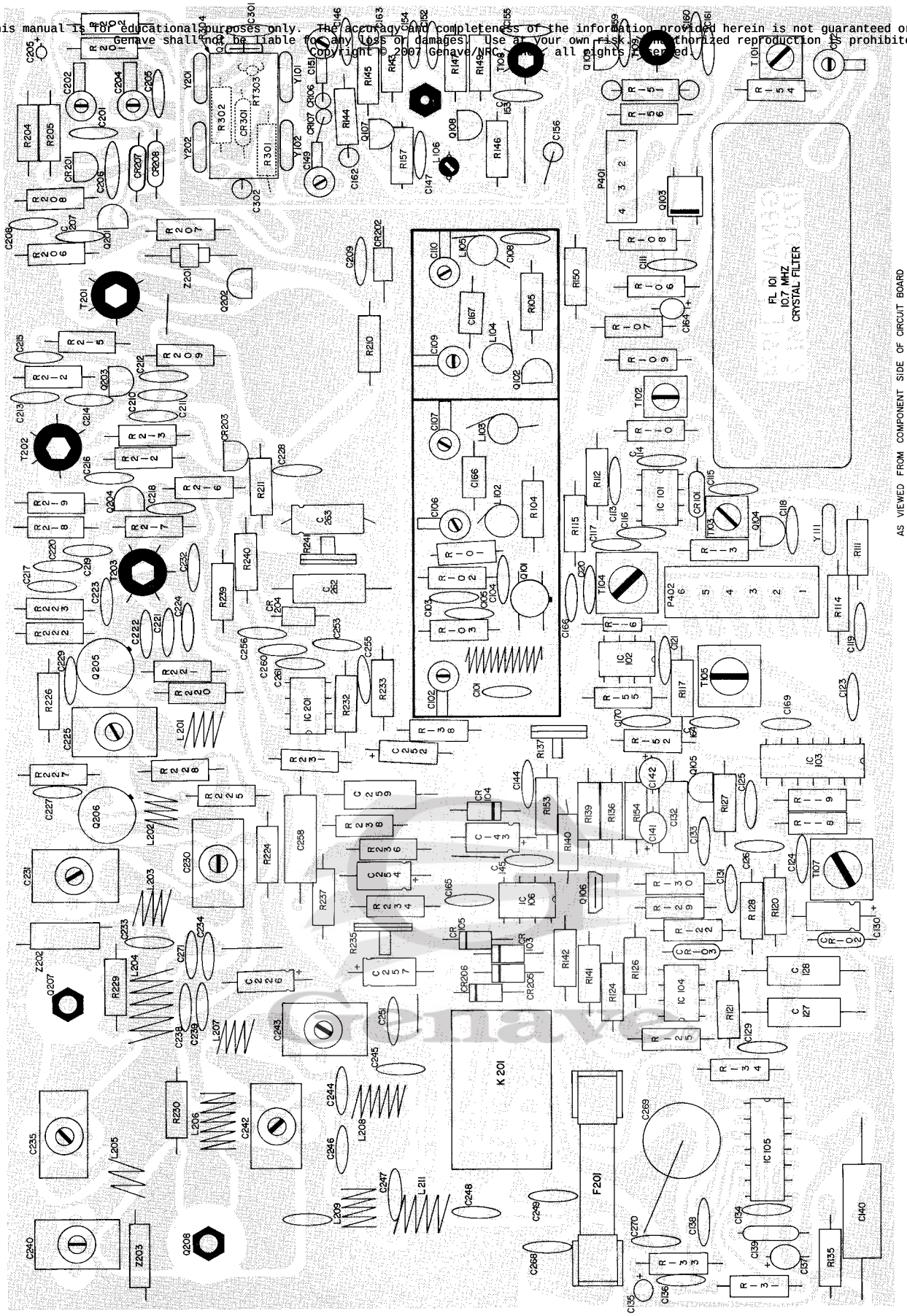


Figure 4-5-3
COMPONENT LOCATION DIAGRAM

Model: Mobiline II

This manual is for educational purposes only. The accuracy and completeness of the information provided herein is not guaranteed or warranted.
Genave shall not be liable for any loss or damages. Use at your own risk. Unauthorized reproduction is prohibited.
Copyright © 2007 Genave/NRC, Inc. All rights reserved.

Figure 4-5-4
RECEIVER SENSITIVITY MEASUREMENTS

Input Frequency	Input Point	Measurement Point	Measured Value
Operating	Ant. Connector	Across Speaker	-116 dbm or better for 20 db quieting.
First IF	Pin 1, FL101	Pin 1, IC101	30 mv for 0.3 Vp-p (Oscilloscope)
No Input		Pin 5, IC101	.3 Vp-p of noise (Oscilloscope)
First IF	Pin 1, FL101	Pin 5, IC101	350 uv for 0.5 Vp-p (Oscilloscope)
No Input		Primary, T104	0.4 Vp-p of noise (Oscilloscope)
First IF	Pin 1, FL101	Primary, T104	300 uv for 0.6 Vp-p (Oscilloscope)
First IF	Pin 1, FL101	Pin 4, IC102	1.5 mv for 0.1 Vp-p (Oscilloscope)
No Input		Pin 8, IC102	1.0 Vp-p of noise (Oscilloscope)
Operating	Ant. Connector	Across Speaker	1.0 uv or better for 1 watt output at 400-3000 Hz.

Figure 4-5-5
TROUBLESHOOTING HINTS

Receiver and Transmitter Inoperative

Check for a blown fuse, F201. F201 is located at the rear center of the printed circuit board. Replace the fuse with a standard 10 amp. type 3AG/AGC fuse. If fuse is okay, check switching of pins 11, 12, and 13 of K201.

Transmitter Inoperative

Check multiplier stages for output by connecting a DC VTVM to the emitters of the first multiplier transistors (TP-7, TP-8, and TP-9) as described in the transmitter alignment procedures. The voltage levels should be approximately 1.2 volts, 0.6 volts, and 1.0 volts for Q203, Q204, and Q205 respectively.

If adequate drive signals are found on the multiplier transistors, an RF detection probe can be used to measure the RF levels on the output of the power amplifier stages. Such a probe is shown in Figure 4-5-6.

Receiver Inoperative

If the receiver is inoperative normal solid state receiver troubleshooting techniques can be employed. If it is desired to check the first local oscillator

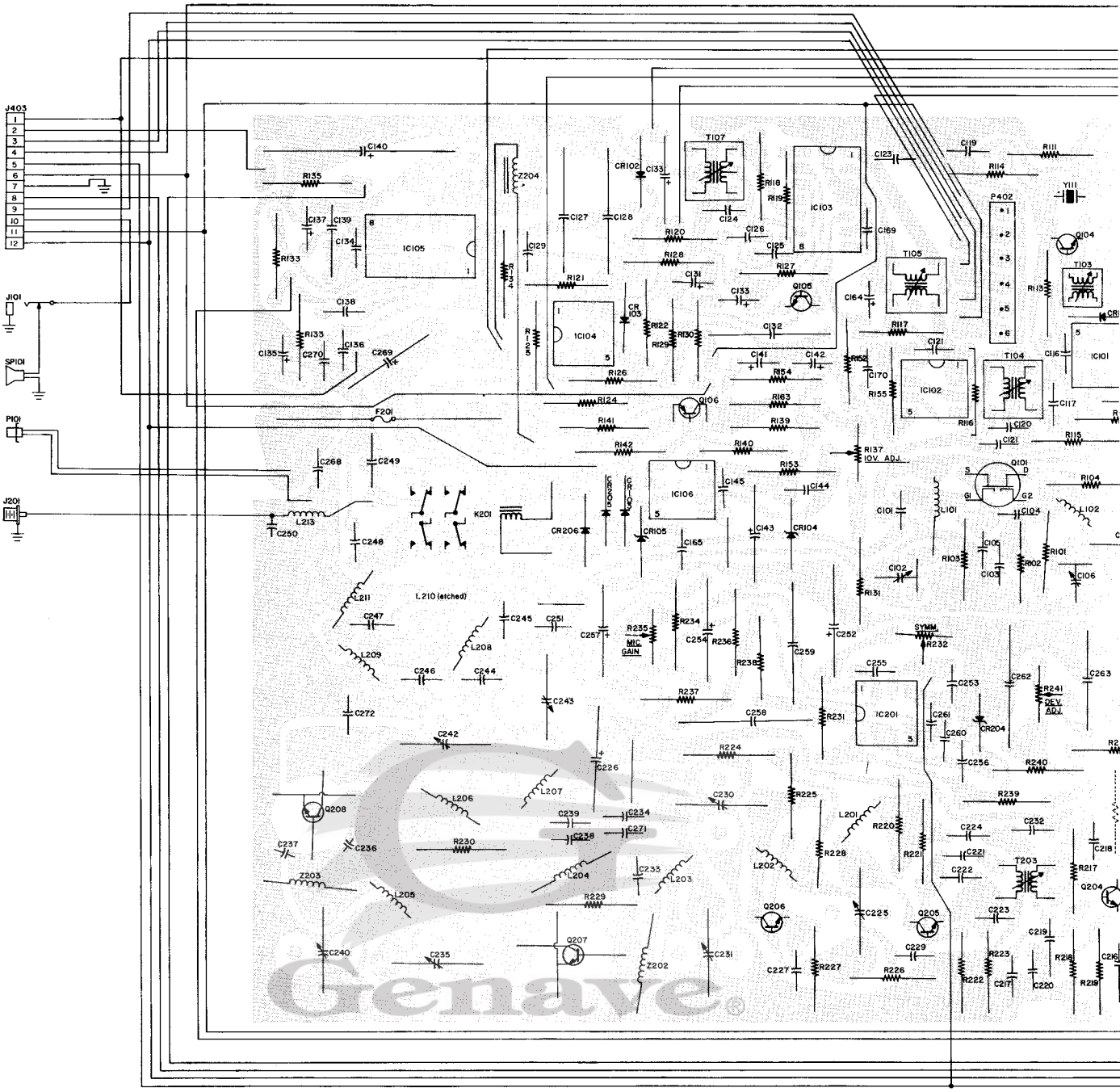
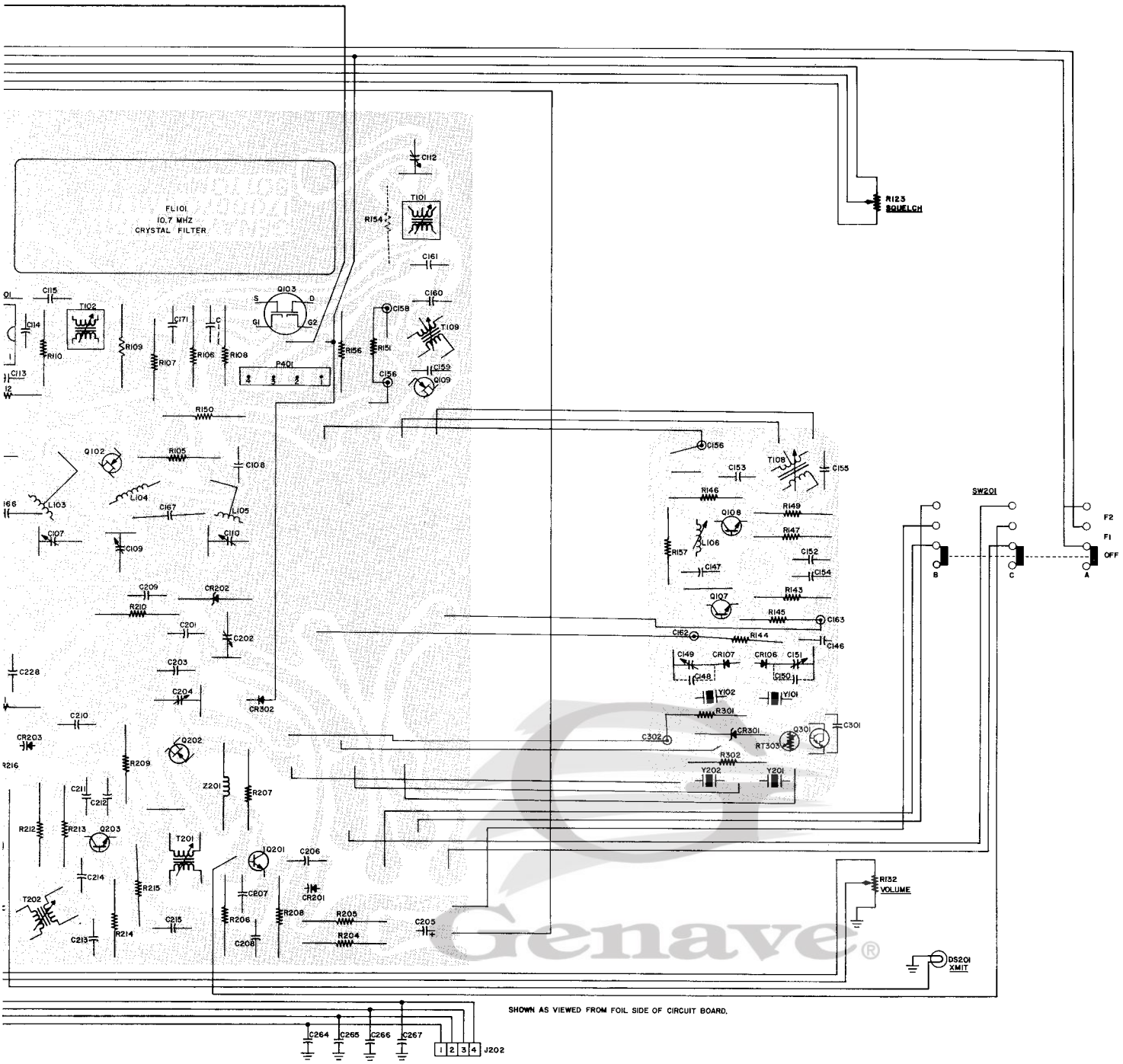
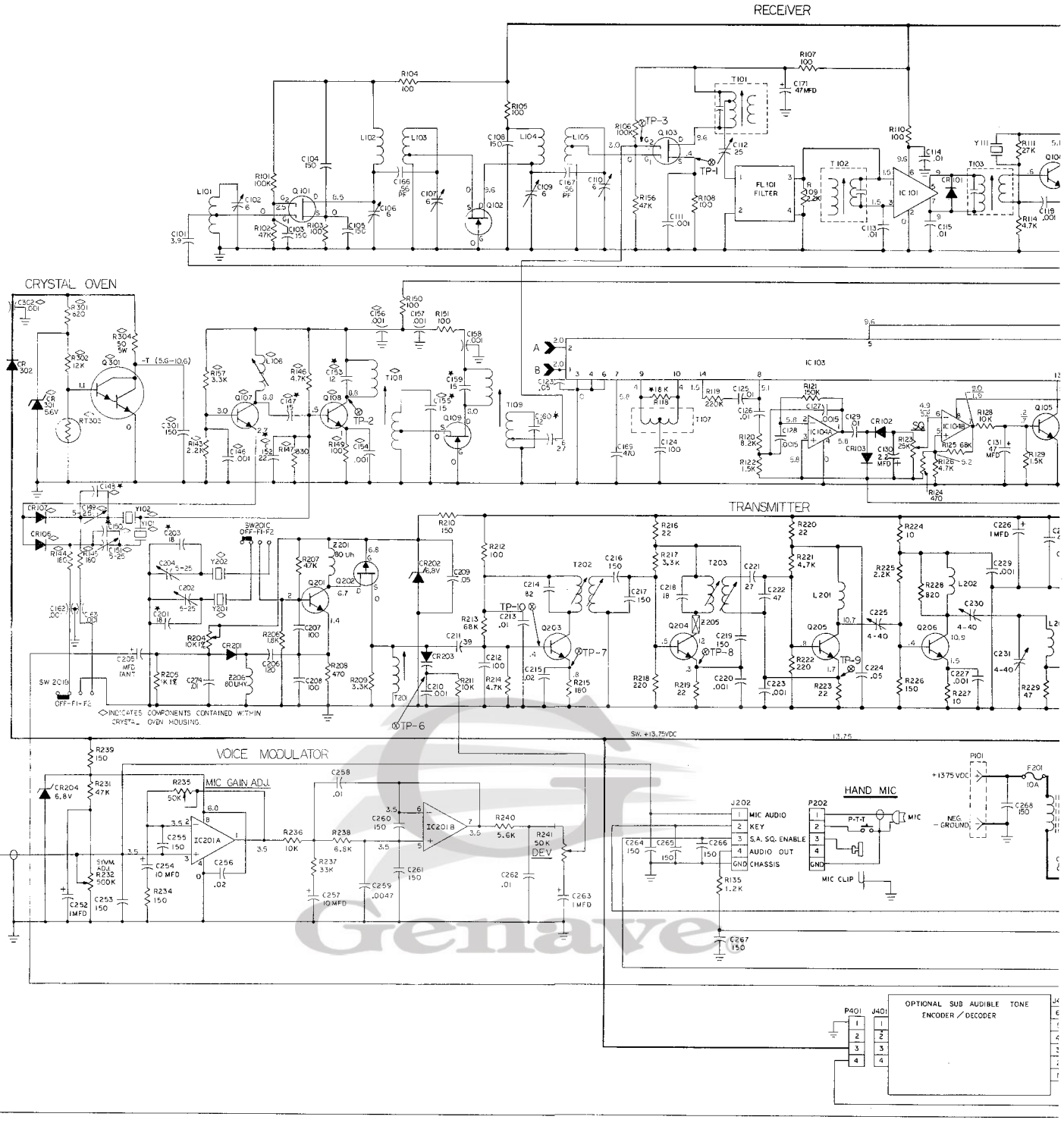


Figure 4-5-2
PARTS/TRACK MAP





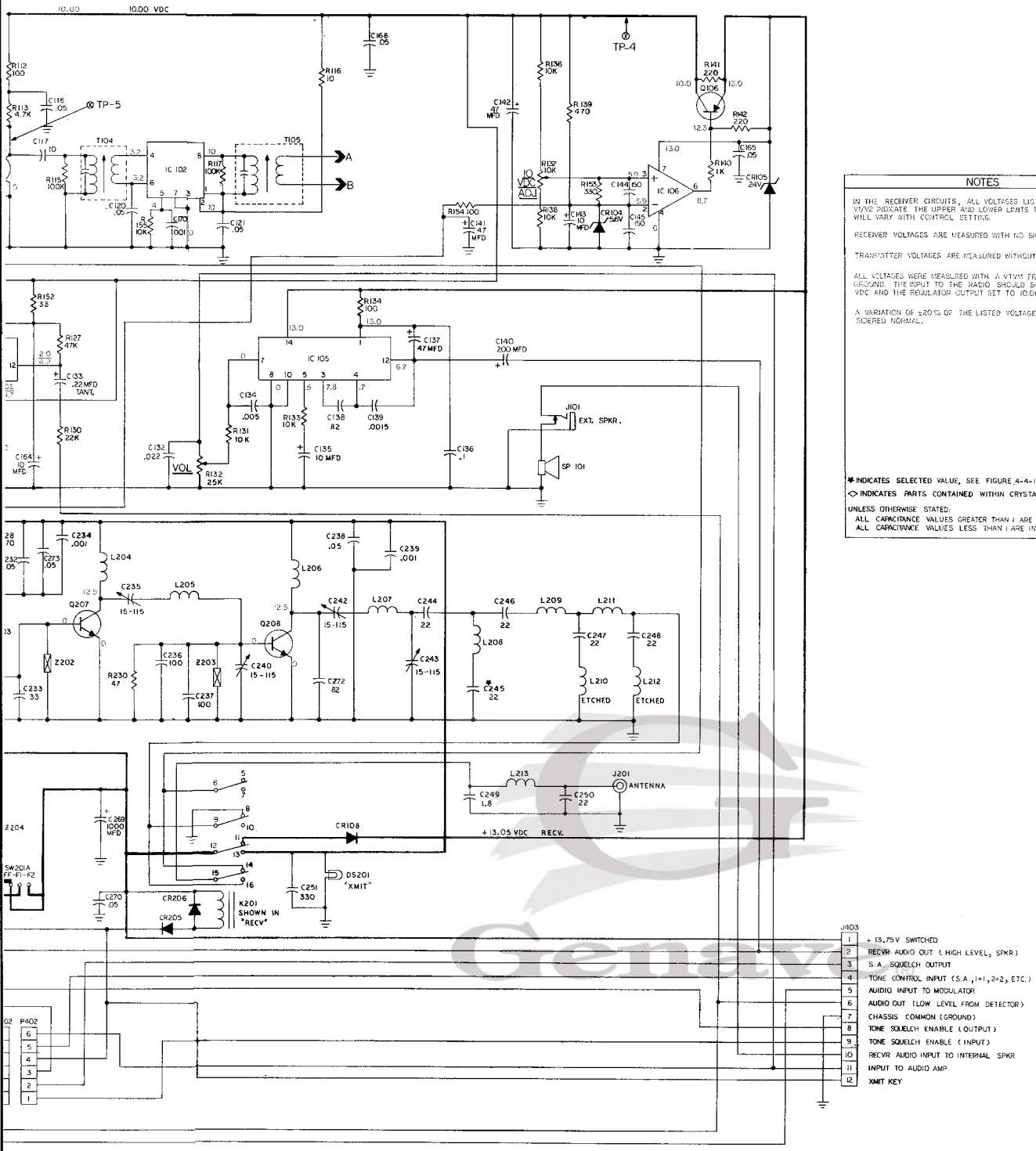


Figure 4-5-1
SCHEMATIC DIAGRAM

4-5. TROUBLESHOOTING INFORMATION

I. General

It is assumed that the technician performing any troubleshooting or repair work on the unit is familiar with the principles of communication electronics and the procedures of troubleshooting solid state electronic equipment. It is further assumed that he has the use of all of the normal test equipment found in the field.

The primary aids to troubleshooting the radio are the Schematic Diagram (Figure 4-5-1), and the Component Location Information (Figures 4-5-2 and 4-5-3). The Receiver Sensitivity Measurements of Figure 4-5-4 may be helpful in locating receiver difficulties while the Troubleshooting Hints of Figure 4-5-5 describe some special problems which may be encountered along with some suggested trouble-shooting approaches.

II. Table of Figures

A. Schematic Diagram

4-5-1 Schematic Diagram

B. Component Location Information

4-5-2 Parts/Track Map

4-5-3 Component Location Diagram

C. Troubleshooting Notes

4-5-4 Receiver Sensitivity Measurements

4-5-5 Troubleshooting Hints

4-5-6 Isolated High Impedance Detector

for output, the isolated high impedance detector of Figure 4-5-6 can be used by connecting it to the tap on T109 and to a VTVM.

Unstable Modulation

This would normally occur only if components within the audio modulation circuitry or the oscillator and buffer circuitry have been replaced. This is normally characterized by unsymmetrical deviation and transmitter carrier break-up. This condition can be caused by either overdriving the modulator or improper biasing of the modulator amplifier (as set by the symmetry adjustment). The latter can easily be remedied by readjusting the voice modulator as described in the alignment procedures.

To check for overdrive conditions proceed as follows:

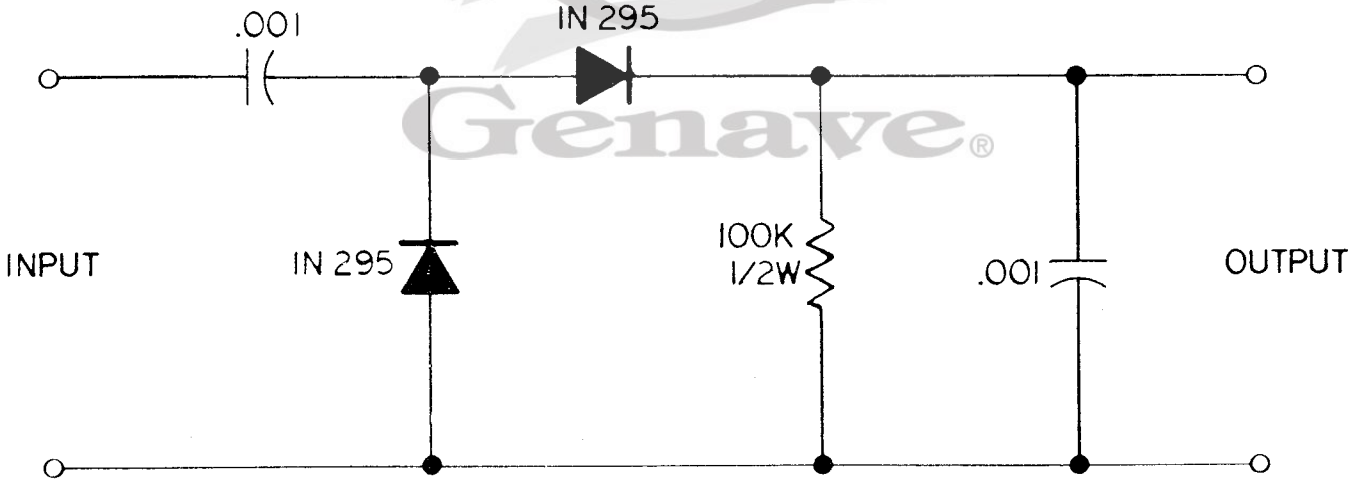
1. Connect the transceiver to the power measurement setup of Figure 4-4-5.

2. Using a VTVM, measure the DC Voltage on the cathode of CR203 (TP-6) with the transceiver in the receive mode.

3. Key the transmitter and note any change in DC voltage level. If greater than a 50 millivolt change occurs, suspect overdrive. This will normally be accompanied by a voltage level in excess of 0.7 volts on the emitter of Q208.

4. To reduce overdrive shunt Z201 with the necessary resistance to reduce the drive (normally a good starting point is a 1 K resistor) sufficiently to restore proper modulation. Check transmitter power to insure that it has not been significantly reduced.

Figure 4-5-6
ISOLATED HIGH IMPEDANCE DETECTOR



4-6. SPECIALIZED PROCEDURES

A. Front Panel Removal

Removing the front panel allows access to SW201 and the transmit indicator lamp, DS201.

1. Remove the Volume and Squelch control knobs from their shafts by pulling straight forward on the knobs.

2. Remove the two (2) recessed head screws from each side of the front panel (4 screws total).

3. The front panel can now be removed from the chassis.

4. To reassemble, reverse the above steps.

B. Sub-panel Removal

Removal of the sub-panel allows access to R123, the squelch conrtol; R132, the volume control; and the rear of SW201.

1. Remove the front panel as described above.

2. Remove the two (2) Phillips head screws from each side of the sub-panel (4 screws total).

3. The sub-panel can now be removed from the chassis.

4. To reassemble, reverse the above steps.

C. Subaudible Tone Board Removal

The subaudible tone board is designed to plug into the main board. Its removal consists of merely removing the #4-40 screw from the side of the "L" mounting bracket as shown in Figure 4-6-3 and unplugging the circuit board by pulling upward on it.

NOTE: It is not necessary to remove the nylon nut and screw which hold the "L" mounting bracket to the subaudible tone board.

D. Crystal Oven Cover Removal

Removal of the crystal oven cover allows access to the transmit and receive crystals along with various parts of the oscillator and crystal oven circuitry.

1. Remove the crystal oven cover mounting screw using a flat bladed screwdriver and a 5/16" wrench.

2. Remove the crystal oven cover.

3. To reassemble, reverse the above steps.

E. Transmitter Power Device Removal

Should it ever be necessary to replace one of the transmitter power amplifier transistors, proceed as follows:

1. Remove the #8-32 hex nut securing the transistor to the mounting tab.

2. Remove the two (2) bypass capacitors from the emitter and base leads.

3. Heat each transistor lead and bend it away from the printed circuit board. The transistor should now be free and easily removed from the board.

4. To install the new transistor, first coat the screw and the metal area at the bottom of the mounting screw with a chemical heatsink compound.

5. Insert the transistor from the bottom of the board and use a #8-32 nut to secure the transistor in place. Be sure that the transistor is properly aligned. See Figure 4-6-4.

6. Bend the four tabs of the transistor so that they mount flat against the foil of the circuit board. Solder all four (4) leads.

7. Resolder the two (2) bypass capacitors to the base and emitter leads, keeping the capacitor leads as close to the board as possible.

F. Oven/Oscillator Board Removal

Should it ever be necessary to replace any of the oven/oscillator board components, proceed as follows:

1. Remove the crystal oven cover as described in Section D (Crystal Oven Cover Removal).

2. Remove the three (3) #2-56 hex nuts securing the oven/oscillator board.

3. On the bottom of the main board, unsolder the nine (9) leads from the oven/oscillator board which protrude through the large holes in the main circuit board.

4. Remove the oven/oscillator board from the unit.

5. To reassemble, reverse the above steps.

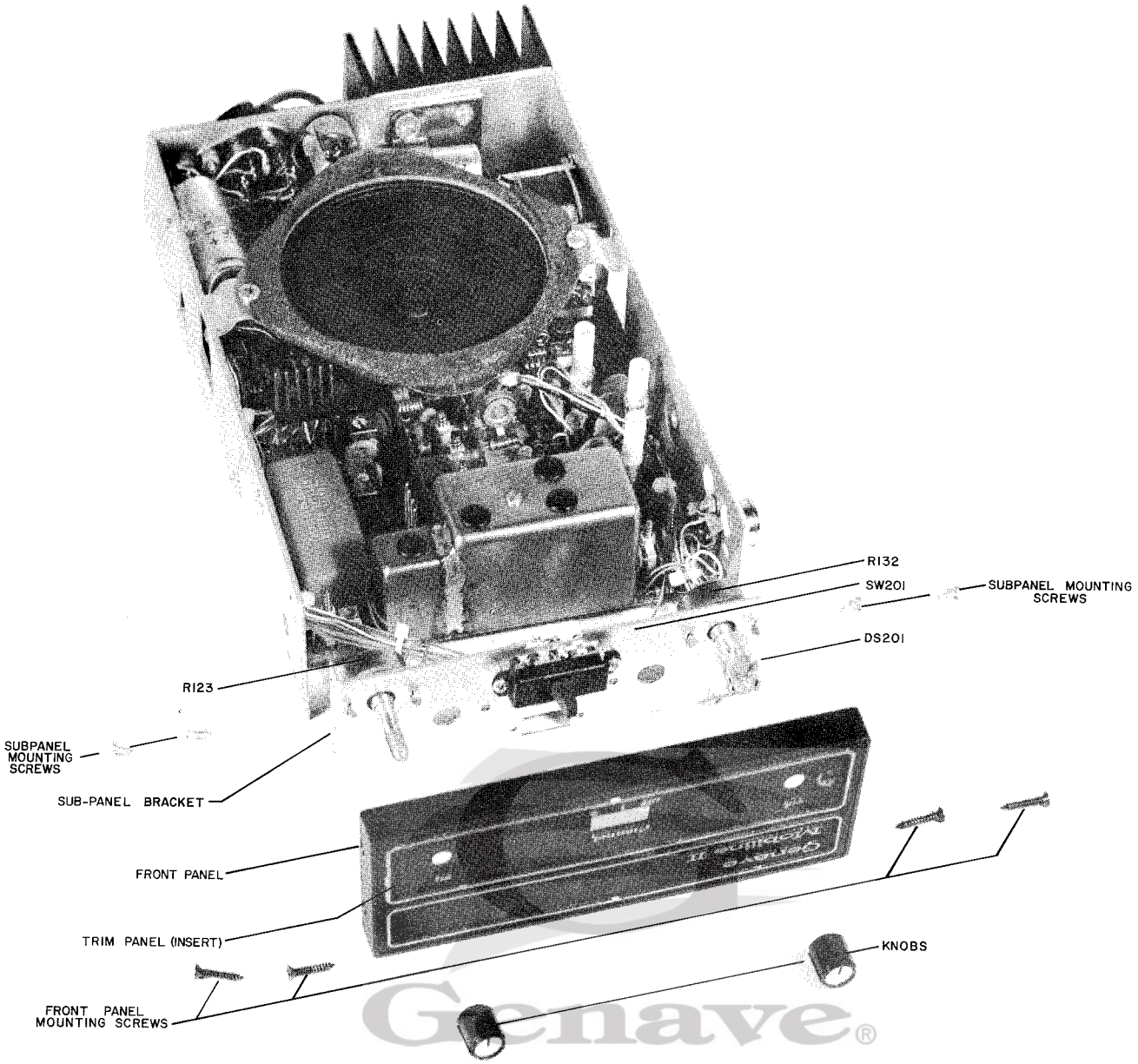


Figure 4-6-1
EXPANDED VIEW

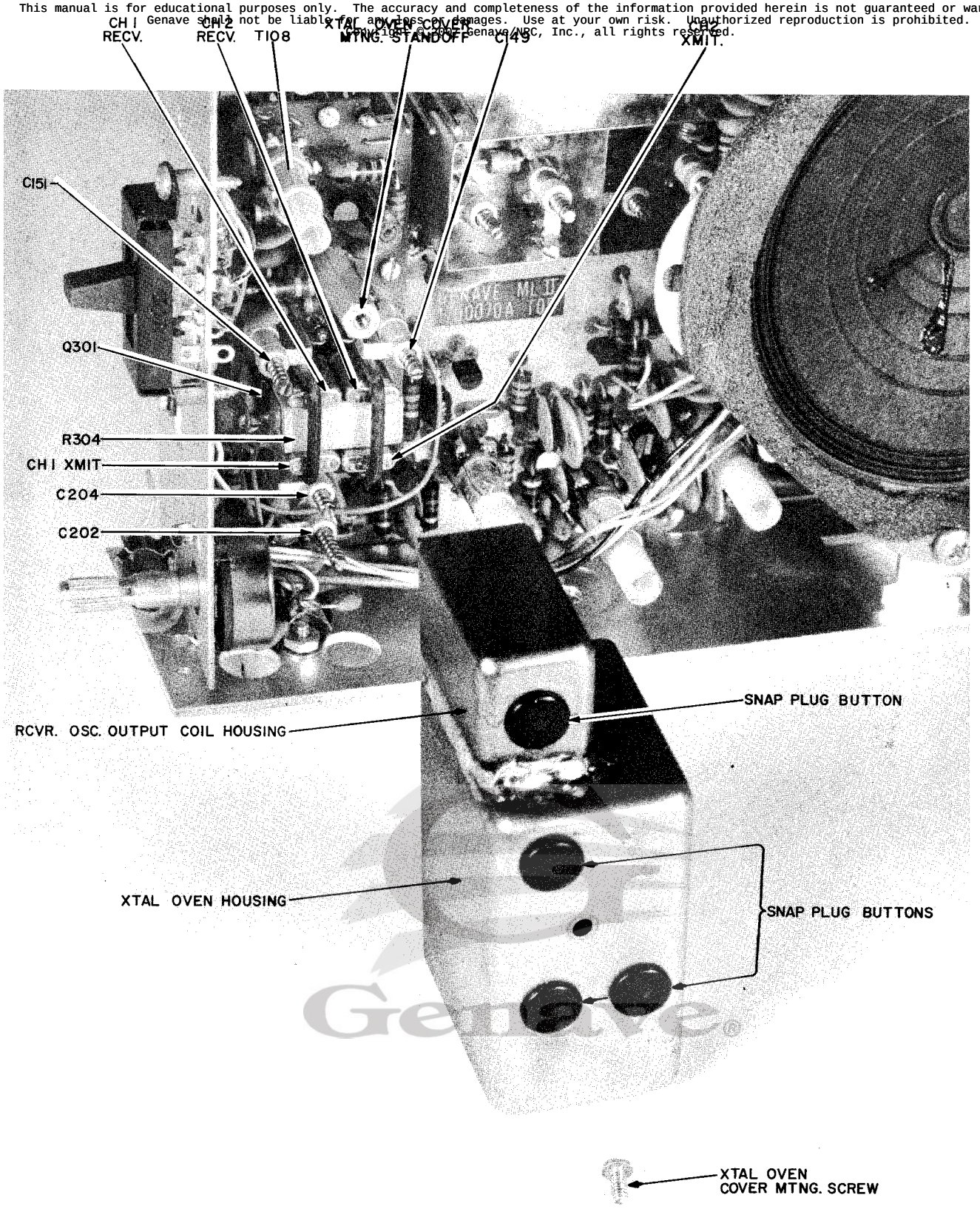


Figure 4-6-2
CRYSTAL OVEN DISASSEMBLY

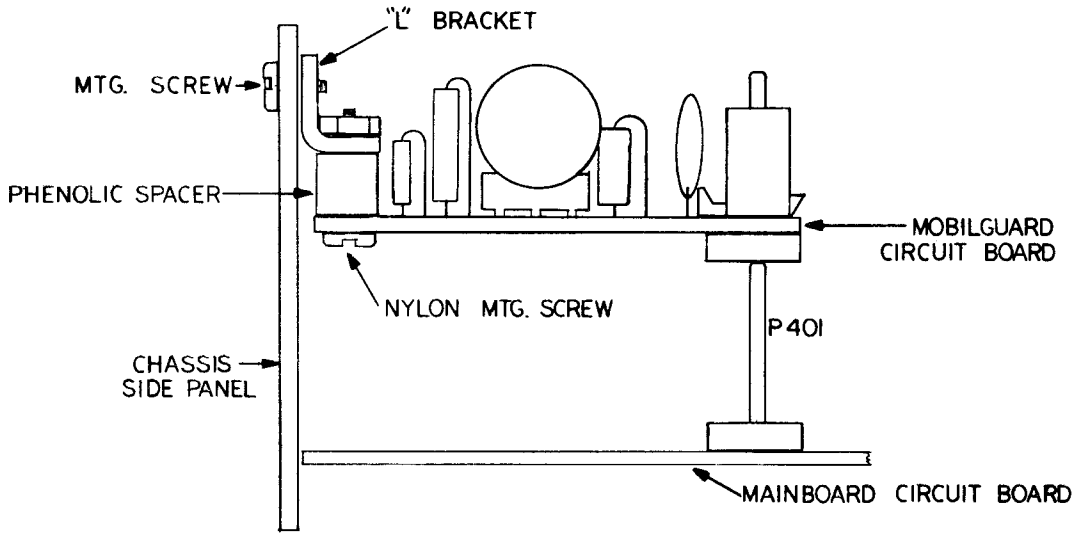


Figure 4-6-3
SUBAUDIBLE TONE BOARD MOUNTING

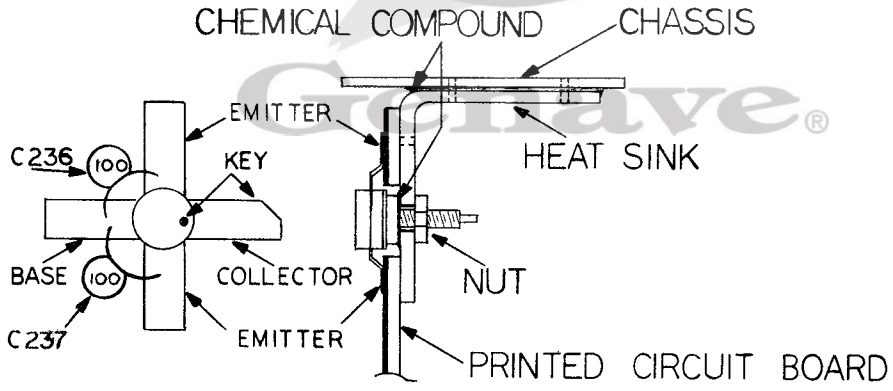


Figure 4-6-4
RF POWER DEVICE INSTALLATION

SECTION V
MOBILINE II
PARTS LIST

Reference Number	Genave Part No.	Description
		CAPACITORS
C101	1520003	NPO, Disc, 3.9 Pf, ±10%
C102	1570120	Trimmer, 1-6 Pf
C103	1520028	Y5E, Disc, 150 Pf, ±10%
C104	1520028	Y5E, Disc, 150 Pf, ±10%
C105	1520028	Y5E, Disc, 150 Pf, ±10%
C106	1570120	Trimmer, 1-6 Pf
C107	1570120	Trimmer, 1-6 Pf
C108	1520028	Y5E, Disc, 150 Pf, ±10%
C109	1570120	Trimmer, 1-6 Pf
C110	1570120	Trimmer, 1-6 Pf
C111	1520048	Z5P, Disc, .001 MFD, ±10%
C112	1570121	Trimmer, 5-25 Pf
C113	1520051	Y5U, Disc, .01 MFD, 25V, ±10%
C114	1520051	Y5U, Disc, .01 MFD, 25V, ±10%
C115	1520051	Y5U, Disc, .01 MFD, 25V, ±10%
C116	1520054	M25, Disc, .05 MFD, 25V, +80-20%
C117	1520007	NPO, Disc, 10 Pf, ±10%
C118	---	Unassigned
C119	1520048	Z5P, Disc, .001 MFD, ±10%
C120	1520054	M25, Disc, .05 MFD, 25V +80-20%
C121	1520054	M25, Disc, .05 MFD, 25V, +80-20%
C122	---	Unassigned
C123	1520054	M25, Disc, .05 MFD, 25V, +80-20%
C124	1520022	N220, Disc, 100 Pf, ±10%
C125	1520051	Y5U, Disc, .01 MFD, 25V, ±10%
C126	1520051	Y5U, Disc, .01 MFD, 25V, ±10%
C127	1500005	Mylar, .0015 MFD, ±10%, 100V, 600 UE
C128	1500005	Mylar, .0015 MFD, ±10%, 100V, 600 UE
C129	1520051	Y5U, Disc, .01 MFD, 25V, ±10%
C130	1540004	Aluminum Electrolytic, 2.2 MFD, 50V
C131	1550005	Tant., 47 MFD, ±10%, 15V
C132	1500024	Mylar, .022 MFD, ±10%, 100V, 600 UE
C133	1550001	Tant., .22 MFD, ±20%, 35V
C134	1500079	Z5U, Disc, .005 MFD, ±20%
C135	1550004	Tant., 10 MFD, ±10%, 25V
C136	1520055	Disc, .1 MFD, +80-20%, 12V
C137	1550005	Tant., 47 MFD, ±10%, 15V
C138	1520176	N330, Disc, 82 Pf, ±10%
C139	1500004	Polyethyle, .0015 MFD, ±10%, 250V
C140	1540212	Aluminum Electrolytic, 200 MFD, 12V
C141	1550005	Tant., 47 MFD, ±10%, 15V
C142	1550005	Tant., 47 MFD, ±10%, 15V

Reference Number	Genave Part No.	Description
C143	1540014	Aluminum Electrolytic, 10 MFD, 16V
C144	1520028	Y5E, Disc, 150 Pf, ±10%
C145	1520028	Y5E, Disc, 150 Pf, ±10%
C146	1520048	Z5P, Disc, .001 MFD, ±10%
C147	1520009	NPO, Disc, 15 Pf, ±10%
C148	---	Selected value 0-27 Pf - Nominal 0 Pf
C149	1570121	Trimmer, 5-25 Pf
C150	---	Selected Value 0-27 Pf - Nominal 0 Pf
C151	1570121	Trimmer, 5-25 Pf
C152	1520011	NPO Disc, 22 Pf, ±10%
C153	1520008	Selected Value 6.8 to 18 Pf - Nominal 12 Pf
C154	1520048	Z5P, Disc, .001 MFD, ±10%
C155	1520009	Selected Value 6.8 to 22 Pf - Nominal 15 Pf
C156	1520061	Feed Thru CAP, .001 MFD
C157	1520061	Feed Thru CAP, .001 MFD
C158	1520061	Feed Thru CAP, .001 MFD
C159	1520009	Selected Value 6.8 to 22 Pf - Nominal 15 Pf
C160	1520008	Selected Value 6.8 to 22 Pf - Nominal 12 Pf
C161	1520012	NPO, Disc, 27 Pf, ±10%
C162	1520061	Feed Thru CAP, .001 MFD
C163	1520061	Feed Thru CAP, .001 MFD
C164	1550004	Tan., 10 MFD, ±10%, 25V
C165	1520054	M25, Disc, .05 MFD, 25V, +80 -20%
C166	1510008	NPO, Gimmick, .56 Pf, ±10%
C167	1510008	NPO, Gimmick, .56 Pf, ±10%
C168	1520054	M25, Disc, .05 MFD, 25V, +80 -20%
C169	1520042	Y5E, Disc, 470 Pf, ±10%
C170	1520048	Z5P, Disc, .001 MFD, ±10%
C171	1550005	Tant, 47 MFD, ±10%, 15V
C201	1520010	Selected Value 6.8 to 33 Pf, - Nominal 18 Pf
C202	1560121	Trimmer, 5-25 Pf
C203	1520010	Selected Value 6.8 to 33 Pf - Nominal 18 Pf
C204	1570121	Trimmer, 5-25 Pf
C205	1550004	Tant., 10 MFD, 25V
C206	1530002	Silver Mica, 120 Pf, ±5%
C207	1520024	N1500, Disc, 100 Pf, ±10%
C208	1520024	N1500, Disc, 100 Pf, ±10%
C209	1520054	M25, Disc, .05 MFD, 25V, +80 -20%
C210	1520048	Z5P, Disc, .001 MFD, ±10%
C211	1520014	MPO, Disc, 39 Pf, ±10%
C212	1520022	N220, Disc, 100 Pf, ±10%
C213	1520051	Y5U, Disc, .01 MFD, 25V, ±10%
C214	1520176	N330, Disc, 82 Pf, ±10%
C215	1520053	M25, Disc, .02 MFD, ±10%
C216	1520027	N750, Disc, 150 Pf, ±10%
C217	1520027	N750, Disc, 150 Pf, ±10%
C218	1520010	NPO, Disc, 18 Pf, ±10%
C219	1520027	N750, Disc, 150 Pf, ±10%
C220	1520048	Z5P, Disc, .001 MFD, ±10%

Reference Number	Genave Part No.	Description
C221	1520012	NPO, Disc, 27 Pf, ±10%
C222	1520015	N1500, Disc, 47 Pf, ±10%
C223	1520048	Z5P, Disc, .001 MFD, ±10%
C224	1520054	M25, Disc, .05 MFD, 25V, +80 -20%
C225	1560403	Trimmer, 40 Pf
C226	1540002	Aluminum Electrolytic, 1 MFD, 50V
C227	1520048	Z5P, Disc, .001 MFD, ±10%
C228	1520042	Y5E, Disc, 470 Pf, ±10%
C229	1520048	Z5P, Disc, .001 MFD, ±10%
C230	1560403	Trimmer, 40 Pf
C231	1560403	Trimmer, 40 Pf
C232	1520054	M25, Disc, .05 MFD, 25V, +80 -20%
C233	1520013	NPO, Disc, 33 Pf, ±10%
C234	1520048	Z5P, Disc, .001 MFD, ±10%
C235	1560406	Trimmer, 115 Pf
C236	1520022	N220, Disc, 100 Pf, ±10%
C237	1520022	N220, Disc, 100 Pf, ±10%
C238	1520054	M25, Disc, .05 MFD, 25V +80-20%
C239	1520048	Z5P, Disc, .001 MFD, ±10%
C240	1560406	Trimmer, 115 Pf
C241	---	Unassigned
C242	1560406	Trimmer, 115 Pf
C243	1560406	Trimmer, 115 Pf
C244	1520011	NPO, Disc, 22 Pf, ±10%
C245	1520011	Selected Value 22 to 33 Pf, NPO - Nominal 22 Pf
C246	1520011	NPO, Disc, 22 Pf, ±10%
C247	1520011	NPO, Disc, 22 Pf, ±10%
C248	1520011	NPO, Disc, 22 Pf, ±10%
C249	1510014	NPO, Gimmick, 1.8 Pf, ±10%
C250	1520011	NPO, Disc, 22 Pf, ±10%
C251	1520037	Y5E, Disc, 330 Pf, ±10%
C252	1540002	Aluminum Electrolytic, 1 MFD, 40V
C253	1520028	Y5E, Disc, 150 Pf, ±10%
C254	1540014	Aluminum Electrolytic, 10 MFD, 16V
C255	1520028	Y5E, Disc, 150 Pf, ±10%
C256	1520053	M25, Disc, .02 MFD, ±10%
C257	1540014	Aluminum Electrolytic, 10 MFD, 16V
C258	1500018	Mylar, .01 MFD, ±10%, 100V, 600 UE
C259	1500013	Mylar, .0047 MFD, ±10%, 100V, 600 UE
C260	1520028	Y5E, Disc, 150 Pf, ±10%
C261	1520028	Y5E, Disc, 150 Pf, ±10%
C262	1500018	Mylar, .01 MFD, ±10%, 100V, 600 UE
C263	1540002	Aluminum Electrolytic, 1 MFD, 40V
C264	1520028	Y5E, Disc, 150 Pf, ±10%
C265	1520028	Y5E, Disc, 150 Pf, ±10%
C266	1520028	Y5E, Disc, 150 Pf, ±10%
C267	1520028	Y5E, Disc, 150 Pf, ±10%
C268	1520028	Y5E, Disc, 150 Pf, ±10%
C269	1540038	Aluminum Electrolytic, 1000 MFD, 30V
C270	1520054	M25, Disc, .05 MFD, 25V, +80-20%

Reference Number	Genave Part No.	Description
C271	---	Unassigned
C272	1520176	N330, Disc, 82 Pf, ±10%
C273	1520054	M25, Disc, .05 MFD, 25V, +80 -20%
C274	1520051	Y5U, .01 MFD, ±20%
C301	1520028	Y5E, Disc, 150 Pf, ±10%
C302	1520061	Feed thru Cap., .001 MFD
		DIODES
CR101	4810017	High Freq. Switching, FD1936
CR102	4810021	1N34A
CR103	4810021	1N34A
CR104	4810005	Zener, 5.6V, ±5%, 3/4W
CR105	4810011	Zener, 24V, ±10%, 1W
CR106	4810017	High Freq. Switching, FD1936
CR107	4810017	High Freq. Switching, FD1936
CR108	4810013	Gen. Purpose, 100V @ 1 amp
CR201	4810017	Diode-SW, FD1936
CR202	4810007	Zener, 6.8V, ±10%
CR203	4812109	Varicap, MV2109, SKV1638
CR204	4810007	Zener, 6.8V, ±10%
CR205	4810013	Gen. Purpose, 100V @ 1 amp
CR206	4810013	Gen. Purpose, 100V @ 1 amp
CR301	4810005	Zener, 5.6V, ±5%, 3/4W
CR302	4810013	Gen. Purpose, 100V @ 1 amp
		LAMPS
DS201	3900025	Clear, 14.4V #53
		COILS
L101	1800225	Coil, Rcv, RF amp input
L102	1800116	Coil, Rcv, RF amp
L103	1800117	Coil, Rcv, RF amp
L104	1800118	Coil, Rcv, RF amp
L105	1800119	Coil, Rcv, RF amp
L106	1800316	Coil, Rcv, Osc
L201	1800203	Coil, Xmtr, 3 1/2 T., L.H.H.
L202	1800201	Coil, Xmtr, 2 1/2 T., L.H.H.
L203	1800201	Coil, Xmtr, 2 1/2 T., L.H.H.
L204	1800202	Coil, Xmtr, 3 1/2 T., R.H.H.
L205	1800201	Coil, Xmtr, 2 1/2 T., L.H.H.
L206	1800204	Coil, Xmtr, 4 1/2 T., L.H.H.

Reference Number	Genave Part No.	Description
L207	1800201	Coil, Xmtr, 2 1/2 T, L.H.H.
L208	1800204	Coil, Xmtr, 4 1/2 T, L.H.H.
L209	1800201	Coil, Xmtr, 2 1/2T, L.H.H.
L210	---	Coil, Xmtr, Etched on P.C. board
L211	1800203	Coil, Xmtr, 3 1/2 T., L.H.H.
L212	---	Coil, Xmtr, Etched on P.C. board
L213	1800205	Coil, Xmtr, 2 T., L.H.H.
		TRANSISTORS
Q101	4800056	MOSFET, Dual Gate, FT0601
Q102	4805484	JFET, N. Channel, 2N5484
Q103	4800122	MOSFET, N. Channel, Dual Gate MPF 122
Q104	4800026	Silicon, NPN, White Dot MPS3693S
Q105	4800033	Silicon, NPN, MPS5172
Q106	4800022	Silicon, PNP, Power, MPSU51
Q107	4800024	Silicon, NPN, Blue Dot, MPS3563
Q108	4800024	Silicon, NPN, Blue Dot, MPS3563
Q109	4805484	JFET, N. Channel, 2N5484
Q201	4800033	Silicon, NPN, MPS5172
Q202	4805461	JFET, P. Channel 2N5461
Q203	4800026	Silicon, NPN, White Dot, MPS3693S
Q204	4800027	Silicon, NPN, MPS6511
Q205	4804427	Silicon, NPN, 2N4427
Q206	4804427	Silicon, NPN, 2N4427
Q207	4806080	Silicon, NPN, 2N6080
Q208	4806082	Silicon, NPN, 2N6082
Q301	2509671	Silicon, NPN, Darlington, MPSU45, Heater Component Assembly
		IC's
IC101	3130016	OP AMP, Linear, LM703LN
IC102	3130017	OP-AMP, RF AGC, MC1350P
IC103	3136666	Silicon, TISN76666N
IC104	3130012	OP-AMP, N5558V
IC105	3136001	Silicon, Audio Output, SN76001N
IC106	3130013	OP-AMP, Single, MC1741CP1
IC201	3130012	OP-AMP, N5558V
		RESISTORS
R101	4700049	100K, ±10%, 1/2W
R102	4700045	47K, ±10%, 1/2W
R103	4700013	100 ohm, ±10%, 1/2W
R104	4700013	100 ohm, ±10%, 1/2W
R105	4700013	100 ohm, ±10%, 1/2W
R106	4700049	100K, ±10%, 1/2W

Reference Number	Genave Part No.	Description
R107	4700013	100 ohm, ±10%, 1/2W
R108	4700013	100 ohm, ±10%, 1/2W
R109	4700029	2.2K, ±10%, 1/2W
R110	4700013	100 ohm, ±10%, 1/2W
R111	4700042	27K, ±10%, 1/2W
R112	4700013	100 ohm, ±10%, 1/2W
R113	4700033	4.7K, ±10%, 1/2W
R114	4700033	4.7K, ±10%, 1/2W
R115	4700049	100K, ±10%, 1/2W
R116	4700003	10 ohm, ±10%, 1/2W
R117	4700049	100K, ±10%, 1/2W
R118	4700040	Selected Value - Nominal, 18K ohm, ±10%, 1/2W
R119	4700053	220K, ±10%, 1/2W
R120	4700036	8.2K, ±10%, 1/2W
R121	4700051	150K, ±10%, 1/2W
R122	4700027	1.5K, ±10%, 1/2W
R123	4760024	Variable, Linear Taper, 25K, ±20%, (SQ.)
R124	4700021	470 ohm, ±10%, 1/2W
R125	4700047	68K, ±10%, 1/2W
R126	4700033	4.7K, ±10%, 1/2W
R127	4700045	47K, ±10%, 1/2W
R128	4700037	10K, ±10%, 1/2W
R129	4700027	1.5K, ±10%, 1/2W
R130	4700041	22K, ±10%, 1/2W
R131	4700037	10K, ±10%, 1/2W
R132	4760025	Variable, Audio Taper, 25K, ±20%, (Vol.)
R133	4700037	10K, ±10%, 1/2W
R134	4700013	100 ohm, ±10%, 1/2W
R135	4700026	1.2K, ±10%, 1/2W
R136	4700037	10K, ±10%, 1/2W
R137	4760019	Variable, 10K, ±20%, Minipot
R138	4700037	10K, ±10%, 1/2W
R139	4700021	470 ohm, ±10%, 1/2W
R140	4700025	1K, ±10%, 1/2W
R141	4700017	220 ohm, ±10%, 1/2W
R142	4700017	220 ohm, ±10%, 1/2W
R143	4700029	2.2K, ±10%, 1/2W
R144	4700016	180 ohm, ±10%, 1/2W
R145	4700016	180 ohm, ±10%, 1/2W
R146	4700033	4.7K, ±10%, 1/2W
R147	4700019	330 ohm, ±10%, 1/2W
R148	---	Unassigned
R149	4700013	100 ohm, ±10%, 1/2W
R150	4700013	100 ohm, ±10%, 1/2W
R151	4700013	100 ohm, ±10%, 1/2W
R152	4700008	33 ohm, ±10%, 1/2W
R153	4700019	330 ohm, ±10%, 1/2W
R154	4700013	100 ohm, ±10%, 1/2W
R155	4700037	10K, ±10%, 1/2W
R156	4700045	47K, ±10%, 1/2W
R157	4700031	3.3K, ±10%, 1/2W

Reference Number	Genave Part No.	Description
R201	---	Unassigned
R202	---	Unassigned
R203	---	Unassigned
R204	4760006	Variable, 10K, Ceramic
R205	4720005	1K, 1%, 1/4W
R206	4700028	1.8K, ±10%, 1/2W
R207	4700033	4.7K, ±10%, 1/2W
R208	4700021	470 ohm, ±10%, 1/2W
R209	4700031	3.3K, ±10%, 1/2W
R210	4700015	150 ohm, ±10%, 1/2W
R211	4700037	10K, ±10%, 1/2W
R212	4700013	100 ohm, ±10%, 1/2W
R213	4700047	68K, ±10%, 1/2W
R214	4700033	4.7K, ±10%, 1/2W
R215	4700016	180 ohm, ±10%, 1/2W
R216	4700006	22 ohm, ±10%, 1/2W
R217	4700031	3.3K, ±10%, 1/2W
R218	4700017	220 ohm, ±10%, 1/2W
R219	4700006	22 ohm, ±10%, 1/2W
R220	4700006	22 ohm, ±10%, 1/2W
R221	4700033	4.7K, ±10%, 1/2W
R222	4700017	220 ohm, ±10%, 1/2W
R223	4700006	22 ohm, ±10%, 1/2W
R224	4700003	10 ohm, ±10%, 1/2W
R225	4700029	2.2K, ±10%, 1/2W
T226	4700015	150 ohm, ±10%, 1/2W
R227	4700003	10 ohm, ±10%, 1/2W
R228	4700024	820 ohm, ±10%, 1/2W
R229	4700009	47 ohm, ±10%, 1/2W
R230	4700009	47 ohm, ±10%, 1/2W
R231	4700045	47K, ±10%, 1/2W
R232	4760039	Variable, 500K, ±20%, Minipot
R233	---	Unassigned
R234	4700015	150 ohm, ±10%, 1/2W
R235	4760021	Variable, 50K, ±20%, Minipot
R236	4700037	10K, ±10%, 1/2W
R237	4700043	33K, ±10%, 1/2W
R238	4700035	6.8K, ±10%, 1/2W
R239	4700015	150 ohm, ±10%, 1/2W
R240	4700034	5.6K, ±10%, 1/2W
R241	4760021	Variable, 50K, ±20%, Minipot
R301	4700024	820 ohm, ±10, 1/2W
R302	4700038	12K, ±10%, 1/2W
RT303	2509671	10K, Thermistor, Heater Component Assembly
R304	2509671	50 ohm, ±10%, 5W, PW5, Heater Component Assy.

Reference Number	Genave Part No.	Description
		XFMRS
T101	5600046	10.7 MHz
T102	5600046	10.7 MHz
T103	5600046	10.7 MHz
T104	5600012	455 kHz, IF, White Core
T105	5600012	455 kHz, IF, White Core
T106	---	Unassigned
T107	5600012	455 kHz, IF, White Core
T108	5600047	Osc, Tripler
T109	5600048	Osc, Buffer
T201	5600081	Xmtr, Osc.
T202	5600082	Xmtr, Tripler
T203	5600083	Xmtr, 1st Doubler
		CRYSTALS
See crystal information following Parts List		
FL101	2303501	Filter, Crystal, 10.7 MHz, 15 kHz, BW, 8 Pole
		CHOKES
Z201	1800032	80 Microhenry
Z202	1800063	Ferrox Cube Core
Z203	1800063	Ferrox Cube Core
Z204	1800247	1 MHY, 5 amps, D.C.
Z205	1870004	Ferrite Bead
Z206	1800032	80 Microhenry
		MISCELLANEOUS
K201	4500007	Relay, 4 PDT
SW201	5100086	Switch, Slide, OFF/CHA. 1/CHA.2
--	2509591	Panel, Front
--	2509391	Panel, Trim
--	2508401	Knob, Vol. & Squelch
--	2509692	Bracket, Sub-panel
--	2502292	Bracket, Mtg. (handle)
--	2508801	Cover, Wrap-around, Black, Vinyl-clad
--	1325070	Microphone (ceramic)
SP101	1320408	Speaker, 1.5W, 8 ohm
F201	5140021	Fuse, 3 AG, 10.0A
--	2509542	Heatsink (rear chassis, ext.) for final
--	2502281	Q208 Mtg. "L" Bracket, Copper (rear chassis)
--	2509551	Housing, Crystal Oven
--	2509461	Housing, Rcvr. Osc. output coil
--	2509471	Shield, RF amplifier
--	2400023	Thumb wheel (for handle bracket)

Reference Number	Genave Part No.	Description
--	2508532	Bracket, Lock (for handle bracket)
--	9050005	Button, Snap plug (oven & output coil housings)
--	2508791	"O" Rings 5/8" I.C. (xtals to PW5 heater)
--	2508732	Chassis, Main
DS201	3900025	Transmit Indicator Light #53
--	2502011	Switch Cover
		CONNECTORS
J201	2100239	Receptacle, SO239 (ant. jack)
P202	2100076	Conn. 4 Pin Male (mic. plug)
J202	2100077	Conn. 4 Pin Female (chassis mic jack)
J403	2100071	Jack, 12 pin, (on rear chassis) female
P403	2100013	Conn., 12 pin male (mate to J403)
J101	2100066	Conn., Phone jack, (ext. speaker)
P401	2100091	Conn. Assembly, 4 pin (sub - aud. tone brd.)
P402	2100090	Conn. Assembly, 6 pin (sub - aud. tone brd.)

5-1. CRYSTAL INFORMATION

Should it become necessary to change or add a secondary transmit and/or receive frequency to the Mobiline II, a new transmit and/or receive crystal will have to be installed in the unit. The transceiver will also have to be realigned to insure proper operation on the new frequency.

Crystals for the Mobiline II are available from the factory at nominal cost by calling the factory Parts Department and specifying the desired operating frequency, whether transmit or receive, and the receiver type designation if receive crystals are desired. Crystals may also be obtained from other sources. The information necessary for ordering these crystals from other sources is as follows:

All Transmit Crystals

Parallel Mode:	C_p = 20 pfd.
Fundamental Cut Tolerance:	±.001% Calibration Tolerance at 25°C ±1°C. ±.001% Maximum Drift Over Temperature Range.
Temperature Range:	-30°C to +60°C.
Holder:	HC-25/U
Crystal Frequency:	$\frac{\text{Operating Frequency}}{12}$
Genave Part No.:	2300211

Type A and B Receivers

Parallel Mode:	C_p = 32 pfd.
Third Overtone Tolerance:	±.001% Calibration Tolerance at 25°C ±1°C. ±.001% Maximum Drift Over Temperature Range.
Temperature Range:	-30°C to +60°C.
Holder:	HC-25/U
Crystal Frequency:	$\frac{\text{Operating Frequency - 10.7 MHz}}{3}$
Genave Part No.:	2300226

Type C and D Receivers

Parallel Mode:	C_p = 32 pfd.
Third Overtone Tolerance:	±.001% Calibration Tolerance at 25°C ±1°C. ±.001% Maximum Drift Over Temperature Range.
Temperature Range:	-30°C to +60°C
Holder:	HC-25/U
Crystal Frequency:	$\frac{\text{Operating Frequency}}{3}$ 10.7 MHz
Genave Part No.:	2300227

Type E and F Receivers

Parallel Mode:	C_p = 32 pfd.
Fifth Overtone Tolerance:	±.001% Calibration Tolerance at 25°C ±1°C. ± 1% Maximum Drift Over Temperature Range.
Temperature Range:	-30°C to +7-°C.
Holder:	HC-25/U
Crystal Frequency:	$\frac{\text{Operating Frequency - 10.7 MHz}}{2}$
Series Impedance:	45 ohms maximum
Genave Part No.:	2300228

Type G and H Receivers

Parallel Mode:	C_p = 32 pfd.
Fifth Overtone Tolerance:	±.001% Calibration Tolerance at 25°C ±1°C. ±.001% Maximum Drift Over Temperature Range.
Temperature Range:	-30°C to +7-°C.
Holder:	HC-25/U
Crystal Frequency:	$\frac{\text{Operating Frequency +10.7 MHz}}{2}$
Series Impedance:	45 ohms Maximum
Genave Part No.:	2300229